

EXHIBIT A – NECESSITY STATEMENT

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EXHIBIT A – NECESSITY STATEMENT

1.0 Introduction

This Necessity Statement describes the need for the Susquehanna-Roseland 500 kV Transmission Line (the “Susquehanna-Roseland line”). As explained in the following sections, this line is needed to ensure reliable long-term electric service to customers within the PJM Interconnection, LLC (“PJM”), including the approximately 1.4 million customers served by PPL Electric Utilities Corporation (“PPL Electric”). It also is expected to provide other ancillary benefits to electricity consumers in northeastern Pennsylvania.

The Energy Policy Act of 2005¹ (“EPAAct 2005”) added section 215 to the Federal Power Act (“FPA”). Pursuant to Section 215, the Federal Energy Regulatory Commission (“FERC”) certified the North American Electric Reliability Corporation (“NERC”) as the electric reliability organization (“ERO”) to develop and enforce mandatory Reliability Standards, which are subject to the FERC review and approval. There are currently over 120 FERC-approved Reliability Standards that are monitored and enforced by NERC and the regional reliability organizations that function under its auspices. These FERC-approved NERC Reliability Standards are mandatory and failure to comply can result in penalties of up to \$1 million per day.

PJM is a FERC-approved Regional Transmission Organization (“RTO”) charged with ensuring the reliability of the electric transmission system under its functional control, and coordinating the movement of wholesale electricity in all or parts of 13 states, including most of Pennsylvania and New Jersey. Among other things, PJM is responsible for assuring compliance with NERC planning and operating standards for the bulk electric system (i.e., above 100 kV) within its control area.

PPL Electric, as an owner of transmission facilities in Pennsylvania, is a full member of PJM and actively participates in the PJM transmission planning process. PPL Electric is responsible for complying with many of the NERC Reliability Standards requirements applicable to the PPL Electric bulk electric system and supporting PJM in complying with the NERC planning and operating standards.

In order to assure reliable transmission service and compliance with NERC requirements, PJM prepares an annual Regional Transmission Expansion Plan (“RTEP”) to determine future system reinforcements that are required to meet NERC standards, as well as PJM and transmission owner planning reliability criteria. PJM prepares each RTEP in consultation with its members, including PPL Electric, and provides full opportunity for comments by interested parties, including the state public service commissions and state consumer advocates.

The 2007 RTEP identified numerous transmission reliability criteria violations on critical 230 kV and 500 kV circuits in eastern Pennsylvania and northern New Jersey, beginning as early as 2013. Sensitivity analyses performed in 2007 suggested that these violations were likely to

¹ *Energy Policy Act of 2005*, Pub. L. No 109-58, Title XII, Subtitle A, 119 Stat. 594, 941 (2005), 16 U.S.C. 824o.

occur as early as 2012, an expectation confirmed through the development of the 2008 RTEP. After identifying these violations, PJM, again in consultation with its members, including PPL Electric, examined various functional alternatives to address these violations. After extensive analysis, PJM concluded that the preferred functional alternative was to establish a 500 kV transmission line between the PPL Electric Susquehanna 500 kV Substation near Berwick, Pennsylvania, and a new Public Service Electric and Gas Company (“PSE&G”) 500 kV substation in Roseland, New Jersey. The Susquehanna-Roseland line will resolve all of the relevant reliability criteria violations and, in conjunction with other RTEP projects, help ensure reliable service to electricity consumers in PJM as well as in the PPL Electric transmission zone.

Pursuant to its FERC-approved Open Access Transmission Tariff (“PJM Tariff”), PJM directed PPL Electric and PSE&G to build the Susquehanna-Roseland line with a specified in-service date of June 1, 2012. The cost to design and construct the Pennsylvania portion of this project is approximately \$510 million, and the total cost of the project is approximately \$1.2 billion. A PPL Electric system map showing existing transmission facilities with design voltages of 230 kV and greater is included in the Attachment C map pocket. This filing addresses only the existing and proposed 230 kV and 500 kV transmission systems for the Pennsylvania portions of the project in Luzerne, Lackawanna, Wayne, Pike, and Monroe Counties.

In addition to remedying the NERC facility overload violations identified in the 2007 RTEP, the Susquehanna-Roseland line will also provide several other important benefits. For example, construction of the Susquehanna-Roseland line will permit PPL Electric to incorporate a previously identified transmission line project, currently estimated to cost approximately \$75 million into a single project. Moreover, the Susquehanna-Roseland project, and other PJM Regional RTEP projects, taken together, are expected to reduce congestion costs in PJM, including an estimated annual reduction in congestion costs on the order of \$150 million in the PPL Electric transmission zone alone.

For the reasons set forth below, the Susquehanna-Roseland 500 kV project is clearly necessary and should be approved by the Pennsylvania Public Utility Commission.

2.0 Reliability Standards

On August 14, 2003, the largest power blackout in North American history occurred and affected an area with an estimated 50 million people in the states of Ohio, Michigan, Pennsylvania, New York, Vermont, Massachusetts, Connecticut and New Jersey, and the Canadian province of Ontario. Following this event, various investigations were undertaken to determine the cause of the blackout and to address the reliability of transmission service in the affected areas. These investigations culminated with the passage of EPOA 2005 and the addition of Section 215 to the FPA. Section 215 required FERC to certify an ERO to develop mandatory and enforceable Reliability Standards, which are subject to FERC review and approval. Once approved, the Reliability Standards may be enforced by the ERO, subject to FERC oversight, or directed by the FERC.²

² 16 U.S.C. § 824o(e)(3).

On February 3, 2006, the FERC certified NERC as the ERO.³ Subsequently, NERC developed reliability standards, which apply to users, owners and operators of the Bulk Power System, and are subject to FERC review and approval. The NERC Reliability Standards define the reliability requirements for planning and operating the North American Bulk Electric System. In addition, EPAct 2005 provided NERC, as the ERO, with the legal authority to enforce compliance with its Reliability Standards, subject to FERC oversight. NERC achieves compliance through monitoring, audits and investigations, and the imposition of financial penalties and other enforcement actions for non-compliance.

In addition, NERC works closely with eight regional reliability organizations, known as Regional Entities. The Regional Entities have delegated authorities and responsibilities, as approved by FERC, to enforce NERC and regional reliability standards, and perform other standards-related functions assigned by NERC. The Regional Entity in the Mid-Atlantic region is the *ReliabilityFirst* Corporation.⁴ *ReliabilityFirst's* primary responsibilities include developing regional reliability standards, monitoring compliance with those reliability standards for all owners, operators and users of the bulk electric system, and providing seasonal and long-term assessments of bulk electric system reliability within its region. *ReliabilityFirst's* member companies, including PJM and PPL Electric, operate in 13 states and the District of Columbia.

Through its membership in *ReliabilityFirst*, PJM is registered as a Responsible Entity for, among other things, the following reliability tasks: Reliability Coordinator, Transmission Operator, and Transmission Planner. As a Responsible Entity for these functions, PJM must comply with approved NERC and *ReliabilityFirst* regional reliability standards.

As noted previously, NERC reliability standards apply to the “bulk electric system” which generally includes transmission facilities operated at voltages of 100 kV or higher.⁵ Regional reliability standards developed through *ReliabilityFirst* are applicable to facilities and control systems necessary for operating an interconnected electric energy transmission network. PJM, as a Responsible Entity, ensures compliance with NERC and regional transmission planning reliability standards through its RTEP process. PJM has planning responsibilities in the RTEP for bulk electric system transmission facilities. Expansion and enhancement of non-bulk electric system transmission facilities are identified through local transmission owners’ plans and are subject to formal PJM stakeholder review and input before they can be included in the PJM RTEP.

³ *North American Electric Reliability Corp.*, 116 FERC ¶ 61,062 (ERO Certification Order), order on reh’g & compliance, 117 FERC ¶ 61,126 (ERO Rehearing Order) (2006), order on compliance, 118 FERC ¶ 61,030 (2007) (January 2007 Compliance Order).

⁴ *ReliabilityFirst* is responsible for ensuring the adequacy and security of the bulk electric system systems in the region encompassing the former MAAC, ECAR and MAIN regions, through coordinated operations and planning of generation and transmission facilities. *ReliabilityFirst* has adopted the NERC reliability standards and has established reliability principles and standards for planning the bulk electric system in these regions.

⁵ Radial transmission facilities serving only load with one transmission source are typically not included in this definition.

3.0 PJM Planning Process

3.1 PJM

PJM was initially formed in 1927 to provide for reliable operation and coordinated planning of the transmission systems of its members. This has resulted in considerable benefits to the PJM members and their customers. For example, the current PJM 500 kV backbone transmission system was mainly a series of jointly planned and financed projects. Recognizing the changing regulatory landscape, resulting from the Energy Policy Act of 1992, PJM and its members began to change the structure of PJM. In 1998, PJM was approved by FERC to be an Independent System Operator (“ISO”) to plan and operate the integrated transmission system in the PJM region and to administer the power markets in the PJM region. PJM and its transmission owners made a joint compliance filing for Order No. 2000 in October 2000, and FERC granted PJM RTO status in December 2002. Since then, PJM membership and territory have increased significantly and its roles as an RTO have likewise grown.

Today, PJM is a FERC-approved RTO responsible for ensuring the reliability of the electric transmission system under its functional control and coordinating the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. The PJM system serves approximately 51 million electricity consumers. PJM dispatches more than 164,000 megawatts (MW) of generation capacity over more than 56,000 miles of transmission lines – a system that serves nearly 20 percent of the United States economy. PJM’s wholesale electricity markets had more than \$30 billion in billings in 2007. As a federally regulated RTO, PJM acts independently and impartially in operating and planning the regional transmission system and in overseeing the wholesale electricity market.

As an independent RTO, PJM is responsible for ensuring the safety, reliability, and security of the bulk electric system. PJM manages and controls the operation of the regional power grid and is charged with conducting comprehensive annual regional transmission planning analyses. PJM also administers a number of wholesale markets including: day-ahead and real-time energy markets; a forward capacity auction process called the Reliability Pricing Model; Financial Transmission Rights auctions; and Regulation, Spinning Reserve, Black Start Service, and Reactive Supply Ancillary Services markets.

PJM currently has more than 500 members, including power generators, transmission owners, electricity distributors, power marketers, and large consumers. As a federally regulated RTO, PJM acts independently and impartially in operating and planning the regional transmission system and in overseeing the wholesale electricity market. PJM’s independence is achieved through a two-tiered governance structure – the PJM Board and the PJM Members Committee. The independent PJM Board ensures that PJM safely and reliably operates the grid and creates and operates fair energy markets. To establish neutrality, the Board members have no personal affiliation or ongoing professional relationship with, or any financial stake in, any PJM market participant. The Board receives advice from the PJM members through the PJM Members

Committee, which through written proposals, provides advice on new programs or changes to existing programs. Each member has representation on this committee.

3.2 PJM RTEP Process

Regional transmission planning, in its broadest sense, is the process that assures that the electric transmission system can supply electricity to all customer loads in a reliable, economic, and environmentally acceptable manner. This process ensures that the sub-regional and bulk power transmission systems:

- Are able to accommodate the forecasted power system flows during the summer peak load conditions;
- Are constructed to provide power delivery at acceptable voltages for all load levels throughout the daily load cycle; and
- Can sustain probable contingencies and disturbances with minimal customer interruptions.

Following approval by FERC to be an ISO, PJM began to plan and operate the integrated transmission system for the entire PJM footprint and to administer the power markets in the PJM region. As part of its ISO responsibilities, PJM was responsible for providing a coordinated and open transmission planning process for the PJM system. PJM's role expanded in 2007 when FERC issued Order No. 890⁶, which amended PJM's existing tariff to require coordinated, open, and transparent transmission planning on both a local and regional level.⁷ In addition, FERC required that transmission providers, such as PJM, coordinate with interconnected systems.⁸ The FERC stated that regional coordination would ensure the feasibility of simultaneously planned projects and the ability to identify system enhancements that could relieve congestion or integrate new resources.⁹ Further, the FERC determined that:

*Greater coordination of planning on a regional basis will also increase efficiency through the coordination of transmission upgrades that have region-wide benefits, as opposed to pursuing transmission expansion on a piecemeal basis.*¹⁰

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 electric service reliability consistent with established reliability criteria. The RTEP process set forth in Schedule 6 addresses the requirement for the RTEP to conform with NERC standards and other applicable reliability criteria, the procedures

⁶ *Preventing Undue Discrimination and Preference in Transmission Service*, Order No. 890, 72 FR 12,266 (March 15, 2007), FERC Stats. & Regs. ¶ 31,241 (2007) (Order No. 890).

⁷ *Id.* at P 435.

⁸ *Id.* at P 523.

⁹ *Id.*

¹⁰ *Id.* at P 524.

for stakeholder input to develop the RTEP, the procedures used to develop the RTEP, the review and approval process for the RTEP, the obligation of transmission owners to build transmission upgrades included in the RTEP, and the process by which interregional transmission upgrades will be developed.

PJM's RTEP is an annual process that encompasses a comprehensive series of detailed analyses to ensure reliability under stringent reliability criteria. PJM and its transmission owners have developed planning reliability criteria to supplement the FERC-approved, NERC reliability standards. The NERC reliability standards, transmission owner criteria, and PJM reliability planning criteria are used by PJM to analyze the system and to determine the specific transmission projects, as part of the overall reliability solution, that are needed to ensure reliable electric service. Based upon this analysis, PJM determines the transmission upgrades that are needed to meet NERC reliability standards and, pursuant to FERC authority, may direct the building of new transmission projects to ensure grid reliability.

PJM's RTEP process includes both five-year and 15-year planning horizons. The five-year planning process enables PJM to assess and recommend transmission upgrades to meet forecasted load growth and to ensure the safe and reliable interconnection of new generation and merchant transmission projects. PJM performs a detailed five-year baseline analysis to assess compliance with reliability criteria and identifies transmission upgrades to meet customer demand growth.¹¹ This process considers existing generation and new resources stemming from interconnection requests by new generation resources or merchant transmission facilities. Under its long-term planning process, PJM also evaluates the needs of the system out to 15 years. The purpose of this longer term analysis is to identify developing trends that will require longer lead-time solutions and examine the long-term reliability impacts of economic growth, the extent of loop flows within PJM and assumptions about generation resources.

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

RTEP integrates numerous factors, including:

- Forecasted load growth, demand-response efforts and distributed generation additions;
- Interconnection requests by developers of new generating resources and merchant transmission facilities;
- Solutions to mitigate persistent congestion and forward-looking economic constraints and to ensure adequate allocation and funding of long-term financial transmission rights;
- Assessments of the potential risk of aging infrastructure;

¹¹ A baseline analysis identifies areas where the electric power system, as forecasted over a specific timeframe, is not compliant with reliability standards developed by NERC, PJM and local transmission owner reliability criteria.

- Long-term firm transmission service requests;
- Generation retirements and other deactivations;
- Transmission owner initiated improvements; and
- Load serving entity capacity plans.

The PJM RTEP process is initiated each year by developing a power flow case for the current year plus five years out. Included in this model are PJM's expectations for future system conditions, which are based upon a number of assumptions, including load forecast, development and retirement of generation, demand response resources, and electricity transfer levels between portions of the grid.

After developing the base power flow case, PJM conducts a comprehensive series of studies, consistent with all applicable reliability criteria, including NERC, regional reliability organization, PJM deliverability and transmission owner criteria. NERC reliability standards require PJM to identify the "critical system conditions" against which the system must be evaluated to ensure that it meets the performance criteria specified in the standards. Specifically, the NERC reliability standards require PJM to test events which fall into the following three categories:

- NERC Category A criteria require that, for all facilities in service, equipment thermal ratings and system voltage levels are within applicable limits and that the system is stable.
- NERC Category B criteria impose similar requirements with one facility removed from service. This is referred to as the "n minus 1" or "n-1" criteria. These criteria ensure that the system continues to remain reliable upon the instantaneous outage of a transmission element.
- NERC Category C criteria require the system to be stable and within applicable equipment thermal ratings and system voltage limits for less probable contingency events. Such events include second contingencies, involving the loss of one system element followed by system readjustments, and then the loss of a second system element. This is referred to as the "n minus 1 minus 1" or "n-1-1" criteria.¹²

PJM applies two primary tests that define the required critical system conditions to ensure compliance with NERC reliability criteria: a load deliverability test and a generation deliverability test. The load deliverability test examines defined load zones within the PJM region and considers the ability of the transmission system to deliver adequate power to the load zone during a generation capacity emergency in that load zone. The generator deliverability test evaluates the capability of the transmission system to assure that capacity resources in specific electrical areas within PJM can be delivered to the remainder of the PJM system at peak load.

¹² Category C also includes events such as the loss of two circuits on a single tower line or for a single faulted system element followed by a circuit breaker failing to operate, which is referred to as a stuck breaker. While generation re-dispatch is allowed after the first element in an n-1-1 event, PJM does not dispatch generation in anticipation of loss of tower line events or stuck breaker events and the test of compliance with these criteria, therefore, does not allow generation patterns to be adjusted.

These tests establish a link between generation resource adequacy for the region and the transmission adequacy necessary to deliver the generation resources to customer load. For use in the RTEP, both studies simulate the transmission system as it is expected to exist during future time periods (i.e., expected load growth, the addition or retirement of generating plants, and planned transmission construction projects). In addition, PJM confirms transmission owners' tests for compliance with established transmission owner reliability criteria.

The RTEP process results in the identification of potential future reliability violations on the PJM system. Through the RTEP process, PJM develops specific transmission projects to resolve such reliability violations and identifies transmission owner(s) obligated to build these projects.

The obligation of a transmission owner to build transmission facilities, approved by the PJM Board, is set forth in PJM's Consolidated Transmission Owners Agreement ("TOA"). For projects involving the construction of baseline facilities at or above the 500 kV voltage level, costs are allocated among the transmission zones in proportion to their load ratio share at the time of each zone's annual peak in the previous year ending October 31. For example, PPL Electric's current allocation for such projects is approximately 5%.

To account for changes in the assumptions relied upon in the RTEP process, PJM annually updates the assumptions used in the previous assessments to account for changes in load forecast, expected generation availability, and demand response.

PJM's RTEP process is open, transparent, and collaborative. All assumptions, analyses and decisions are subject to stakeholder review and participation. PJM's Transmission Expansion Advisory Committee ("TEAC") is the primary forum for stakeholder input into the PJM analyses. The TEAC is open to participation by: (i) all transmission customers; (ii) any other entity proposing to build transmission facilities to be integrated into the PJM region; (iii) all PJM members; (iv) state commissions and consumer advocates, and (v) any other interested entities or persons.

The TEAC meets periodically with PJM to provide advice and recommendations to aid in the development of the RTEP. The TEAC's responsibilities include the review of and the provision of comments and input on the following:

- Scope and assumptions of RTEP studies, including economic/market efficiency analysis;
- Analysis at defined points during the RTEP process cycle;
- RTEP recommendations to be proposed to the PJM Board for endorsement; and
- Specified RTEP process matters as requested by the PJM Board.

Further, the TEAC reviews non-bulk electric system transmission projects identified by transmission owners as presented to the Sub-regional RTEP Committees.

The inclusion of diverse participants in the TEAC promotes the presentation and consideration of divergent opinions and comments in the development of the RTEP and in the recommendations for PJM Board approval. The RTEP and all stakeholder comments to the RTEP are submitted to the PJM Board for its review in determining whether to approve the proposed RTEP. Following

approval of the RTEP by the PJM Board, the cost allocations applicable to the identified projects identified in the RTEP are filed with the FERC.

4.0 The PPL Electric System Planning Process

PPL Electric undertakes an independent analysis of both its bulk electric system transmission facilities, which are under the functional control of PJM, and its non-bulk electric system transmission facilities. Therefore, PPL Electric, as a transmission owner and member of PJM, undertakes system planning for all of its transmission facilities in concert with the PJM RTEP. In this way, PPL Electric actively participates in the PJM RTEP process and through this participation, PPL Electric provides the results of its independent studies of its local reliability plans to PJM for consideration and inclusion in the RTEP. The PPL Electric planning guidelines are outlined in its Reliability Principles and Practices (“Reliability P&P”) document, which was developed to ensure adequate and appropriate levels of electric service consistent with good utility practice. The PPL Electric Reliability P&P for the bulk electric system is consistent with PJM reliability criteria.

PPL Electric’s established reliability criteria may be more stringent than that of PJM or NERC. Consequently, PPL Electric may recommend additional reinforcements to PJM for review and confirmation as part of the RTEP.

In accordance with these guidelines, the PPL Electric transmission zone is planned so that:

- Normal operation of the system will not load any facility beyond its normal continuous rating;
- The loss of any single facility (single or double circuit line, transformer, bus, or generator), or the combination of a line fault and stuck breaker, or a fault with an over-trip and a successful reclosing of the over-tripped terminal, will not cause loadings on remaining facilities to exceed applicable emergency ratings in order to prevent equipment damage and cascading transmission outages; and
- After the initial facility loss, appropriate switching and/or load shedding procedures will be implemented to prevent damage to equipment should a second failure occur.

The PPL Electric planning process begins by developing a computer model of the future transmission system. A specific study year is chosen to define expected facility loadings. The future transmission system model is prepared using the existing transmission system plus any planned modifications to the transmission system that are scheduled to be in service prior to the study year. Load levels used in the transmission system model are based on the latest forecast prepared by the PPL Electric Load Analysis Group.

Once PPL Electric’s system model is complete, comprehensive power flow simulations are performed to determine the ability of the system to comply with the Reliability P&P document. This is accomplished by simulating an outage of each single circuit line, double circuit line,

transformer, bus, generator, or circuit breaker. All conditions where the future system does not meet the Reliability P&P are identified.

Alternatives that can mitigate the reliability criteria violation are then developed and analyzed to ensure the PPL Electric transmission system meets the reliability criteria identified within the Reliability P&P. Estimated costs and lead times to implement the reinforcements are prepared. Computer simulations of the system, considering the identified reinforcement alternatives, are completed to identify the best overall reinforcement plan that will meet the future needs of the region in a reliable, economic, and environmentally acceptable manner.

To the extent that PPL Electric's Reliability P&P identifies additional future bulk electric system reliability violations not previously identified in the RTEP, these violations and recommended reinforcements are forwarded to PJM for additional analysis and verification. If PJM agrees with the PPL Electric findings and recommended reinforcements, the additional projects are presented at TEAC meetings for stakeholder review and discussion, prior to PJM authorizing PPL Electric to proceed with a reinforcement project. PJM solicits and posts comments by the stakeholders on these proposed RTEP projects.

5.0 2007 and 2008 PJM RTEP

The 2007 RTEP was approved by the PJM Board on June 22, 2007. Applying the process outlined above in Section 3.2, the 2007 RTEP identified multiple 230 kV overloads in the Eastern Mid-Atlantic area of PJM. This analysis was updated as part of the 2008 RTEP to incorporate updated assumptions such as load forecasts, generation, and demand response availability. The updated analysis developed as part of the 2008 RTEP validated the findings of the 2007 RTEP. Specifically, the 2008 RTEP identified 23 electric reliability violations that are likely to occur beginning in 2012 on critical circuits across eastern Pennsylvania and northern New Jersey and extending out through PJM's 15-year planning horizon to 2022.

The electric reliability violations identified in eastern Pennsylvania and northern New Jersey are a result of "overloaded" transmission facilities. That is, the loading on the transmission facilities will exceed the applicable rating which may cause permanent damage to transmission infrastructure and widespread power outages. These 23 reliability violations, which are set forth in Attachment D, were determined through the application of NERC Category A¹³ and Category B¹⁴ standards utilizing the PJM Load and Generation Deliverability Procedures. The major violations are summarized below.

The electric reliability violations include 18 load deliverability violations. Nine of these violations occurred for the PSE&G load deliverability criteria with the most severe problem on the Branchburg to Readington 230 kV line.

¹³ NERC Category A requires that the bulk electric system be able to meet customer demands and maintain firm transmission service with all facilities in service.

¹⁴ NERC Category B requires that the bulk electric system be able to meet customer demands and maintain firm transmission with the loss of a single bulk electric system element.

In addition, there were five violations for the Eastern Mid-Atlantic load deliverability criteria with the most severe electric reliability problem on the Martins Creek to Portland 230 kV line, which is a tie line that interconnects the PPL Electric transmission zone with the Metropolitan Edison transmission zone. The other electric reliability problems for the Eastern Mid-Atlantic load deliverability criteria were on the Richmond – Camden 230 kV line, which is a tie line that interconnects the PECO Energy transmission zone with the PSE&G transmission zone; the Waneeta – Richmond 230 kV line in the PECO Energy transmission zone; the Hosensack – Elroy 500 kV line, which is a tie line that interconnects the PPL Electric transmission zone and the PECO Energy transmission zone; and the Bridgewater to Middlesex 230 kV line in the PSE&G transmission zone.

The electric reliability violations also include five generator deliverability criteria violations, all of which occur in the Jersey Central Power & Light transmission zone. The most severe problem is on the Greystone to Whippany 230 kV line. Four other violations are expected to occur on the Kittatinny to Pohatcong 230 kV line, the Martins Creek to Morris Park 230 kV line, the Portland to Kittatinny 230 kV line, and the Portland to Greystone 230 kV line.

PJM's 2008 RTEP, with updated assumptions about generation availability, load forecast, and demand response, confirmed the need for the Susquehanna-Roseland line by 2012. The 2008 RTEP reflected updated load information, as well as demand response forecasts. Similar to the 2007 analysis, the updated 2008 analysis showed multiple violations on many of the circuits identified in PJM's 2007 RTEP.

6.0 Functional Alternatives Considered

To resolve the reliability problems that were identified as part of the 2007 RTEP, PJM and its stakeholders, including PPL Electric, identified several potential solutions and, after analyzing the options, determined that the Susquehanna-Roseland line was the best overall solution.

6.1 Alternative 1 (Preferred Option): Susquehanna-Roseland 500 kV

The construction of the approximately 145-mile Susquehanna-Roseland line will first interconnect the PPL Electric Susquehanna 500 kV Substation to a new 500/230 kV substation at Lackawanna. From the Lackawanna Substation, the Susquehanna-Roseland line will turn eastward to cross the Delaware River into New Jersey and terminate at a new 500 kV station at Jefferson. The Susquehanna-Roseland line will then continue from the Jefferson station, to Roseland station in the PSE&G transmission zone. There will be two 500/230 kV transformers at the Lackawanna Substation to interconnect to the existing 230 kV facilities in the area. At the PSE&G Jefferson station, the Susquehanna-Roseland line will interconnect with an existing 500 kV line that terminates at the PSE&G Branchburg and Consolidated Edison Ramapo stations. At Roseland, there will initially be two 500/230 kV transformers to interconnect with the existing 230 kV system. The Susquehanna-Roseland 500 kV line will be approximately 100 miles in Pennsylvania and 45 miles in New Jersey. A substantial portion of the new line construction will use existing transmission line corridors as 30 miles of the path is already in

place as part of a transmission expansion project completed in 1983. Therefore, the 100-mile section of the Susquehanna-Roseland 500 kV line in Pennsylvania will require only about 70 miles of new line construction.

The Susquehanna-Roseland line will provide long-term (i.e., greater than 15 years) relief of the numerous reliability violations that begin to occur in northeastern PJM as early as 2012. In addition, the Susquehanna-Roseland line will resolve all of the relevant reliability criteria violations and, in conjunction with other RTEP projects, help ensure reliable service to retail electric consumers in PJM as well as in the PPL Electric transmission zone.

6.2 Alternative 2: Bossards-Roseland 500 kV

Alternative 2 would require upgrading existing 230 kV circuits to 500 kV operation along a path from Bossards, located in Lehigh County on the existing Susquehanna-Alburtis 500 kV line, through Martins Creek and Portland to a new Jefferson substation located on the existing Branchburg – Ramapo 500 kV line. The circuit would then continue to Roseland, in the PSE&G system. The PJM RTEP process determined that the Bossards–Roseland 500 kV line would provide less relief on the overloaded facilities over the 15-year planning horizon than that provided by the Susquehanna-Roseland line. Furthermore, this option would have required the outage of several 230 kV lines along the proposed route during construction, which would have significantly affected reliability and congestion during the construction of the line.

6.3 Alternative 3: Stanton-Roseland 230kV

Alternative 3 would have required the construction of a new 230 kV line from the PPL Electric Stanton substation near West Pittston, Pennsylvania to the PSE&G 230 kV substation in Roseland, New Jersey. The analysis of this alternative determined that it was not a robust enough solution as violations on many of the lines were only resolved for two to three years. The Stanton-Roseland alternative was eliminated from consideration by PJM early in the final stages of the RTEP analysis because it provided only a temporary solution to many of the violations identified in the 2007 RTEP.

7.0 Proposed System

The construction of the Susquehanna-Roseland line will first interconnect the PPL Electric Susquehanna 500 kV Substation to a new 500/230 kV substation at Lackawanna.¹⁵ An approximately 1 mile section of new 500 kV single circuit transmission line will be constructed from PPL Electric’s Susquehanna 500 kV Substation north to a connection point with an existing line section that is currently energized at 230 kV but designed for 500 kV operation. The next 30 miles of the transmission path from Susquehanna to Lackawanna will utilize an existing

¹⁵ An initial 0.44-mile section of new 230 kV single circuit transmission line will be constructed from PPL Electric’s Susquehanna T10 230 kV Switchyard to a section of existing 230 kV line that will be disconnected as a result of re-energizing at 500 kV. This new line will be named Susquehanna T10 Yard – Susquehanna 230 kV line.

transmission line built for 500 kV, but currently operated at 230 kV. An additional 13.4 miles of new line, designed for double circuit 500 kV but operated initially as a single circuit 500 kV, will be constructed and terminated at the new Lackawanna 500 kV substation. From the Lackawanna Substation, the Susquehanna-Roseland line will turn eastward for a distance of approximately 58 miles following an existing 230 kV corridor and cross the Delaware River into New Jersey. On the Pennsylvania side of the Delaware River, PPL Electric proposes to reconstruct an existing 230 kV single circuit transmission line for double circuit operation for most of the transmission path. One side of this reconstructed line will operate at 500 kV and the other side will be operated at 230 kV to preserve electrical supply to the stations along this path. The line will continue and terminate at a new 500 kV station at Jefferson. The Susquehanna-Roseland line will then continue from the Jefferson station, to the Roseland station in the PSE&G transmission zone. The total line length in New Jersey is approximately 45 miles. There will be two 500/230 kV transformers at the Lackawanna Substation to interconnect to the existing 230 kV facilities in the area. At the PSE&G Jefferson station, the Susquehanna-Roseland line will interconnect with an existing 500 kV line that terminates at the PSE&G Branchburg substation and the Consolidated Edison Ramapo substation. At Roseland, there will initially be two 500/230 kV transformers to interconnect with the existing 230 kV system.

8.0 Other Benefits

In addition to resolving multiple violations of applicable Reliability Standards, the Susquehanna-Roseland line will provide other benefits as well. For example, PPL Electric has established a program to replace aged and deteriorated 230 kV transmission lines with modern double circuit design, single circuit initially installed with modern conductor (the “vintage conductor replacement program”). Included in this program is a section of the 230 kV transmission line that will be rebuilt as part of the Susquehanna-Roseland 500 kV Transmission Line project. Specifically, this section consists of about 28 miles of 1920s vintage conductors between Bushkill, Blooming Grove, and the Wallenpaupack Hydroelectric Station. Engineering analysis and testing of these conductors in the 1980s identified steel core and splice deterioration. Temporary repairs were made and permanent replacements are necessary within the next several years. Delaying replacement of these aging conductors increases failure risk and creates safety and reliability concerns. The Susquehanna-Roseland project enables PPL Electric to incorporate the modernization of the Wallenpaupack-Bushkill line segment into one project. If designed and constructed as a stand-alone project, the Wallenpaupack-Bushkill modernization would have cost PPL Electric approximately \$75 million. Under current PJM cost allocation rules, all of this cost would be assigned to the PPL Electric Zone.

In addition, the Susquehanna-Roseland project, in conjunction with other major RTEP projects, is expected to reduce congestion costs¹⁶ in PJM, including a reduction in congestion costs on the order of \$150 million in the PPL Electric transmission zone alone. This need is consistent with the mandate in EPAAct 2005 that new transmission construction must be provided to reduce persistent and significant congestion on the grid.

¹⁶ Congestion costs are charges attributable to limitations on the transmission system that result in increased costs of energy delivered at a given location on the transmission system.

In addition, the Susquehanna – Roseland 500 kV line will improve voltage in the northern areas (i.e., Lackawanna and Luzerne Counties) in the Northeast part of the PPL Electric territory and portions of the Pennsylvania Electric Company’s service territory. The voltages in this part of Pennsylvania, while at acceptable levels, have been lower than desired. Power flow studies show that the voltage in this part of PPL Electric’s service territory will fall to unacceptable levels at the Lackawanna, Stanton, and Jenkins 230 kV regional substations under certain operating conditions. The Susquehanna-Roseland 500 kV line, with transformation at Lackawanna, will resolve these issues and provide a more robust transmission system.

The Susquehanna-Roseland 500 kV line will also eliminate existing stability limits imposed on the amount of generation allowed to be on-line in the north-central areas of Pennsylvania during certain transmission equipment outages in that area. Currently, there is a high density of generation in northern Pennsylvania, relative to the number of transmission lines available to transport that energy to the electricity consumers in Pennsylvania and elsewhere. When certain lines in the area are out of service for any reason, generation in north-central Pennsylvania must be curtailed to ensure system stability. The installation of the Susquehanna-Roseland 500 kV Transmission Line removes this limitation, thus providing a more reliable and robust transmission system.

9.0 Conclusion

PJM is the independent entity responsible for ensuring the reliability of the region’s transmission grid. Through its RTEP process, PJM identifies transmission system upgrades, expansions and enhancements that are necessary to ensure the reliability of the PJM transmission system through compliance with the FERC-approved, mandatory NERC reliability standards as well as regional and local reliability criteria. The RTEP provides “an open non-discriminatory framework to identify the system enhancements that will ensure reliability” in PJM. The RTEP process specifies transmission upgrades that are necessary to address both near-term needs within the next five years and longer-term needs within PJM’s long-term planning horizon.

In its 2007 RTEP analysis, PJM identified several potential load and generator deliverability violations in eastern Pennsylvania and northern New Jersey. PJM forecasted that these violations would begin to occur as early as 2013. This analysis was updated in the 2008 RTEP to incorporate updated assumptions such as load forecasts, generation and Demand Response availability. The 2008 RTEP validated the findings of the 2007 RTEP and identified 23 electric reliability violations that are likely to occur beginning in 2012 on critical circuits across eastern Pennsylvania and northern New Jersey and extending out through PJM’s 15-year planning horizon to 2022. The Susquehanna-Roseland line, in conjunction with other RTEP projects, resolves all the 23 identified reliability violations in eastern Pennsylvania and northern New Jersey. Resolving the identified reliability violations ensures the continued reliable operation of the PJM transmission system in eastern Pennsylvania and northern New Jersey.