



PPL Electric Utilities

2014 RTEP Project Proposal Window 1

*Saltville – Naomi 138kV Thermal Overload
Solution #1: Clinch River – Saltville 138kV Line Addition*

Submitted July 28, 2014

REDACTED VERSION

Clinch River-Saltville Station 138kV Transmission Line Addition

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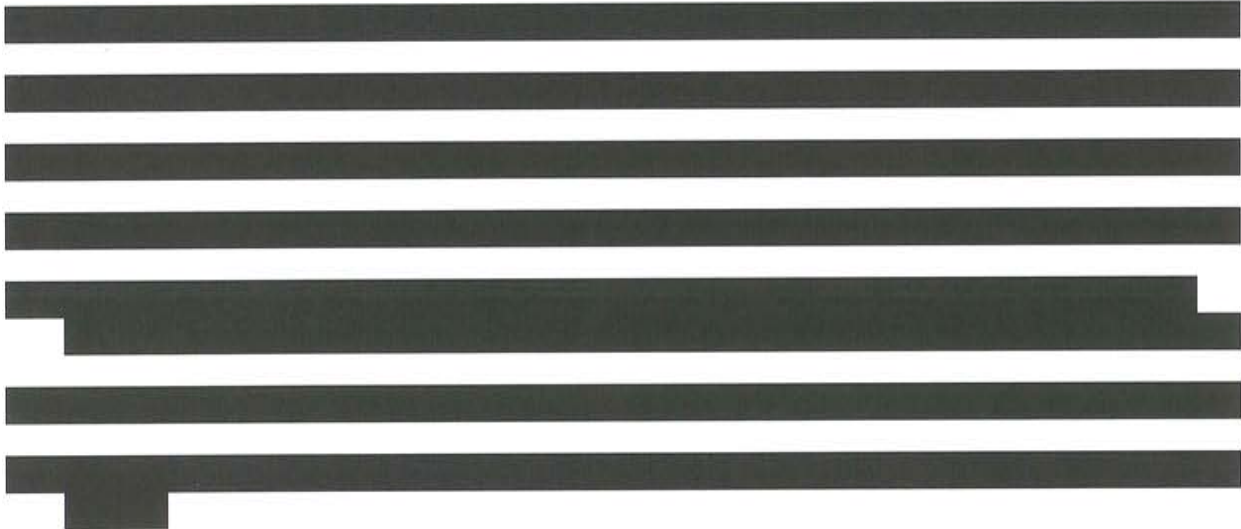


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A Executive Summary

A.1 Name and Address of Proposing Entity

Address:

PPL Electric Utilities Corporation

Two North Ninth Street

GENN5

Allentown, PA 18101-1179

(610) 774 – 5151

Point of Contact:

Vincent J. Cuce

Manager, Asset Management Transmission & Substation

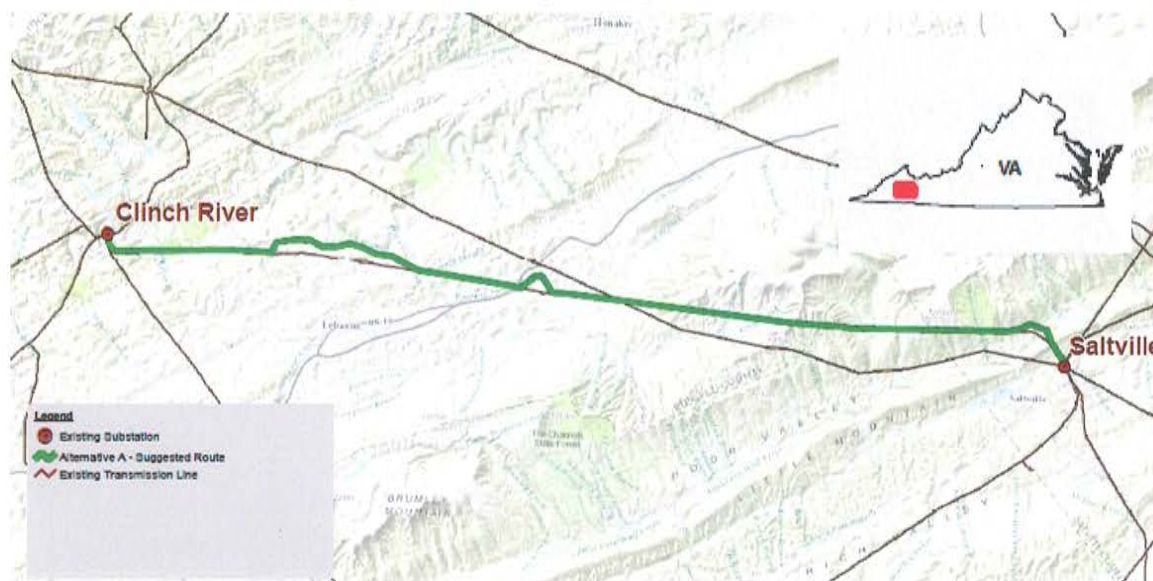
Business: (610) 774 – 6580

Cellular: (610) 737 – 2015

A.2 Description of Problem and Proposed Solution

PPL EU proposes to construct a new 26-mile single-circuit 138kV line from Clinch River to Saltville in western Virginia. This solution will relieve 29 Generation Deliverability violations on various western Virginia 138kV transmission circuits, as identified in PJM's 2014 RTEP study results (see Section C1). PPL EU will be responsible for planning, design, right-of-way acquisition, permitting, construction, operation, and maintenance of the entire solution. PPL EU will coordinate with the incumbent utility to support all aspects of the solution. A map of the proposed development is included in Figure A2-1.

Figure A.2-1 - Map of Proposed Solution Corridor



Why This Solution?

PJM identified six different 138kV lines that overload for a total of 26 outage scenarios and three baseline system Generation Deliverability conditions, the greatest overload reaching as high as approximately 117% of the summer emergency rating. Implementation of this solution mitigates all 29 reliability violations and reduces loads to between [REDACTED] of summer MVA emergency ratings.

Why PPL EU?

PPL EU has successfully developed, operated, and maintained transmission infrastructure throughout its nearly 100 year history and is well positioned to implement the 138kV transmission line from Clinch River Substation to Saltville Substation. PPL EU focuses on delivery excellence, blending capable people, mature processes, and rich vendor networks. PPL EU is backed by its parent company, PPL Corporation, one of the largest investor owned utilities in the U.S. Both companies maintain “investment grade” credit ratings and conduct business according to a set of business standards codified in the PPL EU Standards of Conduct and Integrity.

As a developer, PPL EU:

- Acquires right-of-way successfully (e.g.,75% of Northeast Pocono right-of-way acquired in 9 months
- Obtains siting permit approval with state regulators successfully

- Seeks mutually beneficial arrangements with landowners using a formalized siting and right-of-way process that coordinates the planning-permitting-engineering-construction functions
- Employs best-in-class lifecycle approach to transmission asset management (see Section B1)
- Delivers projects on-time and on-budget, e.g., Susquehanna-Roseland and Northeast Pocono (see Appendix A)

As an operator, PPL EU:

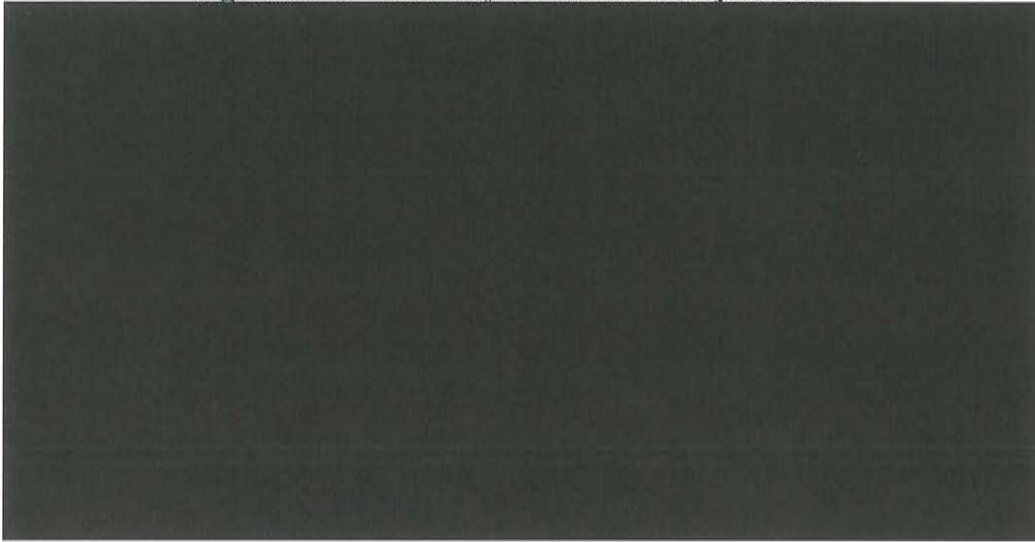
- Conducts business safely with incidence rates lower than industry averages
- Maintains facilities beyond industry standards (top quartile System Average Interruption Frequency Index (SAIFI), multiple awards and recognition for Hurricane Sandy response)
- Builds relationships in the communities in which it operates (\$6M raised for charity in 2013)

Further description of PPL EU's capabilities as a transmission developer and operator is presented in Section B.

A.3 Estimated Solution Cost

Addition of a 26-mile transmission line from Clinch River substation to Saltville substation to resolve the Generation Deliverability violations described in Section A2 is estimated at a total cost of \$82.5M (see Figure A.3-1 for more detail). This estimate is the result of a detailed design process that considered factors specific to this project, e.g., right-of-way, permits, terrain, existing infrastructure, and is informed by PPL EU's recent transmission development experience.

Figure A.3-1 - Summary of Estimated Project Costs



A.4 Solution Schedule and Milestones

The solution described within this document will be commissioned and energized by the end of 2018 (see Figure A.4-1 for a summary), exceeding PJM’s target date for Generation Deliverability violation resolution. PPL EU is prepared to begin the planning and coordination required to execute against this timetable following the award of the project. PPL EU integrated planning; permitting, engineering, constructability capabilities allow for efficient execution of the required activities recognizing that multiple stakeholders will be involved across the project lifecycle. The project will be led by the PPL EU Project Management Organization (PMP certified personnel) using repeatable design and streamlined construction processes along the schedule indicated in the table below.

Figure A.4-1 - Overall Project Schedule and Milestones

Solution: Clinch River – Saltville 138kV Project Overall Schedule	2015				2016				2017				2018				2019							
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
Permitting	[Gantt bar from Q1 2015 to Q3 2016]																							
Engineering and design		[Gantt bar from Q2 2015 to Q4 2016]																						
Long lead-time equipment			[Gantt bar from Q1 2016 to Q4 2017]																					
Site acquisition and/or right of way acquisition				[Gantt bar from Q2 2016 to Q4 2017]																				
Construction activities								[Gantt bar from Q1 2017 to Q4 2018]																
Outages									[Gantt bar from Q3 2017 to Q2 2018]															
Testing & Commissioning									[Gantt bar from Q3 2017 to Q4 2018]															

A.5 Statement of Designated Entity Consideration

PPL EU seeks, through the proposal herein, to be considered the Designated Entity to construct, own, and finance the proposed solution. PPL EU will coordinate with the incumbent utility to support all aspects of the solution, as needed, for those assets outside of PPL's footprint through a contracting arrangement.

A.6 Affirmation of Pre-Qualification Information

PPL's pre-qualification information on record with PJM and as posted on PJM's website, submitted on June 28, 2013 through the Office of the Interconnection prior to the opening of the Market Efficiency project proposal window, reflect the company's current qualifications to be eligible for Designated Entity status as defined in the PJM Amended and Restated Operating Agreement ("PJM OA") in Section 1.5.8(a) (PJM Designation 13-12).

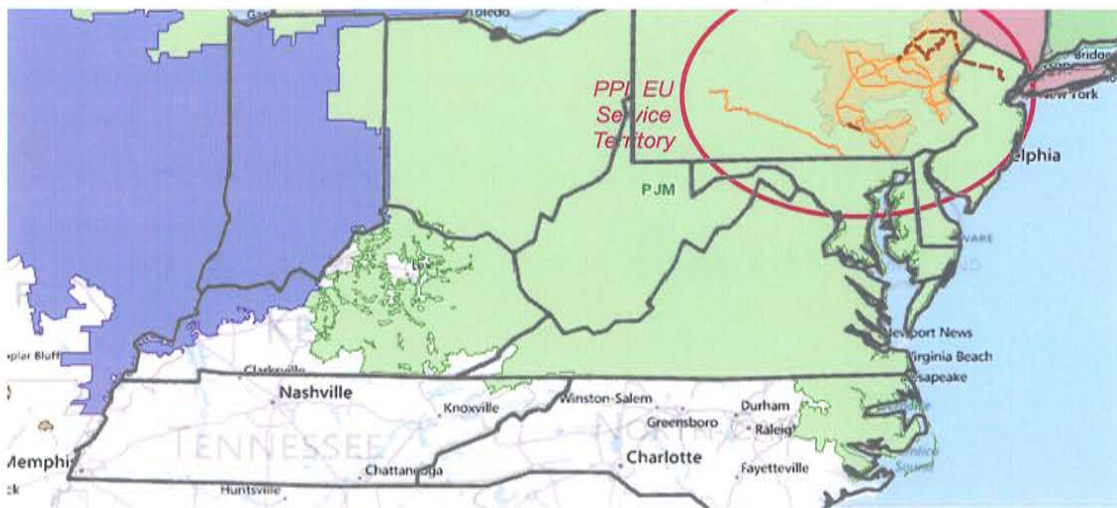
B Company Evaluation Information

B.1 Company Overview

PPL EU engages in the regulated transmission and distribution of electricity, providing high-quality, safe and reliable service to customers across central and eastern Pennsylvania. With the support of its parent company, PPL Corporation, PPL EU has access to the best practices and leading capabilities of one of the largest investor-owned companies in the U.S. utility sector.

PPL EU owns and operates a large transmission system within the PJM footprint, including 62 substations with a total capacity of 18.3 million kVA and approximately 4,000 transmission pole miles in service. Figure B.1-1 depicts PPL EU’s existing transmission service territory within the broader PJM footprint.

Figure B.1-1 - PPL EU Transmission Footprint in PJM

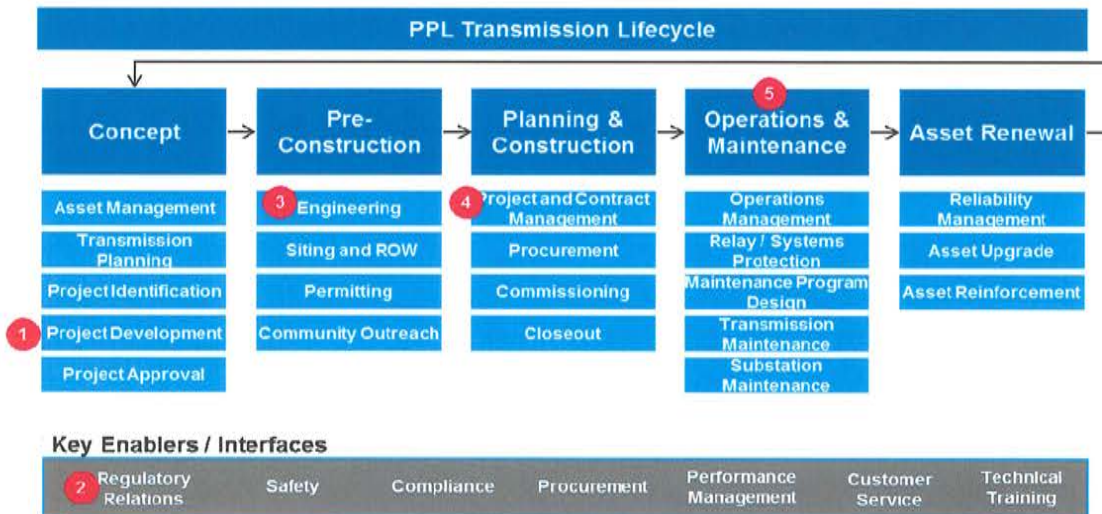


Management of this extensive transmission system and the project experience gained through constructing these assets, has enabled PPL EU to establish unique capabilities that are relevant to the proposed solution to the southeast Ohio 138kV transmission line violations. PPL EU not only brings a well-established strong relationship with PJM, strong financial backing, and extensive project experience, but also a scalable contractor model, engineering expertise, and a culture of operational excellence that is required for successful project execution and asset operation.

PPL EU has established an operating model designed to efficiently and effectively invest in, operate and maintain its transmission system. This model establishes clear roles, responsibilities, processes and procedures to ensure accountability, facilitate timely decision-making, and optimize overall execution. A senior management team with almost 200 years of collective experience is responsible for overseeing an integrated transmission and distribution system. A set of PPL EU-designed operating principles ensure safe and reliable execution of its transmission strategy by aligning and focusing the organization on critical areas for success. Both the management team and the supporting organization have the requisite capabilities to advance transmission as a strategic priority for PPL EU.

Figure B1-2 highlights capabilities particularly relevant for consideration of this proposed solution.

Figure B.1-2: PPL EU Differentiating Capabilities



i. Project Development

PPL EU has extensive experience identifying and executing transmission projects, ranging from simple upgrades to large scale greenfield development. More than \$600 million in transmission grid investment is planned in 2014 alone and \$4.7 billion in the transmission and distribution grids over the next five years. Completing these projects requires extensive technical expertise, effective project management capabilities, the ability to work with numerous stakeholders, and effective cost controls over the capital being deployed. The in-flight 500kV new transmission line build Susquehanna-Roseland and 230kV new transmission line build at Northeast Pocono, described in detail in Appendix A, demonstrate PPL EU’s ability to successfully execute the complexities of large projects concurrently.

ii. *Regulatory Relations*

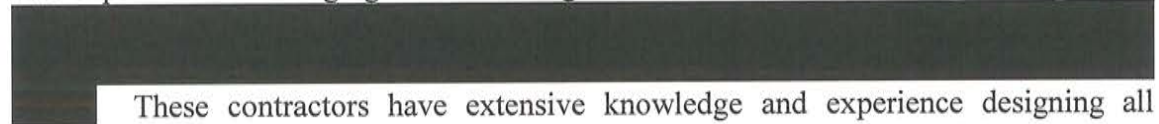
Strong relationships with federal, state and local government and regulatory agencies have facilitated successful development and operation of transmission projects. Throughout PPL EU's nearly 100-year history, PPL EU has worked with agencies, communities and customers to site, permit, and license transmission projects within our transmission service territory. For example, National Park Service and Federal Aviation Administration were key stakeholder relationships that were developed to address routing and permitting requirements for the Susquehanna–Roseland project. Additionally, PPL EU has an outstanding success rate with obtaining siting application approvals through Pennsylvania's Public Utility Commission (PUC).

iii. *Engineering*

With the increase in infrastructure investments, the Engineering department has gained a broad mix of recent design experience including both new capacity additions and upgrades, as well as varied electrical system specifications, weather and geographic topography conditions. PPL EU has designed over 1,000 miles in support of new line builds, existing transmission rebuilds, reconductoring and fiber optic cable additions.

Transmission Engineering utilizes current industry standards and adopts new technologies to improve process efficiency and effectiveness. Updated standards incorporate specifications such as 2-shield wires and high reliability performance lines. New state-of-the-art technology such as a Power Line Computer Aided tool called PLS – CADD acts as a centralized tool for designing and drafting. PPL EU is also a member of key industry forums such as the Electrical Power Research Institute (EPRI) and the EHV Engineering Committee, which build capabilities through collaboration with other members.

PPL's Engineering group not only leverages extensive experience in-house, but also has vast experience in managing contracted engineered services with 12+ engineering firms:



These contractors have extensive knowledge and experience designing all transmission line voltage classes both within PJM as well as outside the PJM territory.

iv. *Project and Contract Management*

The PPL EU Project Management team ensures that project activities are completed to scope, schedule and budget in order to achieve the business objectives and requirements of the company. The team is part of a dedicated organization using best-in-class process and with employees who maintain the Project Management Professional (PMP) certification. The Project Management team remains connected to projects throughout the entire development lifecycle, beginning with a specific Project Manager assigned to a

project in the early stages of Project Planning and Design. The Project Management team has experience managing projects across all service territories and across all types and sizes of projects. Depending on the size and scope of a particular project, Project Managers are responsible for managing and overseeing anywhere from one to fifteen projects at the same time. For the largest and most complex projects PPL EU will assign the most experienced Project Managers to ensure that the project is handled in the most efficient and effective method possible.

The ability to execute projects both large and small is built on a scalable contractor model across the transmission asset lifecycle, while maintaining stringent standards relating to safety, quality, and delivery. PPL EU has established a preferred set of contractors, Contractors of Choice (COC), through an extensive, formal request-for-proposal (RFP) process. The Contract Management team has established relationships with contractors nationwide, which creates a strong ability to effectively source the best contractor(s) for each piece of work required by PPL EU. This contracting process delivers a best practice contracting approach that complies with the National Contract Management Association standards and processes.

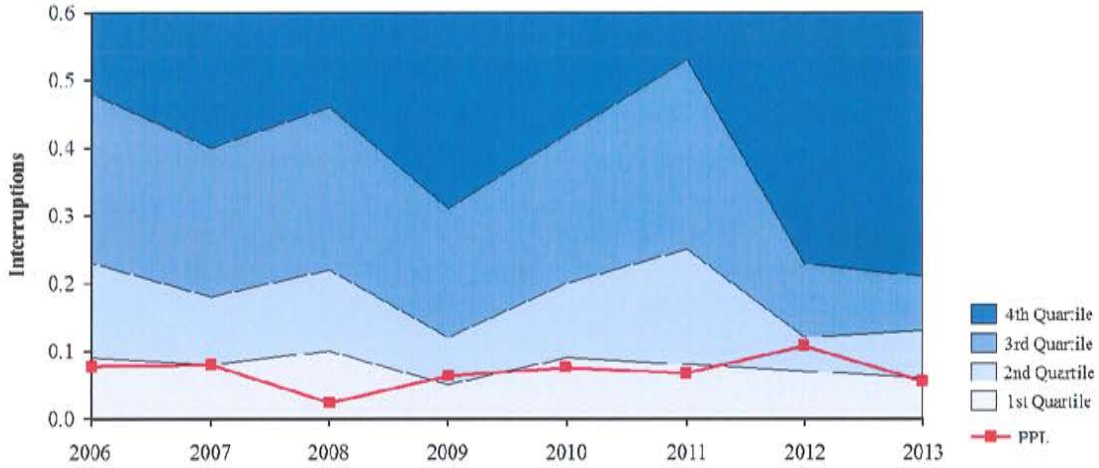
v. *Operations & Maintenance*

PPL EU has a strong history of execution excellence, as demonstrated by our exemplary track record of compliance, safety, reliability, and cost containment. Compliance with North American Electric Reliability Corporation (NERC) standards has always been, and continues to be, a high priority and PPL EU has routinely been recognized by ReliabilityFirst (RF) as a benchmark for compliance. In 2012, RF audited PPL EU on behalf of NERC for both Reliability Standards associated with Operations and Critical Infrastructure Protection (CIP) Reliability Standards, the company received high marks for both. PPL EU adopts standards and processes in advance of compliance requirements and offers regular training programs. Safety is a PPL EU core value embedded throughout PPL EU. The Safety program strives to minimize Occupational Safety and Health Administration (OSHA) designated Recordable Events and results are consistently better than industry peers.

Commitment to system performance through effective, preventive and real-time operations and maintenance programs is evidenced in the reliability performance metrics for PPL EU's system. As shown in Figure B1.5-1, Transmission System Average Interruption Frequency Index ("T-SAIFI") performance has been at or near top-quartile performance for the past six years, averaging less than 0.1 interruptions over the period from 2006 through 2013 (excluding major events).

Figure B.1.5-1: PPL EU T-SAIFI Historical Trend (In Interruptions)

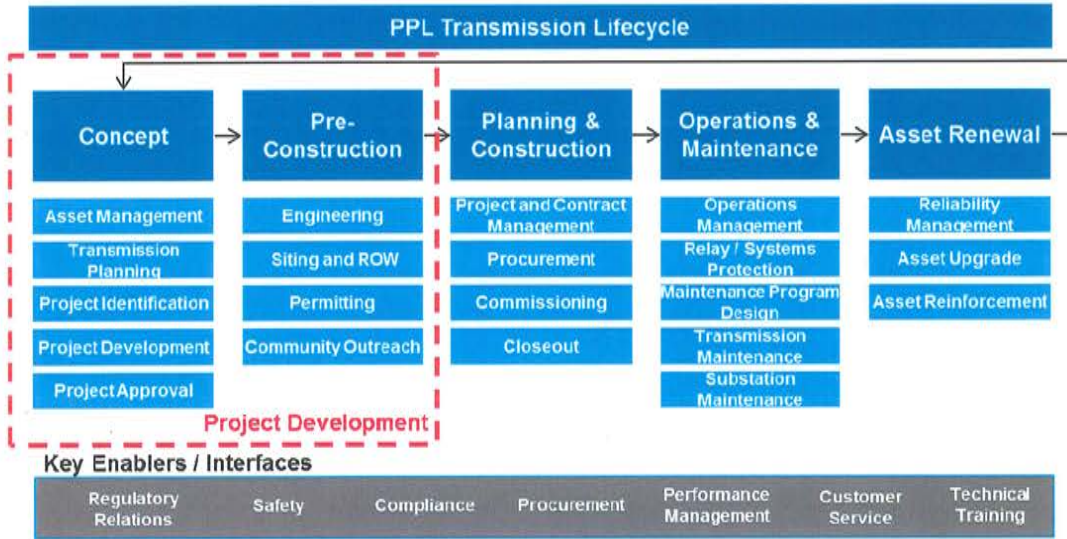
**EEI Benchmarking Survey Transmission SAIFI Performance by Year
(Excluding Major Events)**



B.2 Technical and Engineering Qualifications and Experience

PPL EU has nearly 100 years of experience in transmission development and construction, building everything from core 69kV connection projects to 500kV lines. With refined processes to manage the complexities inherent in all types of transmission projects, PPL EU organizes and operates with project execution in mind. Project control is maintained through strong governance, clear project review processes, and tools for stringent project estimating and control. The early phases are grounded in the principles of constructability, cross-functional collaboration and front-loaded engineering and design to avoid or minimize future scope, schedule or cost changes. For example, during the Concept phase the operations and maintenance teams provide input into new project development on optimal design and construction in terms of ease and cost to maintain the assets. PPL EU uses a blended approach of in-house teams and approved contractor resources to allow for high quality project execution at the lowest overall cost. Regardless of internal or external resources, all projects are delivered through the structured project development model shown in Figure B2-1.

Figure B.2-1: PPL EU Transmission Lifecycle



Proven success in large capital projects such as the recent Susquehanna–Roseland project illustrates PPL EU’s effectiveness in executing its end-to-end transmission operating model. Certain elements of this operating model are highlighted below.

Widespread Contractor Support

With recent project experience at Susquehanna–Roseland and Northeast Pocono projects, PPL EU has built strong relationships with many large firms that have nation-wide capabilities. These relationships will allow access to talent with familiarity with the rules and regulations in PJM through the development and construction phase. In the event that the current vendor base cannot adequately support the project needs, the Sourcing organization has developed an extensive RFP process that comprehensively vets potential contractors for safety, performance, quality, Days Away, Restricted, or Transfer (DART) rates, and safety incidents.

Secure and Cost Effective Supply

Due to the significant volume of projects executed over the last several years, PPL EU receives preferred customer prices that are equal to or better than its peers, and has secured supply when others in the industry are unable to find needed resources and / or materials. For example, materials management for Susquehanna–Roseland was outsourced to HD Supply, a model that would likely be replicated for the proposed project. HD Supply’s widespread footprint positions this partner to effectively manage equipment purchasing, product tracking, and securing lay-down yard, in the territory.

Siting, Permitting and Right-of-Way

The Siting, Permitting and Right-of-Way departments have built a strong set of capabilities to support the proposed solution. The siting process includes the determination of a Project Study Area, identification of Alternative Corridors, identification of Alternative Routes within these Corridors, and Selection of the Preferred Route. Through early stakeholder engagement and public outreach, PPL EU has been successful at avoiding constraints and leveraging opportunities to minimize impact to the public and environment, while maintaining reasonable costs and preserving engineering and construction feasibility. PPL EU has an excellent success rate for securing approval for siting applications from PA PUC.

The Right-of-Way team is heavily integrated with the Siting team, which facilitates more effective community outreach and greater consensus on route development. In the past six years, PPL EU has successfully acquired over 140 right-of-way miles. PPL EU prides itself on taking a “property owner perspective” when acquiring right-of-way and accommodates landowner requests when practical. Acquiring right-of-way is a complex process necessitating the coordination of many stakeholders. PPL EU Permitting has a track record of successfully obtaining the necessary local, state and federal government permits and licenses for proposed transmission projects. Figure B2-2 is a sample listing of projects and the corresponding permits and/or licenses that have recently been acquired to construct transmission projects:

Figure B.2-2: Example of Recent Permits / Licenses Acquired

Project Name	Permit / License Acquired
Susquehanna – Roseland	License for Right-of-Way – Delaware Forest
Susquehanna – Roseland	Letter of Authorization – Lackawanna Forest
Susquehanna – Roseland	License for Right-of-Way – Game Lands 183 & 300
Susquehanna – Roseland	Special Use Permit – PA Game Commission
Susquehanna – Roseland	PennDOT Permits (Min. Use, HOP, LAP)
Susquehanna – Roseland	DEP – Submerged Land License Agreement
Susquehanna – Roseland	PA Turnpike Commission Access & Restoration
NE Pocono Reliability	Special Use Permits – PA Game Commission
NE Pocono Reliability	NPDES Permit – Peckville-Varden Transmission Line
NE Pocono Reliability	NPDES Permit – Paupack Substation
NE Pocono Reliability	NPDES Permit – Paupack Taps, Transmission Line
NE Pocono Reliability	NPDES Permit – Paupack-Honesdale Transmission Line
NE Pocono Reliability	NPDES Permit – Pocono Substation
NE Pocono Reliability	NPDES Permit – Pocono to Paupack Transmission Line

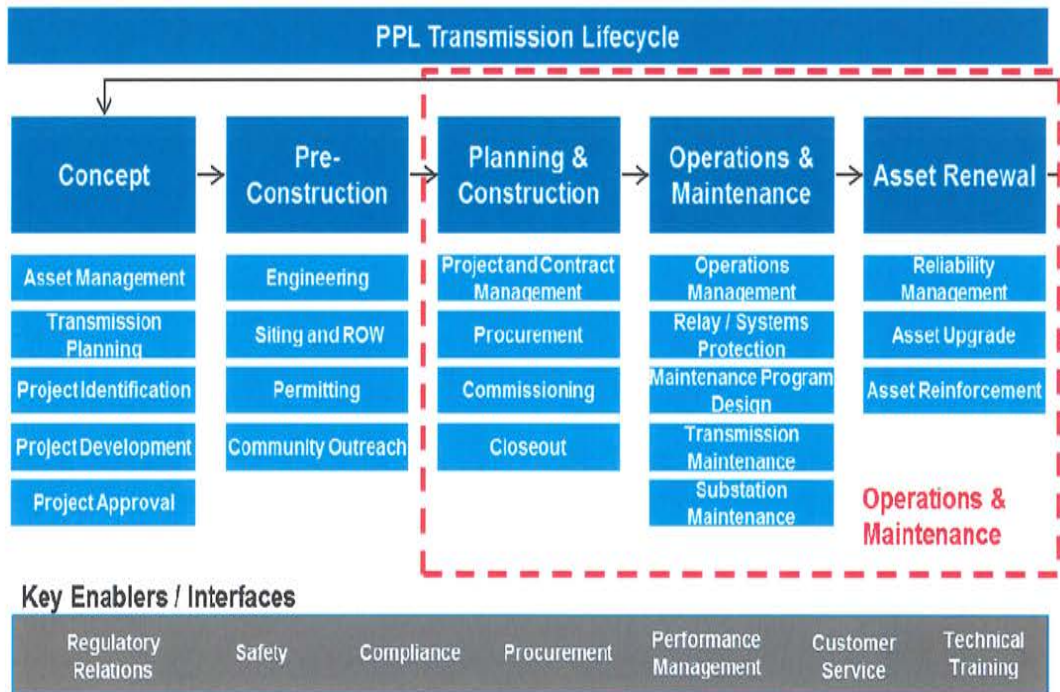
Project Name	Permit / License Acquired
NE Pocono Reliability	Two (2) Joint Permits (one per county) - Pocono to Paupack Transmission Line
NE Pocono Reliability	Joint Permits – Peckville-Varden Transmission Line
NE Pocono Reliability	Joint Permits – Paupack-Honesdale Transmission Line
NE Pocono Reliability	I-84 Clearing Permits
NE Pocono Reliability	PennDOT Permits
Blooming Grove – Hemlock	Road Use Agreement – Delaware Forest
Blooming Grove – Hemlock	License for Right-of-Way – Delaware Forest
Blooming Grove – Hemlock	DEP – GP8 Permit
Susquehanna – Harwood Reconductor	DEP – GP8 and GP11 Permit
Blooming Grove – Jackson	DEP – GP8 and GP11 Permit
Sunbury – Dauphin	NPS – Special Use Permit Appalachian Trail

During the development of the Susquehanna-Roseland project, PPL EU developed a strong capability across its Governmental and External Affairs group. In a challenging environment, PPL EU successfully established a process to allow groups to conduct reviews and on-site examinations to promote transparency and cooperation. With the potential for the proposed project to impact environmentally sensitive areas as further detailed in Section C, PPL EU will leverage this capability to coordinate with the appropriate government agencies. PPL EU understands the importance of engaging stakeholders and developing relationships and would engage local consultants as needed to augment PPL EU's existing network of relationships with federal, state, and local stakeholders.

B.3 Operations & Maintenance Qualifications and Experience

PPL EU is committed to achieving leading operations reliability and system performance for its transmission system. Figure B3-1 depicts the functions that support the operations and maintenance portion of the transmission asset lifecycle.

Figure B.3-1: PPL EU Transmission Lifecycle



PPL EU, as the owner of the conductor assets will provide all required maintenance at PPL’s standards. PPL EU’s stringent prioritized maintenance programs are developed based on established reliability standards, asset management driven-programs, and overall equipment criticality. While all transmission operators face tradeoffs related to optimizing capital, O&M, reliability and overall value, PPL EU has developed a proactive asset renewal program that carefully weighs the most prudent and cost-effective methods to ensure system performance at a sustainable cost. This focus on reducing the number of degraded elements, as well as reducing system vulnerabilities, identifies the most critical infrastructure and prioritizes the most important renewal work. A programmatic approach to preventive maintenance facilitates improvements to field productivity by reducing emergent work initiated by equipment failures, allowing workers to focus on scheduled work. PPL EU’s maintenance model and vegetation management program are well suited to efficiently and effectively maintain the proposed solution.

Maintenance Model

A flexible maintenance model allows PPL EU to provide maintenance support free of geographic constraints. Currently, PPL EU retains asset management responsibilities centrally while using a mix of in-sourcing and outsourcing for in-field maintenance work. The team relies on electronic communications from inspectors, including detailed inventory and images of each structure, which allows PPL EU to easily scale the operation to any geographic area. This model is utilized across the

PPL EU service territory where pictures are taken to manage the maintenance requirements remotely. Trips to the field are the exception and usually do not extend beyond a detailed walk down of the line at the end of construction. PPL EU is confident that its successful experience managing maintenance contractors will allow it to capably manage the maintenance requirements of the proposed project.

Operations Model

PPL EU facilities will be operated at the direction of PJM and controlled and maintained consistent with the current PPL EU operations and maintenance practices.

To operate and maintain the transmission grid reliably, PPL EU manages a Transmission Control Center (TCC) that adheres to the guiding principles of safety, reliability and production in that order.

In addition to real time operations, PPL EU develops a construction and maintenance outage plan. TCC Planning processes requests to upgrade transmission facilities and translates those to equipment outages using the PJM outage criteria time lines. The TCC plans all outage requests, limits risks to the electric system and PPL EU customer base, and responds to any unplanned events. Transmission outage planning, including risk and conflict analysis, is crucial to promoting safety, preserving the reliability of the bulk and non-bulk transmission system, and eliminating volatility in the work portfolio.

Vegetation Management

PPL EU Vegetation Management leverages “open book,” long-term, managed business relationships with two of the largest vegetation management contractors in North America ([REDACTED]). Over the last three years, 100% of the vegetation management plan has successfully been completed for 138kV, 230kV and 500kV lines. PPL EU has had zero tree-related events on 230kV or 500kV transmissions facilities during that timeframe. PPL EU will be able to utilize its contractor base to maintain the same high standards for the proposed solution.

B.4 Emergency Response and Restoration

PPL EU has an industry leading emergency preparedness and response program, led by a dedicated Emergency Preparedness group which develops and maintains comprehensive emergency response plans and supports the effective execution of these plans. PPL EU’s recent experience in major storms, particularly Hurricane Sandy, Hurricane Isaac, a major snow in October of 2012, and extremely high winds in May 2012 have improved our emergency response processes. We have demonstrated the ability to quickly restore our own assets under various scenarios. PPL EU’s award recognition in emergency response can be found in Figure B.4-1.

Figure B.4-1: Summary of Major Award Recognition

PPL's Award Recognition
2013 Electric Light and Power Magazine's Utility of the Year Award. Also, won in 2008.
2013 North East PA Manufactures and Employers Association Process Improvement Award for improvements related to storm response processes
J.D. Powers and Associates conducted a national survey of consumers to rate performance of utilities and local, state and federal government actions prior to and following Hurricane Sandy. In February, 2013 J.D. Power recognized PPL as one of only three utilities that performed "Particularly well"
2012 EEI Emergency Recovery Award for Hurricane Sandy
2012 EEI Emergency Assistance Award, for tremendous support in the recovery from Hurricanes Isaac and Sandy

As owners of the proposed Clinch River-Saltville 138kV line addition, PPL EU will maintain responsibility for executing the emergency response plan. PPL EU is confident that it can successfully execute the response plan as the facilities are proximate to its wide resource network of local contractors, crews, and additional resources gained.

PPL EU is a member of two regional mutual assistance groups, the North Atlantic Mutual Assistance Group (NAMAG) and the Southeastern Electric Exchange (S.E.E.). PPL EU also has access to additional resources through the Contractors of Choice working on PPL EU's transmission and distribution systems and Louisville Gas & Electric and Kentucky Utilities.

Overall, PPL EU has developed a unique network of third party support that will allow it to successfully execute against the emergency response plan. Further detail into PPL's emergency preparedness organization and processes can be found in the pre-qualification document for Designated Entity status.

B.5 Cost / Schedule Adherence

PPL EU has implemented processes, governance, and project management tools to ensure projects are delivered on-time and on-budget.

The Project Controls Department is responsible for monitoring project progress to compare actual versus baseline resource usage and analyze project variances utilizing statistical techniques such as Earned Value Metrics and Reporting to identify trends, develop forecasts, and expose potential problems. The Project Controls Department also implements process controls, monitors and audits projects to control project risks, ensures adherence to Generally Accepted Accounting Principles (GAAP), and compliance to

Federal Energy Regulatory Commission (FERC) and Sarbanes Oxley Act (SOX) regulations.

B.6 Proposed Project Financing

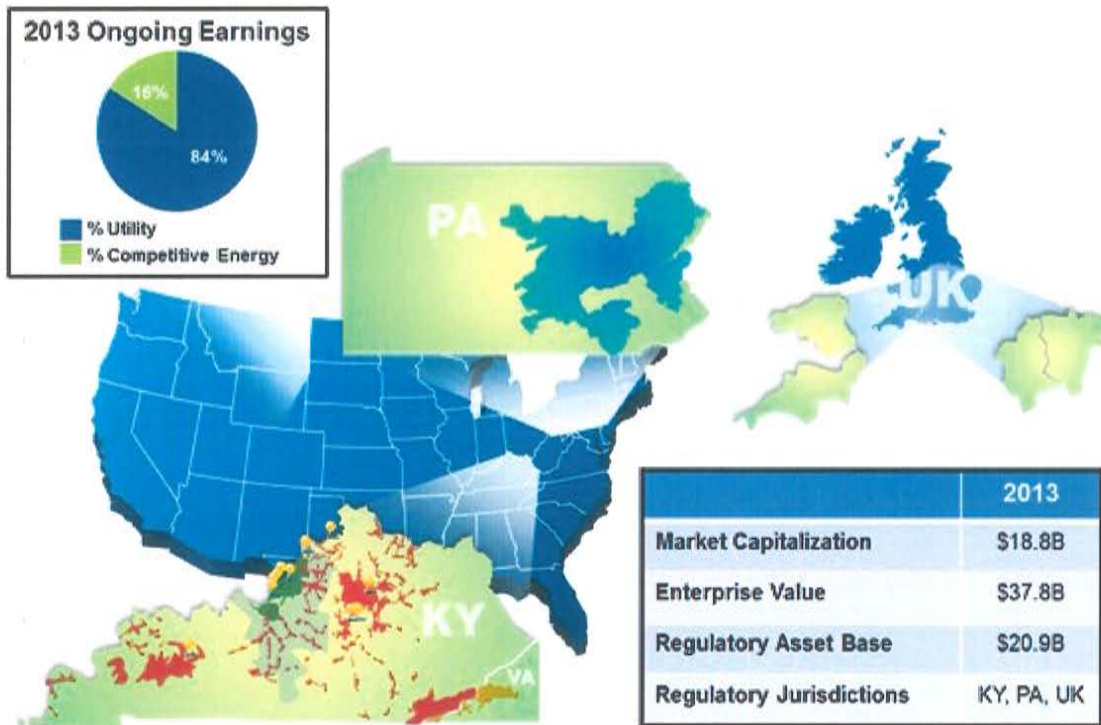
PPL and PPL EU propose to finance the project across its capital structure using approximately 50% debt and equity, including cash from operations. We expect to utilize the commercial bank lending and debt capital markets, using a variety of short-term and long-term securities.

Financial Strength

PPL is one of the largest public utility owners in the US with over \$1.5 billion in ongoing earnings and \$2.9 billion of cash from operations in 2013. The majority of PPL's ongoing earnings and cash flows stemmed from stable, regulated utility operations in the US and UK with over \$20 billion in regulated asset base. This diverse base of regulated cash flows supports PPL's strong balance sheet and enables it to maintain a credit profile that supports consistent access to the equity and debt capital markets and bank markets for additional financing needs at cost effective rates.

PPL EU had over \$500 million of cash flow generated from operations during 2013, and \$300 million of available liquidity, primarily through its commercial paper program and/or bank syndicated credit facilities. PPL EU also has consistent access to the commercial bank lending markets and debt capital markets. Through its parent, PPL, PPL EU has access to appropriate amounts of equity to provide efficient financing resulting in the lowest cost of capital for the ratepayers.

Figure B6-1: PPL Financial Summary



Credit Metrics:

PPL Corporation and PPL EU have a strong financial foundation that enables the development, operation and maintenance of transmission facilities. To manage financing costs and access to credit markets, a key objective of PPL’s strategy is to maintain a strong investment grade credit profile and strong liquidity position. Additionally, PPL has put in place financial and operational risk management programs that, among other things, are designed to monitor and manage its exposure to earnings and cash flow volatility related to changes in energy and fuel prices, interest rates, counterparty credit quality and the operating performance of its generating units.

PPL EU is focused on timely recovery of costs, efficient operations, strong customer service and constructive regulatory relationships. PPL EU has a low-risk, fully regulated business profile with significant borrowing capacity and stable cash flows. Both PPL and PPL EU maintain investment grade credit ratings from the major credit rating agencies. PPL EU’s financing plan would be executed in a manner that does not negatively impact its current credit ratings.

Figure B6-2: Credit Ratings

Issuer	Rating	Moody's	S&P
PPL Corporation	LT Issuer Rating	Baa3	BBB
PPL Electric Utilities Corporation	Senior Secured Debt	A2	A-
PPL Electric Utilities Corporation	Commercial Paper	P-2	A-2

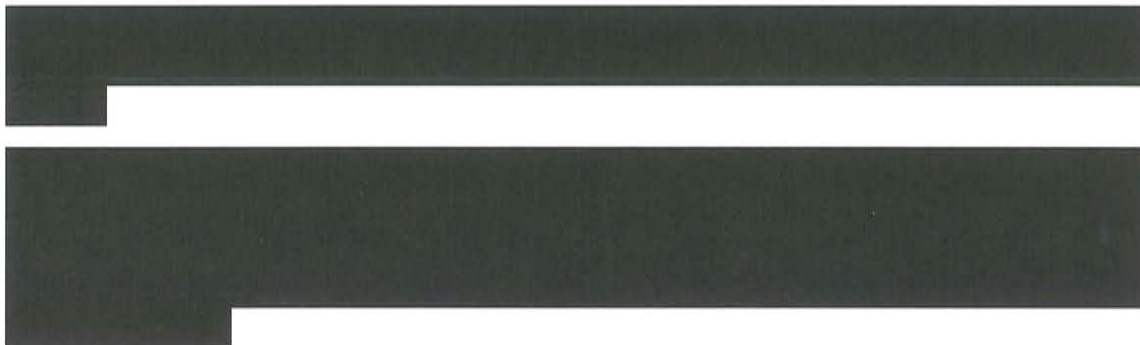
Because of our strong investment grade credit ratings and ability to finance using a wide variety of funding sources, PPL and PPL EU expect the cost of financing to be extremely competitive.

C Proposed Project Constructability Information

C.1 Proposed Solution Scope

C.1.1 Project Summary: Clinch River– Saltville 138kV Transmission Line Addition

PPL EU proposes to construct a new 26-mile single-circuit 138kV line from Clinch River to Saltville in western Virginia.



PPL will be responsible for planning, siting, design, right-of-way acquisition, permitting, construction, operation, and maintenance of the transmission line with the incumbent utility owning and operating equipment in their existing substation facilities. PPL EU will work with the incumbent TO and establish an O&M Agreement defining the operational control of the line.

Figure C.1-1 - Proposed 138kV Transmission Line

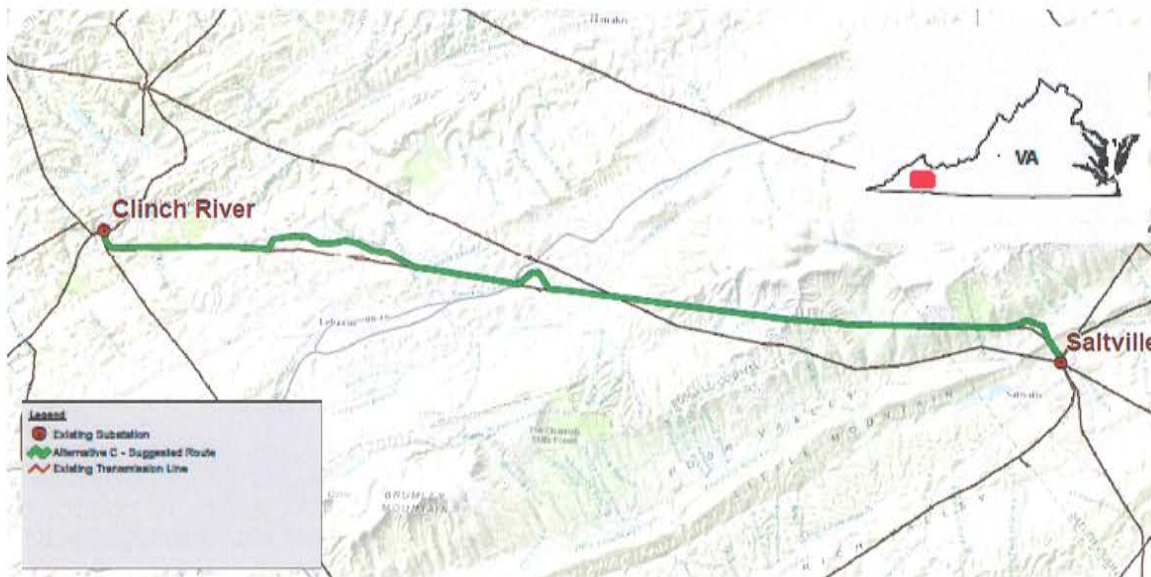
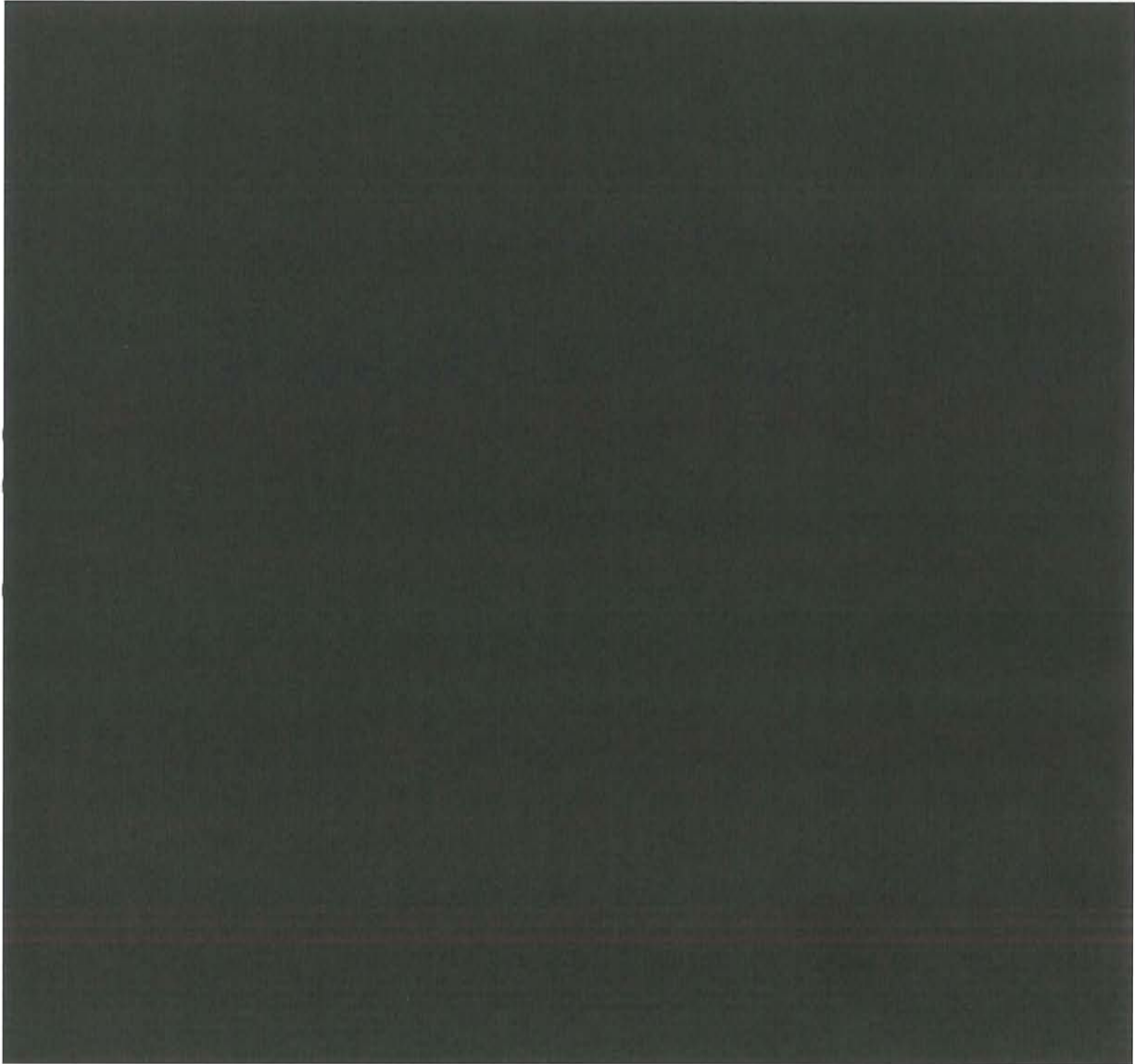


Figure C.1.1-2 below provides an overall one-line diagram that illustrates the system topology for the proposed solution.

Figure C.1.1-2 - Solution One-Line Diagram



C.1.2 Area Description and Reliability Concerns Being Addressed:

The western Virginia transmission area consists of primarily 765kV, 345kV, and 138kV networked transmission lines. There is significant generation at and around Clinch River and the 138kV lines that emanate from Clinch River Substation do not have enough capacity to export

the generation in the local area under certain Generation Deliverability flow patterns. In its RTEP study results analyses, PJM identified that the 138kV system overloads in the Clinch River area for 26 outage events including single line out, breaker failure, and tower outage events. In addition 3 base system Generation Deliverability scenarios resulted in thermal overloads in the Clinch River area without a contingency. The greatest overload was approximately 117% of the applicable emergency rating.

Addition of this upgrade solution mitigates all 29 western VA reliability violations described above, by providing another 138kV path out of Clinch River so that 138kV lines in the area are less taxed when exporting Clinch River area generation. The 138kV system loading on the lines that overloaded pre-project is reduced to between [redacted] of applicable emergency ratings for all critical contingencies.

**Figure C.1.2-1 - Thermal Reliability Violations Resolved by Upgrade
(Loading in % of Applicable MVA Rating)**

FG	Fr B	Name	To B	Name	CK	KV	Area	Ratin	PJM Study (%)		PPL Study (%)		Cont Label	Cont Typ
									No Upgrade	Upgrade	No Upgrade	Upgrade		
105	246766	05ELKGAZ	242768	05SALT1	1	138/138	205/205	32.1	112.00	112.00	73.7	5296_B2_TOR97B_MOAB	single	
106	246766	05ELKGAZ	242768	05SALT1	1	138/138	205/205	32.1	112.2	112.2	73.2	5294_B2_TOR97_WOMDAB	single	
108	246766	05ELKGAZ	242768	05SALT1	1	138/138	205/205	32.1	110.25	100.0	66.9	3375_B3	single	
110	246766	05ELKGAZ	242768	05SALT1	1	138/138	205/205	32.1	103.71	103.1	71.4	5295_B2_TOR97A_MOAB	single	
192	242605	05CLNCHR	242606	05CLNLF0	1	138/138	205/205	22.3	100.00	100.0	98.0	Base Case	single	
209	242605	05CLNCHR	242700	05LEBAN0	1	138/138	205/205	26.6	100.05	100.5	73.0		single	
211	242605	05CLNCHR	242700	05LEBAN0	1	138/138	205/205	26.4	101.21	100.4	67.7	5296_B2_TOR97B_MOAB	single	
212	242605	05CLNCHR	242700	05LEBAN0	1	138/138	205/205	26.4	100.73	-	67.3	5294_B2_TOR97_WOMDAB	single	
219	242606	05CLNLF0	242639	05FLETCH	1	138/138	205/205	22.3	100.61	100.6	65.5	6174_B2_TOR95A_MOAB	single	
220	242606	05CLNLF0	242639	05FLETCH	1	138/138	205/205	22.3	100.48	100.3	65.5	6173_B2_TOR95_WOMDAB	single	
221	242606	05CLNLF0	242639	05FLETCH	1	138/138	205/205	22.3	100.83	102.7	65.1	6175_B2_TOR95B_MOAB	single	
222	242606	05CLNLF0	242639	05FLETCH	1	138/138	205/205	22.3	100.81	100.9	64.5	6176_B2_TOR95C_MOAB	single	
273	242639	05FLETCH	242802	05XEG08	1	138/138	205/205	22.3	104.81	100.2	83.3	6174_B2_TOR95A_MOAB	single	
274	242639	05FLETCH	242802	05XEG08	1	138/138	205/205	22.3	104.26	100.3	83.3	6173_B2_TOR95_WOMDAB	single	
275	242639	05FLETCH	242802	05XEG08	1	138/138	205/205	22.3	103.63	100.4	82.9	6175_B2_TOR95B_MOAB	single	
276	242639	05FLETCH	242802	05XEG08	1	138/138	205/205	22.3	102.91	104.6	82.3	6176_B2_TOR95C_MOAB	single	
301	242700	05LEBAN0	246766	05ELKGAZ	1	138/138	205/205	29.6	100.27	102.3	63.6	Base Case	single	
350	242923	05GAV14	242516	05MOUNFN	1	765/765	205/205	12.7	100.30	-	59.9	707_B2_TOR83315	single	
773	246766	05ELKGAZ	242768	05SALT1	1	138/138	205/205	32.1	118.50	117.3	77.3	3345	tower	
774	246766	05ELKGAZ	242768	05SALT1	1	138/138	205/205	32.1	119.4	117.0	76.5	3634	tower	
775	246766	05ELKGAZ	242768	05SALT1	1	138/138	205/205	32.1	111.25	110.3	73.0	3644	tower	
794	242605	05CLNCHR	242606	05CLNLF0	1	138/138	205/205	31.0	111.0	110.3	97.6	3634	tower	
795	242605	05CLNCHR	242606	05CLNLF0	1	138/138	205/205	31.0	107.04	107.0	95.6	3345	tower	
822	242605	05CLNCHR	242700	05LEBAN0	1	138/138	205/205	26.4	105.13	104.6	70.7	3345	tower	
823	242605	05CLNCHR	242700	05LEBAN0	1	138/138	205/205	26.4	104.34	103.9	69.9	3634	tower	
831	242700	05LEBAN0	246766	05ELKGAZ	1	138/138	205/205	26.4	102.62	102.0	68.0	3345	tower	
832	242700	05LEBAN0	246766	05ELKGAZ	1	138/138	205/205	26.4	101.92	101.2	67.3	3634	tower	
988	246766	05ELKGAZ	242768	05SALT1	1	138/138	205/205	32.1	105.0	114.7	75.0	5228_C2	Breaker	
1005	242605	05CLNCHR	242700	05LEBAN0	1	138/138	205/205	26.4	102.02	102.0	63.4	5228_C2	Breaker	
1132	242700	05LEBAN0	246766	05ELKGAZ	1	138/138	205/205	26.4	100.2	-	66.8	5228_C2	Breaker	

C.1.3 Transmission Line Component(s)

Detailed description:

The new Clinch River to Saltville 138kV line will consist of single circuit self-supporting steel monopoles with conductors arranged in a “delta” configuration. The line will carry one (1) circuit of 556 kcmil 24/7 ACSR conductor (one conductor per phase) with two OPGW shield wires. This new line will have a 193 MVA normal rating and a 252 MVA emergency rating.



[REDACTED]

[REDACTED]

Preliminary list of materials and Structure Type Drawings

The transmission line major materials will include the following:

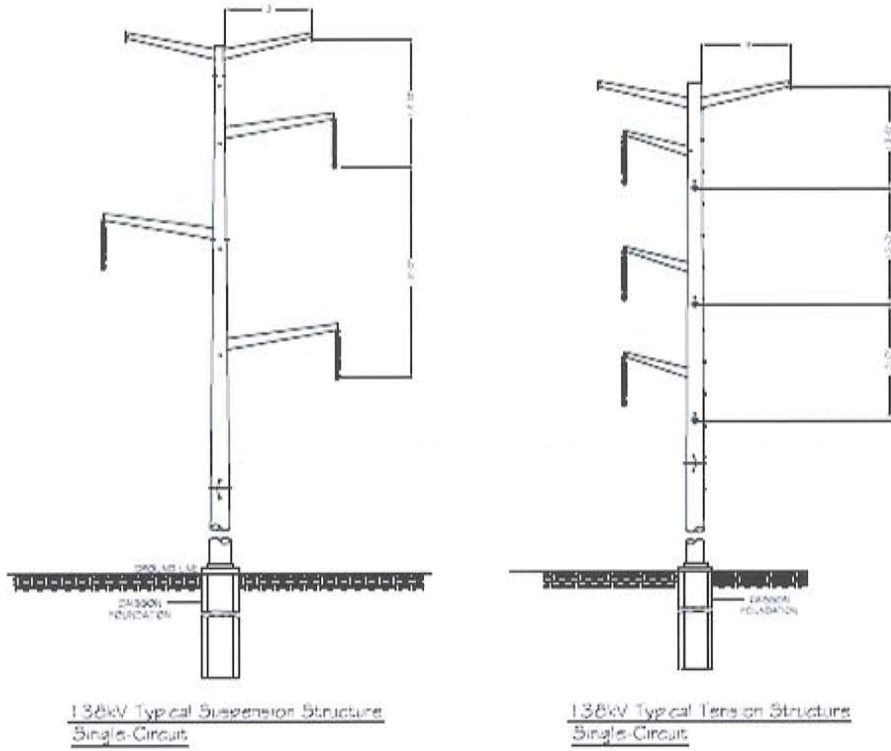
[REDACTED]

[REDACTED]

[REDACTED]

Figure C.1.3-1 below provides a typical 138kV transmission line structure design to illustrate future design of the line:

Figure C.1.3-1 - Typical 138kV Structure Types



C.1.4 Substation Component(s)

No substation expansions or modifications will be constructed by PPL EU

C.1.5 Transmission Facilities to be constructed by Others

Transmission line relocation

No transmission line relocations will be constructed by others.

Clinch River Substation Upgrade

Detailed description

[Redacted]

Substation Major Equipment:

[Redacted]

Relay and Controls Equipment

[Redacted]

Relay Protection Communication Plan

[Redacted]

Transmission Line Protection:

[Redacted]

Substation General Arrangement

[Redacted]

Saltville Substation Upgrade

Detailed description

[Redacted]

Substation Major Equipment:

[Redacted]

Relay Protection Communication Plan

[Redacted]

Substation General Arrangement

[Redacted]

C.2 Environmental, Permitting and Land Acquisition

C.2.1 Siting, Right-of-Way, and Permitting Overview

As described in section B, the Siting, Right-of-Way, and Permitting group has built a strong set of capabilities to support the proposed project. The Siting and Right-of-Way department has established relationships with 5 external Right-of-Way contractors and 4 siting contractors to support the right-of-way and siting processes. The PPL EU Permitting department has a track record of successfully obtaining the necessary local, state and federal government permits and licenses for proposed transmission projects. PPL EU understands the importance of engaging stakeholders and developing relationships and will engage local consultants as needed to augment the company's existing network of relationships with federal, state, and local stakeholders.

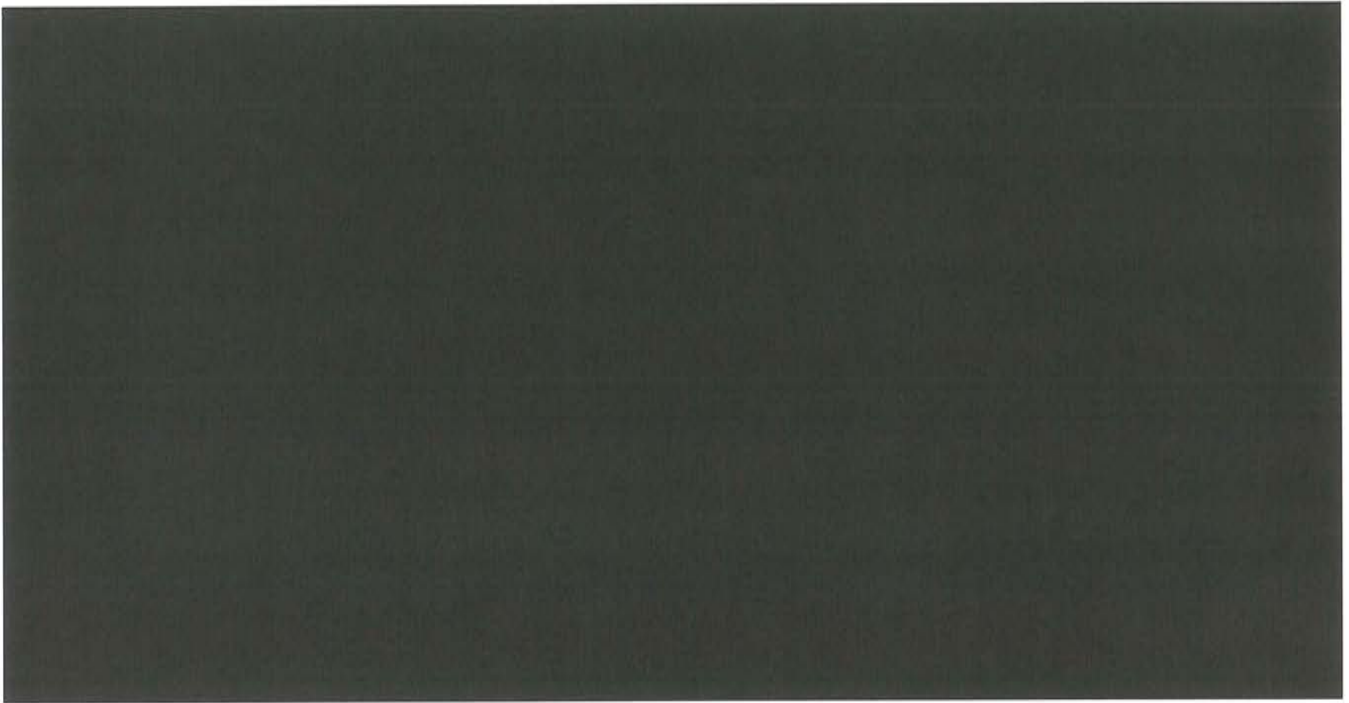
C.2.2 Route Alternative Assessment

When siting high-voltage transmission lines, a balance is struck between multiple objectives, e.g., low environmental impact, high constructability, low cost. The preliminary review conducted evaluated the major opportunities and constraints within the regions between and surrounding the Clinch River and Saltville substations. The project configuration review allowed for the development of general assumptions and permitting requirements to complete a full alternatives report for new 138kV lines connecting these substations [REDACTED]

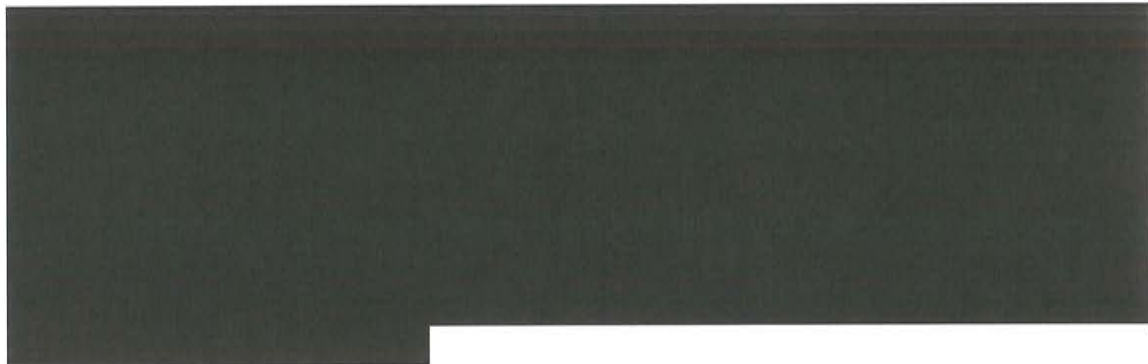
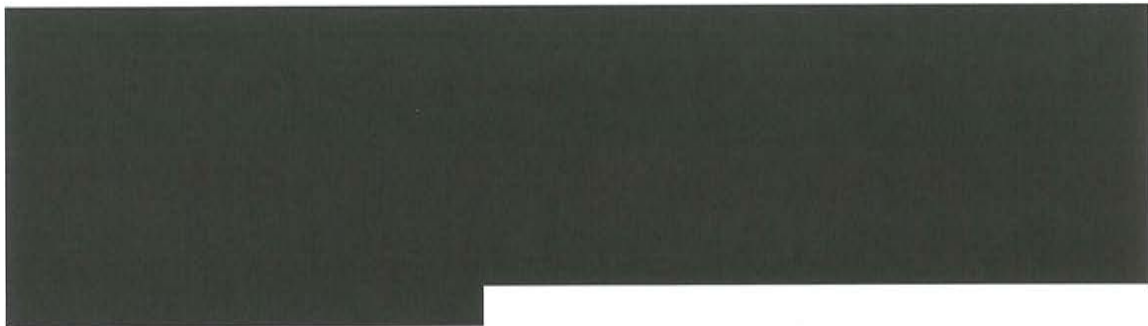
[REDACTED]

[REDACTED]

Figure C.2-1 - Alternative Routes considered between Clinch River to Saltville



C.2.3 Environmental Impact Review Methodology and Preliminary Results





C.2.4 Right of Way & Land Acquisition Plan & Approach (public & private)

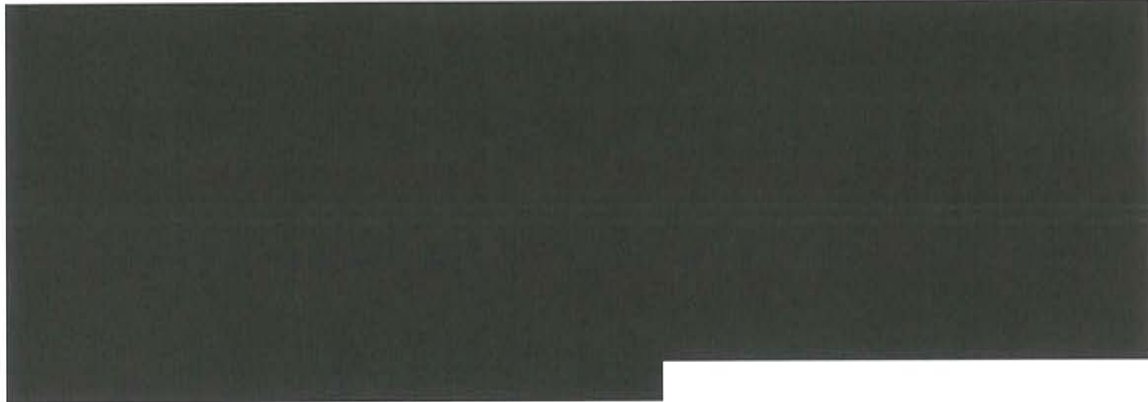
As part of securing the required right of way to accommodate the new line, PPL EU will work with the affected private landowners to acquire permanent irrevocable easements. As further detailed in this section, the project will also be crossing some state land. In this case, PPL EU will work with the affected state agency to obtain licenses to locate required facilities within its land.

PPL EU plans to expand substations within the fence area of the existing substation and therefore the boundary of the current property line, and does not anticipate the need to acquire any additional land.

C.2.5 Permitting Plan and Approach

Project Configuration Preliminary Review





Permitting Support Activities

Wetland and Waterway/Stream Delineation

PPL EU will to evaluate the project area for the presence of wetlands utilizing the methodology identified in the U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual (1987 Manual) (Environmental Laboratory, 1987), and the newly adopted U.S. Army Corps of Engineers Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0). Additionally, based upon previous conversations with the USACE, PPL EU may be required to conduct qualitative wetland evaluations of each delineated wetland for mitigation purposes. Streams in the project right-of-way would be subject to a Unified Stream Methodology (USM) for a rapid assessment of stream compensation requirements for permitting impacts, developed by the USACE Norfolk District and VDEQ.

Threatened and Endangered Species

The results of the desktop review will assist in detailing the potential need for additional Rare Threatened or Endangered (RTE) surveys at the Project site. Based on the United States Fish and Wildlife Service (USFWS) list of federally listed species in Virginia (iPAC, accessed in July 2014), listed RTE species within the counties crossed by the project include the endangered Indiana bat (*Myotis sodalis*) proposed as endangered northern long-eared bat (*Myotis septentrionalis*), endangered gray bat (*Myotis grisecens*), Virginia Big-eared bat (*Corynorhinus(plecotus) townsendii virginianus*), Carolina Northern Flying Squirrel (*Glaucomys sabrinus coloratus*), endangered smooth coneflower (*Echinacea laevigata*), threatened Virginia spiraea (*Spiraea Virginia*) and numerous other species such as clams/mussels, fish, and arachnid species. In addition to the Federally

listed species, Virginia Department of Game and Inland Fisheries (VDGIF) and Virginia Department of Conservation and Recreation Division of Natural Heritage (DCR-DNH) have authority over state-listed species including approximately 16 species of mammals, 67 species of birds, 33 species of amphibians and reptiles, 72 species of fish, and numerous species of mollusks and crustaceans, as well as over 600 rare plant species. Typically, the vast majority of species concerns in Virginia can be alleviated through commitments to no in-water work (i.e. spanning streams). Given the current agency outlook toward bats, it is likely that USFWS and VDGIF will indicate that potential bat summer habitat may be present. PPL EU will coordinate with the USFWS to determine if bat concerns can be avoided through acceptance of seasonal clearing requirements. If this cannot be accomplished, bat surveys may be necessary. Construction practices and seasonal restrictions could minimize the need for other potential presence/absence surveys, but are difficult to predict prior to agency coordination.

Cultural Resources Phase I

PPL EU will likely be required to conduct a Phase I Archaeological Survey of previously undisturbed portions of the project area, as required by the VA Department of Historic Resources (VA DHR) and Section 106 of the National Historic Preservation Act. The Phase I archaeological field reconnaissance will include a desktop and field assessment analysis in which archaeological and architectural areas of potential effects (APE)s will be established and assess the need for further field studies as well as define the necessary agency consultation. Data on previously identified sites will be obtained from the state's database, archaeological site files, and National Register and historic properties files. The purpose of the Phase I archaeological assessment will be to delineate and map the APEs to develop a Phase IB testing plan (as necessary), and present the results in a report suitable for VA DHR and USACE review. Project clearances will be required from both VA DHR and the USACE.

Migratory Birds

Based on review of the solution, limited forested areas are present and similar transmission line infrastructure is already present in adjacent areas. The potential for bird species protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act is low. PPL EU will also coordinate with the USFWS regarding birds protected under MBTA and may need to submit a project-specific Avian Protection Plan.

Public Lands

Public lands may be crossed by the project depending on the final route selected. Based on an initial review of the Public Areas Database of the United States (PADUS), there are two Virginia Department of Conservation and Recreation (DCR) State-managed lands within the Project area including, Cleveland Barrens and Red Rock Mountain. Coordination and approval from DCR would be required for the Project and would

include a level of risk with a potentially lengthy review timeline as well as public opposition. Additional information on potential public lands in the area will be identified during the siting process.

State Permitting.

Virginia Water Protection Program (VWPP) Permit: PPL EU will need to coordinate with the VWPP for Section 401 of the Clean Water Act Water Quality Certification as well as for activities in wetlands and other surface waters. VWPP Permits are required for dredge, fill or discharge into or adjacent to surface waters and excavation in wetlands. It is likely that mitigation requirements will be required. Based on a review of the wetlands and waters in the Project area, it is anticipated that a general permit would be required.

Virginia Department of Conservation and Recreation (DCR): PPL EU will need to coordinate and obtain approval from DCR for two State-managed lands within the Project area including, Cleveland Barrens and Red Rock Mountain. This will be a high risk for the Project with a potentially lengthy review timeline as well as possible public opposition.

Virginia Department of Environmental Quality (VDEQ) – Discharges of Stormwater from Construction (VAR10): PPL EU will need to obtain approval from VDEQ discharges of stormwater from construction for land disturbances over 1 acre. It is assumed with project construction laydown areas, access roads, and work/pull pads, the project will exceed 1 acre of land disturbance. Additionally, local stormwater management approvals may be required and will need to be reviewed for the project.

Virginia Department of Environmental Quality (VDEQ) Soil Erosion & Sediment Control: PPL EU will need to obtain approval from VDEQ for soil erosion and sediment control approval for land disturbances over 10,000 square feet. It is assumed with project construction laydown areas, access roads, and work/pull pads, the project will exceed 10,000 square feet of land disturbance. Additionally, county and/or city approvals may be required and will need to be reviewed for the project

Virginia Department of Game and Inland Fisheries (VDGIF): PPL EU will need to coordinate with the VDGIF to determine the level of anticipated impacts to RTE species.

Virginia Department of Historic Resources (VA DHR): PPL EU will need to coordinate with the VA DHR to determine the level of anticipated cultural impacts from the Project. This will also be required by USACE, under Section 106 through the JPA process.

Virginia State Corporation Commission – Certificate of Public Convenience and Necessity: Developers planning to construct electric power generating facilities in Virginia must obtain the approval of the Virginia State Corporation Commission. The Commission must consider the impact of proposed generating facilities on the reliability of the grid. The Commission also considers the technical and financial viability of the plant developers. For facilities to be included in the rate base of Virginia jurisdictional utilities, the Commission must also find that the facilities are necessary for serving the needs of the public. Approvals are based on general findings of whether or not proposed facilities are in the “public interest.” The Commission has entered into a memorandum of understanding with the Virginia Department of Environmental Quality to coordinate review of proposed generating facilities. Approvals may include conditions necessary to mitigate environmental impacts in addition to any separate approvals that may be

needed from environmental agencies. Certificate of Public Convenience and Necessity (CPCN) is required for overhead lines operated at 138kV or more (of any length), and underground lines (of any length). The Commission must consider reliability, environmental, historic, economic development, and public health and safety impacts. The current CPCN process indicates a duration of approximately six to eight months, although approximately one year is more typical. Public opposition can extend the process considerably.

Virginia Department of Transportation (VDOT) Permits: PPL EU will need to coordinate with VDOT to determine the permitting requirements for aerial crossings as well as permitting requirements for temporary and permanent construction entrances. Typically, to work or perform other activities on a VDOT highway, park-and-ride lot, and rest area, you must have written permission from VDOT. Written permission is granted by a land use permit or a contract let by VDOT. Similar local permits are also typically necessary when spanning or for construction access along local roads.

Federal Permitting

Joint Permit Application (JPA) with United States Army Corps of Engineers (USACE) and Virginia Department of Environmental Quality (VADEQ): PPL EU Electric will need to coordinate with the USACE and VADEQ for a JPA under Section 404 of the Clean Water Act for temporary and permanent impacts to wetlands and streams. The USACE and VADEQ have joint jurisdiction over temporary or permanent project activities that place fill materials into waters of the U.S., including wetlands trigger permitting requirements. A preliminary review of NWI data indicates that majority of wetlands and waters can be spanned, and therefore it is likely that the utility line right-of-way, tower foundations and construction access can be permitted under Nationwide Permit No. 12 (NWP 12), provided that permanent impacts to waters of the U.S. for each single and complete project do not exceed 0.5 acre. Some nationwide permits also require that an applicant submit a pre-construction notification (PCN) to the USACE before work begins. The following general and regional conditions may apply to the proposed project and require a PCN for the NWP 12 if:

- The activity involves mechanized land clearing of forested wetlands
- Discharges result in the loss of greater than 0.1 acre of waters of the U.S.
- Project activities require stream crossings
- Project activities affect Critical Wetlands and Critical Aquatic Sites.

PPL EU anticipates coverage of the project under NWP 12. However, a field delineation of wetlands and waters will need to be completed to determine the extent of resources within the Project area. If the project does not meet the conditions of the NWP 12, an Individual Permit would be required. Individual permits require an increased permitting effort and a longer review period (6-12 months) based on the evaluation of applications under a public interest review and the environmental criteria set forth in the Clean Water Act Section 404(b)(1) Guidelines.

As part of the USACE 404 permitting process, a restoration or mitigation plan is required for temporary and permanent impacts to wetlands greater than 0.1 acre on a Project. Compensatory mitigation for the USACE is required at a minimum 1:1 ratio for all wetland losses that exceed

0.1 acre. The mitigation ratio could be increased depending on the quality of the wetland impacted, degree of public interest, or other site specific and agency circumstances.

United States Army Corps of Engineers (USACE) - Section 10 Rivers and Harbors Act: Construction within or crossing a navigable waterway, as defined by the Rivers and Harbors Act, requires a Section 10 permit. Based on initial review, there are approximately 33 waters (some waters cross multiple times) crossed by the Project. Each water will need to be evaluated for Section 10 requirements; however, it is likely that Little Cedar Creek, Elk Garden Creek, and Dry Branch will require a Section 10 Permit.

U.S. Fish & Wildlife Service (USFWS) Ohio Field Office:

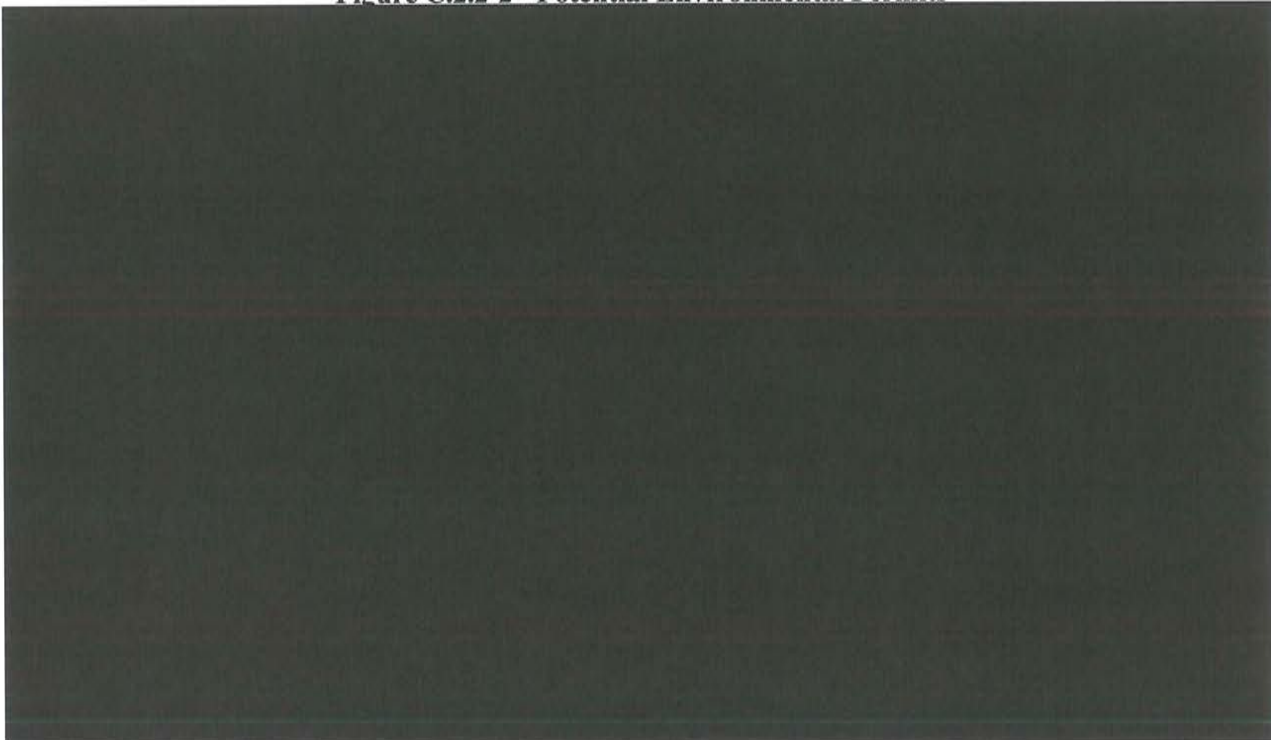
PPL EU will need to coordinate with the USFWS to determine the level of anticipated impacts to RTE species.

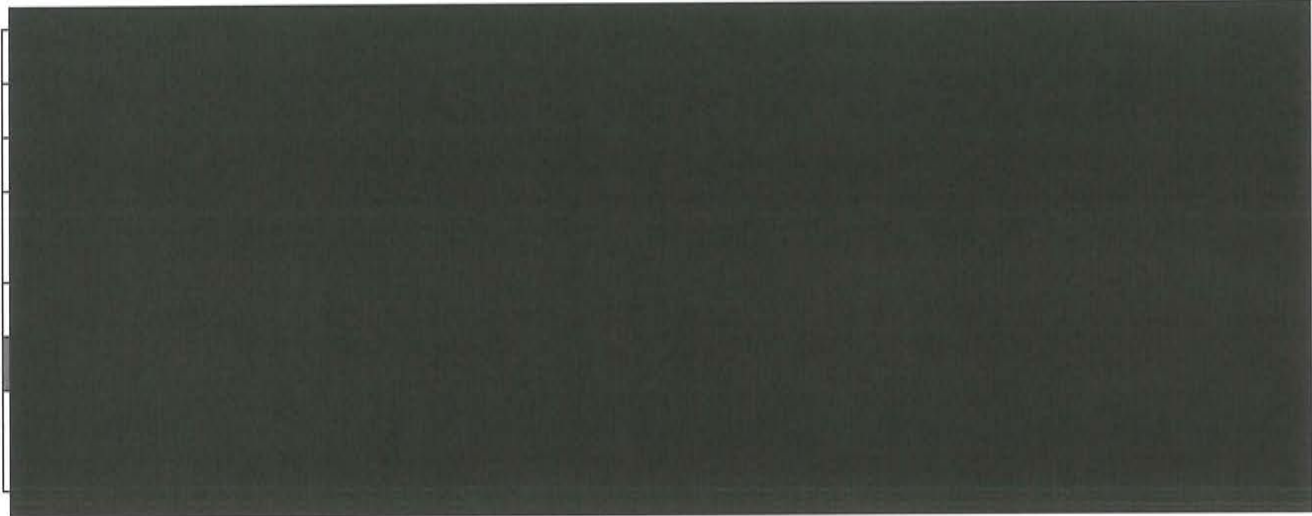
Federal Aviation Administration (FAA) – Obstruction Determination: PPL EU will need to coordinate with the FAA regarding potential obstruction to air travel, which will involve completing online forms available on the FAA’s Notice Criteria Tool website. This tool allows input of heights, elevations, and location of proposed structures to solicit the need to further coordinate with FAA.

Project Permitting Summary

The permits that may be required by environmental regulatory agencies on the federal, state, and county level for the level for the proposed Clinch River to Saltville 138kV projects are listed in Figure C.2.2-2 below. It should be noted that building permits for utility corridors are often exempted by local agencies. Local building permits requirements from specific municipalities will be reviewed when the project moves to its development phase.

Figure C.2.2-2 - Potential Environmental Permits





Permitting of transmission line corridors is a complex process with many involved parties. Because of the potential complexity of the proposed project, it is difficult to quantify all the specific risks associated with the environmental permitting process. Some of the potential risks which will need to be addressed during the solution development phase include:

[Redacted text block containing multiple lines of obscured content]

While the general project area traverses mostly forested areas or wetlands crossings there is a significant potential for impacts to habitat for T&E species. Timing of T&E species surveys may be seasonally dependent and may cause permit schedule delays.

C.2.6 Public Opposition Review

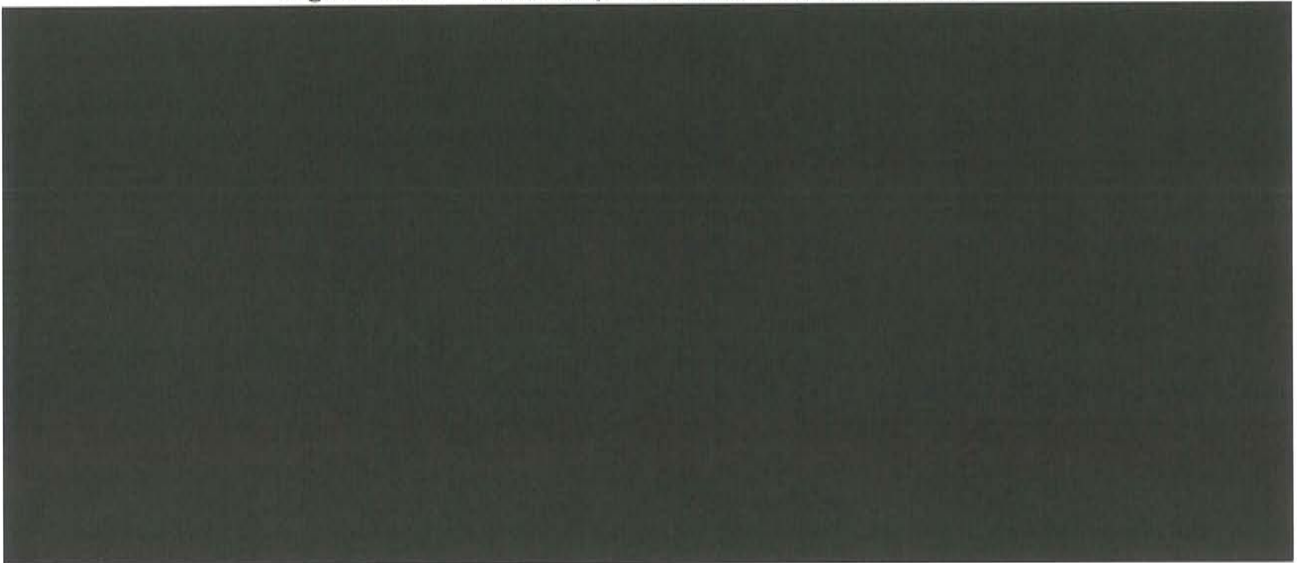
The Clinch River-Saltville 138kV Project could potentially be subject to moderate public opposition. This alignment traverses primarily through forested lands with some open agricultural/pasture land uses. Development of the new line would involve extensive deforestation and numerous stream crossings. Public opposition may focus on these

environmental impacts. The route does not travel near many homes or across numerous properties, thus public opposition from specific landowners may be limited.

C.3 Project Component Cost Estimates

The estimated project cost is \$82.5M and should be interpreted as a budget estimate. The bottom up development and top down verification provides an 80% confidence level in the project estimate based on the baseline scope of work and assumptions.

Figure C.3-1 - Summary of Estimated Project Costs



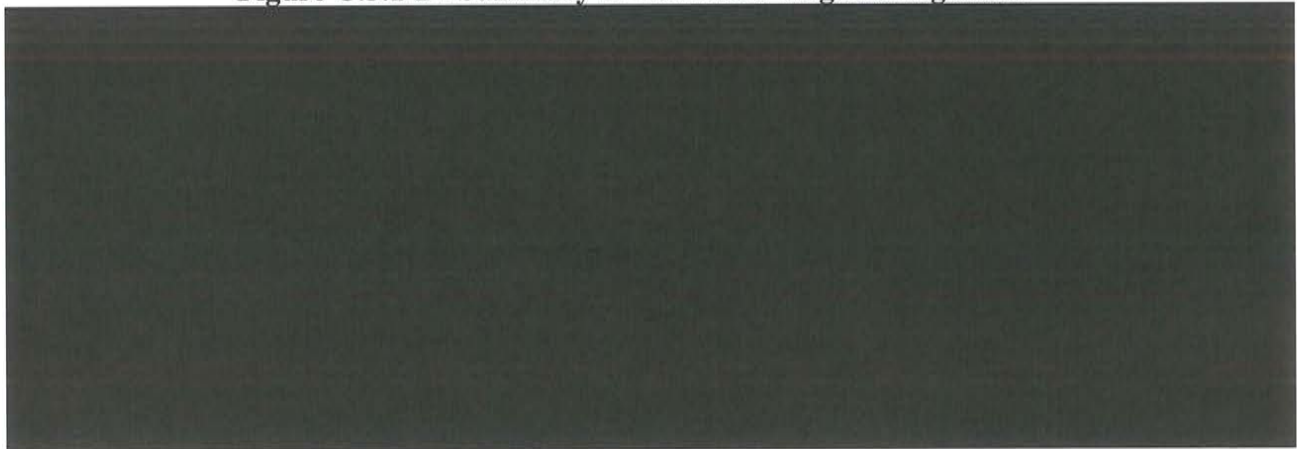
Note 1: Cost in \$ Millions

Note 2: Numbers may not sum due to rounding

C.3.1 Engineering and Design Costs

In order to support the proposed project, engineering will request survey and core borings. These two elements, in addition to the labor required to support the design, will represent the majority of project costs for the proposed project are presented in Figure C3.1-2 below.

Figure C.3.1-2 - Summary of Estimated Engineering Costs



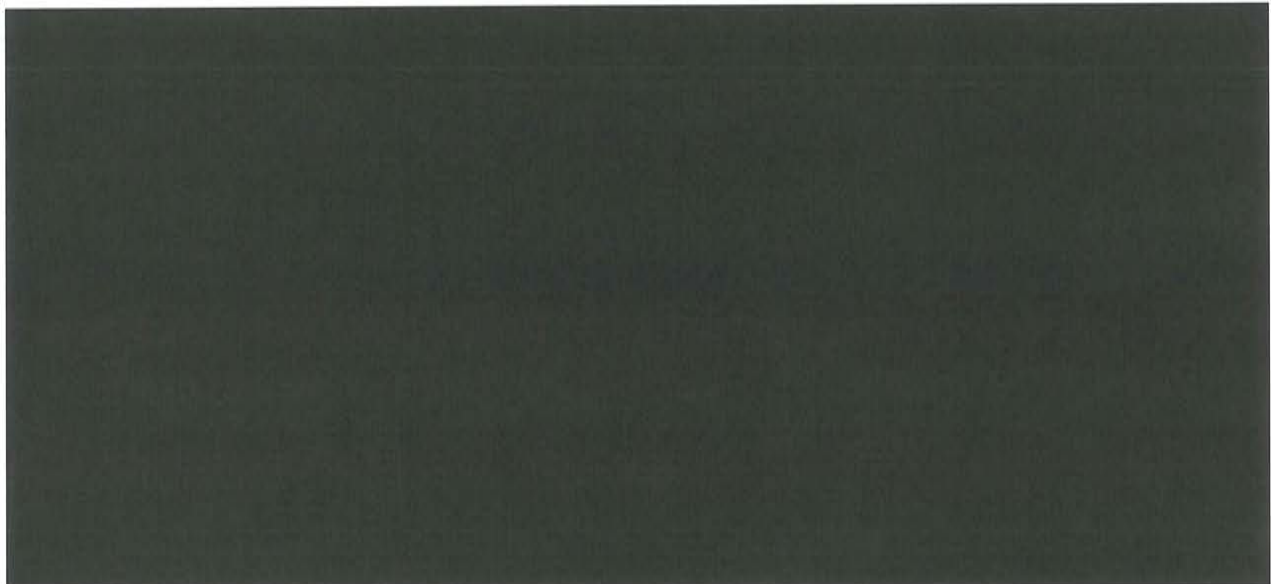
Note 1: Cost in \$ Millions

Note 2: Numbers may not sum due to rounding

C.3.2 Material and equipment costs

Material and equipment cost estimates are based on quantity take-offs for both the transmission and substation scope of work. The pricing for these materials are based on average cost from suppliers utilized in previous PPL EU projects. Material and equipment costs for the proposed project are presented in Figure C3.2-1 below.

Figure C.3.2-1 - Summary of Material Costs



Note 1: Cost in \$ Millions

Note 2: Numbers may not sum due to rounding

C.3.3 Construction and Commissioning Costs

Line construction cost estimates are based on quantity take-offs developed from past experience benchmarking of number of structures per mile multipliers for initial estimation, assuming standard construction designs and construction methods. The transmission line elements include

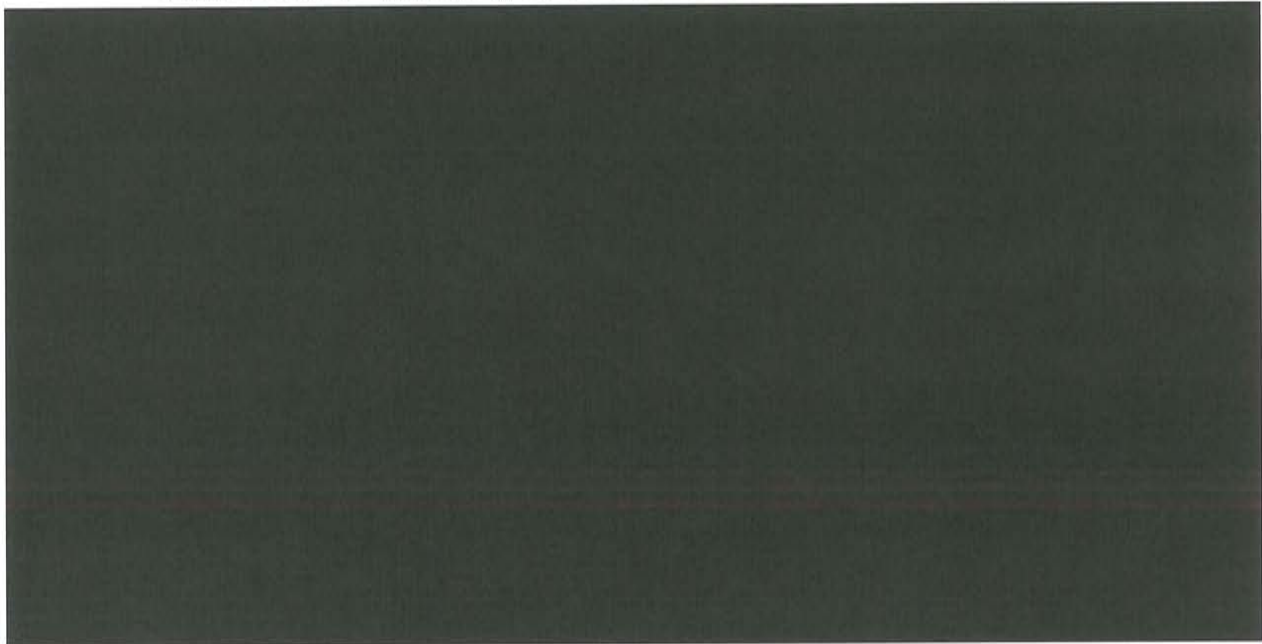
- Below Grade Line Construction: *Foundations for the steel structures including rebar and anchor bolts*
- Transmission Line Structures : *Erection of the steel structures with associated insulators and conductor attachments*
- Conductor Installation: *Stringing, Clipping and sagging the conductor*
- Fiber Optic Installation: *Stringing, sagging and installation of splice cans*
- Access and Crane Pads
- Mobilization, demobilization and Contractor Setup

Substation cost estimates are also based on past experience for similar type of equipment based on anticipated construction take-off commensurable of the current level of definition for the project. Substation construction costs include:

- Substation Steel Structure Construction: *Steel structures assemblies*
- High Voltage Equipment Construction: *Installation of the major substation elements including but not limited to power transformers, breakers, switches.*
- Bus Materials: *Installation of bus related materials including but not limited to bus, insulators, connectors, tap...*
- Conduit: *Installation of conduits in the substation yard*
- Control House: *Installation and dress up of the control house*
- Oil Containment Pit
- Testing and Commissioning
- Mobilization, demobilization and Contractor Setup

Construction and commissioning costs for the proposed project are presented in Figure C3.3-1 below.

Figure C.3.3-1 - Summary of Construction and Commissioning Costs



Note 1: Cost in \$ Millions

Note 2: Numbers may not sum due to rounding

C.3.4 Right-of-Way and Land Procurement Costs

PPL EU conducted a desktop cost analysis for the proposed transmission line regarding the right-of-way and land procurement costs

- Labor to Secure the Land Rights: Survey Permissions, Title, Acquisition, Non-Environmental Permitting, Construction Monitoring and Restoration, Access Roads, Recording Costs, Costs Associated with a Field Office
- Land Costs to Secure Easements: Easement Costs for Right-of-Way, Damages for Crops, Access Roads, Staging Yards and Misc. & Temporary Workspace Agreements

Figure C3.4-1 outlines the estimated right-of-way and land procurement costs for the proposed project

Figure C.3.4-1 - Summary of Estimated Right of Way and Land Procurement Costs



Note 1: Cost in \$ Millions

Note 2: Numbers may not sum due to rounding

C.3.5 Siting & Permitting costs

PPL EU conducted a desktop cost analysis for the solution's siting & permitting costs including: Environmental Permitting, Non Environmental Permits, Siting (Public Outreach, Open House)and Legal Costs.

Figure C3.5-1, outlines the siting and permitting costs for the proposed project.

Figure C.3.5-1 - Summary of Siting/Permitting Costs



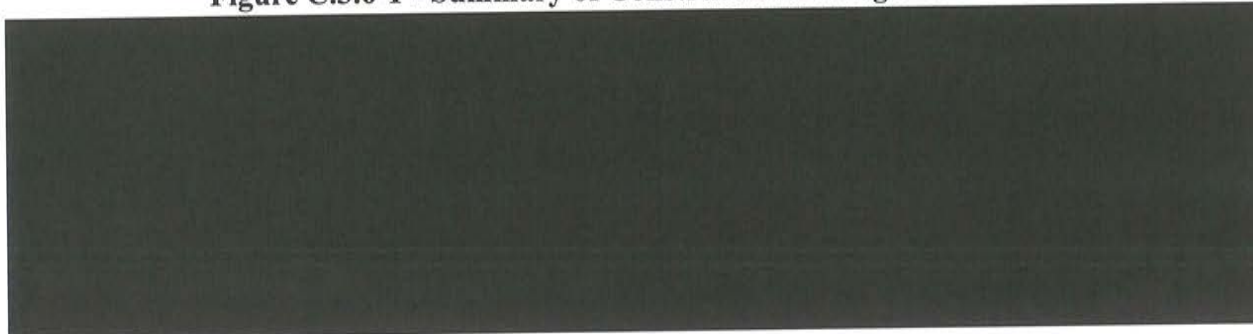
Note 1: Cost in \$ Millions

Note 2: Numbers may not sum due to rounding

C.3.6 Construction Management Costs

PPL EU conducted a desktop cost analysis for the proposed transmission line. Figure C3.6-1 outlines the construction management estimated costs for the proposed project.

Figure C.3.6-1 - Summary of Construction Management Costs



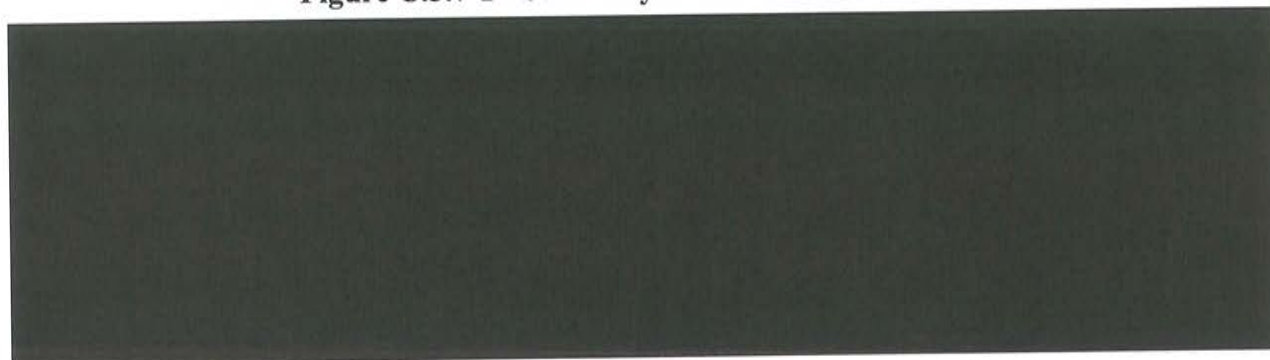
Note 1: Cost in \$ Millions

Note 2: Numbers may not sum due to rounding

C.3.7 Other Costs

The project includes A&G and Allowable Funds Used During Construction (AFUDC) at a rate of 3.25% for each year to account for the cost to borrow capital. Figure C3.7-1 outlines the additional costs added for the proposed project for these categories.

Figure C.3.7-1 - Summary of Other Costs Adders



Note 1: Cost in \$ Millions

Note 2: Numbers may not sum due to rounding

C.3.8 Contingency

As mentioned earlier in this section, PPL EU has developed a budget level estimate. As such, PPL EU recommends that a contingency be applied to cost estimates to account for the unforeseen costs required to support construction activities. Figure C3.8-1 below presents the contingency costs for the proposed project.

Figure C.3.8-1 - Summary of Contingency



Note 1: Cost in \$ Millions

Note 2: Numbers may not sum due to rounding

C.4 Schedule

C.4.1 Overall Project Schedule

A 4-year project schedule is required for the proposed project: 36 months for planning & design, right-of-way, siting, & permitting activities and long lead time procurement, and another 24 months for construction and commissioning (with some overlap). An integrated project schedule is provided in Figure C.4.1-1.

Figure C.4.1-1 - Project Integrated Schedule

Solution: Clinch River – Saltville 138kV Project Overall Schedule	2015				2016				2017				2018				2019							
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
Permitting	[Bar spanning Q1 2015 to Q3 2017]																							
Engineering and design		[Bar spanning Q2 2015 to Q3 2017]																						
Long lead-time equipment			[Bar spanning Q1 2016 to Q3 2017]																					
Site acquisition and/or right of way acquisition				[Bar spanning Q2 2016 to Q3 2017]																				
Construction activities					[Bar spanning Q3 2017 to Q3 2018]																			
Outages														[Bar spanning Q3 2018 to Q4 2018]										
Testing & Commissioning																[Bar spanning Q3 2018 to Q4 2018]								

Successful completion of the Clinch River to Saltville Single Circuit 138kV line addition will require coordination between engineering, right-of-way / land acquisition, long-lead time equipment procurement, permitting, and construction activities.

Permitting requirements

This schedule is based on a preliminary understanding of the topographical and ownership variances in the area. While it is very difficult to predict the extent of required permits for a new transmission line project prior to the Siting and route selection, field surveys, and agency consultations, PPL EU expects to require a combination of federal, state, and county permits.

Site acquisition and/or Right of Way acquisition

Based on an initial review of the proposed project routing, there will be an estimated 21 months schedule for Siting, Permitting, and land acquisition. PPL EU conducted a preliminary review of the transmission line siting considerations in order to develop a high level schedule estimate.

Engineering and design

The proposed solution would require an estimated 26 months of Engineering. Key activities include identifying pole locations, conducting core borings, finalizing steel pole orders, designing the foundation, and finally, completing the engineering release.

Engineering activities will span a variety of disciplines:

- Surveying: *Site selection and physical arrangement utilizing aerial (LiDAR) surveys*
- Civil: *Foundation, ground grid design, water and water retention designs*
- Environmental: *Environmental effects, access road design, spill response, SPCC plans in close conjunction with the ROW/Siting/Permitting team*
- Geo-Technical: *Soil investigation and earth resistivity*
- Structural: *Structural loading, component and hardware analysis including equipment standards, procurement, factory acceptance testing, equipment ratings, insulation ratings*
- Mechanical: *Conductor Sag/Tension design*
- Electrical: *Grounding, clearances analysis, insulation design, lightning performance*
- Telecommunication: *Fiber optics design (OPGW)*

Long lead time equipment

PPL EU expects the construction phase to last 24 months with several key long lead items requiring upfront procurement activities. Site clearing, preparation and delivery as well as site restoration, crop damage, and landscape work are performed in coordination with the Right-of-Way team.

The proposed project design requires several long lead time materials to be delivered prior to the construction phase. Average lead times range from 12 – 30 weeks for transmission line materials and 12 weeks to a year for substation equipment. The typical long lead time materials include

Construction activities, Outage plan to support construction and energization, Testing and commissioning

Construction will follow the standard processes and activities over a 24 month construction schedule:

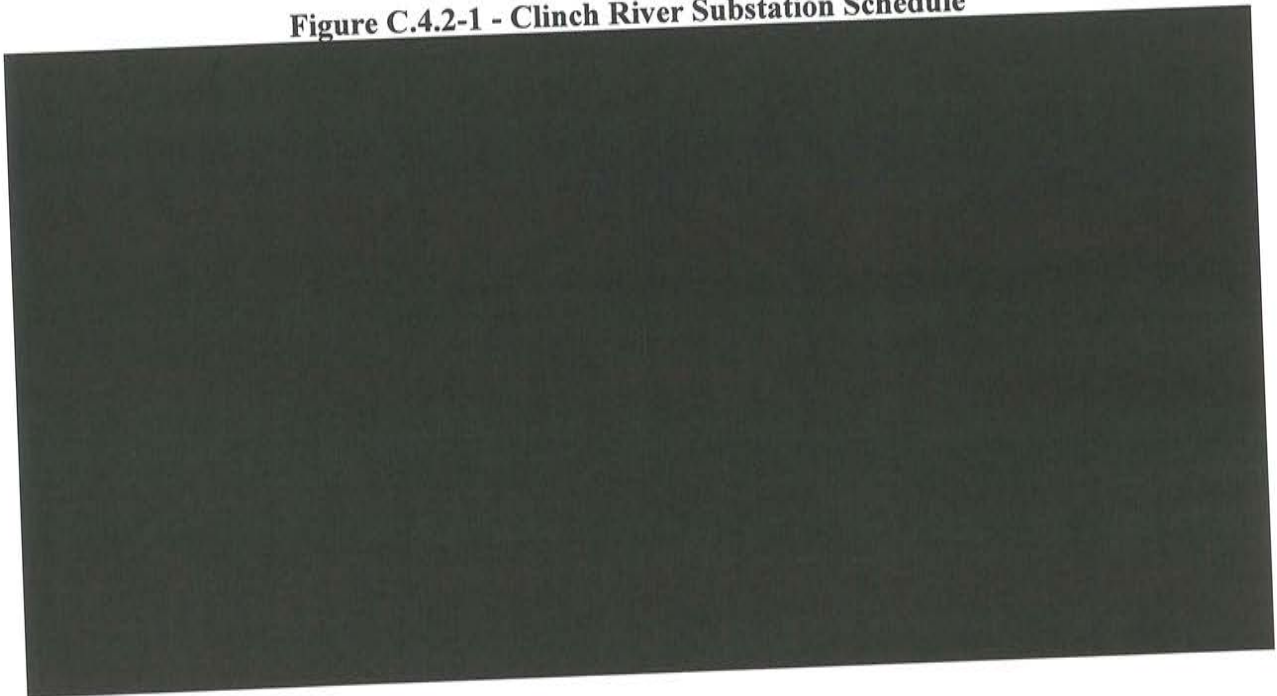
- Site Clearing/Prep/Delivery: *Clearing / grubbing prep, access road completion, site delivery*

- Mechanical: Site pad construction, mechanical work foundation, below grade work, conduit, ground grid
- Electrical: Pole and conductor construction, conductor/device removal, pole testing for ground resistance, structure removal, communication, splicing & testing, substation equipment installation, testing and commissioning
- Demobilization: Site restoration, crop damage, landscaping

C.4.2 Clinch River Substation Schedule

The Clinch River substation expansion will be developed constructed and commissioned as described in the schedule below:

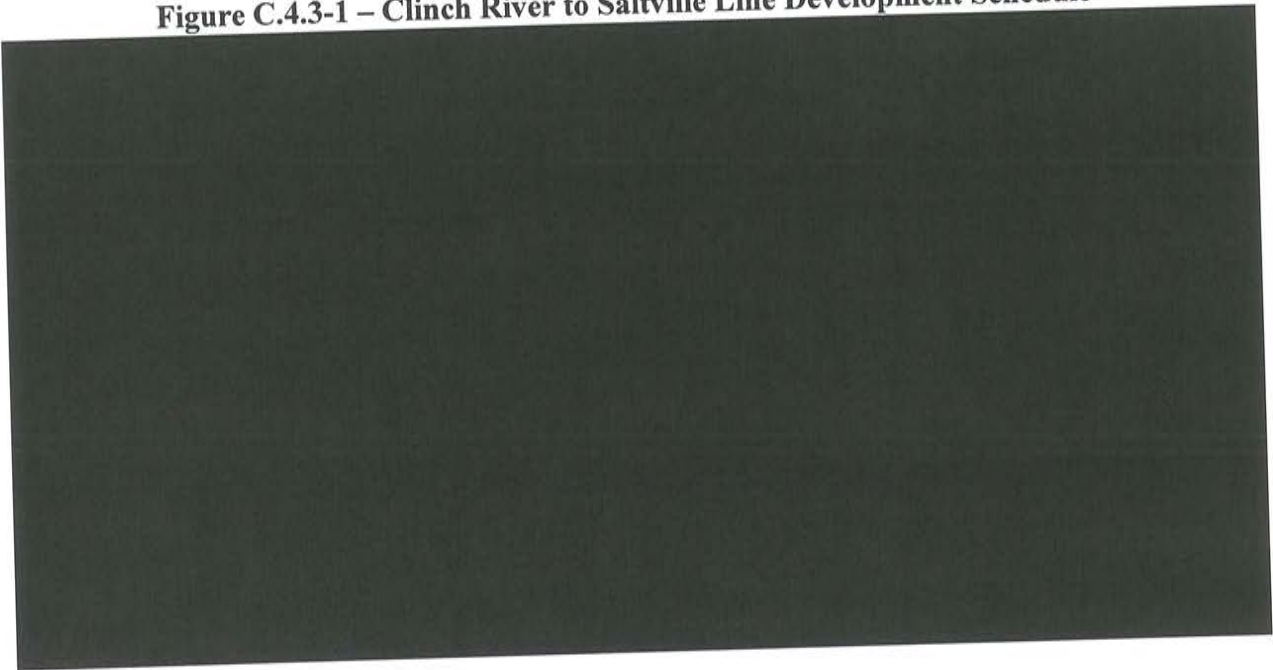
Figure C.4.2-1 - Clinch River Substation Schedule



C.4.3 Clinch River to Saltville 138kV Transmission Line Addition Schedule

The 138kV line addition will be developed constructed and commissioned as described in the schedule below:

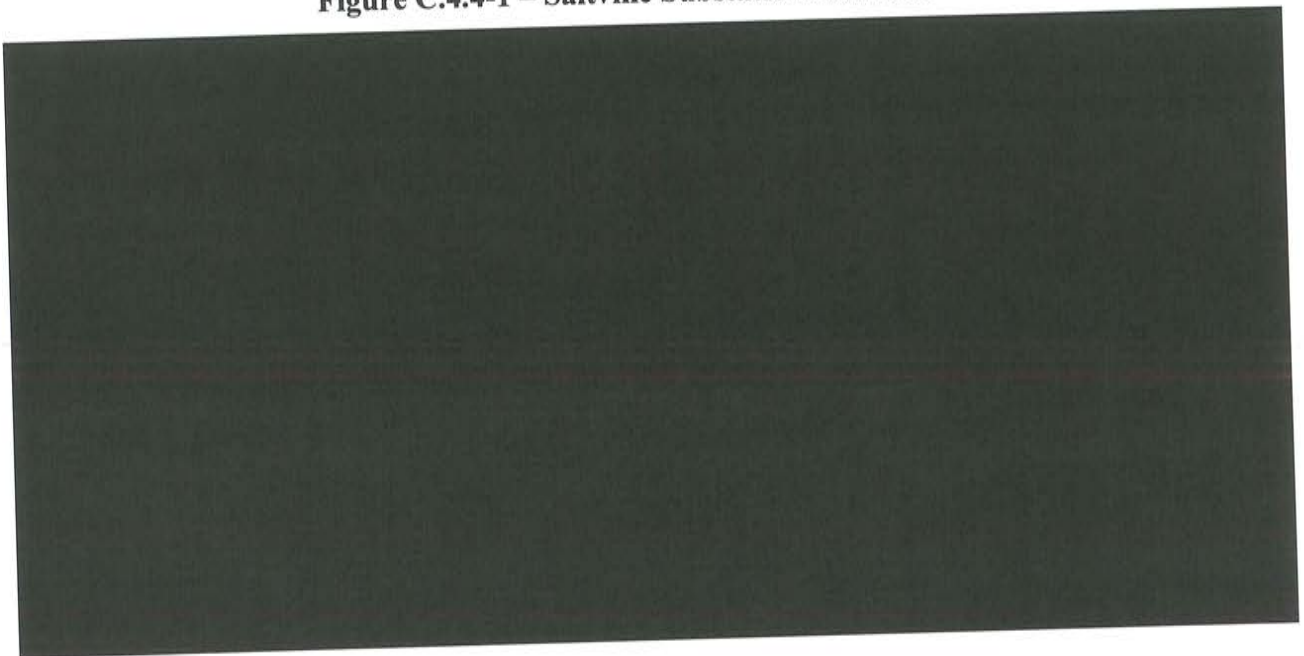
Figure C.4.3-1 – Clinch River to Saltville Line Development Schedule



C.4.4 Saltville Substation Schedule

The Saltville substation expansion will be developed constructed and commissioned as described in the schedule below:

Figure C.4.4-1 – Saltville Substation Schedule



C.5 On-going Transmission Facility Items

C.5.1 Operational Plan

The proposed solution is located in a non-PPL zone and includes assets to be built by the incumbent TO. These facilities will have no electrical ties to PPL EU. In accordance with FERC 1000, and similar to a rebuild of an existing line, the terminal facilities within the incumbent TO's substation would be constructed, controlled, and operated by the incumbent (as also indicated in the section facilities built by others).

Operations of these facilities will be contracted to the incumbent transmission owners who will own the existing terminal facilities at their substations. The affected TO will have the required authority to operate the proposed facilities in PJM territory and have the required telemetry inside PJM and follow all manuals and jurisdictional responsibilities.

C.5.2 Maintenance Plan

Project Spare Equipment

PPL EU owns and maintains a fleet of spare substation equipment to include at least one of each major piece of equipment, such as power transformers, CB's, CCVT's, etc... Items such as spare transformers are kept at strategically located substations based on the location of in-service units. If a piece of equipment were to fail, a cross-functional team evaluates the failure and determines if the system spare is needed. These spares are incorporated into our time-based maintenance program to assure that they are ready when called upon. The proposed project will have equipment specified to match the current standard equipment so that any existing spares would be compatible.

Transmission Line Maintenance

PPL EU Transmission Maintenance Group is responsible for the transmission line preventative and corrective maintenance program for the PPL EU Transmission System. This includes periodic review and comment on the content of the program with ultimate responsibility for the program residing within the Asset & Strategy Policy Group of T&S Asset Management PPL EU currently groups equipment into functional groups allowing optimum scheduling of equipment maintenance under a single outage window. Inspection activities are timed to maintain the desired performance levels defined for each individual asset. These activities include but are not limited to: comprehensive, routine and emergency helicopter patrols, ohmstick testing and thermovision. Additionally to ensure continued performance and public safety right-of-way encroachments are reviewed to ensure proper clearances.

Substation Maintenance


PPL EU Substation Maintenance Group is responsible for the preventative and corrective maintenance programs for PPL EU substations. This includes periodic review and comment on the content of the program with ultimate responsibility for the program residing within the Asset & Strategy Policy Group of T&S Asset Management. Current maintenance programs employ time-based cycles. The equipment data is kept in a maintenance management system (MMS) that serves dual functions; inventory management and maintenance order generation. The substation maintenance department is responsible for the upkeep of both the maintenance program and the inventory data. Test data is reviewed by the maintenance department and corrective or preventative work is issued as needed.

C.6 Assumptions

The project execution model relies upon a set of assumptions described in Figure C6-1.

Figure C.6-1: Summary of Major Assumptions

	Key Assumptions
Transmission Design	<ul style="list-style-type: none"> • No Significant right-of-way or height restrictions which require alternate design • PPL EU designs transmission n facilities to meet or exceed PJM design standards. PPL EU designs transmission structures to have greater resistance to natural elements, e.g., wind loading, ground clearance, lightning protection • Local ground condition assumed based upon typical state geological data
Substation Design	<ul style="list-style-type: none"> • Design based upon PPL EU's bulk power Substation design standard • Yard and control room capacity sufficient to expand within existing footprint • Relay Protection design coordinated with incumbent utility system protection infrastructure • No detailed engineering design completed addressing existing fault duty, DC systems or protection and control
Planning	<ul style="list-style-type: none"> • PJM 2019 RTEP base case is the basis for reliability results that determined drivers for potential upgrades • PJM has multiple base cases to represent various flow gates in a region. PPL EU post-solution loading estimates consolidate multiple flow gates in a region
Schedule	<ul style="list-style-type: none"> • Outages based upon proposed construction sequence and system requirements • Long-lead time items: transformers 12-18 months, steel poles up to 30 weeks • PJM will award a proposal by January 1st, 2015 • Proposed outages will be granted to support construction execution
Siting / Right-of-Way	<ul style="list-style-type: none"> • PUC will approve selected route and allow PPL EU to exercise eminent domain, if needed • Right of way / land costs based on the scheduled time frame for acquisition

<p>Permitting / Environmental</p>	<ul style="list-style-type: none"> • Detailed studies of the existing land to confirm transmission line routes • Phase II and III archaeological studies and threatened and endangered (T&E) species studies may be required for the projects, time and costs to conduct studies not included • Impacts to environmentally sensitive lands such as state parks, state wildlife management areas may result from the projects
<p>Financial</p>	
<p>Operation & Maintenance</p>	<ul style="list-style-type: none"> • Assets to be operated and maintained consistent with PPL EU practices, e.g., through TCC and with Lifecycle Asset Management approach • Operation and maintenance requirements of assets not located in PPL EU territory to be coordinated with incumbent utility

ALL APPENDICES ARE REDACTED