



Reliability Analysis Update

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Transmission Expansion Advisory Committee
September 6, 2022

First Review

Baseline Reliability Projects

Process Stage: First Review

Criteria: Winter Generation Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP winter case

Proposal Window Exclusion: Substation Equipment Exclusion

Problem Statement:

The Elwood-Goodings Grove 345 kV line is overloaded for an N-2 outage.
Violation was posted as part of the 2022 Window 1: FG# 2022W1-GD-W371

Existing Facility Rating: 1334SN/1528SE/1837SSTE/1912SLD,
1590WN/1781WE/1912WSTE/1912WLD MVA

Proposed Facility Rating: 1334SN/1528SE/1837STE/2084SLD,
1590WN/1781WE/2051WSTE/2325WLD MVA

Proposed Solution:

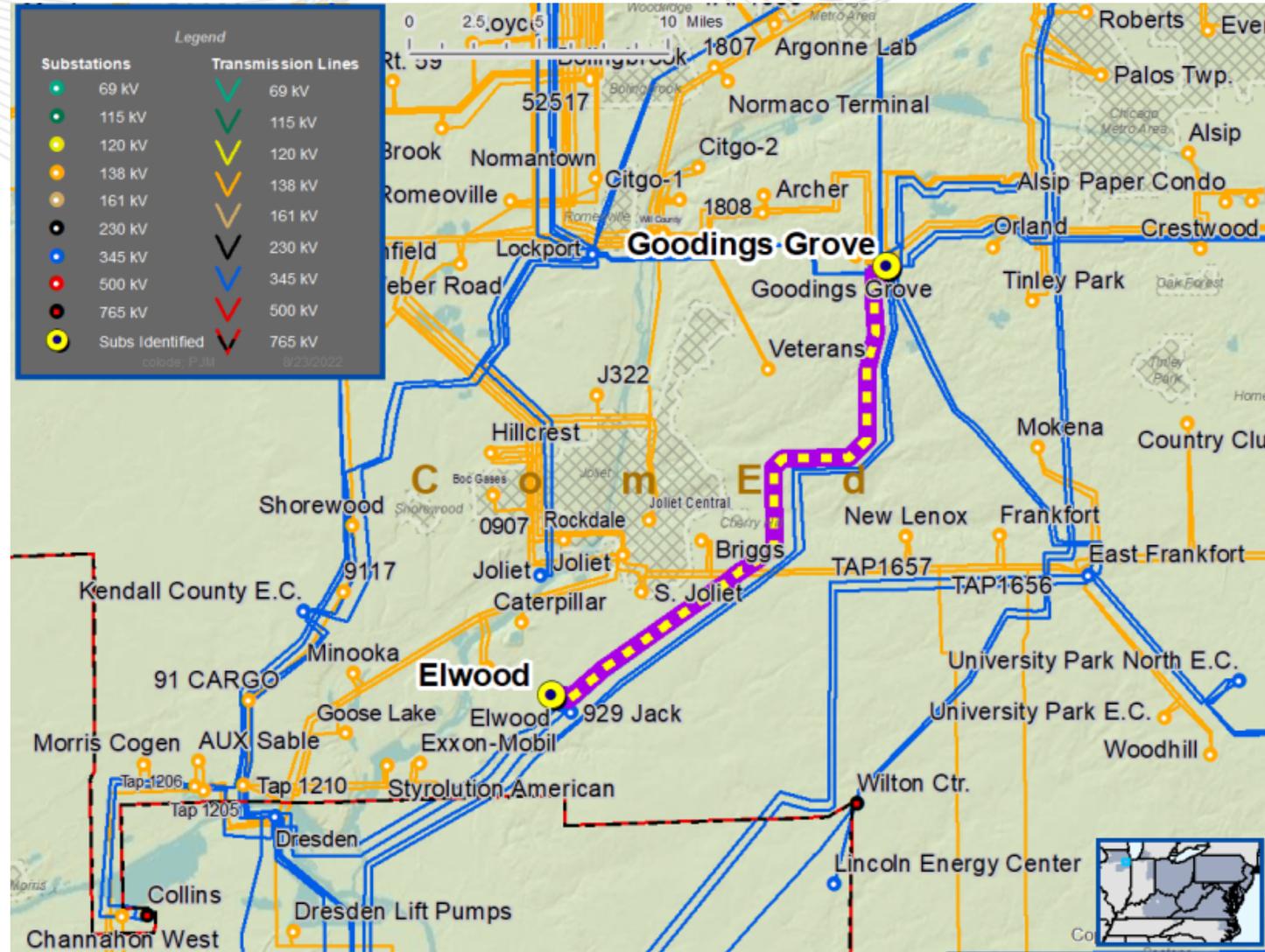
Replace the 1600A bus disconnect switch at Goodings Grove on L11622
Elwood-Goodings Grove 345 kV.

Estimated Cost: \$0.5 M

Alternatives: None

Required In-Service: 12/1/2027

Projected In-Service: 12/1/2027





2022 Multi-Driver Proposal Window 1

- Window opened on 6/7/2022
- Window closed on 8/8/2022
- For this Window, PJM seeks technical solutions, also called proposals, to resolve potential reliability criteria violations on multi-driver facilities identified below in accordance with all applicable planning criteria (PJM, NERC, SERC, RFC, and Local Transmission Owner criteria).
- 14 total proposals submitted from 3 different entities (includes 3 carry-over proposals from 2021 Proposal Window 2)
 - 8 Greenfields
 - 6 Upgrades
- Cost Estimates: Approximate range from \$215K – 127M
- 4 Proposals identified with cost containment
- Redacted public proposals are available:

<https://pjm.com/planning/competitive-planning-process/redacted-proposals>



2022 Multi-Driver Proposal Window 1

Proposal ID #	Project Type	Project Description	Total Construction Cost M\$	Zone	kV Level	Analysis	Flowgate(s)
40	Greenfield	Swap 345kV transmission line at Green Acres, rebuild University Park to Olive 345kV lines and add a reactor along Crete- St John 345kV line.	83.4	AEP/ComEd	345	Winter Gen Deliv, Summer Gen Deliv, Market Efficiency	MDW1-GD-S1620,MDW1-ME-01,MDW1-ME-02,MDW1-GD-W392,MDW1-GD-W393,MDW1-GD-W309,MDW1-GD-W404,MDW1-GD-W419,MDW1-ME-04,MDW1-GD-W172,MDW1-GD-W171,MDW1-GD-W188,MDW1-GD-W190,MDW1-GD-W185,MDW1-GD-W332,MDW1-GD-W331,MDW1-ME-03
82	Greenfield	Add a new 345 kV double circuit to tap existing lines and connect to an existing sub, and reconfigure existing lines at the sub	61.5	AEP/ComEd	345	Winter Gen Deliv, Summer Gen Deliv, Market Efficiency	MDW1-GD-S1620,MDW1-ME-01,MDW1-ME-02,MDW1-GD-W392,MDW1-GD-W393,MDW1-GD-W309,MDW1-GD-W404,MDW1-GD-W419,MDW1-ME-04,MDW1-GD-W172,MDW1-GD-W171,MDW1-GD-W188,MDW1-GD-W190,MDW1-GD-W185,MDW1-GD-W332,MDW1-GD-W331,MDW1-ME-03
91	Greenfield	Goodenow-Lemon Lake 345kV Greenfield Line and Stations (Enhanced)	101.8	AEP/ComEd	345	Winter Gen Deliv, Summer Gen Deliv, Market Efficiency	MDW1-GD-S1620,MDW1-ME-01,MDW1-ME-02,MDW1-GD-W392,MDW1-GD-W393,MDW1-GD-W309,MDW1-GD-W404,MDW1-GD-W419,MDW1-ME-04,MDW1-GD-W172,MDW1-GD-W171,MDW1-GD-W188,MDW1-GD-W190,MDW1-GD-W185,MDW1-GD-W332,MDW1-GD-W331,MDW1-ME-03
165	Upgrade	Dumont-Stillwell Sag Study	0.2	AEP	345	Winter Gen Deliv	MDW1-GD-S1620
401	Greenfield	Add a new 345kV double circuit to reconfigure existing lines	51.2	AEP/ComEd	345	Winter Gen Deliv, Summer Gen Deliv, Market Efficiency	MDW1-GD-S1620,MDW1-ME-01,MDW1-ME-02,MDW1-GD-W392,MDW1-GD-W393,MDW1-GD-W309,MDW1-GD-W404,MDW1-GD-W419,MDW1-ME-04,MDW1-GD-W172,MDW1-GD-W171,MDW1-GD-W188,MDW1-GD-W190,MDW1-GD-W185,MDW1-GD-W332,MDW1-GD-W331,MDW1-ME-03
541	Greenfield	Peregrine Ditch	14.8	AEP/ComEd	345	Winter Gen Deliv	MDW1-GD-W392-MDW1-GD-W393
597	Greenfield	Goodenow-Lemon Lake 345kV Greenfield Line and Stations (Robust)	127.1	AEP/ComEd	345	Winter Gen Deliv, Summer Gen Deliv, Market Efficiency	MDW1-GD-S1620,MDW1-ME-01,MDW1-ME-02,MDW1-GD-W392,MDW1-GD-W393,MDW1-GD-W309,MDW1-GD-W404,MDW1-GD-W419,MDW1-ME-04,MDW1-GD-W172,MDW1-GD-W171,MDW1-GD-W188,MDW1-GD-W190,MDW1-GD-W185,MDW1-GD-W332,MDW1-GD-W331,MDW1-ME-03
612	Greenfield	Goodenow-Lemon Lake 345kV Greenfield Line and Stations (Basic)	98.1	AEP/ComEd	345	Winter Gen Deliv, Summer Gen Deliv, Market Efficiency	MDW1-GD-S1620,MDW1-ME-01,MDW1-ME-02,MDW1-GD-W392,MDW1-GD-W393,MDW1-GD-W309,MDW1-GD-W404,MDW1-GD-W419,MDW1-ME-04,MDW1-GD-W172,MDW1-GD-W171,MDW1-GD-W188,MDW1-GD-W190,MDW1-GD-W185,MDW1-GD-W332,MDW1-GD-W331,MDW1-ME-03
644	Upgrade	Swap 345kV transmission line at Green Acres, rebuild University Park to Olive 345kV lines	98.8	AEP/ComEd	345	Winter Gen Deliv, Summer Gen Deliv, Market Efficiency	MDW1-GD-S1620,MDW1-ME-01,MDW1-ME-02,MDW1-GD-W392,MDW1-GD-W393,MDW1-GD-W309,MDW1-GD-W404,MDW1-GD-W419,MDW1-ME-04,MDW1-GD-W172,MDW1-GD-W171,MDW1-GD-W188,MDW1-GD-W190,MDW1-GD-W185,MDW1-GD-W332,MDW1-GD-W331,MDW1-ME-03
664	Greenfield	Add a new 345 kV double circuit line looping the existing line into a new substation	74.0	AEP/ComEd	345	Winter Gen Deliv, Summer Gen Deliv, Market Efficiency	MDW1-GD-S1620,MDW1-ME-01,MDW1-ME-02,MDW1-GD-W392,MDW1-GD-W393,MDW1-GD-W309,MDW1-GD-W404,MDW1-GD-W419,MDW1-ME-04,MDW1-GD-W172,MDW1-GD-W171,MDW1-GD-W188,MDW1-GD-W190,MDW1-GD-W185,MDW1-GD-W332,MDW1-GD-W331,MDW1-ME-03
908	Upgrade	Olive-University Park Sag Study	1.5	AEP/ComEd	345	Winter Gen Deliv	MDW1-GD-W392-MDW1-GD-W393
253	Upgrade	Rebuild 345 kV Lines 6607/6608 East Frankfort - Crete and 94507/97008 Crete - St. John	62.6	ComEd	345	Winter Gen Deliv	GD-W2-W5, GD-W2-W6
977	Upgrade	Rebuild 345 kV double circuit Lines 94507 and 97008 Crete - Indiana	17.1	ComEd	345	Winter Gen Deliv	GD-W2-W5, GD-W2-W6
994	Upgrade	Install Series Inductor on Line 94507 Crete - St. John	12.0	ComEd	345	Winter Gen Deliv	GD-W2-W5, GD-W2-W6

- PJM is currently reviewing proposal information submitted for completeness
- Preliminary evaluation will begin in early September
- Plan to complete proposal selection by the end of 2022, for PJM Board approval in February 2023
- PJM will coordinate with MISO when evaluating proposal



2022 Reliability Proposal Window 1

- Window opened on 7/1/2022
- Window closed on 8/30/2022
- For this Window, PJM seeks technical solutions, also called proposals, to resolve potential reliability criteria violations on facilities identified in accordance with all applicable planning criteria (PJM, NERC, SERC, RFC, and Local Transmission Owner criteria).
- 17 total proposals submitted from 7 different entities (see Appendix for details)
 - 6 Greenfields
 - 11 Upgrades
- Cost Estimates: Approximate range from \$0.26 – 386.73 M
- 275 Flowgates addressed (265 Competitive, 10 Excluded from competition)
- 7 proposals identified with cost containment
- Redacted public proposals will be posted soon

- PJM has reviewed changes which have occurred since the original 2022 RTEP violations were identified
- The significant changes include, model correction, deactivations, baseline projects board approved after case building, newly signed ISA queue projects and withdrawn ISA queue projects
- The re-tool has resulted in some changes to results, eliminating the violations previously identified – all changes have been posted in an update on the Competitive Planning page
- 265 flowgates are included in the competitive window
- 554-564 flowgates will be addressed out of the window
 - Non-Competitive
 - Multi driver window
 - Additional window for Dominion leftover issues after the immediate solution



2022 RTEP

- Long-term deliverability analysis will identify the need to include in the RTEP:
 - New 230 kV or 345 kV circuits to support load growth in years 6 through 8
 - Right-of way acquisition for any new 230 kV or 345 kV circuits to support load growth in years 9 and 10
 - New 500 kV or greater circuits to support load growth in years 6 through 12
- PJM identified five 230 kV overload in years 7 ~ 10, and one 500 kV overload in years 9

Season	Contingency	From Bus	From Name	To Bus	To Name	CKT	KVs	Areas	100% Year
Summer	Single	200675	26E.TWANDA	200924	26CANYON	1	230/230	226/226	2030
Summer	Single	314068	6OX	314054	6KEENE M	1	230/230	345/345	2032
Summer	Single	314004	6ASHBURN	314010	6BEAMEAD	1	230/230	345/345	2030
Summer	Single	314072	6PL VIEW	314004	6ASHBURN	1	230/230	345/345	2029
Summer	Single	314006	6ASHBURA	314010	6BEAMEAD	1	230/230	345/345	2029
Winter	Single	200064	PCHBTM1S	200004	CNASTONE	1	500/500	230/232	2031

- East Towanda – Canyon and Peach Bottom – Conastone overload could be addressed by line reconductor
- All the other overloads will be addressed by 2022 RTEP immediate need solutions in Dominion

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Reliability Analysis Update



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Version No.	Date	Description
1	9/1/2022	<ul style="list-style-type: none">• Original slides posted
2	9/9/2022	<ul style="list-style-type: none">• Appendix: Corrected zone for proposal 633; corrected flowgate # for proposals 553 and 907
3	9/16/2022	<ul style="list-style-type: none">• Corrected number of proposals identified with cost containment for the 2022 Multi-Driver Proposal Window 1 (slide 5)

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Appendix



2022 RTEP Window 1 Proposals

Proposal ID #	Project Type	Project Description	Cost Estimate (\$M)	kV Level	Zone	Analysis	Flowgate(s)
476	Greenfield	Rebuild the Hunterstown – Carroll 115/138 kV Corridor as Double Circuit using 230kV construction standards. New circuit will be operated at 230kV. Existing circuit to remain at 115/138kV. Construct a new 230 kV Ring Bus at Carroll (PE) and add a new 230 kV Breaker to the Hunterstown 230 kV Substation.	148.83	230	MetEd	Gen Deliv	2022W1-GD-S14, 2022W1-GD-W33, 2022W1-GD-S578, 2022W1-GD-W391, 2022W1-GD-W37, 2022W1-GD-S10, 2022W1-GD-S570, 2022W1-GD-W376
236	Upgrade	Upgrade dead end structures on Conowingo - Colora line in DPL to increase the line ratings	0.26	230	PECO/DPL	Gen Deliv	2022W1-GD-S36
21	Upgrade	Install two new 500 kV breakers on the existing open SVC string to create a new bay position. Relocate & Re-terminate facilities as necessary to move the 500 kV SVC into the new bay position. Install a 500 kV breaker on the 500/138 kV #3 transformer. Upgrade relaying at Black Oak Substation.	17.37	500	APS	Thermal	2022W1-N2-SVD1 through 2022W1-N2-SVD41, 2022W1-N2-VD1 through 2022W1-N2-VD198
209	Upgrade	Rebuild/Reconductor the Germantown - Lincoln 115 kV Line. Approximately 7.6 miles. Upgrade limiting terminal equipment at Lincoln, Germantown and Straban.	17.36	115	MetEd	Gen Deliv	2022W1-GD-S14, 2022W1-GD-W33, 2022W1-GD-S578, 2022W1-GD-W391, 2022W1-GD-W37, 2022W1-GD-S10, 2022W1-GD-S570, 2022W1-GD-W376
94	Upgrade	Reconductor two (2) 230 kV circuits from Conastone to Northwest #2.	37.76	230	BGE	Gen Deliv	2022W1-GD-W42, 2022W1-GD-S38
633	Greenfield	The Proposed Solution consists of: (1) the IEC West Portion, which is comprised of approximately 29 miles of new double-circuit 230 kV AC overhead transmission line between the existing Potomac Edison Ringgold Substation in Washington County, Maryland to a new Rice Substation in Franklin County, Pennsylvania; and (2) the reconfigured IEC East Portion, which is primarily comprised of adding 230 kV AC overhead transmission lines between a new Furnace Run Substation in York County, Pennsylvania, and the existing BGE Conastone (via Baltimore County) and Graceton Substations in Harford County, Maryland.	386.73	230	BGE/PN/PECO/MetEd/PPL/AP S	Gen Deliv	2022W1-GD-S14, 2022W1-GD-W53, 2022W1-GD-S38, 2022W1-GD-W33, 2022W1-GD-W55, 2022W1-GD-W36, 2022W1-GD-W391, 2022W1-GD-W35, 2022W1-GD-W57, 2022W1-GD-S10, 2022W1-GD-W411, 2022W1-GD-S651, 2022W1-GD-S578, 2022W1-GD-S634, 2022W1-GD-S570, 2022W1-GD-W376, 2022W1-GD-S1043, 2022W1-GD-W42, 2022W1-GD-S29, 2022W1-GD-S558, 2022W1-GD-S559, 2022W1-GD-W60, 2022W1-GD-W623, 2022W1-GD-W37, 2022W1-GD-W39, 2022W1-GD-W388, 2022W1-GD-W387
880	Upgrade	Install second 500/230kV Transformer with additional 500 and 230 bus expansions.	30.19	500/230	MetEd	Gen Deliv	2022W1-GD-S29, 2022W1-GD-W36, 2022W1-GD-S634
912	Upgrade	Rebuild 1.4 miles of existing single circuit 230 kV tower line between BGE's Graceton substation to the PPL tie-line at the MD/PA state line to double circuit steel pole line with one (1) circuit installed to uprate 2303 circuit.	8.4	230	PPL/BGE	Gen Deliv	2022W1-GD-S1043, 2022W1-GD-W411, 2022W1-GD-W623, 2022W1-GD-W55



2022 RTEP Window 1 Proposals

Proposal ID #	Project Type	Project Description	Cost Estimate (\$M)	kV Level	Zone	Analysis	Flowgate(s)
994	Greenfield	Build a new 138 kV 3-breaker ring station called "Johnson Fork" just North of the existing Wesley SW 138 kV station (AEP). Bring the existing Tanners Creek–College Corner 138 kV line (AEP) "in and out" of Johnson Fork. Build a new 138 kV line from Johnson Fork (AEP) to Willey (Duke) stations (13 miles). Install 2 breakers at Willey to terminate the new line.	25.52	138	AEP/DEOK	Gen Deliv	2022W1-GD-S586, 2022W1-GD-W377
446	Greenfield	Build a new 138 kV 4-breaker ring station called "Pribble." Bring the existing Tanners Creek–College Corner (AEP) & Miami Fort–Hubbell (Duke) 138 kV lines "in and out" of Pribble station. Rebuild Tanners Creek–Pribble 138 kV (5 miles) and upgrade station equipment at Tanners Creek 138 kV. Rebuild Pribble–Miami Fort 138 kV (6 miles).	39.7	138	AEP/DEOK	Gen Deliv	2022W1-GD-S586, 2022W1-GD-W377
893	Greenfield	Build a new 345 kV line from Tanners Creek station (AEP) to Miami Fort (Duke) station (11.4 miles). Rebuild a portion of the existing Tanners Creek – Hanna 345 kV and Greendale – Miami Fort 138 kV lines to double circuit (4 & 3 miles respectively) to facilitate construction of the new line. Install 1 breaker at Tanners Creek and 2 breakers at Miami Fort to terminate the new line.	58.11	138	AEP/DEOK	Gen Deliv	2022W1-GD-S586, 2022W1-GD-W377
965	Upgrade	Replace four Clifty Creek 345 kV 3000 A switches with 5000 A 345 kV switches. Anticipated SN/SE rating for the branch section to be addressed (242865 to 248000) by the project is 2354/2354 MVA.	0.85	345	AEP/OVEC	Gen Deliv	2022W1-GD-S632
289	Upgrade	At West Bellaire 345kV, the M1 breaker will be moved to the N breaker string, becoming N1. The Tidd circuit will connect to the N string, between N1 and N. Jumpers/conductor will be installed in the place of old breaker M1, to complete the M string. Station protection and SCADA updates will be completed. The Tidd 345kV T-Line will need shifted slightly, to connect to the new station bay to the east.	2.53	345	AEP	Thermal	2022W1-N1-LLVM2, 2022W1-N1-LLVM1, 2022W1-N1-LLVD1, 2022W1-N1-LLVD2
27	Upgrade	Install at Tanners Creek a 345 kV 5000 A 63 kA circuit breaker "R" and move the Tanners Creek - East Bend 345 kV circuit from the "T" and "T1" line position to the "R and "R1" line position, thus mitigating the College Corner - Collinsville 138 kV overload by eliminating the contingency causing the issue.	3.07	345	AEP/DEOK	Gen Deliv	2022W1-GD-S586, 2022W1-GD-W377
127	Upgrade	Reterminate the Lackawanna T3 and T4 500 / 230 kV transformers on the 230 kV side to remove them from the 230 kV buses and bring them into dedicated bay positions that are not adjacent to one another.	10.65	230	PPL	Gen Deliv	2022W1-GD-S595



2022 RTEP Window 1 Proposals

Proposal ID #	Project Type	Project Description	Cost Estimate (\$M)	kV Level	Zone	Analysis	Flowgate(s)
553	Upgrade	Replace the existing Lackawanna 500/230 kV T3 and T4 transformers with larger 1250 MVA units. Upgrade bay equipment to accommodate the new higher rated transformers.	55.97	500/230	PPL	Gen Deliv	2022W1-GD-S595
907	Greenfield	Install a new 1500 MVA 500/230 kV transformer at Lackawanna substation. Tie into bay #1 in the Lackawanna 500 kV yard. Install four single phase transformer units (one on-site spare). Install bus work necessary to facilitate restoration with the onsite spare. Install MODs on the high and low-side of the 500/230 kV transformer. Install a 230 kV dead-end for termination of the Lackawanna Energy 230kV lead line. The 500/230 kV transformer will have double-bundle 1590 ACSR leads on the high-side. Re-terminate the Lackawanna - Lackawanna Energy 230kV line into the dead-end for the new 500/230 kV transformer at Lackawanna utilizing triple bundle 1590 45/7 ACSR conductor and dual 144 OPGW.	51.48	500	PPL	Gen Deliv	2022W1-GD-S595