PPL Electric Utilities

2014 RTEP Project Proposal Window 1

Northern Ohio 138kV Transmission Area Flow Gates

Solution #1: Davis Besse-Carlisle-Avon 345kV Line Addition

Avon to Black River 138kV Line Addition

Submitted July 28, 2014

REDACTED VERSION

Davis Besse-Carlisle-Avon 345kV Line Addition - Avon to Black River 138kV Line Addition

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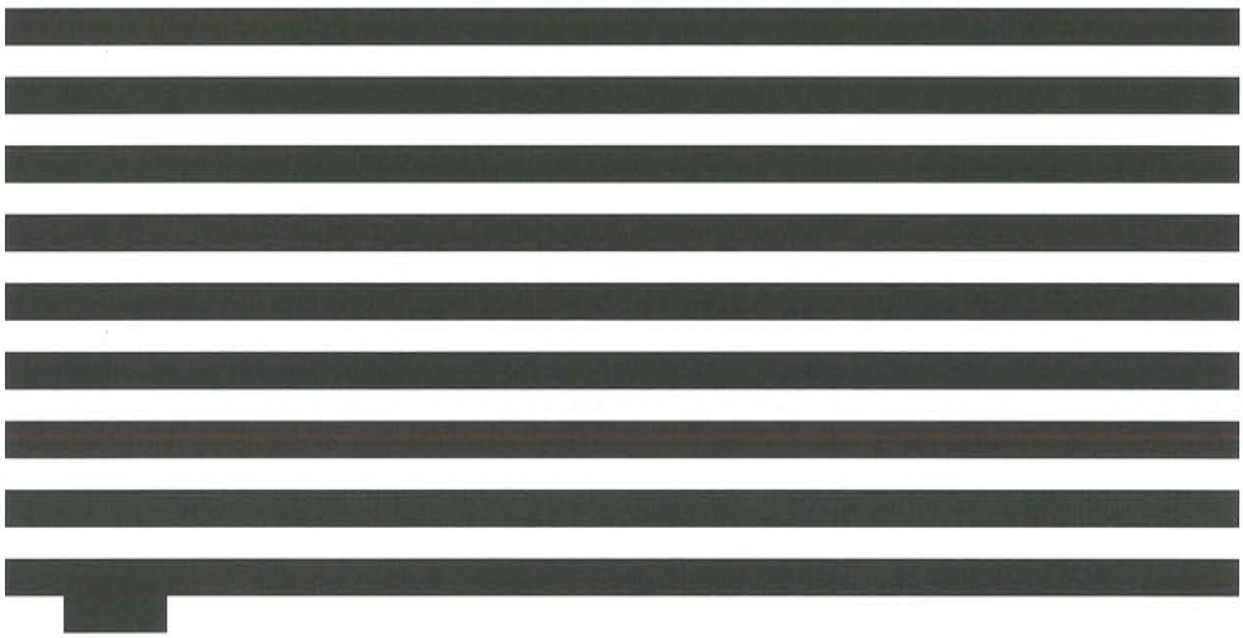

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A Executive Summary

A.1 Name and Address of Proposing Entity

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A.2 Description of Problem and Proposed Solution

PPL Electric Utilities (PPL EU) proposes to construct a new 92-mile single-circuit 345kV line from Davis-Besse to Carlisle to Avon Substations and a 9-mile double-circuit 138kV line from Avon to Black River Substations in northern Ohio. This solution will relieve ten Generation Deliverability violations across northern Ohio, 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 ten (10) Generation Deliverability violations on various northern Ohio transmission circuits. As part of this violation 4 different 138kV lines overloads for a total of 8 outage scenarios, the greatest overload reaching as high as approximately 170% of the applicable MVA emergency rating. PJM also identified that a 345kV line loaded to 110% of its MVA emergency rating for one outage scenario, and a 345/138kV transformer at Avon also overloaded (106% of its emergency rating) for one outage scenario. Addition of this upgrade project mitigates all ten northern Ohio reliability violations described above, bringing loading down to between [redacted] of applicable emergency ratings for all critical contingencies.

This solution provides additional benefit by increasing reliability across northern Ohio. By bringing a second 345kV line from Davis-Besse to Avon, this solution will connect through Carlisle substation offering a complete and diverse 345kV path.

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 345kV transmission line from Davis-Besse to Carlisle to Avon Substations and and the 138kV transmission line from Avon to Black River Substations. 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 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:

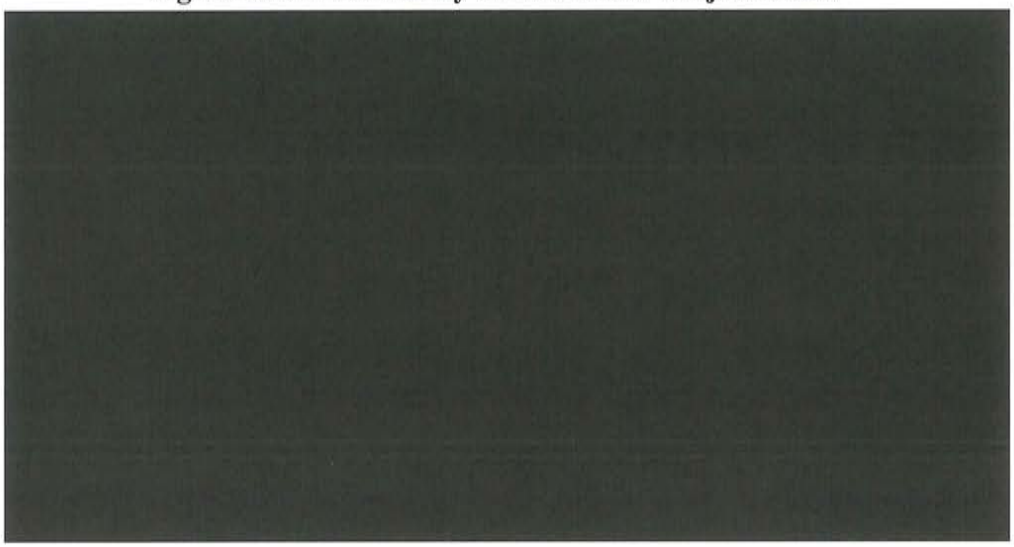
- Conducts business safely with incidence rates lower than industry averages
- Maintains facilities beyond industry standards (top quartile System Average Interruption Frequency Index (SAIFI), multiple awards and recognition for Hurricane Sandy response)
- Builds relationships in the communities in which 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 92-mile 345kV transmission line from Davis-Besse to Carlisle to Avon Substations and a 9-mile double-circuit 138kV line from Avon to Black River Substations to resolve the ten Generation Deliverability violations described in Section A.2 is estimated at a total cost of $279.5M (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.

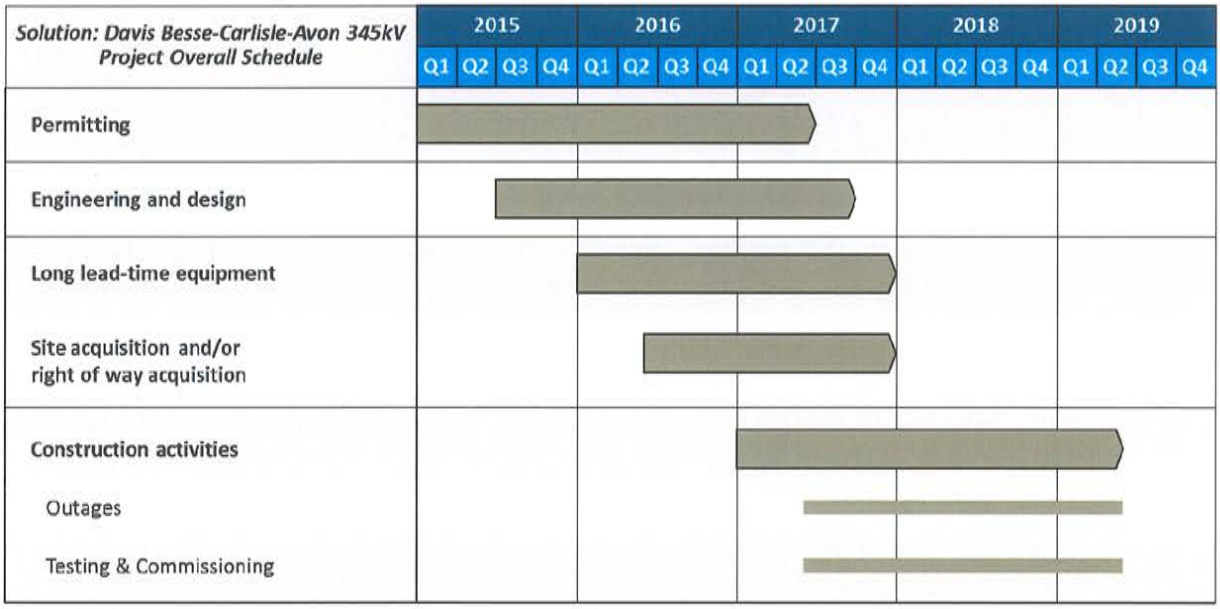
Figure A.3-1: Summary of Estimated Project Costs



A.4 Solution Schedule and Milestones

The solution described within this document will be commissioned and energized by mid-2019 (see Figure A.4-1 for a summary), consistent with 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



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 EU'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, reflects 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).

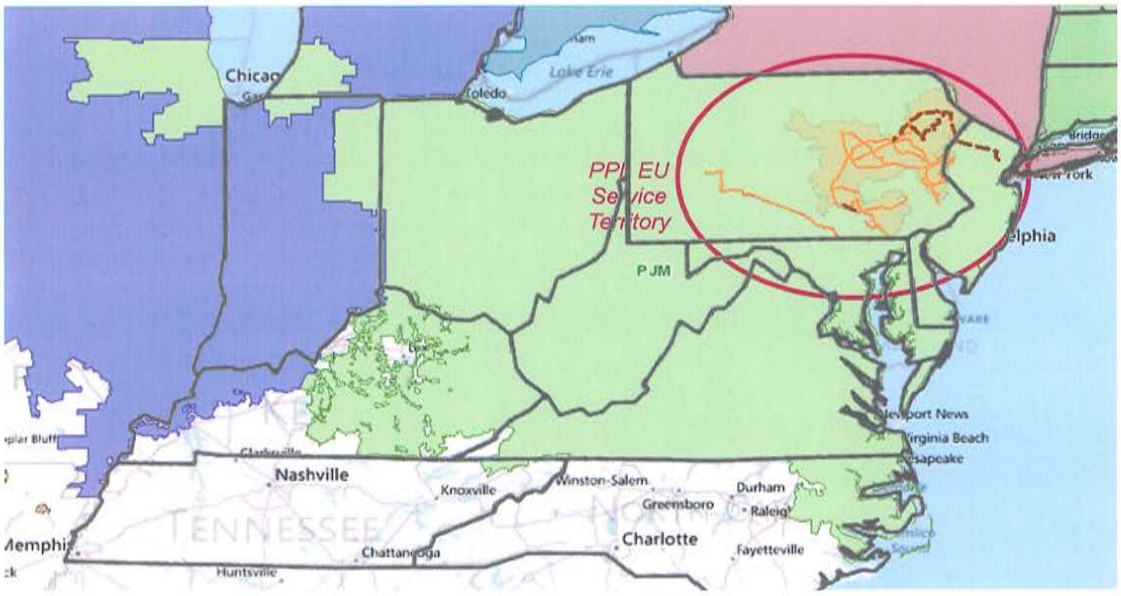
B Company Evaluation Information

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 B1-1 depicts PPL EU's existing transmission service territory within the broader PJM footprint.

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

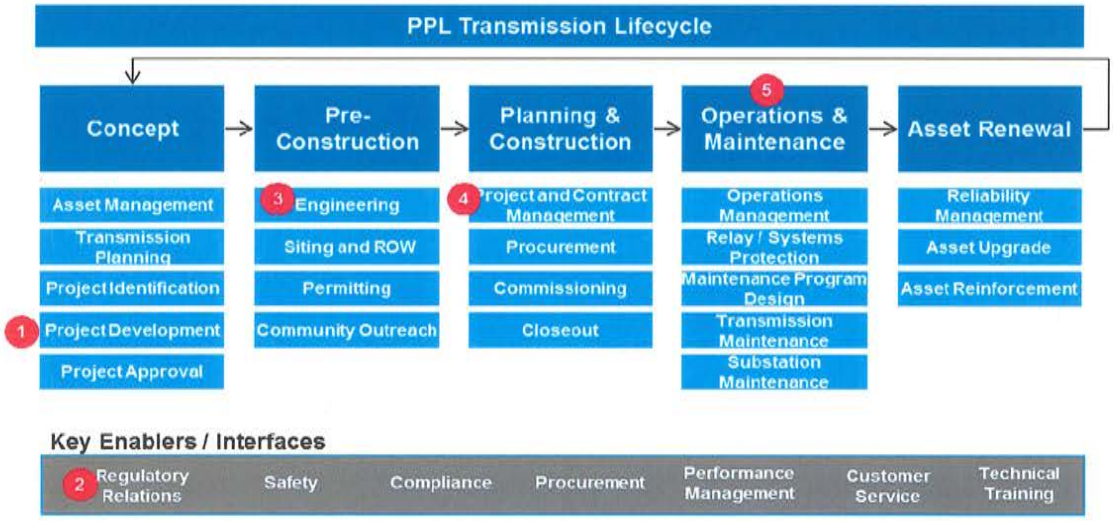


Management of this extensive transmission system and the project experience gained through constructing these assets, has enabled PPL EU to establish unique capabilities that are relevant to the proposed solution to the northern Ohio 138kV transmission area flow gate. PPL EU not only brings a well-established 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 B.1-2 highlights capabilities particularly relevant for consideration of this proposed solution.

Figure B.1-2: PPL EU Differentiating Capabilities



B.1.1 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.

B.1.2 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 was a key stakeholder relationship developed to address the requirements for the Susquehanna-Roseland project to cross three national parks. Additionally, PPL EU has an outstanding success rate with obtaining siting application approvals through Pennsylvania's Public Utility Commission (PUC).

B.1.3 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 EU's Engineering group not only leverages extensive experience in-house, but also has vast experience in managing contracted engineered services with 12+ engineering firms: [redacted] among others. These contractors have extensive knowledge and experience designing all transmission line voltage classes both within PJM as well as outside the PJM territory.

B.1.4 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.

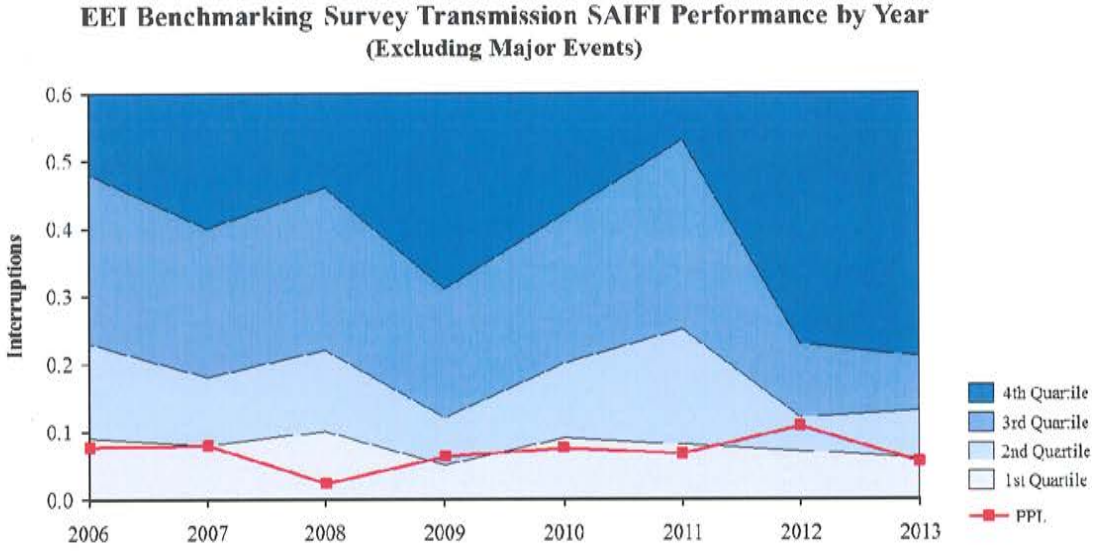
The ability to execute projects both large and small is built on a scalable contractor model across the transmission asset lifecycle, while maintaining stringent standards relating to safety, quality, and delivery. PPL EU has established a preferred set of contractors, Contractors of Choice (COC), through 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.

B.1.5 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).

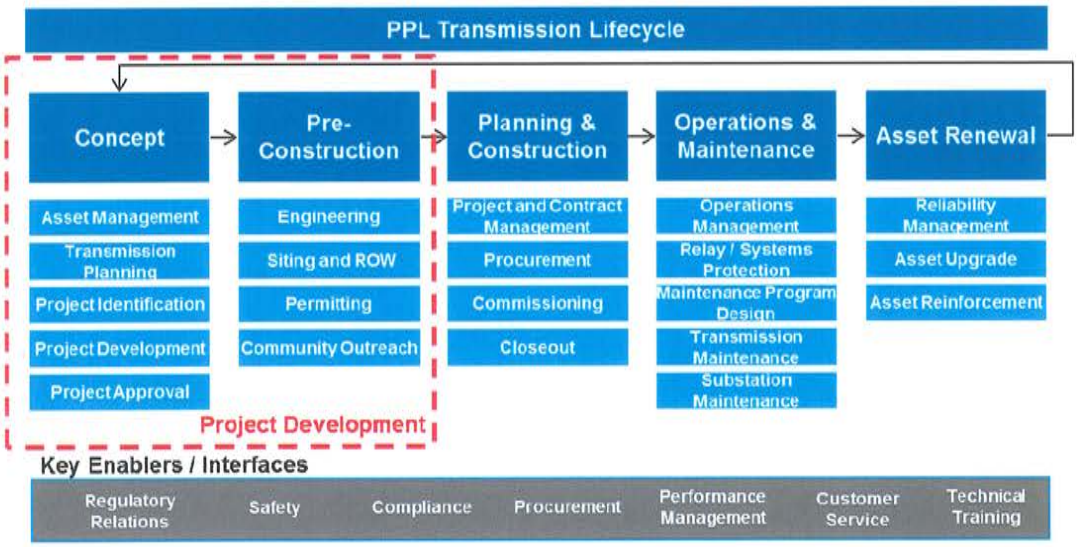
Figure B.1.5-1: PPL EU T-SAIFI Historical Trend (In Interruptions)



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 B.2-1.

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 challenges 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

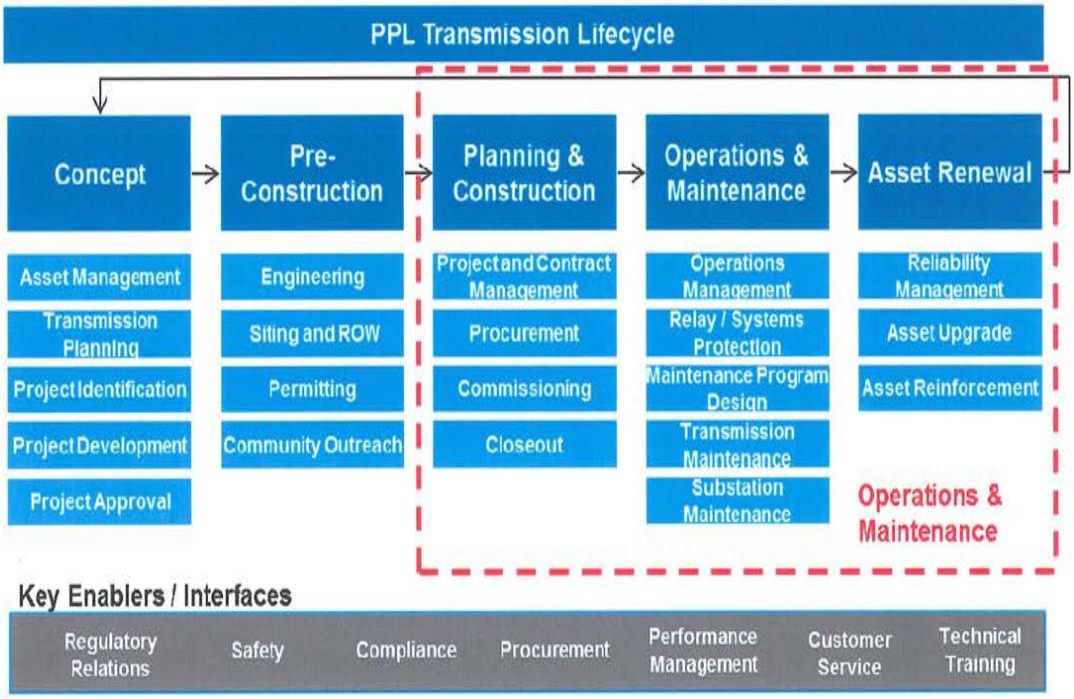
Project Name	Permit / License Acquired
NE Pocono Reliability	NPDES Permit – Paupack-Honesdale Transmission Line
NE Pocono Reliability	NPDES Permit – Pocono Substation
NE Pocono Reliability	NPDES Permit – Pocono to Paupack Transmission Line
NE Pocono Reliability	Two (2) Joint Permits (one per county) – 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 governmental agencies. PPL EU understands the importace 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 EU'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 [redacted] 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 B4-1.

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 Davis Besse-Carlisle-Avon 345kV Transmission Line Addition and Avon to Black River 138kV Transmission 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 through participation in mutual assistance groups.

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 EU'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

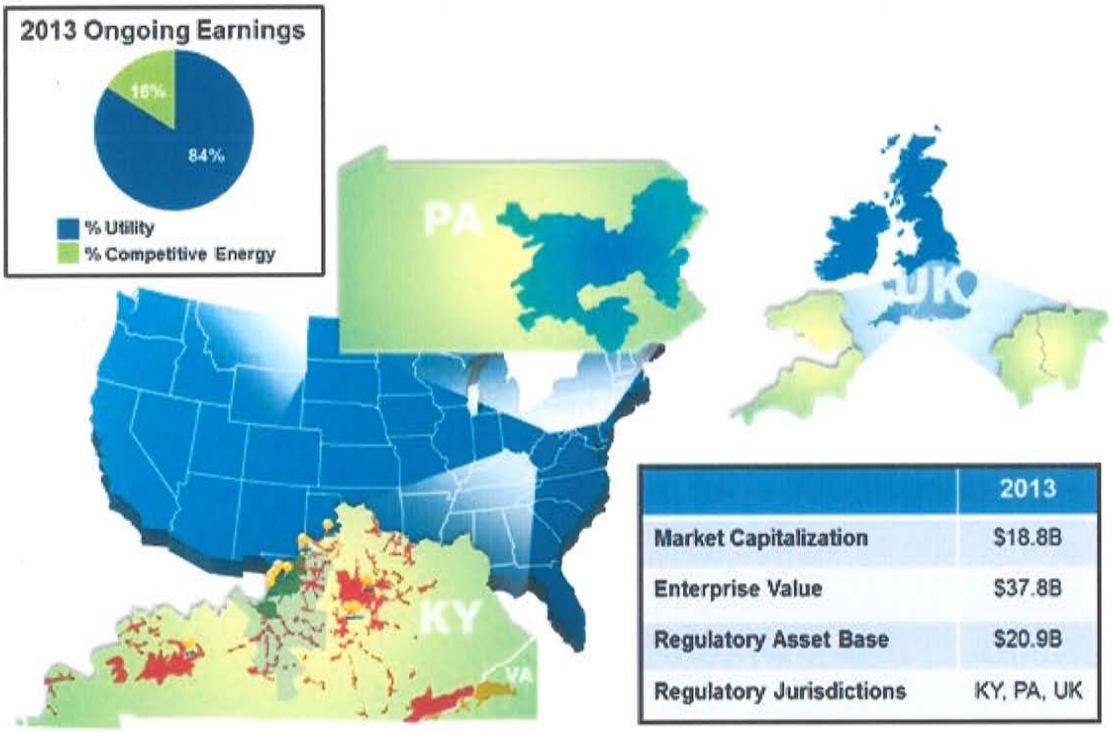
PPL and PPL EU propose to finance the project across its capital structure using approximately 50% debt and equity, including cash from operations. We expect to utilize the commercial bank lending and debt capital markets, using a variety of short-term and long-term securities.

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 rate payers.

Figure B6-1: PPL Financial Summary



	2013
Market Capitalization	$18.8B
Enterprise Value	$37.8B
Regulatory Asset Base	$20.9B
Regulatory Jurisdictions	KY, PA, UK

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: New Davis-Besse – Carlisle - Avon 345kV Line and Avon – Black River 138kV DCT Line Addition

PPL EU proposes to construct a new 92-mile single-circuit 345kV line from Davis-Besse to Carlisle to Avon Substations in northern Ohio. The line segment between Davis-Besse and Carlisle will be 72 miles, and the segment between Carlisle and Avon will be 20 miles. In addition, a new 9-mile 138kV DCT line from the Avon Substation to the Black River Substation will also be constructed to complete this upgrade solution.

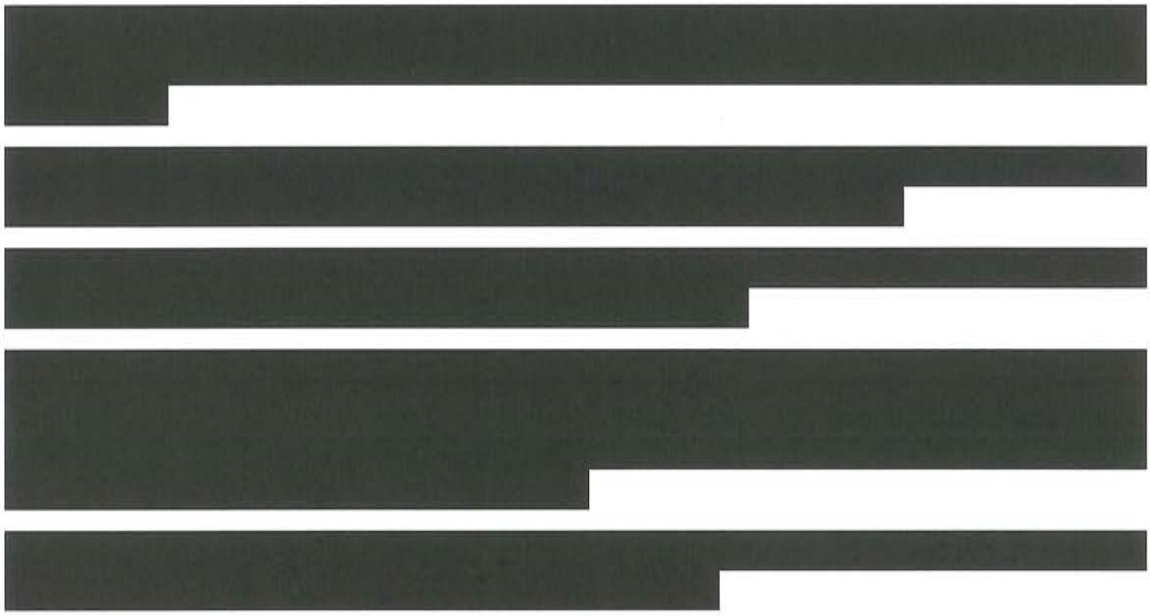


Figure C.1.1-1: Proposed 345kV & 138kV Transmission Line (101 miles)

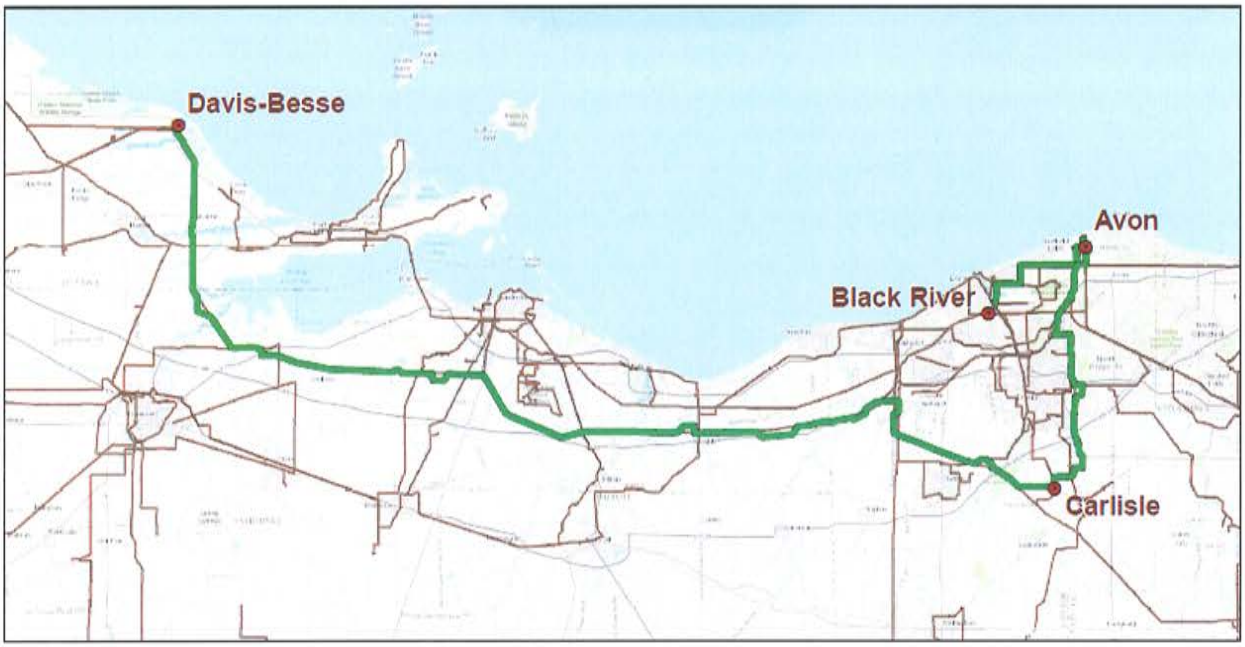
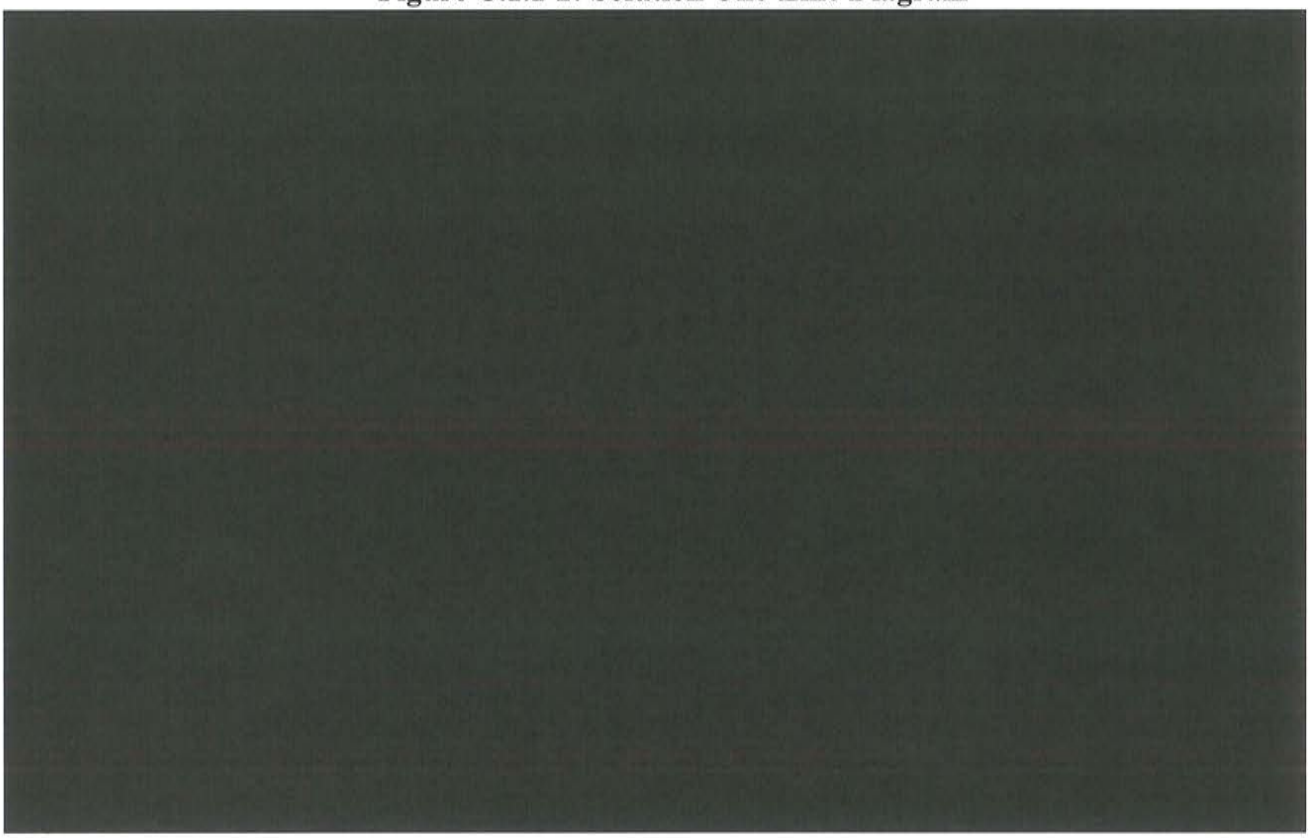


Figure C1.1-2 below provides an overall one-line diagram that illustrates the system topology for the proposed solution.

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



Area Description and Reliability Concerns Being Addressed:

The northern Ohio transmission area consists of 345 and 138kV networked transmission lines that serve the major load pockets of Toledo and Cleveland. There is also significant generation connected to the 345kV system near Lake Erie. Generation changes near Lake Erie, reflected in PJM's Generation Deliverability study, can result in congestion on the 138kV system that is parallel to the 345kV system if a 345kV tower or breaker failure involving two 345kV lines or a line and a transformer occurs. PJM identified 4 different 138kV lines that overload for a total of 8 outage scenarios, the greatest overload reaching as high as approximately 170% of the applicable emergency MVA rating. PJM also identified that a 345kV line loaded to 110% of its emergency MVA rating for one outage scenario, and a 345/138kV transformer at Avon Substation also overloaded (106% of its emergency MVA rating) for one outage scenario.

Addition of this upgrade project mitigates all ten northern Ohio reliability violations described above, by providing a second strong 345kV source in parallel with the existing Davis-Besse to Beaver to Avon 345kV path, so that loss of one 345kV line path does not leave the 138kV system as the primary path for power transfer. Also, the Avon – Black River 138kV DCT line relieves congestion concerns during export of power on the 138kV system leaving Avon.

This upgrade solution reduces flows on the 138kV system, bringing loading on the transmission lines that were overloaded down to between [redacted] of applicable emergency MVA ratings for all critical contingencies.

Figure C.1.1-3: Thermal Reliability Violations Resolved by Upgrade - (Loading in % of Application MVA Rating)

FG	Fr Bus	Name	To Bus	Name	CK	KVs	Area	Rate	PJM Study [X] % Upgrade	PPL Study [X] % Upgrade	PPL Study [X] Upgrade In	Cont Label	Cont Type
720	239070	02AIDHLD	238521	02NADMI	1	138:138	202/202	194	101.05	100.3		C1-BUS-NR0028	Bus
794	239728	02BLKRVR	238915	02LRN 02	1	138:138	202/202	270	111.62	111.0	66.5	C5-TWLNR0940	Tower
790	239030	02CITTAWA	238874	02LAKVIW	1	138:138	202/202	375	102.36	101.0	83.7	C5-TWLCR040A	Tower
802	238874	02LAKVEW	238756	02GRNHLD	1	138:138	202/202	316	105.15	103.8	72.8	C5-TWLCR040A	Tower
918	239728	02BLKRVR	238915	02LRN 02	1	138:138	202/202	270	111.62	111.0	66.5	C2-BRK-NR125A	Breaker
919	239728	02BLKRVR	238915	02LRN 02	1	138:138	202/202	270	121.14	120.4	71.8	C2-BRK-NR04A	Breaker
920	239728	02BLKRVR	238915	02LRN 02	1	138:138	202/202	270	107.89	106.9	75.9	C2-BRK-NR127A	Breaker
921	239728	02BLKRVR	238915	02LRN 02	1	138:138	202/202	270	103.23	102.8	63.7	C2-BRK-NR126A	Breaker
1036	239569	02BEAVER	239715	02LAKEAVE	1A	345:345	202/202	5139	110.03	107.2	73.3	C2-BRK-CR016A	Breaker
1057	239551	02AVON	238552	02AVO4	91	345:138	202/202	601	106.51	104.0	94.0	C2-BRK-NR127A	Breaker

C.1.2 Transmission Line Component(s)

Detailed description:

The new Davis-Besse to Carlisle to Avon 345kV line will consist of single circuit self-supporting steel monopoles with conductors in a "delta" configuration. The line will carry one circuit of 1590 kcmil 45/7 ACSR conductor, in a two (2) conductor bundle per phase, with two OPGW shield wires. This new line will have a 1943 MVA normal rating and a 2406 MVA emergency rating.

[redacted]

Preliminary list of materials and Structure Type Drawings

The transmission line major materials will include the following:

[redacted]

Figure C1.2-1 below provides a typical 138kV transmission line structure design

Figure C.1.2-1: Typical 345kV Structure Types

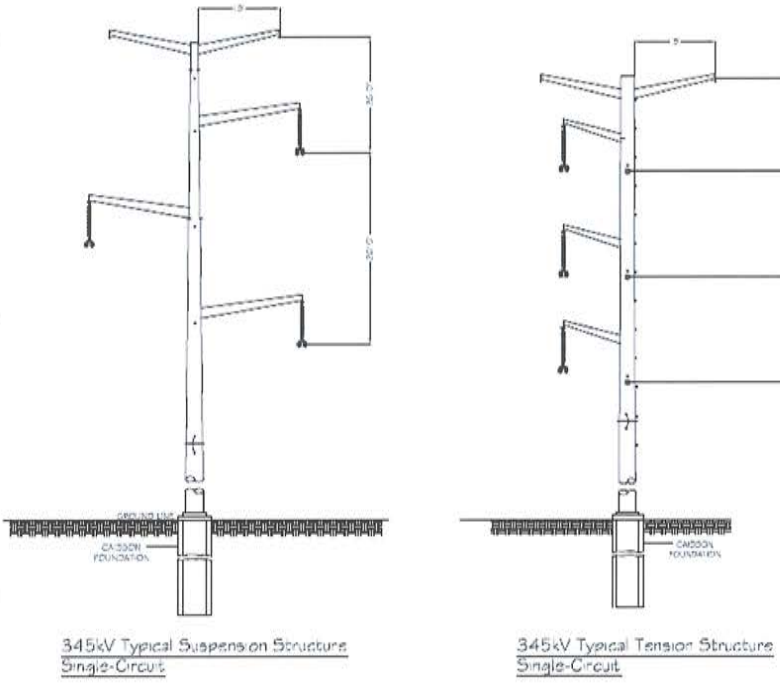
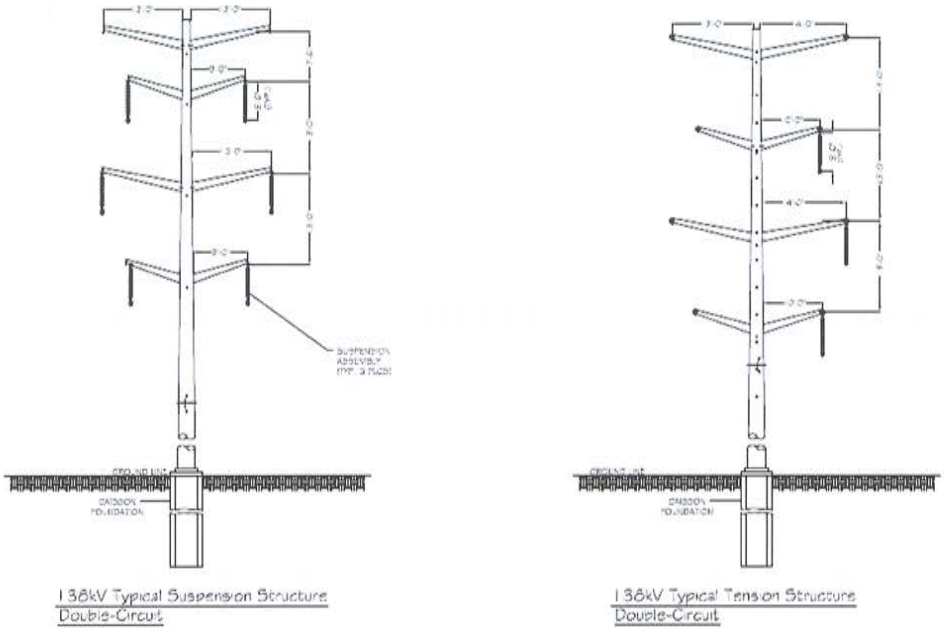


Figure C.1.2-2: Typical 138kV Structure Types



C.1.3 Substation Component(s)

No substation additions or expansions are proposed to be constructed by PPL EU in this solution.

C.1.4 Transmission Facilities to be Constructed by Others

Transmission line relocation

No transmission line relocations will be constructed by others.

Substation Expansion or Modification

Davis-Besse Substation Upgrade

Detailed description

[redacted]

Relay and Controls Equipment

[redacted]

- [redacted]

Relay Protection Communication Plan

[redacted]

[redacted]

Substation General Arrangement

[redacted]

Substation Major Equipment:

[redacted]

Carlisle Substation Upgrade

Detailed Description

[redacted]

Relay and Controls Equipment

[redacted]

Relay Protection Communication Plan

[redacted]

Substation General Arrangement

[redacted]

Substation Major Equipment:

[redacted]

Black River Substation Upgrade

Detailed Description

[redacted]

Relay and Controls Equipment

[redacted]

Relay Protection Communication Plan

[redacted]

Substation General Arrangement

[redacted]

Substation Major Equipment:

[redacted]

Avon 138kV Upgrades

Detailed Description

[redacted]

Relay and Controls Equipment

[redacted]

Relay Protection Communication Plan

[redacted]

Substation General Arrangement

[redacted]

Substation Major Equipment:

[redacted]

[redacted]

C.2 Siting, Permitting and Land Acquisition

C.2.1 Siting, Permitting, and Land Acquisition 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 five external right-of-way contractors and four siting contractors to support the full 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.

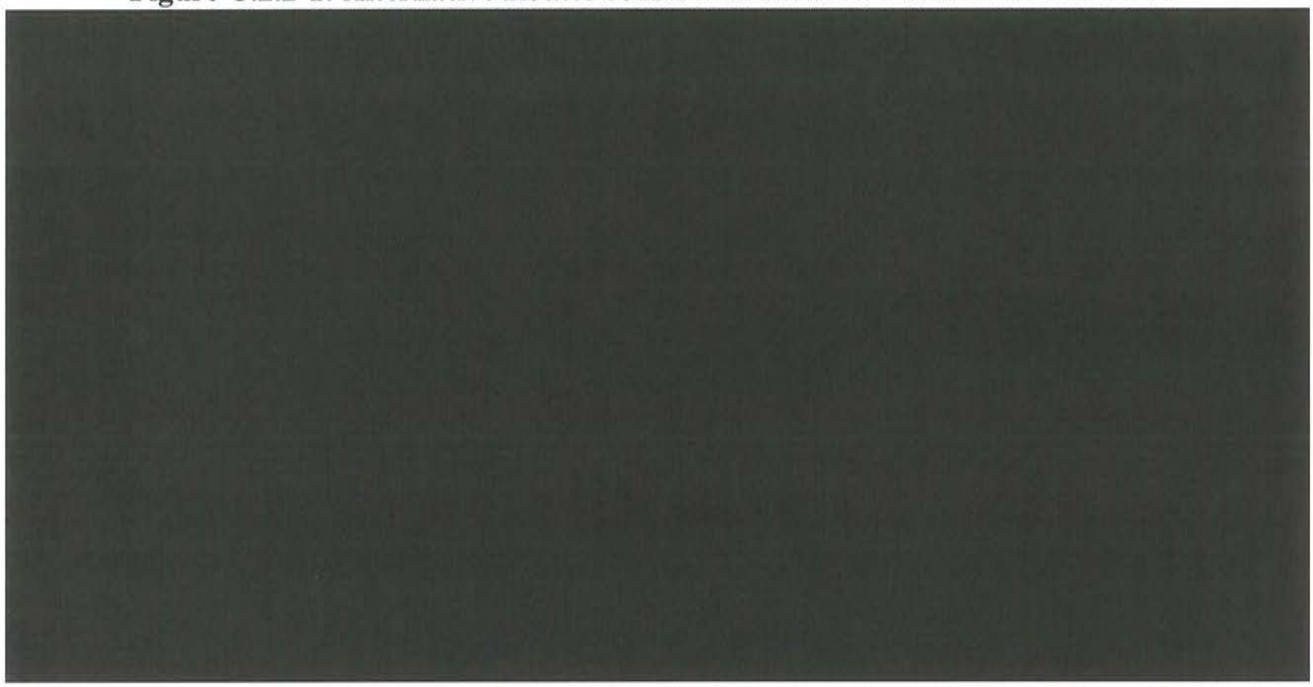
C.2.2 Route Alternative Assessment

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 evaluated the major opportunities and challenges within the regions between and surrounding the Davis-Besse and Carlisle substations and the Avon and Black River substations. The project configuration review allowed for the development of general assumptions and permitting requirements to complete a full alternatives report for new 345kV and 138kV lines connecting these substations [redacted]

Opportunity corridors and challenges within the project vicinities will dictate the Project Study Areas which, along with alternative routes, will be generated as part of a full siting report to determine a selected route for the project.

[redacted]

Figure C.2.2-1: Alternative Routes considered between Davis-Besse and Avon



C.2.3 Environmental Impact Review Methodology and Preliminary Results

[redacted]

[redacted]

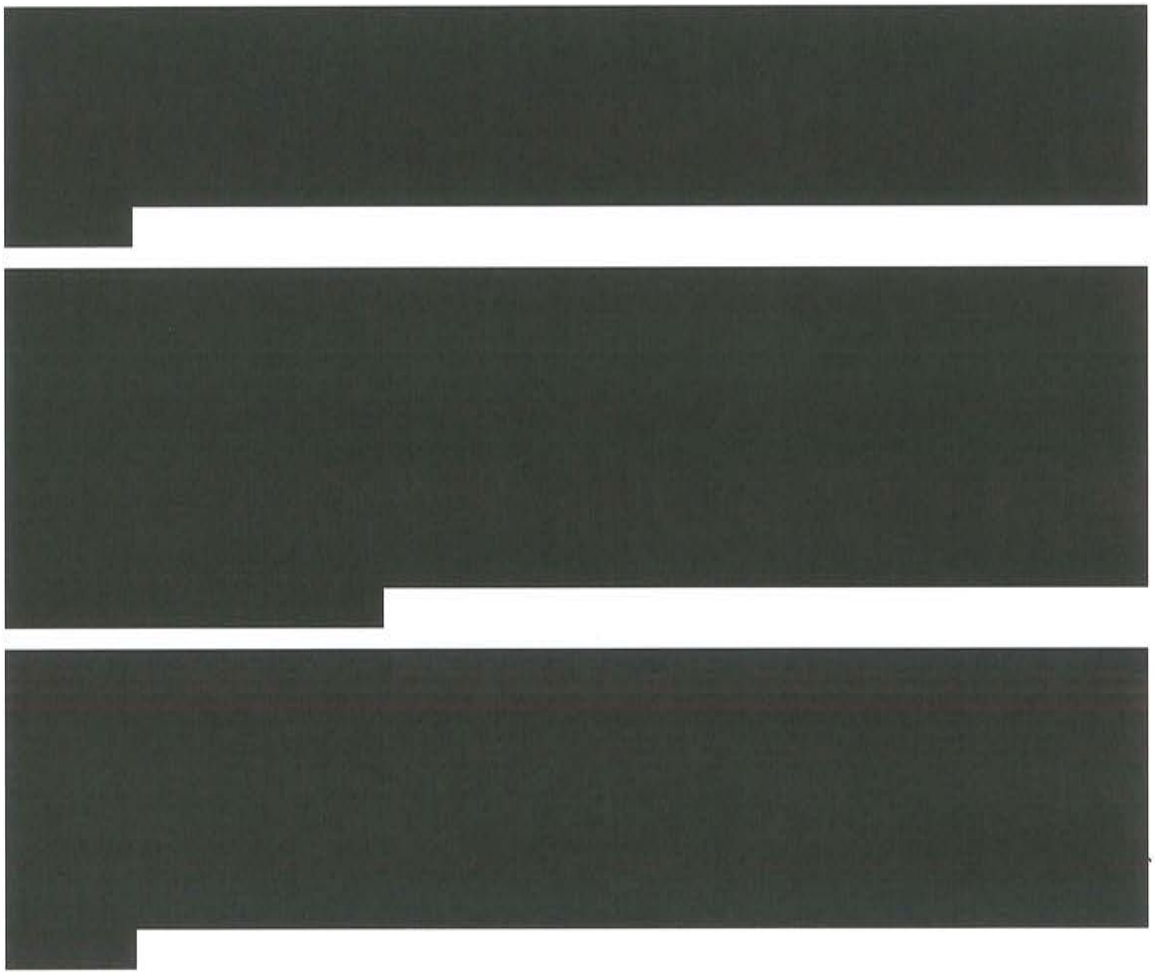
C.2.4 Right-of-Way & Land Acquisition Plan & Approach (public & private)

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 evaluate the project area for the presence of wetlands and streams 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: Northcentral and Northeast Region and Midwest Region (Version 2.0). Additionally, based upon previous conversations with the USACE Buffalo District and the Ohio Environmental Protection Agency (OEPA), PPL EU will be required to conduct qualitative wetland evaluations of each delineated wetland using the Ohio Environmental Protection Agency (Ohio EPA) Ohio Rapid Assessment Method for Wetlands, version 5.0, 2001 (ORAM). Streams in the project right-of-way will also need to be assessed by PPL EU using either the Ohio EPA Headwater Habitat Evaluation Index (HHEI) or Ohio EPA Qualitative Habitat Evaluation Index (QHEI) methodology.

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 solution site. Based on the April 2014 United States Fish and Wildlife Service (USFWS) list of federally listed species in Ohio, 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 Kirtland's warbler (Dendroica kirtlandii), endangered piping plover (Charadrius melodus), proposed threatened red knot (Calidris canutus rufa), candidate eastern massassauga (Sistrurus catenatus), threatened eastern prairie fringed orchid (Platanthera leucopheaea), and threatened lakeside daisy (Hymenoxys herbacea). In addition to the Federally listed species, ODNR has authority over state-listed species including approximately 56 species of mammals, 200 species of birds, 84 species of amphibians and reptiles, 170 species of fish, 100 species of mollusks, 20 species of crustaceans, and over 600 rare plant species. Typically, the vast majority of species concerns in Ohio 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 ODNR will indicate that potential bat summer habitat may be present. PPL EU will need to 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.

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. The Phase I archaeological field reconnaissance

will involve both visual pedestrian inspection of the ground surface and set-interval (15-meter, or 50-foot) shovel-testing within the limits of ground disturbance, in accordance with OHPO guidelines. The background GIS data collected through the route selection study process will be utilized based on the selected route and included in the Phase I report. Additionally, archaeological resources identified by the archaeological field reconnaissance will be submitted to the OHPO for inventory, and preliminarily assessed for National Registry of Historic Places (NRHP) eligibility. Architectural history evaluations may also be necessary. Geomorphological investigations are assumed unlikely due to the nature of the project and surrounding vicinity.

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. PPL EU can review the Public Areas Database of the United States (PADUS) to identify areas of concern as they pertain to public lands. Additional information on potential public lands in the area will be identified during the siting process.

State Permitting

Ohio Power Siting Board (OPSB) – Certificate of Environmental Compatibility and Public Need: Based on the acreage required, it appears likely that Avon substation expansion will be subject to OPSB Letter of Notification (LON) requirements. Based on the lengths and voltages of the proposed Davis Besse-Carlisle-Avon 345kV and Avon-Black River 138kV electric transmission lines, the projects will be subject to Certificate Application requirements under jurisdiction of the OPSB. Preparation of OPSB applications and LONS are a collaborative effort that effectively brings together elements of the environmental, cultural, technical, socio-economic and agency issues under a single application. Therefore, a complete OPSB Application or LON requires considerable technical information from the applicant. The OPSB rules are currently under review and are likely to be promulgated prior to initiation of this project. LONs qualify for accelerated, 90-day review. The current OPSB application process indicates a duration of approximately six to eight months. However, based on the lengths and landscapes of the projects, PPLE EU anticipates the process to extend to approximately one to two years, although public opposition can extend the process considerably.

OEPA – Construction Stormwater Permits: These projects will require permitting under the OEPA's General Permit Authorization for Stormwater Discharges Associated with Construction Activity under the National Pollutant Discharge Elimination System (General Permit). Coverage under the General Permit is required for construction activities that will result in the disturbance of one or more acres of land. Land disturbance activities requiring coverage under the General Permit are broadly defined and include "clearing, grading, excavating, grubbing and/or filling activities that disturb one or more acres of land." In order to obtain coverage under the General Permit, PPL EU will prepare a Stormwater Pollution Prevention Plan (SWP3) and a Notice of Intent (NOI) for submission to OEPA (including permit fee) at least 21 days prior to construction commencement, for each project.

The projects will likely require the clearing and preparation of construction access routes, as well as establishing areas required for staging, material storage, and for installation of the transmission lines. PPL EU does not anticipate disturbing land as part of the clearing activities for the overhead transmission line project routes. Preparation of the construction access routes will require clearing, grading and/or filling, and may also involve the installation of culverts. In addition, land disturbance activities are anticipated in material staging and pole construction areas. PPL EU assumes that no additional permanent access roads, defined as roads that will require the placement of "impervious materials" (i.e., final surface will be similar to existing surface), will be constructed as part of the projects. Under the provisions of the General Permit, post-construction water quality best management practices (BMPs) are required for areas that increase the amount of impervious surfaces. PPL EU also assumes that these post-construction BMPs will not be required that these can generally be avoided on transmission line projects.

In consideration of some of the current unknowns associated with the construction activities, PPL EU assumes the following general tasks necessary for obtaining coverage under the General Permit.

- Estimate Total Area of Disturbance: In order to prepare the NOI and identify the associated fee for each project, total acreage of disturbed area that is likely to meet the definition of construction activities provided above will need to be estimated. In the event that the construction means and methods are not fully established at the time of plan preparation, assumptions will need to be made regarding the limits of the construction that will require coverage under the General Permit. The assumed area of disturbance will be conservative and will allow for unanticipated conditions encountered during the actual construction activities.
- SWP3 Development: The SWP3 must be prepared in advance of the submission of the NOI. The SWP3 will be prepared in accordance with the requirements of the General Permit and will include, at a minimum, the following information for each project:

- Site Description (including maps)
- Total Area of Disturbance and Associated Runoff Calculations
- Proposed Schedule
- Names and Locations of Receiving Streams
- Description of BMPs and Proposed Structural Controls
- Description of Proposed Final Stabilization Activities
- Inspection and Log Forms

NOI Preparation: PPL EU will prepare the NOI form, for each project, for subsequent certification and submission.

In Ohio, OEPA review of the SWP3 is not required at a state level. However, many local jurisdictions (typically at a county level) require SWP3 review and often times have local requirements in addition to those of the General Permit. Local reviews are anticipated in Erie, Lorain, Ottawa, and Sandusky counties. These local reviews typically require additional coordination and may add approximately 30 days to the SWP3 development and approval timeline.

Ohio Department of Transportation (ODOT) Permits: PPL EU will need to coordinate with ODOT to determine the permitting requirements for temporary and permanent construction entrances. These permits vary significantly by jurisdiction and typically include approvals for utility line to span over a state highway and access road driveway permits. Similar local permits are also typically necessary when spanning or for construction access along local roads.

Special Flood Hazard Area (Floodplain) Permits: In Ohio, permits for construction within Special Flood Hazard Areas (i.e., floodplains) are delegated to the counties and are typically issued by the Local Floodplain Coordinator. The specific activities that "trigger" the requirement for a floodplain permit vary significantly by jurisdiction and local ordinance. In some cases, these permits are required for construction of a pole and/or temporary access road within a floodplain area. More often, these activities are considered de minimis and no permit is required. In cases where a permit is required, the effort and timeline required to obtain a permit is relatively minimal.

Federal Permitting

United States Army Corps of Engineers (USACE) – Section 404 Clean Water Act: PPL EU will need to coordinate with the USACE to determine the level of federal permitting required for the project. The USACE has jurisdiction over temporary or permanent project activities that place fill materials into waters of the U.S., including wetlands. Temporary and permanent impacts to wetlands and streams trigger permitting requirements under Section 404 of the Clean Water Act. The potential placement of fill

material in waters of the U.S. for the utility line Right-of Way, tower foundations and construction access can be permitted under Nationwide Permit No. 12 (NWP 12), provided that 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.

PPL EU anticipates coverage of the project under NWP 12. However, projects that do not meet the conditions of the NWP 12 require an Individual Permit from the USACE, and are not authorized under the Nationwide Permit. 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. It is assumed that expansion to Avon substation can meet the NWP 12 conditions, but an Individual Permit may be necessary if impacts exceed the NWP thresholds. Conducting wetland delineation before finalizing land purchase is suggested.

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. Section 10 Rivers within the project vicinity include the Black, Huron, Portage, Sandusky, and Vermillion Rivers. Section 10 permits are expected to be necessary. Crossing at locations adjacent to existing transmission lines typically streamline the Section 10 permit process.

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.

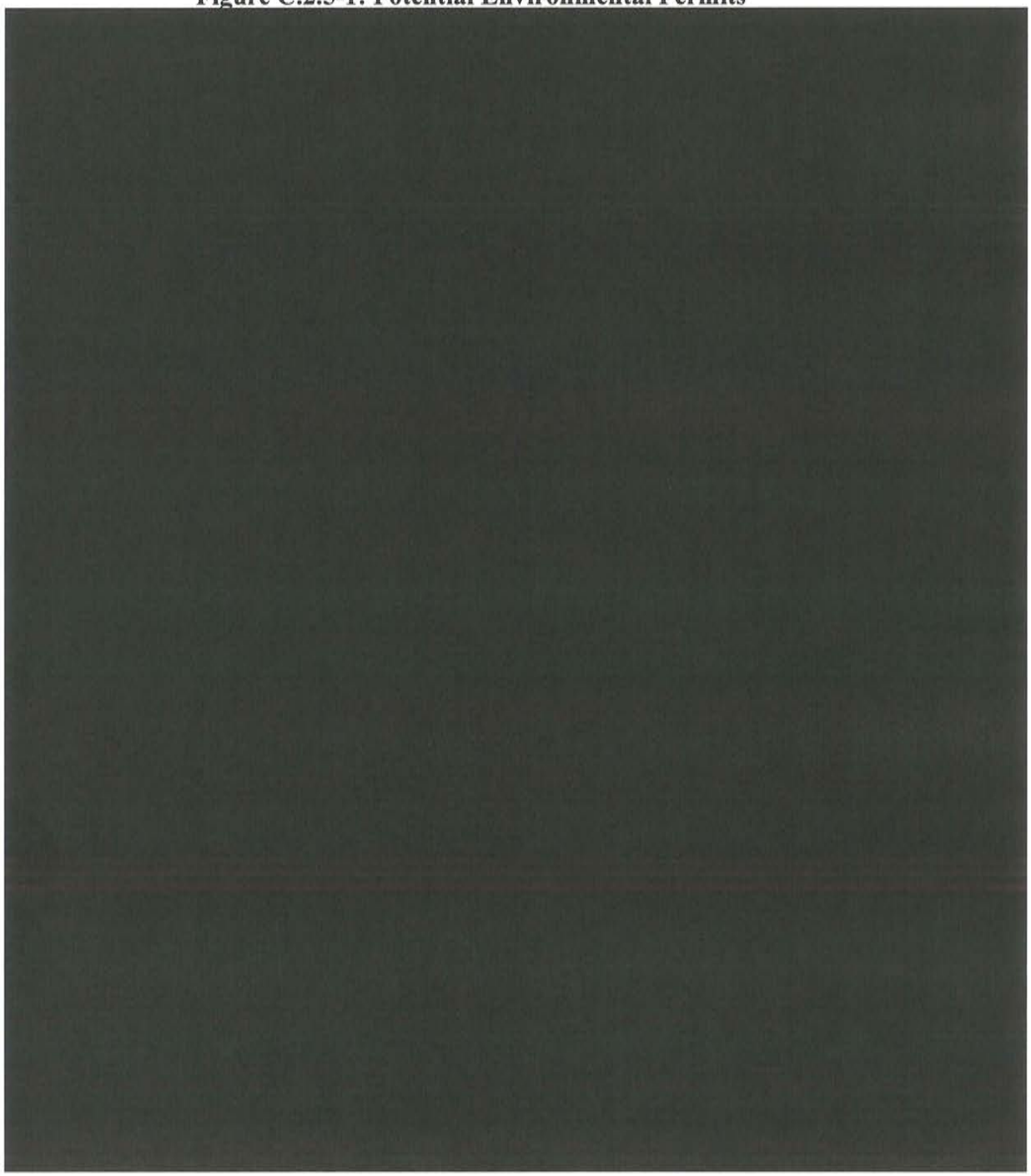
Federal Aviation Administration (FAA) – Obstruction Determination: As the project involves the installation of new poles, PPL EU will need to coordinate with the FAA regarding potential obstruction to air travel, which will involve completing online forms available on the FAA's Notice Criteria Tool website. 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 Davis Besse-Carlisle-Avon 345kV

and Avon-Black River 138kV projects are listed in Figure C2.5-1 below. It should be noted that building permits for utility corridors are often exempted by local municipalities. Local building permits requirements from specific municipalities will be reviewed when the project moves to its development phase.

Figure C.2.5-1: 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 a challenge to quantify 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]

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

C.2.6 Public Opposition Review

Public opposition to the line project components is anticipated to be high. These routes traverse through agricultural and forested lands that currently have few transmission line corridors. Landowner issues would be based on the need for new right-of-way easements and the construction of a new right-of-way on their property. Some sections of the routes would be developed in forested areas, but most would be located in open agricultural fields. [redacted]

[redacted]

C.3 Project Component Cost Estimates

The estimated project cost is $279.5M and should be interpreted as a budget estimate. The bottom up development and top down verification provides an [redacted] confidence level in the project estimate based on the baseline scope of work and assumptions.

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

[redacted]

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 C3.1-1 below.

Figure C.3.1-1: 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 and Equipment 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:

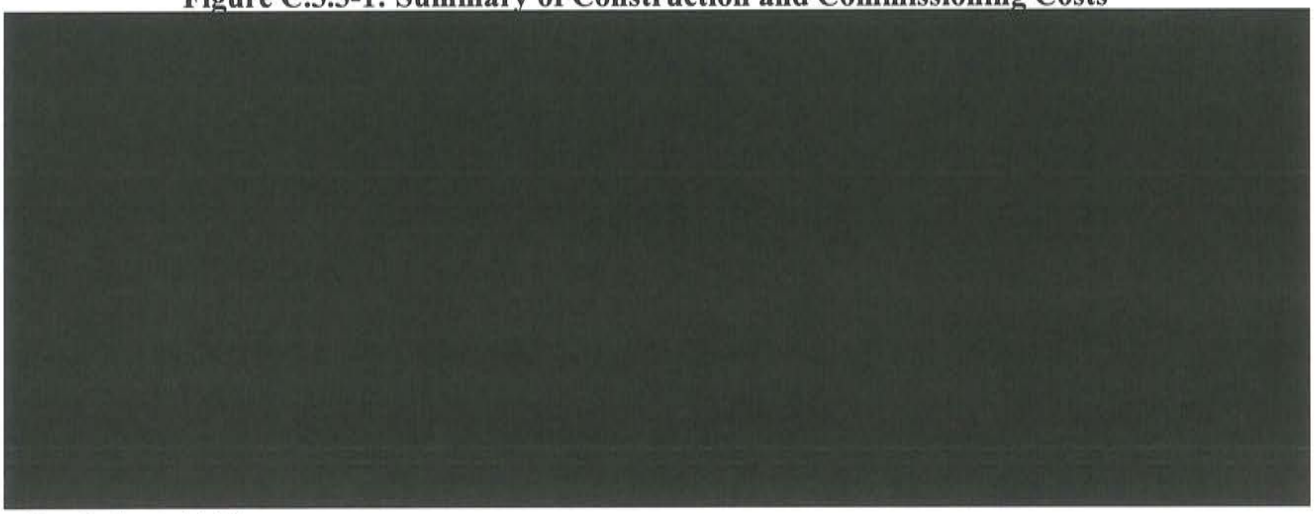
- Below Grade Line Construction: *Foundations for the steel structures including rebar and anchor bolts*
- Transmission Line Structures : *Erection of the steel structures with associated insulators and conductor attachments*
- Conductor Installation: *Stringing, Clipping and sagging the conductor*
- 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: S*teel 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

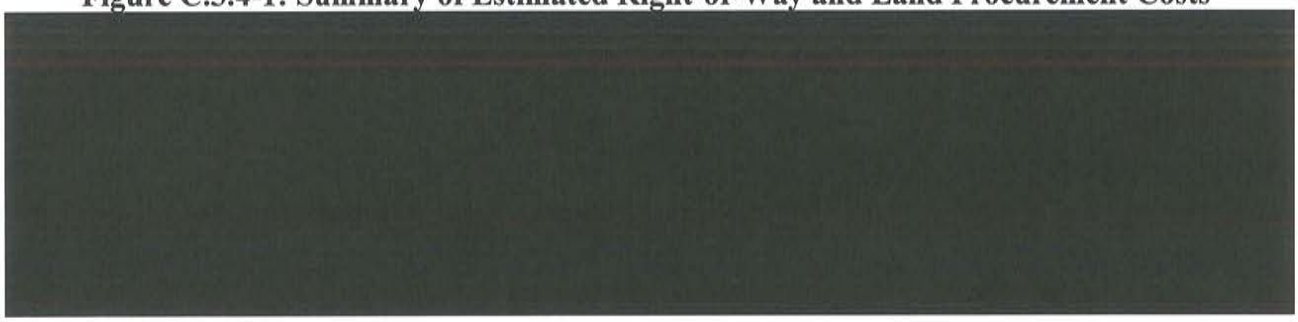
C.3.4 Right-of-Way and Land Procurement Costs

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



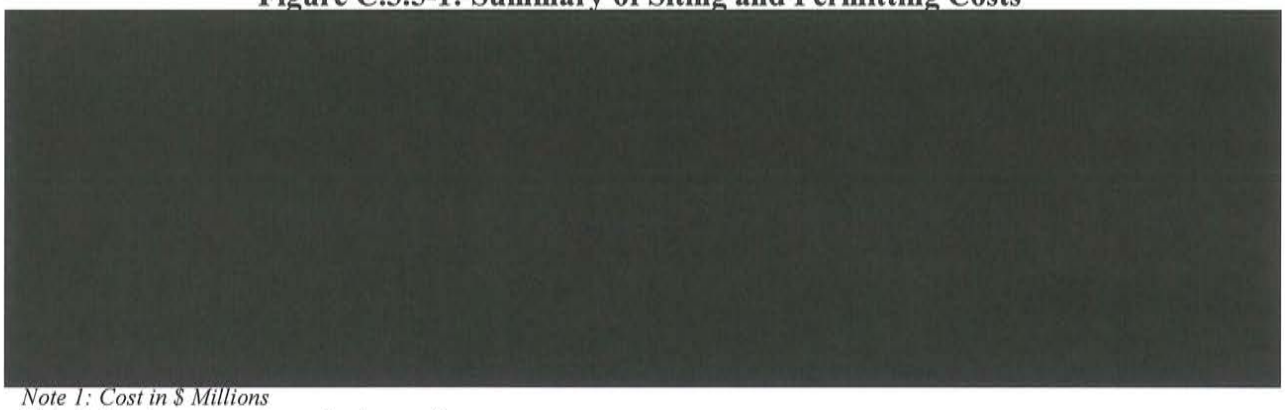
Note 1: Cost in $ Millions
Note 2: Numbers may not sum due to rounding

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 and 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 [redacted] for each year to account for the cost to borrow capital. Figure C3-.87-1 outlines the additional costs adder for the proposed project for these categories.

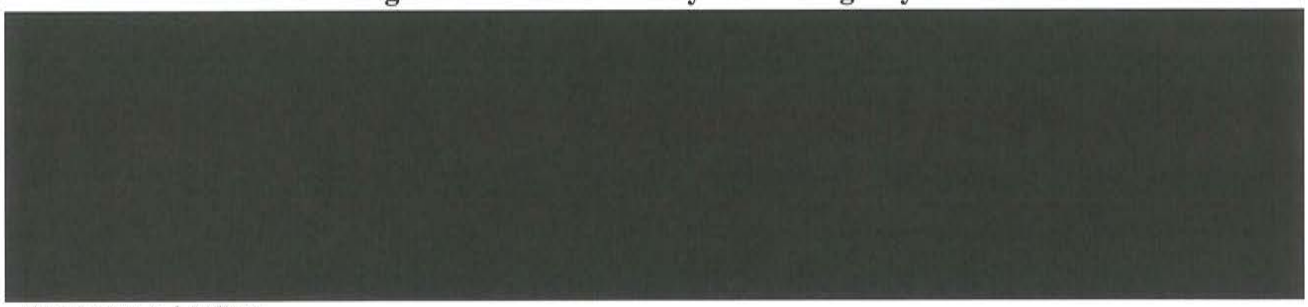
Figure C.3.7-1: Summary of Other Costs Adders

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



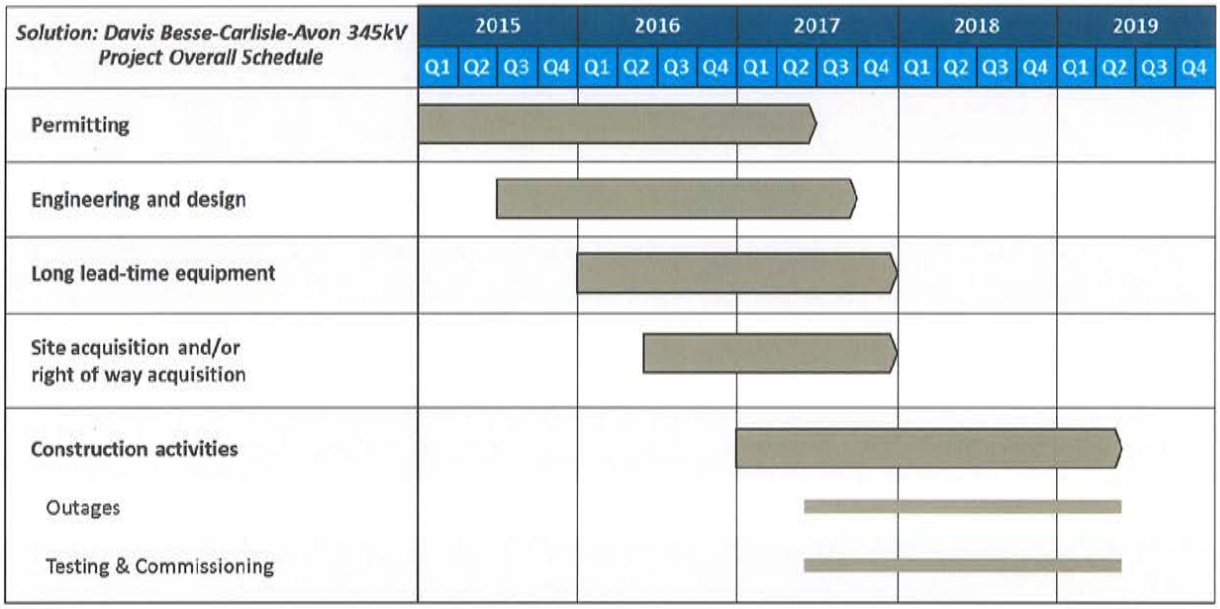
Note 1: Cost in $ Millions
Note 2: Numbers may not sum due to rounding

C.4 Schedule

C.4.1 Overall Project Schedule

A 5-year project schedule is required to complete the proposed project: 36 months for planning & design, right-of-way, siting, & permitting activities and long lead time procurement, and another 17 months for construction and commissioning. An integrated project schedule is provided in Figure C4.1-1.

Figure C.4.1-1: North Central Ohio 345kV & 138kV Integrated Schedule



Successful completion of the Davis Besse to Carlisle 345kV, Carlisle to Avon 345kV and Avon to Black River 138kV line addition will require coordination between engineering, right-of-way / land acquisition, long-lead time equipment procurement, CPCN / permitting, and construction activities.

Permitting requirements

This schedule is based on a preliminary understanding of the topographical and ownership variances in the area. While 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 36 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 27 months of Engineering. Key activities include identifying pole locations, conducting core borings, finalizing steel pole orders, designing the foundation, and 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 Right-of-Way/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 [redacted]

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

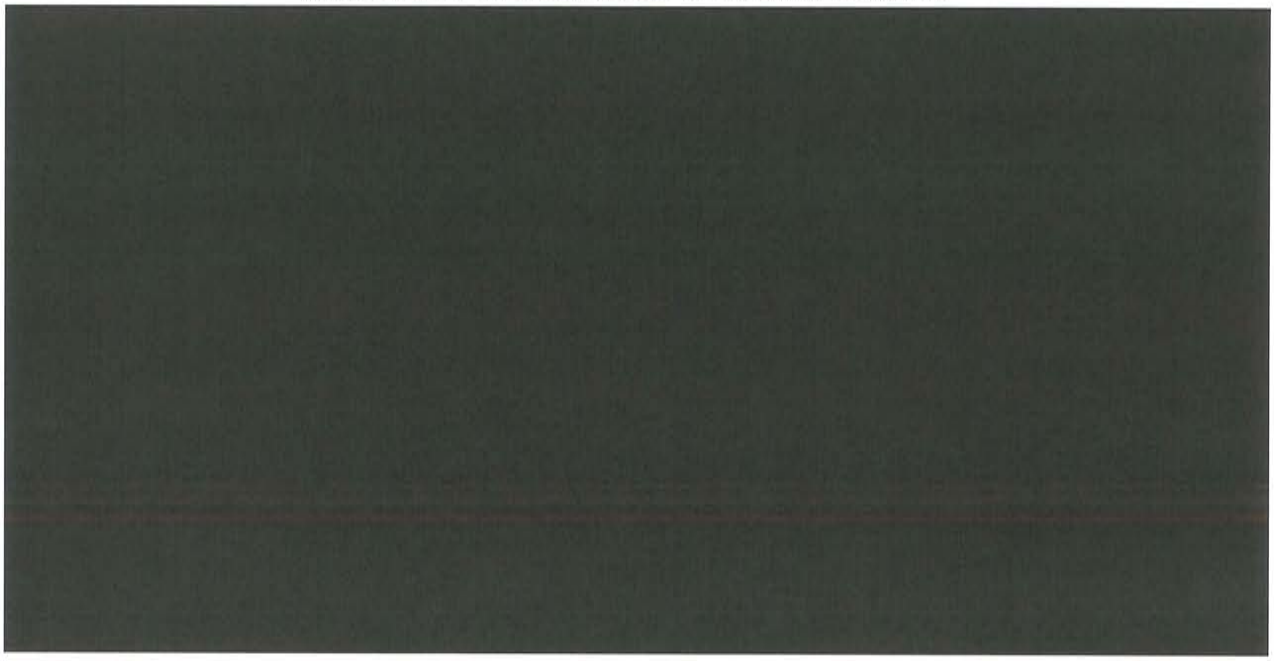
The substation and transmission line schedule includes standard construction activities:

- Site Clearing/Preparation/Delivery: Clearing / grubbing preparation, 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 Davis Besse Substation Schedule

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

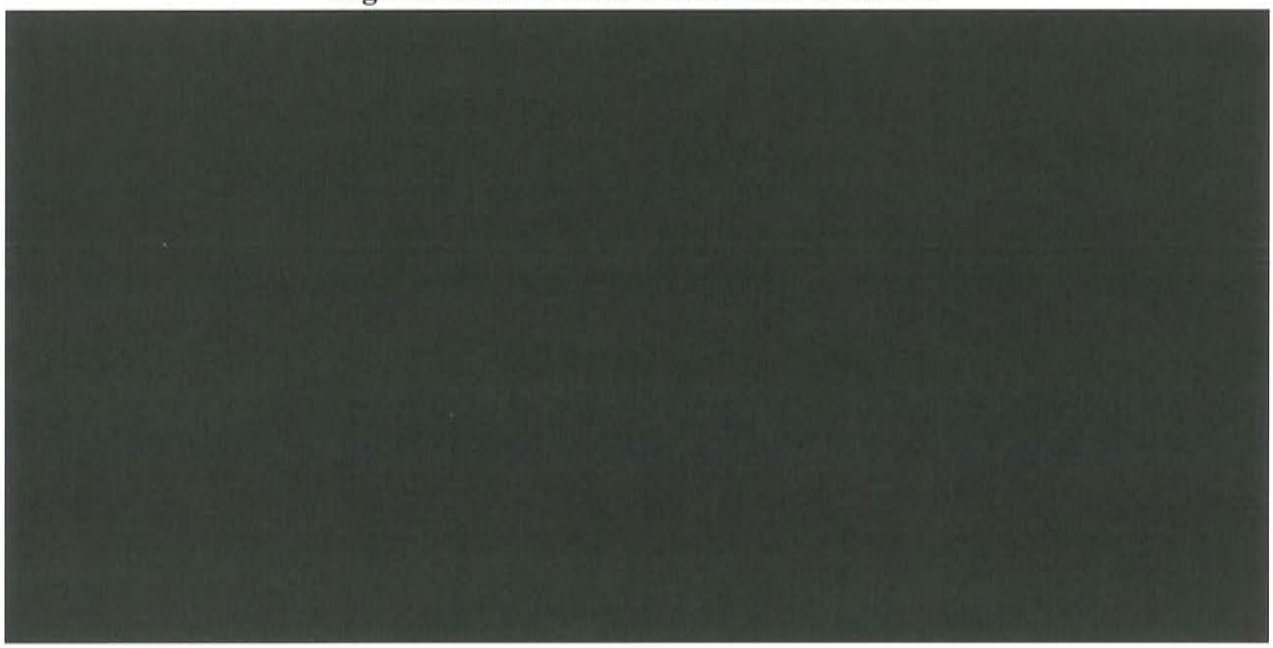
Figure C.4.2-1: Davis Besse Substation Schedule



C.4.3 Carlisle Substation Schedule

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

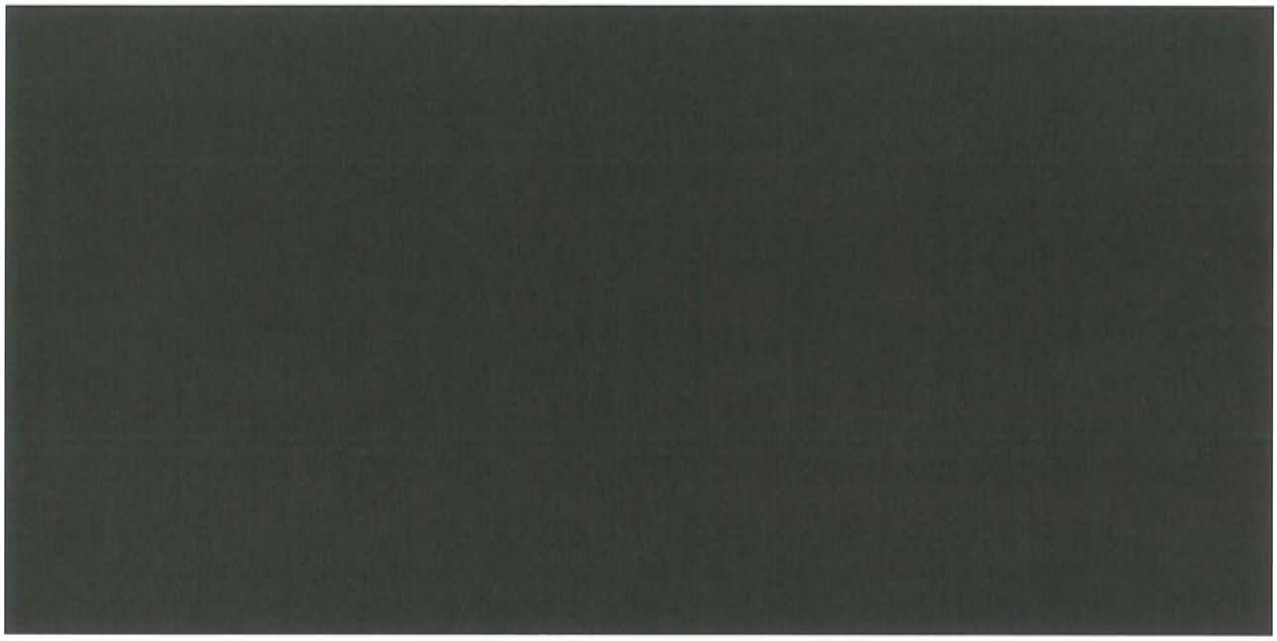
Figure C.4.3-1: Carlisle Substation Schedule



C.4.4 Avon Substation Schedule

The Avon substation expansion will be developed constructed and commissioned as described in the schedule below. The schedule incorporates both the 345kV and 138kV substation yard expansion as both components will be done at the same time.

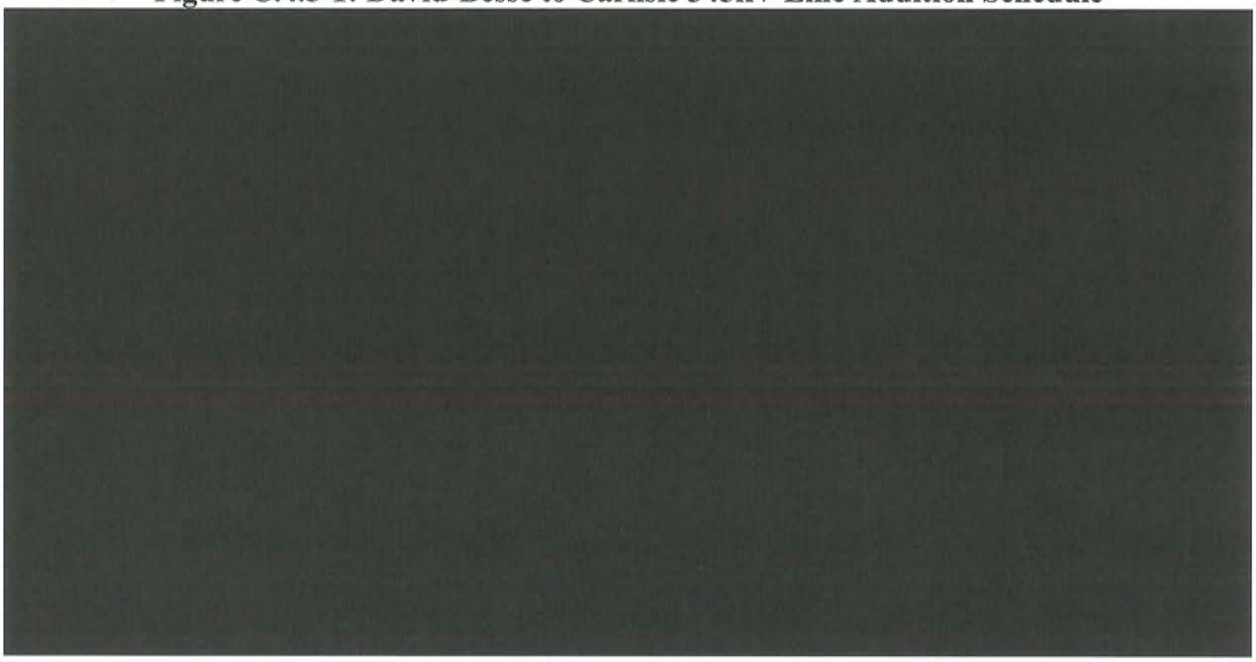
Figure C.4.4-1: Avon Substation Schedule



C.4.5 Davis-Besse to Carlisle 345kV Line Addition Schedule

The 345kV line addition will be developed constructed and commissioned as described in the schedule below:

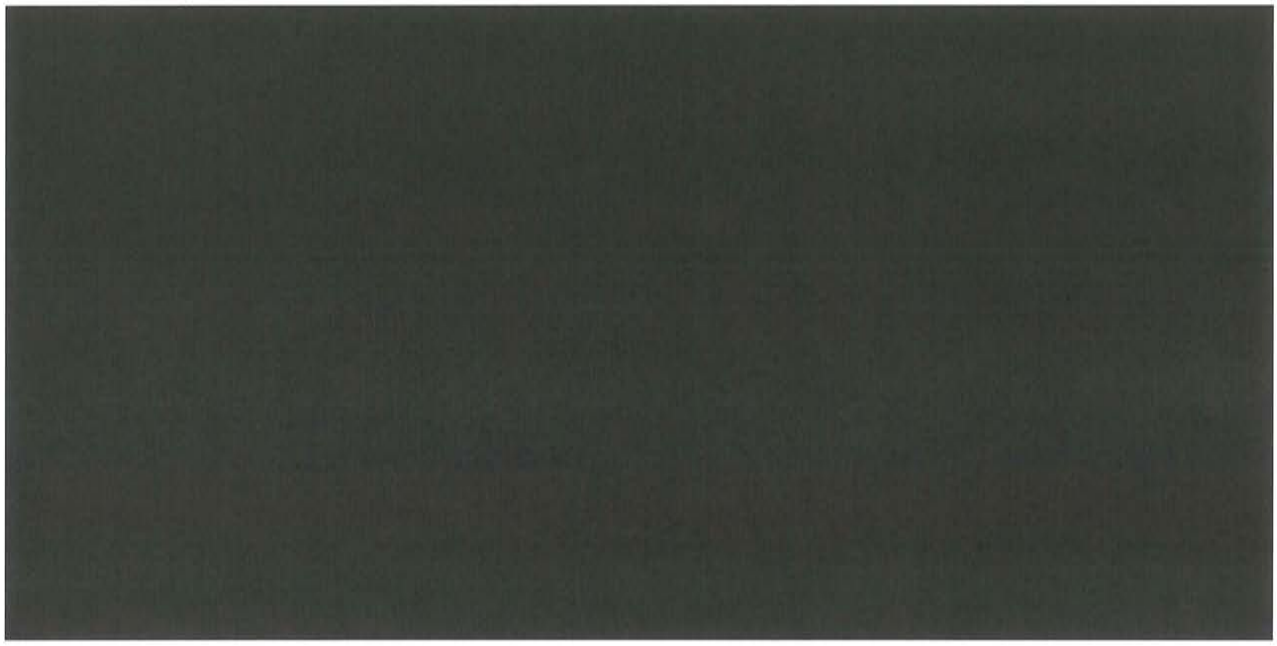
Figure C.4.5-1: David-Besse to Carlisle 345kV Line Addition Schedule



C.4.6 Carlisle to Avon 345kV Line Addition Schedule

The 345kV line addition will be developed constructed and commissioned as described in the schedule below:

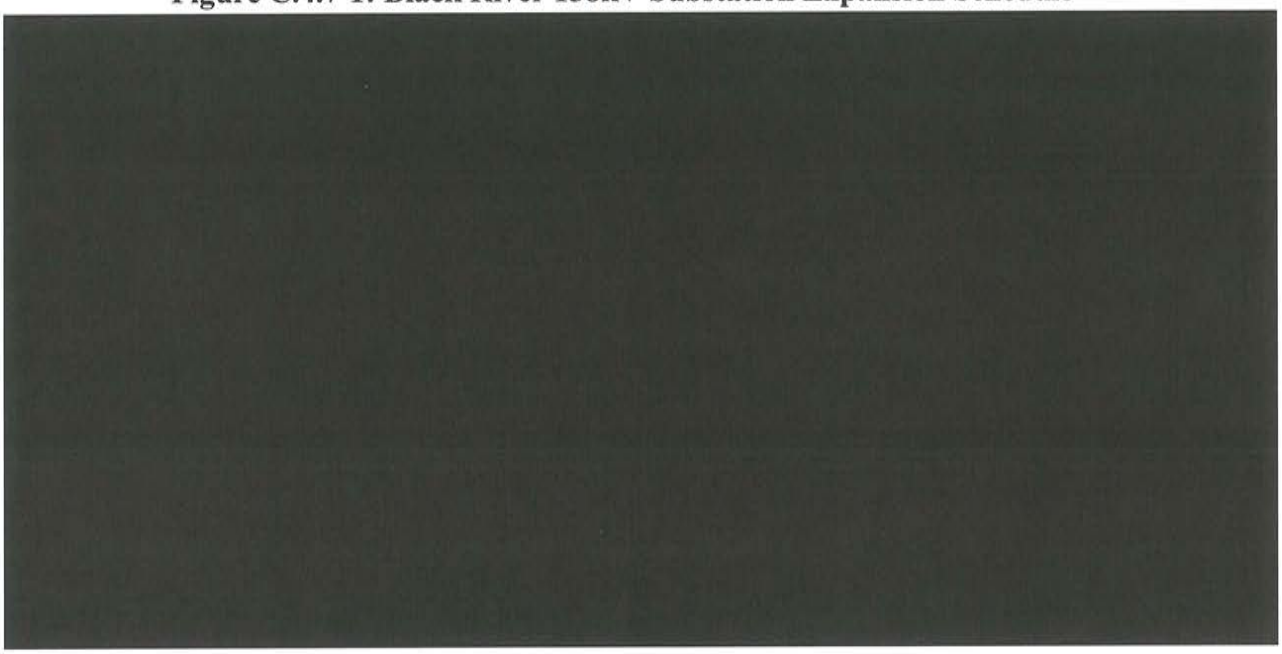
Figure C.4.6-1: Davis-Besse to Carlisle 345kV Line Addition Schedule



C.4.7 Black River Substation Schedule

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

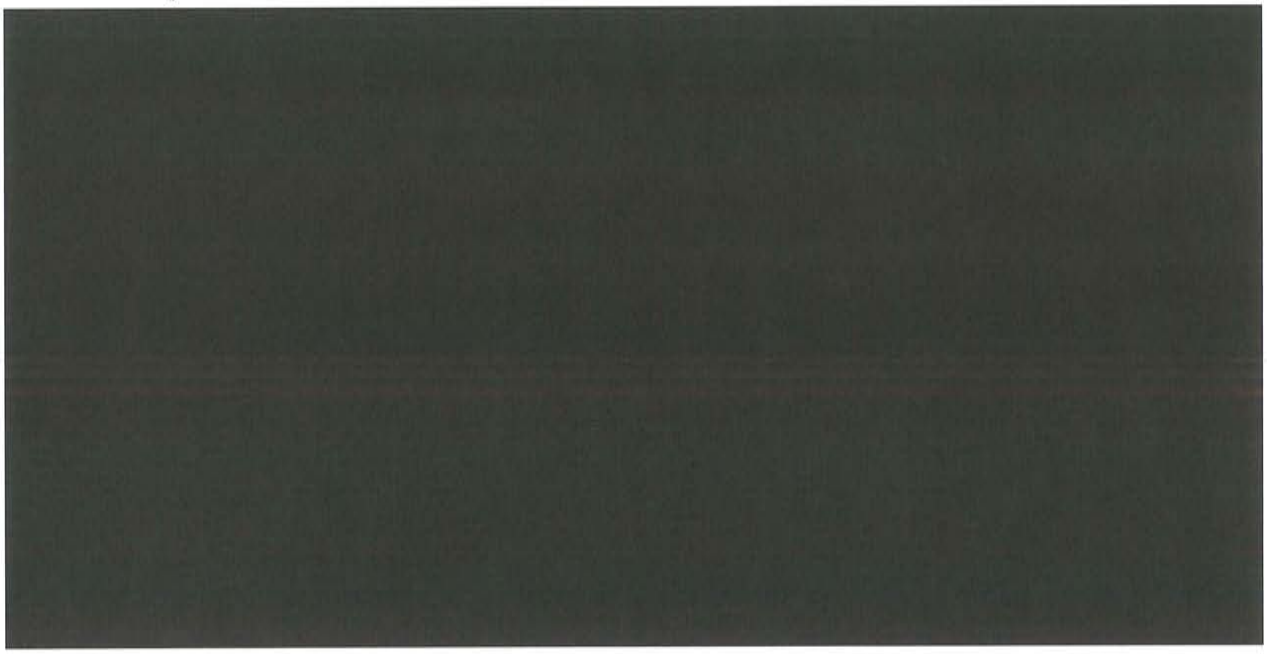
Figure C.4.7-1: Black River 138kV Substation Expansion Schedule



C.4.8 Avon to Black River 138kV Line Addition Schedule

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

Figure C.4.8-1: Avon to Black River 138kV Transmission Line Schedule



C.5 On-going Transmission Facility Items

C.5.1 Operational Plan

Operations Plan Overview

These facilities will be operated by PPL EU at the direction of PJM and controlled and maintained by PPL EU consistent with the current operations and maintenance practices used by PPL EU. PPL EU's Transmission Control Center (TCC) is tasked with the responsibility of monitoring and operating a reliable transmission grid as defined by PJM, RFC and NERC.

Transmission Control Center

In order to operate and maintain the transmission grid reliably, PPL EU manages a Transmission Control Center (TCC) 365 days, 24 hours a day located in the [redacted] PPL EU has operated a Transmission Control Center since its inception in 1926 and was an original PJM member.

Our current NERC/RF certified control center is a secure, state-of-the-art facility with redundant data and communication. The Disaster Recovery Site is an independent facility with similar capability and both sites meet all RFC and NERC criteria. The control center adheres to the guiding principles of safety, reliability and production in that order.

Transmission Control Center Operations

Core responsibilities of the TCC include monitoring and operating the Bulk Electric System and 69kV transmission systems in the PPL EU footprint, directing the application of the PPL EU Energy Control Process (Permit and Tag), and analyzing load flow and contingency analysis studies.

The Operations engineering section resolves operational discrepancies with PJM when load flow models provide inconsistent results and stability studies are required. A key differentiating attribute of the TCC that sets PPL EU apart from other utilities is its experience with nuclear generation and managing complex interfaces safely and reliably. its tight linkage and coordination with the Susquehanna nuclear plant, including interface documents and maintenance and outage coordination meetings. This interface demonstrates PPL EU's ability to manage significant and complex interfaces safely and reliably.

Outage Requests

In addition to real time operations, PPL EU develops a construction and maintenance outage plan. TCC Planning processes request to upgrade transmission facilities and translate those to equipment outages using the PJM outage criteria timelines. The TCC effectively 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, eliminating volatility in the work portfolio.

Employee Qualifications

TCC employees seek continuous improvement in technologies and processes, are trained in all operator tasks, and embrace compliance as a measure of our effectiveness. PPL EU TCC follows best-in-class training practices, which increases the effectiveness of the organization, and creates a distinct advantage when dealing with adverse conditions. All Transmission Control Center employees are trained within the TCC by NERC certified trainers and they receive NERC, PJM Transmission Operator, PJM Generation, and PPL EU training certifications. In addition, PPL EU owns an internal simulator that is used for training.

TCC operators have broad experiences across multiple areas of the control center and are well versed on the uses of security-analysis tools. As a result of the training, the operators are all able to take action when necessary and can perform basic trouble shooting on advanced systems. All team members at the TCC participate in system restoration drills, and act as liaisons between PPL EU and PJM for information dissemination. All operators are coached and trained in system restoration drill requirements.

Significant Operating Response Team

The Significant Operating Response Team (SORT) is a joint effort between the Transmission Operations, Transmission Planning, and Engineering departments, which include Substation and Relay Engineering, Protection Analysis, Transmission Engineering, T&S Maintenance Engineering, and Relay Test. This group of engineers is on-call to address any electric system event that may occur. The team is also responsible for conducting root cause investigations. The SORT and subsequent root-cause analysis allows for PPL EU to successfully translate lessons learned into success for future transmission projects.

C.5.2 Maintenance Plan

PPL EU Transmission Maintenance Group is responsible for the transmission line preventative 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. The T&S Maintenance Engineering – Transmission Maintenance Group reports to the Manager – T&S Maintenance which reports directly to the Director – Engineering. 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.

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.

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.

C.6 Assumptions

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

Figure C6-1: Summary of Major Assumptions

	Key Assumptions
Transmission Design	• 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	• 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	• 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	• 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	• 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
Permitting / Environmental	• 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
Financial	[redacted]
Operation & Maintenance	• 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