Reliability Analysis Update

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Transmission Expansion Advisory Committee

November 1, 2022

First Review

Baseline Reliability Projects

Penelec Transmission Zone: Baseline

Process Stage: First Review

Criteria: TPL-001-4 R2 section 2.1.5 (Spare Equipment)

Assumption Reference: 2026 RTEP assumption

Model Used for Analysis: 2022 Summer, and 2026 RTEP Summer and Winter case

Proposal Window Exclusion: Substation Equipment

Problem Statement:

There are 2- 80 MVAR shunt reactors at Mainesburg 345 kV substation. High voltage violation at Mainesburg for the outage of the two Mainesburg shunt reactors. There is no spare reactor currently to address the high voltage issue if both shunt reactors are out of service.

Proposed Solution:
Purchase one 80 MVAR 345 kV spare reactor.

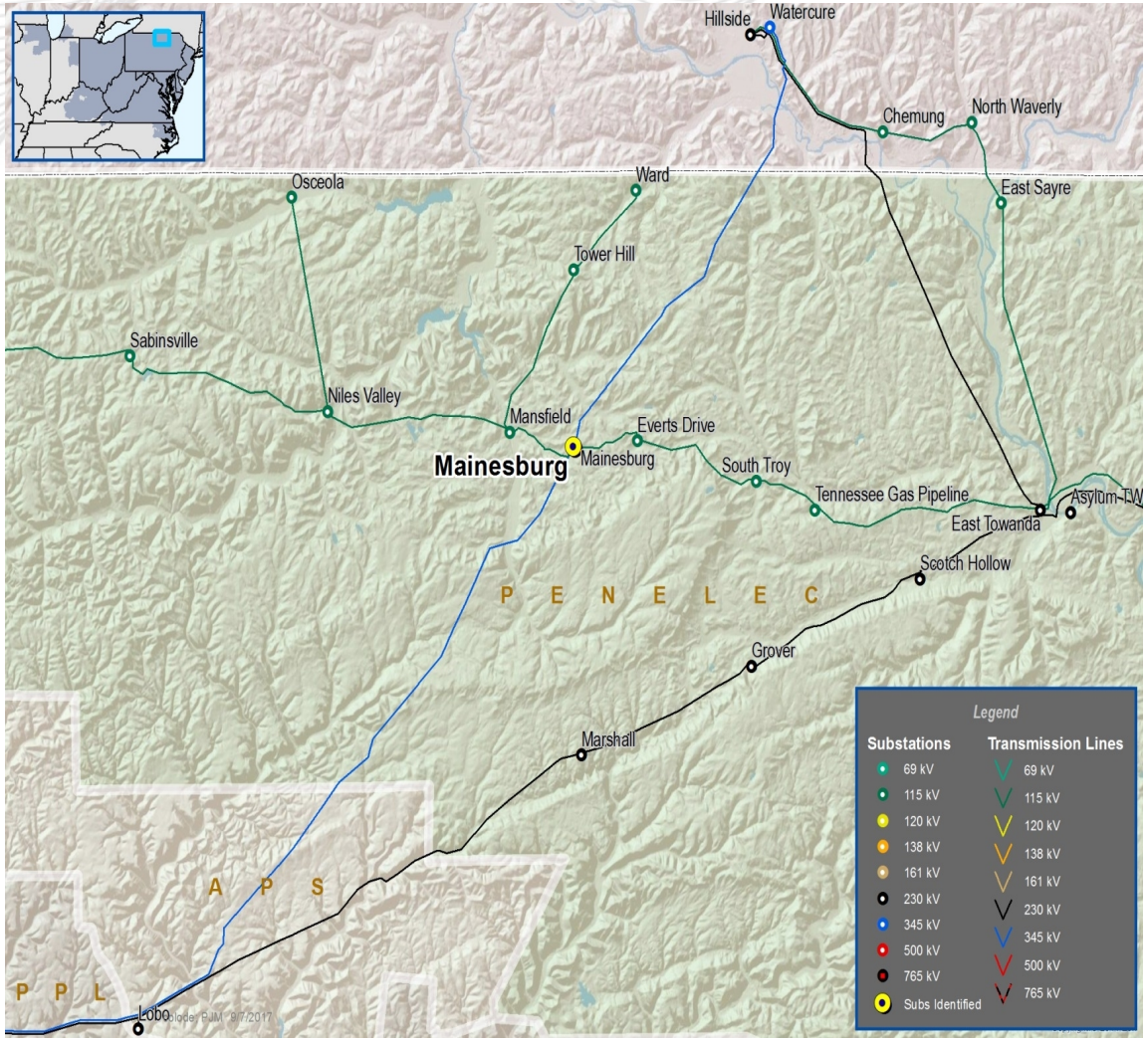
Estimated Cost: $6.44 M

Alternatives:

N/A

Required In-Service: 2022

Projected In-Service: 12/1/2025



Second Review

Baseline Reliability Projects

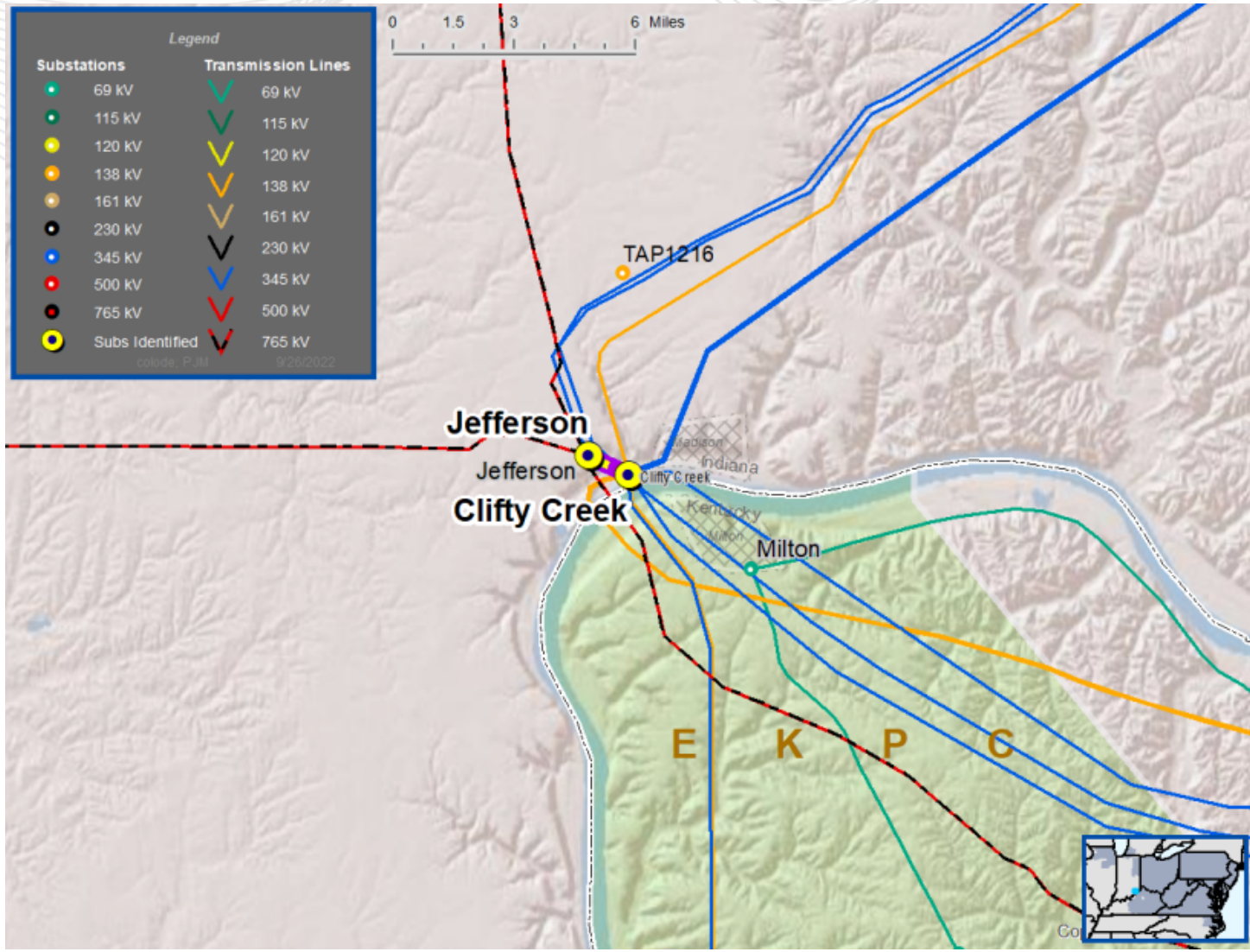
AEP Transmission Zone: Baseline Clifty Creek Switch Replacements

Process Stage: Recommended Solution
Criteria: Summer Generator Deliverability
Assumption Reference: 2027 RTEP assumption
Model Used for Analysis: 2027 RTEP Summer case
Proposal Window Exclusion: None
Problem Statement:
2022W1-GD-S632

In 2027 RTEP Summer case, The Jefferson – Clifty 345KV line is overload for a N-2 contingency in generator deliverability test.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05JEFRSO – 06CLIFTY 345kV	2056/2255/2669/2833



AEP Transmission Zone: Baseline Clifty Creek Switch Replacements

As part of the 2022 RTEP Window #1, the project listed in the table below is proposed to address the following violations: 2022W1-GD-S632

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
965	AEP	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.	0.852

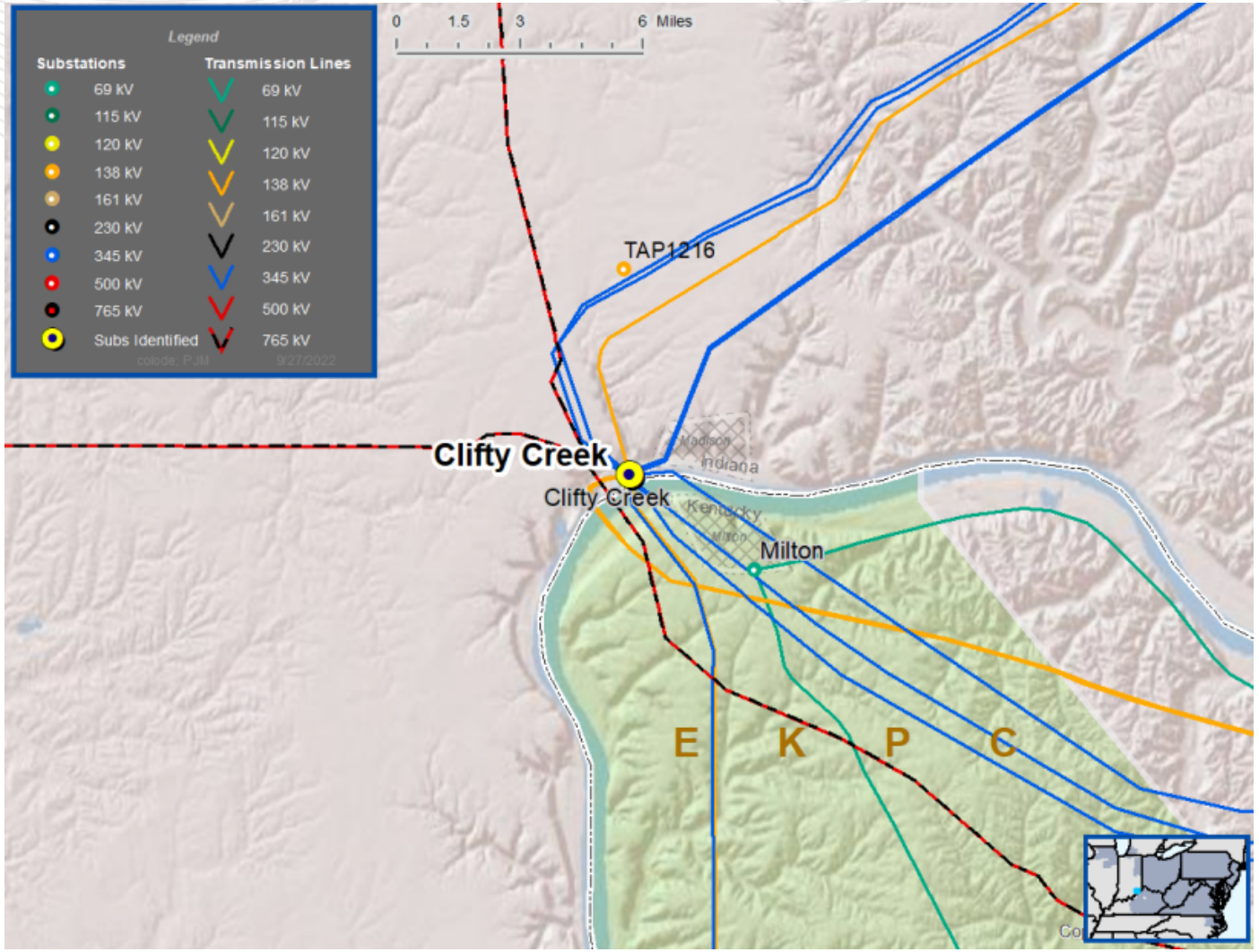
AEP Transmission Zone: Baseline Clifty Creek Switch Replacements

Recommended Solution: Proposal #2022_W1-965
Replace four Clifty Creek 345 kV 3000 A switches with 5000 A 345 kV switches. **(B3748)**

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05JEFRSO – 06CLIFTY 345kV	2354/2354/2991/2991

Estimated Cost: $0.852M
Required IS Date: 6/1/2027
Projected IS Date: 6/30/2024
Previously Presented: 10/4/2022



APS Transmission Zone: Baseline
Black Oak Substation

Process Stage: Recommended solution

Criteria: Summer and Winter N-1-1 baseline Analysis

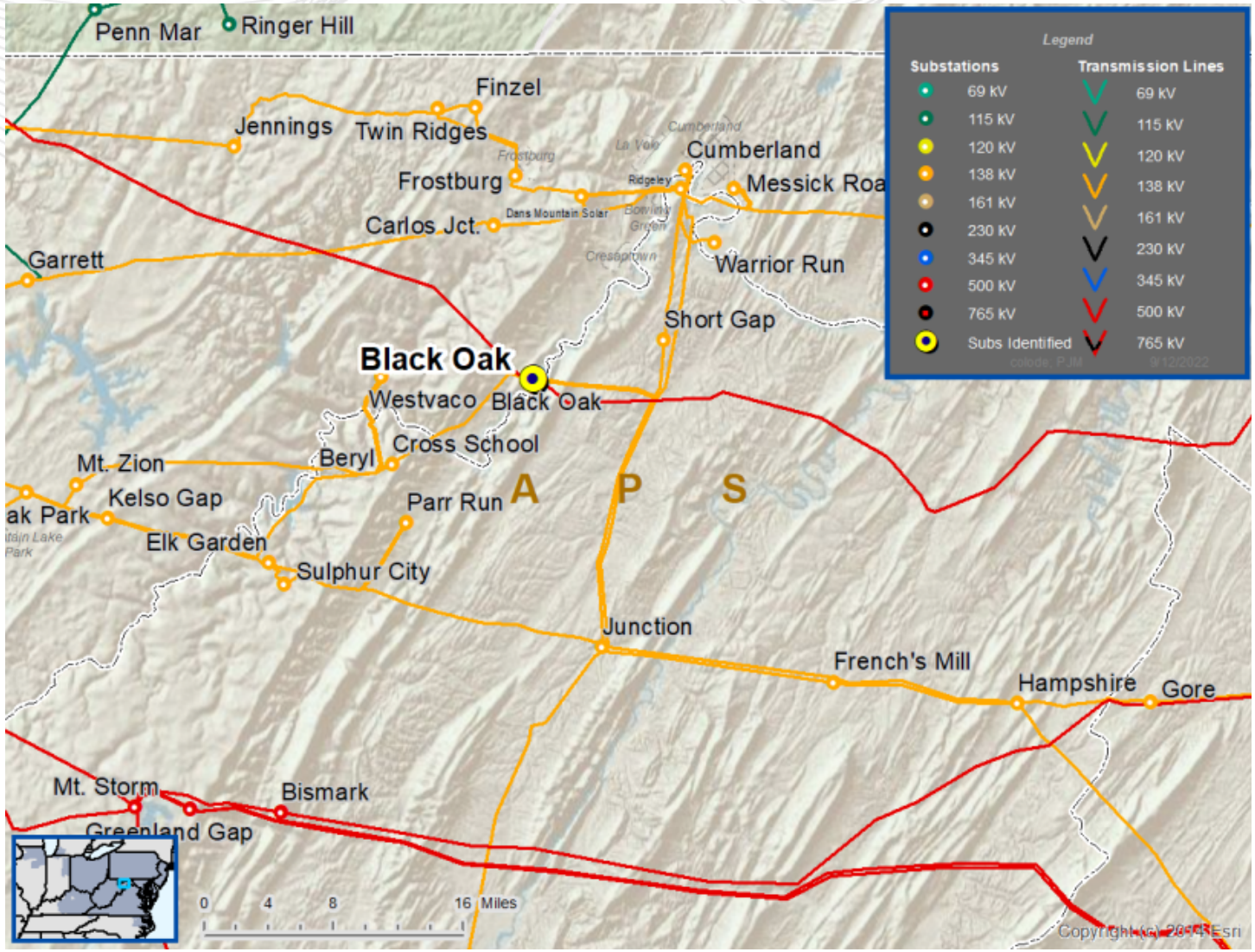
Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP winter case

Proposal Window Exclusion: None

Problem Statement: 2022W1-N2-SVD1 through 2022W1-N2-SVD41, 2022W1-N2-VD1 through 2022W1-N2-VD198

In the 2027 RTEP Summer and Winter case, there are several Voltage drop violations at the Black Oak 500 kV substation.



APS Transmission Zone: Baseline
Black Oak Substation

As part of the 2022 RTEP Window #1, the project listed in the table below is proposed to address the following violations: 2022W1-N2-SVD1 through 2022W1-N2-SVD41, 2022W1-N2-VD1 through 2022W1-N2-VD198

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
21	APS	Black Oak 500 kV Substation: Install New Bay Position for SVC and Install Transformer High Side Breaker	17.37

Recommended Solution: Proposal #2022_21

- 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 . **(b3726)**

Total Estimated Cost: $17.37M

Required IS Date: 6/1/2027
Projected IS Date: 6/1/2027
Previously Presented: 10/4/2022

BGE/PECO Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Winter Generator Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP Winter case

Proposal Window Exclusion: Substation Equipment

Problem Statement:

The Peach Bottom – Conastone 500 kV kV circuit is overloaded for multiple contingencies.

Violations were posted as part of the 2022 Window 1: FG# GD-W35, GD-W39, GD-W53, GD-W57 and GD-W60

Existing Facility Rating: 2828SN/3526E, 3464WN/3700WE MVA

Proposed Facility Rating: 2920SN/3620SE, 3592WN/4290WE

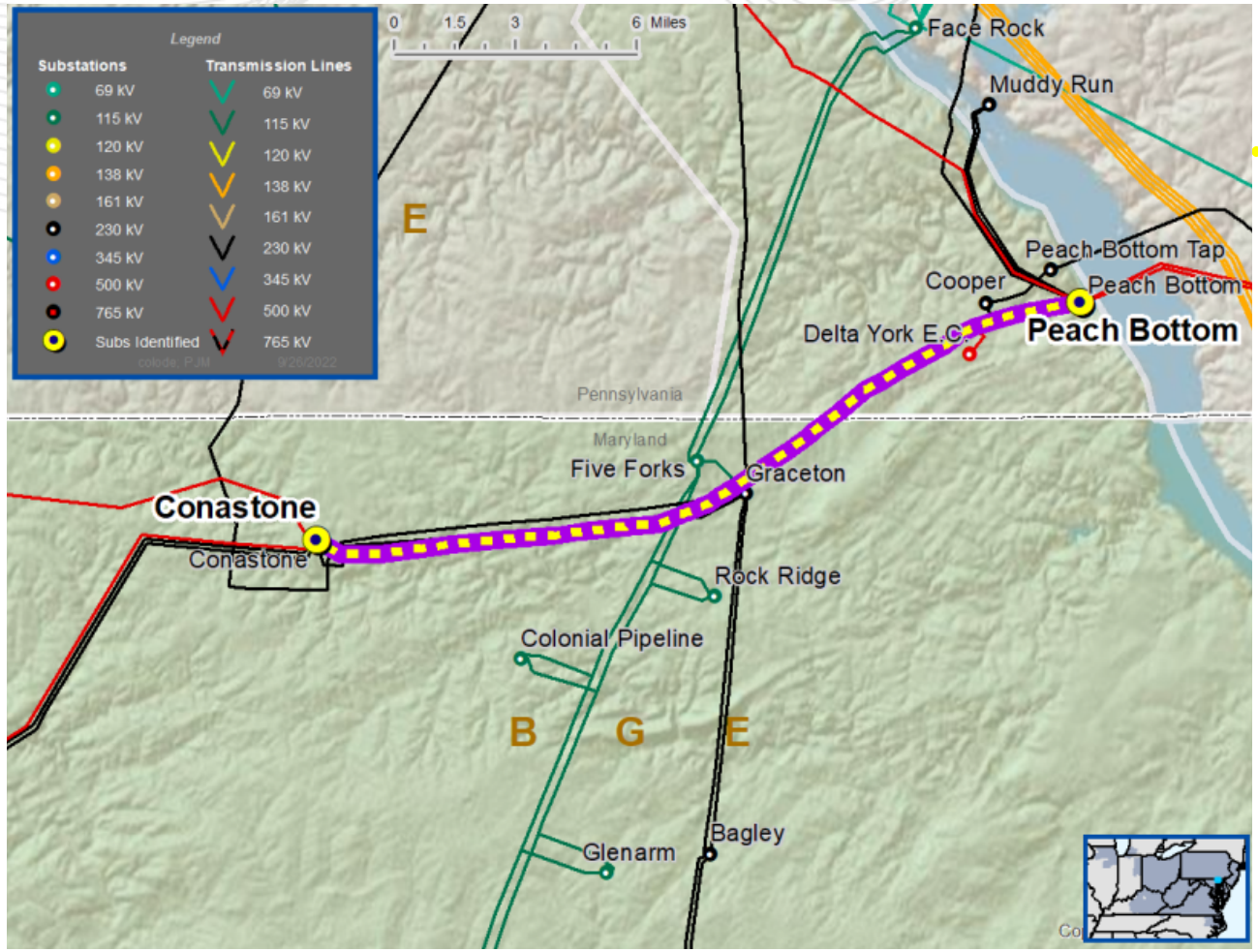
Recommended Solution:
BGE: - Upgrade two Breaker bushinsgs on the 500kV Line 5012 (Conastone – Peach Bottom) at Conastone Substation. (B3728.1)
PECO: Replace 4 meters and bus work inside Peach Bottom substation on the 500 kV Line 5012 (Conastone – Peach Bottom). (B3728.2)

Estimated Cost: $5.8 M

Alternatives: N/A

Required In-Service: 12/1/2027

Projected In-Service: 12/1/2027



DPL Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Summer Generator Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP Summer case

Proposal Window Exclusion: None

Problem Statement:

The Conowingo – Colora 230 kV kV circuit is overloaded for single contingency.

Violations were posted as part of the 2022 Window 1: FG# GD-S36

Existing Facility Rating: 420SN/536E, 485WN/604WE MVA

Proposed Facility Rating: 462SN/559SE, 520WN/636WE

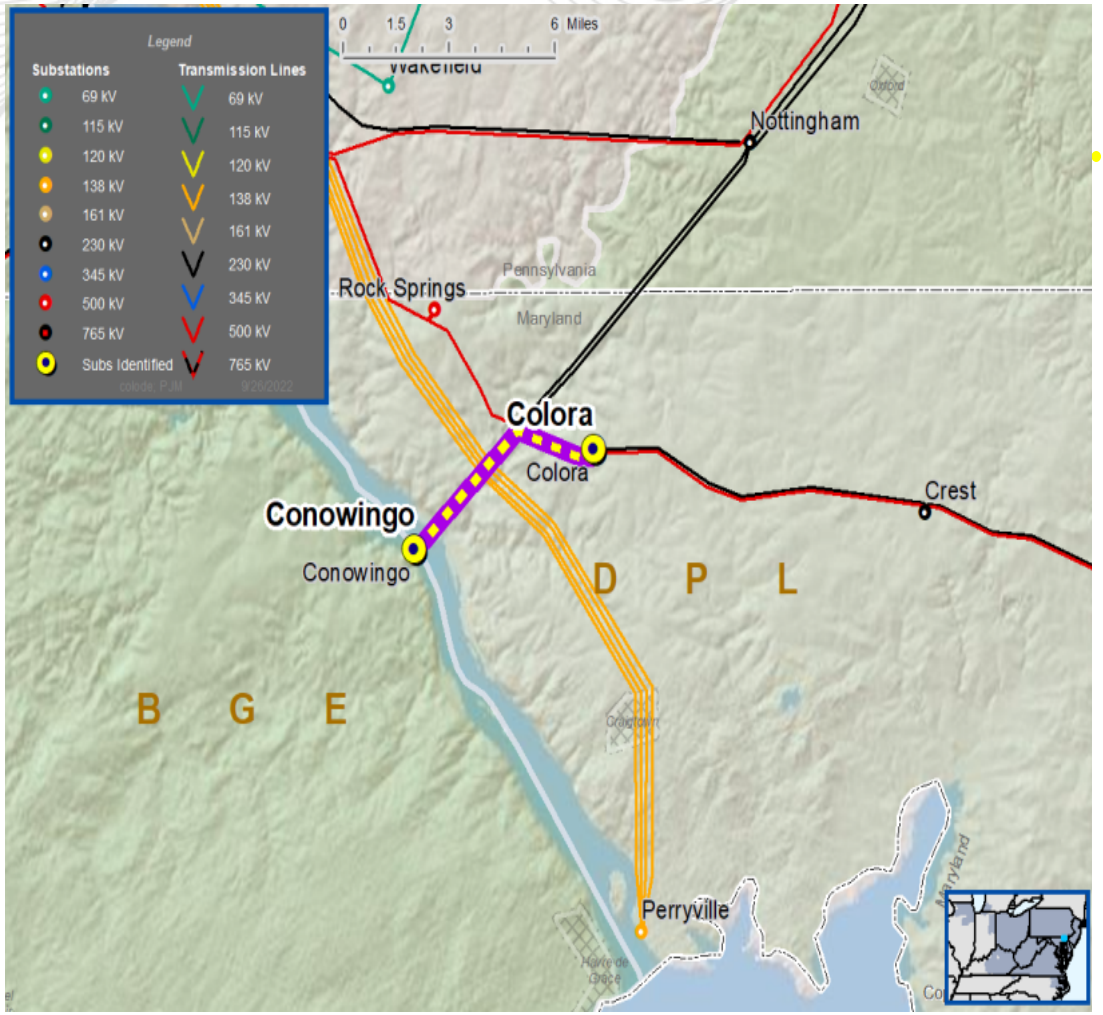
Recommended Solution:
Proposal ID 236: Upgrade dead end structures on Conowingo – Colora 230 kV line in DPL to increase the line rating. Increase the Maximum Operating Temperature of DPL Circuit 22088 from 125 C to 140 C, by installing cable shunts on each phase, on each side of four (4) dead-end structures, and replacing the existing insulator bells. (B3729)

Estimated Cost: $0.2625 M

Alternatives: N/A

Required In-Service: 6/1/2027

Projected In-Service: 6/1/2027



PPL Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Summer Generator Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP Summer case

Proposal Window Exclusion: None

Problem Statement:

The Lackawanna 500/230 kV transformer # T3 is overloaded for line fault stuck breaker contingency.

Violations were posted as part of the 2022 Window 1: FG# GD-S595

Recommended Solution:
Proposal ID 127: Re-terminate 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. (B3730)

Estimated Cost: $10.7 M

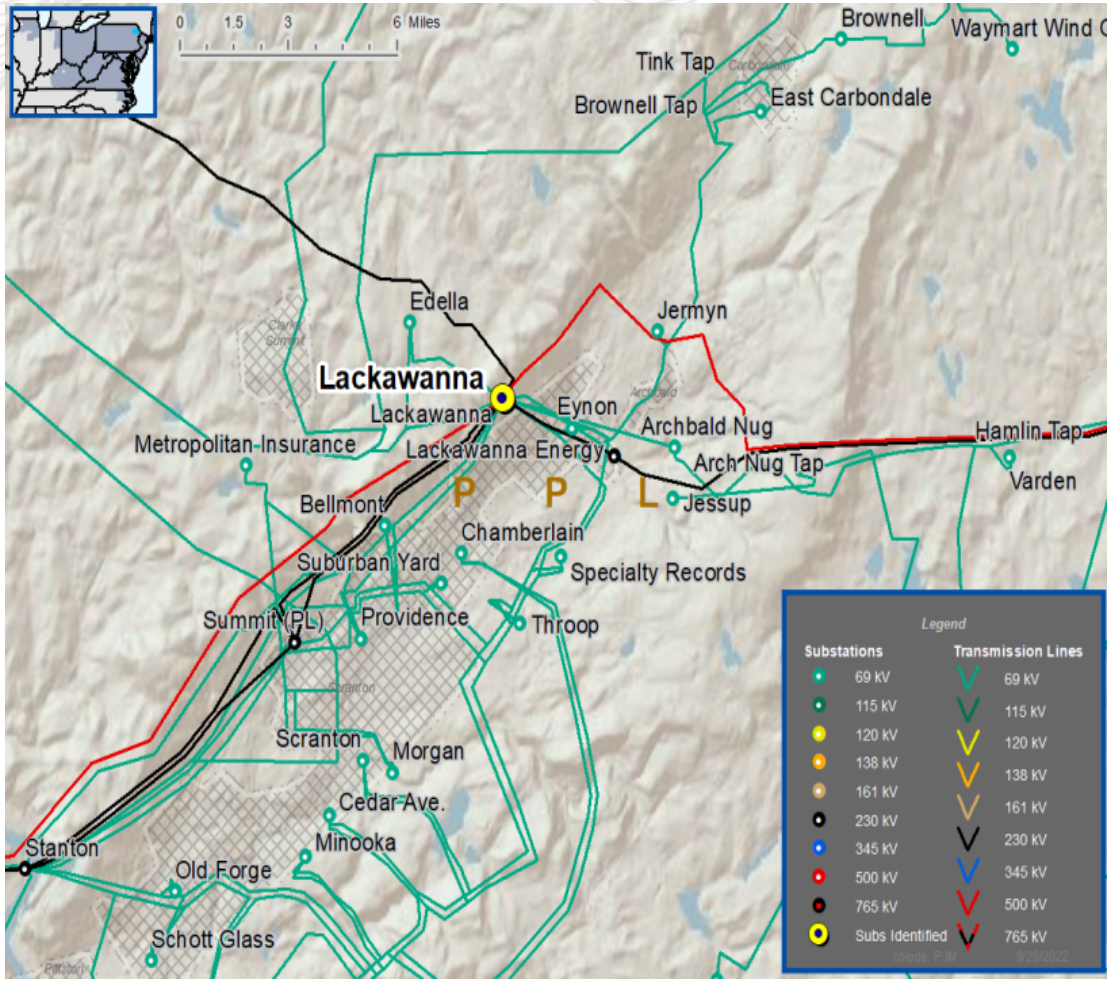
Alternatives:

Proposal ID 553: 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. (Cost Estimate: $55.97 M)

Proposal ID 907: Re-terminate the Lackawanna Energy from 230 kV to 500 kV through new 500/230 kV transformer. (Cost Estimate: $51.48 M)

Required In-Service: 6/1/2027

Projected In-Service: 1/30/2026



2022 Multi-Driver Proposal Window 1

- PJM's reliability evaluation for the proposals is underway
- Plan to complete proposal selection by the end of 2022, for PJM Board approval in February 2023
- PJM will coordinate with MISO during the evaluation process

2022 RTEP Window 1 Proposal Cluster #2 Update

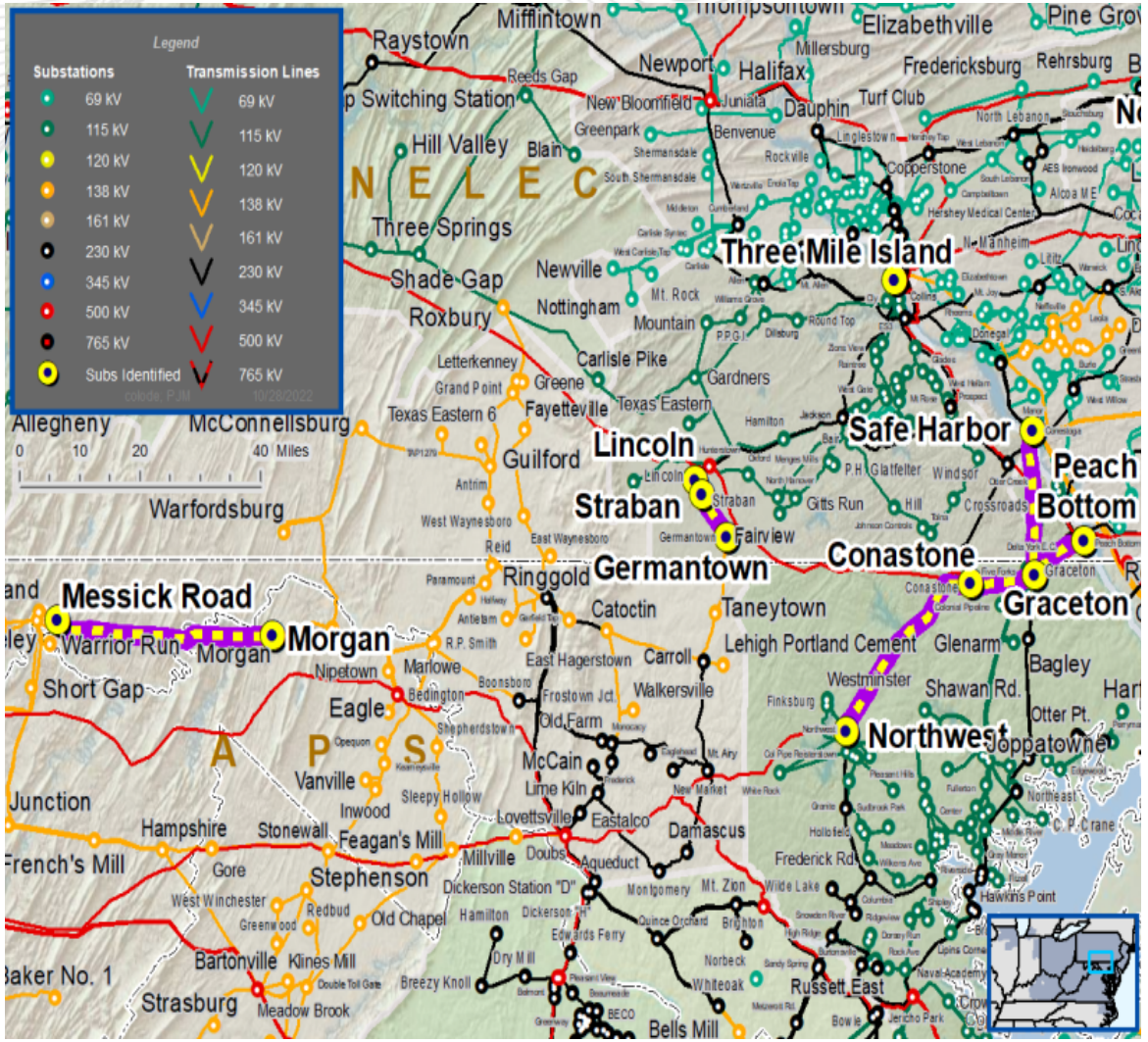
APS, BGE, MetEd and PECO Transmission Zone: Baseline

2022 RTEP Window 1 Cluster 2 - Projects Evaluation Progress

Problem Statement:

Thermal and voltage violations identified in the APS, BGE, MetEd, PECO area.

	List of Flowgates in Cluster #2				
Violations were posted as part of the 2022 Window 1	2022W1-GD-S10	2022W1-GD-S558	2022W1-GD-W33	2022W1-GD-W387	2022W1-GD-W42
	2022W1-GD-S1043	2022W1-GD-S559	2022W1-GD-W35	2022W1-GD-W388	2022W1-GD-W53
	2022W1-GD-S14	2022W1-GD-S570	2022W1-GD-W36	2022W1-GD-W39	2022W1-GD-W55
	2022W1-GD-S29	2022W1-GD-S578	2022W1-GD-W37	2022W1-GD-W391	2022W1-GD-W57
	2022W1-GD-S38	2022W1-GD-S634	2022W1-GD-W376	2022W1-GD-W411	2022W1-GD-W60
	2022W1-GD-W623	2022W1-N2-VM4	2022W1-N2-VM5	2022W1-N2-VM15	2022W1-N2-VM16
	2022W1-N2-VM17	2022W1-N2-VM18	2022W1-N2-VM19	2022W1-N2-VM20	2022W1-N2-VM21
	2022W1-N2-VM22	2022W1-N2-VM23	2022W1-N2-VM24	2022W1-N2-VM27	2022W1-N2-VM32
	2022W1-N2-VM33	2022W1-N2-VM34	2022W1-N2-VM35		



In this cluster, the below summarizes the projects being evaluated to address the violations;

- PJM received 9 proposals from five entities.
- Cost ranges between $2M and $386M
- PJM is working on the reliability evaluation.

Contact

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Reliability Analysis Update

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Revision History

Version No.	Date	Description
1		• Original slides posted
2	10/31/2022	• Added map on slide # 16 • Added slide # 15 to include a title page
3	11/2/2022	• Slide 7, updated Baseline ID to b3748 from b3728

PROTECT THE POWER GRID

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