PPL Load Addition Proposal: Keystone - Susquehanna 500 kV Double Circuit

General Information

Proposing entity name	Confidential Information
Does the entity who is submitting this proposal intend to be the Designated Entity for this proposed project?	Confidential Information
Company proposal ID	Confidential Information
PJM Proposal ID	826
Project title	PPL Load Addition Proposal: Keystone - Susquehanna 500 kV Double Circuit
Project description	Construct a new double circuit 500 kV line from Keystone Substation in MAIT-PN to Susquehanna Substation in PPL. Expand Keystone and Susquehanna substations to accommodate the two new line terminals. Add an additional 500/230 kV transformer at Susquehanna Substation. Upgrade the following circuits to support this plan. Terminal equipment on South Bend - Keystone 500 kV Line, terminal equipment on Brighton (Exelon) - Doubs 500 kV Line, rebuild the East Towanda - Canyon - North Meshoppen 230 kV Line, rebuild the Carlisle Pike - Gardners 115 kV Line, and replace the #3 230/115 kV transformer at North Meshoppen Substation. Refer to Executive Abstract attached to Market Efficiency simulation modeling files section.
Email	Confidential Information
Project in-service date	06/2030
Tie-line impact	Yes
Interregional project	No
Is the proposer offering a binding cap on capital costs?	Yes
Additional benefits	Confidential Information

Project Components

1. Keystone Substation Expansion (MAIT)

2. Susquehanna Substation Expansion

3. South Bend Substation Terminal Upgrade

4. Keystone Substation: Upgrade the South Bend 500kV line terminal

5. Brighton Substation: Upgrade the Doubs 500kV line terminal

6. East Towanda Substation: Upgrade the Canyon 230 kV line terminal

7. Canyon Substation: Upgrade the East Towanda and North Meshoppen 230 kV line terminals

8. North Meshoppen Substation: Upgrade the Canyon 230 kV line terminal

9. North Meshoppen Substation: Replace the #3 230/115 kV Transformer

10. East Towanda - Canyon - North Meshoppen 230 kV Line

11. Carlisle Pike - Roxbury 115 kV Line Rebuild

12. Keystone - Susquehanna 500 kV Line #1: Construct new Line

13. Keystone - Susquehanna 500 kV Line #2: Construct new Line

14. Carlisle Pike Substation: Upgrade the Roxbury 115 kV line terminal

15. Roxbury Substation: Upgrade the Carlisle Pike 115kV line terminal

Substation Upgrade Component

Component title	Keystone Substation Expansion (MAIT)
Project description	Confidential Information
Substation name	Keystone Substation
Substation zone	PENELEC
Substation upgrade scope	-Add a new breaker and a new string with 2 new breakers at the 500 kV breaker-and-a-half switchyard -Connect the new 500 kV double-circuit lines to the new terminals -Add disconnect switches with SCADA to the line exits at the substation -Upgrade terminal equipment as necessary to make the lines as the limiting element in circuit ratings -Replace the relaying panels -Replace the limiting circuit breaker -Replace two wave traps with 5000 A units or convert to fiber. -Replace two 3000 A disconnects with 4000 A units -Replace the 2000 SCCIR -Replace the 4 inch pipe

Transformer Information

Name	Capacity (MVA)

Transformer	na		na
	High Side	Low Side	Tertiary
Voltage (kV)	na	na	na
New equipment description	See substation upgrade scope above		
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.		
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.		
Construction responsibility	Confidential Information		
Benefits/Comments	Confidential Information		
Component Cost Details - In Current Year $			
Engineering & design	Confidential Information		
Permitting / routing / siting	Confidential Information		
ROW / land acquisition	Confidential Information		
Materials & equipment	Confidential Information		
Construction & commissioning	Confidential Information		
Construction management	Confidential Information		
Overheads & miscellaneous costs	Confidential Information		
Contingency	Confidential Information		
Total component cost	$9,772,427.45		
Component cost (in-service year)	$10,934,746.00		

Substation Upgrade Component

Component title	Susquehanna Substation Expansion

Project description	Confidential Information
Substation name	Susquehanna Substation (PPL)
Substation zone	PPL
Substation upgrade scope	Add two new breakers to the 500 kV breaker-and-a-half yard Connect the new 500 kV double-circuit lines to the new terminals Add a new breaker to the 230 kV breaker-and-a-half yard Connect a new 500/230 kV transformer to this new position Terminate the 500 kV side of the transformer at the North Bus of the 500 kV station Add disconnect switches with SCADA to the line exits at the 500 kV and 230 kV substations Upgrade terminal equipment as necessary to make the lines as the limiting element in circuit ratings

Transformer Information

	Name	Capacity (MVA)
Transformer	Susquehanna #2 500/230 kV	420

	High Side	Low Side	Tertiary
Voltage (kV)	500	230	na

New equipment description	See substation upgrade scope above
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.
Construction responsibility	Confidential Information
Benefits/Comments	Confidential Information
Component Cost Details - In Current Year $	
Engineering & design	Confidential Information
Permitting / routing / siting	Confidential Information
ROW / land acquisition	Confidential Information
Materials & equipment	Confidential Information

Construction & commissioning	Confidential Information
Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$38,953,280.04
Component cost (in-service year)	$43,586,363.00

Substation Upgrade Component

Component title	South Bend Substation Terminal Upgrade
Project description	Confidential Information
Substation name	South Bend Substation
Substation zone	APS
Substation upgrade scope	-Replace the relaying panels -Replace the 4000 A wave trap with a 5000 A unit -Replace the limiting 2032 SCCIR conductor

Transformer Information

	Name	Capacity (MVA)
Transformer	na	na

	High Side	Low Side	Tertiary
Voltage (kV)	na	na	na

New equipment description	See substation upgrade scope above
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.
Construction responsibility	Confidential Information

Benefits/Comments	Confidential Information
Component Cost Details - In Current Year $	
Engineering & design	Confidential Information
Permitting / routing / siting	Confidential Information
ROW / land acquisition	Confidential Information
Materials & equipment	Confidential Information
Construction & commissioning	Confidential Information
Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$759,009.36
Component cost (in-service year)	$849,286.00

Substation Upgrade Component

Component title	Keystone Substation: Upgrade the South Bend 500kV line terminal
Project description	Confidential Information
Substation name	Keystone Substation
Substation zone	PENELEC
Substation upgrade scope	-Replace the relaying panels -Replace the limiting circuit breaker -Replace two wave traps with 5000 A units. -Replace two 3000 A disconnects with 4000 A units -Replace the 2000 SCCIR -Replace the 4 inch pipe

Transformer Information

Name	Capacity (MVA)

Transformer	na		na
	High Side	Low Side	Tertiary
Voltage (kV)	na	na	na
New equipment description	See substation upgrade scope above		
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.		
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.		
Construction responsibility	Confidential Information		
Benefits/Comments	Confidential Information		
Component Cost Details - In Current Year $			
Engineering & design	Confidential Information		
Permitting / routing / siting	Confidential Information		
ROW / land acquisition	Confidential Information		
Materials & equipment	Confidential Information		
Construction & commissioning	Confidential Information		
Construction management	Confidential Information		
Overheads & miscellaneous costs	Confidential Information		
Contingency	Confidential Information		
Total component cost	$759,009.36		
Component cost (in-service year)	$849,286.00		

Substation Upgrade Component

Component title	Brighton Substation: Upgrade the Doubs 500kV line terminal

Project description	Confidential Information
Substation name	Brighton Substation
Substation zone	PEPCO
Substation upgrade scope	Upgrade the Doubs 500 kV line terminal at Brighton Substation (PEPCO) replace the breaker, disconnect switches, relaying, and terminal equipment to eliminate the thermal constraints.

Transformer Information

	Name	Capacity (MVA)
Transformer	na	na

	High Side	Low Side	Tertiary
Voltage (kV)	na	na	na

New equipment description	See substation upgrade scope above
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.
Construction responsibility	Confidential Information
Benefits/Comments	Confidential Information
Component Cost Details - In Current Year $	
Engineering & design	Confidential Information
Permitting / routing / siting	Confidential Information
ROW / land acquisition	Confidential Information
Materials & equipment	Confidential Information
Construction & commissioning	Confidential Information
Construction management	Confidential Information

Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$2,967,036.57
Component cost (in-service year)	$3,319,934.00

Substation Upgrade Component

Component title	East Towanda Substation: Upgrade the Canyon 230 kV line terminal
Project description	Confidential Information
Substation name	East Towanda Substation
Substation zone	PENELEC
Substation upgrade scope	At East Towanda Substation: -Replace the wave trap with a 3000 A unit -Replace the limiting substation conductor

Transformer Information

	Name	Capacity (MVA)
Transformer	na	na

	High Side	Low Side	Tertiary
Voltage (kV)	na	na	na

New equipment description	See substation upgrade scope above
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.
Construction responsibility	Confidential Information
Benefits/Comments	Confidential Information

Component Cost Details - In Current Year $

Engineering & design	Confidential Information
Permitting / routing / siting	Confidential Information
ROW / land acquisition	Confidential Information
Materials & equipment	Confidential Information
Construction & commissioning	Confidential Information
Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$.00
Component cost (in-service year)	$.00

Substation Upgrade Component

Component title	Canyon Substation: Upgrade the East Towanda and North Meshoppen 230 kV line terminals
Project description	Confidential Information
Substation name	Canyon Substation
Substation zone	PENELEC
Substation upgrade scope	At Canyon Substation: Upgrade the East Towanda and North Meshoppen 230 kV line terminals -Replace the 1200 A disconnects with 2000 A units on both line terminals -Replace the 1033 ACSR conductor

Transformer Information

	Name	Capacity (MVA)
Transformer	na	na

	High Side	Low Side	Tertiary
Voltage (kV)	na	na	na
New equipment description	See substation upgrade scope above		
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.		
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.		
Construction responsibility	Confidential Information		
Benefits/Comments	Confidential Information		
Component Cost Details - In Current Year $			
Engineering & design	Confidential Information		
Permitting / routing / siting	Confidential Information		
ROW / land acquisition	Confidential Information		
Materials & equipment	Confidential Information		
Construction & commissioning	Confidential Information		
Construction management	Confidential Information		
Overheads & miscellaneous costs	Confidential Information		
Contingency	Confidential Information		
Total component cost	$.00		
Component cost (in-service year)	$.00		

Substation Upgrade Component

Component title	North Meshoppen Substation: Upgrade the Canyon 230 kV line terminal
Project description	Confidential Information

Substation name	North Meshoppen Substation
Substation zone	PENELEC
Substation upgrade scope	North Meshoppen Substation: Upgrade the Canyon 230 kV line terminal -Replace the wave trap with a 3000 A unit -Replace the limiting substation conductor -Adjust Relay Settings

Transformer Information

	Name	Capacity (MVA)
Transformer	na	na

	High Side	Low Side	Tertiary
Voltage (kV)	na	na	na

New equipment description	See substation upgrade scope above
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.
Construction responsibility	Confidential Information
Benefits/Comments	Confidential Information
Component Cost Details - In Current Year $	
Engineering & design	Confidential Information
Permitting / routing / siting	Confidential Information
ROW / land acquisition	Confidential Information
Materials & equipment	Confidential Information
Construction & commissioning	Confidential Information
Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information

Contingency	Confidential Information
Total component cost	$.00
Component cost (in-service year)	$.00

Substation Upgrade Component

Component title	North Meshoppen Substation: Replace the #3 230/115 kV Transformer
Project description	Confidential Information
Substation name	North Meshoppen Substation
Substation zone	PENELEC
Substation upgrade scope	-Replace the #3 230/115 kV transformer with a new 375 MVA transformer.

Transformer Information

	Name	Capacity (MVA)
Transformer	North Meshoppen #3	375

	High Side	Low Side	Tertiary
Voltage (kV)	230	115	na

New equipment description	See substation upgrade scope above
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.
Construction responsibility	Confidential Information
Benefits/Comments	Confidential Information
Component Cost Details - In Current Year $	
Engineering & design	Confidential Information

Permitting / routing / siting	Confidential Information
ROW / land acquisition	Confidential Information
Materials & equipment	Confidential Information
Construction & commissioning	Confidential Information
Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$4,692,057.81
Component cost (in-service year)	$5,250,129.00

Transmission Line Upgrade Component

Component title	East Towanda - Canyon - North Meshoppen 230 kV Line
Project description	Confidential Information
Impacted transmission line	East Towanda - Canyon - North Meshoppen 230 kV Line
Point A	East Towanda Substation
Point B	Canyon Substation
Point C	North Meshoppen Substation
Terrain description	This line traverses several mountain ranges with their peaks, valleys, and associated water crossings. The line already exists and is planned to be primarily rebuilt in the existing right of way, which should assist with the constructability aspects of this line.
Existing Line Physical Characteristics	
Operating voltage	230
Conductor size and type	1033 ACSR 54/7

Hardware plan description	The line will be created using all new hardware and structures. It is not anticipated any equipment will be reused or salvaged.	
Tower line characteristics	Wood pole H-frame construction built in the late1950s.	
Proposed Line Characteristics		
	Designed	Operating
Voltage (kV)	230.000000	230.000000
	Normal ratings	Emergency ratings
Summer (MVA)	896.000000	896.000000
Winter (MVA)	1032.000000	1086.000000
Conductor size and type	1113 ACSS	
Shield wire size and type	OPGW	
Rebuild line length	22.3 miles	
Rebuild portion description	Rebuild the entire 22.3 miles of 230 kV line	
Right of way	No additional ROW is anticipated to be needed.	
Construction responsibility	Confidential Information	
Benefits/Comments	Confidential Information	
Component Cost Details - In Current Year $		
Engineering & design	Confidential Information	
Permitting / routing / siting	Confidential Information	
ROW / land acquisition	Confidential Information	
Materials & equipment	Confidential Information	
Construction & commissioning	Confidential Information	

Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$82,249,013.61
Component cost (in-service year)	$92,031,669.00

Transmission Line Upgrade Component

Component title	Carlisle Pike - Roxbury 115 kV Line Rebuild
Project description	Confidential Information
Impacted transmission line	Carlisle Pike - Roxbury 115 kV Line
Point A	Carlisle Pike Substation
Point B	Roxbury Substation
Point C	na
Terrain description	Mountains and forests with several stream crossings.
Existing Line Physical Characteristics	
Operating voltage	115
Conductor size and type	336 ACSR 26/7
Hardware plan description	No hardware is planned to be reused.
Tower line characteristics	Wood pole H-frame construction built in the 1950s.
Proposed Line Characteristics	

	Designed	Operating
Voltage (kV)	115.000000	115.000000

	Normal ratings	Emergency ratings
Summer (MVA)	373.000000	430.000000
Winter (MVA)	374.000000	452.000000
Conductor size and type	795 ACSS 26/7	
Shield wire size and type	OPGW	
Rebuild line length	~9.2 miles	
Rebuild portion description	The entire 9.2 miles of the line will be rebuilt.	
Right of way	No additional ROW is anticipated to be needed.	
Construction responsibility	Confidential Information	
Benefits/Comments	Confidential Information	
Component Cost Details - In Current Year $		
Engineering & design	Confidential Information	
Permitting / routing / siting	Confidential Information	
ROW / land acquisition	Confidential Information	
Materials & equipment	Confidential Information	
Construction & commissioning	Confidential Information	
Construction management	Confidential Information	
Overheads & miscellaneous costs	Confidential Information	
Contingency	Confidential Information	
Total component cost	$53,763,162.56	
Component cost (in-service year)	$60,157,726.00	

Greenfield Transmission Line Component

Component title	Keystone - Susquehanna 500 kV Line #1: Construct new Line	
Project description	Confidential Information	
Point A	Keystone Substation	
Point B	Susquehanna Substation	
Point C	na	
	Normal ratings	Emergency ratings
Summer (MVA)	4512.000000	5433.000000
Winter (MVA)	6288.000000	7217.000000
Conductor size and type	3x1113 ACSS	
Nominal voltage	AC	
Nominal voltage	500	
Line construction type	Overhead	
General route description	The line is presumed to follow the existing Keystone - Junita 500 kV path from the west to the east. Then we expect the line to turn North presumably following the Juniata - Sunbury 500 kV corridor. A diagonal northeastern route will need to be determined to its final termination at Susquehanna	
Terrain description	This path is hundreds of miles long and will traverse multiple different types of terrain. The most challenging will be the multiple ridges of the Appalachian Mountains that will need to be traverse. At the base of each mountain is typically a moving body of water. Most notably there will be crossings of the branches and tributaries of the Susquehanna and Juniata rivers.	
Right-of-way width by segment	200 feet	
Electrical transmission infrastructure crossings	TBD	
Civil infrastructure/major waterway facility crossing plan	TBD	
Environmental impacts	TBD	

Tower characteristics	Steel monopoles with a double circuit vertical construction
Construction responsibility	Confidential Information
Benefits/Comments	Confidential Information
Component Cost Details - In Current Year $	
Engineering & design	Confidential Information
Permitting / routing / siting	Confidential Information
ROW / land acquisition	Confidential Information
Materials & equipment	Confidential Information
Construction & commissioning	Confidential Information
Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$1,155,000,001.06
Component cost (in-service year)	$1,286,755,737.00

Greenfield Transmission Line Component

Component title	Keystone - Susquehanna 500 kV Line #2: Construct new Line
Project description	Confidential Information
Point A	Keystone Substation
Point B	Susquehanna Substation
Point C	na

	Normal ratings	Emergency ratings

Summer (MVA)	4512.000000	5433.000000
Winter (MVA)	6288.000000	7217.000000
Conductor size and type	3x1113 ACSS	
Nominal voltage	AC	
Nominal voltage	500	
Line construction type	Overhead	
General route description	The line is presumed to follow the existing Keystone - Juniata 500 kV path from the west to the east. Then we expect the line to turn North presumably following the Juniata - Sunbury 500 kV corridor. A diagonal northeastern route will need to be determined to its final termination at Susquehanna	
Terrain description	This path is hundreds of miles long and will traverse multiple different types of terrain. The most challenging will be the multiple ridges of the Appalachian Mountains that will need to be traverse. At the base of each mountain is typically a moving body of water. Most notably there will be crossings of the branches and tributaries of the Susquehanna and Juniata rivers.	
Right-of-way width by segment	200 feet	
Electrical transmission infrastructure crossings	See information below. Each crossing will not be listed as the route is subject to change.	
Civil infrastructure/major waterway facility crossing plan	TBD	
Environmental impacts	TBD	
Tower characteristics	Steel monopoles with a double circuit vertical construction	
Construction responsibility	Confidential Information	
Benefits/Comments	Confidential Information	
Component Cost Details - In Current Year $		
Engineering & design	Confidential Information	
Permitting / routing / siting	Confidential Information	
ROW / land acquisition	Confidential Information	

Materials & equipment	Confidential Information
Construction & commissioning	Confidential Information
Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$.00
Component cost (in-service year)	$.00

Substation Upgrade Component

Component title	Carlisle Pike Substation: Upgrade the Roxbury 115 kV line terminal
Project description	Confidential Information
Substation name	Carlisle Pike Substation
Substation zone	PENELEC
Substation upgrade scope	-Replace the limiting conductors -Replace the three limiting disconnect switches with 2000 A units. -Replace the relaying or convert to fiber communications.

Transformer Information

	Name	Capacity (MVA)
Transformer	na	na

	High Side	Low Side	Tertiary
Voltage (kV)	na	na	na

New equipment description	See substation upgrade scope above
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.

Construction responsibility	Confidential Information
Benefits/Comments	Confidential Information
Component Cost Details - In Current Year $	
Engineering & design	Confidential Information
Permitting / routing / siting	Confidential Information
ROW / land acquisition	Confidential Information
Materials & equipment	Confidential Information
Construction & commissioning	Confidential Information
Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$.00
Component cost (in-service year)	$.00

Substation Upgrade Component

Component title	Roxbury Substation: Upgrade the Carlisle Pike 115kV line terminal
Project description	Confidential Information
Substation name	Roxbury Substation
Substation zone	PENELEC
Substation upgrade scope	-Replace the limiting conductors -Replace the three limiting disconnect switches with 2000 A units. -Replace the relaying

Transformer Information

None

New equipment description	See substation upgrade scope above
Substation assumptions	All substation upgrades should be able to occur within the confines of the existing fence.
Real-estate description	All substation upgrades should be able to occur within the confines of the existing fence.
Construction responsibility	Confidential Information
Benefits/Comments	Confidential Information
Component Cost Details - In Current Year $	
Engineering & design	Confidential Information
Permitting / routing / siting	Confidential Information
ROW / land acquisition	Confidential Information
Materials & equipment	Confidential Information
Construction & commissioning	Confidential Information
Construction management	Confidential Information
Overheads & miscellaneous costs	Confidential Information
Contingency	Confidential Information
Total component cost	$.00
Component cost (in-service year)	$.00

Congestion Drivers

None

Existing Flowgates

None

New Flowgates

Confidential Information

Financial Information

Capital spend start date	03/2026
Construction start date	06/2028
Project Duration (In Months)	51

Cost Containment Commitment

Cost cap (in current year)	Confidential Information
Cost cap (in-service year)	Confidential Information

Components covered by cost containment

1. Keystone - Susquehanna 500 kV Line #1: Construct new Line - MAIT
2. Keystone - Susquehanna 500 kV Line #2: Construct new Line - MAIT

Cost elements covered by cost containment

Engineering & design	Yes
Permitting / routing / siting	Yes
ROW / land acquisition	Yes
Materials & equipment	Yes
Construction & commissioning	Yes
Construction management	Yes
Overheads & miscellaneous costs	Yes

Taxes	No
AFUDC	No
Escalation	No
Additional Information	Confidential Information
Is the proposer offering a binding cap on ROE?	No
Is the proposer offering a Debt to Equity Ratio cap?	Confidential Information

Additional Comments

Ready for submission. Contact us with any questions.