Appendix: Previously Reviewed Baseline Upgrade Recommendations for the February 2021 PJM Board Review

ATSI Transmission Zone

Sammis 1, 2, 3 and 4 deactivations – 668.6 MW

- The units were deactivated on 06/01/2020.
- B3123 was issued for the necessary substation work associated with Sammis 5, 6, and 7 deactivations, and presented on 07/11/2019.
- PJM received FE reinstatement for Sammis 5,6, and 7 on 07/29/2019.
- The necessary substation work identified for B3123 is still needed for Sammis 1,2,3 and 4 deactivations.
  - Install a new control building in the switchyard.
  - Construct a new station access road.
  - Install new switchyard power supply to separate from existing generating station power service.
  - Separate all communications circuits.
  - Remove two breakers connecting to Sammis 3 and 4 and replace with substation conductor at Sammis 345 kV yard.
  - Separate all protection and controls schemes.
- Estimated cost increase as a result of refined field assessments and engineering with the work required in 138 kV yard.

- **Original Estimated Cost**: $8M
- **New Estimated Cost:** $15.3M

- **Projected IS Date**: 06/01/2022

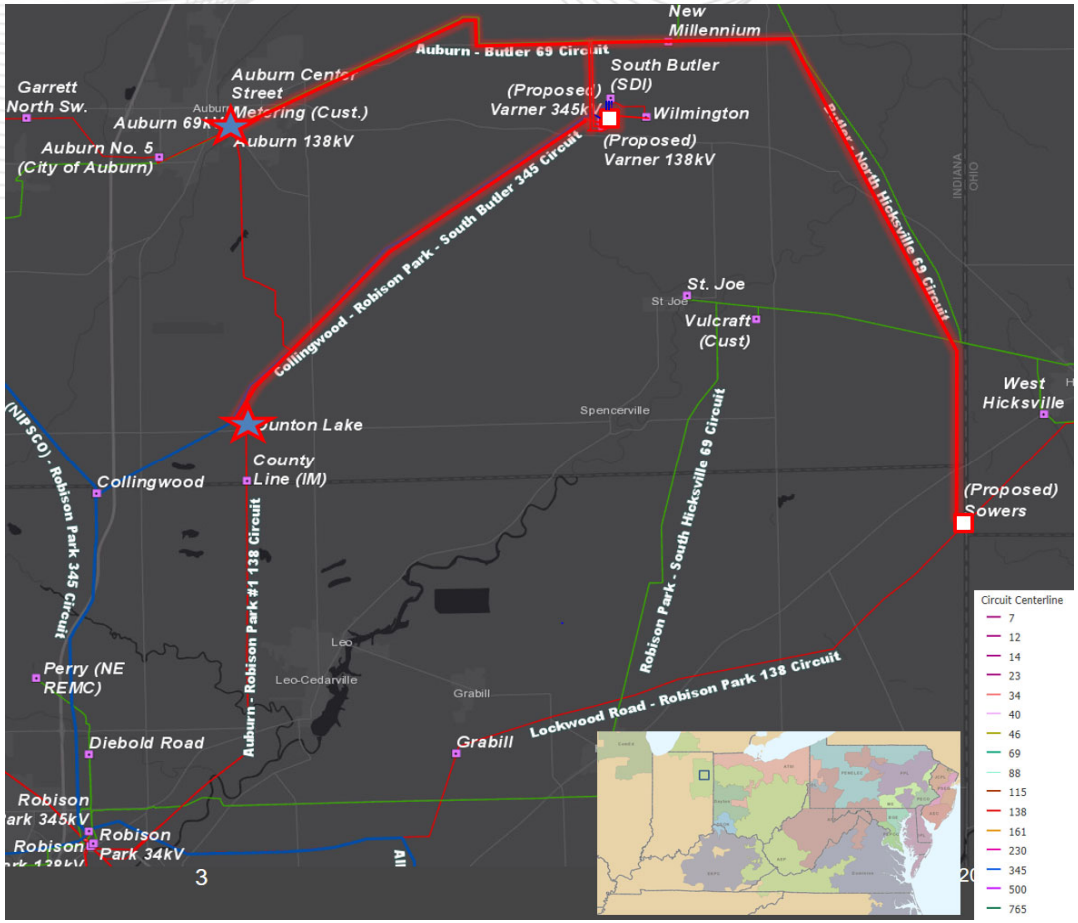
AEP Transmission Zone
B2779 Scope/Cost change

Scope/Cost change for B2779.1 -.5

Original Project Scope: (Previous presented on 1/12/2017 TEAC)

- Construct a new 138 kV station, Sowers (Originally named Campbell Road), tapping into the Grabill – South Hicksville138kV line (**B2779.1**)
- Reconstruct sections of the Butler-N.Hicksville and Auburn-Butler 69kV circuits as 138kV double circuit and extend 138kV from Sowers station (**B2779.2**)
- Construct a new 345/138kV SDI Varner (Originally named Willington) Station which will be sourced from Collingwood 345kV and serve the SDI load at 345kV and 138 kV respectively (**B2779.3**)
- 138kV circuits will be looped in-out of the new SDI Varner station resulting in a direct circuit to Auburn and Rob Park via Dunton Lake, and a circuit to Sowers; Reconductor 138kV line section between Dunton Lake – SDI Wilmington (**B2779.4**)
- Expand 138kV bus at Auburn (**B2779.5**)

Original Total Estimated Cost: $107.7M



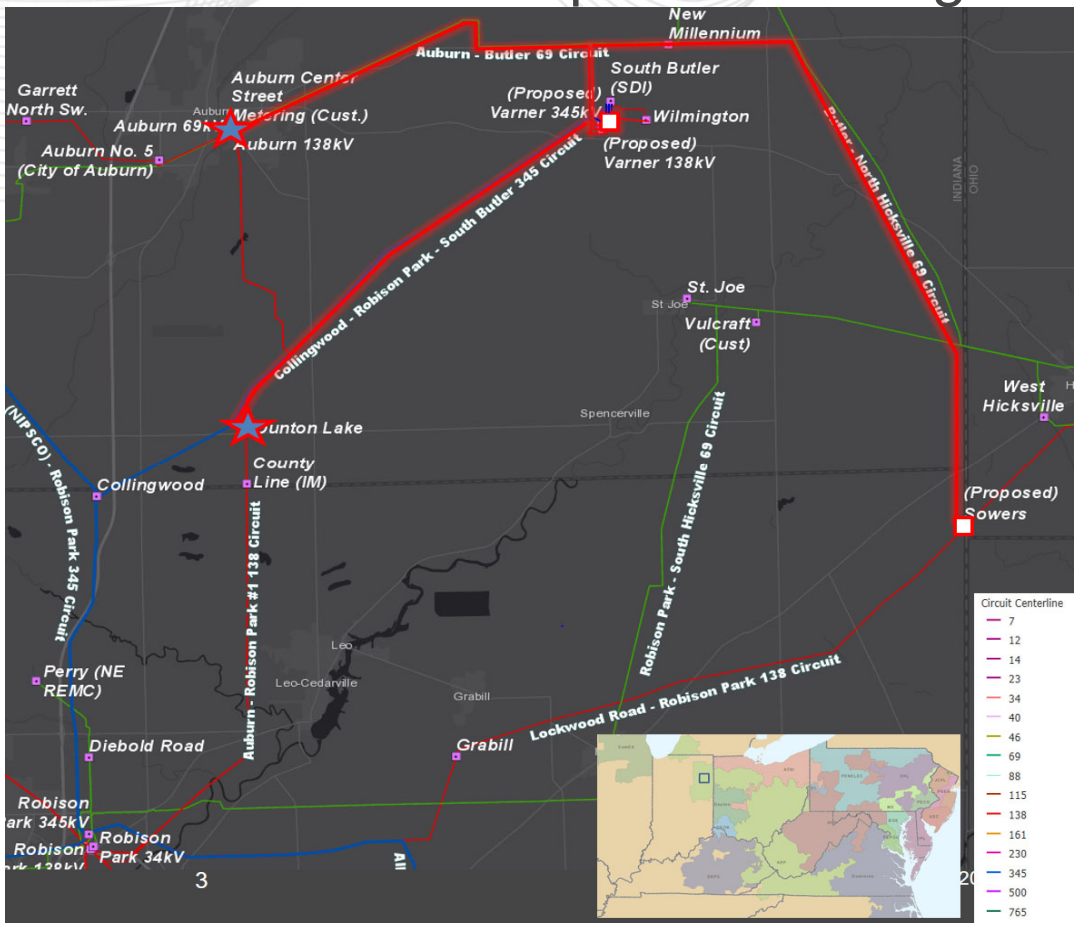
AEP Transmission Zone
B2779 Scope/Cost change

Major Cost Drivers:

- Varner & South Butler cost increase due to circuit breaker additions to ensure segregation of customer and AEP facilities in accordance with AEP connection requirements*: $6.7 M
- Flicker reduction for local customers requiring an expanded 345kV yard with reactors and capacitor banks: $20.3 M
- Collingwood cost increase due to security enhancements and space constraints: $14M
- Cost increase from functional to detail scope: $6.9M
- Wilmington Tap relocation work**: $2.4M
- Cost of (3) 345kV feeds from Varner to South Butler: $6M

Cost at Submittal: $107.7M
Updated Cost: : $164.2M

- *AEP's interconnection requirements require a circuit breaker at the customer end for lines longer than 2 spans. Additional 345kV CB's at South Butler station are required due to supplying three feeds to the load. This configuration also would have required AEP to purchase the through path at South Butler station.
- **To accommodate (3) 345kV lines from Varner to South Butler, the Wilmington Tap had to be rerouted and rebuilt.



Additional Considerations

- The proposed construction plan would require a prolonged outage of the Collingwood 345kV line, which is the only line that currently serves 300+ MW demand at SDI.
- SDI cannot afford to take a prolonged outage.
- The resolution would involve building of the 138 kV infrastructure before the 345 kV outages can be taken resulting in prolonged flicker exposure to local customers.
- Additionally, the future expansion at SDI would risk increased flicker levels to other customers.
- To arrest cost increases and avoid flicker exposure, AEP is recommending modifications to the project scope in consultation with SDI.

AEP Transmission Zone
B2779 Scope/Cost change

New Project Scope:

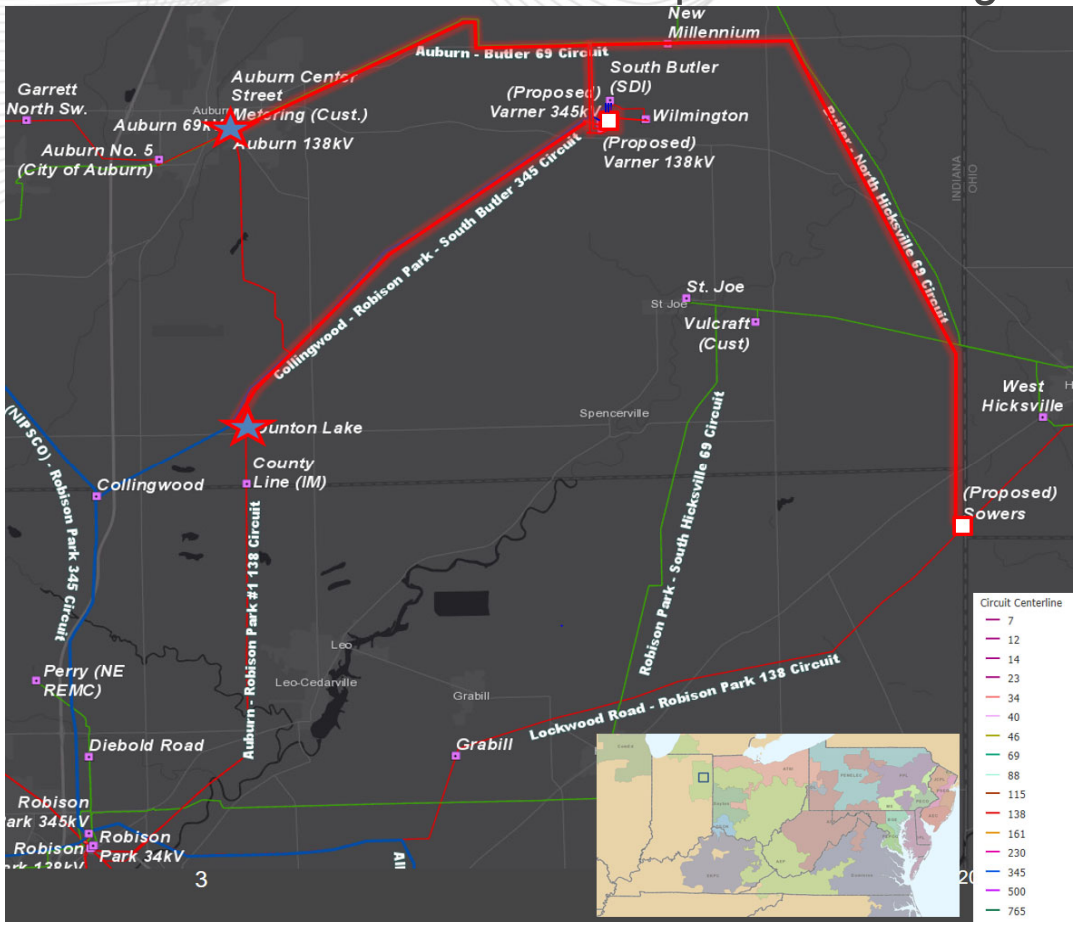
- Construction a new 138 kV station, Sowers, tapping into the Grabill – South Hicksville138kV line (**B2779.1**) **Estimated Cost: $10.1M**
- Reconstruct sections of the Butler-N.Hicksville (9.6miles) and Auburn-Butler (9 miles) 69kV circuits as 138kV double circuit and extend 138kV from Sowers station (3.5miles); (**B2779.2**) **Estimated Cost: $45.1M**
- Construct a new 345/138kV SDI Varner Station which will serve a portion of the SDI load from the 138 kV system; Serve Wilmington Tap from new Varner 138 kV station. Add additional breakers at South Butler station to comply with AEP Interconnection Guidelines. (**B2779.3**) **Estimated Cost: $37.6M**
- 138kV circuits will be looped in-out of the new SDI Varner station resulting in a direct circuit to to Auburn Sowers and Wilmington. String approximately 3 miles of the open side of circuit between Collingwood and Dunton Lake with new conductor thus establishing a second 345 kV feed (utilizing 9 miles of existing 138 kV feed constructed as 345 kV) (**B2779.4**) **Estimated Cost: $14.8M**
- Expand 138kV bus at Auburn (**B2779.5**) **Estimated Cost: $2.6M**
- Construct a 345kV ring bus at Dunton Lake to serve load at SDI at 345 kV via two circuits (**B2779.6**) **Estimated Cost: $23.4M**
- Retire Collingwood station (**B2779.7**) **Estimated Cost: $1.4M**

New Total Estimated Total Cost: $135M

Projected IS Date: 12/31/2021

Notes:

The new configuration splits the load at SDI to serve the furnaces via the 345 kV lines from Dunton Lake and the segregated load via the 138 kV lines from Auburn and Sowers. This configuration eliminates the prolonged outage concerns and also improves power quality by keeping the arc furnaces on the 345 kV. Additionally, the updated configuration allows for future maintenance on any feed to SDI. The total estimated cost is $29.2M less than the original solution.



Dominion Transmission Zone: Baseline
Chickahominy 230kV Breaker “SC122”, “205022”, 209122”, 210222-2”, “28722”, “H222”, “21922”, “287T2129” Replacements

Process Stage: Recommended Solution

Criteria: Over Duty Breaker

Assumption Reference: none

Model Used for Analysis: 2025 short circuit model

Proposal Window Exclusion: Station Equipment

Problem Statement:

Eight (8) Chickahominy 230kV breakers are over duty:
“SC122”, “205022”, 209122”, 210222-2”, “28722”, “H222”, “21922”, “287T2129”

Significant Driver:
b3213: Install 2nd Chickahominy 500/230 kV transformer. (Generator Deactivation of Chesterfield 5 and 6).

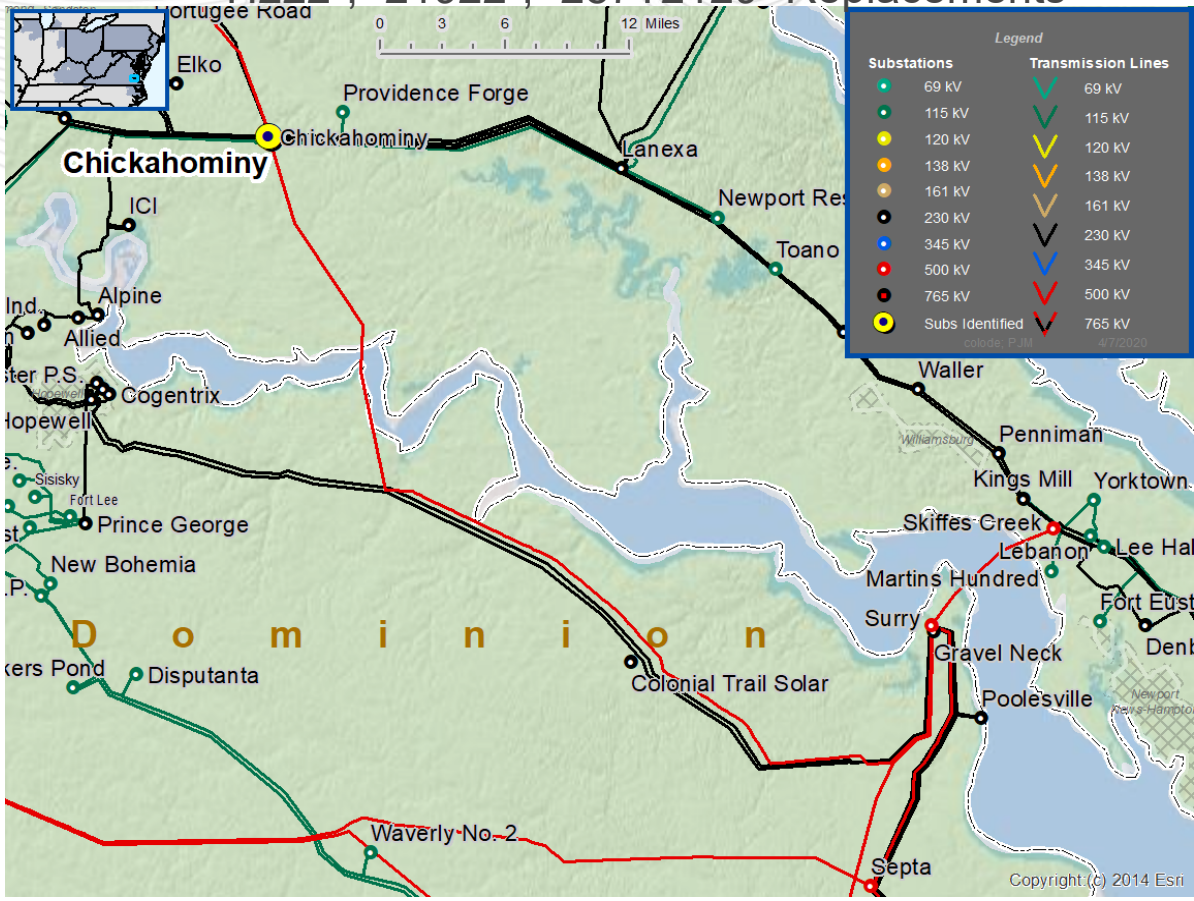
Existing Facility Rating: 50kA interrupting rating

Recommended Solution:
b3213.1: Replace the eight (8) Chickahominy 230kV breakers with 63kA breakers:
“SC122”, “205022”, 209122”, 210222-2”, “28722”, “H222”, “21922”, “287T2129”

- **Estimated Cost:** $3.76M Replace the eight breakers with 63kA breakers ($0.47M each)

Required In-Service: 6/1/2023

Previously Presented: 11/4/2020

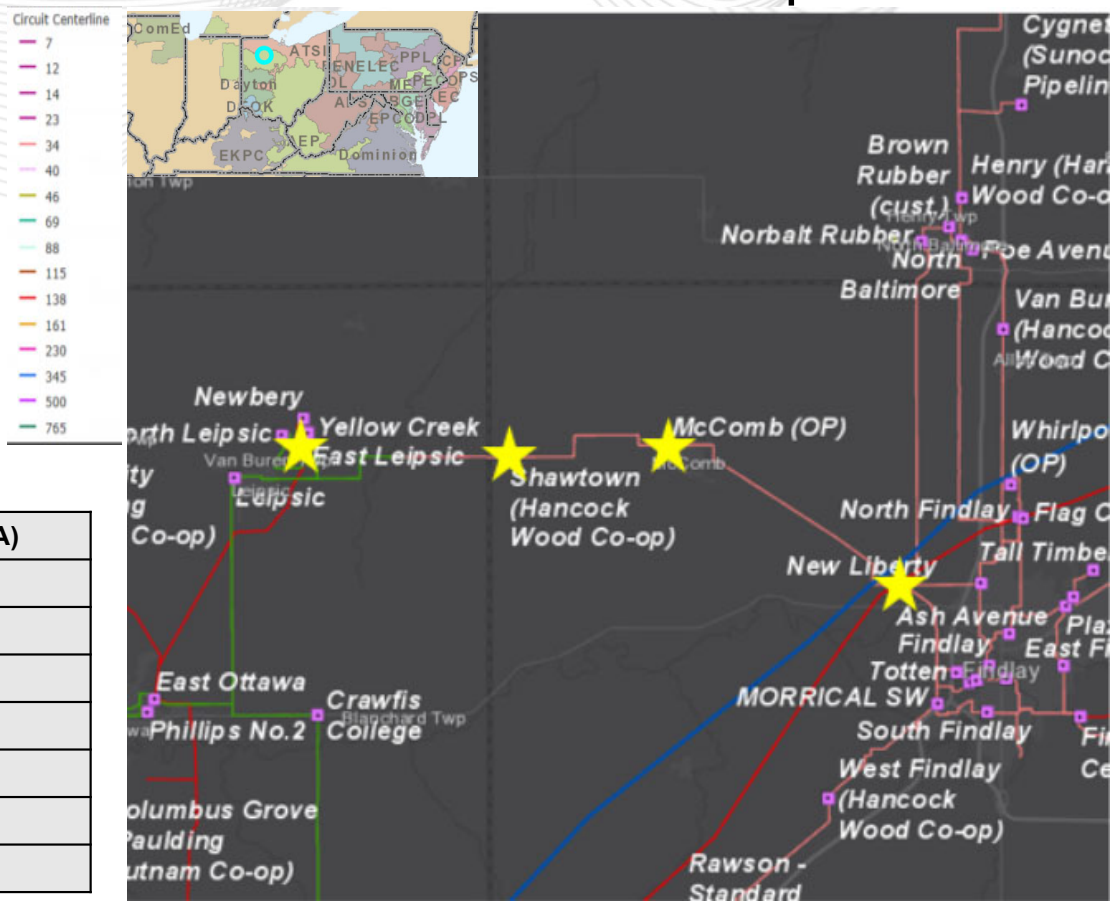


AEP Transmission Zone: Baseline
Leipsic area

Process Stage: Second Review
Criteria: AEP FERC 715 Criteria
Assumption Reference: 2025 RTEP assumption
Model Used for Analysis: 2025 RTEP cases
Proposal Window Exclusion: None
Problem Statement:

AEP-T63,AEP-T64,AEP-T65,AEP-T66,AEP-T67,AEP-T68,AEP-T69,AEP-T70,AEP-T71,AEP-T72,AEP-T73

The East Ottawa – Leipsic – Deshler Tap 69kV line, East Leipsic - North Leipsic 69KV line, East Leipsic 138/69kV transformer, Cairo – East Lima 69kV line, and McComb OP – New Liberty 34.5kV line are overloaded for a tower contingency and multiple N-1-1 contingency pairs.



Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05E OTTAWA -05LEIPSIC 69KV	68/73/90/91
05LEIPSIC – 05DSCHLERT 69KV	73/73/91/91
05DSCHLERT – 05NLEIP SW 69KV	73/73/91/91
05E.LEIPSC – 05NLEIP SW 69KV	73/73/91/91
05MCCOMB OP – 05NEW LIBR 34.5kV	20/20/28/28
05CAIRO – 05E LIMA 69kV	50/50/63/63
05E.LEIPSIC2 -05E.LEIPSC 138/69kV	59/69/69/75

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline
Leipsic area

Recommended Solution: Proposal #2020_1-957

Rebuild and convert the existing 17.6 miles East Leipsic – New Liberty 34.5 kV circuit to 138 kV using 795 ACSR (**B3273.1**) **Estimated Cost: $31.351M**

Convert the existing 34.5kV equipment to 138kV and Expanded the existing McComb station to the north and east to allow for new equipment to be installed. Install two new 138kV box bays to allow for line positions and two new 138-12kV XFs. (**B3273.2**) **Estimated Cost: $0.868M**

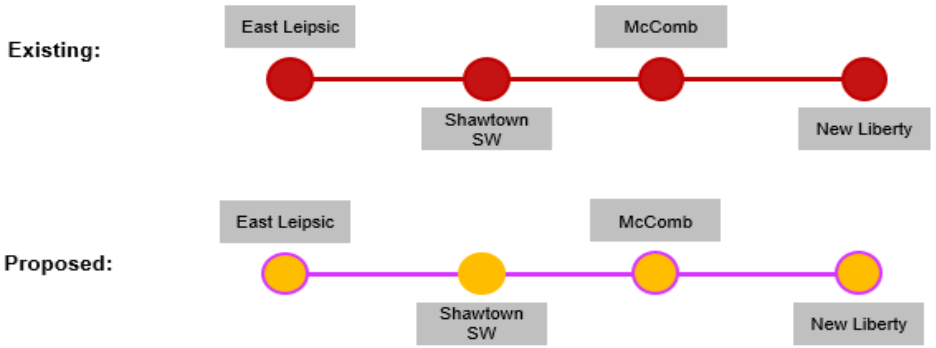
Expand the existing East Leipsic station to the north to allow for another 138kV line exit to be installed. New line exit will involve installing a new 138kV CB, disconnect switches and new dead end structure along with extending existing 138kV bus work. (**B3273.3**) **Estimated Cost: $1.3M**

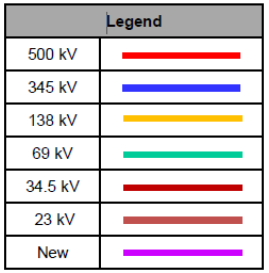
Add one 138kV circuit breaker and disconnect switches in order to add an additional line position at New Liberty station. Install line relaying potential devices and retire 34.5 kV breaker F. (**B3273.4**) **Estimated Cost: $0.899M**

Total Estimated Cost: $34.418M

Preliminary Facility Rating: :

Branch	SN/SE/WN/WE (MVA)
New Liberty to McComb OP 138kV	257/360/325/404
McComb OP to Shawtown 138kV	257/360/325/404
East Leipsic to Shawtown 138kV	257/360/325/404





SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline
Leipsic area

Additional Benefits:

- This project completely addresses the needs reviewed with stakeholders under need number AEP-2020-OH020 in the March 19, 2020 SRRTEP Western meeting.
  - Considering the two loads served from the line at Shawtown and McComb stations, retirement of the facilities is not an option for the line reviewed as need AEP-2020-OH020. In order to address the need, the same solution proposed as proposal No. 2020_1-957 would be the proposed supplemental solution. If a proposal other than proposal No. 957 is chosen, AEP will move forward with to propose this as a supplemental solution in addition to whichever baseline proposal is selected.

AEP-2020-OH020 Attachment M-3 need

AEP no longer maintains 34.5kV installations as part of their standards. The rebuild of the facility for the need would require the use of their 69KV standard or 138kV standard. A rebuild of the facilities for the need using the138kV standard is estimated by the transmission owner to cost $34M

There is no 69 kV established on the New Liberty side of the system. If 69 kV construction is used, there would also be the need to establish a new 69 kV yard at New Liberty with a 138/69 kV transformer at some point in the future. The downtown Findlay area (served partially from New Liberty) is all currently constructed using 34.5 kV requirements with 138 kV sources. So rebuilding at 138 kV reduces the need for additional transformation in the future as additional 34.5 kV facilities reach the end of their life.

AEP Transmission Zone: Baseline
Leipsic area

Additional Benefits: (continued)
This project also solves FG#
AEP-VM137,AEP-VM138,AEP-VM139,AEP-VM140,AEP-VM141,AEP-VM142,AEP-VM143,AEP-VM144,AEP-VM145,AEP-VM146,AEP-VM147,AEP-VM148,AEP-VM149,AEP-VM150,AEP-VM151,AEP-VM152,AEP-VM153,AEP-VM154,AEP-VM155,AEP-VM156,AEP-VM157,AEP-VM158,AEP-VM159,AEP-VM160,AEP-VM161,AEP-VM162,AEP-VM163,AEP-VM164,AEP-VM165,AEP-VM166,AEP-VM167,AEP-VM168,AEP-VM169,AEP-VM170,AEP-VM171,AEP-VM172,AEP-VM173,AEP-VM174,AEP-VM175,AEP-VM176,AEP-VM177,AEP-VM178,AEP-VM179,AEP-VM180,AEP-VM181,AEP-VM182,AEP-VM183,AEP-VM184,AEP-VM185,AEP-VM186,AEP-VM187,AEP-VM188,AEP-VM189,AEP-VM190,AEP-VM191,AEP-VM192,AEP-VM193,AEP-VM194,AEP-VM195,AEP-VM196,AEP-VM197,AEP-VM198,AEP-VM199,AEP-VM200,AEP-VM201,AEP-VM202,AEP-VM203,AEP-VM204,AEP-VM205,AEP-VM206,AEP-VM207,AEP-VM208,AEP-VM209,AEP-VM210,AEP-VM211,AEP-VM212,AEP-VM213,AEP-VM214,AEP-VM215,AEP-VM216,AEP-VM217,AEP-VM218,AEP-VM219,AEP-VM220,AEP-VM221,AEP-VM222,AEP-VM223,AEP-VM224,AEP-VD114,AEP-VD115,AEP-VD116,AEP-VD117,AEP-VD118,AEP-VD119,AEP-VD120,AEP-VD121,AEP-VD122,AEP-VD123,AEP-VD124,AEP-VD125,AEP-VD126,AEP-VD127,AEP-VD128,AEP-VD129,AEP-VD130,AEP-VD131,AEP-VD132,AEP-VD133,AEP-VD134,AEP-VD135,AEP-VD136,AEP-VD137,AEP-VD138,AEP-VD139,AEP-VD140,AEP-VD141,AEP-VD142,AEP-VD143,AEP-VD144,AEP-VD145,AEP-VD146,AEP-VD147,AEP-VD148,AEP-VD149,AEP-VD150,AEP-VD151,AEP-VD152,AEP-VD153,AEP-VD154,AEP-VD155,AEP-VD156,AEP-VD157,AEP-VD158,AEP-VD159,AEP-VD160,AEP-VD161,AEP-VD162,AEP-VD163,AEP-VD164,AEP-VD165,AEP-VD166,AEP-VD167,AEP-VD168,AEP-VD169,AEP-VD170,AEP-VD171,AEP-VD172,AEP-VD173,AEP-VD174,AEP-VD175,AEP-VD176,AEP-VD177,AEP-VD178,AEP-VD179,AEP-VD180,AEP-VD181,AEP-VD182,AEP-VD183,AEP-VD184,AEP-VD185,AEP-VD186,AEP-VD187,AEP-VD188,AEP-VD189,AEP-VD190,AEP-VD191,AEP-VD192,AEP-VD193,AEP-VD194,AEP-VD195,AEP-VD196,AEP-VD197,AEP-VD198,AEP-VD199,AEP-VD357,AEP-VD374, which are low voltage magnitude and voltage drop violations at buses COLGRVE 69KV, GLANDORF 69KV, Philips 69KV, East Ottawa 69KV, Leipsic 69KV, East Leipsic 69KV, North Leipsic 69KV, Deshler Tap 69KV, Miller 69KV, Crawfish College 69KV, Cairo 69KV, Shawtown 34.5KV, McComb 34.5kV, East Leipsic 138kV, Rockport 138kV, Newbery 138kV, Yellow Creek 138kV, and Baseline 138kV

Proposal Window Exclusion: Below 200kV Exclusion

Required In-Service: 6/1/2025

Projected In-Service: 1/31/2024

Previously Presented: 11/4/2020

AEP Transmission Zone: Baseline Newcomerstown –Salt Fork Rebuild

Process Stage: Second Review

Criteria: AEP FERC 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 Summer case

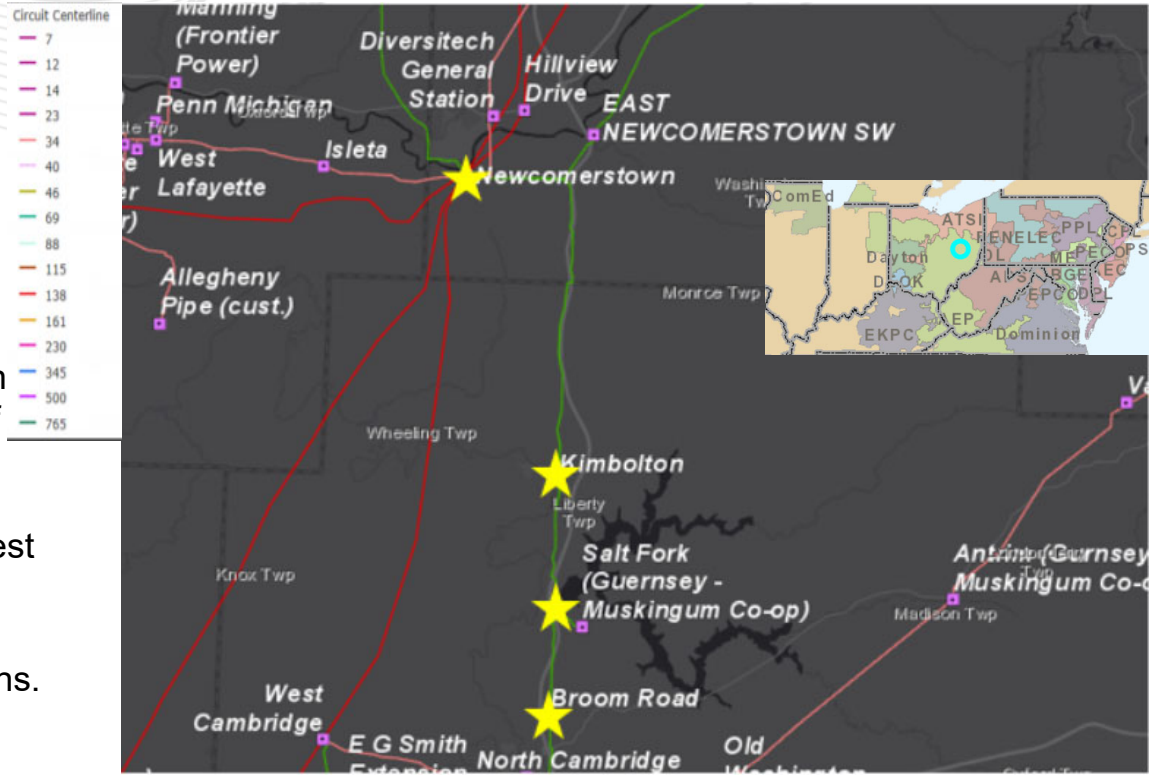
Proposal Window Exclusion: None

Problem Statement:

AEP-T366,AEP-T367,AEP-T368,AEP-T373

The West Newcomerstown – KimBLTN – SaltFork 69kV lin are overloaded for the N-1-1 contingency pair of the loss of the West Cambridge – East New Concord -PHILO 138kV line, West Cambridge138/69 transformer and West Cambridge –Cassell JSS 69kV line, and the loss of the West Byesville – Derwent 69kV line.

As part of the 2020 RTEP Window #1, the projects listed in the table below are proposed to address the above violations.



AEP Transmission Zone: Baseline
Newcomerstown –Salt Fork Rebuild

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05NEWCOMTW - 05KIMBLTN 69kV	46/46/65/65
05KIMBLTN – 05SALTFRKZ 69kV	46/46/65/65

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05NEWCOMTW - 05KIMBLTN 69kV	73/73/91/91
05KIMBLTN – 05SALTFRKZ 69kV	73/73/91/91

Recommended Solution:

Proposal #2020_1-182: Rebuild approximately 8.9 miles of 69 kV line between Newcomerstown and Salt Fork Switch with 556 ACSR conductor. (**B3274**)

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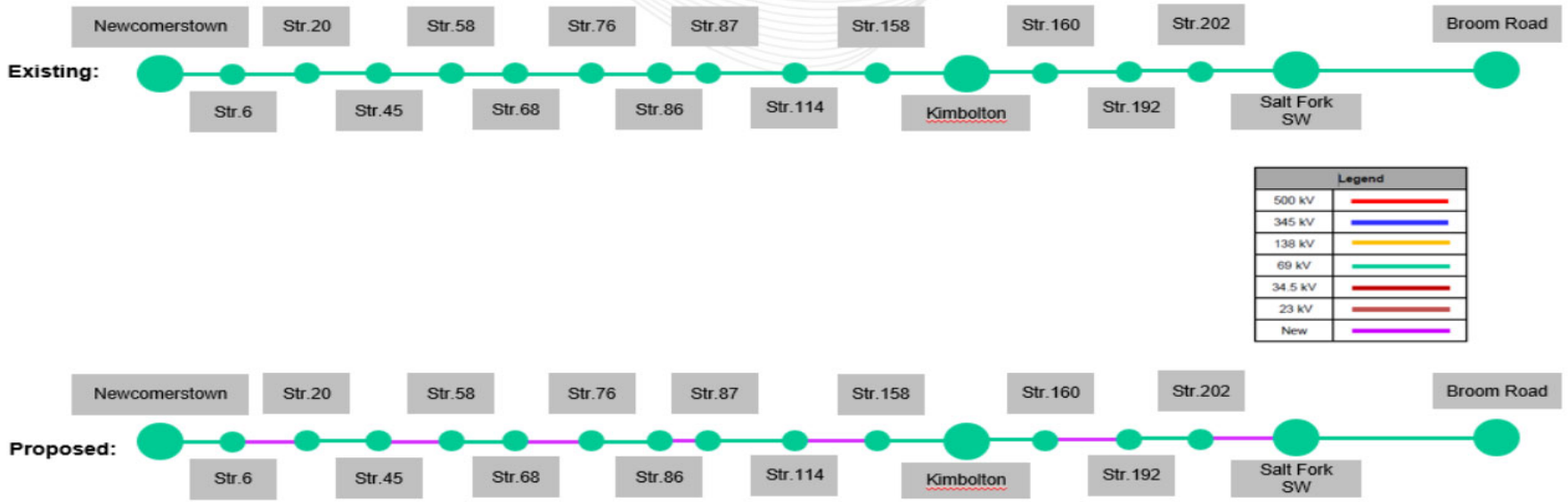


SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline
Newcomerstown –Salt Fork Rebuild

Additional Benefits:

Newcomerstown-Broom Road 69 kV Circuit (17.62 miles)

- From 2015 – 2020 this circuit has experienced 11 momentary and 5 permanent outages resulting in approximately 750k CMI.
- The circuit currently has 53 open conditions on 49 structures (23% of the total structures), including pole damage, rot top, rot heart, rotted/split poles, burnt insulators, and missing ground lead wires.
- Structures are made up of 1926 steel lattice towers (5 structures) and wood poles from the 1960s (88 structures) and the 1980s (120 structures).
- The circuit conductor was primarily installed in 1926 consisting of 3/0 Copper (9.76 miles) and 336 ACSR (4.3 miles) from the 1960s.
- Proposal #2020_1-182 is rebuilding the overloaded 3/0 Copper sections of line between Newcomerstown, Kimbolton, and Salt Fork stations, approximately 8.9 miles.

Required In-Service: 6/1/2025

Projected In-Service: 6/1/2025

Previously Presented: 11/4/2020

AEP Transmission Zone: Baseline
Kammer – Natrium 69kV Rebuild

Process Stage: Second Review

Criteria: AEP FERC 715 Criteria

Assumption Reference: 2025 RTEP assumption

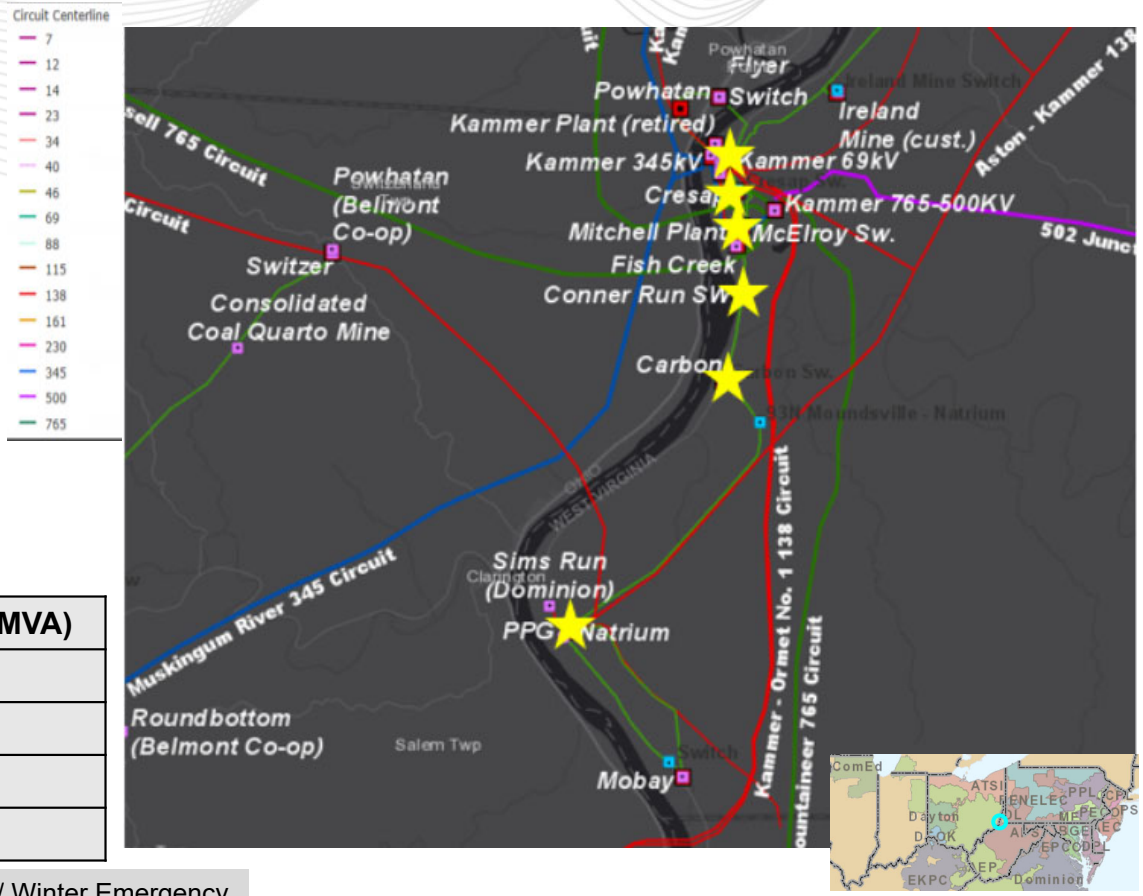
Model Used for Analysis: 2025 Summer case

Proposal Window Exclusion: None

Problem Statement:

AEP-T219, AEP-T221,AEP-T222,AEP-T223,AEP-T225,AEP-T226,AEP-T227,AEP-T228,AEP-T229,AEP-T230,AEP-T231,AEP-T232,AEP-T233,AEP-T234,AEP-T237,AEP-T238,AEP-T239,AEP-T240,AEP-T243,AEP-T244, and AEP-T250

The Conner RN – Columbi - Natrium 69kV line and Kammer – Cresaps –McElroy 69KV line are overloaded for a tower contingency and multiple N-1-1 contingency pairs.



Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05COLOMBI - 05CONNERRN 69KV	50/50/63/63
05COLOMBI - 05NATRIUM 69KV	50/50/63/63
05CRESAPS – 05KAMMER 69KV	82/90/107/113
05CRESAPS – 05MCELROY 69kV	75/75/94/94

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline
Kammer – Natrium 69kV Rebuild

Recommended Solution: Proposal #2020_1-804

Rebuild from Kammer Station to Cresaps Switch 69KV, approximately 0.5 miles.. (**B3275.1**) **Estimated Cost: $0.933M**

Rebuild Cresaps Switch to McElroy Station 69kV, approximately 0.67 miles. (**B3275.2**) **Estimated Cost: $1.25M**

Replace a single span of 4/0 ACSR from Moundsville - Natrium str 93L to Carbon Tap switch 69kV located between Colombia Carbon and Conner Run stations. Remainder of line is 336 ACSR. (**B3275.3**) **Estimated Cost: $0.012M**

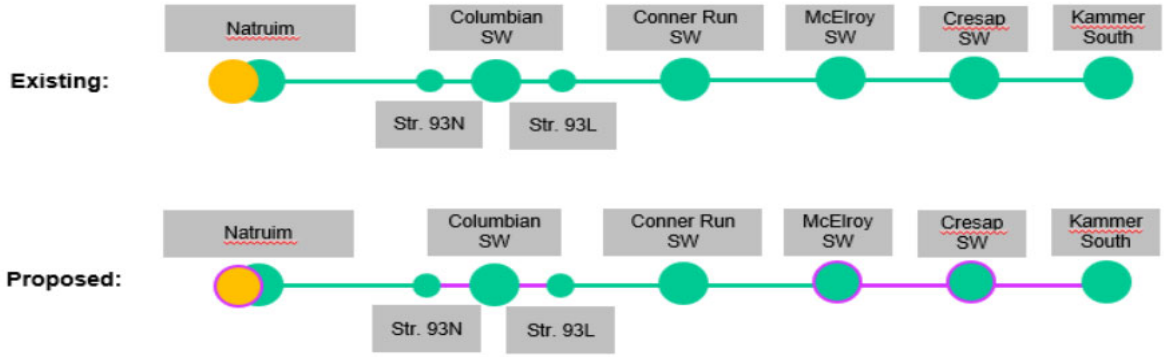
Rebuild from Colombia Carbon to Columbia Carbon Tap str 93N 69KV, approximately 0.72 miles. The remainder of the line between Colombia Carbon Tap structure 93N and Natrium station is 336 ACSR and will remain. (**B3275.4**) **Estimated Cost: $1.082M**

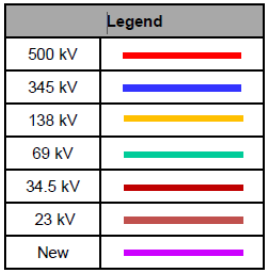
Replace the Cresaps 69kV 3-Way Phase-Over-Phase Switch and structure with a new 1200A 3-Way Switch and Steel Pole. (**B3275.5**) **Estimated Cost: $0.706M**

Replace 477 MCM Alum bus and risers at McElroy 69 kV station (**B3275.6**) **Estimated Cost: $0.325M**

Replace Natrium138kV bus existing between CB-BT1 and along the 138kV Main Bus # 1 dropping to CBH1 from the 500MCM conductors to a 1272 KCM AAC conductor. Replace the dead end clamp and strain insulators (**B3275.7**) **Estimated Cost: $0.291**

Total Estimated Cost: $4.599M





AEP Transmission Zone: Baseline
Kammer – Natrium 69kV Rebuild

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Natrium12 – Natrium34 138KV	383/449/485/534
Cresaps – Kammer 69KV	129/180/162/202
Cresaps – McElroy 69kV	129/180/162/202
Cresaps – Conner Run 69kV	102/102/129/129
Columbi to Conner Run 69kV	82/90/107/113
Columbi to Natrium 69kV	75/75/94/94

Additional Benefits: This project also solves N1-ST41,N1-ST42,GD-S298,GD-S446 and GD-S315, which are overloads on Natrium12 – Natrium34 branch for multiple common mode contingencies in summer generation deliverability test and basecase analysis.

Additionally, Kammer-Natrium 69 kV Circuit (7.6 miles) has supplemental needs. From 2015 – 2020 this circuit has experienced 6 momentary and 2 permanent outages resulting in approximately 100k CMI. The circuit currently has 41 open conditions on 19 structures (20% of the total structures), including pole damage, rot top, rot heart, rotted/split poles, burnt insulators, and missing ground lead wires. 55 structures have been replaced in the 2000s; remaining are wood poles from 1950s and 1960s with two steel lattice towers from 1927. The circuit conductor was primarily installed in 1927 consisting of 336 ACSR (3.73 miles) and 556 ACSR (0.5 miles), and 4/0 ACSR (0.8 miles) from 1971. The remainder was replaced in the 2000s with 556 ACSR (2.6 miles).

The baseline proposal is rebuilding overloaded sections of line that consist of the 1927 era 556 and 336 ACSR (1.17 miles) between Kammer and McElroy stations and the 4/0 ACSR sections (0.72 miles) between Connor Run and Natrium stations.

Required In-Service: 6/1/2025

Projected In-Service: 6/1/2025

Previously Presented: 11/4/2020

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline South Lancaster – Lancaster - Ralston 69kV Rebuild

Process Stage: Second Review

Criteria: AEP FERC 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 Summer case

Proposal Window Exclusion: None

Problem Statement:

AEP-T376,AEP-T377,AEP-T384,AEP-T385,AEP-T388,AEP-T389

The East Lancaster – Lancaster 69kV line and Lancaster – South Lancaster 69kV line, Ralston – Lancaster Junction 69kV line are overloaded for multiple N-1-1 contingency pairs.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05E.LANCAST2 -05LANCASTE 69KV	40/40/56/56
05LANCASTE – 05S.LANCAST1 69KV	40/40/56/56
05RALSTON – 05LANCAS JTZ 69KV	35/35/48/48

Recommended Solution: Proposal #2020_1-915

Rebuild the 2/0 Copper section of line between Lancaster and South Lancaster, approximately 2.9 miles of the 3.2 mile total length. The remaining section has 336 ACSR conductor with 556 ACSR conductor. (**B3276.1**) **Estimated Cost: $5.37M**

Rebuild the 1/0 Copper section of the line between Lancaster Junction and Ralston station, approximately 2.3 miles of the 3.1 mile total length. (**B3276.2**) **Estimated Cost: $4.582M**

Rebuild the 2/0 Copper portion of the line between East Lancaster Tap and Lancaster, approximately 0.81 miles. (**B3276.3**) **Estimated Cost: $1.195M**
Total Estimated Cost: $11.147M

SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline
South Lancaster – Lancaster - Ralston 69kV Rebuild

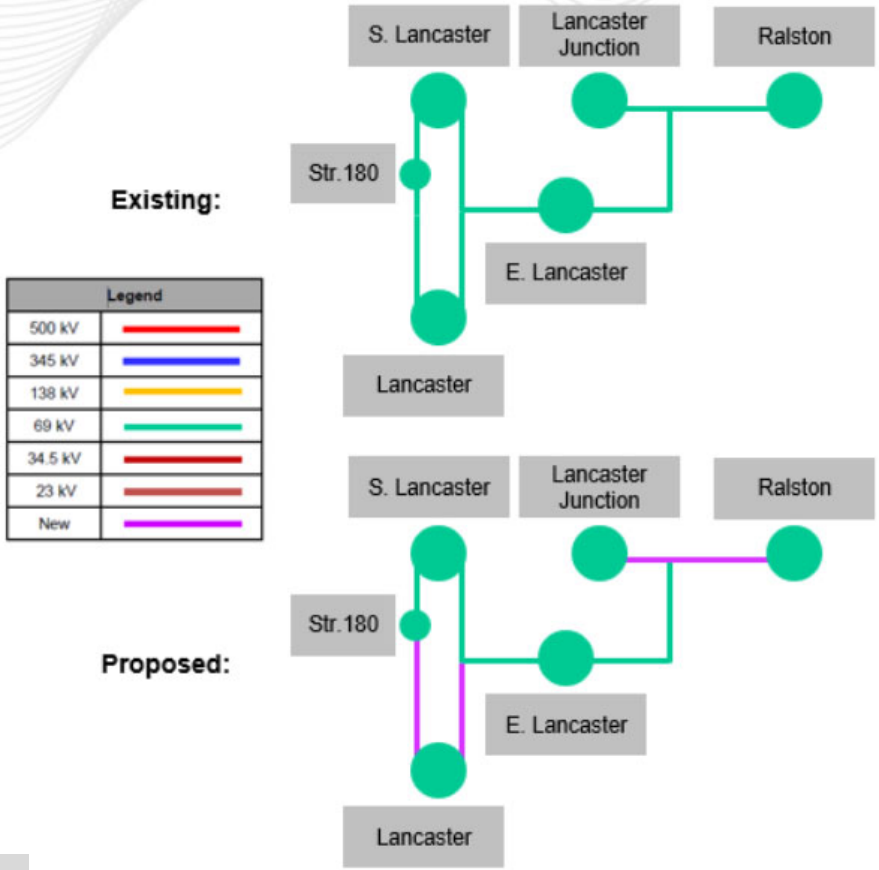
Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05LANCAS JTZ – 05LANCAST JT 69KV	82/90/107/113
05E.LANCASTZ – 05LANCASTE 69KV	68/86/90/103
05S.LANCAST1 – 05LANCASTE 69kV	82/90/107/113
05RALSTON – 05LANCAS JTZ 69kV	82/90/107/113

Additional Benefits:

Lancaster-East Lancaster-South Lancaster 69 kV Circuit (3.35 miles)

- From 2015 – 2020 this circuit has experienced 8 momentary and 2 permanent outages. Since the line does not directly serve customers, there were no CMI.
- The circuit currently has 49 open conditions on 27 structures (47% of the total structures), including bent tower legs, cracked poles, burnt and broken insulators, and heavy rusting.
- Structures are made up of 1923 steel lattice towers (17 structures) and wood poles (41 structures) from the 1950s and 1960s.
- The circuit conductor was primarily installed in 1923 consisting of 2/0 Copper (1.84 miles) and 556 ACSR (1.5 miles) from 1965.
- The baseline proposal is rebuilding the 2/0 Copper single circuit section of line between Lancaster and East Lancaster, approximately 0.8 miles. Approximately 1 mile is a double circuit section that's common to the Lancaster-South Lancaster circuit .



SN / SE / WN / WE: Summer Normal / Summer Emergency / Winter Normal / Winter Emergency

AEP Transmission Zone: Baseline
South Lancaster – Lancaster - Ralston 69kV Rebuild

Additional Benefits: (continued)

Lancaster-South Lancaster 69 kV Circuit (3.3 miles)

- From 2015 – 2020 this circuit has experienced 3 momentary and 2 permanent outages resulting in approximately 1M CMI.
- The circuit currently has 56 open conditions on 30 structures (77% of the total structures), including bent tower legs, cracked poles, burnt and broken insulators, and heavy rusting.
- Structures are made up of 1923 steel lattice towers (25 structures) and wood poles (14 structures) from the 1970s.
- The circuit conductor was primarily installed in 1923 consisting of 2/0 Copper (2.79 miles) and 556 ACSR (0.5 miles) from 1978.
- The baseline proposal is rebuilding the 2/0 Copper sections of line between Lancaster and South Lancaster, approximately 2.8 miles. Approximately 1 mile is a double circuit section that's common to the Lancaster-East Lancaster circuit.

Lancaster Junction-Ralston 69 kV Line (3.08 miles)

- From 2015 – 2020 the entire circuit has experienced 12 momentary and 4 permanent outages resulting in approximately 3.1M CMI.
- The line currently has 33 open conditions on 27 structures (36% of the total structures), including damaged braces, rot top, rot heart, burnt insulators, and broken ground lead wires.
- Structures are made up of wood poles from the 1940s (16 structures) and the 1960s (27). Some structures have been replaced since the 1980s (27 structures).
- The circuit conductor was installed in 1955 consisting of 1/0 Copper (1.9 miles), 1/0 ACSR (0.44 miles), and 556 ACSR (0.74 miles).
- The baseline proposal is rebuilding the 1/0 conductor sections of line between Lancaster and South Lancaster, approximately 2.3 miles.

Required In-Service: 6/1/2025

Projected In-Service: 4/30/2025

Previously Presented: 11/4/2020

Dominion Transmission Zone: Baseline Manassas Area

Process Stage: Second Review

Criteria: N-1-1 Load Drop (Summer and Winter), 300 MW Load Loss

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Summer & Winter cases

Proposal Window Exclusion: Immediate Need

Problem Statement:

- Various load drop violations in the Manassas area greater than 300 MW:
  - The loss of 230kV Line #2195 Cannon Branch-Winters Branch and 230kV Line #2196 Pioneer-Sandlot (N2-SLD5, N2-WLD2).
  - The loss of 230kV Line # 2195 Cannon Branch-Winters Branch and 230kV Line #2148 Cloverhill-Sandlot (N2-SLD6, N2-WLD3).
  - The loss of 230kV Line #2195 Cannon Branch-Winters Branch and 230kV Line #2187 Liberty-Pioneer (N2-SLD7 , N2-WLD1).
  - The loss of 230kV Line#2011 Cannon Branch-Liberty and 230kV Line #2187 Liberty-Pioneer (N2-SLD10, N2-WLD6).

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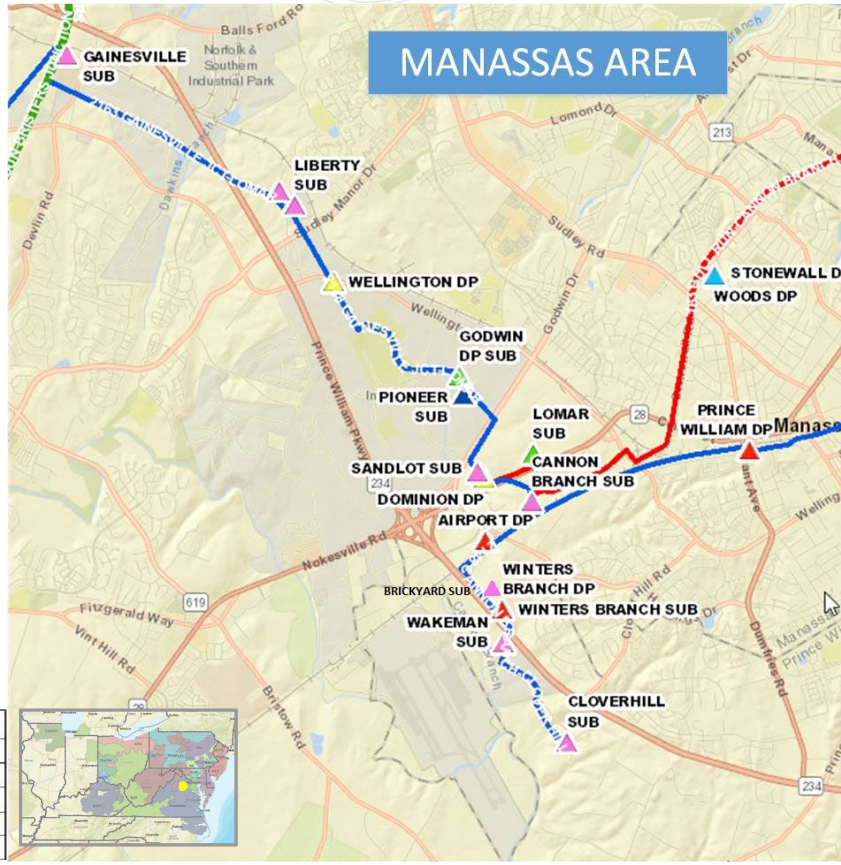


COLOR	VOLTAGE	TRANSMISSION LINE NUMBER
	500 KV.	500 thru 599
	230 KV.	200 thru 299 & 2000 thru 2099
	115 KV.	1 thru 199
	138 KV.	AS NOTED
	69 KV.	AS NOTED

Dominion Transmission Zone: Baseline Manassas Area

Recommended Solution:
Convert 115kV Line #172 Liberty-Lomar and Line#197 Cannon Branch-Lomar to 230kV to provide a new 230kV source between Cannon Branch and Liberty. The majority of Line #172 Liberty-Lomar and Line #197 Cannon Branch-Lomar is adequate for 230kV operation. A wreck and rebuild will be required on 0.36 mile segment of line between Lomar and Cannon Branch junction. Substation work will be required at Liberty, Wellington, Godwin, Pioneer, Sandlot, Cannon Branch, Brickyard, and Winters Branch.

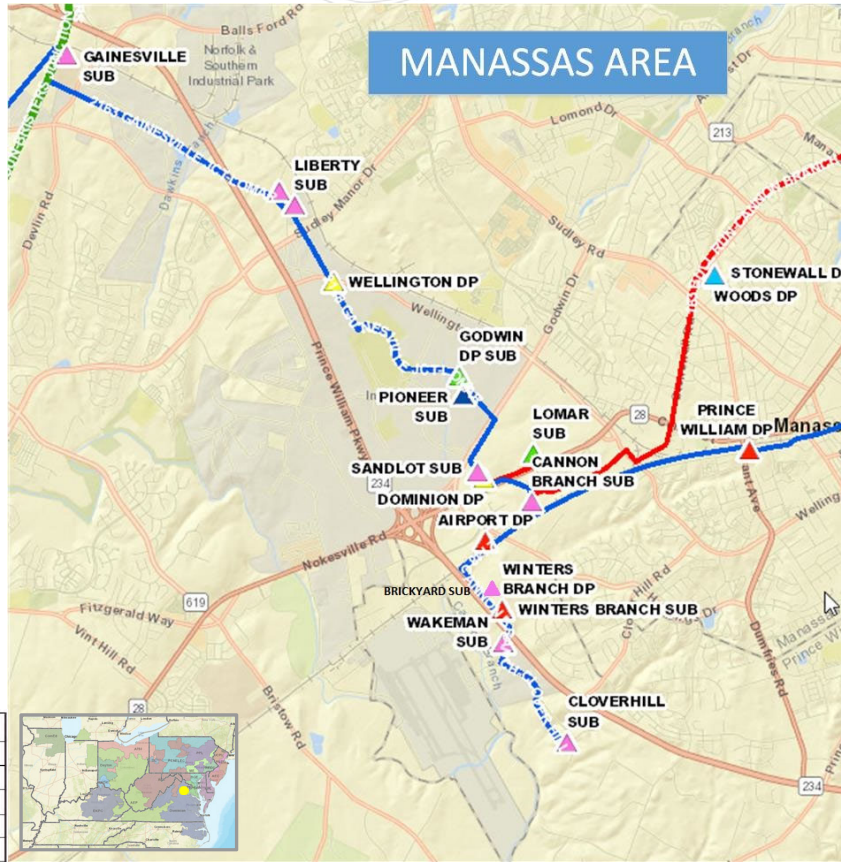
Extend Line #2011 Cannon Branch – Clifton to Winters Branch by removing the existing Line #2011 termination at Cannon Branch and extending the line to Brickyard creating Line #2011 Brickyard-Clifton and extending a new line between Brickyard and Winters Branch. Substation work will be required at Cannon Branch, Brickyard, and Winters Branch.

Replace the Gainesville 230kV 40kA breaker “216192” with a 50kA breaker.

Estimated Cost: $45.5 M
- 115kV to 230kV Line Conversion: $ 10 M **(b3246.1)**
- Substation Work for 115kV to 230kV Line Conversion: $ 21 M **(b3246.2)**
- 230kV Line #2011 Extension: $ 10 M **(b3246.3)**
- 230kV Line #2011 Substation Work for Extension: $ 4
- Gainesville 230kV “216192” breaker replacement: $ 0.

Alternatives: N/A

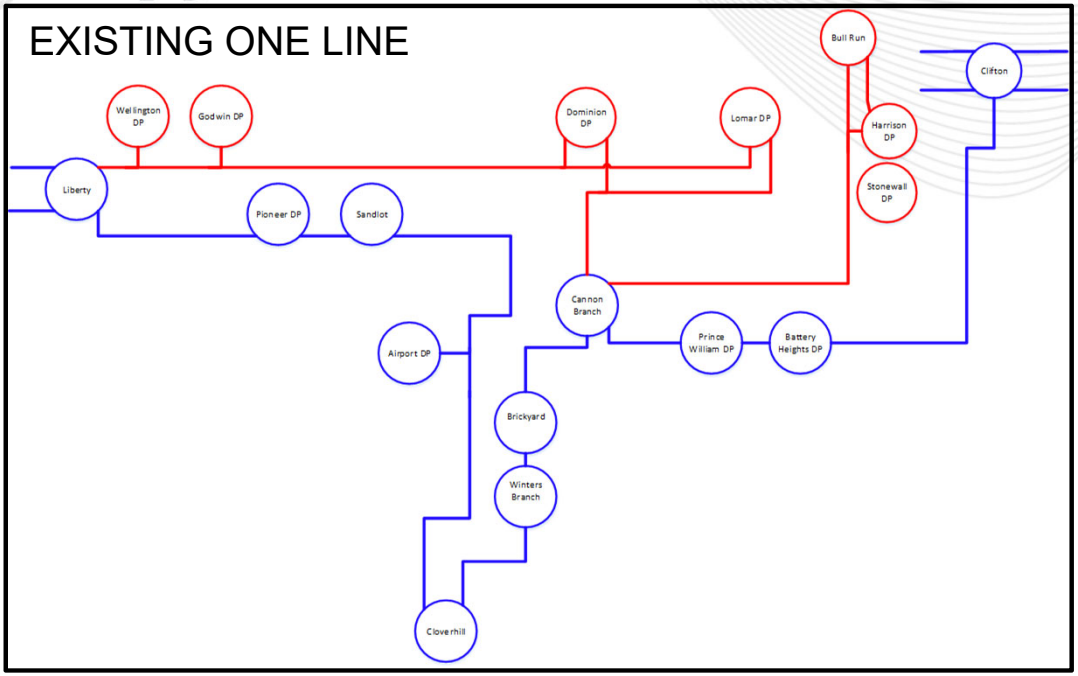
Required In-Service: 12/1/2023



COLOR	VOLTAGE	TRANSMISSION LINE NUMBER
	500 KV.	500 thru 599
	230 KV.	200 thru 299 & 2000 thru 2099
	115 KV.	1 thru 199
	138 KV.	AS NOTED
	69 KV.	AS NOTED

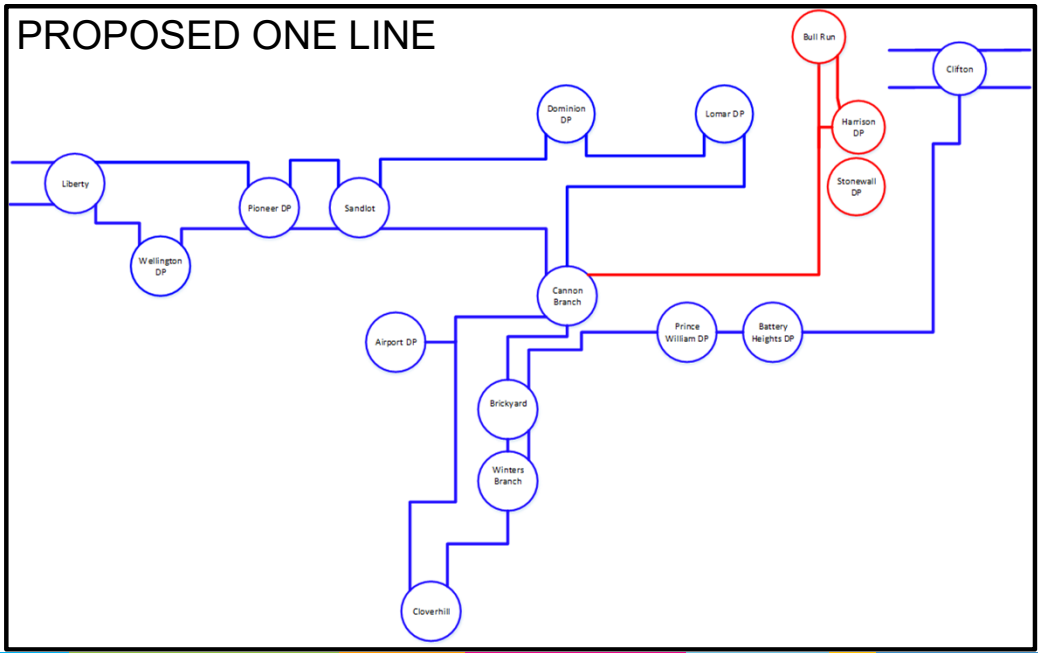
Dominion Transmission Zone: Baseline Manassas Area

EXISTING ONE LINE



COLOR	VOLTAGE	TRANSMISSION LINE NUMBER
	500 KV.	500 thru 599
	230 KV.	200 thru 299 & 2000 thru 2099
	115 KV.	1 thru 199
	138 KV.	AS NOTED
	69 KV.	AS NOTED

PROPOSED ONE LINE



BGE Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Summer Generator Deliverability

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Summer case

Proposal Window Exclusion: None

Problem Statement: The Constitution to Concord 115 kV circuits # 110567 and 110568 are overloaded for towerline outage loss of the Brandon Shore to Riverside 230 kV circuits #2344 & 2345. The circuits are overloaded in the Summer generation deliverability test.

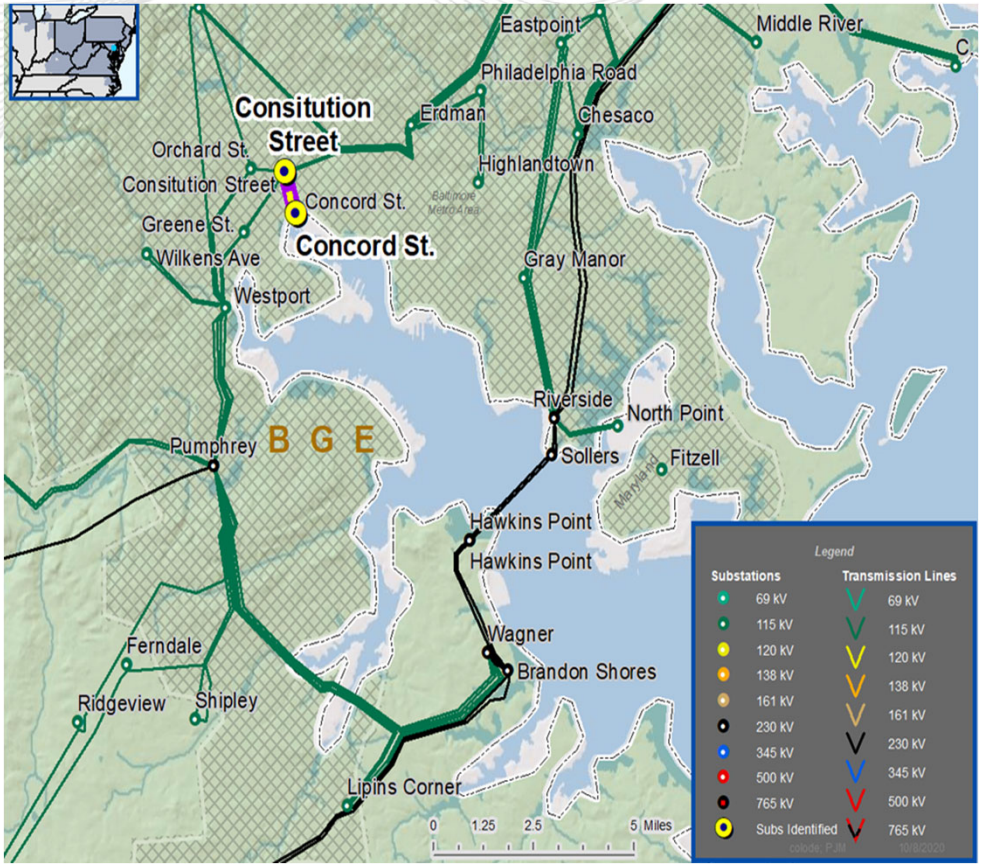
Violations were posted as part of the 2020 Window 1: (FG# GD-S480 and GD-S483)

Existing Facility Rating: 155SN/169SE, 166SN/183SE MVA

Recommended Solution: (Proposal # 2020-1-494)
Replace Pumphrey 230/115kV transformer. (B3305)

Estimated Cost: $4.692M

Required In-Service: 6/1/2025



Penelec Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Summer and Winter N-1-1

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Summer and Winter cases

Proposal Window Exclusion: None

Problem Statement: Post contingency high voltage violation on the Pierce Brook 345kV substation. The Pierce Brook 345kV bus has high voltage issue for N-1-1 contingency loss of the Pierce Brook – Five Mile 345 kV circuit plus Pierce Brook shunt reactor, and Pierce Brook – Five Mile 345 kV circuit plus Lewis Run - Pierce Brook 230 kV circuits in both summer and winter analysis results.

Violations were posted as part of the 2020 Window 1: FG# N2-SVM52 to N2-SVM55 and N2-WVM15 to N2-WVM19

Existing Facility Rating: N/A

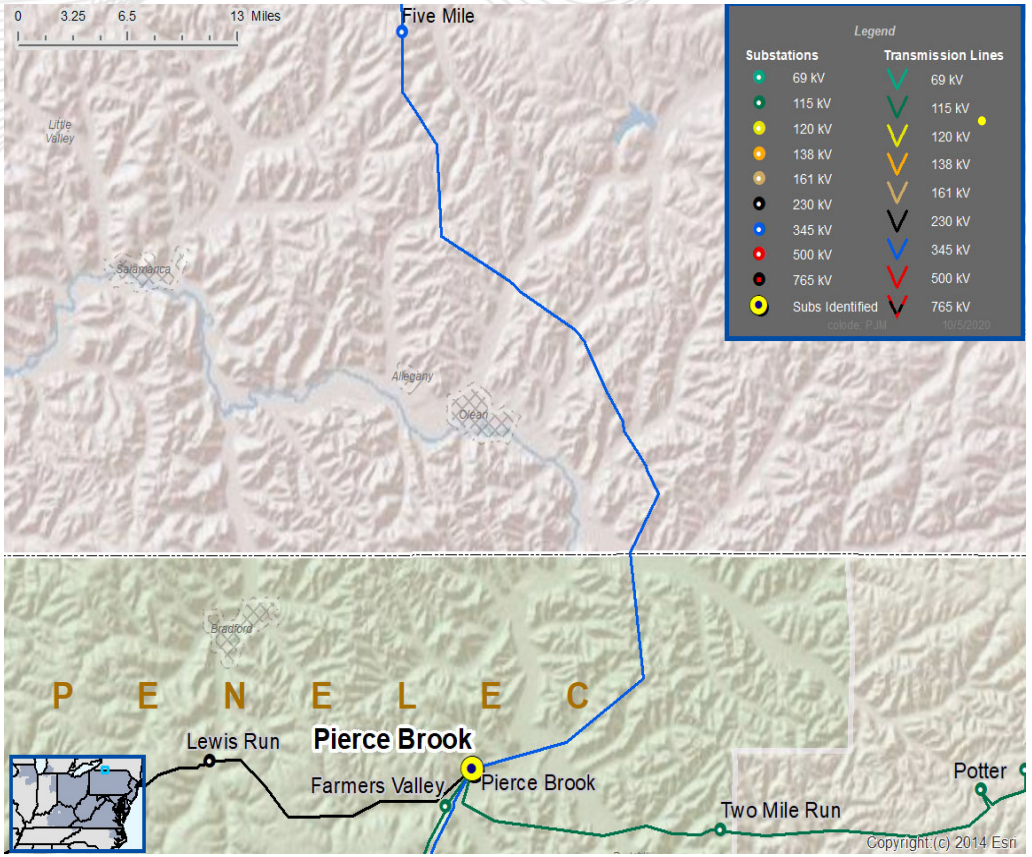
Proposed Facility Rating: N/A

Recommended Solution: (Proposal # 2020-1-855)
Install a second 125 MVAR 345 kV shunt reactor and associated equipment at Pierce Brook
Substation. Install a 345 kV breaker on the high side of the #1 345/230 kV transformer.(B3306)

Estimated Cost: $8.08 M

Alternatives: N/A

Required In-Service: 6/1/2025



AEC Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Summer N-1-1

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Summer case

Proposal Window Exclusion: Below 200 kV exclusion

Problem Statement: The Corson-Court 69 kV line is overloaded for seve
outages including the Corson-Middle 138 kV line and Corson-England 13

Violations were posted as part of the 2020 Window 1: FG# N2-ST25 to N
N2-ST37, and N2-ST38

Existing Facility Rating: 87SN/111SE, 110WN/129WE MVA

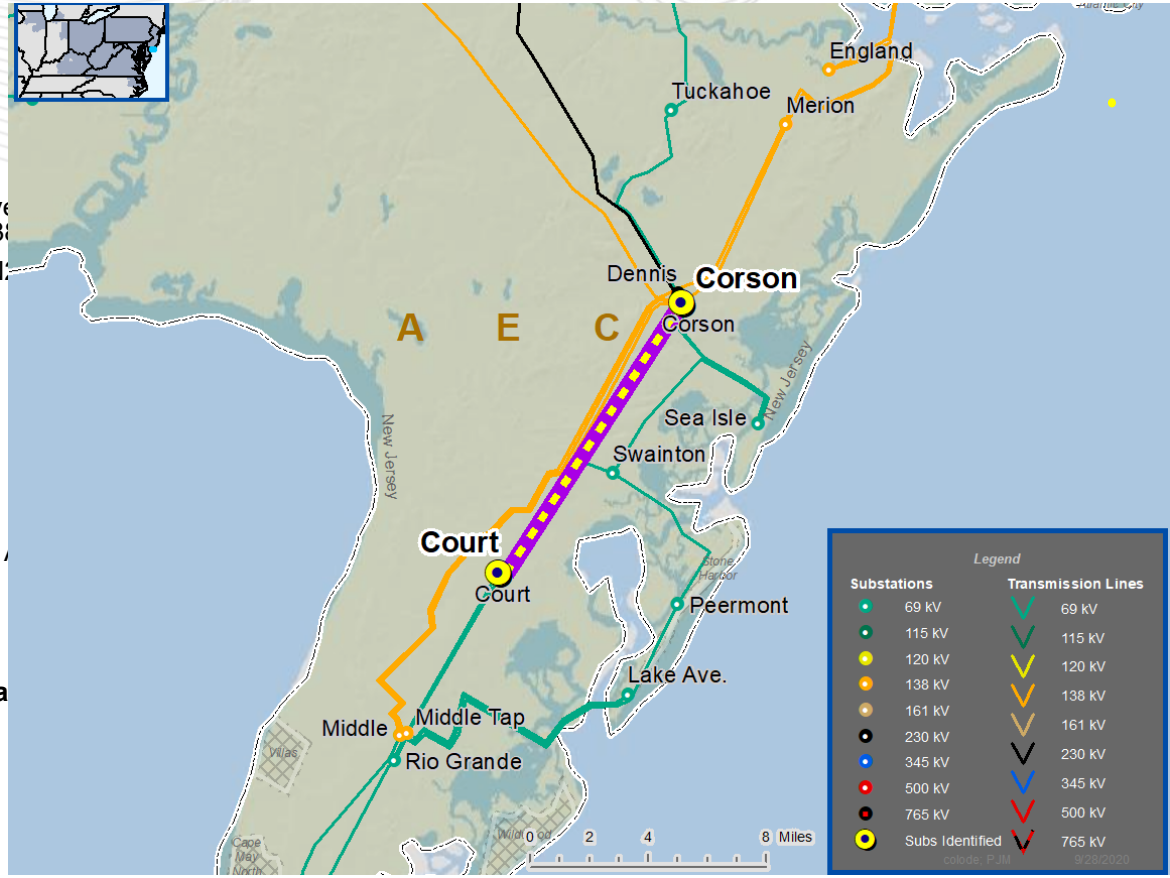
Proposed Facility Rating: 122SN/157SE MVA
141WN/177WE MVA

Recommended Solution:
Rebuild the Corson-Court 69 kV line to achieve ratings equivalent to 795 A
conductor or better. **(b3227**)

Estimated Cost: $13.2 M

**Alternatives: Reconductor the Corson-Court 69 kV line to achieve ra
equivalent to 795 ACSR conductor or better (not feasible)**

Required In-Service: 6/1/2025



AEC Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Summer Baseline

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Summer case

Proposal Window Exclusion: Below 200 kV exclusion

Problem Statement: Post contingency voltage violation at Peermont and Swainton 69 kV stations. The Peermont and Swainton 69 kV buses have low voltage and voltage drop violation for single contingency outage of the Carson – Swainton 69 kV circuit.

Violations were posted as part of the 2020 Window 1: FG# N1-SVM9, N1-SVM10, N1-SVD15, and N1-SVD16

Existing Facility Rating: N/A

Proposed Facility Rating: N/A

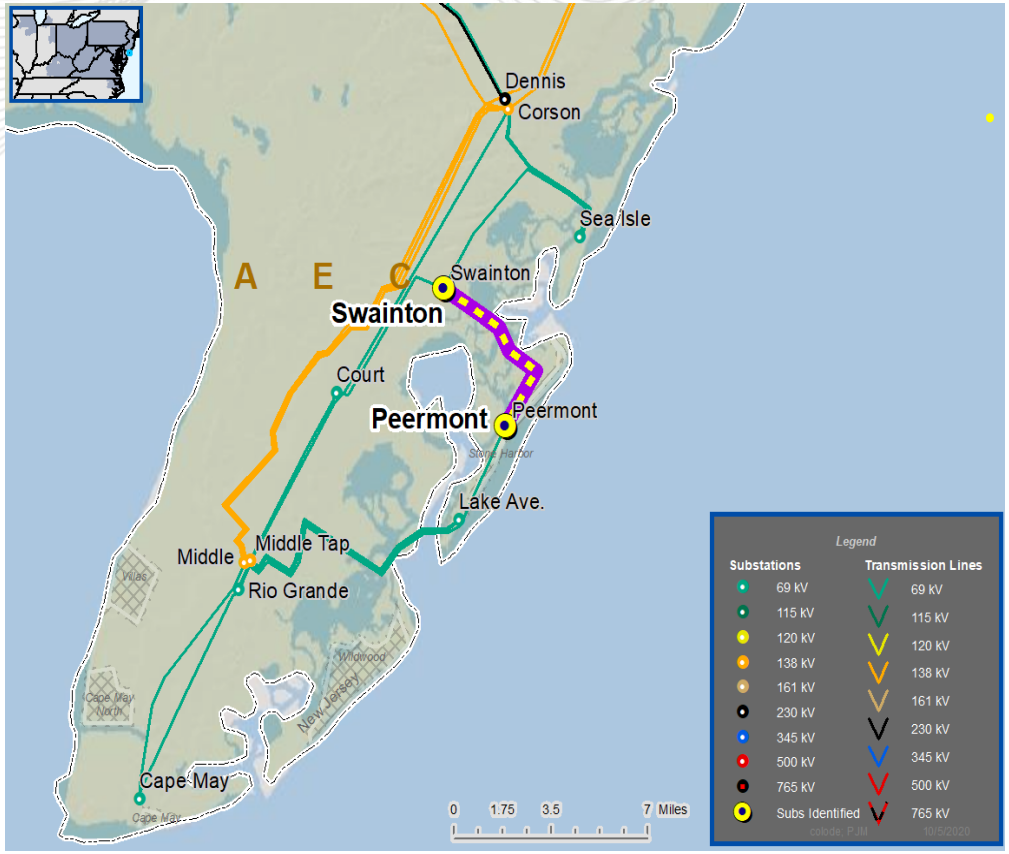
Recommended Solution:
Add 10 MVAR 69 kV capacitor bank at Swainton substation. **(b3226)**

Estimated Cost: $2.9 M

Alternatives:

Cut the Middle-Peermont 69 kV line and connect to Court substation ($4.4M)

Required In-Service: 6/1/2025



BGE Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Winter baseline, Winter and Summer Generator Deliverability

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Summer and winter case

Proposal Window Exclusion: Substation Equipment

Problem Statement: The Westport to Center 115 kV circuit is overloaded for towerline outage loss of the Brandon Shore to Riverside 230 kV circuits #2344 & 2345. The circuits are overloaded in both Summer and Winter studies.

Violations were posted as part of the 2020 Window 1: (FG# GD-S482, N1-W-T13, GD-W307)

Existing Facility Rating: 278SN/278SE, 278WN/278WE MVA

Proposed Facility Rating: 296/329 SN/SE MVA

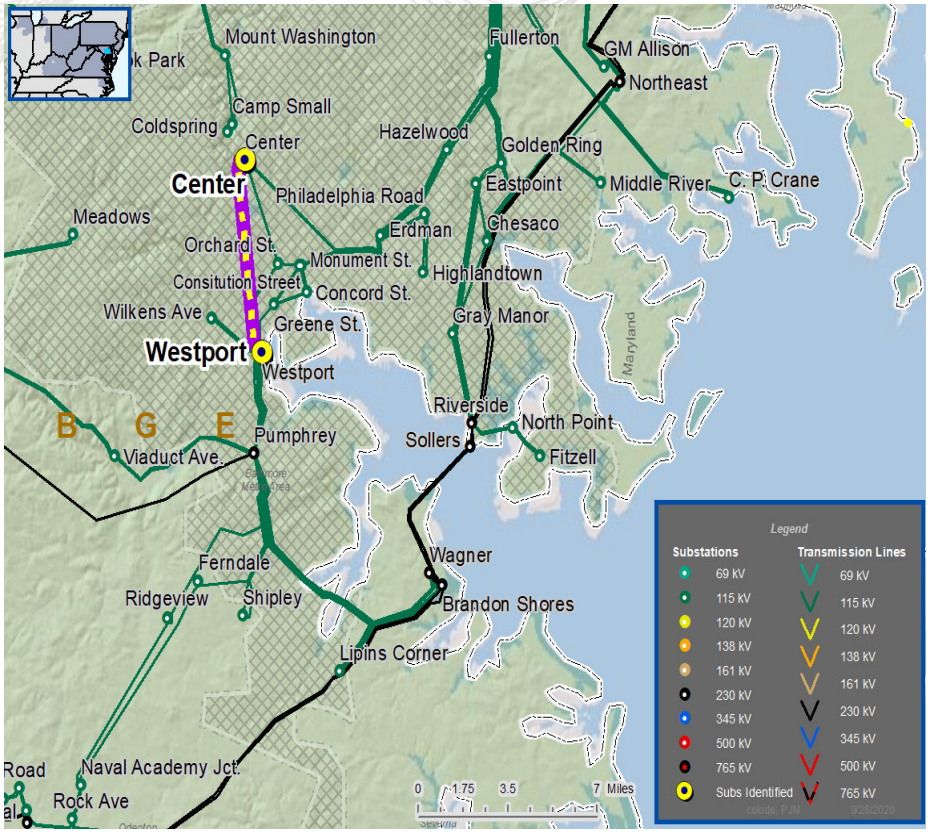
334/360 WN/WE MVA

Recommended Solution:
Replace two relays at Center 115 kV Substation to increase ratings on the Westport to Center 115 kV (110552) circuit. **(b3228)**

Estimated Cost: $0.025 M

Alternatives: N/A

Required In-Service: 6/1/2025



DPL Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Winter baseline, Summer and Winter Generator Deliverab

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Summer and winter cases

Proposal Window Exclusion: Below 200 kV exclusion

Problem Statement: The Mt. Pleasant to Middletown Tap 138 kV c is overloaded for towerline outage loss of the Keeney to Steele 230 circuits #23009 & 23001. The circuit is overloaded in both Summer Winter studies.

Violations were posted as part of the 2020 Window 1: FG# N1-W-T GD-W308

Existing Facility Rating: 273SN/348SE, 315WN/392WE MVA

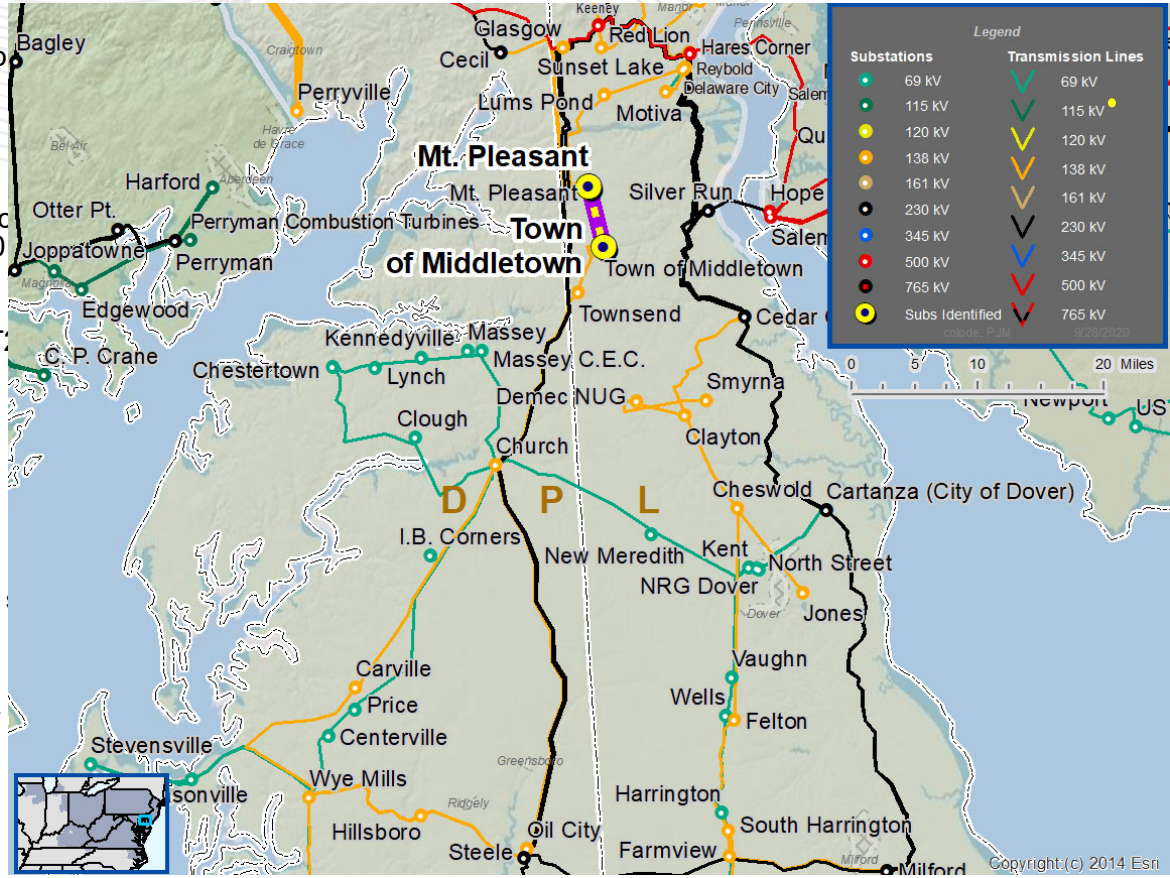
Proposed Facility Rating: 390SN/478SE MVA
449WN/478WE MVA

Recommended Solution:
Replace a disconnect switch at Middletown Tap and reconductor a span of Mt. Pleasant - Middletown Tap line. **(b3224)**

Estimated Cost: $0.425 M

Alternatives: Build a second Mt. Pleasant-Middletown Tap 138 kV with new ring bus at Middletown Tap. **Estimated Cost:** $24 M

Required In-Service: 6/1/2025



PPL Transmission Zone: Baseline

Process Stage: Second Review

Criteria: PPL FERC Form 715

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Summer and Winter cases

Proposal Window Exclusion: Below 200 kV

Problem Statement: Post contingency voltage violation on the 69 kV system along the Limestone – Lock Haven – Renovo path. The Limestone, Laural Renovo, First Quality and Mifflinburg 69 kV buses have a voltage magnitude and Voltage drop issues for several contingencies in both Summer and Winter cases.

Existing Facility Rating: N/A

Proposed Facility Rating: N/A

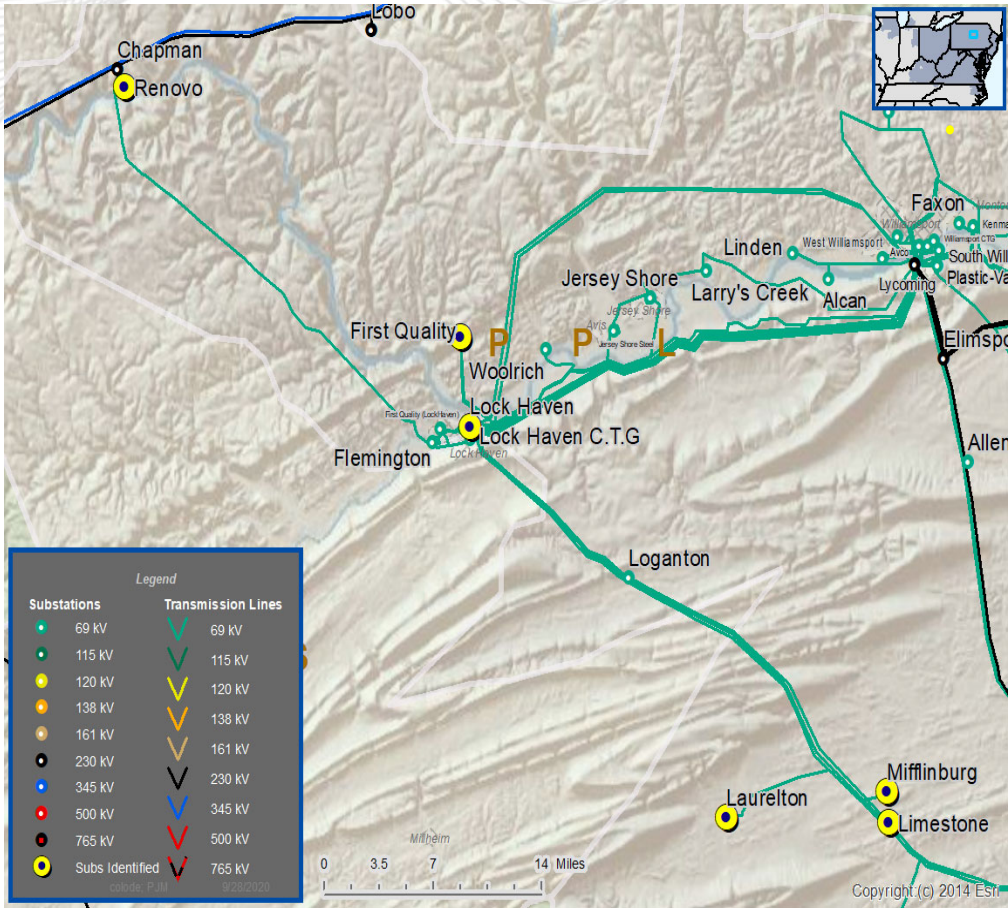
Recommended Solution:

Install one (1) 7.2 MVAR fixed cap bank on the Lock Haven-Reno 69 kV line and one (1) 7.2 MVAR fixed cap bank on the Lock Haven-Flemington 69 kV line near the Flemington 69/12kV substation. **(b3222)**

Estimated Cost: $1.9 M

Alternatives: N/A

Required In-Service: 6/1/2025



Penelec Transmission Zone: Baseline

Process Stage: Second Review

Criteria: Light Load baseline

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Light Load case

Proposal Window Exclusion: Below 200 kV

Problem Statement: Post contingency high voltage violations along the Rockwood – Mayersdale North 115 kV line. The Mayersdale, Bigby, Lick Run, Arnold Rec, Rockwood and Somerset buses resulted in a high voltage issue for multiple single, bus and line fault stuck breaker contingencies in the Rockwood vicinity.

Violations were posted as part of the 2020 Window 1: FG# N1-LLVH1 – N1-LLVH26

Existing Facility Rating: N/A

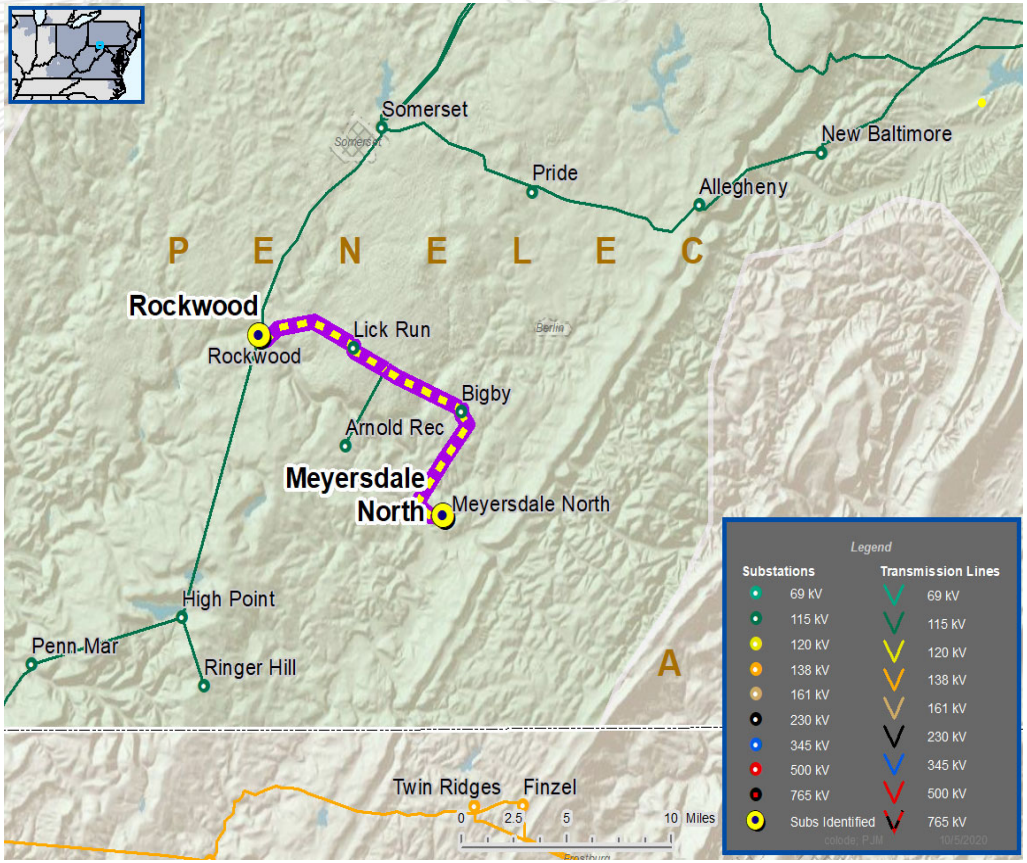
Proposed Facility Rating: N/A

Recommended Solution:
Lick Run substation: Install one 34 MVAR 115 kV shunt reactor and breaker. Install one 115 kV circuit breaker to expand the substation to a 4 breaker ring bus**. (b3233)**

Estimated Cost: $4.9 M

Alternatives: N/A

Required In-Service: 6/1/2025



Penelec Transmission Zone: Baseline

Process Stage: Second Review
Criteria: Winter Baseline
Assumption Reference: 2025 RTEP assumption
Model Used for Analysis: 2025 RTEP Winter case
Proposal Window Exclusion: Below 200 kV

Problem Statement: Post contingency voltage drop violation on the Williams 115 kV substation. The Williams 115 kV bus has a voltage drop issue for a line fault stuck breaker contingency loss of the Williams – Tiffany – Laurel lake – Westover 115 kV circuit.

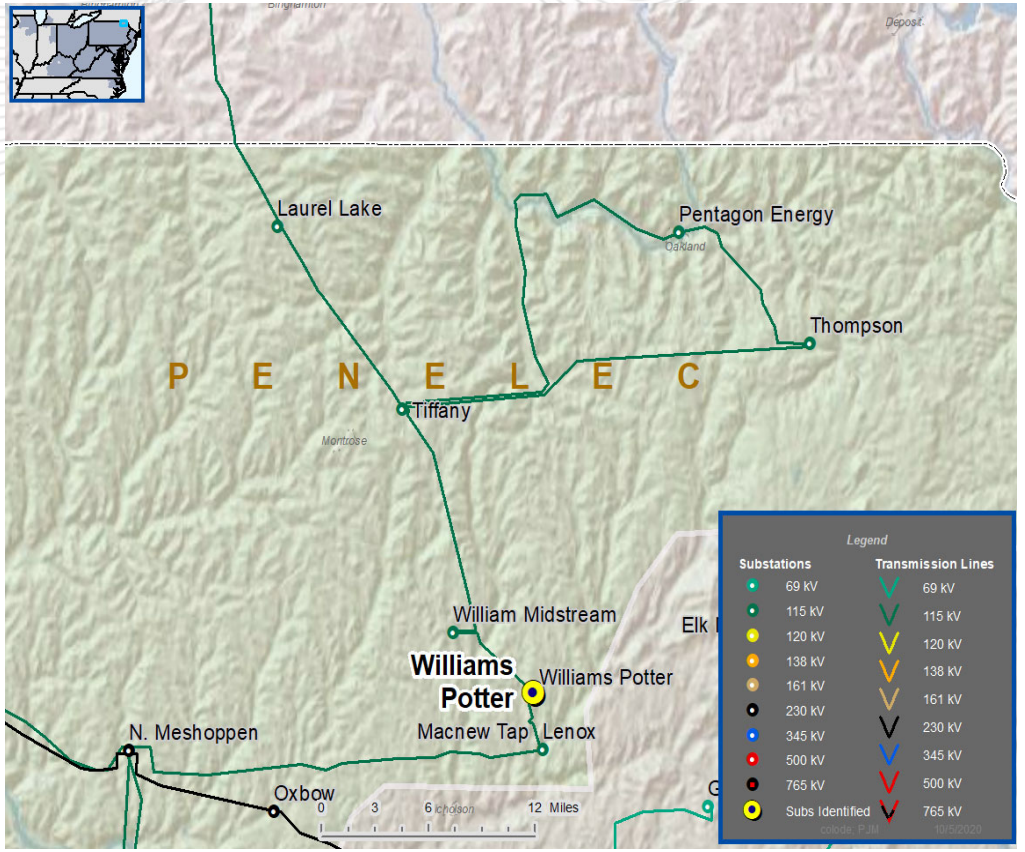
Violations were posted as part of the 2020 Window 1: FG# N1-WVD1

Existing Facility Rating: N/A
Proposed Facility Rating: N/A

Recommended Solution:
Construct a new breaker-and-a-half 115 kV (Warriner Pond) substation near Tiffany substation. All transmission assets and lines will be relocated from Tiffany to the new substation. The two distribution transformers will be fed via two dedication 115 kV feeds to the existing Tiffany substation. **(b3245)**

Estimated Cost: $23.2 M

Alternatives: Convert Tiffany Substation to a ring bus configuration (Not feasible).
Required In-Service: 6/1/2025



Penelec Transmission Zone: Baseline

Process Stage: Second Review

Criteria: First Energy FERC Form 715

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP Summer and Winter cases

Proposal Window Exclusion: Below 200 kV

Problem Statement: Post contingency voltage violation on the 46 kV system along the Hill Valley – Mount Union – Mapleton path. Several 46 kV station including Hill Valley, Mount Union 46 kV buses have a voltage magnitude and Voltage drop issues for several contingencies in both Summer and Winter cases.

Violations were posted as part of the 2020 Window 1:FG#s PN-VM1 - PN-VM19 and PN-VD1 - PN-VD16

Existing Facility Rating: N/A

Proposed Facility Rating: N/A

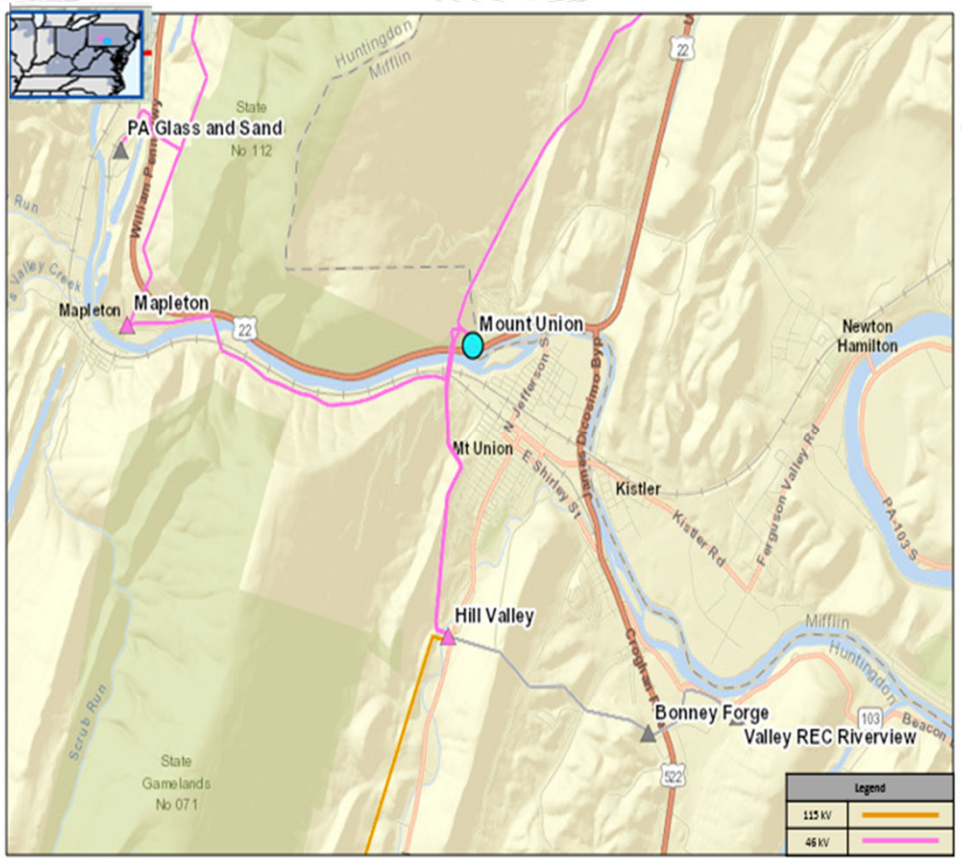
Recommended Solution:

Install two 46 kV 6.12 MVAR capacitors at Mt Union. **(b3237)**

Estimated Cost: $4.0 M

Alternatives: N/A

Required In-Service: 6/1/2025



JCPL Transmission Zone Baseline
Freneau 34.5 kV Breakers

Process Stage: Second Review

Criteria: First Energy FERC Form 715

Assumption Reference: First Energy Transmission Planning Criteria

Model used for analysis: 2020 Series -2025 Short circuit model

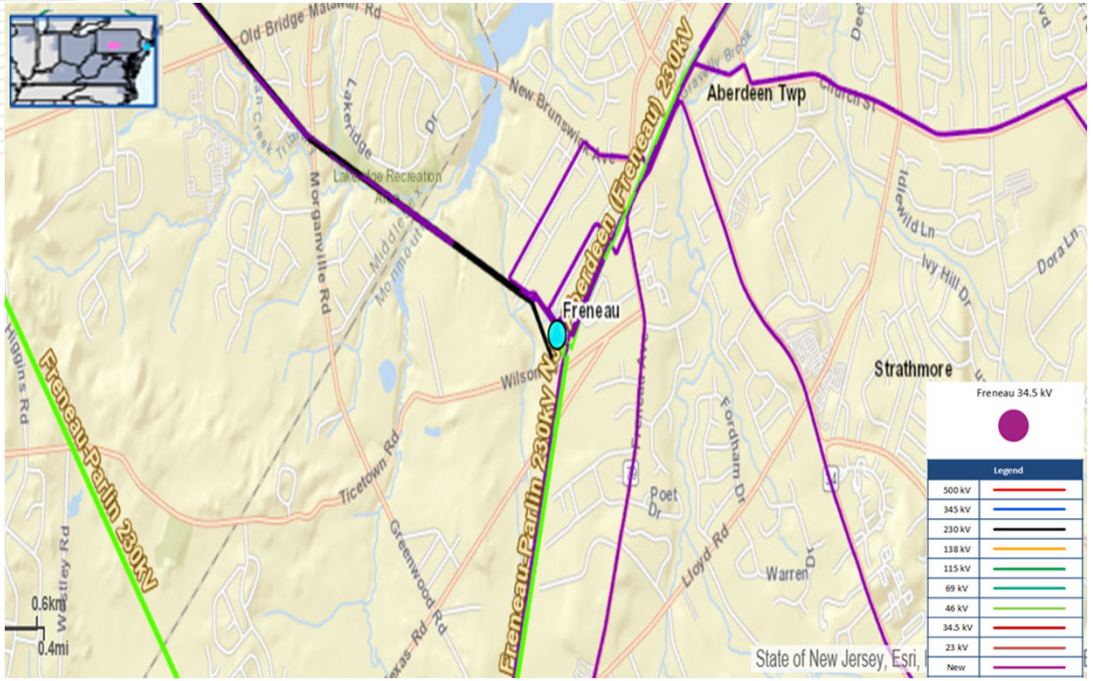
Proposal Window Exclusion: Below 200 kV

Problem Statement:
Fourteen (14) existing 40kA Freneau 34.5 kV breakers (M139A, M139B, C211, B29 (V100, W101, Z104, O15, S45, F32, E31, BK1A, BK1B, BK2A and BK2B) are overdutied in the 2025 case model.
Violations were posted as part of the 2020 Window 1: FG# JCPL-SC1 to JCPL-SCPN-SC10 and JCPL-SC18 to JCPL-SCPN-SC21

Recommended Solution:
Replace (14) Freneau overdutied 34.5 kV breakers with 63 kA rated breakers and associated equipment. **(b3239)**

Estimated Cost: $5.7 M
Alternatives: None

Required In-Service Date: 6/1/2025



JCPL Transmission Zone Baseline
Whippany 34.5 kV Breakers

Process Stage: Second Review

Criteria: First Energy FERC Form 715

Assumption Reference: First Energy Transmission Planning Criteria

Model used for analysis: 2020 Series -2025 Short circuit model

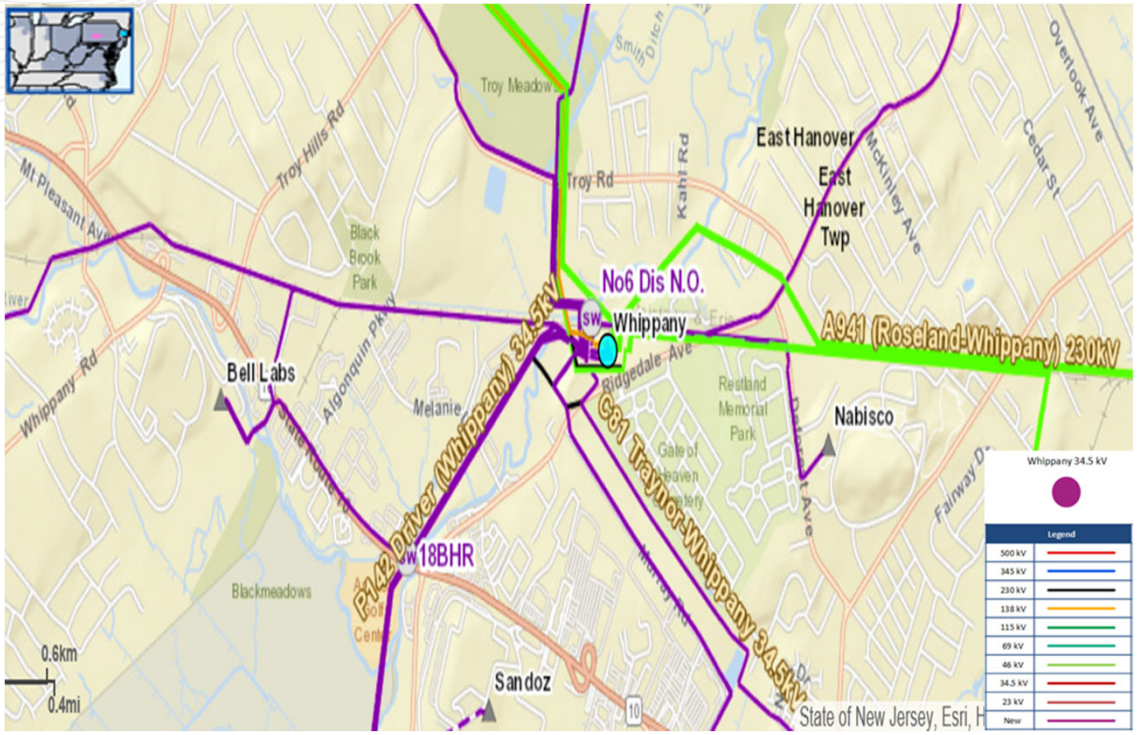
Proposal Window Exclusion: Below 200 kV

Problem Statement:
Seven(7) existing 40kA Whippany 34.5 kV breakers (X76, B37 (O769), D4, F6, P142, 320BY77 and A157) are overdutied in the 2025 case model. Violations were posted as part of the 2020 Window 1: FG# JCPL-SC11 to JCPL-SCPN-SC17

Recommended Solution:
Replace (7) Whippany overdutied 34.5 kV breakers with 50 kA rated breakers and associated equipment. **(b3238)**

Estimated Cost: $8.67 M
Alternatives: None

Required In-Service Date: 6/1/2025



Penelec Transmission Zone Baseline
Altoona 46 kV Breakers

Process Stage: Second Review

Criteria: First Energy FERC Form 715

Assumption Reference: First Energy Transmission Planning Criteria

Model used for analysis: 2020 Series -2025 Short circuit model

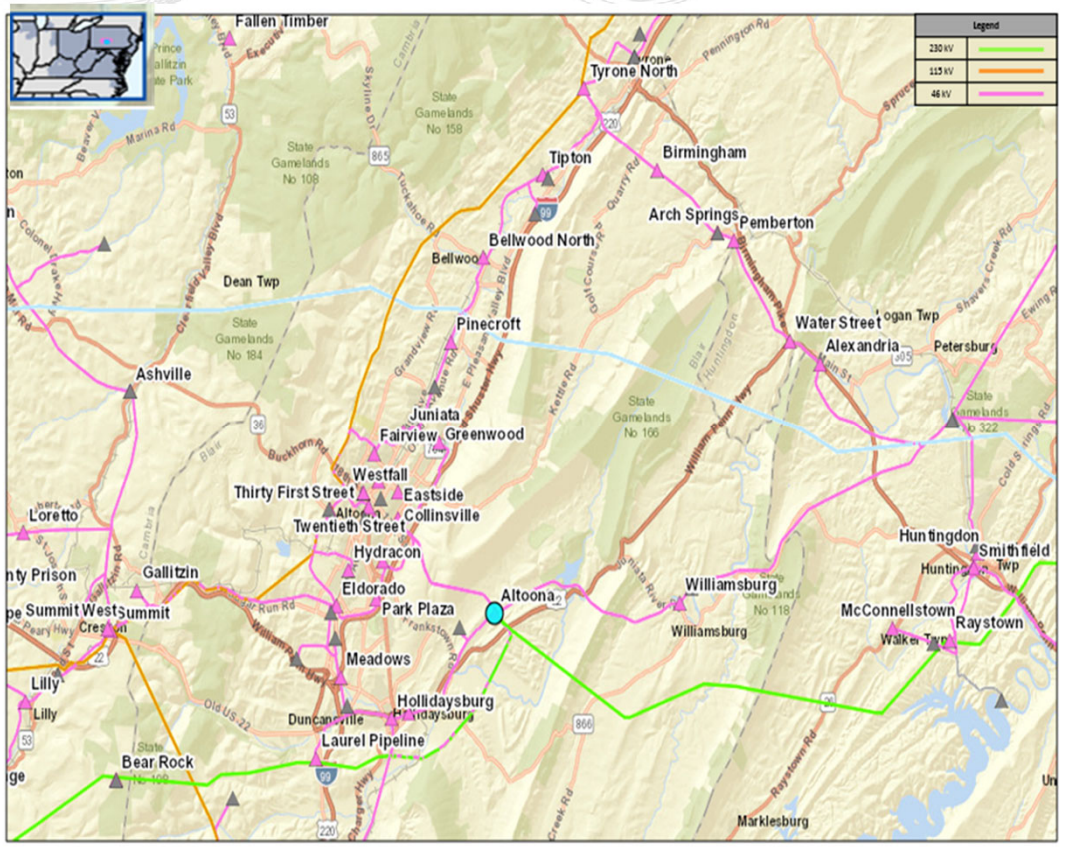
Proposal Window Exclusion: Below 200 kV

Problem Statement:
Three Altoona 46 kV breakers are overdutied. The Altoona #1 (BUS_SECT and ALH_HOLI) breakers and Altoona #2 (WMSBURG) breaker.
Violations were posted as part of the 2020 Window 1: FG# PN-SC1, PN-SC2 and PN-SC3

Recommended Solution:
Replace the existing Williamsburg, ALH (Hollidaysburg) and bus section breaker at the Altoona substation with 40 kA rated breaker and associated equipment. (**b3232)**

Estimated Cost: $1.7M
Alternatives: None

Required In-Service Date: 6/1/2025



Penelec Transmission Zone Baseline
Huntingdon 46 kV Breaker

Process Stage: Second Review

Criteria: First Energy FERC Form 715

Assumption Reference: First Energy Transmission Planning Criteria

Model used for analysis: 2020 Series -2025 Short circuit model

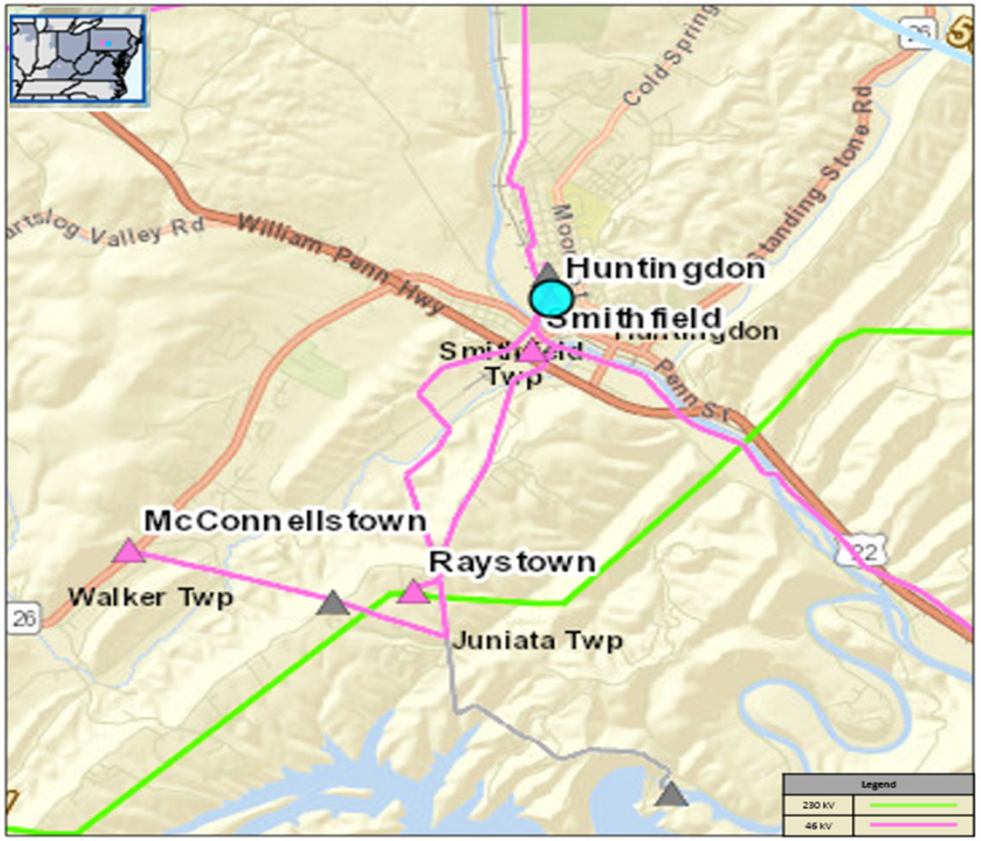
Proposal Window Exclusion: Below 200 kV

Problem Statement:
The Huntingdon 46 kV breaker # 2 is overdutied in the 2025 case model.
Violations were posted as part of the 2020 Window 1: FG# PN-SC4

Recommended Solution:
Replace the existing No. 2 cap bank breaker at Huntingdon substation with a 40 kA rated breaker and associated equipment. **(b3231)**

Estimated Cost: $0.8M
Alternatives: None

Required In-Service Date: 6/1/2025



Dominion Transmission Zone: Baseline
Line #72 (Chesterfield-Plaza)

Existing b3161 Scope Modification

Previously Presented: PJM SRRTEP 02/11/2020

Criteria: Dominion's FERC 715 Planning Criteria (C.2.7 –Limitations on Direct Connect Loads)

Assumption Reference: Dominion Energy's Facility Interconnection Requirements

Model Used for Analysis: 2024 RTEP Summer

Proposal Window Exclusion: Below 200kV, FERC 715 (TO Criteria)

Problem Statement: 115kV Line #72 (Chesterfield to Plaza) exceeds the Company's limitation of serving 4 tapped facilities on one transmission line. The line serves 5 tap stations: National Cylinder Gas, Bellwood, Brown Boveri, Kingsland, and Reymet. Also, the tap line serving Brown Boveri, built in the 1970's with a length of 1.1 miles, does not meet the company's requirement of a terminal station for tap lines longer than one mile.

Original Solution: **(Old)**

Split Line #72 by rebuilding the Brown Boveri tap line as double circuit loop in-and-out of the station. **(b3161.1)**

- **Estimated Cost:**$3.0M

Install a 115kV breaker at the station. Site expansion is required to accommodate the new layout. **(b3161.2)**

- **Estimated Cost:**$2.3M

Total Estimated Baseline Cost: $5.3M

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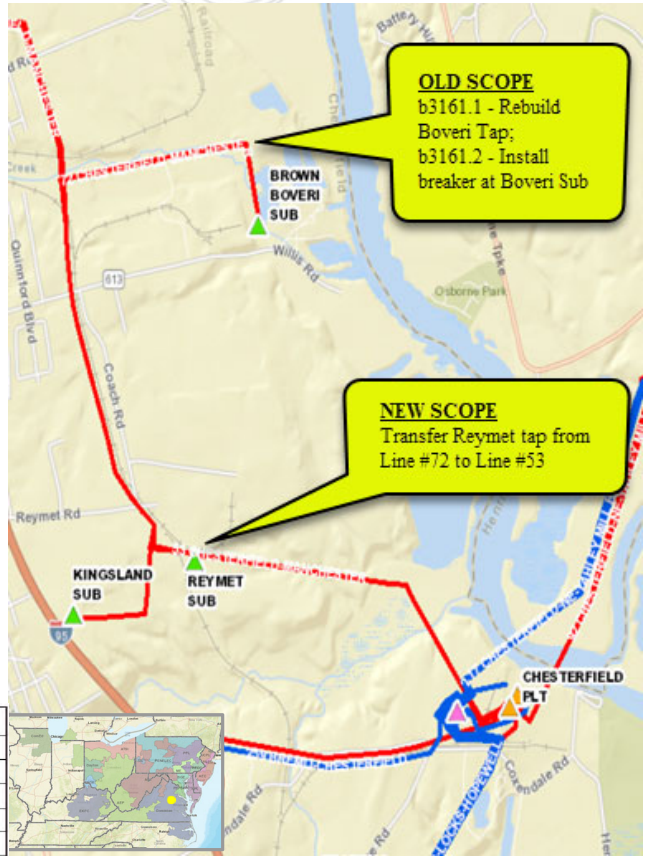


COLOR	VOLTAGE	TRANSMISSION LINE NUMBER
	500 KV.	500 thru 599
	230 KV.	200 thru 299 & 2000 thru 2099
	115 KV.	1 thru 199
	138 KV.	AS NOTED
	69 KV.	AS NOTED

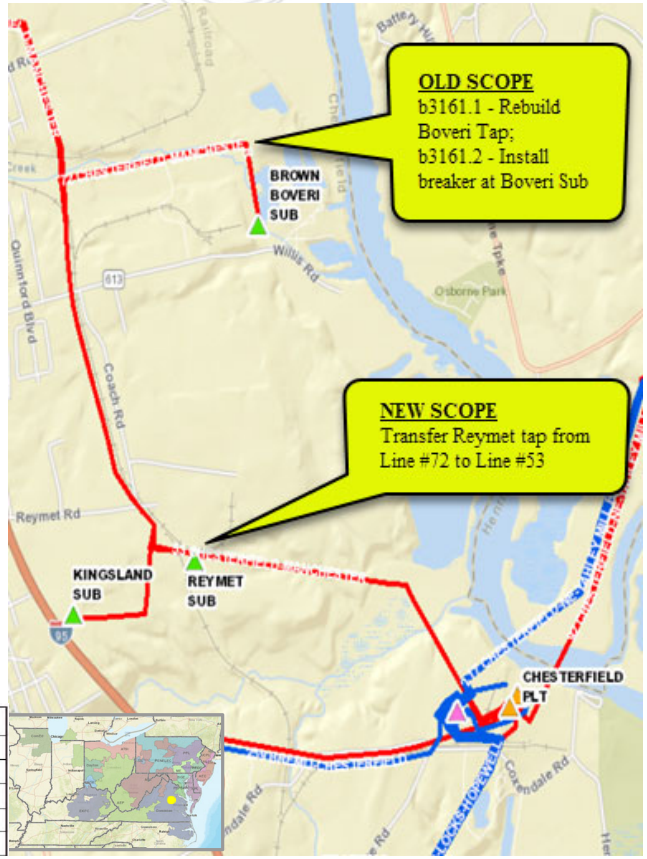
Revised Solution: (New)

Install two, 2000 Amp, 115kV line switches. Extend Reymet fence and bus to allow installation of risers to Line #53.

Estimated Cost:$3.0M

Required In-service Date: 6/1/2024

Projected In-service Date: 12/31/2023



COLOR	VOLTAGE	TRANSMISSION LINE NUMBER
	500 KV.	500 thru 599
	230 KV.	200 thru 299 & 2000 thru 2099
	115 KV.	1 thru 199
	138 KV.	AS NOTED
	69 KV.	AS NOTED

DLC Transmission Zone: Baseline Arsenal – Riazzi 138 kV line

Process Stage: Recommended Solution

Criteria: FERC 715 (TO Criteria)

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2020 RTEP 2025 Cases

Proposal Window Exclusion: Below 200KV

Problem Statement:

FGs: DLCO-T1, DLCO-T2

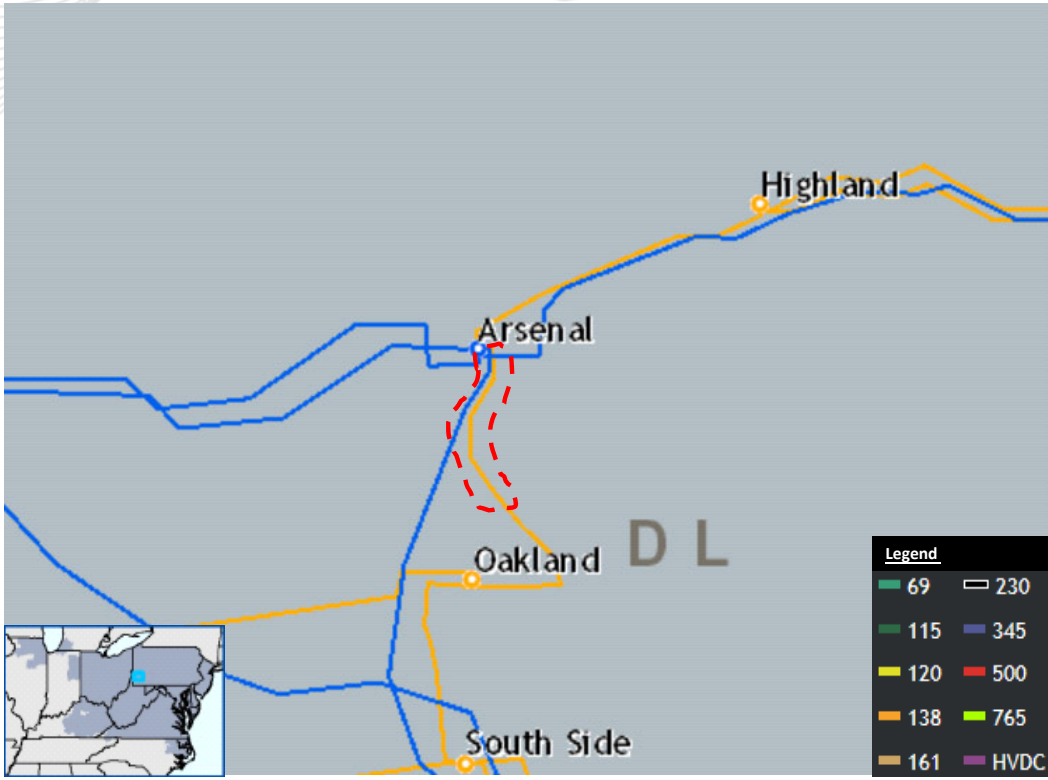
The Arsenal - Riazzi (Z-101) 138 kV line exceeds its normal rating as a result of an N-2 failure of underground cables (Z-47 and Z-48) in a common trench. This violates DLC's FERC 715 criteria in regard to managing system conditions during an N-2 underground cable common trench failure.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Arsenal –Riazzi 138kV	185/247/185/247

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Arsenal –Riazzi 138kV	208/268/208/268 under normal conditions 215/273/215/273upon loss of the Z-47 (Carson - Oakland) and Z-48 (Oakland - Forbes) 138kV circuits 217/274/217/274 upon loss of the 302 (Brunot Island - Carson) and 307 (Carson - Arsenal) 345kV circuits



DLC Transmission Zone: Baseline Arsenal – Riazzi 138 kV line

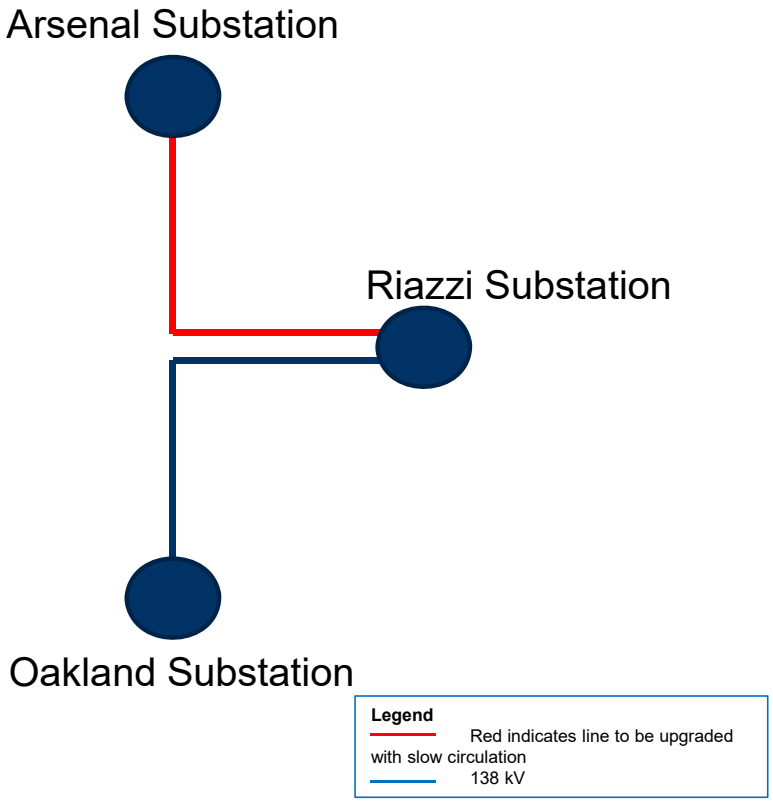
Recommended Solution:
Implement slow circulation on existing underground 138 kV high pressure fluid filled (HPFF) cable between Arsenal and Riazzi Substations (**B3265**)

Estimated Cost: $2.4M

Required In-Service: 6/1/2025

Projected IS-Service: 6/1/2025

Previously Presented: 10/16/2020



AEP Transmission Zone: Baseline Bass 34.5kV Riser Replacement

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Substation equipment exclusion

Problem Statement:

FGs: AEP - T136, AEP-T137

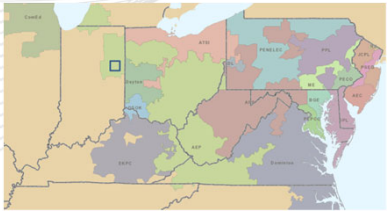
The Bass – Spy Run1 34.5kV line is overloaded for the N-1-1 contingency pair of the loss of the Robison Park – Purdue 138kV line and the loss of the Illinois Road – Industrial Park – McKinley 3 and Summit - Industrial Park - Spy Run1 138kV line, Industrial park 138/69/34.5kV transformer, and Industrial Park – Kroemer 69kV line.

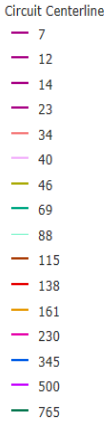
Existing Facility Rating:

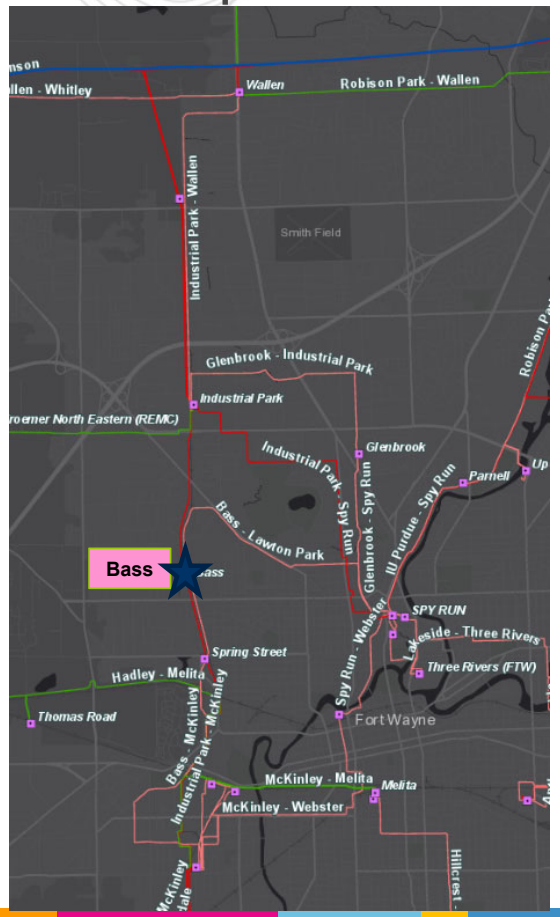
Branch	SN/SE/WN/WE (MVA)
05BASS – 05SYP RUN1	26/26/28/28

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05BASS – 05SYP RUN1	46/46/58/58







AEP Transmission Zone: Baseline Bass 34.5kV Riser Replacement

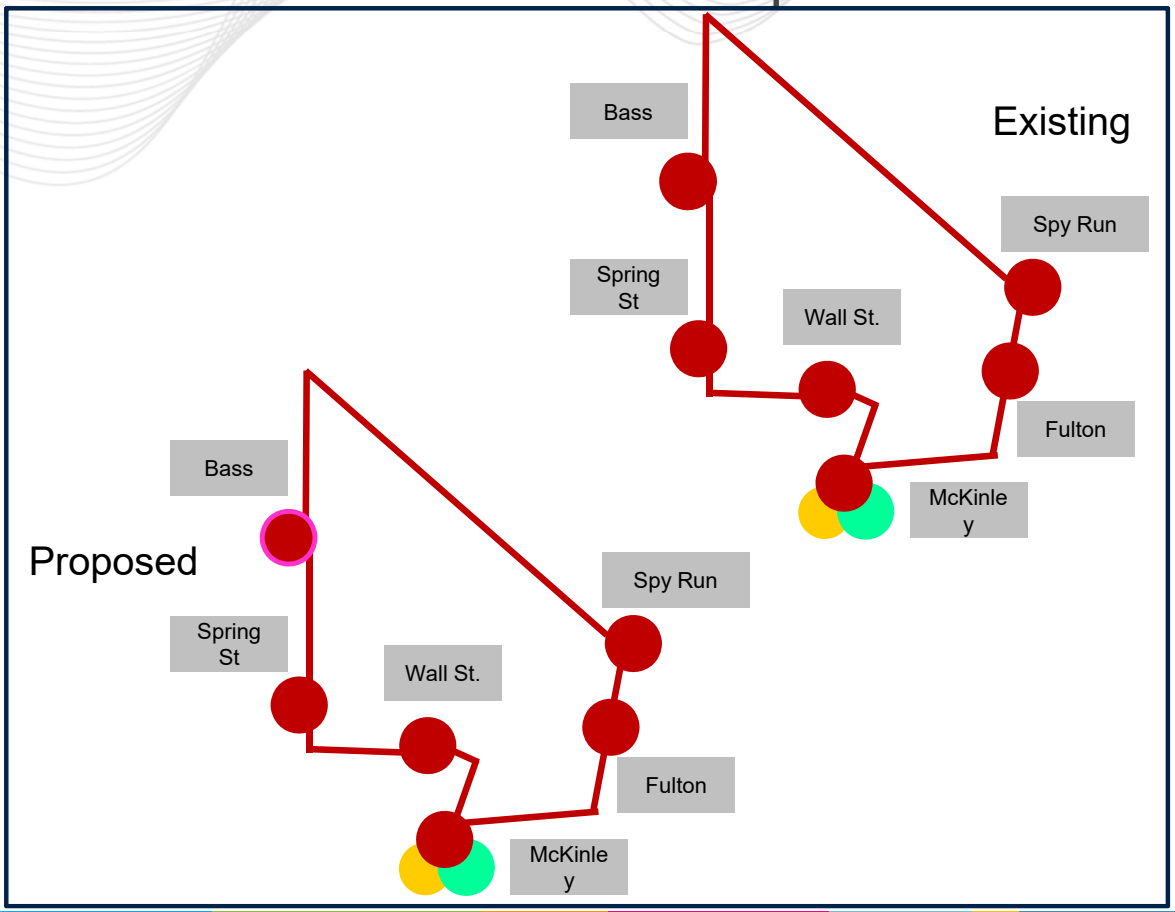
Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Recommended Solution: Replace Risers at Bass 34.5kV Station (**B3243**)
Estimated Cost: $0.1M

Required In-Service: 6/1/2025

Projected IS-Service: 5/16/2022

Previously Presented: 10/16/2020



AEP Transmission Zone: Baseline Rob Park - Harlan 69kV Rebuild

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

FG: AEP – T404

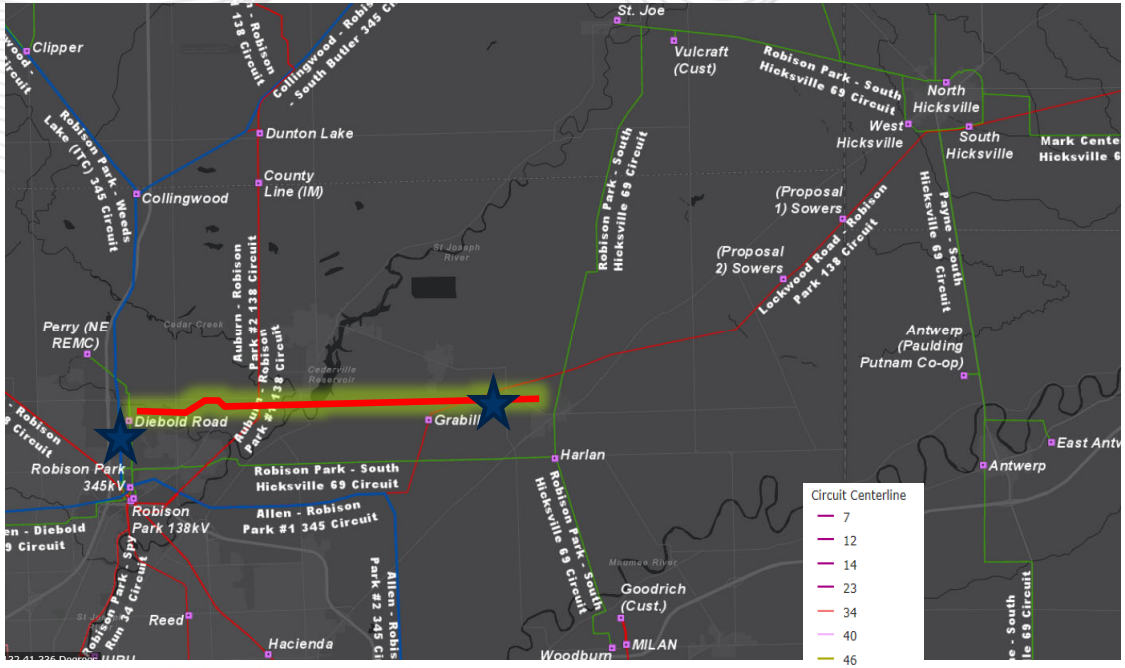
The Harlan - Robinson Park 69kV line is overloaded the N-1-1 contingency pair of the loss of Sowers - South Hicksville - Lockwood 138kV line with South Hicksville 138/69kV transformer and the loss of the Auburn – Joist – Butler 69kV line

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05HARLAN - 05ROBISONP	50/50/63/63

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05HARLAN - 05ROBISONP	79/90/100/109



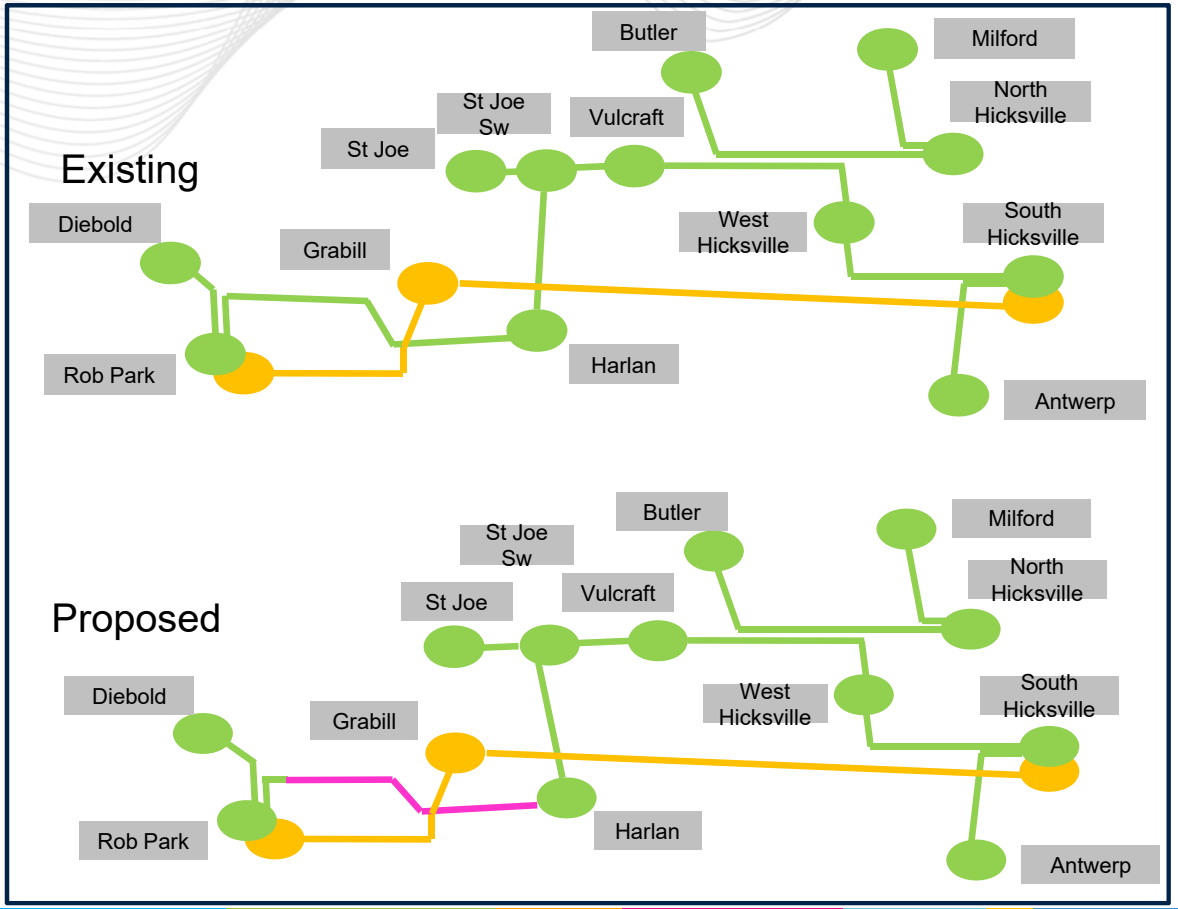
AEP Transmission Zone: Baseline Rob Park - Harlan 69kV Rebuild

Recommended Solution: Rebuild approximately 9 miles of the Rob Park - Harlan 69kV line. (**B3244**)
Estimated Cost: $20.9M
Ancillary Benefits: Line also identified as supplemental need AEP-2019-IM014 (Needs meeting 4/23/2019, solution meeting 9/11/2020)

Required In-Service: 6/1/2025

Projected IS-Service: 6/2/2023

Previously Presented: 10/16/2020



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

AEP Transmission Zone: Baseline Sand Hill 138 kV Riser Upgrades

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

FG: AEP-T295

The Sand Hill – Cricket138kV line can not be dispatched below normal rating after the loss of Sand Hill – Warton Hill #1 138kV line in N-1-1 test.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05SAND H – 05CRICKET SS 138kV	219/255/277/303

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05SAND H – 05CRICKET SS 138kV	257/341/325/404

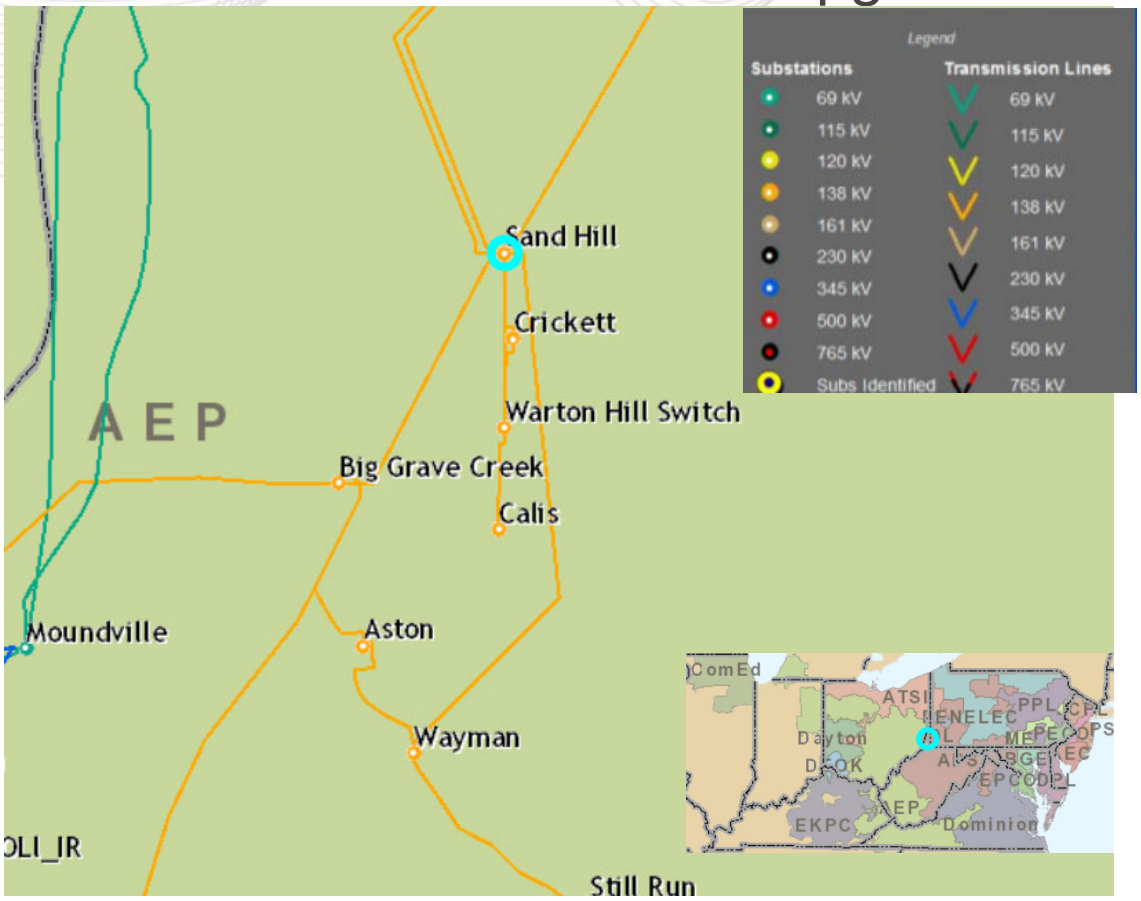
Recommended Solution: Upgrade 795 AAC risers at Sand Hill station towards Cricket Switch with 1272 AAC (**B3255**)

Estimated Cost: $0.04M

Required In-Service: 6/1/2025

Projected IS-Service: 9/1/2024

Previously Presented: 10/16/2020



AEP Transmission Zone: Baseline Tidd Riser Upgrades

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Substation Equipment

Problem Statement:

FGs: AEP-T296, AEP-T297

One of the Tidd – Wheeling Steel 138kV lines #1 and #2 can not be dispatched below normal rating after the loss of the other line in N-1-1 test.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05TIDD – 05WHELGS 138kV	187/205/247/258

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05TIDD – 05WHELGS 138kV	205/205/258/258

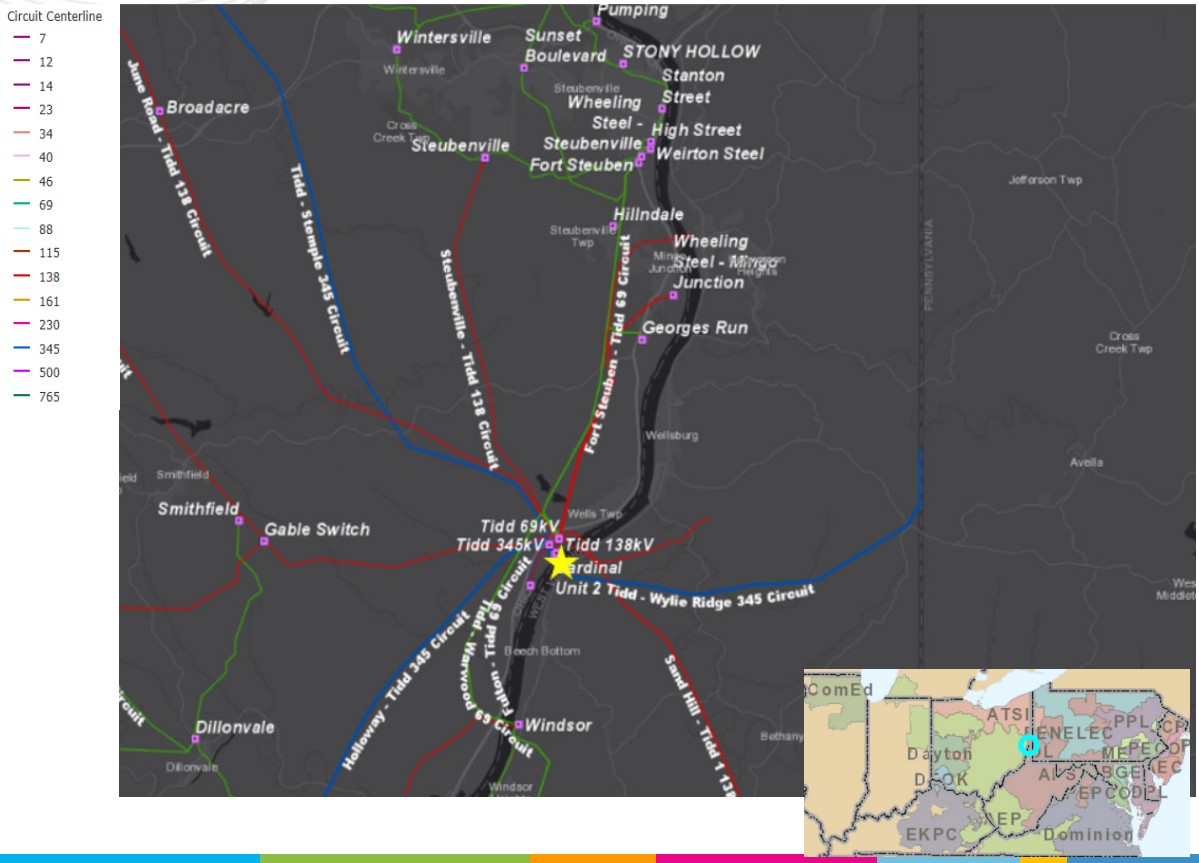
Recommended Solution: Upgrade 500 MCM Cu risers at Tidd station towards Wheeling Steel; replace with 1272 AAC conductor. (**B3256**)

Estimated Cost: $0.07M

Required In-Service: 6/1/2025

Projected IS-Service: 9/1/2021

Previously Presented: 10/16/2020



AEP Transmission Zone: Baseline
Twin Branch Hydro

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Substation Equipment

Problem Statement:

FGs: AEP-T453, AEP-T458, AEP-T459, AEP-T452, AEP-T460, AEP-T447, AEP-T442, AEP-T443, AEP-T444, AEP-T446, AEP-T445

Twin Branch 1 – Twin Branch 2 34.5kV line is overloaded for multiple N-1 contingencies and N-1-1 contingency pairs.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05TWIN BRCH1 – 05TWIN BRCH 2 34.5kV	37/37/47/47

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
05TWIN BRCH1 – 05TWIN BRCH 2 34.5kV	52/62/69/75

Recommended Solution: replace two spans of 336.4 26/7 ACSR on Twin Branch-AM General #2 Circuit. (**B3257**)

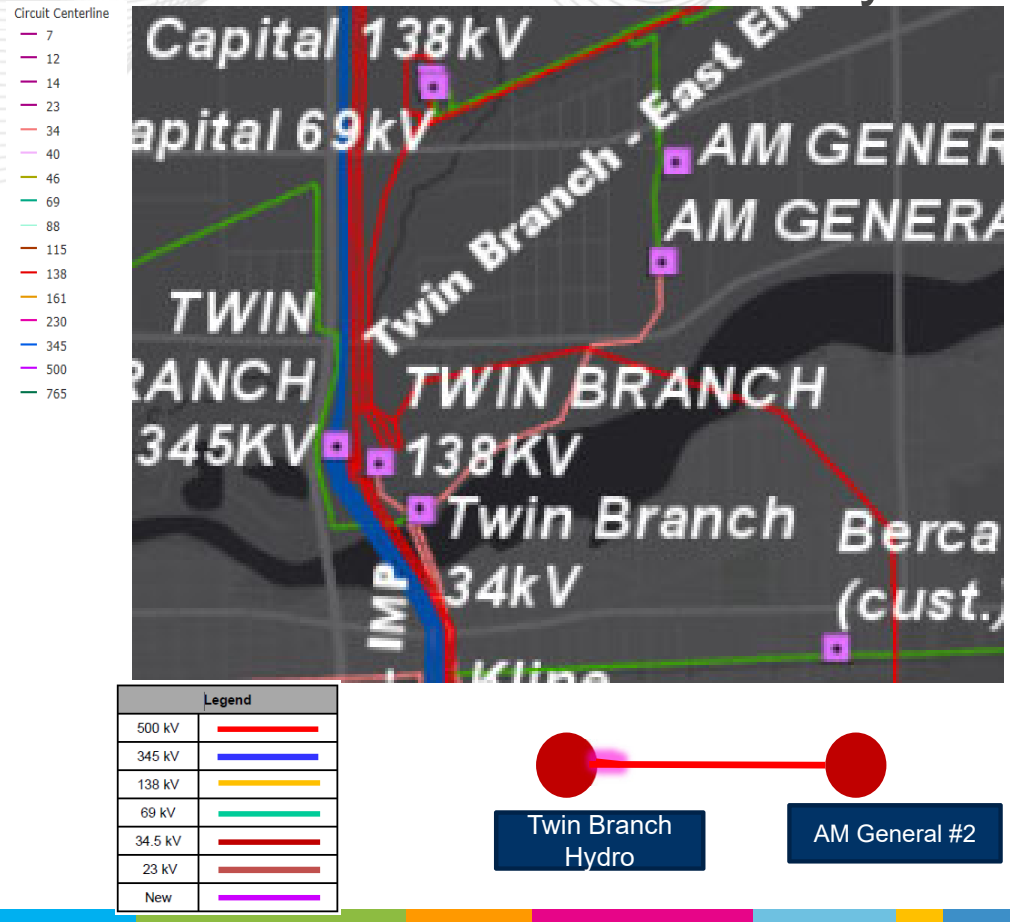
Estimated Cost: $0.14M

Ancillary Benefits: First two spans of AEP-2020-IM020 (Presented 8/14/2020), Structures relocated for station work AEP-2019-IM044 (presented 11/22/2019)

Required In-Service: 6/1/2025

Projected IS-Service: 3/17/2024

Previously Presented: 10/16/2020



AEP Transmission Zone: Baseline Albion CB Addition

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

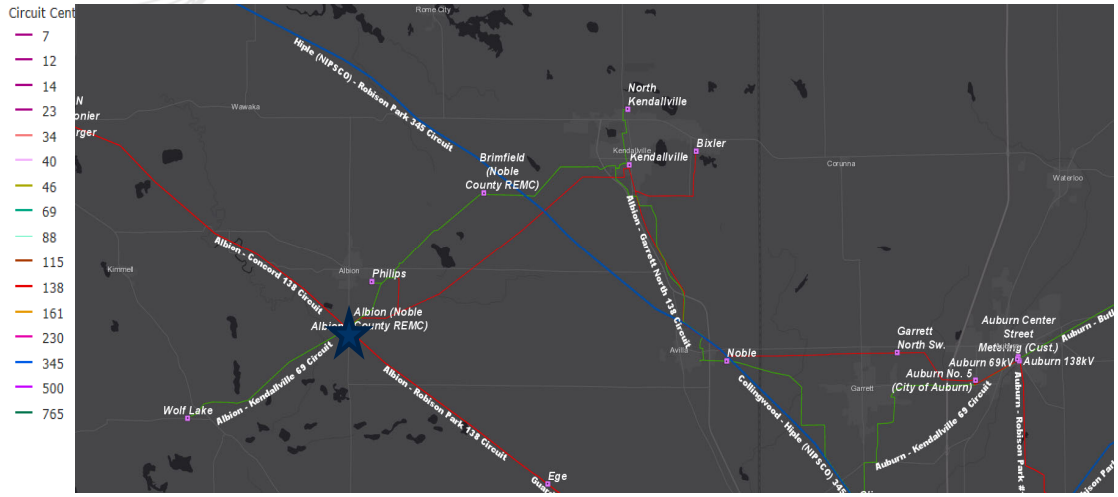
Problem Statement:

FGs: AEP-VD102 through AEP-VD113

The voltage drop violation at Wolf Lake, Albion, Philips, Brimfield, North Kendallville, Kendallville 69kV buses for multiple N-1-1 contingency pairs.

Existing Facility Rating: N/A

Preliminary Facility Rating: 40KA



AEP Transmission Zone: Baseline Albion CB Addition

Process Stage: Recommended Solution

Recommended Solution: Install a low side 69KV CB at Albion 138/69kV transformer 1 to eliminate the critical contingency (**B3248**)

Estimated Cost: $0.4M

Required In-Service: 6/1/2025

Projected IS-Service: 6/1/2025

Previously Presented: 10/16/2020

Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

AEP Transmission Zone: Baseline
Millbrook Park 138 kV Breaker Installation

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

FGs: AEP-VM1 through AEP-VM56, AEP-VM658 through AEP-VM661, AEP-VM666 through AEP-VM669, AEP-VM801, AEP-VM802, AEP-VM818, AEP-VM820, AEP-VD2 through AEP-VD26, AEP-VD900, AEP-VD901, AEP-VD908

The voltage magnitude and voltage drop violations at Mill Street, Sugar Hill, Friendship, Central Portsmouth, Cornerstone Station, Ruhlman, Rosemount, Sciotoville, Millbrook Park, Oertels Corners, Siloam, South Shore 69kV buses and South Lucasville 138kV bus for multiple N-1-1 contingency pairs.

Existing Facility Rating: N/A

Preliminary Facility Rating: 40KA

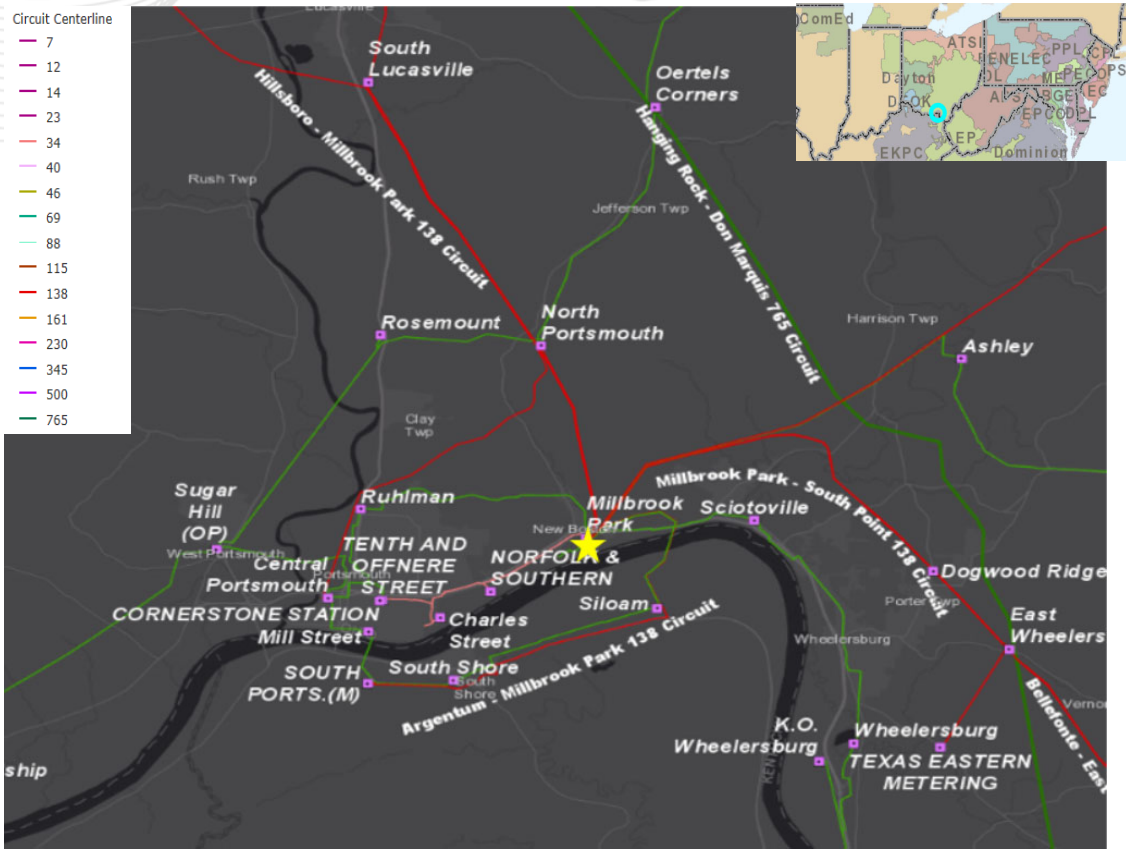
Recommended Solution: Install a 3000A 40 kA 138 kV breaker on high side of 138/69 kV transformer #5 at Millbrook Park station. The transformer and associated bus protection will be upgraded accordingly. (**B3253**)

Estimated Cost: $0.63M

Required In-Service: 6/1/2025

Projected IS-Service: 9/1/2024

Previously Presented: 10/16/2020



AEP Transmission Zone: Baseline Wagenhals 138 kV Breaker Installation

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

FGs: AEP-T390, AEP-T391, AEP-VD1135, AEP-VD1136, AEP-VD1137

The Easton – North Canton 69kV line is overload and voltage drop violations at Belden Village, Wayview 69KV buses for N-1-1 contingency pair of the loss of West Canton -Promway – Wayview 138kV line and the loss of Wagnenhals 138/69/23kV transformer and the Canton Center –Wagenhals-June Road 138kV line, LTV Steel – Wagenhals- North East Canton 138KV line and West Louisville – Georgetown 69kV line.

Existing Facility Rating: N/A

Preliminary Facility Rating: 63KA

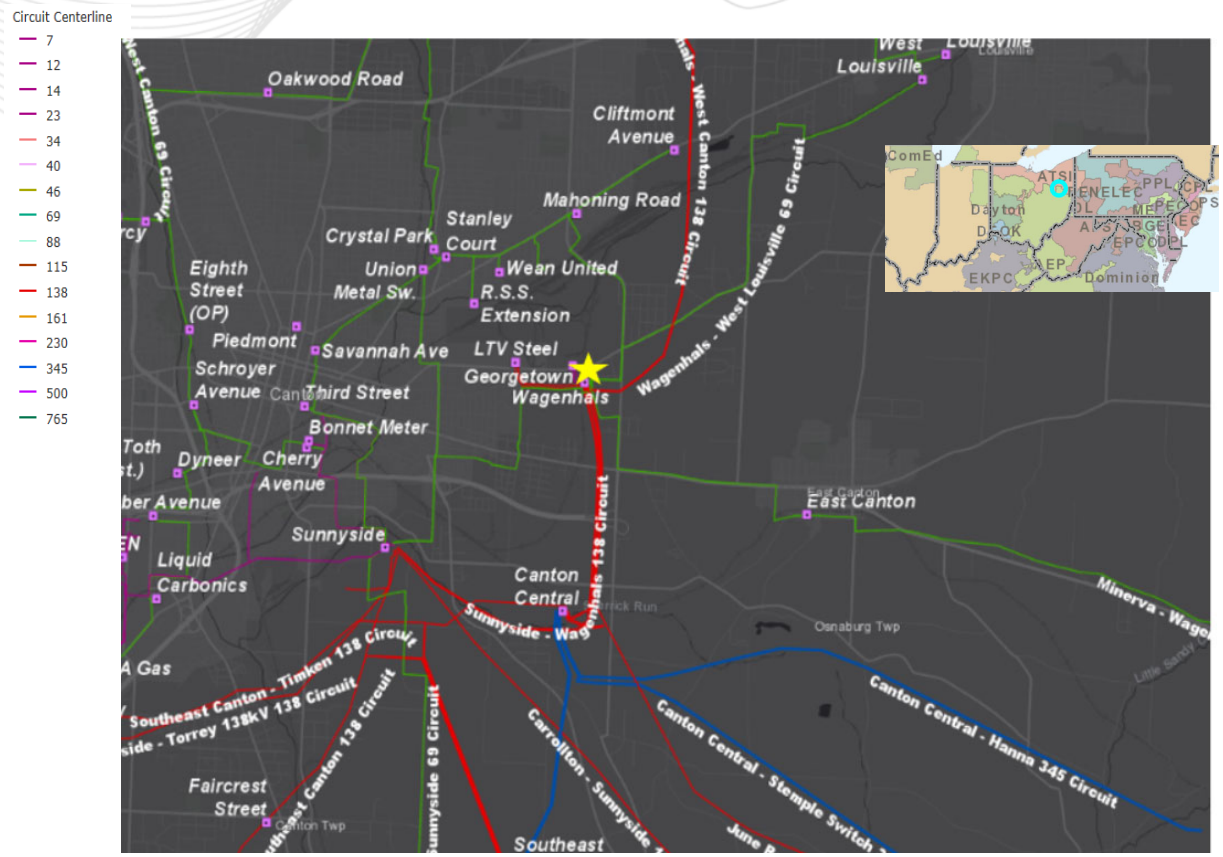
Recommended Solution: Install a 3000A 63 kA 138 kV breaker on high side of 138/69 kV transformer #2 at Wagenhals station. The transformer and associated bus protection will be upgraded accordingly (**B3258**)

Estimated Cost: $1.10M

Required In-Service: 6/1/2025

Projected IS-Service: 9/1/2024

Previously Presented: 10/16/2020



AEP Transmission Zone: Baseline
West Millersburg 138kV Breaker Installation

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

FGs: AEP-VD975, AEP-VD976, AEP-VD977, AEP-VD978, AEP-VD979, AEP-VD980, AEP-VD981, AEP-VD982, AEP-VD458, AEP-VD459

The voltage drop violations at BILLIAR, North Fredericksburg, Shreve, Big Prairie, PAINTVSS, Drake Valley, and LOUDNVL 69kV buses for the fault South Millersburg - West Millersburg – Wooster – East Wooster 138kV line with stuck breaker at Wooster 138kV bus.

Existing Facility Rating: N/A

Preliminary Facility Rating: 40KA

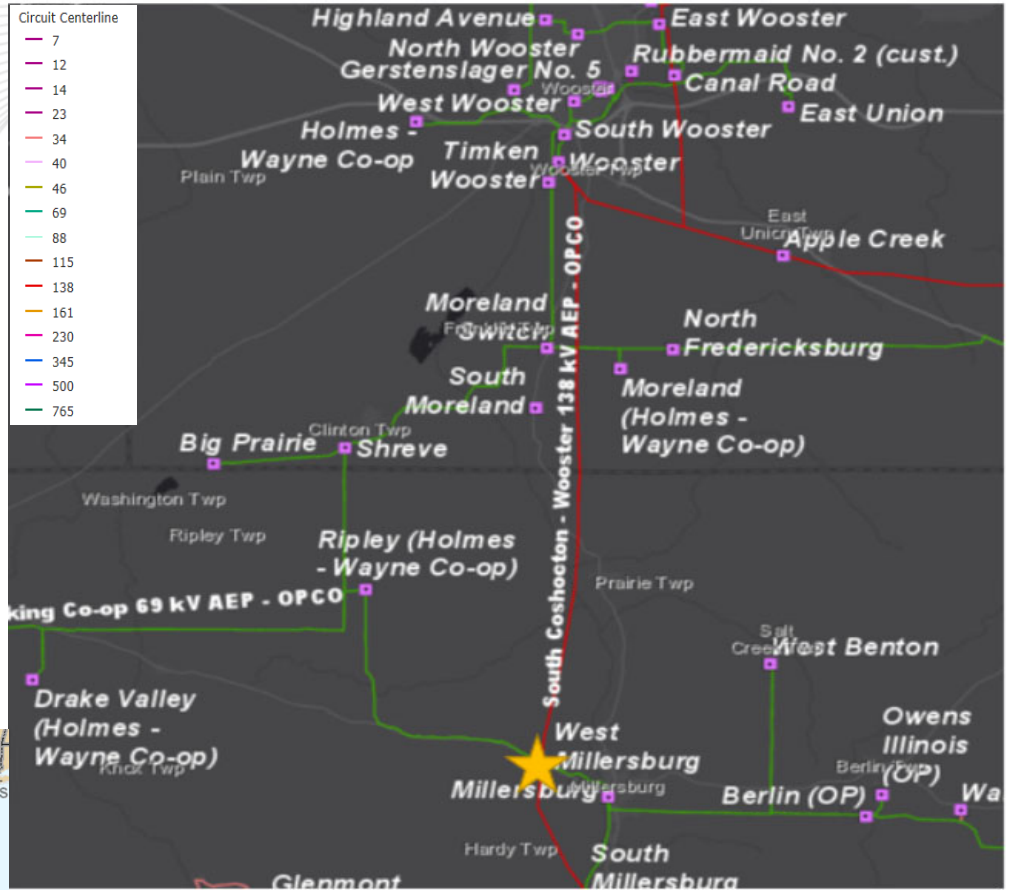
Recommended Solution: At West Millersburg station, replace the 138kV MOAB on the West Millersburg - Wooster 138kV line with a 3000A 40kA breaker (**B3259**)

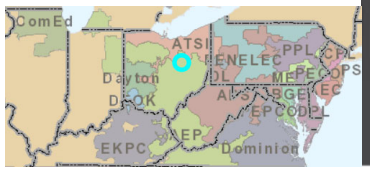
Estimated Cost: $0.68M

Required In-Service: 6/1/2025

Projected IS-Service: 9/1/2024

Previously Presented: 10/16/2020





ATSI Transmission Zone: Baseline Pine 138 kV Reactor

Process Stage: Recommended Solution

Criteria: ATSI 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

FG: ATSI-LLVM12, ATSI-LLVM13, ATSI-LLVM14, ATSI-LLVM15, ATSI-LLVM16, ATSI-LLVM17, ATSI-LLVM18, ATSI-LLVM19, ATSI-LLVM20, ATSI-LLVM21, ATSI-LLWM22, ATSI-LLVM107, ATSI-LLVM108, ATSI-LLVM109, ATSI-LLVM110, ATSI-LLVM111, ATSI-LLVM112, ATSI-LLVM113, ATSI-LLVM114, ATSI-LLVM115, ATSI-LLVM116

High Voltages, based on ATSI TO Criteria, observed for voltage magnitude analysis of the Light load case in the area of Pine 138 kV

Proposed Solution: Extend both the east and west 138 kV buses

Install one (1) 138 kV breaker and associated disconnect switches

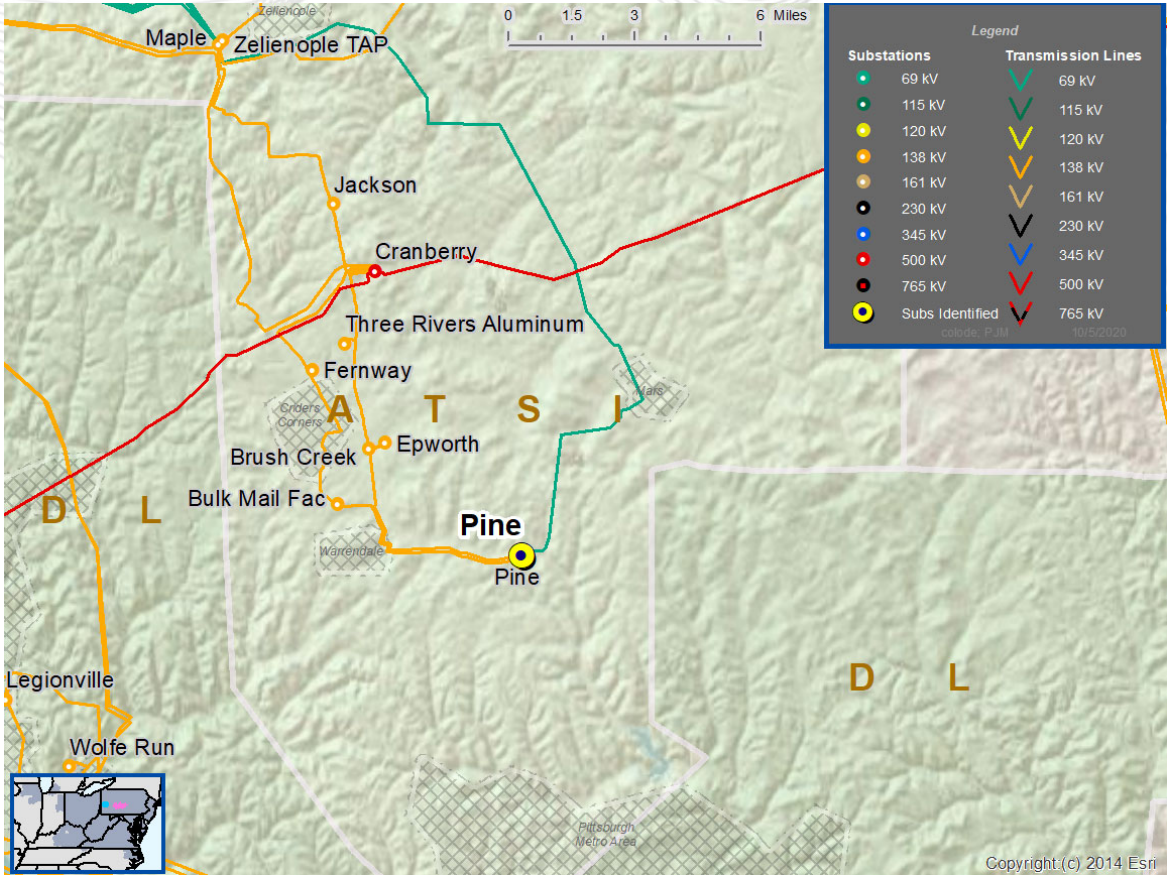
Install one 100 MVAR reactor **(B3234)**

Estimated Cost: $3.8M

Alternatives: None

Required In-Service: 6/1/2025

Previously Presented: 10/16/2020



ATSI Transmission Zone: Baseline Tangy 138 kV Reactor

Process Stage: Recommended Solution

Criteria: ATSI 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

FG: ATSI-LLVM38

High Voltage, based on ATSI TO Criteria, observed for voltage magnitude analysis of the Light load case at Tangy 138 kV for the loss of the Gavin – Flatlick 765 kV line.

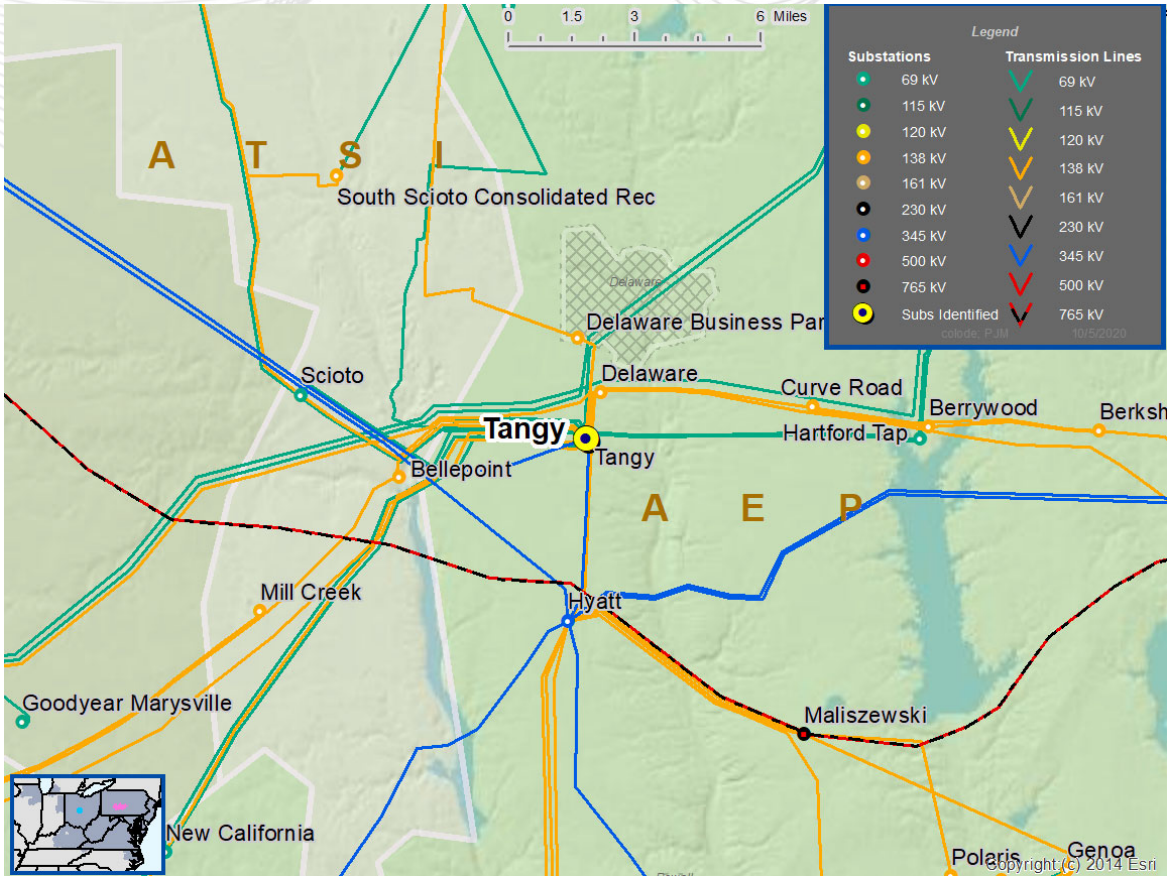
Proposed Solution: Extend 138 kV bus work to the west of Tangy Substation for the addition of the 100 MVAR reactor bay **(B3235)**

Estimated Cost: $3.7M

Alternatives: Larger reactor at Tangy

Required In-Service: 6/1/2025

Previously Presented: 10/16/2020



ATSI Transmission Zone: Baseline Broadview 138 kV Reactor

Process Stage: Recommended Solution

Criteria: ATSI 715 Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

FG: ATSI-LLVM101, ATSI-LLVM102, ATSI-LLVM103, ATSI-LLVM104, ATSI-LLVM105, ATSI-LLVM106

High Voltage, based on ATSI TO Criteria, observed for voltage magnitude analysis of the Light load case around Broadview, Tech + and Morefiel138 kV busses for the loss of the Edgewood – Urbana 69 kV line.

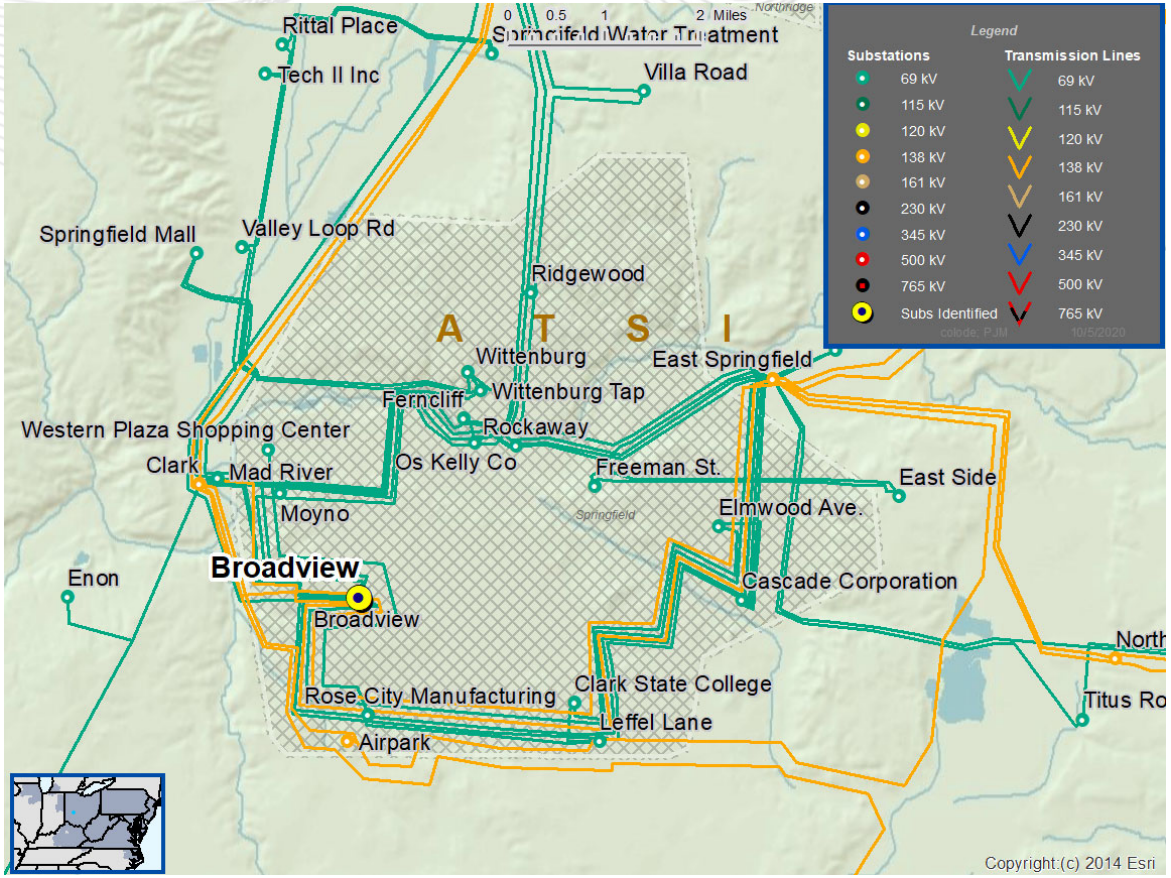
Proposed Solution: Extend the Broadview 138 kV Bus by adding two new breakers and associated equipment and install a 75 MVAR Reactor **(B3236)**

Estimated Cost: $4.5M

Alternatives: Larger reactor at Tangy

Required In-Service: 6/1/2025

Previously Presented: 10/16/2020



ATSI Transmission Zone: Baseline
East Akron 138kV Substation Breaker Upgrade

Process Stage: Recommended Solution

Criteria: Short Circuit: Overdutied Breaker

Assumption Reference: Davis Besse, Perry, Sammis reinstatement

Model Used for Analysis: 2024 RTEP

Proposal Window Exclusion: Station Equipment

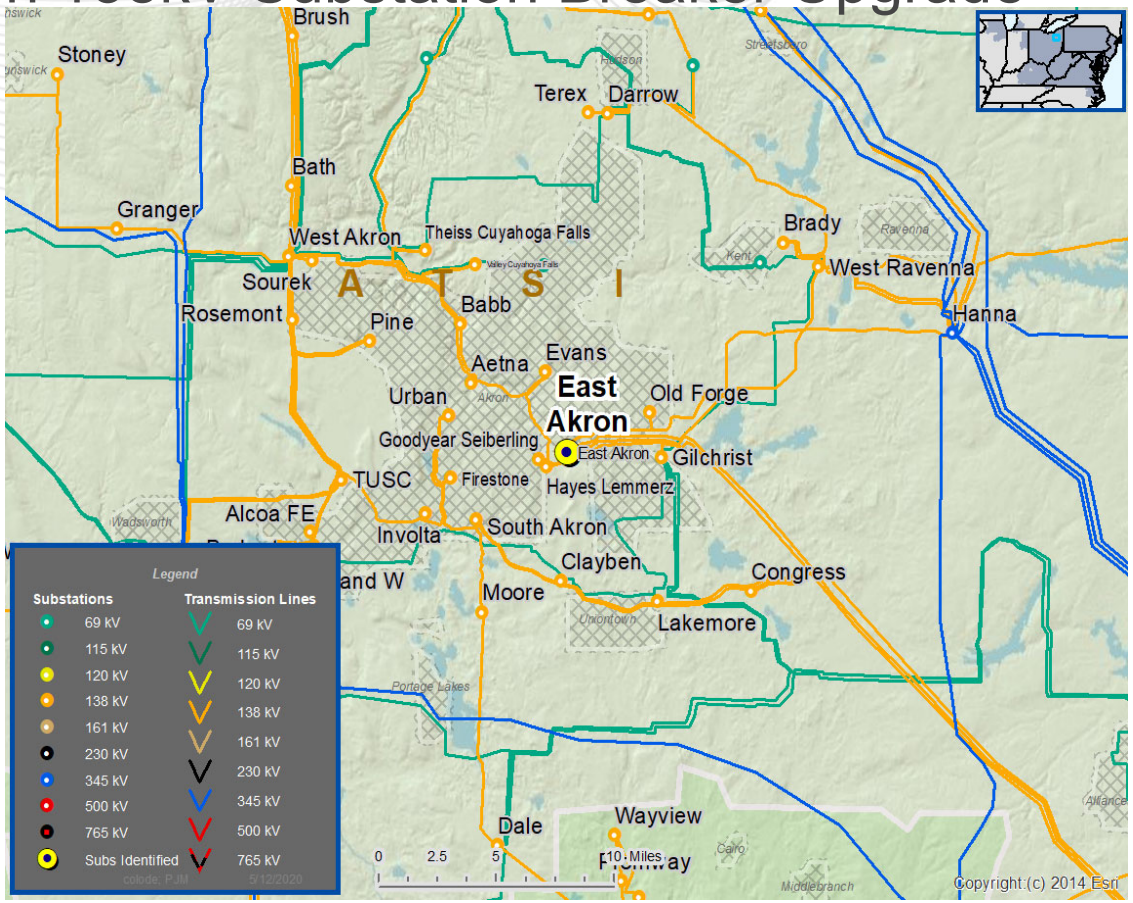
Problem Statement: The East Akron 138 kV breaker B-22 is overdutied due to the Davis Besse 1, Perry 1, Sammis 5-7 reinstatement

Existing Facility Rating: 20 kA

Proposed Solution: Replace the existing East Akron 138 kV breaker B-22 with 3000A continuous, 40 KA momentary current interrupting rating circuit breaker. **(B3277)**

Estimated Cost: $552.5K

Required In-Service: 6/1/2021
Projected In-Service: 6/1/2021
Previously Presented: 5/22/2020



AEP Transmission Zone
B2555 Scope/Cost Change

B2555:Previously present on 9/2/2014 and 9/25/2014 TEAC

2014 RTEP Proposal Window #1 Violations: Baseline (FG# 133, 204, 205) and Generator Deliverability /Common Mode Outage (FG# 232, 234, 799, 1042)

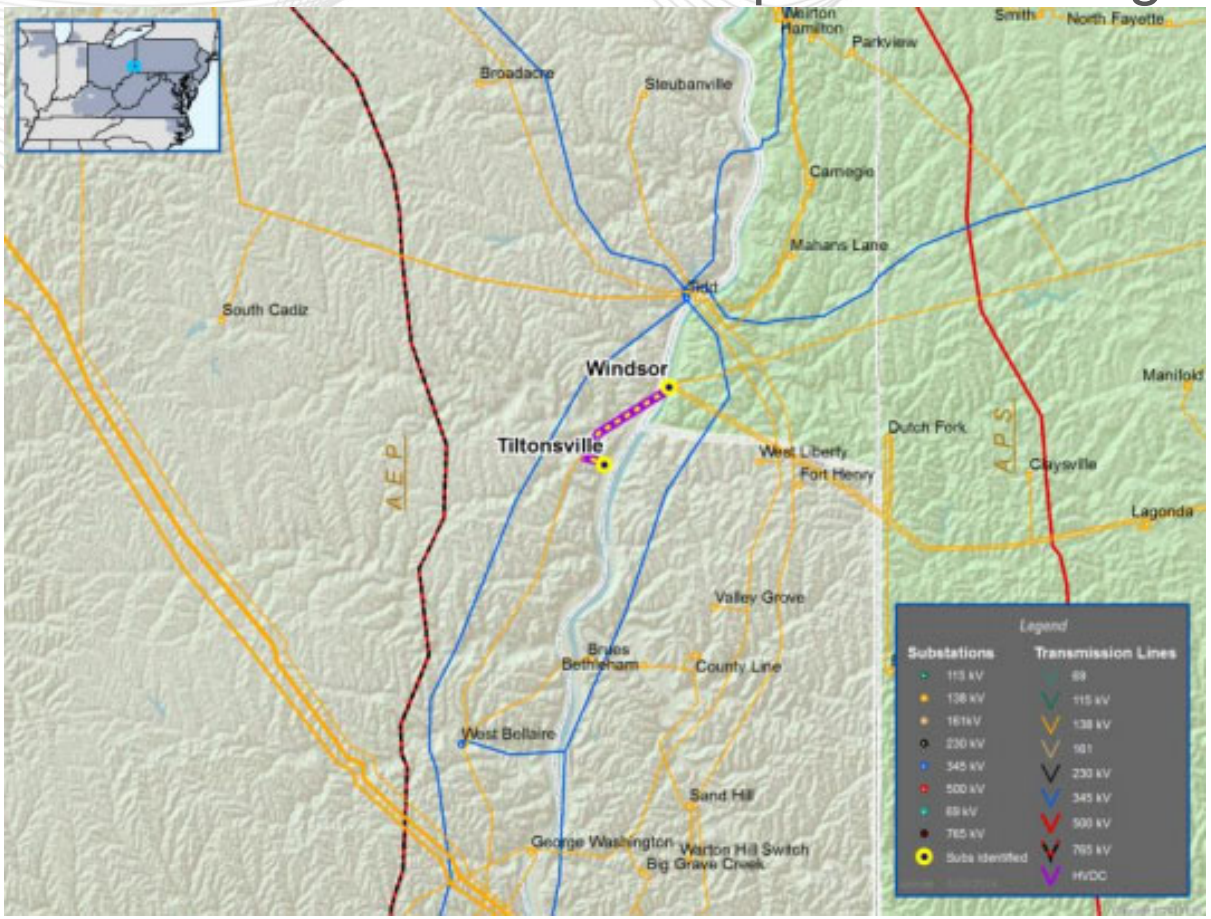
The Tilton – Windsor 138kV is overloaded for system normal and multiple contingencies.

Recommended Solution: Reconductor 0.5 miles of Tiltonsville-Windsor 138 kV and string the vacant side of the 4.5 mile section using 556 ACSR in a six wire configuration. (B2555) (P2014_1-2A)
Updated scope: Reconductor 0.3 miles of Tiltonsville-Windsor 138 kV into Tiltonsville station with 795 ACSS; string the vacant side of the 3.8 mile middle section using 556 ACSR and operate in a six wire configuration; rebuild the 0.9 mile section crossing from Ohio into the Windsor station in West Virginia, using 795 ACSS.

Estimated Project Cost: ~~$2.0M~~ $10.8M
Reasons for the Cost Increase:

- Final 0.9 mile section crossing Ohio River and into Windsor station could not be reconductored due to the age and condition of the towers crossing the Ohio river. The 1916-vintage structures required replacement.
- Higher expected construction access roads.The project area's terrain is very challenging, with rolling hills in the Ohio River valley. Helicopter construction methods are being explored, to hopefully reduce the actual projects costs.

Required IS Date: 6/1/2019
Projected IS Date: 9/1/2021



AEP Transmission Zone
B2670 Cost Change

B2670 previously presented in 9/10/2015 TEAC

Common Mode Outage (FG# 801):

The Lebanon – Elk Garden 138 kV circuit is overloaded for line fault stuck breaker contingency loss of the Broadford – Sullivan 500 kV circuit and Broadford 765/500 kV transformer.

Alternatives considered:

- 2015_1-2B (~~$1.25~~ 4.8M):Lebanon, Elk Garden Switch Replacements
- 2015_1-2C (~~$2.5~~ 11.0M):Clinch River Area Ratings Uprates
- 2015_1-2D ($38.5 M): Construct 22 miles of new 1033 ACSR line between Clinch River and Keen Mtn 138kV stations
- 2015_1-2E ($95 M): Construct 43 miles of new 1033 ACSR line between Clinch River and Beaver Creek 138kV stations

Recommended Solution:

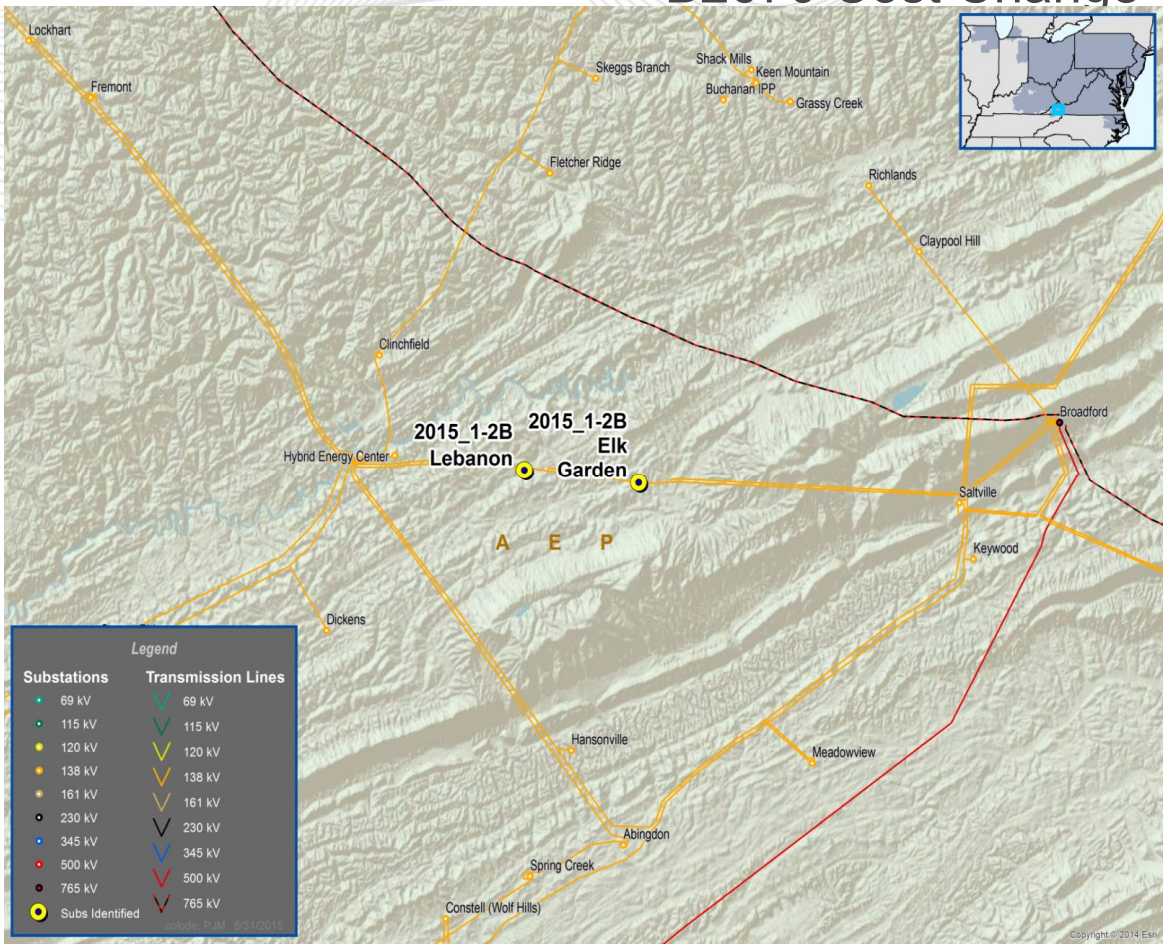
- Replace switches at Elk Garden and Lebanon 138 kV substations (on the Elk Garden – Lebanon 138 kV circuit). (2015_1-2B) (B2670)

Estimated Project Cost: $~~1.25~~ **4.8**M

Reasons for Cost Increase: a mobile transformer install and temporary T-line work required to keep customers in-service from Lebanon and Elk Garden stations. Additionally, there is limited accessibility and rough terrain around the switch locations which increased construction costs. Note: The Lebanon switch replacement was included in the original project submittal but was not mentioned on the slide previously. It was added for clarity to the description.

Required IS Date: 6/1/2020

Projected IS Date: 6/1/202~~0~~**1**



EKPC Transmission Zone: Baseline
Clay Village-Clay Village T metering CT upgrade

Process Stage: Recommended Solution

Criteria: EKPC 715 Criteria

Assumption Reference: EKPC Assumptions Presentation Slide 3-7

Model Used for Analysis: EKPC's internal models representing 2021/22 winter peak conditions that were used for EKPC's annual system screening analysis in 2019. Includes LGE/KU EW Brown Unit 3 off with replacement generation imported from north of EKPC system.

Proposal Window Exclusion: Substation equipment

Problem Statement: FG: EKPC-T1

The Clay Village- Clay Village T 69 KV line section is overloaded for the loss of the Ghent - Owen County Tap 138kV line.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
2CLAY VILLAG – 2CLAY VILG T 69kV	47/47/47/47

Recommended Solution: Upgrade the Metering CT associated with the Clay Village-Clay Village T 69 KV line section to increase the line ratings.(**B3266**)

Preliminary Facility Rating:

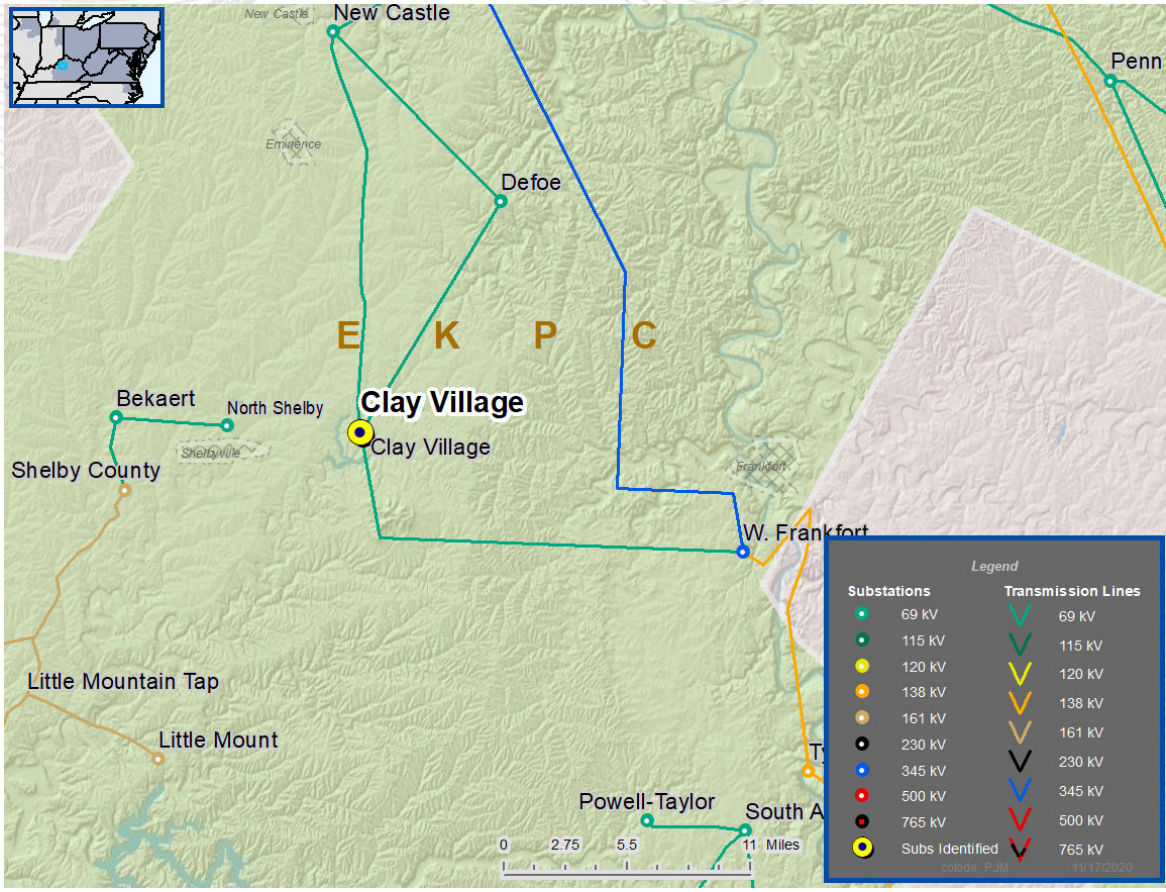
Branch	SN/SE/WN/WE (MVA)
2CLAY VILLAG – 2CLAY VILG T 69kV	49/54/70/73

Estimated Cost: $0.025M

Required In-Service: 12/1/2021

Projected In-Service: 12/1/2021

Previously Presented: 11/20/2020



EKPC Transmission Zone: Baseline Norwood-Shopville 69 KV rebuild

Process Stage: Recommended Solution

Criteria: EKPC 715 Criteria

Assumption Reference: EKPC Assumptions Presentation Slide 3-7

Model Used for Analysis: EKPC's internal models representing 2021/22 winter peak conditions that were used for EKPC's annual system screening analysis in 2019. Includes Cooper Units 1 and 2 off with replacement generation imported from south of EKPC system.

Proposal Window Exclusion: Below 200 kV

Problem Statement: FG: EKPC-VM1

Low voltage at the Brodhead distribution substation of 0.89 PU for the loss of the Brodhead – Three Link 69kV line .

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
2NORWOOD T – 2SHOPVILLE 69kV	49/54/70/73

Recommended Solution: Rebuild the 4/0 ACSR Norwood-Shopville 69 KV line section using 556 ACSR/TW. (**B3267**) **Estimated Cost:** $3.788M

Preliminary Facility Rating:

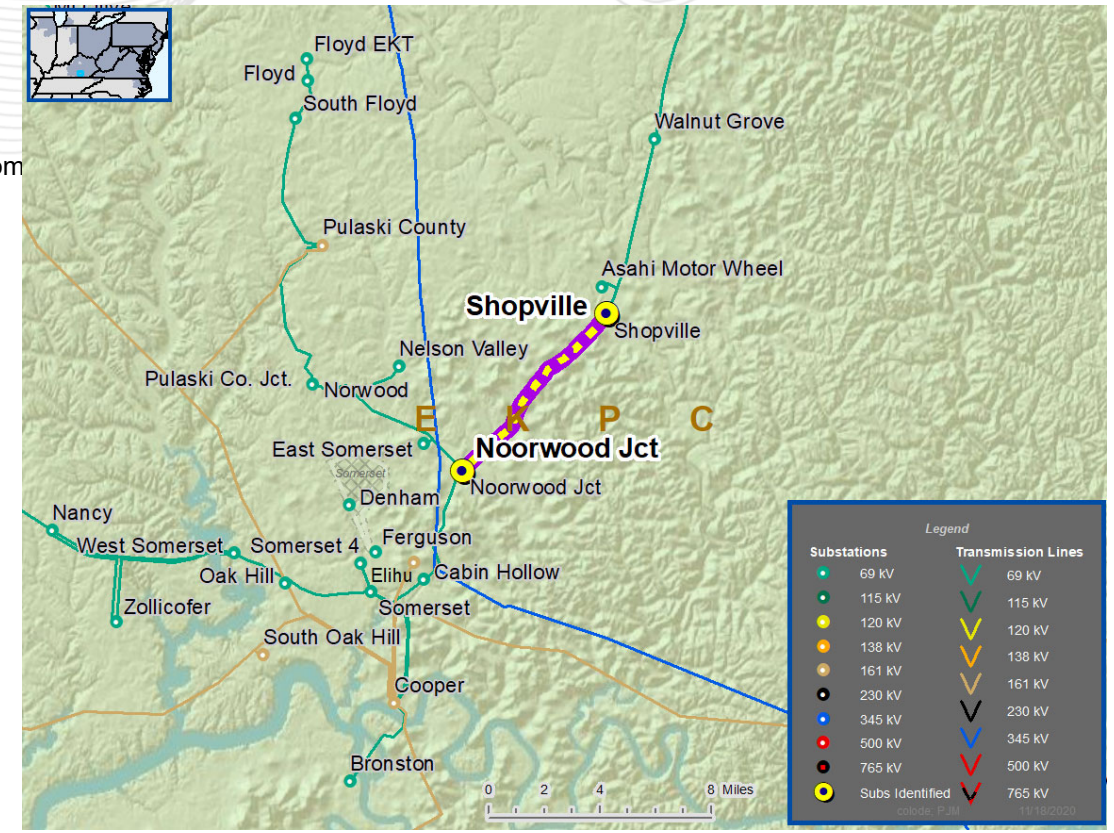
Branch	SN/SE/WN/WE (MVA)
2NORWOOD T – 2SHOPVILLE 69kV	77/90/95/100

Ancillary Benefits: Replacement of Aging Infrastructure, Norwood-Shopville line was constructed in 1959 (61 years old).

Required In-Service: 12/1/2021

Projected In-Service: 12/1/2023

Previously Presented: 11/20/2020



APS Transmission Zone: Baseline Cherry Run – Morgan 138 kV

Process Stage: Second Review

Criteria: Winter Generator Deliverability

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

FG: GD-W197, GD-W198

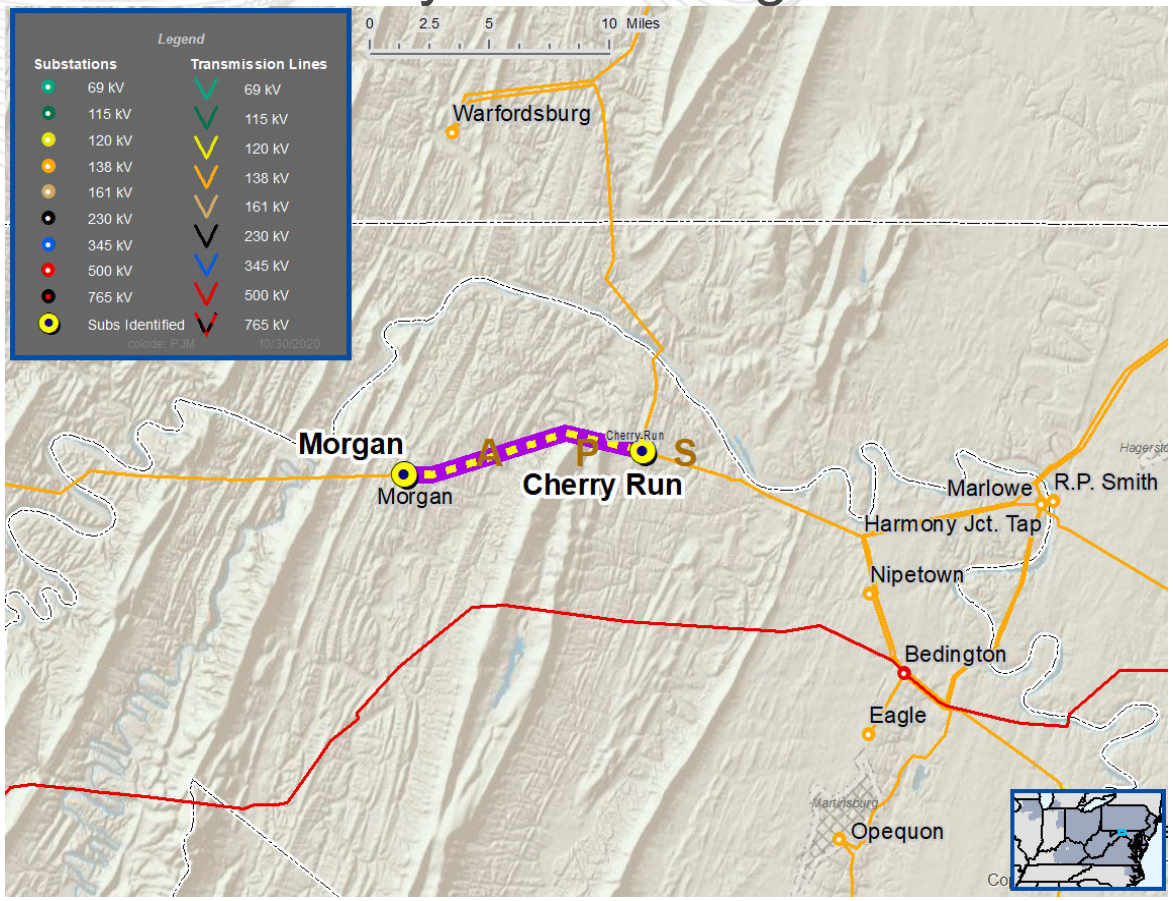
In the 2020 RTEP 2025 Winter Generator Deliverability analysis a stuck breaker of the BDL3 or BDL4 500 kV breakers at Bedington substation results in a thermal violation on the Cherry Run - Morgan 138 kV line at 103.4%.

Recommended Solution: Upgrade Cherry Run and Morgan terminals to make the Transmission Line the limiting component. Morgan: Wave Trap; Cherry Run: Substation conductor, relays, CT (**B3240**)

Estimated Cost: $0.23M

Alternatives: N/A

Required In-Service: 12/1/2025



APS Transmission Zone: Baseline Hardy 138 kV Capacitor

Process Stage: Second Review

Criteria: N-1 and N-1-1 Summer Voltage Magnitude/Drop; TO Criteria: Voltage Magnitude/Drop

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

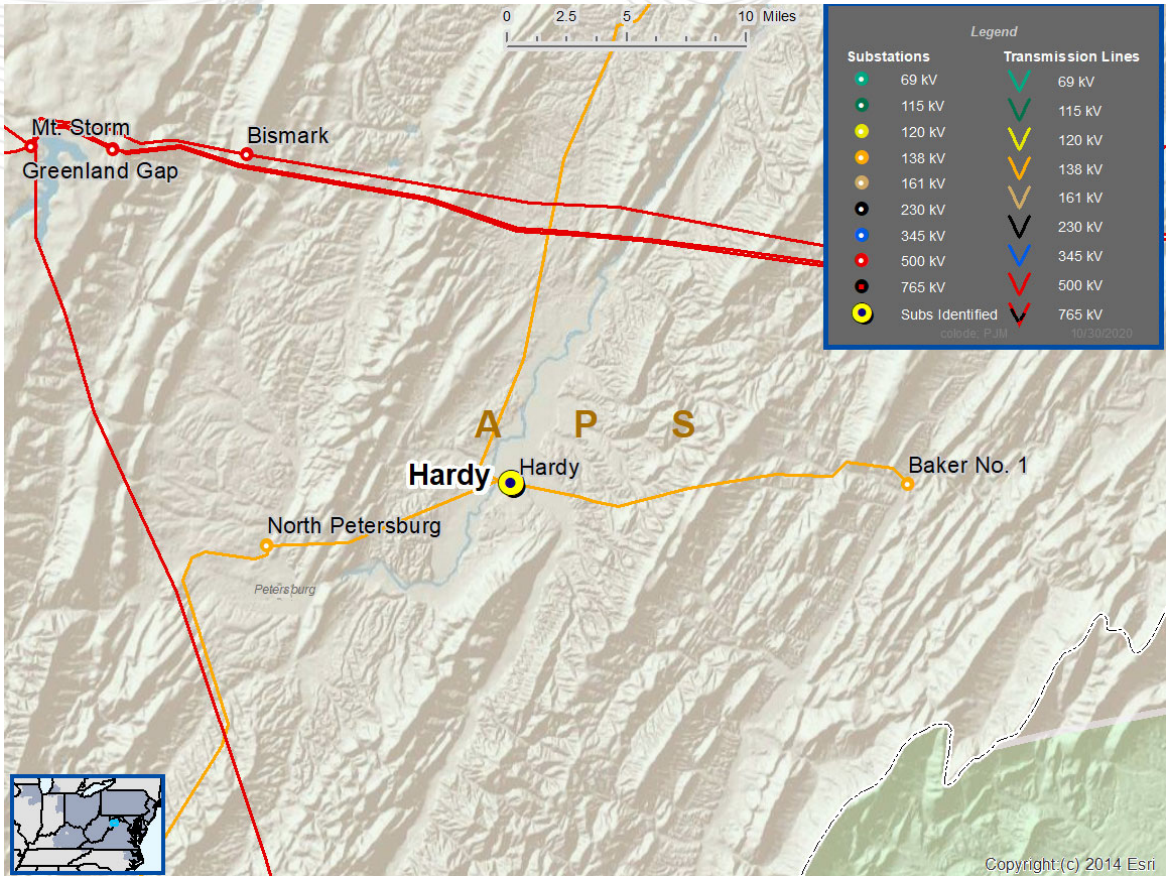
Flowgates:

N1-SVM1, N1-SVM2, N1-SVM3, N1-SVM4, N1-SVM5, N1-SVM6, N1-SVM7, N1-SVM8,

N1-SVD1, N1-SVD2, N1-SVD3, N1-SVD4, N1-SVD5, N1-SVD6, N1-SVD7, N1-SVD8, N1-SVD9, N1-SVD10, N1-SVD11, N1-SVD12,

N2-SVM16, N2-SVM17, N2-SVM18, N2-SVM19, N2-SVM20, N2-SVM21, N2-SVM22, N2-SVM23, N2-SVM24, N2-SVM25, N2-SVM26, N2-SVM27, N2-SVM28, N2-SVM29, N2-SVM39, N2-SVM40, N2-SVM41, N2-SVM42, N2-SVM43, N2-SVM44, N2-SVM45, N2-SVM46, N2-SVM47, N2-SVM48, N2-SVM49, N2-SVM50, N2-SVM51, N2-SVD2, N2-SVD3,

APS-VM1, APS-VM2, APS-VM3, APS-VM4, APS-VM5, APS-VM6, APS-VM7, APS-VM12, APS-VM13, APS-VM14, APS-VM15, APS-VM16, APS-VM17, APS-VM18, APS-VM19, APS-VM20, APS-VM21, APS-VM22, APS-VM23, APS-VM24, APS-VM34, APS-VM35, APS-VM36, APS-VM37, APS-VM38, APS-VM39, APS-VM40, APS-VM41, APS-VM42, APS-VM43, APS-VM44, APS-VM45, APS-VM46, APS-VM47, APS-VM48, APS-VM49, APS-VM55, APS-VM56, APS-VM57, APS-VM58, APS-VM59, APS-VM60, APS-VM61, APS-VM62, APS-VM78, APS-VM79, APS-VM80, APS-VM81, APS-VM82, APS-VM83, APS-VM84, APS-VM85, APS-VM86, APS-VM87, APS-VM88, APS-VM89, APS-VM90, APS-VM104, APS-VM105, APS-VM108, APS-VM124, APS-VM125, APS-VM126, APS-VM127, APS-VM128, APS-VM129, APS-VM130, APS-VD4, APS-VD9, APS-VD10, APS-VD11, APS-VD12, APS-VD13, APS-VD14, APS-VD15, APS-VD21, APS-VD22, APS-VD23, APS-VD24, APS-VD31, APS-VD32, APS-VD33



APS Transmission Zone: Baseline Hardy 138 kV Capacitor

Problem Statement Con't:

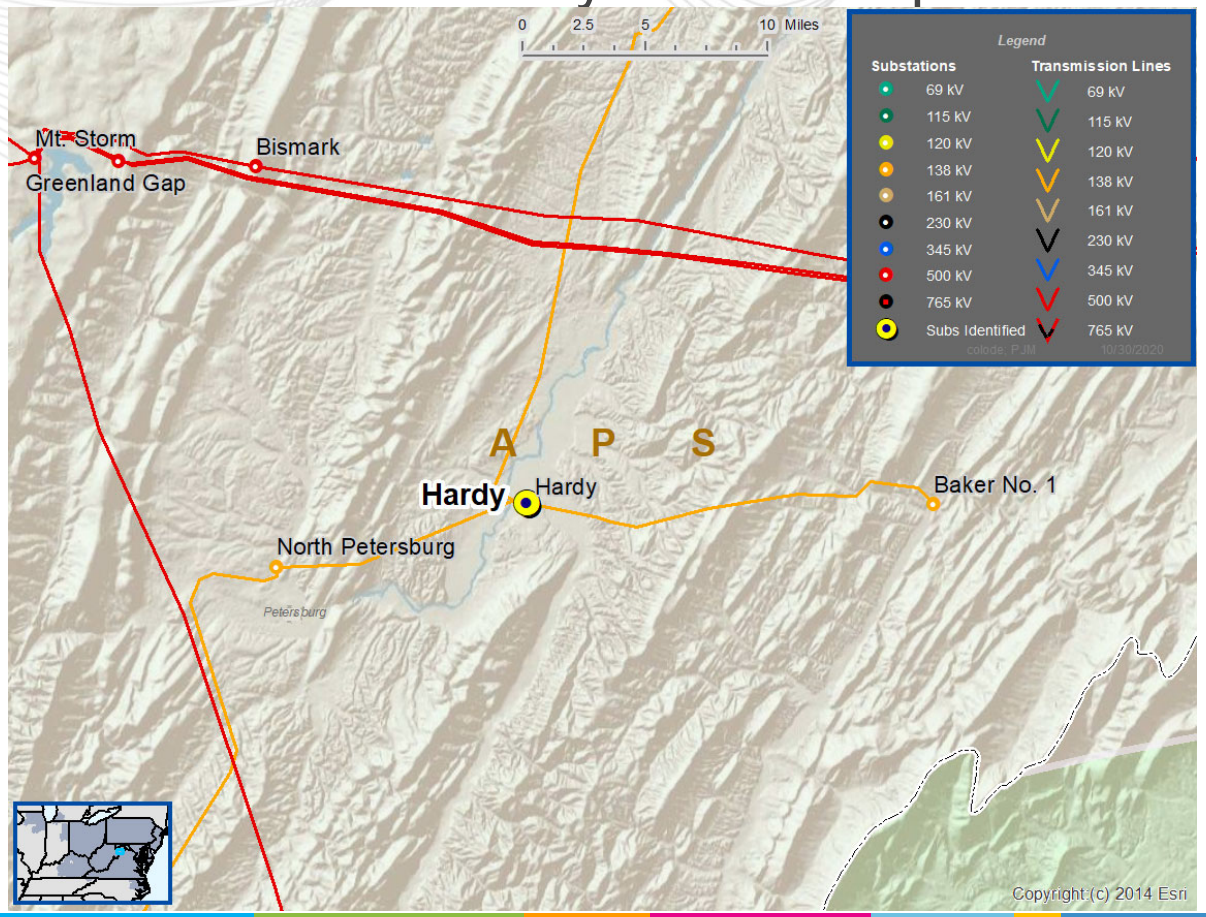
In the 2020 RTEP 2025 Summer Basecase analysis a bus contingency at Junction 138 kV substation results in a low voltage violation at multiple substations. (Baker 138 kV substation at 88% pu.)

Recommended Solution: Install 138 kV, 36 MVAR capacitor and a 5 uF reactor protected by a 138 kV capacitor switcher. Install a breaker on the 138 kV Junction terminal. Install a 138 kV 3.5 uF reactor on the existing Hardy 138 kV capacitor. (**B3241**)

Estimated Cost: $2.85M

Alternatives: N/A

Required In-Service: 6/1/2025



APS Transmission Zone: Baseline Stonewall 138 kV Capacitor

Process Stage: Second Review

Criteria: N-1-1 Summer Voltage Magnitude; TO Criteria: Voltage Magnitude/Drop

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Proposal Window Exclusion: Below 200 kV

Problem Statement:

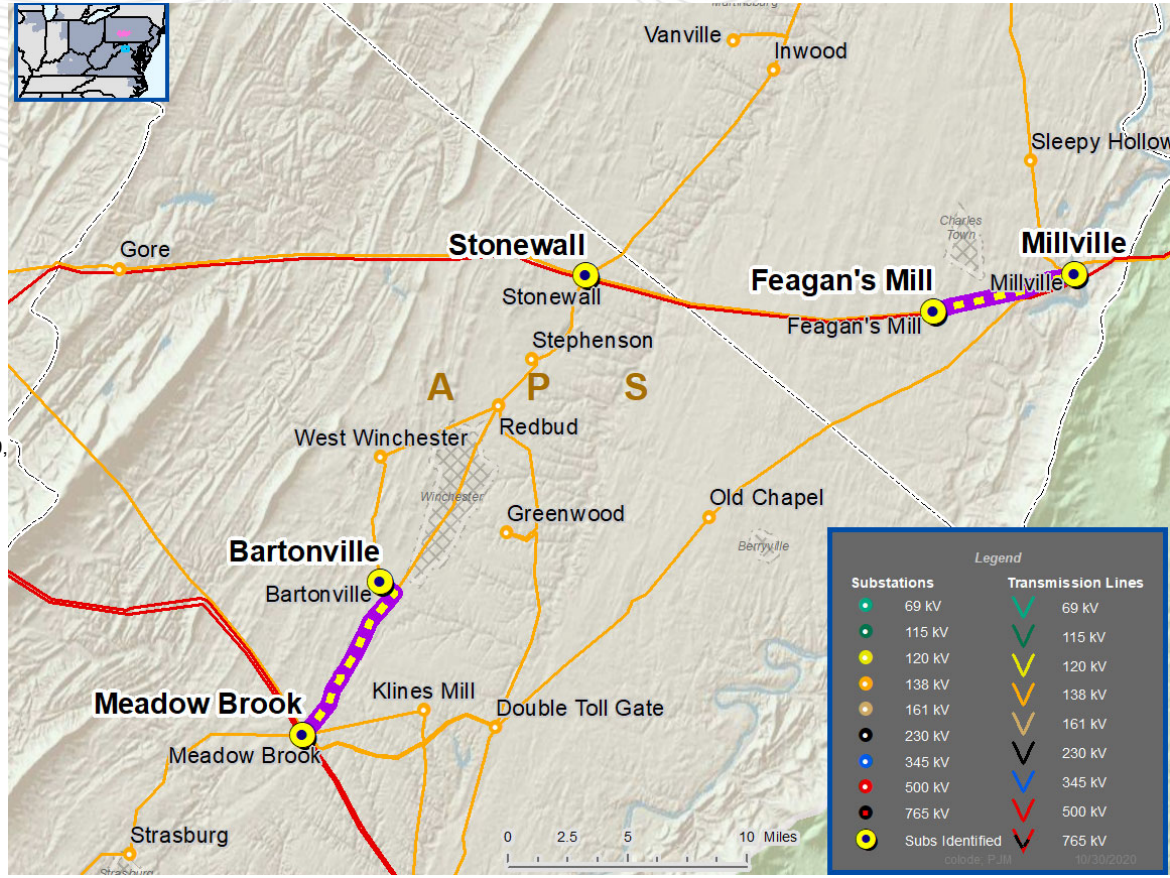
Flowgates:

N2-SVM1, N2-SVM2, N2-SVM3, N2-SVM4, N2-SVM5, N2-SVM6, N2-SVM7, N2-SVM8, N2-SVM9, N2-SVM10, N2-SVM11, N2-SVM12, N2-SVM13, N2-SVM14, N2-SVM15, N2-SVM30, N2-SVM31, N2-SVM32, N2-SVM33, N2-SVM34, N2-SVM35, N2-SVM36, N2-SVM37, N2-SVM38, N2-SVD1,

N2-WVM1, N2-WVM2, N2-WVM3, N2-WVM4, N2-WVM5, N2-WVM6, N2-WVM7, N2-WVM8, N2-WVM9, N2-WVM10, N2-WVM11, N2-WVM12, N2-WVM13, N2-WVM14,

APS-VM8, APS-VM9, APS-VM10, APS-VM11, APS-VM25, APS-VM26, APS-VM27, APS-VM28, APS-VM29, APS-VM30, APS-VM31, APS-VM32, APS-VM33, APS-VM50, APS-VM51, APS-VM52, APS-VM53, APS-VM54, APS-VM63, APS-VM64, APS-VM65, APS-VM66, APS-VM67, APS-VM68, APS-VM69, APS-VM70, APS-VM71, APS-VM72, APS-VM73, APS-VM74, APS-VM75, APS-VM76, APS-VM77, APS-VM91, APS-VM92, APS-VM93, APS-VM94, APS-VM95, APS-VM96, APS-VM97, APS-VM98, APS-VM99, APS-VM100, APS-VM101, APS-VM102, APS-VM103, APS-VM106, APS-VM107, APS-VM109, APS-VM110, APS-VM111, APS-VM112, APS-VM113, APS-VM114, APS-VM115, APS-VM116, APS-VM117, APS-VM118, APS-VM119, APS-VM120, APS-VM121, APS-VM122, APS-VM123, APS-VM131, APS-VM132, APS-VM133, APS-VM134, APS-VM135, APS-VM136, APS-VM137, APS-VM138, APS-VM139,

APS-VD1, APS-VD2, APS-VD3, APS-VD5, APS-VD6, APS-VD7, APS-VD8, APS-VD16, APS-VD17, APS-VD18, APS-VD19, APS-VD20, APS-VD25, APS-VD26, APS-VD27, APS-VD28, APS-VD29, APS-VD30, APS-VD34, APS-VD35, APS-VD36, APS-VD37, APS-VD38, APS-VD39, APS-VD40, APS-VD41, APS-VD42, APS-VD43, APS-VD44



APS Transmission Zone: Baseline Stonewall 138 kV Capacitor

Problem Statement Con't:

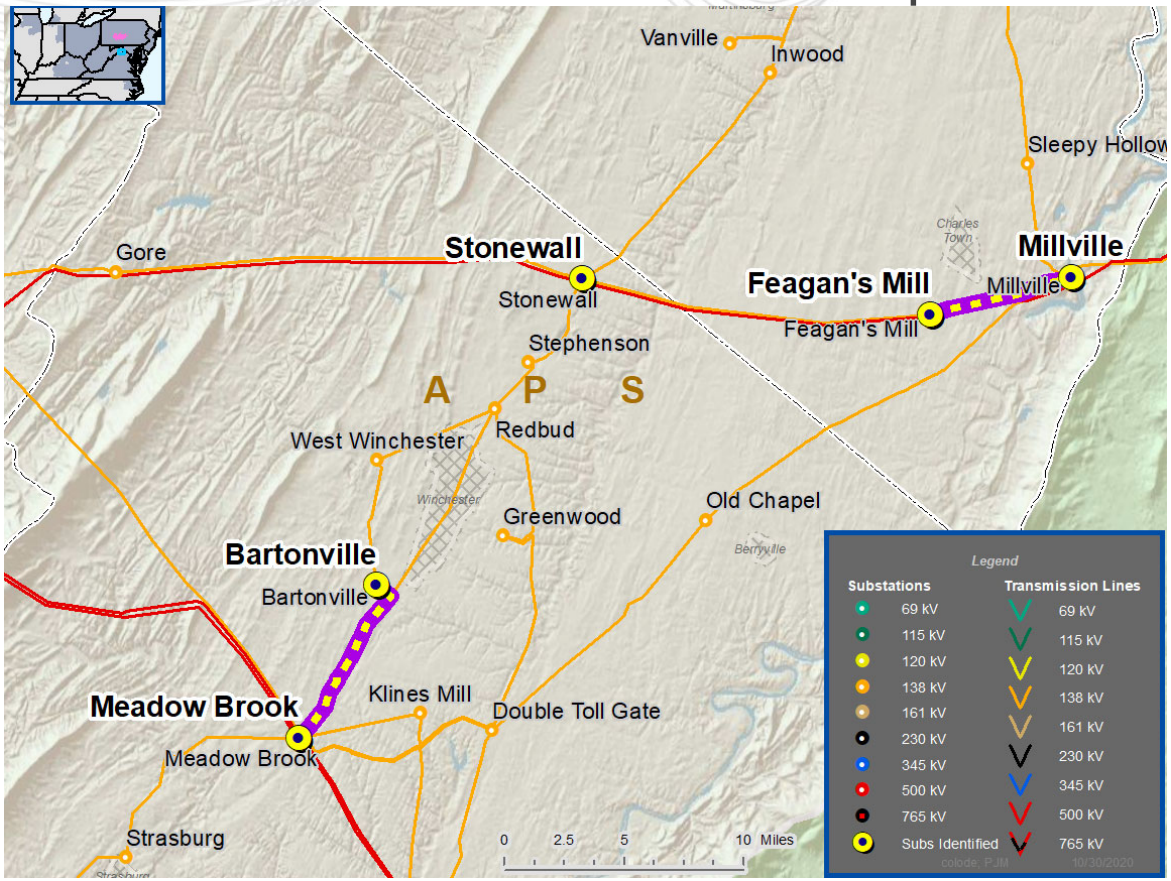
In the 2020 RTEP 2025 Summer Basecase analysis an N-1-1 contingency on the Bartonville - Meadowbrook and Feagans Mill - Millville 138 kV lines results in a low voltage violation at multiple substations (Stonewall 138 kV substation at 89% pu.).

Recommended Solution: Reconfigure Stonewall 138 kV substation from its current configuration to a six-breaker breaker-and-a-half layout and add two 36 MVAR capacitors with capacitor switchers. (**B3242**)

Estimated Cost: $13.3M

Alternatives: N/A

Required In-Service: 6/1/2025



APS Transmission Zone: Baseline
Enon 138 kV Substation

Process Stage: Second Review

Criteria: TO Voltage Magnitude Criteria

Assumption Reference: 2025 RTEP assumption

Model Used for Analysis: 2025 RTEP cases

Problem Statement:

FG: APS-VM3, APS-VM4

In the 2020 RTEP 2025 summer N-1 analysis, the loss of the Dutch Fork 138 kV capacitor or the Enon 138 kV capacitor the voltage must be adjustable back to the N-0 values (0.95 p.u.) post contingency.

Recommended Solution: At Enon Substation install a second 138 kV, 28.8 MVAR nameplate, capacitor and the associated 138 kV capacitor switcher. (**B3230**)

Estimated Cost: $1.8M

Alternatives: N/A

Required In-Service: 6/1/2025