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Docket No. A-2022-3037374

Hearing Date: August 15, 2023

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**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-2022-3037374
For Approval To Rebuild The Existing :
Double-Circuit Stanton-Summit #3 :
And #4 230 kV Transmission Lines :
Connecting the Stanton 230 kV :
Substation And A Two-Pole Turn :
Structure That Are Respectively :
Located In Luzerne And Lackawanna :
Counties, Pennsylvania :

PPL Electric Utilities Corporation

Statement No. 1

Written Direct Testimony of

Joseph B. Lookup

Topics Addressed: **System Planning Process**
 Need for the Project and Alternatives
 Considered
 Engineering and Design of the Project

Dated: **May 24, 2023**

1 **I. INTRODUCTION**

2 **Q. Please state your full name and business address.**

3 A. My name is Joseph B. Lookup. My business address is 2 North 9th Street,
4 Allentown, PA 18101

5

6 **Q. By whom are you employed and in what capacity?**

7 A. I am employed by PPL Services Corporation as Director of Asset Management and
8 provide services to PPL Electric Utilities Corporation (“PPL Electric” or the
9 “Company”).

10

11 **Q. What are your current responsibilities?**

12 A. I oversee the Transmission Planning, Asset Strategy, Portfolio Management,
13 Project Development, Real Estate, Project Management and Construction
14 Management Groups. This includes responsibility for Transmission system
15 reliability, investment strategy and project execution.

16

17 **Q. Please provide your educational background.**

18 A. I received a Bachelors of Engineering in Architectural Engineering – Electrical,
19 from The Pennsylvania State University.

20

21 **Q. Please describe your professional experience.**

22 A. Prior to working at PPL Electric I worked as a consultant providing engineering,
23 project management, construction management services for utility, industrial,
24 commercial, and educational clients. At PPL Electric I have worked in

1 Engineering, Project and Construction Management, and Asset Management in
2 various engineering and project leadership, and management roles.

3

4 **Q. What is the subject matter of your direct testimony?**

5 A. The purpose of my testimony is to summarize the information detailed in the above-
6 captioned Letter of Notification or “LON” and associated Attachment 1 – Necessity
7 Statement, Attachment 2 – Engineering Description, Attachment 3 – Description of
8 Project Area, and Attachment 4 – PPL Electric Design Criteria and Safety Practices
9 to PPL Electric’s Stanton-Summit #3 and #4 230 kV COR-TEN® Rebuild Project.
10 As such, I will describe: (1) PPL Electric’s transmission system planning process,
11 including the role of PJM Interconnection, LLC (“PJM”); (2) the existing double-
12 circuit Stanton-Summit #3 and #4 230 kV Transmission Lines connecting the
13 Stanton 230 kV Substation (“Stanton Substation”) and a two-pole structure
14 (Structures 56275-N-4751(L)/56274-N-47518(R) located approximately 1.4 miles
15 north of the Summit 230-69kV Substation (“Summit Substation”) that are
16 respectively located in Luzerne and Lackawanna Counties, Pennsylvania
17 (“Project”); (3) the need for PPL Electric’s proposal to rebuild the Stanton-Summit
18 #3 and #4 230 kV Transmission Lines; (4) PPL Electric’s proposed engineering
19 and design of the Project, including the Company’s design criteria and safety
20 practices; and (5) the proposed Project and alternatives considered by PPL Electric.
21 PPL Electric witness Christopher Szmodis is sponsoring direct testimony regarding
22 the certain possible alternatives to the Project that have been the subject of

1 discovery by the Office of Consumer Advocate (“OCA”) as part of PPL Electric
2 St. No. 2.

3

4 **Q. Are you responsible for the preparation of any of the Attachments filed with**
5 **the above captioned Letter of Notification?**

6 A. Yes. Attachments 1-4 were prepared by me or under my supervision. These
7 attachments are included with my direct testimony as PPL Electric Exhibits JBL-1
8 through JBL-4. In addition, I verified the contents of the Letter of Notification filed
9 by the Company at the above-captioned docket.

10

11 **II. OVERVIEW OF PLANNING PROCESS**

12 **Q. Please provide an overview of PPL Electric’s responsibility to provide and**
13 **maintain transmission system assets.**

14 A. PPL Electric has a responsibility to provide transmission assets and maintain them
15 in a manner that is safe, reliable, and resilient to meet the needs of the electric
16 system and the service expectations of its customers. To meet this duty, PPL
17 Electric applies its Transmission Asset Management Procedure, which includes
18 system performance and condition assessments. These performance and condition
19 assessments identify system needs and prioritize projects based on several variables
20 such as equipment age, condition, maintenance schedule, and impact on system
21 reliability and performance to ensure a reliable electric grid and reasonable service
22 to its customers.

23

24 **Q. What is the role that the transmission system plays in the electric grid?**

1 A. The nation’s interconnected transmission system (“Transmission Grid”) serves as
2 the backbone for safe and reliable delivery of large amounts of electricity from
3 generating stations over substantial distances to customers served by transmission
4 and local distribution systems. It is critical that the Transmission Grid be planned
5 and designed to ensure reliable electric service is provided under all loading
6 conditions or when certain elements of the Transmission Grid are out of service
7 (system contingencies) due to planned or unplanned outages.

8

9 **Q. Can you briefly describe PJM, its responsibilities, and PPL Electric’s role as**
10 **a member of PJM?**

11 A. PJM is a Federal Energy Regulatory Commission (“FERC”)-approved Regional
12 Transmission Organization (“RTO”) charged with ensuring the reliability of the
13 electric transmission system under its functional control (100 kV and above), and
14 coordinating the movement of electricity in all or parts of thirteen states and the
15 District of Columbia, including Pennsylvania. To ensure reliable transmission
16 service, PJM prepares an annual Regional Transmission Expansion Plan (“RTEP”)
17 to identify system reinforcements that are required to, among other things, meet the
18 NERC Reliability Standards, PJM reliability planning criteria, and Transmission
19 Owner reliability criteria.

20 When transmission owning utilities (including PPL Electric) set up PJM as
21 an RTO, they agreed to bind themselves to maintaining their existing transmission
22 systems using Good Utility Practice. The Consolidated Transmission Owners
23 Agreement (“TOA”) is an agreement among (1) individual Transmission Owners

1 operating within the PJM Region and (2) between the Transmission Owners and
2 PJM. The TOA facilitates the planning and operation of the Transmission Grid
3 within the PJM region and establishes the rights and responsibilities of each party
4 to the TOA. Section 4.6 of the TOA requires that transmission systems “[b]e kept
5 in place and maintained in good operating condition in accordance with Good
6 Utility Practice and principles, guidelines and standards of the applicable Regional
7 Reliability Council and NERC.” The Project is required to fulfill PPL Electric’s
8 obligations under the TOA.

9

10 **Q. Please describe PPL Electric’s transmission system planning process.**

11 A. PPL Electric’s Transmission Asset Management Procedure involves identifying
12 system needs and determining the best available solution to address those needs.
13 This process includes asset evaluation, asset condition and system risk assessments,
14 analysis of alternative solutions, and project initiation and scheduling. System
15 needs are identified based on the overarching goals of reducing outage frequency
16 and duration, improving system reliability, decreasing system maintenance cost,
17 and maintaining operational flexibility to ensure safe and reliable electric service
18 of the transmission system and to PPL Electric’s customers.

19

20 **III. NEED FOR PROPOSED PROJECT**

21 **Q. What existing PPL Electric facilities are the subjects of the Project?**

22 A. The Project proposes to rebuild approximately 7.7 miles of existing double-circuit
23 230 kV transmission lines that connect the Stanton Substation and Summit
24 Substation, *i.e.*, the Stanton-Summit #3 and #4 230 kV Transmission Lines. These

1 lines are currently supported by 46 COR-TEN® lattice tower structures. The
2 double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines are in PPL
3 Electric’s Northeast Region and are part of a larger 230 kV transmission network
4 that connects generation in this region to load throughout PPL Electric and the rest
5 of PJM’s footprint. This 230 kV network includes the Lackawanna-Paupack 230
6 kV, Summit-Lackawanna 230 kV, Jenkins-Stanton 230 kV, Lackawanna-Paupack
7 230 kV, and Susquehanna-Jenkins 230 kV Transmission Lines, which all support
8 bulk power flow and feed various 230-69 kV substations in the Northeast Region.
9 Figure 1-1 in Attachment 1 – Necessity Statement, provides a map of the existing
10 system configuration.

11

12 **Q. Please describe why it is necessary to rebuild the existing Stanton-Summit #3**
13 **and #4 230 kV Transmission Lines, as proposed in the Letter of Notification**
14 **and associated Attachments.**

15 A. The Project is needed to address asset health concerns that are being accelerated by
16 increased incidences of pack-out rust¹ associated with COR-TEN® lattice towers.
17 The subject lattice towers had an expected service life of 75 years and were installed
18 in the early 1970s. The subsequent discovery of increased incidences of pack-out
19 rust associated with COR-TEN® lattice towers has accelerated the rate at which
20 these towers were expected to reach end-of-life, and, in some cases, the towers have

¹ “Pack-out rust” or “pack rust” is a form of localized corrosion typical of steel components that develop a crevice into an open atmospheric environment, which results in rust packing between conjoined steel components. Pack-out rust accelerates the deterioration of asset health and can result in shearing off bolts, loss of structural integrity, members disconnecting from lattice towers, and tower failure.

1 deteriorated and are continuing to deteriorate beyond the point where they can
2 safely operate as designed and cannot be reasonably or cost effectively remediated.

3

4 **Q. Has the Company conducted any reviews of its transmission system to assess**
5 **COR-TEN® lattice structures on its 230 kV transmission lines?**

6 A. Yes.

7

8 **Q. Please describe the reviews that have been conducted by or for the Company.**

9 A. In 2013, PPL Electric utilized a third-party contractor to perform an assessment of
10 the COR-TEN® lattice structures on its 230 kV transmission lines under a steel
11 structure capital maintenance program. The assessment identified that 126 of 131
12 COR-TEN® structures (96%) had one or more structure legs rated Condition C
13 (poor) or Condition D (very poor). As explained in Attachment 1 – Necessity
14 Statement, 25 structures had one or more legs that were identified as “priority” and
15 required immediate attention, and protective coating was applied to the 101 other
16 non-priority structures. However, those structures face constant asset health
17 concerns due to the presence of pack-out rust. Ongoing inspections conducted since
18 2014 have confirmed that these structures are continuing to degrade.

19 PPL Electric subsequently contracted with independent, non-affiliated
20 inspection companies to conduct evaluations of COR-TEN® lattice towers to
21 determine the overall condition of these towers on the PPL Electric Transmission
22 System in 2019. These evaluations included inspection of 15 randomly selected
23 COR-TEN® lattice towers across the PPL Electric Transmission System by three

1 separate contractors.² Review of the three contractor reports revealed that over 90%
2 of the joints at each structure exhibited visible pack-out in the connections. In
3 addition, the review revealed that pack-out and section-loss was most prominent on
4 the lower portions of the towers where there was higher likelihood of moisture build
5 up.

6 Furthermore, in early 2020, PPL Electric initiated a second, more robust
7 evaluation of the COR-TEN® lattice towers to determine the full extent of the
8 deterioration on the transmission system. PPL Electric’s Data Analytics Team
9 developed a strategic approach that utilized advanced statistical analysis and
10 modeling to comprehensively determine the overall condition of the COR-TEN®
11 lattice towers in a cost-efficient manner. The statistical analysis determined that
12 inspection of 192 randomly selected COR-TEN® towers would provide a
13 statistically significant representation of all 1,284 COR-TEN® towers on the PPL
14 Electric system with a 90% confidence level and 5% confidence interval. To assist
15 with the analysis, PPL Electric contracted with AmpJack, an independent
16 consultant, to complete an inspection of 192 randomly selected COR-TEN® towers
17 and classify the observed condition. The results of the 2020 inspection program
18 confirmed the severity of deterioration noted during the 2019 inspection.

19 Attachment 1 – Necessity Statement more fully describes each of the
20 assessments of existing COR-TEN® lattice structures performed by or for PPL
21 Electric, and the results of these assessments.

² Each contractor was asked to inspect 5 structures and prepare an engineering analysis of their condition, proposed remediation approach and estimated costs to remediate the identified structural defects.

1 **Q. Has the Company had any studies prepared to specifically assess the condition**
2 **of the existing Stanton-Summit #3 and #4 230 kV Transmission Lines?**

3 A. Yes. The Company hired RTR Energy Solutions, Inc. (“RTR”) to prepare a
4 condition assessment of the existing Stanton-Summit #3 and #4 230 kV
5 Transmission Lines in March 2022.

6

7 **Q. Please describe the condition assessment conducted by RTR and the results of**
8 **this assessment.**

9 A. The assessment consisted of all 46 COR-TEN® lattice towers on this line. The
10 scope of the assessment included a visual inspection of each selected structure from
11 the ground. Each joint of the structure was reviewed to determine if pack rust was
12 present. The structure condition was noted as either Mild, Moderate or Severe
13 using the following classification:

- 14 • **Mild** Condition Rating: <25% of total joints contain pack rust.
- 15 • **Moderate** Condition Rating: >25% & <50% of total joints contain pack
16 rust.
- 17 • **Severe** Condition Rating: >50% of total joints contain pack rust.

18 A summary of the results of the inspection are represented in Table 1-2 of
19 Attachment 1 – Necessity Statement, which is reproduced below:

20 **TABLE 1-2: Structure Condition Rating Summary**

Condition	Structure Count
Mild	0
Moderate	40

Severe	6
Total	46

1

2 **Q. Did the assessment performed by RTR observe pack rust at specific locations**
3 **on each structure?**

4 A. Yes. The majority of the pack rust observed on each structure was found in the
5 lower sections of the post leg where horizontal and diagonal members are bolted to
6 the post leg. However, pack rust was observed in joints all the way up some towers.

7

8 **Q. What do the assessments of existing COR-TEN® structures performed by or**
9 **for PPL Electric demonstrate?**

10 A. Based on the results of the inspection programs described above, it is clear that the
11 poor performance of the protective patina on the COR-TEN® lattice towers has
12 accelerated the deterioration of these structures and has brought the assets to the
13 end of their service life much sooner than would have been anticipated. At roughly
14 50 years of age, the COR-TEN® lattice towers that comprise the Stanton-Summit-
15 #3 and #4 230 kV Transmission Lines have exceeded their useful life and can no
16 longer be relied upon to safely operate as designed. The proposed rebuild addresses
17 the safety issues resulting from the presence of pack-out rust (e.g., structures failing
18 due to deteriorated joints at the arms or legs). Possible shearing of bolts, members
19 disconnecting from lattice towers, or complete tower failure pose a major safety
20 risk to both the public and PPL Electric employees.

21

1 **Q. If the COR-TEN® lattice towers that support the Stanton-Summit #3 and #4**
2 **230 kV Transmission Lines were to fail, would the service provided to PPL**
3 **Electric’s customers be impacted?**

4 A. As explained in the PPL Electric Exhibit JBL-1 (Attachment 1 – Necessity
5 Statement), if these transmission lines fail, it is expected that the service of
6 approximately 34,968 customers would be impacted for the next contingency,
7 including critical customers such as Williams Pipeline Compressor Station 605 and
8 Metropolitan Insurance.

9

10 **Q. Will the proposed Project address these asset health concerns?**

11 A. Yes. With respect to the COR-TEN® asset health condition, the Project will
12 immediately and fully resolve the deteriorated condition of the existing structures
13 on a long-term basis by removing the existing COR-TEN® lattice towers and
14 replacing them with steel monopoles. By rebuilding these structures, PPL Electric
15 will resolve the existing COR-TEN® issue and avoid the possibility of the issue
16 worsening and/or recurring with respect to these structures and developing into both
17 a reliability and public safety issue.

18

19 **Q. Did PPL Electric consider any alternatives to the Project as proposed?**

20 A. Yes. As more fully explained in PPL Electric Exhibit JBL-1 (Attachment 1 –
21 Necessity Statement), PPL Electric considered three alternatives, including the
22 proposed full rebuild of the Stanton-Summit #3 and #4 230 kV Transmission Lines.

23

1 **Q. Why did PPL Electric choose to undertake the proposed full rebuild of the**
2 **Stanton-Summit #3 and #4 230 kV Transmission Lines, as opposed to the other**
3 **alternatives considered?**

4 A Although PPL Electric evaluated replacement and remediation options, these
5 alternatives present substantial uncertainties regarding their immediate and long-
6 term effectiveness to address the COR-TEN® issue. As explained in the Letter of
7 Notification and PPL Electric Exhibit JBL-1 (Attachment 1 – Necessity Statement),
8 the health and safety risks associated with the assets’ advanced age and degree of
9 deterioration are so great that replacement and remediation would fail to adequately
10 address their poor health conditions.

11 In addition, the proposed full rebuild is the most cost-effective. PPL
12 Electric estimated the total cost of each alternative over both a 45-year and 75-year
13 period (the expected service life of a new steel structure), and a summary of this
14 analysis is presented in Table 1-3 of PPL Electric Exhibit JBL-1 (Attachment 1 –
15 Necessity Statement). Based upon this analysis, PPL Electric determined that the
16 proposed full rebuild most efficiently addresses the asset health conditions of the
17 Stanton-Summit #3 and #4 230 kV Transmission Lines.

18

19 **IV. DESCRIPTION OF PROPOSED PROJECT**

20 **Q. Please describe the proposed Project.**

21 A. In order to resolve the identified COR-TEN® lattice tower health condition, PPL
22 Electric proposes to fully rebuild the Stanton-Summit #3 and #4 230 kV
23 Transmission Lines. All the COR-TEN® lattice structures as well as the
24 conductors at the 46 locations will be replaced.

1 The Stanton-Summit Project will extend approximately 7.7 miles from the
2 existing Stanton Substation in Luzerne County to the existing Summit Substation
3 in Lackawanna County. A network of existing access roads or temporary roads
4 will be utilized during construction of the rebuilt transmission lines.

5 A detailed map of the proposed Project, including the rebuilt structure
6 locations, is provided in Figure 3-1 in PPL Electric Exhibit JBL-3 (Attachment 3 –
7 Description of the Project Area). The entire Project will be constructed entirely
8 within the existing right-of-way (“ROW”) currently occupied by the existing
9 Stanton-Summit #3 and #4 230 kV Transmission Lines or on the same PPL Electric
10 fee-owned properties as the existing transmission lines.

11 There is currently no pending litigation regarding environmental matters
12 related to the Project.

13
14 **Q. When is construction of the Project scheduled to begin?**

15 A. Construction is scheduled to begin upon Commission approval of the proposed
16 Project.

17
18 **Q. What is the in-service date of the proposed Project?**

19 A. The contemplated in-service date is December 2025.

20
21 **Q. Has the proposed Project been reviewed by PJM?**

1 A. Yes. At the October 2020 PJM TEAC meeting,³ PPL Electric presented its plan to
2 address COR-TEN® needs on the 230 kV system. As part of this plan, PPL Electric
3 also shared the need with PJM stakeholders to address COR-TEN® towers on the
4 Stanton-Summit #3 and #4 230 kV Transmission Lines (need # PPL-2020-0006).
5 The need # PPL-2020-0006 will be addressed by the Stanton-Summit #3 and #4
6 230 kV Transmission Line rebuild under supplemental project s2367.

7

8 **V. ENGINEERING DESCRIPTION AND SAFETY CRITERIA**

9 **Q. Please describe the design of the proposed rebuild of the Stanton-Summit #3**
10 **and #4 230 kV Transmission Lines.**

11 A. Connection between the Summit Substation and Stanton Substation involves a 7.7-
12 mile-long section of the double-circuit Stanton-Summit #3 and #4 230 kV
13 Transmission Lines. The existing Stanton-Summit #3 and #4 230 kV Transmission
14 Lines contain six 1590 kcmil⁴, 45/7 stranding, “Lapwing” ACSR⁵ conductor wires
15 and two overhead ground wires (“OHGW”). These wires are supported by a series
16 of transmission line structures that include 46 COR-TEN® double-circuit steel
17 lattice tower structures. Other existing structures involved in the Project include a
18 two-pole turn structure (Structures 56275-N-47514(L)/56274-N47518(R)) located
19 approximately 1.4 miles north of the Summit Substation.

³ Refer to slides at <https://www.pjm.com/~media/committees-groups/committees/teac/2020/20201006/20201006-item-09-ppl-supplemental.ashx>.

⁴ 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.

⁵ ACSR stands for aluminum conductor steel reinforced.

1 To rebuild the existing double-circuit Stanton-Summit #3 and #4 230 kV
2 Transmission Lines, PPL Electric will: (i) install approximately 31 new double-
3 circuit long span suspension structures; (ii) install approximately two new double-
4 circuit long span angle suspension structures; and (iii) install approximately 13 new
5 double-circuit long span angle tension structures. The proposed Stanton-Summit #3
6 and #4 230 kV Transmission Lines will consist of six 1590 kcmil, 54/19 stranding,
7 “Falcon” ACSS⁶ conductors. The two OHGW will be removed and be replaced
8 with 48 fiber optical ground wires (“OPGW”).

9 The proposed Stanton-Summit #3 and #4 230 kV Transmission Lines will
10 consist of 46 new monopole structures. The new monopole structures will be offset
11 approximately 10 feet off center from the existing COR-TEN® lattice towers as a
12 safety precaution. This lateral shift will move the Stanton-Summit #3 and #4 230
13 kV Transmission Lines to the north and slightly closer to the existing 500 kV
14 structures that share the 325-foot-wide ROW corridor that extends through the
15 Project area from the Stanton Substation to the Summit Substation turn structures.

16 As explained in PPL Electric Exhibit JBL-2 (Attachment 2 – Engineering
17 Description), the existing COR-TEN® lattice tower structures range in height from
18 between approximately 120-170 feet with an average structure height of
19 approximately 144 feet. The proposed double-circuit monopole structures to
20 replace the COR-TEN® lattice towers will range in height between approximately
21 110 and 175 feet with an average structure height of approximately 140 feet. As

⁶ ACSS stands for aluminum conductor steel supported.

1 such, the proposed monopole structures will reduce the average height and ground
2 impacts associated Stanton-Summit #3 and #4 230 kV Transmission Lines

3 A detailed engineering description is provided in PPL Electric Exhibit JBL-
4 2 (Attachment 2 – Engineering Description).

5
6 **Q. Will the proposed Project create any unreasonable risk of danger to the public
7 health or safety?**

8 A. No. The proposed lines will be designed, constructed, operated, and maintained
9 in a manner that meets or surpasses all applicable National Electrical Safety Code
10 (“NESC”) minimum standards and all applicable legal requirements. Descriptions
11 of the NESC standards, PPL Electric’s design criteria, and PPL Electric’s safety
12 practices are provided in PPL Electric Exhibit JBL-4 (Attachment 4 - PPL Electric
13 Design Criteria and Safety Practices).

14
15 **Q. Does the Letter of Notification explain how PPL Electric managements
16 magnetic fields?**

17 A. Yes. PPL Electric Exhibit JBL-4 (Attachment 4 – PPL Electric Design Criteria and
18 Safety Practices) also explains PPL Electric’s standards for Magnetic Field
19 Management. Ground clearances for the proposed Project will be increased
20 between approximately 3.0 and 7.0 feet higher than those required by the NESC
21 standard in order to reduce the magnetic field exposure. The proposed rebuild of
22 the Stanton-Summit #3 and #4 230 kV Transmission Lines will continue to allow
23 for double-circuit operation, which will allow for reverse phasing. A reduction in

1 magnetic field exposure is anticipated due to the higher ground clearances and
2 reverse phasing.

3

4 **VI. THE PROJECT COMPLIES WITH ALL APPLICABLE STATUTES AND**
5 **REGULATIONS PROVIDING FOR THE PROTECTION FOF NATURAL**
6 **RESOURCES.**

7 **Q. Please generally describe the permitting and environmental evaluations**
8 **performed in advance of the proposed Project.**

9 A. PPL Electric reviewed the site and surrounding areas for cultural resources, unique
10 geological, scenic, natural areas, wetlands, waterways, and threatened or
11 endangered species as explained in more detail below.

12

13 **Q. Please describe the existing land-uses on the PPL Electric owned properties,**
14 **within the existing ROW, and within 0.25 miles (1,320 feet) of the ROW**
15 **(“Project Area”).**

16 A. As noted in PPL Electric Exhibit JBL-3 (Attachment 3 – Description of Project
17 Area) to the LON, the Project spans the Reading Blue Mountain and Northern
18 Railroad, which parallels the eastern side of the North Branch Susquehanna River
19 near the Stanton Substation. Two Buckeye Partners product pipelines are also
20 crossed east of Ransom Road in the central portion of the Project. Two
21 communication towers that are also located in the central portion of the Project are
22 located within one mile of the alignment. Access roads to these facilities are
23 spanned by the Project. The Project does not cross other electrical utility ROWs but
24 does parallel the PPL Electric Susquehanna-Roseland 500 kV Transmission Line
25 for the entire length of the Project.

1 The closest active airports relative to the Project Area are the Wilkes-Barre
2 Scranton International Airport, which is approximately five miles to the south of
3 the Stanton Substation, and the Wilkes-Barre Wyoming Valley Airport, located
4 approximately six miles to the southwest. PPL Electric does not anticipate any
5 interference with airport operations because the Project is located in an area where
6 there are existing electrical facilities. However, PPL Electric will comply with any
7 applicable requirements of the Federal Aviation Administration and the
8 Pennsylvania Department of Transportation, Bureau of Aviation.

9 This broader Project Area was reviewed to provide a sense of the landscape
10 in which the Project is located. Based on review of the 2021 National Land Cover
11 Data (“NLCD”), land use in the Project Area is approximately 90% forested with
12 the remaining 10% comprised of mixed agricultural and residential areas that are
13 crossed at intersections with local roads.

14

15 **Q. Will the proposed Project affect any Conserved Lands?**

16 A. No. The proposed Project will not affect any national parks, state parks, local parks,
17 recreational areas, or natural landmarks. None of these features are located within
18 the Project Area. Review of the National Conservation Easement Database and PA
19 Conserved Lands websites notes that no conserved lands are crossed by the Project.

20

21 **Q. Did PPL Electric conduct a review of the cultural resources in the area?**

22 A. Yes. PPL Electric conducted an online review of the Project Area and surrounding
23 landscape was conducted through the Pennsylvania Historical and Museum

1 Commission (“PHMC”) State Historic and Archaeological Resource Exchange
2 site. No State Historic Preservation Office (“SHPO”) listed or eligible properties
3 are crossed by the Project but the Bedell-Courtright Farmstead (SHPO resource
4 Number 2011RE00513) borders the north side of the ROW along Ransom Road in
5 the central portion of the Project Area. No effect to this resource is anticipated by
6 the proposed Project activities.

7 PPL Electric is in the initial stage of coordination with the PHMC for the
8 modifications being made to the transmission lines. PPL Electric does not
9 anticipate any impacts to SHPO eligible properties or any other PHMC related
10 properties. Based on results of the initial coordination and since PPL Electric will
11 be obtaining a General Permit for NPDES, additional reviews and field
12 survey/sampling will not be needed.

13

14 **Q. Were there any unique geological, scenic, or natural areas located in the**
15 **Project Area?**

16 A. No. According to the Pennsylvania Department of Conservation and Natural
17 Resources (“PDCNR”), no unique geological, scenic, or natural areas are located
18 within the Project Area.

19

20 **Q. Is the proposed Project anticipated to negatively affect any soils, waterways,**
21 **wetlands, 100-year Floodplains, or vegetation?**

22 A. No. The Company will develop and implement Erosion and Sedimentation
23 (“E&S”) control plans to minimize the displacement of soils and address

1 stormwater control. Moreover, for federal and state permitting purposes, the
2 wetlands and waterways within the Project Area have been delineated, surveyed,
3 and illustrated according to regulatory standards. This information is being used to
4 minimize wetland and waterway impacts where feasible. Additionally, PPL
5 Electric will avoid impacts to wetlands and waterways where possible by aerially
6 spanning these features. Further, after review of available data, PPL Electric does
7 not anticipate any impact to 100-year Floodplains near the Project Area. Lastly,
8 vegetative cover in the Project Area consists almost entirely of forested habitat.
9 Several areas of forest clearing, agricultural use, and rural residential development
10 are present based on aerial imagery. The existing ROW areas for the transmission
11 line has previously been cleared of woody vegetation and no extensive tree clearing
12 is anticipated on most of those lines. If vegetation management is required in this
13 specific location, PPL Electric will apply its “Specifications for Transmission
14 Vegetation Management LA-79827” to minimize potential impacts.

15

16 **Q. Is the proposed Project anticipated to affect any threatened or endangered**
17 **species?**

18 A. No. A Pennsylvania Natural Diversity Inventory was run for the Project on October
19 8, 2021, to assess the potential presence of threatened and endangered species
20 and/or special concern species. Specific agencies reviewing the Project included
21 the following:

- 22 • Pennsylvania Game Commission,
- 23 • Pennsylvania Fish and Boat Commission,

- 1 • PDCNR, and
- 2 • U.S. Fish and Wildlife Service.

3 PDCNR is the only agency that responded with potential threatened and endangered
4 species concerns within the Project Area. Surveys for the identified plant species
5 of concern were conducted in spring and fall 2022. The specific plant species
6 identified by PDCNR were not found in the Project Area, but a different plant
7 species of concern was found in a location that will not be affected by Project
8 activities. PPL Electric will continue to consult with the PDCNR regarding
9 avoidance of this protected species.

10

11 **Q. Will PPL Electric obtain and comply with all necessary approvals and permits**
12 **for Project construction and comply with all conditions placed on those**
13 **permits?**

14 A. Yes.

15

16 **VII. THE PROJECT WILL HAVE MINIMAL ADVERSE ENVIRONMENTAL**
17 **IMPACT**

18 **Q. Please generally describe the anticipated environmental impacts as a result of**
19 **the proposed Project.**

20 A. As explained in the LON, construction of the proposed Project will take place
21 entirely within existing rights-of-way. Therefore, it is anticipated that the proposed
22 Stanton-Summit #3 and #4 230 kV Transmission Lines will have minimal
23 incremental impacts on land use in the area.

24

1 **Q. How will PPL Electric access its ROW to pursue the proposed Project?**

2 A. PPL Electric will use and update previously established access roads for
3 construction to the extent practical to further reduce interference with existing uses
4 and minimize land use impacts. A detailed description of the route of each
5 individual component of the Project can be found in Attachment 3 to the LON.

6

7 **Q. Is an evaluation of alternative transmission line routes necessary in this**
8 **proceeding?**

9 A. No. As I've noted, and as was explained in the LON filing, including the various
10 attachments, the proposed rebuild Project is to take place entirely within the
11 Company's existing ROW where the Stanton-Summit #3 and #4 230 kV
12 Transmission Lines are already located. Thus, a rebuild within the same ROW
13 containing existing structures will have minimum environmental impacts compared
14 to any greenfield transmission line construction alternative, or any other alternative
15 that would require new construction outside of the existing ROW. As such, an
16 analysis of alternative routes would be redundant, at best.

17

18 **Q. Please describe PPL Electric's environmental evaluation of the Project area.**

19 A. PPL Electric's environmental evaluation of the project area included identification
20 and identification of impacts to cultural resources, unique geological, scenic,
21 natural areas, wetlands, waterways, and threatened or endangered species as
22 explained above. Moreover, it is important to emphasize that because the proposed
23 Project does not contemplate development outside of the existing HV transmission

1 line ROW, all else being equal, it will result in fewer environmental impacts than
2 alternatives that involve greenfield construction of transmission infrastructure
3 where none currently exists.

4

5 **Q. Were any conditions imposed by permitting agencies for the Project related to**
6 **environmental concerns?**

7 A. No.

8

9 **VIII. CONCLUSION**

10 **Q. Does this conclude your direct testimony?**

11 A. Yes, it does. If necessary, I will supplement my testimony if and as additional
12 issues arise during the course of this proceeding.

PPL ELECTRIC
EXHIBIT NO. JBL-1

STANTON-SUMMIT #3 AND #4 230 kV COR-TEN® REBUILD PROJECT

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1.0 INTRODUCTION

PPL Electric Utilities Corporation (“PPL Electric”) is requesting Pennsylvania Public Utility Commission (“PUC” or “Commission”) approval to rebuild the existing double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines connecting the Stanton 230 kV Substation (“Stanton Substation”) and a two-pole turn structure (Structures 56275-N-47514(L)/56274-N-47518(R)) located approximately 1.4 miles north of the Summit 230-69 kV Substation (“Summit Substation”) that are respectively located in Luzerne and Lackawanna Counties, Pennsylvania (“Project”)¹.

This Project is required to address reliability concerns related to the deteriorated condition of the COR-TEN® lattice towers on the Stanton-Summit #3 and #4 230 kV Transmission Lines. In addition, the Project is also required to comply with:

- The Consolidated Transmission Owners Agreement (“CTOA”) Rate Schedule - FERC No. 42 (FERC ER10-2713-000), which requires transmission systems to “[b]e kept in place and maintained in good operating condition in accordance with Good Utility Practice and principles, guidelines and standards of the applicable Regional Reliability Council and NERC.”

The Project is necessary for PPL Electric to avoid violating its obligations under the CTOA to maintain its transmission facilities in good operating condition and avoid public safety concerns caused by failed assets. The Project is one of several essential PPL Electric projects designed to address a system-wide concern related to the structural reliability of COR-TEN® lattice towers on its bulk transmission system. As explained below, the existence of “pack-out rust”² in many of the joints of the subject lattice towers diminishes structural integrity and increases the risk of system failures that could negatively impact public safety and affect approximately 34,968 PPL

¹ For a complete list of municipalities and counties crossed by the Project, please refer to Attachment 5 to the Letter of Notification.

² “Pack-out rust” or “pack rust” is a form of localized corrosion typical of steel components that develop a crevice into an open atmospheric environment, which results in rust packing between conjoined steel components. As described in Attachment 1, pack-out rust accelerates the deterioration of asset health and can result in shearing off bolts, loss of structural integrity, members disconnecting from lattice towers, and tower failure.

Electric customers. The Project is necessary to avoid these risks and provide the best solution to immediately address the identified asset health issues on a long-term basis.

Moreover, in order for PPL Electric’s transmission facilities to be considered in good operating condition, they must be maintained in a manner consistent with the standards of the North American Electric Reliability Corporation (“NERC”), Reliability First Corporation, and Good Utility Practice as defined by the CTOA.

Subject to the Commission’s approval, construction will begin in September 2023 to support an in-service date of December 2025.³ PPL Electric will continue to own, operate, and maintain the rebuilt 230 kV transmission lines. The total estimated cost of this Project, as described below, is approximately \$36.8 Million, and the cost for the Project will be paid by PPL Electric.⁴

2.0 BACKGROUND

PPL Electric has a responsibility to provide transmission assets and maintain them in an adequate, efficient, safe, reliable, and reasonable manner to meet the needs of the electric system and the expectations of its customers. To achieve this, PPL Electric applies its Transmission Asset Management Procedure as part of its system performance and condition assessment process. These performance and condition assessments identify system needs and prioritize projects based on several variables such as equipment age, condition, maintenance schedule, and impact on system reliability and asset performance to ensure a reliable electric grid and service to its customers.

³ PPL Electric is submitting the Letter of Notification in its schedule at a point in time that will allow the Company to maintain its planned construction schedule and, in the end, complete our scheduled in-service requirement. PPL Electric’s schedule accounts for long lead material timelines, additional detailed engineering activities, and construction competitive bidding that all will be required to be completed prior to construction start. In addition, it also should be noted that the Company has had to increase material procurement durations and shipping durations based on industry and national supply chain delays on certain materials.

⁴ The estimated cost was developed using averages of recent costs for similar projects and without an in-depth analysis of field investigation. The 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 transmission system is the backbone of the electric grid. Failure to maintain the system in accordance with Good Utility Practice and reliability practices and standards can decrease overall transmission system reliability and increase the risk of customer outages.

3.0 TRANSMISSION SYSTEM PLANNING PROCESS

The nation’s interconnected transmission system (“Transmission Grid”) serves as the backbone for 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 critical that the Transmission Grid be planned and designed to ensure reliable electric service is provided under all loading conditions or when certain elements of the Transmission Grid are out of service (system contingencies) due to planned or unplanned outages.

Robust transmission planning enables the transmission system to supply electricity to all customer loads in a reliable and economical manner. This system planning process ensures that both the Bulk Electric System (“BES”)⁵ and non-Bulk Electric System (non-BES)⁶ are planned and constructed so that:

- They can accommodate forecasted system flows during summer and winter peak load;
- They can adequately serve each customer’s need regarding 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 NERC, PJM Interconnection, LLC (“PJM”), and the Transmission Owner’s reliability criteria for all normal and emergency operating conditions.

PJM is a Federal Energy Regulatory Commission (“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

⁵ Includes transmission facilities operated at voltages of 100 kV or higher.

⁶ Includes transmission facilities operated at voltages less than 100 kV.

all or parts of thirteen states and the District of Columbia, including Pennsylvania. To ensure reliable transmission service, PJM prepares an annual Regional Transmission Expansion Plan (“RTEP”)⁷ 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.

PPL Electric’s Transmission Asset Management Procedure involves identifying system needs and determining the best available solution to address those needs. This process includes asset evaluation, asset condition and system risk assessments, analysis of alternative solutions and project initiation and scheduling. System needs are identified based on the overarching goals of reducing outage frequency and duration, improving system reliability, decreasing system maintenance cost, and maintaining operational flexibility to ensure safe and reliable electric service of the transmission system and to our customers.

When transmission owning utilities (including PPL Electric) set up PJM as an RTO, they agreed to bind themselves to maintaining their existing transmission systems using Good Utility Practice. The CTOA is an agreement among (1) individual Transmission Owners operating within the PJM Region and (2) between the Transmission Owners and PJM. The CTOA facilitates the planning and operation of the Transmission Grid within the PJM region and establishes the rights and responsibilities of each party to the CTOA. Section 4.6 of the CTOA requires that transmission systems “[b]e kept in place and maintained in good operating condition in accordance with Good Utility Practice and principles, guidelines and standards of the applicable Regional Reliability Council and NERC.” This Project is required to fulfill PPL Electric’s obligations under the CTOA.

⁷ 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.

4.0 THE NEED FOR THE PROJECT

4.1 Existing System

The Stanton and Summit 230 kV Substations are connected by the double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines. The Stanton-Summit #3 and #4 230 kV Transmission Lines are approximately 7.7 miles long and supported by 46 COR-TEN® lattice structures. These towers are designed and being used for double-circuit 230 kV operation. The Stanton-Summit #3 230 kV Transmission Line is one of the circuits on these towers, and the Stanton-Summit #4 230 kV Transmission Line is the other.

The double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines are in PPL Electric's Northeast Region and are part of a larger 230 kV transmission network that connects generation in this region to load throughout PPL Electric and rest of PJM's footprint. This 230 kV network includes the Lackawanna-Paupack 230 kV Transmission Line, the Summit-Lackawanna 230 kV Transmission Line, the Jenkins-Stanton 230 kV Transmission Line, and the Susquehanna-Jenkins 230 kV Transmission Line, that support bulk power flow and feeds various 230-69 kV substations in the Northeast Region. As noted below, if the Stanton-Summit #3 and #4 230 kV Transmission Lines fail, it is expected that the service of approximately 34,968 customers would be impacted for the next contingency, including critical customers such as Williams 605 Pumping Station and Metropolitan Insurance.

A map of the existing system configuration is provided as Figure 1-1.

4.2 Project Need

This Project is needed to address asset health concerns that are being accelerated by increased incidences of pack-out rust associated with COR-TEN® lattice towers. The subject lattice towers had an expected service life of 75 years and were installed in the early 1970s. The subsequent discovery of increased incidences of pack-out rust associated with COR-TEN® lattice towers has accelerated the rate at which these towers were expected to reach end-of-life, and, in some cases, the towers have deteriorated and are continuing to deteriorate beyond the point where they can safely operate as designed and cannot be reasonably or cost effectively remediated.

4.2.1 Asset Health

There are approximately 236 circuit miles containing COR-TEN® lattice structures or approximately 1,284 structures across PPL Electric’s Transmission System that it currently anticipates will need to be addressed in order to resolve asset health concerns similar to those identified below.⁸

Originally constructed in 1970, the existing Stanton-Summit #3 and #4 230 kV Transmission Lines have 46 weathering-steel COR-TEN® lattice structures spanning approximately 7.7 miles. COR-TEN® lattice towers were commonly installed by the industry during this time because it was believed that the corrosion-resistant properties of weathering-steel would reduce future maintenance needs/costs.

In 2013, PPL Electric utilized a third-party contractor to perform an assessment of the COR-TEN® lattice structures on its 230 kV transmission lines under a steel structure capital maintenance program. The program evaluated the ground-line of the steel structures, performing minor excavation around the base of the structure and assessing the condition of the steel, and then applying a protective coating to the exposed steel. No joints or members above the base of the structure were included in this assessment. The assessment identified that 126 of 131 COR-TEN® structures (96%) had one or more structure legs rated Condition C (poor) or Condition D (very poor). Of those 126 structures, 25 had one or more structure legs that were identified as “priority”, requiring immediate attention. In order to extend the life of the asset and ensure no failures at the ground line, the 25 structures identified as “priority” received maintenance repairs in 2014, which included post leg, diagonal and base shoe repairs. Protective coating was applied to the remaining 101 COR-TEN® structures that rated Condition C or D but were not identified as “priority”. However, these remaining structures face constant asset health concerns due to the presence of pack-out rust. Ongoing inspections conducted since 2014 have confirmed that these structures are continuing to degrade.

These asset health concerns were further heightened by the discovery of pack-out rust in the section joints of the COR-TEN® lattice towers. In particular, the protective surface coating of weathering

⁸ PPL Electric anticipates that addressing the currently anticipated COR-TEN® projects associated with the 230 kV system (approx. 1112 of the identified structures) will cost approximately \$562 million in total. However, these estimates are preliminary in nature and subject to change. PPL Electric is also currently evaluating one other transmission line asset that includes 172 COR-TEN® lattice structures, but it has not yet developed a cost estimate for the remediation or replacement of these structures.

steel that provides resistance to atmospheric corrosion, known as the patina, did not form properly on the structure joints and members due to moisture trapped between the joints. The trapped moisture prevented completion of the required wetting and drying cycle needed to form the patina. Over time, this has led to the formation of pack-out rust within the joints of connecting tower members and section-loss in the steel members and joints. When the pack rust becomes too severe, it can deform steel members and connecting hardware. It can shear off bolts, cause loss of structural integrity, cause members to disconnect from the tower, and even result in tower failure. PPL Electric is experiencing pack-out rust failures on its transmission line system, which are a leading indicator of ultimate structure failure as outlined above. Over the past few years, PPL Electric has encountered multiple instances of COR-TEN® tower members becoming detached, broken, and deformed/corroded to failure due to severe pack-out rust. Failures of this nature on a transmission tower create emergent safety and reliability concerns which must be proactively addressed.

This now well-known inherent problem with COR-TEN® steel is also being seen in other infrastructure where two pieces of COR-TEN® steel overlap at joints, such as those present on lattice towers⁹ and other steel structures such as bridges. The presence of pack-out rust on COR-TEN® structures and its negative impacts on asset health have diminished the expected service life of these structures from 75 to 50 years. As these structures were installed approximately 50 years ago, they have effectively reached end-of-life¹⁰. No manufacturer’s warranty currently exists for remediation of the COR-TEN® lattice towers. After a reasonable investigation, PPL Electric is not aware of whether a manufacturer’s warranty was in existence at the time the structures were installed.

To better understand the heightened asset health concerns associated with COR-TEN® steel, PPL Electric contracted with independent, non-affiliated inspection companies to conduct evaluations

⁹ See, e.g., *Application of Virginia Electric and Power Company d/b/a Dominion Virginia Power For approval and certification of Carson-Rogers Road 500 kV Transmission Line Rebuild under Va. Code § 56-46.1 and the Utility Facilities Act, Va. Code § 56-265.1 et seq.*, Va. SCC Case No. PUE-2016-00078, at pp. 2-3, 9-10 (Hearing Examiner Report dated March 10, 2017) ; *Application of Virginia Electric and Power Company For approval and certification of Cunningham-Dooms 500kV Transmission Line Rebuild under Va. Code § 56-46.1 and the Utility Facilities Act, Va. Code § 56-265.1 et seq.*, Va. SCC Case No. PUE-2016-00020, at pp. 3-4 (Response of Dominion Virginia Power to Staff’s Supplemental Filing of March 30, 2017, filed April 13, 2017) (discussing the problems associated with “pack-out” rust on another utility’s COR-TEN® lattice tower structures).

¹⁰ New steel structures that will be installed under the Project have an anticipated service life of 75 years.

of COR-TEN® lattice towers to determine the overall condition of these towers on the PPL Electric Transmission System in 2019. The 2019 evaluations included inspection of 15 randomly selected COR-TEN® lattice towers across the PPL Electric Transmission System by three separate contractors.¹¹ Review of the three contractor reports revealed that over 90% of the joints at each structure exhibited visible pack-out in the connections. In addition, the review revealed that pack-out and section-loss was most prominent on the lower portions of the towers where there was higher likelihood of moisture build up. The contractors' estimates to remediate each tower ranged from \$140,000 to \$240,000 per tower depending on the contractor's proposed remediation approach and extent of remediation recommended. For the sake of any analysis associated with the remediation option, a cost of \$183,891 per structure was utilized, which is the average of the 3 remediation costs received from contractors.

Based on the prevalence of observed deterioration on the COR-TEN® lattice towers across the PPL Electric Transmission System and the estimated per-tower cost to rehabilitate, PPL Electric determined that a more thorough and strategic evaluation was needed to determine the full extent of the deterioration of COR-TEN® lattice towers across its system.

In early 2020, PPL Electric initiated a second, more robust evaluation of the COR-TEN® lattice towers to determine the full extent of the deterioration on the transmission system. PPL Electric's Data Analytics Team developed a strategic approach that utilized advanced statistical analysis and modeling to comprehensively determine the overall condition of the COR-TEN® lattice towers in a cost-efficient manner. The statistical analysis determined that inspection of 192 randomly selected COR-TEN® towers would provide a statistically significant representation of all 1,284 COR-TEN® towers on the PPL Electric system with a 90% confidence level and 5% confidence interval. To assist with the analysis, PPL Electric contracted with AmpJack, an independent consultant, to complete an inspection of 192 randomly selected COR-TEN® towers and classify the observed condition.

The inspection of 192 randomly selected COR-TEN® towers performed by AmpJack included a field-based visual overhead inspection of each structure from the ground, taking measurements of

¹¹ Each contractor was asked to inspect 5 structures and prepare an engineering analysis of their condition, proposed remediation approach and estimated costs to remediate the identified structural defects.

pack-out at each joint and section-loss at each member on the lower section of each structure, visual observations of pack-out and section loss for the higher sections of the towers, and visual observations of the damage at attachment points. The measured values of each joint and member rated according to guidelines provided by PPL Electric using both the measured and visual observations (A-Good, B-Fair, C-Poor, D-Severe and F-Priority). This approach is consistent with the method used by Osmose, an essential asset inspection service company, in grading steel structure corrosion in applications across the country. The results of the AmpJack overall structure ratings are summarized in Table 1-1 below:

TABLE 1-1: Structure Rating Summary

Overall Structure Rating			
Class	Condition	Structure Count	Percent
A	Good	0	0.0%
B	Fair	0	0.0%
C	Poor	95	49.5%
D	Severe	88	45.8%
F	Priority	9	4.7%

The results of the 2020 inspection program confirmed the severity of deterioration identified during the 2019 inspection program as follows:

- Over 90% of the joints showed visible pack-out in the connections, which is anticipated to worsen over time.
- The protective patina needed to protect the steel from corrosion did not properly develop at numerous members resulting in section-loss across the entire structure.
- Pack-out damage was typically more prevalent on lower sections of the tower except for some specific attachment points where severe pack-out was observed on higher sections.
- Structural damage was found on several members from pack-out that ruptured bolts and split/deformed members.

The accelerated deterioration of the asset health of the COR-TEN® lattice towers that are the subject of the Project revealed by 2019 and 2020 inspection programs has been further corroborated by a recent study prepared by RTR Energy Solutions, Inc. (“RTR”) in March 2022. RTR was contracted to perform a condition assessment on the Stanton-Summit #3 and #4 230 kV Transmission Lines. The assessment consisted of all 46 COR-TEN® lattice towers on this line. The scope of the assessment included a visual inspection of each selected structure from the ground. Each joint of the structure was reviewed to determine if pack rust was present. The structure condition was noted as either Mild, Moderate or Severe using the following classification:

- **Mild** Condition Rating: <25% of total joints contain pack rust.
- **Moderate** Condition Rating: >25% & <50% of total joints contain pack rust.
- **Severe** Condition Rating: >50% of total joints contain pack rust.

A summary of the results of the inspection are represented in Table 1-2 below:

TABLE 1-2: Structure Condition Rating Summary

Condition	Structure Count
Mild	0
Moderate	40
Severe	6
Total	46

Out of the 40 structures classified as "moderate", the average percentage of total joints containing pack rust is approximately 46%. This shows that the average structure that is classified as moderate in the assessment is very close to being considered "severe" and the condition of the structures on the line are overall more severe.

The majority of pack rust observed on each structure was found in the lower sections of the post leg where horizontal and diagonal members are bolted to the post leg. However, pack rust was observed in joints all the way up some towers. This assessment shows that the asset health conditions observed in the system-wide assessment are being exhibited on the specific structures targeted for replacement by the Project.

Based on the results of the inspection programs described above, it is clear that the poor performance of the protective patina on the COR-TEN® lattice towers has accelerated the deterioration of these structures and has brought the assets to the end of their service life much sooner than would have been anticipated. At roughly 53 years of age, the COR-TEN® lattice towers that comprise the Stanton-Summit #3 and #4 230 kV Transmission Lines have exceeded their useful life and can no longer be relied upon to safely operate as designed. The proposed rebuild addresses the safety issues resulting from the presence of pack-out rust (e.g., structures failing due to deteriorated joints at the arms or legs). Possible shearing of bolts, members disconnecting from lattice towers, or complete tower failure pose a major safety risk to both the public and PPL Electric employees. PPL Electric has determined that it must address these safety risks now, rather than at a later date, in order to avoid these risks increasing.

These asset health concerns are also important as the Stanton-Summit #3 and #4 230 kV Transmission Lines are a critical component of PPL Electric’s Bulk Transmission System and are required to serve local load to several critical customer facilities. If these transmission lines were to fail due to COR-TEN® issues, the following reliability issues would likely occur:¹²

A) Failure of the Stanton-Summit #3 and #4 230 kV Transmission Lines and:

- The next contingency loss of the Summit – Lackawanna #1 & #2 230 kV Transmission Lines would result in the loss of the Summit substation. This will result in up to 175 mega-watts (“MW”) of load drop resulting in approximately 34,968 customers losing service. Critical facilities including Williams 605 Pumping Station and Metropolitan Insurance will be impacted by this outage. This would result in all PPL Electric distribution substation load on the west side of Scrantonarea being removed from service.

¹² In general, 230kV BES lines do not have a direct contribution to traditional IEEE 1366 metrics (i.e., SAIFI, SAIDI and CAIDI) since a single line outage should not cause customer outages. The 5-year history on this line has no contribution to those metrics and it should remain that way after completion of the rebuild. However, as stated in the Letter of Notification, the lines are in poor condition and if not addressed will ultimately fail. The decision to rebuild the transmission line is based on the condition of the COR-TEN® towers and not previous or future operational performance or its impact on customer outages. Transmission lines must be addressed prior to entering failure mode. The BES would experience unnecessary additional outages and customers would experience additional maintenance costs if PPL Electric allowed the transmission lines to enter failure mode before PPL Electric rebuilds the lines.

Additionally, there is a need to consider how changing weather patterns will impact the reliability of the existing COR-TEN® lattice structures. Over the last 20 years, PPL Electric has seen a trend of increasing storms per year within the PPL Electric service territory. With each storm comes more exposure to extreme precipitation and wind events. If a tower is structurally compromised due to COR-TEN® pack-out and section loss, wind events create an increased risk of structural failure. With projected increases of more frequent and intense heat waves over the next century in the Northeast, the occurrence of more severe wind and precipitation events is expected to rise as well. This is evident in the storms associated with Hurricane Ida that hit the Northeast in 2021, as a storm of that strength would have been rare decades ago. Due to drastic weather pattern changes, it is imperative to re-evaluate the COR-TEN® structures in the safest and most reliable way to protect against the pack rust issue in the joints of the structures and guard the transmission system from catastrophic failures of COR-TEN® towers.

At the October 2020 PJM TEAC meeting,¹³ PPL Electric presented its plan to address COR-TEN® needs on the 230 kV system. As part of this plan, PPL Electric also shared the need with PJM stakeholders to address COR-TEN® towers on the Stanton-Summit #3 and #4 230 kV Transmission Lines (need # PPL-2020-0006). The need # PPL-2020-0006 will be addressed by the Stanton-Summit #3 and #4 230 kV Transmission Line rebuild under supplemental project s2367, which will be completed at an estimated cost of \$36.8 Million.

5.0 ALTERNATIVES

PPL Electric evaluated three potential solutions to address the degrading health of the Stanton-Summit #3 and #4 230 kV Transmission Lines. The following three alternatives were considered and compared based upon their ability to resolve the asset health conditions identified by PPL Electric and upon a 45-year and 75-year cost of service basis¹⁴:

¹³ Refer to slides at <https://www.pjm.com/~media/committees-groups/committees/teac/2020/20201006/20201006-item-09-ppl-supplemental.ashx>

¹⁴ PPL Electric is providing this comparison based upon a 45-year cost of service basis, due to the Commission's routine data requests for a 45-year cost of service analysis in prior Letter of Notification proceedings. PPL Electric notes that it does not utilize a stand-alone cost of service calculation for individual projects, and does not prepare a cost of service analysis for rebuild projects in its regular course of business. However, PPL Electric has prepared this

- (1) Alternative 1 – Replace all structures on the Stanton-Summit #3 and #4 230 kV Transmission Lines;
- (2) Alternative 2 – Remediate all structures on the Stanton-Summit #3 and #4 230 kV Transmission Lines; and
- (3) Alternative 3 – Full Rebuild of the Stanton-Summit #3 and #4 230 kV Transmission Lines (“Proposed Solution”).

The Proposed Solution is necessary to address the COR-TEN® asset health condition described above. Although PPL Electric evaluated replacement and remediation options, these alternatives present substantial uncertainties regarding their immediate and long-term effectiveness to address the COR-TEN® issue. As explained herein, the health and safety risks associated with the assets’ advanced age and degree of deterioration are so great that replacement and remediation would fail to adequately address their poor health conditions. For these reasons, the replacement and remediation alternatives were rejected as neither prudent nor reasonable.

Furthermore, the Proposed Solution is the most cost-effective. To estimate the total cost of each alternative over both a 45-year and 75-year period (the expected service life of a new steel structure), cost-of-service calculations for the revenue requirement were completed on a per-structure basis.¹⁵ A summary of this analysis is presented in Table 1-3 below. Based upon this analysis, PPL Electric determined that Alternative 3 – Full Rebuild most efficiently addresses the asset health conditions of the Stanton-Summit #3 and #4 230 kV Transmission Lines. Therefore, as explained in Section 6.0, PPL Electric has proposed Alternative 3 as the Proposed Solution in this proceeding.

line-specific calculation in anticipation of data requests from the Commission. PPL Electric used its current transmission rate for these calculations and notes that it cannot predict what its transmission rate will be in the future. PPL Electric’s transmission rate, and the associated calculations, are subject to change. Furthermore, PPL Electric submits that it is reasonable and appropriate to consider the 75-year cost of service for this project, as the expected life of the steel structures at issue is 75 years.

¹⁵ Because all COR-TEN® lattice structures on the system are of a similar design and vintage, doing the cost of service calculation on a per structure basis allows for a determination of the most cost effective option for any COR-TEN® structure on the system regardless of the total line length. It is assumed that the cost of service calculation could be extrapolated across the total number of structures on a given line with a similar result. The revenue requirement is the total cost that the customers would be charged based on calculations that include a combination of operations and maintenance (“O&M”) expense, depreciation, and return on capital.

5.1 Alternative 1 – Structure Replacement

The first alternative considered by PPL Electric to address the poor health condition of the weathering steel COR-TEN® lattice towers on these lines was to replace each of the lattice structures. This alternative would include replacing the existing weathering-steel lattice towers with new standard monopole structures. The estimated replacement cost is approximately \$647,243/structure. This option would also require PPL Electric to replace the existing conductors with new conductors in 2026 when it has reached its end-of-life at an additional cost of \$256,402/structure. In addition, there would be ongoing Operations and Maintenance (“O&M”) costs for the remainder of the service life of the transmission lines.

5.2 Alternative 2 – Structure Remediation

The second alternative considered by PPL Electric to address the poor health condition of the weathering steel COR-TEN® lattice towers on these lines was to remediate the entire lattice tower line, which would include replacing badly damaged members with galvanized steel members, installing new hardware and spacers, and cleaning pack-out from affected joints. The average estimated cost of remediation is approximately \$200,943/structure. This alternative was rejected by PPL Electric due to substantial uncertainties regarding its immediate and long-term effectiveness to address the COR-TEN® issue.¹⁶ Although remediation could extend the life of the structures, it would, at a minimum, require re-evaluation and possible subsequent remediation every 10 years following the initial remediation. Moreover, the health and safety risks associated with the assets’ advanced age and degree of deterioration are so great that remediation would fail to adequately address their poor health conditions.

Subsequent remediation work would be treated as an O&M expense. However, after 30 years, the structures will have to be replaced with new structures. Further, remediation would not address all underlying issues which, in turn, would ultimately requiring additional, duplicative projects.

¹⁶ The contractors that provided the cost estimate have never performed a full weathering-steel COR-TEN® lattice tower remediation before. And, moreover, it is PPL Electric’s understanding that complete remediation of COR-TEN® lattice towers has never been undertaken by another electric utility. Given the lack of industry experience with remediation, PPL Electric cannot adequately benchmark the efficacy and costs of this alternative. Rebuilding the subject transmission lines, as proposed by the Project, would avoid these potential unknown risks and costs.

For the reasons stated above, it is not reasonable or prudent to pursue Alternative 2. Remediation would fail to address the underlying COR-TEN® asset health conditions on a long-term basis and is a less cost-efficient option.

5.3 Alternative 3 – Full Rebuild

The third alternative considered by PPL Electric is to fully rebuild the existing Stanton-Summit #3 and #4 230 kV Transmission Lines. Replacing the existing lattice towers with monopoles will improve performance by increasing clearances and improving lightning performance. The estimated rebuild cost is approximately \$799,353/structure.

Although the full rebuild cost per structure is higher than the replacement and remediation options, the revenue requirements over both a 45 and 75-year period¹⁷ are lower (as shown in Table 1-3) due to lower O&M expense and fully replacing the affected structures (as opposed to attempting to add more useful life being added to those structures via remediation), which makes the rebuild a more cost-effective solution. Rebuilds are also less risky than remediation due to factors such as lack of remediation experience, lack of evidence for long-term remediation effectiveness, and risk of returning pack-out rust. The structure replacement option would continue to have ongoing O&M expense with the additional need to return in 2026 to reconductor the line for an additional \$256,402/structure. When compared to the remediation or replacement options, the full rebuild option is more cost-effective, long-term, and presents lower risk, making it the best long-term solution.

¹⁷ The \$36.8 Million is the total estimated upfront cost of the Project, including design and construction. To evaluate total cost-of-service, the calculation must factor in all lifecycle costs associated with that asset over the analysis window (i.e., 45 years). The Project lifecycle costs include 1) annual depreciation expense over the 45-year window, 2) annual Return on Capital over the 45-year window, and 3) O&M expense for minor repairs at year 45. Those costs will make up the total revenue requirement that is entered annually on the FERC Form 1 formula rate.

TABLE 1-3: Cost of Service of Evaluated Options

Project Scope	45 Year Cost of Service (\$M)	75 Year Cost of Service (\$M)
Replace Structures on Stanton-Summit #3 and #4 230 kV Transmission Lines	\$125.8	\$150.9
Remediate Structures on Stanton-Summit #3 and #4 230 kV Transmission Lines	\$116.7	\$235.7
Full Rebuild Stanton-Summit #3 and #4 230 kV Transmission Lines	\$111.2	\$134.9

6.0 PROPOSED SOLUTION

To resolve COR-TEN® lattice tower health condition, PPL Electric proposes to rebuild the existing Stanton-Summit #3 and #4 230 kV Transmission Lines. All the COR-TEN® lattice structures as well as the conductors at the 46 locations will be replaced.

The Project will improve overall reliability, safety and system resiliency by resolving the asset health needs associated with COR-TEN® lattice tower replacement. The transmission line rebuild solution was deemed to be the most cost-effective solution to address these needs.

Importantly, the Proposed Solution also avoids excess costs and uncertainties surrounding the remediation solution contemplated in Alternative 2. As noted above, if PPL Electric were to remediate the existing COR-TEN® lattice towers, further routine inspections would be required to identify any new pack-out rust growth requiring additional corrective action. The remediation effort could provide a short-term extension of life, but ultimately these towers will still need to be replaced to permanently address the issue of pack-out rust since structural integrity of the COR-TEN® steel will become too compromised to remediate. In this regard, Alternative 2 does not represent an alternative that effectively addresses the structural issues associated with the COR-TEN® lattice towers. Moreover, PPL Electric is unaware of another project that has undergone

full weathering-steel COR-TEN® lattice tower remediation. As such, the recurring costs of remediation could be even greater than anticipated and are unlikely to successfully mitigate the risk. The Proposed Solution avoids these excess costs and uncertainties, efficiently rebuilds the transmission lines to ensure the continued provision of safe and reliable service, and resolves the additional reliability concerns identified above.

The approximate cost of the entire transmission line rebuild Project is \$36.8 Million.

On a total cost of service basis, the Proposed Solution is approximately 88% of the cost of Alternative 1 (replacing each of the existing structures) on a 45-year basis and 95% of the cost of Alternative 1 on 75-year basis. In addition, on a total cost of service basis, the Proposed Solution is approximately 89% of the cost of Alternative 2 (remediating the existing structures) on a 45-year basis and 57% of the cost of Alternative 2 on 75-year basis.

As discussed in Section 4.2.1, above, the project scope (Supplemental Project Number s2367) to rebuild the Stanton-Summit #3 and #4 230 kV Transmission Lines was presented to PJM in the October 2020 TEAC meeting¹⁸ to address the COR-TEN® asset health issues.

A map of the proposed system alignment is provided as Figure 1-2.

¹⁸ Refer to slides 13 and 14 at <https://www.pjm.com/~media/committees-groups/committees/teac/2020/20201006/20201006-item-09-ppl-supplemental.ashx>

Figure 1-1: Existing System Configuration



This figure was prepared using publicly available tax parcel data to show the general location of facilities and easements. The location of all easements and facilities were based on a visual review of the aerial imagery. This figure was not prepared by a site specific survey and all locations are approximate.

Legend

● Existing Structure (To Remain)	Existing Transmission Lines
■ Existing Structure (To Be Replaced)	69 kV
— PPL Electric ROW	230 kV
▨ NWI Wetlands	500 kV
▨ Natural Areas (Core Habitat)	
— Chapter 93 Designated Use Stream	
— CWF	
— HQ	
— TSF	
— WWF	

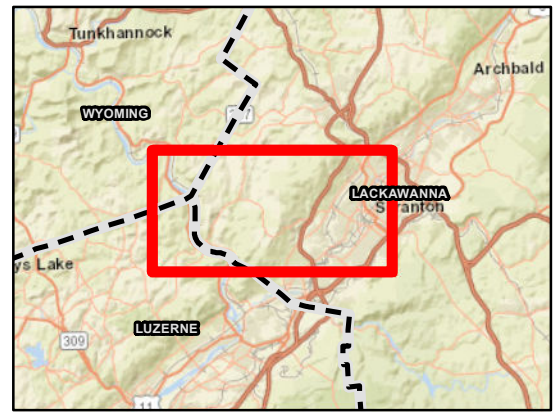
Notes:

- Existing structure locations and right-of-way were provided by PPL Electric in January 2022.
- Existing Transmission Lines provided by PPL Electric in April 2019.

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

References:
 Ch. 93 Designated Use Streams (PADEP 2022)
 NWI Wetlands (2021)
 Natural Areas (PNHP 2020)
 Google Maps Satellite (2019)

0 2,000 4,000 8,000
 Feet
 1 inch = 4,000 feet



AECOM

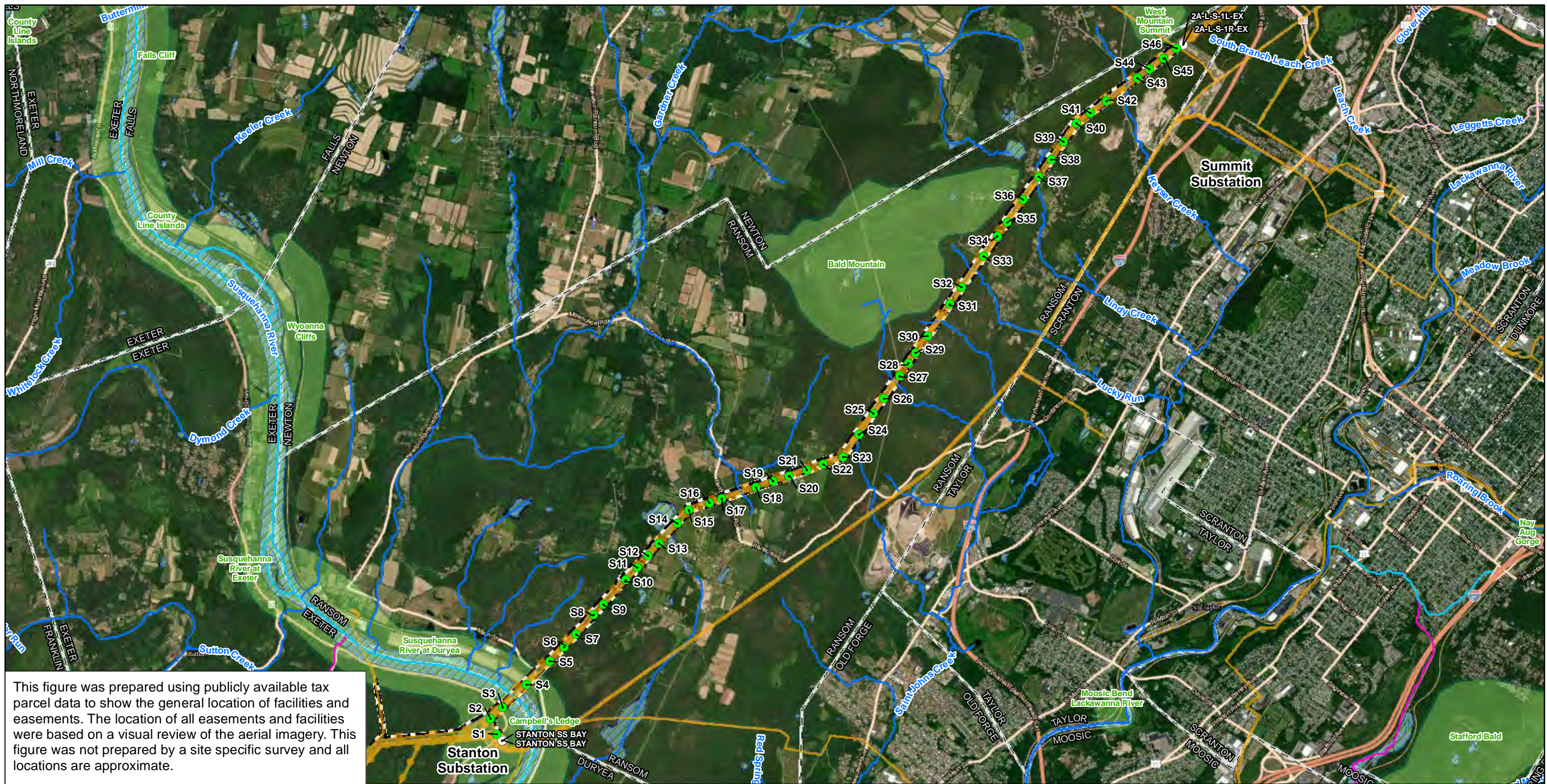
FIGURE 1-1
Existing System Configuration
Stanton-Summit 230 kV
COR-TEN Rebuild Project

Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 8/22/2022

Figure 1-2: Proposed System Configuration



This figure was prepared using publicly available tax parcel data to show the general location of facilities and easements. The location of all easements and facilities were based on a visual review of the aerial imagery. This figure was not prepared by a site specific survey and all locations are approximate.

Legend

- Proposed Structure
- Existing Structure (To Remain)
- PPL Electric ROW
- ▨ NWI Wetlands
- ▨ Natural Areas (Core Habitat)
- ▨ Chapter 93 Designated Use Stream
- CWF
- HQ
- TSF
- WWF

Existing Transmission Lines

- 69 kV
- 230 kV
- 500 kV

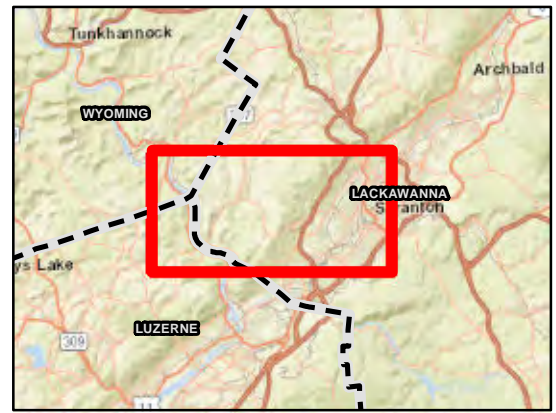
Notes:

- Existing structure locations and right-of-way were provided by PPL Electric in January 2022.
- Proposed structure locations were provided by PPL Electric in September 2022.
- Existing Transmission Lines provided by PPL Electric in April 2019.

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

References:
 Ch. 93 Designated Use Streams (PADEP 2022)
 NWI Wetlands (2021)
 Natural Areas (PNHP 2020)
 Google Maps Satellite (2019)

0 2,000 4,000 8,000
 Feet
 1 inch = 4,000 feet



AECOM

FIGURE 1-2
Proposed System Configuration
Stanton-Summit 230 kV
COR-TEN Rebuild Project
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF
 Checked By: DJY/BAB
 Job: 60664608
 Date: 9/14/2022

PPL ELECTRIC
EXHIBIT NO. JBL-2

STANTON-SUMMIT #3 AND #4 230 KV COR-TEN® REBUILD PROJECT

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1.0 INTRODUCTION

As explained in **Attachment 1**, PPL Electric Utilities Corporation (“PPL Electric”) is requesting Pennsylvania Public Utility Commission (“PUC” or “Commission”) approval to rebuild the existing double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines connecting the Stanton 230 kV Substation (“Stanton Substation”) and a two-pole turn structure (Structures 56275-N-47514(L)/56274-N-47518(R)) located approximately 1.4 miles north of the Summit 230-69 kV Substation (“Summit Substation”) that are respectively located in Luzerne and Lackawanna Counties, Pennsylvania (“Project”).

The proposed transmission line system will be designed according to, and generally exceed, all National Electrical Safety Code (“NESC”) standards. Design specifications and safety rules adhered to by PPL Electric are included as **Attachment 4**.

2.0 DESCRIPTION OF THE EXISTING AND PROPOSED LINES AND STRUCTURES

Connection between the Stanton Substation and Summit Substation turn structures involves a 47.7-mile-long section of the double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines. The existing Stanton-Summit #3 and #4 230 kV Transmission Lines contain six 1590 kcmil¹, 45/7 stranding, “Lapwing” ACSR² conductor wires and two overhead ground wires (“OHGW”) from the Stanton Substation to the Summit Substation turn structures. These conductor and ground wires are supported by a series of transmission line structures that include 46 COR-TEN® double-circuit steel lattice tower structures.

Due to the corrosion and development of pack rust³ on these COR-TEN® lattice tower structures, PPL Electric proposes to replace them with double-circuit steel monopole structures. The COR-

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.

² ACSR stands for aluminum conductor steel reinforced.

³ “Pack-out rust” or “pack rust” is a form of localized corrosion typical of steel components that develop a crevice into an open atmospheric environment, which results in rust packing between conjoined steel components. As described in Attachment 1, pack-out rust accelerates the deterioration of asset health and can result in shearing off bolts, loss of structural integrity, members disconnecting from lattice towers, and tower failure.

TEN® lattice tower structures to be replaced extend consecutively between existing tower 53500-N-44772 (proposed Structure 66) located near the Stanton Substation and tower 56252-N-47468 (proposed Structure 119) located next to the Summit Substation turn structures. The Summit Substation turn structures will not be replaced but will be upgraded with new ground wires. A detailed map of the Project alignment is provided as **Figure 3-1 in Attachment 3**.

The existing COR-TEN® lattice tower structures range in height from between approximately 120 and 170 feet with an average structure height of approximately 144 feet. The proposed monopole structures for the Stanton-Summit #3 and #4 230 kV Transmission Lines will range in height from between approximately 110 and 175 feet with an average structure height of approximately 140 feet. **Table 2-1** provides a summary of the number and heights of the existing and proposed structures.

Table 2-1: Existing and New Transmission Line Structures

Transmission Line	No. of Existing Structures	Existing Structure Height Range (feet)	Proposed No. of New Structures	Proposed Structure Height Range (feet)	Applicable Framing/ Specifications
STANTON-SUMMIT #3 and #4 230 kV	46	120-170	46	110-175	7-009-061 7-009-062 7-009-064
Total	46		46		

Figures 2-1 and 2-2 depict typical structure types that will be used for the Stanton-Summit #3 and #4 230 kV Transmission Lines, which include the following:

- Install approximately 31 new double-circuit long span suspension structures (**Figure 2-1**).
- Install approximately two new double-circuit long span angle suspension structures (**Figure 2-2**), and
- Install approximately 13 new double-circuit long span angle tension structures (**Figure 2-3**).

The proposed Stanton-Summit #3 and #4 230 kV Transmission Lines will consist of 46 new monopole structures. The new monopole structures will be offset approximately 10 feet off center from the existing COR-TEN® lattice towers as a safety precaution. This lateral shift will move the Stanton-Summit #3 and #4 230 kV Transmission Lines to the north and slightly closer to the existing 500 kV structures that share the 325-foot-wide right-of-way (“ROW”) corridor that

extends through the Project area from the Stanton Substation to the Summit Substation turn structures. PPL Electric has designed the proposed transmission line system so that it fits entirely within the existing ROW. The proposed Stanton-Summit #3 and #4 230 kV Transmission Lines will consist of six 1590 kcmil, 54/19 stranding, “Falcon” ACSS⁴ conductors. The two OHGW will be removed and be replaced with 48 fiber optical ground wires (“OPGW”). The minimum conductor-to-ground clearance will be 25.5 feet which occurs at the emergency maximum thermal conductor temperature of 250°C (482°F). The design minimum conductor clearances and conductor thermal ratings for the reconstructed lines are noted in **Tables 2-2 and 2-3**.

Table 2-2: Design for Minimum Conductor Clearance for 1590 kcmil 54/19 Stranding ACSS


Condition	Transmission Double-Circuit Design Clearance-to-Ground
PPL Heavy Ice (1” ice, 32°F)	25.5’
Max Operating Temperature (250°C / 482°F)	25.5’
PPL Blowout (15psf, 60°F)	25.5’

Table 2-3: Conductor Thermal Rating 1590 kcmil 54/19 Stranding Falcon ACSS – 200°C Normal Maximum Conductor Temperature (250°C Emergency)

Condition	Ambient Temperature (°C)	Wind Speed (Ft./sec)	Ampacity (Amps)
Summer Normal	35	0	2344
Winter Normal	10	0	2506
Summer Emergency	35	2.53	3074
Winter Emergency	10	2.53	3201

⁴ ACSS stands for aluminum conductor steel supported

Figure 2-1: Typical 230 kV Long Span Double-Circuit Steel Pole Structure

	7-009-061 230kV Long Span Double Circuit Steel Pole 0° to 1° Suspension Structure	Revision: 0 Effective Date: 3/18/2016 Sheet 1 of 1
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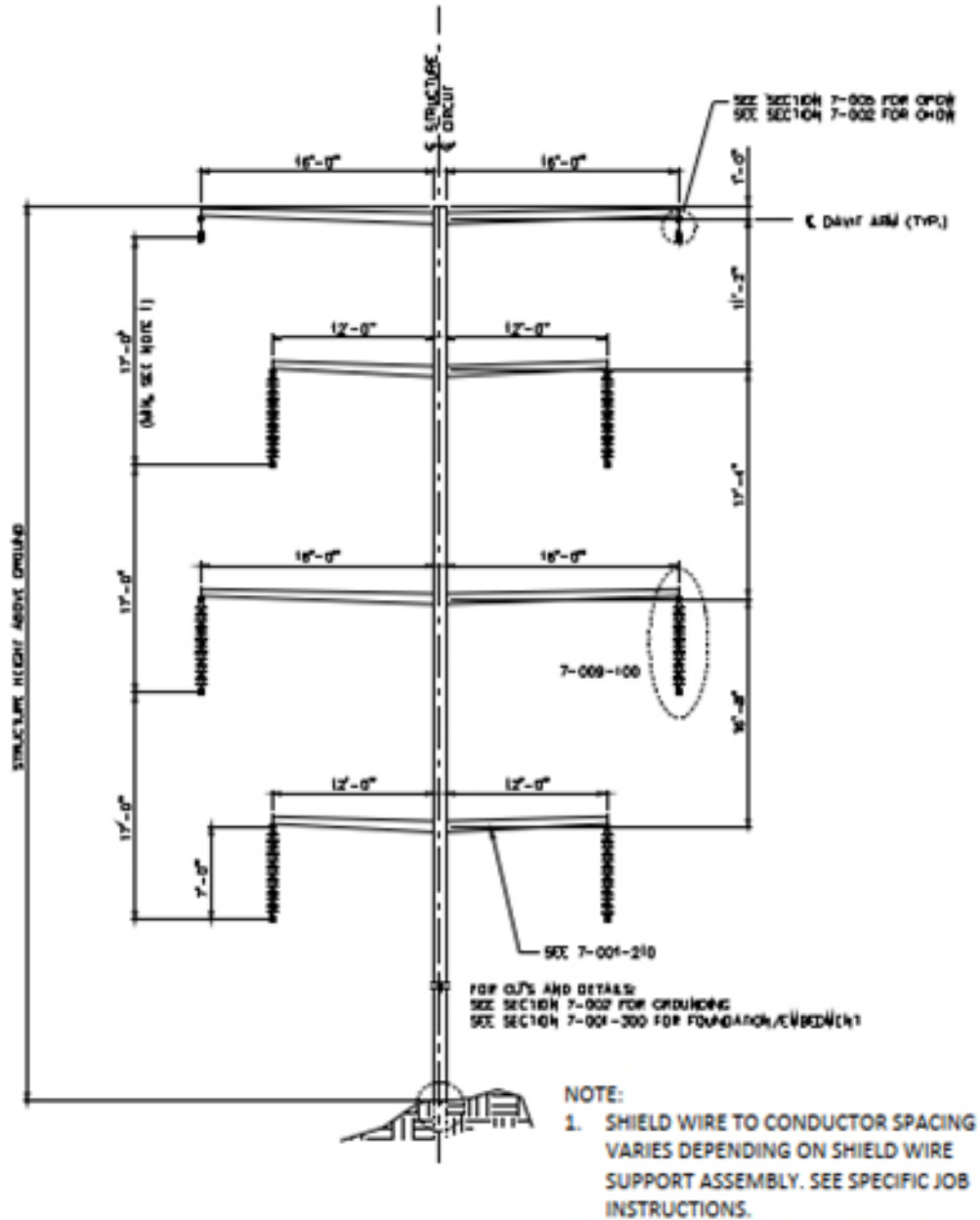

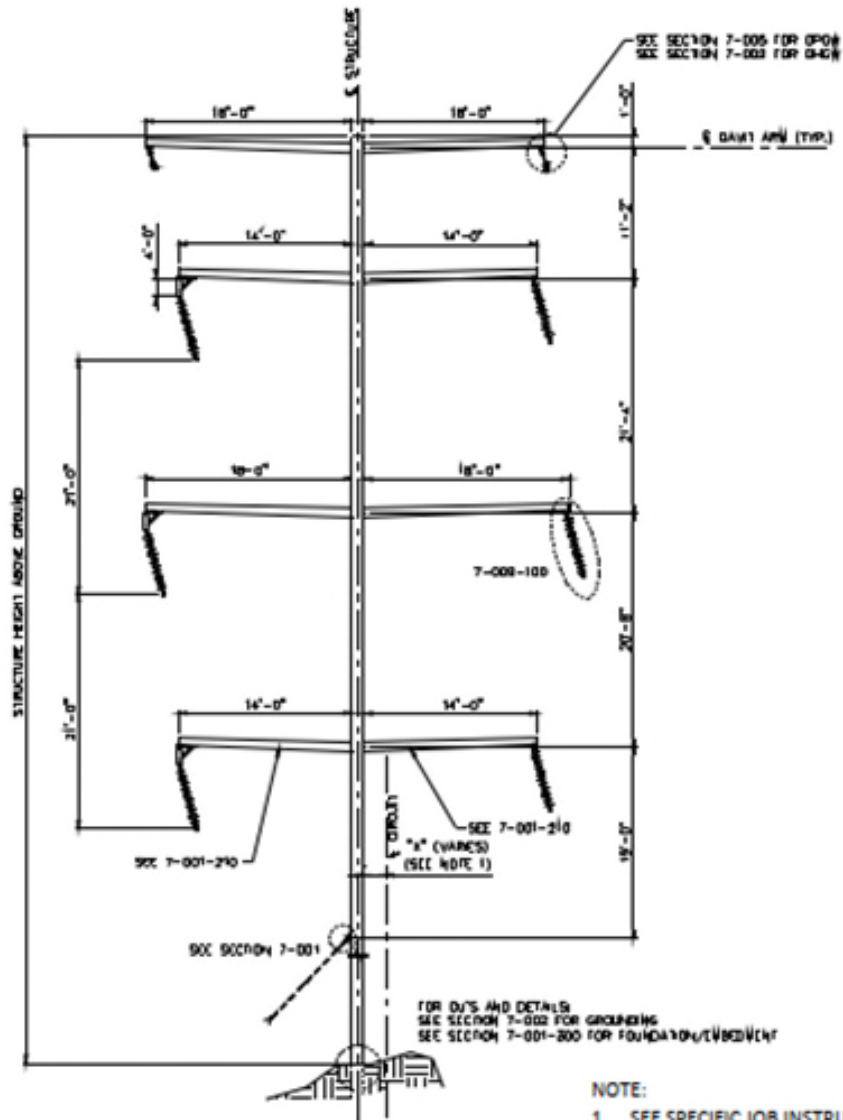



Figure 2-2: Typical 230 kV Long Span Double-Circuit Steel Pole Angle Suspension Structure

	7-009-062 230kV Long Span Double Circuit Steel Pole 1° to 10° Angle Suspension Structure	Revision: 0 Effective Date: 3/18/2016 Sheet 1 of 1
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REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	Approved T. P. Hinson Manager Standards

Figure 2-3: Typical 230 kV Long Span Double-Circuit Steel Pole Angle Tension on Arm Structure



7-009-064

230kV Long Span Double Circuit Steel Pole
 0° To 90° Angle Tension on Arm Structure

Revision: 0
 Effective Date: 3/18/2016
 Sheet 1 of 1

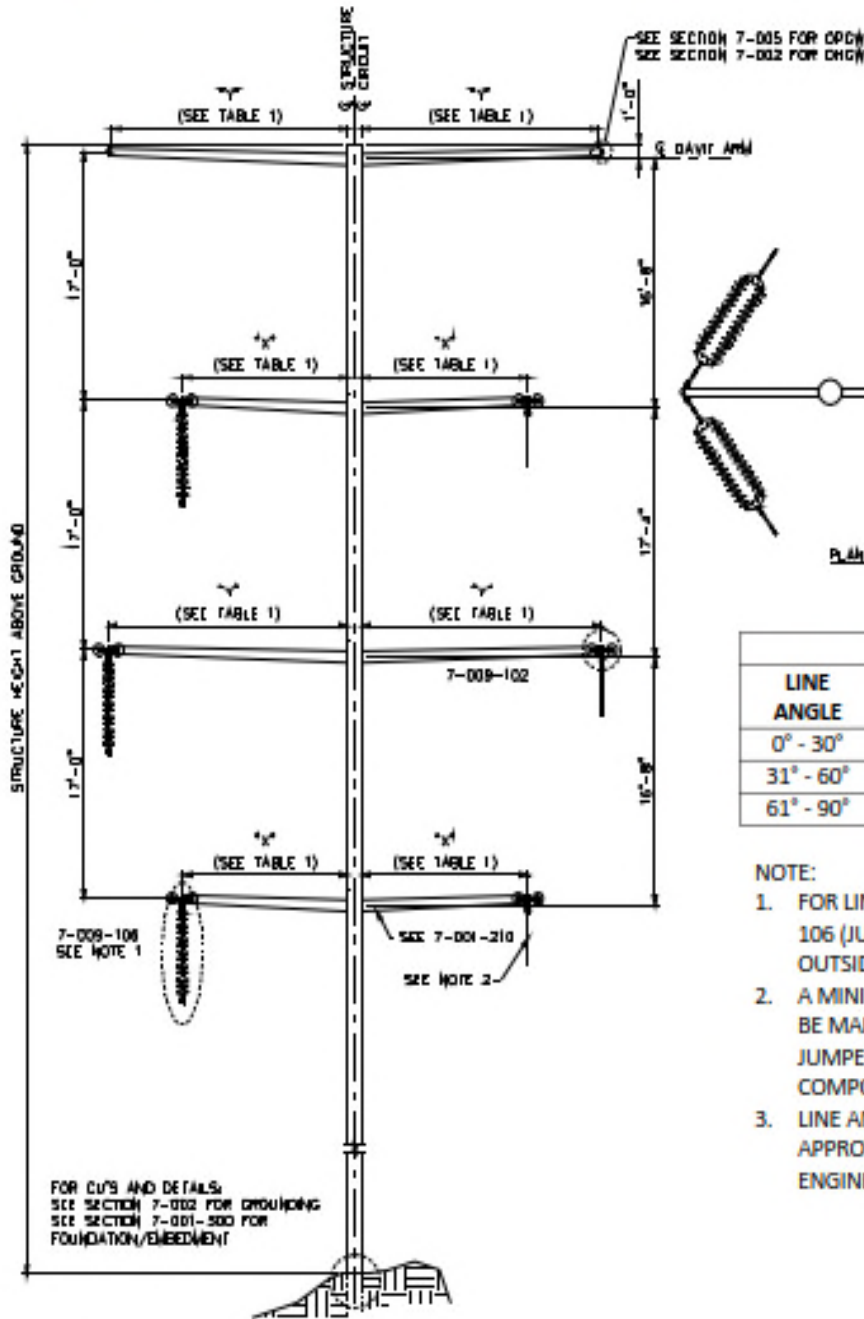


TABLE 1		
LINE ANGLE	DAVIT ARM LENGTH "X"	DAVIT ARM LENGTH "Y"
0° - 30°	12'-0"	16'-0"
31° - 60°	14'-0"	18'-0"
61° - 90°	17'-0"	21'-0"

NOTE:

1. FOR LINE ANGLES OVER 10° INSTALL 7-009-106 (JUMPER SUSPENSION ASSEMBLY) ON OUTSIDE CIRCUIT ONLY.
2. A MINIMUM 86 1/4 INCH CLEARANCE SHALL BE MAINTAINED FROM ANY POINT ON THE JUMPER TO ALL GROUNDED STRUCTURAL COMPONENTS AND HARDWARE.
3. LINE ANGLE MAY EXCEED 90° WITH APPROVAL FROM PPL ENGINEERING/STANDARDS.

PPL ELECTRIC
EXHIBIT NO. JBL-3

STANTON-SUMMIT #3 AND #4 230 kV COR-TEN® REBUILD PROJECT

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1.0 INTRODUCTION

PPL Electric Utilities Corporation (“PPL Electric”) is requesting Pennsylvania Public Utility Commission (“PUC” or “Commission”) approval to rebuild 7.7 miles of the existing double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines connecting the Stanton 230 kV Substation (“Stanton Substation”) and a two-pole turn structure (Structures 56275-N-47514(L)/56274-N-47518(R)) located approximately 1.4 miles north of the Summit 230-69 kV Substation (“Summit Substation”) that are respectively located in Luzerne and Lackawanna Counties, Pennsylvania (“Project”).

The rebuilt double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines will be on the same structure alignment and in the same right-of-way (“ROW”) as the existing transmission lines. The centerline alignment, however, is being shifted approximately 10-feet to the north toward the center of the ROW to account for construction safety concerns. The existing ROW is approximately 325 feet wide and contains another PPL Electric-owned transmission line that parallels the northern side of the Stanton-Summit #3 and #4 230 kV Transmission Lines. The Project will require the replacement of 46 existing structures that will be constructed entirely within the existing ROW. A network of existing access roads or temporary roads will be utilized during construction of the rebuilt transmission lines. Detailed maps of the proposed rebuilt double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines and associated structures are provided in **Figure 3-1**.

From the Stanton Substation, the Project travels in a northeasterly direction across forested mountains and mixed agricultural and low-density residential areas before reaching the turn structures that lead into the Summit Substation as shown in **Figure 3-1**. The ROW for the Project is further described below:

- From the Stanton Substation, the Project will extend north approximately 0.2 miles (1,125 feet) over State Route 92 and open meadow to Structure S2 using two COR-TEN® structures that will be replaced with two long span angle tension monopole structures (7-009-064) (Sheet 1, Structures S1 and S2 in **Figure 3-1**). These structures are located entirely on ROW maintained by PPL Electric.

- From Structure S2, the Project turns to the northeast and extends 2.2 miles (11,640 feet) to Structure S15 (Sheets 1 to 4, Structures S3 to S15 in **Figure 3-1**). This segment spans State Route 92, the North Branch Susquehanna River, the Reading Blue Mountain and Northern Railroad, and Lower Narrows Road before extending upslope across a forested mountain to Ransom Road located near Structure S15. Starting with Structure S3, the thirteen COR-TEN® structures along this segment will be replaced with new structures that include seven long span suspension monopole structures (7-009-061), one long span angle suspension monopole structure (7-009-062), and five long span angle tension monopole structures (7-009-064). These structures are located entirely on ROW maintained by PPL Electric.
- From Structure S15, the Project turns to the east and extends for 1.25 miles (6,590 feet) to Structure S23 (Sheets 4 to 6, Structures S16 to S23 in **Figure 3-1**). This segment extends across predominantly agricultural lands that are bordered by low density residential development. Four local roads are spanned along the alignment. The eight COR-TEN® structures along this segment will be replaced with new structures that include five long span suspension monopole structures (7-009-061), one long span angle suspension monopole structure (7-009-062), and two long span angle tension monopole structures (7-009-064). These structures are located entirely on ROW maintained by PPL Electric.
- From Structure S23, the Project turns to the northeast and extends 3.05 miles (16,120 feet) to Structure S40 (Sheets 6 to 10, Structures S24 to S40 in **Figure 3-1**). This segment extends predominantly across the forested slopes of Bald Mountain but does span two local roads that are bordered by low density residential development closer to Structure S40. The seventeen COR-TEN® structures along this segment will be replaced with new structures that include fifteen long span suspension monopole structures (7-009-061) and two long span angle tension monopole structures (7-009-064). These structures are located entirely on ROW maintained by PPL Electric.
- From Structure S40, the Project turns to the east and extends 1.00 miles (5,420 feet) to the turn structures to Summit Substation (Sheets 10 and 11, Structures S41 to S46 in **Figure 3-1**). This segment continues across the forested slopes of Bald Mountain that is bisected by one local road and also consists of active quarry operations. The six COR-TEN® structures along this segment will be replaced with new structures that include five long span suspension monopole structures (7-009-061) and one long span angle tension

monopole structures (7-009-064). These structures are located entirely on ROW maintained by PPL Electric.

2.0 LAND USE

PPL Electric evaluated the existing land uses on the PPL Electric owned properties, within the existing ROW, and within 0.25 miles (1,320 feet) of the ROW (“Project Area”). This broader Project Area was reviewed to provide a sense of the landscape in which the Project is located. Based on review of the 2021 National Land Cover Data (“NLCD”), land use in the Project Area is approximately 90% forested with the remaining 10% comprised of mixed agricultural and residential areas that are crossed at intersections with local roads.

The Project spans the Reading Blue Mountain and Northern Railroad, which parallels the eastern side of the North Branch Susquehanna River near the Stanton Substation. Two Buckeye Partners product pipelines are also crossed east of Ransom Road in the central portion of the Project. Two communication towers that are also located in the central portion of the Project are located within one mile of the alignment. Access roads to these facilities are spanned by the Project. The Project does not cross other electrical utility ROW’s but does parallel the PPL Electric Susquehanna-Roseland 500 kV Transmission Line for the entire length of the Project.

The closest active airports relative to the Project Area are the Wilkes-Barre Scranton International Airport, which is approximately five miles to the south of the Stanton Substation, and the Wilkes-Barre Wyoming Valley Airport, located approximately six miles to the southwest. PPL Electric does not anticipate any interference with airport operations because the Project is located in an area where there are existing electrical facilities. However, PPL Electric will comply with any applicable requirements of the Federal Aviation Administration and the Pennsylvania Department of Transportation, Bureau of Aviation.

Conserved Lands

The proposed Project will not affect any national parks, state parks, local parks, recreational areas, or natural landmarks. None of these features are located within the Project Area. Review of the National Conservation Easement Database and PA Conserved Lands websites notes that no conserved lands are crossed by the Project.

3.0 CULTURAL RESOURCES

An online review of the Project Area and surrounding landscape was conducted through the Pennsylvania Historical and Museum Commission (“PHMC”) State Historic and Archaeological Resource Exchange site. No State Historic Preservation Office (“SHPO”) listed or eligible properties are crossed by the Project but the Bedell-Courtright Farmstead (SHPO resource Number 2011RE00513) borders the north side of the ROW along Ransom Road in the central portion of the Project Area. No effect to this resource is anticipated by the proposed Project activities.

PPL Electric is in the initial stage of coordination with the PHMC for the modifications being made to the transmission lines. This coordination will be required to receive permits to construct the Project and will be conducted in the near future. PPL Electric does not anticipate any impacts to SHPO eligible properties or any other PHMC related properties. PPL Electric will perform any reviews and field survey/sampling work required by the PHMC to avoid, minimize, and mitigate impacts to archaeological or historic architectural resources that may be located within the Project Area.

4.0 NATURAL FEATURES

Unique Natural Features

No unique geological, scenic, or natural areas are located within the Project Area, according to the Pennsylvania Department of Conservation and Natural Resources (“PDCNR”).

Soils

The Project traverses over mountains and crosses along hillsides and plateau ridges with topography ranges from approximately 600 feet above sea level (“abs”) at the Stanton Substation to approximately 1,920 feet abs at the mountain summits near the turn structures to Summit Substation. The soils present within the Project Area consist of very stony to channery loams, silt loams, and rock outcrops found on moderate to steeply sloped mountain, hillside, and plateau ridge landforms.

Erosion and Sedimentation (“E&S”) control plans will be developed and implemented for the Project to minimize the displacement of soils. These plans will require prior approval from the local county conservation districts. National Pollutant Discharge Elimination System (“NPDES”) permits will also be required from the Pennsylvania Department of Environmental Protection (“PADEP”) as needed. During construction, PPL Electric will adhere to all conditions specified in the NPDES permit. Impacts to local soil resources are anticipated to be minimal.

Waterways

The existing transmission lines span eight National Hydrography Dataset waterways that will remain in place after the Project construction activities have occurred. The waterways crossed by the Project include the North Branch Susquehanna River, Saint John’s Creek, Lucky Run, Lindy Creek, Keyser Creek and several tributaries to these features. These waterways are located in the Obendoffers Creek-Susquehanna River Watershed (HUC-02050106409), the Lackawanna River-Susquehanna River Watershed (HUC-020501070110), and the City of Scranton-Lackawanna River Watershed (HUC-020501070109). The North Branch Susquehanna River has a PADEP Chapter 93 Designated Use of Warm Water Fishes, Migratory Fishes (“MF”) and all of the remaining waterways have a Designated Use of Cold-Water Fishes; MF. Lucky Run is also classified as a Wild Trout (Natural Reproduction) stream by the Pennsylvania Fish and Boat Commission (“PFBC”). No direct impacts to these waterway features are anticipated by the Project activities.

An E&S control plan will be developed to address stormwater control in all watershed areas crossed by the Project. PPL Electric will obtain all approvals and permits necessary for the construction of the Project and will comply with any conditions placed on those permits.

Wetlands

Based on review of the U.S. Fish and Wildlife Service's ("USFWS") National Wetlands Inventory ("NWI"), the Project crosses one Palustrine Emergent (PEM1/SS1E) and one Palustrine Scrub-Shrub (PSS1/EM1) wetland complex and eight waterways classified as Riverine Unknown Perennial (R5UBH) stream habitats. The Project also spans the North Branch Susquehanna River which is classified as a Riverine Lower Perennial (R2UBH) waterway. No impacts to these NWI features are anticipated by the proposed Project activities.

The NWI only provides a general overview of the potential wetlands that may be located within an area. For federal and state permitting purposes, the wetlands and waterways within the Project Area have been delineated, surveyed, and illustrated according to regulatory standards. This information is being used to minimize wetland and waterway impacts where feasible. Additionally, PPL Electric will avoid impacts to wetlands and waterways where possible by aerially spanning these features.

100-year Floodplains

The National Flood Hazard Layers for Luzerne and Lackawanna Counties, Pennsylvania were obtained through the Federal Emergency Management Agency ("FEMA") Flood Map Service Center website and analyzed for 100-year floodplains within the Project Area and surrounding landscape. Based on review of this data, the Project Area is within the FEMA 100-year floodplain bordering the North Branch Susquehanna River. No impacts to this floodplain area are anticipated by the proposed Project activities.

Vegetation

Vegetative cover in the Project Area consists almost entirely of forested habitat. Several areas of forest clearing, agricultural use, and rural residential development are present based on aerial imagery. The existing ROW areas for the transmission line has previously been cleared of woody vegetation and no extensive tree clearing is anticipated on most of those lines. If vegetation management is required in this specific location, PPL Electric will apply its “Specifications for Transmission Vegetation Management LA-79827” to minimize potential impacts.

5.0 THREATENED AND ENDANGERED SPECIES

Natural Areas Inventory

Based on review of the *Natural Areas Inventory of Luzerne County, Pennsylvania*, published by The Western Pennsylvania Conservancy in 2006, and the *Natural Areas Inventory of Lackawanna County, Pennsylvania*, published by The Nature Conservancy in 2003, the Project is located within the Susquehanna River at Duryea natural area and adjacent to the Bald Mountain natural area. The Susquehanna River at Duryea natural area is located in Luzerne and Lackawanna Counties and consists of aquatic and riparian habitats along the Susquehanna River corridor that support two species of concern. The Bald Mountain natural area is located in Lackawanna County and includes a Ridgetop Dwarf-Tree Forest Natural Community and an Acidic Rocky Summit Natural Community as well as habitat for four plant species of concern.

Threatened and Endangered Species

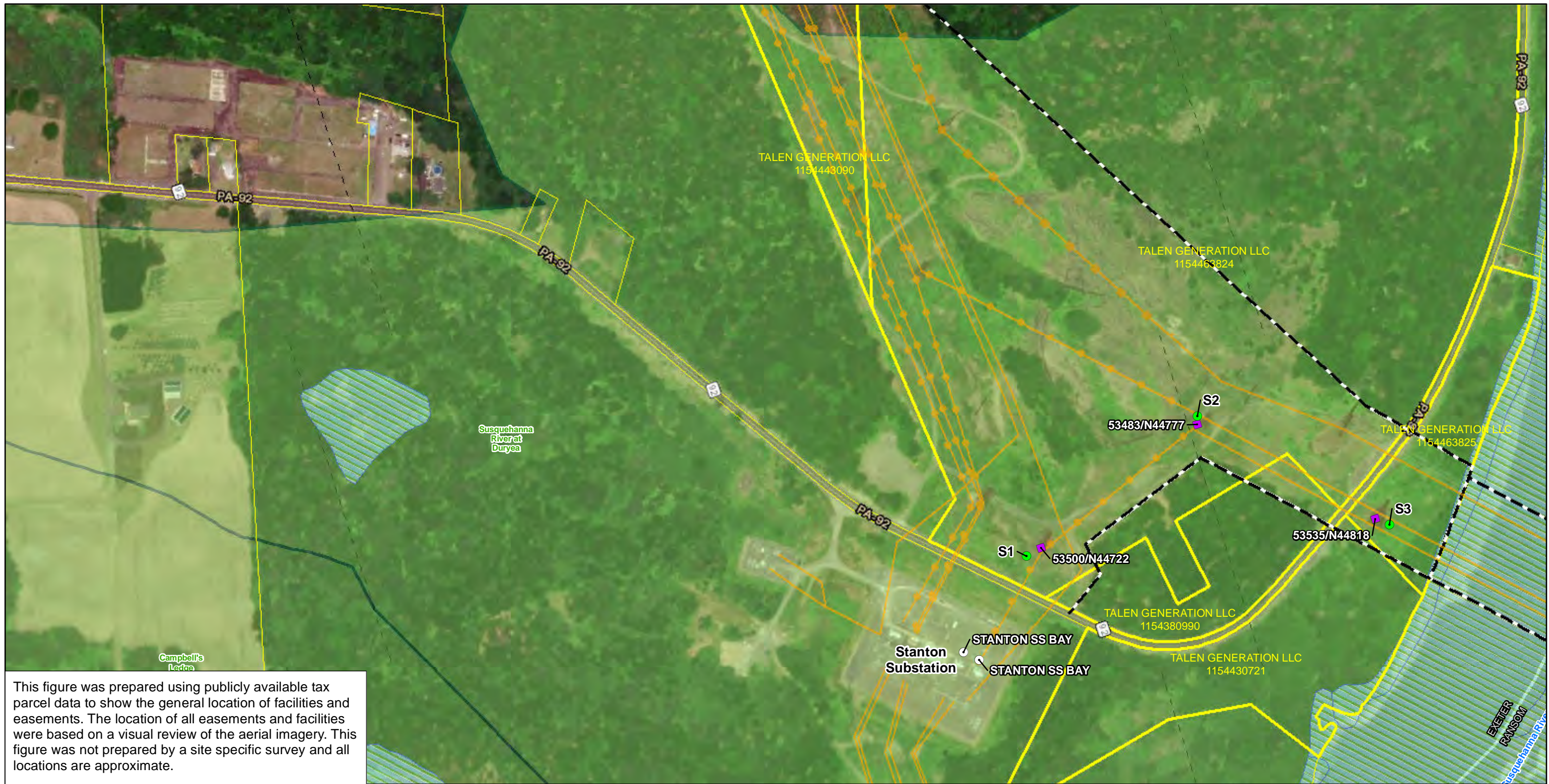
A Pennsylvania Natural Diversity Inventory was run for the Project on October 8, 2021, to assess the potential presence of threatened and endangered species and/or special concern species. Specific agencies reviewing the Project included the following:

- Pennsylvania Game Commission,
- PFBC,
- PDCNR, and
- USFWS.

PDCNR is the only agency that responded with potential threatened and endangered species concerns within the Project Area. Surveys for the identified plant species of concern were conducted in spring and fall 2022. The specific plant species identified by PDCNR were not found in the Project Area, but a different plant species of concern was found in a location that will not be affected by Project activities. PPL Electric will continue to consult with the PDCNR regarding avoidance of this protected species.

PPL Electric will obtain all necessary approvals and permits for Project construction and comply with all conditions placed on those permits.

Figure 3-1: Aerial Map of the Project



This figure was prepared using publicly available tax parcel data to show the general location of facilities and easements. The location of all easements and facilities were based on a visual review of the aerial imagery. This figure was not prepared by a site specific survey and all locations are approximate.

Legend

Proposed Structure	Existing Transmission Lines
Existing Structure (To Remain)	69 kV
Existing Structure (To Be Replaced)	230 kV
PPL Electric ROW	500 kV
NWI Wetlands	
Natural Areas (Core Habitat)	
Parcel Boundary	
Chapter 93 Designated Use Stream	
WWF	

Notes:

- Existing structure locations and right-of-way were provided by PPL Electric in January 2022.
- Proposed structure locations were provided by PPL Electric in September 2022.
- Existing Transmission Lines provided by PPL Electric in April 2019.

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

References:
 Ch. 93 Designated Use Streams (PADEP 2022)
 NWI Wetlands (2021)
 Natural Areas (PNHP 2020)
 Google Maps Satellite (2019)

1 inch = 300 feet

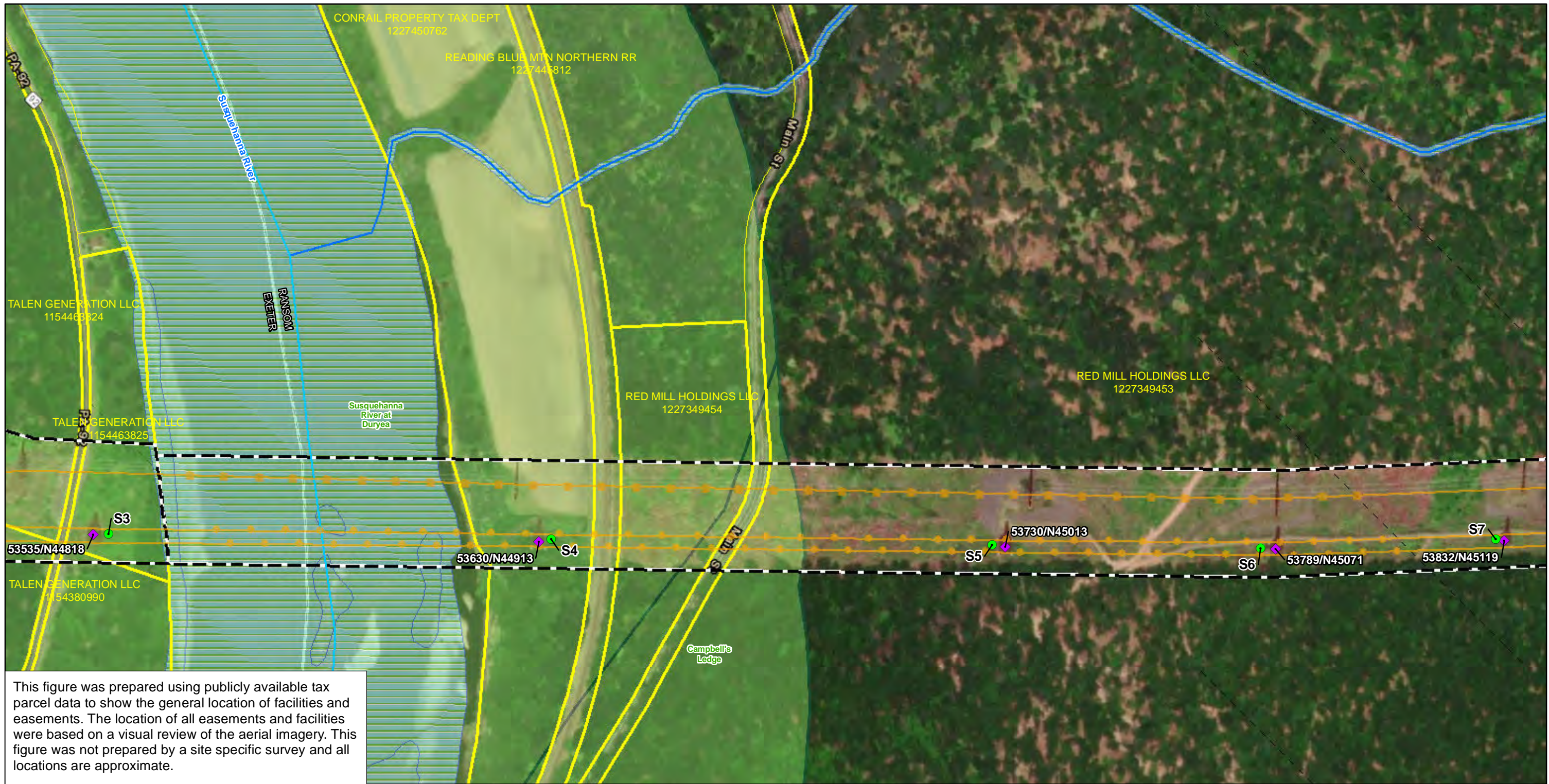


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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 1 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



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Legend

- Proposed Structure
- Existing Structure (To Be Replaced)
- PPL Electric ROW
- ▨ NWI Wetlands
- ▨ Natural Areas (Core Habitat)
- ▭ Parcel Boundary
- Chapter 93 Designated Use Stream
 - CWF
 - WWF

Existing Transmission Lines

- 230 kV
- 500 kV

Notes:

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2. Proposed structure locations were provided by PPL Electric in September 2022.
3. Existing Transmission Lines provided by PPL Electric in April 2019.

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

References:
 Ch. 93 Designated Use Streams (PADEP 2022)
 NWI Wetlands (2021)
 Natural Areas (PNHP 2020)
 Google Maps Satellite (2019)

0 150 300 600
 Feet
 1 inch = 300 feet



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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 2 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



Legend

- Proposed Structure
- Existing Structure (To Be Replaced)
- PPL Electric ROW
- ▨ NWI Wetlands
- ▭ Parcel Boundary
- Chapter 93 Designated Use Stream
- CWF

Existing Transmission Lines

- 230 kV
- 500 kV

Notes:

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- Existing Transmission Lines provided by PPL Electric in April 2019.

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

References:
Ch. 93 Designated Use Streams (PADEP 2022)
NWI Wetlands (2021)
Natural Areas (PNHP 2020)
Google Maps Satellite (2019)

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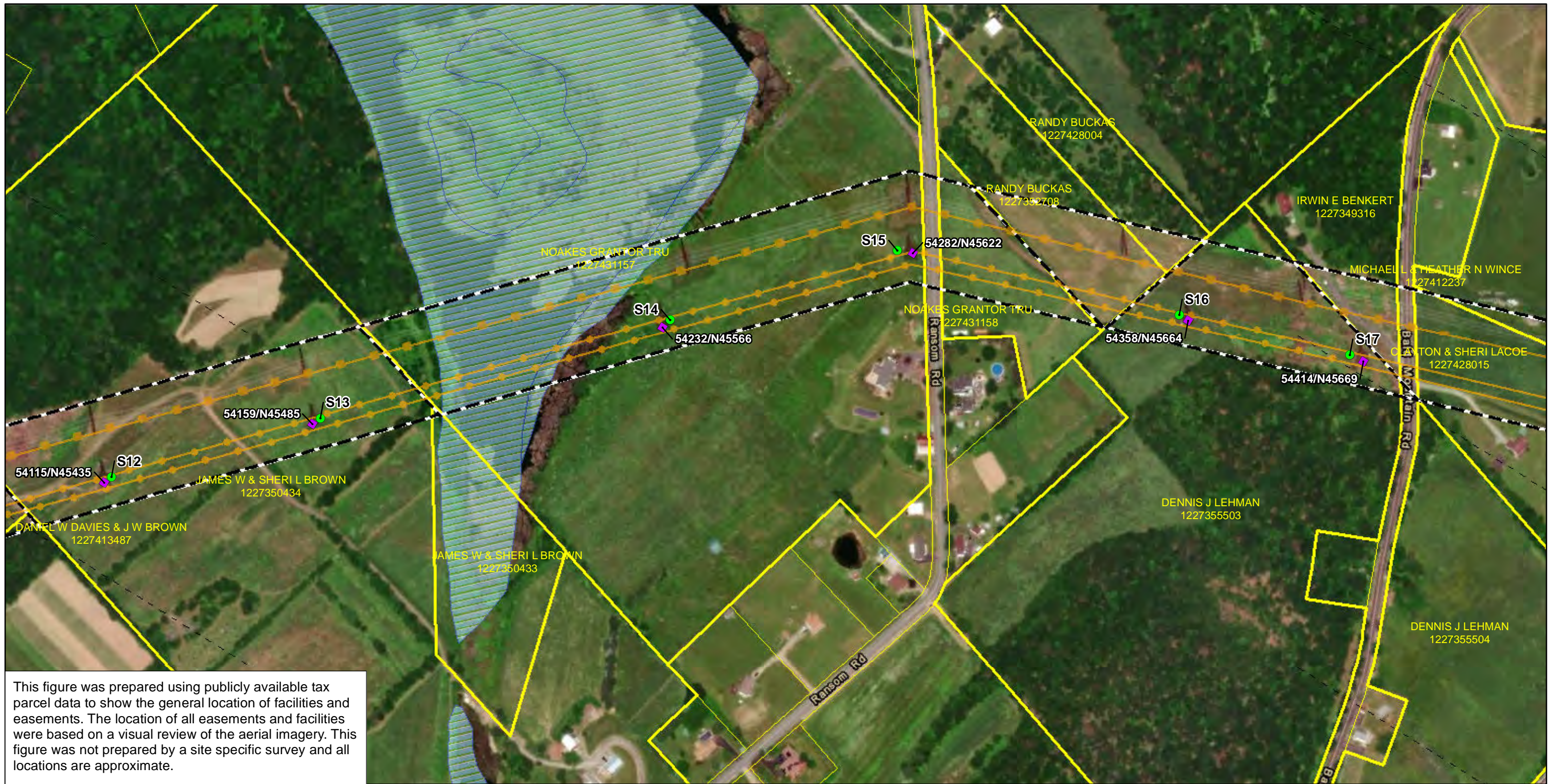


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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 3 of 11
Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



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Legend

- Proposed Structure
- Existing Structure (To Be Replaced)
- PPL Electric ROW
- NWI Wetlands
- Parcel Boundary

Existing Transmission Lines

- 230 kV
- 500 kV

Notes:

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- Existing Transmission Lines provided by PPL Electric in April 2019.

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

References:
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 NWI Wetlands (2021)
 Natural Areas (PNHP 2020)
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0 150 300 600
 Feet
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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 4 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



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Legend

- Proposed Structure
- Existing Structure (To Be Replaced)
- PPL Electric ROW
- NWI Wetlands
- Parcel Boundary
- Chapter 93 Designated Use Stream
- CWF

Existing Transmission Lines

- 230 kV
- 500 kV

Notes:

1. Existing structure locations and right-of-way were provided by PPL Electric in January 2022.
2. Proposed structure locations were provided by PPL Electric in September 2022.
3. Existing Transmission Lines provided by PPL Electric in April 2019.

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

References:
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 NW1 Wetlands (2021)
 Natural Areas (PNHP 2020)
 Google Maps Satellite (2019)

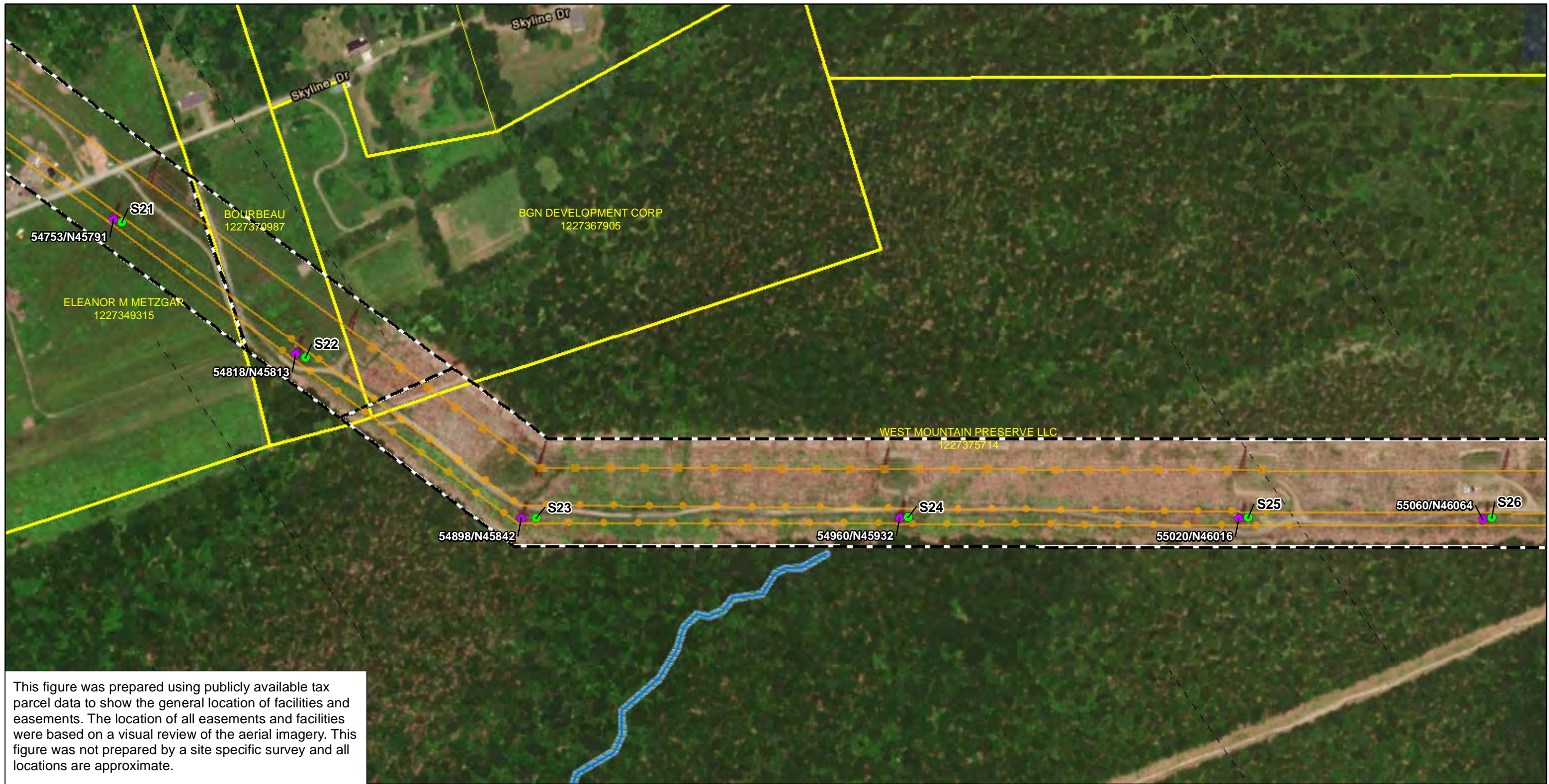


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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 5 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



Legend

- Proposed Structure
- Existing Structure (To Be Replaced)
- PPL Electric ROW
- NWI Wetlands
- Parcel Boundary
- Chapter 93 Designated Use Stream
- CWF

Existing Transmission Lines

- 230 kV
- 500 kV

Notes:

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3. Existing Transmission Lines provided by PPL Electric in April 2019.

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

References:
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 Feet
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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 6 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



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Legend

- Proposed Structure
- Existing Structure (To Be Replaced)
- PPL Electric ROW
- NWI Wetlands
- Natural Areas (Core Habitat)
- Parcel Boundary
- Chapter 93 Designated Use Stream
- CWF

Existing Transmission Lines

- 230 kV
- 500 kV

Notes:

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3. Existing Transmission Lines provided by PPL Electric in April 2019.

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 Pennsylvania North FIPS 3701
 Projection: Lambert Conformal Conic
 Linear Unit: US Foot

References:
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0 150 300 600
 Feet
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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 7 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



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Legend

- Proposed Structure
- Existing Structure (To Be Replaced)
- PPL Electric ROW
- NWI Wetlands
- Natural Areas (Core Habitat)
- Parcel Boundary
- Chapter 93 Designated Use Stream
- CWF
- Existing Transmission Lines
 - 230 kV
 - 500 kV

Notes:

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- Proposed structure locations were provided by PPL Electric in September 2022.
- Existing Transmission Lines provided by PPL Electric in April 2019.

NAD 1983 State Plane Pennsylvania North FIPS 3701
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 Linear Unit: US Foot

References:
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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 8 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



Legend

- Proposed Structure
- Existing Structure (To Be Replaced)
- PPL Electric ROW
- ▨ NWI Wetlands
- ▨ Natural Areas (Core Habitat)
- ▭ Parcel Boundary
- Chapter 93 Designated Use Stream
- CWF

Existing Transmission Lines

- 230 kV
- 500 kV

Notes:

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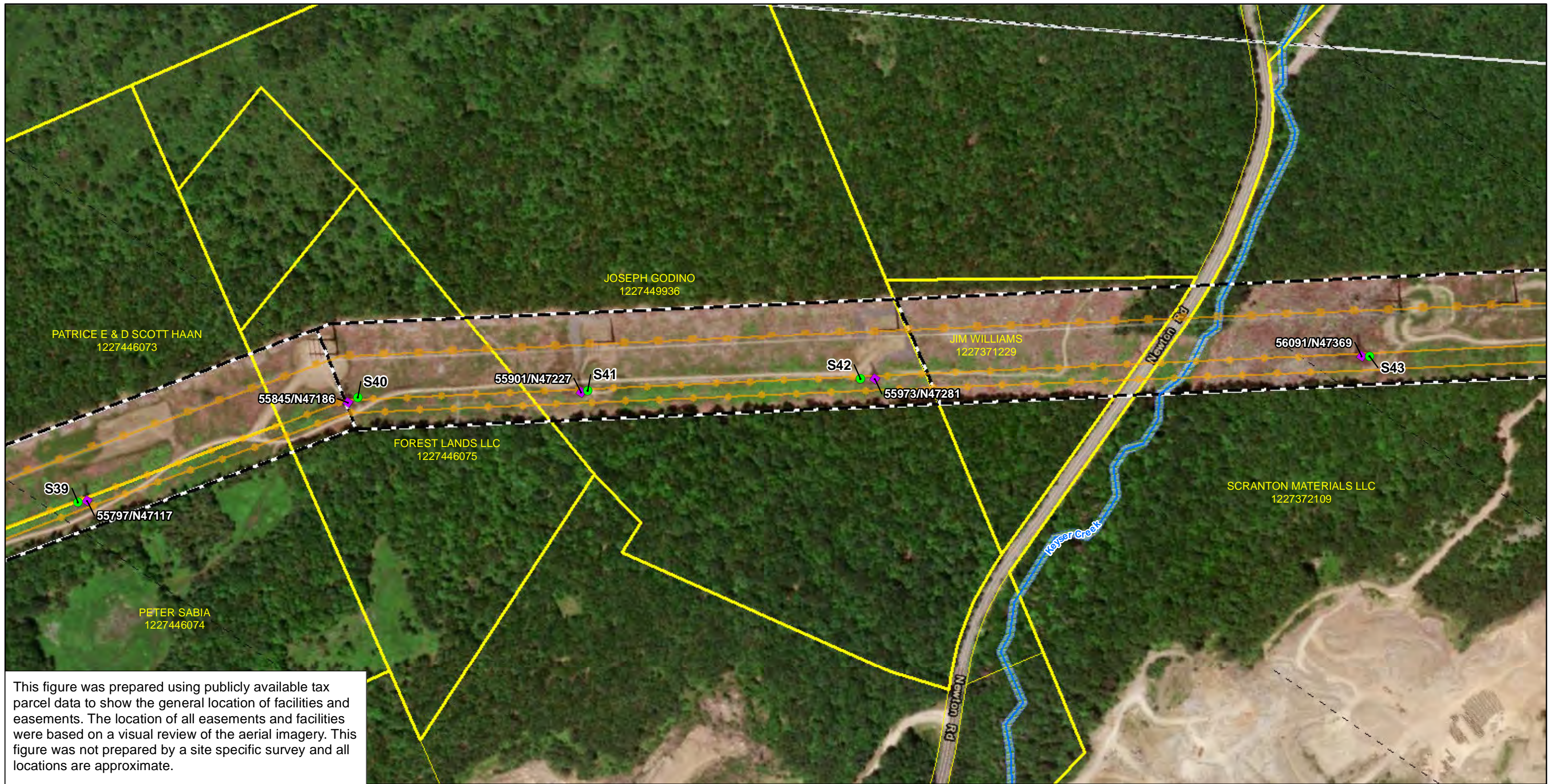


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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 9 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



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Legend

- Proposed Structure
- Existing Structure (To Be Replaced)
- PPL Electric ROW
- NWI Wetlands
- Parcel Boundary
- Chapter 93 Designated Use Stream
- CWF

Existing Transmission Lines

- 230 kV
- 500 kV

Notes:

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3. Existing Transmission Lines provided by PPL Electric in April 2019.

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 Pennsylvania North FIPS 3701
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0 150 300 600
 Feet
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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 10 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022



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Legend

● Proposed Structure	Existing Transmission Lines
○ Existing Structure (To Remain)	— 69 kV
■ Existing Structure (To Be Replaced)	— 230 kV
— PPL Electric ROW	— 500 kV
▨ NWI Wetlands	
▨ Natural Areas (Core Habitat)	
▭ Parcel Boundary	
— Chapter 93 Designated Use Stream	
— TSF	

Notes:

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- Existing Transmission Lines provided by PPL Electric in April 2019.

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 Pennsylvania North FIPS 3701
 Projection: Lambert Conformal Conic
 Linear Unit: US Foot

References:
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 Feet
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FIGURE 3-1
Aerial Map of the Project
Stanton-Summit 230 kV
COR-TEN Rebuild Project
Sheet 11 of 11
 Lackawanna and Luzerne Counties, Pennsylvania

PPL Electric Utilities
 Allentown, Pennsylvania

Prepared By: BSF	Checked By: DJY/BAB
Job: 60664608	Date: 9/14/2022

PPL ELECTRIC
EXHIBIT NO. JBL-4

STANTON-SUMMIT #3 AND #4 230 kV COR-TEN® REBUILD PROJECT

TABLE OF CONTENTS

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2.0	PERIODIC MAINTENANCE PROGRAM ON ALL TRANSMISSION LINES.....	4
3.0	PERSONNEL SAFETY RULES.....	4
4.0	MAGNETIC FIELD MANAGEMENT PLAN.....	5

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1.0 DESIGN CONSIDERATIONS

PPL Electric Utilities Corporation’s (“PPL Electric”) new and rebuilt transmission lines are designed according to, and generally exceed, all National Electric Safety Code (“NESC”) minimum standards. The NESC is a set of rules guiding safety standards 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 are designed to maintain public safety.

The NESC specifies strength and loading rules based on three different “grades of construction” for conductors and supporting structures:

- Grade B – This grade of construction provides the highest margin of safety and is required when the pole supports spans that cross limited access highways, railroads, and waterways.
- Grade C – This grade of construction is most common and provides a basic margin of safety. It is often utilized for the typical power and joint-use distribution pole.
- Grade N – This is the lowest grade of construction and is most often used for emergency and temporary construction.

PPL Electric designs all its transmission lines for Grade B construction. The use of Grade B design and construction translates to higher levels of structural reliability and safety to withstand the environmental conditions of ice and/or wind loading.

PPL Electric’s rigorous design standards are further incorporated into the parameters utilized to account for ice and wind loadings on the wires and structure. Structure loading and line designs

must accommodate a variety of operating conditions as different ice and wind combinations can impact the conductor sags and tensions of the line. PPL Electric’s transmission lines are designed to exceed NESC requirements by accounting for additional load cases due to various ice and wind loading conditions beyond what is required by NESC. This means that PPL Electric lines are designed to operate safely and reliably during extreme inclement weather. In addition, PPL Electric design standards include a clearance to ground buffer in excess of NESC required clearances to account for construction and design tolerances and the filling or grading of land within the right-of-way by property owners. This buffer also significantly reduces the risk of a property owner inadvertently contacting a transmission line. This has occurred on PPL Electric’s system in the past and higher clearances minimize the likelihood of future occurrences.

TABLE 4-1: 69 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	PPL Conductor Clearances
Roads, streets, and other areas subject to truck traffic	19.2 Ft.	22.2 Ft.
Other land traversed by vehicles such as cultivated grazing, forest, orchards, etc.	19.2 Ft.	22.2 Ft.
Spaces and ways subject to pedestrians or restricted traffic only	15.2 Ft.	22.2 Ft.
Track rails of railroads (except electrified railroads using overhead trolley conductors)	27.2 Ft.	30.2 Ft.

TABLE 4-2: 138 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	PPL Conductor Clearances
Roads, streets, and other areas subject to truck traffic	20.6 Ft.	23.6 Ft.
Other land traversed by vehicles such as cultivated grazing, forest, orchards, etc.	20.6 Ft.	23.6 Ft.
Spaces and ways subject to pedestrians or restricted traffic only	16.6 Ft.	23.6 Ft.
Track rails of railroads (except electrified railroads using overhead trolley conductors)	28.6 Ft.	31.6 Ft.

TABLE 4-3: 230 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	PPL Conductor Clearances
Roads, streets, and other areas subject to truck traffic	22.5 Ft.	25.5 Ft.
Other land traversed by vehicles such as cultivated grazing, forest, orchards, etc.	22.5 Ft.	25.5 Ft.
Spaces and ways subject to pedestrians or restricted traffic only	18.5 Ft.	25.5 Ft.
Track rails of railroads (except electrified railroads using overhead trolley conductors)	30.5 Ft.	33.5 Ft.

TABLE 4-4: 500 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	PPL Conductor Clearances
Roads, streets, and other areas subject to truck traffic	28.4 Ft.	31.4 Ft.
Other land traversed by vehicles such as cultivated grazing, forest, orchards, etc.	28.4 Ft.	31.4 Ft.
Spaces and ways subject to pedestrians or restricted traffic only	24.4 Ft.	31.4 Ft.
Track rails of railroads (except electrified railroads using overhead trolley conductors)	36.4 Ft.	39.4 Ft.

A relay protection system is also used on PPL Electric’s transmission lines to protect public safety, as well as the equipment on the transmission system. The purpose of relay protection is 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 using helicopter patrols, with supplemental foot patrols as needed. Helicopter patrols are performed on all lines on a predetermined frequency, depending on voltage level. The two-man helicopter crew flies parallel to 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 Electric designs and constructs projects with high regard to both public and employee safety and follows or exceeds all codes and requirements. The following are a few examples of PPL Electric’s safety rules that demonstrate its dedication to employee and contractor safety:

- 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 has been received.
- Various other tags are used for limited operations and informational purposes.
- 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 voltage test is performed 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. Although there is no current scientific evidence demonstrating that magnetic fields cause any adverse health effects or pose a health or safety threat to the public, PPL Electric has established a policy to design its new and rebuilt transmission lines to reduce magnetic fields. 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 is considered, provided those modifications can be made at low or no cost and will not interfere with the operation of the line.

The program will be applied to this Project and designed with clearances that are at least three feet higher than NESC standards.

**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-2022-3037374
For Approval To Rebuild The Existing :
Double-Circuit Stanton-Summit #3 :
And #4 230 kV Transmission Lines :
Connecting the Stanton 230 kV :
Substation And A Two-Pole Turn :
Structure That Are Respectively :
Located In Luzerne And Lackawanna :
Counties, Pennsylvania :

PPL Electric Utilities Corporation

Statement No. 1-R

Written Rebuttal Testimony of

Joseph B. Lookup

Topics Addressed: **Project Need**
Rebuttal to OCA's Concerns Regarding
the Transmission Planning Process

Dated: **August 3, 2023**

1 **I. INTRODUCTION**

2 **Q. Please state your name and business address.**

3 A. My name is Joseph B. Lookup. My business address is 827 Hausman Road,
4 Allentown, PA 18104.

5

6 **Q. Did you previously submit testimony in this proceeding on behalf of PPL
7 Electric Utilities Corporation (“PPL Electric” or the “Company”)?**

8 A. Yes. I submitted my direct testimony, PPL Electric Statement No. 1, on May 24,
9 2023.

10

11 **Q. What is the purpose of your rebuttal testimony?**

12 A. My rebuttal testimony responds to certain portions of the direct testimony
13 submitted by the Office of Consumer Advocate (“OCA”), OCA Statement No. 1,
14 the direct testimony of Rao Konidena. I will explain why the issues raised by OCA
15 witness Mr. Konidena do not provide the Administrative Law Judges (the “ALJs”)
16 or the Pennsylvania Public Utility Commission (“Commission”) with a basis to
17 reject the above-captioned Letter of Notification or “LON.”

18 I will specifically address Mr. Konidena’s claims regarding the need for
19 PPL Electric’s proposal to rebuild the existing double-circuit Stanton-Summit #3
20 and #4 230 kV Transmission Lines connecting the Stanton 230 kV Substation
21 (“Stanton Substation”) and a two-pole structure (Structures 56275-N-
22 4751(L)/56274-N-47518(R) located approximately 1.4 miles north of the Summit
23 230-69kV Substation (“Summit Substation”) that are respectively located in
24 Luzerne and Lackawanna Counties, Pennsylvania (the “Project”). I will also

1 respond to Mr. Konidena’s claims regarding PPL Electric’s transmission system
2 planning process, including the role of PJM Interconnection, LLC (“PJM”).

3 As a preliminary matter, Mr. Konidena appears to challenge the adequacy
4 of the PJM Supplemental Project review process. Specifically, Mr. Konidena
5 argues that he is concerned with the “do no harm study” as a “minimalistic
6 assessment.” OCA St. No. 1 at p. 14. Mr. Konidena concedes that “the PJM
7 process is suited for the PJM system,” but goes on to argue that it is “not well suited
8 for protecting PA ratepayers.” OCA St. No. 1 at p. 20. The PJM Supplemental
9 Project process does not have any bearing on what PPL Electric must demonstrate
10 for the Project to be approved before the Commission under 52 Pa. Code § 57.76(a).
11 PPL Electric is not suggesting otherwise; it is not the Company’s position that the
12 Commission should simply defer to the PJM when conducting its analysis under 52
13 Pa. Code § 57.76(a). It is the Company’s position that it has adhered to the
14 mandate(s) of 52 Pa. Code § 57.76(a). Mr. Konidena does not credibly contend
15 otherwise. Indeed, as explained below, his concerns center around the existing
16 regulatory scheme, not the Project’s compliance with that scheme.

17
18 **Q. Are you sponsoring any exhibits with your rebuttal testimony?**

19 **A.** Yes. I am sponsoring PPL Electric Exhibits JBL-1R through JBL-3R.

20

1 **II. PPL ELECTRIC’S PROPOSED REBUILD OF THE STANTON-SUMMIT**
2 **#3 AND #4 TRANSMISSION LINES IS NEEDED TO ADDRESS A**
3 **SIGNIFICANT ASSET HEALTH CONCERN**

4 **Q. Did the OCA assert that the Commission should reject the LON?**

5 A. Yes. OCA witness Mr. Konidena recommended that the Commission reject the
6 LON at this time. OCA St. 1 at 5-6, 44.

7

8 **Q. Please summarize why Mr. Konidena asserts that the Commission should**
9 **reject the LON.**

10 A. Mr. Konidena claims that the LON should be rejected because “the existing PJM
11 processes do not provide a robust evaluation of potential alternatives and thus do
12 not adequately protect PA ratepayers.” OCA St. 1 at 5-6. He further asserts that
13 PPL Electric “should be required to rigorously evaluate the potential alternatives,
14 including those identified herein, in order for the Commission to fully evaluate PPL
15 [Electric]’s proposed project.” OCA St. 1 at 6. Finally, after identifying the criteria
16 PPL Electric must satisfy under 52 Pa. Code § 57.76(a) in order for the Commission
17 to approve the Project, he states that he “do[es] not believe that PPL Electric has
18 satisfied the need requirement for their proposed Project.” OCA St. 1 at 7
19 (emphasis added). Contrary to Mr. Konidena’s claims, PPL Electric evaluated
20 potential solutions to address the need and compared the alternatives on the criteria
21 described above in addition to the total cost of ownership.

22

1 **Q. Mr. Lookup, as an initial matter, what is your understanding of what the**
2 **Commission must find and determine in order to approve the Project?**

3 A. While I am not lawyer, based on my experience supporting other high voltage
4 (“HV”) transmission line projects submitted to the Commission for approval, it is
5 my understanding that a utility must satisfy the four criteria set forth in 52 Pa. Code
6 § 57.76(a) of the Commission’s regulations. As explained by Mr. Konidena, those
7 criteria require a utility to show that: (1) there is a need for the project; (2) the
8 project will not create an unreasonable risk of danger to the health and safety of the
9 public; (3) the project is in compliance with applicable statutes and regulations
10 providing for the protection of natural resources of this Commonwealth; and (4) the
11 project will have minimum adverse environmental impacts, considering the electric
12 power needs of the public, the state of available technology and the available
13 alternatives. *See* 52 Pa. Code § 57.76(a)(1)-(4); OCA St. 1 at 6-7.

14
15 **Q. What is the basis of the OCA’s challenge to the Project under these criteria?**

16 A. As stated by Mr. Konidena, the OCA “do[es] not believe that PPL Electric has
17 satisfied the need requirement for their proposed Project.” OCA St. 1 at 7
18 (emphasis added). Mr. Konidena confirmed in response to discovery request PPL
19 to OCA-I-6 that OCA’s challenge was limited to the need requirement under 52 Pa.
20 Code § 57.76(a)(1), and that OCA was not raising issues under the other three
21 criteria. Mr. Konidena’s response to PPL to OCA-I-6 is attached to my rebuttal
22 testimony as PPL Electric Exhibit JBL-1R.

23

1 **Q. Has PPL Electric identified and explained the need for the Project?**

2 A. Yes. My direct testimony fully identified and explained the need for the Project.
3 PPL Electric St. 1 at 5-12. Further details regarding the identified need for the
4 Project were set forth in PPL Electric Exhibit JBL-1, which is a copy of Attachment
5 1 – Necessity Statement to the LON.

6

7 **Q. Does Mr. Konidena’s direct testimony challenge the need for the Project**
8 **identified by PPL Electric requirement under 52 Pa. Code § 57.76(a)(1)?**

9 A. No. Mr. Konidena does not, at any point in his testimony, address the “need”
10 identified by PPL Electric.

11

12 **Q. Please explain.**

13 A. Specifically, Mr. Konidena never disputes the fact that the 46 COR-TEN® lattice
14 towers at issue are the subject of asset health concerns that are being accelerated by
15 increased incidences of pack-out rust. The increased incidences of pack-out rust
16 have caused these towers to reach end-of-life faster than expected, and, in some
17 cases, have caused the towers to deteriorate beyond the point where they can safely
18 operate as designed and cannot be reasonably or cost effectively remediated.
19 Indeed, Mr. Konidena accepts PPL Electric’s description of this need and
20 acknowledges that “it is an asset health issue” and “a public safety issue.” OCA St.
21 1 at 8. Mr. Konidena also admitted that a need based on “asset health concerns” is
22 different from a need based on “congestion” in response to PPL to OCA-I-19, a
23 copy of which is attached to my rebuttal testimony as PPL Electric Exhibit JBL-

1 2R. Mr. Konidena specifically admitted in this response that “Transmission
2 congestion and asset health concerns are two different needs.” *See* PPL Electric
3 Exhibit JBL-2R.

4 Instead, Mr. Konidena attempts to distract from the fact that there is a
5 specific asset health need for the Project—which he does not dispute—by (1)
6 broadly challenging the PJM transmission planning process, and specifically the
7 process applicable to Supplemental Projects, and (2) identifying supposed
8 “alternatives” to the Project that he asserts PPL Electric should have evaluated or
9 should be required to evaluate by the Commission. Neither of these arguments
10 actually address or respond to the underlying need for the Project

11
12 **Q. Why is it significant for the ALJs and the Commission to recognize that OCA**
13 **witness Mr. Konidena has not challenged the asset health need that is driving**
14 **the proposed Project?**

15 A. It is important for several reasons.

16 First, PPL Electric’s identified need for the Project is undisputed. OCA has
17 presented no evidence that addresses PPL Electric’s evaluation of the pack-rust
18 issue faced by the existing 46 COR-TEN® structures that are the subject of this
19 LON and the primary driver for the Project. Rather, they have conceded that the
20 need for this project is justified as “it is an asset health issue” and “a public safety
21 issue.” OCA St. 1 at 8.

22 Second, the Project is not based on a need to address congestion over the
23 transmission system or other market efficiency concerns. As explained by PPL

1 Electric witness Mr. Christopher Szmodis in his rebuttal testimony (PPL Electric
2 St. 2-R), the alternatives proposed by OCA (a) do not actually address the asset
3 health and public safety need, (b) are substantially more expensive than the
4 proposed Project with no showing of commensurate additional benefits, and/or (c)
5 are more appropriate to address congestion or other market efficiency concerns,
6 which are not at issue in this case. Many of these alternatives are not feasible in
7 this case and all of them are not reasonable. Therefore, OCA's proposed
8 alternatives should be rejected.

9 Third, once it is recognized that Mr. Konidena has not challenged the asset
10 health and public safety concerns at issue, it becomes clear that his testimony
11 simply raises his concerns with PJM planning process generally, and with specific
12 respect to Supplemental Projects. These concerns are neither unique to the above-
13 captioned LON nor appropriate for this proceeding. Mr. Konidena appears to be
14 attempting to use a single letter of notification, filed by a single Pennsylvania
15 electric utility, to ask the Commission to impose specific additional requirements
16 on HV transmission line siting applications and letters of notification seeking
17 approval of Supplemental Projects approved by PJM.

18 Fourth, Mr. Konidena conceded in his responses to discovery requests that
19 his basis for asserting that PPL Electric should have or could have considered "other
20 alternatives" to the Project is unsound. While I am not an attorney, Mr. Konidena
21 indicated that he was only rendering an opinion regarding the "need" for the Project
22 under 52 Pa. Code § 57.76(a)(1) in response to PPL to OCA-I-6. *See* PPL Electric
23 Exhibit JBL-1R. However, in response to PPL to OCA-I-8 he concedes that

1 “alternatives are considered by the Commission under 52 Pa. Code § 57.76(a)(4).”
2 A copy of PPL to OCA-I-8 is attached to my rebuttal testimony as PPL Electric
3 Exhibit JBL-3R. However, based on my experience with HV transmission line
4 siting filings with the Commission, this criterium considers alternatives in the
5 context of evaluating whether a transmission line will have a minimum adverse
6 environmental impact; it does not address the need for a project. Yet, Mr.
7 Konidena does not provide a conclusion regarding environmental impacts or
8 provide any analysis of environmental impacts of the alternatives he is proposing
9 or the Project itself. It appears Mr. Konidena is simply fishing for a basis to second
10 guess PPL Electric’s and PJM’s transmission planning processes.

11 Fifth, Mr. Konidena repeatedly admits in discovery that he has not
12 conducted any analysis or evaluation of the feasibility or reasonableness of any of
13 the alternatives that he has proposed on behalf of OCA in his direct testimony. PPL
14 Electric witness Mr. Szmodis addresses the lack of analysis conducted by Mr.
15 Konidena in his rebuttal testimony (PPL Electric St. 2-R).

16

17 **Q. Mr. Konidena further asserts that PPL Electric could have considered non-**
18 **transmission alternatives and explored other transmission solutions between**
19 **the time it notified the Commission about asset health projects in January 2021**
20 **until the time it submitted the instant LON in December 2022. OCA St. 1 at**
21 **20-21. Please respond.**

22 A. Mr. Konidena’s reference to this 24-month timeframe has no bearing on the
23 demonstrated need for the Project, and does not show that PPL Electric’s evaluation

1 of alternatives in this case were unreasonable. Essentially, Mr. Konidena is arguing
2 that the Commission should second guess PPL Electric’s analysis of alternatives,
3 not because its analysis is unreasonable or arbitrary, but because, according to him,
4 it could or should have done more. The Company does not need more time to
5 review Mr. Konidena’s alternatives as they are imprudent and do not address the
6 Project need.

7 I also note that between January 2021 and December 2022, the Commission
8 has reviewed and approved 6 HV transmission line filings made by PPL Electric to
9 address increased incidences of pack-out rust across its system, as follows:

- 10 • Sunbury-Milton-Montour 230 kV Transmission Line - Corten Rebuild Project
11 (Docket A-2021-3024033)
- 12 • Elimspport-Lycoming #2 & #3 230 kV Transmission Lines – Corten Rebuild
13 Project (Docket # A-2021-3029267)
- 14 • Manor-Millwood 230 kV/Face Rock-Millwood 69 kV Transmission Lines -
15 Corten Rebuild Project (Docket #A-2021-3029689)
- 16 • Summit-Lackawanna #1 and #2 230 kV Transmission Lines - Corten Rebuild
17 Project (Docket #A-2022-3030969)
- 18 • Saegers - Elimspport #1 and #2 230 kV Transmission Lines - Corten Rebuild
19 Project (Docket A-2022-3034224)
- 20 • South Akron - Millwood 230 kV #1 and #2 230 kV Transmission Lines - Corten
21 Rebuild Project (Docket A-2022-3034794)

22 In each of these orders, the Commission approved the filing as proposed. Mr.
23 Konidena’s recommendations essentially ask the Commission to ignore its prior
24 review of similar projects across PPL Electric’s footprint, which are each designed
25 to address the same need, *i.e.*, increased incidences of pack-out rust in COR-TEN®
26 lattice towers.

27

1 **Q. How should the Commission address OCA witness Mr. Konidena’s concerns**
2 **and recommendations regarding the “need” for the instant Project?**

3 A. The Commission should not fall for Mr. Konidena’s sleight of hand, and it should
4 reject his challenges as collateral attacks on the existing PJM planning process.
5 PPL Electric submits that OCA witness Mr. Konidena’s recommendations, if
6 adopted, constitute an end-run around the Commission’s and the Federal Energy
7 Regulatory Commission’s (“FERC”) rulemaking processes as well as the PJM
8 Consolidated Transmission Owners Agreement (“CTOA”). Furthermore, PPL
9 Electric submits that Mr. Konidena’s recommendations also ask the Commission
10 to create additional regulatory requirements that could be broadly applicable to
11 other Pennsylvania electric utilities that are not parties to this proceeding. Some of
12 Mr. Konidena’s suggestions, like adding capacity to a bulk electric line without
13 PPL Electric or PJM identifying a need for such additional capacity would be
14 imprudent and subject to challenge in PPL Electric’s formula rate update process.
15 It may also violate the Attachment M-3 process, which only allows PJM
16 Transmission Owners to propose Solutions (i.e., transmission projects) that address
17 the Needs previously presented to PJM. This further demonstrates that Mr.
18 Konidena’s testimony is primarily an attack on the PJM planning process, and not
19 a rebuttal of PPL Electric’s identified Project need.

20 I do not believe the instant LON—or any isolated HV transmission line
21 siting filing by a Pennsylvania public utility—is the proper forum for these
22 concerns, and I am advised by counsel that PPL Electric will further address these
23 legal issues in its briefs.

1 **III. OCA WITNESS MR. KONIDENA’S CONCERNS REGARDING THE PJM**
2 **PLANNING PROCESS FOR SUPPLEMENTAL PROJECTS SHOULD BE**
3 **REJECTED**

4 **Q. Does Mr. Konidena provide an overview of the PJM planning process as a part**
5 **of his direct testimony?**

6 A. Yes, he does at pages 11-13 of his direct testimony.

7
8 **Q. Does any part of Mr. Konidena’s description of the PJM planning process**
9 **warrant correction?**

10 A. Mr. Konidena does not make any incorrect statements regarding the steps or timing
11 involved in this process. However, I do wish to clarify a point regarding the
12 reliability planning cycle at PJM and the presentation of the Project in the M-3
13 process.

14
15 **Q. Please explain.**

16 A. Mr. Konidena states that baseline projects are studied as a part of the 24-month
17 reliability planning cycle at PJM and that this 24-month study identifies short-term
18 and long-term reliability upgrades. OCA St. 1 at 11. Based on my experience with
19 respect to PPL Electric’s participation in this process, the process actually lasts
20 about 15 months.

21 In addition, Mr. Konidena asserts during the Assumptions meeting stage of
22 the M-3 process, the Project “was not explicitly called out” in PPL Electric’s 2020
23 RTEP Planning Assumptions at the PJM Sub-Regional RTEP Committee meeting.
24 OCA St. 1 at 12. It appears that Mr. Konidena may be insinuating that the Project
25 should have been called out at this meeting, and that PPL Electric did something

1 wrong by not calling it out at that time. To the contrary, **no projects** are called out
2 as a part of the Assumptions meeting presentation and there is no reason to do so.
3 The purpose of this presentation is only to document the TO's (i.e., PPL Electric's)
4 assumptions for the subject period.

5
6 **Q. Does Mr. Konidena testify that PPL Electric did not comply with PJM's**
7 **processes for the submission, evaluation and approval of Supplemental**
8 **Projects?**

9 A. No, he does not. Instead, Mr. Konidena identifies general concerns he has with the
10 PJM process related to Supplemental Projects. OCA St. 1 at 14-20.

11
12 **Q. What concerns does Mr. Konidena have with respect to the PJM planning**
13 **process for Supplemental Projects?**

14 A. Mr. Konidena essentially raises six concerns with the PJM planning process.

15 First, he claims that the “do no harm study” conducted as a part of the M-3
16 process is “minimalistic,” because PJM does not have access to a transmission
17 owner's system used to identify the priority of projects and relies on the
18 transmission owners to bring this information to a PJM Transmission Expansion
19 Advisory Committee (“TEAC”) meeting. OCA St. 1 at 14-15.

20 Second, Mr. Konidena claims that ten days is insufficient for stakeholder
21 comments in each phase of the M-3 process. OCA St. 1 at 15.

22 Third, Mr. Konidena argues that Supplement Projects are not required to go
23 through FERC's competitive planning process under FERC Order 1000, and asserts

1 that there are potential costs savings from the competitive transmission processes
2 that are being missed due to “the fact that Supplemental Projects are not being
3 competitively bid.” OCA St. 1 at 15-16.

4 Fourth, Mr. Konidena takes issue with PJM’s consideration of transmission
5 and non-transmission alternatives in the context of Supplemental Projects. OCA
6 St. 1 at 16-18.

7 Fifth, Mr. Konidena takes issue with the PJM CTOA, and claims that it is
8 an “old document” and that the Commission should “note the implications of the
9 CTOA on Pennsylvania’s consumers.” OCA St. 1 at 18-19. He further concludes
10 that other planned rebuilds by PPL Electric demonstrate that “the PJM process is
11 suited for the PJM system, but...that it is not well suited for protecting PA
12 ratepayers.” OCA St. 1 at 20.

13 Finally, Mr. Konidena raises concerns regarding the cost estimates provided
14 for the Project. OCA St. 1 at 21-22.

15

16 **Q. What does Mr. Konidena recommend to the Commission regarding the**
17 **proposed Project?**

18 A. Based upon the alleged “minimal review process that PJM conducts,” Mr.
19 Konidena proposes that “Supplemental Projects like the one proposed by PPL here
20 should be given a heightened level of scrutiny by the PUC. Specifically, the PUC
21 should ensure that PPL has thoroughly investigated[] all reasonable transmission
22 and non-transmission alternatives, as is required by Commission Regulation.[]”
23 OCA St. 1 at 22 (emphasis added).

1 **Q. Does PPL Electric agree with any of Mr. Konidena’s concerns?**

2 A. No.

3

4 **Q. As a general matter, please explain why these concerns should be rejected in**
5 **this proceeding.**

6 A. As noted above, none of the concerns identified by Mr. Konidena are unique to this
7 LON. Rather, his testimony provides his opinions regarding the PJM planning
8 process for Supplement Projects, which was approved by FERC and is part of the
9 relevant transmission tariff, required to be followed by PJM and the PJM
10 Transmission Owners. Importantly, Mr. Konidena specifically admits that the
11 concerns identified by his testimony are already the subject of an Advanced Notice
12 Of Proposed Rulemaking (“ANOPR”) at FERC, regarding the concept of an
13 Independent Transmission Monitor. OCA St. 1 at 22, n. 33. He further notes that
14 the Commission is actively participating in this proceeding, FERC has not acted,
15 and any FERC order would be subject to rehearing. *Id.* As such, Mr. Konidena is
16 asking the Commission to impose additional regulatory requirements on PPL
17 Electric in this proceeding, outside of the FERC-approved tariff process, as an end-
18 run around an existing FERC rulemaking process.

19 Furthermore, I am advised by counsel that the in *Re: Interim Guidelines for*
20 *the Filing of Electric Transmission Line Siting Applications*, Docket No. M-2008-
21 2141293 (Order entered Nov. 5, 2010) (“*Interim Guidelines Order*”), the
22 Commission addressed and rejected the imposition of additional guidelines
23 proposed by the Office of Trial Staff (“OTS”) that would have required

1 transmission siting applications to include documentation for each and every
2 present and projected individual reliability criteria violation sought as justification
3 for or otherwise related to the construction and siting of the proposed high voltage
4 transmission line. *Interim Guidelines Order*, at p. 39. As explained by the
5 Commission:

6 OTS contends that inclusion of this information will: (1) give the
7 Commission the opportunity to consider whether the proposed
8 construction and siting will enhance reliability; (2) require
9 applicants to describe available alternatives; and (3) require
10 applicants to provide cost comparisons between construction of high
11 voltage transmission, lower voltage lines or non-transmission
12 alternatives.

13 *Interim Guidelines Order*, at p. 39.

14 The Commission rejected OTS's proposal and explained:

15 OTS' proposal addresses an issue that was not referenced as part of
16 the Interim Guidelines and has not been subject to full review and
17 comment. It would be inappropriate to include this proposed change
18 in the Interim Guidelines at this time. The Commission believes the
19 forthcoming Proposed Rulemaking would be the appropriate forum
20 for consideration of this issue.

21 *Interim Guidelines Order*, at pp. 39-40 (emphasis added). The Commission has
22 recognized that requiring utilities to consider alternatives that are beyond the
23 Commission's existing regulations would require further rulemaking to impose
24 such requirements.

25 Therefore, Mr. Konidena's recommendations and the relief sought are not
26 appropriate for the instant LON proceeding. Rather, these must be addressed by
27 rulemakings at the state and/or federal level(s).

28

1 **Q. Please explain why PPL Electric disagrees with Mr. Konidena’s concerns**
2 **regarding the “do no harm study” conducted by PJM (OCA St. 1 at 14-15).**

3 A. PPL Electric and PJM conduct a “do no harm study” for PPL Electric’s
4 supplemental projects to ensure the project does not cause adverse effects to PPL
5 Electric’s or other utilities transmission system. This is a robust study that can take
6 PJM months to study to ensure it does not cause any adverse effects to the grid.
7 Mr. Konidena states that PJM is aware its TO’s have a system to identify priority
8 of individual TO assets and that PJM doesn’t have access to or control over this
9 data. It is not PJM’s responsibility to track this data or prioritize these projects.

10 This is consistent with similar processes on the baseline and network
11 upgrade sides, where PJM uses the same models to determine the sufficiency of an
12 upgrade, the impact of an interconnection, etc. PJM has an obligation to ensure
13 these models are complete and correct. To the extent it needs additional
14 information from the PJM TOs, it can (and does) request that information pursuant
15 to Section 4 of the CTOA.

16

17 **Q. Do Mr. Konidena’s concerns regarding the 10-day comment periods during**
18 **each phase of the M-3 process have any merit (OCA St. 1 at 15)?**

19 A. No.

20

21 **Q. Please explain why not.**

22 A. PJM posts these slides for 10 days for others to review and determine if they have
23 other needs or solutions in that area that also need to be considered. These dates

1 are known about three months in advance so others can prepare for this ten day
2 review period. These ten days are an adequate period to review this material. These
3 are the comment periods provided for in Attachment M-3, which is the FERC-
4 approved tariff on file. They were litigated in various FERC dockets, including
5 ER17-179.

6 Again Mr. Konidena is using this testimony to broadly challenge the PJM
7 process rather than the specific subject matter relevant to this LON.

8

9 **Q. Please respond to Mr. Konidena’s assertion that there are cost savings that**
10 **could be achieved from competitively bidding Supplemental Projects (OCA St.**
11 **1 at 16-18).**

12 A. Mr. Konidena simply assumes cost savings “could” be achieved without actually
13 supporting his claim, or demonstrating that PPL Electric’s planning process does
14 not reasonably control project scope, schedule and budget. To be clear, PPL
15 Electric utilizes proven processes and procedures that are benchmarked within and
16 outside of the utility industry. Our processes provide governance throughout the
17 project life-cycle to control project scope, schedule, and budget. PPL Electric
18 requires all service and material contracts to be competitive and evaluated utilizing
19 different contract strategies depending on the type of work. We are also
20 continuously benchmarking best practices, evaluating new technologies,
21 optimizing standards, and installation methods that deliver cost savings to
22 customers.

1 I further note that Mr. Konidena’s reliance on the study commissioned by
2 LS Power and done by the Brattle Group lends little credibility to his claims. This
3 study and its talking points are speculative and self-interested. Moreover, the
4 study’s findings were thoroughly rebutted by a subsequent Cocentric Energy
5 Advisors, Inc. study.¹ Simply stated, LS Power has sought to bring more
6 Supplemental and Asset Management work into the Order 1000 competitive
7 process to provide itself with more business opportunities. These types of projects
8 were always excluded from FERC Order 1000 competition. See, e.g., *Transmission*
9 *Planning and Cost Allocation by Transmission Owning and Operating Public*
10 *Utilities*, Docket No. RM10-23-000; Order No. 1000 at PP 318-319 (July 21, 2011)
11 (“Order 1000”). These types of projects have also been excluded from competition
12 in the PJM Tariff, which was approved as in compliance with Order 1000 and which
13 reserves such projects to the PJM TOs under Attachment M-3.

14

15 **Q. Do Mr. Konidena’s claims regarding PJM’s consideration of transmission and**
16 **non-transmission alternatives in the context of Supplemental Projects provide**
17 **a basis for rejecting this LON (OCA St. 1 at 16-18)?**

18 A. No.

19

¹ See https://ceadvisors.com/wp-content/uploads/2019/06/CEA_Order1000report_final.pdf.

1 **Q. Please explain why not.**

2 A. Mr. Konidena does not provide any non-transmission alternative that solves the
3 need of the Project or does not consider environmental impacts and total cost of the
4 Project.

5 Mr. Konidena's attempt to assert that certain non-wire alternatives could
6 have been considered is little more than an attempt to distract from the fact that PPL
7 Electric followed the PJM tariff in evaluating the asset health need impacting the
8 subject structures and proposing the Project as a solution for this need.

9 Moreover, as discussed in the rebuttal testimony of Mr. Szmodis (PPL
10 Electric St. 2-R), the Company has shown that no non-transmission alternatives
11 could address the asset health need presented in the LON at a reasonable cost.

12

13 **Q. Does Mr. Konidena admit that PPL Electric has, in fact, investigated potential**
14 **alternatives to the proposed Project?**

15 A. Yes. He does on page 22 of his direct testimony he affirms that PPL Electric has
16 investigated potential alternatives to the Project. Furthermore, he acknowledges
17 that "PPL [Electric] routinely looks at cost-effective alternatives, but most[] are
18 transmission related." OCA St. 1 at 22-23. Despite acknowledging that PPL
19 Electric considered alternatives to the Project, and routinely considers cost-
20 effective alternatives, Mr. Konidena asks the Commission to act as a super board
21 of directors, and second-guess PPL Electric's evaluation of alternatives.

22 Moreover, he acknowledges that PPL Electric is not required to investigate
23 potential alternatives as thoroughly as what OCA proposes in its testimony. In

1 response to the question “Has PPL investigated potential alternatives,” Mr.
2 Konidena responded “Yes, but not as thoroughly as what should be required.” OCA
3 St. 1 at 22 (emphasis added). This statement makes clear that OCA’s proposals
4 regarding the evaluation of alternatives in this case are above and beyond what is
5 currently required of Pennsylvania electric utilities like PPL Electric.

6

7 **Q. Does Mr. Konidena’s claim that the CTOA is an “old document” and that**
8 **PJM’s process does not protect Pennsylvania ratepayers have any merit (OCA**
9 **St. 1 at 18-20)?**

10 A. No.

11

12 **Q. Why not?**

13 A. The age of the document has no bearing on its merit, or the requirement that PPL
14 Electric must comply with it so long as it is effective. The CTOA is part of the
15 OATT on file, and PPL and PJM are required to follow it. In addition, I note that
16 the M-3 is much more recent (having been approved in its current form only in
17 2020, which further undercuts Mr. Konidena’s claims regarding the age of these
18 documents.

19 Finally, Mr. Konidena’s focus on the age of these documents ignores the
20 fact that PPL Electric actively reviews and implements non-transmission
21 alternatives on its system when identified as appropriate solution for the project
22 need. Indeed, PPL Electric has been recognized in industry in recent years for its

1 use of non-transmission alternatives on multiple transmission lines.² In fact, PPL
2 Electric was the first in the United States to successfully use a non-wired solution
3 to resolve a market efficiency issue on a transmission line.³ However, these types
4 of non-transmission alternatives do not address the asset health concern at issue.

5
6 **Q. Please respond to Mr. Konidena’s claims regarding PPL Electric’s cost
7 estimates for the Project.**

8 A. The projects listed do not show project actual cost in Table 1 do not show actual
9 Project costs and, to the extent those Projects were approved by the Commission
10 PPL Electric must report the actual project costs to the Commission as a condition
11 of their approval. Furthermore, as explained by PPL Electric witness Mr. Szmodis
12 in his rebuttal testimony (PPL Electric St. 2-R), the costs of the alternatives that
13 Mr. Konidena alleges that PPL Electric should have considered generally far
14 exceed the estimated costs of the proposed Project.

15
16 **Q. Does Mr. Konidena raise any other claims regarding PPL Electric’s evaluation
17 of the proposed Project, in the context of transmission planning?**

18 A. Yes. Mr. Konidena also insinuates that PPL Electric’s proposed Project may not
19 be “Good Utility Practice” as set forth in the CTOA. OCA St. 1 at 24-25. He
20 further recommends that “[t]he Commission should ensure that good utility practice

² See <https://www.eei.org/en/news/news/all/ppl-electric-utilities-wins-95th-annual-edison-award>;
https://www.theexchange.org/awards_winners.html.

³ <https://www.eei.org/en/news/news/all/ppl-electric-utilities-wins-95th-annual-edison-award>.

1 works in the interests of utility consumers and becomes good consumers practice.”
2 OCA St. 1 at 25.

3

4 **Q. Please respond.**

5 A. PPL Electric has used “Good Utility Practice” to pursue a solution to the subject
6 deteriorated transmission lines. PPL Electric reviewed alternatives that could
7 potentially address these asset health concerns as a part of developing the proposed
8 Project. However, PPL Electric does not believe that Mr. Konidena has shown any
9 of his proposed alternatives will actually resolve this need and/or are more cost
10 effective and/or have a higher level of reliability than the Project proposed. PPL
11 Electric witness Mr. Szmodis explains in why the alternatives presented by Mr.
12 Konidena are neither feasible or reasonable (PPL Electric St. 2-R), and based on
13 his testimony it is clear that none of the alternatives proposed by Mr. Konidena
14 could or should be considered as “good utility practice.”

15

16 **IV. CONCLUSION**

17 **Q. Does this conclude your Rebuttal Testimony?**

18 A. Yes, it does. If necessary, I will supplement my Rebuttal Testimony if and as
19 additional issues arise during the course of this proceeding.

PPL ELECTRIC
EXHIBIT JBL-1R

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties, Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

6. Refer to OCA Statement No. 1 at page 7, lines 1-3.
- a. Is it Mr. Konidena's conclusion that "As my testimony provides that PPL has not adequately investigated all available alternatives, I do not believe that PPL has satisfied the need requirement for their proposed Project?"
 - b. Would Mr. Konidena agree that his conclusion quoted in subpart a. to this discovery request asserts that PPL Electric has not satisfied the need requirement for its proposed Project under 52 Pa. Code § 57.76(a)(1)?
 - c. Does Mr. Konidena render any opinion or conclusion as to whether PPL Electric has shown that its Project "will not create an unreasonable risk of danger to the health and safety of the public" under 52 Pa. Code § 57.76(a)(2)?
 - d. Does Mr. Konidena render any opinion or conclusion as to whether PPL Electric has shown that its Project "is in compliance with applicable statutes and regulations providing for the protection of the natural resources of this Commonwealth" under 52 Pa. Code § 57.76(a)(3)?
 - e. Does Mr. Konidena render any opinion or conclusion as to whether PPL Electric has shown that its Project "it will have minimum adverse environmental impact, considering the electric power needs of the public, the state of available technology and the available alternatives" under 52 Pa. Code § 57.76(a)(4)?

Response:

- a. Yes.
- b. Yes.
- c. Mr. Konidena did not render any opinion or conclusion on this subject.
- d. Mr. Konidena did not render any opinion or conclusion on this subject.
- e. Mr. Konidena did not render any opinion or conclusion on this subject.

PPL ELECTRIC
EXHIBIT JBL-2R

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties,
Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

19. Refer to OCA Statement No. 1 at page 43, lines 1-4. Does Mr. Konidena contend that reduction of transmission congestion would address asset health concerns on the Stanton-Summit #3 and #4 230 kV transmission lines? Please fully explain.

Response:

No. Transmission congestion and asset health concerns are two different needs. A reduction of transmission congestion would not address asset health concerns on a transmission line but a transmission line that is “healthy” could handle transmission congestion up to a certain limit and duration. In sum, congestion and asset health are two different needs but somewhat related.

PPL ELECTRIC
EXHIBIT JBL-3R

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties, Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

8. Refer to OCA Statement No. 1 at page 22, lines 7-9.
- a. Please define “thoroughly investigated” as this phrase is used by Mr. Konidena on page 22, lines 7-9 of his direct testimony.
 - b. Is it Mr. Konidena’s contention that the Commission’s regulations applicable to the siting and construction of HV transmission lines use the phrase “thoroughly investigated” as defined by Mr. Konidena? If so, please identify the specific regulation that uses this phrase as defined by Mr. Konidena.
 - c. Please define “non-transmission alternatives” as this phrase is used by Mr. Konidena on page 22, lines 7-9 of his direct testimony.
 - d. Is it Mr. Konidena’s contention that the Commission’s regulations applicable to the siting and construction of HV transmission lines use the phrase “non-transmission alternatives” as defined by Mr. Konidena? If so, please identify the specific regulation that uses this phrase as defined by Mr. Konidena.
 - e. Please identify what Commission regulation requires an electric utility to “thoroughly investigate all reasonable transmission and non-transmission alternatives.”

Response:

- a. It is Mr. Konidena’s opinion that PPL should have evaluated all reasonable options or alternatives.
- b. No.
- c. Mr. Konidena relied on the definition of “non-transmission alternatives” provided in “Updating the Electric Grid: An Introduction to Non-Transmission Alternatives for Policymakers”, published September 2009, Prepared by The National Council on Electricity Policy, available here, <https://perma.cc/3ZZJ-G3GS> – “NTAs are programs and technologies that complement and improve operation of existing transmission systems that individually or in combination defer or eliminate the need for upgrades to the transmission system.” Mr. Konidena also points to a paper written by Mr. Scott Hempling, who is currently an Administrative Law Judge at FERC, titled, ““Non-Transmission Alternatives”: FERC’s “Comparable Consideration” Needs Correction” page 4, “If by reducing demand, a demand response investment in a particular location defers or avoids the need to build transmission to carry power that that location, then it is

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties, Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

an alternative to transmission—an NTA. Energy storage technologies, depending on their function, can act as transmission or non-transmission.”

Source:

[http://sustainableferc.org/wp-content/uploads/2013/09/Library/5-Scott-Hempling-Papers/NonTransmission%20Alternatives%20and%20FERC%27s%20Comparable%20Consideration%20\(May%202013\).pdf](http://sustainableferc.org/wp-content/uploads/2013/09/Library/5-Scott-Hempling-Papers/NonTransmission%20Alternatives%20and%20FERC%27s%20Comparable%20Consideration%20(May%202013).pdf)

Finally, in FERC Order 890, paragraph 479, FERC explicitly stated that Demand Response is as an alternative that should be studied on a comparable basis in transmission planning, “We therefore find that, where demand resources are capable of providing the functions assessed in a transmission planning process, and can be relied upon on a long-term basis, they should be permitted to participate in that process on a comparable basis.”
<https://ferc.gov/sites/default/files/2020-06/OrderNo.890.pdf>

d. No.

e. It is Mr. Konidena’s understanding that alternatives are considered by the Commission under 52 Pa. Code § 57.76(a)(4).

**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-2022-3037374
For Approval To Rebuild The Existing :
Double-Circuit Stanton-Summit #3 :
And #4 230 kV Transmission Lines :
Connecting the Stanton 230 kV :
Substation And A Two-Pole Turn :
Structure That Are Respectively :
Located In Luzerne And Lackawanna :
Counties, Pennsylvania :

PPL Electric Utilities Corporation

Statement No. 2

Written Direct Testimony of

Christopher Szmodis

**Topics Addressed: Need for the Project and Evaluation of OCA's
Proffered Alternatives**

Dated: May 24, 2023

1 **I. INTRODUCTION**

2 **Q. Please state your full name and business address.**

3 A. My name is Christopher Szmodis. My business address is 827 Hausman Road
4 Allentown, PA 18104.

5
6 **Q. By whom are you employed and in what capacity?**

7 A. I am employed by PPL Services Corporation as the Transmission Planning
8 Supervisor and provide services to PPL Electric Utilities Corporation (“PPL
9 Electric” or “Company”).

10
11 **Q. What are your current responsibilities?**

12 A. I supervise the Transmission Planning in the Asset Management group for PPL
13 Electric. Transmission planning in PPL Electric’s Asset Management group
14 involves conducting load flow analysis of PPL Electric’s transmission system to
15 determine if future voltage issues or equipment overloads will occur on the
16 transmission system. If and when an issues are discovered, the Asset Management
17 Group, under my supervision, develops alternatives to solve the issue and then
18 creates a written document summarizing the technical requirements for the selected
19 alternative to address the issue. Under my supervision, the Asset Management
20 group conducts studies to connect new customers and generators to the Company’s
21 transmission system. In sum, we are responsible for ensuring that the transmission
22 system is stable and reliable.

23

1 **Q. Please provide your educational background.**

2 A. I received a Bachelors degree in Electrical Engineering with a minor in Engineering
3 Leadership Development from The Pennsylvania State University.

4

5 **Q. Please describe your professional experience.**

6 A. Prior to working at PPL Electric, I worked at an engineering company in Reading,
7 Pennsylvania, providing services for relay and substation engineering projects for
8 approximately one-year. I have now worked for PPL Electric for approximately 16
9 years in the following capacities: Distribution Planner, Customer Support Engineer,
10 Asset Strategy & Policy, Transmission Design Engineering, and Transmission
11 Planning. I've been a supervisor for the past 5 years; three of those years I have
12 been a supervisor in Transmission Planning and the other two years I have been a
13 supervisor in Transmission Design Engineering.

14

15 **Q. What is the subject matter of your direct testimony?**

16 A. The purpose of my testimony is to summarize and detail the overall need for the
17 rebuild of the existing double-circuit Stanton-Summit #3 and #4 230 kV
18 Transmission Lines connecting the Stanton 230 kV Substation (“Stanton
19 Substation”) and a two-pole structure (Structures 56275-N-4751(L)/56274-N-
20 47518(R) located approximately 1.4 miles north of the Summit 230-69kV
21 Substation (“Summit Substation”) that are respectively located in Luzerne and
22 Lackawanna Counties, Pennsylvania (“Project”). In this context, I will also address
23 certain possible alternatives to the Project that have been the subject of discovery

1 requests issued by the Office of Consumer Advocate (“OCA”) in this proceeding,
2 and why those proposals are unreasonable.

3

4 **Q. Are you sponsoring any exhibits as part of your Direct Testimony?**

5 A. Yes. I will be sponsoring PPL Electric Exhibit CS-1 through CS-5, which are
6 certain of the Company’s responses to discovery requests issued by the OCA.

7

8 **II. NEED FOR THE PROPOSED PROJECT**

9 **Q. Why is the Project necessary at this time?**

10 A. As explained more fully by Mr. Lookup in PPL Electric Statement No. 1, the
11 Project is necessary for a number of reasons, primarily, to address asset health
12 concerns. Thus, the Project is not designed in response to grid congestion or market
13 efficiency concerns. Rather, its primary driver is to maintain safe and reliable
14 service by preventing the failure of PPL Electric’s existing facilities, which will be
15 rebuilt.

16

17 **Q. Please explain the “asset health concerns.”**

18 A. As Mr. Lookup explains in PPL Electric Statement No. 1, the Project is needed to
19 address the asset health concerns that are being accelerated by increased incidences
20 of pack-out rust associated with the existing COR-TEN® lattice towers. While
21 those towers had an expected service life of 75 years, the pack-out rust has
22 accelerated the rate in which they are expected to reach end-of-life. Indeed, some
23 of the towers have deteriorated – and are continuing to deteriorate – beyond the

1 point they can safely operate as designed and cannot be reasonably or cost
2 effectively remediated.

3

4 **Q. What would be the effects of the complete failure of one or more of the existing
5 COR-TEN® lattice towers?**

6 A. If these transmission lines were to fail, PPL Electric anticipates that approximately
7 34,968 customers would be impacted for the next contingency. Some of these
8 customers are considered critical customers.

9

10 **Q. Do you believe that the Project completely and effectively addresses the asset
11 health concerns caused by the presence of pack-out rust on the COR-TEN®
12 lattice towers?**

13 A. Unquestionably yes. This is addressed in further detail by Mr. Lookup in PPL
14 Electric Statement No. 1.

15

16 **III. EVALUATION OF OTHER ALTERNATIVES TO THE PROPOSED**
17 **PROJECT**

18 **Q. Since PPL Electric filed the LON, has it received inquiries regarding other
19 alternatives to the proposed Project?**

20 A. Yes. PPL Electric received OCA Set I Discovery Requests on March 16, 2023.
21 Therein, OCA asked whether PPL Electric considered the following additional
22 alternatives: (1) undergrounding transmission lines; or (2) installation of a Battery
23 Energy Storage System (“BESS”). Additionally, OCA inquired whether the
24 Company had future plans or examples of past projects that include(d) deploying

1 “grid enhancing technologies,” like Dynamic Line Ratings (“DLR”), or included
2 Demand Response (“DR”), Energy Efficiency (“EE”), or other Distributed Energy
3 Resources (“DER”) prior to the Project’s proposal. PPL Electric responded to the
4 OCA Set I Discovery Requests on April 5, 2023. OCA served its Set II Discovery
5 Requests on April 20, 2023, which asked for additional information regarding the
6 alternatives inquired about in its initial discovery. PPL Electric responded to the
7 OCA Set II Discovery Requests on May 9, 2023.

8

9 **Q. When the Company reviews its transmission and distribution systems, does**
10 **this review include consideration of alternatives other than the construction of**
11 **overhead transmission and distribution lines?**

12 A. Yes, it does. PPL Electric’s transmission and distribution planning processes
13 include a holistic review of the needs of its system. Once specific needs are
14 identified, the Company also reviews various solutions determine what solution
15 best resolves an identified need. This process includes consideration of
16 technologies other than the construction of overhead transmission and distribution
17 lines, such as undergrounding transmission/distribution lines, BESS, DLR and
18 DR/EE/DER technologies, where those technologies could potentially address the
19 identified need.

20 Indeed, PPL Electric has deployed these technologies where across its
21 system, where they can adequately address specific needs. For example:

- 22 • PPL Electric has most recently installed underground transmission lines
23 with respect to the Spring-State Hill Tie and Hershey-S. Hershey 69 kV
24 transmission lines. See PPL Electric Exhibit CS-1 (response to OCA-
25 II-7).

- 1 • PPL Electric has installed DLR on the Juniata - Cumberland 230 kV
2 transmission line and the Susquehanna – Harwood #1 and #2 230 kV
3 transmission lines to address network congestion. *See* PPL Electric
4 Exhibit CS-2 (response to OCA-II-5)

- 5 • PPL Electric has supported the implementation of DR and DER
6 technologies across its system to address system overload issues. *See*
7 PPL Electric Exhibit CS-3 (response to OCA-II-6).

8 I note that the Company has installed a BESS on its distribution system, but has not
9 deployed this technology on its transmission system previously. However, where
10 a given technology will not address the identified need, PPL Electric does not
11 consider it to be a feasible and/or reasonable alternative solution.

12

13 **Q. Does PPL Electric believe that any of the alternatives that were the subject of**
14 **the OCA Set I and Set II Discovery Requests are reasonable alternatives to the**
15 **proposed Project?**

16 A. No.

17

18 **Q. Please generally explain why not.**

19 A. Generally speaking, the alternatives identified by the OCA through discovery did
20 not address the primary driver for this Project, which is the asset health condition
21 related to incidences of pack-rust in existing COR-TEN® lattice tower structures
22 that support the Stanton-Summit #3 and #4 230 kV Transmission Lines. In
23 addition, the alternatives that were the subject of OCA’s discovery are not as cost
24 effective or do not provide the same level of reliability benefits as the Project.
25 Moreover, the OCA’s inquiries regarding the use of DLR, as well as DR, EE, or
26 other DER are misplaced and unnecessary, as the primary driver for the project is

1 deteriorating asset health and not related to load. Below, I will: describe each of
2 the alternatives advanced by the OCA, explain why PPL Electric did or did not
3 consider them in its evaluation of the Stanton-Summit #3 and #4 230 kV
4 Transmission Lines, and explain why each of the alternatives is not reasonable and
5 should not be relied upon by the ALJs or the Commission to second-guess PPL
6 Electric's proposed Project.

7

8 **Q. Please describe what it means to “underground transmission lines.”**

9 A. Traditionally, transmission lines are built on poles to hold the conductor high above
10 the ground. This is the most economical way to build a transmission line when
11 space is available. However, it is also possible to build transmission lines
12 underground. The conductor used to build an underground transmission line is
13 much different than overhead conductor because it is encased in insulation to ensure
14 it is not electrically connected to its surroundings. The placement of underground
15 conductor is much more expensive than installation of an overhead conductor
16 placed on an above-ground utility pole. On average, underground conductors last
17 approximately 40 years. Conversely, overhead conductors typically have a useful
18 life of approximately 65 years.

19 Underground conductors are placed inside of conduit to help protect it and
20 to allow for replacement in the future. This conduit is then encased in concrete
21 about 4-6 feet below the surface. At either end of the transmission line there will
22 be a structure which is a transition point for the underground conductor to be
23 connected to the overhead conductor or, in some cases, substation equipment.

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Q. Would undergrounding the Stanton-Summit #3 and #4 230 kV Transmission Lines be a reasonable alternative to the Project as proposed?

A. No.

Q. Please explain why not.

A. It is preferred to build a transmission line above-ground when the requisite rights of way (“ROW”) are owned or acquirable. It is much more expensive to build a transmission line underground compared to constructing an overhead transmission line. PPL Electric has undergrounded transmission lines in the past. Two recent underground 69kV transmission projects had a cost per mile of \$24 million and \$14.8 million, respectively. See PPL Electric Exhibit CS-2. In comparison, the approximate cost per mile for building an above-ground 230kV transmission line is \$3-\$5 million. Moreover, as I noted previously, overhead transmission line conductors can last over 65 years, compared to underground transmission line conductors lasting for about 40 years. Fewer replacements of the conductor(s) mean lesser costs. Further, when failures occur, the location of the issue can be found more easily and repaired more quickly with an aboveground transmission line compared to an underground line.

1 **Q. Are there other reasons why undergrounding the transmission lines at issue**
2 **would not be a reasonable alternative to the Project?**

3 A. For the Project, PPL Electric already owns the necessary ROW. Indeed, As
4 explained more fully by Mr. Lookup in PPL Electric Statement No. 1, PPL Electric
5 is currently operating the double-circuit Stanton-Summit #3 and #4 230 kV
6 Transmission Lines connecting the Stanton Substation and a two-pole structure
7 (Structures 56275-N-4751(L)/56274-N-47518(R) located approximately 1.4 miles
8 north of the Summit Substation. Therefore, a path already exists for the rebuild
9 Project. Undergrounding the transmission line is unreasonable because the
10 Company already has the necessary above-ground ROW for the Project. Moreover,
11 as I noted above, there is a significant cost difference between constructing an
12 above-ground transmission line compared to constructing an underground
13 transmission line; building overhead lines is much cheaper and the conductors
14 typically last more than 20-years longer. Further, undergrounding the line would
15 create significant environmental impacts that do not exist today due to the trenching
16 required to accommodate the concrete encased conduit. For these reasons, PPL
17 Electric does not believe undergrounding this transmission line is reasonable.

18

19 **Q. What is a “Battery Energy Storage System” or “BESS”?**

20 A. A BESS is a system of batteries connected to the transmission system. The BESS
21 stores electrical energy in the batteries so that when the battery is called upon, it is
22 able to deliver power to the electrical system. A BESS functions similarly to a
23 standard household battery in that it needs to be charged after being discharged.

1 This means that the battery itself must be connected to a source of power in order
2 to be useful. Additionally, batteries use direct current electricity, and the electric
3 grid uses alternating current electricity. Any BESS must have inverters to convert
4 the power from direct current to alternating current in order to work and send
5 electricity into the transmission system. Moreover, a BESS has a finite ability to
6 supply electricity.

7

8 **Q. Would the installation of a BESS be a reasonable alternative to the proposed**
9 **Project with respect to Stanton-Summit #3 and #4 230 kV Transmission**
10 **Lines?**

11 A. No.

12

13 **Q. Please explain why not.**

14 A. PPL Electric's past evaluations of a BESS have made clear that building a BESS
15 involves much higher costs than simply rebuilding an above-ground 230 kV
16 transmission line, like the Company is proposing here.

17 In addition, a transmission line is built to transport electricity on the bulk
18 electric system from electricity generators to end-use customers. The bulk electric
19 system is designed as a network so that if there is an outage on a transmission line,
20 the power can be rerouted and flow continuously from the generators to the end-
21 use customers with no interruption to service. While the BESS could potentially
22 be used to address system overload issues, a BESS cannot economically replace a
23 transmission line where no such issues exist because installing a BESS would

1 disconnect a section of this grid and the BESS has a finite ability to supply power.
2 Additionally, as I noted previously, the cost for a battery energy storage system is
3 significantly higher than rebuilding the transmission line. It is estimated that a
4 battery large enough to serve the load served by the Stanton-Summit 230 kV
5 Transmission Lines would cost \$287 million dollars, and only last four hours. A
6 BESS is not a reasonable alternative to a transmission line in this instance.

7
8 **Q. What is DLR?**

9 A. DLR is a technology that allows a transmission owner to set conductor ratings based
10 upon real time values. Conductor ratings refer to the maximum current-carrying
11 capacity of a transmission line's conductors. The rating is typically determined by
12 using a calculation using many static factors related to the conductor material and
13 the environment. Some of the factors considered to determine a conductor rating
14 are conductor maximum temperature, air temperature, wind speed, emissivity, and
15 sun exposure. These factors are generally based upon predicted assumptions. DLR
16 uses sensors on the conductor and sensors at other locations on a transmission line
17 to obtain real time values of some of these factors. This allows the conductor to be
18 rated with real time values instead of assumptions.

19

1 **Q. Is PPL Electric proposing to include DLR or other grid enhancing**
2 **technologies for the transmission lines as part of the proposed Project?**

3 A. No. As explained in PPL Electric Exhibit CS-4 (Response to OCA-I-7), PPL
4 Electric has no plans to install DLR on the Stanton – Summit #3 and #4
5 transmission lines because the anticipated loading of the line is within the design
6 capacity, thus, there would be no benefit to adding DLR that would justify this
7 increased cost. Because this is not a load capacity driven project, no grid enhancing
8 technologies are needed. As I noted above, the primary driver for the Project is
9 asset health. Should load increase in the future, the Stanton – Summit #3 and #4
10 transmission lines can accommodate DLR without structure or conductor
11 modification. However, at this point, DLR is unnecessary and would not be cost-
12 justified.

13
14 **Q. Please describe what DR, EE and DER technologies are, and the role that they**
15 **could play on PPL Electric’s transmission system.**

16 A. DR technology is when a customer can shift their electric usage to different times
17 of the day. This could be used to reduce the amount of power being used at a peak
18 time of day. EE technology is where equipment can be replaced with more efficient
19 equipment to reduce the amount of power being used. This could be used to reduce
20 the amount of power being used at a peak time of day. DER technology involves
21 small generators connected to the distribution system. This could be used to reduce
22 the amount of power being used at a peak time of day. While EE, DR and DER are

1 useful tools in reducing system peaks, they are not appropriate solutions to replace
2 an existing 230 kV transmission line.

3

4 **Q. Is PPL Electric proposing to include any DR, EE, or DER technologies in the**
5 **Project?**

6 A. No. As shown in PPL Electric Exhibit CS-5 (response to OCA-I-8), PPL Electric
7 did not include DR, EE, or other DER technologies in the Project because the
8 Project is asset health driven, not load driven. Indeed, for the Project, DR and DER
9 technologies are not feasible. Moreover, they would present reliability risks to the
10 larger transmission network because they cannot act as adequate substitutes to serve
11 the existing load on the subject Stanton – Summit #3 and #4 transmission lines.
12 Lastly, the substation energy needs could not be met cost effectively by replacing
13 the Stanton – Summit #3 and #4 transmission lines with DER related solutions.

14

15 **IV. CONCLUSION**

16 **Q. Does this conclude your direct testimony?**

17 A. Yes, it does. If necessary, I will supplement my testimony if and as additional issues
18 arise during the course of this proceeding.

PPL ELECTRIC
EXHIBIT NO. CS-1

**PPL Electric Utilities Corporation
Response to the Set II Data Requests of
The Office of Consumer Advocate
Dated April 20, 2023
Docket No. A-2022-3037374**

OCA II-7

In response to OCA 1-9, PPL states that “PPL Electric did not evaluate underground transmission lines for this project as they are typically significantly more expensive and would result in significantly more environmental and ecological impacts to the Project Area”. What studies or analysis has PPL conducted to support the statement that underground transmission lines for this project are “significantly” more expensive? Does PPL have underground transmission lines as part of its transmission system? If so, what was the cost?

PPL
Response

PPL Electric did not complete any formal studies or analysis to determine that constructing transmission lines underground is significantly more expensive than constructing above ground. The earlier answer was based on PPL Electric’s direct experience with multiple projects where transmission lines were installed below ground. These experiences have continuously showed that constructing underground transmission lines is significantly more expensive than constructing them above ground for several reasons including:

1. The installation of underground transmission lines requires more specialized equipment and labor than above ground transmission lines. A trench must be dug the entire length of the transmission line as opposed to intermittently accessing the right of way to install structures, concrete duct banks must be constructed within the trench, and conductors must be pulled, which is more time consuming and expensive than installing above ground transmission lines on monopole structures. Specialized crews must be hired for pulling and splicing these underground cables.
2. The material used in underground transmission lines, such as insulated cables, is typically more expensive than those used in above ground transmission lines.
3. Underground transmission lines require more extensive permitting and environmental studies than above ground transmission lines.

4. Underground Transmission Lines are more expensive to engineer. They require Subsurface Utility Engineering Studies, along with finding a route that minimizes rock and other subsurface obstructions, such as water or gas lines.
5. Underground Transmission lines are far more expensive to backfill and restore. Underground transmission lines built in roads require backfilling, compacting the roadway, and repaving the road, which is very expensive.

The Spring-State Hill Tie and Hershey-S. Hershey 69 kV transmission lines were the last two transmission lines that PPL Electric installed underground. Construction of the 1.25-mile Spring-State Hill Tie was completed in 2020 at a cost of approximately \$30 million and the 2.5-mile Hershey-South Hershey line was completed in 2021 at a cost of approximately \$37.1 million¹. These costs represent \$24 million per mile and \$14.8 million per mile for the Spring-State Hill and Hershey-South Hershey, respectively.

It is expected that the cost per mile for construction of the Stanton-Summit 230 kV line underground would be substantially more expensive than these two lines for several reasons, including but not limited to:

1. The overall costs of materials have increased (as previously mentioned).
2. The conductor needed for a 230 kV transmission line is typically 2.5 times more expensive than for a 69 kV line.
3. Accessibility to the work areas will require extensive construction of access roads through mountainous terrain as opposed to the Spring-State Hill Tie and Hershey-South Hershey lines where the work was completed in accessible yards and road right of way.
4. Any rock encountered on an underground transmission line is also very costly to excavate. Excavating a 4 to 6 foot deep trench in mountainous terrain will make the Stanton- Summit Line even more expensive due to the time and work methods required to excavate rock. Depending on the composition of the rock, drilling, hammering, or even blasting may be required. All of these activities are very time-consuming and expensive. For example, there was one section of the State Hill Underground where the team encountered blue granite in an

¹ The project costs for the Spring- State Hill Tie Line and Hershey-South Hershey Line include some overhead costs needed to facilitate the construction of these lines underground.

WITNESS: Joseph B. Lookup

area where the splicing vaults were required to be buried. It took approximately 8 weeks to break through this rock in an area about 12 feet deep, 20 feet wide and 60 feet long. PPL anticipates hitting a significant amount of rock in the mountainous terrain of the Stanton- Summit Line.

PPL ELECTRIC
EXHIBIT NO. CS-2

PPL Electric Utilities Corporation
Response to the Set II Data Requests of
The Office of Consumer Advocate
Dated April 20, 2023
Docket No. A-2022-3037374

OCA II-5 In response to OCA 1-7, PPL states that it has installed Dynamic Line Rating (DLR) on Juniata – Cumberland 1 230 kV, and Susquehanna – Harwood 1 & 2 230 kV. What led PPL to install DLR on these 2 Transmission lines? Is it reliability or congestion or both or other drivers? If it is other drivers, please state those drivers.

PPL DLR was installed on the Juniata – Cumberland 1 230 kV, and
Response Susquehanna – Harwood 1 & 2 230 kV to address network
 congestion.

PPL ELECTRIC
EXHIBIT NO. CS-3

**PPL Electric Utilities Corporation
Response to the Set II Data Requests of
The Office of Consumer Advocate
Dated April 20, 2023
Docket No. A-2022-3037374**

OCA II-6 In response to OCA 1-8, PPL states that “For this project, other technologies such as Demand Response or Distributed Energy Resources are not feasible and would pose reliability risks to the transmission network”. What studies or analysis has PPL conducted to support the statement that Demand Response or Distributed Energy Resources pose “reliability risk” to the PPL’s transmission network?

PPL
Response PPL Electric’s response to OCA 1-8 was not meant to convey that adding Demand Response (“DR”) or Distributed Energy Resources (“DER”) to its transmission network would create reliability risks. Rather the Company was stating that using DR or DER as solution to avoid having to rebuild the Stanton-Summit 230 kV line would create reliability risks as it would not be feasible for DR or DER to adequately serve the load currently being served by the Stanton-Summit 230 kV line. The Company supports the development of DER and one of the reasons that it invests in the transmission network is to accommodate future DER interconnections. PPL Electric did not perform a specific study to answer OCA 1-8, however it relied upon the knowledge and experience of its employees who operate PPL Electric’s transmission network on a daily basis to determine that DR and DER are not suitable substitutes for the Stanton-Summit 230 kV line. Additionally, DR or DER are potentially useful in addressing system overload issues, however, as mentioned previously this project is designed to address asset health needs and not system overloads.

PPL ELECTRIC
EXHIBIT NO. CS-4

PPL Electric Utilities Corporation
Response to the Set I Data Requests of
The Office of Consumer Advocate
Dated March 16, 2023
Docket No. A-2022-3037374

OCA I-7 Please provide any future plans or past projects that include deploying grid enhancing technologies, such as Dynamic Line Ratings (DLR), on the Stanton-Summit 3 & 4 230 kV lines or other PPL transmission lines. Please provide all benefits of DLR deployment on the Stanton-Summit 3 & 4 230 kV lines, including if any reduction in the 175 MW of the critical load is possible by the reduced line loading due to DLR deployment.

PPL
Response PPL Electric presently has no plans to install DLR on Stanton – Summit 3 & 4 230kV lines. Since the anticipated loading of the line is within the design capacity, there would be no benefits in adding DLR at this point. Since this is not a load capacity driven project, no other grid enhancing technologies are needed. However, the Stanton-Summit 3 & 4 230kV lines can accommodate the future addition of DLR if load increases would warrant such addition without having to modify the structures or conductor.

DLR has been installed on circuits that would benefit from the allowance of additional load increase:

Juniata – Cumberland 1 230kV

Susquehanna – Harwood 1 & 2 230kV

PPL ELECTRIC
EXHIBIT NO. CS-5

**PPL Electric Utilities Corporation
Response to the Set I Data Requests of
The Office of Consumer Advocate
Dated March 16, 2023
Docket No. A-2022-3037374**

OCA I-8 Did PPL include any Demand Response, Energy Efficiency, or other Distributed Energy Resources in the Stanton – Summit 230 kV reliability analysis?

PPL Response PPL Electric did not include any Demand Response, Energy Efficiency, or other Distributed Energy Resources in the Stanton – Summit 230 kV reliability analysis since load was not a concern for this project. Rather this project is to address the asset health of an existing line.

For this project, other technologies such as Demand Response or Distributed Energy Resources are not feasible and would pose reliability risks to the transmission network. DERs are also typically not applicable for larger loads and regional substations. The substation energy needs could not be met in a cost-effective manner by replacing the SUMT-LACK 1 & 2 230 kV circuits with alternative DER solutions.

**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-2022-3037374
For Approval To Rebuild The Existing :
Double-Circuit Stanton-Summit #3 :
And #4 230 kV Transmission Lines :
Connecting the Stanton 230 kV :
Substation And A Two-Pole Turn :
Structure That Are Respectively :
Located In Luzerne And Lackawanna :
Counties, Pennsylvania :

PPL Electric Utilities Corporation

Statement No. 2-R

Written Rebuttal Testimony of

Christopher Szmodis

Topics Addressed: **PPL Electric’s Alternatives Analysis
Rebuttal to OCA’s Transmission
Alternatives
Rebuttal to OCA’s Non-Transmission
Alternatives**

Dated: **August 3, 2023**

1 **I. INTRODUCTION**

2 **Q. Please state your full name and business address.**

3 A. My name is Christopher Szmodis. My business address is 827 Hausman Road
4 Allentown, PA 18104.

5

6 **Q. Did you previously submit testimony in this proceeding on behalf of PPL
7 Electric Utilities Corporation (“PPL Electric” or the “Company”)?**

8 A. Yes. I submitted my direct testimony, PPL Electric Statement No. 2, on May 24,
9 2023.

10

11 **Q. What is the purpose of your rebuttal testimony?**

12 A. My rebuttal testimony responds to certain portions of the direct testimony
13 submitted by the Office of Consumer Advocate (“OCA”), OCA Statement No. 1,
14 the direct testimony of Rao Konidena. I will explain why the issues raised by OCA
15 witness Mr. Konidena do not provide the Administrative Law Judges (the “ALJs”)
16 or the Pennsylvania Public Utility Commission (“Commission”) with a basis to
17 reject the above-captioned Letter of Notification or “LON.”

18 I will specifically address certain alternatives that Mr. Konidena claims PPL
19 Electric should be required to evaluate, relative to its proposal to rebuild the
20 existing double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines
21 connecting the Stanton 230 kV Substation (“Stanton Substation”) and a two-pole
22 structure (Structures 56275-N-4751(L)/56274-N-47518(R) located approximately
23 1.4 miles north of the Summit 230-69kV Substation (“Summit Substation”) that are

1 respectively located in Luzerne and Lackawanna Counties, Pennsylvania (the
2 “Project”).

3 As explained below, Mr. Konidena identifies a number of transmission and
4 non-transmission alternatives, which he recommends that the ALJs and the
5 Commission should require PPL Electric to further evaluate before the instant LON
6 is approved. However, none of the alternatives identified by Mr. Konidena can act
7 as a feasible or reasonable substitute to an existing 230 kV transmission line, and
8 almost all of the alternatives will be more expensive than the Project as proposed.
9 As explained at more length later in my Rebuttal Testimony, Mr. Konidena’s
10 recommendations that PPL Electric further study a variety of “alternatives” to the
11 Project miss the mark entirely. Indeed, his proposals – beyond adding unnecessary
12 expense and delay – would fail to address the primary driver for the Project, *i.e.*,
13 asset-health concerns. Mr. Konidena’s recommendations, in a generous light,
14 target transmission congestion concerns. Asset-health presents an entirely different
15 problem to congestion, and Mr. Konidena’s one-size-fits-all approach disregards
16 that fact. Thus, requiring PPL Electric to evaluate congestion solutions would be
17 counterproductive and merely add cost to the project.

18

19 **Q. Are you sponsoring any exhibits with your rebuttal testimony?**

20 A. Yes. I am sponsoring PPL Electric Exhibits CS-1R through CS-4R.

21

1 **II. REBUTTAL TO OCA’S CLAIMS REGARDING THE ALTERNATIVES**
2 **CONSIDERED BY PPL ELECTRIC**

3 **Q. Does OCA witness Mr. Konidena make specific claims about PPL Electric’s**
4 **evaluation and consideration of alternatives to the Project?**

5 A. Yes. As a general matter, Mr. Konidena asserts that PPL Electric “should be
6 required to rigorously evaluate the potential alternatives, including those identified
7 herein” (OCA St. 1 at 6), and that PPL Electric “has not adequately investigated all
8 available alternatives” to the Project (OCA St. 1 at 7). He then proposes a number
9 of transmission and non-transmission alternatives that he asserts PPL Electric did
10 not evaluate, and should be required to evaluate before the Commission approves
11 the Project.

12
13 **Q. Did PPL Electric evaluate every alternative identified by Mr. Konidena prior**
14 **to proposing the Project that is the subject of the above-captioned LON?**

15 A. No, PPL Electric did not evaluate every alternative identified by Mr. Konidena.
16 However, as he acknowledges on page 22 of his direct testimony, PPL Electric has
17 investigated potential alternatives to the Project. Moreover, PPL Electric has
18 conducted a robust evaluation of the several alternatives advanced by OCA in Mr.
19 Konidena’s Direct Testimony (PPL Electric St. No. 2 at 8-13) and discovery
20 requests (PPL Electric Exhibit Nos. CS-1, CS-3, CS-5). PPL Electric further
21 responds to these alternatives in its rebuttal testimony.

22

1 **Q. Why did PPL Electric not investigate every alternative identified by Mr.**
2 **Konidena prior to proposing the subject Project?**

3 A. In the transmission planning process, a specific need is identified and then potential
4 solutions that could address that specific need are identified and evaluated.
5 Potential alternatives are evaluated for their feasibility, and some are quickly
6 removed as options due to a variety of factors. The feasibility of alternatives is
7 evaluated based on the alternatives' reliability impact, environmental/siting
8 concerns, cost, and engineering complexity, among other things. Moreover, based
9 upon engineering judgment and good utility practices related to the resolution of
10 asset health concerns, many of the alternatives identified by Mr. Konidena are
11 quickly seen as cost prohibitive; similarly, other of the alternatives identified by
12 Mr. Konidena are wholly unresponsive to the need-basis for the Project. There is
13 not and should not be a requirement to address "alternatives" which are cost
14 prohibitive and/or do not even address the identified problem. Nevertheless, PPL
15 Electric has evaluated each of the alternatives posed by OCA during the course of
16 this proceeding, and demonstrated that they are neither feasible nor reasonable.

17
18 **Q. Please describe the interplay between the PJM planning process and the**
19 **Commission's review of a transmission projects and alternatives.**

20 A. The process used by PJM is designed to develop and review alternatives and then
21 present the final solution at a PJM meeting. After PJM reviews the project, PPL
22 Electric then regularly seeks approval of the PJM-reviewed project from the

1 Commission. As a part of that process, PPL Electric demonstrates that the Project
2 satisfies the Commission's regulations.

3 It is not reasonable to require transmission owners to review alternatives
4 which are cost prohibitive and/or do not even address the identified problem, either
5 after the solution has been presented to PJM or after the solution has been presented
6 to the Commission. While it may be possible to review a new alternative based on
7 feedback if it is better than the proposed solution, requiring evaluation of every
8 possible alternative—especially alternatives that (a) do not address the specific
9 need that drives a project or (b) are cost-prohibitive on their face—would result in
10 significant costs added to the evaluation process and, ultimately, these costs would
11 be passed on to the downstream customers. Nevertheless, PPL Electric has
12 thoroughly evaluated OCA's proposed alternatives in its direct testimony,
13 discovery responses and rebuttal testimony, and demonstrated that these
14 alternatives are neither feasible nor reasonable for the instant Project. Moreover,
15 OCA has presented no evidence to show the alternatives identified by Mr. Konidena
16 are a better solution to the asset health problem sought to be addressed by the
17 Project.

18

19 **Q. Has PPL Electric addressed the alternatives identified by OCA witness Mr.**
20 **Konidena in the context of this proceeding, which OCA has advanced after the**
21 **Project was submitted to PJM and after PPL Electric filed the instant LON?**

22 A. Yes. As explained in my direct testimony (PPL Electric St. 2 at 4-5), after
23 receiving and responding to discovery requests from the OCA regarding the

1 Company's consideration of these alternatives, the Company anticipated that OCA
2 might attempt to propose specific alternatives to the Project. My direct testimony
3 explained how PPL Electric reviews its transmission and distribution systems, and
4 considers alternatives other than the construction of overhead transmission and
5 distribution lines to address the needs of the system. I then explained why each of
6 the presented alternatives was not a feasible or reasonable alternative in the context
7 of the above-captioned LON.

8

9 **Q. Does Mr. Konidena acknowledge or respond to your direct testimony**
10 **regarding each of these transmission alternatives?**

11 A. As a general matter, he does not. As I explained in my direct testimony, none of
12 the alternatives presented by the OCA are feasible or reasonable to replace the
13 Project. Mr. Konidena does not grapple with this presentation, nor does he dispute
14 the Company's discovery responses explaining why his proposed alternatives are
15 unreasonable.

16

17 **Q. Should the ALJs or the Commission find that any of the alternatives proposed**
18 **by Mr. Konidena are feasible or reasonable, or should be evaluated by PPL**
19 **Electric in the context of this Project?**

20 A. No. In addition to the specific issues with each of the alternatives identified by Mr.
21 Konidena that I address below, PPL Electric submits that OCA's proposals should
22 be rejected for the reasons identified in Mr. Lookup's rebuttal testimony (PPL

1 Electric St. 1-R). Those alternatives – and the reasons why they are unreasonable
 2 and unfeasible, are briefly identified below:

Mr. Konidena’s Proposed Alternative	Reason(s) Why Unreasonable
1. Dynamic Line Ratings	Unresponsive to driver for Project
2. 500 kV Upgrade	Requires substantial change to existing PPL Electric facilities. Requires substantial change to non-PPL Electric owned facilities. Requires acquisition of additional ROW. Reliability concerns. More costly, with no additional benefits.
3. Undergrounding	More costly, with no additional benefits. Increased outage response time. Increased land disturbance.
4. Battery Energy Storage System	Unresponsive to driver for Project. More costly, with no additional benefits. Requires acquisition of additional land. More complex.
5. Demand Response and Distributed Energy Resources	Unresponsive to driver for Project. Customer driven. Weather dependent.

3

1 **III. REBUTTAL TO OCA’S PROPOSED TRANSMISSION ALTERNATIVES**

2 **Q. Does OCA witness Mr. Konidena identify specific “transmission alternatives”**
3 **that he believes the Commission should order PPL Electric to evaluate?**

4 A. Yes. Mr. Konidena recommends PPL Electric be ordered to evaluate the
5 installation of Dynamic Line Ratings (“DLR”), increasing the voltage of the
6 existing Stanton-Summit #3 and #4 230 kV Transmission Lines to 500 kV, and the
7 undergrounding of all or portion(s) of the existing Stanton-Summit #3 and #4 230
8 kV Transmission Lines. OCA St. 1 at 25. I will address each of the transmission
9 alternatives advanced by Mr. Konidena below.

10

11 **A. REBUTTAL TO MR. KONIDENA’S PROPOSED DLR**
12 **ALTERNATIVE**

13 **Q. Please summarize OCA witness Mr. Konidena’s direct testimony regarding**
14 **the DLR alternative.**

15 A. With respect to DLR, Mr. Konidena raises “concerns” regarding the Company’s
16 treatment of this alternative. OCA St. 1 at 26. However, other than identifying a
17 separate letter of notification driven by a need to address transmission network
18 congestion where DLR was used, and generally asserting that PPL Electric could
19 deploy DLRs on existing transmission lines so that they “could be loaded much
20 lighter to the point that they might not be needed” (OCA St. 1 at 26), Mr. Konidena
21 does not raise any specific concern regarding the evaluation of this option. He
22 nevertheless recommends that “before approving this project, or as a condition of
23 approval...the PUC should require PPL to provide a complete study on how the use

1 of DLR technology may impact the need for the planned rebuilds of PPL
2 [Electric]’s 230kV system.” OCA St. 1 at 26.

3

4 **Q. Please briefly explain DLR.**

5 A. As explained in greater detail in my direct testimony (PPL Electric St. No. 1 at 11),
6 DLR is a technology that allows a transmission owner to set conductor ratings based
7 upon real time values. An example of some of these real time values are ambient
8 temperature and wind speed. These values are incorporated into determine the
9 rating of the transmission line conductor.

10

11 **Q. Does PPL Electric agree with Mr. Konidena’s concerns regarding its
12 treatment of DLR?**

13 A. No.

14

15 **Q. Why not?**

16 A. DLR is used to reduce real-time power-flow congestion on the electric system. It
17 is not a technology that affects the standard steady-state load-flow analysis because
18 you can not rely on a possible increase in conductor rating due to DLR during an
19 electrical system event. OCA witness Mr. Konidena suggests that the widespread
20 employment of DLR will allow PPL Electric to retire existing HV transmission
21 lines. This is simply not true, and to my knowledge DLR has not been utilized in
22 the manner suggested by Mr. Konidena anywhere in the nation. While DLR may
23 be able to slow the need for additional transmission investments to address

1 congestion issues, it cannot act as a substitute for facilities. Moreover, the Project
2 is not driven by a need to address or remediate any congestion issues, rather, its
3 primary driver is related to asset health concerns. Installation of DLR would not
4 address the asset-health concerns, thus, is not an appropriate alternative.

5
6 **Q. Did Mr. Konidena conduct any analysis or evaluation of the costs and benefits**
7 **of his proposed DLR alternative?**

8 A. No, he provides no such analysis. Rather, he admitted as much in response to PPL
9 to OCA-I-10 and that he believed PPL Electric should be required to study the
10 installation of DLR to determine if there “could” be a benefit. Having admitted
11 that his claims about the benefits of DLR are speculative, he then conceded that he
12 conducted no analysis of the costs of such a proposal and that his proposal has never
13 before been adopted by the Commission. A copy of his response to OCA-I-10 is
14 attached to my rebuttal testimony as PPL Electric Exhibit CS-1R.

15
16 **B. REBUTTAL TO MR. KONIDENA’S PROPOSED 500 KV UPGRADE**
17 **ALTERNATIVE**

18 **Q. Please summarize Mr. Konidena’s direct testimony regarding the increased**
19 **voltage alternative.**

20 A. OCA witness Mr. Konidena claims that the Company could explore increasing the
21 existing Stanton-Summit #3 and #4 230 kV Transmission Lines to 500 kV because
22 of “the close geographic proximity of the Stanton 230 kV double circuit to the
23 existing Susquehanna-Roseland 500 kV Transmission Lines.” OCA St. 1 at 27.
24 Mr. Konidena then raises general concerns regarding the design of PPL Electric’s

1 500 kV – 230 kV – 69 kV system, and argues that the Commission “should require
2 PPL [Electric] to develop a 500 kV solution that removes the need for some of the
3 proposed 230 kV buildings, including the Stanton-Summit lines” identified in
4 Table 1 of his direct testimony. OCA St. 1 at 27-28. He further states that a possible
5 500 kV alternative for this project is to upgrade the Stanton-Summit #3 and #4 230
6 kV Transmission Lines to 500 kV because they parallel the Shickshinny –
7 Lackawanna segment of the Susquehanna-Roseland 500 kV Transmission Lines;
8 he further claims this alternative “could avoid the need to rebuild 8.5 miles of
9 Jenkins - Stanton and Mountain - Stanton 230kV and 9.8 miles of Mountain -
10 Stanton and Mountain - Jenkins 230kV at a total estimated cost of \$49.8 Million -
11 \$87.15 Million (this estimate is 1.75 times the \$49.8), from Table 1. Summary of
12 PPL Rebuilds.” OCA St. 1 at 28.

13
14 **Q. Does PPL Electric agree that Mr. Konidena’s proposed alternative to upgrade**
15 **the Stanton-Summit #3 and #4 230 kV Transmission Lines to 500 kV is**
16 **reasonable?**

17 A. No.

18

19 **Q. Please explain why not.**

20 A. As an initial matter, I note that upgrading the existing Stanton-Summit #3 and #4
21 230 kV Transmission Lines would primarily serve to add more capacity to these
22 lines. However, the Stanton-Summit #3 and #4 230 kV Transmission Lines have
23 about 1,420 MVA capacity, which is more than adequate for existing load and

1 currently projected load growth. Upgrading to one 500 kV line would simply add
2 about 50 MVA of capacity that is not needed at substantial additional cost.

3 This alternative should also be rejected for several additional reasons, as
4 described below: (1) The Stanton and Summit Substations do not have 500 kV
5 switchyards; (2) it would require the acquisition of additional right-of-way
6 (“ROW”) along the line’s whole path, thereby impacting additional landowners;
7 (3) this so-called alternative would also be substantially more costly; and (4) this
8 alternative could reduce reliability on PPL Electric’s system.

9

10 **Q. Please explain why Stanton and Summit substations would need 500/230 kV**
11 **switchyards in order to pursue this alternative.**

12 A. A transmission line transmits power from one substation to another substation at a
13 specific voltage. The existing Stanton and Summit substations are connected to the
14 electric grid with 230 kV transmission lines and 69 kV transmission lines. The
15 power flows from the 230 kV system to the 69 kV system through a transformer
16 which is located inside of the substation. In order to connect a 500kV line between
17 Stanton and Summit substations to transfer power, a 500kV switchyard would need
18 to be built at Stanton and Summit substations. The 500 kV switchyard would have
19 transformers installed to transform the power from the 500 kV system to the 230
20 kV system.

21

1 **Q. How much ROW would PPL Electric need to acquire to pursue this**
2 **alternative?**

3 A. PPL Electric would need to acquire 200 ft. of ROW a long this whole path to build
4 a 500 kV line. The existing ROW is approximately 150 feet wide and additional
5 ROW would need to be acquired to widen the existing corridor to the required 200
6 feet. This additional ROW would need to be purchased from the landowners along
7 the path.

8

9 **Q. How much would this alternative cost?**

10 A. PPL Electric would need to acquire approximately 20 acres of land near each the
11 Stanton and Summit Substations to build 500 kV substations with transformers to
12 connect the 500 kV line to the 230 kV system. Constructing two new 500 kV
13 substations and the transmission line would cost approximately \$150 million.

14

15 **Q. Mr. Konidena also asserts that PPL Electric’s concerns that an upgrade to a**
16 **500 kV line would require PJM to study the retirement of the existing Stanton-**
17 **Summit #3 and #4 230 kV Transmission Lines, and that such study may**
18 **indicate the need for additional transmission lines, is “speculative.” OCA St.**
19 **1 at 29. Please respond.**

20 A. The existing 230 kV transmission lines provide a path for power to flow from the
21 west to the east. Mr. Konidena’s alternative would remove two transmission lines
22 and install one new path. PPL Electric and PJM conduct load flow analysis
23 according to NERC Standard TPL-001. This standard requires the study of an

1 outage to all transmission lines in the same ROW for over a mile. Pursuing a 500
2 kV alternative would remove two 230 kV lines and then have two 500 kV lines in
3 the ROW for over a mile. This would have a dramatic effect on the west to east
4 power flow on the electrical system. In this regard, PPL Electric's concerns are
5 not "speculative." If PPL Electric were to attempt to upgrade its existing 230 kV
6 transmission lines to 500 kV lines, PJM would have to study the impact of the
7 retirement of the existing facilities on the grid. While the Company does not know
8 what the exact results of this study would be, the study would be required and PPL
9 Electric cannot simply implement this alternative as Mr. Konidena seems to
10 suggest.

11 On the other hand, this alternative, like every alternative proposed in OCA
12 witness Mr. Konidena's testimony, is "speculative." Mr. Konidena is asking the
13 Commission to evaluate this Project based upon what he believes the PJM
14 transmission planning process "should" or "could" work, and what he believes the
15 Commission's regulations "should" or "could" require. Moreover, he has
16 conducted no analysis or evaluation regarding the feasibility and reasonableness of
17 this alternative, or any other alternative he proposes. Instead, he merely states that
18 they "could" or "should" be reviewed. Indeed, his responses to PPL to OCA-I-12
19 and PPL to OCA-I-13 confirm this. A copy of these responses to discovery are
20 attached to my testimony as PPL Electric Exhibit CS-2R and PPL Electric Exhibit
21 CS-3R, respectively.

22

1 **Q. Does Mr. Konidena offer any further support for his proposed 500 kV upgrade**
2 **alternative?**

3 A. Mr. Konidena further asserts that an estimate of upgrading the existing Stanton-
4 Summit #3 and #4 230 kV Transmission Lines to 500 kV should be compared
5 against the cost of other rebuilds planned by PPL Electric. OCA St. 1 at 29-30. He
6 further recommends PPL Electric should be directed to estimate the benefits of this
7 alternative. OCA St. 1 at 30.

8

9 **Q. Is Mr. Konidena's comparison of costs proper?**

10 A. No.

11

12 **Q. Why not?**

13 A. Mr. Konidena did not consider the additional cost to also install a 500/230 kV yard
14 at Summit Substation and Stanton Substation. Obviously, that would incur
15 substantial additional costs, which Mr. Konidena admits. Indeed, on page 30 of his
16 direct testimony, Table 2 sets forth his estimated costs for various alternatives to
17 the Project, including his 500 kV proposal. This alternative costs approximately 5-
18 6 times as much as the proposed Project, and Mr. Konidena makes no showing of
19 any associated benefits with this option that would justify these costs. Furthermore,
20 I note that Mr. Konidena specifically admits he conducted no evaluation of the costs
21 associated with upgrading some or all of PPL Electric's 230 kV circuits to 500 kV,
22 and also conducted no evaluation of the impacts of this proposal on system

1 reliability in response to PPL to OCA-I-14. A copy of this discovery request and
2 response is attached to my rebuttal testimony as PPL Electric Exhibit CS-4R.

3

4 **Q. Should the Commission adopt Mr. Konidena’s recommendation and require**
5 **PPL Electric to analyze the benefits of the 500 kV upgrade alternative?**

6 A. No. As described above, the costs for the 500 kV alternative would be much more
7 expensive than the proposed Project due to the substation work needed.
8 Additionally, the reliability reduction on the system for having one less path for
9 power to flow west to east along with having two 500 kV lines in a common ROW
10 is another reason why Mr. Konidena’s recommendation is not viable. Simply put,
11 there would be no benefit in pursuing this alternative any further. As I have
12 previously explained, Mr. Konidena’s proposal is based entirely on his speculative
13 view of how he believes the PJM transmission planning process “should” or
14 “could” work, and what he believes the Commission’s regulations “should” or
15 “could” require.

16

17 **C. REBUTTAL TO MR. KONIDENA’S PROPOSED**
18 **UNDERGROUNDING ALTERNATIVE**

19 **Q. Please summarize Mr. Konidena’s direct testimony regarding an**
20 **undergrounding alternative to the Project.**

21 A. Mr. Konidena states that PPL Electric did not conduct an analysis evaluating
22 whether undergrounding is a viable alternative, and that it should be evaluated to
23 “ascertain if overall asset health is improved for the duration of the project.” OCA
24 St. 1 at 31. He then asserts that undergrounding may be a better longer-term option

1 for consumers because (1) “there is no possible rusting issue that PPL experienced
2 with the overhead transmission lines” (OCA St. 1 at 31) and (2) the undergrounding
3 ensures that the transmission investment is not exposed to weather elements (OCA
4 St. 1 at 31-32). He then reviews PPL Electric’s cost estimates related to
5 undergrounding, but states the Company has not quantified the benefits and has not
6 evaluated customer interruption costs that could be avoid by undergrounding. OCA
7 St. 1 at 32-33.

8

9 **Q. Does PPL Electric agree that undergrounding is viable alternative to the**
10 **Project?**

11 A. No.

12

13 **Q. Why not?**

14 A. The cost to build underground transmission lines is substantially more expensive
15 than an overhead line, as Mr. Konidena concedes in Table 2, on page 30 of his
16 direct testimony. Moreover, undergrounding transmission lines would result in
17 much more earth disturbance. That is not an issue with simply rebuilding the
18 existing lines within the existing ROW.

19

1 **Q. Please respond to OCA witness Mr. Konidena’s claim that “there is no possible**
2 **rusting issue that PPL experienced with the underground transmission lines”**
3 **(OCA St. 1 at 31).**

4 A. Underground lines have other areas of concern, such as insulation deterioration,
5 dig-ins, and failure risks of terminators. Additionally, underground lines make it
6 extremely difficult to find a fault location. Generally speaking, undergrounding a
7 line can add reliability in certain situations, but when maintenance is required it is
8 much more difficult and expensive to perform relative to performing maintenance
9 on an overhead HV transmission line.

10

11 **Q. Please respond to OCA witness Mr. Konidena’s claim that the**
12 **undergrounding alternative ensures that the transmission investment is not**
13 **exposed to weather elements (OCA St. 1 at 31-23).**

14 A. An underground transmission line would have manhole construction along the path
15 to pull the conductor through the conduit. These manholes can get filled with water
16 in extreme precipitation events. PPL Electric’s 230 kV overhead transmission
17 system rarely experiences storm and/or precipitation related outages, so its
18 reliability is very comparable to an underground transmission line. The latest
19 overhead transmission line standards are designed for the transmission lines to
20 withstand most extreme weather events. Notably, one of the reasons that PPL
21 Electric is pursuing this project is that the pack-out rust on the COR-TEN lattice
22 towers makes the structures much more susceptible to storm damage in extreme

1 weather events. The proposed overhead solution provides storm hardening benefits
2 at a much lower cost than undergrounding the line.

3

4 **Q. Is Mr. Konidena’s recommendation that PPL Electric should be required to**
5 **quantify the benefits of undergrounding and compare them to the benefits of**
6 **overhead transmission necessary?**

7 A. No.

8

9 **Q. Please explain why it is not necessary.**

10 A. As previously stated, PPL Electric’s 230kV overhead transmission system rarely
11 sees storm outages, so its reliability is very comparable to an underground
12 transmission line at a significantly lower cost per mile. Mr. Konidena’s
13 undergrounding suggestion would result in a much more expensive, much more
14 disruptive, project with no additional reliability benefits.

15

16 **Q. Does Mr. Konidena propose any other options related to the underground**
17 **alternative?**

18 A. Yes. In acknowledgment of the substantial cost increases that would result from
19 undergrounding the entire Stanton-Summit #3 and #4 230 kV Transmission Lines,
20 Mr. Konidena proposes that “undergrounding only a segment of the 7.7 miles” is
21 one option, and that the Commission should require that PPL Electric evaluate what
22 segment of the network lends itself to undergrounding and what benefits would
23 result. OCA St. 1 at 34.

1 **Q. Is Mr. Konidena’s proposal to underground only a portion of the Project a**
2 **reasonable alternative?**

3 A. No. Mr. Konidena’s suggestion to underground a portion of the line is a solution
4 in search of a problem. As explained earlier, PPL Electric does not see value in
5 having a segment of this line underground. As discussed previously, even
6 undergrounding a portion of the line would still be more expensive—with no
7 ascertainable reliability benefits—than rebuilding the existing overhead line. With
8 modern transmission line construction there is no additional weather related outage
9 risk between overhead and underground construction.

10

11 **IV. REBUTTAL TO OCA’S PROPOSED NON-TRANSMISSION**
12 **ALTERNATIVES**

13 **Q. Does OCA witness Mr. Konidena identify specific “non-transmission**
14 **alternatives” that he believes the Commission should order PPL Electric to**
15 **evaluate?**

16 A. Yes. Mr. Konidena recommends that PPL Electric be ordered to evaluate the
17 installation of a battery energy storage system (“BESS”) at the Summit Substation,
18 and demand response (“DR”) and aggregation of distribution energy resources
19 (“DER”). OCA St. 1 at 25. I will address each of the non-transmission alternatives
20 advanced by Mr. Konidena below.

21

1 **A. REBUTTAL TO MR. KONIDENA’S PROPOSED BESS**
2 **ALTERNATIVE**

3 **Q. Please summarize Mr. Konidena’s direct testimony regarding a BESS**
4 **alternative to the Project.**

5 A. Mr. Konidena asserts that a BESS located at the Summit Substation with a rating
6 of 26.2 MW/104.8 MWh is a potential alternative to the Project. OCA St. 1 at 35-
7 36. He further states that “BESS offers the flexibility of discharging for 1 hour or
8 2 hours, or 3 hours depending on how long the transmission need occurs, as well as
9 the flexibility of discharging multiple MW amounts up to the 26.2 MW load on
10 each line.” OCA St. 1 at 36. In addition, Mr. Konidena claims that “BESS's
11 flexibility is a viable alternative to Stanton rebuild because it is all or nothing with
12 the Stanton rebuild.” OCA St. 1 at 36. Mr. Konidena further takes issue with PPL
13 Electric’s estimated costs of the BESS alternative. OCA St. 1 at 37-39. Finally, he
14 claims that the Company “does not recognize that a transmission line and a BESS
15 solution are similar” for three asserted reasons. OCA St. 1 40-41.

16
17 **Q. Does PPL Electric agree that a BESS is a viable alternative to the Project?**

18 A. No.

19
20 **Q. Why not?**

21 A. For a variety of reasons. Importantly, installation of a BESS would primarily
22 address congestion concerns.¹ As I’ve previously explained, the primary reason for

¹ See *The Economics of Battery Energy Storage*, Rocket Mountain Institute, p. 16 (October 2015), <https://rmi.org/wp-content/uploads/2017/03/RMI-TheEconomicsOfBatteryEnergyStorage-FullReport->

1 the Project is unrelated to congestion, rather, it's driven by asset-health concerns.
2 As such, installation of a BESS would target a non-existent concern, while being
3 substantially more expensive in the process.

4 Additionally, a BESS has a finite time that it can discharge power onto the
5 transmission system, which is dependent upon the amount of power the BESS can
6 store and has stored prior to its use. On the other hand, a transmission line that
7 provide a path for power to flow for throughout its useful life. Moreover,
8 installation of a BESS does not address the ultimate need for the Project: addressing
9 asset-health concerns. The presence of a battery – even in the best of circumstances
10 – does not account for total structural failure of a transmission line. The Project
11 seeks to address exactly that.

12 Furthermore, in order for batteries to recreate the value of a transmission
13 line, it would take significantly more investment than contemplated in Mr.
14 Konidena's testimony. The requisite cost for a BESS would thus be dramatically
15 more expensive than the Project. Indeed, it would require the acquisition and
16 installation of BESS infrastructure at a scale sufficient to replace the existing
17 transmission lines, which PPL Electric is not aware has been done before.

18 Moreover, the BESS solution proposed by OCA would require the
19 acquisition of additional land at the Stanton and Summit Substations. This would
20 result in incremental land impacts which do not exist today, and which Mr.
21 Konidena has not accounted for in his testimony.

FINAL.pdf; *Spatiotemporal Arbitrage of Large-Scale Portable Energy Storage for Grid Congestion Relief*, Guannan He, Da Szhang, Xidong Pi, Qixin Chen, Sounmya Kar, Jay Whitacre, <https://arxiv.org/ftp/arxiv/papers/1811/1811.09924.pdf>; *Evaluation of Energy Storage Providing Virtual Transmission Capacity*, Tu A. Nguyen, Raymond H. Byrne, <https://www.osti.gov/servlets/purl/1884172>.

1 In addition, operating a BESS is much more complex than operating a
2 transmission line. Although work is being done on batteries being used on the
3 transmission system (the so-called Storage as a Transmission Only Asset or
4 SATOA initiatives), there are not appropriate tariff structures in place to enable this
5 at this time.

6

7 **Q. Is Mr. Konidena correct that a BESS located at the Summit Substation with a**
8 **rating of 26.2 MW/104.8 MWh is a potential alternative to the Project?**

9 A. No. This battery would only last for 4 hours at 26.2 MW. The needs of the
10 transmission system require a battery to last for more time than that – potentially
11 days - depending on the configuration of the electric grid. If a transmission pole
12 were to fail, then it could take days to replace it. A battery would need to last this
13 whole time until the pole was replaced.

14

15 **Q. Why would this not be considered a feasible or reasonable alternative from a**
16 **planning perspective?**

17 A. The cost for a BESS to take the place of these transmission lines would be
18 dramatically more expensive and it would require acquisition of many acres of land
19 at the Stanton and Summit Substations. The 4 hour BESS relied upon in Mr.
20 Konidena’s example is already too costly to be a viable solution which means that
21 a BESS that can last for days is clearly not a feasible solution. A BESS with enough
22 capacity to reliably replace the Stanton-Summit Transmission lines would cost
23 billions of dollars.

1 **Q. Do you agree with Mr. Konidena’s description of the Project as an “all or**
2 **nothing” approaching relative to his proposed BESS alternative?**

3 A. No.

4
5 **Q. Please explain why not.**

6 A. It appears that Mr. Konidena’s reference to “all or nothing” relates to the
7 transmission line being either energized or not. I do not agree with this comment
8 because a BESS could also be out of service and not energized. In either instance,
9 PPL Electric would have to be prepared for the transmission line or the BESS to be
10 out of service. A transmission line is also capable of transferring power at all levels
11 for an indefinite period of time as long as it is below the conductor’s rated value.

12
13 **Q. Mr. Konidena also raises several issues with respect to the Company’s cost**
14 **estimates for this alternative. Please respond.**

15 A. First, Mr. Konidena’s claim that a BESS alternative can be rated at 26.2 MW
16 instead of 287 MW is flawed. OCA St. 1 at 37-38. On a peak system load day with
17 all equipment in service, there is about 26.2 MW on each of these transmission
18 lines. The system must be planned according to NERC Standard TPL-001. This
19 requires the system to still be operational with equipment out of service. In specific
20 scenarios there is 287 MW of flow at these transmission substations. A battery
21 would need to be installed at Stanton and Summit substations to serve this entire
22 load. Mr. Konidena’s suggestions around a BESS solution are not consistent with
23 standard industry transmission planning practices.

1 Second, Mr. Konidena asserts that the \$250 per kWh cost estimate is based
2 on 2021 values, which is the high value in the National Renewable Energy
3 Laboratory (“NREL”) estimates and it does not include the latest cost estimates and
4 leaves out the Inflation Reduction Act (“IRA”) subsidies and Investment Tax Credit
5 (“ITC”) incentives. OCA St. 1 at 38-39. Table 2 at the end of the NREL document
6 lists cost estimate values for a 4-hour battery in a low, mid, and high cost ranges
7 for each year into the future out to 2050. PPL Electric used the mid-range value
8 for 2024 and 2025 and averaged them, resulting in an estimate of approximately
9 \$250/kWh. The high value for 2025 is \$295/kWh. The high value for 2030 is
10 \$248/kWh, which is still very close to PPL’s estimate of \$250/kWh. PPL Electric
11 anticipates these costs will increase due to the increase in equipment costs and labor
12 costs the Company has seen on current projects. In sum, these values show a BESS
13 is not a cost-effective solution and further shows that a BESS needed to solve the
14 loss of another transmission line would need to be much larger than a 4-hour
15 battery. A battery that lasts 24-hours would be approximately six times more
16 expensive than a 4-hour battery.

17 It is also inappropriate to speculate that the Company would qualify for
18 incentives under the IRA or the ITC, which are complex federal processes that have
19 not been fully determined. As such, there is no guarantee that PPL Electric would
20 qualify for the same under either program.

21

1 **Q. Do you agree with Mr. Konidena’s characterization of a BESS as being similar**
2 **to a transmission line?**

3 A. No.

4

5 **Q. Why not?**

6 A. A battery has a finite amount of energy and, when that finite amount of energy is
7 expended, a BESS will draw power from the transmission system to recharge.
8 Again, installation of a BESS is generally considered a means to remediate
9 congestion issues. That consideration is irrelevant here, because the primary driver
10 for the Project is wholly unrelated to congestion concerns. I’m also unaware of any
11 example of a BESS being used to replace an existing transmission line as Mr.
12 Konidena suggests.

13

14 **B. REBUTTAL TO MR. KONIDENA’S PROPOSED DEMAND**
15 **RESPONSE AND DISTRIBUTED ENERGY RESOURCE**
16 **ALTERNATIVES**

17 **Q. Please summarize Mr. Konidena’s direct testimony regarding an alternative**
18 **involving DR and DER.**

19 A. Mr. Konidena claims that “[a] combination of Demand Response and DERs with
20 the right BESS size could defer the need to rebuild Stanton lines until a longer-
21 terms solution is in place, such as an underground transmission line or a 500 kV
22 overhead line.” OCA St. 1 at 41-42. He claims that PPL Electric must therefore
23 “proactively plan for Aggregations of DERS and evaluate their impact on the
24 transmission asset management starting with the Stanton rebuild.” OCA St. 1 at
25 43.

1 **Q. Do you agree with Mr. Konidena’s claim that DR and DER could act as a**
2 **reasonable alternative to the Project?**

3 A. No.

4

5 **Q. Please explain why not.**

6 A. Both of these alternatives serve to reduce demand on the transmission grid. Neither
7 of these alternatives address asset health issues generally, or the specific asset
8 health and public safety concerns that are the need driver for the Project. Moreover,
9 Mr. Konidena seems to recognize that these alternatives are not feasible, and admits
10 that “[a]ggregation of DERs cannot replace the need for a transmission line.” OCA
11 St. 1 at 42. The electric industry has predicted that more transmission lines will be
12 needed in the future to enable the use of more DER on the system. DER is not
13 predicted to cause the removal of transmission lines. NERC standard TPL-001 lists
14 the contingencies an electric utility must study to ensure the electric grid does not
15 have any overload or voltage violations. If these two 230 kV lines are removed
16 from the system, then this study would result in low voltage violations and overload
17 violations in many areas. NERC standard TPL-001 would not allow for DR and
18 DER to resolve these violations. A fatal flaw in Mr. Konidena’s analysis is that he
19 does not consider PPL Electric’s obligation to comply with NERC standards.

20

1 **Q. Are there other reasons why DR and DER are not reasonable alternatives to**
2 **the Project?**

3 A. With respect to DR, PPL Electric is not able to force customers to sign up for DR
4 to ensure the load would be reduced low enough at specific times when it is needed
5 to support the retirement of the Stanton-Summit Transmission lines. DR is a real-
6 time market response to help reduce load on the system similar to dispatching
7 additional generation resources. It cannot be relied on from a transmission planning
8 perspective.

9 Furthermore, with respect to DER, PPL Electric is not able to force
10 customers to install DER to ensure the load would be reduced low enough to
11 eliminate the need for the Stanton-Summit 230 kV Transmission Lines.
12 Additionally, weather conditions may prevent DER measures from generating
13 additional power, so they cannot be reliably considered to reduce system load at all
14 times.

15

16 **V. CONCLUSION**

17 **Q. Does this conclude your Rebuttal Testimony?**

18 A. Yes, it does. If necessary, I will supplement my Rebuttal Testimony if and as
19 additional issues arise during the course of this proceeding.

**PPL ELECTRIC
EXHIBIT CS-1R**

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties, Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

10. Refer to OCA Statement No. 1 at page 26, lines 12-14.

- a. Please identify and explain all aspects of the study that Mr. Konidena recommends the Commission should require PPL Electric to complete regarding the use of DLR on its 230 kV transmission system.
- b. Has Mr. Konidena conducted any analysis or evaluation of the cost that would be required to complete the study referenced at page 26, lines 12-14 of his direct testimony? If yes, please provide a copy of such analysis or evaluation and all Documents relied upon by Mr. Konidena to complete it.
- c. Is Mr. Konidena aware of the Commission ever requiring such a study for other transmission line related projects? If yes, provide the docket number where the Commission required such a study.

Response:

- a. Mr. Konidena believes the Commission should require PPL to study if the installation of DLR on its 230 kV transmission system could be a benefit and reduce the need to rebuild for one or more of the 230 kV lines.
- b. No.
- c. No.

PPL ELECTRIC
EXHIBIT CS-2R

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties, Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

12. Refer to OCA Statement No. 1 at page 27, lines 8-9.

- a. Provide all documents and workpapers relied upon to conclude that “upgrading the voltage of the Stanton-Summit double circuit 230 kV to a 500 kV system could be a viable option.”
- b. Has Mr. Konidena conducted any analysis or evaluation of the cost that would be required to upgrade the voltage of the Stanton-Summit double circuit 230 kV to a 500 kV system? If yes, please provide a copy of such analysis or evaluation and all Documents relied upon by Mr. Konidena to complete it.
- c. Has Mr. Konidena conducted any analysis or evaluation of the impacts to system reliability that would result from an upgrade the voltage of the Stanton-Summit double circuit 230 kV to a 500 kV system? If yes, please provide a copy of such analysis or evaluation and all Documents relied upon by Mr. Konidena to complete it.

Response:

- a. There are no documents and workpapers. This is simply a proposal and opinion on what PPL should have investigated as an option.
- b. No.
- c. No.

**PPL ELECTRIC
EXHIBIT CS-3R**

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties,
Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

13. Refer to OCA Statement No. 1 at page 28, lines 6-9.

- a. Please explain fully the basis for Mr. Konidena's recommendation that "[t]he Commission should require PPL to develop a 500 kV solution that removes the need for some of the proposed 230 kV rebuilds, including the Stanton-Summit lines because there should be some reasonable alternatives to incurring almost \$972 Million in rebuild costs for the existing 230kV system," and provide all Documents and workpapers relied upon in making this recommendation.
- b. Has Mr. Konidena conducted any analysis or evaluation of the cost that would be required to develop a 500 kV solution that removes the need for some of the proposed 230 kV rebuilds? If yes, please provide a copy of such analysis or evaluation and all Documents relied upon by Mr. Konidena to complete it.
- c. Has Mr. Konidena conducted any analysis or evaluation of the impacts to system reliability that would result from the development of a 500 kV solution that removes the need for some of the proposed 230 kV rebuilds? If yes, please provide a copy of such analysis or evaluation and all Documents relied upon by Mr. Konidena to complete it.

Response:

a. There are no documents and workpapers. This is simply a proposal and opinion on what PPL should have investigated.

b. No.

c. No.

PPL ELECTRIC
EXHIBIT CS-4R

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties, Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

14. Refer to OCA Statement No. 1 at page 29, lines 12-13:

- a. Please explain fully the basis for Mr. Konidena's statement that "it is possible that upgrading the existing 230 kV circuits to 500 kV solution could lessen the need to rebuild all of the additional lines in the 230 kV network" and provide all Documents and workpapers relied upon in making this recommendation.
- b. Has Mr. Konidena conducted any analysis or evaluation of the cost that would be required "upgrade" some or all existing 230 kV circuits to 500 kV? If yes, please provide a copy of such analysis or evaluation and all Documents relied upon by Mr. Konidena to complete it.
- c. Has Mr. Konidena conducted any analysis or evaluation of the impacts to system reliability that would result from "upgrading" some or all of the existing 230 kV circuits to 500 kV? If yes, please provide a copy of such analysis or evaluation and all Documents relied upon by Mr. Konidena to complete it.

Response:

a. Mr. Konidena believes that a 500 kV solution could allow PPL to take full advantage of their 500 kV system. The rating of a 500 kV solution is greater than a 230 kV solution, hence more energy flows are possible. When more energy flows on 500 kV that could result in reduced flows on the 230 kV system. These reduced flows on some parts of the 230 kV system could reduce the need to rebuild those elements of the 230 kV network.

b. No.

c. No.

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties, Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

6. Refer to OCA Statement No. 1 at page 7, lines 1-3.
- a. Is it Mr. Konidena's conclusion that "As my testimony provides that PPL has not adequately investigated all available alternatives, I do not believe that PPL has satisfied the need requirement for their proposed Project?"
 - b. Would Mr. Konidena agree that his conclusion quoted in subpart a. to this discovery request asserts that PPL Electric has not satisfied the need requirement for its proposed Project under 52 Pa. Code § 57.76(a)(1)?
 - c. Does Mr. Konidena render any opinion or conclusion as to whether PPL Electric has shown that its Project "will not create an unreasonable risk of danger to the health and safety of the public" under 52 Pa. Code § 57.76(a)(2)?
 - d. Does Mr. Konidena render any opinion or conclusion as to whether PPL Electric has shown that its Project "is in compliance with applicable statutes and regulations providing for the protection of the natural resources of this Commonwealth" under 52 Pa. Code § 57.76(a)(3)?
 - e. Does Mr. Konidena render any opinion or conclusion as to whether PPL Electric has shown that its Project "it will have minimum adverse environmental impact, considering the electric power needs of the public, the state of available technology and the available alternatives" under 52 Pa. Code § 57.76(a)(4)?

Response:

- a. Yes.
- b. Yes.
- c. Mr. Konidena did not render any opinion or conclusion on this subject.
- d. Mr. Konidena did not render any opinion or conclusion on this subject.
- e. Mr. Konidena did not render any opinion or conclusion on this subject.

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties,
Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

16. Refer to OCA Statement No. 1 at page 36, lines 15-16. Does Mr. Konidena believe that locating a BESS at the Summit Substation would address the identified asset-health concerns present on the Stanton-Summit #3 and #4 230 kV Transmission Lines? Please fully explain.

Response:

No. The Summit substation is critical. However, Mr. Konidena believes that locating a BESS at Summit would buy PPL some time to address which rebuild could be avoided with either an undergrounding or a 500 kV option or other options that PPL's analysis might show.

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, For Approval to Rebuild the Existing Doubt Circuit Stanton-Summit #3 And #4 230 kV Transmission Lines Connecting the Stanton 230 kV Substation And A Two-Pole Turn Structure That Are Respectively Located In Luzerne and Lackawanna Counties,
Pennsylvania
Docket No. A-2022-3037374

Responses to PPL Electric Utilities Corporation
Set I to OCA

19. Refer to OCA Statement No. 1 at page 43, lines 1-4. Does Mr. Konidena contend that reduction of transmission congestion would address asset health concerns on the Stanton-Summit #3 and #4 230 kV transmission lines? Please fully explain.

Response:

No. Transmission congestion and asset health concerns are two different needs. A reduction of transmission congestion would not address asset health concerns on a transmission line but a transmission line that is “healthy” could handle transmission congestion up to a certain limit and duration. In sum, congestion and asset health are two different needs but somewhat related.

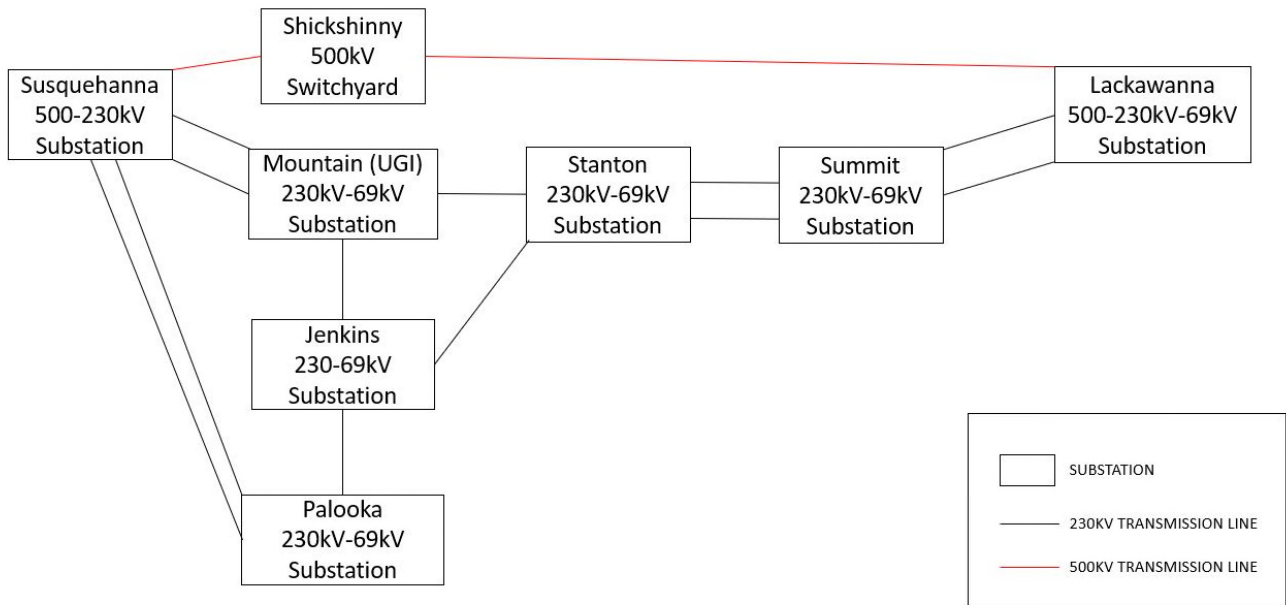
Letter of Notification of PPL Electric Utilities :
Corporation, Filed Pursuant To 52 Pa. Code :
Chapter 57 Subchapter G, For Approval To :
Rebuild The Existing Double-Circuit :
Stanton-Summit #3 And #4 230 kV :
Transmission Lines Connecting the Stanton :
230 kV Substation And A Two-Pole Turn :
Structure that are Respectively Located :
in Luzerne and Lackawanna Counties, :
Pennsylvania :

Docket No. A-2022-3037374

**PPL Electric Utilities Corporation
Response to the Set III Data Requests of
The Office of Consumer Advocate
Dated June 9, 2023
Docket No. A-2022-3037374**

OCA IV-3 Has PPL conducted an engineering analysis to determine if tapping into the existing Susquehanna-Roseland 500 kV Transmission Line through 230kV/500 kV step-up transformers at both ends of existing 500 kV substations located at Susquehanna and Roseland is an alternative option instead of rebuilding the Stanton – Summit 3 & 4 230kV circuits? If so, please provide this engineering analysis. If not, please explain why not.

PPL
Response The Susquehanna – Roseland line is broken into segments from Susquehanna to Shickshinny to Lackawanna to Hopatcong to Roseland. The Stanton – Summit 3 & 4 230kV lines parallel the Shickshinny – Lackawanna section. There are 500-230kV step down transformers at Susquehanna and Lackawanna. These transformers feed the 230kV network that the Stanton – Summit 3 & 4 230kV lines are a part of. The proposed rebuild of the Stanton – Summit 3 & 4 is to maintain the reliability of this 230kV network. The 500 kV and 230 kV transmission systems are designed with two distinct functions. The 500 kV system is designed to carry bulk electric through PPL Electric's service territory and beyond, while also feeding PPL Electric's 230 kV network. The 230 kV network is designed to carry bulk electric across the system and feed the local transmission system at 69 kV, which is the backbone of the Company's distribution system. Removing the Stanton – Summit 3 & 4 230 kV lines creates reliability concerns on both the 230 kV transmission system and the local 69 kV system that could not be resolved by adding additional 500kV sources to Stanton and Summit Substations by tapping the Susquehanna-Roseland line between Shickshinny and Lackawanna. Additionally, simply removing the Stanton-Summit 3 & 4 lines from the 230 kV network can result in reduced reliability, capacity constraints and may cause additional capacity concerns on other transmission lines, potential congestion issues, and difficulty in operating the system by removing two west to east paths on the system.



**PPL Electric Utilities Corporation
Response to the Set III Data Requests of
The Office of Consumer Advocate
Dated June 6, 2023
Docket No. A-2022-3037374**

OCA III-1 Reference PPL Statement 2, page 1, Mr. Szmodis mentions, “If and when any issues are discovered, the Asset Management Group, under my supervision, develops alternatives.” Has the Transmission Planning department ever developed an alternative other than a Transmission line?

PPL
Response

Yes. Examples of alternatives that have been used are the following: build a new substation, install a new transformer, replace a transformer, install DLR, install a capacitor bank and install a reactor. The Company evaluates a variety of solutions to determine the most cost effective way to resolve the issue.

Additionally, the Consolidated Transmission Owners Agreement (“CTOA”) with PJM requires transmission owners to “operate and maintain its Transmission Facilities”. PJM’s planning assumptions include that transmission facilities will not be retired without PJM study and review. In order for PPL Electric to retire a transmission line it would first have to provide PJM advance notice so that PJM could study the impact of the retirement. Retiring a 230 kV transmission line, like the Stanton-Summit 230 #3 and #4 Transmission Lines may have the cumulative effect of negatively impacting the reliability, efficiency, safety, resilience and security of the transmission system. That cumulative negative impact could also drive the need for additional facilities to be constructed to compensate for those removed, including greenfield installations.

PPL Electric Utilities Corporation
Response to the Set I Data Requests of
The Office of Consumer Advocate
Dated March 16, 2023
Docket No. A-2022-3037374

OCA I-11 When initially proposed at the PJM Transmission Expansion Advisory Committee meeting on October 6, 2020, the estimate for the 7.7-mile Stanton-Summit 230 kV transmission line rebuild was \$21 million. However, the current estimate for this transmission line rebuild project, as provided in the Letter of Notification, is \$37 million. Please provide detailed cost estimates that explain the increase from \$21 million to the current estimate of \$37 million in the Letter of Notification filed on December 27, 2022. Source: Slide 14 from the Transmission Expansion Advisory Committee PPL Supplemental Projects presentation; available at:

<https://www.pjm.com/~media/committees-groups/committees/teac/2020/20201006/20201006-item-09-ppl-supplemental.ashx>

PPL
Response The initial estimate provided to PJM was an order of magnitude estimate developed using averages of costs for similar projects that were completed prior to the preparation and submission of it to PJM. Since that time, there have been significant increases in procurement costs. For example, the steel index price increased by 175%. Additionally, the order of magnitude cost estimate submitted to PJM did not take into account constructability of the Project, sequence of construction, and other site-specific factors that may affect the cost of the project. Since that time, PPL Electric has initiated site-specific engineering and evaluation of the project and has a better understanding of the Project requirements and associated costs. For example, it was determined that both circuits cannot be taken out of service simultaneously so there is an increase in labor costs due to working next to an energized circuit.

**PPL Electric Utilities Corporation
Response to the Set III Data Requests of
The Office of Consumer Advocate
Dated June 6, 2023
Docket No. A-2022-3037374**

OCA III-4 Reference PPL Statement 2, page 8, Mr. Szmodis states, “when failures occur, the location of the issue can be found more easily and repaired more quickly with an aboveground transmission line compared to an underground line.” Please provide an explanation on whether less failures occur in underground transmission lines compared to overhead transmission lines? In your explanation, please include details to answer the following:

- a) How do above ground structures fare in extreme weather events as compared to underground facilities?
- b) Has PPL considered the “total costs” of new transmission as to above or underground?
- c) What is the history of outages/failures on above ground facilities?
- d) Has PPL considered the lost economic activity costs to its customers when a transmission outage occurs due to an aerial transmission outage?

PPL
Response

a) PPL Electric’s current design standards for 230kV overhead transmission structures are robust and designed to withstand most weather events. Outages on 230kV structures due to extreme weather events are rare, and outages on underground facilities are even less likely. However, due to the condition of the CORTEN steel and the development of pack out rust, the Stanton-Summit #3 and #4 Transmission Lines are more susceptible to damage from extreme weather events, including structure failure. This is the reason that the Company is proposing to rebuild this transmission line.

b) PPL has not done a “cost of service” calculation comparing overhead and underground options because the upfront costs of underground facilities are cost prohibitive and could not be offset over the life of the asset from maintenance savings, if any. Underground facilities are generally constructed when overhead facilities are not a feasible option.

c) PPL has had 27 sustained outages on the 230kV system in the last 5 years, however only 2 of those outages could have been avoided with underground facilities.

d) PPL plans the system to maintain reliability and minimize the impact that the outages have on customers. Typically, an outage on a 230 kV transmission line will not cause an outage to customers. This is because the system is planned with redundancies so that a loss of a single 230 kV transmission line will not cause customers to experience an outage. The Company plans the system in this manner because it recognizes the severe impact that a loss of transmission service would have to customers.

**Table 3.1.5 Conductor selection per circuit – A/C
Transmission**

Voltage class	69kV line	115kV line	138kV line	161kV line	230kV line	345kV line	500kV line	765kV line
Conductor size	477kcmil	795kcmil	795kcmil	795kcmil	795kcmil	795kcmil	954kcmil	795kcmil
Conductor type	ACSS	ACSS	ACSS	ACSS	ACSS	ACSS	ACSR	ACSR
Conductor quantity	1	1	1	1	1	2	3	6
Amp rating	1175	1650	1650	1650	1650	3000	3000	5000
Power rating (MVA)	140	329	394	460	657	1792	2598	6625

Available at pg. 33

<https://cdn.misoenergy.org/MISO%20Transmission%20Cost%20Estimation%20Guide%20for%20MTEP23337433.pdf>



DLR From the Utility Perspective

David Quier – VP Transmission and Substations



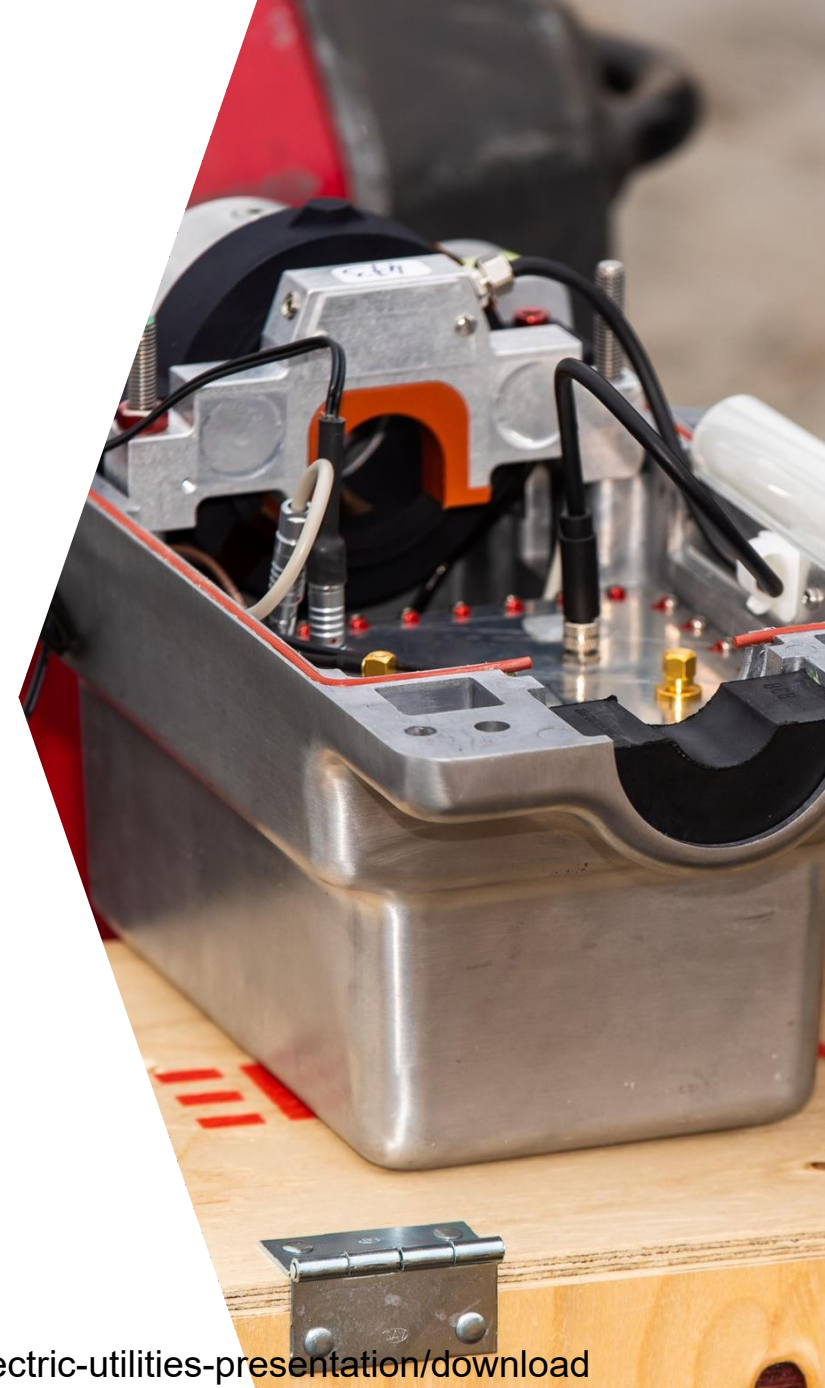
What Is DLR?

Traditional Line Ratings

- Based on conservative assumptions

Dynamic Line Ratings

- Based on real time data from sensors
- Maximizes ratings of existing equipment



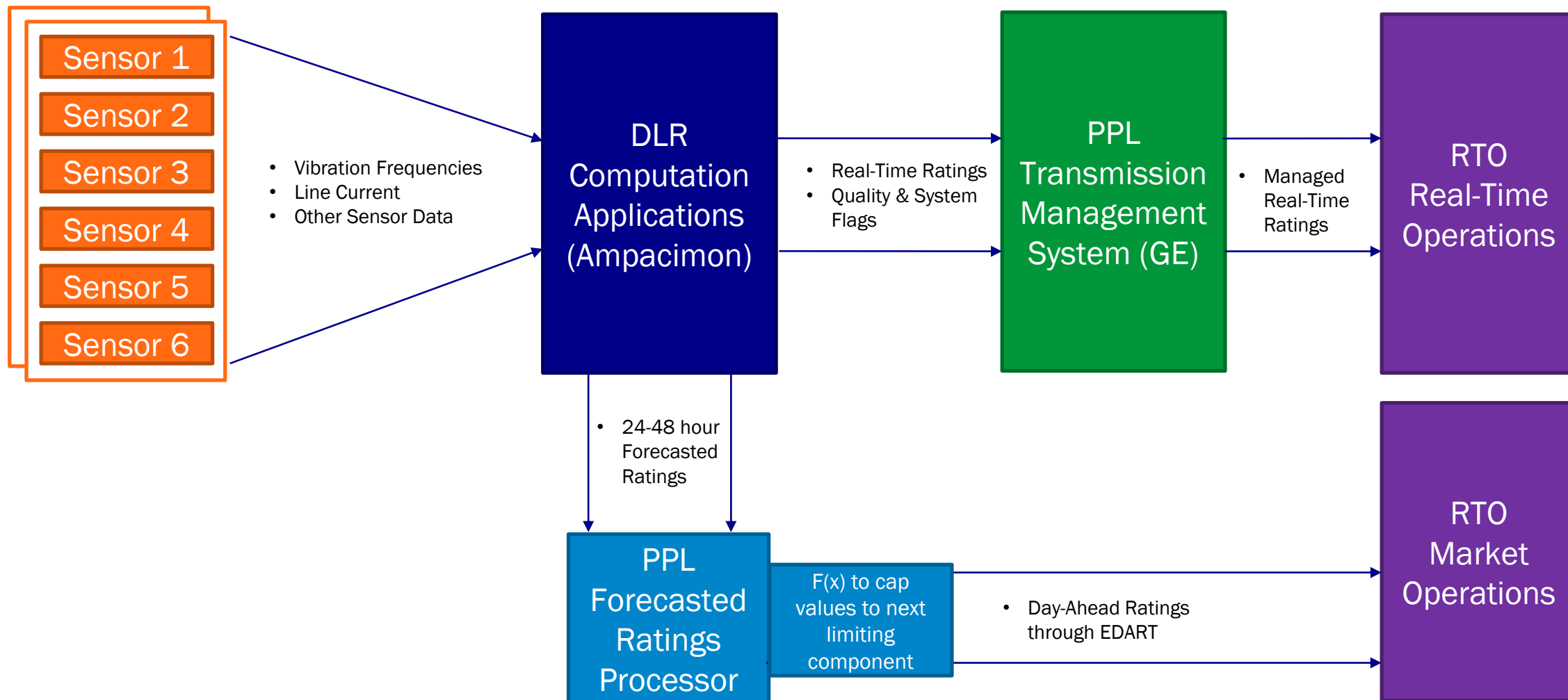


Benefits of DLR

- **Eliminated \$23 million** annually in congested generation costs
- \$250,000 DLR solution instead of an estimated \$50 million line rebuild.
- DLR is considered as a solution for market efficiency congestion.
- PPL's integration of DLR infrastructure allows faster and less costly DLR implementation on other transmission lines.
- DLR provides asset health data for lines.



Overview: DLR at PPL



Challenges: Solved and Ongoing



- NERC standards impacts and processes
- Ratings management
- Regional transmission operator and stakeholder coordination
- Best practices for ratings validation
- Ratings methodologies industry best practices:
 - Real-time
 - Long-term forecasts
- Large scale system considerations, risks and mitigations

<https://www.mass.gov/doc/ma-eoea-pop-up-forum-on-grid-enhancing-technologies-ppl-electric-utilities-presentation/download>

PPL Electric Utilities Corporation
Response to the Set III Data Requests of
The Office of Consumer Advocate
Dated June 6, 2023
Docket No. A-2022-3037374

OCA III-8 Reference PPL Statement 2, page 10, Mr. Szmodis states, “While the BESS could potentially be used to address system overload issues.” Please provide an explanation on whether system overload issues were studied due to the loss of Stanton-Summit #3 and #4 – 230 kV transmission lines?

PPL
Response It was studied and there are no system overloads for the loss of these two transmission lines. Rather, as explained previously, it is the asset health of the transmission lines that is the primary need driver for the project. System overloads are example of a need driver for a transmission project, but are not the only need drivers. Maintaining the transmission system in a safe condition is also an obligation of all transmission owners. See PPL Electric’s response to OCA III-1.

**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 Rebuild The Existing	:	
Double-Circuit Stanton-Summit #3	:	
And #4 230 kV Transmission Lines	:	Docket No. A-2022-3037374
Connecting the Stanton 230 kV	:	
Substation And A Two-Pole Turn	:	
Structure That Are Respectively	:	
Located In Luzerne And Lackawanna	:	
Counties, Pennsylvania	:	

**DIRECT TESTIMONY OF
RAO KONIDENA**

**ON BEHALF OF
THE OFFICE OF CONSUMER ADVOCATE**

JULY 07, 2023

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1 **I. QUALIFICATIONS**

2

3 **Q. What is your name and business address?**

4 A. My name is Rao Konidena. My business address is Rakon Energy LLC, Roseville, MN
5 55113.

6

7 **Q. By whom are you employed and in what capacity?**

8 A. I am the President of Rakon Energy LLC. Rakon Energy is owned and operated by me.

9

10 **Q. On whose behalf are you testifying today?**

11 A. I am testifying on behalf of the Office of Consumer Advocate (“OCA”).

12

13 **Q. Please describe your background and experience in transmission planning.**

14 A. I have been an independent energy consultant for five years, primarily focusing on
15 Regional Transmission Organization practices and policy. I worked in Transmission
16 Asset Management at Midcontinent Independent System Operator (“MISO”), similar to
17 PJM, from September 2003 to May 2018. I started as an Applications Engineer for
18 Planning, where I ran Loss of Load Expectation (“LOLE”) studies, Capacity Benefit
19 Margin (“CBM”) calculations, and Load Deliverability analysis for the MISO
20 Transmission Expansion Plan (“MTEP”). MISO's MTEP is similar to PJM's Regional
21 Transmission Expansion Plan (“RTEP”).

1 I was later promoted to Lead, Resource Forecasting in 2006, responsible for a
2 team of engineers running the capacity forecasting software EPRI EGEAS. That
3 forecasting work is incorporated in the MTEP non-transmission alternatives section.
4 After a promotion to Manager of Resource Forecasting in 2009, I led Demand Response
5 and Energy Efficiency forecasting for MTEP, including interfacing with consultants at
6 Applied Energy Group and NG Planning.

7 I worked in compliance, process, and project management for the Transmission
8 Asset Management (“TAM”) division as Senior Manager of TAM Operations from 2013
9 to 2015. In this role, my team and I were responsible for division-wide financial and
10 strategic planning, supporting corporate planning and compliance efforts. I came back to
11 the Policy Studies department in the Principal Policy Advisor role for MISO in 2015,
12 leading the long-term load forecasting project with Purdue University's State Utility
13 Forecasting Group and Applied Energy Group demand response (“DR”), energy
14 efficiency (“EE”) and distributed generation (“DG”) potential study at MISO.

15 Before leaving MISO in 2018, I led policy efforts on energy storage and
16 distributed energy resources within economic transmission planning. I presented to MISO
17 state commissions, including the Iowa Utilities Board, the South Dakota State Public
18 Utilities Commission, and the Organization of MISO States.

19 As an independent consultant, I have submitted direct testimonies on behalf of my
20 clients at the Public Service Commission of Wisconsin (Transmission Line Certificate of
21 Public Convenience & Need docket), Minnesota Public Utilities Commission
22 (Aggregator of Retail Customer docket), Kansas Corporation Commission (Demand
23 Response Aggregator docket), and California Public Utilities Commission (Diablo

1 Canyon Power Plant extension docket). Additionally, I have provided comments
2 representing myself at Minnesota Public Utilities Commission and Colorado Public
3 Utilities Commission on Integrated Distribution Planning. Finally, I have submitted
4 comments representing myself at the Texas Public Utilities Commission on Reliability
5 Metrics and Aggregation of the DERs Pilot Program.

6 I have also provided energy storage expertise to the Pennsylvania Office of
7 Consumer Advocate (“OCA”) in the Pennsylvania Public Utilities Commission energy
8 storage Docket No. M-2020-3022877. I have also provided generic electrical engineering
9 expertise for OCA in the transmission, distribution services and miscellaneous electric
10 issues.

11 My resume is attached as Appendix A.

12
13 **Q. Please provide your educational background.**

14 A. I received a Bachelor of Engineering in Electrical & Electronics Engineering from
15 Bangalore University, a Master of Science in Electrical Engineering from the University
16 of Texas at Arlington, and a Master of Business Administration from the University of
17 Minnesota.

1 **II. DIRECT TESTIMONY**

2

3 **Q. What is the purpose of your testimony in this case?**

4 A. The purpose of my testimony is to highlight the gaps in the current transmission planning
5 process, specifically as to Supplemental Projects, and to provide transmission and non-
6 transmission alternatives to the rebuild of existing double-circuit Stanton-Summit #3 and
7 #4 230 kV Transmission Lines.

8

9 **Q. Have you previously testified before this Commission?**

10 A. No, I did not testify but assisted the Office of Consumer Advocate in the Energy Storage
11 docket by writing a report and providing general electrical engineering consulting
12 services and analysis to assist OCA in transmission, distribution, and miscellaneous
13 electric issues.

14

15 **Q. On what information is your testimony based?**

16 A. My testimony is based on reviewing PPL Statement No.1, PPL Statement No.2, PPL
17 responses to OCA Data Requests Set I-IV, and PPL Letter of Notification to rebuild the
18 existing double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines (“Stanton
19 rebuild”). Additionally, I reviewed PJM's Transmission Expansion Advisory Committee
20 (“TEAC”) presentations when PPL's Supplemental Projects were presented. I have also
21 reviewed PJM's Manuals and Regional Transmission Expansion Plan (“RTEP”) reports
22 when needed.

1 **Q. How is your testimony organized?**

2 A. My direct testimony is organized in the following sections –

3 **III. Project Description:** This section describes the Project, what PPL proposes
4 to build, and why.

5 **IV. PJM's M-3 process:** This section highlights the gaps in PJM's Supplemental
6 projects assessment and provides the Commission with solutions to fill these gaps,
7 including the role of an Independent Transmission Monitor.

8 **V. Transmission Options:** This section discusses three transmission options: a)
9 Dynamic Line Ratings, b) Increasing the 230 kV Overhead Transmission Lines to
10 500 kV, and c) Underground Transmission Lines.

11 **VI. Non-Transmission Alternatives:** This section discusses two Non-
12 Transmission Alternative options: a) Battery Energy Storage System and b)
13 Demand Response and Aggregation of Distributed Energy Resources.

14
15 **VII. Summary:** This section summarizes the transmission and non-transmission
16 alternatives to Stanton rebuild.

17
18 **Q. Can you please summarize your conclusions and recommendations?**

19 A. The Commission should reject the PPL Letter of Notification to rebuild the existing
20 double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines, at this time, as the
21 existing PJM processes do not provide a robust evaluation of potential alternatives and

1 thus do not adequately protect PA ratepayers. PPL should be required to rigorously
2 evaluate the potential alternatives, including those identified herein, in order for the
3 Commission to fully evaluate PPL’s proposed project.

4 **Q. Are your recommendations and conclusions consistent with your understanding of**
5 **what the Commission must find in order to approve this Project?**

6 A. Yes. Although I am not providing a legal opinion, I understand that the Commission must
7 find, at a minimum:

8 (1) That there is a need for it.

9 (2) That it will not create an unreasonable risk of danger to the health and safety of the
10 public.

11 (3) That it is in compliance with applicable statutes and regulations providing for the
12 protection of the natural resources of this Commonwealth.

13 (4) That it will have minimum adverse environmental impact, considering the electric
14 power needs of the public, the state of available technology and the available
15 alternatives.¹

¹ 52 Pa. Code § 57.76.

1 As my testimony provides that PPL has not adequately investigated all available
2 alternatives, I do not believe that PPL has satisfied the need requirement for their
3 proposed Project.

4 5 **III. Project Description**

6
7 **Q. Please briefly describe the Stanton – Summit 230 kV double circuit transmission**
8 **line.**

9 A. Built in 1970, the existing Stanton – Summit 230 kV double circuit #3 and #4
10 transmission line is part of the PPL 230 kV transmission system. Others in the 230 kV
11 network² include 1) Lackawanna-Paupack 230 kV Transmission Line, 2) the Summit-
12 Lackawanna 230 kV Transmission Line, 3) the Jenkins-Stanton 230 kV Transmission
13 Line, and 4) the Susquehanna-Jenkins 230 kV Transmission Line. These 230 kV lines
14 feed the 230-69 kV substations in PPL's northeast region.

15 The Stanton substation is in Luzerne County, and the Summit substation is in
16 Lackawanna County, Pennsylvania.

17
18

² Letter Of Notification, Page 5, “are part of a larger 230 kV transmission network that connects generation in this region to load throughout PPL Electric and rest of PJM’s footprint. This 230 kV network includes the Lackawanna-Paupack 230 kV Transmission Line, the Summit- Lackawanna 230 kV Transmission Line, the Jenkins-Stanton 230 kV Transmission Line, and the Susquehanna-Jenkins 230 kV Transmission Line, that support bulk power flow and feeds various 230-69 kV substations in the Northeast Region.”

1 **Q. What is PPL proposing?**

2 A. PPL proposes rebuilding 7.7 miles of Stanton - Summit 230 kV #3 and #4 transmission
3 line at an estimated cost of \$38.8 Million (\$5 Million per mile). Forty-Six COR-TEN
4 lattice structures currently support the Stanton double-circuit transmission line. PPL
5 proposes replacing all 46 COR-TEN lattice structures, including the Stanton – Summit
6 230 kV double circuit conductors.

7 Construction is expected to start³ after the Commission's approval in September 2023
8 with an In-Service Date (“ISD”) of December 2025.

9

10 **Q. Why is PPL proposing a rebuild of the Stanton – Summit 230 kV double circuit**
11 **transmission line?**

12 A. PPL proposes⁴ a rebuild due to reliability, asset health, and safety concerns. According to
13 PPL, it is a reliability issue because the Stanton – Summit is part of the 230 kV network.
14 Loss of Stanton – Summit overloads the Summit – Lackawanna line, the loss of which
15 results in a load drop. It is an asset health issue due to the pack-out rust issue described
16 below, which deteriorated the structural integrity of the supporting structures. It is a
17 public safety issue because⁵ of the "possible shearing of bolts, members disconnecting
18 from lattice towers, or complete tower failure" to PPL Electric employees and the public.

³ Ibid, page 2, “Construction of the Project will commence upon the Commission’s approval of this filing, with an estimated construction start date of September 2023 with an anticipated in-service date of December 2025.”

⁴ PPL LON, first page “The proposed Project will address reliability, asset health and safety concerns related to the deteriorated condition of the COR-TEN® lattice towners of PPL Electric’s Stanton-Summit #3 and #4 230 kV Transmission Lines.”

⁵ Attachment 1 – Necessity Statement, page 11, “Possible shearing of bolts, members disconnecting from lattice towers, or complete tower failure pose a major safety risk to both the public and PPL Electric employees.”

1 PPL first identified pack-out rust in the section joints of the COR-TEN lattice structures
2 in 2013 when PPL hired a third-party contractor to assess its 230 kV transmission system
3 as part of a steel structure capital maintenance program.

4 The contractor found⁶ that 96% of the surveyed structures (126 out of 131) were in
5 Condition C (poor) or Condition D (very poor). PPL identified that 25 out of the 126
6 structures required immediate attention and performed maintenance repairs (post leg,
7 diagonal, and base shoe repairs) in 2014 and applied protective coating to the remaining
8 101.

9 Following the 2013 assessment, PPL hired several independent contractors to inspect the
10 pack-out rust issue in 2019. In early 2020, PPL conducted another evaluation of the pack-
11 out rust issue, which confirmed the earlier assessments.

12 PPL hired RTR Energy Solutions, Inc. in March 2022, to assess the Stanton – Summit
13 230 kV double circuit transmission line. RTR found that⁷ 6 structures were rated at
14 "severe" and 40 were rated at "moderate." In the Letter of Notification filed in December
15 2022, ten years since first identifying the pack-out rust issue in 2013, PPL proposes
16 rebuilding the entire Stanton – Summit #3 and #4 transmission lines due to the
17 deteriorated condition of the COR-TEN structures from the pack-out rust issue.

⁶ Ibid, page 6, “The assessment identified that 126 of 131 surveyed structures (96%) had one or more structure legs rated Condition C (poor) or Condition D (very poor). Of those 126 structures, 25 had one or more structure legs that were identified as “priority,” requiring immediate attention. In order to extend the life of the asset and ensure no failures at the ground line, the 25 structures identified as “priority” received maintenance repairs in 2014, which included post leg, diagonal and base shoe repairs. Protective coating was applied to the remaining 101 COR-TEN® structures that rated Condition C or D but were not identified as “priority.””

⁷ PPL Electric Attachment 1. Table 1-2: Structure Condition Rating Summary, page 10.

1 **Q. Did PPL consider any alternatives to a complete rebuild?**

2 A. Yes, PPL considered two alternatives – 1) structure replacement and 2) structure
3 remediation.

4 For the first alternative – structure replacement, PPL looked into replacing all the
5 46 structures⁸ at an estimated cost of \$647,243 per structure plus the cost of replacing
6 conductors because they were reaching end of life in 2026 at an estimated cost of
7 \$256,402 per conductor. So, the total cost of structure replacement including conductors
8 would be \$903,645 per structure and per conductor. Since there are 46 structures and
9 conductors, the total estimated cost of the first alternative – structure replacement would
10 be \$41.5 Million, which is higher than the \$36.8 Million for complete rebuild.

11 For the second alternative – structure remediation, PPL estimated⁹ the cost of
12 remediation at \$200,943 per structure. For 46 structures, the total estimated cost of the
13 second alternative is \$9.2 Million, which is quarter of the rebuild cost. But PPL rejected
14 this alternative due to the following reasons: 1) even if remediation¹⁰ was done now,
15 remediation must be done every 10 years, 2) health and safety concerns¹¹ related to
16 structure age and degree of deterioration, and 3) the contractor’s inexperience¹² with
17 remediation for COR-TEN lattice structures.

18 _____

⁸ PPL Attachment 1 – Necessity Statement, Page 14, “The estimated replacement cost is approximately \$647,243/structure. This option would also require PPL Electric to replace the existing conductors with new conductors in 2026 when it has reached its end-of-life at an additional cost of \$256,402/structure.”

⁹ Ibid, “The average estimated cost of remediation is approximately \$200,943/structure.”

¹⁰ Ibid, “Although remediation could extend the life of the structures, it would, at a minimum, require re-evaluation and possible subsequent remediation every 10 years following the initial remediation.”

¹¹ Ibid, “the health and safety risks associated with the assets’ advanced age and degree of deterioration are so great that remediation would fail to adequately address their poor health conditions.”

¹² Ibid, footnote 16, “The contractors that provided the cost estimate have never performed a full weathering-steel COR-TEN® lattice tower remediation before.”

1 **IV. PJM's M-3 process**

2

3 **Q. Please briefly describe PJM's Regional Transmission Expansion Plan (RTEP)**
4 **process and how Supplemental Projects fit into this process.**

5 A. PJM's RTEP process has 3 transmission project categories – 1) Baseline, 2) Network, and
6 3) Supplemental. As a Regional Transmission Organization (RTO), PJM is responsible
7 for assessing transmission needs in the next 5 years and over a 15 year horizon.
8 Transmission projects identified in this needs assessment are called Baseline projects.
9 Baseline projects are primarily reliability-based (e.g., NERC Transmission Planning
10 standards) transmission projects. These projects are studied as part of the 24-month
11 reliability planning cycle at PJM. The 24-month study includes the identification of short-
12 term reliability upgrades and long-term reliability upgrades.

13 PJM lumps quite a few drivers¹³ in this baseline project identification, including
14 NERC Regional Entity (e.g., ReliabilityFirst) criteria, PJM Operations, PJM Load Serving
15 Entity Capacity plans, Generator and Transmission Interconnection Requests,
16 Transmission Owner and other stakeholder transmission development plans, Long-Term
17 Transmission Service Requests, and several economic and operational risk drivers.
18 These Baseline projects fall under PJM Manual M-14B and are approved by the PJM
19 Board of Managers.
20 Customer-funded upgrades, local upgrades, or merchant network upgrades paid by an
21 Interconnection Customer are Network projects. New Service Customers, customers

¹³ PJM Manual 14B, page 36, <https://www.pjm.com/-/media/documents/manuals/m14b.ashx>

1 seeking new transmission service or generator interconnection drive Network projects at
2 PJM.

3
4 Rebuilding the existing double-circuit Stanton-Summit #3 and #4 230 kV Transmission
5 Lines fall under the third category – Supplemental Projects because these projects are
6 "supplemental" to the Baseline reliability projects. There are 5 drivers¹⁴ for Supplemental
7 projects. Asset health falls under the "Equipment Material Condition, Performance and
8 Risk" driver. Supplemental projects are not approved¹⁵ by the PJM Board of Managers.

9
10 **Q. Please describe briefly PJM's M-3 process.**

11 A. Supplemental projects follow the "M-3" process at PJM. There are 4 stages to this M-3
12 process.

13 The first stage starts with an Assumptions meeting. PJM Transmission Owner ("TO")
14 assumptions are posted 20 days before the Assumptions meeting. Stakeholder comments
15 are due 10 days after the Assumptions meeting. PPL presented its "2020 RTEP Planning
16 Assumptions" at the PJM Sub-Regional RTEP Committee meeting¹⁶ in December 2019.
17 The Stanton rebuild was not explicitly called out in this presentation.

18

¹⁴ Slide 5, <https://pjm.com/-/media/committees-groups/committees/srtepm/20191216/20191216-ppl-local-planning-assumptions-2020.ashx>

¹⁵ "The PJM Board of Managers do not approve Supplemental Projects." <https://insidelines.pjm.com/pjm-members-review-planning-under-m-3-process/>

¹⁶ <https://pjm.com/-/media/committees-groups/committees/srtepm/20191216/20191216-ppl-local-planning-assumptions-2020.ashx>

1 The next stage is the Needs meeting. TOs send the project Needs to PJM, and PJM posts
2 on its TEAC meeting website these Needs meeting slides 10 days before the meeting.
3 Once again, stakeholders have 10 days to comment after the Needs meeting. The PJM
4 TEAC meeting¹⁷ on September 1, 2020, served as the Needs meeting for the Stanton
5 rebuild project. The Supplemental Project Driver and the Problem Statement are
6 presented at the Needs meeting.

7
8 After the Needs stage, there is a Solutions meeting. Like the Needs meeting, the slides are
9 posted 10 days before the Solutions meeting, and stakeholder comments are due 10 days
10 after the Solutions meeting. PPL's Stanton rebuild Solutions meeting¹⁸ was held on
11 October 6, 2020. The Proposed Solution, TO Alternatives, Estimated Project Costs and
12 Projected In-Service Date are presented at the Solutions meeting.

13
14 Finally, PJM's M-3 process moves to the "Submission of Supplemental Projects & Local
15 Plan" stage, where Supplemental projects are integrated into PJM's Regional
16 Transmission Expansion Plan ("RTEP"). The Stanton rebuild is designated "**s2367** -
17 Rebuild the 7.7-mile COR-TEN tower section of the Stanton-Summit 3 & 4 230kV
18 circuits with steel monopoles and new conductor." in PJM's Project Status and Cost
19 Allocation website - <https://www.pjm.com/planning/project-construction>

17 <https://www.pjm.com/-/media/committees-groups/committees/teac/2020/20200901/20200901-item-09-ppl-supplemental.ashx>

18 <https://www.pjm.com/-/media/committees-groups/committees/teac/2020/20201006/20201006-item-09-ppl-supplemental.ashx>

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Q. What is the “do no harm study” purpose in the M-3 process?

A. Since PJM is responsible for the entire region, before including a Supplemental project like Stanton rebuild in the RTEP, PJM conducts a “do no harm study.” In this study,¹⁹ PJM ensures that the Stanton rebuild is not harming the reliability of the PJM's transmission system. If a Supplemental project is found harmful, then the sponsoring TO is responsible for implementing upgrades to the transmission system.

Q. What are your concerns with PJM's “do no harm study”?

A. I am concerned with PJM categorizing²⁰ the “do no harm study” as a **minimalistic assessment**. PJM is aware that its TOs have a system²¹ that identifies the relative priority of individual TO transmission assets to the PJM system. But PJM does not have access to this TO system. Hence, PJM depends on TOs bringing these supplemental projects to the

¹⁹ “It should also be noted that prior to integrating a Supplemental Project into the RTEP base case PJM performs a “do no harm study” to evaluate whether a proposed Supplemental Project will adversely impact the reliability of the Transmission System as represented in the planning models used in all other PJM reliability planning studies. If as a result of the do no harm study, system upgrades are required, such upgrades will be considered part of the Supplemental Project and are the responsibility of the Transmission Owner sponsoring the Supplemental Project.”

<https://pjm.com/directory/manuals/m14b/index.html#Sections/11%20Planning%20Process%20Work%20Flow.html>

²⁰ “Additionally, as solutions to aging infrastructure needs are brought forward as Supplemental Projects, planning is conducted solely by the TO, with PJM conducting a minimalistic ‘do no harm’ assessment only.” <https://pjm.com/-/media/committees-groups/committees/pc/20190912/20190912-item-05a-transparency-and-end-of-life-planning-problem-statement.ashx>

²¹ “Some TOs have developed sophisticated systems and models to assess aging infrastructure. Based on field inspections, equipment testing, outage history, etc., these TOs utilize a probabilistic approach to identify risk of facility failure and the relative priority this asset has to the rest of its system. These models enable the TO to justify continued maintenance versus replacement decisions for many years in to the future.” <https://pjm.com/-/media/committees-groups/committees/pc/20190912/20190912-item-05a-transparency-and-end-of-life-planning-problem-statement.ashx>

1 TEAC meeting. Only then can PJM conduct its “do no harm study.” It is a minimal
2 assessment because PJM stakeholders lack access to all the information needed to model
3 alternatives to these Supplemental projects.
4

5 **Q. Is ten days sufficient for stakeholder comments in each phase of the M-3 process?**

6 A. No, ten days is insufficient for stakeholders to respond with non-transmission alternatives
7 to an identified need on the transmission system after the Needs meeting. Additionally,
8 even though 10 days is technically given after each Assumptions, Needs, and Solutions
9 meeting – this adds up to only 30 days.

10 This 30-day time period to respond to a PJM TO's transmission plan should be contrasted
11 with months in preparation time that PJM TOs have. The fast-paced transmission
12 planning process is an area for the Pennsylvania Public Utility Commission
13 (“Commission” or “PUC”) to consider and address by continuing to support the creation
14 of an Independent Transmission Monitor for the PJM TEAC process.
15

16 **Q. Do Supplemental Projects fall into the Competitive Planning Process at PJM
17 required by FERC Order 1000?**

18 A. No, unlike baseline RTEP projects, Supplemental projects are not required to go through
19 the FERC Order 1000 required Competitive Planning Process²² at PJM.
20
21

²² <https://www.pjm.com/planning/competitive-planning-process>

1 **Q. Why is this a concern?**

2 A. According to a report²³ prepared for LSP Transmission Holdings LLC, an independent
3 transmission company by The Brattle Group, a consulting firm, there is a potential for 20
4 to 30% cost savings from competitive transmission processes. Hence, Pennsylvania is
5 missing out on these potential cost savings by the fact that Supplemental projects are not
6 being competitively bid.

7
8 **Q. What additional evaluation does PJM perform for a Supplemental project like the**
9 **Stanton-Summit #3 and #4 230 kV transmission lines?**

10 A. The PJM Board²⁴ does not want to assume responsibility for the asset management
11 decisions of TOs. Hence, in addition to ensuring Stanton rebuild is not harming the PJM
12 transmission system, the remaining PJM evaluation²⁵ centers around whether any
13 Baseline project would address the Supplemental project need either partially or fully. I

²³ “**Cost Savings Offered by Competition in Electric Transmission**” Experience to Date and the Potential for Additional Customer Value, “Based on the experience with competitive projects in the U.S. to date, we estimate that the potential cost savings from expanding competitive processes could range from **approximately 20% to 30%**, consistent with savings achieved with similar competitive transmission processes in Canada, the U.K., and Brazil.” https://www.brattle.com/wp-content/uploads/2021/05/16726_cost_savings_offered_by_competition_in_electric_transmission.pdf

²⁴ PJM Board Letter dated October 4, 2019, regarding transparency of Supplemental Projects, “PJM does not have the authority or expertise to assume responsibility for asset management decisions or to determine when a facility is at the end of its useful life or otherwise needs to be replaced. Those decisions are the sole responsibility of the Transmission Owner.” <https://pjm.com/-/media/about-pjm/who-we-are/public-disclosures/20191004-pjm-board-reliability-committee-chair-dean-oskvig-regarding-supplemental-projects.ashx?la=en>

²⁵ “As part of the review of Supplemental Projects PJM will also apprise the relevant Transmission Owner if a baseline upgrade might alleviate or partially mitigate the need for a Supplemental Project. In addition, PJM will determine if a Supplemental Project might impact a baseline need identified through the RTEP process, which might be in progress.” <https://pjm.com/directory/manuals/m14b/index.html#Sections/11%20Planning%20Process%20Work%20Flow.html>

1 did not find any PJM TEAC presentation that addresses whether PJM found a Baseline
2 project that addresses PPL's Stanton rebuild need because PJM does not share the results
3 of this evaluation after the “do no harm study.”
4

5 **Q. Did Other PJM Transmission Owners propose alternatives to PPL's rebuild of**
6 **Stanton-Summit #3 and #4 230 kV transmission lines as part of the TEAC process?**

7 A. No. I found no TEAC presentation that shows PJM TOs proposing alternatives to
8 Stanton-Summit #3 and #4 230 kV transmission lines.
9

10 **Q. Did PJM evaluate alternative options to the proposed rebuild of the Stanton-**
11 **Summit #3 and #4 230 kV transmission lines?**

12 A. PJM did not evaluate alternative options to rebuild the Stanton-Summit #3 and #4 230 kV
13 transmission lines. Since the PJM Board stated²⁶ that PJM does not have the authority or
14 expertise to assume responsibility for its TO's asset management decisions, and since
15 other TOs proposed no alternatives – PJM's process moved forward with the inclusion of
16 Stanton rebuild in the 2021 Regional Transmission Expansion Plan (“RTEP”).
17

²⁶ PJM Board Letter dated October 4, 2019, regarding transparency of Supplemental Projects, “PJM does not have the authority or expertise to assume responsibility for asset management decisions or to determine when a facility is at the end of its useful life or otherwise needs to be replaced. Those decisions are the sole responsibility of the Transmission Owner.” <https://pjm.com/-/media/about-pjm/who-we-are/public-disclosures/20191004-pjm-board-reliability-committee-chair-dean-oskvig-regarding-supplemental-projects.ashx?la=en>

1 **Q. Is PJM required to evaluate non-transmission alternatives or an alternative to a**
2 **transmission solution?**

3 A. Yes, PJM as a Transmission Provider under FERC jurisdiction, must²⁷ evaluate non-
4 transmission alternatives or alternatives to transmission solutions per FERC Order 1000.
5 But those alternatives must be proposed by stakeholders.²⁸ As I mentioned, 10 days
6 between M-3 meetings is insufficient for stakeholders to develop alternatives and propose
7 solutions.

8
9 **Q. What are your concerns with the PJM's Consolidated Transmission Owners**
10 **Agreement (“CTOA”)?**

11 A. The role of a PJM TO for asset health project need-based projects appears to be limited to
12 transmission solutions per the PJM CTOA. PJM TOs are not required to assess non-
13 transmission alternatives and other alternatives, such as Dynamic Line Ratings, even
14 though some PJM TOs are actively deploying those technologies, including PPL²⁹.
15 Hence it does not appear that PJM CTOA is written for the present day when
16 transmission technologies and alternatives to transmission solutions have evolved and are

²⁷ FERC Order 1000 Paragraph 148, “When evaluating the merits of such alternative transmission solutions, public utility transmission providers in the transmission planning region also must consider proposed non-transmission alternatives on a comparable basis.”

<https://www.federalregister.gov/documents/2012/10/04/2012-24437/transmission-planning-and-cost-allocation-by-transmission-owning-and-operating-public-utilities>

²⁸ FERC Order 1000 notes “The term “stakeholder” is intended to include any party interested in the regional transmission planning process.” Paragraph 151, Footnote 143,

<https://www.federalregister.gov/documents/2012/10/04/2012-24437/transmission-planning-and-cost-allocation-by-transmission-owning-and-operating-public-utilities>

²⁹ PPL response to OCA II-5, “DLR was installed on the Juniata – Cumberland 1 230 kV, and Susquehanna – Harwood 1 & 2 230 kV to address network congestion.”

1 cost-effective. Rather, it is an old agreement relevant when one or two transmission
 2 projects are needed.

3 The Commission should note the implications of the CTOA on Pennsylvania's
 4 consumers. If the Commission approves Stanton rebuild, there are 9 more rebuilds
 5 scheduled in the next 7 years. PPL has 15 scheduled transmission line rebuilds³⁰ within
 6 the next 8 years (2023-2030) with a combined cost of (\$555- \$971 M³¹). That is
 7 approximately one transmission line rebuild per year at a cost range of (\$69 - \$121 M).
 8

9 **Table 1. Summary of PPL Rebuilds**

S No	Line	# of miles	Cost (\$M)	Proposed ISD
1	Summit-Lackawanna 1 & 2 230kV	5	\$14.30	12/31/2023
2	Elimsport-Lycoming 2 & 3 230kV	4.1	\$10.40	12/31/2023
3	Manor-Millwood 230kV line and Face Rock-Millwood 1 69kV	5.2	\$13.20	12/31/2023
4	Montour-Milton 230kV (Budgeted under S1106)	10.7		12/31/2023
5	Sunbury-Milton 230kV and Sunbury-Milton 69kV	10.4	\$26.10	12/31/2023
6	Stanton-Summit 3 & 4 230kV	7.7	\$21.10	12/31/2025
7	Saegers-Elimsport and Clinton-Elimsport/Clinton-Saegers 230kV	8	\$23.10	12/31/2026
8	South Akron-Millwood 230kV and the Millwood-Strasburg tie 69kV	20.4	\$53.30	12/31/2025
9	Montour-Saegers 1 & 2 230kV	6.2	\$17.50	12/31/2027

³⁰ After tabulating all the PPL rebuilds from the October 6, 2020, TEAC meeting. <https://www.pjm.com/-/media/committees-groups/committees/teac/2020/20201006/20201006-item-09-ppl-supplemental.ashx>

³¹ The actual costs will be higher because it is likely that, similar to the Stanton-Summit estimates, the actual cost estimates in LON could be 75% higher than the cost estimates presented at a PJM TEAC meeting.

10	Jenkins-Stanton and Mountain-Stanton 230kV	8.5	\$22.80	12/31/2028
11	Mountain-Stanton and Mountain-Jenkins 230kV	9.8	\$27	12/31/2029
12	Montour-Susquehanna and Montour-Susquehanna T10 230kV	21.9	\$69.60	12/31/2029
13	Siegfried-Harwood and Harwood-East Palmerton/Siegfried-East Palmerton 230kV	38	\$136.80	12/31/2026
14	Montour-Columbia 230kV	9.25	\$28.20	12/31/2028
15	Frackville-Columbia 230kV	25.9	\$91.90	12/31/2030
Total Rebuild Miles & Cost		191.05	\$ 555.30	\$ 2.91 per mile
With a 75% cost increase			\$ 971.78	\$ 5.09 per mile

1

2

3 **Q. What conclusions do you draw from the summary of the PPL rebuilds table?**

4 A. The PPL rebuilds table from the PJM TEAC meeting shows that the PJM process is
5 suited for the PJM system, but the PUC must understand that it is not well suited for
6 protecting PA ratepayers. Thus, the PUC needs to carefully evaluate these supplemental
7 projects.

8

9 **Q. When did PPL first communicate to PJM about the need for this project?**

10 A. PPL first communicated the need for this project at the PJM TEAC meeting in September
11 2020. PPL notified the PUC about asset health projects in January 2021. This timeline is

1 relevant to understand the implications of the cost estimates of the Stanton line rebuild.
2 The LON filing was submitted in December 2022. PPL could have conducted a detailed
3 engineering analysis for non-transmission alternatives and explored other transmission
4 solutions during the 24 months (January 2021 – December 2022) before it filed the LON
5 application.

6
7 **Q. Did the cost estimate increase between the PJM TEAC meeting and the LON filing**
8 **date?**

9 A. Yes, the cost estimate increased by 75% in the 27 months from when it was initially
10 mentioned at the PJM TEAC “Solutions” meeting in October 2020 to when the LON was
11 filed at the PUC in December 2022. When initially proposed, the rebuild was \$ 21.1 M.
12 Now PPL estimates the cost at \$37 M. While steel prices³² are beyond PPL's control,
13 Pennsylvania's consumers are left to bear this 75% cost increase.

14
15 **Q. Are you suggesting that the PUC should actively seek to change PJM’s processes?**

16 A. No. Such actions are beyond the scope of this proceeding. What I am illustrating here is
17 the fact that PJM’s processes may work well for PJM TOs but are not designed to protect
18 the best interests of Pennsylvania ratepayers. Furthermore, the standard that PJM uses to
19 evaluate inclusion of the supplemental project in its RTEP is a do not harm standard.

³² PPL response to OCA I-11, “ The initial estimate provided to PJM was an order of magnitude estimate developed using averages of costs for similar projects that were completed prior to the preparation and submission of it to PJM. Since that time, there have been significant increases in procurement costs. For example, the steel index price increased by 175%..”

1 This is in contrast to the standard that the Commission must use in this proceeding which
2 requires a determination that the project is necessary.

3
4 **Q. What are you recommending to the PUC as it applies to PPL's Proposed Project?**

5 A. Although I am not providing or rendering a legal opinion, I do believe that considering
6 the minimal review process that PJM conducts, Supplemental Projects like the one
7 proposed by PPL here should be given a heightened level of scrutiny by the PUC.

8 Specifically, the PUC should ensure that PPL has thoroughly investigated³³ all reasonable
9 transmission and non-transmission alternatives, as is required by Commission
10 Regulation.³⁴

11
12 **Q. Has PPL investigated potential alternatives?**

13 A. Yes, but not as thoroughly as what should be required.
14

15 **Q. What concerns do you have with PPL's alternatives to rebuild?**

16 A. PPL's alternatives to rebuild are primarily transmission asset-related alternatives –
17 transmission structure replacement and remediation. These alternatives are variations of

³³ In comments filed at FERC on the generator interconnection Advanced Notice Of Proposed Rulemaking (ANOPR), the Commission urged FERC to examine the concept of an Independent Transmission monitor to recommend best practices on cost containment. The Commission stated it favors ITM in an advisory role at PJM's RTEP process. But since the FERC process has not created an ITM yet and any FERC Order is subject to rehearing, which takes time, the Commission should consider creating its own internal team to assist in evaluating these Supplemental projects in order to protect the interests of Pennsylvania ratepayers. FERC Docket # RM 21-17-000, <https://elibrary.ferc.gov/eLibrary/filedownload?fileid=8cc10de9-0854-c62a-a7b9-7c79c0500000>

³⁴ See *infra* at fn. 1.

1 rebuilding the entire double-circuit transmission lines. PPL routinely looks at cost-
2 effective alternatives, but most³⁵ are transmission related (e.g., new substation, new
3 transformer, transformer replacement, Dynamic Line Rating). Only the capacitor bank
4 and reactor are cost-effective non-transmission alternatives that PPL looks at regularly.
5

6 **Q. How is PPL's designation of Stanton rebuild as an asset health-need-based project**
7 **hampering the evaluation of other viable alternatives?**

8 A. Due to the "asset health" needs designation, not transmission congestion, PPL did not
9 evaluate other possible alternatives like Dynamic Line Ratings. The Commission should
10 require PPL to evaluate all options to reduce consumer costs irrespective of the need
11 designation.
12

13 **Q. Did PPL evaluate non-transmission alternatives to the rebuild of Stanton-Summit**
14 **#3 and #4 230 kV transmission lines?**

15 A. PPL did not thoroughly evaluate the breadth of non-transmission alternatives to the
16 rebuild because PPL asserts that Stanton rebuild is needed for asset health. To explore
17 Battery Energy Storage System ("BESS"), PPL mentions³⁶ that PJM must study the
18 reliability impacts of retiring the Stanton – Summit lines, which could result in a need to

³⁵ PPL response to OCA III-1, "Examples of alternatives that have been used are the following: build a new substation, install a new transformer, replace a transformer, install DLR, install a capacitor bank and install a reactor."

³⁶ PPL response to OCA III-9, "Even if the Company proposed a BESS to replace the Stanton-Summit 230 kV Transmission Lines, the retirement of those lines would require PJM to perform a study of the system without the lines and would likely lead to the need to build new lines."

1 build new lines. But that result is speculative because we don't know if PJM will find a
2 regional line best suited for Pennsylvania's consumers.

3 Regarding demand-side options such as Demand Response and Distributed Energy
4 Resources, PPL stated³⁷ that it does not consider DERs in its planning process because it
5 has no control over the customer-owned generation. As I state later in my testimony, this
6 ownership question is for the Commission to decide whether PPL must include DERs in
7 planning because consumers end up paying for interconnecting DERs and transmission if
8 PPL's planning process does not include DERs.

9
10 **Q. What are your concerns with PPL's assertion of “Good Utility Practice”?**

11 A. PPL mentions “Good Utility Practice” in the context³⁸ of its responsibilities per the PJM's
12 Consolidated Transmission Owners Agreement. It implies that it is pursuing the rebuild
13 project before the line deteriorates, causing customer interruptions. However, good utility
14 practice could also mean studying non-transmission alternatives thoroughly because³⁹

³⁷ PPL response to OCA III-14, “DER cannot be relied upon to alleviate the contingency created by the loss of Stanton – Summit #3 and #4 Transmission Lines because PPL Electric does not have any control of the operation or capacity of the customer owned DER.”

³⁸ PPL response to OCA I-3, “the project is needed to comply with the Consolidated Transmission Owner Agreement (“CTOA”) Rate Schedule – FERC No. 42 (FERC ER10-2713-000), which requires transmission systems to “[b]e kept in place and maintained in good operating condition in accordance with Good Utility Practice and principles, guidelines and standards of the applicable Regional Reliability Council and NERC.””

³⁹ PJM Operating Agreement, “Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather is intended to include acceptable practices, methods, or acts generally accepted in the region; including those practices required by Federal Power Act Section 215(a)(4).” <https://www.pjm.com/directory/merged-tariffs/oa.pdf>

1 "good utility practice is not intended to be limited to the optimum practice ... to the
2 exclusion of all others".

3 Good utility practice also implies⁴⁰ "reasonable cost" and does not have to be the most
4 expensive for the ratepayers. The Commission should ensure that good utility practice
5 works in the interests of utility consumers and becomes good consumers practice.
6

7 **Q. What are some options the Commission should require PPL to investigate further?**

8 A. The Commission should order PPL to evaluate all potential options for this line rebuild.
9 At least three potential transmission options exist a) Dynamic Line Ratings Option, b)
10 Increasing the 230 kV Overhead Transmission Lines to 500 kV, and c) Underground
11 Transmission Lines. Additionally, at least two Non-Transmission Alternative options
12 exist a) Battery Energy Storage System and b) Demand Response and Aggregation of
13 Distributed Energy Resources.
14
15

⁴⁰ PJM Operating Agreement, ““Good Utility Practice” shall mean any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather is intended to include acceptable practices, methods, or acts generally accepted in the region; including those practices required by Federal Power Act Section 215(a)(4).”

<https://www.pjm.com/directory/merged-tariffs/oa.pdf>

1 **Va. Dynamic Line Ratings Option**

2

3 **Q. What concerns do you have with PPL's treatment of Dynamic Line Ratings**
4 **(“DLR”)?**

5 A. As the data request shows⁴¹, DLR was installed on Juniata and Susquehanna lines to
6 address network congestion. In addition to reduced transmission congestion, DLRs
7 provide increased transfer capacity⁴² and resiliency benefits⁴³, and PPL does not need to
8 schedule an outage on existing transmission lines to install sensors, unlike transmission
9 options discussed below. Hence if PPL deployed DLRs on existing transmission lines,
10 some of the lines listed in Table 1 (Summary of PPL Rebuilds) could be loaded much
11 lighter to the point that they might not be needed. Thus, before approving this project, or
12 as a condition of approval if the Commission determined that the rebuild is needed, the
13 PUC should require PPL to provide a complete study on how the use of DLR technology
14 may impact the need for the planned rebuilds of PPL’s 230kV system.

15
16
17

41 PPL response to OCA I-7, “DLR has been installed on circuits that would benefit from the allowance of additional load increase: Juniata – Cumberland 1 230kV, Susquehanna – Harwood 1 & 2 230kV”

42 Unlocking the Queue with Grid-Enhancing Technologies, Brattle presentation, February 1, 2021, “DOE/ONCOR study indicates DLR transfer capability to be 5 to 25% higher than SLR.” SLR is Static Line Rating. https://watt-transmission.org/wp-content/uploads/2021/02/Brattle_Unlocking-the-Queue-with-Grid-Enhancing-Technologies_Final-Report_Public-Version.pdf90.pdf

43 “DLR technology can identify additional capacity on transmission lines, potentially relieving congestion and creating economic efficiencies. Such technology can also enhance system resilience by providing enhanced real-time monitoring of transmission assets.” <https://www.pjm.com/-/media/library/reports-notices/2022-rtep/2022-rtep-report.ashx>

1 **Vb. Increasing the 230 kV Overhead voltage to 500 kV**

2
3 **Q. Why is increasing the Stanton 230 kV to 500 kV an option for PPL to explore?**

4 A. Given the close geographic proximity of the Stanton 230 kV double circuit to the existing
5 Susquehanna-Roseland 500 kV Transmission Line⁴⁴ (Summit to Stanton is parallel⁴⁵ to
6 the Shickshinny – Lackawanna segment of the Susquehanna – Roseland 500 kV) and
7 asset health concerns associated with the 230 kV transmission system (the COR-TEN
8 issue), upgrading the voltage of the Stanton-Summit double circuit 230 kV to a 500 kV
9 system could be a viable option.

10
11 **Q. What are your concerns with PPL's 500 kV – 230 kV – 69 kV transmission system?**

12 A. PPL asserts⁴⁶ that the 500 kV system is designed to feed its 230 kV system, which is
13 designed to feed the 69 kV system. PPL implies that this link of 500-230-69 kV
14 connection cannot be broken because the 69 kV system is connected to PPL's distribution
15 system. The implication of this 500-230-69 kV link for Pennsylvania's consumers is that
16 they are stuck with the rebuilding costs of a large part of the 230 kV system due to the

⁴⁴ PPL Statement No. 1, Mr. Lookup testimony, Page 17, “The Project does not cross other electrical utility ROWs but does parallel the PPL Electric Susquehanna-Roseland 500 kV Transmission Line for the entire length of the Project.”

⁴⁵ PPL response to OCA IV-3, “The Susquehanna – Roseland line is broken into segments from Susquehanna to Shickshinny to Lackawanna to Hopatcong to Roseland. The Stanton – Summit 3 & 4 230kV lines parallel the Shickshinny – Lackawanna section.”

⁴⁶ PPL response to OCA IV-3, “The 500 kV and 230 kV transmission systems are designed with two distinct functions. The 500 kV system is designed to carry bulk electric through PPL Electric’s service territory and beyond, while also feeding PPL Electric’s 230 kV network. The 230 kV network is designed to carry bulk electric across the system and feed the local transmission system at 69 kV, which is the backbone of the Company’s distribution system.”

1 COR-TEN issue, which could amount to almost \$972 Million (Table 1. Summary of PPL
2 Rebuilds).

3
4 **Q. Given the link in PPL's transmission system, what is the analysis that the
5 Commission should require of PPL?**

6 A. The Commission should require PPL to develop a 500 kV solution that removes the need
7 for some of the proposed 230 kV rebuilds, including the Stanton-Summit lines because
8 there should be some reasonable alternatives to incurring almost \$972 Million in rebuild
9 costs for the existing 230kV system.

10
11 **Q. What is a possible 500 kV alternative and which 230 kV rebuild need could be
12 avoided?**

13 A. Stanton – Summit 230 kV double circuit could be upgraded to a 500 kV transmission line
14 because of the close proximity⁴⁷ to Shickshinny – Lackawanna segment of the
15 Susquehanna – Roseland 500 kV line. This 500 kV alternative could avoid the need to
16 rebuild 8.5 miles of Jenkins - Stanton and Mountain - Stanton 230kV and 9.8 miles of
17 Mountain - Stanton and Mountain - Jenkins 230kV at a total estimated cost of \$49.8
18 Million - \$87.15 Million (this estimate is 1.75 times the \$49.8), from Table 1. Summary
19 of PPL Rebuilds.

⁴⁷ PPL response to OCA IV-3, “The Stanton – Summit 3 & 4 230kV lines parallel the Shickshinny – Lackawanna section.”

1 **Q. What is PPL's concern regarding possibly retiring Stanton-Summit transmission**
2 **lines?**

3 A. To upgrade from 230 kV to a 500 kV solution, PPL is concerned⁴⁸ that PJM must study
4 the retirement of Stanton-Summit lines, and the results of that retirement study could
5 indicate the need for additional transmission lines. This reasoning is speculative, as no
6 analysis has yet been performed for this option.

7
8 **Q. What about the cost estimates of the 500 kV overhead solution?**

9 A. PPL claims⁴⁹ upgrading the Stanton and Summit substations from 230 kV to 500 kV is
10 approximately \$180 - \$250 Million. But this estimate should be compared against the
11 \$555 - \$972 Million in "**Table 1. Summary of PPL Rebuilds**" presented earlier in my
12 testimony because it is possible that upgrading the existing 230 kV circuits to 500 kV
13 solution could lessen the need to rebuild all of the additional lines in the 230 kV network.
14 There are trade-offs between going down the current PPL path of rebuilding the 230 kV
15 network one transmission line at a time until 2030 due to the COR-TEN issue that
16 reduced the life of a 75-year asset to 45-years or evaluating the benefits of upgrading the
17 Stanton-Summit lines now to a 500 kV system if doing so reduces the need to rebuild
18 other parts of the 230kV system. Again, I am not suggesting that this *is* the preferred

⁴⁸ PPL response to OCA III-1, "In order for PPL Electric to retire a transmission line it would first have to provide PJM advance notice so that PJM could study the impact of the retirement. Retiring a 230 kV transmission line, like the Stanton-Summit 230 #3 and #4 Transmission Lines may have the cumulative effect of negatively impacting the reliability, efficiency, safety, resilience and security of the transmission system. That cumulative negative impact could also drive the need for additional facilities to be constructed to compensate for those removed, including greenfield installations."

⁴⁹ PPL response to OCA III-15, "New 500 kV yards at the Stanton and Summit Substations would cost approximately \$180-250 million dollars. This may also require the Company acquiring additional land, right-of-way, and obtain applicable permits."

1 alternative, it is just that PPL has not explored this alternative and prior to giving
2 approval to a \$38 million link in a \$900 million chain of line re-build the Commission
3 should require PPL to consider the alternatives.

4
5 **Q. What is the Commission's role in addressing PPL's concern about the cost of**
6 **building a 500 kV solution?**

7 A. The Commission should direct PPL to estimate the benefits of upgrading to a 500 kV
8 overhead solution quantitatively and compare them against the underground option
9 (discussed next) because, as the table below indicates, only the costs are known at this
10 stage, it does not show benefits of each of these options in dollars.

11 **Table 2. Comparing the costs of Stanton rebuild to a 500 kV solution**

Transmission Option	Cost ⁵⁰
Stanton 230 kV Rebuild - Overhead	\$36.8 M
Stanton 230 kV Underground	\$115.5 M
Stanton 500 kV - Overhead	\$180 - \$250 M
Total PPL 230 kV Rebuild	\$555 - \$972 M

12
13

⁵⁰ The \$115.5 Million estimate for Underground Transmission Option is from PPL response to OCA III-5.

1 **Vc. Undergrounding Option**

2

3 **Q. What concerns do you have with PPL's treatment of underground transmission**
4 **lines?**

5 A. Even though PPL has experience⁵¹ with undergrounding transmission lines, PPL did not
6 conduct an analysis evaluating whether undergrounding is a viable alternative in this
7 LON due to cost considerations⁵². Since PPL asserted Stanton lines are needed due to
8 asset health, undergrounding should be evaluated to ascertain if overall asset health is
9 improved for the duration of the project.

10

11 **Q. Why might undergrounding be a better option for mitigating the asset health issue?**

12 A. There are two reasons why undergrounding of Stanton – Summit might be a better longer
13 term option for consumers. First, with undergrounding, there is no possible rusting
14 issue⁵³ that PPL experienced with the overhead transmission lines. PPL mentioned that
15 Stanton lines experienced the COR-TEN rust issue, reducing the asset life from 75 to 45
16 years. Second, undergrounding ensures that the transmission investment is not exposed to
17 weather elements, possibly increasing the life of the asset. PPL stated⁵⁴ that due to recent

⁵¹ PPL response to OCA II-7, “The Spring-State Hill Tie and Hershey-S. Hershey 69 kV transmission lines were the last two transmission lines that PPL Electric installed underground.”

⁵² PPL response to OCA III-12, “Only the underground transmission line alternative would solve the need for this project, and as explained earlier would be a much more costly option.”

⁵³ PPL response to OCA III-2, “Under normal circumstances, underground transmission lines do not face rusting issues. This is due to the underground transmission lines not being exposed to weather elements.”

⁵⁴ PPL Letter of Notification, Page 9, “Furthermore, as the topic of severe weather patterns becomes increasingly relevant, there is a need to consider how changing weather patterns will impact the reliability of the existing COR-TEN® lattice structures. Over the last 20 years, PPL Electric has seen a trend of increasing storms per year within the PPL Electric service territory. With each storm comes more exposure to extreme precipitation and wind events.”

1 weather patterns and storms experienced over the past 20 years, the overhead
2 transmission towers are exposed to "extreme precipitation and wind events." Hence
3 undergrounding could improve the overall health of PPL's 230 kV system.
4

5 **Q. What about the cost estimates of undergrounding compared to the overhead**
6 **transmission lines?**

7 A. While it is true that initial estimates of undergrounding are higher compared to the
8 overhead transmission lines, PPL should look at the overall cost⁵⁵ of undergrounding,
9 including but not limited to the customer interruption costs due to repeated weather-
10 related forced outages. Specifically, PPL should evaluate the total costs of ownership as it
11 applies to the ratepayers who would be paying for this Project and are served by PPL's
12 transmission system. According⁵⁶ to the National Centers for Environmental Information,
13 part of the National Oceanic and Atmospheric Administration ("NOAA"), Pennsylvania
14 experienced 24 Severe Storms in the past 5 years (2018-2023) with a total disaster cost of
15 \$2.0 - \$5.0 Billion. PPL stated⁵⁷ it experienced "27 sustained outages" on the 230 kV
16 system in the last 5 years. There are undoubtedly economic costs that ratepayers must
17 absorb when there is a power outage, such as lost business productivity, work hours, and
18 many other costs that go beyond just looking at the construction costs alone.

⁵⁵ PPL response to OCA III-4b, "PPL has not done a "cost of service" calculation comparing overhead and underground options because the upfront costs of underground facilities are cost prohibitive and could not be offset over the life of the asset from maintenance savings, if any. Underground facilities are generally constructed when overhead facilities are not a feasible option."

⁵⁶ NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2023). <https://www.ncei.noaa.gov/access/billions/>, DOI: [10.25921/stkw-7w73](https://doi.org/10.25921/stkw-7w73)

⁵⁷ PPL response to OCA III-4c.

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Q. What is the Commission's role in addressing PPL's concern about the cost of undergrounding?

A. The cost of rebuilding Stanton – Summit lines is \$36.8 Million for 7.7 miles (\$4.8 Million per mile). According to PPL⁵⁸, undergrounding costs three times the cost (\$15 Million per mile) of overhead transmission lines. Hence the cost of underground Stanton – Summit lines would be approximately \$115.5 Million.

Undergrounding has benefits but comes at a higher upfront cost to Pennsylvania's consumers. The undergrounding cost estimate provided by PPL does not quantify all the benefits (e.g., lack of rust, fewer outages⁵⁹, and less exposure to precipitation and wind) and the drawbacks (e.g., degradation of insulation materials). Hence, the Commission should direct PPL to estimate the benefits of underground quantitatively and compare them against the overhead transmission benefits.

⁵⁸ PPL response to OCA III-5, “it is likely that constructing this line underground would cost over \$15 million per mile, as opposed to the \$4.8 million per mile provided in the LON (\$36.8 million for 7.7 miles).”
⁵⁹ PPL response to OCA III-4a, “Outages on 230kV structures due to extreme weather events are rare, and outages on underground facilities are even less likely.”

1

Table 3. Comparing Stanton rebuild costs and the Underground option

OH/UG	Cost (Million)	Miles	\$ M/Mile	Voltage	Note	Source
Overhead	\$36.80	7.7	\$4.78	230 kV	Stanton rebuild	PPL
Underground	\$30	1.25	\$24.00	69 kV	Spring-State Hill Tie	PPL
Underground	\$37	2.5	\$14.84	69 kV	Hershey-South Hershey line	PPL
Underground	\$115.50	7.7	\$15.00	230 kV	Stanton rebuild	PPL

2

3

4 **Q. What is the Commission's role in addressing PPL's concern about the feasibility of**
5 **undergrounding a segment of the Stanton – Summit lines?**

6 A. To reduce the costs of undergrounding, one option is, undergrounding only a segment of
7 the 7.7 miles (e.g., 1 mile) Stanton – Summit lines. The Commission should require PPL
8 to evaluate which segment of its 230 kV network lends itself to an undergrounding option
9 and how that would benefit Pennsylvania's consumers, such as removing the need for a
10 portion of planned rebuilds in Table 1. Summary of PPL Rebuilds.

11

12 **Q. Are you endorsing the undergrounding option?**

13 A. No, I am not. I am mentioning the undergrounding as an alternative to indicate that PPL
14 did not explore all the alternatives.

15

1 substation if outages occur simultaneously⁶⁴ on Stanton – Summit 3 & 4 230kV circuits
2 and Summit – Lackawanna #1 & #2 230 kV circuits. So, the Summit substation is critical
3 to mitigating the load drop risk.

4 Finally, BESS offers the flexibility of discharging for 1 hour or 2 hours, or 3 hours
5 depending on how long the transmission need occurs, as well as the flexibility of
6 discharging multiple MW amounts up to the 26.2 MW load on each line. BESS's
7 flexibility is a viable alternative to Stanton rebuild because it is all or nothing with the
8 Stanton rebuild.

9
10 **Q. Why is locating a BESS at the Summit substation a viable alternative? Why not at**
11 **the Stanton substation?**

12 A. The Stanton substation-end of the Stanton-Summit #3 and #4 230 kV Transmission Lines
13 is served⁶⁵ by 2 transmission lines in the 230 kV network: Mountain - Stanton and
14 Jenkins – Stanton 230 kV Transmission Lines. Hence the risk of local load drop is higher
15 on the Summit substation end than on the Stanton end. Hence placing a BESS at the
16 Summit substation is a viable alternative.

⁶⁴ PPL response to OCA III-14, “If the Lackawanna – Summit #1 and #2 Transmission Lines were impacted by an outage while the Stanton –Summit lines were also out, all the sources into the Summit Substation would be eliminated resulting in 34,968 customers being out of service.”

⁶⁵ Ibid, “Stanton Substation would be served by the Mountain – Stanton and Jenkins – Stanton 230kV Transmission Lines.”

1 **Q. Does PPL have experience with the evaluation of BESS?**

2 A. Yes, it appears PPL has limited experience⁶⁶ evaluating BESS at the transmission system.
3 But with the recent cost reductions and additional incentives from the Federal
4 government, many electric utilities⁶⁷ are installing BESS. Hence, the Commission should
5 order PPL to perform a more detailed analysis of the BESS as a non-transmission
6 alternative prior to approving a rebuild of this line.

7
8 **Q. What concerns do you have with PPL's BESS rating in the cost estimate?**

9 A. If BESS is rated at 26.2 MW, the cost of BESS is less than the Stanton rebuild. PPL is
10 assuming 287 MW to estimate the cost of BESS because⁶⁸ the "total current peak load
11 serving Stanton and Summit substations is approximately 287 MW". But PPL should be
12 assuming 26.2 MW for the BESS rating because⁶⁹ "The total current peak load on both
13 Stanton – Summit 3 & 4 230kV **circuits** is approximately 26.2 MW." If we assume 26.2
14 MW for the BESS rating, then the BESS cost estimate⁷⁰ is \$26.2 Million using PPL's cost

⁶⁶ PPL response to OCA III-7, "PPL Electric evaluated installing a BESS on a 69kV line. The BESS considered for installation in this instance was 3.7MWs and it would last for approximately eight hours. The cost estimate was approximately \$14.3M"

⁶⁷ More than 7,000 MWs was installed in 2022 alone, See EIA Electricity Monthly Update, June 27, 2023 <https://www.eia.gov/electricity/monthly/update/>

Also see NPR News Story Headline "Xcel gets \$20 million for batteries to store solar, wind power", "Xcel said it also plans to use renewable energy tax credits in the federal Inflation Reduction Act to reduce the cost of the iron-air batteries." <https://www.mprnews.org/story/2023/05/01/xcel-gets-20-million-for-batteries-to-store-solar-wind-power>

⁶⁸ PPL response to OCA I-1, "The total current peak load serving Stanton and Summit substations is approximately 287 MW".

⁶⁹ PPL response to OCA I-6, "The total current peak load on both Stanton – Summit 3 & 4 230kV circuits is approximately 26.2 MW".

⁷⁰ Revised cost estimate for 26.2 MW is \$250/kWh*26.2 MW*4hours=\$26.2 Million

1 assumption, not the \$287 Million. The \$26.2 Million BESS cost estimate is less than the
2 \$36.8 Million Stanton rebuild cost estimate.

3
4 **Q. What other concerns do you have with PPL's BESS cost estimate?**

5 A. PPL is assuming a \$250 per kWh cost estimate⁷¹ for a BESS based on 2021 values. But,
6 that is the high value in the National Renewable Energy Laboratory (“NREL”) estimates
7 and it does not include the latest cost estimates and leaves out the Inflation Reduction Act
8 (“IRA”) subsidies and Investment Tax Credit⁷² (“ITC”) incentives.

9
10 **Q. What would be the BESS cost using Low, Medium values of NREL estimate?**

11 A. Without including the IRA subsidies and ITC incentives, a 26.2 MW/104.8 MWh would
12 cost \$15.72 - \$26.2 Million. Including the subsidies and incentives, it would cost even
13 lower. These BESS cost estimates are 50% less than the \$36.8 Million Stanton rebuild
14 cost estimate. Hence, PPL must take a more thorough review of BESS as an alternative to
15 Stanton rebuild.

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⁷¹ Cole, Wesley, A. Will Frazier, and Chad Augustine. 2021. *Cost Projections for Utility-Scale Battery Storage: 2021 Update*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-79236. <https://www.nrel.gov/docs/fy21osti/79236.pdf>.

⁷² Stand-alone BESS qualifies for 30% ITC in the Inflation Reduction Act, “The Act will extend the ITC for up to 30% of the cost of installed equipment for ten years and will then step down to 26% in 2033 and 22% in 2034.” <https://www.jdsupra.com/legalnews/inflation-reduction-act-set-to-boost-1821618/>

1

Table 4. BESS Cost Estimates

MW	Hours	Cost/kWh	Source	BESS Cost	Note
287	4	\$250	PPL - NREL	\$287,000,000	High value
287	4	\$200	PPL - NREL	\$229,600,000	Mid Value
287	4	\$150	PPL - NREL	\$172,200,000	Low Value
26.2	4	\$250	PPL - NREL	\$26,200,000	High value
26.2	4	\$200	PPL - NREL	\$20,960,000	Mid Value
26.2	4	\$150	PPL - NREL	\$15,720,000	Low Value

2

3

4 **Q. Besides NREL, are there other sources for BESS cost estimates?**

5 A. There are at least two other sources for BESS cost estimates. Unfortunately, one source⁷³
6 is behind a paywall. Bloomberg's New Energy Finance (“BloombergNEF”) estimates⁷⁴
7 battery pack prices on average at \$151 per kWh in 2022. But BloombergNEF also
8 predicts⁷⁵ battery pack costs to drop below \$100 per kWh by 2026. Battery packs are a
9 significant cost component of BESS. Hence there are other sources of cost estimates for
10 BESS that PPL should consider in its evaluation.

11

12

⁷³ It costs \$5,990 for Wood Mackenzie “United States grid-scale energy storage pricing 2023” issued in May 2023, <https://www.woodmac.com/reports/power-markets-united-states-grid-scale-energy-storage-pricing-2023-150128102/>

⁷⁴ “Lithium-ion Battery Pack Prices Rise for First Time to an Average of \$151/kWh” December 2022, <https://about.bnef.com/blog/lithium-ion-battery-pack-prices-rise-for-first-time-to-an-average-of-151-kwh/>

⁷⁵ Ibid, “Based on the updated observed learning rate, BNEF’s 2022 Battery Price Survey predicts that average pack prices should fall below \$100/kWh by 2026.”

1 **Q. What final concerns do you have with PPL's treatment of BESS?**

2 A. I am concerned that PPL does not recognize that a transmission line and a BESS solution
3 are similar for 3 reasons. First, both need a power source because a transmission line is
4 not useful unless there is a source of power on one end of the line and a load on another.
5 But PPL asserts⁷⁶ that a BESS depends on "a source of power in order to be useful,"
6 implying that BESS depends on another generation source to charge the batteries. Then
7 only the batteries can discharge and reduce the overloads⁷⁷ on transmission lines such as
8 Summit – Lackawanna #1 & #2 230 kV Transmission Lines.
9 Second, a Transmission Service Request ("TSR") must be entered into PJM's Open
10 Access Same-Time Information System⁷⁸ ("OASIS") to reserve capacity on a
11 transmission line. Similarly, a BESS must make a transmission reservation to charge if it
12 depends on the PJM transmission system. Finally, both would require⁷⁹ PJM to perform a
13 study before retiring. So, transmission lines and BESS are similar.
14 PPL also fails to recognize that BESS has an inherent advantage over a transmission line.
15 A BESS can store energy, but a transmission line cannot.

⁷⁶ PPL Statement No. 2. Page 10, "This means that the battery itself must be connected to a source of power in order to be useful"

⁷⁷ For an outage on the existing double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines.

⁷⁸ PJM's OASIS website, "The Open Access Same-Time Information System (OASIS) provides information about available transmission capability for point-to-point service and a process for requesting transmission service on a non-discriminatory basis. OASIS enables transmission providers and transmission customers to communicate requests and responses to buy and sell available transmission capacity offered under the Open Access Transmission Tariff." <https://www.pjm.com/markets-and-operations/etools/oasis>

⁷⁹ PPL response to OCA III-9, "Even if the Company proposed a BESS to replace the Stanton-Summit 230 kV Transmission Lines, the retirement of those lines would require PJM to perform a study of the system without the lines and would likely lead to the need to build new lines."

1 Hence, a BESS solution must be treated as a viable non-transmission alternative, sizing
2 the BESS at 26.2 MW/104.8 MWh and considering the IRA subsidies and ITC cost
3 incentives.
4

5 **VIb. Non-Transmission Alternatives - Demand Response and Aggregation of** 6 **Distributed Energy Resources**

7 8 **Q. What role could Demand Response and Aggregation of Distributed Energy** 9 **Resources (“DERs”) play in reducing consumer costs?**

10 A. A combination of Demand Response and DERs with the right BESS size could defer the
11 need to rebuild Stanton lines until a longer-term solution is in place, such as an
12 underground transmission line or a 500 kV overhead line.

13 Reducing demand on the customer end during peak demand at the transmission grid
14 reduces the probability of an outage. Customers need an economic incentive to reduce
15 demand⁸⁰ on the transmission system. FERC defines Distributed Energy Resources as
16 "any resource located on the distribution system, any subsystem thereof or behind a
17 customer meter." Demand Response⁸¹ and Distributed Energy Resources are legitimate

⁸⁰ FERC Order 745 definition of Demand Response, “Demand response means a reduction in the consumption of electric energy by customers from their expected consumption in response to an increase in the price of electric energy or to incentive payments designed to induce lower consumption of electric energy” 134 FERC ¶ 61,187 <https://www.ferc.gov/sites/default/files/2020-06/Order-745.pdf>

⁸¹ During Winter Storm Elliott, PJM saw 5,000 MW of demand response. Source – Frequently Asked Question #12, “Preliminary numbers show the Dec. 23 load at about 140,000 MW (demand response brought it down to about 135,000 MW); the final numbers will be part of PJM’s comprehensive report on the event.” <https://www.pjm.com/-/media/markets-ops/winter-storm-elliott/faq-winter-storm-elliott.ashx>

1 non-transmission alternatives because they engage the customer in reducing consumer
2 costs.

3
4 **Q. What are PPL's concerns regarding DER ownership?**

5 A. PPL is concerned⁸² that it cannot own and operate customer-owned DERs and hence does
6 not consider DERs viable alternatives. The Commission must weigh in on these PPL
7 concerns and recognize that increasing penetrations of customer-owned DERs must be
8 considered in the utility's planning process, especially since PJM is required to evaluate
9 non-transmission alternatives as part of the RTEP process. If customer-owned DERs are
10 set aside from PPL's planning process because PPL has no control over these DERs, then
11 the customer ends up paying for DERs and transmission costs. The Commission must
12 ensure that distribution planning and transmission planning are integrated as a part of its
13 responsibility to maintain a reliable system.

14
15 **Q. Why is the Aggregation of DERs a viable alternative for an asset health-need-based
16 project?**

17 A. Aggregation of DERs cannot replace the need for a transmission line. However,
18 according⁸³ to FERC Order 2222, PJM must accommodate aggregations of similar and

⁸² PPL response to OCA III-14, "DER cannot be relied upon to alleviate the contingency created by the loss of Stanton – Summit #3 and #4 Transmission Lines because PPL Electric does not have any control of the operation or capacity of the customer owned DER. It is for this reason that DER is not a viable solution and not considered in the Company's planning process."

⁸³ 85 FR 67094, Paragraph 142, "we clarify the NOPR proposal and require each RTO/ISO to revise its tariff to allow different types of distributed energy resource technologies to participate in a single distributed energy resource aggregation (i.e., allow heterogeneous distributed energy resource aggregations)" <https://www.federalregister.gov/documents/2020/10/21/2020-20973/participation-of-distributed-energy-resource-aggregations-in-markets-operated-by-regional>

1 dissimilar DER technologies. For instance, aggregations of distribution-connected energy
2 storage at a transmission node could impact transmission congestion. Similarly, an
3 aggregation of distribution-connected solar and energy storage at a single transmission
4 node could reduce transmission congestion. According to PJM's proposal, which FERC
5 has largely approved, aggregation of DERs will be able to participate in the PJM market
6 starting in 2026. Hence aggregations could be included in the M-3 process and the “do no
7 harm study” assessment starting with 2026 RTEP. So, PPL must proactively plan for
8 Aggregations of DERs and evaluate their impact on the transmission asset management
9 starting with the Stanton rebuild.

10

11

1 **VII. Summary**

2
3 **Q. Please summarize your testimony.**

4 A. The Commission should reject the PPL Letter of Notification to rebuild the existing
5 double-circuit Stanton-Summit #3 and #4 230 kV Transmission Lines, at this time, as the
6 existing PJM processes do not provide a robust evaluation of potential alternatives and
7 thus do not adequately protect PA ratepayers. PPL should be required to rigorously
8 evaluate the potential alternatives, including those identified herein, in order for the
9 Commission to fully evaluate PPL’s proposed project.

10 My testimony provides the following guidance to the Commission to ensure prudent
11 Pennsylvania consumer costs, specifically for PJM Supplemental projects -

- 12 1. The Commission should note that Pennsylvania is missing out on 20-30%
13 potential cost savings by the fact that Supplemental projects are not being
14 competitively bid. Hence the Commission should require PPL to evaluate all
15 options to reduce consumer costs irrespective of the need designation.
- 16 2. The Commission should note that if the Commission approves Stanton rebuild,
17 there are 9 more rebuilds scheduled in the next 7 years at a total cost of \$970
18 Million. Hence the Commission should require PPL to provide a complete study
19 on how the use of DLR technology may impact the need for the planned rebuilds
20 of PPL’s 230 kV system. The Commission should require this DLR study as a
21 condition of approval if the Commission determined that the rebuild is needed or
22 before approving this project.

- 1 3. The Commission should direct PPL to estimate the benefits of upgrading to a 500
2 kV overhead solution quantitatively and compare them against the underground
3 option.
- 4 4. The Commission should direct PPL to estimate the benefits of underground
5 quantitatively and compare them against the overhead transmission benefits. The
6 Commission should require PPL to evaluate which segment of its 230 kV
7 network lends itself to an undergrounding option and how that would benefit
8 Pennsylvania's consumers, such as removing the need for a portion of planned
9 rebuids.
- 10 5. The Commission should ensure that distribution and transmission planning are
11 integrated because PPL does not consider DERs in planning due to a lack of
12 control over customer-owned generation. But that lack of PPL control should not
13 lead to consumers paying twice – for interconnecting DERs and Supplemental
14 transmission projects.

15 My testimony proposes the following transmission alternatives, all of which PPL has the
16 operating experience to employ –

- 17 1. PPL must evaluate the use of DLR technology, upgrade Stanton – Summit 230
18 kV to a 500 kV solution or investigate which segment of its 230 kV network
19 lends itself to an undergrounding option, and how that would benefit
20 Pennsylvania's consumers, such as removing the need for a portion of planned
21 rebuids.

22 My testimony proposes the following non-transmission alternatives for PPL to consider:

- 1 1. PPL should evaluate installing a 26.2 MW/104.8 MWh BESS at the Summit
2 substation. It is clear from the PPL responses received as part of the data requests
3 that the Summit substation is critical for local load drop. The BESS costs are also
4 dropping with the Inflation Reduction Act and Investment Tax Credit incentives.
5 Hence installing a BESS at Summit makes reliability and economic sense.
- 6 2. PPL should incorporate Demand Response and Aggregation of DERs in re-
7 evaluating the Stanton rebuild. Both DR and DERs could defer the need for
8 rebuilding Stanton lines until a longer-term solution is in place, such as
9 upgrading to a 500 kV solution or underground.

10

11 **Q. Does this complete your testimony?**

12 A. Yes.

13

14

15

1 **APPENDIX A – RAO KONIDENA RESUME**

2 **RAO KONIDENA**

3 **ENERGY MARKET EXPERTISE IN DISTRIBUTED ENERGY RESOURCES**

4
5 Roseville, MN 55113 Cell: 612-594-9257 · rkonidena76@gmail.com

6
7 Rao Konidena is an independent energy consultant. He worked at the Midcontinent Independent System Operator
8 (MISO) for 15 years. Before he left MISO, he was the Principal Advisor for Policy Studies, working on energy
9 storage and distributed energy resources. At MISO, Rao worked in management and non-management roles around
10 resource adequacy, economic planning, business management, and policy functions.

11
12 Rao is the President of the Finnish American Chamber of Commerce – Minnesota (FACC-MN) and sits on the
13 Board of Ever Green Energy and Minnesota Solar Energy Industries Association (MnSEIA).

14

EXPERIENCE

RAKON ENERGY LLC, Roseville, MN
President & Chief Executive Officer (CEO)
Present

May 2018 –

Providing consulting services related to Federal and state energy policies focusing on energy storage and distributed energy resources

- Consumer advocates and non-profit organizations have engaged the expertise of Rakon Energy to provide an opinion on whether Non-Transmission Alternatives were sufficiently modeled in transmission line Certificate of Need proceedings.
- A renewable energy developer engaged Rakon Energy to provide MISO expertise for their renewable energy project portfolio in various stages and study cycles of the Generator Interconnection Queue and the capacity credit impact from MISO's seasonal capacity construct.
- An Independent Power Producer engaged Rakon's services to understand MISO's seasonal resource adequacy construct and its impact on Power Purchase Agreement negotiations with a MISO utility.
- An aggregator engaged Rakon Energy as part of the team to represent their interests at RTO stakeholder committees on FERC Order 2222.

- Rakon Energy was part of the team engaged by a technology company to represent their interests at the PJM RTO. Another similar company hired Rao to navigate MISO's market rules for data center interconnection.
- Advanced Energy Economy and the Natural Resources Defense Council's Sustainable FERC Project engaged Rakon to monitor MISO's FERC Order 2222 implementation process.
- The Commonwealth of Pennsylvania's Office of Consumer Advocate engaged Rakon Energy LLC to support OCA's response to the questions posed by the Pennsylvania Public Utility Commission's Secretary in the policy proceeding - Utilization of Storage Resources as Electric Distribution Assets.
- A prominent solar advocacy group currently engaged Rao for expert testimony work in Nevada and Minnesota IOUs IRP filing.
- He submitted comments to Minnesota and Colorado Public Utilities Commission on Integrated Distribution Planning dockets.
- He has provided expert testimony support for Environmental Law and Policy Center (ELPC) at the Public Service Commission of Wisconsin (PSCW) on the MISO Multi-Value Project (MVP) line in Wisconsin.
- He provided affidavit support for the Office of the People's Counsel of the District of Columbia (OPC-DC) at the Federal Energy Regulatory Commission (FERC) on PJM's Reserves Pricing Proposal and municipal utilities in Wisconsin and Missouri at FERC on MISO's Resource Adequacy construct.
- He provided advocacy support for Energy Storage Association (ESA) at MISO on FERC Order 841 Compliance.
- He provided training as part of the Tuatara team on DERs to Colombia's grid operator XM and the ESTA International team on energy storage benefits to Mexican regulator CRE.

Advisor, Volunteer, Pro-Bono assignments

- Rao presented on Distributed Energy Resources (DER) and peer-reviewed Demand Side Management and DER plans for Central American regulators, as part of NARUC International Peer Review.
- Rao presented and shared best practices around the impact of provisioning ancillary services. At an Eastern Africa regional workshop organized by the United States Energy Agency (USEA), the United States Agency for International Development (USAID) and the Power Africa initiative.

MIDCONTINENT INDEPENDENT SYSTEM OPERATOR (MISO), Eagan, MN

Principal Advisor, Policy Studies
2018

Aug 2015 – May

- Recognized as an expert on all things energy storage and distributed energy resources from an economic transmission planning perspective
- Project manager for long term independent load forecast and demand response/energy efficiency/distributed generation potential study.
- MISO representative on Department of Energy (DOE) US DRIVE Grid Interaction Technical Team

Senior Manager, Transmission Asset Management Operations
2015

Feb 2013 – July

- He engaged the division lead in the development of strategic initiatives and operating plans.
- Rao chaired the Economic Modeling Framework Working Group of international Grid operators GO-15.

Manager, Resource Forecasting (started at Engineer II) Sep 2003 – Jan 2013

- **Main Accomplishments**

- In this role, I directed the Demand Response & Energy Efficiency potential study for MISO, with the support of Global Energy Partners consultants.
- Directed the MISO Energy Storage Study identifying the economic potential for grid-scale energy storage in MISO footprint, providing strategic consulting services to investor-owned utilities, public power utilities, asset owners, and investors.

- **Regulatory Experience**

- Responsible for analytical assessments that meet MISO's Federal Energy regulatory compliance obligations as well as our Transmission Owners (e.g., FERC Market-based rates).
- Responsible for supporting state regulators and MISO Board of Directors with technical analysis related to policy drivers.

PWRSOLUTIONS, Inc., Dallas, TX (Consulting) May 2001 – August 2003

Student Intern and Electrical Engineer

- Rao executed generator interconnection studies for Independent Power Producers (IPPs) clients.
- Analyzed future generator and transmission needs in the Eastern Interconnection.

EDUCATION

THE UNIVERSITY OF MINNESOTA, Minneapolis, Minnesota
Carlson School of Management
Master of Business Administration, Global Executive Program
2011

May

Emphases: Strategic Management, International Business

- Responsible for all financial aspects of marketing mobile charging services for Electric vehicles in the Singapore market.

UNIVERSITY OF TEXAS AT ARLINGTON, Arlington, Texas
Energy Systems Research Center (ESRC)
Master of Science in **Electrical Engineering**
2002

May

- Master's Thesis in Economic Analysis of Distributed Generation (Photovoltaics (P.V.) and Fuel Cells)

1

BLOG POSTING, PUBLICATIONS & PRESENTATIONS

1. Co-Author for a graduate level textbook titled "Modern Electricity Systems: Engineering, Operations, and Policy to address Human and Environmental Needs". Release date - August 2022 with Wiley.
2. **He has authored multiple publications in Electricity Journal, Renewable Energy World (blog), and other peer-reviewed industry journals.**

BOARD & VOLUNTEER ACTIVITIES

- Board of Directors, Ever Green Energy. Sep 2019 – present
- Board of Directors, Minnesota Solar Energy Industries Association. Sep 2020 – Sep 2023.
- President, Finnish American Chamber of Commerce – Minnesota (FACC-MN). Jan 2016 - present

2

3

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 :
Rebuild The Existing Double-Circuit :
Stanton-Summit #3 And #4 230 kV : Docket No. A-2022-3037374
Transmission Lines Connecting the Stanton :
230 kV Substation And A Two-Pole Turn :
Structure that are Respectively Located :
in Luzerne and Lackawanna Counties, :
Pennsylvania :

VERIFICATION

I, Rao Konidena, hereby state that the facts set forth in my Direct Testimony, OCA Statement 1, are true and correct (or are true and correct to the best of my knowledge, information, and belief) and that I expect 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).

DATED: July 7, 2023
*348275

Signature: Rao Konidena
Rao Konidena

Consultant Address: Rakon Energy, LLC
2309 Auerbach Street
Roseville, MN 55113