PJM Identified Issues and Planned Solutions Near the MISO Seam

4th Quarter Review - 2023

December 11, 2023

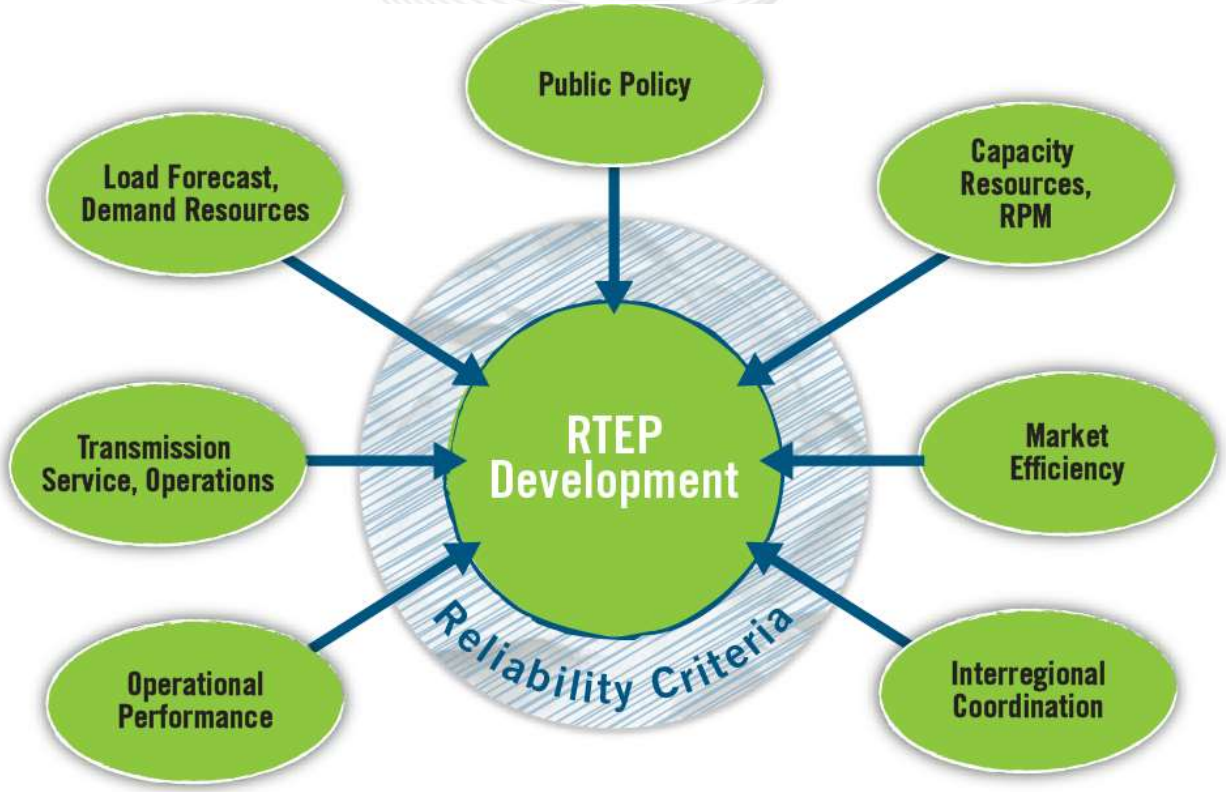
Notes

- This slide deck provides a summary of significant transmission projects near the PJM – MISO seam which have been added or modified in 2023
  - **It is not a comprehensive review of all planned projects**
- Where projects were presented on multiple occasions, efforts were made to only include the latest information
- For additional information:
  - TEAC: http://pjm.com/committees-and-groups/committees/teac.aspx
  - Subregional RTEP Committee – Western: http://pjm.com/committees-and-groups/committees/srrtep-w.aspx

Links for Various Information related to PJM Planning

- Transmission Expansion Advisory Committee (TEAC)/PJM RTEP Windows
  - http://www.pjm.com/committees-and-groups/committees/teac.aspx
- Interregional Planning
  - http://www.pjm.com/planning/interregional-planning.aspx
- Queue (future) Generation
  - https://pjm.com/planning/service-requests/services-request-status
- Generation Deactivation
  - https://pjm.com/planning/service-requests/gen-deactivations
- Competitive Planning Process
  - https://www.pjm.com/planning/competitive-planning-process.aspx

System Expansion Drivers for RTEP



Open Issues

Open Issues

PJM currently has no open issues for which potential solutions have not been identified

- New reliability issues will be identified in Q2, 2024
- 2022-23 market efficiency window was delayed until the violations from the 2022 window 3 are being addressed
- Preliminary market efficiency issues are expected to be identified in Q1, 2024
- New operational performance or public policy issues will be identified on an ad-hoc basis

2023 Acceleration Analysis of RTEP Reliability Projects

Acceleration Analysis: 2027 Load, Generation and Economic Assumptions

Congestion Decreases Associated With Approved Reliability Projects - 2027 Study Year			2027 Study year		
			2024 Topology	2027 Topology	
Constraint Name	AREA	TYPE	Year 2027 Congestion ($ Millions)	Year 2027 Congestion ($ Millions)	Congestion Savings ($ Millions)
COLORA-CONOWING 220-88	PECO/DPL	LINE	$0.8	$0.0	$0.8
CHAPRLTP-CARSON4 249B	DOM	LINE	$1.8	$0.0	$1.8

Upgrade Associated with Congestion Reduction	ISD
B3729: To increase the Maximum Operating Temperature of DPL Circuit 22088 (Colora-Conowingo 230 kV), install cable shunts on each phase, on each side of four (4) dead-end structures and replace existing insulator bells.	2027
b3694.8: Partial wreck and rebuild 10.34 miles of 230 kV line #249 Carson-Locks to achieve a minimum summer emergency rating of 1047 MVA. Upgrade terminal equipment at Carson and Locks to not limit the new conductor rating.	2026

Note: For a particular flowgate, the congestion savings for the study year are calculated as the difference in simulated congestion between the PROMOD case with AS-IS topology and the PROMOD case with the RTEP topology.

Acceleration Analysis Results

- Project B3729 - a $0.26 million project to increase the Maximum Operating Temperature of DPL Circuit 22088 (Colora - Conowingo 230 kV), will be accelerated to June 2026 at no additional cost.

- Project B3694.8 - a $25.6 million project to rebuild 10.34 miles of 230 kV line #249 Carson-Locks will be accelerated to June 2025 at no additional cost.

DPL: Acceleration of Reliability Project B3729

Process Stage: First Review

Criteria: Market Efficiency - Acceleration Analysis

Assumptions Reference: 2023 Market Efficiency Assumptions with Dominion Load from 2022 Forecast

Problem Statement:

Simulated congestion on DPL Circuit 22088 (Colora-Conowingo 230 kV) line without the B3729 project

Proposed Solution:

Accelerate the expected in service date of the reliability project B3729 from 6/1/2027 to 6/1/2026

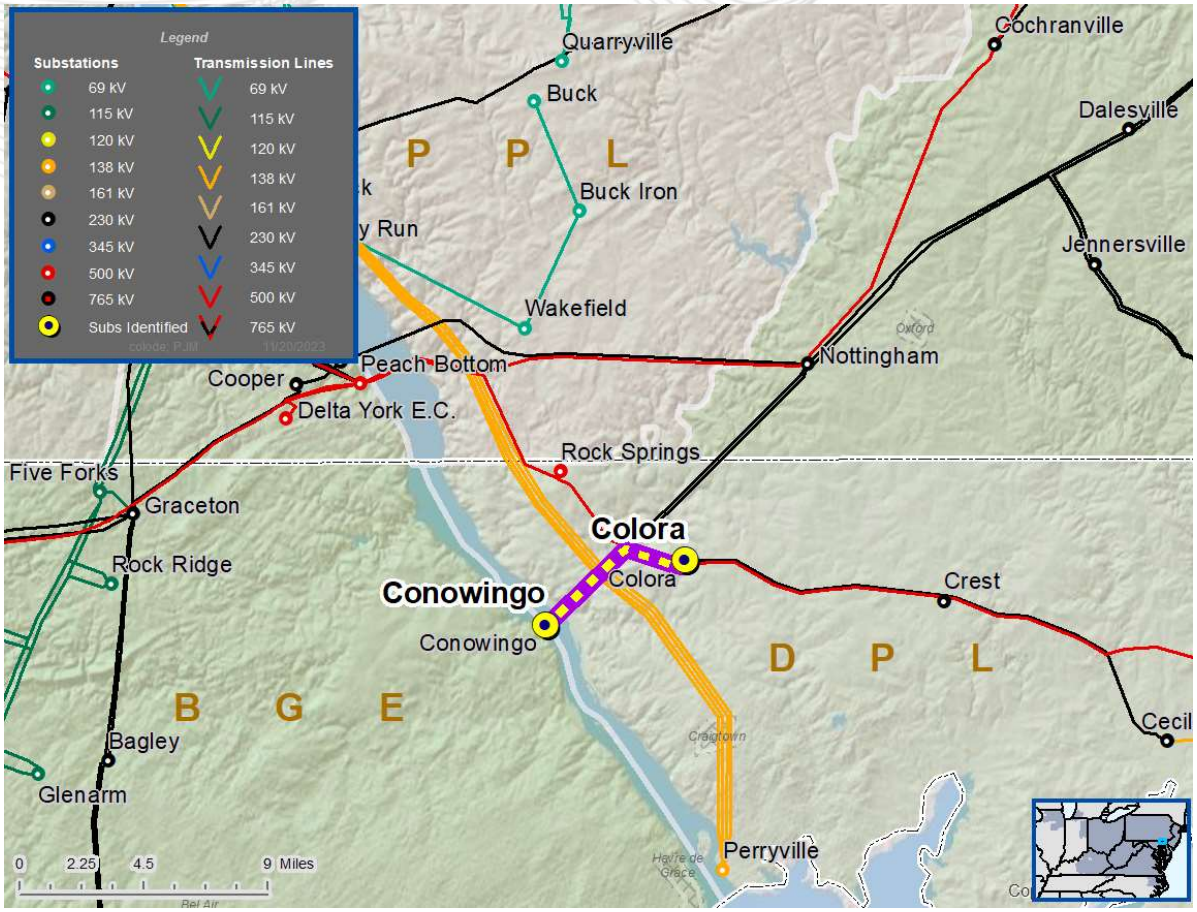
Project Description:

Increase of the Maximum Operating Temperature of DPL Circuit 22088 (Colora-Conowingo 230 kV), install cable shunts on each phase, on each side of four (4) dead-end structures and replace existing insulator bells.

Cost/Benefit Analysis:

- **Acceleration Cost**: $0
- **Estimated Annual Congestion Benefit**: $ .8 M

New Expected In-Service: 6/1/2026



DOM: Acceleration of Reliability Project B3694.8

Process Stage: First Review

Criteria: Market Efficiency - Acceleration Analysis

Assumptions Reference: 2023 Market Efficiency Assumptions with Dominion Load from 2022 Forecast

Problem Statement:

Simulated congestion on DOM Circuit 249B (Carson-Chaparral Tap 230 kV) line without the B3694.8 project

Proposed Solution:

Accelerate the expected in service date of the reliability project B3694.8 from 6/1/2026 to 6/30/2025

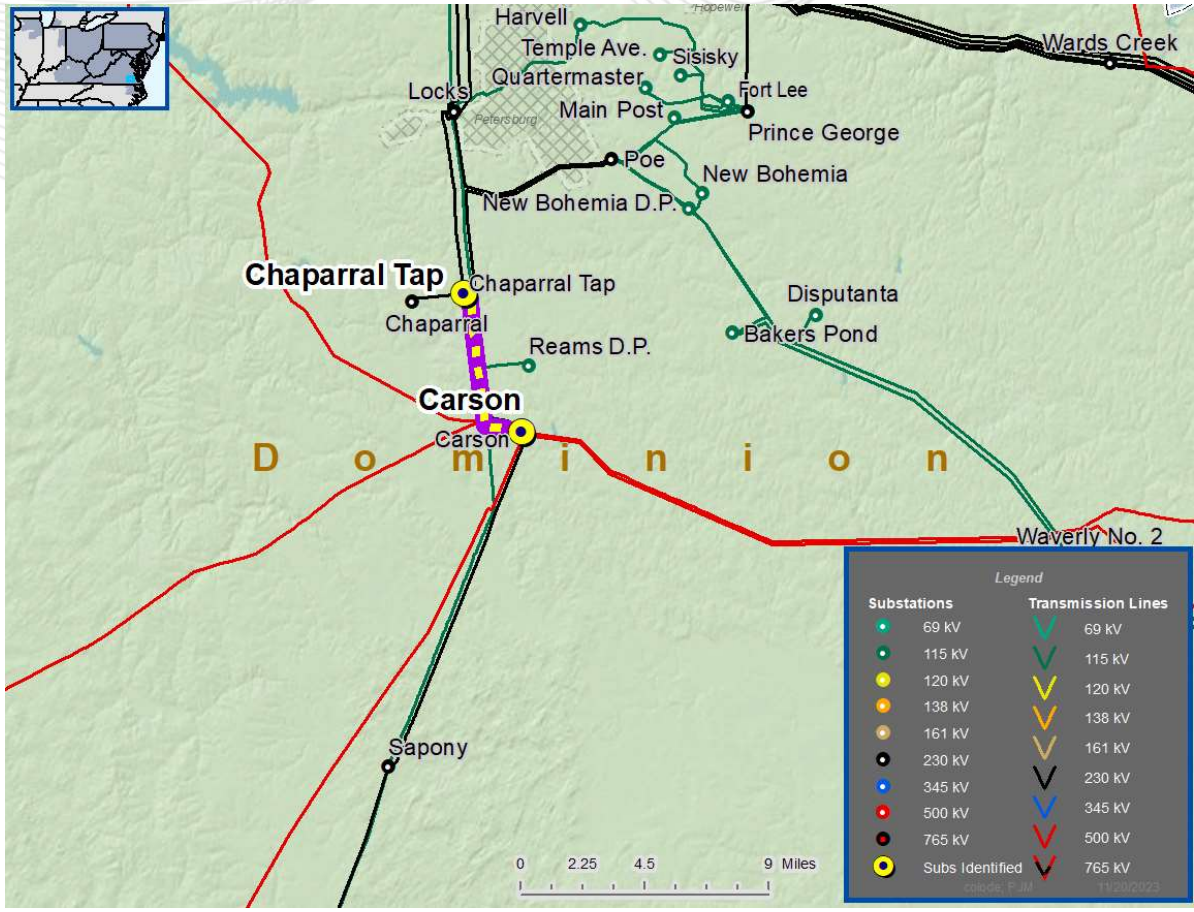
Project Description:

Partial wreck and rebuild 10.34 miles of 230 kV line #249 Carson-Locks to achieve a minimum summer emergency rating of 1047 MVA. Upgrade terminal equipment at Carson and Locks to not limit the new conductor rating.

Cost/Benefit Analysis:

- **Acceleration Cost**: $0
- **Estimated Annual Congestion Benefit**: $ 1.8 M

New Expected In-Service: 6/30/2025



Generation Interconnection and LTF
(Status as of 11/6/2023)

AE1 Queue

Q position	Status	Project Type	Description
AE1-002	Withdrawn	Generation Interconnection	AE1-002 connects to Wilton Center-Loretto in Illinois MW : 100 MW MWE : 100 MW MWC : 0 MW fuel type : Storage
AE1-008	Withdrawn	Generation Interconnection	AE1-008 connects to College Corner 138 kV in Ohio MW : 100 MW MWE : 20 MW MWC : 7.6 MW fuel type : Solar
AE1-039	In Service	Generation Interconnection	AE1-039 connects to West Street (Orchard Hills) 12.47 kV in Michigan MW : 4 MW MWE : 0.8 MW MWC : 0.8 MW fuel type : Methane
AE1-070	Active	Generation Interconnection	AE1-070 connects to Elwood 345 kV in Illinois MW : 1485 MW MWE : 135 MW MWC : 135 MW fuel type : Natural Gas
AE1-089	Withdrawn	Generation Interconnection	AE1-089 connects to Elderberry-Dumont 345 kV in Indiana MW : 310 MW MWE : 310 MW MWC : 130.65 MW fuel type : Solar
AE1-102	Engineering and Procurement	Generation Interconnection	AE1-102 connects to Maddox Creek 345 kV in Ohio MW : 26 MW MWE : 26 MW MWC : 15.6 MW fuel type : Solar
AE1-113	Engineering and Procurement	Generation Interconnection	AE1-113 connects to Mole Creek 345 kV in Illinois MW : 300 MW MWE : 300 MW MWC : 85 MW fuel type : Wind
AE1-114	Active	Generation Interconnection	AE1-114 connects to Maryland-Lancaster in Illinois MW : 150 MW MWE : 150 MW MWC : 40 MW fuel type : Wind
AE1-119	Withdrawn	Generation Interconnection	AE1-119 connects to Lemoyne 345 kV in Ohio MW : 1260 MW MWE : 550 MW MWC : 550 MW fuel type : Natural Gas; Other
AE1-120	In Service	Generation Interconnection	AE1-120 connects to Hillcrest 138 kV in Ohio MW : 200 MW MWE : 0 MW MWC : 44 MW fuel type : Solar
AE1-134	In Service	Generation Interconnection	AE1-134 connects to Nelson 345 kV in Illinois MW : 640 MW MWE : 9 MW MWC : 24.4 MW fuel type : Natural Gas
AE1-143	Suspended	Generation Interconnection	AE1-143 connects to Marion County 161 kV in Kentucky MW : 96 MW MWE : 96 MW MWC : 64.163 MW fuel type : Solar; Storage
AE1-144	Active	Generation Interconnection	AE1-144 connects to Goddard-Plumville 138 kV in Kentucky MW : 120 MW MWE : 120 MW MWC : 80.2 MW fuel type : Solar; Storage
AE1-146	Engineering and Procurement	Generation Interconnection	AE1-146 connects to Ebersole #2-Fostoria Central 138 kV in Ohio MW : 120 MW MWE : 120 MW MWC : 81.3 MW fuel type : Solar
AE1-163	Engineering and Procurement	Generation Interconnection	AE1-163 connects to Powerton-Goodings Grove 345 kV in Illinois MW : 350 MW MWE : 350 MW MWC : 49 MW fuel type : Wind
AE1-166	Active	Generation Interconnection	AE1-166 connects to Loretto-Wilton & Braidwood-Davis Creek in Illinois MW : 150 MW MWE : 150 MW MWC : 78 MW fuel type : Solar
AE1-170	Engineering and Procurement	Generation Interconnection	AE1-170 connects to Kenzie Creek-Colby 138 kV in Michigan MW : 150 MW MWE : 150 MW MWC : 63 MW fuel type : Solar
AE1-172	Active	Generation Interconnection	AE1-172 connects to Loretto-Wilton Center in Illinois MW : 300 MW MWE : 300 MW MWC : 52.8 MW fuel type : Wind
AE1-178	In Service	Generation Interconnection	AE1-178 connects to Wolf Hills 138 kV in Virginia MW : 294 MW MWE : 19 MW MWC : 19 MW fuel type : Natural Gas
AE1-193	Withdrawn	Generation Interconnection	AE1-193 connects to Kewanee in Illinois MW : 500 MW MWE : 500 MW MWC : 65 MW fuel type : Wind
AE1-194	Withdrawn	Generation Interconnection	AE1-194 connects to Crete in Illinois MW : 500 MW MWE : 500 MW MWC : 65 MW fuel type : Wind
AE1-195	Withdrawn	Generation Interconnection	AE1-195 connects to Crete 345 kV in Illinois MW : 500 MW MWE : 500 MW MWC : 65 MW fuel type : Wind
AE1-198	Withdrawn	Generation Interconnection	AE1-198 connects to Kewanee in Illinois MW : 357 MW MWE : 357 MW MWC : 193 MW fuel type : Solar; Storage
AE1-246	Active	Generation Interconnection	AE1-246 connects to Barren County 161 kV in Kentucky MW : 120 MW MWE : 120 MW MWC : 80.7 MW fuel type : Solar; Storage
AE1-247	Withdrawn	Generation Interconnection	AE1-247 connects to Barren County-Summer Shade 161 kV in Kentucky MW : 205 MW MWE : 205 MW MWC : 137.1 MW fuel type : Solar; Storage
AE1-252	Withdrawn	Generation Interconnection	AE1-252 connects to Loretto-Wilton Center in Illinois MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar; Storage

AE2 Queue

Q position	Status	Project Type	Description
AE2-008	Withdrawn	Generation Interconnection	AE2-008 connects to Elderberry-Dumont 345 kV in Indiana MW : 390 MW MWE : 80 MW MWC : 80 MW fuel type : Storage
AE2-035	Partially in Service - Under Construction	Generation Interconnection	AE2-035 connects to Lena 138 kV in Illinois MW : 50 MW MWE : 50 MW MWC : 21 MW fuel type : Solar
AE2-038	Active	Generation Interconnection	AE2-038 connects to Goddard-Plumsville 138 kV II in Kentucky MW : 200 MW MWE : 80 MW MWC : 53.5 MW fuel type : Solar; Storage
AE2-045	Active	Generation Interconnection	AE2-045 connects to Olive-Reynolds 345 kV in Indiana MW : 280 MW MWE : 280 MW MWC : 118 MW fuel type : Solar
AE2-049	Withdrawn	Generation Interconnection	AE2-049 connects to Wilmington-Davis Creek in Illinois MW : 115 MW MWE : 115 MW MWC : 69 MW fuel type : Solar
AE2-050	Withdrawn	Generation Interconnection	AE2-050 connects to Braidwood-E. Frankfort in Illinois MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AE2-062	In Service	Generation Interconnection	AE2-062 connects to Romeoville in Illinois MW : 1 MW MWE : 0.98 MW MWC : 0 MW fuel type : Storage; Battery
AE2-063	Withdrawn	Generation Interconnection	AE2-063 connects to Romeoville in Illinois MW : 1 MW MWE : 0.98 MW MWC : 0 MW fuel type : Storage
AE2-071	Under Construction	Generation Interconnection	AE2-071 connects to Patton Rd-Summer Shade 69 kV in Kentucky MW : 35 MW MWE : 35 MW MWC : 21 MW fuel type : Solar
AE2-072	Engineering and Procurement	Generation Interconnection	AE2-072 connects to East Leipsic-Richland 138 kV in Ohio MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AE2-077	Withdrawn	Generation Interconnection	AE2-077 connects to Pierpoint-Freeport in Illinois MW : 70 MW MWE : 70 MW MWC : 26.6 MW fuel type : Solar
AE2-089	Engineering and Procurement	Generation Interconnection	AE2-089 connects to Pennville-Adams 138 kV in Indiana MW : 155 MW MWE : 155 MW MWC : 93 MW fuel type : Solar
AE2-090	Withdrawn	Generation Interconnection	AE2-090 connects to Randolph-Hodgin 138 kV in Indiana MW : 144 MW MWE : 144 MW MWC : 86.4 MW fuel type : Solar
AE2-107	Active	Generation Interconnection	AE2-107 connects to Haumesser-W DeKalb in Illinois MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AE2-130	Active	Generation Interconnection	AE2-130 connects to Rockport 765 kV in Indiana MW : 800 MW MWE : 800 MW MWC : 480 MW fuel type : Solar; Storage
AE2-138	Active	Generation Interconnection	AE2-138 connects to Avon-NorthClark 345 kV in Kentucky MW : 260 MW MWE : 260 MW MWC : 189.8 MW fuel type : Solar
AE2-152	Active	Generation Interconnection	AE2-152 connects to Wilton Center-Loretto in Illinois MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AE2-153	Withdrawn	Generation Interconnection	AE2-153 connects to Braidwood-Davis Creek in Illinois MW : 200 MW MWE : 200 MW MWC : 35.2 MW fuel type : Wind
AE2-154	Withdrawn	Generation Interconnection	AE2-154 connects to Meadow Lake 345 kV (MLV VIII) in Indiana MW : 250 MW MWE : 250 MW MWC : 32.5 MW fuel type : Wind
AE2-169	Engineering and Procurement	Generation Interconnection	AE2-169 connects to Delaware-Van Buren 138 kV in Indiana MW : 163 MW MWE : 33 MW MWC : 33 MW fuel type : Storage
AE2-170	Withdrawn	Generation Interconnection	AE2-170 connects to Gaston-Desoto 138 kV in Indiana MW : 250 MW MWE : 50 MW MWC : 50 MW fuel type : Storage
AE2-171	Withdrawn	Generation Interconnection	AE2-171 connects to Makahoy 138 kV in Indiana MW : 150 MW MWE : 30 MW MWC : 30 MW fuel type : Storage
AE2-172	Engineering and Procurement	Generation Interconnection	AE2-172 connects to Mississinewa-Gaston 138 kV in Indiana MW : 200 MW MWE : 40 MW MWC : 40 MW fuel type : Storage
AE2-173	Active	Generation Interconnection	AE2-173 connects to McLean 345 kV in Illinois MW : 50 MW MWE : 50 MW MWC : 50 MW fuel type : Battery
AE2-174	Withdrawn	Generation Interconnection	AE2-174 connects to Seneca 138 kV in Ohio MW : 198 MW MWE : 198 MW MWC : 34.85 MW fuel type : Wind
AE2-176	Engineering and Procurement	Generation Interconnection	AE2-176 connects to Groton 138 kV Solar in Ohio MW : 125 MW MWE : 125 MW MWC : 75 MW fuel type : Solar
AE2-181	Engineering and Procurement	Generation Interconnection	AE2-181 connects to Holiday City 69 kV in Ohio MW : 49 MW MWE : 49 MW MWC : 29.4 MW fuel type : Solar
AE2-208	Withdrawn	Generation Interconnection	AE2-208 connects to Chavies-Bonnyman 69 kV in Kentucky MW : 25 MW MWE : 25 MW MWC : 25 MW fuel type : Storage
AE2-210	Active	Generation Interconnection	AE2-210 connects to North Clark 345 kV in Kentucky MW : 90 MW MWE : 90 MW MWC : 65.4 MW fuel type : Solar
AE2-219	Engineering and Procurement	Generation Interconnection	AE2-219 connects to Bluff Point-Randolph 138 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 42 MW fuel type : Solar
AE2-220	Active	Generation Interconnection	AE2-220 connects to Losantville 345 kV in Indiana MW : 125 MW MWE : 125 MW MWC : 52.5 MW fuel type : Solar
AE2-223	Active	Generation Interconnection	AE2-223 connects to McLean 345 kV in Illinois MW : 150 MW MWE : 150 MW MWC : 19.5 MW fuel type : Wind
AE2-234	Active	Generation Interconnection	AE2-234 connects to Liberty Center-Buckeye Tap 69 kV in Indiana MW : 35 MW MWE : 35 MW MWC : 24.1 MW fuel type : Solar
AE2-235	Withdrawn	Generation Interconnection	AE2-235 connects to Murphysville-Plumville 69 kV in Kentucky MW : 60 MW MWE : 60 MW MWC : 41.9 MW fuel type : Solar
AE2-236	Engineering and Procurement	Generation Interconnection	AE2-236 connects to Columbia-Northeast 138 kV in Indiana MW : 55 MW MWE : 55 MW MWC : 38.5 MW fuel type : Solar
AE2-254	In Service	Generation Interconnection	AE2-254 connects to Garrard County-Tommy-Gooch 69 kV in Kentucky MW : 50 MW MWE : 50 MW MWC : 30 MW fuel type : Solar
AE2-255	Engineering and Procurement	Generation Interconnection	AE2-255 connects to Molecreek 345 kV in Illinois MW : 400 MW MWE : 100 MW MWC : 25 MW fuel type : Wind
AE2-261	Active	Generation Interconnection	AE2-261 connects to Kincaid-Pana in Illinois MW : 299 MW MWE : 299 MW MWC : 179.4 MW fuel type : Solar
AE2-267	Engineering and Procurement	Generation Interconnection	AE2-267 connects to Woodsdale 345 kV in Ohio MW : 50 MW MWE : 50 MW MWC : 30.9 MW fuel type : Solar
AE2-275	Active	Generation Interconnection	AE2-275 connects to JK Smith-Fawkes 138 kV in Kentucky MW : 90 MW MWE : 90 MW MWC : 65.4 MW fuel type : Solar
AE2-276	Active	Generation Interconnection	AE2-276 connects to Sullivan 345kV in Indiana MW : 50 MW MWE : 50 MW MWC : 50 MW fuel type : Storage
AE2-281	Engineering and Procurement	Generation Interconnection	AE2-281 connects to Powerton-Goodings Grove in Illinois MW : 400 MW MWE : 50 MW MWC : 7 MW fuel type : Wind
AE2-282	Partially in Service - Under Construction	Generation Interconnection	AE2-282 connects to East Fayette 138 kV in Ohio MW : 67 MW MWE : 67 MW MWC : 43.9 MW fuel type : Solar
AE2-284	Withdrawn	Generation Interconnection	AE2-284 connects to Kenzie Creek-Colby 138 kV in Michigan MW : 225 MW MWE : 75 MW MWC : 75 MW fuel type : Storage
AE2-297	In Service	Generation Interconnection	AE2-297 connects to Madison-Tanners Creek 138 kV in Indiana MW : 152.5 MW MWE : 152.5 MW MWC : 91.5 MW fuel type : Solar
AE2-298	Active	Generation Interconnection	AE2-298 connects to Haviland-N. Van Wert 69 kV in Ohio MW : None MW MWE : 50 MW MWC : 30 MW fuel type : Solar
AE2-307	Withdrawn	Generation Interconnection	AE2-307 connects to Braidwood-East Frankfort in Illinois MW : 375 MW MWE : 225 MW MWC : 165 MW fuel type : Solar; Storage
AE2-308	Active	Generation Interconnection	AE2-308 connects to Three Forks-Dale 138 kV in Kentucky MW : 150 MW MWE : 150 MW MWC : 110 MW fuel type : Solar; Storage
AE2-310	Withdrawn	Generation Interconnection	AE2-310 connects to Wilmington-Davis Creek in Illinois MW : 200 MW MWE : 85 MW MWC : 67 MW fuel type : Solar; Storage
AE2-318	Engineering and Procurement	Generation Interconnection	AE2-318 connects to Ford-Cedarville 138 kV in Ohio MW : 100 MW MWE : 100 MW MWC : 67.2 MW fuel type : Solar
AE2-321	Active	Generation Interconnection	AE2-321 connects to Belvidere-Marengo in Illinois MW : 100 MW MWE : 100 MW MWC : 67 MW fuel type : Solar
AE2-322	Engineering and Procurement	Generation Interconnection	AE2-322 connects to Mark Center 69 kV in Ohio MW : 60 MW MWE : 60 MW MWC : 40.3 MW fuel type : Solar
AE2-323	Engineering and Procurement	Generation Interconnection	AE2-323 connects to Twin Branch-Guardian 138 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 67.1 MW fuel type : Solar
AE2-325	Active	Generation Interconnection	AE2-325 connects to Valley 138 kV in Michigan MW : 152.2 MW MWE : 52.2 MW MWC : 31.32 MW fuel type : Storage
AE2-339	Active	Generation Interconnection	AE2-339 connects to Avon 138 kV in Kentucky MW : 40 MW MWE : 40 MW MWC : 26.8 MW fuel type : Solar
AE2-341	Active	Generation Interconnection	AE2-341 connects to Sandwich-Plano in Illinois MW : 150 MW MWE : 150 MW MWC : 100.6 MW fuel type : Solar

AF1 Queue

Q position	Status	Project Type	Description
AF1-009	Withdrawn	Generation Interconnection	AF1-009 connects to Dixon-McGirr in Illinois MW : 125 MW MWE : 25 MW MWC : 5 MW fuel type : Storage
AF1-011	Withdrawn	Generation Interconnection	AF1-011 connects to Schauff Road in Illinois MW : 30 MW MWE : 30 MW MWC : 11.2 MW fuel type : Storage
AF1-012	Withdrawn	Generation Interconnection	AF1-012 connects to Electric Junc-Nelson in Illinois MW : 175 MW MWE : 175 MW MWC : 105 MW fuel type : Solar
AF1-029	Withdrawn	Generation Interconnection	AF1-029 connects to Haviland-N Van Wert 69 kV in Ohio MW : 75 MW MWE : 25 MW MWC : 15 MW fuel type : Solar
AF1-030	Active	Generation Interconnection	AF1-030 connects to Plano-R 138 kV in Illinois MW : 100 MW MWE : 100 MW MWC : 66.9 MW fuel type : Solar
AF1-038	Suspended	Generation Interconnection	AF1-038 connects to Sewellton Jct-Webbs Crossroads 69 kV in Virginia MW : 60 MW MWE : 60 MW MWC : 36 MW fuel type : Solar; Storage
AF1-045	Engineering and Procurement	Generation Interconnection	AF1-045 connects to Cedarville-Ford 138 kV in Ohio MW : 152.2 MW MWE : 52.2 MW MWC : 31.3 MW fuel type : Storage
AF1-046	Withdrawn	Generation Interconnection	AF1-046 connects to Twin Branch-Guardian 138 kV in Indiana MW : 152.2 MW MWE : 52.2 MW MWC : 31.32 MW fuel type : Storage
AF1-047	Withdrawn	Generation Interconnection	AF1-047 connects to Mark Center 69 kV in Ohio MW : 94.8 MW MWE : 34.8 MW MWC : 20.88 MW fuel type : Storage
AF1-048	Active	Generation Interconnection	AF1-048 connects to Belvidere-Marengo in Illinois MW : 52.2 MW MWE : 52.2 MW MWC : 31.32 MW fuel type : Storage
AF1-050	Suspended	Generation Interconnection	AF1-050 connects to Summer Shade - Green County 161 kV in Kentucky MW : 60 MW MWE : 60 MW MWC : 36 MW fuel type : Solar; Storage
AF1-060	Withdrawn	Generation Interconnection	AF1-060 connects to Lena 138 kV in Illinois MW : 110.3 MW MWE : 10.34 MW MWC : 10.34 MW fuel type : Storage
AF1-063	Active	Generation Interconnection	AF1-063 connects to Lockwood Road 138 kV in Ohio MW : 30 MW MWE : 30 MW MWC : 19.3 MW fuel type : Solar
AF1-064	Engineering and Procurement	Generation Interconnection	AF1-064 connects to Weston 69 kV in Ohio MW : 50 MW MWE : 50 MW MWC : 33.4 MW fuel type : Solar
AF1-071	Active	Generation Interconnection	AF1-071 connects to College Corner 138 kV in Ohio MW : 100 MW MWE : 20 MW MWC : 7.6 MW fuel type : Solar
AF1-072	Withdrawn	Generation Interconnection	AF1-072 connects to Rocky Road in Illinois MW : 410.8 MW MWE : 17.2 MW MWC : 17.2 MW fuel type : Natural Gas
AF1-080	Withdrawn	Generation Interconnection	AF1-080 connects to Deer Creek-Fisher Body-Mullin 138 kV in Indiana MW : 220 MW MWE : 20 MW MWC : 20 MW fuel type : Storage
AF1-083	Suspended	Generation Interconnection	AF1-083 connects to Green County-Saloma 161 kV in West Virginia MW : 55 MW MWE : 55 MW MWC : 33 MW fuel type : Solar; Storage
AF1-084	Active	Generation Interconnection	AF1-084 connects to East Hartford-Murch 69 kV in Michigan MW : 85 MW MWE : 85 MW MWC : 54.1 MW fuel type : Solar
AF1-090	Active	Generation Interconnection	AF1-090 connects to Kincaid-Pana in Illinois MW : 200 MW MWE : 200 MW MWC : 35.2 MW fuel type : Wind
AF1-091	Active	Generation Interconnection	AF1-091 connects to Butler-S Hicksville 138 kV in Indiana MW : 180 MW MWE : 180 MW MWC : 138.4 MW fuel type : Solar; Storage
AF1-092	Active	Generation Interconnection	AF1-092 connects to Huntington Jct. 138 kV in Indiana MW : 150 MW MWE : 150 MW MWC : 115 MW fuel type : Solar; Storage
AF1-116	Active	Generation Interconnection	AF1-116 connects to Marion County 161 kV in Tennessee MW : 120 MW MWE : 120 MW MWC : 72 MW fuel type : Solar
AF1-118	Active	Generation Interconnection	AF1-118 connects to Sorenson-Desoto 345 kV in Indiana MW : 350 MW MWE : 350 MW MWC : 268.9 MW fuel type : Solar; Storage
AF1-119	Active	Generation Interconnection	AF1-119 connects to Keystone-Desoto 345 kV in Indiana MW : 200 MW MWE : 200 MW MWC : 140 MW fuel type : Solar; Storage
AF1-120	Partially in Service - Under Construction	Generation Interconnection	AF1-120 connects to East Fayette 2 138 kV in Ohio MW : 107 MW MWE : 40 MW MWC : 26.6 MW fuel type : Solar
AF1-122	Engineering and Procurement	Generation Interconnection	AF1-122 connects to Cardington 138 kV in Ohio MW : 64 MW MWE : 64 MW MWC : 26.88 MW fuel type : Solar
AF1-127	Withdrawn	Generation Interconnection	AF1-127 connects to Avon 345 kV in Kentucky MW : 80 MW MWE : 80 MW MWC : 53.6 MW fuel type : Solar
AF1-141	Active	Generation Interconnection	AF1-141 connects to Varner 138 kV in Indiana MW : 96 MW MWE : 96 MW MWC : 62.8 MW fuel type : Solar
AF1-148	Active	Generation Interconnection	AF1-148 connects to Sorenson-Desoto 345 kV in Indiana MW : 159 MW MWE : 159 MW MWC : 95.4 MW fuel type : Solar; Storage
AF1-156	Withdrawn	Generation Interconnection	AF1-156 connects to Braidwood-Davis Creek in Illinois MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AF1-158	Engineering and Procurement	Generation Interconnection	AF1-158 connects to Edison-Gravel Pit 138 kV in Indiana MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar; Storage
AF1-161	Active	Generation Interconnection	AF1-161 connects to Valley 138 kV in Michigan MW : 50 MW MWE : 50 MW MWC : 25 MW fuel type : Storage
AF1-176	Active	Generation Interconnection	AF1-176 connects to Corey 138 kV in Michigan MW : 300 MW MWE : 300 MW MWC : 155.684 MW fuel type : Solar; Storage
AF1-199	Deactivated	Generation Interconnection	AF1-199 connects to Avon Lake 10 138 kV in Ohio MW : 36 MW MWE : 4 MW MWC : 4 MW fuel type : Oil
AF1-202	Active	Generation Interconnection	AF1-202 connects to Keystone-Desoto 345 kV in Indiana MW : 200 MW MWE : 200 MW MWC : 34 MW fuel type : Wind
AF1-203	Under Construction	Generation Interconnection	AF1-203 connects to Patton Rd-Summer Shade 69 kV in Kentucky MW : 55 MW MWE : 20 MW MWC : 12 MW fuel type : Solar; Storage
AF1-204	Active	Generation Interconnection	AF1-204 connects to Eugene 345 kV in Indiana MW : 255 MW MWE : 255 MW MWC : 63.75 MW fuel type : Wind
AF1-205	Engineering and Procurement	Generation Interconnection	AF1-205 connects to Napolean Muni 138 kV in Ohio MW : 40 MW MWE : 40 MW MWC : 24 MW fuel type : Solar
AF1-206	Active	Generation Interconnection	AF1-206 connects to Fayette-Lyons 138 kV in Ohio MW : 199 MW MWE : 199 MW MWC : 119.4 MW fuel type : Solar
AF1-207	Active	Generation Interconnection	AF1-207 connects to Reynolds–Olive #1 345 kV in Indiana MW : 180 MW MWE : 180 MW MWC : 34 MW fuel type : Wind
AF1-215	Engineering and Procurement	Generation Interconnection	AF1-215 connects to Reynolds-Olive 345 kV in Indiana MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AF1-219	Withdrawn	Generation Interconnection	AF1-219 connects to Hunt Farm 69 kV in Kentucky MW : 30 MW MWE : 30 MW MWC : 20.4 MW fuel type : Solar; Storage
AF1-221	Active	Generation Interconnection	AF1-221 connects to College Corner-Drewersburg 138 kV in Indiana MW : 180 MW MWE : 180 MW MWC : 138.4 MW fuel type : Solar
AF1-223	Active	Generation Interconnection	AF1-223 connects to Jay-Desoto 138 kV in Indiana MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AF1-229	Active	Generation Interconnection	AF1-229 connects to Galion-South Berwick 345 kV in Ohio MW : 120 MW MWE : 120 MW MWC : 72 MW fuel type : Solar
AF1-233	Active	Generation Interconnection	AF1-233 connects to Flemingsburg 138 kV in Kentucky MW : 225 MW MWE : 225 MW MWC : 150.6 MW fuel type : Solar; Storage
AF1-249	Engineering and Procurement	Generation Interconnection	AF1-249 connects to Nickel 12.47 kV in Ohio MW : 19.9 MW MWE : 19.92 MW MWC : 14 MW fuel type : Solar
AF1-251	Withdrawn	Generation Interconnection	AF1-251 connects to Avon-North Clark 345 kV in Kentucky MW : 220 MW MWE : 220 MW MWC : 132 MW fuel type : Solar; Storage
AF1-252	Active	Generation Interconnection	AF1-252 connects to Kincaid-Pana in Illinois MW : 262.4 MW MWE : 62.4 MW MWC : 62.4 MW fuel type : Storage
AF1-253	Active	Generation Interconnection	AF1-253 connects to Kincaid-Pana in Illinois MW : 305.6 MW MWE : 43.2 MW MWC : 43.2 MW fuel type : Storage
AF1-256	Active	Generation Interconnection	AF1-256 connects to Flemingsburg-Spurlock 138 kV in Kentucky MW : 80 MW MWE : 80 MW MWC : 48 MW fuel type : Solar
AF1-267	Withdrawn	Generation Interconnection	AF1-267 connects to Union City Tap 138 kV in Kentucky MW : 54 MW MWE : 54 MW MWC : 37 MW fuel type : Solar
AF1-268	Active	Generation Interconnection	AF1-268 connects to Desoto-Jay 138 kV in Indiana MW : 83 MW MWE : 83 MW MWC : 57.1 MW fuel type : Solar
AF1-279	Withdrawn	Generation Interconnection	AF1-279 connects to Carlisle 138 kV in Ohio MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar; Storage
AF1-280	Active	Generation Interconnection	AF1-280 connects to Nelson-Lee County in Illinois MW : 200 MW MWE : 200 MW MWC : 137 MW fuel type : Solar
AF1-281	Active	Generation Interconnection	AF1-281 connects to Nelson-Lee County in Illinois MW : 220 MW MWE : 20 MW MWC : 3 MW fuel type : Storage
AF1-296	Active	Generation Interconnection	AF1-296 connects to Garden Plain 138 kV in Illinois MW : 212.1 MW MWE : 212.1 MW MWC : 37.3296 MW fuel type : Wind
AF1-313	Withdrawn	Generation Interconnection	AF1-313 connects to Wes Del-Royerton 138 kV in Indiana MW : 40 MW MWE : 40 MW MWC : 24 MW fuel type : Solar
AF1-314	Active	Generation Interconnection	AF1-314 connects to Lena 138 kV in Illinois MW : 212 MW MWE : 212 MW MWC : 37.31 MW fuel type : Wind
AF1-315	Withdrawn	Generation Interconnection	AF1-315 connects to Cedarville-Ford 138 kV in Ohio MW : 60 MW MWE : 60 MW MWC : 36 MW fuel type : Solar
AF1-317	Withdrawn	Generation Interconnection	AF1-317 connects to Electric Jct-Nelson in Illinois MW : 175 MW MWE : 0 MW MWC : 20 MW fuel type : Storage
AF1-318	Active	Generation Interconnection	AF1-318 connects to Crescent Ridge-Corbin in Illinois MW : 300 MW MWE : 299.97 MW MWC : 52.7947 MW fuel type : Wind
AF1-322	Active	Generation Interconnection	AF1-322 connects to Meadow Lake 345 kV in Indiana MW : 200 MW MWE : 200 MW MWC : 84 MW fuel type : Solar
AF1-330	Active	Generation Interconnection	AF1-330 connects to Marengo in Illinois MW : 40 MW MWE : 20 MW MWC : 16.4 MW fuel type : Solar
AF1-331	Active	Generation Interconnection	AF1-331 connects to Twombley Road in Illinois MW : 60 MW MWE : 20 MW MWC : 20 MW fuel type : Solar

AF2 Queue

Q position	Status	Project Type	Description
AF2-004	Active	Generation Interconnection	AF2-004 connects to Beaver 345kV in Ohio MW : 378.2 MW MWE : 33 MW MWC : 33 MW fuel type : Natural Gas
AF2-005	Active	Generation Interconnection	AF2-005 connects to Beaver 138kV in Ohio MW : 95.2 MW MWE : 8 MW MWC : 8 MW fuel type : Natural Gas
AF2-014	Active	Generation Interconnection	AF2-014 connects to Maddox Creek 345 kV in Ohio MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AF2-027	Active	Generation Interconnection	AF2-027 connects to Zion Energy Center 345 kV in Illinois MW : 635 MW MWE : 50 MW MWC : 20 MW fuel type : Storage
AF2-031	Active	Generation Interconnection	AF2-031 connects to River E.C. in Illinois MW : 347 MW MWE : 20 MW MWC : 8 MW fuel type : Storage
AF2-032	Active	Generation Interconnection	AF2-032 connects to Kincaid in Illinois MW : 1132 MW MWE : 20 MW MWC : 13.6 MW fuel type : Solar
AF2-033	Withdrawn	Generation Interconnection	AF2-033 connects to Miami Fort GT 138 kV in Ohio MW : 1076 MW MWE : 20 MW MWC : 8 MW fuel type : Storage
AF2-034	Active	Generation Interconnection	AF2-034 connects to Kendall in Illinois MW : 1238.8 MW MWE : 20 MW MWC : 10.8 MW fuel type : Solar; Storage
AF2-041	Active	Generation Interconnection	AF2-041 connects to Nelson-Electric Junction 345 kV in Illinois MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AF2-068	Active	Generation Interconnection	AF2-068 connects to Jay 138 kV in Indiana MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AF2-069	Active	Generation Interconnection	AF2-069 connects to Crescent Ridge 138 kV in Illinois MW : 88.7 MW MWE : 9.3 MW MWC : 2.2 MW fuel type : Wind
AF2-070	Active	Generation Interconnection	AF2-070 connects to Crescent Ridge 138 kV in Illinois MW : 72.6 MW MWE : 18.15 MW MWC : 3.1 MW fuel type : Wind
AF2-078	Active	Generation Interconnection	AF2-078 connects to Reynolds-Olive #1 345 kV in Indiana MW : 200 MW MWE : 200 MW MWC : 120 MW fuel type : Solar; Storage
AF2-083	Active	Generation Interconnection	AF2-083 connects to Ed Lowe-Kendal Creek 138 kV in Michigan MW : 150 MW MWE : 150 MW MWC : 120 MW fuel type: Solar; Storage
AF2-090	Active	Generation Interconnection	AF2-090 connects to Central Hardin 138 kV in Kentucky MW : 110 MW MWE : 110 MW MWC : 73.6 MW fuel type : Solar
AF2-094	Active	Generation Interconnection	AF2-094 connects to Huntington Jct. 138 kV in Indiana MW : 190 MW MWE : 40 MW MWC : 26.4 MW fuel type : Solar; Storage
AF2-095	Active	Generation Interconnection	AF2-095 connects to Wilmington-Davis Creek in Illinois MW : 200 MW MWE : 200 MW MWC : 136 MW fuel type : Solar; Storage
AF2-096	Active	Generation Interconnection	AF2-096 connects to Braidwood-East Frankfort 345 kV in Illinois MW : 375 MW MWE : 375 MW MWC : 255 MW fuel type : Solar; Storage
AF2-103	Partially in Service - Under Construction	Generation Interconnection	AF2-103 connects to Haviland 138 kV in Ohio MW : 103.2 MW MWE : 3.15 MW MWC : 1.32 MW fuel type : Solar; Storage
AF2-111	Active	Generation Interconnection	AF2-111 connects to North Clark-Spurlock 345 kV in Kentucky MW : 250 MW MWE : 250 MW MWC : 150 MW fuel type : Solar
AF2-125	Active	Generation Interconnection	AF2-125 connects to Vamer 138 kV in Indiana MW : 150 MW MWE : 54 MW MWC : 35.5 MW fuel type : Solar
AF2-126	Active	Generation Interconnection	AF2-126 connects to Weston 69 kV II in Ohio MW : 101 MW MWE : 51 MW MWC : 33.4 MW fuel type : Solar
AF2-127	Active	Generation Interconnection	AF2-127 connects to Lockwood Road 138 kV in Ohio MW : 68 MW MWE : 38 MW MWC : 24.9 MW fuel type : Solar
AF2-128	Active	Generation Interconnection	AF2-128 connects to Crescent Ridge-Corbin 138 kV in Illinois MW : 79.5 MW MWE : 79.5 MW MWC : 13.992 MW fuel type : Wind
AF2-132	Active	Generation Interconnection	AF2-132 connects to Reynolds-Olive #1 345 kV in Indiana MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AF2-133	Active	Generation Interconnection	AF2-133 connects to Reynolds-Olive #2 345 kV in Indiana MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AF2-134	Engineering and Procurement	Generation Interconnection	AF2-134 connects to Reynolds-Olive #2 345 kV in Indiana MW : 400 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AF2-142	Active	Generation Interconnection	AF2-142 connects to Nevada 345 kV in Illinois MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AF2-143	Active	Generation Interconnection	AF2-143 connects to Powerton-Nevada 345 kV in Illinois MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AF2-150	Engineering and Procurement	Generation Interconnection	AF2-150 connects to Galion 138 kV in Ohio MW : 88 MW MWE : 88 MW MWC : 36.96 MW fuel type : Solar
AF2-162	Active	Generation Interconnection	AF2-162 connects to Keystone-Desoto 345 kV in Indiana MW : 245 MW MWE : 45 MW MWC : 30 MW fuel type : Solar
AF2-173	Active	Generation Interconnection	AF2-173 connects to Desoto 345kV in Indiana MW : 200 MW MWE : 200 MW MWC : 84 MW fuel type : Solar
AF2-177	Active	Generation Interconnection	AF2-177 connects to Sorenson-DeSoto #2 345 kV in Indiana MW : 200 MW MWE : 200 MW MWC : 26 MW fuel type : Wind
AF2-182	Active	Generation Interconnection	AF2-182 connects to Nelson-Lee County 345 kV II in Illinois MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AF2-183	Active	Generation Interconnection	AF2-183 connects to Nelson-Lee County 345 kV in Illinois MW : 80 MW MWE : 80 MW MWC : 32 MW fuel type : Storage
AF2-186	Withdrawn	Generation Interconnection	AF2-186 connects to South Cecil 69 kV in Ohio MW : 45 MW MWE : 45 MW MWC : 18.9 MW fuel type : Solar
AF2-187	Active	Generation Interconnection	AF2-187 connects to Brookside-Cloverdale 138 kV in Ohio MW : 130 MW MWE : 130 MW MWC : 78 MW fuel type : Solar
AF2-188	Withdrawn	Generation Interconnection	AF2-188 connects to Reynolds-Meadow Lake #1 345 kV in Indiana MW : 112 MW MWE : 112 MW MWC : 67.2 MW fuel type : Solar
AF2-189	Withdrawn	Generation Interconnection	AF2-189 connects to Greentown 138 kV in Indiana MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AF2-191	Active	Generation Interconnection	AF2-191 connects to New Carlisle 138 kV in Indiana MW : 110 MW MWE : 110 MW MWC : 66 MW fuel type : Solar
AF2-199	Active	Generation Interconnection	AF2-199 connects to Nelson-Electric Junction 345 kV in Illinois MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AF2-200	Active	Generation Interconnection	AF2-200 connects to Nelson-Electric Junction 345 kV in Illinois MW : 200 MW MWE : 200 MW MWC : 120 MW fuel type : Solar
AF2-201	Active	Generation Interconnection	AF2-201 connects to Lena-Ecogrove 138kV in Illinois MW : 199 MW MWE : 199 MW MWC : 51.4 MW fuel type : Wind; Solar
AF2-204	Active	Generation Interconnection	AF2-204 connects to Van Buren 138 kV in Indiana MW : 110 MW MWE : 110 MW MWC : 83.3 MW fuel type : Solar; Storage
AF2-205	Active	Generation Interconnection	AF2-205 connects to Olive-Reynolds #2 345 kV in Indiana MW : 200 MW MWE : 200 MW MWC : 120 MW fuel type : Solar
AF2-209	Active	Generation Interconnection	AF2-209 connects to South Hicksville-Sowers 138 kV in Ohio MW : 140 MW MWE : 140 MW MWC : 95.4 MW fuel type : Solar; Storage
AF2-210	Withdrawn	Generation Interconnection	AF2-210 connects to Foster-Garver Road 345 kV in Ohio MW : 200 MW MWE : 200 MW MWC : 120 MW fuel type : Solar
AF2-211	Withdrawn	Generation Interconnection	AF2-211 connects to College Corner 138 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AF2-224	Active	Generation Interconnection	AF2-224 connects to Allen 345 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 42 MW fuel type : Solar
AF2-225	Active	Generation Interconnection	AF2-225 connects to McLean 345 kV in Illinois MW : 150 MW MWE : 150 MW MWC : 63 MW fuel type : Solar
AF2-226	Active	Generation Interconnection	AF2-226 connects to Kalydid Road 345 kV in Illinois MW : 50 MW MWE : 50 MW MWC : 20 MW fuel type : Storage
AF2-252	Active	Generation Interconnection	AF2-252 connects to Blue Mound 345 kV in Illinois MW : 50 MW MWE : 50 MW MWC : 20 MW fuel type : Storage
AF2-260	Active	Generation Interconnection	AF2-260 connects to Stephensburg 69 kV in Kentucky MW : 90 MW MWE : 90 MW MWC : 60 MW fuel type : Solar
AF2-298	Active	Generation Interconnection	AF2-298 connects to Crown-Brookville 69 kV in Ohio MW : 49.9 MW MWE : 49.9 MW MWC : 29.9 MW fuel type : Solar
AF2-305	In Service	Generation Interconnection	AF2-305 connects to Brokaw-Lanesville 345 kV in Illinois MW : 200 MW MWE : 0 MW MWC : 9.2 MW fuel type : Wind
AF2-306	Active	Generation Interconnection	AF2-306 connects to Hope-Blevins Valley Tap 69 kV in Kentucky MW : 26 MW MWE : 26 MW MWC : 26 MW fuel type : Storage
AF2-307	Active	Generation Interconnection	AF2-307 connects to Hope-Blevins Valley Tap 69 kV in Virginia MW : 66 MW MWE : 66 MW MWC : 39.6 MW fuel type : Solar
AF2-308	Active	Generation Interconnection	AF2-308 connects to Central Hardin-Stephensburg 69 kV in Kentucky MW : 28 MW MWE : 28 MW MWC : 28 MW fuel type : Storage
AF2-309	Active	Generation Interconnection	AF2-309 connects to Central Hardin-Stephensburg 69 kV in Kentucky MW : 70 MW MWE : 70 MW MWC : 42 MW fuel type : Solar
AF2-317	In Service	Generation Interconnection	AF2-317 connects to Hill Topper 345 kV in Illinois MW : 65 MW MWE : 0 MW MWC : 15.68 MW fuel type : Wind
AF2-319	Active	Generation Interconnection	AF2-319 connects to Kalydid Road 345 kV in Illinois MW : 50 MW MWE : 50 MW MWC : 20 MW fuel type : Storage
AF2-321	Active	Generation Interconnection	AF2-321 connects to Stryker-Ridgeville 138 kV in Ohio MW : 148 MW MWE : 148 MW MWC : 88.8 MW fuel type : Solar
AF2-329	Active	Generation Interconnection	AF2-329 connects to Sandwich-Plano 138 kV in Illinois MW : 152.2 MW MWE : 52.2 MW MWC : 52.2 MW fuel type : Storage
AF2-335	Active	Generation Interconnection	AF2-335 connects to West Del-Royerton 138 kV in Indiana MW : 140 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AF2-346	Withdrawn	Generation Interconnection	AF2-346 connects to Electric Junction-Nelson 345 kV in Illinois MW : 250 MW MWE : 75 MW MWC : 45 MW fuel type : Solar
AF2-348	Active	Generation Interconnection	AF2-348 connects to North Clark-Spurlock 345 kV in Kentucky MW : 250 MW MWE : 250 MW MWC : 150 MW fuel type : Solar
AF2-349	Active	Generation Interconnection	AF2-349 connects to Garden Prairie-Silver Lake 345 kV in Illinois MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AF2-350	Active	Generation Interconnection	AF2-350 connects to Kensington 138 kV in Illinois MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AF2-351	Active	Generation Interconnection	AF2-351 connects to Kensington 138 kV in Illinois MW : 20 MW MWE : 20 MW MWC : 8 MW fuel type : Storage
AF2-352	Active	Generation Interconnection	AF2-352 connects to Blue Mound 34.5 kV in Illinois MW : 50 MW MWE : 50 MW MWC : 20 MW fuel type : Storage
AF2-355	Active	Generation Interconnection	AF2-355 connects to West Garrard-J.K. Smith 345 rkV in Kentucky MW : 225 MW MWE : 225 MW MWC : 135 MW fuel type : Solar
AF2-359	Active	Generation Interconnection	AF2-359 connects to Olive-University Park 345 kV in Indiana MW : 125 MW MWE : 125 MW MWC : 75 MW fuel type : Solar
AF2-363	Active	Generation Interconnection	AF2-363 connects to Glidden 138 kV in Undetermined MW : 81.4 MW MWE : 81.4 MW MWC : 48.84 MW fuel type : Solar
AF2-364	Withdrawn	Generation Interconnection	AF2-364 connects to Wayne Red 138 kV in Undetermined MW : 81.4 MW MWE : 81.4 MW MWC : 48.84 MW fuel type : Solar
AF2-365	Active	Generation Interconnection	AF2-365 connects to Munfordville KU Tap-Horse Cave Jct. 69 kV in Kentucky MW : 50 MW MWE : 50 MW MWC : 30 MW fuel type : Solar
AF2-366	Active	Generation Interconnection	AF2-366 connects to Glidden-Waterman 138 kV in Undetermined MW : 94.9 MW MWE : 94.9 MW MWC : 56.94 MW fuel type : Solar
AF2-370	Active	Generation Interconnection	AF2-370 connects to West Del-Royerton 138 kV in Indiana MW : 140 MW MWE : 0 MW MWC : 20 MW fuel type : Solar
AF2-375	Active	Generation Interconnection	AF2-375 connects to Fostoria Central 138 kV in Ohio MW : 129.6 MW MWE : 129.6 MW MWC : 77.76 MW fuel type : Solar
AF2-376	Active	Generation Interconnection	AF2-376 connects to Timber Switch 138 kV in Ohio MW : 50 MW MWE : 50 MW MWC : 20 MW fuel type : Storage
AF2-377	Active	Generation Interconnection	AF2-377 connects to Logtown 138 kV in Ohio MW : 50 MW MWE : 50 MW MWC : 20 MW fuel type : Storage
AF2-388	Active	Generation Interconnection	AF2-388 connects to Desoto-Sorenson 345 kV in Indiana MW : 200 MW MWE : 200 MW MWC : 35.2 MW fuel type : Wind
AF2-389	Active	Generation Interconnection	AF2-389 connects to Pokagon-Corey 69 kV in Michigan MW : 50 MW MWE : 50 MW MWC : 30 MW fuel type : Solar
AF2-391	Active	Generation Interconnection	AF2-391 connects to Central Hardin 69 kV in Kentucky MW : 120 MW MWE : 120 MW MWC : 72 MW fuel type : Solar; Storage
AF2-392	Active	Generation Interconnection	AF2-392 connects to Nelson-Dixon 138 kV in Undetermined MW : 200 MW MWE : 200 MW MWC : 35.2 MW fuel type : Wind
AF2-393	Active	Generation Interconnection	AF2-393 connects to Nelson-Dixon 138 kV in Undetermined MW : 60 MW MWE : 60 MW MWC : 60 MW fuel type : Storage
AF2-394	Active	Generation Interconnection	AF2-394 connects to Nelson-Dixon 138 kV in Undetermined MW : 40 MW MWE : 40 MW MWC : 40 MW fuel type : Storage
AF2-396	Active	Generation Interconnection	AF2-396 connects to Stinger 138 kV in Michigan MW : 200 MW MWE : 200 MW MWC : 200 MW fuel type : Solar; Storage
AF2-407	Active	Generation Interconnection	AF2-407 connects to Fall Creek 345 kV in Indiana MW : 300 MW MWE : 300 MW MWC : 300 MW fuel type : Storage
AF2-408	Active	Generation Interconnection	AF2-408 connects to Fall Creek 138 kV in Indiana MW : 80 MW MWE : 80 MW MWC : 80 MW fuel type : Storage
AF2-441	Active	Generation Interconnection	AF2-441 connects to Burnham 138kV in Illinois MW : 200 MW MWE : 200 MW MWC : 80 MW fuel type : Storage

AG1 Queue

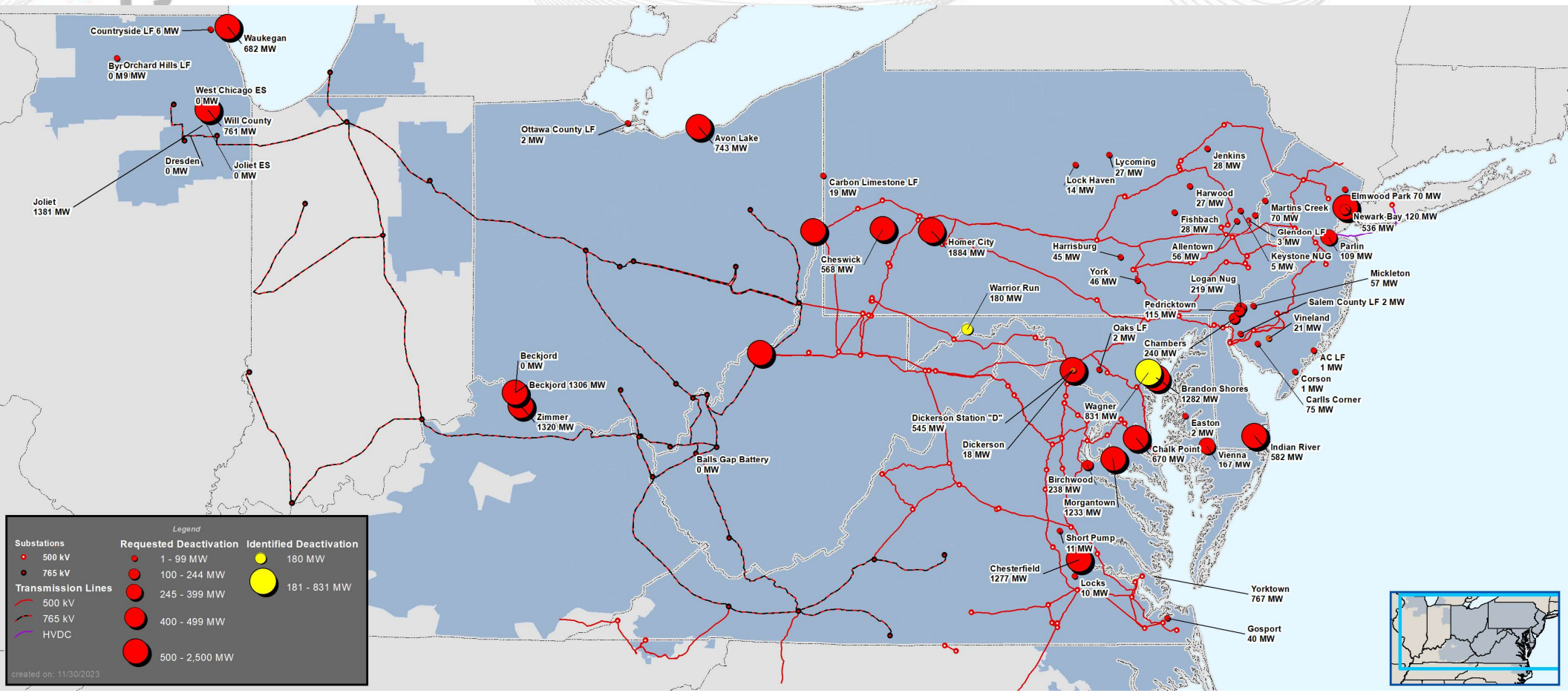
Q position	Status	Project Type	Description
AG1-005	Active	Generation Interconnection	AG1-005 connects to Corbin-Crescent Ridge 138 kV in Illinois MW : 250 MW MWE : 250 MW MWC : 150 MW fuel type : Solar
AG1-017	Active	Generation Interconnection	AG1-017 connects to Jay 138 kV in Indiana MW : 146.6 MW MWE : 16.64 MW MWC : 2.93 MW fuel type : Wind
AG1-039	Active	Generation Interconnection	AG1-039 connects to Galion 138 kV in Ohio MW : 144 MW MWE : 56 MW MWC : 23.52 MW fuel type : Solar
AG1-044	In Service	Generation Interconnection	AG1-044 connects to Whiteside County in Illinois MW : 0.5 MW MWE : 0.5 MW MWC : 0 MW fuel type : Storage
AG1-047	Active	Generation Interconnection	AG1-047 connects to Jay 138 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AG1-049	Withdrawn	Generation Interconnection	AG1-049 connects to College Corner 138 kV in Ohio MW : 80 MW MWE : 0 MW MWC : 17.6 MW fuel type : Solar
AG1-056	Withdrawn	Generation Interconnection	AG1-056 connects to Stryker-Ridgeville 138 kV in Ohio MW : 202 MW MWE : 54 MW MWC : 32.4 MW fuel type : Solar
AG1-067	Active	Generation Interconnection	AG1-067 connects to Temple Hill 69 kV in Kentucky MW : 38 MW MWE : 38 MW MWC : 24.8 MW fuel type : Solar
AG1-070	Active	Generation Interconnection	AG1-070 connects to Bon Ayr 69 kV in Kentucky MW : 45 MW MWE : 45 MW MWC : 37.7 MW fuel type : Solar
AG1-071	Active	Generation Interconnection	AG1-071 connects to Bon Ayr 69 kV in Kentucky MW : 55 MW MWE : 55 MW MWC : 37.5 MW fuel type : Solar
AG1-076	Engineering and Procurement	Generation Interconnection	AG1-076 connects to Fostoria Central 138 kV in Ohio MW : 205 MW MWE : 0 MW MWC : 46 MW fuel type : Solar
AG1-096	Withdrawn	Generation Interconnection	AG1-096 connects to Rineyville 69 kV in Kentucky MW : 55 MW MWE : 55 MW MWC : 36.6667 MW fuel type : Solar; Storage
AG1-109	Active	Generation Interconnection	AG1-109 connects to Valley 138 kV in Michigan MW : 50 MW MWE : 0 MW MWC : 25 MW fuel type : Storage
AG1-118	Active	Generation Interconnection	AG1-118 connects to Sugar Grove 138 kV in Illinois MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AG1-119	Active	Generation Interconnection	AG1-119 connects to Wayne-Byron 345 kV in Illinois MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AG1-120	Active	Generation Interconnection	AG1-120 connects to Glidden-Cherry Valley 138 kV in Illinois MW : 118.6 MW MWE : 118.6 MW MWC : 71.16 MW fuel type : Solar
AG1-121	Active	Generation Interconnection	AG1-121 connects to Crescent Ridge 138 kV in Illinois MW : 294.7 MW MWE : 294.7 MW MWC : 51.9 MW fuel type : Wind
AG1-127	Active	Generation Interconnection	AG1-127 connects to Glidden-Waterman 138 kV in Illinois MW : 105.1 MW MWE : 105.1 MW MWC : 63.06 MW fuel type : Solar
AG1-128	Withdrawn	Generation Interconnection	AG1-128 connects to Shady Oaks 138 kV in Illinois MW : 294.2 MW MWE : 294.2 MW MWC : 51.8 MW fuel type : Wind
AG1-132	Withdrawn	Generation Interconnection	AG1-132 connects to Tait 69 kV in Ohio MW : 606 MW MWE : 20 MW MWC : 20 MW fuel type : Natural Gas
AG1-199	Active	Generation Interconnection	AG1-199 connects to Allen Junction 345 kV in Ohio MW : 300 MW MWE : 300 MW MWC : 300 MW fuel type : Storage
AG1-208	Withdrawn	Generation Interconnection	AG1-208 connects to Sideview-Mt Sterling 69 kV in North Carolina MW : 35 MW MWE : 35 MW MWC : 21.9 MW fuel type : Solar
AG1-220	Withdrawn	Generation Interconnection	AG1-220 connects to West Dekalb 138 kV in Illinois MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AG1-222	Active	Generation Interconnection	AG1-222 connects to Guardian-Twin Branch 138 kV in Indiana MW : 302.2 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AG1-224	Active	Generation Interconnection	AG1-224 connects to Pendleton-Tanners Creek 138 kV in Indiana MW : 210 MW MWE : 210 MW MWC : 126 MW fuel type : Solar
AG1-225	Active	Generation Interconnection	AG1-225 connects to Adams 138 kV in Indiana MW : 346 MW MWE : 346 MW MWC : 207 MW fuel type : Solar
AG1-226	Active	Generation Interconnection	AG1-226 connects to Eugene-Dequine 345 kV in Indiana MW : 450 MW MWE : 450 MW MWC : 331.5 MW fuel type : Solar; Storage
AG1-232	Active	Generation Interconnection	AG1-232 connects to Magley 138 kV in Indiana MW : 135 MW MWE : 135 MW MWC : 81 MW fuel type : Solar
AG1-236	Active	Generation Interconnection	AG1-236 connects to Lanesville-Brokaw 345 kV in Illinois MW : 400 MW MWE : 200 MW MWC : 26 MW fuel type : Wind
AG1-237	Active	Generation Interconnection	AG1-237 connects to Dequine-Eugene 345 kV in Undetermined MW : 200 MW MWE : 200 MW MWC : 26 MW fuel type : Wind
AG1-238	Withdrawn	Generation Interconnection	AG1-238 connects to Dumont 345 kV in Indiana MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AG1-297	Active	Generation Interconnection	AG1-297 connects to Hanna-Tanners Creek 345 kV in Indiana MW : 500 MW MWE : 500 MW MWC : 200 MW fuel type : Storage
AG1-298	Active	Generation Interconnection	AG1-298 connects to Calumet-Burnham 345 kV in Illinois MW : 500 MW MWE : 500 MW MWC : 500 MW fuel type : Storage
AG1-302	Active	Generation Interconnection	AG1-302 connects to Reynolds-Olive 345 kV in Indiana MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AG1-306	Active	Generation Interconnection	AG1-306 connects to Fawkes-Dale 138 kV in Kentucky MW : 65 MW MWE : 65 MW MWC : 39 MW fuel type : Solar
AG1-319	Active	Generation Interconnection	AG1-319 connects to Northside 138 kV in Ohio MW : 206 MW MWE : 166 MW MWC : 99.6 MW fuel type : Solar
AG1-320	Active	Generation Interconnection	AG1-320 connects to Glendale-Stephensburg 69 kV in Kentucky MW : 82 MW MWE : 82 MW MWC : 52 MW fuel type : Solar
AG1-321	Active	Generation Interconnection	AG1-321 connects to Dresden-Pontiac Midpoint 345 kV in Illinois MW : 200 MW MWE : 200 MW MWC : 126.4 MW fuel type : Solar
AG1-324	Active	Generation Interconnection	AG1-324 connects to Jay-Desoto 138 kV in Indiana MW : 45 MW MWE : 45 MW MWC : 45 MW fuel type : Solar; Storage
AG1-341	Active	Generation Interconnection	AG1-341 connects to Summer Shade 161 kV in Kentucky MW : 106 MW MWE : 106 MW MWC : 63.6 MW fuel type : Solar; Storage
AG1-349	Active	Generation Interconnection	AG1-349 connects to Olive-Reynolds #2 345 kV in Indiana MW : 260 MW MWE : 260 MW MWC : 156 MW fuel type : Solar
AG1-352	Withdrawn	Generation Interconnection	AG1-352 connects to Hunt Farm Junction 69 kV in Kentucky MW : 50 MW MWE : 50 MW MWC : 30 MW fuel type : Solar
AG1-353	Active	Generation Interconnection	AG1-353 connects to Greene County-Marion County 161 kV in Wisconsin MW : 98 MW MWE : 98 MW MWC : 58.8 MW fuel type : Solar
AG1-354	Active	Generation Interconnection	AG1-354 connects to Summershade-Green County 161 kV in Kentucky MW : 150 MW MWE : 150 MW MWC : 90 MW fuel type : Solar
AG1-358	Withdrawn	Generation Interconnection	AG1-358 connects to Howard-Melmore 138 kV in Ohio MW : 58 MW MWE : 58 MW MWC : 34.8 MW fuel type : Solar
AG1-365	Active	Generation Interconnection	AG1-365 connects to Allen 345 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AG1-366	Active	Generation Interconnection	AG1-366 connects to Allen 345 kV in Indiana MW : 50 MW MWE : 50 MW MWC : 20 MW fuel type : Storage
AG1-367	Active	Generation Interconnection	AG1-367 connects to DeSoto 345 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AG1-368	Active	Generation Interconnection	AG1-368 connects to Tillman 138 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AG1-369	Active	Generation Interconnection	AG1-369 connects to Logtown 138 kV in Ohio MW : 49.9 MW MWE : 49.9 MW MWC : 29.94 MW fuel type : Solar
AG1-371	Active	Generation Interconnection	AG1-371 connects to Nelson-Electric Junction 345 kV in Illinois MW : 300 MW MWE : 0 MW MWC : 30 MW fuel type : Storage

AG1 Queue (continued)

AG1-372	Withdrawn	Generation Interconnection	AG1-372 connects to Nelson-Electric Junction 345 kV in Illinois MW : 0 MW MWE : 0 MW MWC : 20 MW fuel type : Storage
AG1-373	Active	Generation Interconnection	AG1-373 connects to Nelson-Electric Junction 345 kV in Illinois MW : 100 MW MWE : 0 MW MWC : 10 MW fuel type : Storage
AG1-374	Active	Generation Interconnection	AG1-374 connects to Blue Mound 345 kV in Illinois MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar; Storage
AG1-375	Active	Generation Interconnection	AG1-375 connects to Sorenson-Desoto 345 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AG1-376	Withdrawn	Generation Interconnection	AG1-376 connects to Sorenson-DeSoto 345 kV in Indiana MW : 30 MW MWE : 30 MW MWC : 12 MW fuel type : Storage
AG1-379	Active	Generation Interconnection	AG1-379 connects to Minonk 345 kV in Illinois MW : 200 MW MWE : 200 MW MWC : 137.2 MW fuel type : Solar
AG1-381	Withdrawn	Generation Interconnection	AG1-381 connects to Hope 69 kV in North Carolina MW : 27 MW MWE : 27 MW MWC : 17.4 MW fuel type : Solar
AG1-398	In Service	Generation Interconnection	AG1-398 connects to Brokaw-Lanesville 345 kV in Illinois MW : 200 MW MWE : 0 MW MWC : 7.33 MW fuel type : Wind
AG1-399	Active	Generation Interconnection	AG1-399 connects to Blue Mound-Chestnut 345 kV in Illinois MW : 300 MW MWE : 300 MW MWC : 52.8 MW fuel type : Wind
AG1-400	Active	Generation Interconnection	AG1-400 connects to Blue Mound-Chestnut 345 kV in Illinois MW : 150 MW MWE : 150 MW MWC : 150 MW fuel type : Storage
AG1-401	Active	Generation Interconnection	AG1-401 connects to Blue Mound-Chestnut 345 kV in Illinois MW : 300 MW MWE : 300 MW MWC : 52.8 MW fuel type : Wind
AG1-402	Active	Generation Interconnection	AG1-402 connects to Blue Mound-Chestnut 345 kV in Illinois MW : 150 MW MWE : 150 MW MWC : 150 MW fuel type : Storage
AG1-403	Active	Generation Interconnection	AG1-403 connects to Clinton-Brokaw 345 kV in Illinois MW : 200 MW MWE : 200 MW MWC : 35.2 MW fuel type : Wind
AG1-404	Active	Generation Interconnection	AG1-404 connects to Clinton-Brokaw 345 kV in Illinois MW : 100 MW MWE : 100 MW MWC : 100 MW fuel type : Storage
AG1-405	Active	Generation Interconnection	AG1-405 connects to Walnut Grove-Asahi 69 kV in Illinois MW : 57 MW MWE : 57 MW MWC : 34.2 MW fuel type : Solar
AG1-406	Active	Generation Interconnection	AG1-406 connects to Walnut Grove-Asahi 69 kV in Illinois MW : 79 MW MWE : 22 MW MWC : 22 MW fuel type : Storage
AG1-410	Active	Generation Interconnection	AG1-410 connects to Maddox Creek-RP Mone 345 kV in Ohio MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AG1-411	Active	Generation Interconnection	AG1-411 connects to Maddox Creek-RP Mone 345 kV in Ohio MW : 100 MW MWE : 100 MW MWC : 100 MW fuel type : Storage
AG1-414	Active	Generation Interconnection	AG1-414 connects to Mississinewa 138 kV in Indiana MW : 75 MW MWE : 75 MW MWC : 45 MW fuel type : Solar; Storage
AG1-417	Active	Generation Interconnection	AG1-417 connects to Gateway 69 kV in Indiana MW : 50 MW MWE : 50 MW MWC : 30 MW fuel type : Solar
AG1-418	Active	Generation Interconnection	AG1-418 connects to Columbia City 138 kV in Indiana MW : 50 MW MWE : 50 MW MWC : 30 MW fuel type : Solar
AG1-423	Active	Generation Interconnection	AG1-423 connects to Wayne 345 kV in Illinois MW : 200 MW MWE : 200 MW MWC : 120 MW fuel type : Solar
AG1-424	Active	Generation Interconnection	AG1-424 connects to Sowers 138 kV in Indiana MW : 100 MW MWE : 100 MW MWC : 60 MW fuel type : Solar
AG1-425	Active	Generation Interconnection	AG1-425 connects to Groton 138 kV in Ohio MW : 125 MW MWE : 0 MW MWC : 20 MW fuel type : Storage
AG1-433	Active	Generation Interconnection	AG1-433 connects to DeSoto-Keystone 345 kV in Indiana MW : 300 MW MWE : 100 MW MWC : 17.6 MW fuel type : Wind
AG1-434	Active	Generation Interconnection	AG1-434 connects to Electric Junction-Nelson 345 kV in Illinois MW : 200 MW MWE : 200 MW MWC : 35.2 MW fuel type : Wind
AG1-435	Active	Generation Interconnection	AG1-435 connects to Kewanee-Hennepin 138 kV in Illinois MW : 200 MW MWE : 200 MW MWC : 35.2 MW fuel type : Wind
AG1-436	Active	Generation Interconnection	AG1-436 connects to Olive-University Park 345 kV in Indiana MW : 250 MW MWE : 125 MW MWC : 75 MW fuel type : Solar
AG1-447	Active	Generation Interconnection	AG1-447 connects to Olive-University Park 345 kV in Indiana MW : 305 MW MWE : 55 MW MWC : 55 MW fuel type : Storage
AG1-448	Withdrawn	Generation Interconnection	AG1-448 connects to Olive-University Park 345 kV in Indiana MW : 360 MW MWE : 55 MW MWC : 55 MW fuel type : Storage
AG1-453	Active	Generation Interconnection	AG1-453 connects to Guardian 138 kV in Indiana MW : 140 MW MWE : 140 MW MWC : 84 MW fuel type : Solar
AG1-454	Active	Generation Interconnection	AG1-454 connects to Guardian 138 kV in Indiana MW : 50 MW MWE : 50 MW MWC : 50 MW fuel type : Storage
AG1-460	Active	Generation Interconnection	AG1-460 connects to Kincaid-Pana 345 kV in Illinois MW : 30 MW MWE : 30 MW MWC : 12 MW fuel type : Storage
AG1-462	Active	Generation Interconnection	AG1-462 connects to Quad Cities-Sterling Steel 345 kV in Illinois MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AG1-471	Active	Generation Interconnection	AG1-471 connects to Up Church-Wayne County 69 kV in Undetermined MW : 60 MW MWE : 60 MW MWC : 36 MW fuel type : Solar
AG1-472	Withdrawn	Generation Interconnection	AG1-472 connects to Seymour-Cave City 69 kV in Kentucky MW : 80 MW MWE : 80 MW MWC : 48 MW fuel type : Solar
AG1-477	Withdrawn	Generation Interconnection	AG1-477 connects to Grundy County 34.5 kV in Illinois MW : 19.9 MW MWE : 19.9 MW MWC : 10 MW fuel type : Solar; Storage
AG1-478	Engineering and Procurement	Generation Interconnection	AG1-478 connects to Will County 34.5 kV in Illinois MW : 19.9 MW MWE : 19.9 MW MWC : 10 MW fuel type : Solar; Storage
AG1-479	Withdrawn	Generation Interconnection	AG1-479 connects to Grundy County 34.5 kV II in Illinois MW : 19.9 MW MWE : 19.9 MW MWC : 15.9 MW fuel type : Solar; Storage
AG1-488	Active	Generation Interconnection	AG1-488 connects to Marion IP 161 kV in Ohio MW : 70 MW MWE : 70 MW MWC : 42 MW fuel type : Solar
AG1-491	Withdrawn	Generation Interconnection	AG1-491 connects to Central Hardin 69 kV in Kentucky MW : 70 MW MWE : 70 MW MWC : 42 MW fuel type : Solar; Storage
AG1-500	Active	Generation Interconnection	AG1-500 connects to the Beaver 345 kV in Ohio MW: 784.6 MW MWE: 406.4 MW MWC: 385.5 MW fuel type: Natural Gas
AG1-501	Active	Generation Interconnection	AG1-501 connects to the Beaver 138 kV in Ohio MW: 95.2 MW MWE: 11.3 MW MWC: 10 MW fuel type: Natural Gas
AG1-512	Active	Generation Interconnection	AG1-512 connects to University Park North 345 kV in Illinois MW : 40 MW MWE : 40 MW MWC : 16 MW fuel type : Storage
AG1-513	Engineering and Procurement	Generation Interconnection	AG1-513 connects to Aurora 138 kV in Illinois MW : 10 MW MWE : 10 MW MWC : 4 MW fuel type : Storage
AG1-521	Withdrawn	Generation Interconnection	AG1-521 connects to Dixon-McGirr Road 138 kV in Illinois MW : 100 MW MWE : 100 MW MWC : 80 MW fuel type : Solar
AG1-522	Active	Generation Interconnection	AG1-522 connects to Sullivan-Rockport 765 kV in Indiana MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AG1-523	Active	Generation Interconnection	AG1-523 connects to Sullivan-Rockport 765 kV in Indiana MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AG1-524	Active	Generation Interconnection	AG1-524 connects to Sullivan-Rockport 765 kV in Indiana MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AG1-525	Active	Generation Interconnection	AG1-525 connects to Sullivan-Rockport 765 kV in Indiana MW : 300 MW MWE : 300 MW MWC : 180 MW fuel type : Solar
AG1-526	Active	Generation Interconnection	AG1-526 connects to West Garrard 345 kV in Kentucky MW : 222 MW MWE : 222 MW MWC : 133.2 MW fuel type : Solar
AG1-535	Active	Generation Interconnection	AG1-535 connects to Franklin Park 138 kV in Illinois MW : 85 MW MWE : 85 MW MWC : 85 MW fuel type : Storage
AG1-553	Active	Generation Interconnection	AG1-553 connects to Cordova 345 kV in Illinois MW : 330 MW MWE : 330 MW MWC : 264 MW fuel type : Solar
AG1-555	Active	Generation Interconnection	AG1-555 connects to Dequine 345 kV in Indiana MW : 120 MW MWE : 120 MW MWC : 88.4 MW fuel type : Solar; Storage

Generation Deactivation Notification Update (Between 11/1/2022 and 12/1/2023)

Generation Deactivation Announcements 2020-2023



Deactivation Status

Unit(s)	MW	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Homer City 1,2 and 3	1,884	Penelec	7/1/2023	Reliability analysis completed , no impact identified
Cape May County Municipal Lf2	0.6	ACE	10/1/2023	Reliability analysis completed , no impact identified
Carlls Corner CT1 and CT2	74	ACE	6/1/2024	Reliability analysis completed , no impact identified
Mickleton CT1	57.2	ACE	6/1/2024	Reliability analysis completed , no impact identified
Gosport 1	40	Dominion	7/1/2024	Reliability analysis completed , no impact identified
Vienna 8 and 10	167.3	DPL	6/1/2025	Reliability analysis completed , no impact identified

Deactivation Status

Unit(s)	MW	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Easton Unit 8	2	DPL	10/1/2023	Reliability analysis in progress.
Parlin CT1, CT2, ST1, ST2	109	JCPL	11/1/2023	Reliability analysis in progress.
Brandon Shores 1,2	1,282	BGE	6/1/2025	Reliability analysis complete. Reliability impacts identified. New baselines b3780.1 – b3780.13, b3781 and b3782 resolve identified reliability impacts. provided they are completed by the requested deactivation date. Operating measures are not available in the interim. PJM Planning, Operations and Transmission Owner are continuing to investigate mitigation and timing.

* PJM does not approve deactivations, but rather identifies whether the requested deactivation date could lead to reliability concerns on the system. When PJM determines a proposed deactivation would adversely affect the reliability of the Transmission System due to upgrade completion timeline and absent operational measures, PJM desires and requests the Generation Owner extend operations of the deactivating unit(s). The Generation Owner may elect to support system reliability by operating until necessary network upgrades are completed by either filing its proposed Cost of Service Recovery Rate (CSRR) at FERC or accepting the Deactivation Avoidable Cost Credit (DACC) provided in the Tariff. PJM will announce at subsequent TEAC(s) after the Generation Owner submits a CSRR to the FERC and after the FERC accepts the CSRR filing or after the Generation Owner agrees to the DACC.

Deactivation Status

Unit(s)	MW	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Easton Unit 8	2	DPL	10/1/2023	Reliability analysis completed. No impact identified.
Parlin CT1, CT2, ST1, ST2	109	JCPL	11/1/2023	Reliability analysis completed. No impact identified.

* PJM does not approve deactivations, but rather identifies whether the requested deactivation date could lead to reliability concerns on the system. When PJM determines a proposed deactivation would adversely affect the reliability of the Transmission System due to upgrade completion timeline and absent operational measures, PJM desires and requests the Generation Owner extend operations of the deactivating unit(s). The Generation Owner may elect to support system reliability by operating until necessary network upgrades are completed by either filing its proposed Cost of Service Recovery Rate (CSRR) at FERC or accepting the Deactivation Avoidable Cost Credit (DACC) provided in the Tariff. PJM will announce at subsequent TEAC(s) after the Generation Owner submits a CSRR to the FERC and after the FERC accepts the CSRR filing or after the Generation Owner agrees to the DACC.

Deactivation Status

Unit(s)	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Lorain County 1 LF - 14 MW	ATSI	4/1/2023	Reliability analysis complete. No reliability violation identifed.
Solberg 1 BT - Frequency Regulation	ComEd	4/1/2022	Reliability analysis complete. No reliability violation identifed.
Yorktown 3 -767.1 MW	Dominion	5/31/2023	Reliability analysis underway

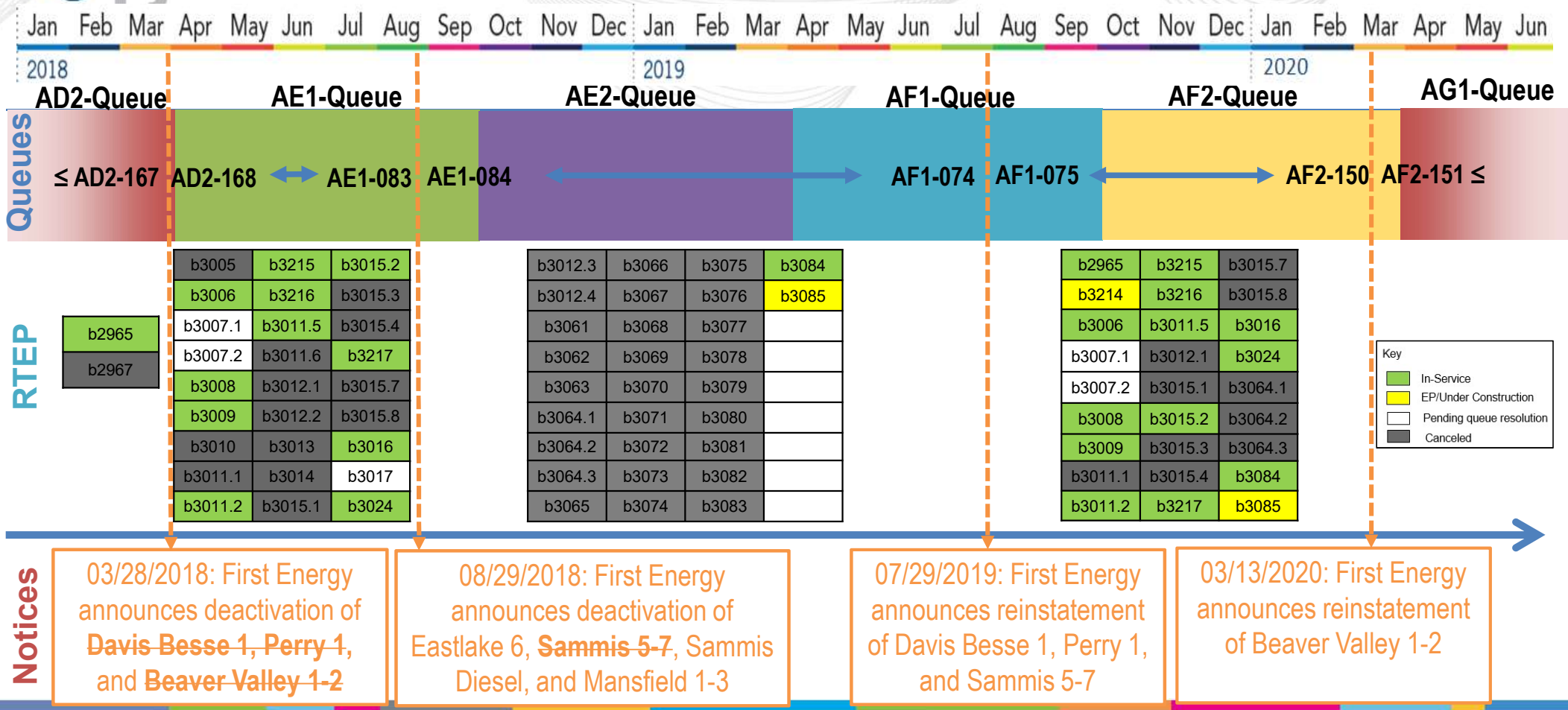
Deactivation Status

Unit(s)	MW	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Warrior Run Gen 1	180	APS	06/01/2024	Reliability analysis completed. Reliability impacts identified. Operating measures available in interim.
H.A Wagner	844	BGE	06/01/2025	Reliability analysis in progress.

* PJM does not approve deactivations, but rather identifies whether the requested deactivation date could lead to reliability concerns on the system. When PJM determines a proposed deactivation would adversely affect the reliability of the Transmission System due to upgrade completion timeline and absent operational measures, PJM desires and requests the Generation Owner extend operations of the deactivating unit(s). The Generation Owner may elect to support system reliability by operating until necessary network upgrades are completed by either filing its proposed Cost of Service Recovery Rate (CSRR) at FERC or accepting the Deactivation Avoidable Cost Credit (DACC) provided in the Tariff. PJM will announce at subsequent TEAC(s) after the Generation Owner submits a CSRR to the FERC and after the FERC accepts the CSRR filing or after the Generation Owner agrees to the DACC.

Generation Deactivation: Baseline Reliability

Beaver Valley 1 & 2 Reinstatement Queue Impact on Baselines



Baseline upgrade Cancelation -APS

Upgrade Id	Description
b2967	Convert the existing 6 wire Butler - Shanor Manor - Krendale 138 kV Line into two separate 138 kV lines. New lines will be Butler - Keisters and Butler - Shanor Manor - Krendale 138 kV
b3005	Reconductor 3.1 mile 556 ACSR portion of Cabot to Butler 138 kV with 556 ACSS and upgrade terminal equipment. 3.1 miles of line will be reconductored for this project. The total length of the line is 7.75 miles.
b3010	Replace terminal equipment at Keystone and Cabot 500 kV buses. At Keystone, bus tubing and conductor, a wavetrap, and meter will be replaced. At Cabot, a wavetrap and bus conductor will be replaced.
b3011.1	Construct new Route 51 substation and connect 10 138 kV lines to new substation
b3011.6	Upgrade remote end relays for Yukon –Allenport – Iron Bridge 138 kV line
b3012.1	Construct two new 138 kV ties with the single structure from APS's new substation to DUQ's new substation. The estimated line length is approximately 4.7 miles. The line is planned to use multiple ACSS conductors per phase.
b3012.3	Construct a new Elrama - Route 51 138 kV No.3 line: reconductor 4.7 miles of the existing line, and construct 1.5 miles of a new line to the reconductored portion. Install a new line terminal at APS Route 51 substation.

Baseline upgrade Cancelation -APS

Upgrade Id	Description
b3013	Reconductor Vasco Tap to Edgewater Tap 138 kV line. 4.4 miles. The new conductor will be 336 ACSS replacing the existing 336 ACSR conductor.
b3015.8	Upgrade terminal equipment at Mitchell for Mitchell – Elrama 138 kV line
b3064.3	Upgrade line relaying at Piney Fork and Bethel Park for Piney Fork – Elrama 138 kV line and Bethel Park – Elrama 138 kV line.
b3066	Reconductor the Cranberry - Jackson 138 kV line (2.1 miles), reconductor 138 kV bus at Cranberry and replace 138 kv line switches at Jackson
b3067	Reconductor the Jackson - Maple 138 kV line (4.7 miles), replace line switches at Jackson 138 kV and replace the line traps and relays at Maple 138 kV
b3068	Reconductor the Yukon - Westraver 138 kV line (2.8 miles), replace the line drops and relays at Yukon 138 kV and replace switches at Westraver 138 kV
b3069	Reconductor the Westraver - Route 51 138 kV line (5.63 miles) and replace line switches at Westraver 138 kV

Baseline upgrade Cancelation -APS

Upgrade Id	Description
b3070	Reconductor the Yukon - Route 51 #1 138 kV line (8 miles), replace the line drops, relays and line disconnect switch at Yukon 138 kV
b3071	Reconductor the Yukon - Route 51 #2 138 kV line (8 miles) and replace relays at Yukon 138 kV
b3072	Reconductor the Yukon - Route 51 #3 138 kV line (8 miles) and replace relays at Yukon 138 kV
b3074	Replace Substation conductor on the 345/138 kV transformer at Armstrong substation
b3075	Replace substation conductor and 138 kV circuit breaker on the #1 transformer (500/138 kV) at Cabot substation
b3076	Reconductor the Edgewater - Loyalhanna 138 kV line (0.67 miles)
b3079	Replace the Wylie Ridge 500/345 kV transformer #7
b3083	Replace substation conductor at Butler (138 kV) Replace substation conductor and line trap at Karns City (138 kV)

Baseline upgrade Cancelation -ATSI

Upgrade Id	Description
b3066	Reconductor the Cranberry - Jackson 138 kV line (2.1 miles), reconductor 138 kV bus at Cranberry and replace 138 kv line switches at Jackson
b3067	Reconductor the Jackson - Maple 138 kV line (4.7 miles), replace line switches at Jackson 138 kV and replace the line traps and relays at Maple 138 kV
b3080	Reconductor 138 kV bus at Seneca
b3081	Replace 138 kV breaker and substation conductor at Krendale

Baseline upgrade Cancelation -PENELEC

Upgrade Id	Description
b3014	Replace the existing Shelocta 230/115 kV transformer and construct a 230 kV ring bus
b3073	Replace the Blairsville East 138/115 kV transformer and associated equipment such as breaker disconnects and bus conductor
b3077	Reconductor the Franklin Pike - Wayne 115 kV line (6.78 miles)
b3078	Reconductor 138 kV bus and replace the line trap, relays at Morgan Street. Reconductor 138 kV bus at Venango Junction
b3082	Construct a 4-breaker 115 kV ring bus at Franklin Pike

Problem Statement: Generation Deliverability Violation – Yorktown 3 Deactivation

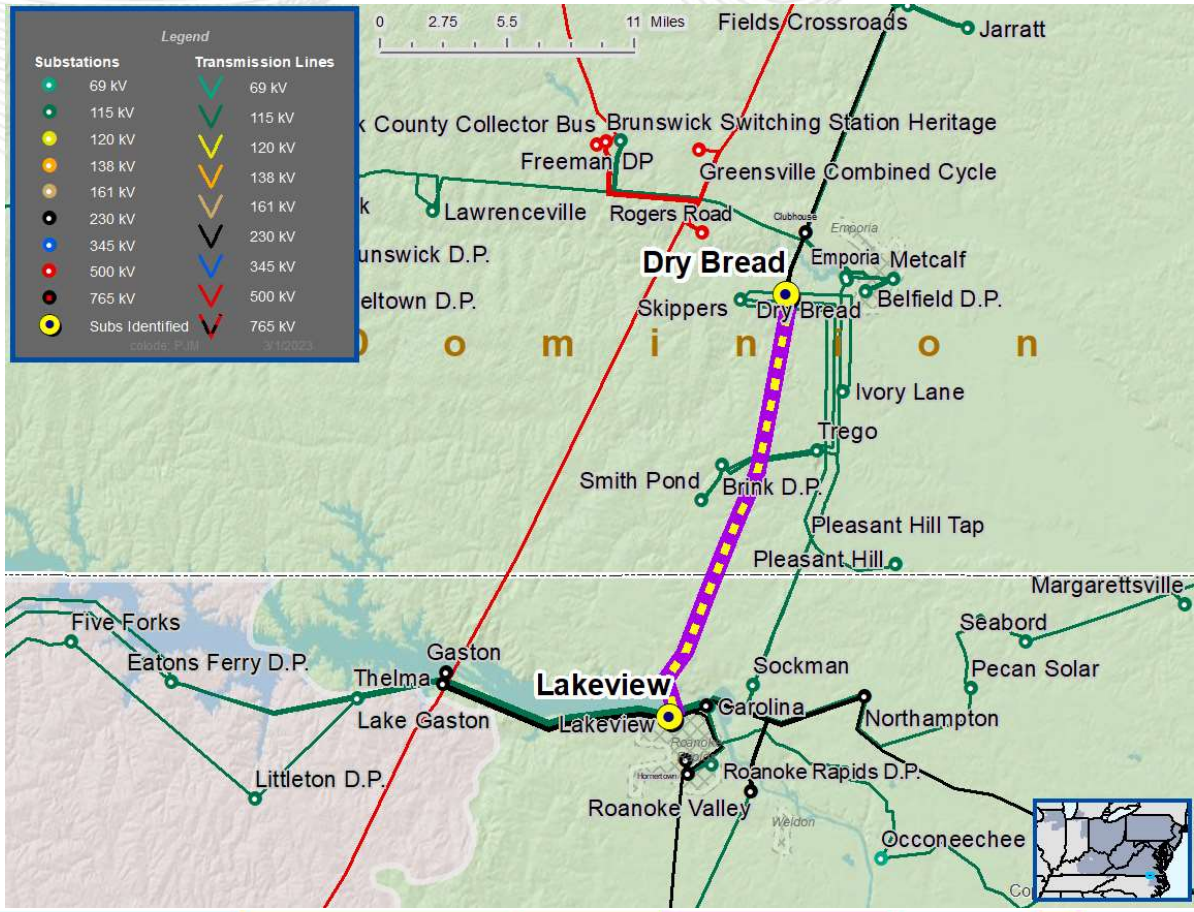
- Thermal violation: Lake View – Dry Bread 230 kV line
- Contingency: N-2

Recommended Solution:

- Existing baseline B3121 - Rebuild Clubhouse-Lakeview 230 kV Line.
- Current Rating: 399 MVA SN/ 399 MVA SE
- New Rating: 1047 MVA SN/ 1047 MVA SE

Required IS Date: 06/01/2023
Projected IS Date: 12/31/2023

Operating measures identified to mitigate reliability impacts in interim.



Problem Statement: Generation Deliverability Violation – Yorktown 3 Deactivation

- Thermal violation: Chaparral – Locks 230 kV line
- Contingency: N-1

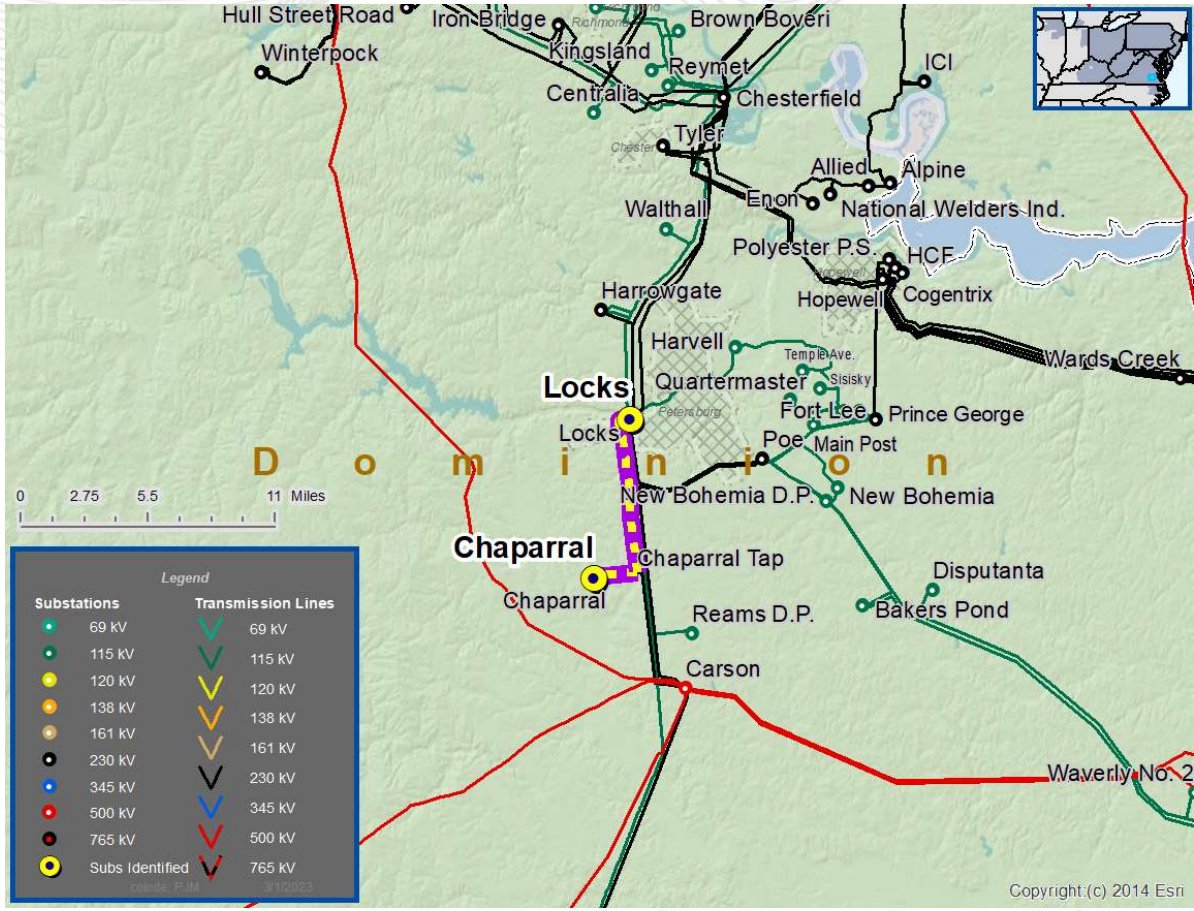
Recommended Solution:

- Existing baseline B3694.8 **-** Partial wreck and rebuild 10.34 miles of 230 kV line #249 Carson-Locks. Upgrade terminal equipment at Carson and Locks.

- Current Rating: 595 MVA SN/ 595 MVA SE
- New Rating: 1047 MVA SN/ 1047 MVA SE

Required IS Date: 06/01/2023
Projected IS Date: 06/01/2026

Operating measures identified to mitigate reliability impacts in interim.

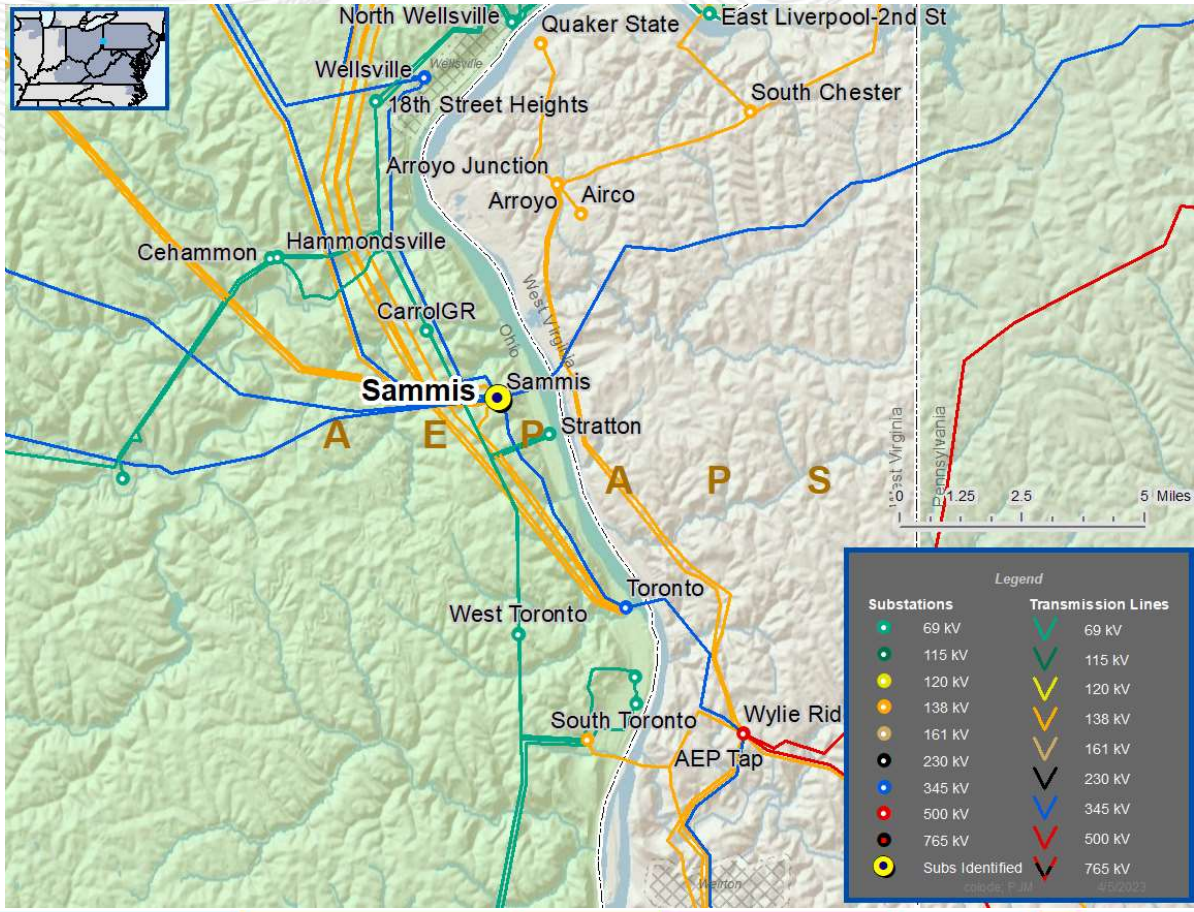


Sammis 5,6, and 7 Deactivation – 1491.3 MW

- The actual deactivation date will be 06/01/2023
- All impacts and associated baseline projects were presented on 05/10/2022
- FE recently informed of the necessary substation work associated with deactivating those units (B3777)

  - Disconnect and remove three 345 kV breakers, foundations, and associated equipment from Sammis substation.
  - Remove nine 345 kV CVT's.
  - Remove two 345 kV disconnect switches.
  - Install new 345 kV buswork and foundations.
  - Install new fencing.
  - Remove and adjust relaying at Sammis substation

Estimated Cost: $2.1M
Projected IS Date: 06/01/2023

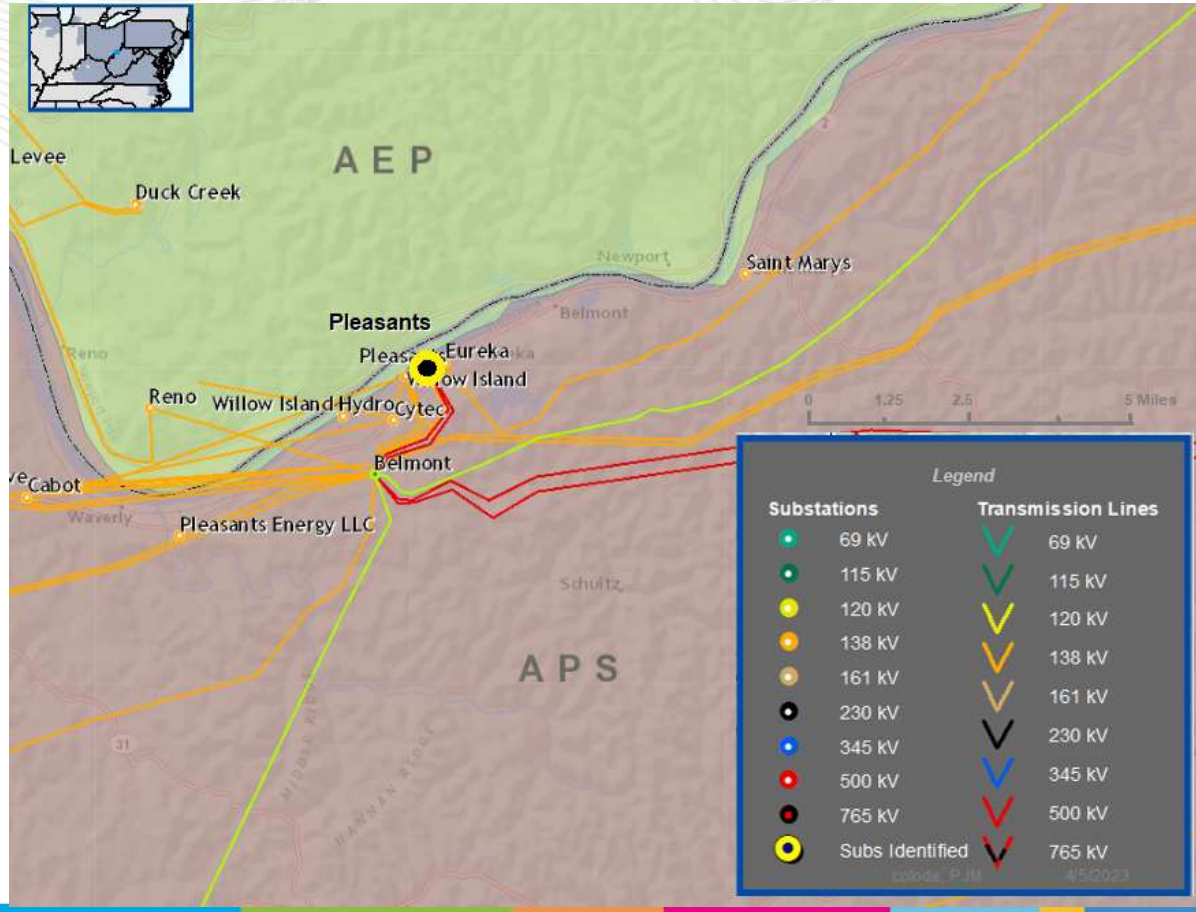


Pleasant 1 and 2 Deactivation – 1278 MW

- The actual deactivation date will be 06/01/2023
- All impacts and associated baseline project were presented on 05/10/2022
- FE recently informed of the necessary substation work associated with deactivating those units (B3778)

  - Remove the Pleasants #1 and Pleasants #2 500 kV line exits at Belmont Substation.
  - Remove the Belmont – Pleasants 500 kV #1 and #2 Transmission Lines.
  - Modify relay settings at Belmont Substation.

Estimated Cost: $0.67M
Projected IS Date: 06/01/2023



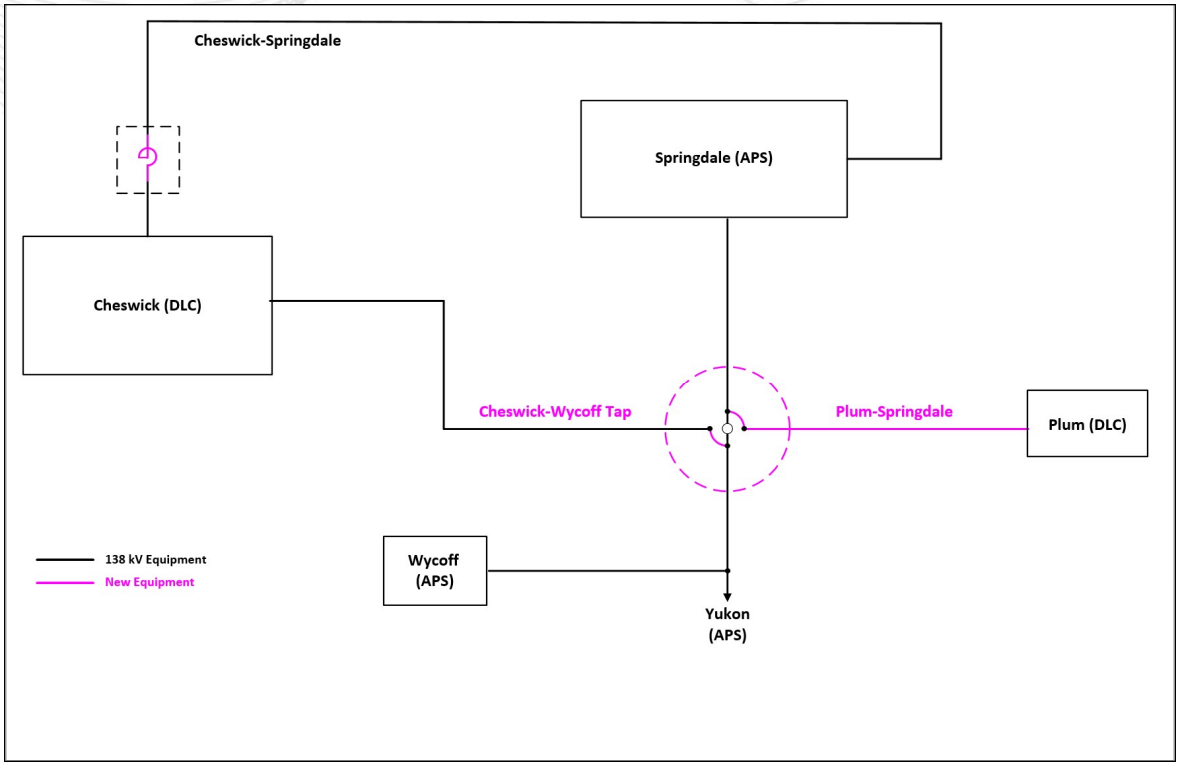
Cheswick Deactivation - 567.5 MW

- The actual deactivation date was 03/31/2022.
- FE recently informed of the necessary work associated with the existing baseline projects with Duquesne Light.
  - DLCO - B3717.1: Install a series reactor on Cheswick - Springdale 138 kV line.
  - FE – B3713.3: Relay work at Springdale.
  - DLCO - B3717.2: Transmission Line Rearrangement
    - Replacement of four structures and reconductor DLCO portion of Plum – Springdale 138 kV line.
    - Associated communication and relay setting changes at Plum and Cheswick.
  - FE - B3717.4: Transmission Line work – a new transmission structure and necessary tower work to handle the change in tension

Projected ISD: 12/31/2024*

Estimated Cost: B3717.3 - $1M, B3717.2: $2M

* Operating measures identified to mitigate reliability impacts in interim.



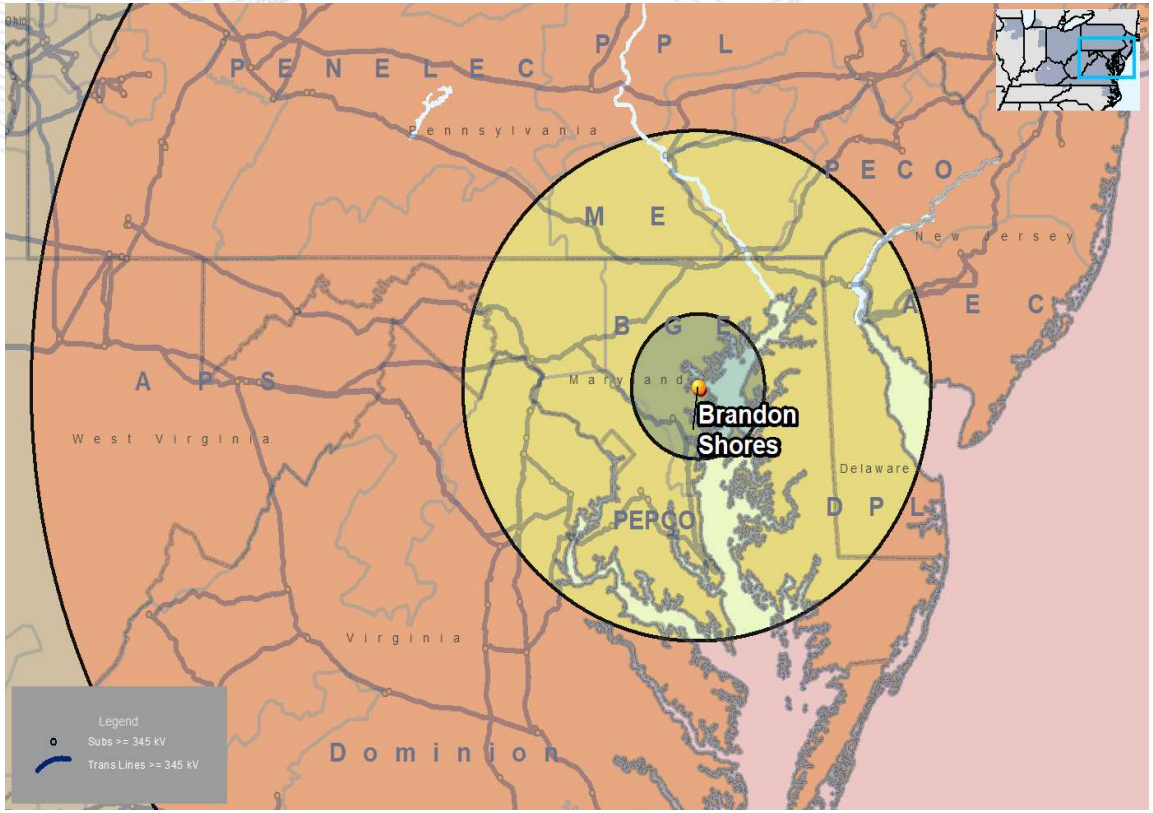
Voltage Violations – Multiple Transmission Owner Areas

Problem Statement: N-1-1 and Load Deliverability Voltage Violations – Brandon Shores Deactivations, 1282 MW

- Voltage violations: Multiple Transmission owner areas
- Contingency: N-1-1, N-1

Reliability tests indicate wide spread voltage deviation violations upon Brandon Shores' deactivations

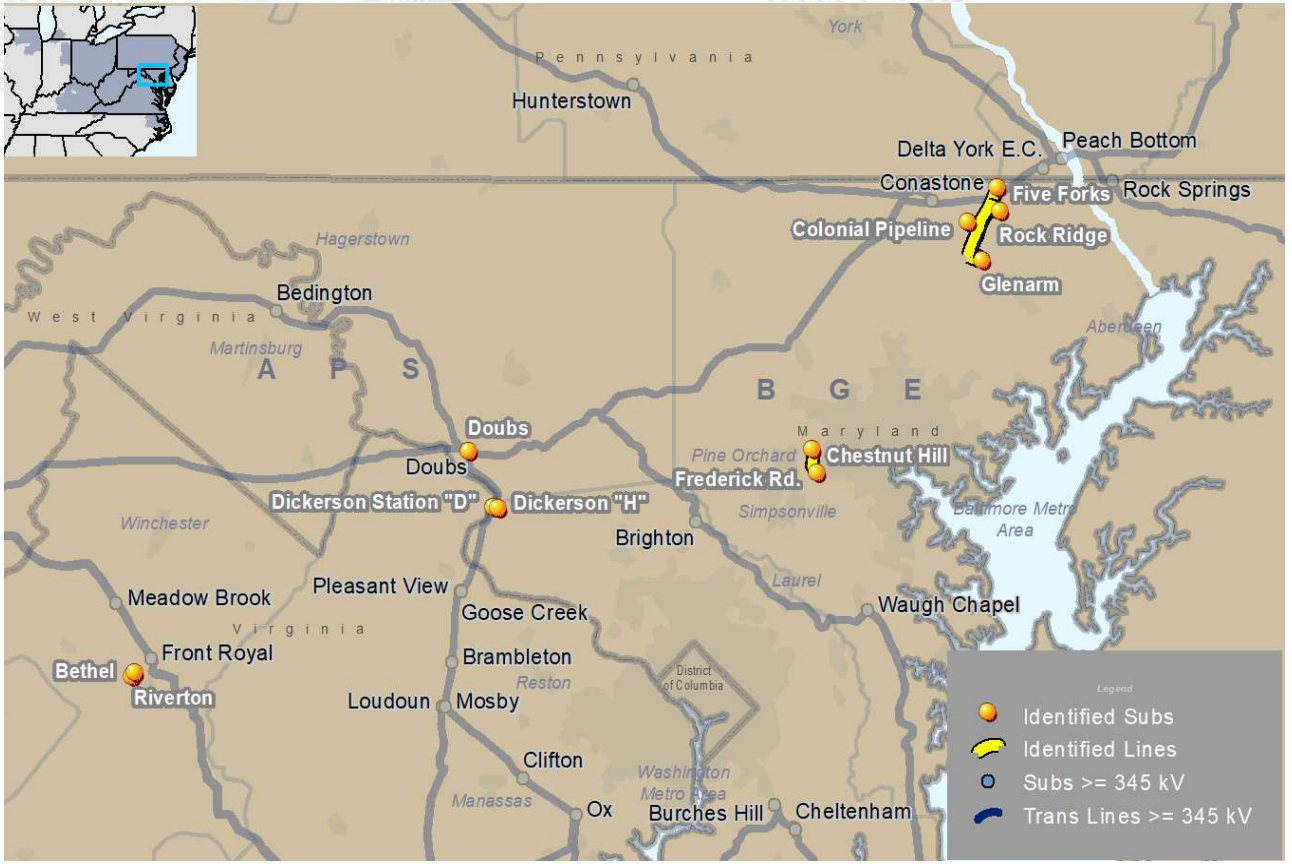
- Impacted areas :
  - BGE
  - PEPCO
  - Dominion
  - PECO
  - APS
  - ME
  - PPL



Thermal Violations - BGE, APS and PEPCO Transmission Owner Areas

Problem Statement: Generation Deliverability, N-1-1 Violations – Brandon Shores 1 and 2, 1282 MW

- Contingency: N-1-1, N-1
- BGE
  - Five Rock – Rock Ridge 1 115kV
  - Five Rock – Rock Ridge 2 115kV
  - Rock Ridge – Colonial Pipeline 1 115kV
  - Rock Ridge – Colonial Pipeline 2 115kV
  - Colonial Pipeline – Glenarm 1 115kV
  - Colonial Pipeline – Glenarm 2 115kV
  - Chestnut Hill 7 – Frederick Road 7 115kV
  - Chestnut Hill 8 – Frederick Road 8 115kV
- APS
  - Doubs Transformer 3 500/230 kV
  - Bethel – Riverton 138kV
- PEPCO
  - Dickerson – Dickerson H 230kV



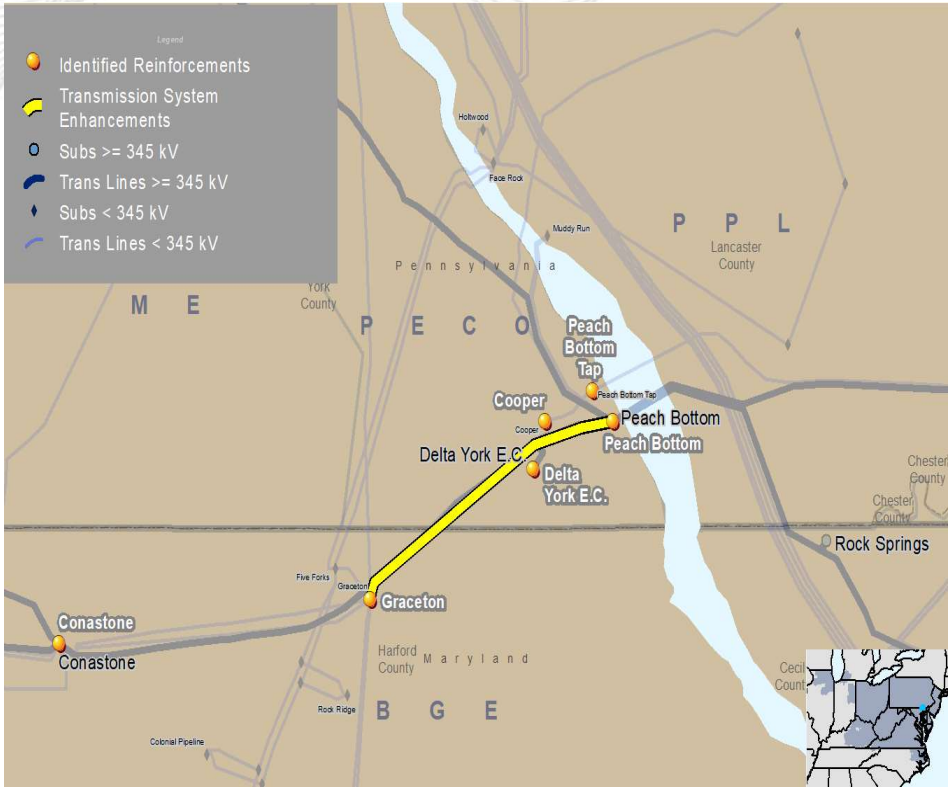
Reinforcements - BGE, PECO, and PEPCO Transmission Areas

500kV Recommended Reinforcements

- PECO - B3780.1: Peach Bottom North Upgrades – substation work
- PECO - B3780.2: Peach Bottom to Graceton – New 500kV Transmission line
- PECO - B3780.3: West Cooper Substation expansion
- BGE - B3780.4 : Peach Bottom to Graceton (BGE) – New 500kV Transmission line
- PECO - B3780.8: Graceton 500kV expansion
- PECO - B3780.10: Install New Conastone Capacitor
- PEPCO - B3780.11 : Brighton Statcom and Capacitor
- PEPCO - B3780.12 : Burchess Hill Cap

- **Projected ISD**: 12/31/2028
- **Required ISD**: 6/1/2025
- **Estimated Cost**: $333 Million

* Operating measures are not available in interim.



Reinforcements – BGE and APS Transmission Areas

230 kV & 115kV Recommended Reinforcements

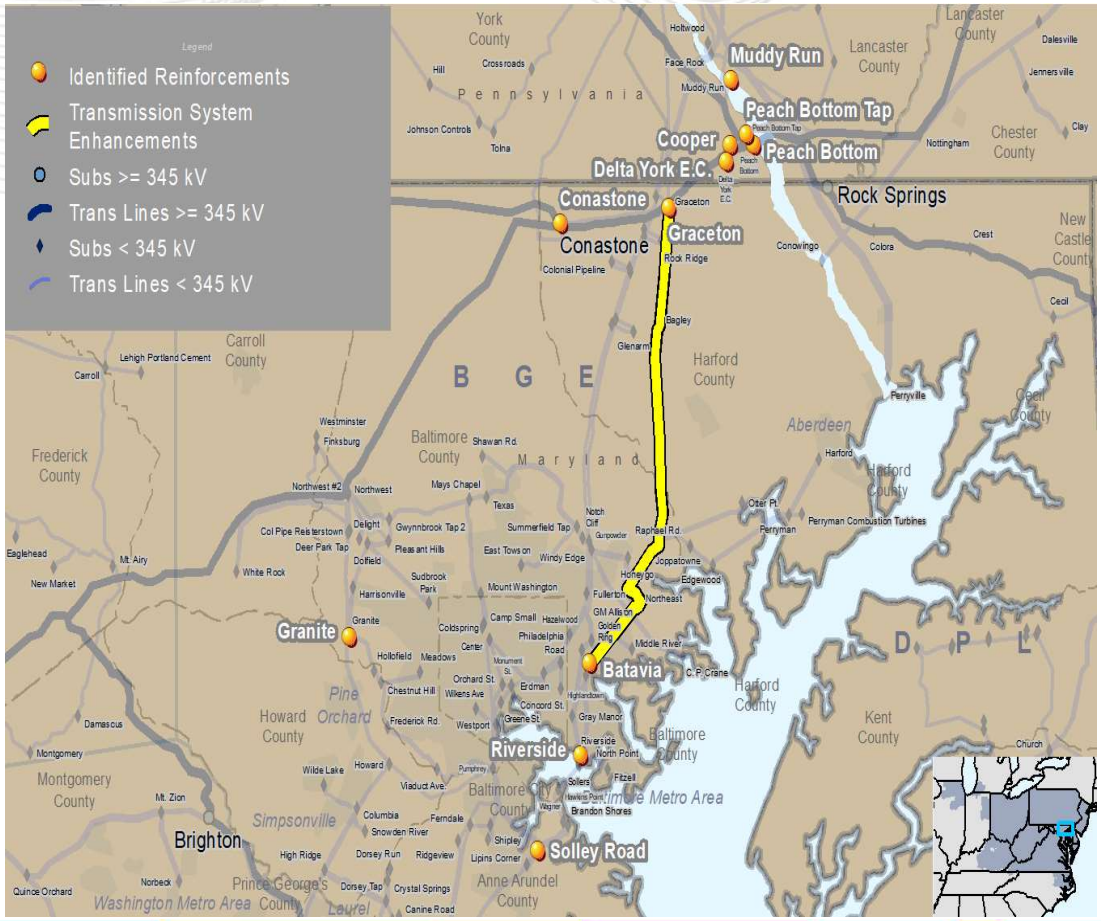
- BGE - B3780.5: Build Solley Road Substation + Statcom
- BGE - B3780.6: Build Granite Substation + Statcom
- BGE - B3780.7 : Build Batavia Road Substation
- BGE - B3780.9: Graceton to Batavia Road 230 kV Double Circuit Pole Line
- BGE – B3718.13: Batavia Road to Riverside 115kV reconductor

- **Projected ISD**: 12/31/2028
- **Required ISD**: 6/1/2025
- **Estimated Cost**: $ 452 Million

*Operating measures are not available in interim.

- APS - B3781: Replace line drops to Doubs Transformer 3

- **Projected ISD**: 12/31/2025
- **Required ISD**: 6/1/2025
- **Estimated Cost**: $ 0.8 Million

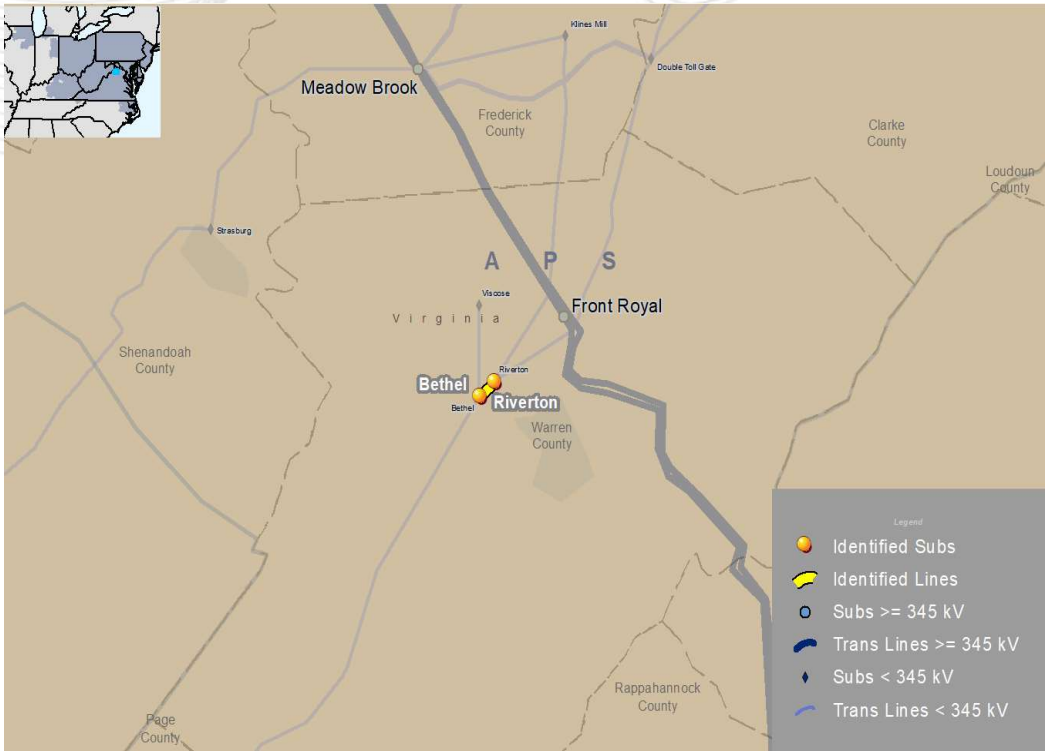


Reinforcements –APS Transmission Areas

138kV Recommended Reinforcements

– APS - B3782: Adjust Relay setting at Riverton 138kV

- **Projected ISD**: 6/1/2025
- **Required ISD**: 6/1/2025
- **Estimated Cost**: $ 0.078 Million



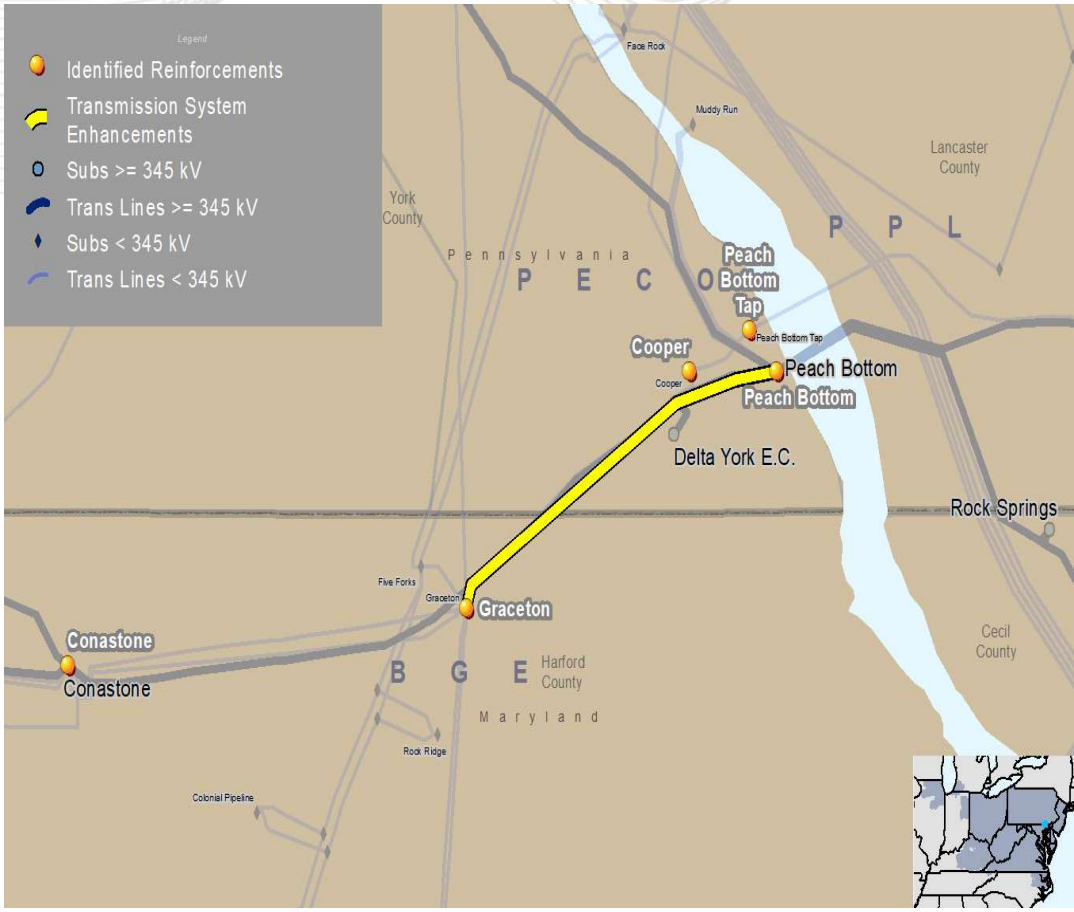
Reinforcements - BGE, PECO, and PEPCO Transmission Areas

500kV Recommended Reinforcements

- PECO - B3780.1: Peach Bottom North Upgrades – substation work
- PECO - B3780.2: Peach Bottom to Graceton – New 500kV Transmission line
- PECO - B3780.3: West Cooper Substation expansion
- BGE - B3780.4 : Peach Bottom to Graceton (BGE) – New 500kV Transmission line
- BGE - B3780.8: Graceton 500kV expansion
- BGE - B3780.10: Install New Conastone Capacitor
- PEPCO - B3780.11 : Brighton Statcom and Capacitor
- PEPCO - B3780.12 : Burchess Hill Cap

- **Projected ISD**: 12/31/2028
- **Required ISD**: 6/1/2025
- **Estimated Cost**: $333 Million

* Operating measures are not available in interim.



Reinforcements – BGE and APS Transmission Areas

230 kV Recommended Reinforcements

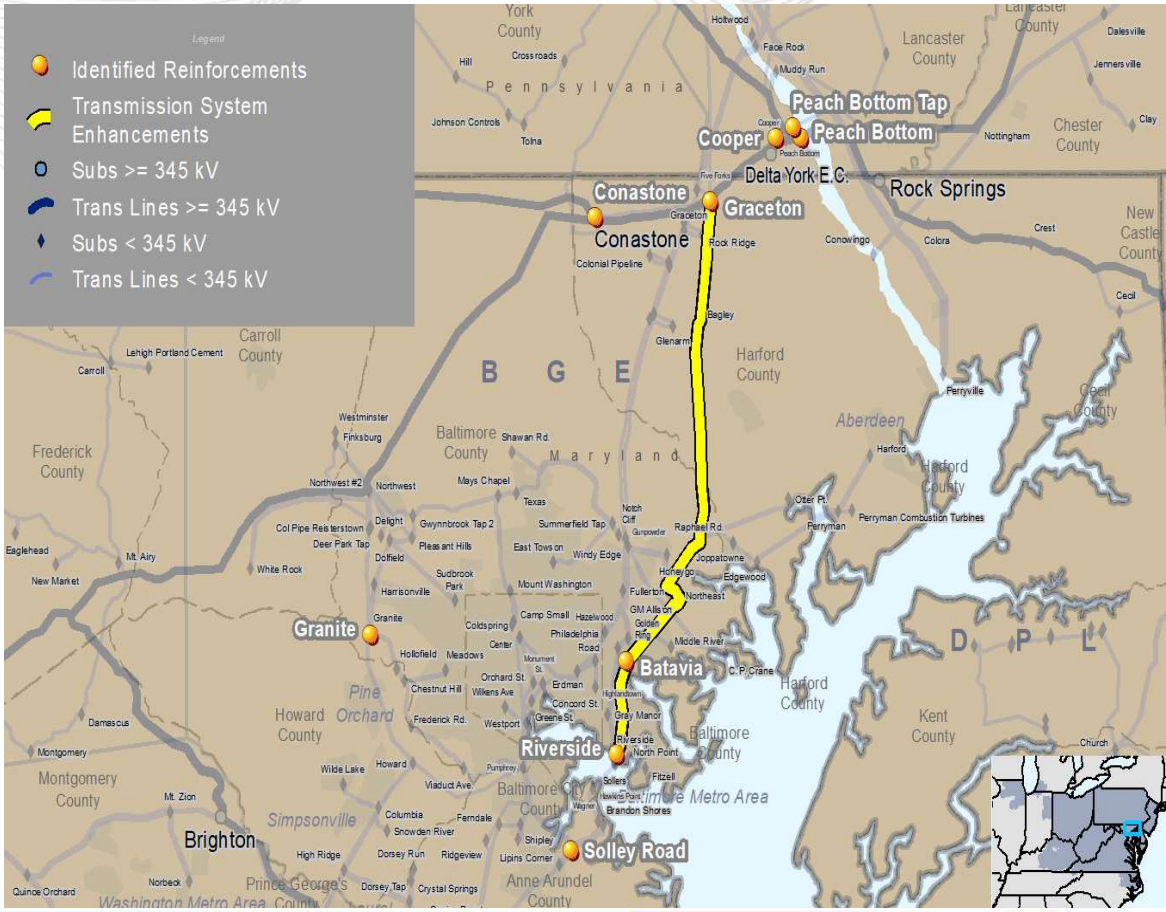
- BGE - B3780.5: Build Solley Road Substation + Statcom
- BGE - B3780.6: Build Granite Substation + Statcom
- BGE - B3780.7 : Build Batavia Road Substation
- BGE - B3780.9: Graceton to Batavia Road 230 kV Double Circuit Pole Line
- BGE – B3780.13: Batavia Road to Riverside 230kV reconductor

- **Projected ISD**: 12/31/2028
- **Required ISD**: 6/1/2025
- **Estimated Cost**: $ 452 Million

*Operating measures are not available in interim.

- APS - B3781: Replace line drops to Doubs Transformer 3

- **Projected ISD**: 12/31/2025
- **Required ISD**: 6/1/2025
- **Estimated Cost**: $ 0.8 Million

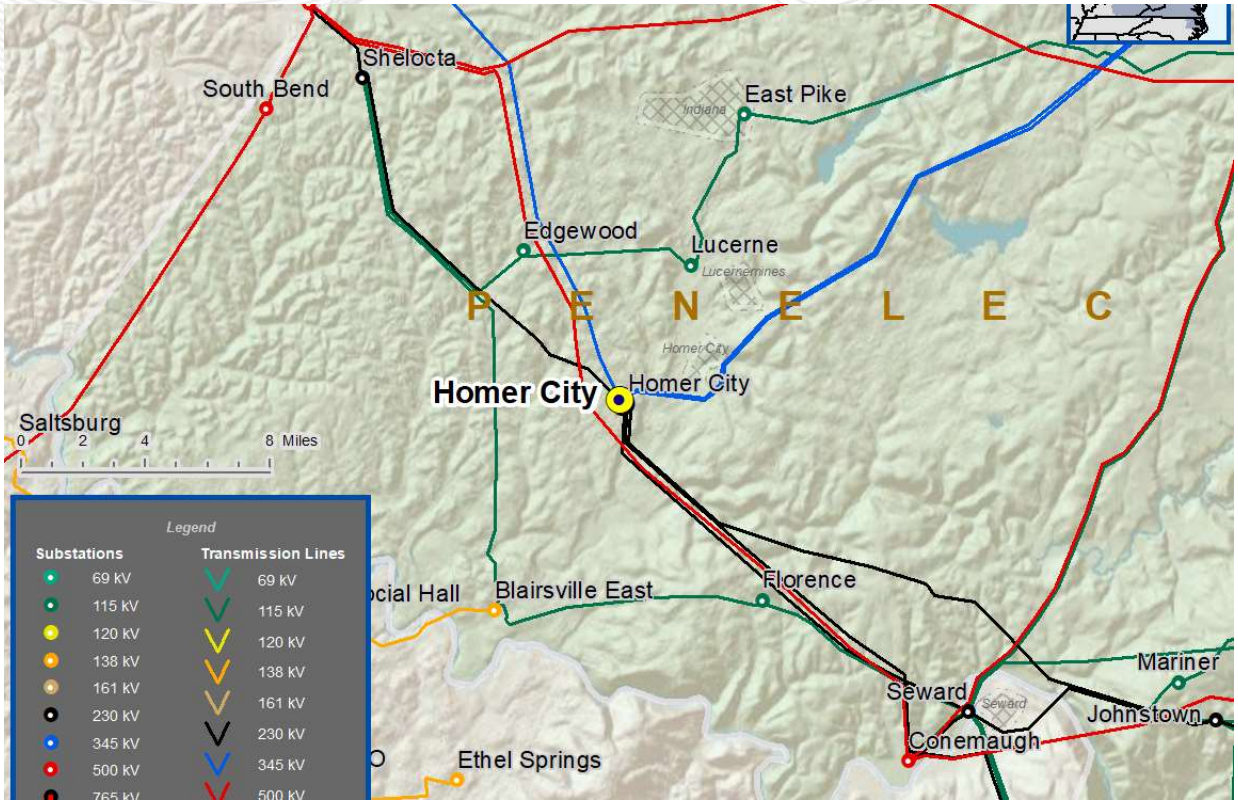


PENELEC Transmission Area

Homer City Deactivation

- **PENELEC –B3783:**
  - Cut and remove the 345 kV and 230 kV generator lead lines
  - Install new station service supply and separate AC station service
  - Separate protection and controls schemes
  - Review and adjust relay protection settings

- **Projected ISD:** 6/1/2025
- **Required ISD:** 6/1/2025
- **Estimated Cost:** $ 2.25 Million



Cheswick Deactivation – APS Transmission Area

Cheswick Deactivation - 567.5 MW

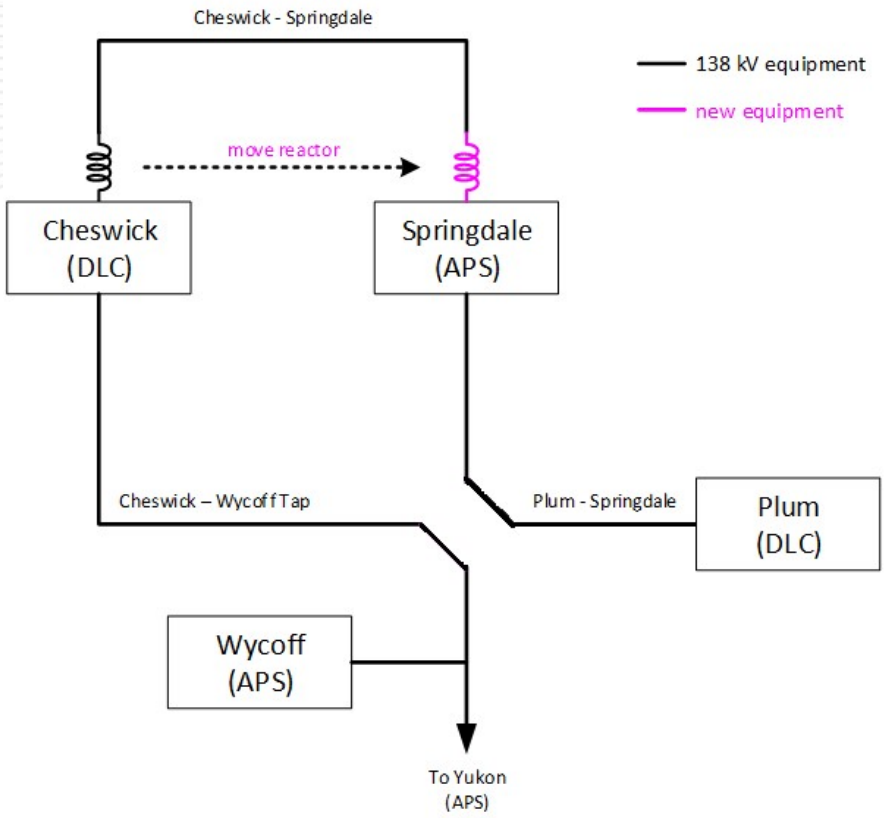
- The actual deactivation date was 03/31/2022.
- FE recently informed of the necessary work associated with the existing baseline projects with Duquesne Light.
- **Update: Series reactor from Cheswick (DLCO) will be relocated to Springdale (APS) due to insufficient space.**

  - DLCO - B3717.1:
    - Install a series reactor on Cheswick – Springdale 138 kV line.
  - DLCO - B3717.2:
    - Transmission Line Rearrangement: Replacement of four structures and reconductor DLCO portion of Plum – Springdale 138 kV line.
    - Associated communication and relay setting changes at Plum and Cheswick.
  - FE – B3713.3:
    - Relay work at Springdale.
  - FE – B3717.4:
    - Transmission Line work – a new transmission structure and necessary tower work to handle the change in tension at Cheswick.

Projected ISD: **06/01/2025**

Estimated Cost: **B3717.1 - $7.36M**, B3717.2: $15M, B3717.3 - $1M, B3717.4: $2M

* Operating measures identified to mitigate reliability impacts in interim.
**



Deactivation Status

Unit(s)	MW	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Warrior Run Gen 1	180	APS	06/01/2024	Reliability analysis completed. Reliability impacts identified. Operating measures available in interim.
H.A Wagner	844	BGE	06/01/2025	Reliability analysis in progress.

* PJM does not approve deactivations, but rather identifies whether the requested deactivation date could lead to reliability concerns on the system. When PJM determines a proposed deactivation would adversely affect the reliability of the Transmission System due to upgrade completion timeline and absent operational measures, PJM desires and requests the Generation Owner extend operations of the deactivating unit(s). The Generation Owner may elect to support system reliability by operating until necessary network upgrades are completed by either filing its proposed Cost of Service Recovery Rate (CSRR) at FERC or accepting the Deactivation Avoidable Cost Credit (DACC) provided in the Tariff. PJM will announce at subsequent TEAC(s) after the Generation Owner submits a CSRR to the FERC and after the FERC accepts the CSRR filing or after the Generation Owner agrees to the DACC.

Thermal Violations - APS Transmission Owner Areas

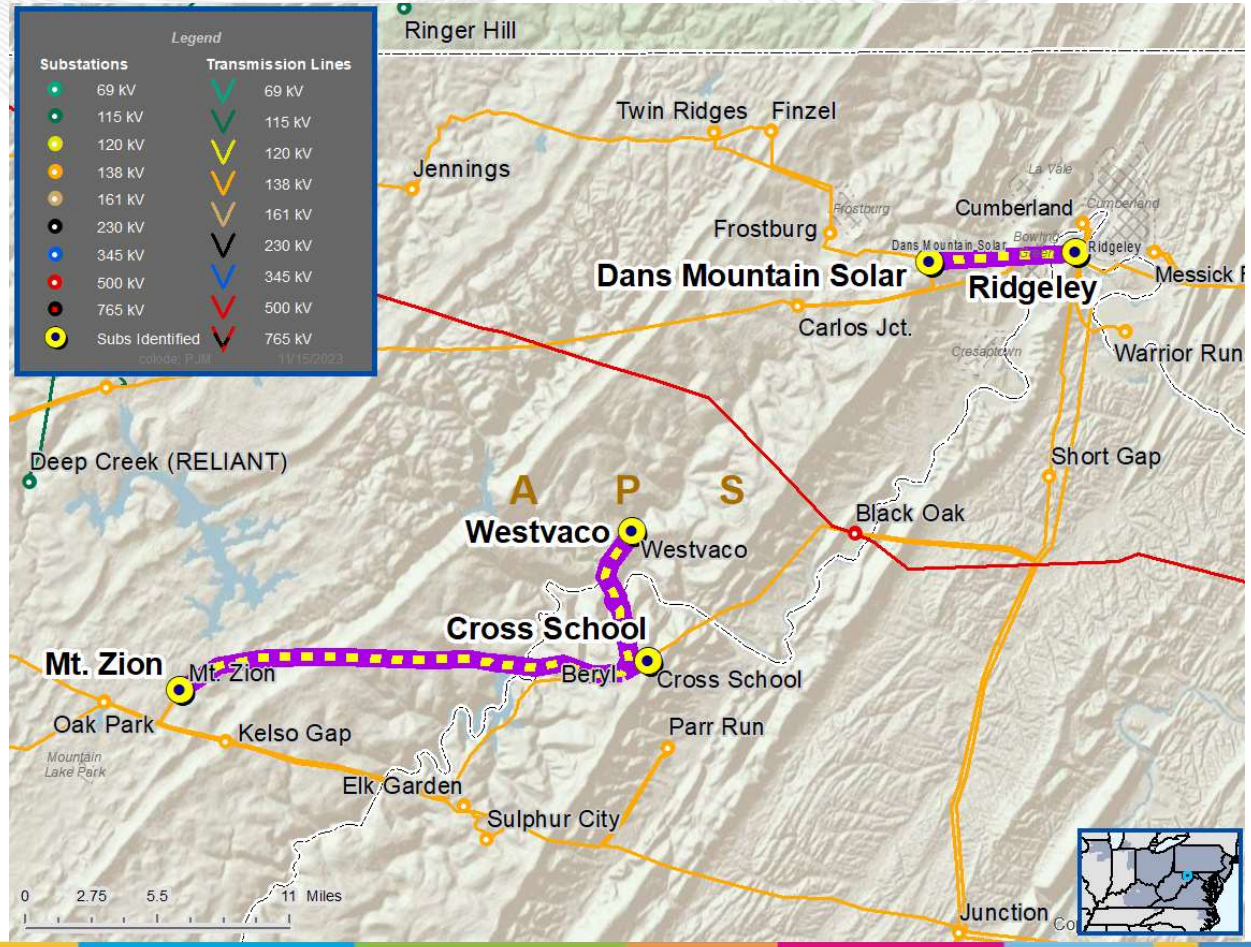
Problem Statement: Generation Deliverability, – Warrior Run 1, 180 MW

- Contingency: Generation Deliverability

PJM's assessment indicates reliability violations with Warrior Run's requested deactivation of the following circuits .

- APS
  - Mt. Zion – Westvaco 138 kV
  - Westvaco – Cross School 138 kV
  - Dans Mountain Solar – Ridgeley 138 kV

- 2028 Window 3 solutions will mitigate the above violations
- Interim operational measures identified to alleviate violations until planning solution is in-service.



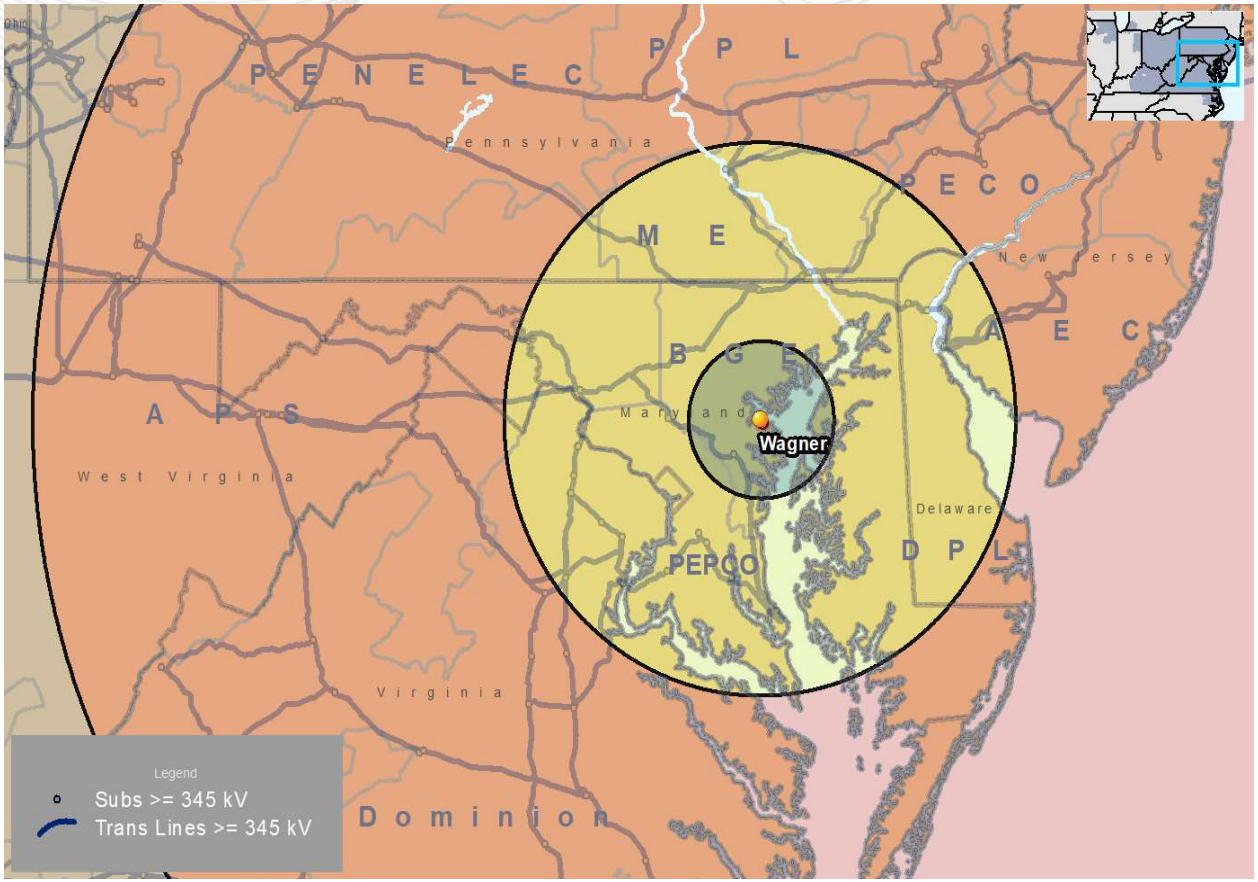
Voltage Violations – Multiple Transmission Owner Areas

Problem Statement: N-1-1 Voltage Violations – Wagner Deactivations, 844 MW

- Voltage violations: Multiple Transmission owner areas
- Contingency: N-1-1

Reliability tests indicate wide spread voltage deviation violations upon Wagner ' deactivations, majority of them are associated with losing Brandon Shore's Generator(s)

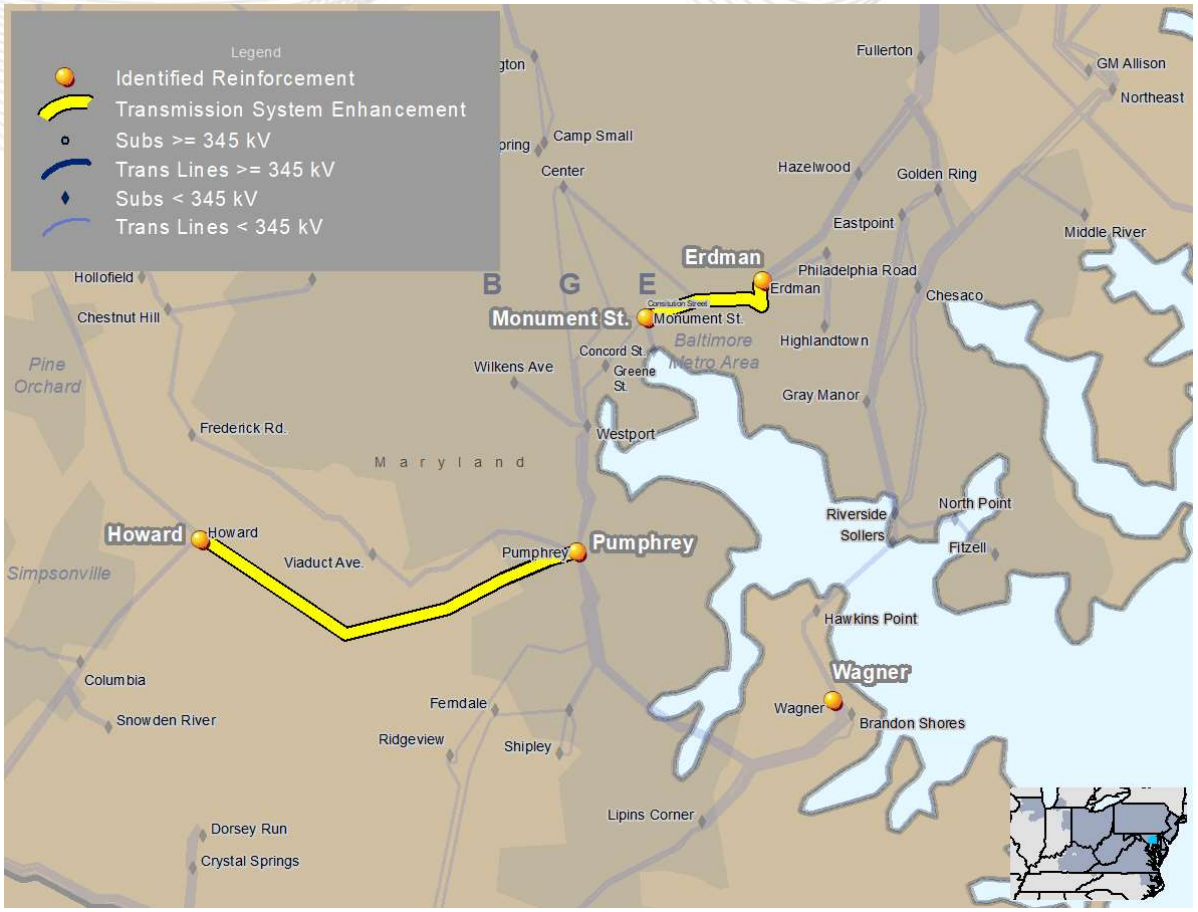
- Impacted areas :
  - BGE
  - PEPCO
  - Dominion
  - PECO
  - APS
  - PPL



Thermal Violations - BGE, APS and PEPCO Transmission Owner Areas

Problem Statement: N-1-1 Violations – Wagner Deactivations, 844 MW

- BGE
  - Wagner 230/115kV Transformer 1
  - Wagner 230/115kV Transformer 2
  - Howard – Pumphrey 230kV
  - Monument St to Erdman 115kV



BGE Transmission Zone – Wagner Deactivation

- PJM is in the process of performing additional assessments in light of the upcoming Brandon Shore's immediate need solutions and 2022 Window 3 solutions.
- PJM will continue its analysis to determine impact and communicate findings in subsequent TEAC meetings.

No Identified Issues: Operational Performance

2022 RTEP Multi-Driver Proposal Window No. 1

2022 RTEP Multi-Driver Proposal Window 1

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

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

ComEd Transmission Zone: Baseline
Crete-St. John 345 kV Area Improvement

Process Stage: Recommended Solution

Criteria: Summer & Winter Generator Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP Summer & Winter case

Proposal Window Exclusion: None

Problem Statement:

MDW1-GD-S1620, MDW1-GD-W172, MDW1-GD-W171, MDW1-GD-W188, MDW1-GD-W190, MDW1-GD-W185, MDW1-GD-W332, MDW1-GD-W331, MDW1-GD-W309, MDW1-GD-W404, MDW1-GD-W419, MDW1-GD-W392, MDW1-GD-W393; MDW1-ME-01, MDW1-ME-02, MDW1-ME-03, MDW1-ME-04

In 2027 RTEP summer case, the Stillwell-Dumont 345 kV line is overload for an N-2 outage. In the 2027 RTEP winter case, the Crete-St. John 345 kV line is overloaded for N-1 and N-2 outages, and the Crete-E. Frankfort and University Park N-Olive 345 kV lines are overloaded for N-1 outages.

Additionally, in the 2027 RTEP cases there was congestion identified on the Dumont-Stillwell 345 kV line, the E. Frankfort-Crete-St. John 345 kV line and University Park N-Olive 345 kV line.

ComEd Transmission Zone: Baseline
Crete-St. John 345 kV Area Improvement

Recommended Solution: Proposal 644 (modified) and proposal 908

- Outside of the Green Acres substation, swap the NIPSCO Green Acre Tap towers from the St. John-Green Acres-Olive 345 kV line to the University Park N-Olive 345 kV line to create a University Park N-Green Acres-Olive and St. John-Olive 345 kV lines. **(B3775.1)** – NEET ($1.98 M)
- Reconductor NEET's section of Crete(IN/IL border)-St. John 345 kV line (6.95 miles) (conversion of part of S2631). **(B3775.2)**– NEET ($1.99 M)
- Rebuild ComEd's section of 345 kV double circuit in IL from St. John to Crete (5 miles) with twin bundled 1277 ACAR conductor. **(B3775.3)** – ComEd ($16.64 M)
- Rebuild 12.7 miles of 345 kV double circuit extending from Crete to E. Frankfort with twin bundled 1277 ACAR conductor. **(B3775.4)**– ComEd ($42.28 M)
- Replace E. Frankfort 345 kV circuit breaker "9-14" with 3150A SF6 circuit breaker. **(B3775.5)**– ComEd ($3.27 M)
- Perform sag study mitigation work on the Dumont-Stillwell 345 kV line (remove a center-pivot irrigation system from under the line allowing for the normal and emergency ratings of the line to increase, replace two structures and modify a third structure). **(B3775.6)**– AEP (~~$0.22 M~~ $2.22M)
- Upgrade the limiting element at ~~Stillwell or~~ Dumont substation to increase the rating of the Stillwell-Dumont 345 kV line to match conductor rating. **(B3775.7)**– AEP ($2 M ~~$1M~~)

(continued on next slide)

ComEd Transmission Zone: Baseline
Crete-St. John 345 kV Area Improvement

Recommended Solution: (continued from previous slide)

- Upgrade the existing terminal equipment (substation conductor) at St. John on the existing Crete to St. John 345 kV line with bundled 2x1590 ACSR Lapwing **(B3775.8)** – NIPSCO* ($2 M)
- Upgrade the existing terminal equipment (substation conductor) at Green Acres on the existing St. John to Green Acres 345 kV line with bundled 2x1590 ACSR Lapwing **(B3775.9)** – NIPSCO* ($2 M)
- Perform a sag study on the Olive – University Park 345kV line to increase the operating temperature to 225 F. Remediation work includes two tower replacements on the line. **(B3775.10)** – AEP ($1.5 M)
- Upgrade the limiting element at Stillwell substation to increase the rating of the Stillwell-Dumont 345 kV line to match conductor rating. **(B3775.11)**– NIPSCO** ($1.78M)

* NEET will be designated to coordinate with NIPSCO to construct the work required on NIPSCO

** AEP will be designated to coordinate with NIPSCO to construct the work required on NIPSCO

Market Efficiency Benefits:

- B/C Ratio: ~~1.99~~ 1.92
- Congestion solved: 87%
- 15-years Net Load Payment Savings: $169.83 million
- 15-years PJM CO2 Decrease: 556,740 metric tons

Additional Benefits: Addresses aging infrastructure on ComEd's section of Crete-St. John 345 kV double circuit (5 miles), NEET's section of Crete-St. John 345 kV line (6.95 miles) and ComEd's 345 kV double circuit extending from Crete to East Frankfort (12.7 miles).

Total Estimated Cost: ~~$73.88M~~ 77.66M

Required IS Date: 12/1/2026

Projected IS Date: 12/1/2026

Previously Presented: 12/6/2022

ComEd Transmission Zone: Baseline
Crete-St. John 345 kV Area Improvement

SN/SE/WN/WE (MVA) Ratings

Facility	Existing	Preliminary
Stillwell-Dumont 345 kV	1075/1075/1532/1532	1408/~~1887~~ 1832/1780/~~2143~~ 2038

SN/SE/SSTE/SLD
WN/WE/WSTE/WLD (MVA) Ratings

Facility	Existing	Preliminary
Crete-St. John 345 kV	1091/1399/1483/1508 1310/1557/1658/1772	1679/2058/2107/2280 2091/2381/2390/2390
E. Frankfort-Crete 345 kV	1091/1399/1483/1674 1310/1557/1658/1873	1679/2058/2107/2280 2091/2381/2445/2648
E. Frankfort-University Park N 345 kV	1091/1399/1483/1674 1310/1557/1658/1873	1679/2058/2107/2280 2091/2381/2445/2648
University Park N-Olive 345 kV	971/971/971/1001 1234/1234/1234/1272	N/A
St. John-Olive 345 kV	N/A	971/971/971/1001 1234/1234/1234/1272
University Park N - Green Acre Tap West 345 kV	N/A	1679/2004/2107/2280 1976/2142/2445/2648
Green Acre Tap West - Green Acre 345 kV	N/A	1958/2390/2390/2390 2239/2390/2390/2390
Green Acre-Green Acre Tap East 345 kV	N/A	1091/1091/1091/1195 1195/1195/1195/1195
Green Acre Tap East -Olive 345 kV	N/A	971/1079/1079/1112 1234/1310/1310/1350

NP* = Not Provided; **Note**: Ratings in table are as provided in modeling files.

SN/SE/SSTE/SLD: Summer Normal/Summer Emergency/Summer Short Term Emergency/ Summer Load Dump
WN/WE/WSTE/WLD: Winter Normal/Winter Emergency/Winter Short Term Emergency/Winter Load Dump

PJM-MISO TMEP Study
2nd Review

- Historically binding (2020 + 2021) Market-to-Market flowgates
  - Focus on constraints with >$1million congestion
- Initial list of TMEP study candidates posted at the April 25, 2022 IPSAC meeting.
- TMEP Criteria
  - Limited to historically binding M2M flowgates.
  - Projects must be in service by 3rd summer peak .
  - Projects capital cost < $20 million.
  - Benefits based on average of past 2 years of historical congestion (Day Ahead + Balancing)
  - Four years worth of benefits must completely cover project's installed capital cost
- Interregional cost allocation based on congestion relief in each RTO
    - Adjusted by M2M payments

ComEd: Baseline
Powerton Sub 138kV Wave Trap

Process Stage: Recommended Solution

Reference: PJM/MISO JOA – Article 9 – Interregional TMEP Analysis

Assumptions: 2-year historical congestion (2020, 2021)

Analytical Framework: 2022 Coordinated System Plan Study

TMEP Candidate: Yes

Problem Statement: Greater than $1 M of historical congestion identified on the Powerton-Towerline 138kV tie-line with MISO (Ameren)

Existing Facility Rating: SN/SE/WN/WE = 195 / 214 / 211 / 229

Proposed Facility Rating: SN/SE/WN/WE = 207 / 268 / 252 / 298

Proposed Solution:

b3760: At Powerton Substation (ComEd), replace most limiting facility, 800A wave trap with 2000A wave trap, on the Powerton-Towerline 138kV line terminal.

Cost/Benefit Analysis:

- **Estimated TMEP Cost**: $0.2 M
- **Annual TMEP Congestion Benefit**: $ 1.827 M/Year (2-Years Hist. Cong. Avg.)
- **Expected TMEP Future Congestion Relief:** $ 7.31 M = 4 x $ 1.827 M/Year
  (Sum of $ 1.827 M annual congestion benefit over 4 years period after study year).

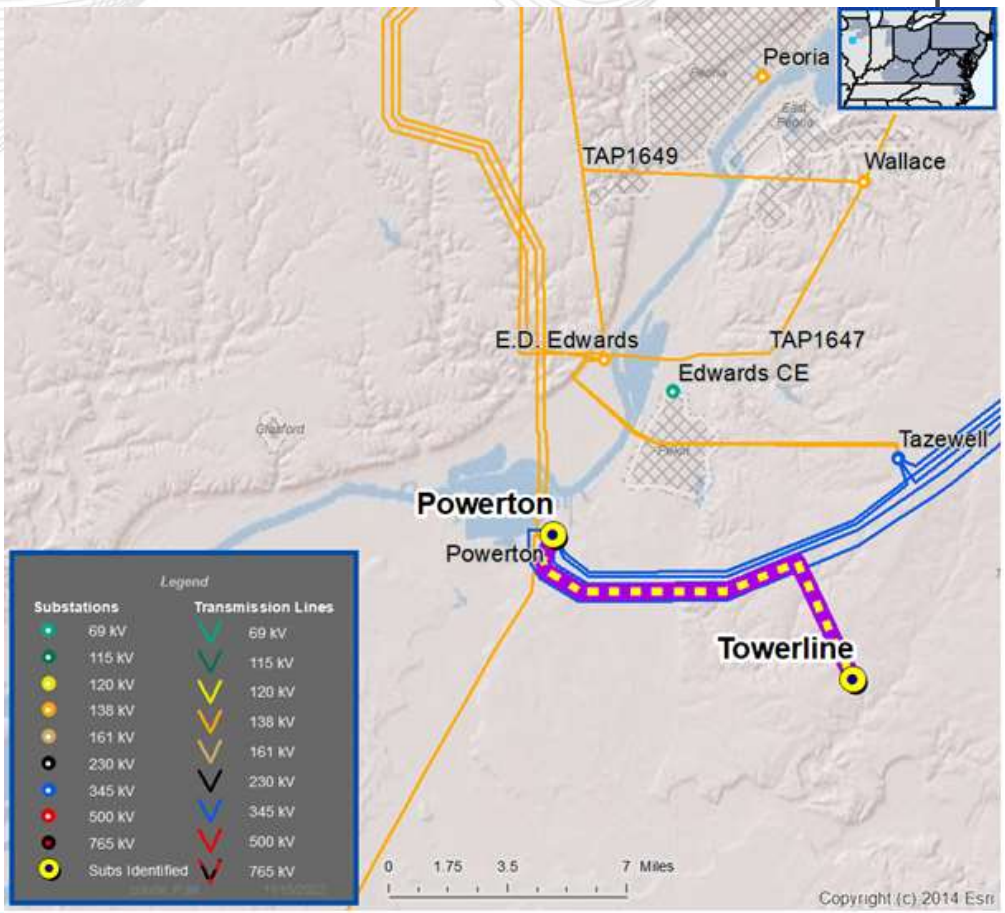
Criterion: TMEP Capital Cost < Expected TMEP Future Congestion Relief

$0.2 M < $ 7.31 M

Interregional Cost Allocation: PJM 71.62%, MISO 28.38%

Required In-Service: 6/1/2025

Previously Presented: 12/6/2022



PJM 2022 Window 1 RTEP Update

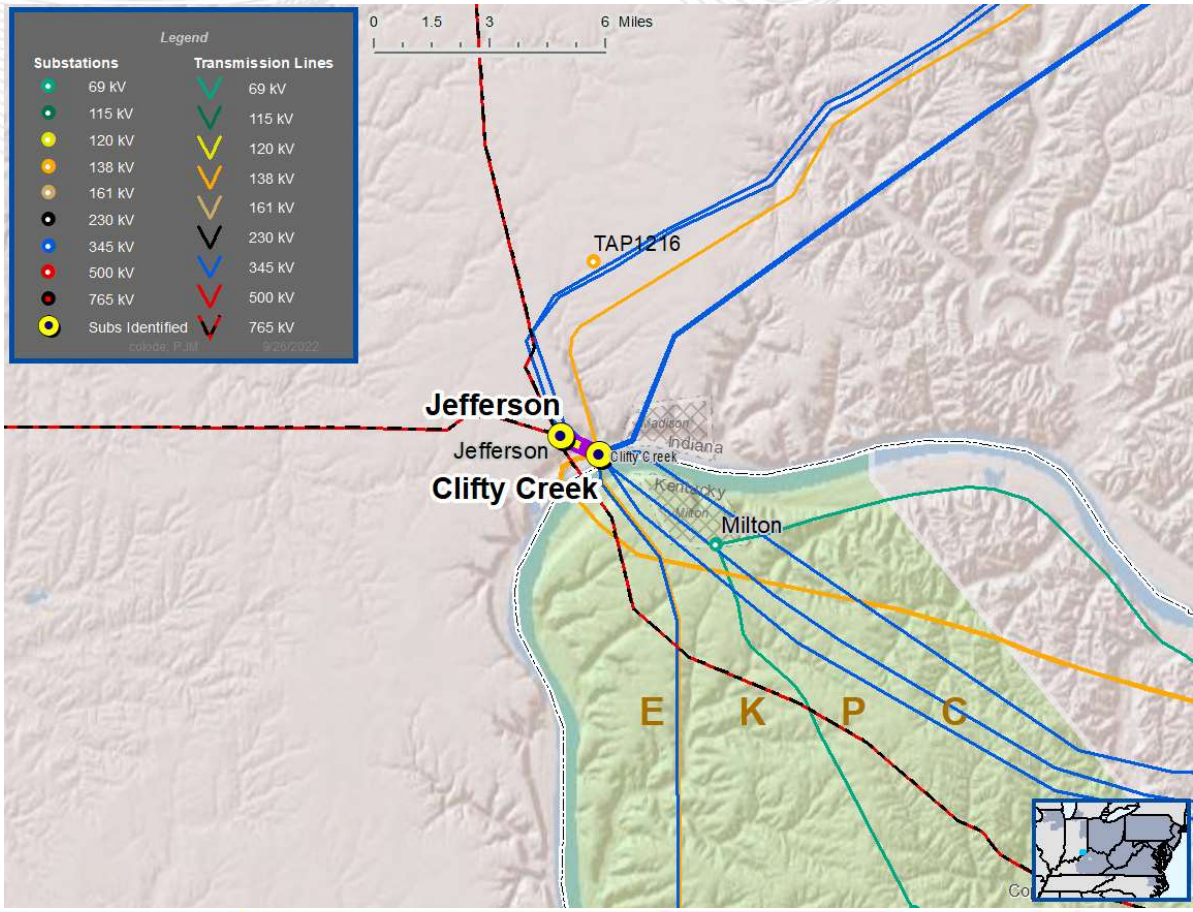
AEP Transmission Zone: Baseline
Clifty Creek Switch Replacements

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

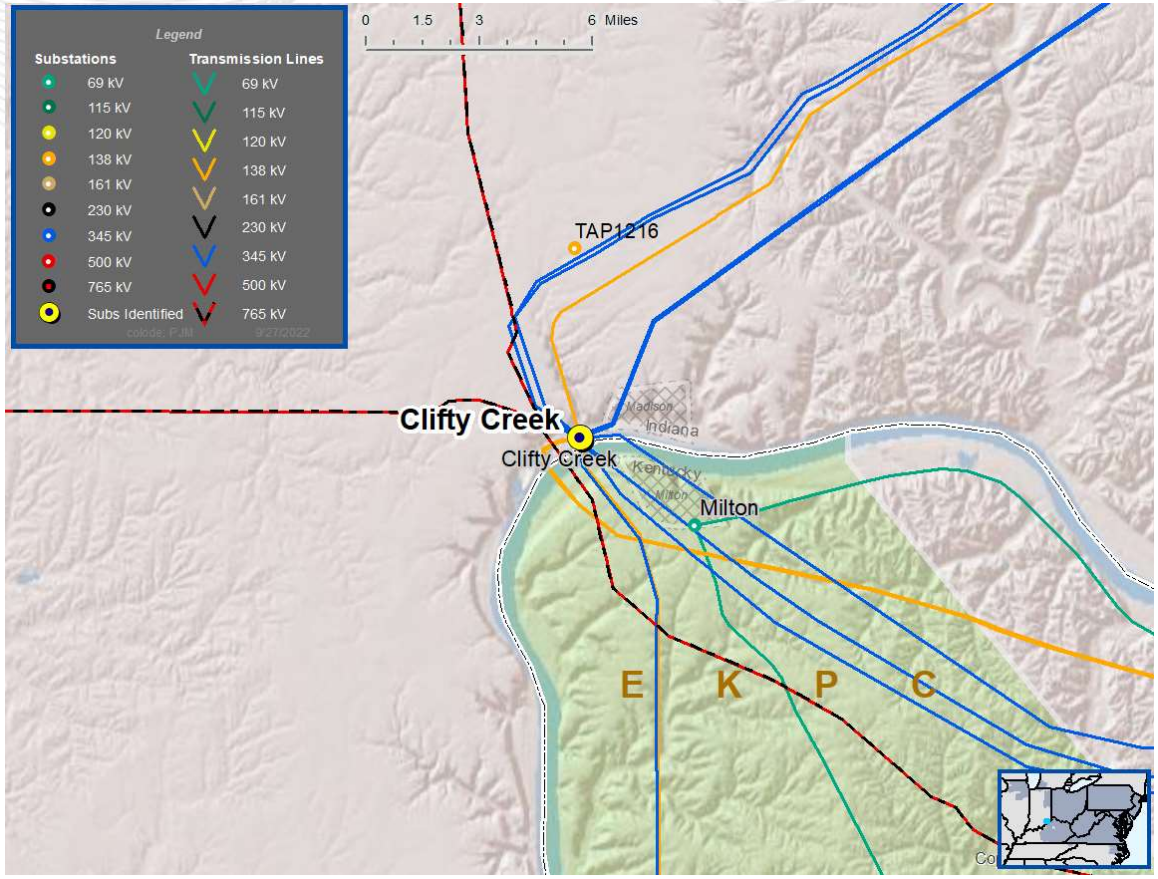
Recommended Solution: Proposal #2022_W1-965

Replace four Clifty Creek 345 kV 3000 A switches with 5000 A 345 kV switches. **(B3728)**

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

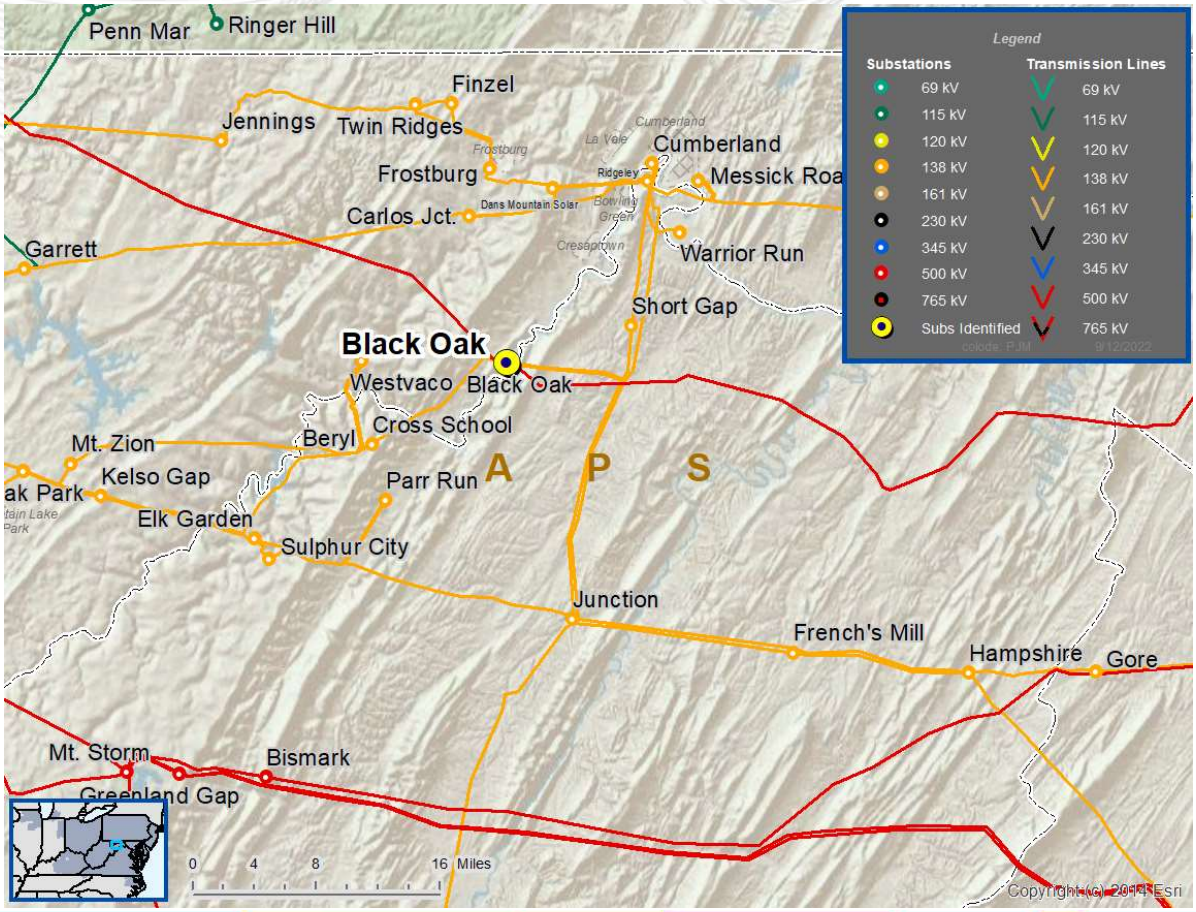
Assumption Reference: 2027 RTEP assumption

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: 10/4/2027

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

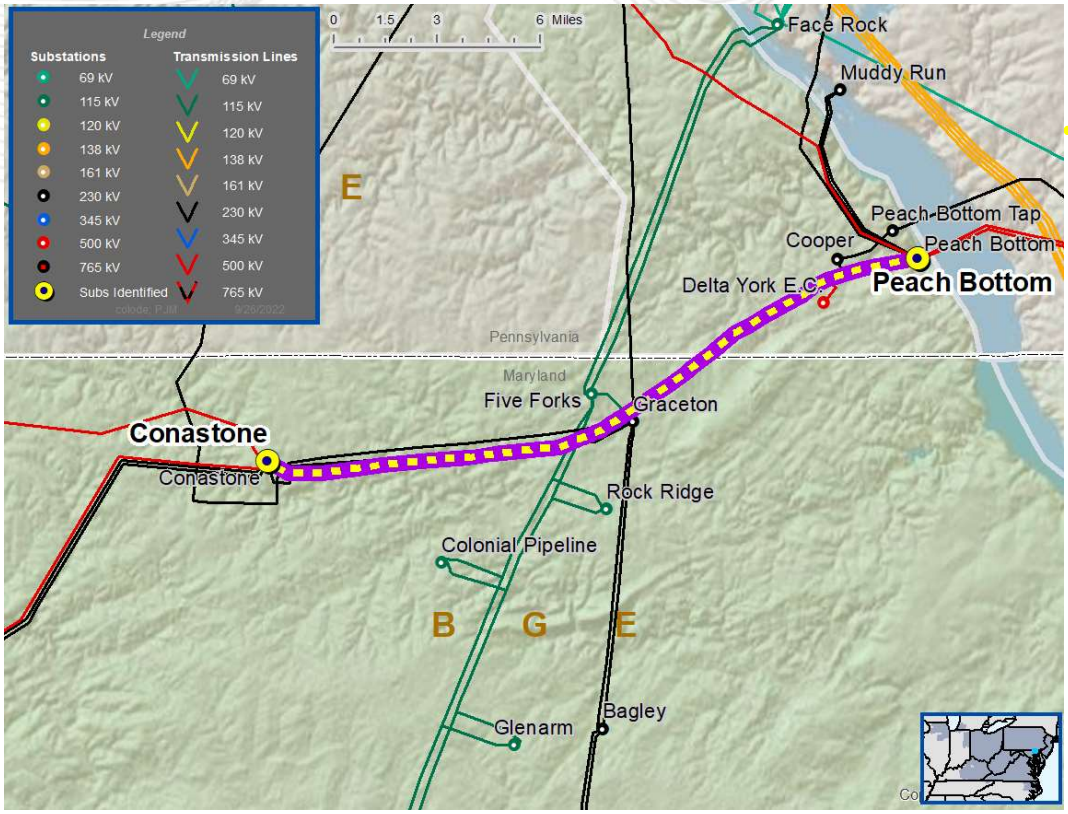
Recommended Solution:
BGE: - Upgrade two Breaker bushinsgs on the 500kV Line 5012 (Conastone – Peach Bottom) at Conastone Substation. (B3728.1)
PECO: Replace 4 meters and bus work inside Peach Bottom substation on the 500 kV Line 5012 (Conastone – Peach Bottom). (B3728.2)

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

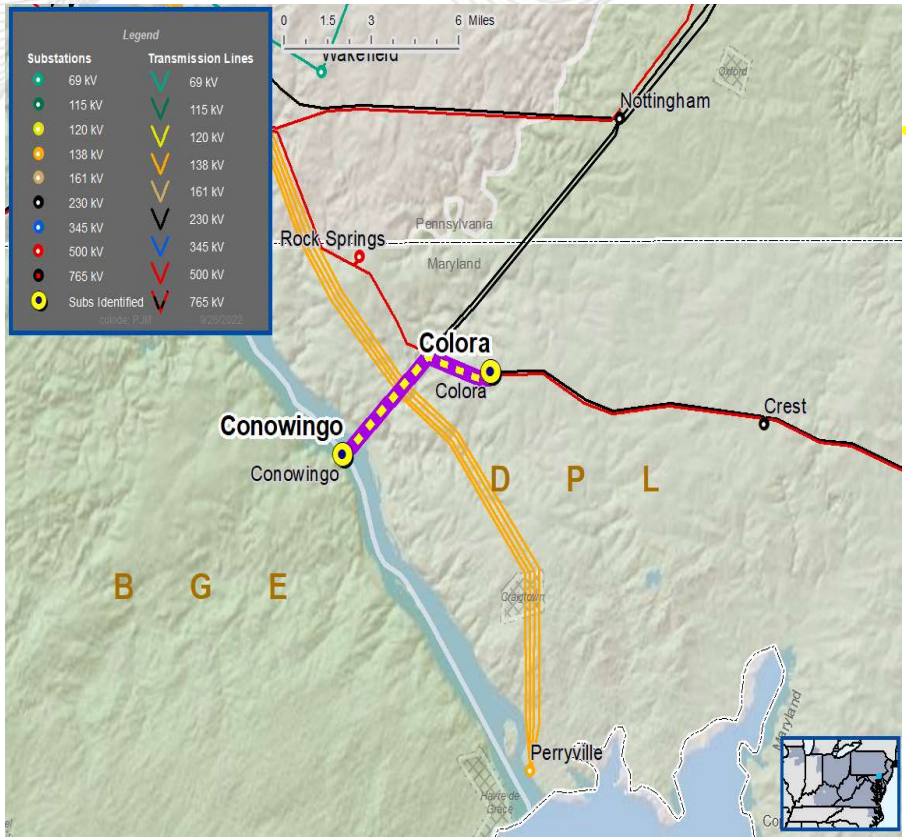
Recommended Solution:
Proposal ID 236: Upgrade dead end structures on Conowingo – Colora 230 kV line in DPL to increase the line rating. Increase the Maximum Operating Temperature of DPL Circuit 22088 from 125 C to 140 C, by installing cable shunts on each phase, on each side of four (4) dead-end structures,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

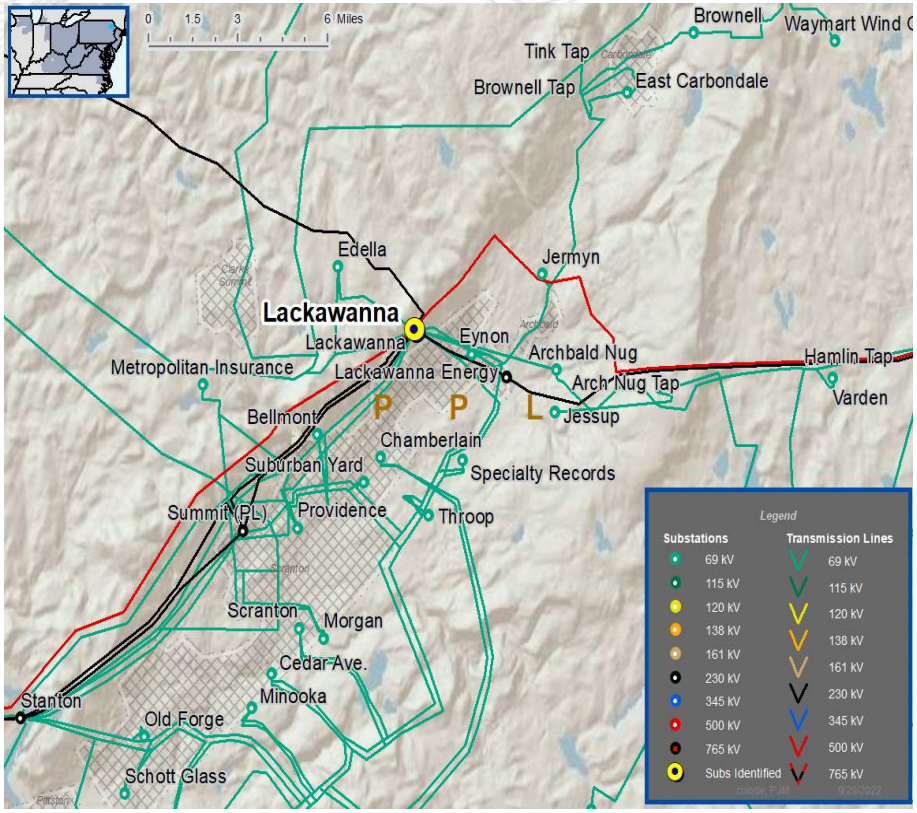
Alternatives:

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



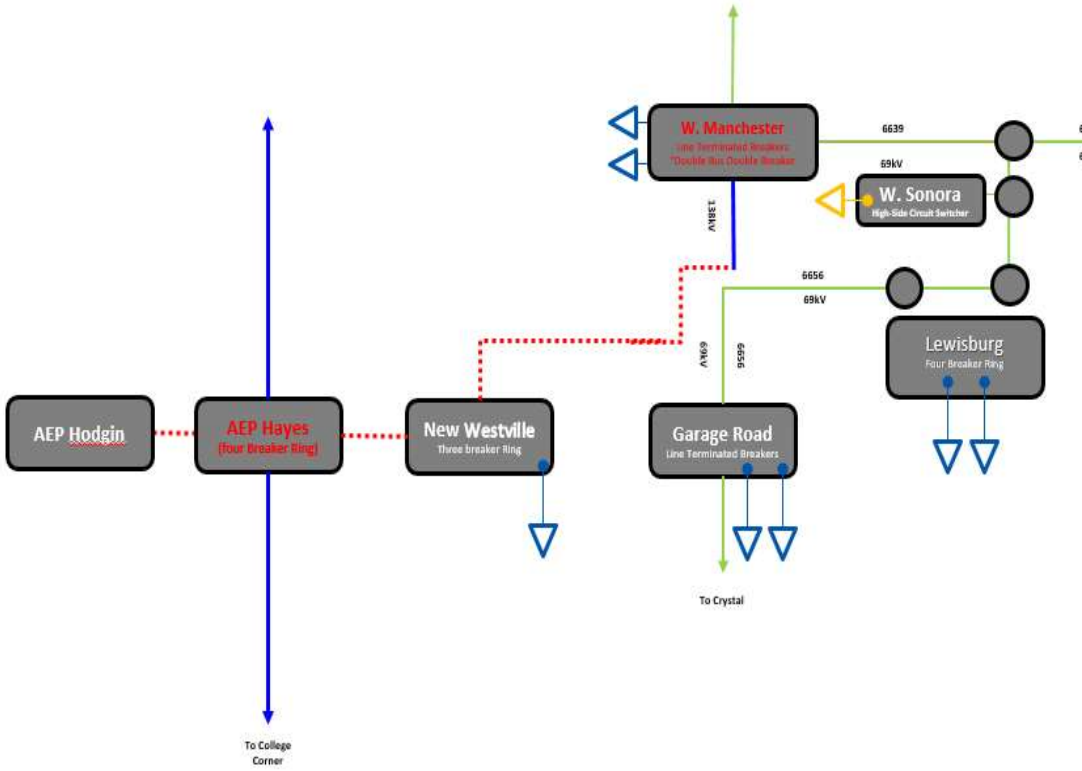
Recommended Solution: PJM Identified Option: Converting s2585.2 through .4 and .11 through .13
S2585.2: Construct a 138kV 1.86-mile single circuit transmission line from New Westville – AEP Hayes station. (**B3766.1**) Estimated Cost: $3.7M, **Projected IS Date**: 12/31/2025
S2582.3: Construct a new approximate 11-mile single circuit 138kV line from New Westville to the Lewisburg tap off 6656. Convert a portion of 6656 West Manchester – Garage Rd 69kV line between West Manchester - Lewisburg to 138kV operation (circuit is built to 138kV). This will utilize part of the line already built to 138kV and will take place of the 3302 that currently feeds New Westville. The 3302 line will be retired as part of this project. (**B3766.2**) Estimated Cost: $16.0M, **Projected IS Date**: 12/31/2026
S2585.4: The West Manchester Substation will be expanded to a double bus double breaker design where AES Ohio will install one 138kV circuit breaker, a 138/69kV transformer, and eight new 69kV circuit breakers. (**B3766.3**) Estimated Cost: $9.9M **Projected IS Date**: 12/31/2026
S2585.11: Hayes – New Westville 138 kV line: Build ~0.19 miles of 138 kV line to the Indiana/ Ohio State line to connect to AES's line portion of the Hayes – New Westville 138 kV line with the conductor size 795 ACSR26/7 Drake. (**B3766.4**) Estimated Cost: $0.38M **Projected IS Date**: 12/31/2025
S2585.12: Hayes – Hodgin 138 kV line: Build ~0.05 miles of 138 kV line with the conductor size 795 ACSR26/7 Drake. (**B3766.5**) Estimated Cost: $1.22M **Projected IS Date**: 12/31/2025
S2585.13: Hayes 138 kV: Build a new 4-138 kV circuit breaker ring bus. (**B3766.6**) Estimated Cost: $7.44M **Projected IS Date**: 12/31/2025

Total Estimated Cost: $38.64M

Additional Benefits: This project is part of the solution to address Dayton-2020-011, Dayton-2021-001, Dayton-2021-008. No additional transmission cost is needed to address the reliability violations.

Required IS Date: 6/1/2027

Previously Presented: 12/6/2022



MetEd Transmission Zone: Baseline
Lincoln – Germantown 115 kV

Process Stage: Second Review

Criteria: Summer and Winter Generator Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP Summer and Winter cases

Proposal Window Exclusion: No

Problem Statement:

The Lincoln – Straban – Germentown 115 kV circuit is overloaded for multiple contingencies.

Violations were posted as part of the 2022 Window 1: Violations were posted as part of the 2022 Window 1: FG, GD-S10, GD-S14, GD-S70, GD-S78, GD-W33, GD-W37, GD-W376 and GD-W391

Existing Facility Rating: 175SN/208SE, 208WN/238WE MVA

Proposed Facility Rating: 257SN/313SE, 291WN/371WE MVA

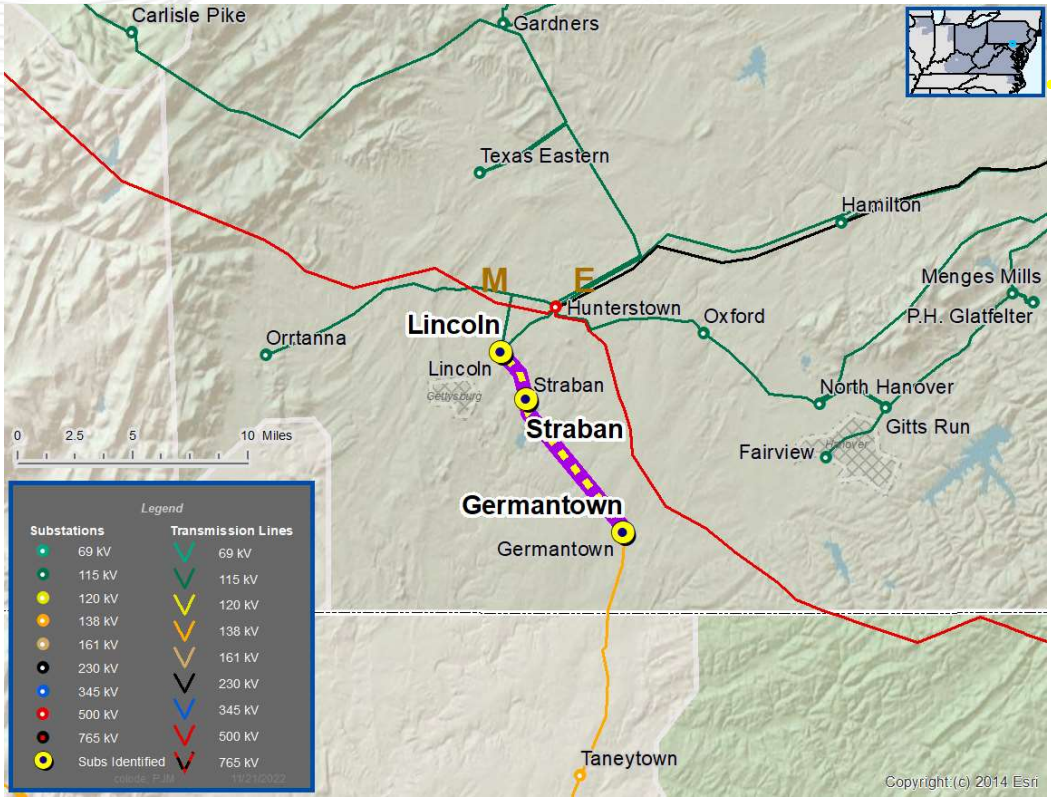
Recommended Solution:
Proposal ID 209 - Rebuild/Reconductor the Germantown - Lincoln 115 kV Line. Approximately 7.6 miles. Upgrade limiting terminal equipment at Lincoln, Germantown and Straban. (b3768)

Estimated Cost: $17.36 M

Alternatives: See slide #11 and #12

Required In-Service: 6/1/2027

Projected In-Service: 6/1/2027



MetEd Transmission Zone: Baseline
TMI 500/230 kV Transformer

2022 RTEP Window 1 Cluster 2 - Second Read

Process Stage: Second Review

Criteria: Summer and Winter Generator Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP Summer and Winter cases

Proposal Window Exclusion: No

Problem Statement:

The TMI 500/230 kV transformer is overloaded for multiple contingencies.

Violations were posted as part of the 2022 Window 1: Violations were posted as part of the 2022 Window 1: FG, GD-S29, GD-S34, and GD-W36

Existing Facility Rating: 840SN/1070SE, 1049WN/1219WE MVA

Proposed Facility Rating: 972SN/1100SE, 1182WN/1364WE MVA

Recommended Solution:

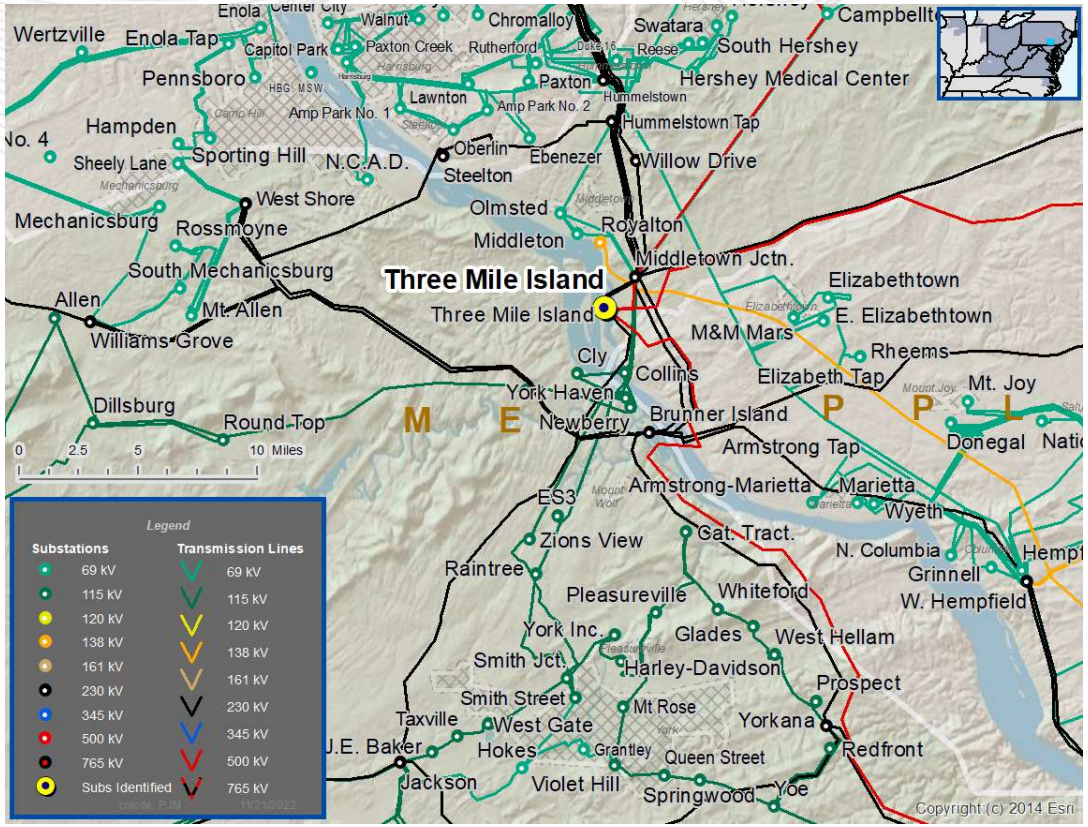
Proposal ID 880 - Install second TMI 500/230kV Transformer with additional 500 and 230 bus expansions. (b3769)

Estimated Cost: $30.19 M

Alternatives: See slide #12

Required In-Service: 6/1/2027

Projected In-Service: 6/1/2027



BGE Transmission Zone: Baseline

2022 RTEP Window 1 Cluster 2 - Second Read

Process Stage: Second Review

Criteria: Summer and Winter Generator Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP Summer and Winter cases

Proposal Window Exclusion: No

Problem Statement:

The BEG section of the Graceton – Brunner Island 230 kV circuit is overloaded for multiple contingencies.

Violations were posted as part of the 2022 Window 1: Violations were posted as part of the 2022 Window 1: FG, GD-S1043, GD-W411, GD-W55 and GD-W623

Existing Facility Rating: 501SN/598SE, 554WN/652WE MVA

Proposed Facility Rating: 666SN/797SE, 767WN/898WE MVA

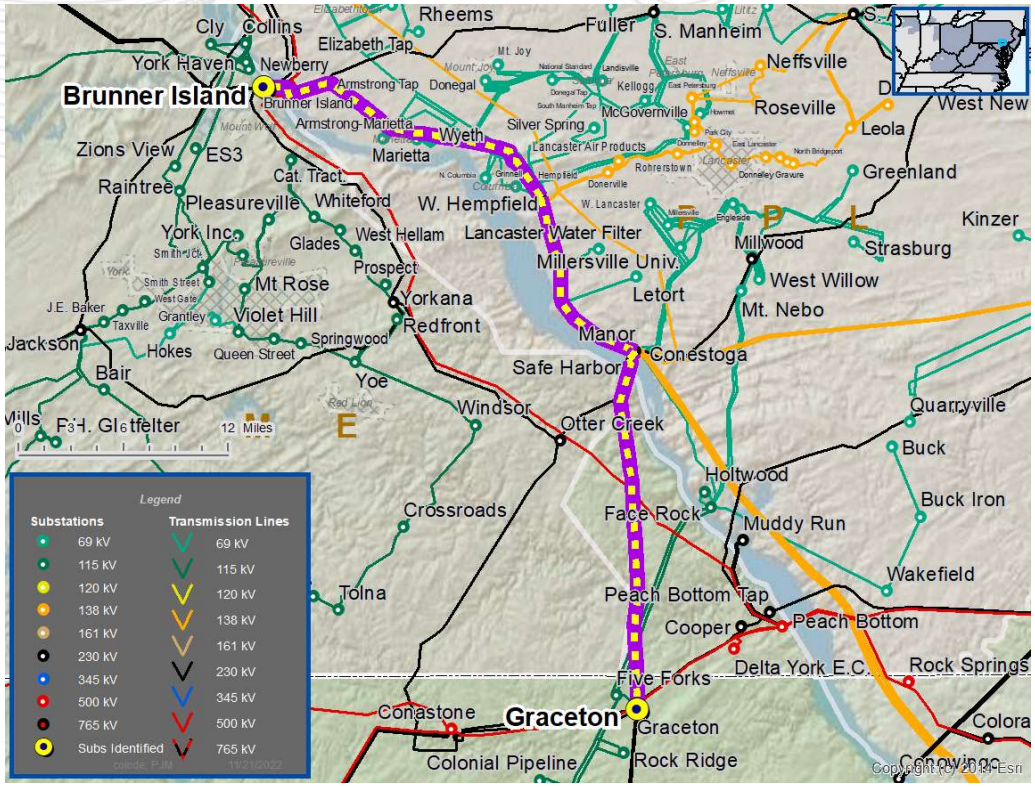
Recommended Solution:
Proposal ID 912 - Rebuild 1.4 miles of existing single circuit 230 kV tower line between BGE's Graceton substation to the PPL tie-line at the MD/PA state line to double circuit steel pole line with one (1) circuit installed to uprate 2303 circuit. (b3770)

Estimated Cost: $8.4 M

Alternatives: See slide #12

Required In-Service: 6/1/2027

Projected In-Service 6/1/2026



BGE Transmission Zone: Baseline

2022 RTEP Window 1 Cluster 2 - Second Read

Process Stage: Second Review

Criteria: Summer and Winter Generator Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP Summer and Winter cases

Proposal Window Exclusion: No

Problem Statement:

The Conastone – North West 230 kV circuit is overloaded for multiple contingencies.

Violations were posted as part of the 2022 Window 1: Violations were posted as part of the 2022 Window 1: FG, GD-S38 and GD-W42

Existing Facility Rating: 670SN/852SE, 802WN/912WE MVA

Proposed Facility Rating: 1100SN/1364SE, 1170WN/1381WE MVA

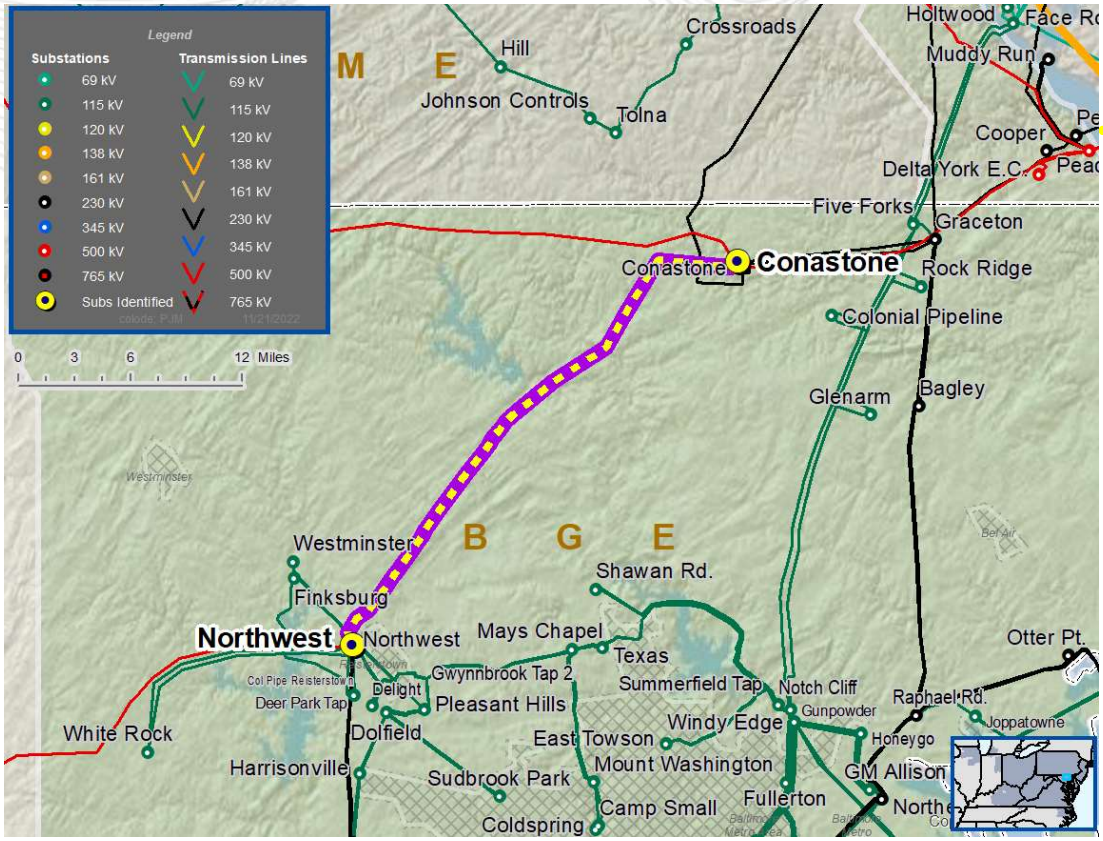
Recommended Solution:
Proposal ID #94 - Reconductor two (2) 230 kV circuits from Conastone to Northwest #2. **The total cost of the project is approximately $81 M and** $43.6M spent to date as part of 9-A project. (b3771)

Estimated Cost: $37.76 M

Alternatives: N/A

Required In-Service: 6/1/2027

Projected In-Service: 6/1/2026



APS Transmission Zone: Baseline

Messick Road - Morgan 138 kV

2022 RTEP Window 1 Cluster 2 - Second Read

Process Stage: Second Review

Criteria: Generation Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 Summer and Winter RTEP case

Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: 2022W1-GD-S558, 2022W1-GD-S559, 2022W1-GD-W387 and 2022W1-GD-W388

In 2027 RTEP Summer and Winter cases, Messick road to Morgan 138 kV line is overloaded due to two breaker contingencies.

Existing Facility Rating: 221SN/268SE, 250WN/317WE MVA

Proposed Facility Rating: 308SN/376SE, 349WN/445WE MVA

Recommended Solution:

- Reconductor 27.3 miles of the Messick Road - Morgan 138 kV Line from 556 ACSR to 954 ACSR
- At Messick Road Substation: Replace 138 kV wave trap, circuit breaker, CT's, disconnect switch, and substation conductor and upgrade relaying
- At Morgan Substation: Upgrade Relaying. (b3772)

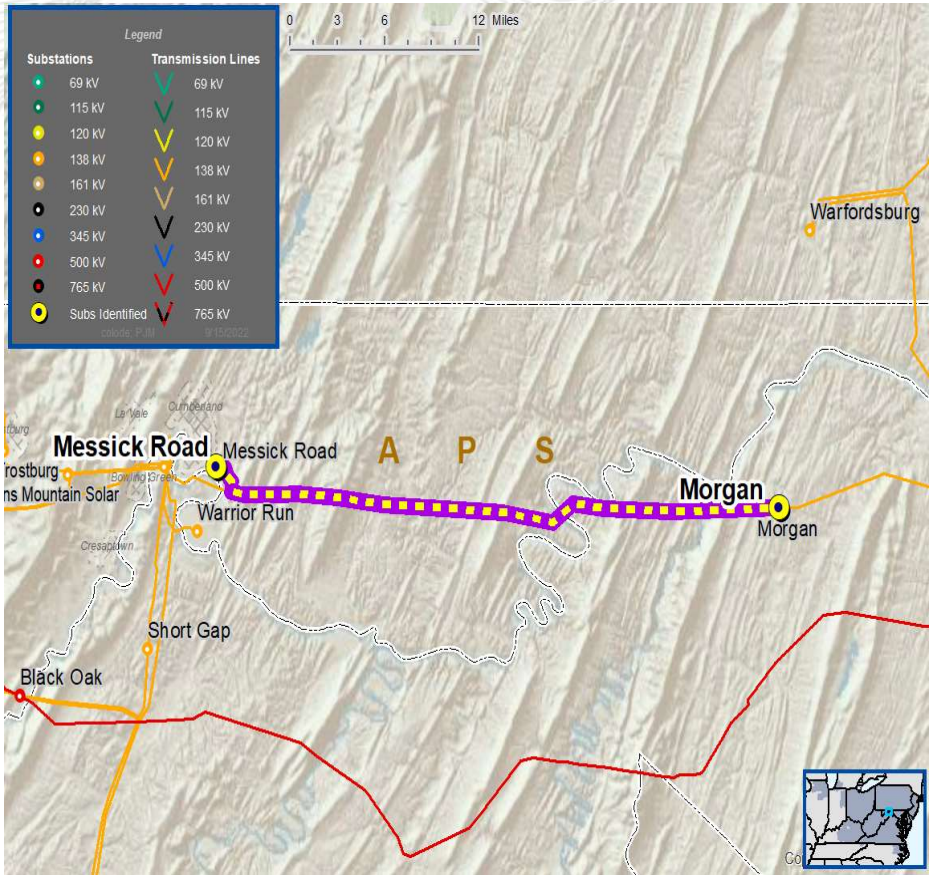
Estimated Cost: $49.23M

Alternatives: - See slide #12

-A full rebuild of the Beddington 500 kV substation into a breaker and half configuration to eliminate the breaker contingency.

Required in-service date: 6/1/2027

Projected in-service date: 6/1/2027



APS Transmission Zone: Baseline
McConnellsburg 138 kV

2022 RTEP Window 1 Cluster 2 - Second Read

Process Stage: Second Review

Criteria: Winter N-1-1

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 Winter RTEP case

Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: 2022W1-N2-VM1 to 2022W1-N2-VM5, 2022W1-N2-VM12, 2022W1-N2-VM15 to 2022W1-N2-VM29, 2022W1-N2-VM32 to 2022W1-N2-VM35

In 2027 RTEP Winter case, Low Voltage is observed at McConnellsburg, Warfordsburg, Morgan and Cherry Run 138 kV substation due to N-1-1 contingencies.

Recommended Solution:

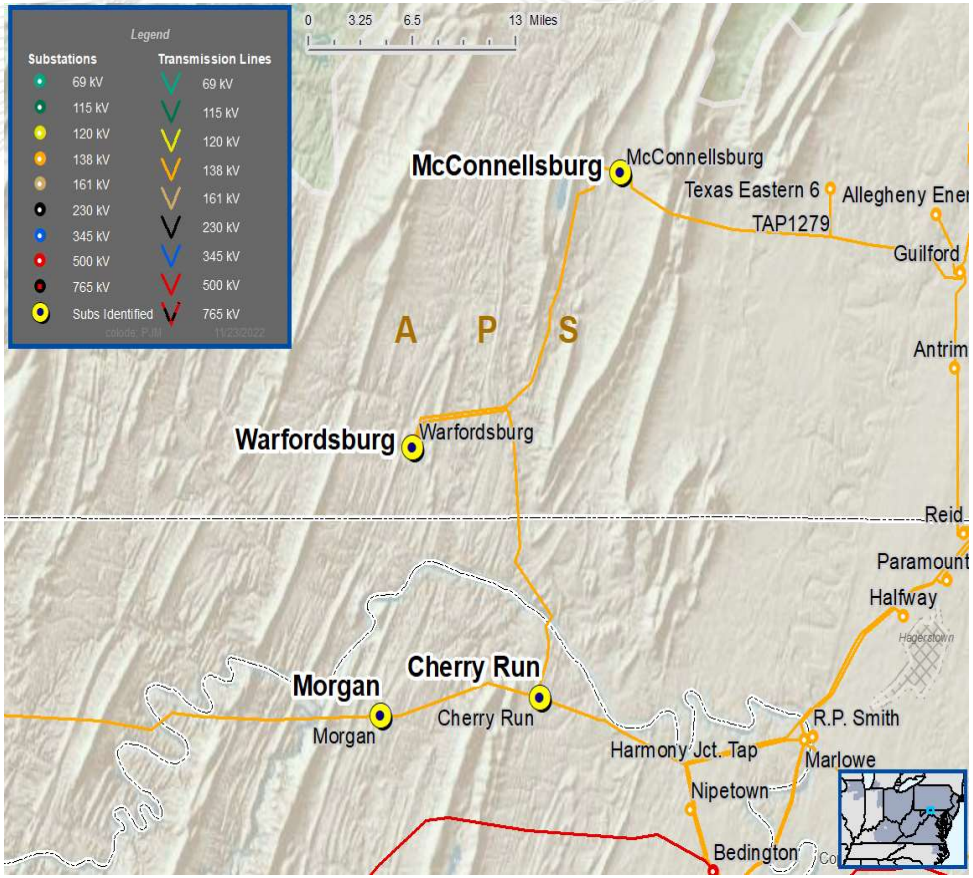
- McConnellsburg 138 kV Susbtation: Install 33 MVAR switched capacitor, 138 kV Breaker, and associated relaying. (b3773)

Estimated Cost: $3.05M

Alternatives: N/A

Required in-service date: 6/1/2027

Projected in-service date: 6/1/2027



PPL Transmission Zone: Baseline

2022 RTEP Window 1 Cluster 2 - Second Read

Process Stage: Second Review

Criteria: Winter Generator Deliverability

Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 RTEP Winter cases

Proposal Window Exclusion: Substation Equipment

Problem Statement:

The Brunner Island – Yorkanna 230 kV circuit is overloaded for single contingency.

Existing Facility Rating: 647SN/8041E, 746WN/903WE MVA

Proposed Facility Rating: 709SN/869SE, 805WN/1031WE MVA

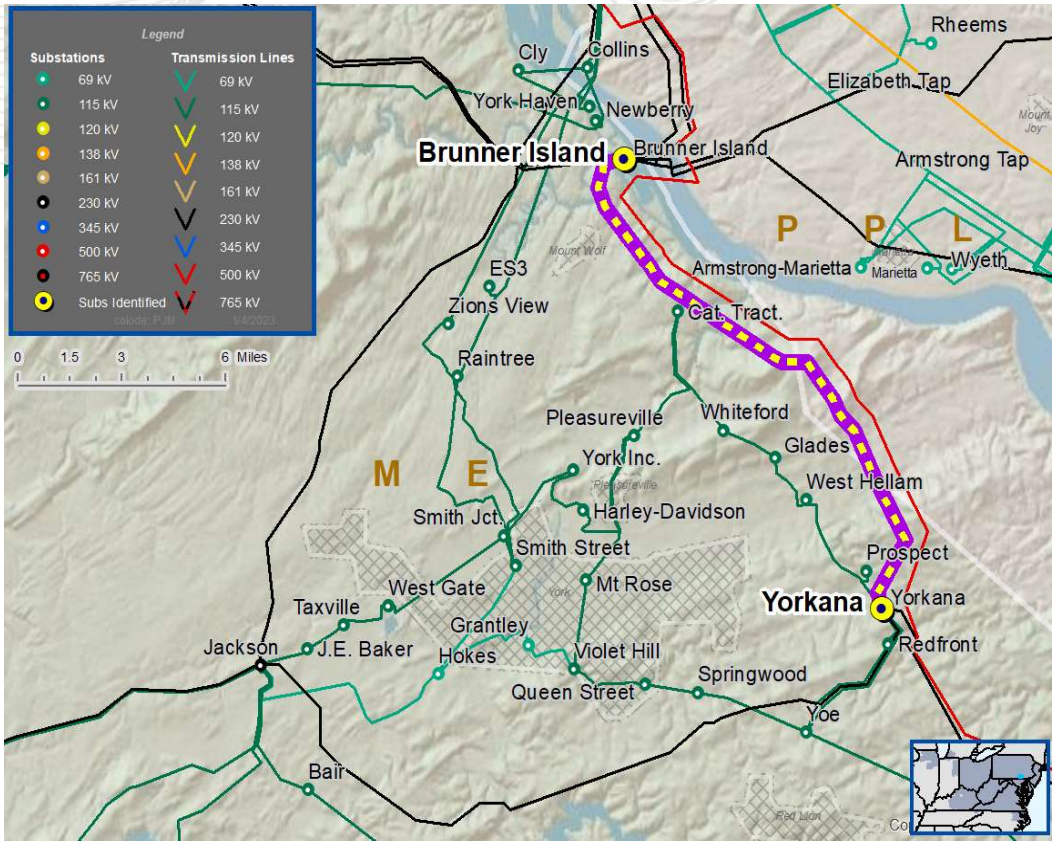
Recommended Solution:
Reconductor/rebuild 0.64 miles of the PPL side of the Brunner Island - Yorkana 230 kV circuit. (b3774)

Estimated Cost: $2.5 M

Alternatives: N/A

Required In-Service: 6/1/2027

Projected In-Service: 6/1/2027



AEP Transmission Zone: Baseline
Jug Street 138kV Breaker Replacement

Process Stage: Recommend Solution

Criteria: Short Circuit

Assumption Reference: 2027 RTEP Assumption

Model Used for Analysis: 2022 Series 2024 RTEP Short Circuit Model

Proposal Window Exclusion: Immediate Need, Below 200 kV

Problem Statement:

2022W1-SC-1 through 4, 2022W1-SC-6, 2022W1-SC-7, 2022W1-SC-10 through 2022W1-SC-13, and 2022W1-SC-24 through 2022W1-SC-27

Jug Street 138kV breakers M, N,BC,BF, BD, BE,D, H, J, L, BG, BH, BJ, BK are overdutied.

Existing Facility Rating: 40kA

Proposed Solution:

Replace the Jug Street 138kV breakers M, N, BC, BF, BD, BE, D, H, J, L, BG, BH, BJ, BK with 80KA breakers **(B3763)**

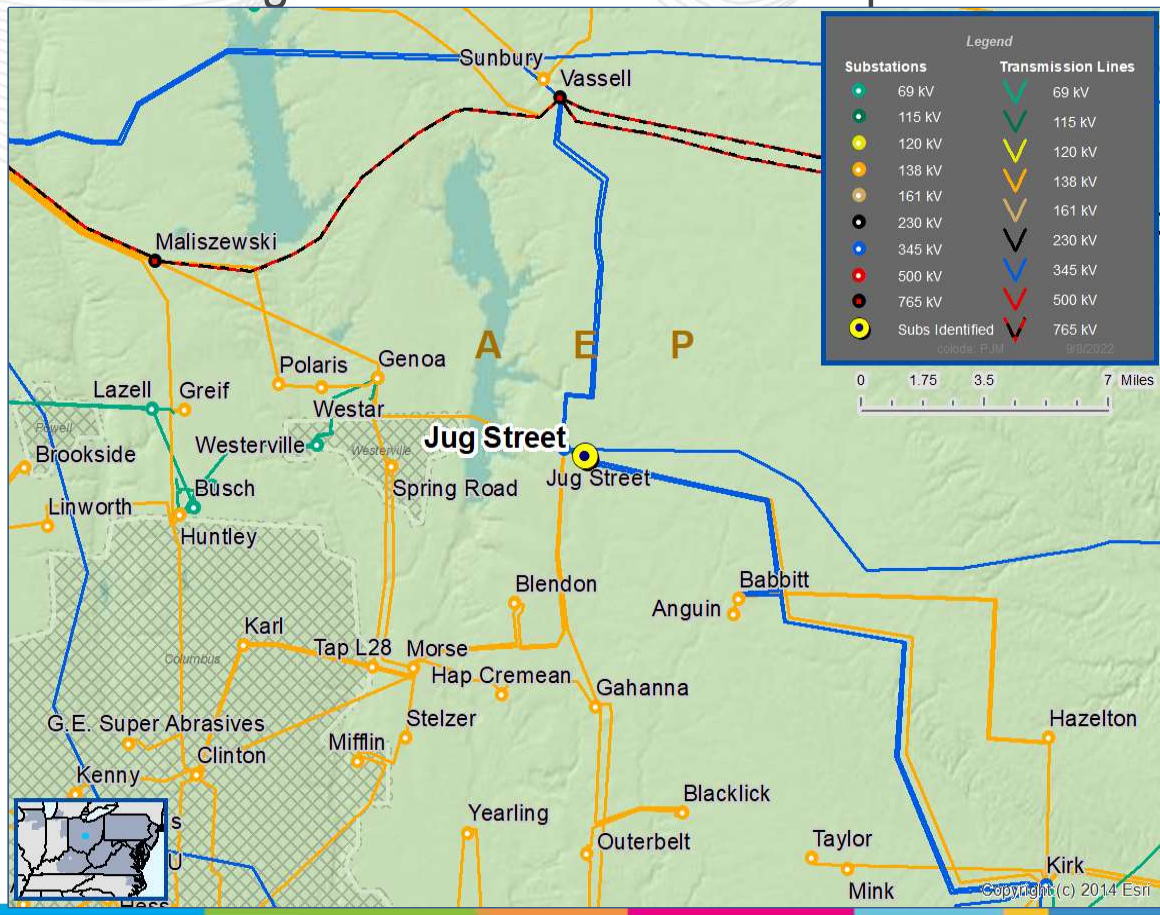
Estimated Total Cost: $14M

Preliminary Facility Rating: 80kA

Required In-Service: 06/01/2024

Projected In-Service: 06/01/2024

Previously Presented: 11/18/2022



AEP Transmission Zone: Baseline
Hyatt 138kV Breaker Replacements

Process Stage: Recommended Solution

Criteria: Short Circuit

Assumption Reference: 2027 RTEP Assumption

Model Used for Analysis: 2022 Series 2024 RTEP Short Circuit Model

Proposal Window Exclusion: Immediate Need, Below 200 kV

Problem Statement:

2022W1-SC-15 and 2022W1-SC-23

Hyatt 138kV breakers AB1 and AD1 are overdutied.

Existing Facility Rating: 50kA

Proposed Solution:

Replace the Hyatt 138kV breakers AB1 and AD1 with 63kA breakers **(B3764)**

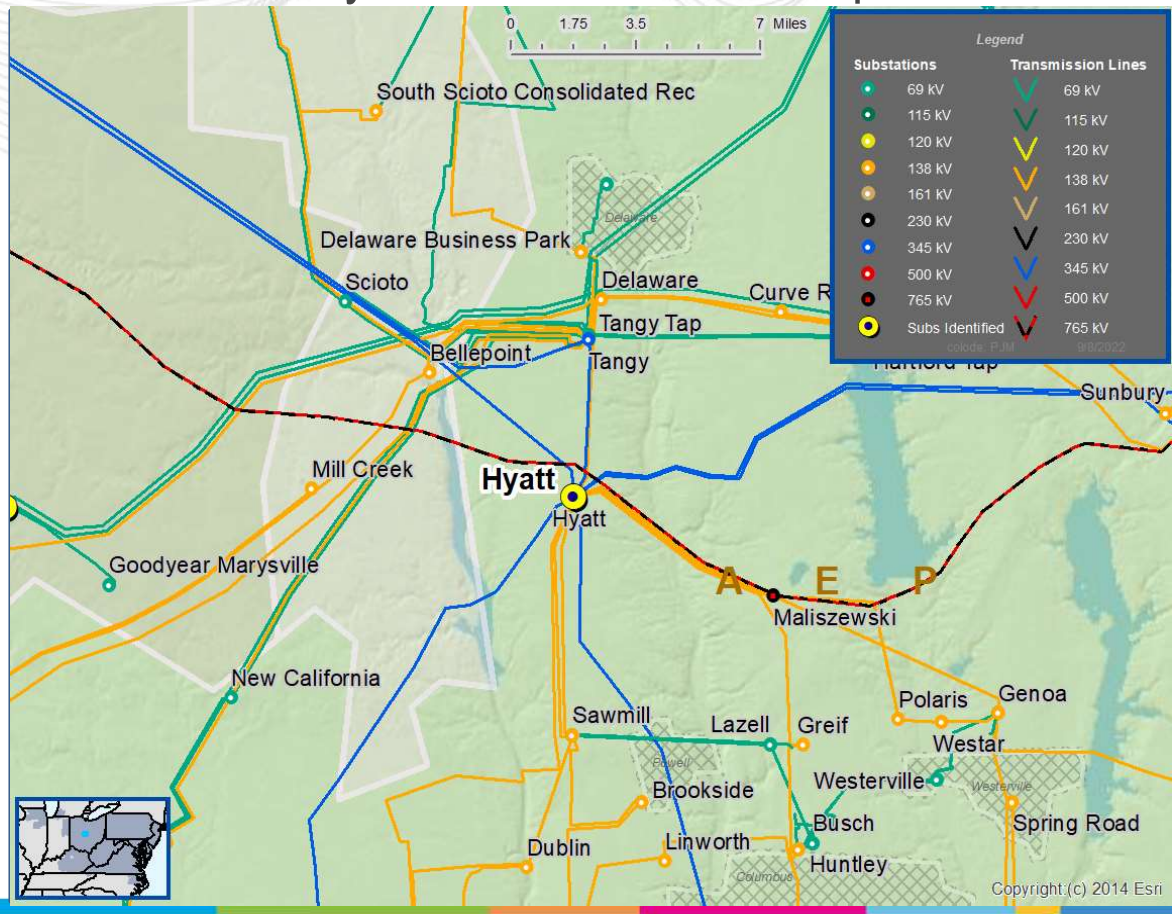
Existing Facility Rating: 63kA

Estimated Total Cost: $2M ($1M each)

Required In-Service: 06/01/2024

Projected In-Service: 06/01/2024

Previously Presented: 11/18/2022



APS Transmission Zone: Baseline Ridgway 138/46 #2 Transformer

Process Stage: Recommended Solution

Criteria: Baseline N-1-1 Analysis

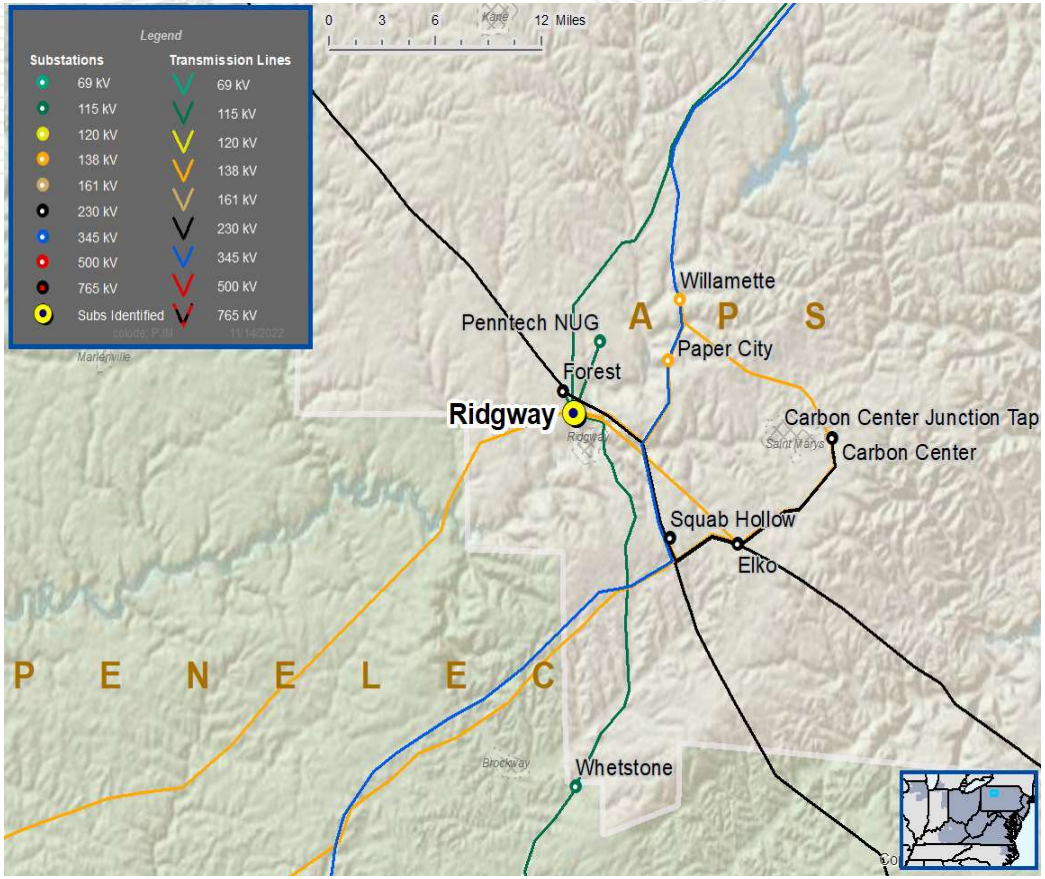
Assumption Reference: 2027 RTEP assumption

Model Used for Analysis: 2027 Summer RTEP case

Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: 2022W1-N2-ST1

In 2027 RTEP Summer case, Carbon Center to Elko 138 kV line is overloaded due to N-1-1 contingencies.



APS Transmission Zone: Baseline Ridgway 138/46 #2 Transformer

Recommended Solution:

- Install 138 kV Breaker on the Ridgway 138/46 kV #2 Transformer **(b3761)**

Transmission Estimated Cost: $1.1M

Ancillary Benefits: Adding a 138 kV breaker on the Ridgway #2 138/46 kV Transformer will prevent the 138 kV bus from being de-energized in the event of a transformer fault.

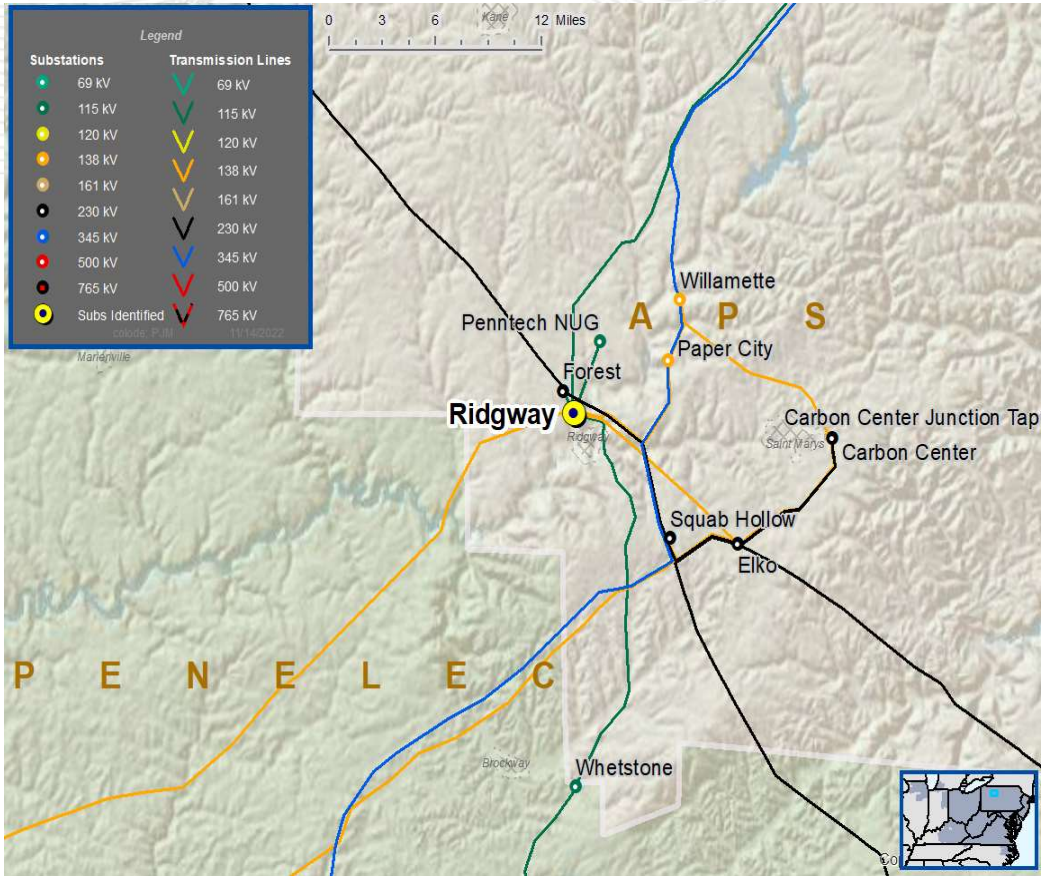
Alternatives: None

Preliminary Facility Rating: N/A

Required in-service date: 6/1/2027

Projected in-service date: 6/1/2027

Previously Presented: 11/18/2022



EKPC Transmission Zone: Baseline
Fawkes-Duncannon Lane Tap 69 kV Rebuild

Process Stage: Recommended Solution

Criteria: EKPC 715 Criteria

Assumption Reference: EKPC Assumptions Presentation slides 3-10

Model Used for Analysis: EKPC's internal models representing 2026/27 winter peak conditions that were used for EKPC's annual system screening analysis for 2022 planning cycle. Includes Cooper Units 1 and 2 off with replacement generation imported from the north of EKPC system.

Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement:

The Fawkes-Duncannon Lane Tap 69 kV line (LGEE-EKPC tie line) is overloaded for an N-1 outage.

Violation was posted as part of the 2022 Window 1: FG# 2022W1-EKPC-T1

Existing Facility Rating: 89SN/98SE, 128WN/134WE MVA

Proposed Facility Rating: 114SN/127SE, 166WN/174WE MVA

Proposed Solution:

Rebuild EKPC's Fawkes-Duncannon Lane Tap 556.5 ACSR 69 kV line section (7.2 miles) using 795 ACSR. **(b3762)**

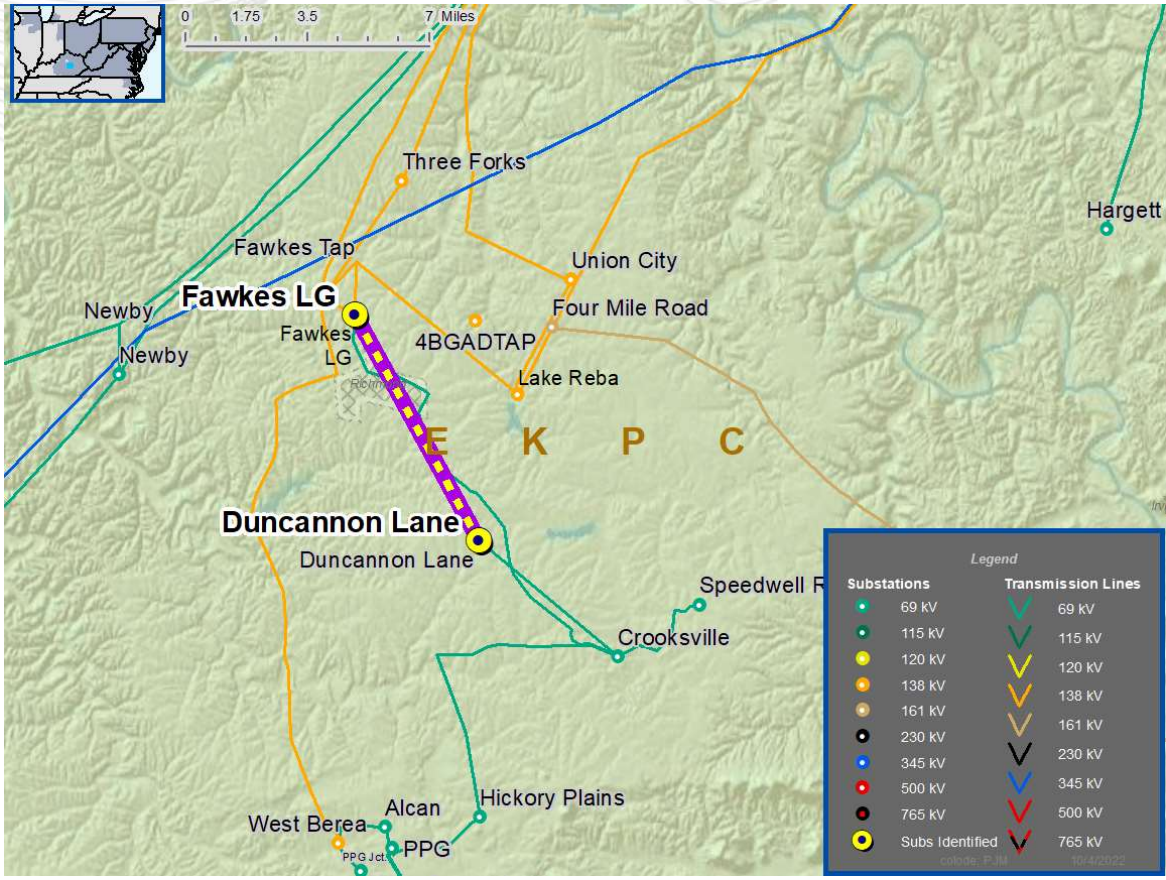
Estimated Cost: $8.5 M

Ancillary Benefits: Replacement of aging infrastructure associated with line section.

Required In-Service: 12/1/2026

Projected In-Service: 12/31/2024

Previously Presented: 10/14/2022



2022 RTEP Window 2 Update

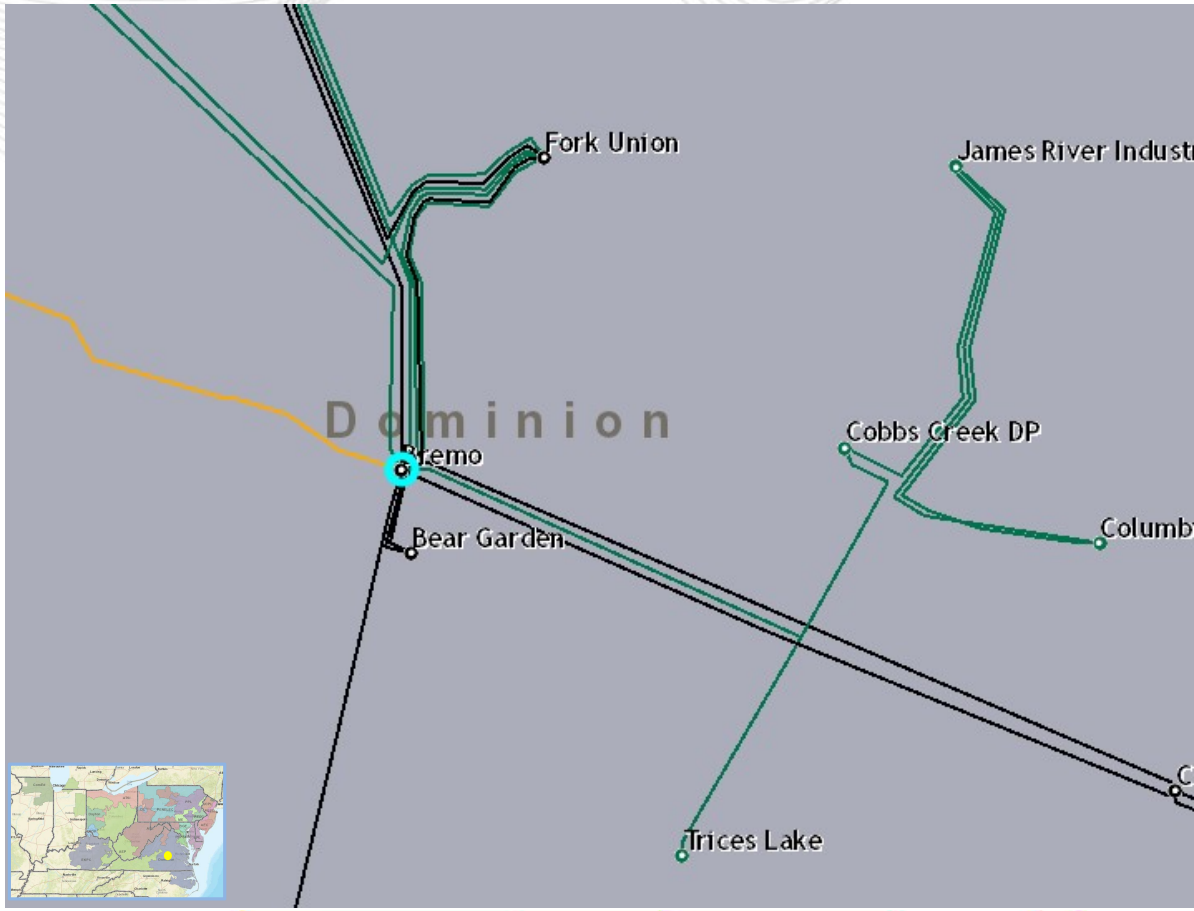
Dominion Transmission Zone: Baseline 230/115kV Bremo Transformer Overload

Process Stage: First Read
Criteria: Light Load N-1 & Generator Deliverability
Assumption Reference: 2027 RTEP assumption
Model Used for Analysis: 2027 RTEP Light Load case
Proposal Window Exclusion: None
Problem Statement:
2022W2-N1-LLT1 & 2022W2-GD-LL1

In the 2027 RTEP Light Load case, The 230/115kV Bremo transformer is overloaded for a single contingency in the N-1 & Generator Deliverability tests.

Existing Facility Rating:

Facility	SN/SE/WN/WE (MVA)
230/115kV Bremo Transformer	262.9/286.8/320.3/337



Dominion Transmission Zone: Baseline 230/115kV Bremo Transformer Overload

As part of the 2022 RTEP Window #2, the projects listed in the table below are proposed to address the following violations: 2022W2-N1-LLT1 & 2022W2-GD-LL1.

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
473	Dominion	Disconnect 230kV line #2111 Bear Garden – Bremo at the Bremo terminal and extend line approximately 1.6 miles to Fork Union. Wreck and rebuild 230kV Line #2193 Bremo – Fork Union as a double circuit. Line #2111 extension will share double circuit structures with Line #2193.	10.09
873	Dominion	Retire Bremo substation. Relocate 6 transmission lines and 2 transformers to Fork Union substation. Add a 2nd 224 MVA 230/115kV transformer at Fork Union.	35.17

Dominion Transmission Zone: Baseline 230/115kV Bremo Transformer Overload

Proposed Solution: Proposal #2022_2-473(1)

- Wreck and rebuild 230kV Line #2193 Bremo – Fork Union to achieve a summer rating of 1573 MVA using double circuit structures.
- Disconnect 230kV Line #2111 Bear Garden – Bremo at the Bremo terminal.
- Extend Line #2111 approximately 1.6 miles to Fork Union. The extension will share the double circuit structures with Line #2193.
- Terminate Line #2111 at Fork Union to create a Bear Garden – Fork Union 230kV line.
- Update relays and settings on Line #2111 at Bear Garden.

Total Estimated Cost: $10.09M

Required IS Date: 11/1/2027
Projected IS Date: 11/1/2027

(1) Note:

- There is not enough space at Bremo substation to add another transformer.
- This proposal considers future relocation of the remaining lines from Bremo substation to Fork Union substation for its eventual retirement. However, selection of this proposal may not offer sufficient headroom if assumptions change.

Dominion Transmission Zone: Baseline
Evergreen Mills - 300MW Load Drop Violation

Process Stage: Recommended Solution

Criteria: 300MW Load Loss

Assumption Reference: 2027 RTEP assumption

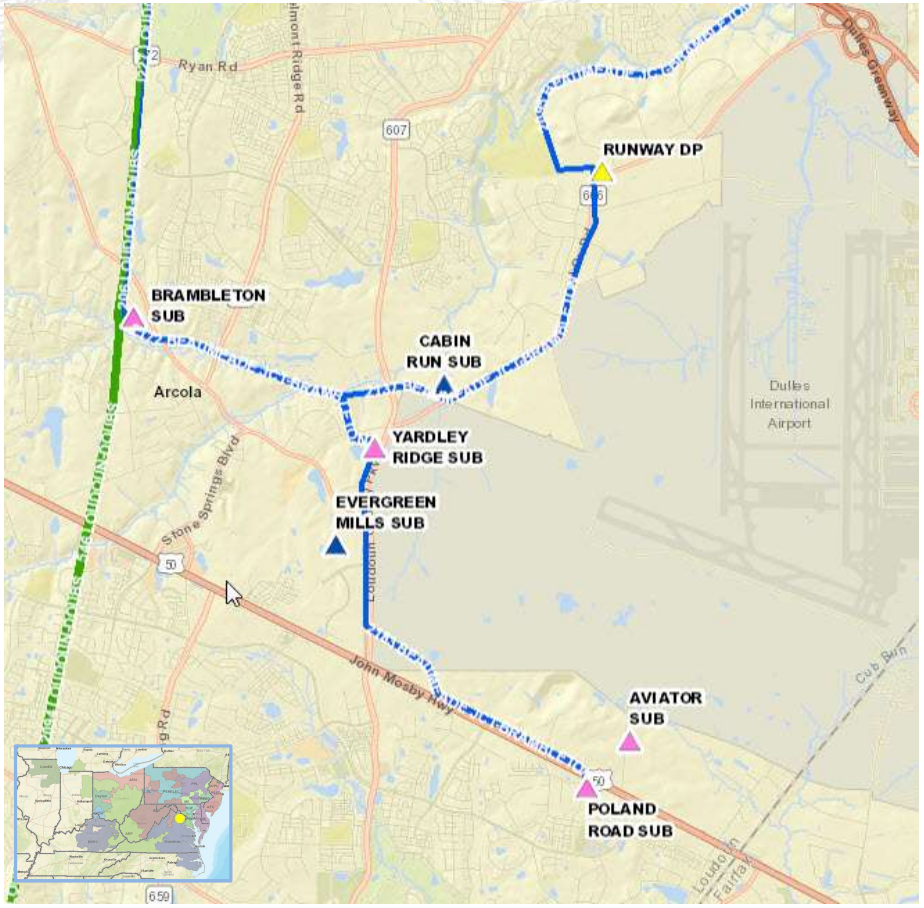
Model Used for Analysis: 2027 RTEP Summer & Winter cases

Proposal Window Exclusion: None

Problem Statement:

2022W2-N2-SLD1, 2022W2-N2-SLD2, 2022W2-N2-WLD1, 2022W2-N2-WLD2

In the 2027 RTEP Summer & Winter cases, a 300 MW load loss occurs under an N-1-1 scenario.



Dominion Transmission Zone: Baseline
Evergreen Mills - 300MW Load Drop Violation

As part of the 2022 RTEP Window #2, the projects listed in the table below are proposed to address the following violations: 2022W2-N2-SLD1, 2022W2-N2-SLD2, 2022W2-N2-WLD1 & 2022W2-N2-WLD2

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
648	Dominion	Cut existing 230kV Line #2183 (Brambleton - Poland Road) and extend double circuit 230kV lines creating new Line #2210 (Brambleton - Evergreen Mills) and Line #2183 (Evergreen Mills - Poland Road)	7.71

Recommended Solution: Proposal #2022_2-648

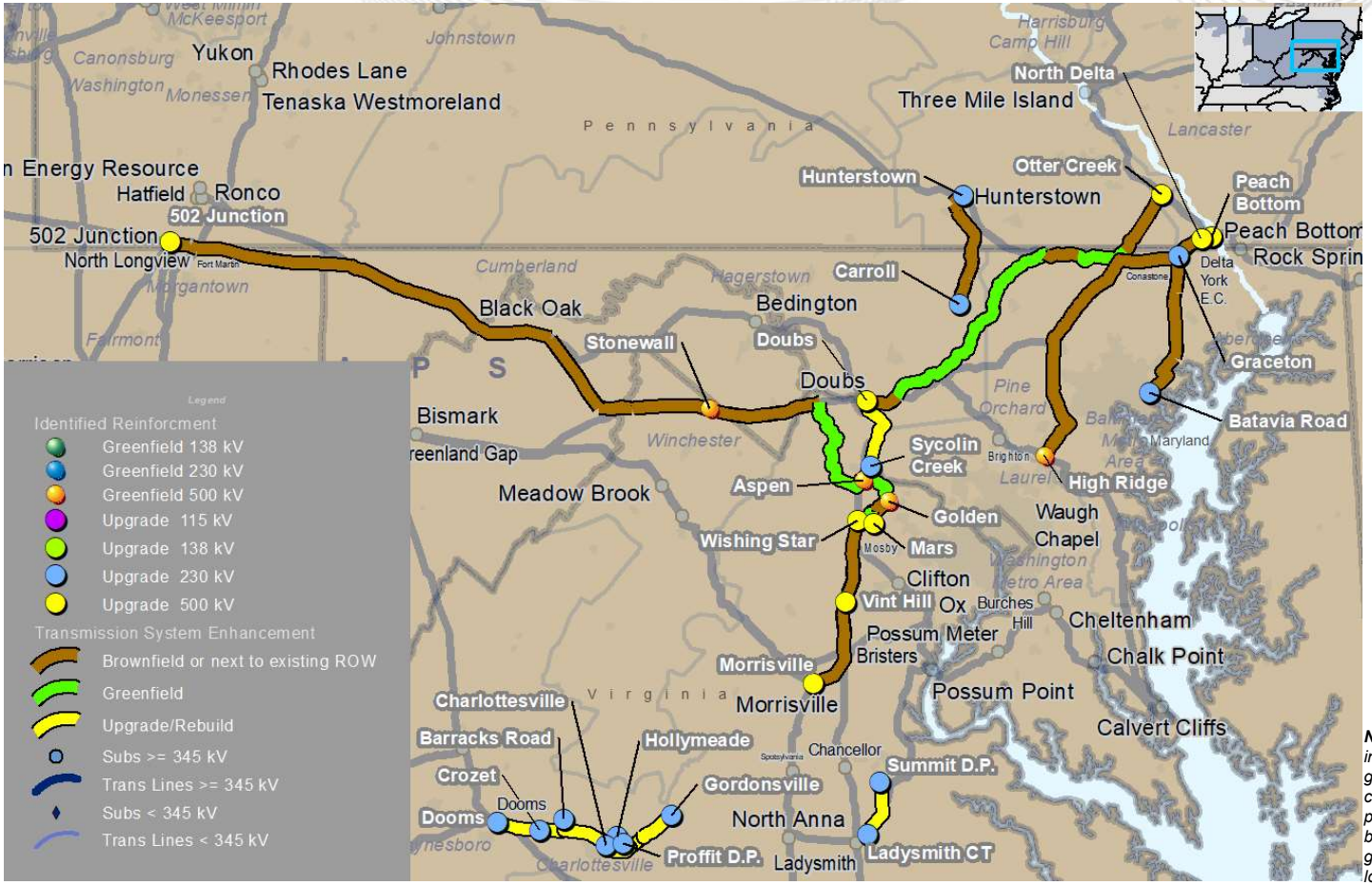
- Cut existing 230kV line #2183 and extend from Poland Road substation to Evergreen Mills substation. Approximately 0.59 miles of new line will be built from the cut-in to the Evergreen Mills substation. Cut and extend the existing 230kV line #2183 creating a new line #2210 from Brambleton substation to be terminated at Evergreen Mills substation. Approximately 0.59 miles of new line will be built from the cut-in to the Evergreen Mills substation. (**b3779)**

Total Estimated Cost: $7.71M

Required IS Date: 6/1/2027
Projected IS Date: 6/1/2027
Previously Presented: 2/7/2023

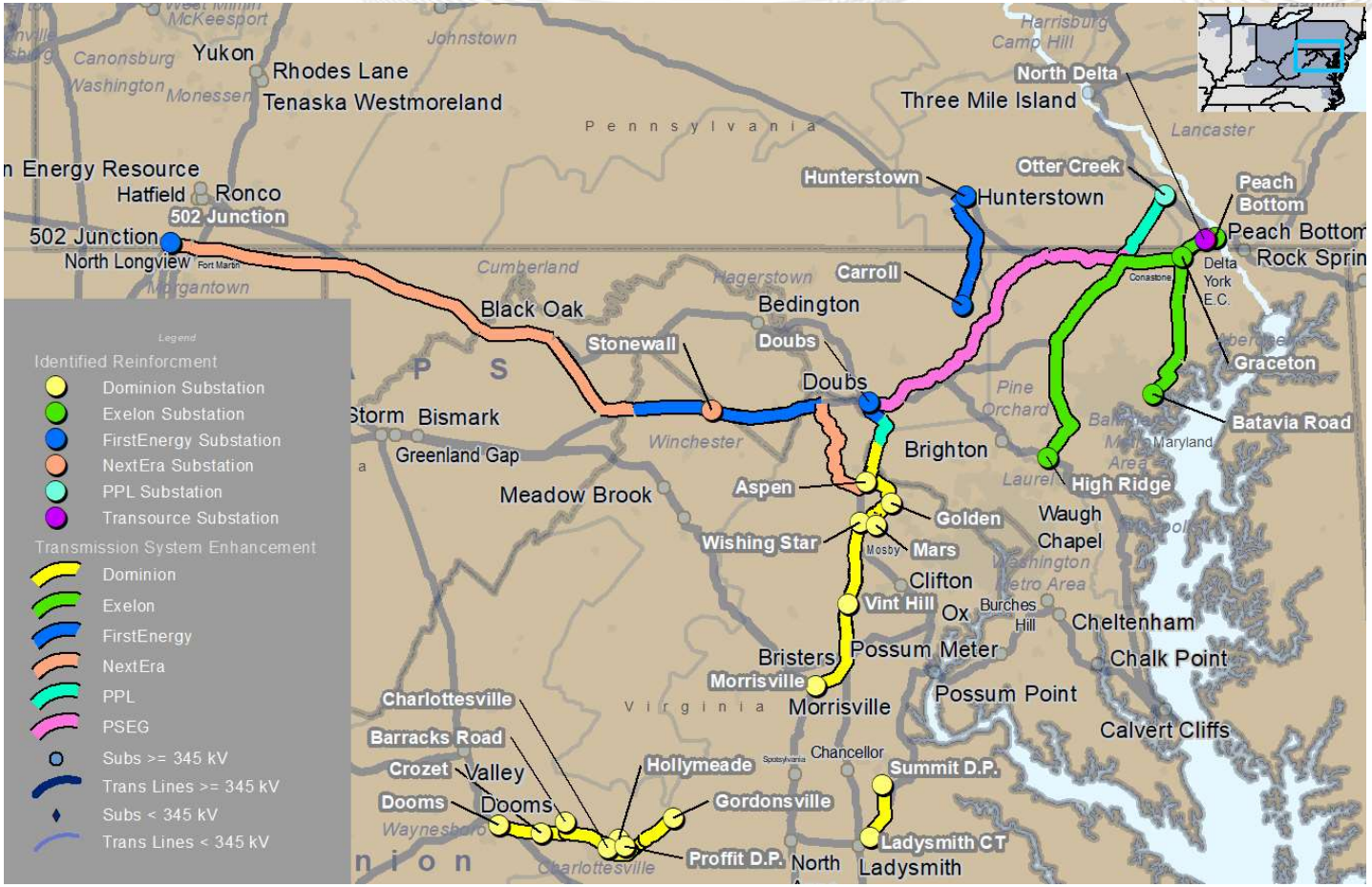
Recommended Solution – 2022 Window 3
Second Read
Baseline Reliability Projects

Major Proposals Selected in 2022 Window 3



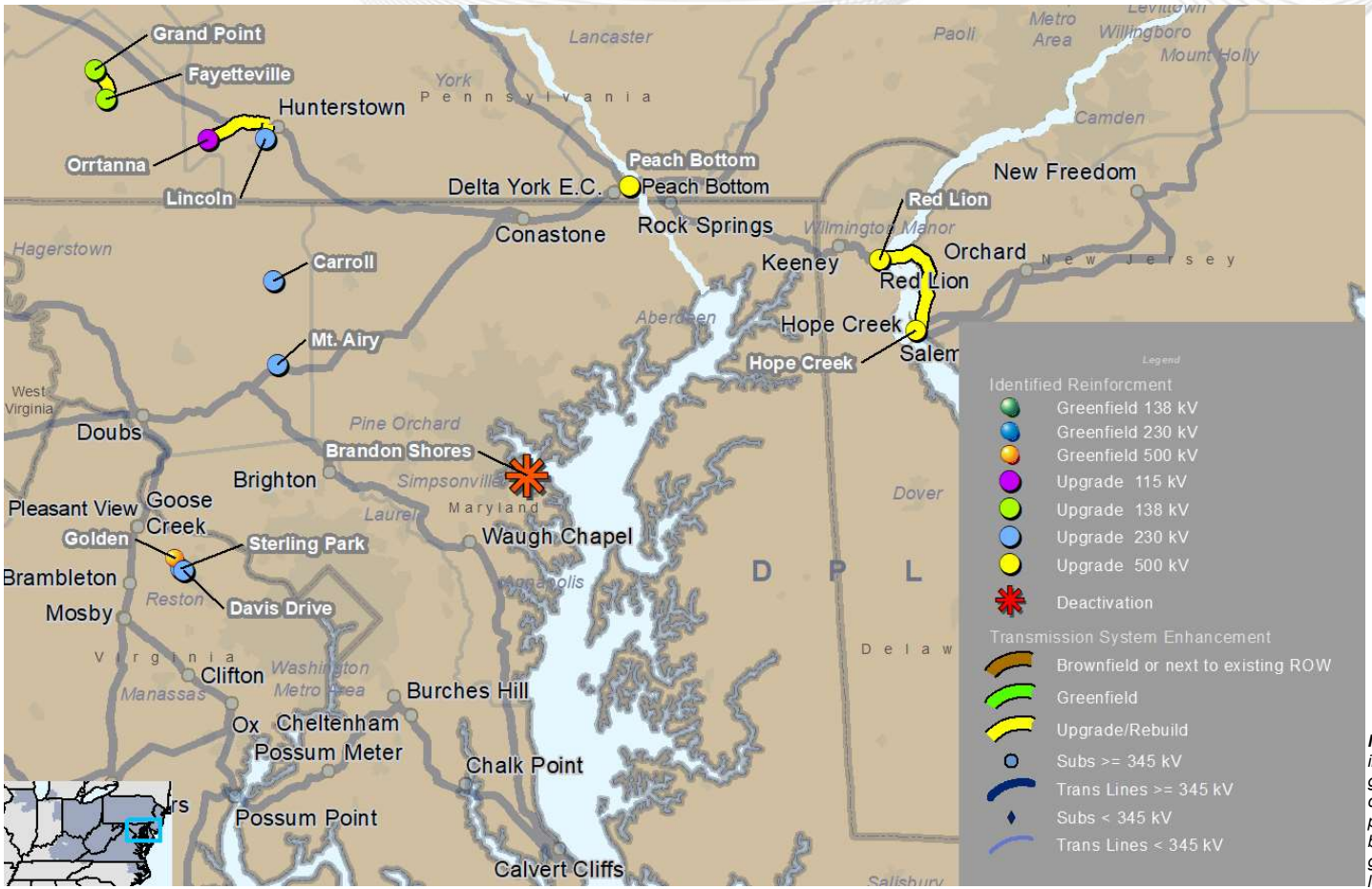
NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Major Proposals Selected in 2022 Window 3 - by Designated Entity



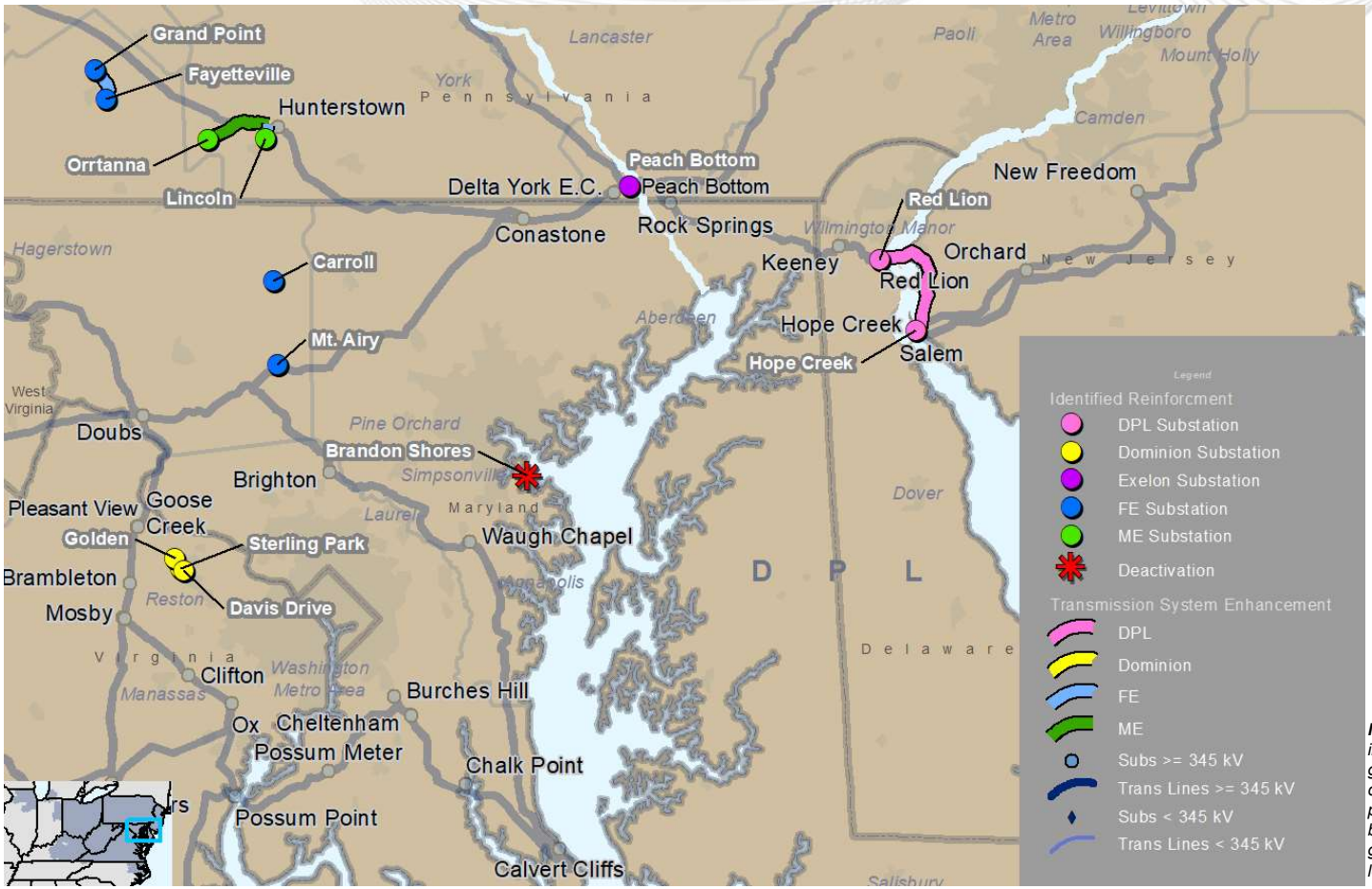
NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Additional upgrades needed in 2022 Window 3



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Additional upgrades needed in 2022 Window 3 – by TO



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

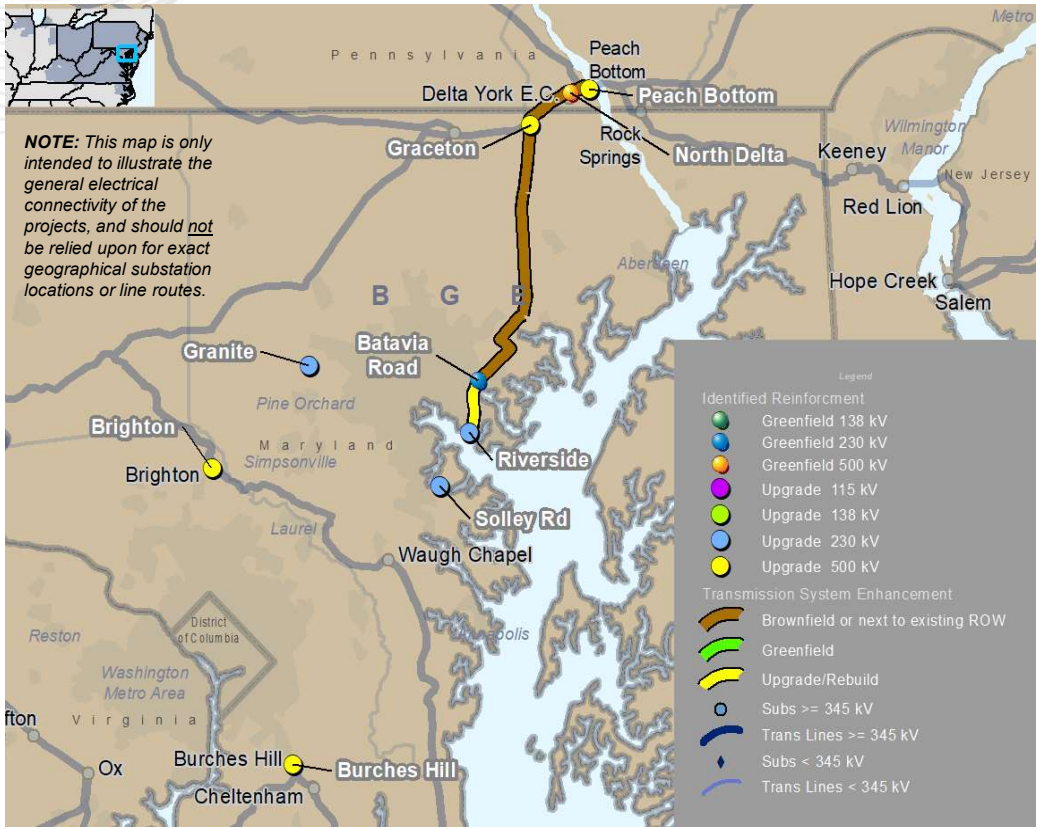
Adjustments to Earlier Approved Projects

PJM recommended adjustments to Earlier Approved Brandon Shores De-Activation Scope

B3780 - Substation Projects: (Approved components under Brandon Shores Deactivation Immediate Need)

- **B3780 – (assigned by PJM to Transource) Substation Projects**
  - Modify the planned North Delta 500/230 kV substation (cut into Peach Bottom – Delta/Calpine 500 kV line)
    - Cut into Peach Bottom – Conastone 500 kV (5012) line
    - Three breaker ring bus configuration
    - Install one 500/230 kV transformer
    - This scope will amend the approved B3737.47 (NJOSW-SAA 1.0)
- **B3780 – Exelon Scope -Substation Projects**
  - Expand Peach Bottom North yard to accommodate additional 500kV circuits to BGE (Graceton).
  - Build Graceton 500 kV substation – adjacent to the existing Graceton 230kV yard
    - Three bay breaker and half configuration
    - Two 500/230 kV transformers
  - Build new Batavia Rd. 230 kV switching station (cut in to the existing Northeast – Riverside 230 kV circuits
    - Four bay 8-position GIS BAAH switching station
- **Cancel B3780.3** (Build 500/230 kV West Cooper substation) (Cost Estimate: $60M)

B3780 Continue on next slide …



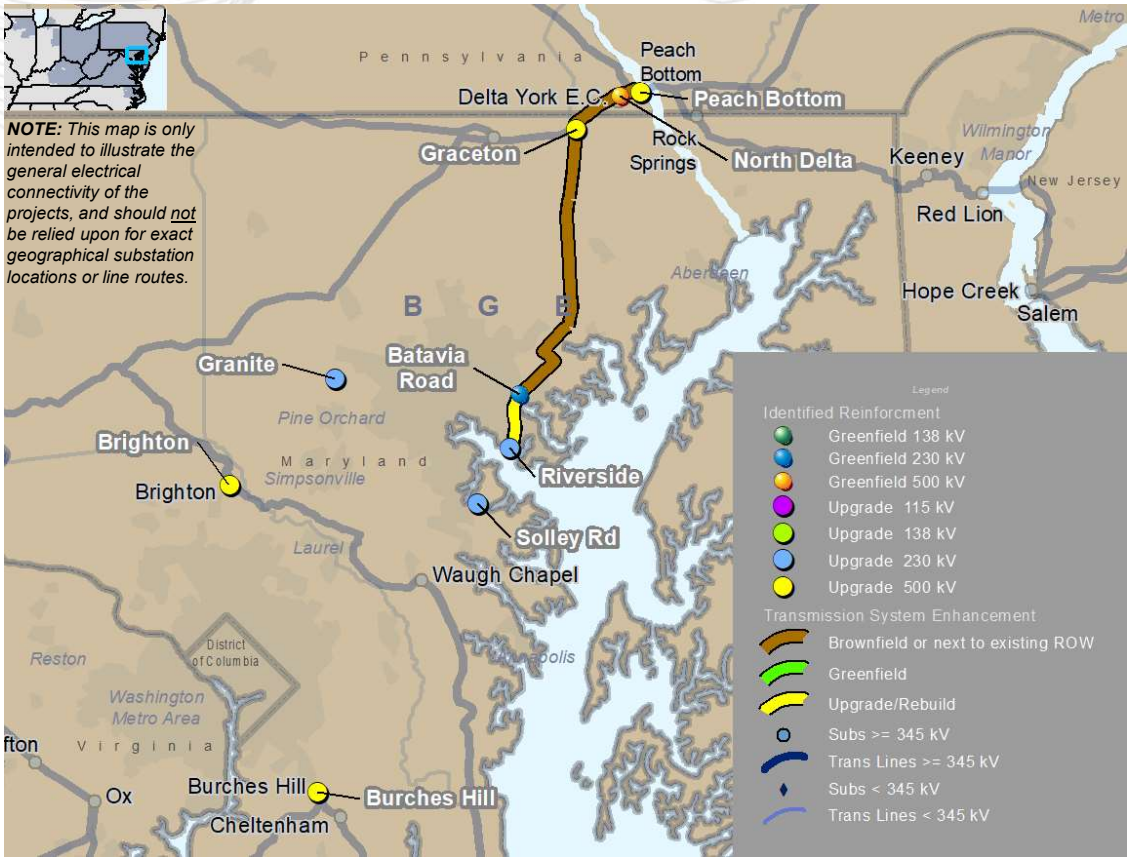
PJM recommended adjustments to Earlier Approved Brandon Shores De-Activation Scope

B3780 - Transmission Projects: (Approved components under Brandon Shores Deactivation Immediate Need)

- Build new Peach Bottom North - Graceton 500kV Line - (~10 miles)
  - New Rating - 4503SN/5022SE/5206WN/5802WE MVA
- Build new 230 kV double circuit from Graceton to Batavia Road with 2 x 1590kcm 54/19 ACSR (~29 miles)
  - New Rating – 1331SN/1594SE/1534WN/1795WE MVA
- Reconductor 230 kV double circuit from Batavia Road to Riverside with bundled 1622kcm 38/19 ACCR/TW (~6 miles)
  - New Rating – 1941SN/2181SE/WN2065/WE2302 MVA
- Install Statcom at Granite 230 kV (+/- 350MVAR) and Solley 230kV (+/- 350 MVAR), and 250 MVAR capacitor at Graceton 230 kV
- Install Statcom at Brighton 500 kV (+/- 350MVAR), Capacitors - 350 MVAR at Brighton 500 kV, 250 MVAR at Burchess Hill 500 kV, and 350 MVAR at Conastone 500 kV

Required In-Service Date : June 2025

Projected In-Service Date: 2026-2028



AEP Local - Selected Proposals

2022W3 – Preferred Solutions: AEP Local

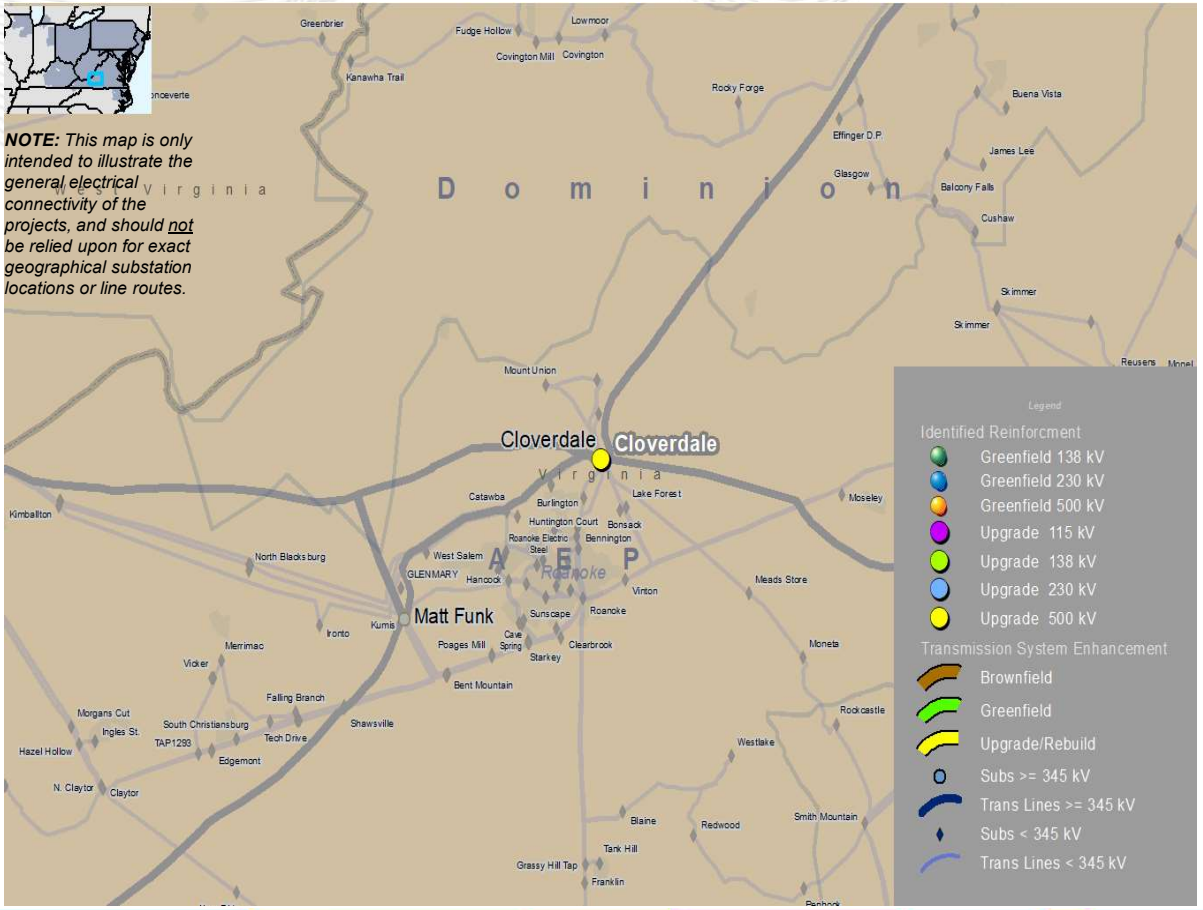
AEP: 2022-W3-410

- Establish a new 500 kV breaker position for the low-side of the existing 765/500 kV transformer at Cloverdale Station. The new position will be between two new 500 kV circuit breakers located in a new breaker string, electrically converting the 500 kV yard to "double-bus double-breaker" configuration. (**B3800.100**)

Estimated Cost: $11.59 M

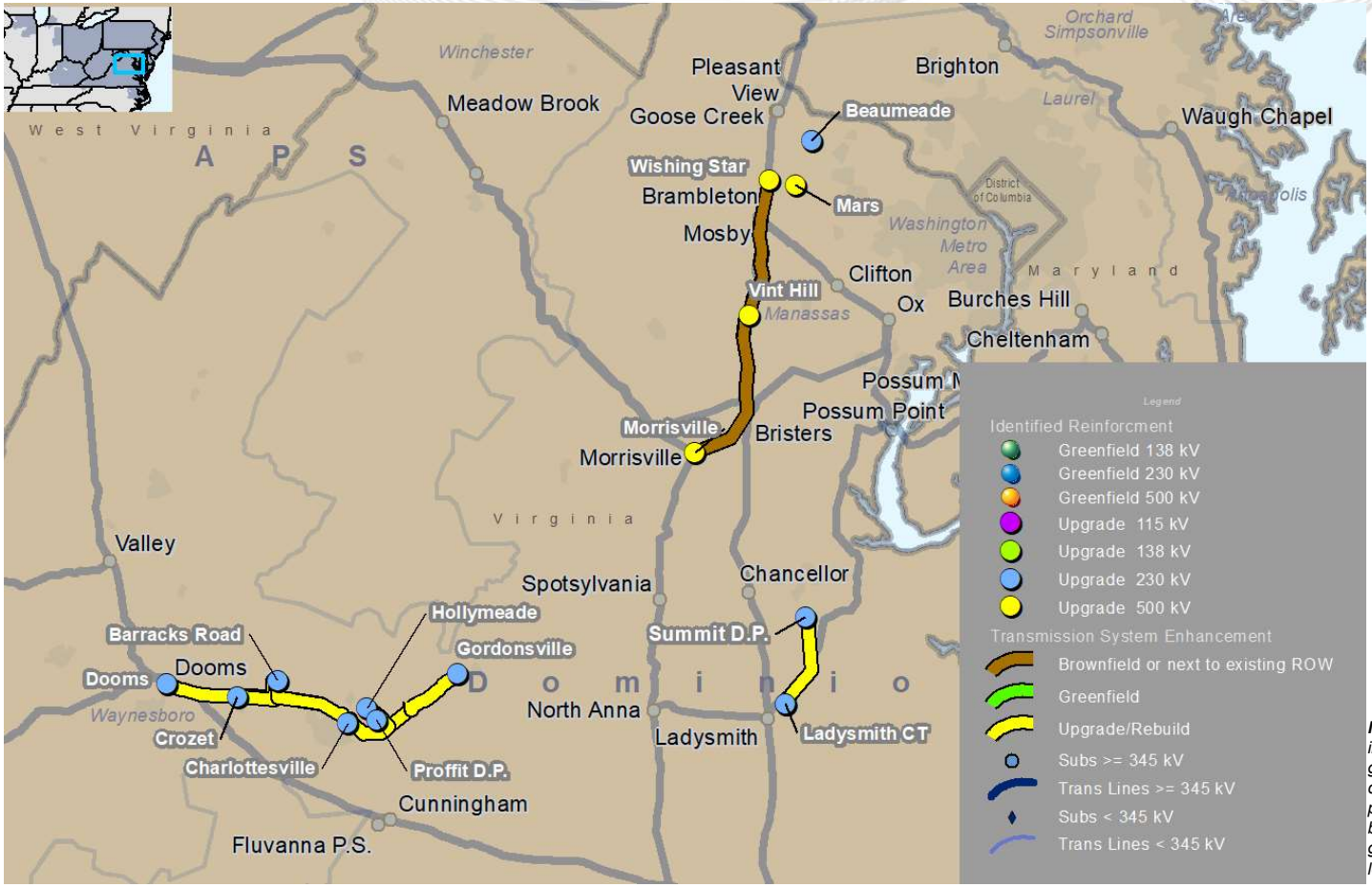
Required IS Date: 6/1/2027

Projected IS Date: 10/31/2026



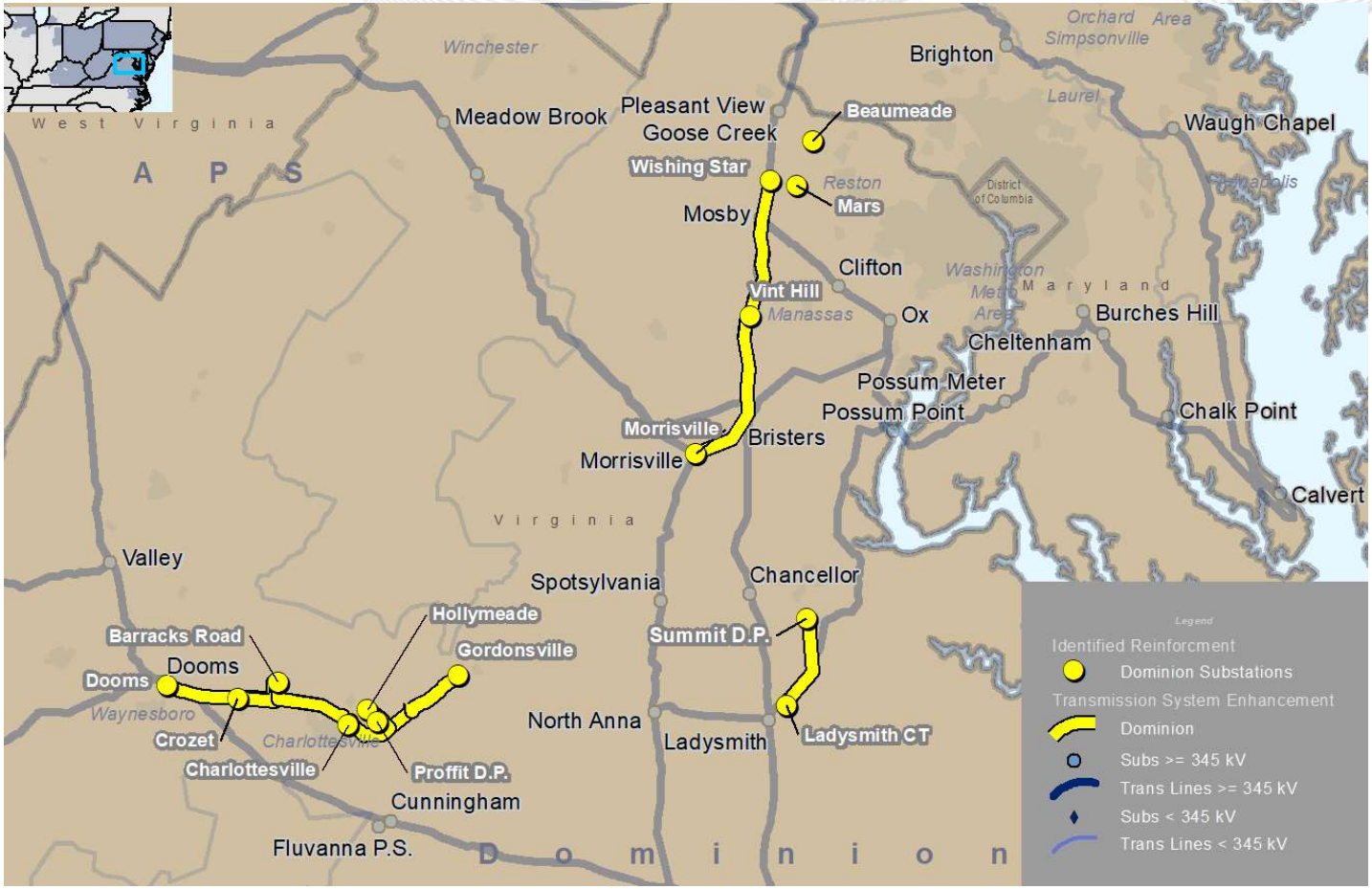
South Cluster - Selected Proposals

2022W3 – Recommended Solutions: South Cluster



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: South Cluster by Designated Entity

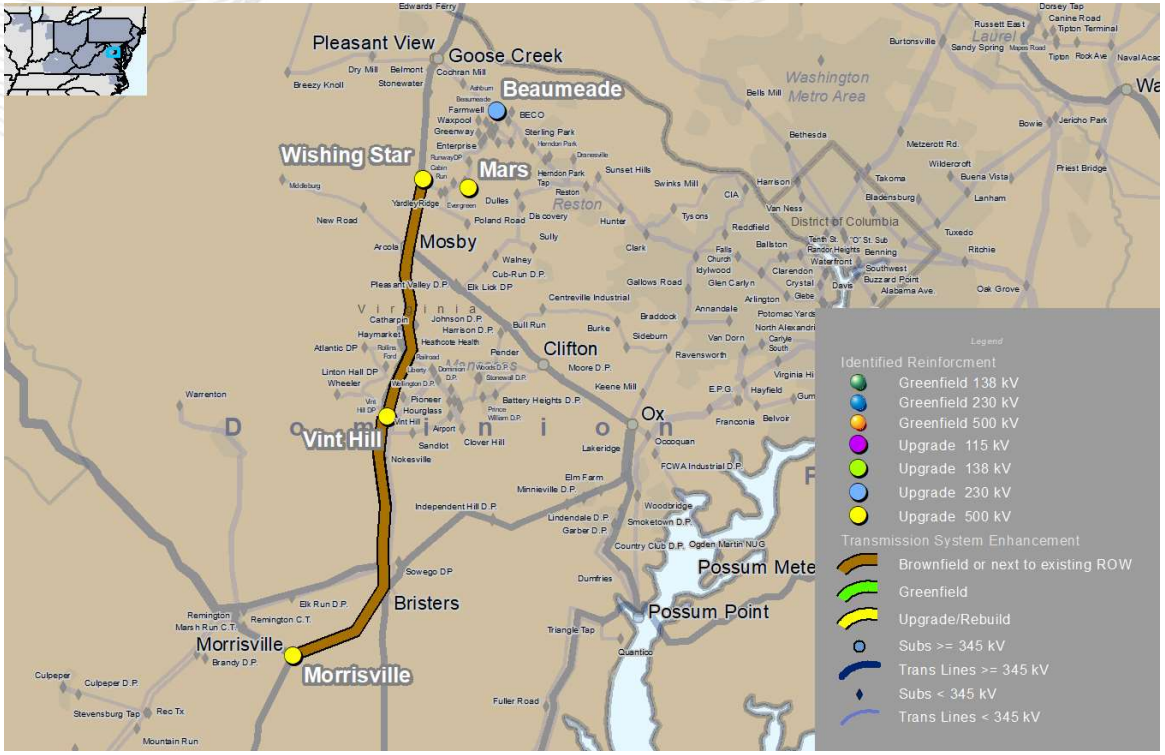


NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: South Cluster

Recommended Solution: 2022-W3-711 (**Partial**)

- Build a new 500kV line from Morrisville – Vint Hill – Wishing Star (approximately 36.3 miles) while maximizing the use of existing ROW within this corridor.
- Wrecking and rebuilding both the 5-2 towers in the Morrisville-Loudoun-Brambleton corridor to free up space for the new single-500kV monopole within the same corridor.
  - 500kV Line #545 Bristers - Morrisville rebuild
  - 500kV Line #569 Loudoun to Morrisville rebuild
  - 500kV Line #535 Meadowbrook - Loudoun rebuild
  - 500kV Line #546 Mosby - Wishing Star rebuild
  - 500kV Line #590 Mosby - Wishing Star rebuild
  - 230kV Line #2030 Gainesville - Loudoun rebuild
  - 230kV Line #2045 Loudoun - Brambleton rebuild
  - 230kV Line #2094 & 2227 Brambleton - Racefield - Loudoun rebuild
  - 230kV Line #2101 Bristers - Vint Hill rebuild
  - 230kV Line #2114 Remington CT - Rollins Ford rebuild



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Continued on next slide…

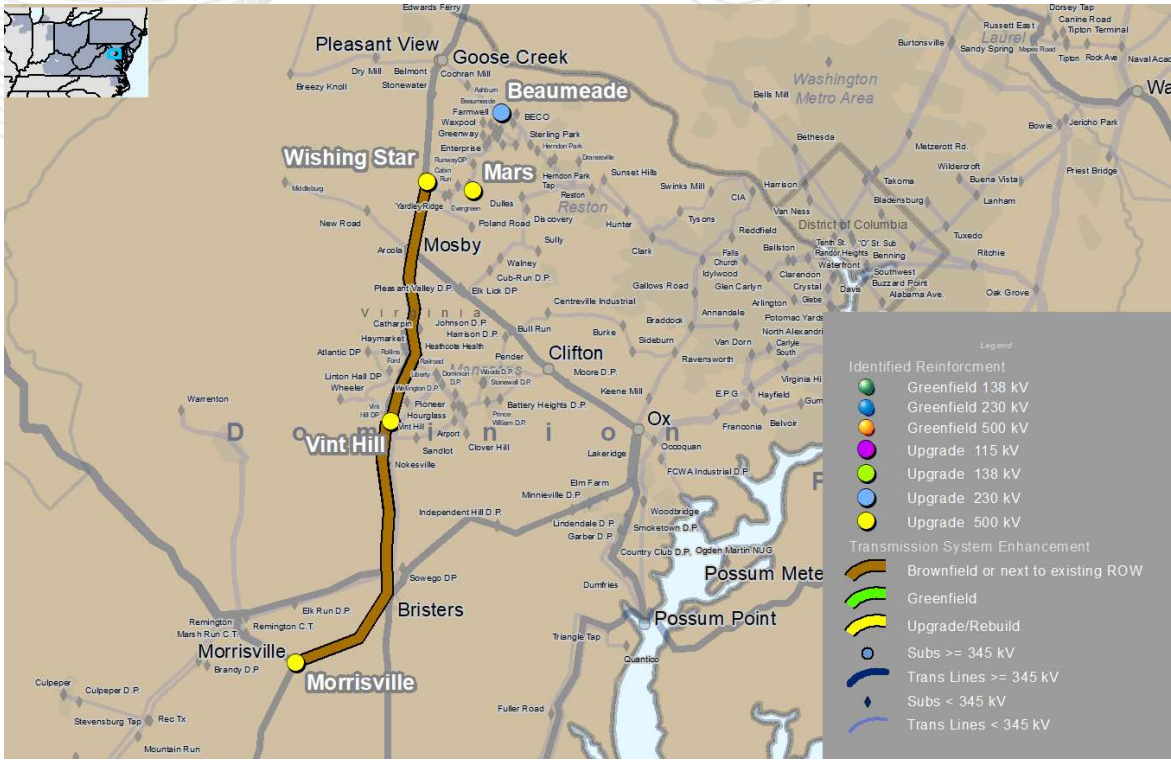
2022W3 – Recommended Solutions: South Cluster

Recommended Solution: 2022-W3-711 (**Partial**)

- 230kV Line #2140 Loudoun - Heathcote rebuild
- 230kV Line #2151 Railroad DP - Gainesville rebuild
- 230kV Line #2163 Vint Hill - Liberty rebuild
- 230kV Line #2176 Heathcote - Gainesville rebuild
- 230kV Line #2222 Rollins Ford - Gainesville rebuild
- 115kV Line #183 Bristers - Ox rebuild

- Substation upgrades at:
  - Bristers, Brambleton, Dawkins Branch, Gainesville, Heathcote, Loudoun, Mint Springs, Morrisville, Mosby, North Star, Racefield, Railroad, Vint Hill, Wishing Star, Youngs Branch
- Breaker upgrades at the following substations:
  - Loudoun 230kV, Ox 500kV

Baseline # B3800.311 – B3800.357



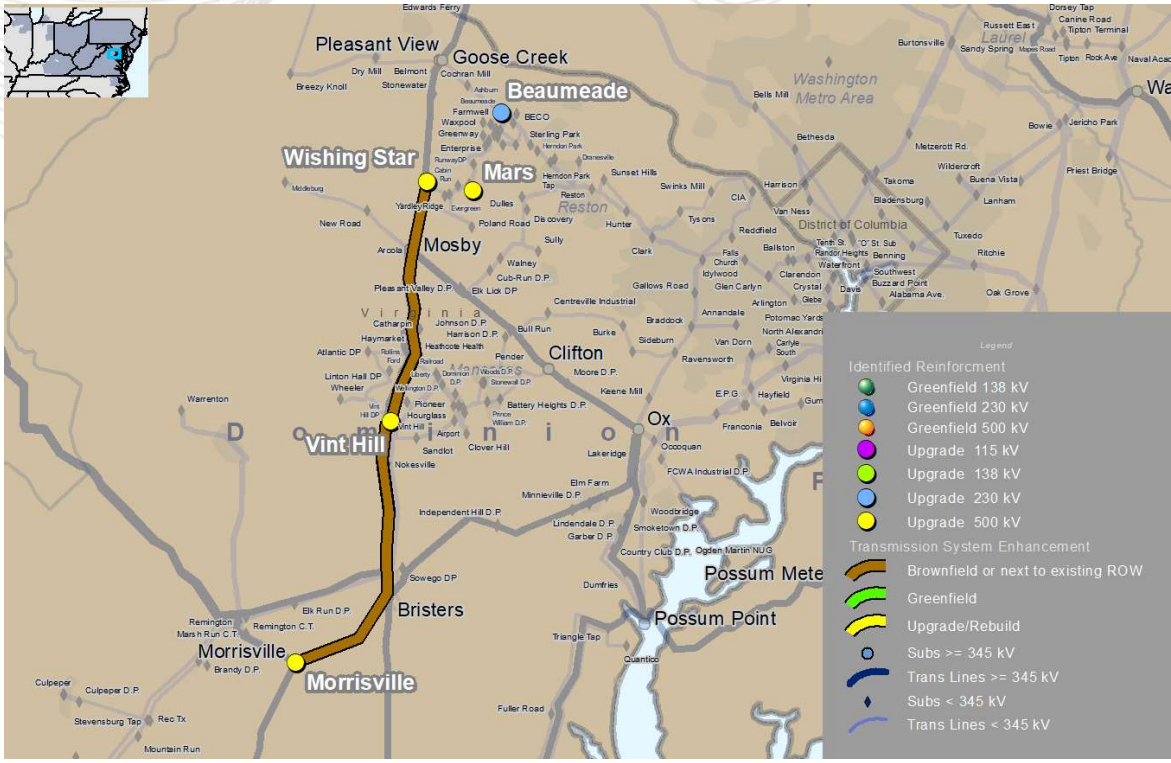
NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Continued on next slide…

2022W3 – Recommended Solutions: South Cluster

Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
500kV Line #545 Bristers – Morrisville	3426/3426/4375/4375
500kV Line #569 Loudoun - Morrisville	3426/3426/3464/3464
500kV Line #535 Vint Hill – Loudoun	3572/3622/4560/4599
500kV Line #546 Mosby - Wishing Star	4295/4357/5155/5155
500kV Line #590 Mosby - Wishing Star	3464/3464/3984/4018
230kV Line #2030 Gainesville – Loudoun	1047/1047/1160/1160
230kV Line #2045 Loudoun – Brambleton	1047/1047/1160/1160
230kV Line #2094 & 2227 Brambleton - Racefield - Loudoun	1047/1047/1160/1160
230kV Line #2101 Bristers - Vint Hill	1047/1047/1160/1160
230kV Line #2114 Remington CT - Rollin Ford	1573/1573/1648/1648
230kV Line #2140 Loudoun – Heathcote	1047/1047/1160/1160
230kV Line #2151 Railroad DP – Gainesville	1573/1573/1648/1648
230kV Line #2163 Vint Hill – Liberty	1573/1573/1648/1648
230kV Line #2176 Heathcote – Gainesville	1047/1047/1160/1160
230kV Line #2222 Rollins Ford – Gainesville	1573/1573/1648/1648
115kV Line #183 Bristers – Ox	1573/1573/1648/1648 (@230kV)
500kV Line Vint Hill to Wishing Star	NA
500kV Line Morrisville - Vint Hill	NA



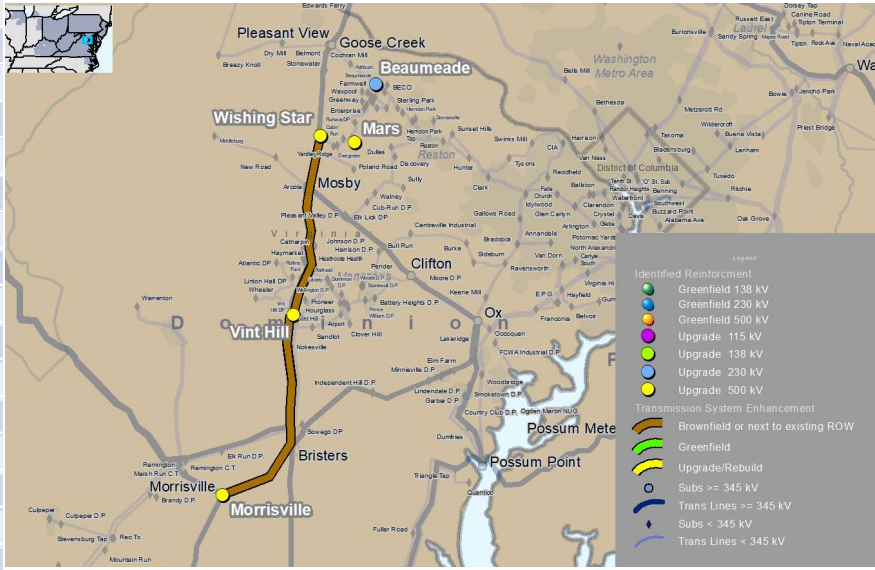
NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should <u>not</u> be relied upon for exact geographical substation locations or line routes.*

Continued on next slide…

2022W3 – Recommended Solutions: South Cluster

Preliminary Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
500kV Line #545 Bristers – Morrisville	4357/4357/5155/5155
500kV Line #569 Loudoun - Morrisville	4357/4357/5155/5155
500kV Line #535 Vint Hill – Loudoun	4357/4357/5155/5155
500kV Line #546 Mosby - Wishing Star	4357/4357/5155/5155
500kV Line #590 Mosby - Wishing Star	4357/4357/5155/5155
230kV Line #2030 Gainesville – Loudoun	1573/1573/1648/1648
230kV Line #2045 Loudoun – Brambleton	1573/1573/1648/1648
230kV Line #2094 & 2227 Brambleton - Racefield - Loudoun	1573/1573/1648/1648
230kV Line #2101 Bristers - Vint Hill	1573/1573/1648/1648
230kV Line #2114 Remington CT - Rollin Ford	1573/1573/1648/1648
230kV Line #2140 Loudoun – Heathcote	1573/1573/1648/1648
230kV Line #2151 Railroad DP – Gainesville	1573/1573/1648/1648
230kV Line #2163 Vint Hill – Liberty	1573/1573/1648/1648
230kV Line #2176 Heathcote – Gainesville	1047/1047/1160/1160
230kV Line #2222 Rollins Ford – Gainesville	1573/1573/1648/1648
115kV Line #183 Bristers – Ox	1573/1573/1648/1648 (@230kV)
500kV Line Vint Hill to Wishing Star	4357/4357/5155/5155
500kV Line Morrisville - Vint Hill	4357/4357/5155/5155



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Estimated Cost: $842.19 M

Required IS Date: 6/1/2027
Projected IS Date: 6/1/2028

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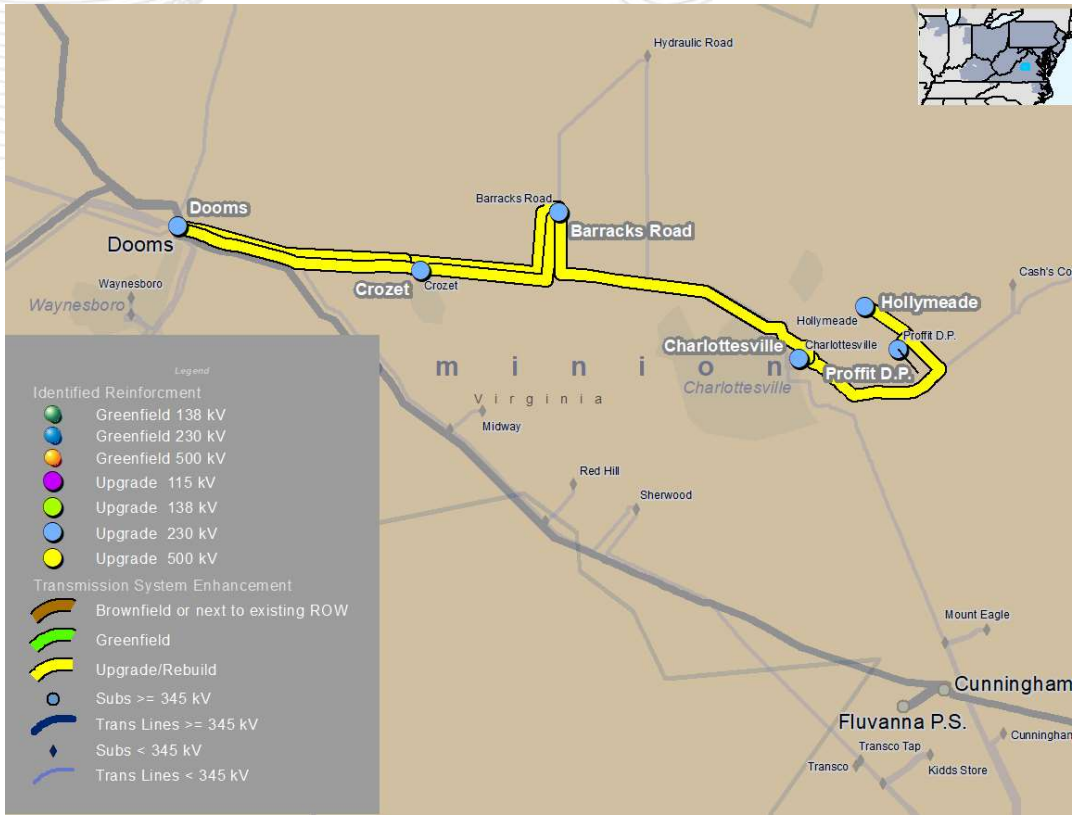
2022W3 – Recommended Solutions: South Cluster

Recommended Solution: 2022-W3-967

- Rebuild 230kV Line #2054 Charlottesville – Proffit DP using double-circuit capable 500/230 kV poles (the 500kV circuit will not be wired as part of this project).
- Rebuild 230kV Line #233 Charlottesville – Hydraulic Rd – Barracks Road – Crozet – Dooms
- Rebuild 230kV Line #291 Charlottesville – Barracks Road – Crozet – Dooms
- Relay resets/revisions at the following substations:
  - Hollymeade, Proffit, Barracks Road, Crozet
- Terminal equipment upgrades at the following substations:
  - Charlottesville for Lines #2054, #233 & #291 rebuilds
  - Hydraulic Rd for #233 & #291 rebuilds
  - Dooms for #233 & #291 rebuilds

Baseline # B3800.360 – B3800.372



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Continued on next slide…

2022W3 – Recommended Solutions: South Cluster

Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #2054 Charlottesvillle – Proffit D.P.	586/586/741/741
230kV Line #233 Barracks Road – Crozet	608/608/769/769
230kV Line #291 Charlottesville – Barracks Road – Crozet – Dooms	595/595/757/757

Preliminary Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #2054 Charlottesvillle – Proffit D.P.	1047/1047/1160/1160
230kV Line #233 Charlottesville – Hydraulic Rd – Barracks Road – Crozet – Dooms	1573/1573/1648/1648
230kV Line #291 Charlottesville – Barracks Road – Crozet – Dooms	1573/1573/1648/1648

Estimated Cost: $183.49 M
Required IS Date: 6/1/2027
Projected IS Date: 6/1/2028

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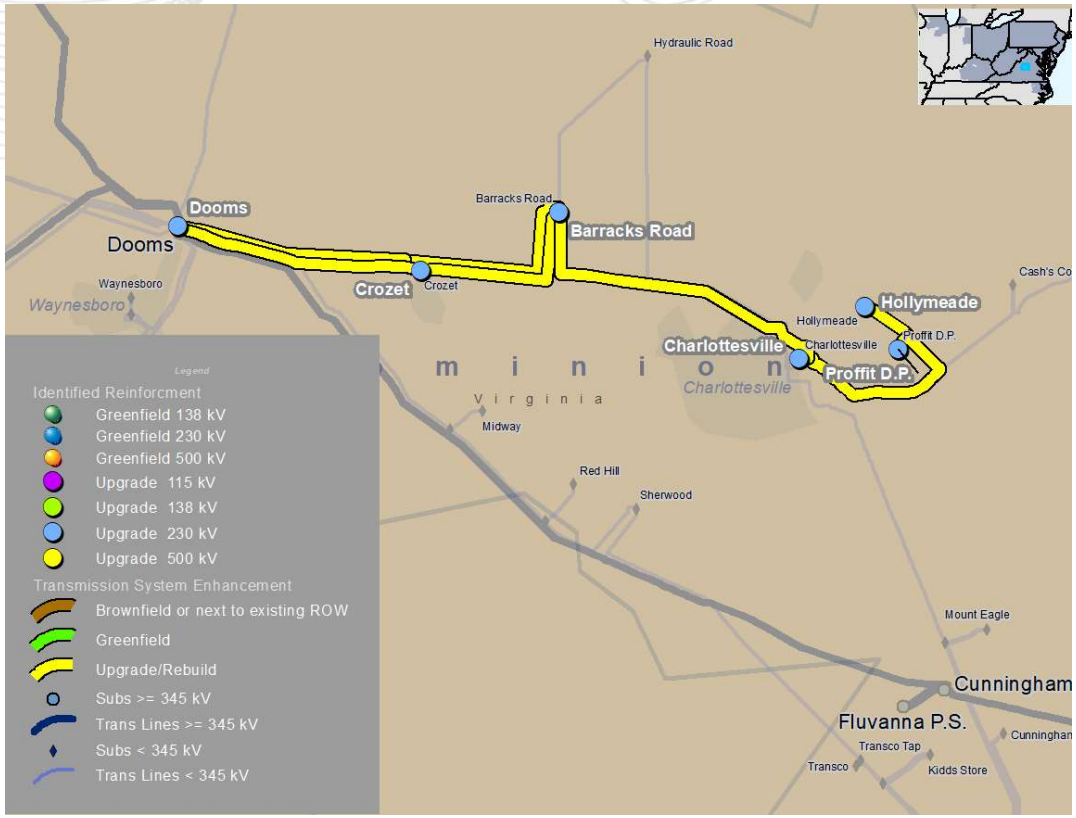

NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: South Cluster

Recommended Solution: 2022-W3-211

- Rebuild 230kV Line #2135 Hollymeade – Gordonsville using double-circuit capable 500/230 kV poles (the 500kV circuit will not be wired as part of this project).
- Terminal equipment upgrades at the following substations:
  - Hollymeade, Gordonsville, Cash's Corner

Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #2135 Cash's Corner - Gordonsville	586/586/741/741
230kV Line #2135 Cash's Corner - Hollymeade	586/586/741/741

Preliminary Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #2135 Cash's Corner - Gordonsville	1573/1573/1648/1648
230kV Line #2135 Cash's Corner - Hollymeade	1047/1047/1160/1160

Baseline # B3800.300 – B3800.304
Estimated Cost: $54.85 M
Required IS Date: 6/1/2027
Projected IS Date: 6/1/2028

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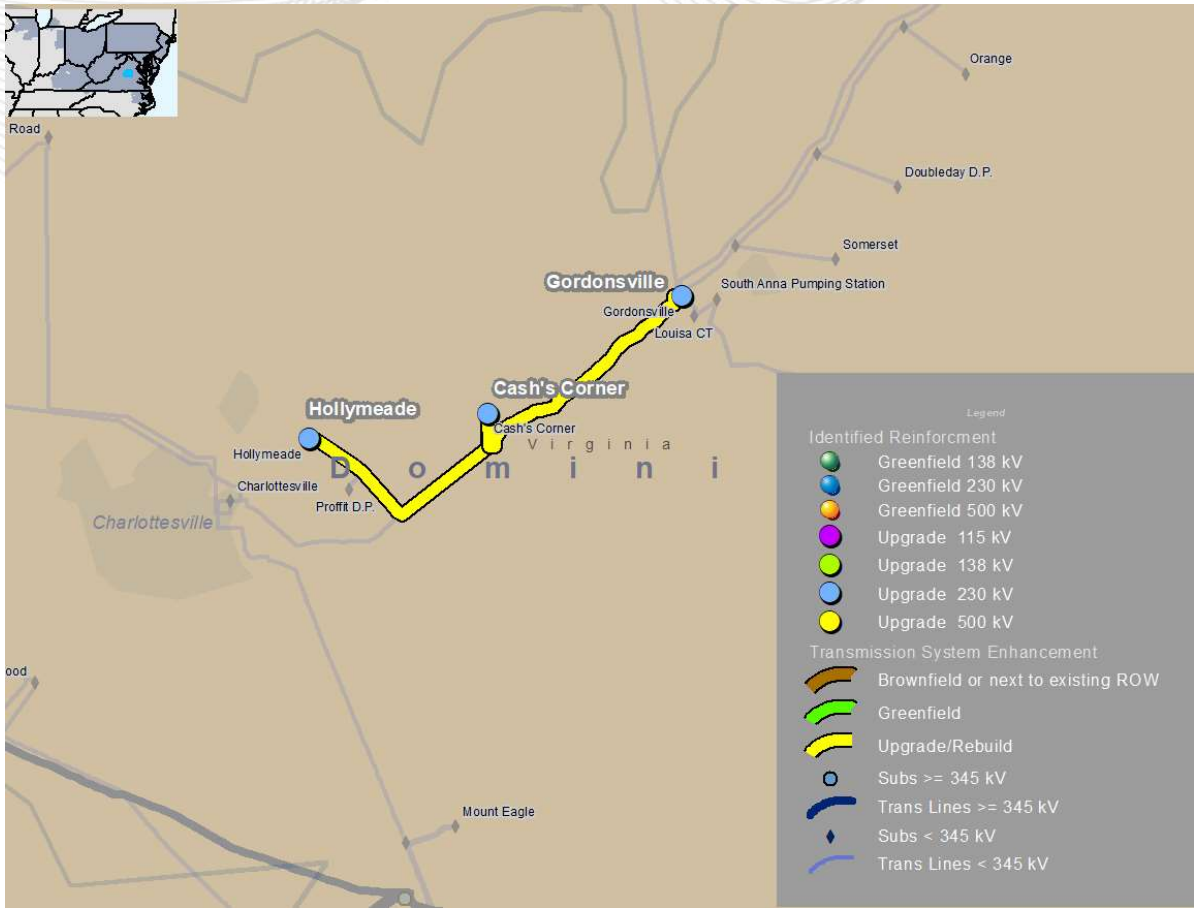

NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: South Cluster

Recommended Solution: 2022-W3-731

- Replace single unit Locks 230/115 kV 168MVA transformer #7 with a new single unit transformer with a rating of 224 MVA.
- Lead lines at the 115 kV level will be upgraded to 2000 A.

Baseline # B3800.358

Estimated Cost: $7.14 M

Required IS Date: 6/1/2027
Projected IS Date: 6/1/2028

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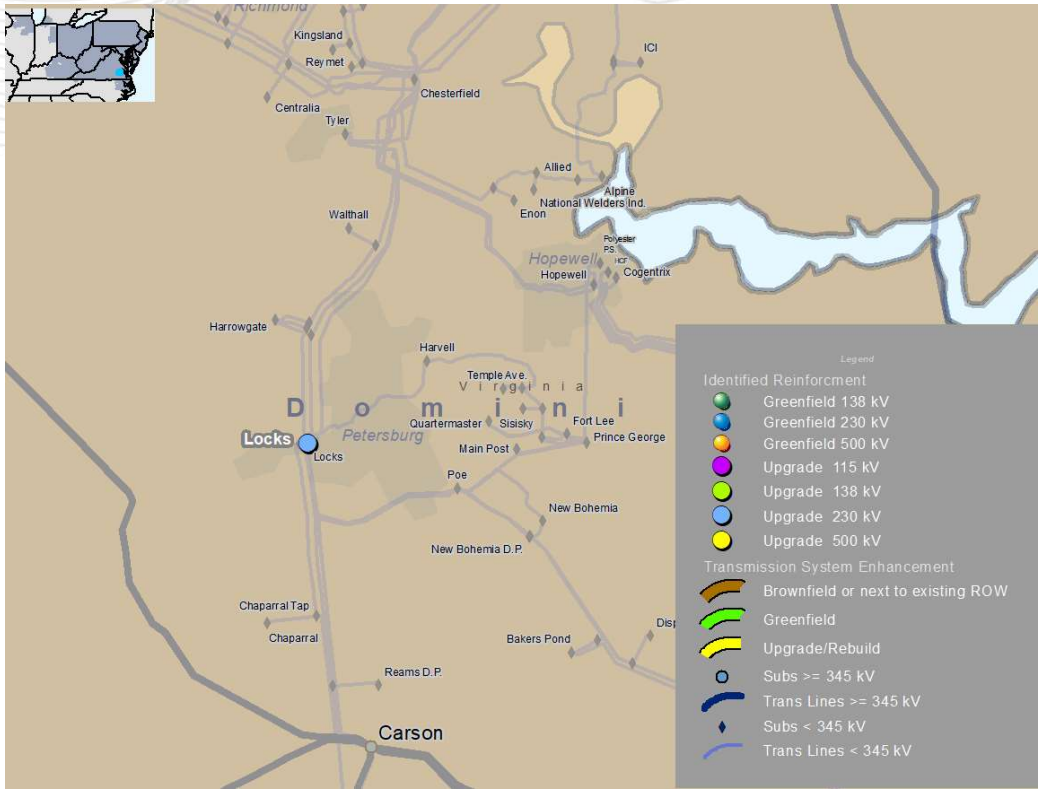

NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: South Cluster

Recommended Solution: 2022-W3-74 (**Partial**)

- Wreck and rebuild Line #2090 Ladysmith CT – Summit D.P. segment as a double circuit 230kV line. Only one circuit will be wired at this stage.
- Upgrade circuit breaker leads, switches and line leads at Ladysmith CT.

Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #2090 Ladysmith CT – Summit D.P	1225/1225/1358/1358

Preliminary Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #2090 Ladysmith CT – Summit D.P	1573/1573/1648/1648

Baseline # B3800.359
Estimated Cost: $36.50 M
Required IS Date: 6/1/2027
Projected IS Date: 12/1/2027

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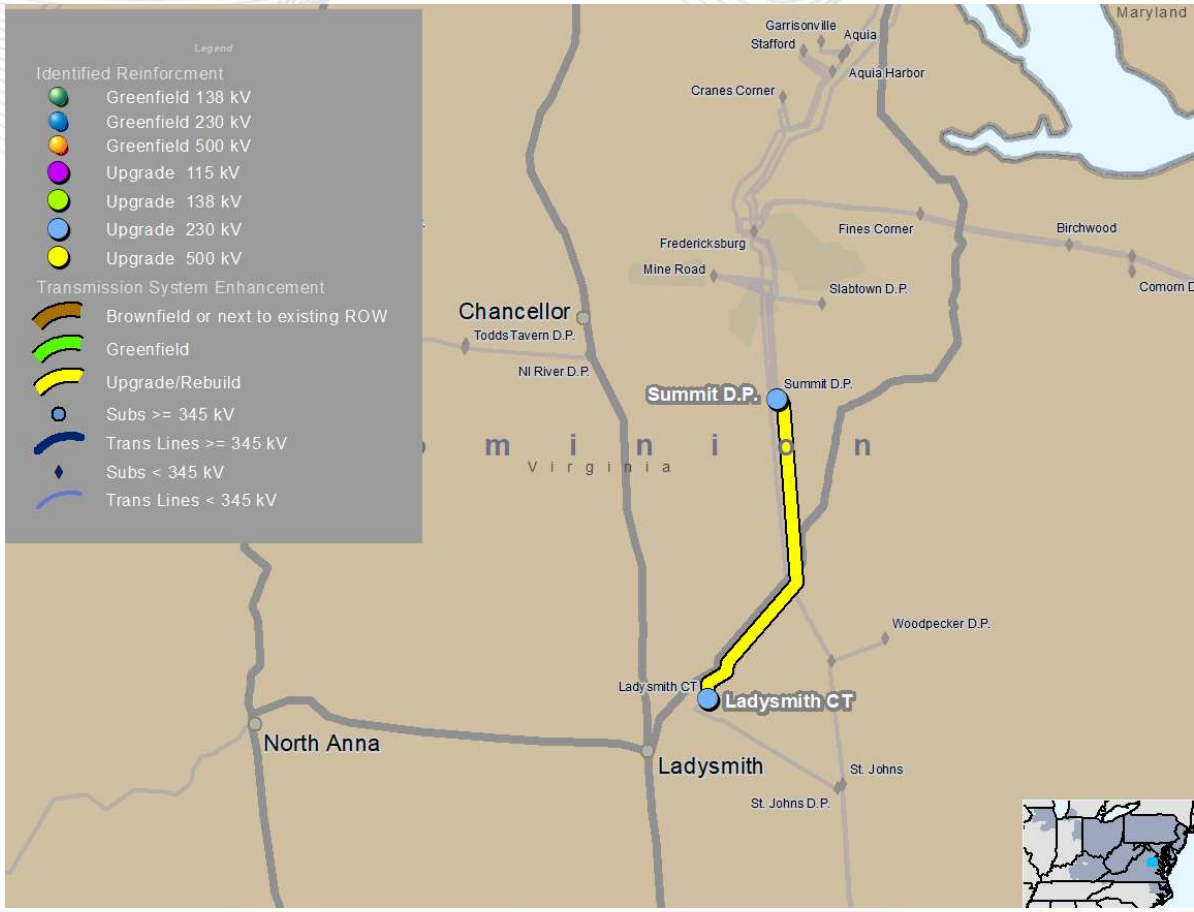

2022W3 – Recommended Solutions: South Cluster

Recommended Solution: 2022-W3-231 (**Partial**)

- Install 230kV, 500kV shunt capacitor banks and STATCOMs and associated equipment to address the reactive power needs of the system
  - Morrisville Substation
    - (1) 500kV, 150 MVAr Shunt Capacitor Bank & associated equipment
  - Wishing Star Substation
    - (1) 230kV, 150 MVAr Shunt Capacitor Bank and (1) 500kV, 293.8MVAr Shunt Capacitor Bank & associated equipment
  - Mars Substation
    - (1) 500kV, 300 MVAr STATCOM and (1) 230kV, 150MVAr Shunt Capacitor Bank & associated equipment
  - Beaumeade Substation
    - (1) 230kV, 300 MVAr STATCOM & associated equipment

Baseline # B3800.305 – B3800.310

Estimated Cost: $103.79 M

Required IS Date: 6/1/2027

Projected IS Date: 12/1/2027

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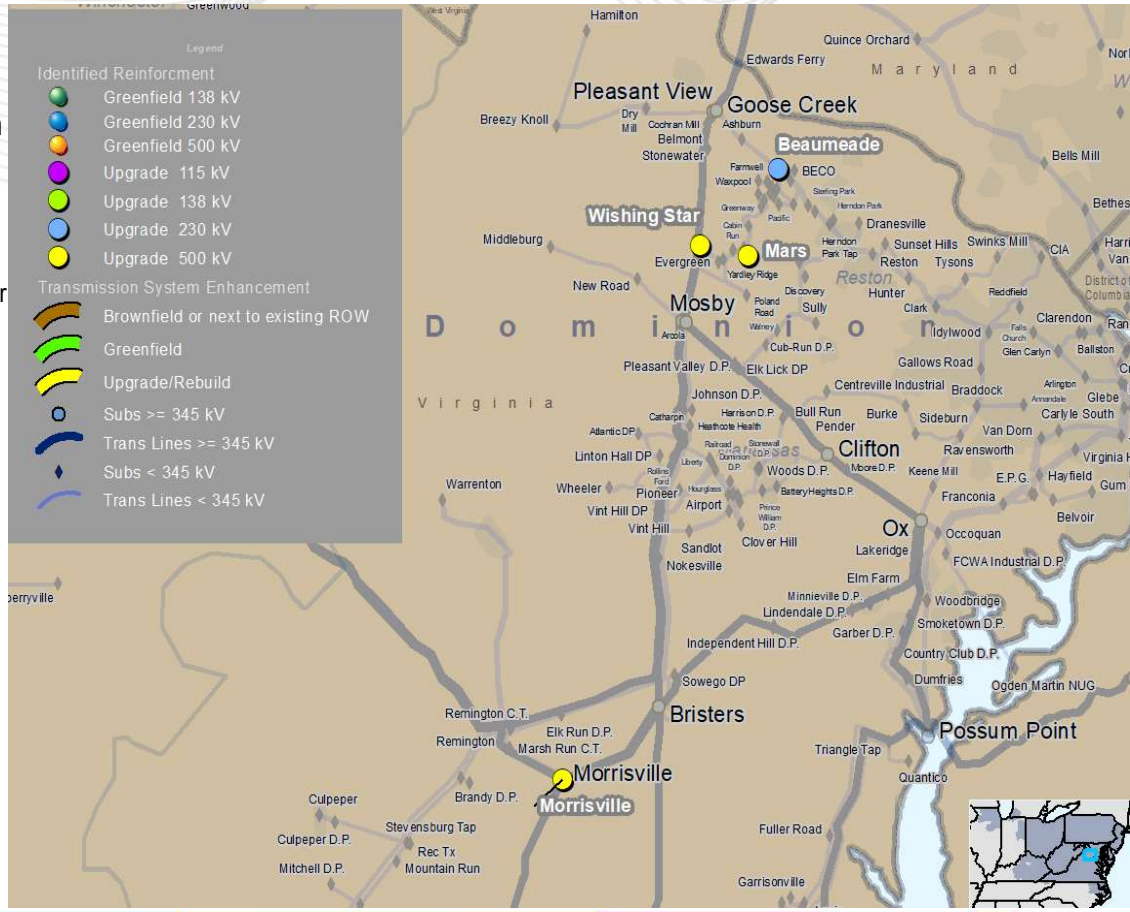

NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: South Cluster

Recommended Solution: Additional 230kV upgrades **(Dominion)**

- Uprate 12.44 miles of 230kV circuit 256 from St. Johns to Ladysmith CT
  - Approximately 7.14 miles of the line from St Johns Substation to 256/108 will be rebuilt with a mix of light duty steel DOM pole tangent H-frames and engineered steel 3-pole deadend angle structures. The proposed conductor for the rebuilt line will be 2-768 ACSS "Maumee" with dual 48 fiber DNO-11410 for shielding.
  - The remaining 5.30 miles of the line from structure 256/107 to Ladysmith CT will be reconductored with proposed 2-768 ACSS "Maumee" conductor and the existing structures and shield wire will remain.
- Transmission line switch 25666 will be upgraded to 4000A at St. Johns Substation. Terminal equipment at remote end substations will be upgraded to 4000A continuous current rating to support new conductor ratings.

Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #256 Ladysmith CT – St. Johns	876/956/876/956

Preliminary Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #256 Ladysmith CT – St. Johns	1573/1573/1648/1648

Baseline # B3800.373 – B3800.374

Estimated Cost: $37.89 M

Required IS Date: 6/1/2028

Projected IS Date: 6/1/2028

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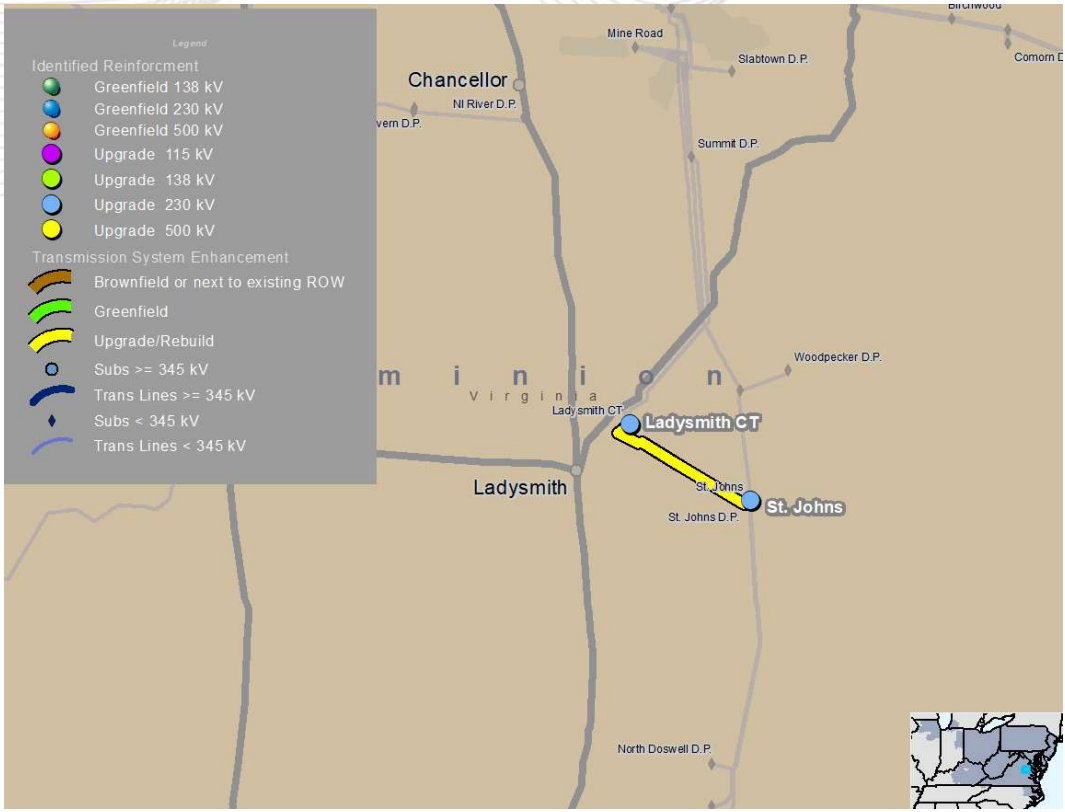

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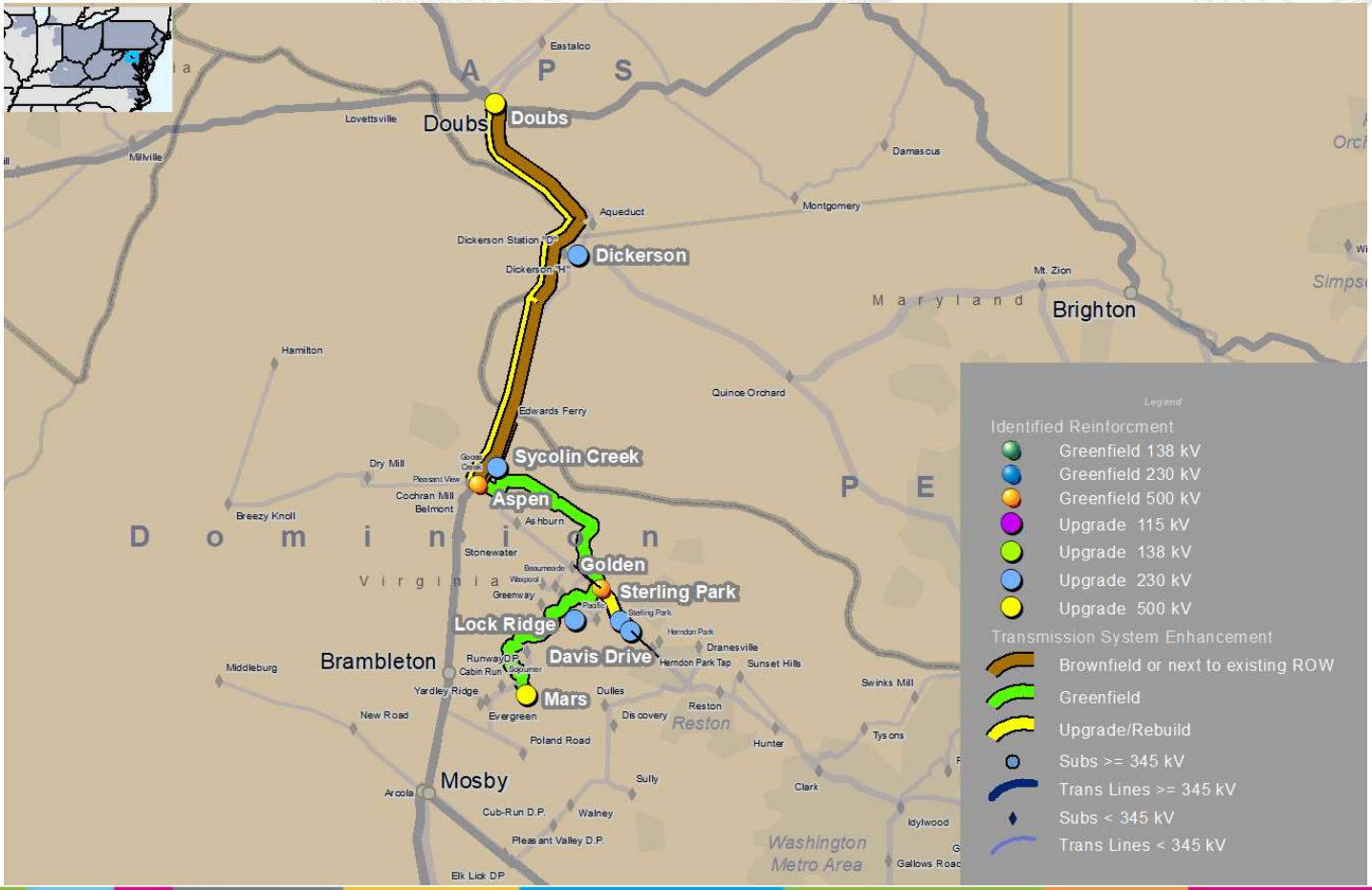
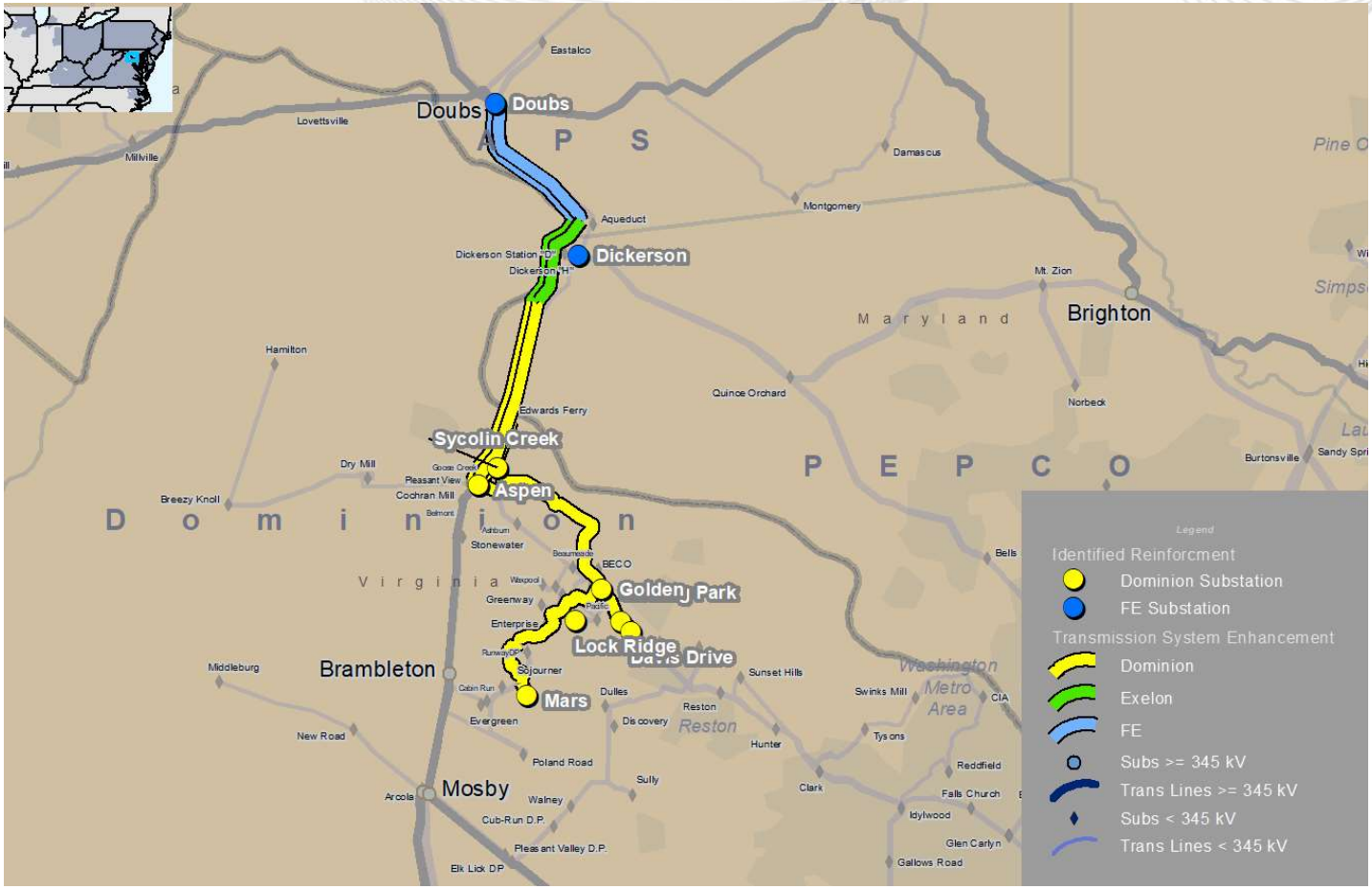
Northern Virginia/Doubs- Selected Proposals

2022W3 – Recommended Solutions: North Virginia/Doubs Cluster



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: North Virginia/Doubs Cluster by Designated Entity



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: Northern Virginia/Doubs Cluster

Recommended Solution: 2022-W3-692

- Construct new double-circuit 500/230 kV lines from Aspen substation to Golden substation
  - 230kV Line will connect Aspen – Sycolin Creek – Golden
- Construct new double-circuit 500/230 kV lines from Golden substation to Mars substation
  - 230kV Line will connect Golden – Lockridge – Mars
- Construct a new 500kV Line from Aspen to Goose Creek
- Install the 2nd 500-230 kV 1440 MVA transformer at Mars Substation
- Construct a new Aspen 500/230kV substation by tapping 500kV Line #558
- Construct a new Golden 500/230kV substation
- Upgrade existing double-circuit 230 kV lines from Golden substation to Paragon Park substation (Lines # 2150 & 2081)
- Upgrade existing single circuit 230 kV line from Paragon Park substation to BECO Substation (Line # 2207) to a minimum normal summer rating of 1573 MVA. Equipment at each substation will be upgraded to support the new conductor rating of 4000A
- Equipment upgrades at the following substations:
  - Paragon Park, BECO
- Golden relay setting reset
- Replace overdutied breakers at Belmont, BECO, Beaumeade, Pleasant View, Shellhorn, and Discovery.

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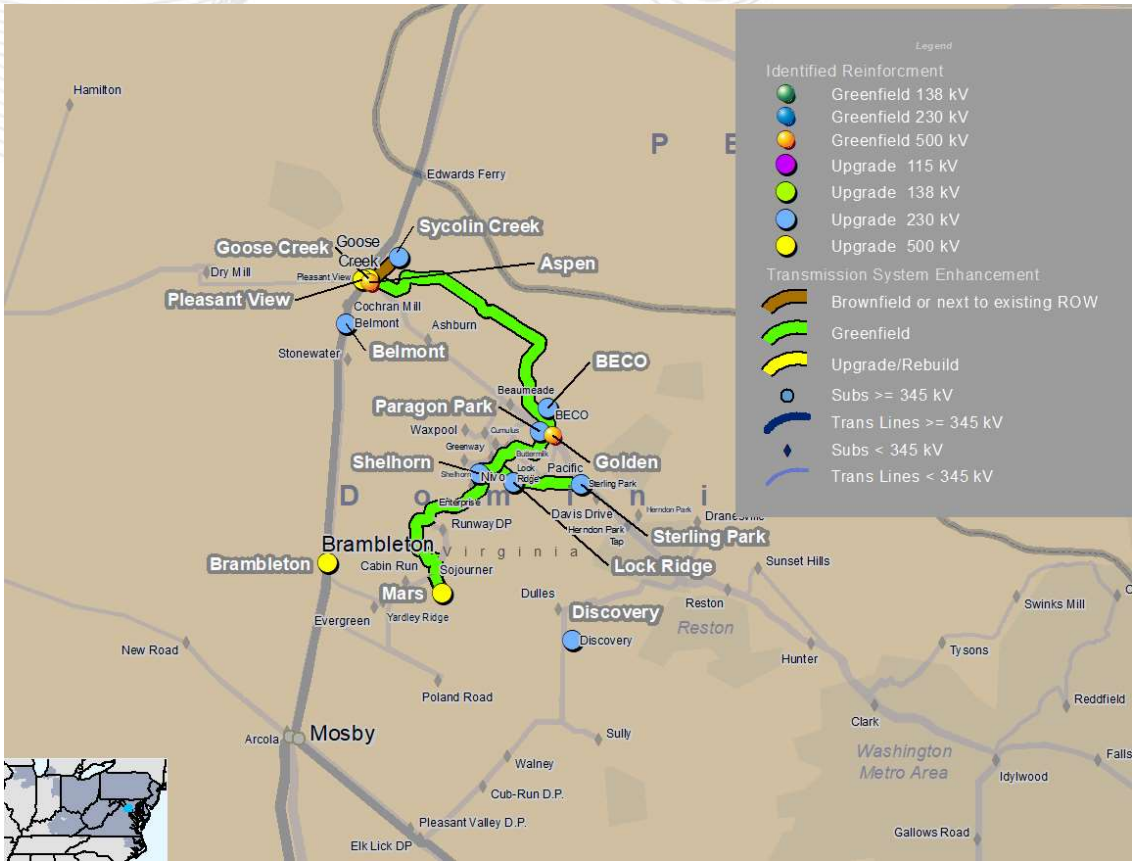
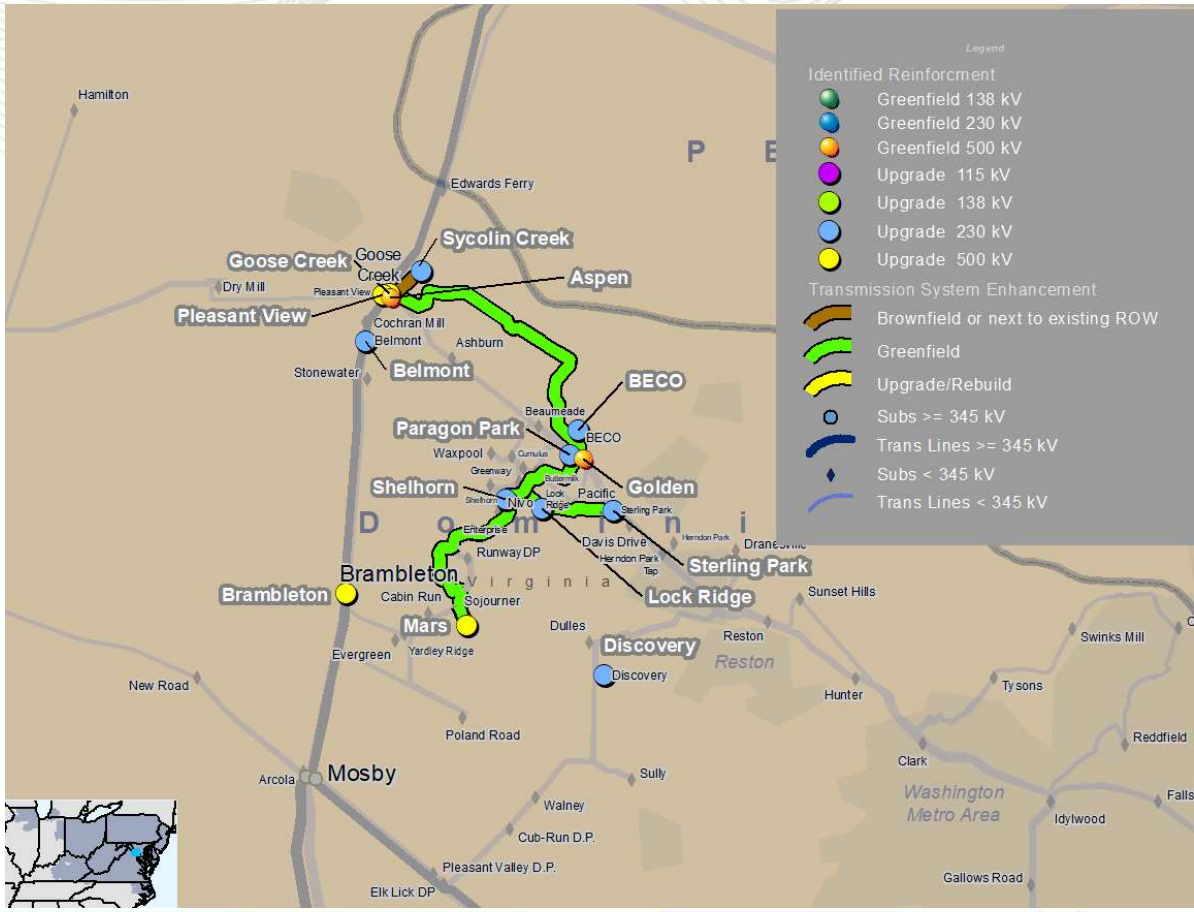
NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*



2022W3 – Recommended Solutions: Northern Virginia/Doubs Cluster

Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
500kV Line Aspen – Goose Creek 2	NA
500kV Line Golden – Mars	NA
230kV Line Aspen – Sycolin Creek – Golden	NA
230kV Line Golden – Lockridge – Mars	NA
230kV Line #2150 Golden – Paragon Park 1	762/762/849/849
230kV Line #2081 Golden – Paragon Park 2	765/765/852/852
230kV Line #2207 Paragon Park – BECO	762/762/849/849



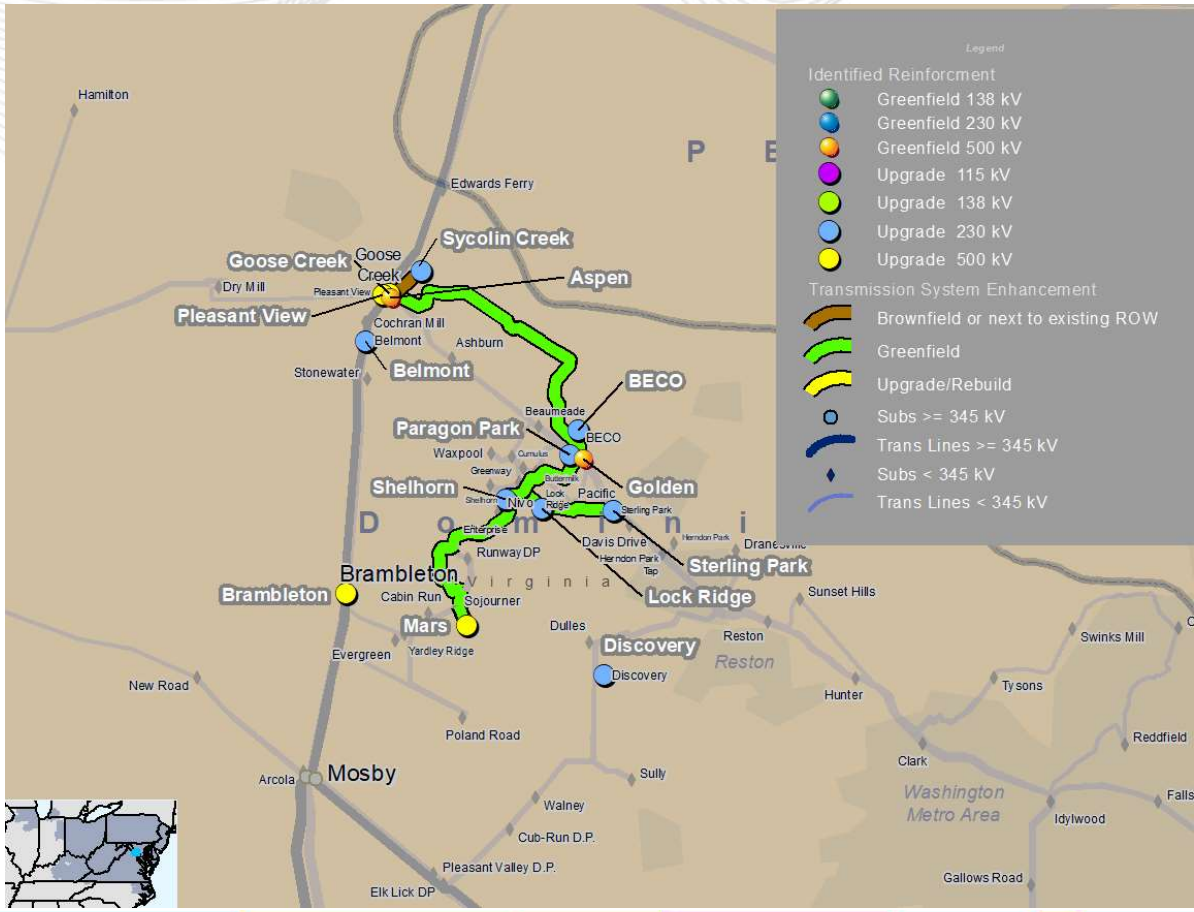
NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Continued on next slide…

2022W3 – Recommended Solutions: Northern Virginia/Doubs Cluster

Preliminary Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
500kV Line Aspen – Goose Creek	4357/4357/5155/5155
500kV Line Golden – Mars	4357/4357/5155/5155
230kV Line Aspen – Sycolin Creek – Golden	1573/1573/1648/1648
230kV Line Golden – Lockridge – Mars	1573/1573/1648/1648
230kV Line #2150 Golden – Paragon Park 1	1573/1573/1648/1648
230kV Line #2081 Golden – Paragon Park 2	1573/1573/1648/1648
230kV Line #2207 Paragon Park – BECO	1573/1573/1648/1648



Baseline # B3800.200 – B3800.227
Estimated Cost: $1025.06 M
Required IS Date: 6/1/2027
Projected IS Date: 6/1/2028

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NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: Northern Virginia/Doubs Cluster

Recommended Solution: Additional upgrades **(Dominion)**

- Reconductor 1.47 miles of 230kV circuits 2081 and 2150 from Sterling Park to Golden substation
- Reconductor 0.67 miles of 230kV circuits 2194 and 9231 from Davis Drive to Sterling Park substation

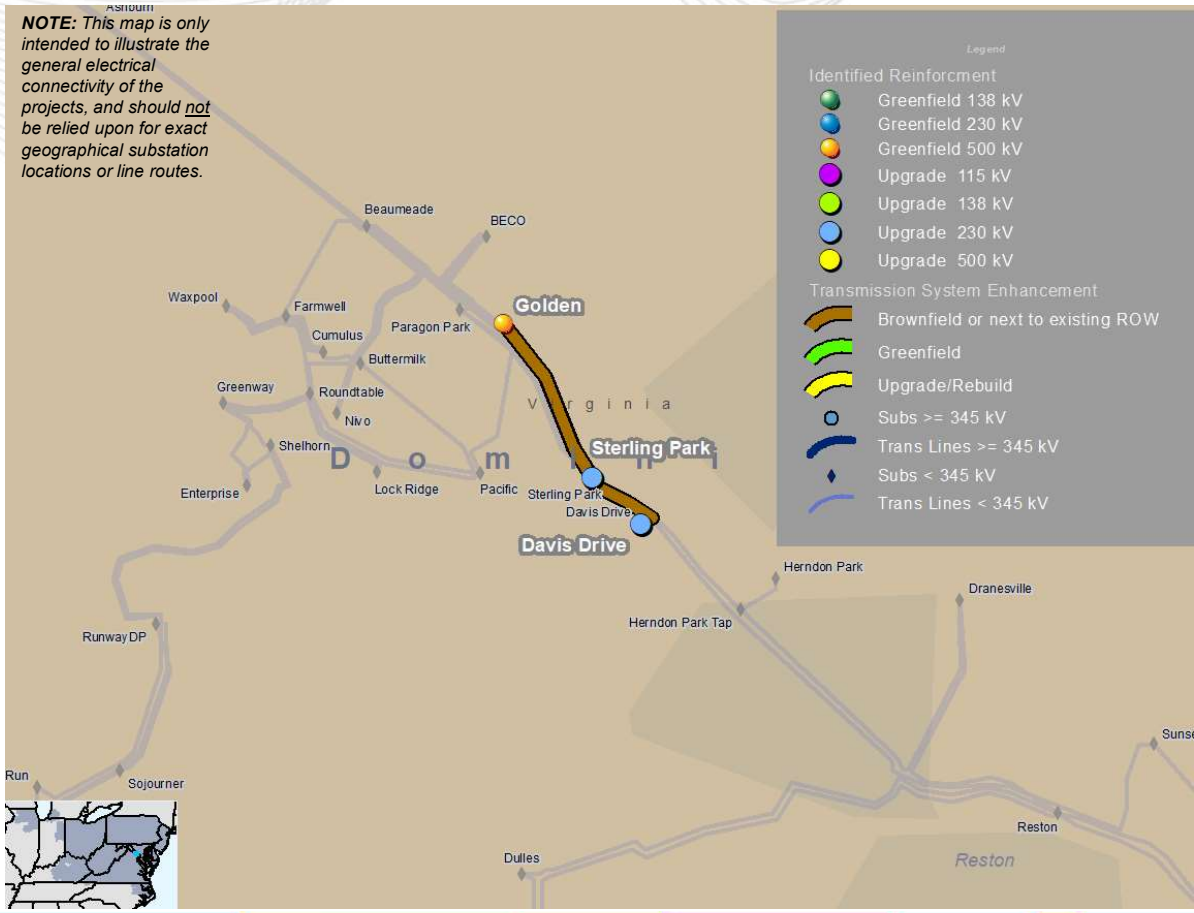
Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #2150 Golden – Sterling A	762/762/849/849
230kV Line #2081 Golden – Sterling B	765/765/852/852
230kV Line #2194 Davis Drive – Sterling A	762/762/849/849
230kV Line #9231 Davis Drive – Sterling B	629/629/721/721

Preliminary Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
230kV Line #2150 Golden – Sterling A	1573/1573/1648/1648
230kV Line #2081 Golden – Sterling B	1573/1573/1648/1648
230kV Line #2194 Davis Drive – Sterling A	1573/1573/1648/1648
230kV Line #9231 Davis Drive – Sterling B	1573/1573/1648/1648

Baseline # B3800.228 – B3800.229
Estimated Cost: $13.50 M
Required IS Date: 6/1/2027
Projected IS Date: 6/1/2028

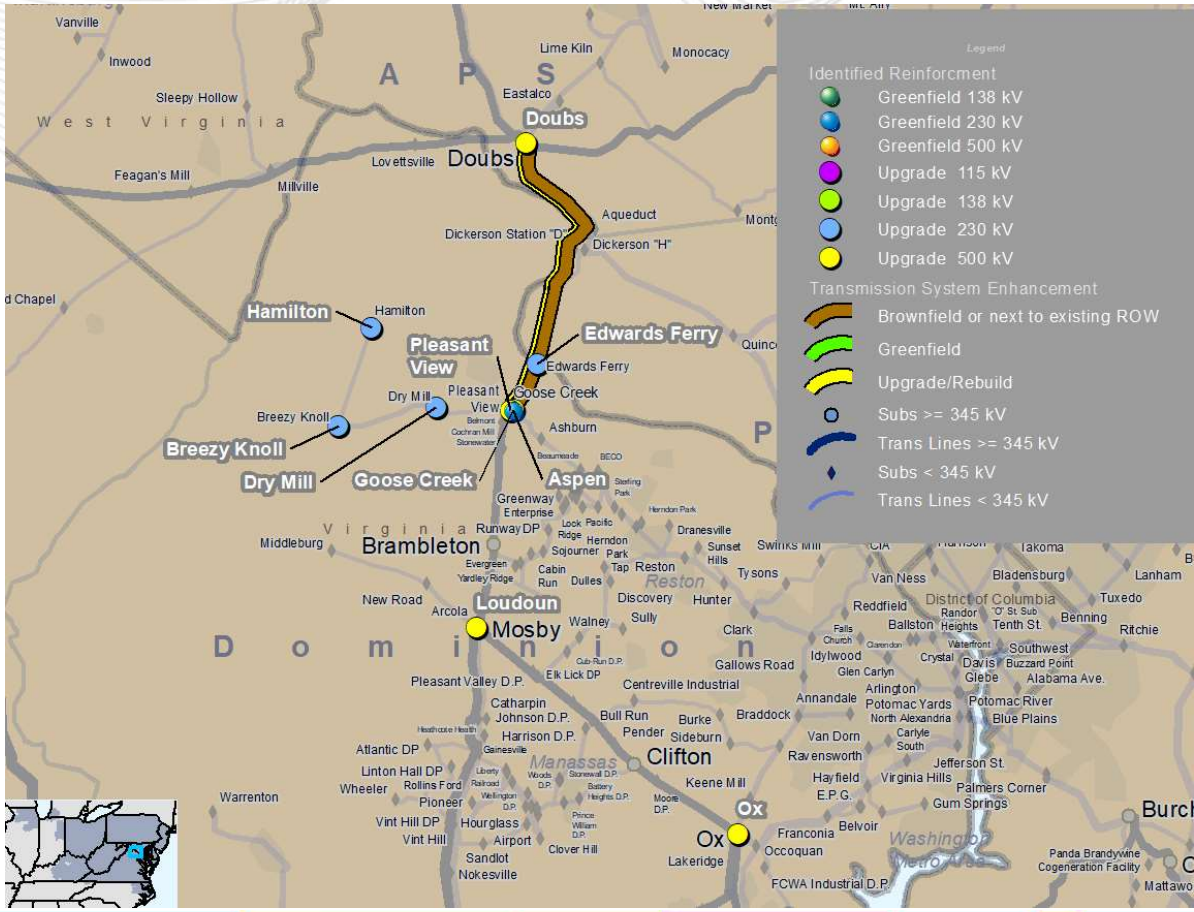


2022W3 – Recommended Solutions: Northern Virginia/Doubs Cluster

Recommended Solution: 2022-W3-516 **(Dominion)**

- Rebuild 500kV Line #514 Doubs – Goose Creek using double circuit 500kV/230kV towers on foundations. Scope covers line construction between Goose Creek and the Doubs Interconnection point, which is south of the Potomac River.
- Construct a new 500kV Line between Doubs and a new substation called Aspen. Scope covers line construction between Aspen and the Doubs Interconnection point, which is south of the Potomac River.
- Rebuild 230kV Line #203 Pleasant View – Dickerson (from Pleasant View substation and structure 203/15 within the existing ROW using double circuit 500kV/230kV towers on foundations.
- Wreck and rebuild approximately 1 mile of 230kV Line #2098 between Pleasant View and Structure 2098/9, where Line 2098 turn towards Hamilton Substation. The 1 mile portion will share the new double circuit 500/230kV towers with Line 514, which is being rebuilt as part of this project.
- Relay resets/revisions at the following substations:
  - Breezy Knoll, Dry Mill, Hamilton
- Terminal equipment upgrades at the following substations:
  - Goose Creek, Pleasant View, Edwards Ferry
- Replace overdutied breakers at Loudoun, Ox, Pleasant View.

- Earlier approved EOL baseline B3247 (DOM) and supplemental S2386 (FE) will be cancelled



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

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2022W3 – Recommended Solutions: Northern Virginia/Doubs Cluster

Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
500kV Line #514 Doubs – Goose Creek	4224/4357/5155/5155
500kV Line #5XX Doubs – Aspen	NA
230kV Line #203 Pleasant View – Twin Creeks	1315/1412/1564/1564
230kV Line #9303 Twin Creeks – Edwards Ferry	1315/1412/1564/1564

Preliminary Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
500kV Line #514 Doubs – Goose Creek	4357/4357/5155/5155
500kV Line #5XX Doubs – Aspen	4357/4357/5155/5155
230kV Line #203 Pleasant View – Twin Creeks	1573/1573/1648/1648
230kV Line #9303 Twin Creeks – Edwards Ferry	1573/1573/1648/1648

Baseline # B3800.230 – B3800.242
Estimated Cost: $78.4 M
Required IS Date: 6/1/2027
Projected IS Date: 12/1/2027

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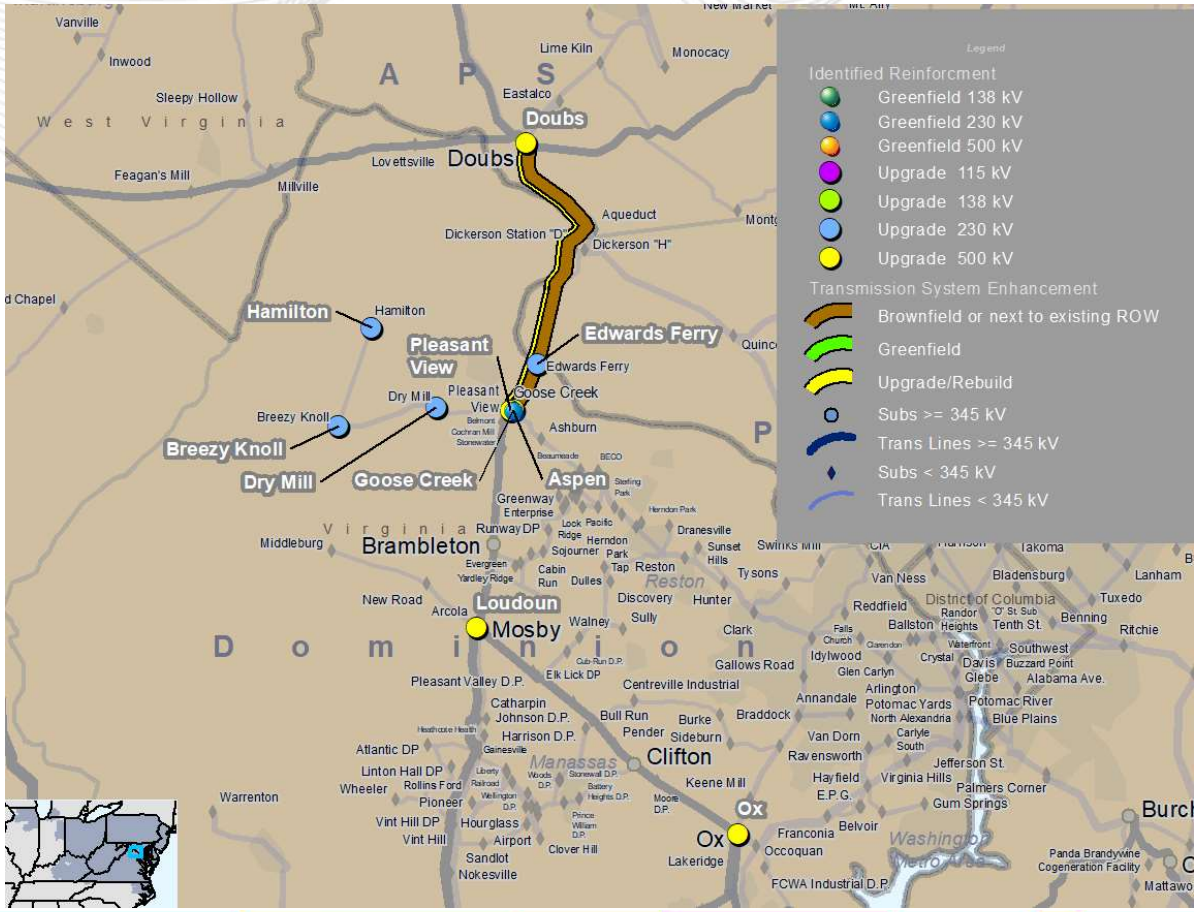


2022W3 – Recommended Solutions: Northern Virginia/Doubs Cluster

Recommended Solution: 2022-W3-344/660 **(Exelon)**

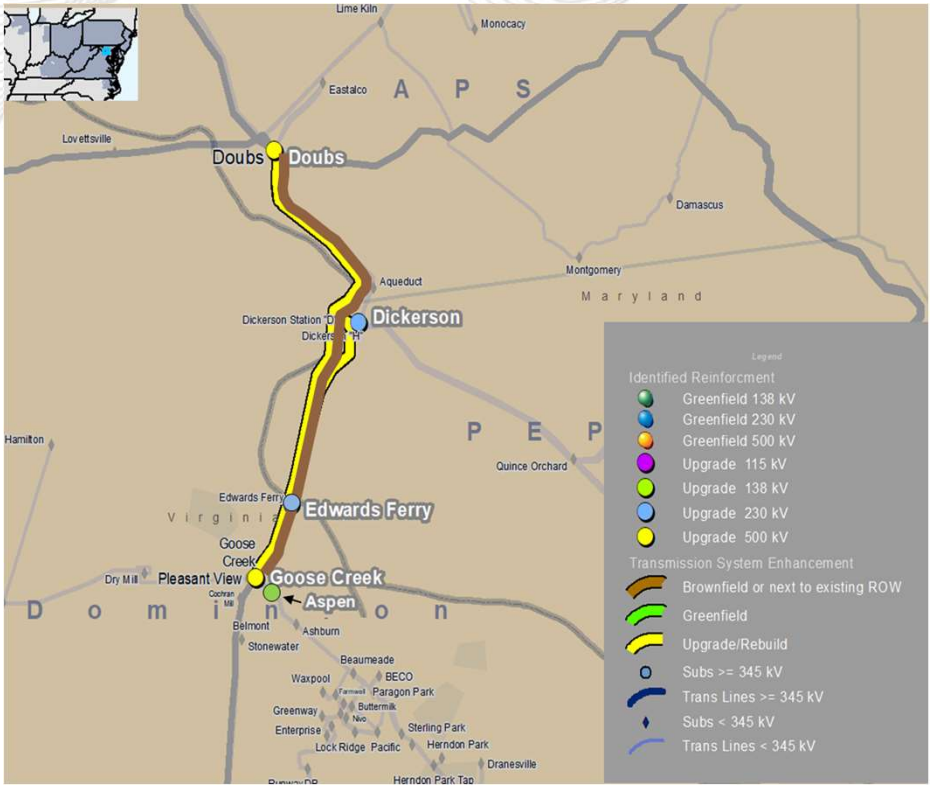
- Exelon portion of the New 500 kV Doubs to Goose Creek utilizing Existing Exelon ROW
  - Rebuild 7.26 miles of existing 230 kV circuit from Dickerson Station H to Ed's Ferry area to accommodate the new 500 kV circuit between Doubs and Goose Creek. The new structure will carry both 500 kV and the 230 kV from Dickerson Station H to Ed's Ferry circuits. (**Exelon**)
    - 500 kV New Rating 4357SN/4357SE/WN5155/5155WE MVA
    - 230 kV New Rating 1618SN/1867SE/WN1702/1951WE MVA
  - Reconfigure Dickerson H 230 kV Substation and upgrade terminal equipment. (**Exelon**)

Baseline # B3800.243 – B3800.245

Proposed Cost Estimate: $66.38 M

Required In-Service Date : 6/1/2027

Projected In-Service Date : 2028-2030

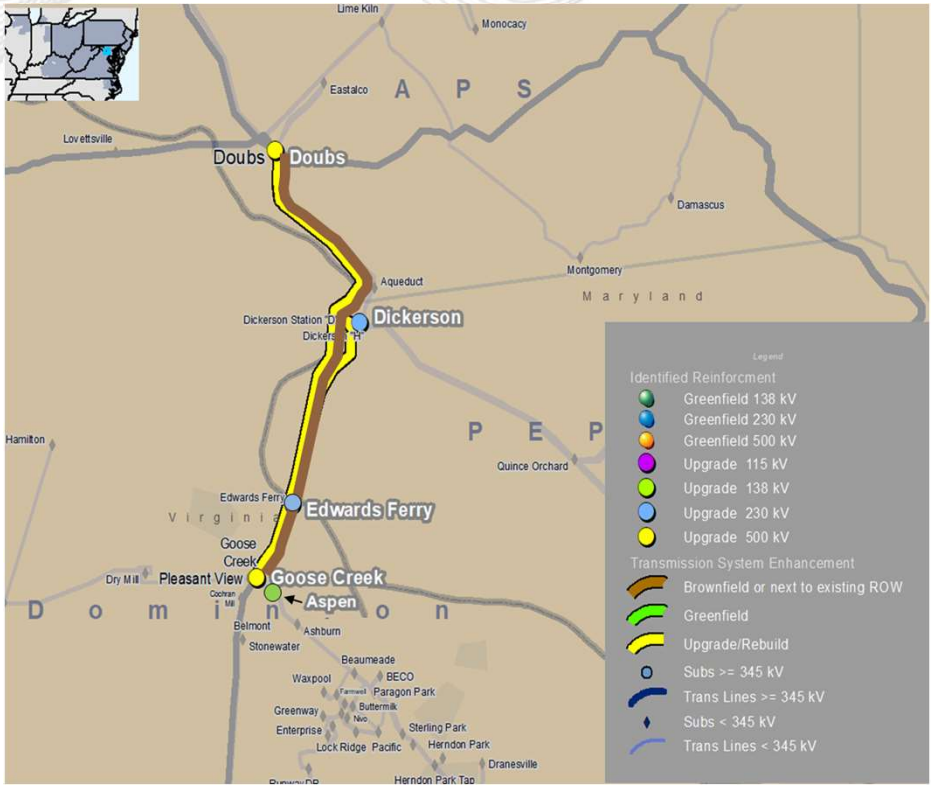


NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: Northern Virginia/Doubs Cluster

Recommended Solution: 2022-W3-837 **(FirstEnergy)**

- Existing Doubs to Goose Creek 500 kV rebuild and New Doubs to Aspen 500 kV line
  - **Rebuild 500kV Line #514 from Doubs – Goose Creek 500 kV line**. The Doubs – Goose Creek 500 kV Line will be rebuilt and the Doubs - Dickerson 230 kV will be relocated and underbuilt on the same structure - **(FE Cost Estimate: $103.27M)**
  - **New Doubs to Aspen 500 kV line -** Aspen Substation is not yet constructed but is a component in Dominion's proposal 2022-W3-692. - **(FE Cost Estimate: $68.8M)**
  - **Doubs Substation work** - Re-terminate the rebuilt Doubs – Goose Creek 500 kV line in its existing bay, Terminate the new Doubs – Aspen 500 kV line in the open bay at Doubs, Replace three 500 kV breakers, Replace 500 kV terminal equipment including disconnect switches, CTs and substation conductor & Replace relaying - **(FE Cost Estimate: $31.7M)**
  - Rebuild the Doubs - Dickerson 230 kV Line, Rebuild the Doubs - Aqueduct 230 kV Line and Rebuild the Dickerson - Aqueduct 230 kV Line. This will be underbuilt on the new Doubs - Aspen 500 kV Line - **(FE Cost Estimate: $31.19M)**



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

2022W3 – Recommended Solutions: Northern Virginia/Doubs Cluster

Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
Doubs – Goose Creek 500 kV Rebuild	4224/4357/5155/5155
Doubs - Aqueduct 230 kV	1106/1290/1121/1357
Aqueduct - Dickerson H 230 kV	1104/1195/1121/1195
Doubs - Dickerson H 230 kV	1104/1195/1121/1195

Preliminary Facility Ratings:

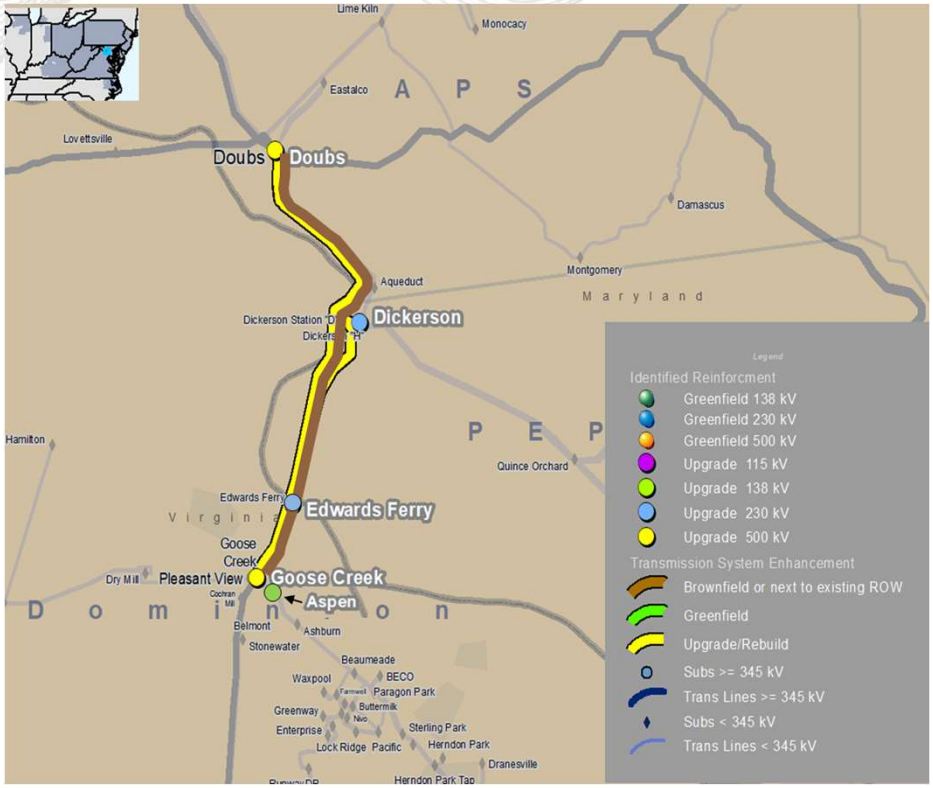
Branch	SN/SE/WN/WE (MVA)
Doubs – Goose Creek 500 kV Rebuild Doubs – ASPEN 500 kV (New)	4357/4357/5155/5155
Doubs - Aqueduct 230 kV	1106/1323/1360/1512
Aqueduct - Dickerson H 230 kV	1104/1195/1195/1195
Doubs - Dickerson H 230 kV	1104/1195/1195/1195

Estimated Cost: **$234.96M**

Baseline ID's: b3800.122 – b3800.127

Required IS Date: **6/1/2027**

Projected IS Date: **6/1/2030**



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Eastern Cluster - Selected Proposals

Recommended Solutions to Address Clusters - East

Transource – North Delta substation Expansion

Recommended Solution:

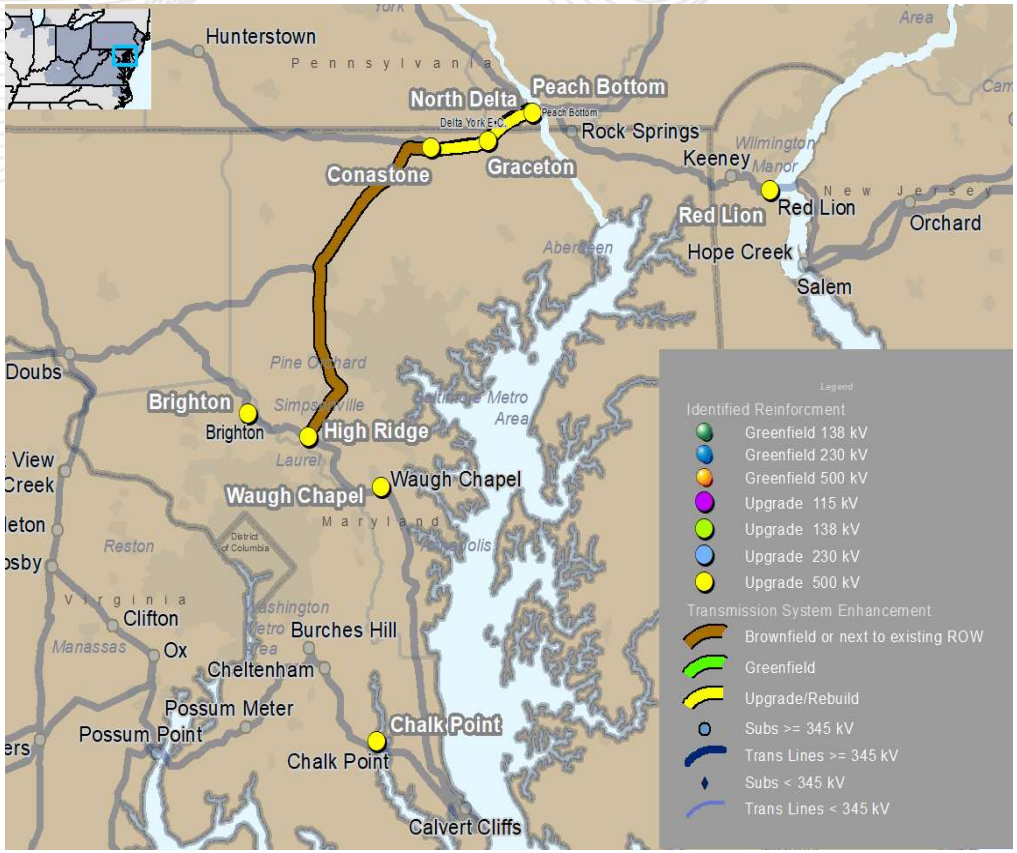
- Expand North Delta 500 kV substation
  - Expand the North Delta 500 substation to include four bay breaker and half configuration
  - Expansion will allow termination of six 500 kV lines and one 500/230 kV transformer

Baseline # B3737.47 (NJOSW – SAA 1.0)

Proposed Cost Estimate: $104.1 M

Required In-Service Date : 6/1/2027

Projected In-Service Date : 12/31/2027



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Recommended Solutions to Address Clusters - East

Exelon:2022-W3-344/660

Recommended Solution:

- Build new Peach Bottom South - North Delta 500kV line – cut in to Peach Bottom tie #1 and extending line to North Delta (~1.25 miles new ROW)
  - New Rating - 4503SN/5022SE/5206WN/5802WE MVA
- North Delta termination for the North Delta - High Ridge 500 line
- North Delta 500 kV termination for the Rock Springs 500 kV line (5034/5014 line)
- North Delta 500 kV termination for the new Peach Bottom - North Delta 500 kV line
- North Delta 500 kV termination for the Calpine generator

Baseline # B3800.44 –B3800.51

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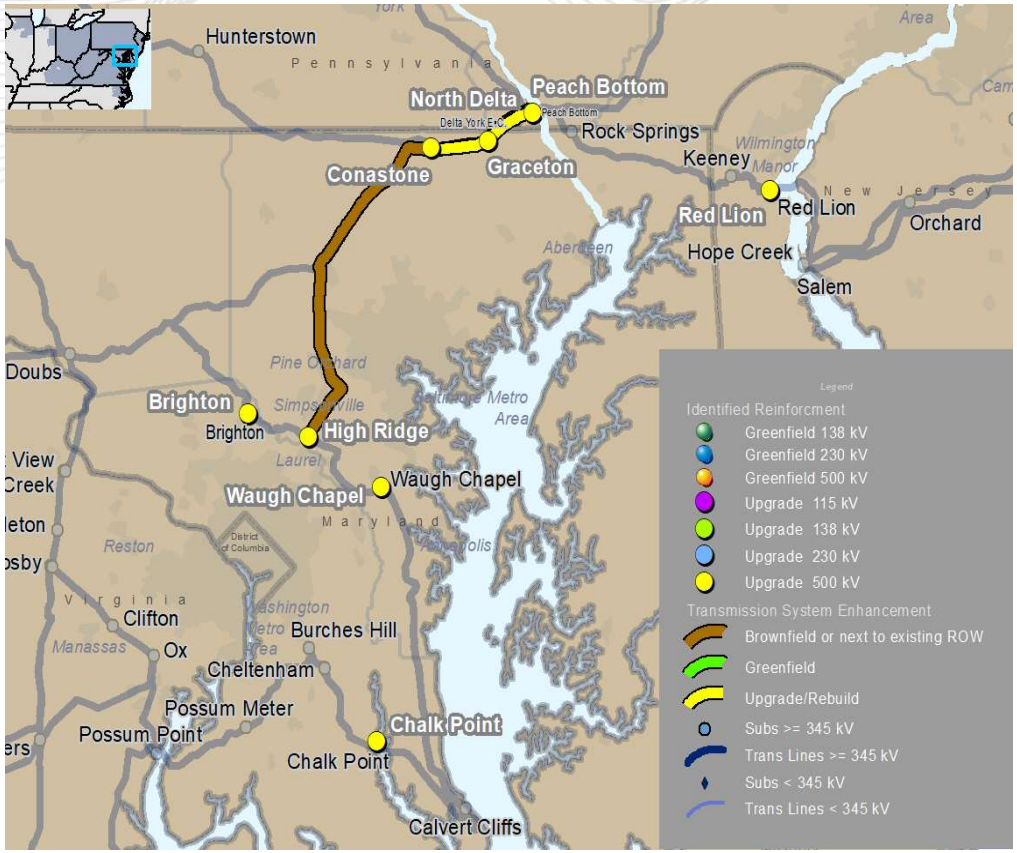

NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Recommended Solutions to Address Clusters - East

Exelon:2022-W3-344/660

Recommended Solution:

- Build High Ridge 500 kV substation (cut into Brighton – Waugh Chapel 500 kV line)
  - ➢ Three bay breaker and half configuration
  - ➢ Two 500/230 kV transformers
  - ➢ Replace terminal equipment at both Brighton and Waugh Chapel

Baseline # B3800.26 –B3800.30

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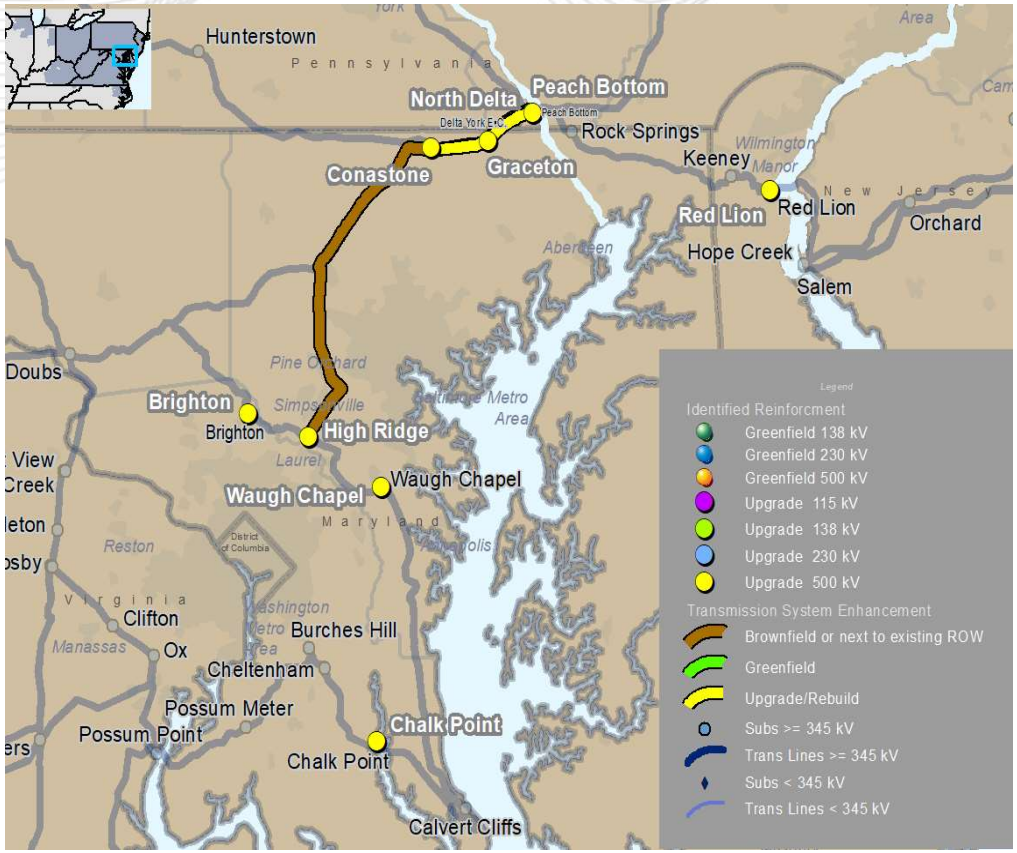

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Recommended Solutions to Address Clusters - East

Exelon:2022-W3-344/660

Recommended Solution:

- Rebuild 5012 (existing Peach Bottom – Conastone) 500 kV line on single circuit structures within existing ROW and cut into North Delta 500 kV and Gracetone 500 kV stations.**(B3800.34- B3800.36**)
  - New Rating - 4503SN/5022SE/5206WN/5802WE MVA
- Build new North Delta – High Ridge 500 kV line. (~65 miles). **(B3800.31&B3800.32**)
  - New Rating - 4503SN/5022SE/5206WN/5802WE MVA

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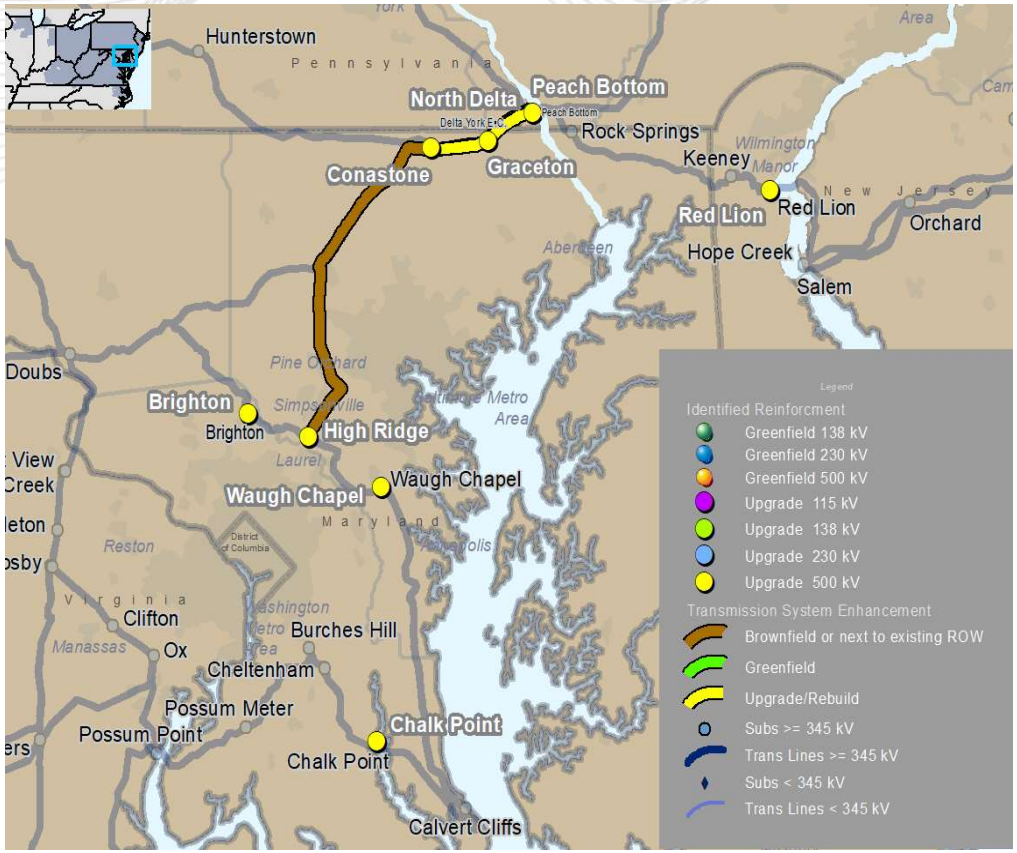

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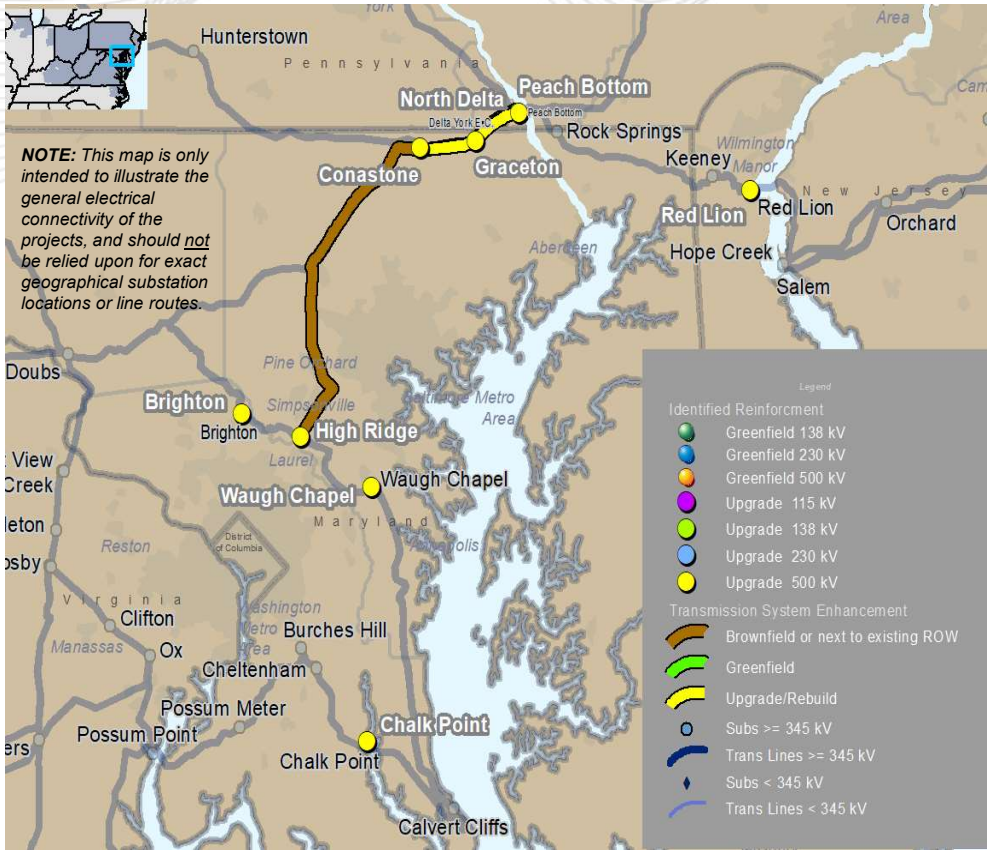
Recommended Solutions to Address Clusters - East

Exelon:2022-W3-344/660

Recommended Solution:

- Conastone - Brighton 500 kV (5011 circuit) - Replace terminal equipment limitations at both Conastone and Brighton 500 kV **(B3800.40& B3800.41)**
  - (New Rating 2920SN/3598SE/3594WN/4264WE)
- Brighton - Waugh Chapel 500kV (5053) - Replace terminal equipment limitations at Brighton 500kV **(B3800.33)**
  - (New Rating 3498SN/4070SE/4014WN/4010WE MVA)
- Chalk Point - Cheltanham 500 kV (5073) - Replace relay at Chalk Point 500 kV **(B3800.38)**
  - (New Rating – 2670SN/3099SE/3064WN/3567WE MVA)
- Conastone - Peach Bottom 500 kV (5012 circuit)- Upgrade (2) existing 500 kV breakers at Conastone from 4000A to 5000A. **(B3800.37)**
  - (New Rating - 4503SN/5022SE/5206WN/5802WE MVA)



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Recommended Solutions to Address Clusters - East

Exelon:2022-W3-344/660

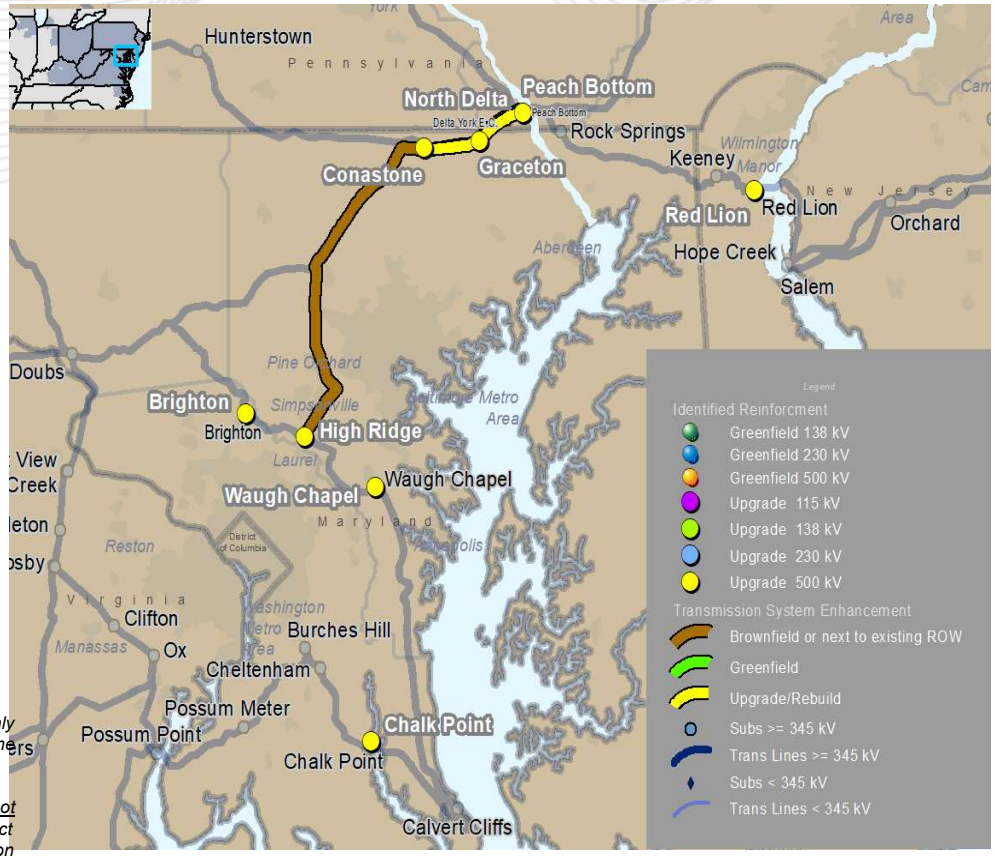
Recommended Solution:

- Peach Bottom 500 kV – Reconfigure and upgrade several terminal/substation equipment at both North and South Peach Bottom 500 kV substations **(B3800.42)**
- Red Lion - Hope Creek 500 kV - Replace terminal equipment at Red Lion **(B3800.39)**
  - (New Rating – 2598SWN/2598SWE MVA)

Proposed Cost Estimate: $708.77 M

Required In-Service Date : 6/1/2027

Projected In-Service Date : 2028-2030



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Recommended Solutions to Address Clusters - East

PPL:2022-W3-374

Recommended Solution:

- Build New Otter Creek 500 kV switching station – cut into Peach Bottom – TMI 500 kV line
  - Two bay three breaker configuration
- Build New 500kV AC line from the new Otter Creek substation – towards Conastone station fence – Conastone demarcation point (~17 miles)
  - Rebuild the existing Otter Creek - Conastone 230 kV line to become a double-circuit 500 and 230 kV line. The existing line is owned by PPL and BGE, and both will share responsibility.
    - New Rating - 4398SN/5237SE/4762WN/5609WE MVA
- Upgrade relay/terminal equipment at Peach Bottom and TMI substations
  - New Rating - 2644SN/3016SE/2917WN/3250WE MVA

Baseline # B3800.1 –B3800.6

Proposed Cost Estimate: $134.2 M

Required In-Service Date : 6/1/2027

Projected In-Service Date : 6/1/2027

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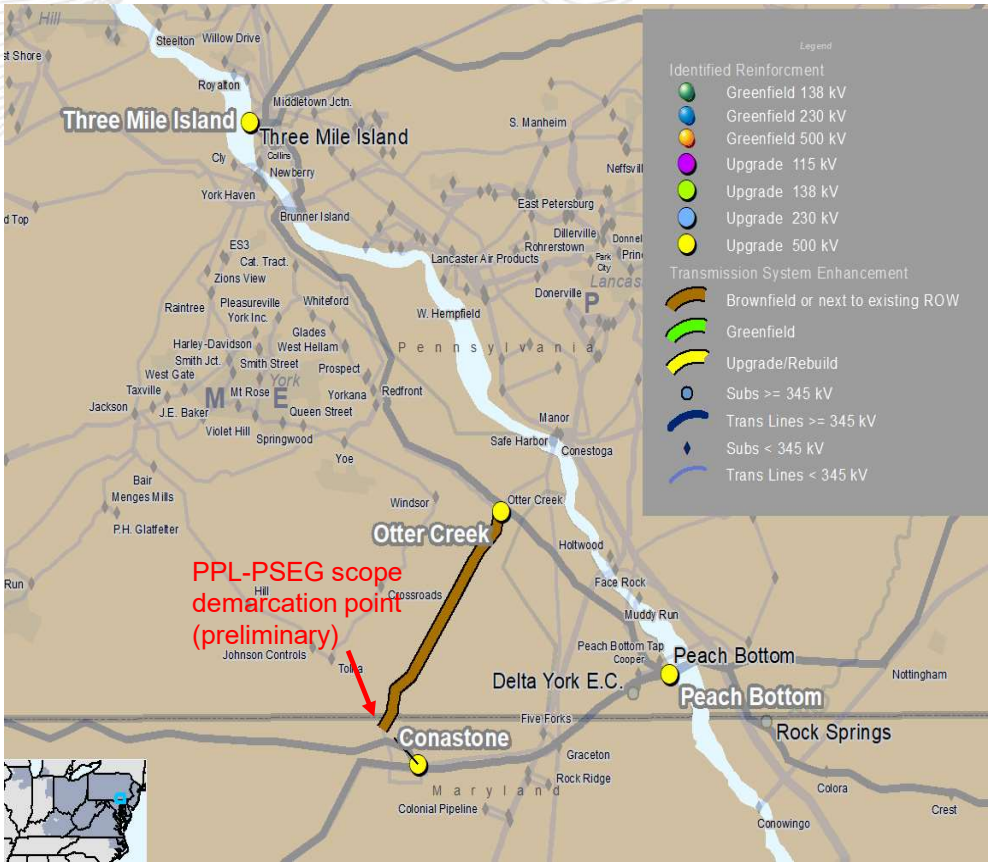

Recommended Solutions to Address Clusters - East

PSEG: 2022-W3-637

Recommended Solution:

- Build new 500kV AC line from the Conastone demarcation point with PPL Otter Creek line to – Doubs station (~70 miles)
  - Construct a 500kV overhead AC line between the Conastone demarcation point and the Doubs Substations
    - New Rating - 3341SN/4156SE/3759WN/4595WE MVA
  - The 500 kV line will tie into the PPL proposed Otter Creek – Conastone, bypassing the Conastone station
  - Reconfigure Doubs 500 kV station and upgrade terminal equipment to terminate new Otter Creek – Doubs 500 kVline

Baseline # B3800.7 –B3800.8 and B3800.43

Proposed Cost Estimate: $447.5 M
Required In-Service Date : 6/1/2027
Projected In-Service Date : 6/1/2027

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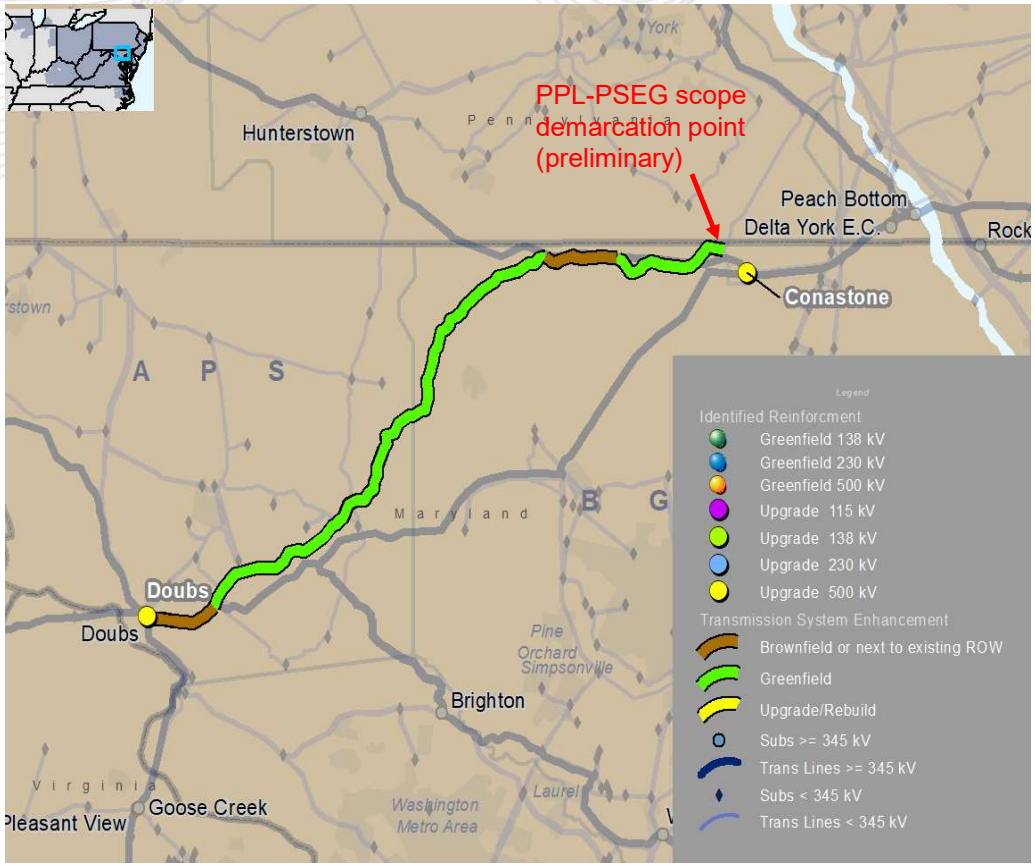


Recommended Solutions to Address Clusters - East

Recommended Solution:

FE: 2022-W3-837

Build new 230 kV AC circuit from Hunterstown - Carroll

- Rebuild the existing Hunterstown – Carroll 115/138 kV Corridor as Double Circuit using 230kV construction standards
  - 230kV New Rating – 726SN/890SE/824WN/1056WE MVA
  - 115kV New Rating – 363SN/445SE/412WN/528WE MVA

PJM Identified upgrades:

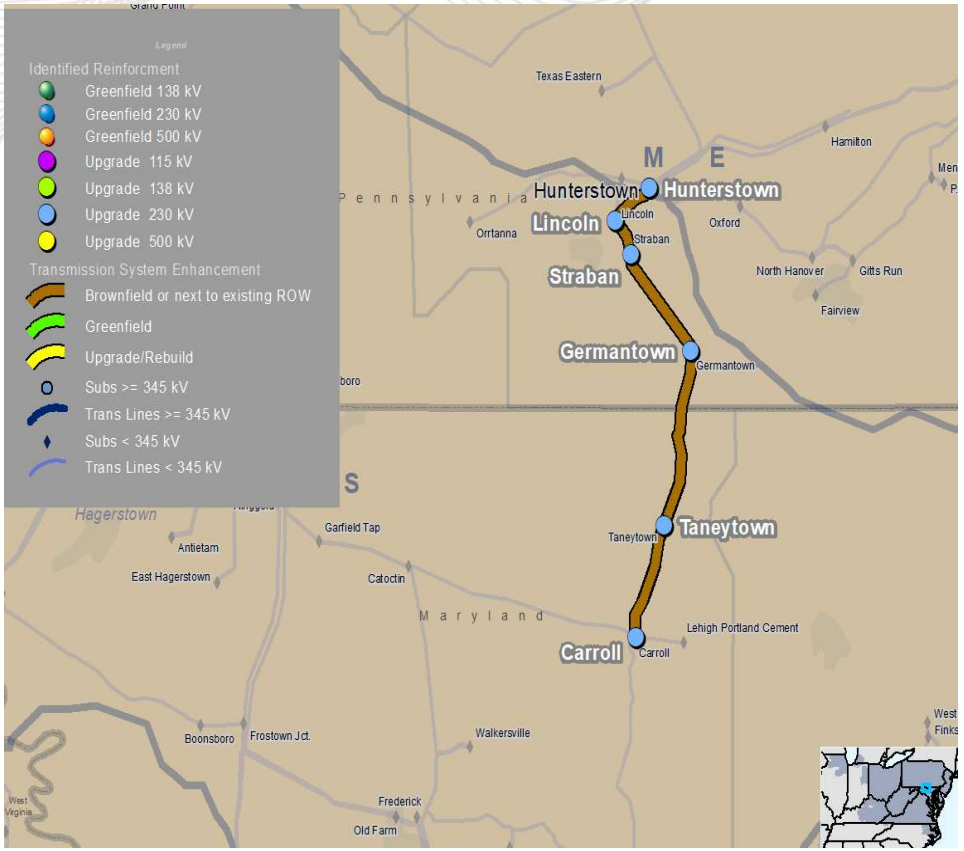
- Reconductor Lincoln – Orrtanna 115 kV Line
  - New Rating- 232SN/282SE/263WN/334WE MVA
- Fayetteville – Grand Point 138 kV - Replace line trap at Grand Point 138 kV
  - New Rating – 195SN/258SE/280WN/368WE MVA
- Reid - Ringgold 138 kV - Replace line trap, substation conductor, breaker at Ringgold, relaying and CTs
  - New Rating – 308SN/376SE/349WN/445WE MVA
- Cancel b3768 (Rebuild/Reconductor the Germantown - Lincoln 115 kV Line.) (Cost: $17.36M)

Baseline # B3800.9 –B3800.25

Proposed Cost Estimate: $152.65 M – $17.36 M = $135.3 M

Required In-Service Date : **6/1/2027**

Projected In-Service Date : 6/1/2028



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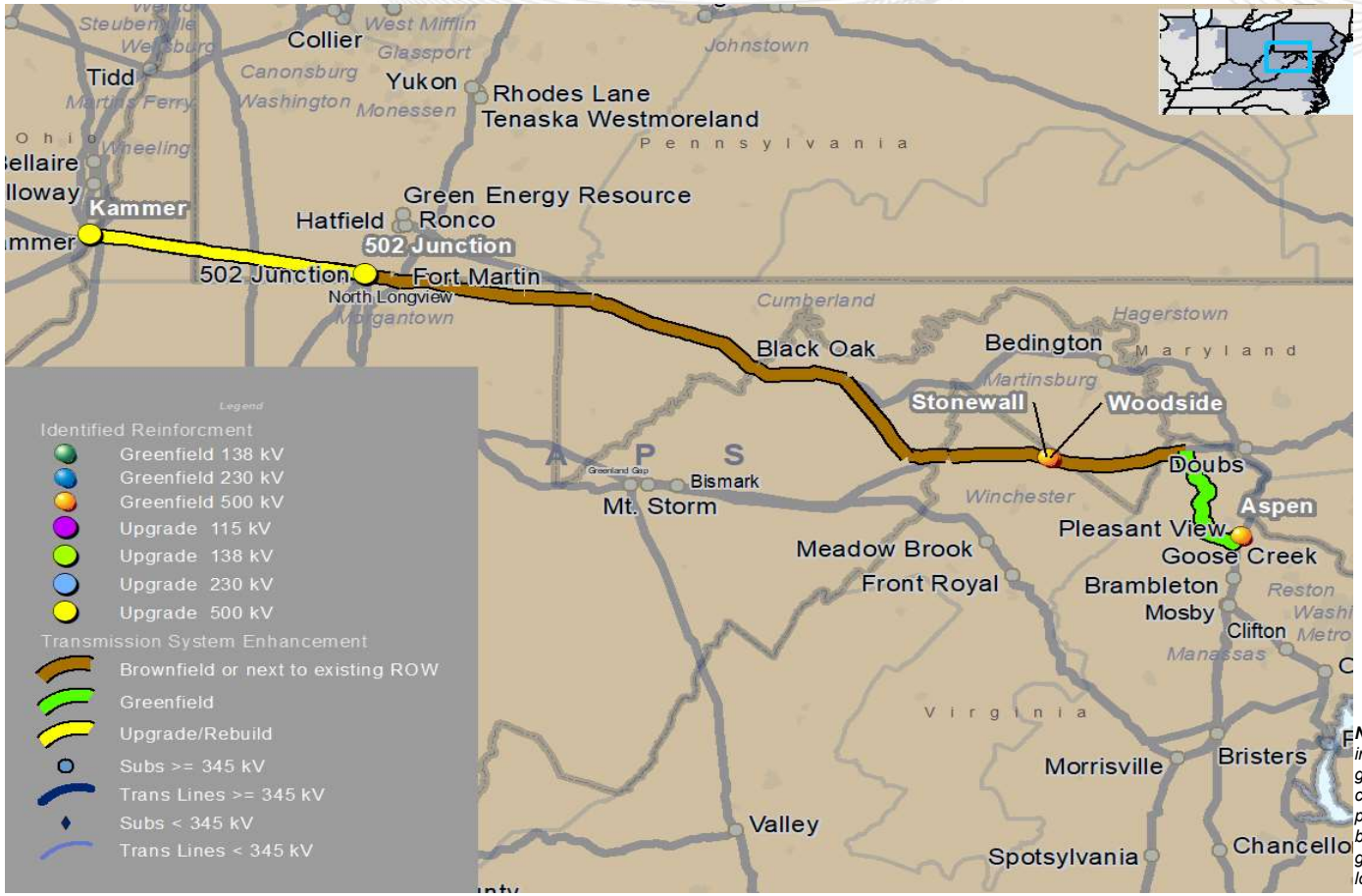
Western Cluster - Selected Proposals

2022W3 – Preferred Solutions: West Cluster



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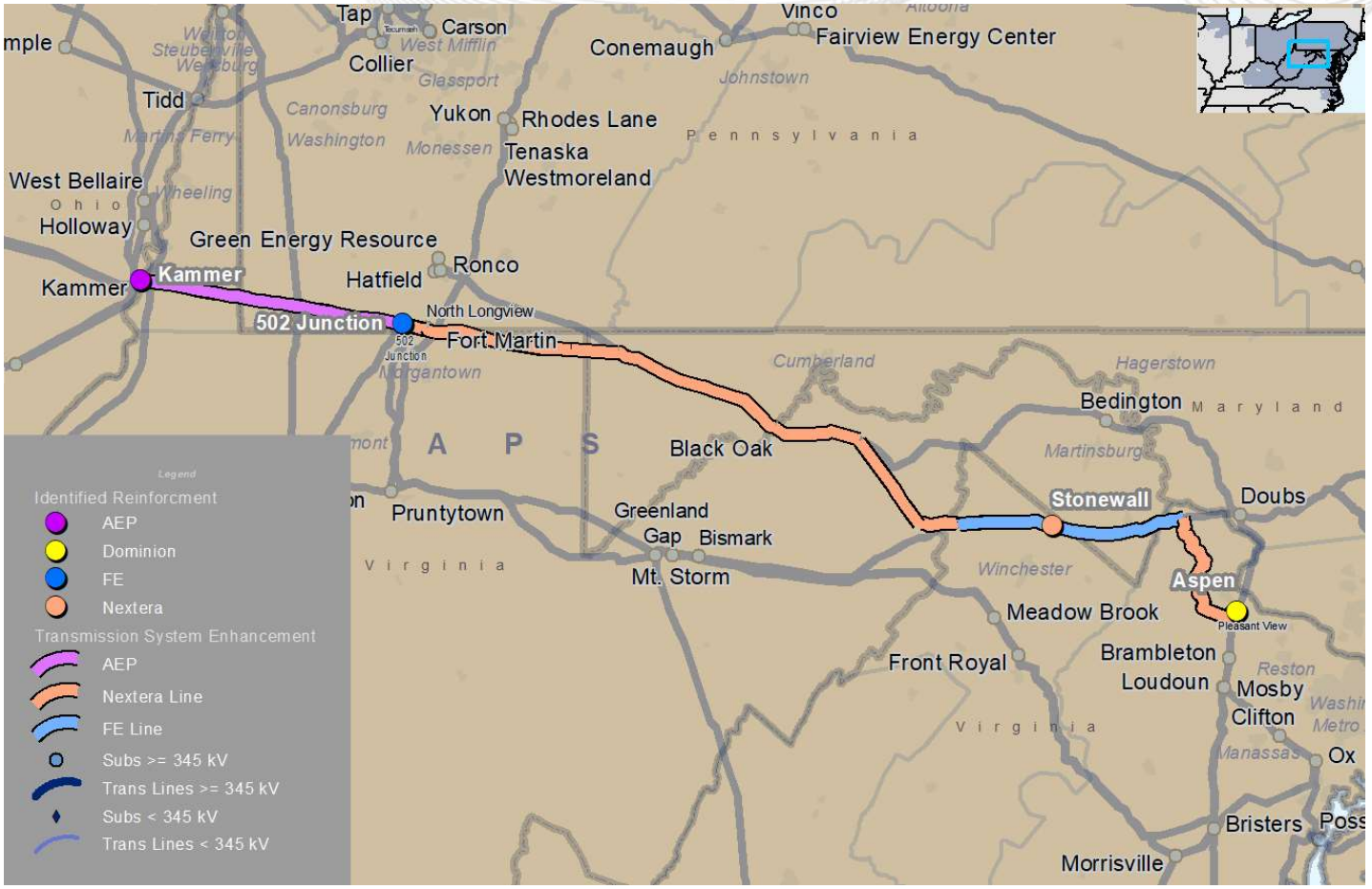
2022W3 – Preferred Solutions: West Cluster By Designated Entity



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Preferred Proposals to Address Clusters - West

- **NextEra:2022-W3-853** (bypass Black Oak, terminate at Aspen instead of Gant) – **NextEra Scope**
  - New 500kV line from existing 502 Junction substation to New Stonewall/Woodside substation **(bypass Black Oak) (NextEra) - (Cost Estimate: $315.64M)**
  - Woodside substation adjacent to existing Stonewall 138 kV substation. **(NextEra)** (**Cost Estimate: $125.25M**)
    - Loop in Bismark to Doubs 500 kV line.
    - Two 500/138 kV transformers
    - Two 150 MVAR Cap banks and one +500/-300 MVAR STATCOM
    - Line termination scope for Doubs to Bismark 500 kV line
  - New 500kV transmission line from new Woodside substation to Aspen substation – (**NextEra**)**(Cost Estimate: $71.72M)**

Preliminary Facility Ratings:

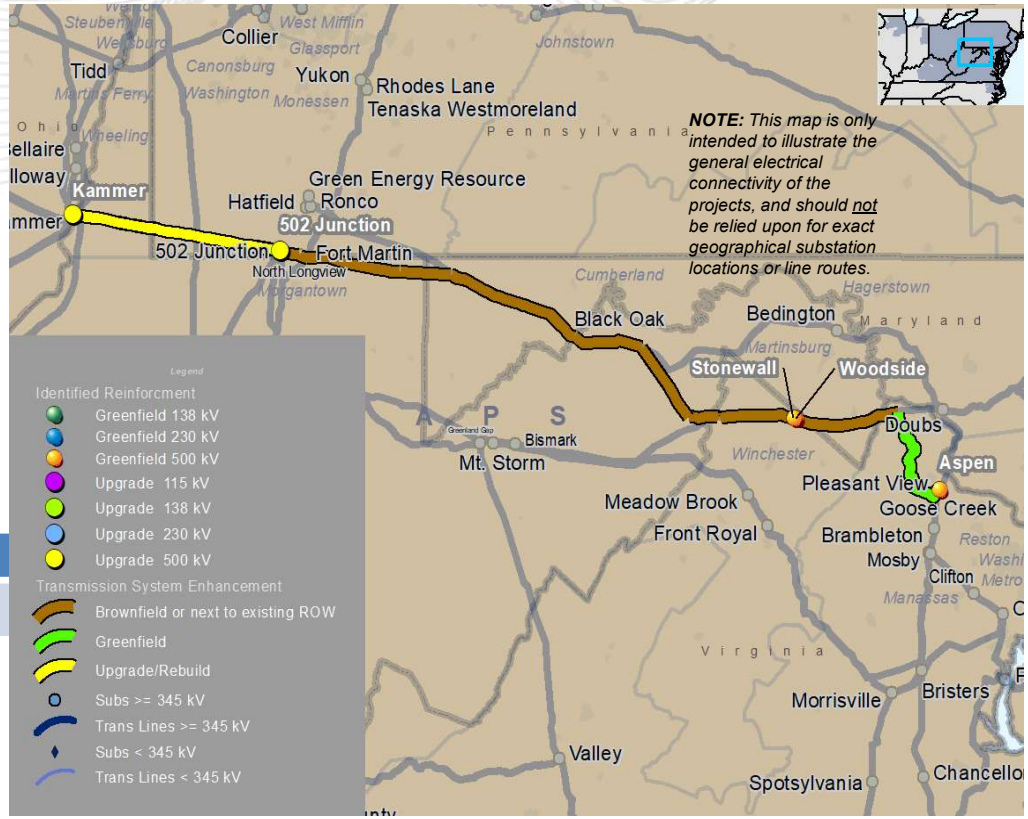
Branch	SN/SE/WN/WE (MVA)
502 Jct – Woodside –ASPEN 500 kV	4295/4357/5066/5196

Estimated Cost: $**512.61M**

Baseline numbers: b3800.102, b3800.106 - b3800.110, b3800.113, b3800.115, b3800.117 & b3800.119

Required IS Date: 6/1/2027

Projected IS Date: 6/1/2027



Preferred Projects to Address Clusters - West

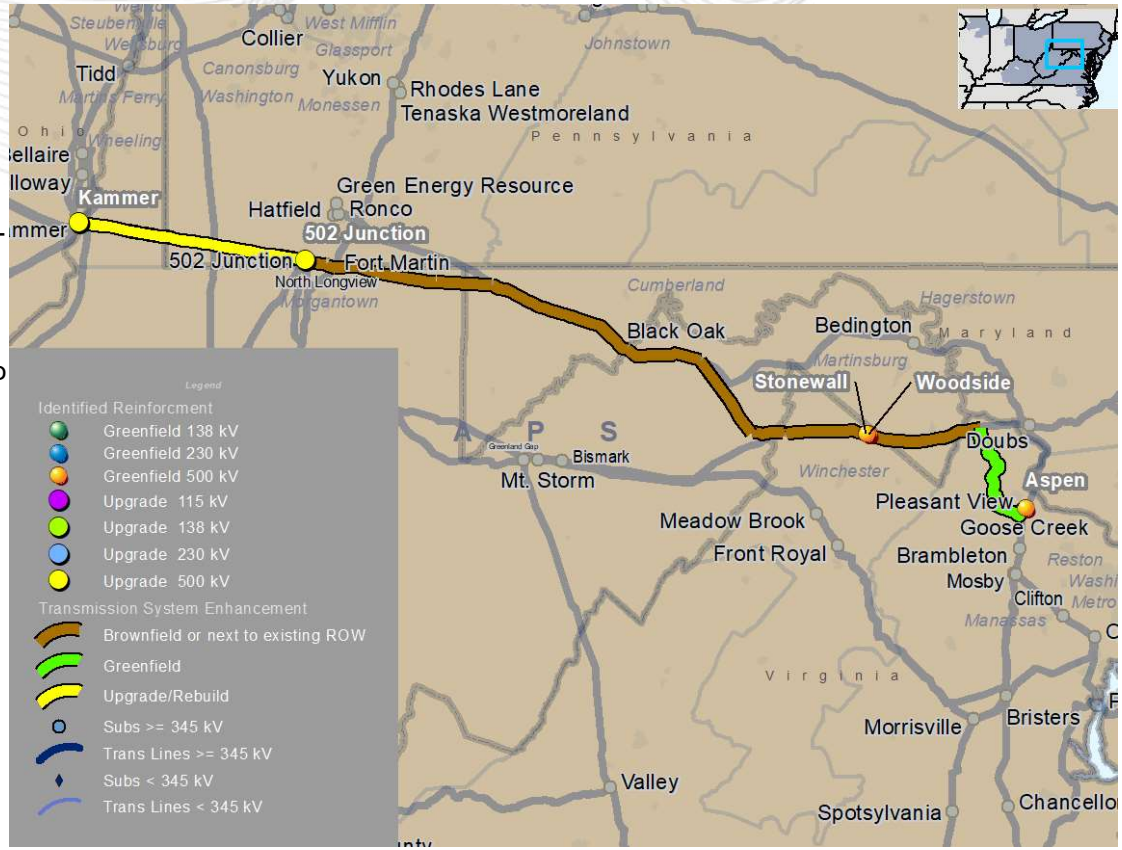
- **NextEra:2022-W3-853 (FE Scope)**
  - Rebuild ~16 miles of the Gore - Stonewall 138 kV Line with 500 kV overbuild, rebuild ~15 miles of the Stonewall - Millville 138 kV Line with 500 kV overbuild & rebuild ~6 miles of the Millville - Doubs 138 kV Line with 500 kV overbuild - **(FE Cost Estimate: $341M) (Incumbent)**
  - Stonewall 138 kV substation two 138kV breaker expansion - **(FE Cost Estimate: $8.3M) (Incumbent)**
  - 502 Junction substation two 500 kV circuit breaker expansion - **(FE Cost Estimate: $30.6M) (Incumbent)**
  - Line termination scope associated with terminating Doubs to Bismark line for Doubs end into the Woodside 500 kV substation - **(FE Cost Estimate: $0.06M) (Incumbent)**
  - Line scope associated with two 138 kV line from Woodside 500 kV substation to FE Stonewall 138 kV substation - **(FE Cost Estimate: $12.59M) (Incumbent)**

Estimated Cost: **$392.55M**

Baseline ID's: **b3800.101, b3800.103 – b3200.105, b3800.111, b3800.112, b3800.114 & b3800.116**

Required IS Date: 6/1/2027

Projected IS Date: 6/1/2027 – 6/1/2030



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

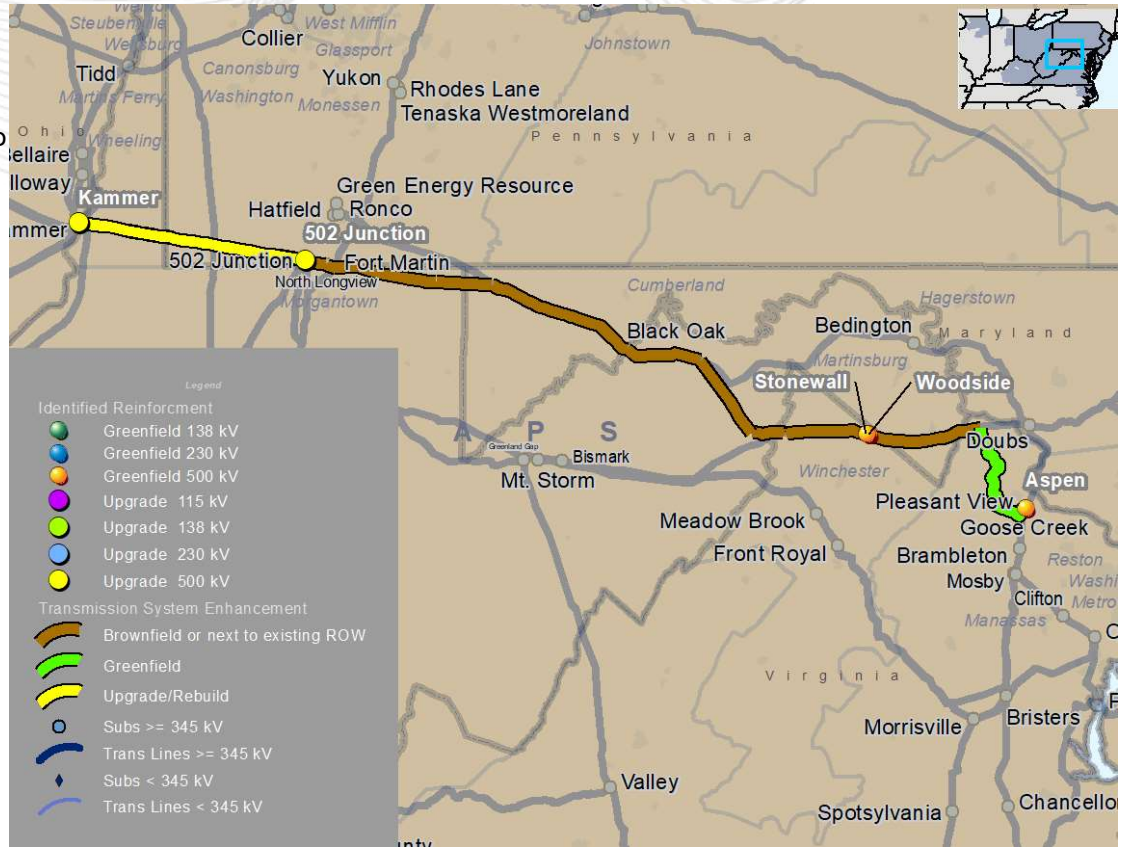
Preferred Projects to Address Clusters - West

- **NextEra:2022-W3-853 (Dominion Scope)**
  - Aspen substation work to terminate new NextEra 500 kV line **(Dominion)** (**Cost Estimate : $30.49M) (Incumbent)**
  - Line termination scope associated with terminating Doubs to Bismark line into the Woodside 500 kV substation - **(Dominion) (Cost Estimate: $5.1M) (Incumbent)**

Estimated Cost: **$35.59M**

Baseline ID's: **b3800.118 & b3800.120**

Required IS Date: 6/1/2027
Projected IS Date: 6/1/2027



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Preferred Projects to Address Clusters – West

- **NextEra:2022-W3-853 (AEP Scope)**
  - Kammer to 502 Junction 500kV line: Conduct LIDAR Sag Study to assess SE rating and needed upgrades (**AEP Scope**) **(Cost Estimate: $0.1M)**

Existing Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
502 Jct – Kammer	3173/3173/3928/4030

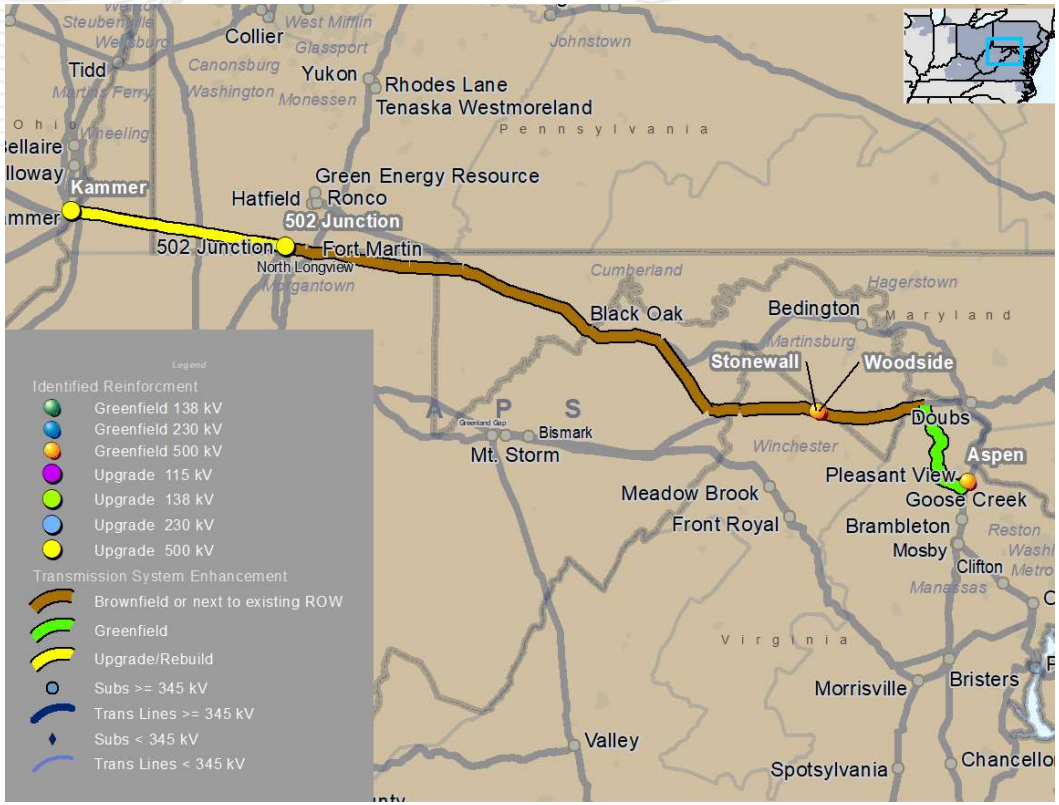
Preliminary Facility Ratings:

Branch	SN/SE/WN/WE (MVA)
502 Jct – Kammer	3204/3729/3928/4140

Estimated Cost: $**0.1M**

Baseline ID's: **b3800.121**

Required IS Date: 6/1/2027
Projected IS Date: 6/1/2027



NOTE: *This map is only intended to illustrate the general electrical connectivity of the projects, and should not be relied upon for exact geographical substation locations or line routes.*

Short Circuit Evaluation and Associated Upgrades

2022 Window 3

- Posted window case based on 2027 topology
- Considered impacts to existing breakers in 11 TO areas

	Over Duty Bus (Qty)						Over Duty CBs	Maximum Fault Duty (kA)						
Scenario Description	115 kV	138 kV	230 kV	345 kV	500 kV	765 kV	Total	765 kV	500 kV	345 kV	230 kV	138 kV	115 kV	Comment
2022 Window 3 Recommended Solution	1	1	14	0	5	0	80	38.3	61.9	59.7	76.1	74.4	59.1	Conastone 500kV bus operating below the 52kA rated capability Peachbottom 500kV bus operating below the 63kA rated capability

APS Area and Dominion Area - Short Circuit Upgrades

RTEP ID	Cost	TO Area	Substation	kV	BREAKER (Qty)	BREAKER NAME						
B3800.401	$0.79M	DOM	ASHBURN	230	1	SC432						
B3800.402	$2.31M	DOM	BEAUMEADE	230	1	227T2152						
B3800.403	$4.21M	DOM	BECO	230	2	215012	H12T2150					
B3800.404	$2.24M	DOM	BELMONT	230	1	227T2180						
B3800.405	$9.38M	DOM	BRAMBLETON	230	6	20102	20602	204502	209402	201T2045	206T2094	
B3800.406	$3.11M	DOM	GAINESVILLE	230	1	216192						
B3800.407	$5.57M	DOM	LOUDON	230	2	204552	217352					
B3800.408	$9.02M	DOM	OX	230	7	22042	24342	24842	220T2063	243T2097	248T2013	H342
B3800.409	$4.96M	DOM	PARAGON PARK	230	4	208132	215032	2081T2206	2150T2207			
B3800.410	$0.79M	DOM	RESTON	230	1	264T2015						
B3800.411	$4.95M	DOM	STONEWATER	230	4	20662-1	20662-2	217862-1	217862-2			
B3800.412	$2.93M	DOM	WAXPOOL	230	4	214922-5	214922-6	216622-5	216622-6			
B3800.413	$3.00M	APS	DOUBLE TOLL GATE	138	1	MDT 138 OCB						
B3800.414	$10.01M	APS	DOUBS	500	1	DL-55 522LIN						
TOTAL	**$63.27M**				**36**							

Recommended Solutions – 2023 Window 1

Baseline Reliability Projects

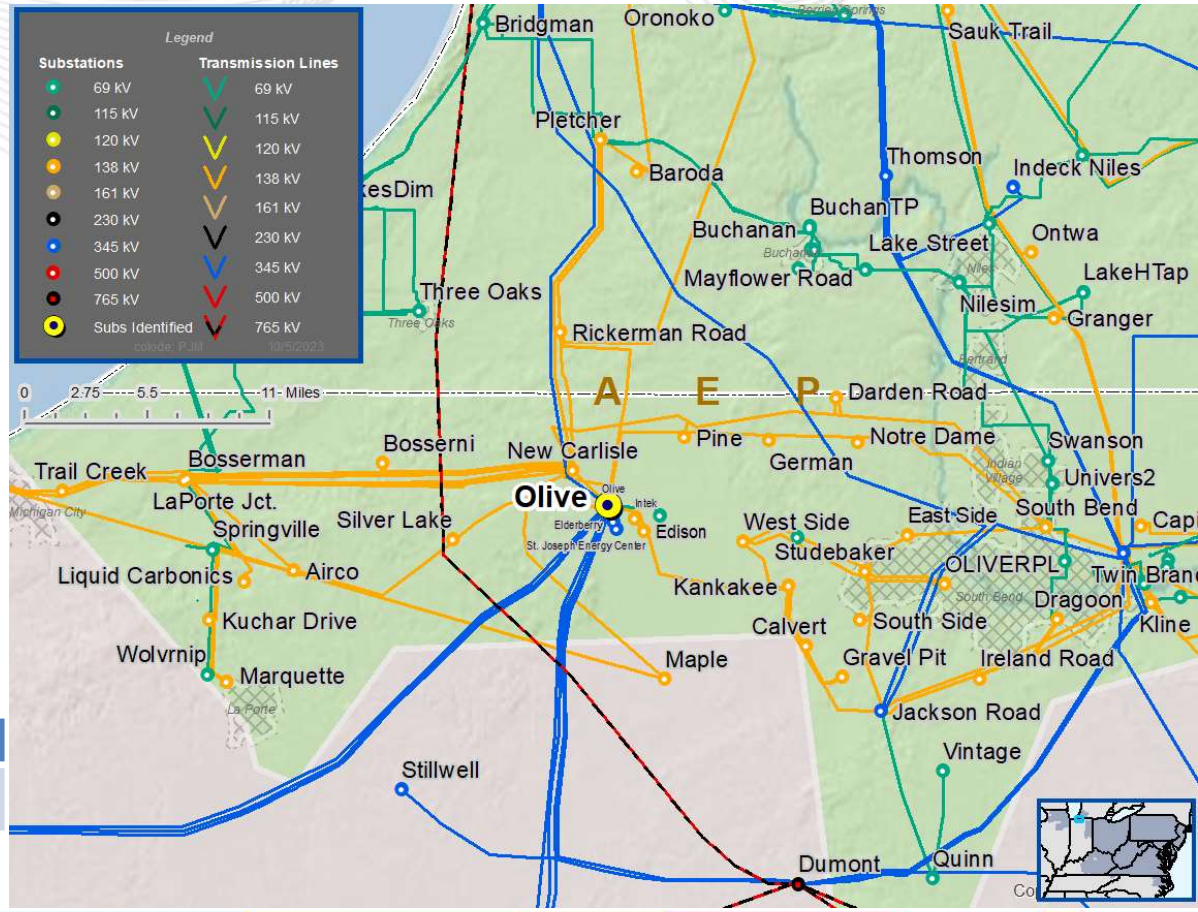
AEP Transmission Zone: Baseline
Olive 345kV Breaker "D" Replacement

Process Stage: Recommended Solution
Criteria: Over Duty Breaker
Assumption Reference: 2028 RTEP assumption
Model Used for Analysis: 2028 RTEP Short Circuit base case
Proposal Window Exclusion: None
Problem Statement:
2023W1-SC-4

In th2028 RTEP Short Circuit base case, the Olive 345 kV breaker "D" is identified as over duty.

Existing Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
Olive 345kV breaker "D"	50



AEP Transmission Zone: Baseline Olive 345kV Breaker “D” Replacement

As part of the 2023 RTEP Window #1, the project listed in the table below is proposed to address the following violations: 2023W1-SC-4

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
384	AEP	Replace the overdutied Olive 345kV circuit breaker "D" with a 5000A 63 kA circuit breaker.	1.083

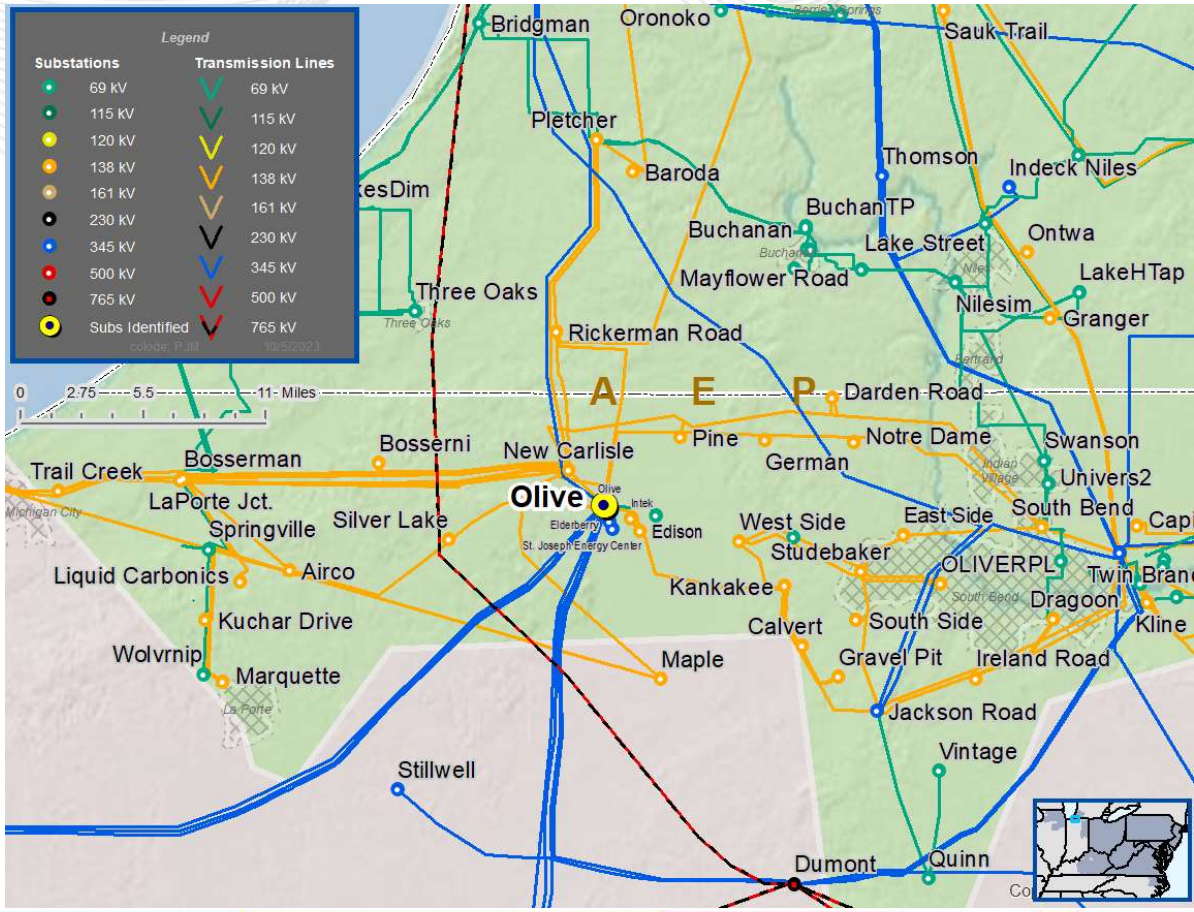
Proposed Solution: Proposal #2023_W1-384

1) Replace the overdutied Olive 345kV circuit breaker "D" with a 5000A 63 kA circuit breaker.
2) Re-use existing cables and a splice box to support the CB install. **(B3790)**

Preliminary Facility Rating:

Circuit Breaker	Interrupting Rating (kA)
Olive 345kV breaker “D”	63

Estimated Cost: $1.083M
Required IS Date: 6/1/2028
Projected IS Date: 9/1/2027
Previously Presented: 10/31/2023



Process Stage: Recommended Solution

Criteria: Summer Gen Deliv

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 RTEP cases

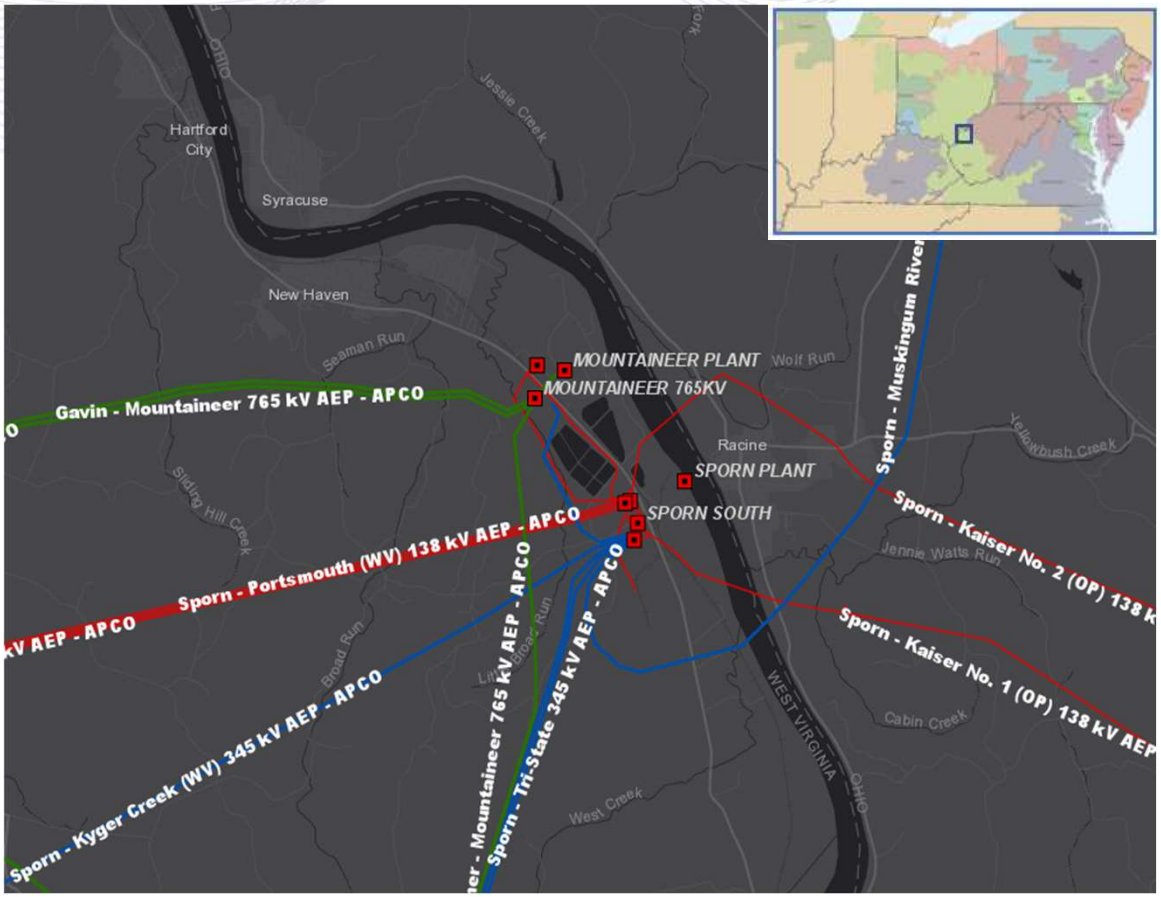
Proposal Window Exclusion: Substation Equipment Exclusion

Problem Statement: FG: 2023-W1-GD-S1286, 2023-W1-GD-S595, 2023-W1-GD-S671, 2023-W1-GD-S726, 2023-W1-GD-S820, 2023-W1-GD-S834

In 2028 RTEP Summer case, the Belmont - Mountaineer-765 kV is overloaded in generator deliverability test for multiple common mode contingencies.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Mountaineer - Belmont 765kV line	4047/4571/4484/4961



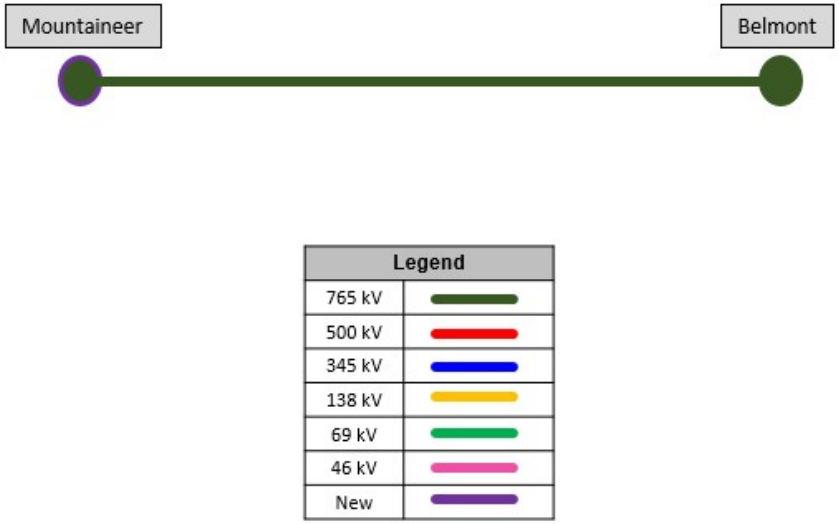
Proposed Solution: Replace existing 3000 A wavetrap at Mountaineer 765 kV, on the Belmont - Mountaineer 765 kV line, with a new 5000 A wavetrap.
(B3785)
Estimated Cost: $0.46M

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Mountaineer - Belmont 765kV line (Existing)	4047/4571/4484/4961
Mountaineer - Belmont (765) (Post Upgrade)	4558/5523/5992/6845

Required IS Date: 6/1/2028
Projected IS Date: 6/1/2028
Previously Presented: 10/31/2023

Proposed:



Process Stage: Recommended Solution

Criteria: Summer Gen Deliv

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 RTEP cases

Proposal Window Exclusion: Substation Equipment Exclusion

Problem Statement: FG: 2023-W1-GD-S582, 2023-W1-GD-S584, 2023-W1-GD-S590, 2023-W1-GD-S646, 2023-W1-GD-S650

In 2028 RTEP Summer case, the Kyger Creek-Sporn 345 kV line is overloaded under gen deliv analysis for multiple common mode contingencies.

Existing Facility Rating:

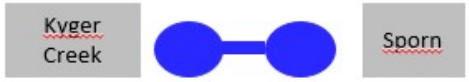
Branch	SN/SE/WN/WE (MVA)
Kyger Creek - Sporn (345)	1025/1204/1298/1512

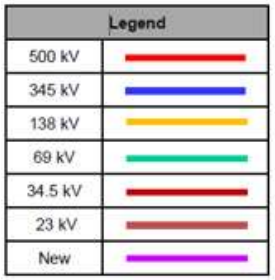
Proposed Solution:
Replace AEP owned station takeoff riser and breaker BB risers at OVEC owned Kyger Creek station.(B3788.1) **Estimated Cost: 0.41M**
Replace OVEC owned breaker AA risers, bus work, and breaker AA disconnect switches at OVEC owned Kyger Creek station. (B3788.2) **Estimated Cost: 0.75M**
Total Estimated Cost: $1.16 M

Branch	SN/SE/WN/WE (MVA)
Kyger Creek - Sporn 345kV line	1189/1540/1507/1778

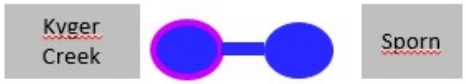
Required IS Date: 6/1/2028
Projected IS Date: 6/1/2028
Previously Presented: 10/31/2023

Existing:





Proposed:



AEP Transmission Zone: Baseline Abert – Reusens 69kV Rebuild

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 RTEP cases

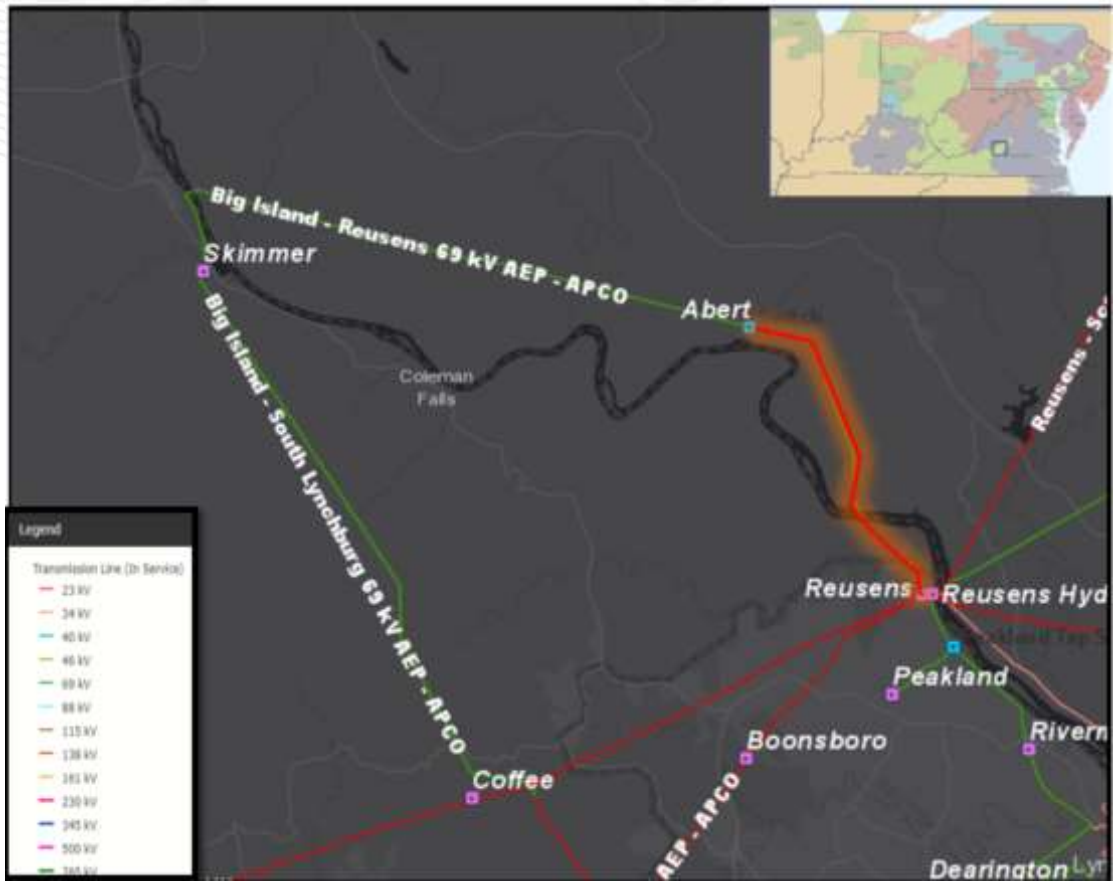
Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: FG: 2023W1-AEP-T15, 2023W1-AEP-T16

In 2028 RTEP summer case, the Abert-Reusens 69 kV line is overloaded for N-1-1 outages .

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Abert - Reusens (69)	49/49/61/61



AEP Transmission Zone: Baseline
Abert – Reusens 69kV Rebuild

Recommended Solution: Rebuild ~4.5 miles of 69 kV line between Abert and Reusens Substations. Update Line Settings at Reusens and Skimmer. (**B3786**)

Total Estimated Cost: $14.4 M

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Abert - Reusens 69kV line	82/90/107/113

Ancillary Benefits: Addresses 1970s era wood pole structures that are starting to exhibit signs of deterioration and rotting along this corridor.

Required In-Service: 06/01/2028

Projected In-Service: 06/01/2028

Previously Presented: 10/20/2023

Existing

Proposed

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

AEP Transmission Zone: Baseline
Canal Street 138kV Breaker 5 Replacement

Process Stage: Recommended Solution

Criteria: Short Circuit

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 Short Circuit RTEP case

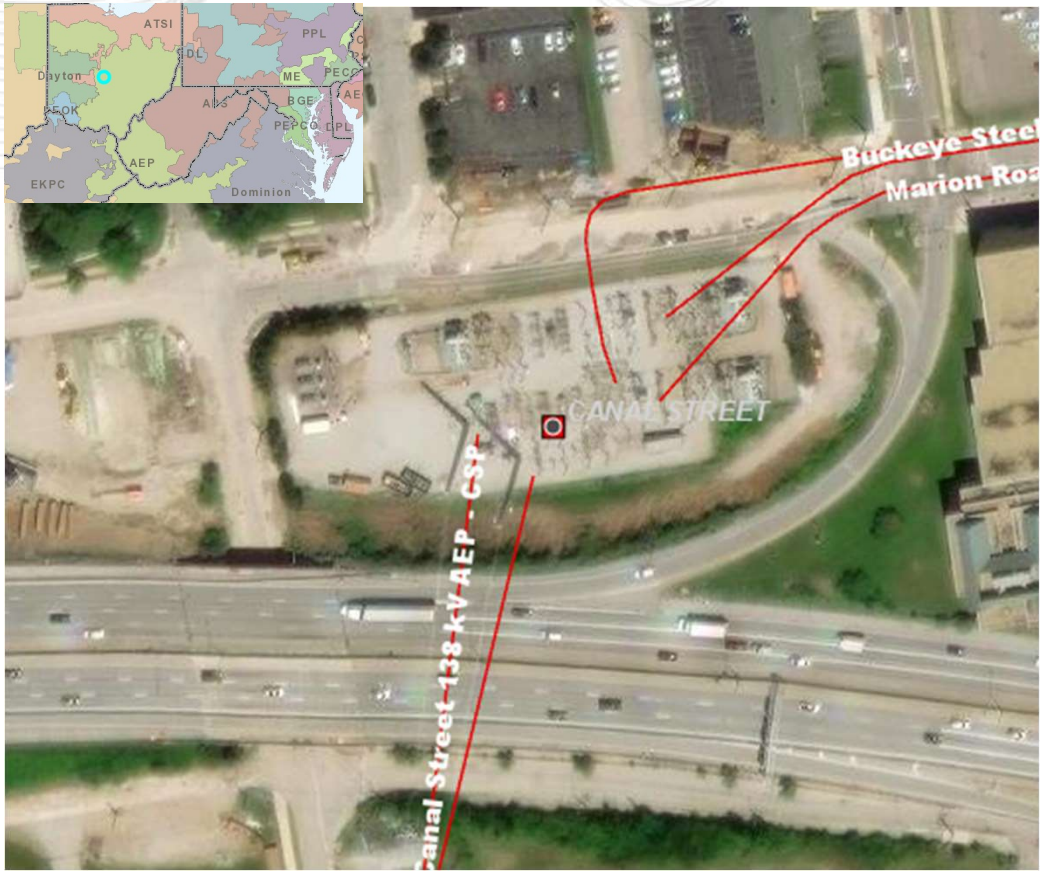
Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: FG: 2023W1-SC-2

In 2028 RTEP short circuit case, Canal street 138 kV breaker 5 has been identified as overdutied.

Existing Facility Rating:

Breaker	Capacity (KA)
Canal Street 138kV Breaker 5	40



AEP Transmission Zone: Baseline
Canal Street 138kV Breaker 5 Replacement

Recommended Solution: Replace 138kV breaker 5 at Canal St station with a new 3000A 63kA breaker. (**B3784**)

Total Estimated Cost: $0.5 M

Existing Facility Rating:

Breaker	Capacity (KA)
Canal Street 138kV Breaker 5	63

Existing:

Proposed:

Required In-Service: 06/01/2028

Projected In-Service: 4/30/2025

Previously Presented: 10/20/2023

AEP Transmission Zone: Baseline Coalton Relay Upgrades

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2023 RTEP assumption

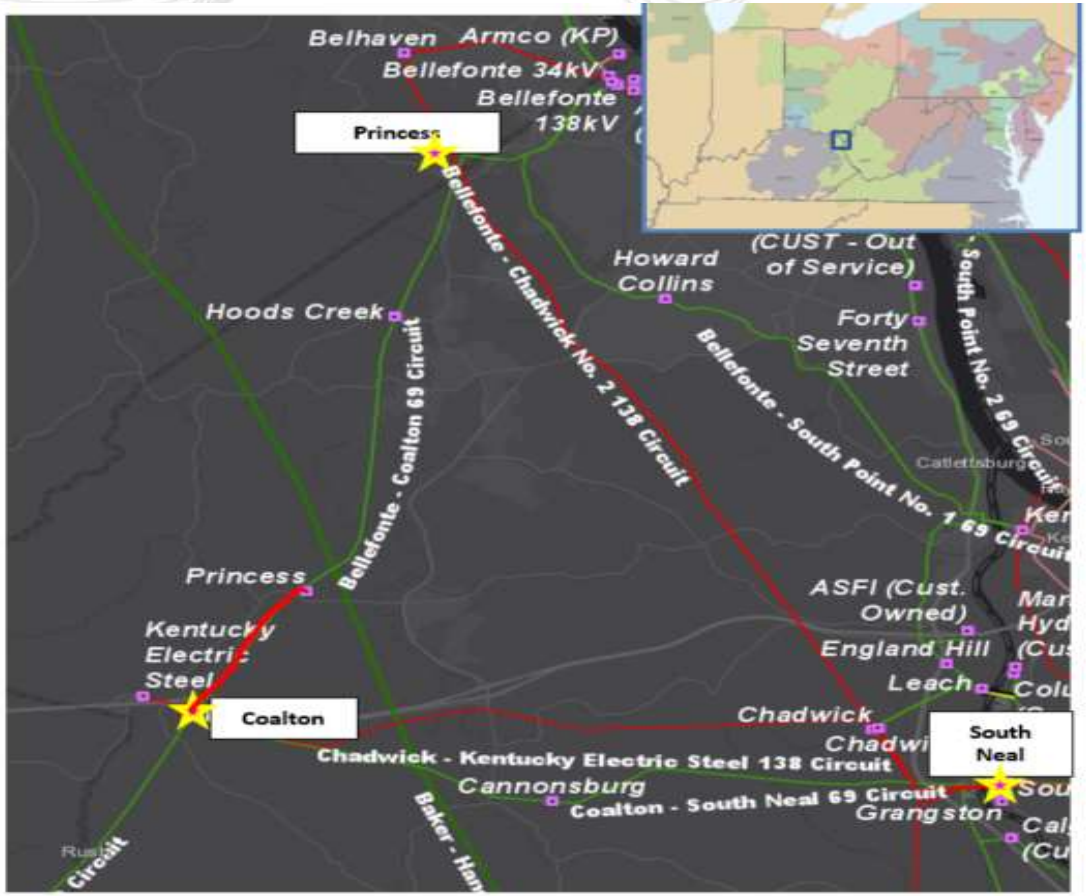
Model Used for Analysis: 2028 RTEP cases

Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: FG: 2023-W1-AEP-T19, 2023-W1-AEP-T20, 2023-W1-AEP-T21, 2023-W1-AEP-T22
In 2028 RTEP winter case, the Coalton - Princess 69 kV line is overloaded for multiple common mode contingencies.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Coalton - Princess 69kV line	64/64/64/64



AEP Transmission Zone: Baseline Coalton Relay Upgrades

Recommended Solution: Install a CCVT on 3 phase stand and remove the single phase existing CCVT on the 69kV Coalton to Bellefonte line exit. The existing CCVT is mounted to lattice on a single phase CCVT stand, which will be replaced with the 3 phase CCVT stand. The line riser between line disconnect and line take off is being replaced. This remote end work changes the MLSE of the line section between Coalton - Princess 69kV line section. (**B3787**)

Total Estimated Cost: $0.0 M

Preliminary Facility Rating:

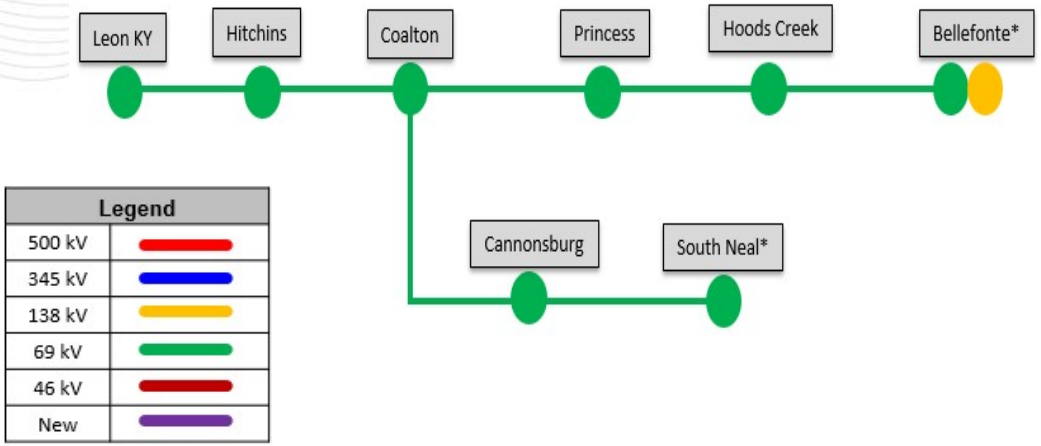
Branch	SN/SE/WN/WE (MVA)
Coalton - Princess 69kV line	79/92/100/109

Required In-Service: 12/1/2028

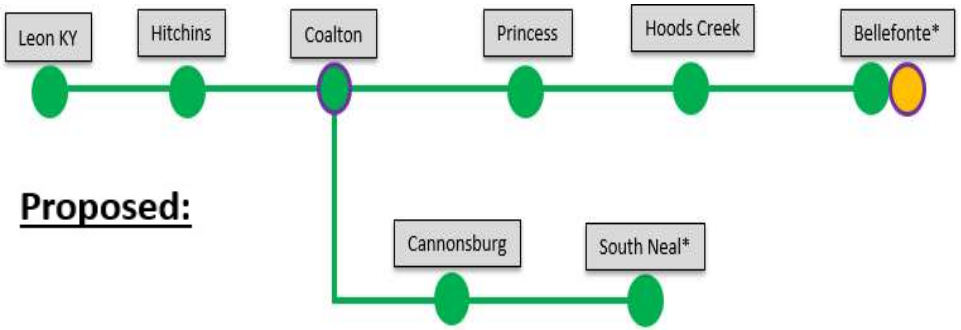
Projected In-Service: 6/1/2026

Previously Presented: 10/20/2023

Existing:



Proposed:



AEP Transmission Zone: Baseline
Chemical – Washington Street 46kV Rebuild

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 RTEP cases

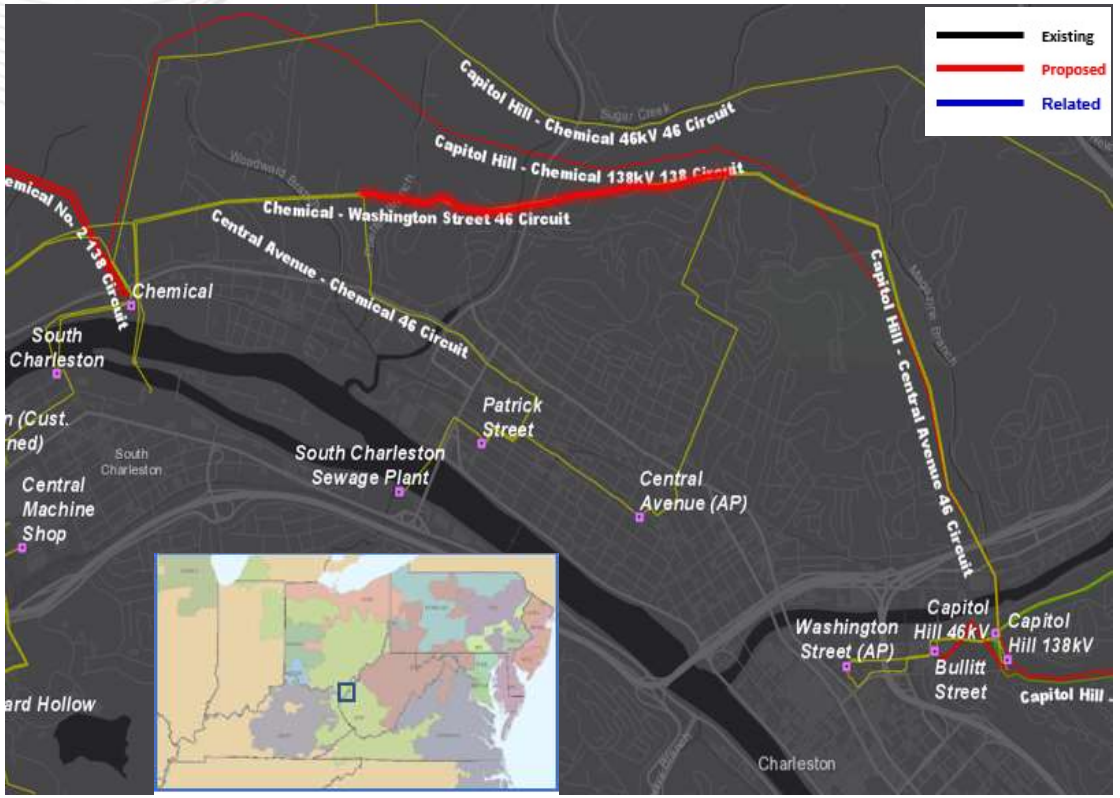
Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: FG: 2023-W1-AEP-T17, 2023-W1-AEP-T18

In 2028 RTEP Summer case, the Chemical – Washington Street 46 kV line is overloaded for an N-1-1 contingency pair.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Chemical - Washington Street 138kV line	36/36/46/50



AEP Transmission Zone: Baseline
Chemical – Washington Street 46kV Rebuild

Recommended Solution: Rebuild approximately 1.7 miles of line on the Chemical - Washington Street 46 kV circuit. (**B3836**)

Total Estimated Cost: $7.6 M

Preliminary Facility Rating:

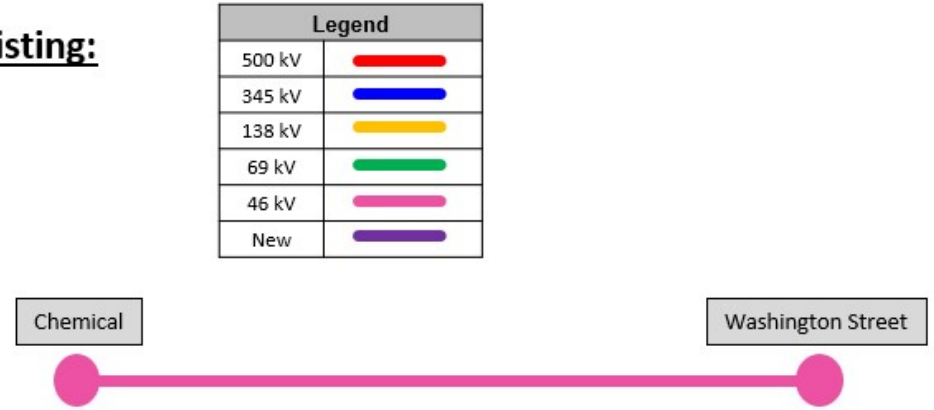
Branch	SN/SE/WN/WE (MVA)
Chemical - Washington Street 138kV line	46/83/46/84

Required In-Service: 6/1/2028

Projected In-Service: 6/1/2028

Previously Presented: 10/20/2023

Existing:



Proposed:

AEP Transmission Zone: Baseline
West Huntington 34.5kV Breaker Replacement

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 RTEP Short Circuit case

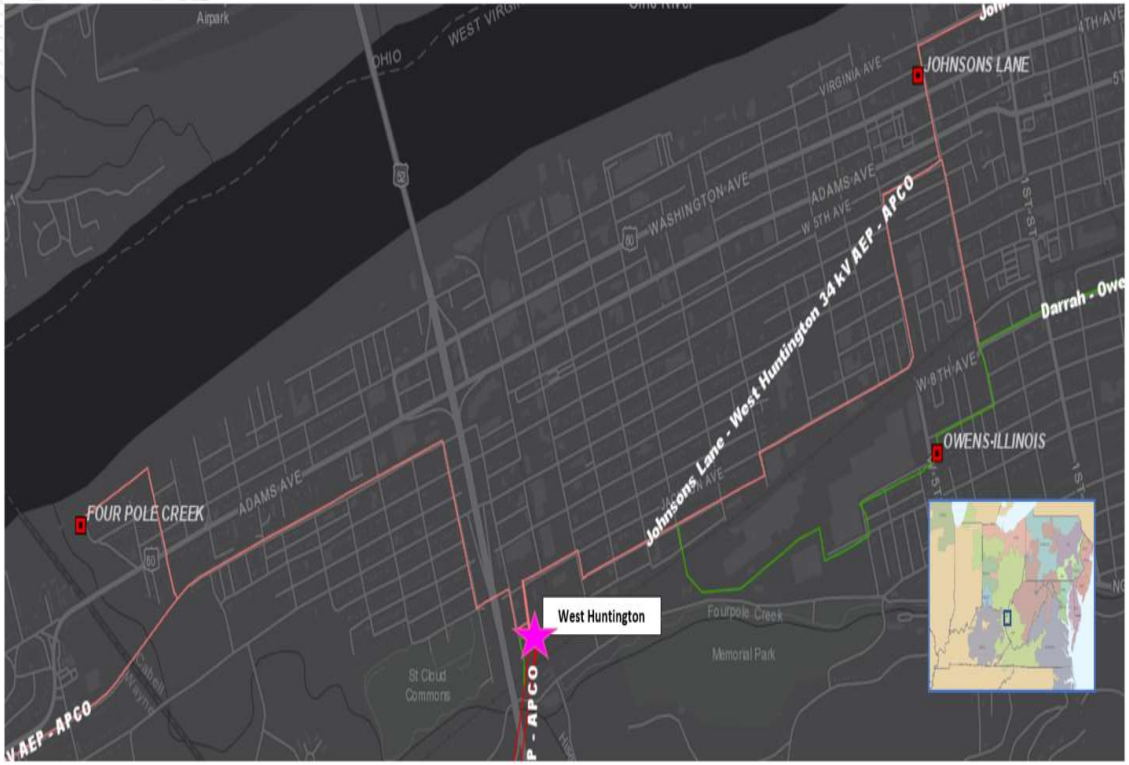
Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: FG: 2023-W1-AEP-SC1

In 2028 RTEP Short Circuit case, the 34.5KV Breaker B at West Huntington station is overdutied .

Existing Facility Rating:

Breaker	Capacity (KA)
West Huntington 34.5kV breaker B	25



AEP Transmission Zone: Baseline
West Huntington 34.5kV Breaker Replacement

Recommended Solution: Replace existing 34.5 kV, 25 kA circuit breaker B at West Huntington Station with new 69 kV, 40 kA circuit breaker. (**B3837**)

Total Estimated Cost: $0.365 M

Breaker	Capacity (KA)
West Huntington 34.5kV breaker B	40

Required In-Service: 06/01/2028

Projected In-Service: 12/1/2027

Previously Presented: 10/20/2023

Existing:

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

Proposed:

AEP Transmission Zone: Baseline Timken 138kV Breaker Replacement

Process Stage: Recommended Solution

Criteria: Short Circuit

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 RTEP Short Circuit case

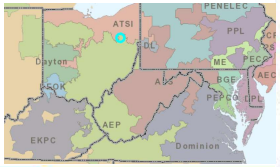
Proposal Window Exclusion: Below 200 kV Exclusion

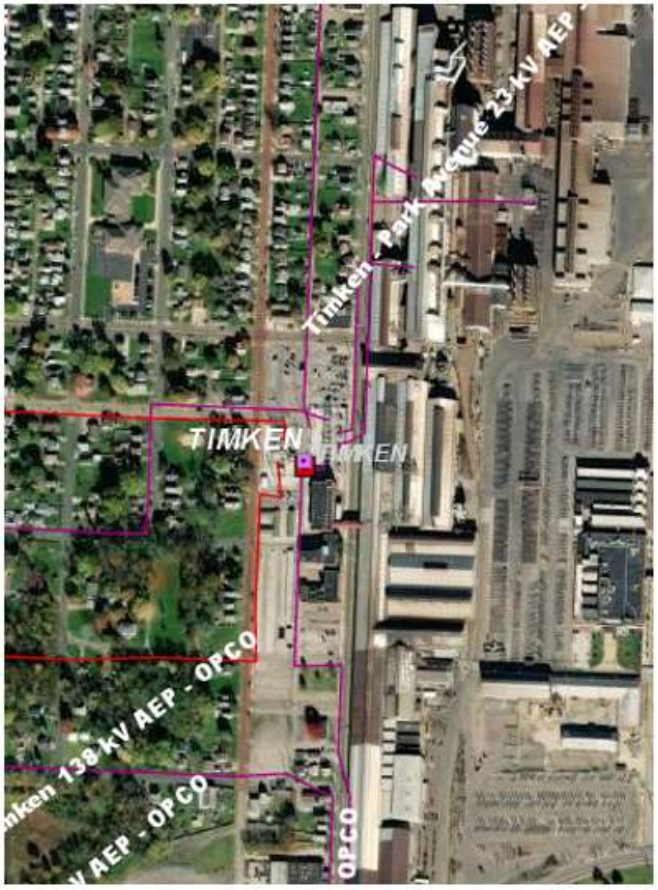
Problem Statement: FG: 2023-W1-SC-8, 2023-W1-SC-9

In 2028 RTEP Short Circuit case, 138 kV breakers A and B at Timken station are overdutied.

Existing Facility Rating:

Breaker	Capacity (KA)
Timken 138kV Breaker A	18
Timken 138kV Breaker B	18





AEP Transmission Zone: Baseline Timken 138kV Breaker Replacement

Recommended Solution: Replace the 138kV breakers A and B at Timken Station with 40 kA breakers (**B3838**)

Total Estimated Cost: $1.2 M

Preliminary Facility Rating:

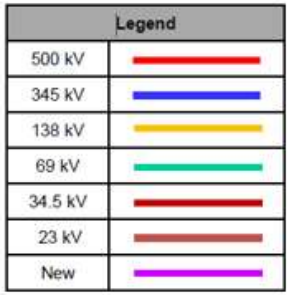
Breaker	Capacity (KA)
Timken 138kV Breaker A	40
Timken 138kV Breaker B	40

Required In-Service: 06/01/2028

Projected In-Service: 06/01/2028

Previously Presented: 10/20/2023

Existing:



Proposed:

AEP Transmission Zone: Baseline
Haviland 69kV Breaker C Replacement

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 RTEP Short Circuit case

Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: FG: 2023W1-AEP-SC6

In 2028 RTEP Short Circuit case, 69 kV breakers C at Haviland station are overdutied

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Haviland - Latty Junction Switch 69kV	68/73/90/98

Breaker	Capacity (KA)
Haviland 69kV Breaker C	9

AEP Transmission Zone: Baseline
Haviland 69kV Breaker Replacement

Recommended Solution: Replace 69kV breaker C at Havilland Station with a 40 kA breaker (**B3839**)

Total Estimated Cost: $0.4 M

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Haviland - Latty Junction Switch 69kV	68/86/90/103

Breaker	Capacity (KA)
Haviland 69kV Breaker C	40

Required In-Service: 06/01/2028

Projected In-Service: 06/01/2028

Previously Presented: 10/20/2023

Existing:

Proposed:

AEP Transmission Zone: Baseline 24th Street Retirement

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 RTEP cases

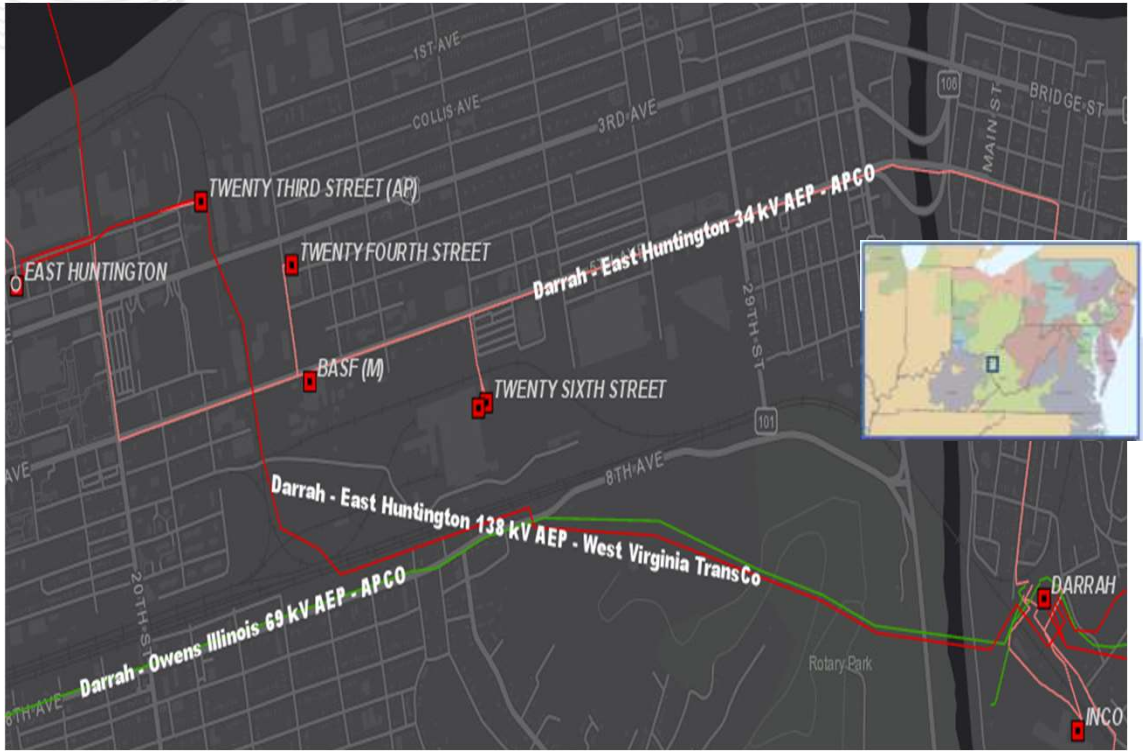
Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: FG: 2023-W1-AEP-T1, 2023-W1-AEP-T10, 2023-W1-AEP-T11, 2023-W1-AEP-T12, 2023-W1-AEP-T13, 2023-W1-AEP-T14, 2023-W1-AEP-T2, 2023-W1-AEP-T3, 2023-W1-AEP-T4, 2023-W1-AEP-T5, 2023-W1-AEP-T6, 2023-W1-AEP-T7, 2023-W1-AEP-T8, 2023-W1-AEP-T9

In 2028 RTEP Summer case, the 26th Street - 24th Street - BASF Tap line is overloaded for multiple N-1-1 contingencies.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
East Huntington - 26th Street 34.5kV	25/25/31/31



AEP Transmission Zone: Baseline 24th Street Retirement

Recommended Solution: Replace Structures 382-66 and 382-63 on Darrah - East Huntington 34.5 kV line to bypass 24th Street station. Retire structures 1 through 5 on Twenty Fourth Street 34.5 kV Extension. Retire 24th Street Station. Remove conductors from BASF Tap to BASF. (**B3840**)

Total Estimated Cost: $1.8 M

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
East Huntington - 26th Street 34.5kV	56/56/70/70

Ancillary Benefits: This proposal retires an obsolete station and lines that are no longer serving load. Addresses asset conditions on 2 structures of the Darrah - East Huntington 34.5 kV line. 23rd St and BASF are electrically disconnected from the system.

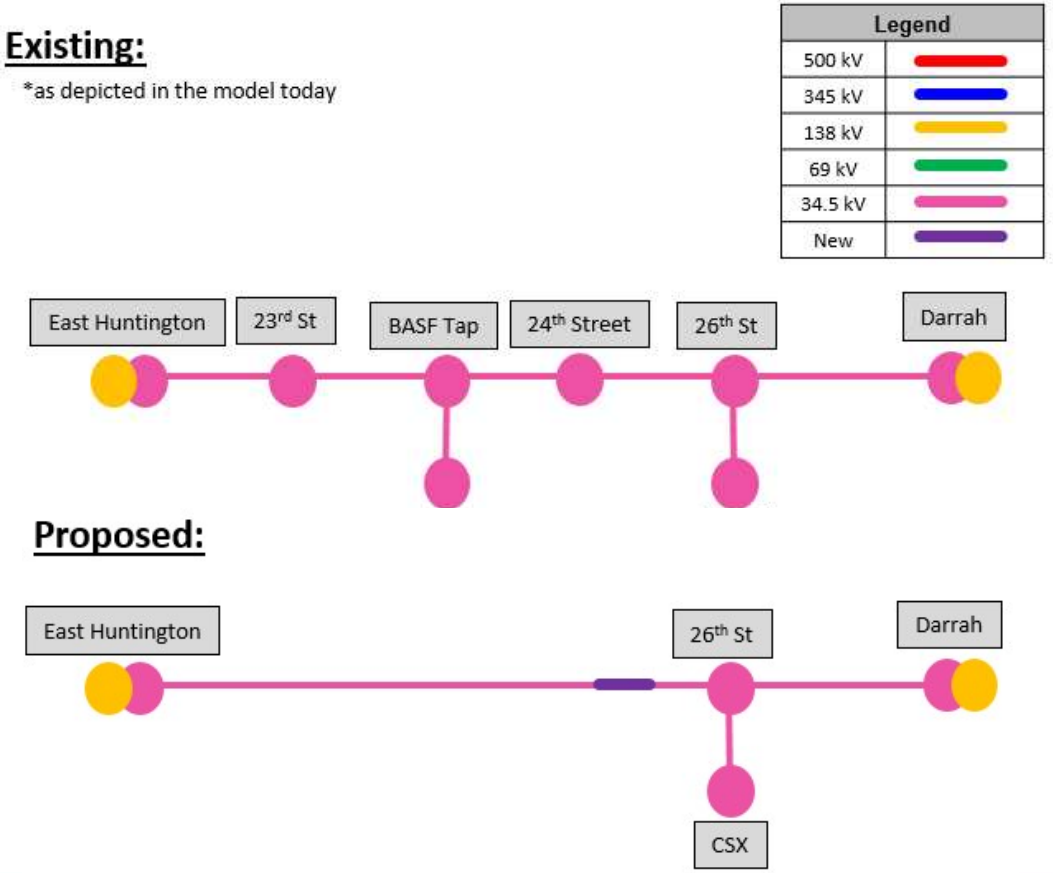
Required In-Service: 06/01/2028

Projected In-Service: 04/01/2024

Previously Presented: 10/20/2023

Existing:

*as depicted in the model today



AEP Transmission Zone: Baseline
West Clark – Ohio University UG Line Rebuild

Process Stage: Recommended Solution

Criteria: AEP 715 Criteria

Assumption Reference: 2023 RTEP assumption

Model Used for Analysis: 2028 RTEP cases

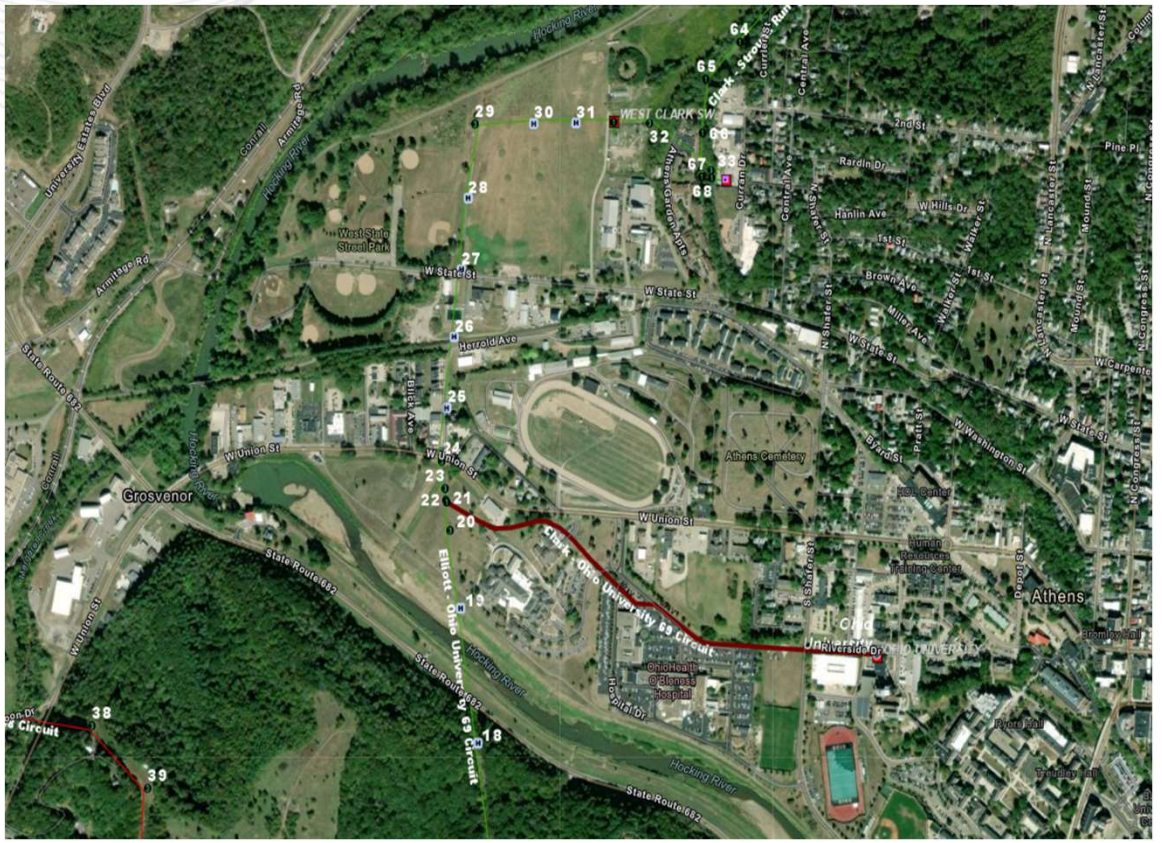
Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: FG: 2023-W1-AEP-T23, 2023-W1-AEP-T24, 2023-W1-AEP-T25, 2023-W1-AEP-T26, 2023-W1-AEP-T27, 2023-W1-AEP-T28, 2023-W1-AEP-T29, 2023-W1-AEP-T30

In 2028 RTEP Summer case, the underground conductor section of the Ohio University-West Clark 69 kV line is overloaded under N-1-1 for multiple N-1-1 contingencies.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
West Clark - Ohio University 69KV	60/67/62/68



AEP Transmission Zone: Baseline
West Clark – Ohio University UG Line Rebuild

Recommended Solution: Rebuild the underground portion of the Ohio University-West Clark 69 kV line, approximately 0.65 miles. (**B3843**)

Total Estimated Cost: $4.6 M

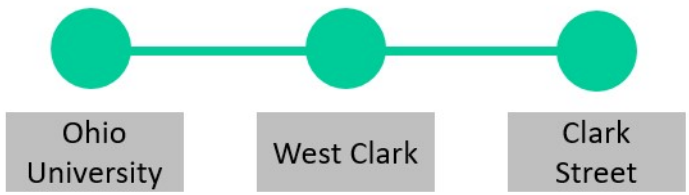
Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
West Clark - Ohio University 69kV	102/142/104/151

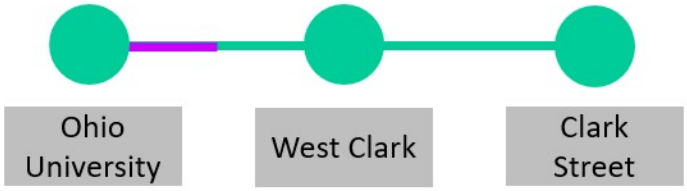
Required In-Service: 06/01/2028
Projected In-Service: 06/01/2028

Previously Presented: 10/20/2023

Existing:



Proposed:



ATSI Transmission Zone: Baseline
Salt Springs 69 kV

Process Stage: Recommended Solution

Criteria: FERC 715

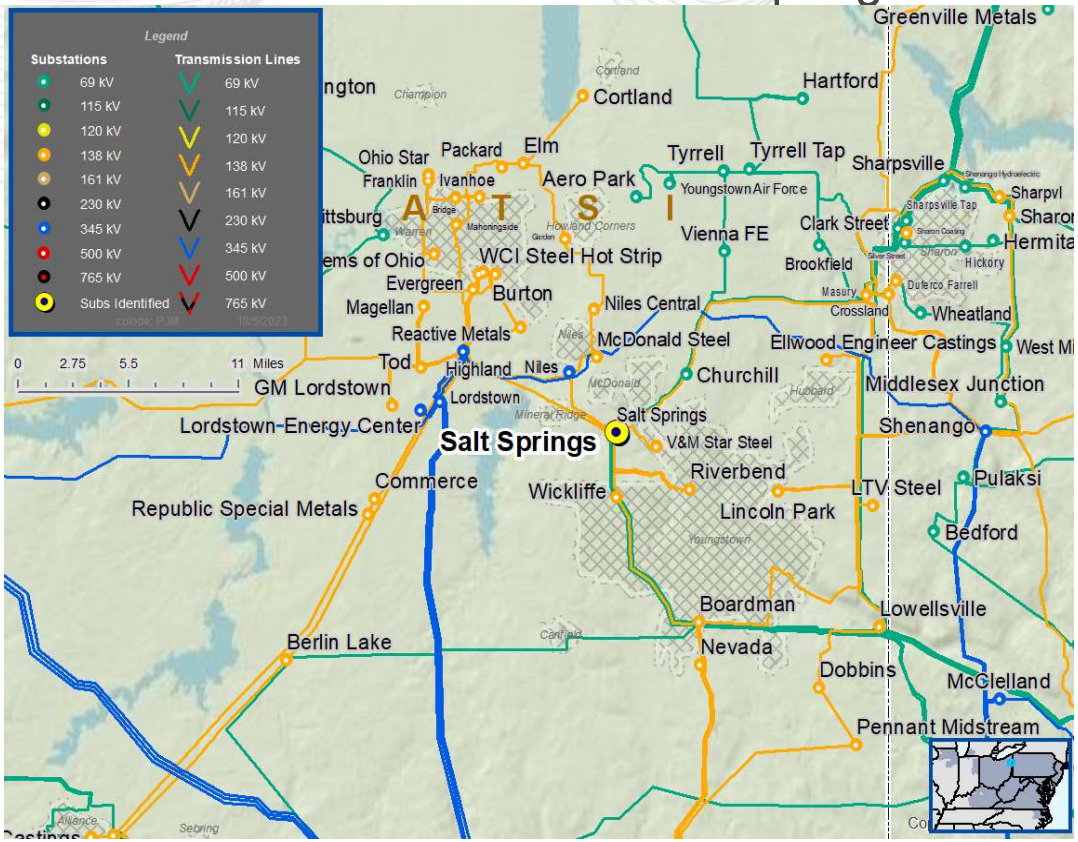
Assumption Reference: 2028 RTEP assumption

Model Used for Analysis: 2028 Light Load RTEP case

Proposal Window Exclusion: Below 200 kV Exclusion

Problem Statement: 2023W1-ATSI-VM1 to 2023W1-ATSI-VM7

In 2028 RTEP Light Load case, high voltage is observed in several buses around Salt Spring 69 kV for N-1 event



ATSI Transmission Zone: Baseline
Salt Springs 69 kV

Recommended Solution: A 69 kV, 60 MVAR Shunt Reactor will be installed at the Salt Springs Substation. The reactor terminal will be connected to the existing 69 kV bus and an independent-pole operation, 1200 A circuit breaker will be installed for reactor switching. (**b3789)**

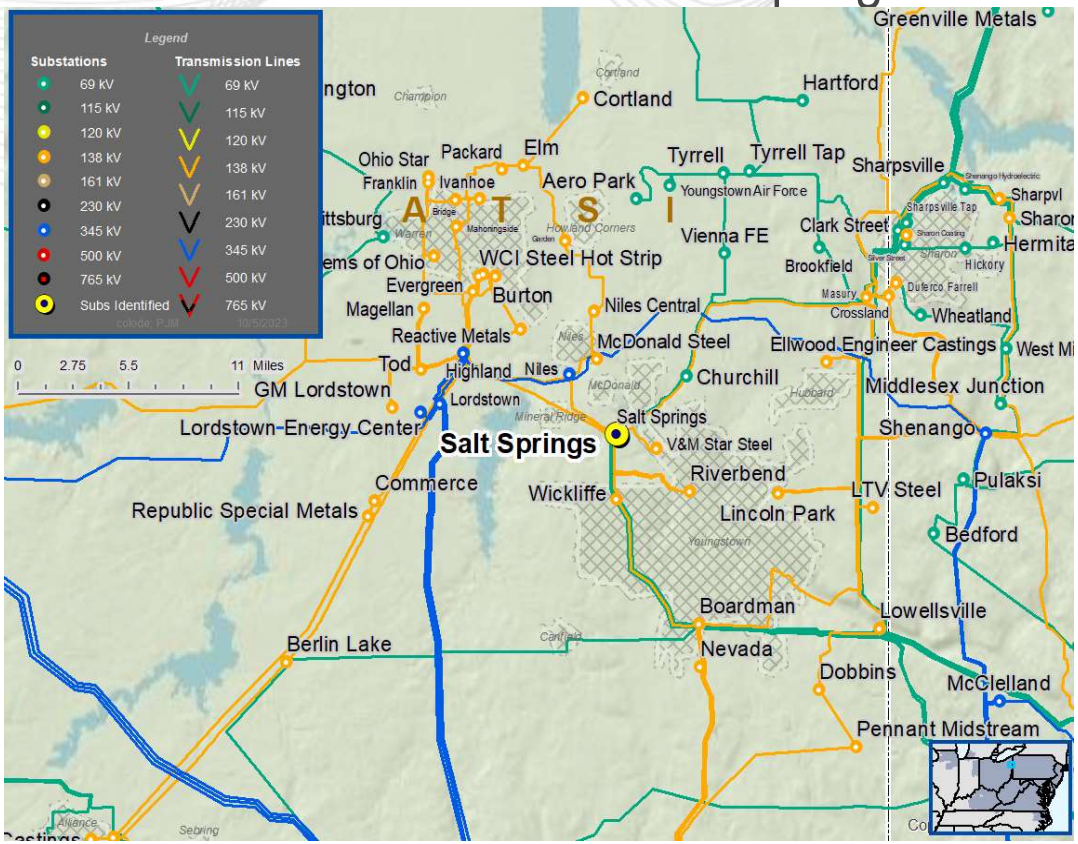
Total Estimated Cost: $5.45 M

Alternatives: Reactor installations were evaluated at other locations but Salt Springs provided the most benefit.

Ancillary Benefits: N/A

Projected In-Service: 06/01/2028

Required In-Service: 06/01/2028



DPL Transmission Zone: Baseline

Process Stage: Recommended Solution – Second Read

Criteria: Summer Generation Deliverability

Assumption Reference: 2028 RTEP assumption

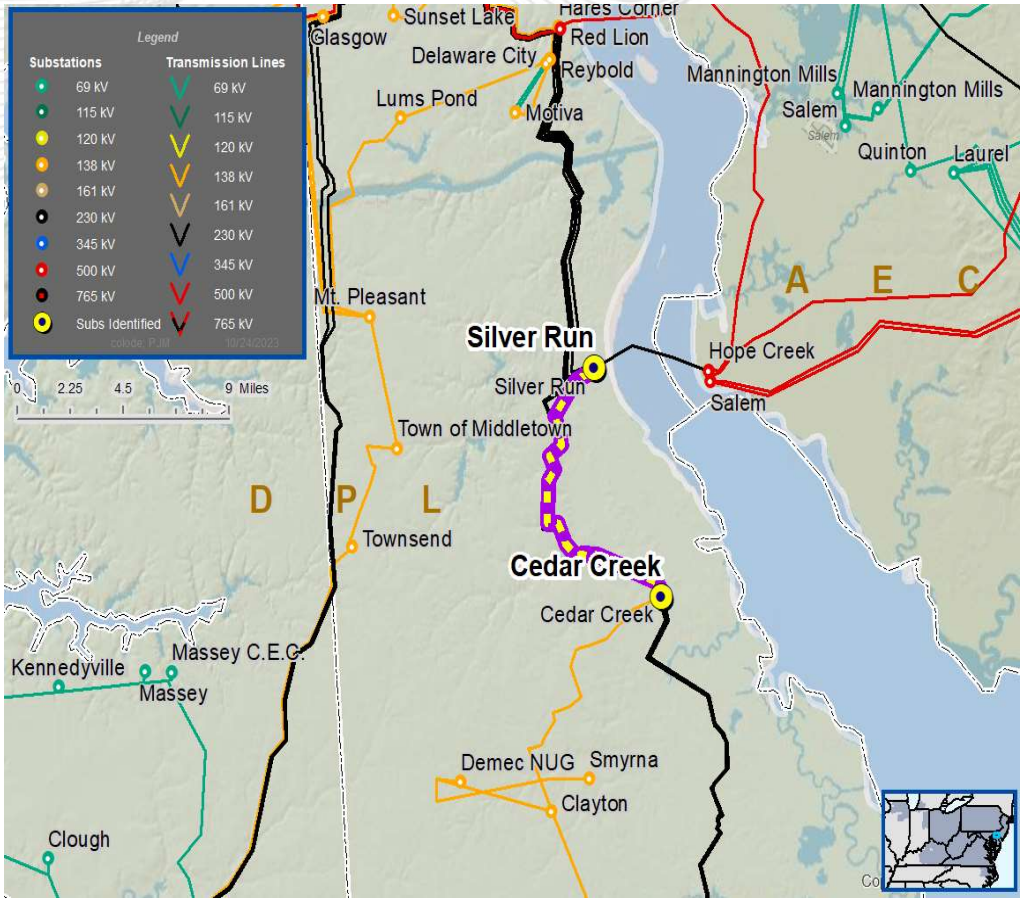
Model Used for Analysis: 2028 RTEP Summer case

Proposal Window Exclusion: No

Problem Statement: The Silver Run – Cedar Creek 230 kV circuit overloaded for several contingencies

Violations were posted as part of the 2023 Window 1: FG#s

2023W1-IPD-S1	2023W1-IPD-S5	2023W1-IPD-S9	2023W1-IPD-S13	2023W1-IPD-S17	2023W1-IPD-S27
2023W1-IPD-S2	2023W1-IPD-S6	2023W1-IPD-S10	2023W1-IPD-S14	2023W1-IPD-S18	2023W1-IPD-S28
2023W1-IPD-S3	2023W1-IPD-S7	2023W1-IPD-S11	2023W1-IPD-S15	2023W1-IPD-S19	2023W1-IPD-S29
2023W1-IPD-S4	2023W1-IPD-S8	2023W1-IPD-S12	2023W1-IPD-S16	2023W1-IPD-S26	



Continued on the next slide……

DPL Transmission Zone: Baseline

Recommended Solution: Proposal #2023-W1-573

- Reconductor Silver Run - Cedar Creek 230kV line. Reconductor 8.8 miles of 230 kV Circuit with 1594-T11/ACCR “Lapwing” conductor and replace all insulators with high temp hardware. **(B3793.1)**
- **Cedar Creek**– Replace three (3) standalone CTs, disconnect switch, stranded bus, and rigid bus to achieve higher rating. **B3793.2)**
- **Silver Run -** Replace three(3) 1-1590 ACSR Jumpers and one(1) air disconnect switch. **B3793.3)**

Existing Facility Rating: 653SN/808SE, 753WN/911WE MVA

Proposed Facility Rating: 996SN/1146SE , 1060WN/1209WE MVA

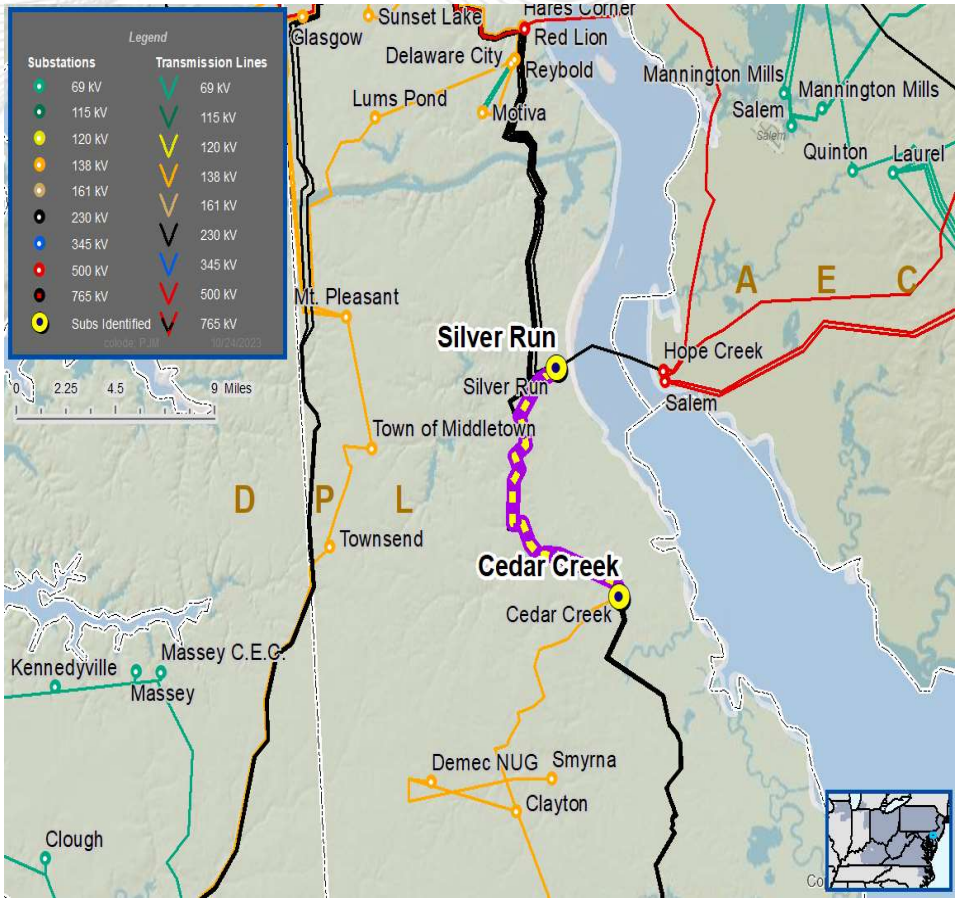
Estimated Cost: $8.7 M

Alternatives

- None

Required In-Service: 6/1/2028

Projected In-Service: 6/1/2028



PECO Transmission Zone: Baseline

Process Stage: Recommended Solution – Second Read

Criteria: Summer Generation Deliverability

Assumption Reference: 2028 RTEP assumption

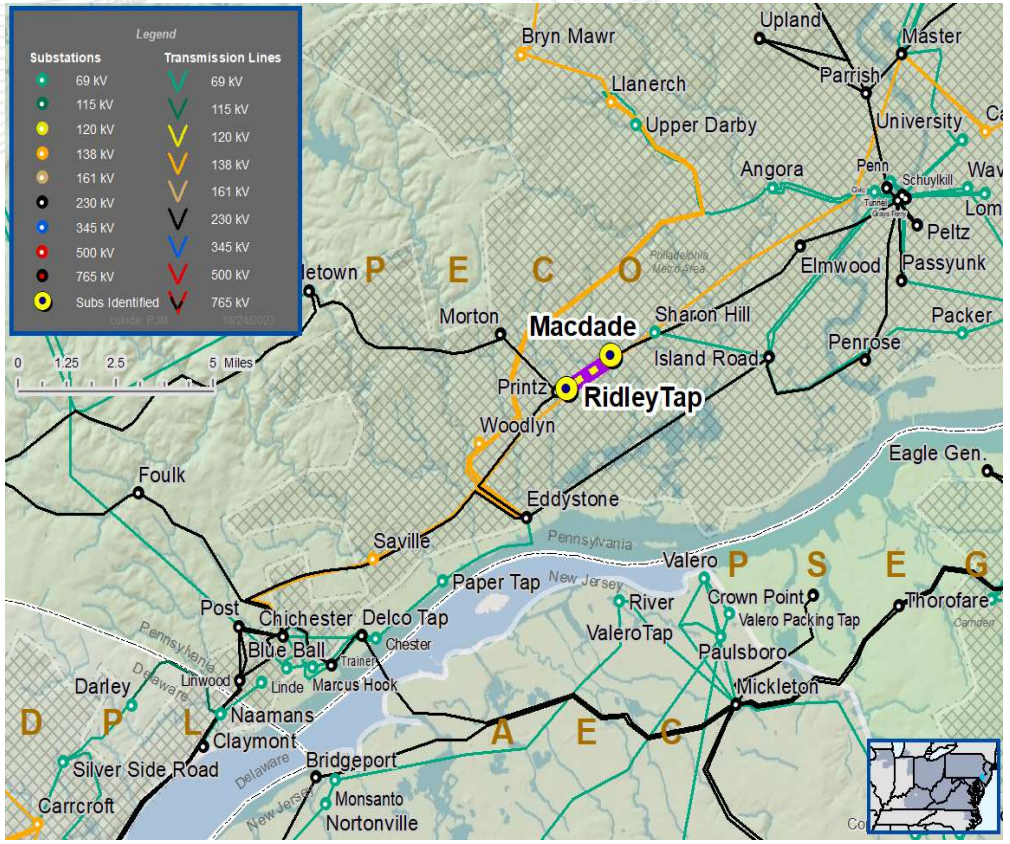
Model Used for Analysis: 2028 RTEP Summer case

Proposal Window Exclusion: Substation equipment Exclusion

Problem Statement: The Ridley – Macdade 230 kV circuit overloaded for several contingencies

Violations were posted as part of the 2023 Window 1: FG#s

2023W1-GD-S108	2023W1-GD-S1267	2023W1-GD-S1276
2023W1-GD-S693	2023W1-GD-S1397	2023W1-GD-S833
2023W1-GD-S704	2023W1-GD-S134	2023W1-GD-S845
2023W1-GD-S705		



Continued on the next slide……

PECO Transmission Zone: Baseline

Recommended Solution:

- Replace relays at Macdade, Printz, and Morton 230 kV station to increase rating limits of transmission. Line protection relays will be upgraded with latest standard relays used across the PECO system. **(B3844)**

Existing Facility Rating: 927SN/927SE, 927WN/927WE MVA

Proposed Facility Rating: 1079SN/1260SE, 1301WN/1455WE MVA

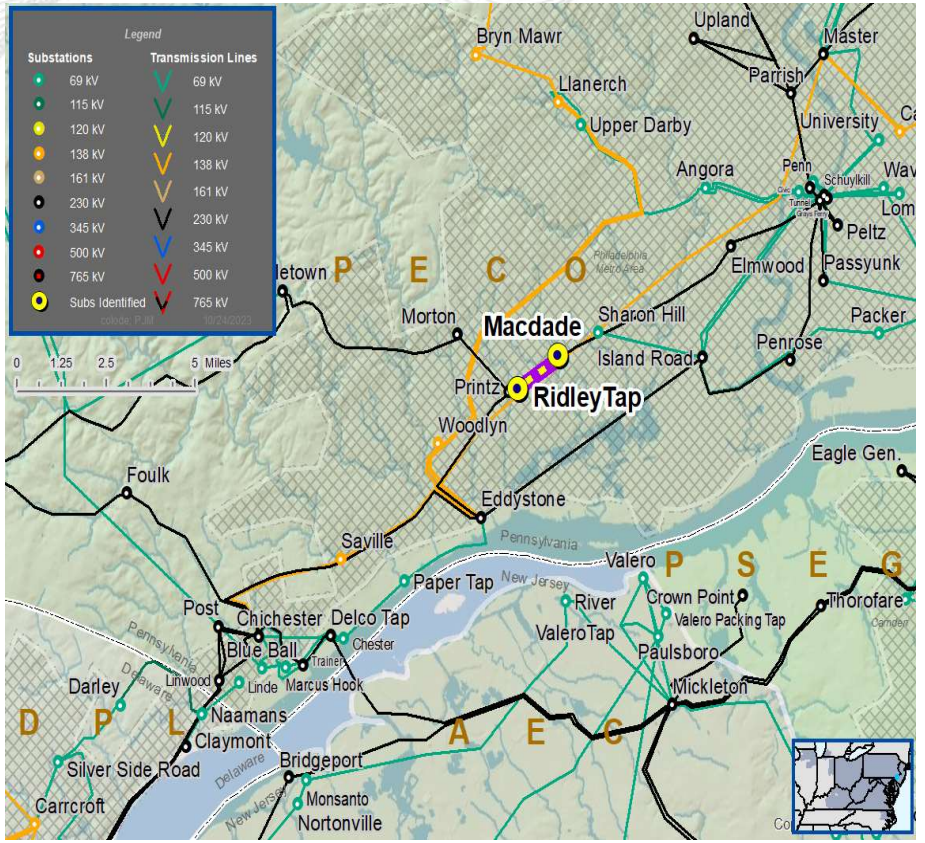
Estimated Cost: $1.4 M

Alternatives

- None

Required In-Service: 6/1/2028

Projected In-Service: 6/1/2028



PSEG Transmission Zone: Baseline

Process Stage: Recommended Solution – Second Read

Criteria: Light Load Baseline Voltage

Assumption Reference: 2028 RTEP assumption

Model Used for Analysis: 2028 RTEP Summer case

Proposal Window Exclusion: No

Problem Statement: High voltage issue on multiple stations around Waldwick vicinity for several contingencies.

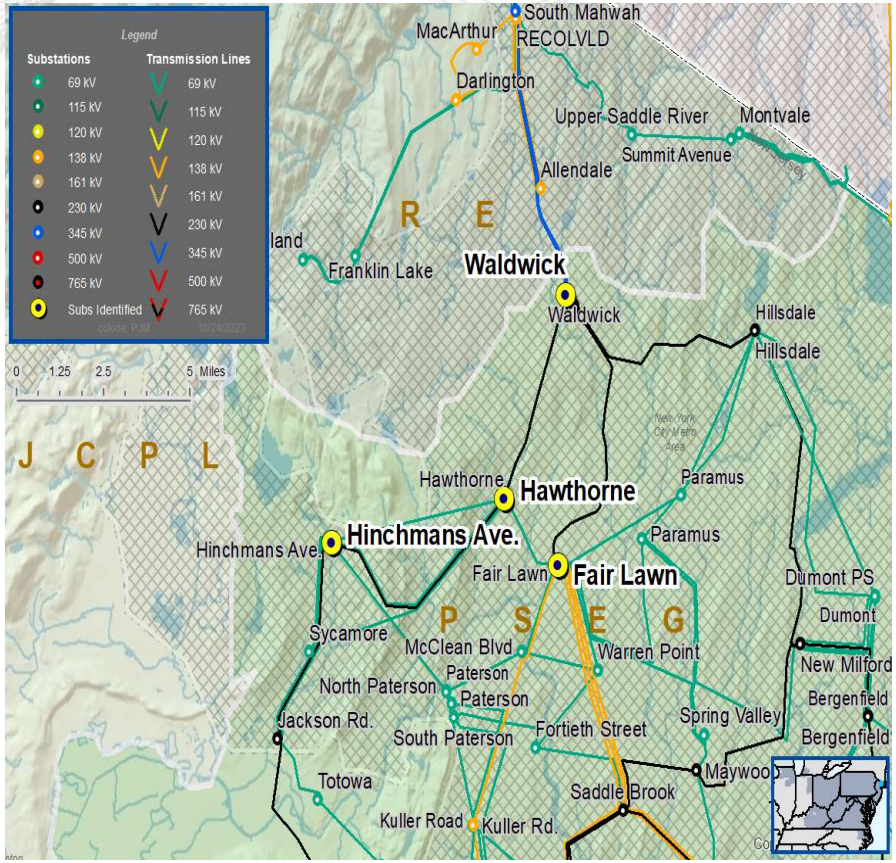
Violations were posted as part of the 2023 Window 1: FG#s

2023W1-N1-LLVM13	2023W1-N1-LLVM17	2023W1-N1-LLVM21	2023W1-N1-LLVM25	2023W1-N1-LLVM29	2023W1-N1-LLVM33
2023W1-N1-LLVM14	2023W1-N1-LLVM18	2023W1-N1-LLVM22	2023W1-N1-LLVM26	2023W1-N1-LLVM30	2023W1-N1-LLVM34
2023W1-N1-LLVM15	2023W1-N1-LLVM19	2023W1-N1-LLVM23	2023W1-N1-LLVM27	2023W1-N1-LLVM31	2023W1-N1-LLVM35
2023W1-N1-LLVM16	2023W1-N1-LLVM20	2023W1-N1-LLVM24	2023W1-N1-LLVM28	2023W1-N1-LLVM32	2023W1-N1-LLVM36
2023W1-N1-LLVM37	2023W1-N1-LLVM38				

Recommended Solution:
Replace existing 230kV 50MVAR fixed shunt reactor with a 230kV 150MVAR variable shunt reactor. **(B3794.1)**
Replace existing 345kV 100MVAR fixed shunt reactor with a 345kV 150MVAR variable shunt reactor. **(B3794.2)**
Estimated Cost: $29.6 M

Alternatives
- None

Required In-Service: 6/1/2028
Projected In-service: 6/1/2028



2023 Window 1
First Read
Baseline Reliability Projects

APS Transmission Zone: Baseline
2023 RTEP Window 1 Cluster 1

Process Stage: First Read

Criteria: Summer Generator Deliverability

Assumption Reference: 2028 RTEP assumptions

Model Used for Analysis: 2028 RTEP Summer case

Proposal Window Exclusion: None

Problem Statement:

2023W1-GD-S499, 2023W1-GD-S500, 2023W1-GD-S501, 2023W1-GD-S87, 2023W1-GD-S80 & 2023W1-GD-S89

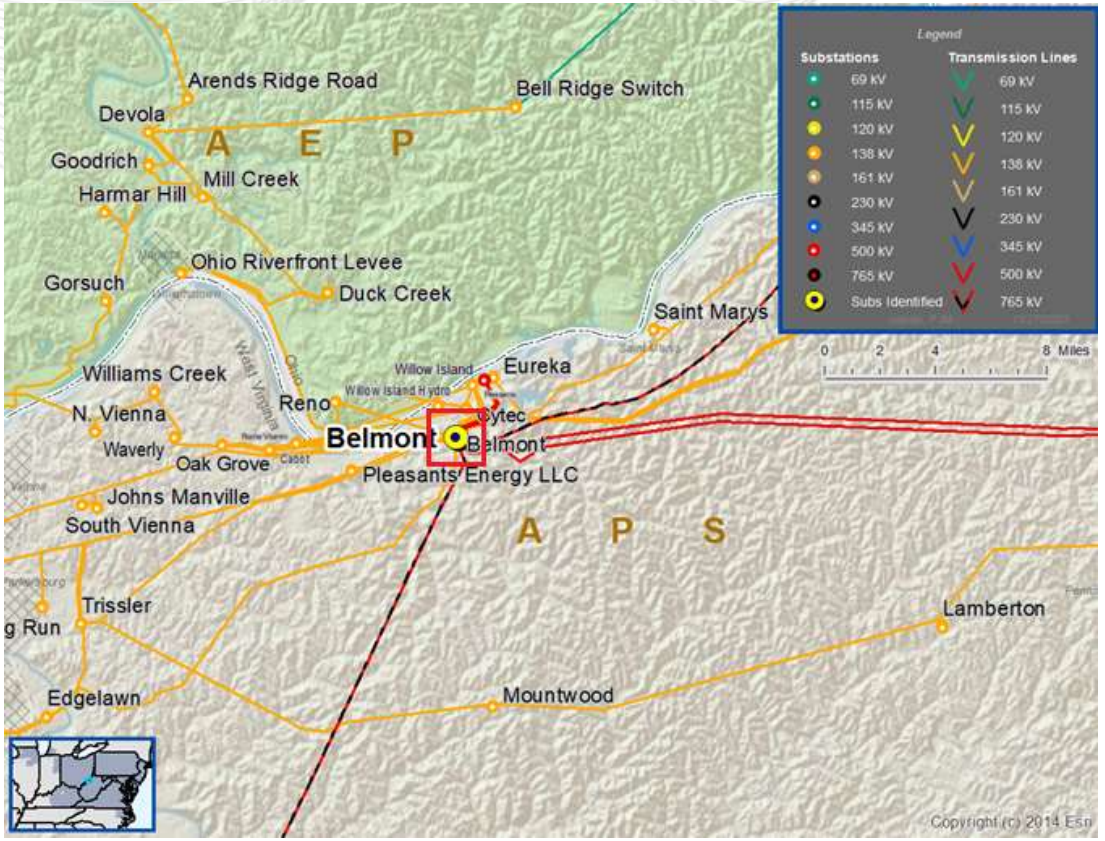
In the 2028 RTEP Summer case, Belmont 765/345 kV Transformer # 5 is overloaded for three common mode and single contingencies.

Existing Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Belmont Transformer # 5	1986/2492/2611/2991

Preliminary Facility Rating:

Branch	SN/SE/WN/WE (MVA)
Belmont Transformer # 5	3125/4000/3500/4250



APS Transmission Zone: Baseline
2023 RTEP Window 1 Cluster 1

As part of the 2023 RTEP Window #1, project 2023-W1-903 listed in the table below is proposed to address the following violations: 2023W1-GD-S499, 2023W1-GD-S500, 2023W1-GD-S501, 2023W1-GD-S87, 2023W1-GD-S89 & 2023W1-GD-S80

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
2023-W1-903	FE (Selected)	Replace the Belmont 765/500 kV Transformer #5 with a new transformer bank consisting of three single-phase transformers and an additional single phase spare transformer.	42.05
2023-W1-851	TRANSOURCE (Not-Selected)	New Greenfield Cork 765kV substation will be roughly 0.55 miles from existing Belmont substation. The new substation will be a ring bus design with existing Kammer to Belmont and Mountaineer to Belmont line 765 kV lines terminating at the new Cork substation.	60.05
2023-W1-850	FE (Not-Selected)	Install second 765/500 kV transformer (#6) consisting of three single-phase transformers and a single phase spare unit, in parallel with the existing Transformer #5. Install 765 kV four-breaker ring bus and two 500 kV breakers. Replace 500 kV disconnect switches.	123.40
2023-W1-831	TRANSOURCE (Not-Selected)	New Greenfield Polecat Station will be roughly 3 miles from the existing Belmont Subation . The new 765/500kV Station that features a 765kV three-position ring bus and a 500kV three-position ring bus. The 765kV ring bus connects Belmont-Mountaineer 765kV, Kammer 765kV, and a new 765/500 transformer. The 500kV ring bus connects the new transformer, Belmont 500kV, and Flint Run 500kV transmission lines. 765kV circuit breaker upgrades will be completed at Mountaineer Station to meet the required 5000A rating.	145.70
2023-W1-605	TRANSOURCE (Not-Selected)	This project enhances 2023-W1-905 by using 954 KCMIL Rail ACSR which increases the throughPut of power by increasing the line conductor ampacity by 8%.Install reactor at New London and Oppossum Creek substation. Upgrade (3) wavetraps and (2) Circuit Breakers to 5000A equipment at Jacksons Ferry 765kV and Upgrade (2) Circuit Breakers to 5000A equipment at Cloverdale 765kV. Upgrade (1) Circuit Breaker to 5000A equipment at Broadford 765kV.	857.33

Proposal ID	Proposing Entity	Upgrade Description	Upgrade Cost ($M)
2023-W1-905	TRANSOURCE (Not-Selected)	New roughly 114 mi 765 kV line between Jousha Falls to new Transource Substation Yeat. Add (2) 765kV breakers at Joshua Falls to create a 2-breaker ring with the transformer still connected off the bus. New Yeat 765/500/230kV will be near existing Bristers 500/230kV substation. This substation will have (10) 500kV breakers, (2) 765/500kV transformers, (2) 500/230kV transformers, (2) 230kV CB's and (1) 765kV CB. Cut in Bristers–Ox 500kV and Meadowbrook–Vint Hill 500kV lines into Yeat's 500kV yard. AEP installs a new 12-mile dbl ckt BOLD (Breakthrough Overhead Line Design) 230kV line from Yeat–CloverHIll. Dominion installs a new 7.5-mile dbl ckt BOLD (Breakthrough Overhead Line Design) 230kV line from Warrenton–Wheeler. Dominion installs (2) 230kV breakers at Wheeler substation. Dominion installs new 0.1% reactor at Vinthill on Vinthill–Morrisville. Dominion Install new 0.1% reactor at Vinthill on Vinthill–Loudoun 1. Dominion Rebuilds 1.7 miles 230kV line from Marsh Run–RemingtonCt as double circuit. Dominion replaces remote end equipment to bring rating up on 230kV line from Wheeler–Linton Tap–Atlantic. Dominion rebuilds the 0.23-mile line between Bristers 500kV and Yeat 500kV.	1,300.86

Proposed Solution: 2023-W1-903 - Replace the Belmont 765/500 kV Transformer #5 with a new transformer bank with nameplate rating of 1500/2000/2500 MVA (ONAN/ONAF/ONAF), consisting of three single-phase transformers and a spare transformer. The loadability ratings of the new transformer are 3125/4000/4750 SN/SE/SLD and 3500/4250/4750 WN/WE/WLD. Replace 500 kV disconnect switches **(2023-W1-903)**

Total Estimated Cost: $42.05M

Required IS Date: 06/01/2028
Projected IS Date: 06/01/2028

ComEd Transmission Zone: Baseline
Cherry Valley Circuit Breakers

Process Stage: First Read

Criteria: Summer Generator Deliverability

Assumption Reference: 2023 RTEP assumptions

Model Used for Analysis: 2028 RTEP cases

Proposal Window Exclusion: None

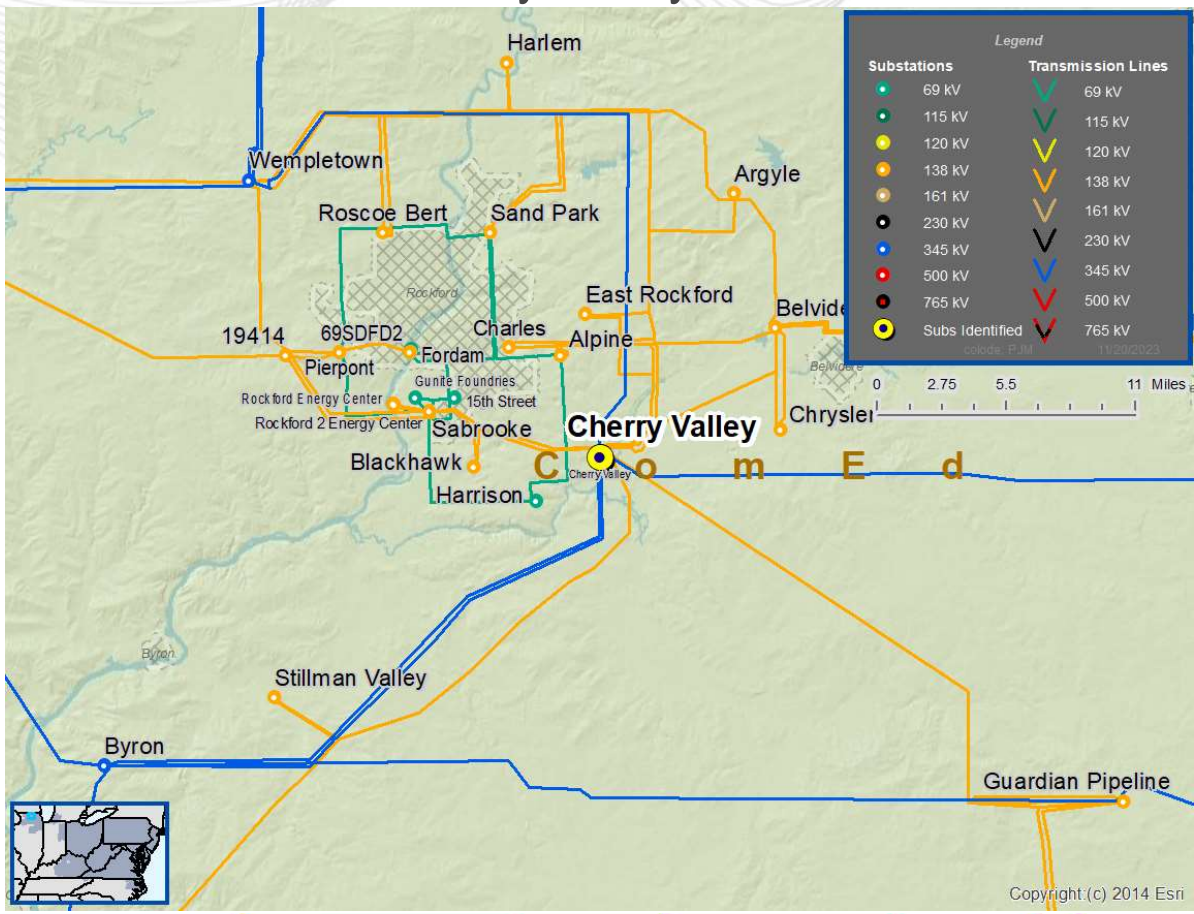
Problem Statement:

2023W1-GD-S641, 2023W1-GD-S642, 2023W1-GD-S662, 2023W1-GD-S663, 2023W1-GD-S1262, 2023W1-GD-S1263

In 2028 RTEP Summer case, the Cherry Valley R 345/138 kV transformer is overloaded for N-2 outages.

Existing Facility Rating:

Branch	SN/SE/SSTE/SLD WN/WE/WSTE/WLD (MVA)
Chery Valley R 345/138 kV Transformer	420/480/520/530 420/480/520/530



ComEd Transmission Zone: Baseline
Cherry Valley Circuit Breakers

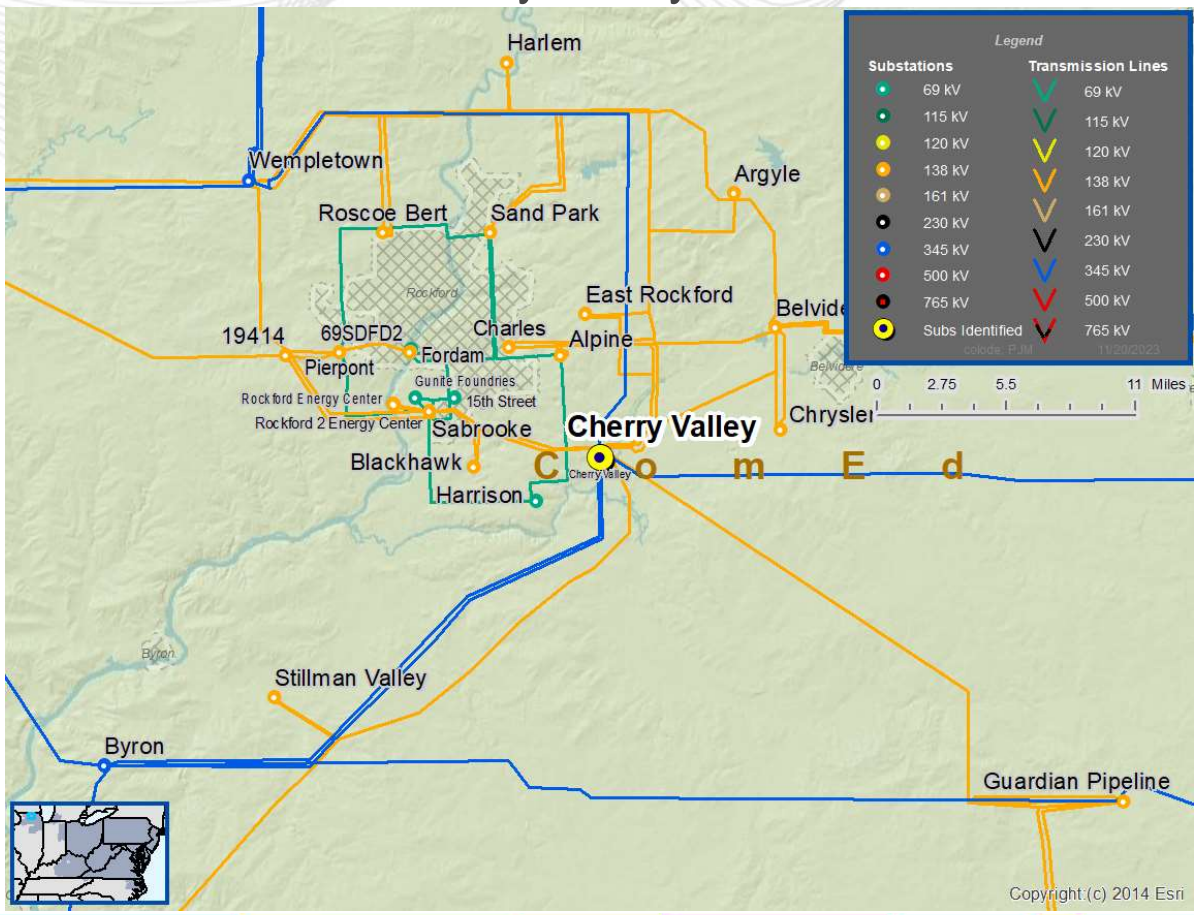
Proposed Solution: Proposal No. 2023-W1-771
Add three 345 kV circuit breakers to Cherry Valley substation.

Estimated Cost: $7.75 M

Preliminary Facility Rating: No change to transformer rating, 63 kA circuit breakers

Alternatives: None

Required IS Date: 6/1/2028
Projected IS Date: 6/1/2028



ComEd Transmission Zone: Baseline
2023 RTEP Window 1 Cluster 3

Process Stage: First Read

Criteria: Winter Generator Deliverability

Assumption Reference: 2023 RTEP assumptions

Model Used for Analysis: 2028 RTEP cases

Proposal Window Exclusion: None

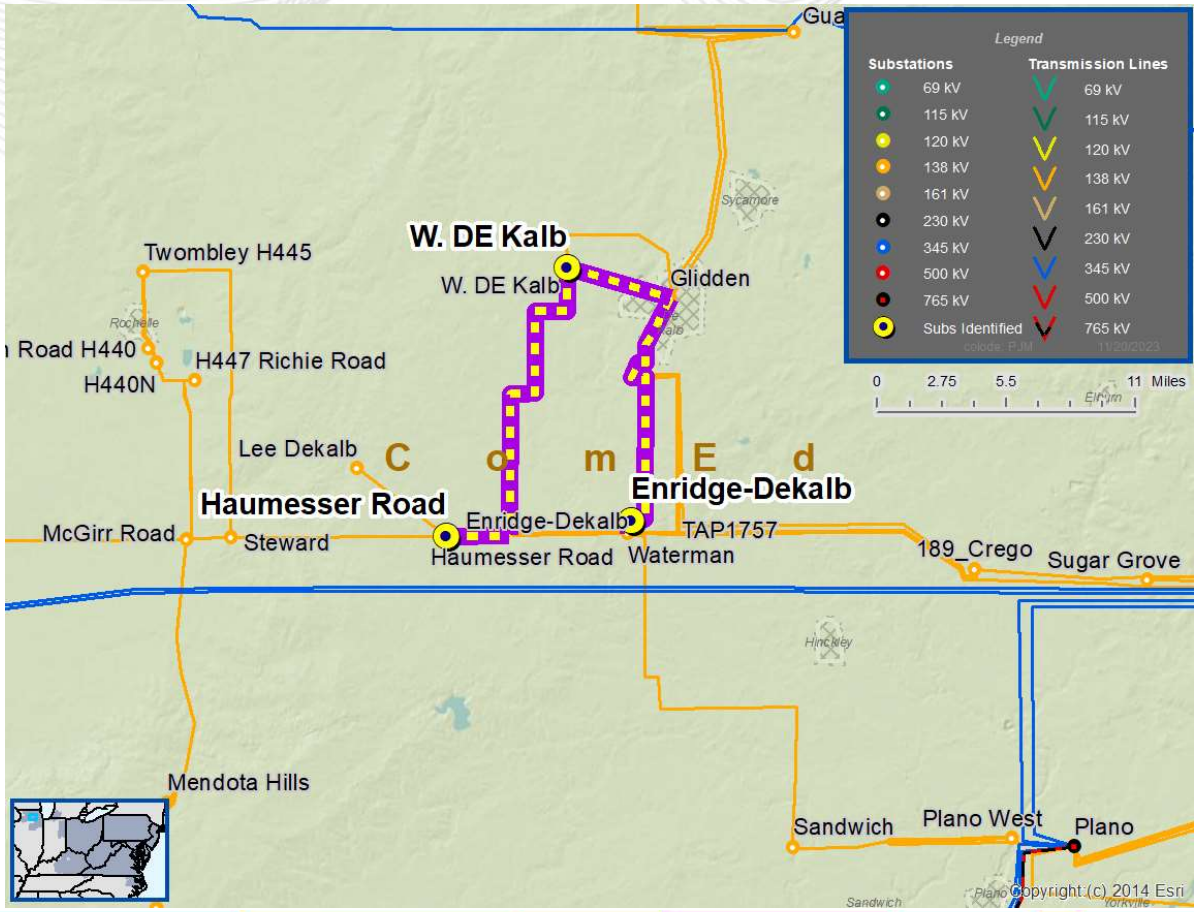
Problem Statement:

2023W1-GD-W229, 2023W1-GD-W955, 2023W1-GD-W988, 2023W1-GD-W945, 2023W1-GD-W993, 2023W1-GD-W268, 2023W1-GD-W972, 2023W1-GD-W1397, 2023W1-GD-W1387, 2023W1-GD-W946

In 2028 RTEP Winter case, the Haumesser Road-West DeKalb Tap-ESS H452 (Enridge-DeKalb) Tap 138 kV line is overloaded for N-1 and N-2 outages.

Existing Facility Rating:

Branch	SN/SE/SSTE/SLD WN/WE/WSTE/WLD (MVA)
HAUMESSER; B-W DEKALB ;3T 138 kV	452/452/455/471 472/472/476/495
W DEKALB ;3T-ESS H452 ;RT 138 kV	376/452/455/471 452/472/476/495



ComEd Transmission Zone: Baseline
2023 RTEP Window 1 Cluster 3

As part of the 2023 RTEP Window #1, project 2023-W1-712 listed in the table below is proposed to address the following violations: 2023W1-GD-W229, 2023W1-GD-W955, 2023W1-GD-W988, 2023W1-GD-W945, 2023W1-GD-W993, 2023W1-GD-W268, 2023W1-GD-W972, 2023W1-GD-W1397, 2023W1-GD-W1387, 2023W1-GD-W946

Proposal ID	Proposing Entity	Project Type	Upgrade Description	Upgrade Cost ($M)
500 (Not Selected)	ComEd	Greenfield	Expand Haumesser Road substation. Extend the line 11323 West Dekalb tap 1.6 miles into Haumesser Road to create new line 9411 from Haumesser to West Dekalb. Expand West Dekalb to tie line 9411 from Haumesser Road to the existing line 8315 from Glidden. Reconductor/rebuild 10 miles of line 9411 and 6 miles of line 8315.	113.94
712 (Selected)	ComEd	Upgrade	Rebuild/reconductor 138 kV line 11323 from Haumesser Road to the H-452 tap.	10.22
972 (Not Selected)	ComEd	Upgrade	Rebuild 138 kV line 11323 as double circuit from Haumesser Road to the H-452 tap and string a second circuit. Expand Haumesser Road to a 4 circuit breaker ring bus. Add a circuit breaker at H-452 to create a second path between Haumesser Road and Waterman.	28.11

ComEd Transmission Zone: Baseline
2023 RTEP Window 1 Cluster 3

Proposed Solution: Proposal No. 2023-W1-712
Rebuild/reconductor 138 kV line 11323 from Haumesser Road to the H-452 tap.

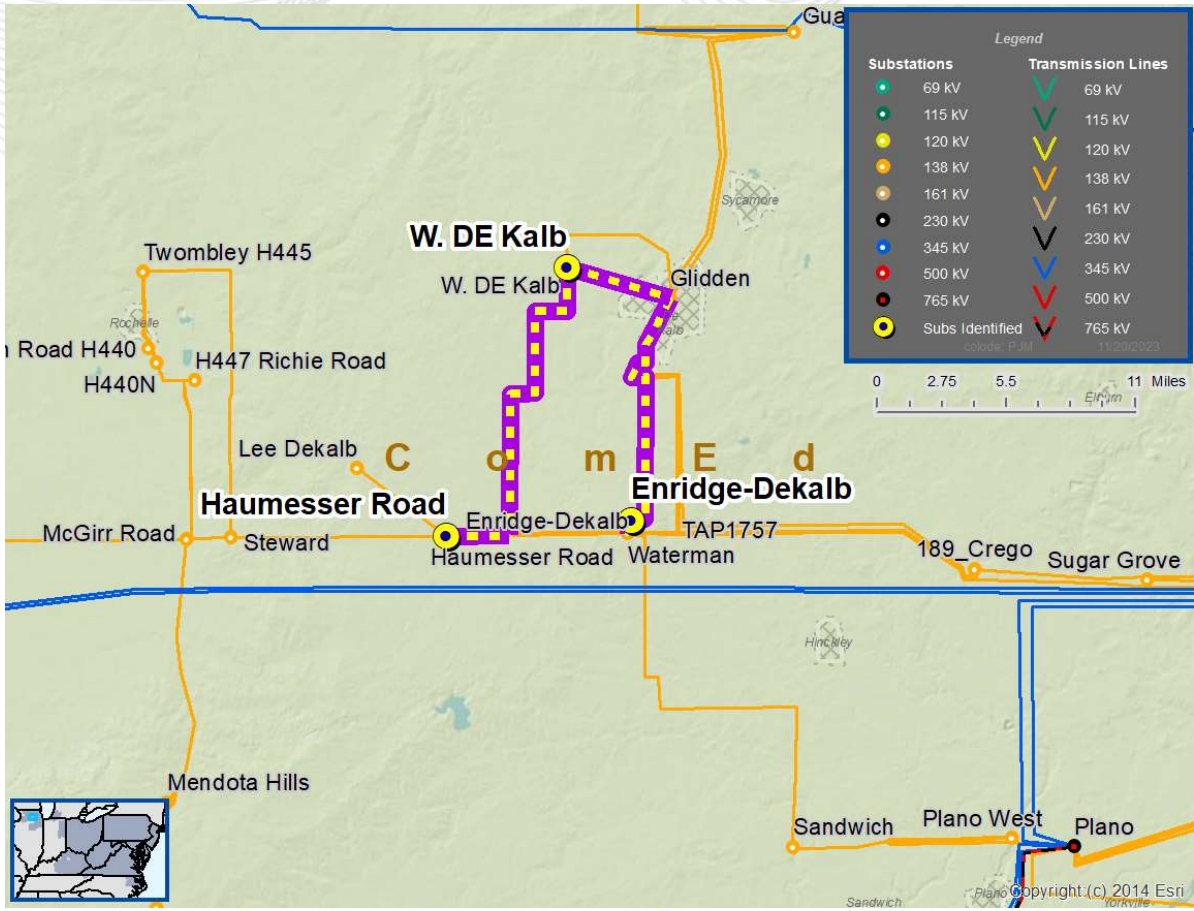
Estimated Cost: $10.22 M

Preliminary Facility Rating:

Branch	SN/SE/SSTE/SLD WN/WE/WSTE/WLD (MVA)
HAUMESSER; B-W DEKALB ;3T-ESS H452 ;RT 138 kV	405/511/522/563 479/565/578/625

Additional Benefits: The line will be rebuilt as double circuit to accommodate a future circuit from Haumesser Road to H-452, but only a single circuit will be installed for this project.

Required IS Date: 6/1/2028
Projected IS Date: 12/1/2026



Update for Existing Projects

Baseline Reliability Projects

- **Scope Clarification (administrative update):**
  - A portion of the Windsor to Clarksville Subproject b3737.40 scope was modified to reconductor one span (0.1 mile) of the C1017 (Clarksville-Windsor) 230 kV in lieu of creating a paired conductor path between Clarksville and Windsor.
  - A portion of the Windsor to Clarksville Subproject b3737.41 (Upgrade all terminal equipment at Windsor 230 kV and Clarksville 230 kV) previously included both PSEG and JCPL scope of work. This sub-ID was broken up into 2 sub-IDs to reflect both TOs' scope of work (PSEG scope remains with .41 sub-ID, while JCPL scope was transferred to new .59 sub-ID).
  - The b3737.48 scope of work to build a new North Delta-Graceton 230 kV line by rebuilding the existing Cooper-Graceton 230 kV line to double circuit previously included both PECO and BGE scope of work. This sub-ID was broken up into 2 sub-IDs to reflect both TOs' scope of work (PECO scope remains with .48 sub-ID, while BGE scope was transferred to new .56 sub-ID).

NJ SAA Project Updates

- **JCPL Zone Updates:**
  - Additional Project Scope:
    - Remove the existing E83 Line 115 kV (not in-service) to accommodate the new 500kV/230kV lines (approximately 7.7 miles) **(b3737.53)** - $8.47M
    - Remove the existing H2008 Larrabee-Smithburg No. 2 230 kV to accommodate the new 500kV/230kV lines **(b3737.54)** - $8.47 M
    - Middlesex Substation 230kV - Replace the 2000A Circuit Switcher at Middlesex Switch point for the Lake Nelson I1023 230kV exit **(b3737.55)** - $0.53 M
  - Updated Project Costs:
    - Rebuild approximately 0.8 miles of the D1018 (Clarksville-Lawrence 230 kV) line (b3737.27) cost increase from $11.45 M to $14.58 M
    - Reconductor Red Oak A-Raritan River 230 kV (b3737.33) cost increase from $11.05 M to $12.53 M
    - Reconductor small section of Raritan River-Kilmer I 230 kV (b3737.35) cost increase from $0.2 M to $27.3 M

NJ SAA Project Updates

- **PSEG Zone Updates:**
  - Cost to Install the new 345/230 kV transformer at Linden 345 kV, and relocate Linden-Tosco 230 kV (b3737.38) has increased from $24.92M to $35.30M.
  - Cost to upgrade inside plant equipment at Lake Nelson I 230 kV (b3737.42) has increased from $3.80M to $4.80M.
  - Cost to upgrade Kilmer W – Lake Nelson W 230 kV (b3737.43) has increased from $0.16M to $0.57M.
  - Cost to upgrade Lake Nelson – Middlesex – Greenbrook W 230 kV (b3737.44) has increased from $0.12M to $0.58M.
- **PECO Zone Updates:**
  - PECO's project scope to replace four 63 kA circuit breakers "205", "235", "225" and "255" at Peach Bottom 500 kV with 80 kA (b3737.51) is no longer needed due to a case correction, resulting in a total project decrease of $5.6 M.

NJ SAA Project Updates

- **MAOD's Project Updates:**
  - Costs to construct the Larrabee Collector Station AC switchyard, and procure and prepare land adjacent to the AC switchyard (b3737.22) have increased from $121.1 M to $193.3 M. Includes costs that were explicitly excluded from MAOD's original estimate, that are required for the project.
  - Additional cost and scope for MAOD Pre-build Infrastructure evaluation study
    - Pre-build Infrastructure scope is intended so that either an Offshore wind developer, or other entity selected by NJBPU, construct the necessary duct banks and access cable vaults for other Offshore wind generators, to fully utilize the Larrabee Tri-Collector Solution.
    - The NJBPU approved that MAOD perform a Pre-build Infrastructure evaluation study in alignment with requirements in Attachment 10 of the NJBPU Solicitation Guidance Document (SGD).
    - The deliverables for this study will be a desktop study, updated cable routes and cross-section diagrams, detailed scope, schedule and cost estimates for the pre-build infrastructure.
    - Study cost estimate is $290K, and targeted for completion by June 2, 2023.
- **NJ SAA Project Total Cost Increase:** $1,064.36 M → $1,191.70 M

Canceled Projects

Baseline Reliability Projects

APS Transmission Zone: Baseline
B3710 Cancellation: AA2-161 to Yukon ckt 1 and 2 138 kV

B3710: Previously presented on 11/18/2022 SRRTEP-W

Problem Statement:

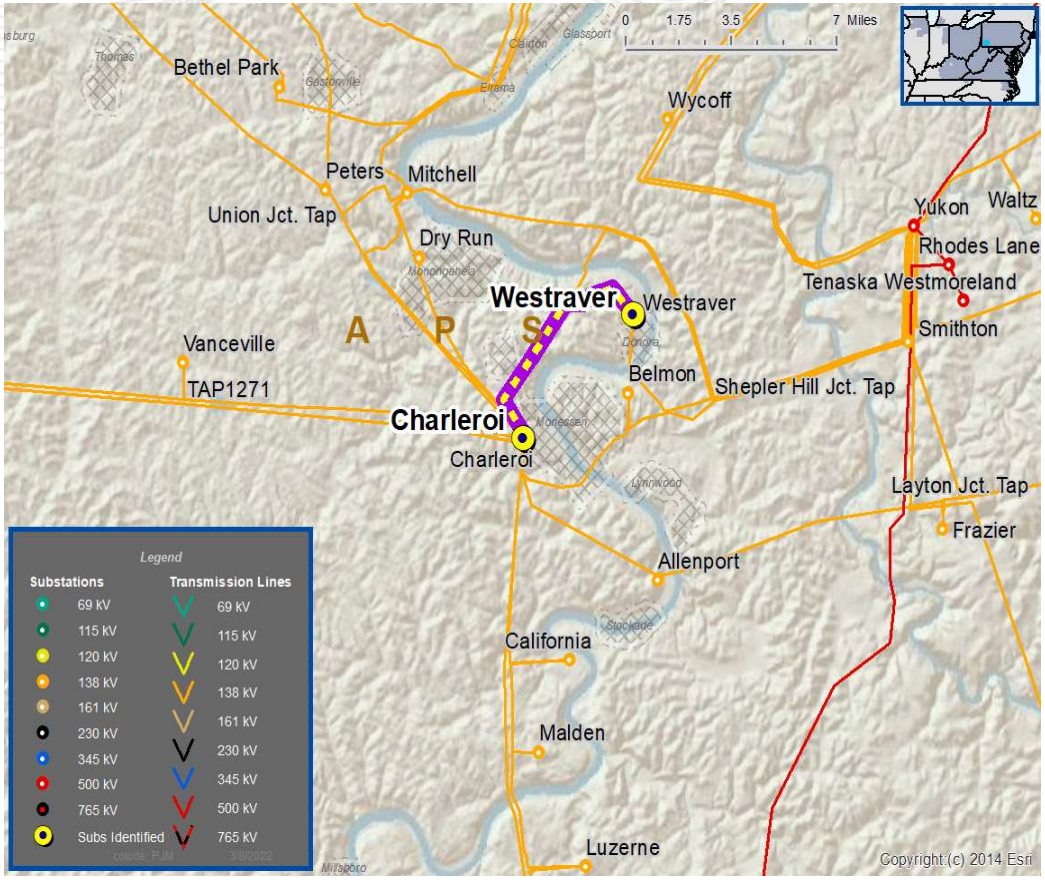
In 2026 RTEP Summer case, Yukon to AA2-161 Tap 138 kV lines are overloaded due to single contingencies.

Recommended Solution:

Reconductor AA2-161 to Yukon 138 kV lines ckt 1 and 2 with 954 ACSS conductor.

Total Estimated Transmission Cost: $10.64M

Ancillary Benefits: None



APS Transmission Zone: Baseline
B3710 Cancellation: AA2-161 to Yukon ckt 1 and 2 138 kV

Preliminary Facility Rating:

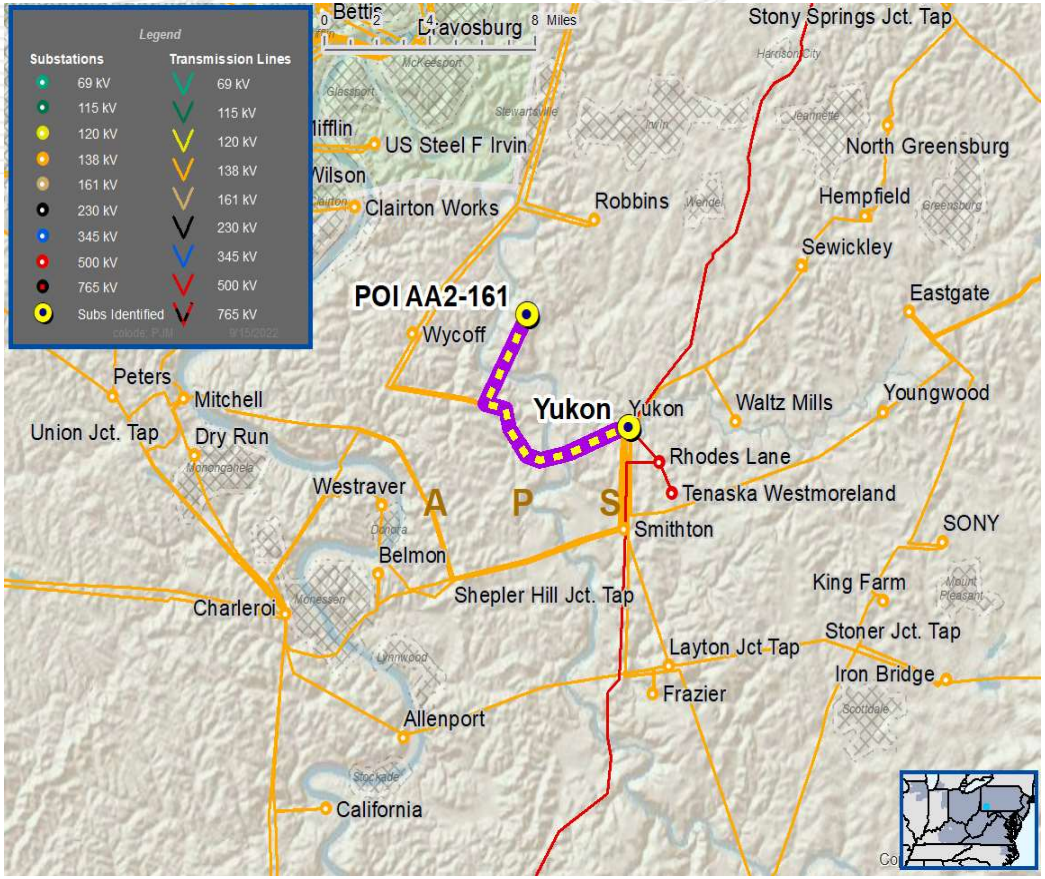
Branch	SN/SE/WN/WE (MVA)
AA2-161 – Yukon Ckt 1 and 2	501/577/501/607

Required IS Date: 06/01/2026

Projected IS Date: 06/01/2026

Reason for Cancellation:

PJM IPP project AA2-161 withdrew on 10/17/2023. As a result, the baseline is no longer needed.



Changes to the Existing Projects

Solutions of the M-3 Process

S1782:

Posted to 2019 DEOK Local plan to address Need Number DEOK-2018-001.

Process Stage: Solutions Meeting 12-16-2022

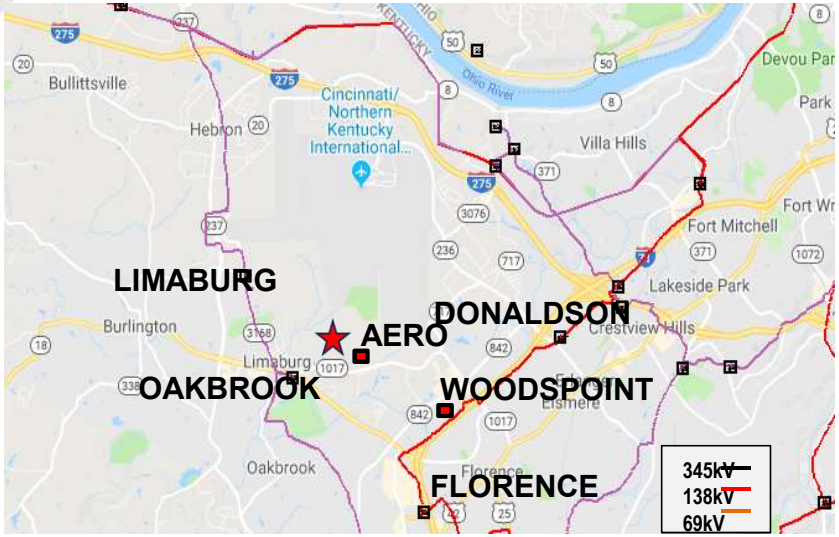
Previously Presented:

Solutions Meeting 01-11-2019

Project Driver: Customer Service

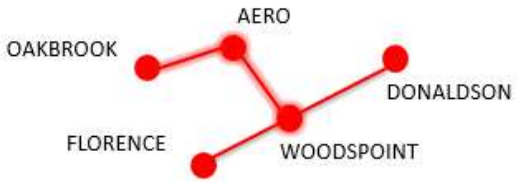
Specific Assumption Reference:

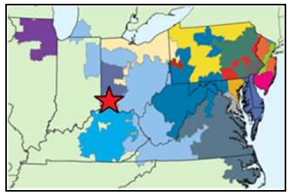
Duke Energy Ohio & Kentucky Local Planning Assumptions slide 9

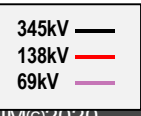


Original Scope:

Install a new 138kV, 3-breaker ring bus substation, Woodspoint. Install a new 138kV, 6-breaker ring bus, Aero, near Amazon Prime Hub. Install new 138kV lines from Woodspoint to Aero, and from Aero to Oakbrook. The lines will be rated at 301MVA. At AERO install four 138/13kV, 22MVA transformers. At Oakbrook install one 138/69kVA, 150MVA transformer with high side and low side breakers.







S1782

Process Stage: Solutions Meeting 12-16-2022

Previously Presented: Solutions Meeting 01-11-2019

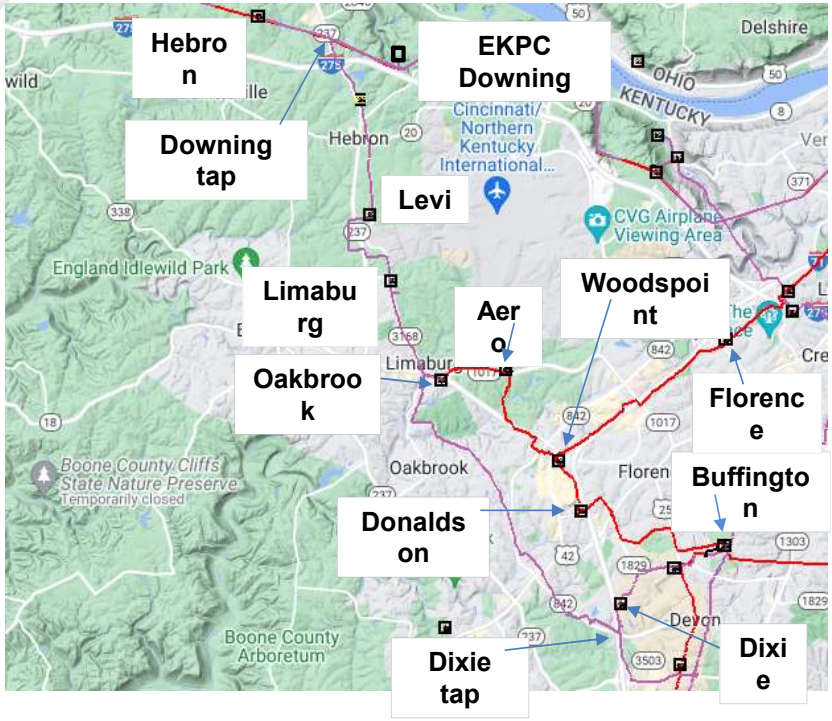
Project Driver: Customer Service

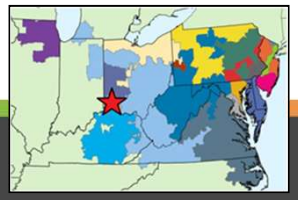
Specific Assumption Reference:

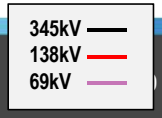
Duke Energy Ohio & Kentucky Local Planning Assumptions slide 9

Problem Statement:

Subsequent to submitting the Aero/Woodspoint project (DEOK-2018-001, s1782) to the 2019 Duke Energy Local Plan, a thermal violation was found on the 69 kV circuit from Buffington to Oakbrook for the loss of the 138 kV circuit from Aero to Woodspoint. Need DEOK-2020-001 addressed this violation in the February 2020 PJM Subregional RTEP-Western meeting. Analysis by PJM found that the violation occurred with incremental loading from the Aero/Woodspoint project and was not tied to the load growth from DEOK-2020-001. PJM advised that need DEOK-2020-001 should be withdraw and any scope to address the Buffington to Oakbrook violation be amended the solution for the Aero/Woodspoint project. Need DEOK-2020-001 was withdrawn in the April 2020 PJM Subregional RTEP-Western meeting.







DEOK Transmission Zone
S1782 Additional Scope

Additional Scope:

At Hebron substation expand the box structure and install two new 69 kV, 2000A breakers to create a 4-position ring bus with individual positions for a circuit to Downing and a circuit to Oakbrook. Retire a feeder section from Downing tap to structure HL-752 (0.67mi.). Construct a new section of feeder from Hebron to structure HL-752 with 954 ACSR on steel poles (1.75 mi). Raise two other circuits on shared structures in the corridor near the former Downing tap to allow the new feeder to pass under. At Levi replace 500 MCM strain bus with 954 ACC conductor, remove bus tie switch SW4250. Replace drops into and out of Limaburg with 954 ACSR conductor. At Limaburg replace 500 MCM strain bus with 954 ACC conductor, remove bus tie switch SW610, close normally open switch SW620 to complete the circuit to Oakbrook. Rebuild the section of feeder from Midvalley to Oakbrook with 954 ACSR on steel poles (1.5 mi.). Retire a feeder section from Oakbrook to Dixie tap (5.70mi.). The ratings on the circuit from Hebron to Oakbrook will increase from 54/54 MVA to 133/133 MVA, S/N/E, and from 69/69 MVA to 166/166 MVA W/N/E. (**S1782.1**)

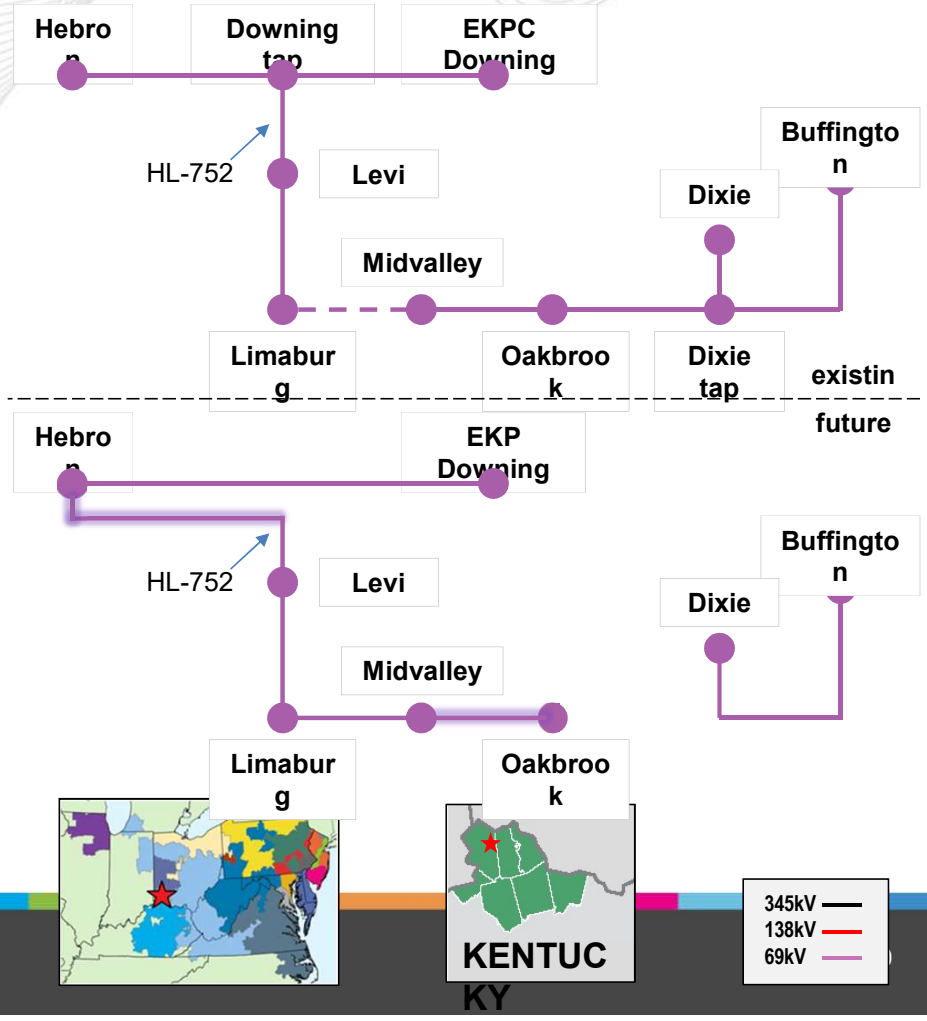
Alternatives: Keeping the Downing tap was considered. However, the Heborn to Oakbrook circuit is the only transmission available in this high growth area. The ring bus separates the circuits increasing the reliability of both the Hebron-Downing circuit and the Hebron-Oakbrook circuit.

Ancillary Benefits: Operational options for switching, provides more options to deal with non-standard operating conditions, improves the system's ability to absorb and recover from an interruption, and reconfigures infrastructure to limit load loss.

Estimated Transmission Cost: $32,001,508

Projected In-Service Date: 04-22-2026

Project Status: Engineering



AEP Transmission Zone: Supplemental Project S2098 Changes

S2098: Need number AEP-2019-IM006, Need Meeting 2/20/2019, Solution Meeting 10/25/2019, posted to 2019 AEP local plan

Reason for Changes: Hard tapped customer "Universal Tool" removed from transmission system. Basket Switch POP no longer needed

Rebuild 7.35 miles from Butler – ~~Basket Factory Switch -~~ Hamilton 69kV with 556 ACSR. (**S2098.1**) **Estimated Cost: $14.3M**

Install 1.6 mile long greenfield line on the Hamilton – Muskrat Sw 69kV Section to loop Hamilton and replace roughly 0.8 miles of poles with woodpecker holes on the Hamilton – Muskrat Sw 69kV Section with 556 ACSR. (**S2098.2**) **Estimated Cost: $2.9M**

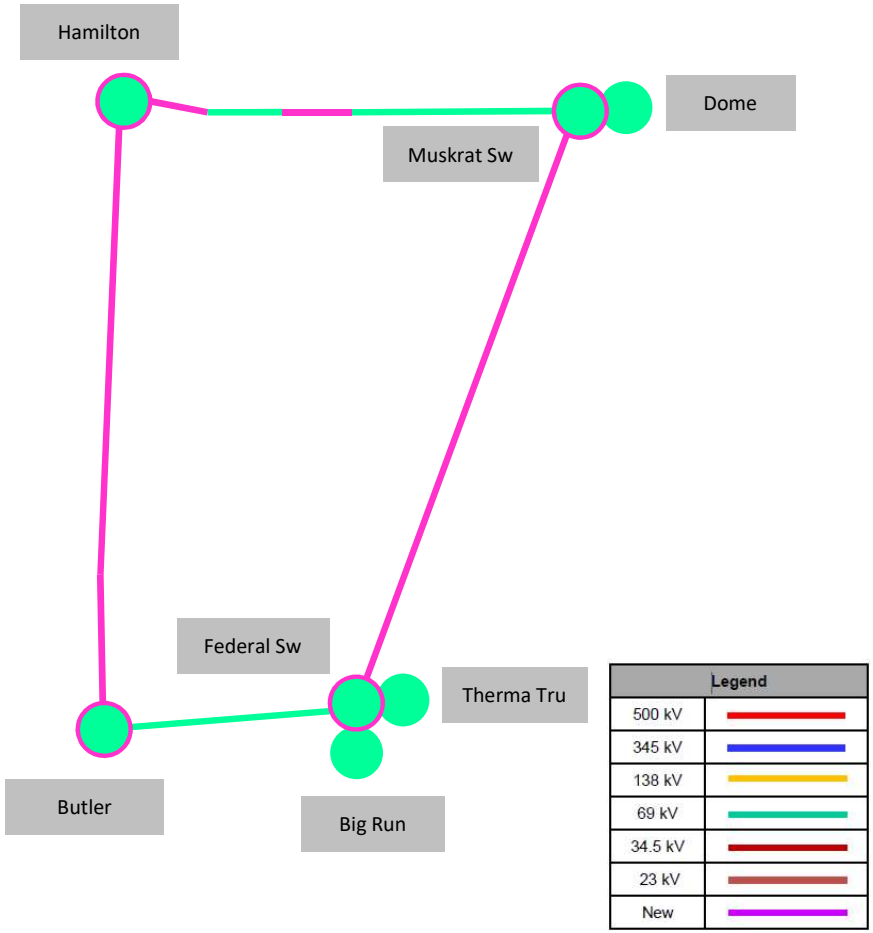
Install 8.37 mile long greenfield line with 556 ACSR from Federal Sw to Muskrat Sw to provide two way service to ~~University Tool,~~ Hamilton and Dome Stations. (**S2098.3**) **Estimated Cost: $13.0M**

Install a 0.04 mile long greenfield line with 556 ACSR to eliminate the hard tap on the Butler – Hicksville Junction 138kV Line. (**S2098.4**) **Estimated Cost: $0.4M**

Relocate the line entrance at Butler Station. (**S2098.5**) **Estimated Cost: $0.6M**

At Butler station, install (3) 69kV breakers and (2) Cap Banks to accommodate the line loops. (**S2098.6**) **Estimated Cost: $5.5M**

~~Install 69kV phase over phase switch outside Universal Tool called Basket Factory Switch.~~ (**S2098.7**) ~~**Estimated Cost: $0.5M**~~



AEP Transmission Zone: Supplemental Project S2098 Changes

At Hamilton station, install (1) line MOAB and (1) line breaker. (**S2098.8**) **Estimated Cost: $2.7M**

Install 69kV phase over phase switch outside Dome station called Muskrat Switch. (**S2098.9**) **Estimated Cost: $0.3M**

Install 69kV phase over phase switch outside Therma Tru called Federal Switch (**S2098.10**) **Estimated Cost: $0.6M**

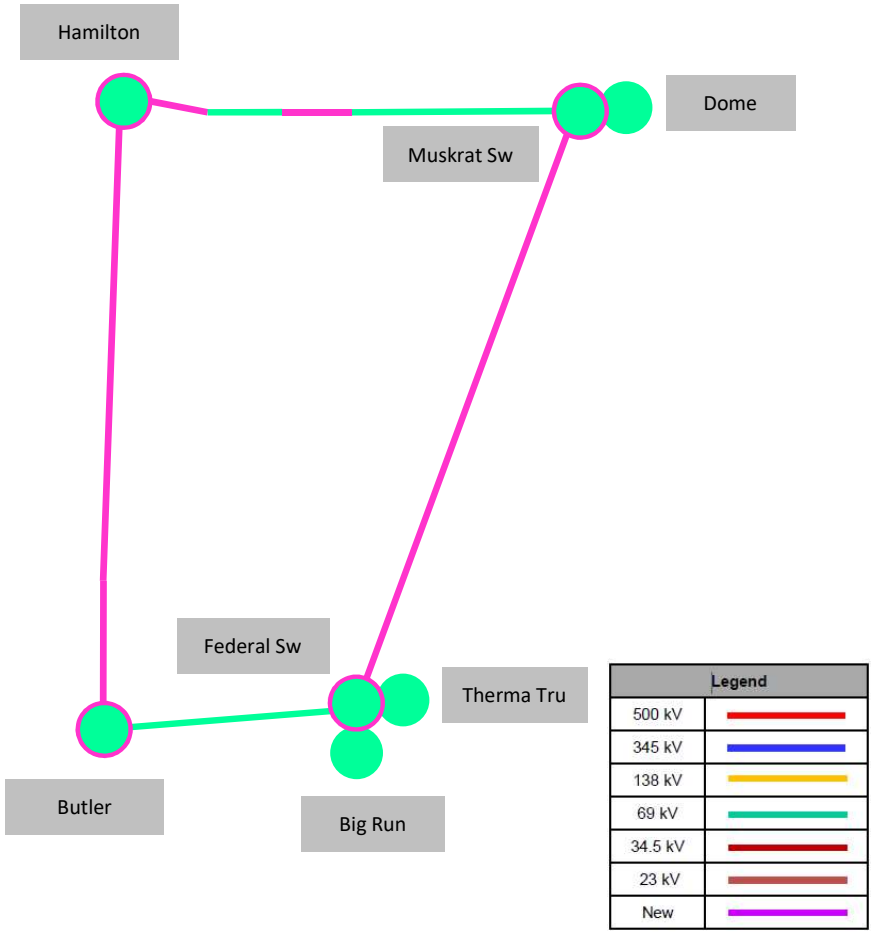
Remove Metcalf tap from the Butler-North Hicksville line and reconnect the through path. (**S2098.11**) **Estimated Cost: $1.0M**

Remote end relay upgrades at North Hicksville. (**S2098.12**) **Estimated Cost: $1.0M**

Total Estimated Cost: **$42.12 M** ~~**$42.62M**~~

Projected In-Service: 1/19/2024

Project Status: Construction



AEP Transmission Zone: Supplemental Project S2401 Changes

S2401: Need Number AEP-2020-OH006, Need Meeting 2/21/2020, Solution Meeting 9/11/2020, Posted to 2021 AEP Local Plan

Reason for Scope Change: During detailed engineering it was determined that the terrain in the area would not allow for sufficient physical space to install the proposed three breaker ring bus configuration without significant amounts of civil improvements that were not initially anticipated. Therefore, the station design has been revised to a two breaker "in and out" configuration.

Note: **s2791** be will removing the 69kV line from Grace to Muskingum 69kV station & installing Patten Mills 69kV Switch & the line to West Watertown 138/69kV Station.

S2401 Scope:

- Install a ~~3 - 3000A Breaker 69kV ring bus~~ a two breaker (3000A, 40 kA) 69kV straight bus station called Grace along the proposed South Rokeby – West Watertown 69 kV circuit (s2791) to serve the requested delivery point. (**S2401.1**) **Estimated Cost: ~~$2.3M~~ $1.8M**
- Remove the South Stockport Switch. (**S2401.5**) **Estimated Cost: $0.07M**
- Install approximately 0.2 miles of 69kV line to tie the greenfield Grace station in-and-out to the Muskingum River – South Rokeby 69kV circuit. (**S2401.2**) **Estimated Cost: $2.1M**
- Remove/Relocate approximately 0.05 miles of line on the Muskingum River – South Rokeby 69kV Line asset between structures 75 and 74A to accommodate the cut in to the new station. (**S2401.3**) **Estimated Cost: $0.1M**
- Remote end work at South Rokeby Switch. (**S2401.4**) **Estimated Cost: $0.9M**

Total Estimated Transmission Cost: ~~$5.4M~~ $4.97M

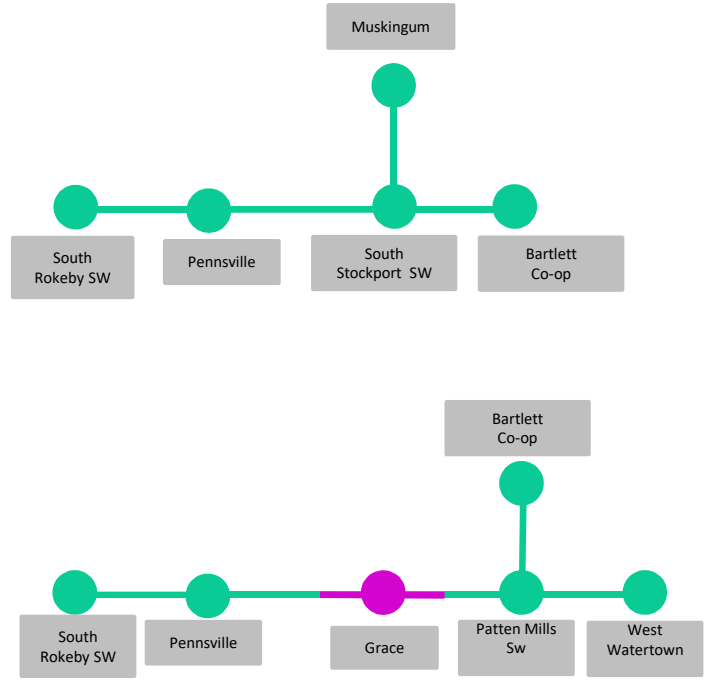
Projected In-Service: ~~5/1/2022~~ 6/12/2024

Project Status: Engineering

Model: 2024 RTEP

Existing:

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



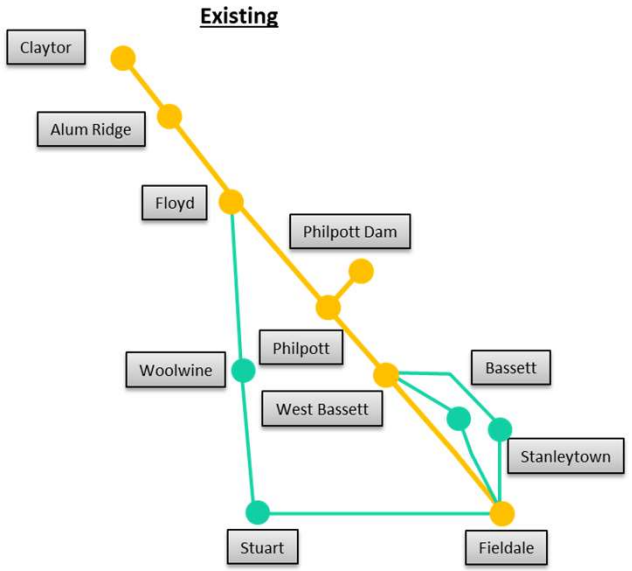
Proposed:

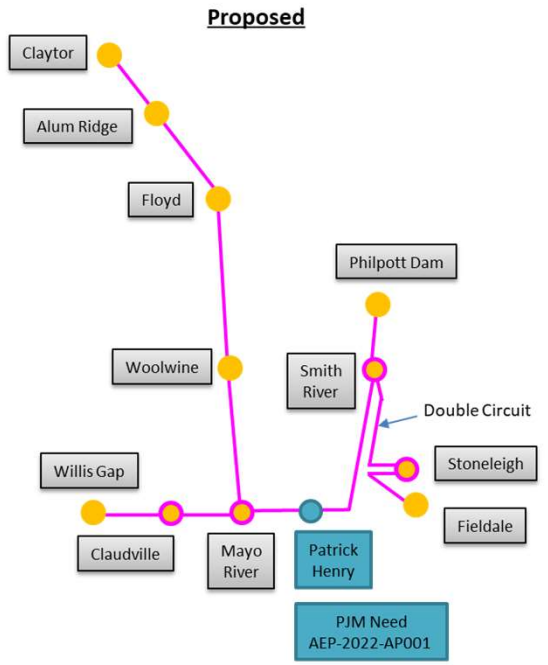
AEP Transmission Zone: Supplemental Project S2179 Changes

S2179: Need Number(s): AEP-2018-AP016 (Need Meeting 1/11/2019), AEP-2018-AP020 (Need Meeting 1/11/2019), AEP-2019-AP036 (Need Meeting 9/25/2019), AEP-2019-AP037 (Need Meeting 9/25/2019), AEP-2019-AP038 (Need Meeting 9/25/2019), Solutions Meeting 1/17/2020, posted to 2020 AEP Local Plan

Reason For Revision:

- As the Stuart Area Improvements Project has moved through functional and detailed scoping, updates to the scope of work have been made, although the electrical solution has remained the same. The lack of availability of new station property has impacted some of the scope of work. The replacement and conversion of the existing Stanleytown and Bassett substations has evolved into combining the substations into a new Stoneleigh station that will serve the former Stanleytown distribution load and Bassett distribution load will be served from the new Smith River substation. In addition, the former Salem Highway station has been renamed to Mayo River and the former Fairystone station has been renamed to Smith River.

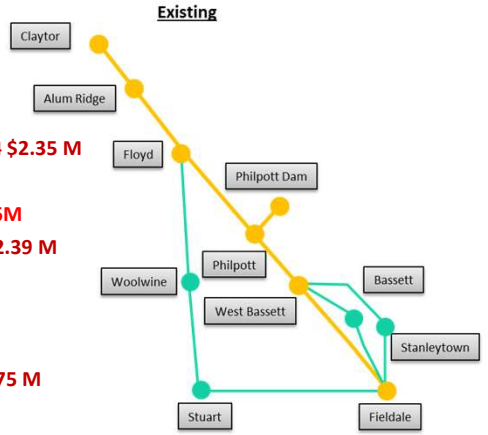


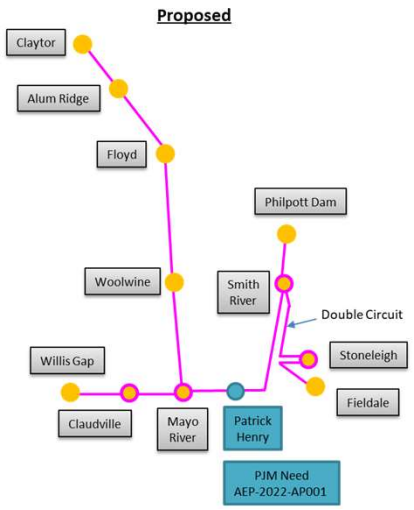


AEP Transmission Zone: Supplemental Project S2179 Changes

Proposed Solution:

- Construct ~12.5 miles 138 kV line from Alum Ridge to Claytor. (**S2179.1**) **Estimated Cost: ~~$34.3M~~ $40.78 M**
- Construct ~6.5 miles 138 kV line from Alum Ridge to Floyd. (**S2179.2**) **Estimated Cost: ~~$20.6M~~ $23.85**
- ~~Construct ~7 miles of 138 kV line from Fieldale-Fairystone. (**S2179.3**) **Estimated Cost: $17.6M**~~
- Construct ~~~1.25~~ 0.4 miles of double circuit 138 kV line to connect ~~Stanleytown~~ Stoneleigh. (**S2179.4**) **Estimated Cost: ~~$5.3M~~ $2.35 M**
- ~~Construct 0.07 miles of 138 kV line from Bassett Switch-Bassett. (**S2179.5**) **Estimated Cost: $1.5M**~~
- Construct ~~~1.2~~ 1.9 miles of 138 kV line from Philpott Dam- ~~Fairystone~~ Smith River. (**S2179.6**) **Estimated Cost: ~~($3.6 M)~~ $6.86M**
- Construct ~~~22~~ 12.5 miles of 138 kV line from ~~Salem Highway~~ Claudville to Willis Gap. (**S2179.7**) **Estimated Cost: ~~$65.0M~~ $42.39 M**
- Construct ~11.4 miles of 138 kV line from Claudville to Mayo River. (**S2179.35**) **Estimated Cost: $38.87 M**
- ~~Construct ~21 miles of 138 kV line from Salem Highway-Fairystone. (**S2179.8**) **Estimated Cost: $60.0M**~~
- Construct ~11 miles of 138 kV line from Floyd-Woolwine. (**S2179.9**) **Estimated Cost: ~~$29.2M~~ $33.44 M**
- Construct ~10 miles of 138 kV line from ~~Salem Highway~~ Mayo River to Woolwine. (**S2179.10**) **Estimated Cost: ~~$29.6M~~ $34.75 M**
- Remove ~11 miles of 69 kV line from Floyd-Woolwine. (**S2179.11**) **Estimated Cost: ~~$1.3M~~ $1.55 M**
- Remove ~10 miles of 69 kV line from Stuart-Woolwine. (**S2179.12**) **Estimated Cost: ~~$4.8M~~ $5.02 M**
- Remove ~12.2 miles of 138 kV line from Alum Ridge-Claytor. (**S2179.13**) **Estimated Cost: ~~$1.2M~~ $1.49 M**
- Remove ~6.25 miles of 138 kV line from Alum Ridge-Floyd. (**S2179.14**) **Estimated Cost: ~~$0.8M~~ $0.94 M**
- Remove ~19 miles of 138 kV line from Floyd-West Bassett. (**S2179.15**) **Estimated Cost: ~~$12.1M~~ $16.61 M**
- Remove ~6.4 miles of 138 kV line from Fieldale-West Bassett. (**S2179.16**) **Estimated Cost: ~~$2.9M~~ $3.77 M**
- Remove ~0.34 miles of 138 kV line from Philpott SS-Philpott. (**S2179.17**) **Estimated Cost: ~~$0.1M~~ $0.13 M**
- Remove ~19 miles of 69 kV line from Fieldale to Stuart. (**S2179.18**) **Estimated Cost: ~~$8.3M~~ $8.26 M**
- Remove ~7.1 miles of 69 kV line from Fieldale to West Bassett #1. . (**S2179.19**) **Estimated Cost: ~~$10.1M~~ $11.56 M**
- Remove ~6.8 miles of 69 kV line from Fieldale to West Bassett #2. . (**S2179.20**) **Estimated Cost: ~~$9.5M~~ $10.77 M**
- Remove ~0.4 miles of 69 kV line from Woolwine "in and out" loop . (**S2179.36**) **Estimated Cost: $0.09 M**
- Construct ~9.5 miles 138 kV from Stoneleigh Station Site to Proposed Patrick Henry Site . (**S2179.37**) **Estimated Cost: $28.87 M**
- Construct ~4.1 miles of double circuit 138 kV from Stoneleigh Station Site to Smith River . (**S2179.38**) **Estimated Cost: $11.89 M**
- Construct ~1.8 miles of 138 kV from Fieldale to Stoneleigh tap structure . (**S2179.39**) **Estimated Cost: $6.92 M**
- Construct ~11 miles 138 kV from Mayo River to Proposed Patrick Henry Site . (**S2179.40**) **Estimated Cost: $34.98 M.**



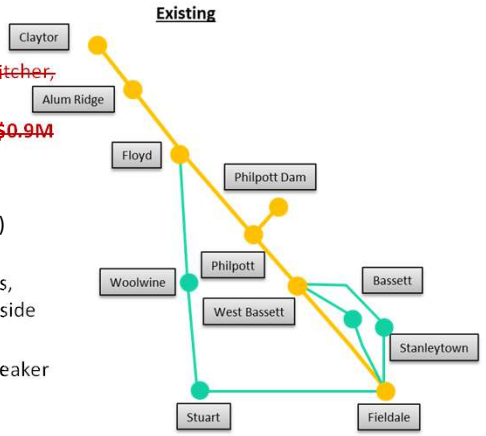


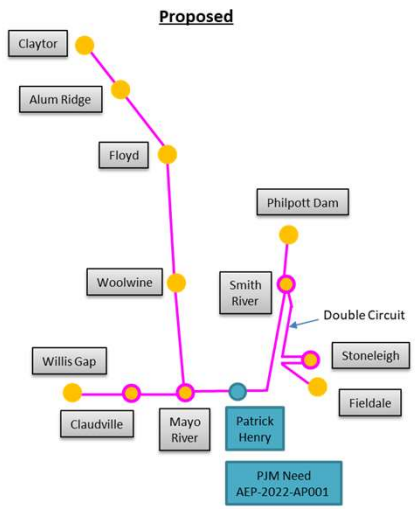
Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

AEP Transmission Zone: Supplemental Project S2179 Changes

Continued from previous slide…

- At Floyd station, install 2-138 kV circuit breakers (3000 A, 40 kA). Install high-side circuit switcher on T2 (3000A, 40 kA), replace 138/34.5 kV T2. Station expansion to accommodate new equipment and DICM. Install 138 kV line relaying, CCVT's, breaker controls, bus differential protection, transformer #2 protection. (**S2179.21**) **Estimated Cost: ~~$6.0M~~ $10.75 M**
- At Fieldale station, retire 69 kV CB G, D and C. Install CCVTs and arresters on 138 kV West Bassett Line. (**S2179.22**) **Estimated Cost: $0.7M**
- ~~At Bassett switch, install 138 kV Switch with 2-138 kV MOABs. (S2179.23) Estimated Cost: $0.5M~~
- At Bassett station, ~~convert station from 69 kV to 138 kV. Install 138/12 kV transformer with high-side circuit switcher, transclosure and associated distribution feeders~~. Retire station (**S2179.24**) **Estimated Cost: $0M**
- At Claytor station, install line relaying. Remove wavetrap, replace 1590 AAC risers. (**S2179.25) Estimated Cost: ~~$0.9M~~ $0.55 M**
- Retire Philpott 138 kV switch structure. (**S2179.26**) **Estimated Cost: ~~$0.3M~~ $0.4 M**
- At Willis Gap station, install 2-138 kV MOABs. Terminate new Salem Highway-Willis Gap 138 kV line. (**S2179.27**) **Estimated Cost: $0M**
- At Woolwine station, convert station from 69 kV to 138 kV. Retire/remove 69 kV switch structure, 69 kV MOABs, 69/34.5 kV transformer. Install 138 kV 3-way switch structure with MOABs, 138/34.5 kV transformer with high-side circuit switcher. (**S2179.28**) **Estimated Cost: $0M**
- At ~~Salem Highway~~ Mayo River station, establish new 138 kV station replacing Stuart Station. Install 138 kV 5-breaker ring bus, 138/34.5 kV & 138/12 kV transformers with high-side circuit switchers. Terminate Huffman, Floyd and Fairystone 138 kV circuits. (**S2179.29**) **Estimated Cost: $0M**
- At Stuart station, retire and remove all existing equipment and control house. (**S2179.30**) **Estimated Cost: $0M**
- At Stanleytown station, ~~convert station from 69 kV to 138 kV. Retire/remove 69 kV switch structure, 69 kV MOABs, 69/12 kV transformer. Install 138 kV 3-way switch structure with MOABs, 138/12 kV transformer with high-side circuit switcher~~ Retire station. (**S2179.31**) **Estimated Cost: $0M**
- At ~~Fairystone~~ Smith River station, establish new 138 kV station replacing West Bassett. Install 138 kV 4-breaker ring bus, 138/34.5 kV transformer with high-side circuit switcher and associated distribution feeders. Terminate Salem Highway, Fieldale and Philpott Dam 138 kV circuits. (**S2179.32**) Estimated Cost: **$0M**
- At Claudville station, establish new 138/34.5 kV distribution station with 2-138 kV CBs, 138/34.5 kV transformer and 3-34.5 kV feeders. (**S2179.33**) **Estimated Cost: $0M**
- Provide transition, entry and termination for OPGW connectivity at Willis Gap, Claytor, Alum Ridge, Floyd, Woolwine, Stuart, Fairystone, Philpott Dam, Bassett, Stanleytown, Fieldale, and Salem Highway to support fiber relaying. (**S2179.34**) **Estimated Cost: ~~$0.7M~~ $0.83 M**





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

AEP Transmission Zone: Supplemental Project S2179 Changes

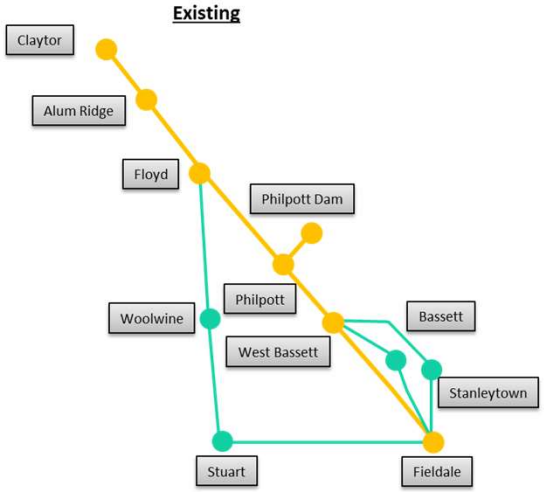
Continued from previous slide …

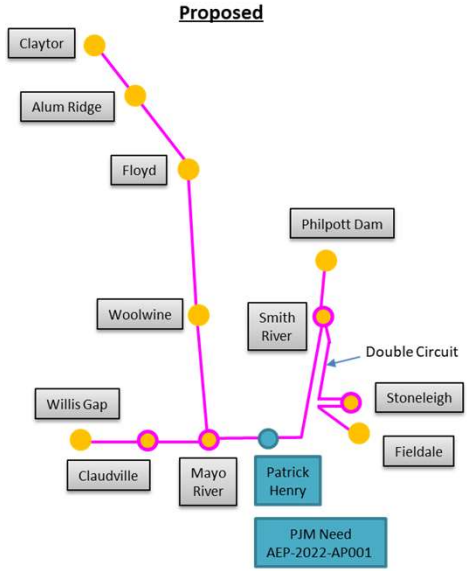
- At Huffman station remove CB "C" bypass switch and Install CCVT with Wavetrap on Willis Gap line **(S2179.41) Estimated Cost: $0M**
- Retire West Bassett station **(S2179.42) Estimated Cost: $0M**
- At Stoneleigh station establish new 138 kV tap station, install 3-way MOAB switch, install 138/12 kV transformer and associated feeders **(S2179.43) Estimated Cost: $0M**

Total Estimated Transmission Cost: ~~$326.9M~~ $379.37 M

Ancillary Benefits:

The new Salem Highway-Willis Gap 138 kV line provides an additional support to both the Galax area and the Stuart area during contingency scenarios.





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

AEP Transmission Zone: Supplemental Project S2179 Changes

Continued from previous slide …

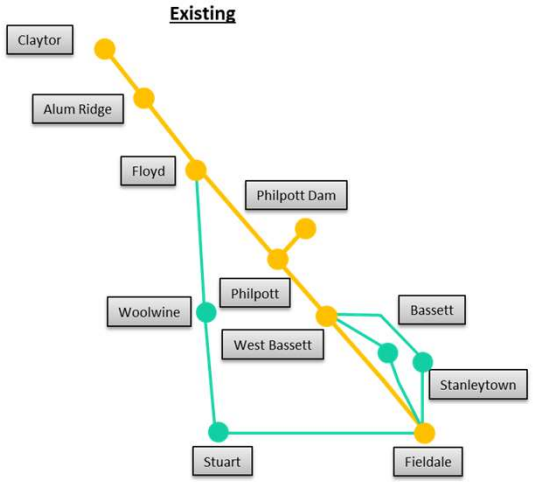
Alternatives Considered:
Address the asset renewal needs by rebuilding all the transmission lines of concern on existing centerline and replacing the identified station equipment in need of replacement. This would include rebuilding the following lines totaling approximately 99 miles: Claytor-Fieldale 138 kV (~45 mi.), Floyd-Stuart 69 kV (~21 mi.), Fieldale-Stuart 69 kV (~19 mi.), Fieldale-West Bassett 69 kV No. 1 (~7 mi.), Fieldale-West Bassett 69 kV No. 2 (~7 mi.). The station asset replacements include: Stuart (2-69 kV CBs, 69 kV circuit switcher and identified relays), Floyd (2-138 kV CBs, 1-138 kV circuit switcher), and West Basset (1-138 kV CB, 3-69 kV CBs, 138/69/34 kV transformer #1 and identified relays). In addition, a new ~~22~~ 24 mile 138 kV line would be required between Willis Gap, Claudville, and Stuart along with a 138/69 kV transformer at Stuart with associated transformer protection and 14.4 MVAr cap bank replacement.

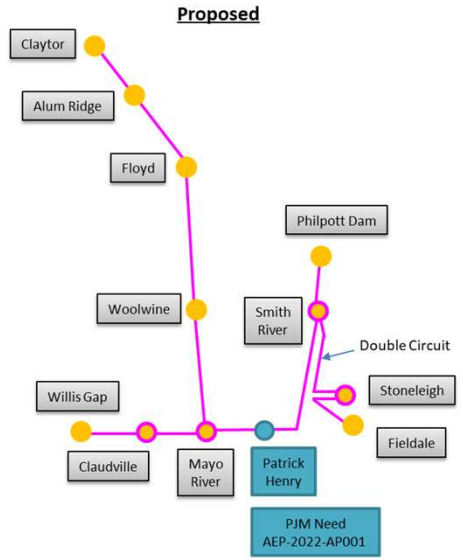
While this alternate plan would address the identified aging infrastructure, it would not provide the additional benefits of the preferred plan, which include: conversion of the local 69 kV system to a more robust and reliable 138 kV system, allow for the retirement of ~18 miles of 138 kV line and ~7 miles of 69 kV line, provide more reliable sectionalizing with ring bus configurations at Stuart ~~(Salem Highway)~~ (Mayo River) and West Bassett ~~(Fairystone)~~(Smith River).

Estimated Cost~~: $375 M~~ 414 M

Projected In-Service: 10/31/2027 through 2030

Project Status: Scoping





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

ATSI Transmission Zone M-3 Process
Carlisle-Wellington 69 kV Line

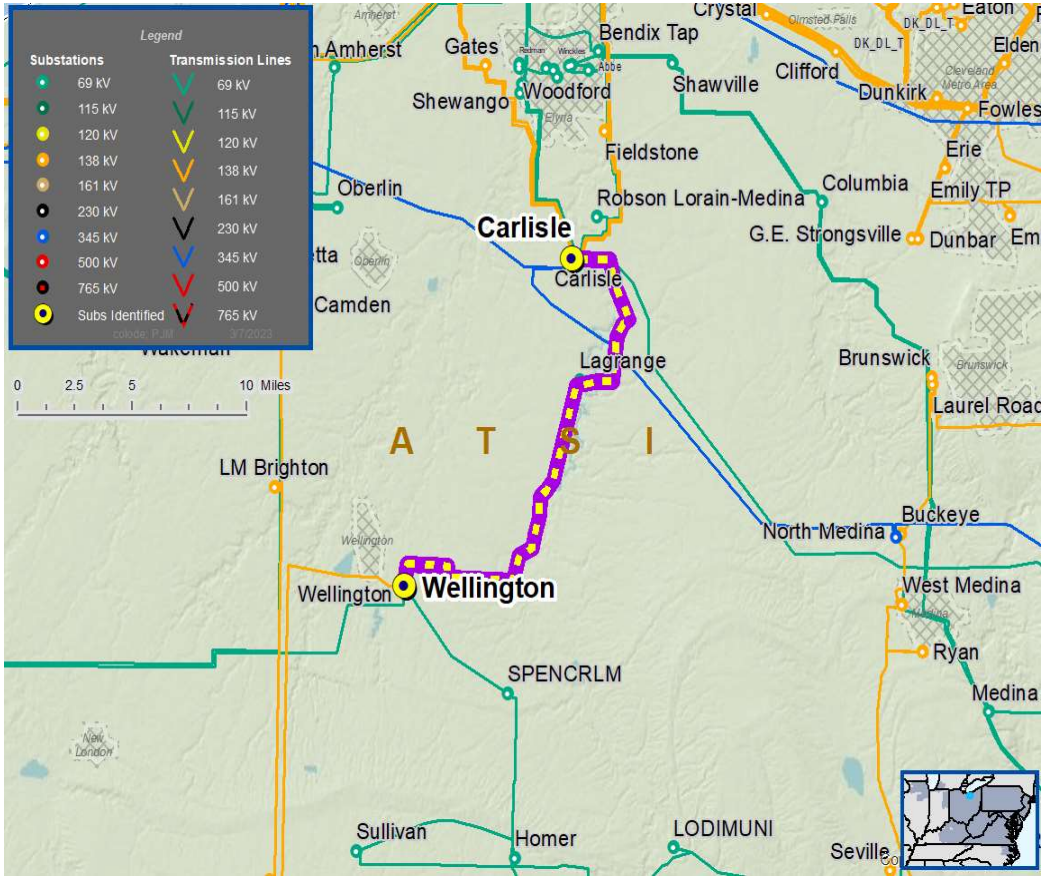
Need Number: ATSI-2018-018 (s1803)
Process Stage: Re-present Solution Meeting – 3/17/2023
Previously Presented: Solution Meeting – 10/26/2018
Need Meeting – 09/28/2018
Original Problem Statement and Solution
Supplemental Project Driver(s):
Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)
Line Condition Rebuild / Replacement
Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Problem Statement
Carlisle-Wellington 69 kV Condition Assessment (Approximately 29 miles)

- Identified obsolete and deteriorated equipment.
  - ~~50–75-year-old construction; poor inspection results, 75 % rejection rate.~~
  - ~~Negative outage history over past 5 years;~~
  - ~~Approximately 29 repair records over the past 5 years; increasing trend.~~
- Multiple transmission delivery points (9) impacted.



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ATSI Transmission Zone M-3 Process
Carlisle-Wellington 69 kV Line

Need Number: ATSI-2018-018 (s1803)

Process Stage: Re-present Solution Meeting – 3/17/2023

Previously Presented: Solution Meeting – 10/26/2018
Need Meeting – 09/28/2018

Problem Statement

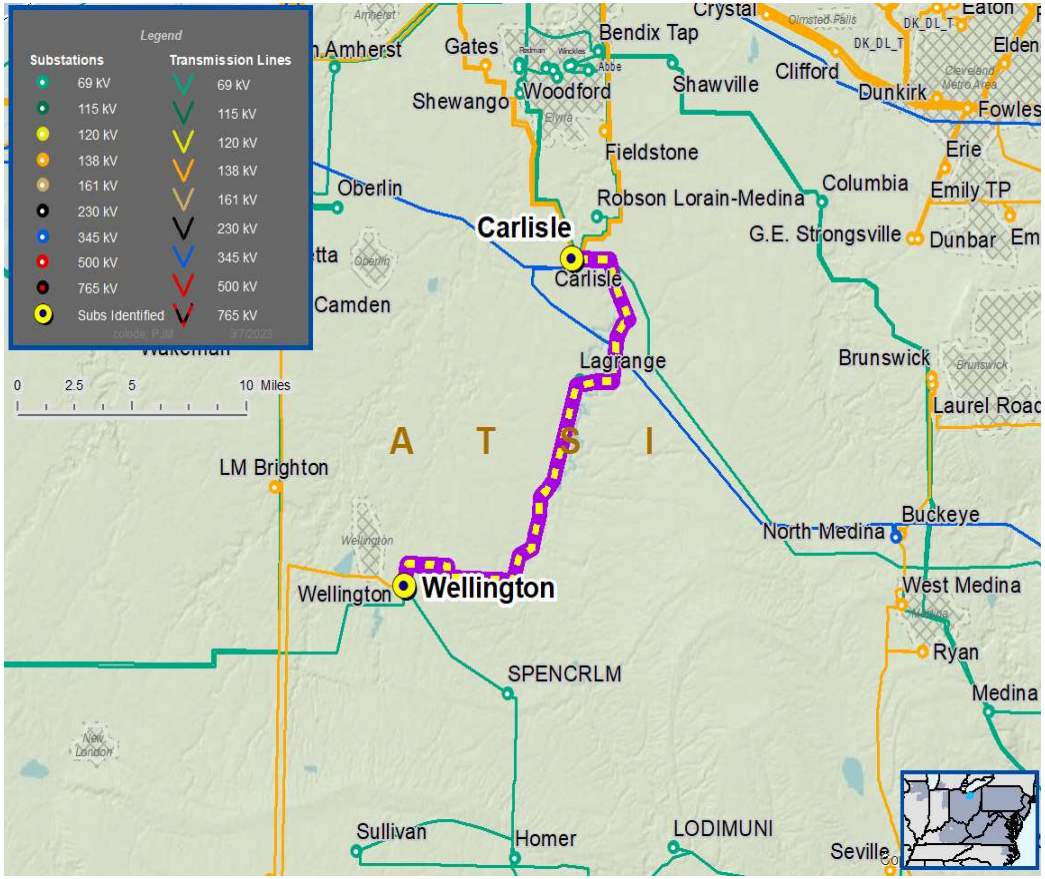
Carlisle-Wellington 69 kV Condition Assessment Update (Approximately 22.4 miles)

- From Carlisle substation to structure #19 (Larson tap)
  - Pole Condition failure 69%; Condition plus age failure 83%.
- From Wellington substation to structure #69 (excluding Litchfield tap)
  - Pole condition failure 20%; Condition plus age failure 91%.
- From Larson tap (structure #19) to Litchfield tap (structure #69)
  - Pole condition failure 16%; Condition plus age 33%;

- Note: condition failures identified would impact the integrity of the structure such as cracking/splitting, large holes due to woodpecker damage, sign of pole rot, damage to or splitting of bayonets or crossarms, etc.

- Outage history from 2017-2023YTD: sixteen total outages; seven momentary and nine sustained outages with average sustained outage duration of 29 minutes

- Approximately 26,075 customers and 58 MW of load impacted



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ATSI Transmission Zone M-3 Process
Carlisle-Wellington 69 kV Line

Need Number: ATSI-2018-018 (s1803)
Process Stage: Re-present Solution Meeting – 3/17/2023
Previously Presented: Solution Meeting – 10/26/2018
Need Meeting – 09/28/2018

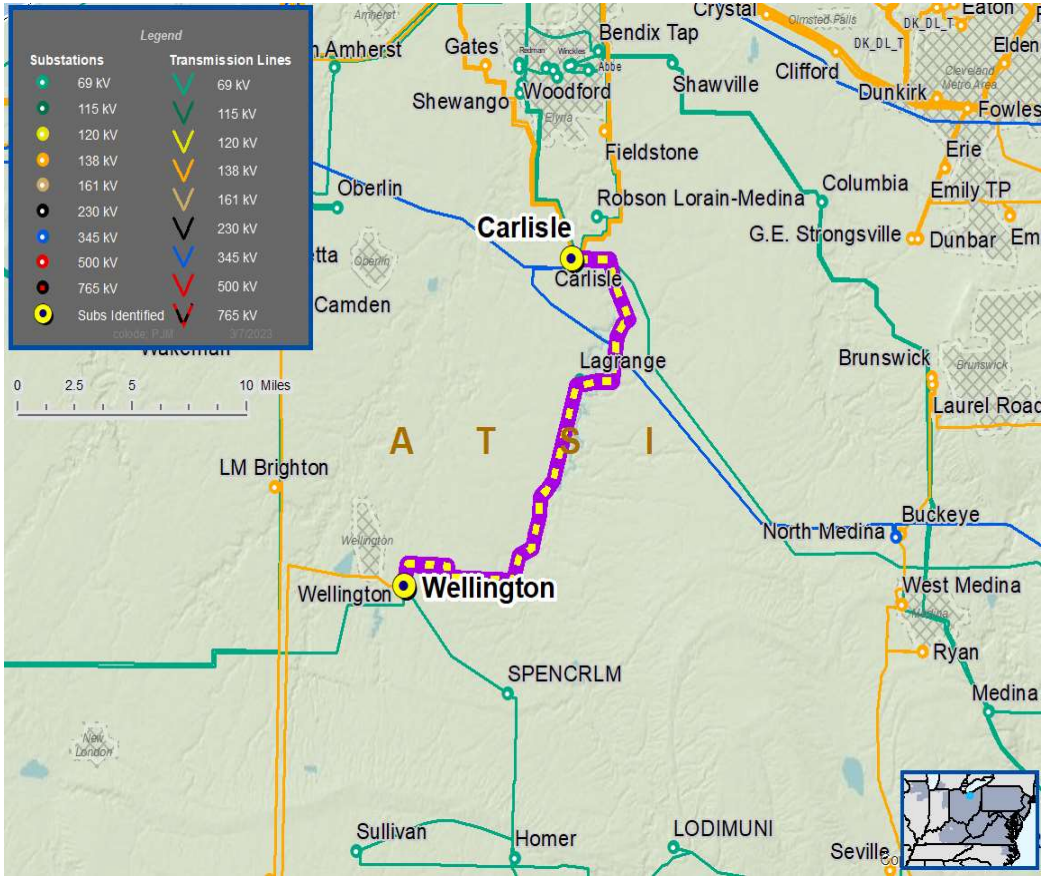
Proposed Solution:

Carlisle-Wellington 69 kV Line

- ~~Rebuild/reconductor ~29 miles of the existing Carlisle-Wellington 69 kV Line with 477 ACSR (existing conductor 605 ACSR and 336 ACSR)~~
- Rebuild the section of line from structure #70 to structure #19 including the loop to the Carlisle substation, ~3.8 miles using 556 kcmil 26/7 ACSR conductor
- Rebuild the section of line from the Wellington substation to structure #67 (excluding Litchfield tap), ~4.8 miles using 556 Kcmil 26/7 ACSR conductor
- Rehab the section of the line from the Larson tap (structure #19) to the Litchfield tap (structure #69), ~13.8 miles using existing conductor will be used. The rehab will include the Webster and Grafton Muni taps.
- Replace line switches A-37, A-40, A-41, A-48, A-49, A-50, A-69, and A-70
- Install underground fiber cable from Carlisle substation to Wellington substation
- At Carlisle replace relays and controls.
- At Wellington, replace Disconnect D-33, D-35 & A-36.
- At Lagrange reconductor main bus.

~~*Wellington 69 kV Substation – Terminal equipment to be replaced includes:*~~

- ~~Circuit breaker B34 and relays and controls Replaced due to failure~~



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ATSI Transmission Zone M-3 Process
Carlisle-Wellington 69 kV Line

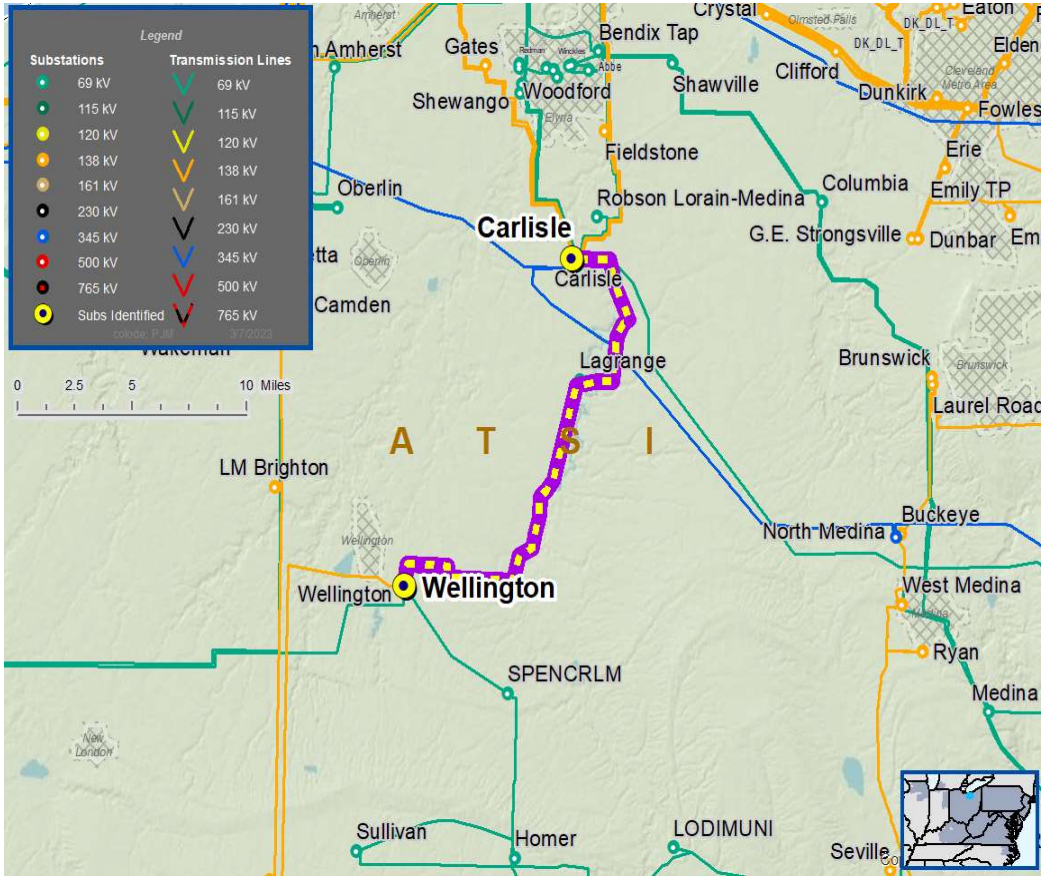
Need Number: ATSI-2018-018 (s1803)
Process Stage: Re-present Solution Meeting – 3/17/2023
Previously Presented: Solution Meeting – 10/26/2018
Need Meeting – 09/28/2018

Proposed Solution:
Transmission Line Ratings:

- ~~Existing line rating: 76 MVA SN / 92 MVA SE~~
- ~~New line rating: 100 MVA SN / 121 MVA SE~~

Carlisle-Wellington 69 kV Line:

- Carlisle-Carlisle tap section:
  - Existing line rating: 108 MVA SN / 108 MVA SE /118 MVA SLD
  - New line rating: 111 MVA SN / 134 MVA SE /151 MVA SLD
- Carlisle tap-Larson tap section:
  - Existing line rating: 76 MVA SN / 92 MVA SE /104MVA SLD
  - New line rating: 111 MVA SN / 134 MVA SE /151 MVA SLD
- Wellington-Wellington Muni section:
  - Existing line rating: 76 MVA SN / 92 MVA SE /95 MVA SLD
  - New line rating: 111 MVA SN / 134 MVA SE /151 MVA SLD
- Wellington Muni-LMREC Central section:
  - Existing line rating: 76 MVA SN / 92 MVA SE /104 MVA SLD
  - New line rating: 111 MVA SN / 134 MVA SE /151 MVA SLD
- LMREC Central-Litchfield tap section:
  - Existing line rating: 76 MVA SN / 92 MVA SE /104 MVA SLD
  - New line rating: 111 MVA SN / 134 MVA SE /151 MVA SLD



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ATSI Transmission Zone M-3 Process
Carlisle-Wellington 69 kV Line

Need Number: ATSI-2018-018 / (s1803)

Process Stage: Re-present Solution Meeting – 3/17/2023

Previously Presented: Solution Meeting – 10/26/2018
Need Meeting – 09/28/2018

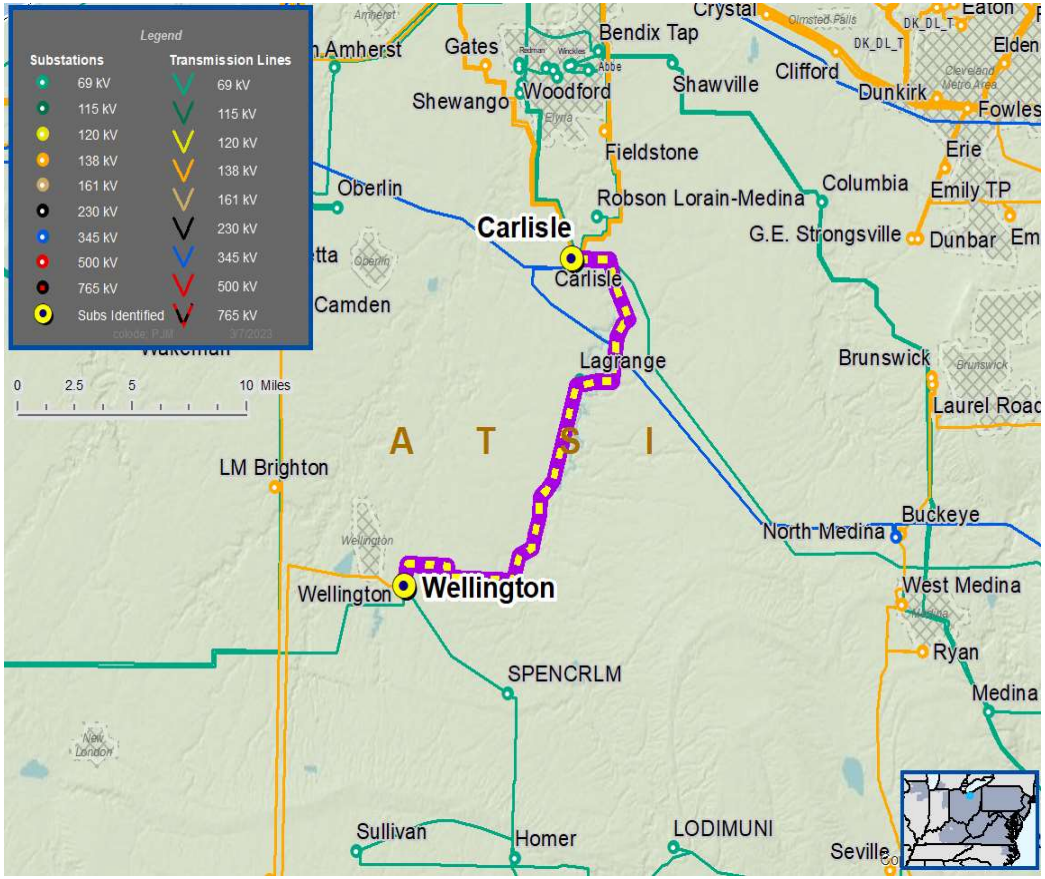
Alternatives Considered:

- Rebuild entire line. This was not considered since the condition of some structures along the transmission line are in good condition and do not require replacement.
- Maintain existing condition and elevated risk of failure

Estimated Project Cost: ~~$27.9M~~ $18.8M

Projected IS Date: ~~3/1/2022~~ 12/4/2023

Status: ~~Conceptual~~ Construction

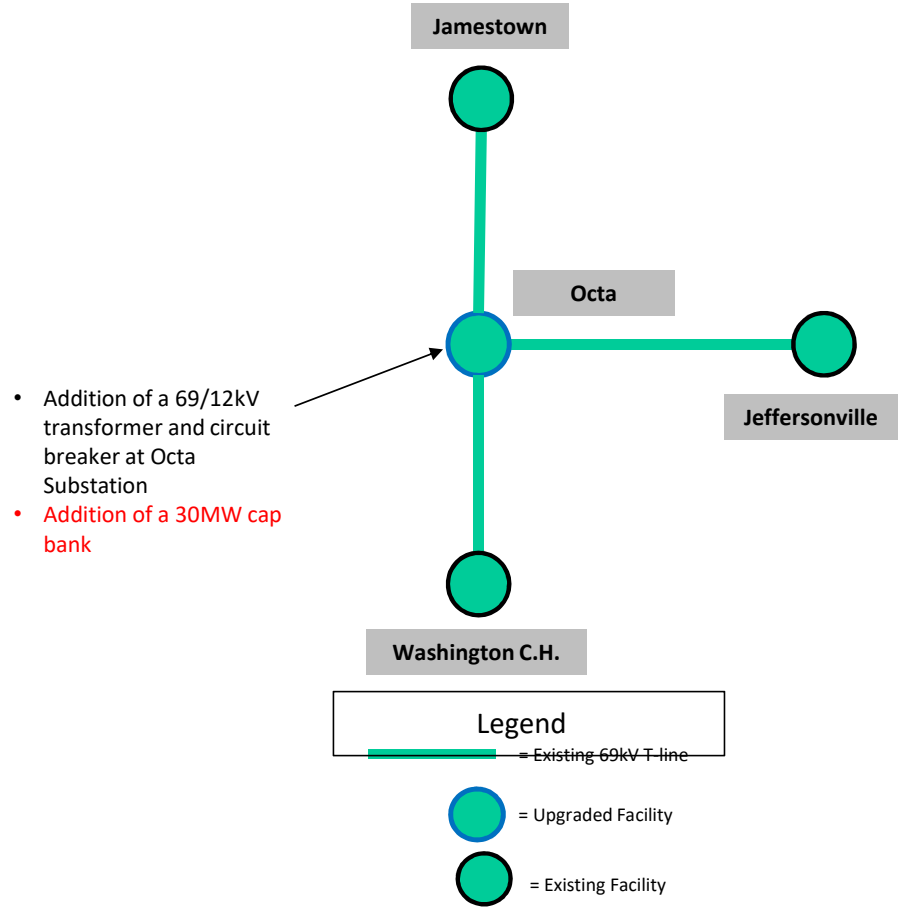


S2695 : Need Number: Dayton-2021-011 - Needs Meeting 12/17/2021, Solutions Meeting 2/18/2022, posted to 2022 Dayton Local Plan

Scope change and reasons:

- **Octa Substation**
  - A new 69/12kV transformer will be installed at Octa Substation and terminated into a new 69kV breaker position. This will expand Octa Substation from a three breaker 69kV ring bus to a four breaker 69kV ring bus. This transformer will create a new delivery point for AES Ohio distribution. This delivery point will provide capacity and switching flexibility, particularly at the Washington Courthouse and Jeffersonville substations, ensuring load can be restored under contingency conditions.
  - Install a 30MW cap bank to support the voltage profile and improve operational flexibility due to area development and the large load addition in Jeffersonville

- **Estimated cost :** ~~$310K~~ $0.71M
- **Projected In-Service:** ~~12/31/2023~~ 06/30/2026
- **Project Status:** Engineering



ATSI Transmission Zone M-3 Process
Carol 138-69 kV Switching Station

Need Number: (s1712)
Process Stage: Re-Present Solutions Meeting – 04/21/2023
Previously Presented: Need Meeting – 8/31/2018
Solution Meeting – 9/28/2018

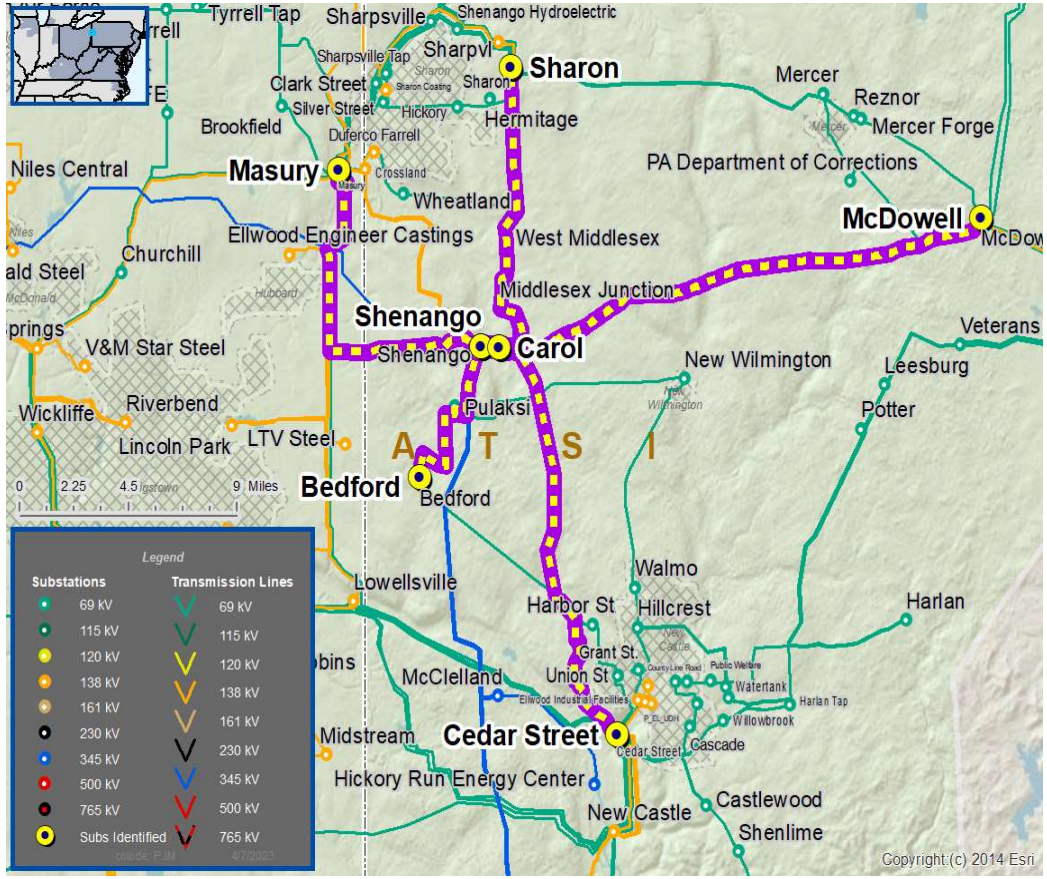
Supplemental Project Driver(s):
Operational Flexibility and Efficiency

Specific Assumption Reference(s):
Global Factors

- Load Loss
- System Reliability and Performance

Problem Statement

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss (Approximately 35 MWs worse case) under multiple (P1) contingency conditions on the 69 kV system.
  - Loss of the Cedar Street-Cascade (Walmo) 69 kV normally open radial line
- Improve relay coordination and network normally open 69 kV lines.
- Approximately 21,000 customers and radial load of 86 MWs at risk in the area.



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ATSI Transmission Zone M-3 Process
Carol 138-69 kV Switching Station

Need Number: (s1712)

Process Stage: Re-Present Solutions Meeting – 04/21/2023

Previously Presented: Need Meeting – 8/31/2018

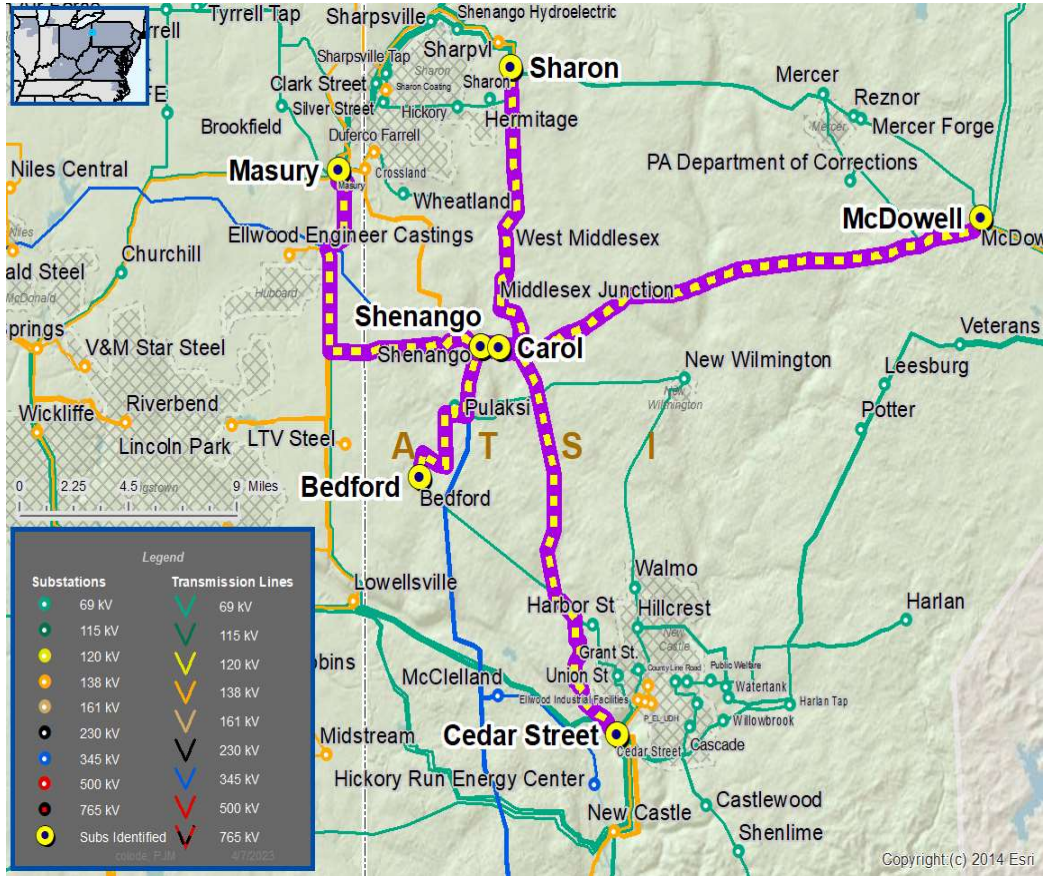
Solution Meeting – 9/28/2018

Proposed Solution:

~~*Shenango 69 kV Switching Station*~~

- ~~Network radial 69 kV system by constructing two double circuit 477 ACSR 69 kV lines (~ 1.2 miles) to create four (4) new 69 kV circuits from the new Shenango 69 kV station~~
  - ~~Shenango-Masury 69 kV line~~
  - ~~Shenango-Sharon 69 kV line~~
  - ~~Shenango-Cedar Street #1 69 kV line~~
  - ~~Shenango-Cedar Street #2 69 kV line~~
- ~~Install two (2) 138/69 kV transformers at Shenango~~
- ~~Expand Shenango substation to create a six (6) breaker 69 kV ring bus~~

Shenango substation is built in a floodplain with significant challenges, including permitting and environmental mitigation costs.



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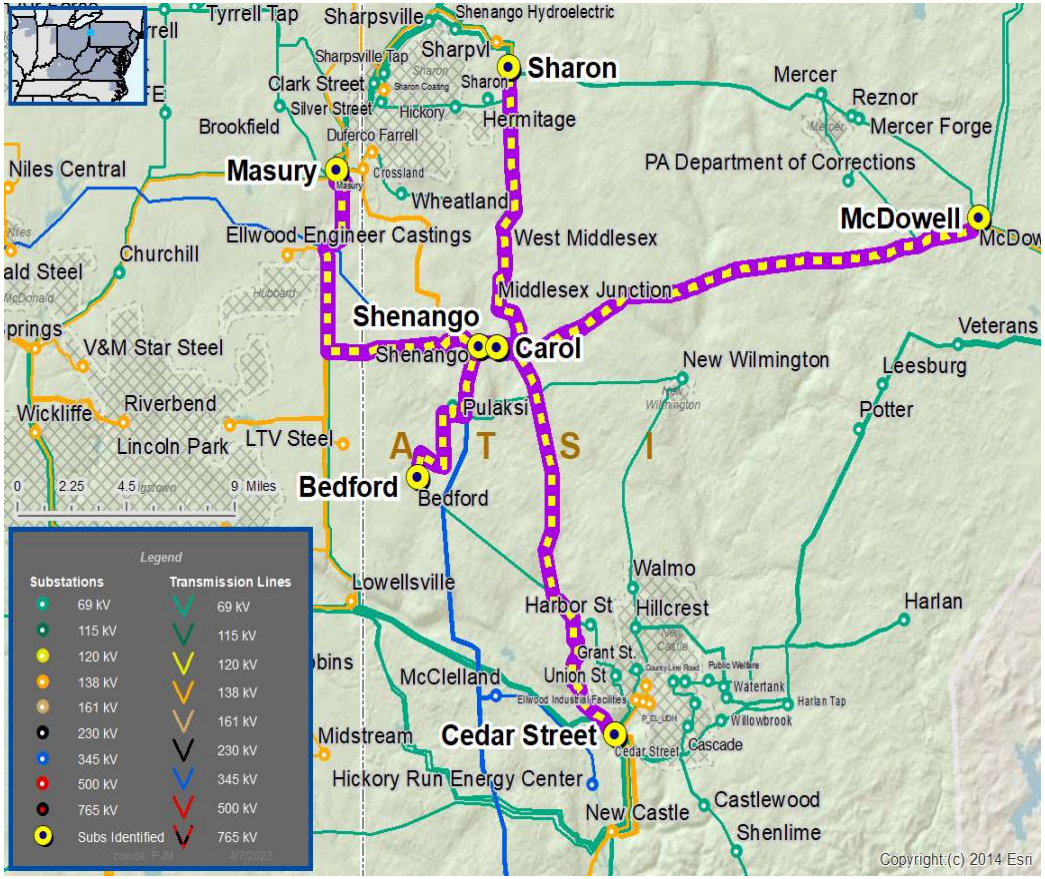
ATSI Transmission Zone M-3 Process
Carol 138-69 kV Switching Station

Need Number: (s1712)
Process Stage: Re-Present Solutions Meeting – 04/21/2023
Previously Presented: Need Meeting 8/31/2018
Solution Meeting – 9/28/2018

Proposed Solution:

- Carol 138-69 kV Switching Substation
- Construct a new 138 kV 6-breaker ring bus substation near the Shenango Substation (Future 12-Breaker Breaker-and-a-Half).
- Loop in the Cedar Street-Shenango and Shenango-McDowell 138 kV lines into the new substation.
- Construct a new 69 kV six-breaker ring bus adjacent to the new 138 kV substation.
- Loop in the Cedar Street-Masury-Sharon 69 kV line, undo the six-wire configuration between structures #169 and #216 to create four new 69 kV circuits out of the new Carol 69 kV Substation.
- Rebuild and reconductor approximately 3.0 miles
- Install (2) 138-69 kV 100/134 MVA transformers
- Install new control building



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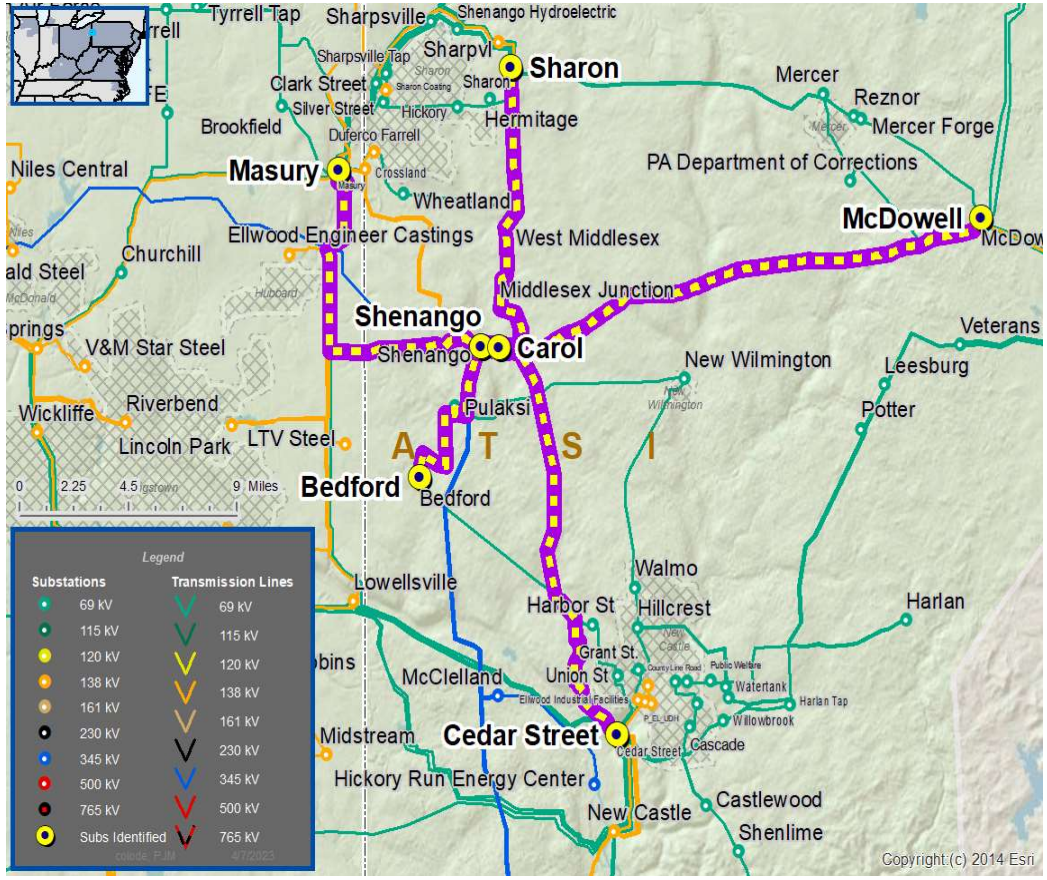
ATSI Transmission Zone M-3 Process
Carol 138-69 kV Switching Station

Need Number: (s1712)
Process Stage: Re-Present Solutions Meeting – 04/21/2023
Previously Presented: Need Meeting 8/31/2018
Solution Meeting – 9/28/2018

Proposed Solution:

- At Masury:
  - Replace Y-188 (B17) 69 kV line relaying and control with standard relay panel
- At Sharon:
  - Replace Y-188/Y-303 (B6) 69 kV line relaying and control with standard relay panel
  - Replace the limiting disconnect switch
- At Shenango:
  - Replace 138 kV breaker (B48) and line relaying
  - Replace two 138 kV breaker disconnect switches (D37 & D43)
  - Upgrade the terminal equipment (line drops) to exceed the TL rating
- At McDowell:
  - Upgrade the terminal equipment (substation conductor) to exceed the TL rating



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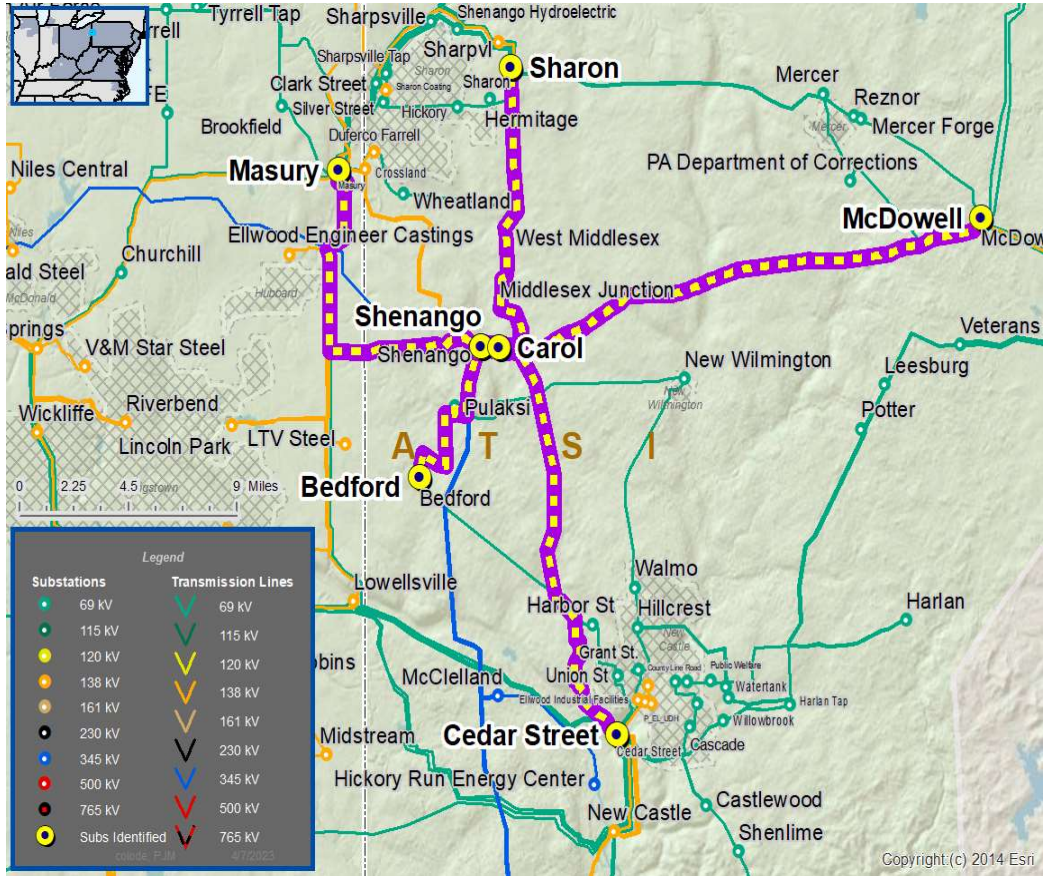
ATSI Transmission Zone M-3 Process
Carol 138-69 kV Switching Station

Need Number: (s1712)
Process Stage: Re-Present Solutions Meeting – 04/21/2023
Previously Presented: Need Meeting – 8/31/2018
Solution Meeting – 9/28/2018

Proposed Solution:
Transmission Line Ratings:
Existing Lines:

- Cedar Street-Shenango 138 kV Line:
  - SN: 278 MVA SE: 339 MVA WN: 315 MVA WE: 401 MVA
- McDowell-Shenango 138 kV Line:
  - SN: 265 MVA SE: 309 MVA WN: 309 MVA WE: 309 MVA
- Cedar Street-Masury-Sharon 69 kV Line:
  - SN: 94 MVA SE: 113 MVA



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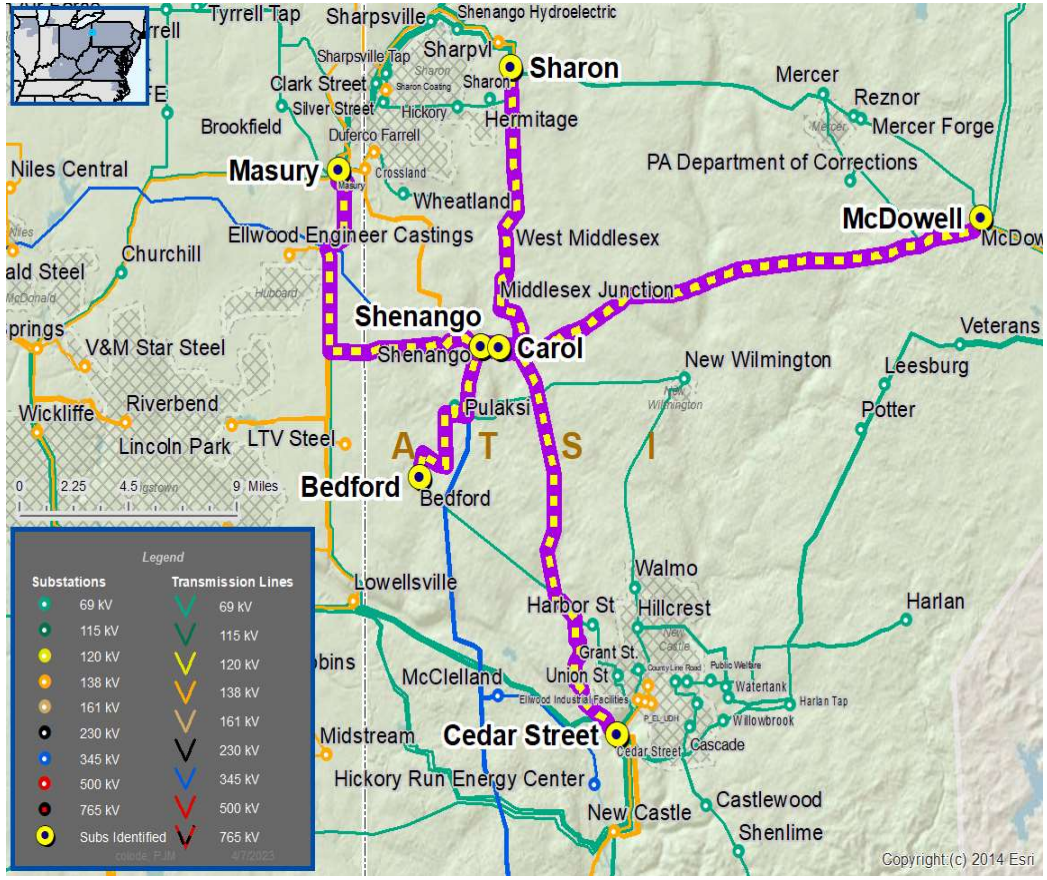
ATSI Transmission Zone M-3 Process
Carol 138-69 kV Switching Station

Need Number: (s1712)
Process Stage: Re-Present Solutions Meeting – 04/21/2023
Previously Presented: Need Meeting – 8/31/2018
Solution Meeting – 9/28/2018

Proposed Solution:
Transmission Line Ratings:
New Lines:

- Carol-Sharon 69 kV Line:
  - SN: 100 MVA SE: 121 MVA WN: 113 MVA WE: 143 MVA
- Carol- Masury 69 kV Line:
  - SN: 80 MVA SE: 96 MVA WN: 90 MVA WE: 114 MVA
- Carol- Pulaski (#1) 69 kV Line (Cedar Street):
  - SN: 80 MVA SE: 96 MVA WN: 90 MVA WE: 114 MVA
- Carol- Bedford (#2) 69 kV Line (Cedar Street):
  - SN: 94 MVA SE: 113 MVA WN: 105 MVA WE: 133 MVA
- Carol-Shenango (#1) 138 kV Line:
  - SN: 278 MVA SE: 339 MVA WN: 315 MVA WE: 401 MVA
- Carol-Cedar St (#1) 138 kV Line:
  - SN: 278 MVA SE: 339 MVA WN: 315 MVA WE: 401 MVA
- Carol-Shenango (#2) 138 kV Line:
  - SN: 278 MVA SE: 339 MVA WN: 315 MVA WE: 401 MVA
- Carol-McDowell (#2) 138 kV Line:
  - SN: 278 MVA SE: 339 MVA WN: 315 MVA WE: 401 MVA



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ATSI Transmission Zone M-3 Process
Carol 138-69 kV Switching Station

Need Number: (s1712)

Process Stage: Re-Present Solutions Meeting – 04/21/2023

Previously Presented: Need Meeting – 8/31/2018
Solution Meeting – 9/28/2018

Proposed Solution:

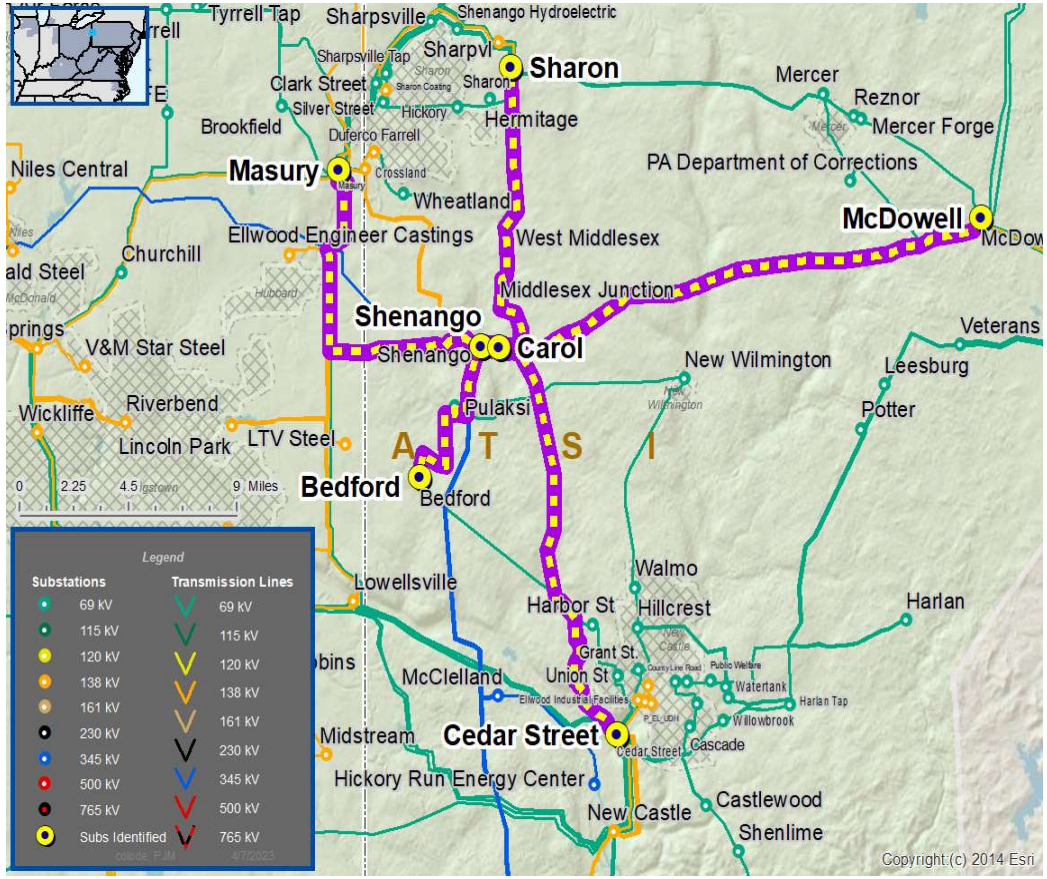
Alternatives Considered: Network radial 69 kV system by constructing two double circuit 477 ACSR 69 kV lines (~ 1.2 miles) to create four (4) new 69 kV circuits from the new Shenango 69 kV station. Install two (2) 138-69 kV transformers at Shenango. Expand Shenango substation to create a six (6) breaker 69 kV ring bus.

Estimated Project Cost: ~~$16.3M~~ $45M

Project IS Date: ~~12/31/2021~~ 12/1/2025

Model: 2022 RTEP model for 2027 Summer (50/50) Case

Status: ~~Conceptual~~ Pre-Engineering



AEP S2781 Scope/Cost Update
New Albany, Ohio

S2781: Need Number: AEP-2021-OH031, Posted to 2022 AEP local Plan

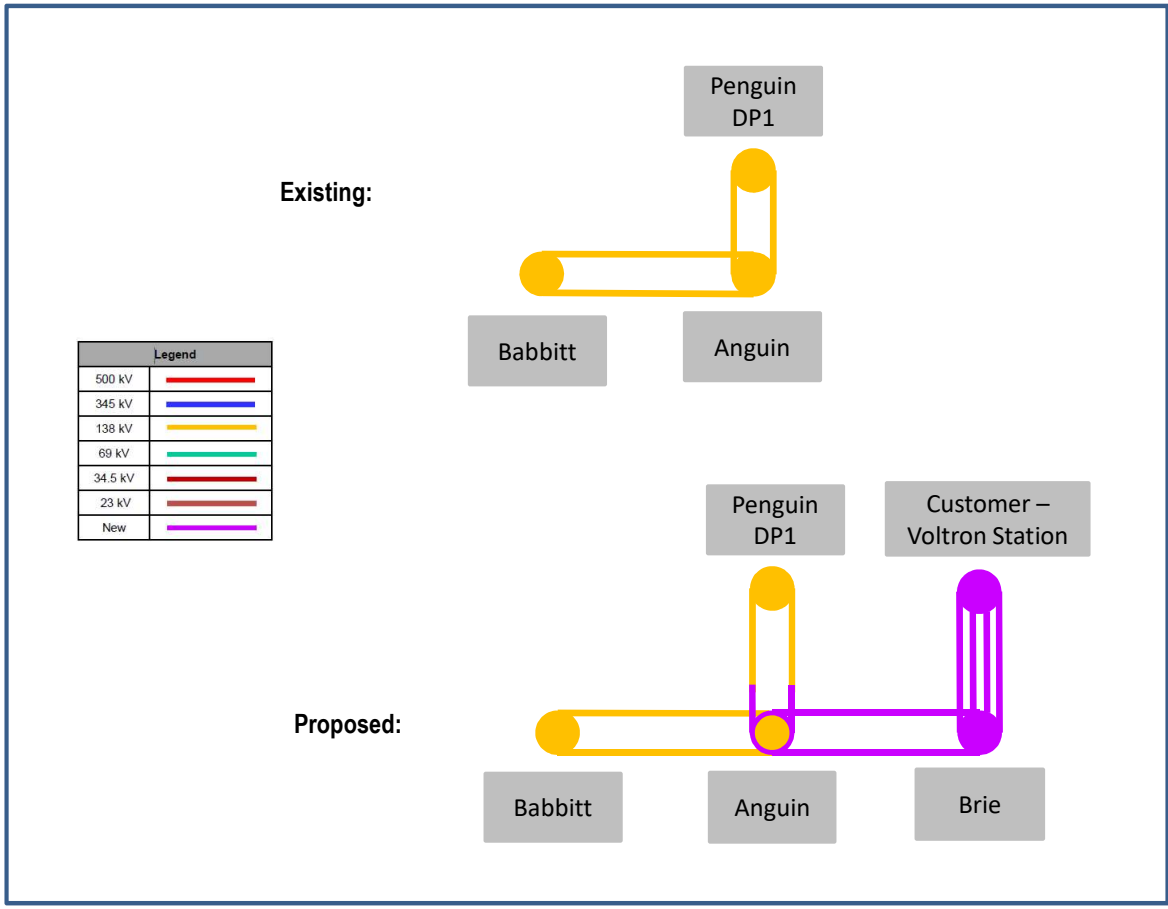
Project Description (Changes are marked in Red):

- **Anguin 138 kV Station:** Relocate the Anguin extension No. 4 into strings C & D at Anguin station installing two circuit breakers in each string to complete the strings. The new double circuit line to Brie station will be installed in strings A & B. Expand DICM to accommodate additional relays. **Estimated Cost: $1.33M (s2781.1)**
- **Anguin – Penguin DP1 138kV:** Re-terminate the existing 138 kV Anguin Extension lines into strings C & D at Anguin Station. **Estimated Cost: $0.78M (s2781.2)**
- **Brie 138kV Station:** Establish the greenfield 138kV Brie station. Two full breaker and a half strings and 2 partial strings will be initially installed; total of ten (10) 138 kV breakers. **Estimated Cost: $11.04M (s2781.3)**
- **Anguin – Brie 138 kV:** Build ~1.5 miles of greenfield 138kV double circuit line between Anguin and Brie station with 2 Bundle ACSS 1033.5 Curlew. Extend the telecom fiber into Brie station for relaying/communication. Short span construction and larger than normal foundations are required in this area to maintain clearances and paths for future development from the customers in the area, leading to higher than normal costs for this line. **Estimated Cost: $7.83M (s2781.4)**
- **Brie – Customer (Voltron)138kV:** Construct approximately 2 miles of two double circuit 138 kV tie lines #1-4 to the customer's facility. **Estimated Cost: ~~$0.11M~~ $4.11M (s2781.5)**

Total Estimated Transmission Cost: ~~$21.08M~~ $25.08M

Projected In-Service: ~~6/1/2023~~ 5/14/2024

Reason for the change: The specific location for the customer station was updated and is further from Brie station than originally thought.



AEP Transmission Zone: Supplemental
S1598 Scope change

S1598: Originally presented in 3/27/2018 and 4/17/2018 W-SRRTEP

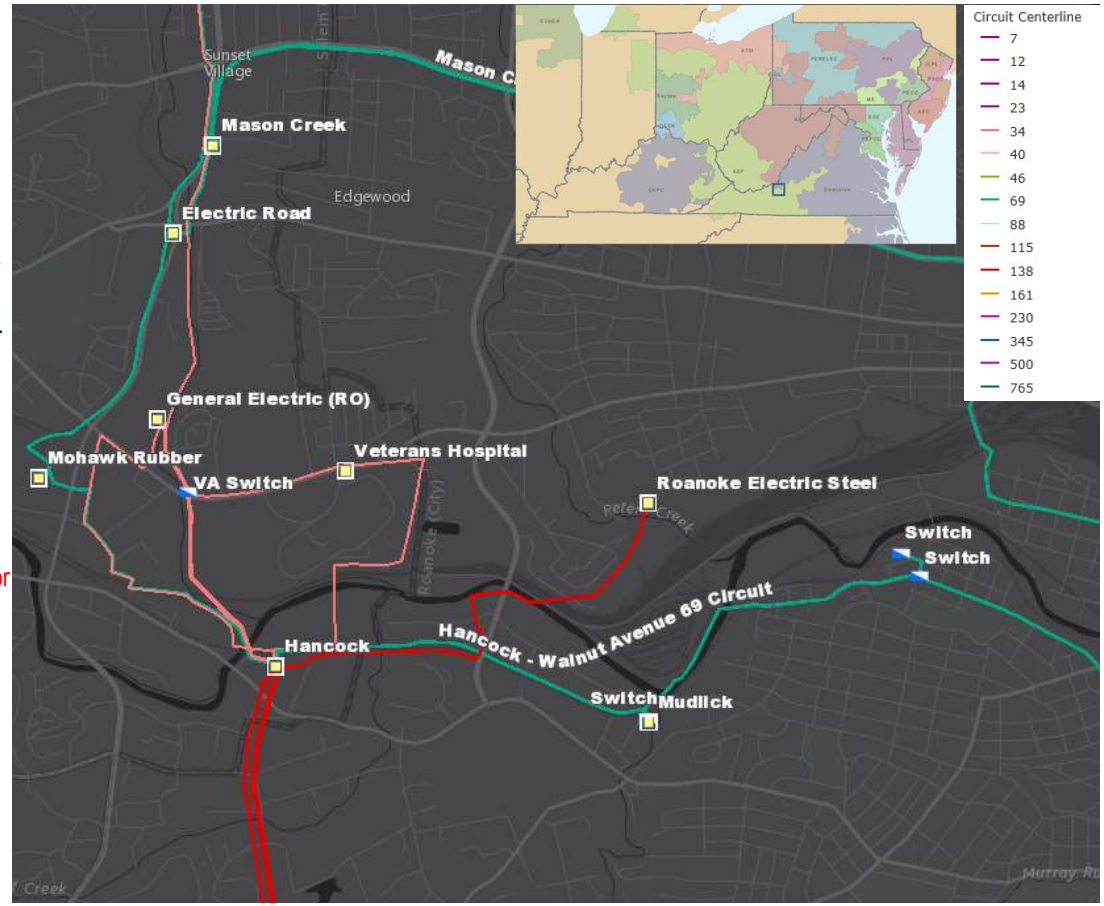
Changes are marked in red

Problem Statement:

Equipment Material/Condition/Performance/Risk:

Hancock station 138 kV circuit breakers 'A', 'B' & 'C', ~~69 kV circuit breakers 'CA', 'M' and 'N',~~ 34 kV circuit breakers 'J', ~~'I',~~ 'P', ~~'R' & 'S'~~ are oil type breakers without oil containment. In general, oil breakers have become increasingly difficult to maintain due to the oil handling requirements. Oil spills are frequent with failures and routine maintenance which is also an environmental hazard. Other drivers include damage to bushings. CBs 'A', 'B', 'C', ~~'CA', 'N',~~ 'J', ~~'I'~~ & 'P' are also legacy oil-filled FK type breakers which have little to no replacement parts. ~~69KV circuit breaker 'Q' is a EPB Gas Circuit Breaker with gas leaks, bushing failures and CT gasket problems.~~

Following a Station Engineering evaluation and site visit, it was determined the 34.5 kV bus work needed to be replaced due to its age, condition and safety concerns around potential error traps to try and replace in place. The 34.5 kV bays are 51 years old and the bus conductor is copper. An existing 69 kV circuit passes through the 34.5 kV bay adding to the existing safety and switching concerns.



AEP Transmission Zone: Supplemental S1598 Scope change

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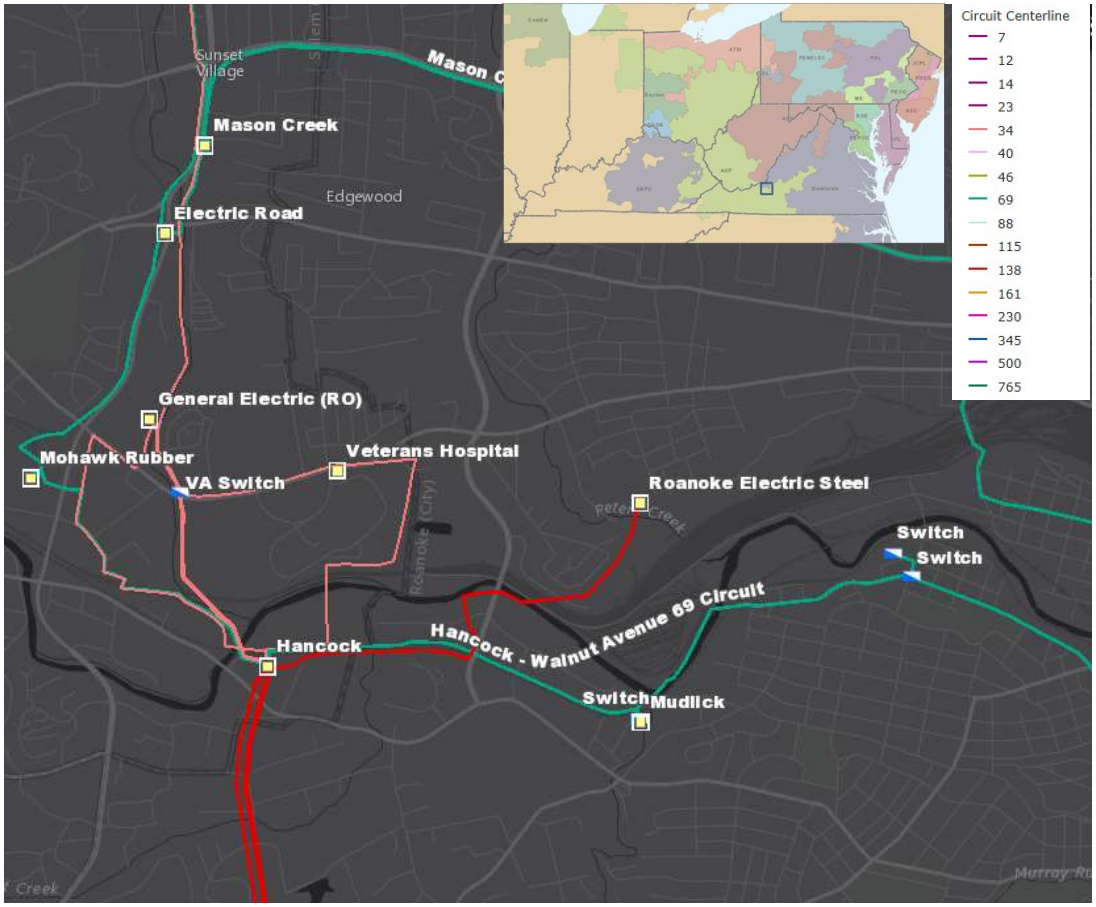
Hancock 138/69/34.5 kV Transformer #2, 1951 vintage, is currently in a poor physical and operational condition. All three single phase transformers are showing short circuit strength breakdown caused through fault events, gassing of the unit, and a significant number of overheating events. There is an upward trending of oil moisture content resulting in downward trending to the oil dielectric strength. Increasing moisture content is a resultant of water ingress through aged gaskets, tank or pump leaks, or a breakdown of paper insulation of the transformer windings. In the Phase 1 tank, the most current reading for ethylene is at IEEE Condition 3 and has been steadily rising over the bank's lifetime. In the Phase 2 and 3 tanks, the most current reading for carbon dioxide is at IEEE Condition 3 and 2, respectively, and has recently been on the rise.

The Hancock 138/69-34.5 kV Transformer #1 was manufactured in 1969 and has elevated trends in insulation power factor, which indicates an increase in particles in the oil. Also, elevated moisture levels were observed in relation to the dielectric health of the unit in addition to increased levels of CO2.



AEP Transmission Zone: Supplemental
S1598 Scope change

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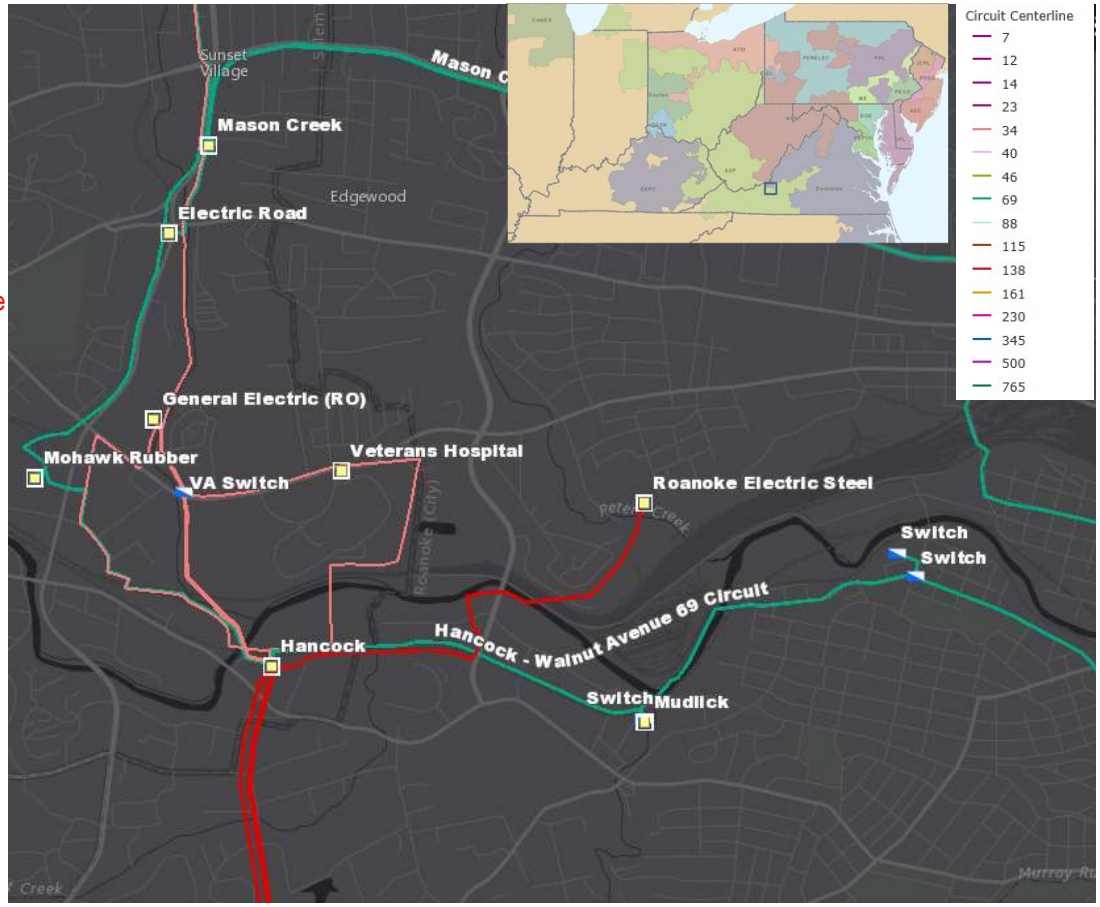
Circuit Switcher BB is a Mark V which is no longer supported by the manufacturer and parts are not available. We have to scavenge for parts during maintenance. These are older designed circuit switchers with old controls that no longer coordinate well with modern relaying. The associated 138 kV, 50.4 MVAr capacitor bank "BB" has approximately half of the capacitor cans have failed.

The 34.5 kV transmission owned circuit switcher AA is a VBM-34 type switcher. This switcher is of 1990's vintage. This model family has experienced malfunctions including failing to trip due to pole malfunction, worn out stops on the control yoke or solenoid nylon pin binding not allowing it to trip due to corrosion, loose bolts, or broken poles. Older VBM types have been very problematic over the years especially on higher voltages where there are two vacuum interrupters in series per phase. In addition, these breakers performed poorly in cold weather, leading to more malfunctions.

The 69 kV Mason Creek and Walnut Ave. lines have pilot wire line relaying. Copper pilot wire is a relatively obsolete technology, and since the telephone companies almost never use it anymore, it is increasingly difficult to find suitable pilot wire cable and hardware. Consequently, we are avoiding like-kind replacement of pilot wire because the technology will be increasingly difficult to maintain. Hancock Substation currently deploys 156 relays, implemented to ensure the adequate protection and operation of the substation. Currently, 132 of the 156 relays (85% of all station relays) are in need of replacement. All 116 of the electromechanical type and 7 static type have significant limitations with regards to spare part availability and fault data collection and retention and are in need of replacement. In addition, these relays lack of vendor support. Currently, 9 of the 33 microprocessor relays are past their average life expectancy and have outdated firmware.



AEP Transmission Zone: Supplemental S1598 Scope change

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Operational Flexibility and Efficiency

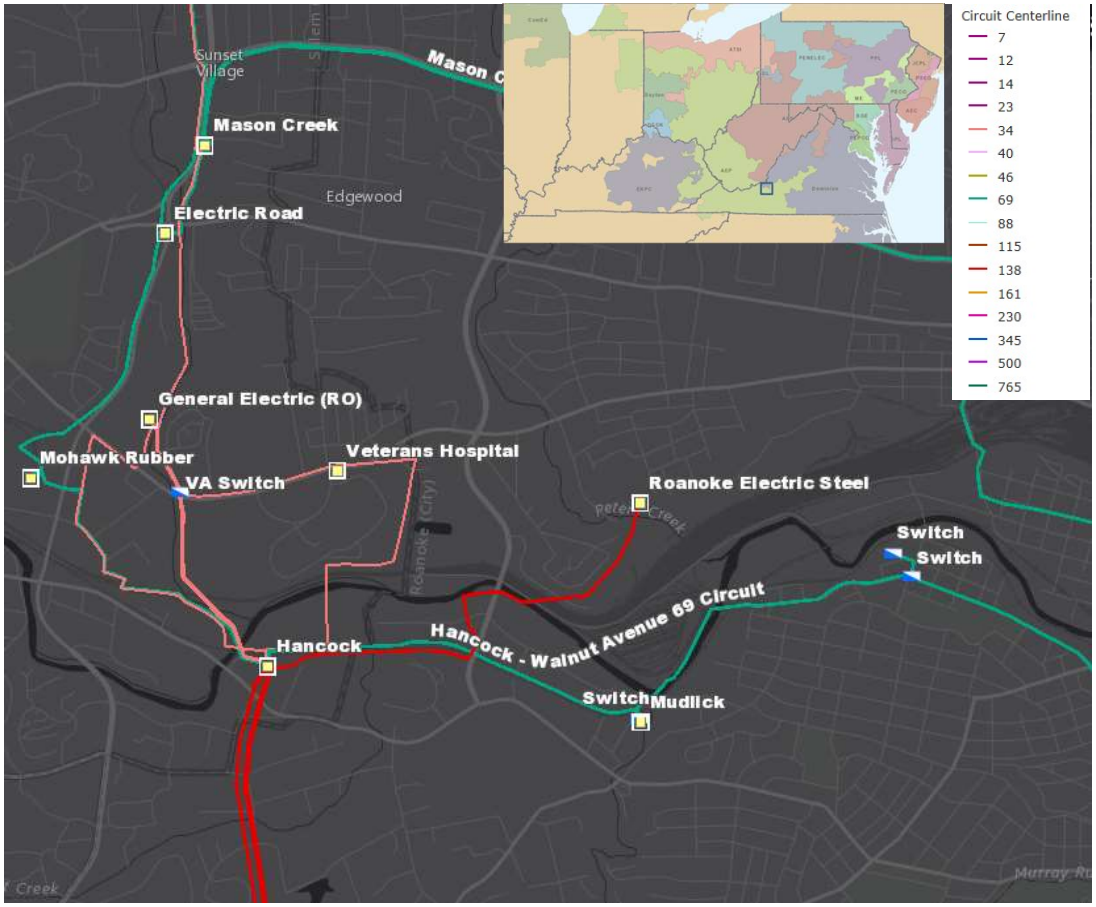
~~The breaker and half configuration will break the three dissimilar zones of protection (138 kV bus #2, transformer #1 and transformer #2), increase reliability, and allow for shorter maintenance outages. With the current configuration we are susceptible to a station outage with a breaker failure of 138 kV bus tie breaker "F".~~

The existing 138 kV high-side MOAB transformer protection for 138/69-34.5 kV T1 and 138/34.5 kV T2 and the MOAB located on the radial feed to Roanoke Electric Steel, are susceptible to momentary outages in addition to their associated 138 kV high-side 138 kV buses. Also, three overlapping zones of protection exist between the 138/69-34.5 kV T1, 138/34.5 kV T2 and 138 kV Bus 2.

The Hancock Distribution 34.5/34.5 kV #3 transformer is 2016 vintage, presents operational and safety concerns due to its non-standard configuration. The bypass switches utilized create the potential for poor grounding conditions, creating an unsafe switching hazard even when the equipment is properly operated. This is 34.5/34.5 kV non-standard configuration has no spare units of its kind on the AEP System.

Customer Service:

Hancock is a critical station for customers in the area. It feeds Roanoke Electric Steel (RES), VA Hospital, General Electric and City of Salem. Roanoke Electric Steel (RES) is large industrial customer (~65 MVA) served from a 1.75 mile radial 138 kV line out of Hancock Station. The radial line to RES is connected directly to the Hancock 138 kV bus #1 via a 138 kV MOAB switch.



AEP Transmission Zone: Supplemental S1598 Scope change

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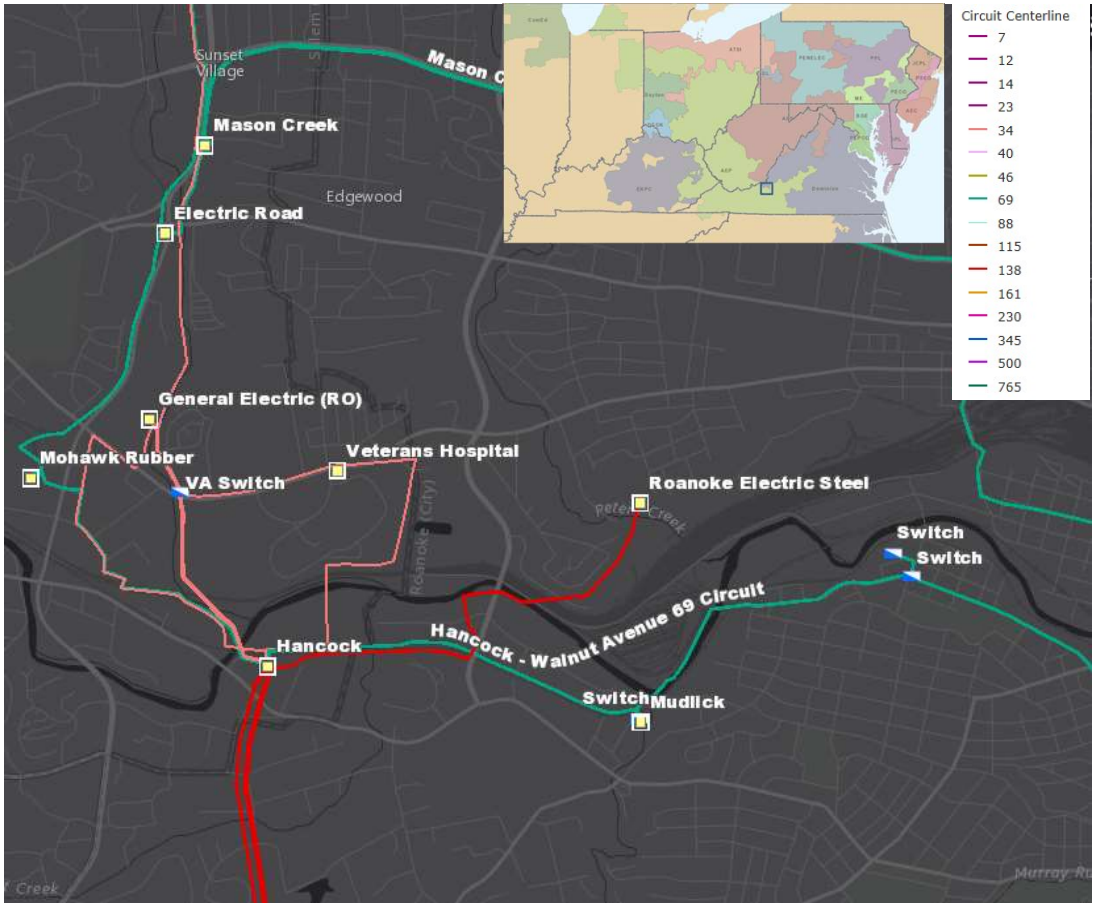
Potential Solution

~~At Hancock station, build a new 138 kV breaker and half configuration with 3 strings. Install 9 new 3000 A/40 kA circuit breakers. Replace the existing 69 kV/27 kA/1800 A CB "N" and "CA", 1200 A/21 kA CB "M" and 2000 A/31.5 kA CB "Q" with 3000 A/40 kA circuit breakers. Replace the existing 34.5 kV/560 A/12 kA CB "R" and "S", 1200 A/16.8 kA CB "I" with 1200 A/25 kA circuit breakers. Install new DICM. Replace 138/34 45 MVA Transformer #2 with new 138/69/34.5kV 130MVA. Add new 138/34.5 kV 30 MVA Transformer #3 with high side Circuit Switcher (3000 A, 40 kA). Replace the existing 138 kV 1200 A/61 kA Circuit Switcher "BB" with new 650A, 31.5 kA CS. Replace 138kV Bus #1, 34.5kV Bus #1 and 34.5kVBus #2 CCVT's. Replace 34.5 kV Circuit Breakers "P" and "J" with new 34.5 kV, 3000 A, 40 kA CB's. Replace 34.5 kV Capacitor Bank Circuit Switcher "AA" with new 40 kA CS. Install Bus Regulators on 34.5kV Bus #3. Replace remote end line relaying.~~ **~~Estimated Cost: $30.0M~~**

Reason for Revision:

The initially proposed breaker and a half configuration was determined not to be feasible physically. Also, after additional engineering investigation, the 138 kV bus work was in relatively good condition and the 34.5 kV equipment was in need of repair. Several of the 69 kV and 34.5 kV circuit breakers had already been replaced.



AEP Transmission Zone: Supplemental S1598 Scope change

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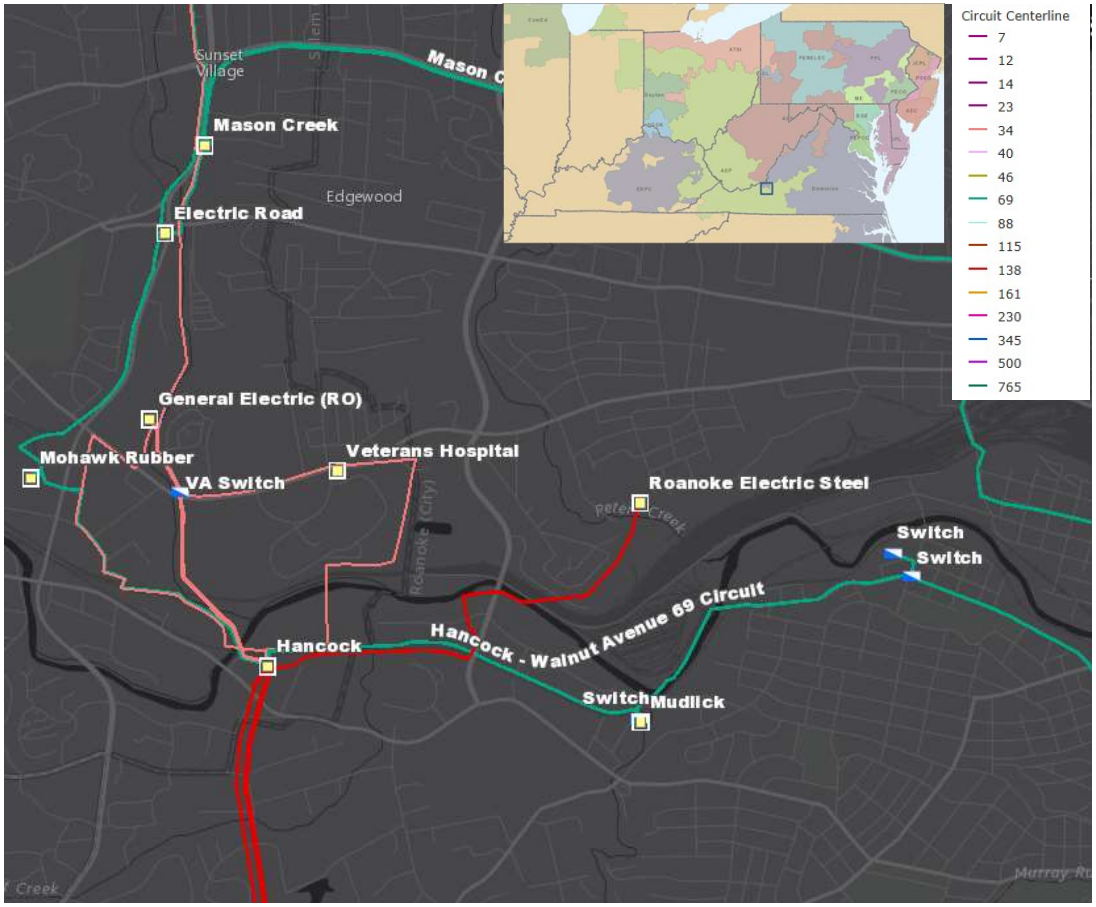
Potential Solution

At Hancock Station:

- Replace 138 kV CBs A, B, C and associated disconnect switches, foundations, and CCVTs
- Install 2 additional 138 kV bus tie breakers and utilize the position between the breakers to feed Roanoke Electric Steel
- Replace 138/69/34.5 kV T1, install a high-side circuit switcher and change connection to bus #1, Install ground bank on 69 kV side
- Replace 138/34 kV T2, install a high-side circuit switcher, new foundations, add oil containment, Install ground bank on 69 kV side
- Replace 138 kV, 50.4 MVAr Capacitor Bank and Circuit Switcher BB, associated switches and foundation
- Replace all Transmission 34.5 kV bus work, circuit breakers, associated disconnect switches and foundations. Replacement 34.5 kV breakers will be 3000 A, 40 kA. Replace 34.5 kV capacitor bank AA with 9.6 MVAr bank, associated circuit switcher and foundation.
- Expand control house and replace all electromechanical relays (116), 7 static relays and 9 microprocessor relays
- Install 138/34.5 kV 30 MVA non-LTC Transformer with high side circuit switcher replacing the non-standard 34.5/34.5 kV configuration and removing the N.O. by-pass around 34.5 kV CB K

Estimated Cost: $30.5 M



AEP Transmission Zone: Supplemental S1598 Scope change

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Alternatives:

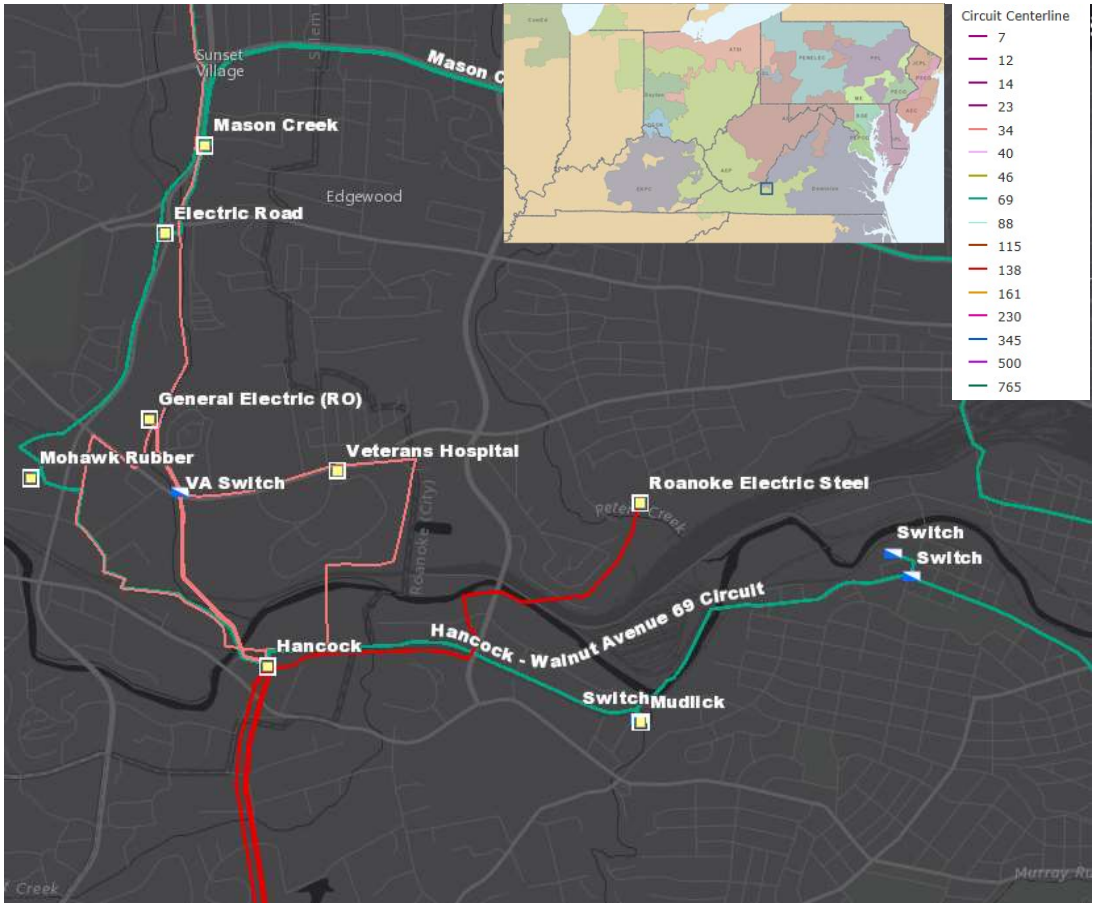
~~Use existing 138 kV structures, replace 138 kV circuit breakers in place, add 138 kV breaker on Roanoke Electric Steel line, add a 138 kV bus tie breaker between 138/69/34 transformer #1 and 138/34 kV transformer #2. Replace 138/34 kV transformer #2 with new 138/69/34 kV 130 MVA transformer and install high side circuit switcher. Install 138 kV circuit switcher on 138/69/34 transformer #1. Install a new 138/34 kV 30 MVA transformer and move 34.5 kV distribution load here. Adding the second bus tie breaker was going to require to reinforce the existing 138 kV structures. Long outages on the 138 kV would have necessary to accomplish this. Due to the customers in the area it was going to be difficult to coordinate and get approval for an outage of this magnitude. With the second 138 kV bus tie breaker Hancock Station would have had three 138 kV buses and still open to a loss of all transformers with a breaker failure scenario. The 138 kV breaker and half scheme has proven to be the most reliable configuration and gives flexibility for performing maintenance without affecting customers.~~ **~~Estimated Cost: $18M~~**

Construct a new breaker and a half 138 kV greenfield station in the clear, keeping it adjacent to the existing Hancock station site, however, no site nearby was feasible due to the proximity of buildings, roads and Roanoke River to the existing station site. The greenfield station would include all the 138 kV associated equipment with the intent to leave the 69 kV and 34.5 kV equipment in the existing station. Nine (9) 138 kV circuit breakers would be required to establish the breaker and a half arrangement. Significant line re-termination work would be required to accommodate the relocation of the station site. In addition, the 34.5 kV work would still be necessary. The project team also evaluated providing a looped feed to the large industrial customer, RES, but it was not physical feasible due to the urban location

Estimated Cost: $43 M – *for comparison purposes only, does not account for associated T-line relocation costs, since a feasible site was not found.*

Projected In-service: ~~12/18/2021~~ 10/14/2024

Project Status: Engineering



ATSI Transmission Zone M-3 Process
Customer - North Star BlueScope Steel 345 kV Expansion

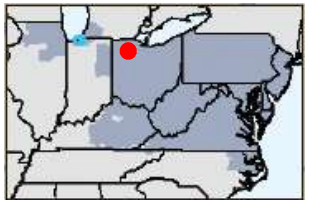
Need Number: ATSI-2019-082
Process Stage: Re-Present Solutions Meeting – 04/11/2023
Previously Presented: Need Meeting – 11/22/2019
Solutions Meeting – 11/04/2020

Supplemental Project Driver(s):
Customer Service

Specific Assumption Reference(s)
Customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
Existing Customer Connection – Load Increase
An existing transmission customer (North Star BlueScope Steel) is requesting load demand increase for the existing 345/34.5 kV substation to a new peak of 300 MVA on the Fulton-North Star Steel 345 kV line.
Requested In-Service Date: 03/01/2021

The customer is also requesting load demand increase for its existing 138/34.5 kV substation to a new peak load of 40 MVA on the Delta-Wauseon 138 kV line.
Requested In-Service Date: 11/01/2020



ATSI Transmission Zone M-3 Process
Customer - North Star BlueScope Steel 345 kV Expansion

Need Number: ATSI-2019-082
Process Stage: Re-Present Solutions Meeting – 04/11/2023
Previously Presented: Need Meeting – 11/22/2019
Solutions Meeting – 11/04/2020

Proposed Solution:

When the additional 40 MVA from the customer is energized on the Delta-Wauseon 138 kV line, the N-1-1 contingency of losing the Midway-Wauseon 138 kV line and the Delta-Fulton 138 kV line results in voltage of 0.90 PU.

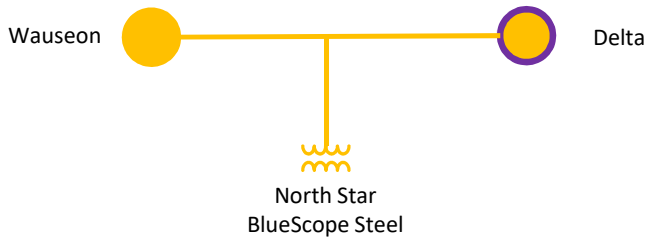
- Install two (2) 26 MVAR Capacitor Bank at Delta 138 kV substation.

Estimated Project Cost: $2.3 M

Alternatives Considered:

- None (obligation to serve)

In-Service: 4/27/2021
Status: In-Service
Model: 2019 Series 2024 Winter RTEP 50/50



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

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ATSI Transmission Zone M-3 Process
Customer - North Star BlueScope Steel 345 kV Expansion

New additional scope to mitigate load loss criteria violation (s2237.2):

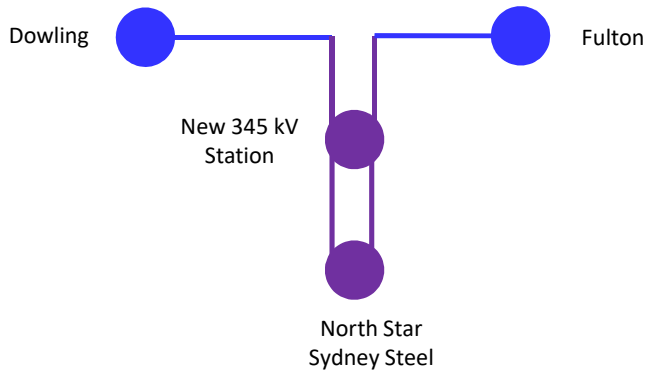
Contingency: P6 Loss of the Fulton-North Star Steel 345 kV Line and any additional line.
Ex. Loss of Fulton-North Star Steel 345 kV Line (300 MW) and loss of the Allen Junction-Westgate 138 kV line (79 MW) totaling over 379 MW of load loss.

Proposed Solution - Continued:

- Construct a new 345 kV four breaker ring bus.
- De-energize approx. 1.0 mile of the Dowling-Fulton 345 kV line.
- Construct 8.7 miles of 345 kV line to connect the Dowling 345 kV line into the new 345 kV station with 954 ACSR 45/7 bundled (2 conductors per phase). ~~New 345 kV line to be built and share structures with the Delta-Wauseon 138 kV line and Delta – Fulton 138 kV line.~~ New greenfield 345 kV line to be built as preferred option based on the results of route selection study that was conducted. This route also avoids more densely populated areas near the town of Delta. The line will primarily be constructed on steel monopole structures.
- Replace the wave trap at Dowling 345 kV line to ensure the Dowling-New 345 kV station 345 kV transmission line is the limiting element.
- Re-terminate the Fulton 345 kV line that serves North Star Steel Sydney into the new 345 kV station.
- Provide two feeds from the new 345 kV station to North Star Steel Sydney with 954 ACSR 45/7 bundled (2 conductors per phase).
- Since conceptual estimate previously presented, material prices for the 345 kV line and the four breaker ring bus have escalated. In addition, a more extensive real estate review has been conducted and anticipate much higher ROW acquisition costs.

Transmission Line Ratings:
Dowling-New 345 kV Station Rating:
- 1542/1878 MVA SN/SE, 1746/2225 MVA WN/WE

Fulton-New 345 kV Station Rating:
- 1542/1878 MVA SN/SE, 1746/2225 MVA WN/WE



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

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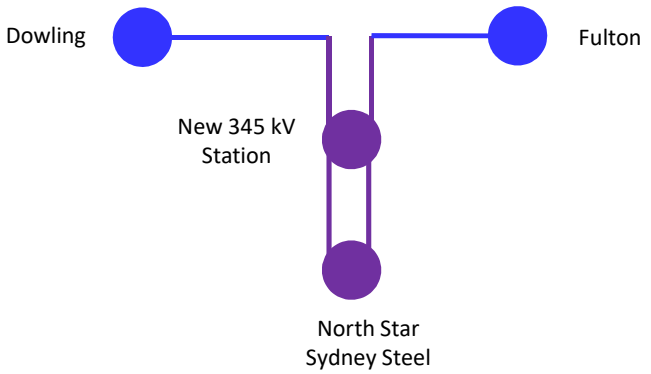
ATSI Transmission Zone M-3 Process
Customer - North Star BlueScope Steel 345 kV Expansion

New additional scope to mitigate load loss criteria violation (s2237.2):

Alternatives Considered:

- Construct a new four breaker 345 kV ring bus. Construct a six breaker 138 kV ring bus and tie it to the 345 kV station with transformation. Re-terminate the Fulton-North Star Steel Sydney 345 kV line into the new 345 kV station. Expand Fulton substation to install a second 345/138 kV transformer. Expand Delta substation to install a second line from Fulton-Delta 138 kV. Rebuild the Delta Wauseon 138 kV line as double circuit and loop in the double circuit line into the new 138 kV Ring Bus. (~~$107.2M~~ $128.2M, Conceptual Estimate)

Estimated Project Cost: ~~$67M~~ $104.3M
Projected In-Service: ~~6/1/2024~~ 6/1/2026
Status: ~~Conceptual~~ Pre-Engineering
Model: 2020 Series 2025 Summer RTEP 50/50



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

Planned Projects: Supplemental

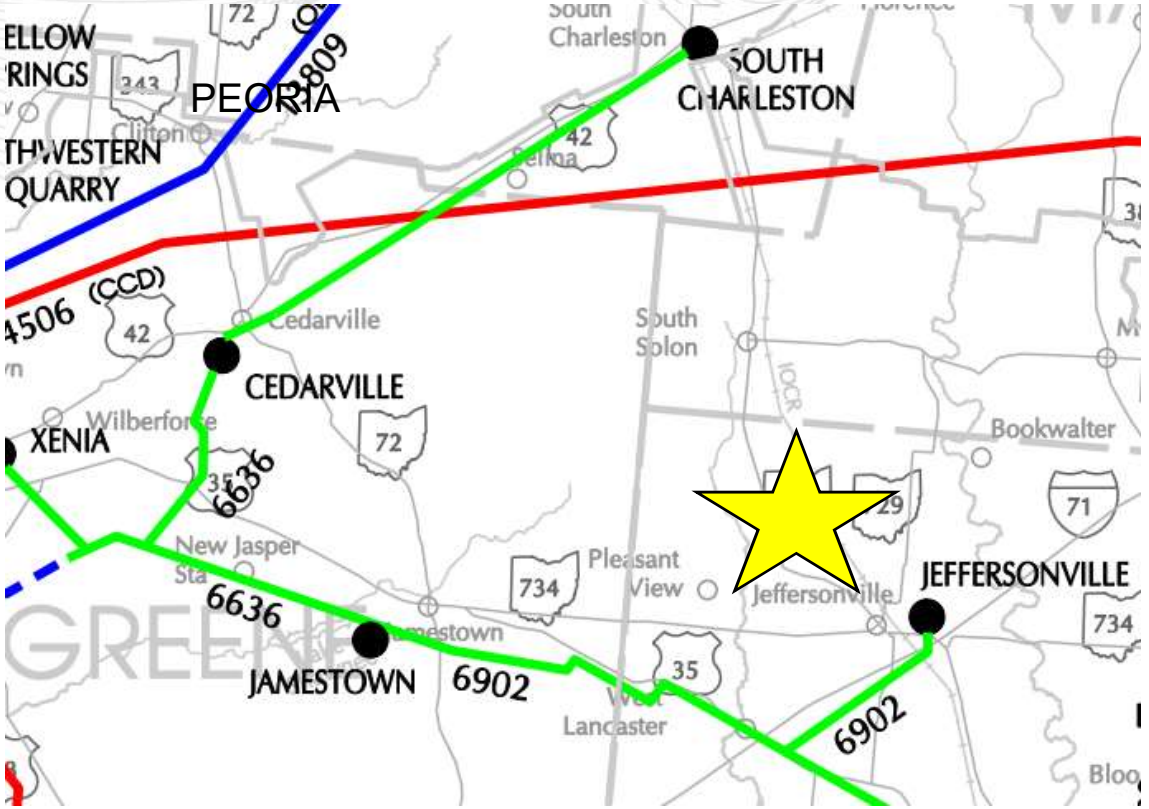
Solutions of the M-3 Process

Dayton Transmission Zone M-3 Process

Need Number: Dayton-2022-004
Previously Presented: Need Presented, 8/19/2022
Process Stage: Solution Presentation, 12/6/2022
Project Driver: Customer Request
Specific Assumption Reference: Dayton Local Plan Assumptions (Slide 5)

Problem Statement:

- AES has received multiple large industrial customer requests for service in the Jeffersonville area.
- Total load requests have ranged from 100MW to several hundred megawatts
- Presently, Jeffersonville has certified 2,000-acres for industrial development with over 250 acres currently under option by customers.
- AES projects the site will be capable of supporting over 1,000 MWs of new manufacturing related load based upon the total number and size of customer requests.
- AES currently has a supplemental project, S0323, that proposes to build a 69kV line from South Charleston – Jeffersonville. AES believes that the magnitude of the load requests in the area exceed the capabilities of the existing project.



Model: 2021 RTEP Series, 2026 Summer Case

Need Number: Dayton-2022-004
Previously Presented: Need Presented, 8/19/2022
Process Stage: Solution Presentation, 12/6/2022
Project Driver: Customer Request
Specific Assumption Reference: Dayton Local Plan Assumptions (Slide 5)

Dayton Transmission Zone M-3 Process

Proposed Solution:

- **Fayette Substation:**
  - The newly established Fayette Substation will serve as the primary source for the Jeffersonville area and will step service down from 345kV to 138kV and 69kV. This substation is located central to the largest developing load center in the AES Ohio area supporting the electric vehicle manufacturing industry developing in the area. The new substation called Fayette will have a breaker and half 345kV design, two 345/138kV 450MVA transformers, a breaker and half 138kV design, a 138/69kV 200MVA transformer, 138kV capacitor, and 69kV feed to a new Panther Substation. A 0.25-mile 138kV extension will span from AES's Fayette Substation to a 138kV delivery point to serve the first 140MW development. **Estimated Transmission Cost: $33.9M, ISD 8/1/2024**
- **Madison-Fayette 1 & 2 345kV Lines*:**
  - AES will construct a 13-mile double circuit 345kV line from Madison to Fayette Substation utilizing bundled 1024.5 ACAR 30x7 conductor. The new 345kV transmission lines will provide the primary feed into the new Fayette Substation and Jeffersonville, Ohio region which will be the primary load center between Dayton, Cincinnati, and Columbus, Ohio.

  Estimated Transmission Cost: $51.2M, ISD 8/1/2024
- **Madison Substation*:**
  - AES will establish a new 3-bay breaker and half 345kV substation at Madison. Madison plays a critical role in sourcing the emerging load center while also improving reliability by looping present day radial loads at Cedarville, Jeffersonville, and South Charleston. The Madison Substation will have a single 345/69kV transformer and will have 4-345kV line exits. **Estimated Transmission Cost: $27M, ISD 8/1/2024**
- **Jeffersonville 69kV Substation Relocation & Retirement:**
  - Retire the existing radial Jeffersonville Substation that is located in floodplain and not conducive to further expansion for an additional 69kV source. The retired substation will be replaced with a new 69kV looped substation called Panther. The new Panther Substation will have three 69/12kV 30MVA distribution transformers. The new Panther sub will be designed as a 69kV breaker and a half station. **Estimated Transmission Cost: $15.5M, ISD 12/31/2025**
- **6946 69kV Reroute & Extension*:**
  - Establish a new ~1.5-mile 69kV transmission line from Fayette Substation to Panther Substation using 1351 AAC conductor. Reroute and upgrade to 1351 AAC conductor approximately 5.5 miles of line from Panther Substation to Octa Substation.

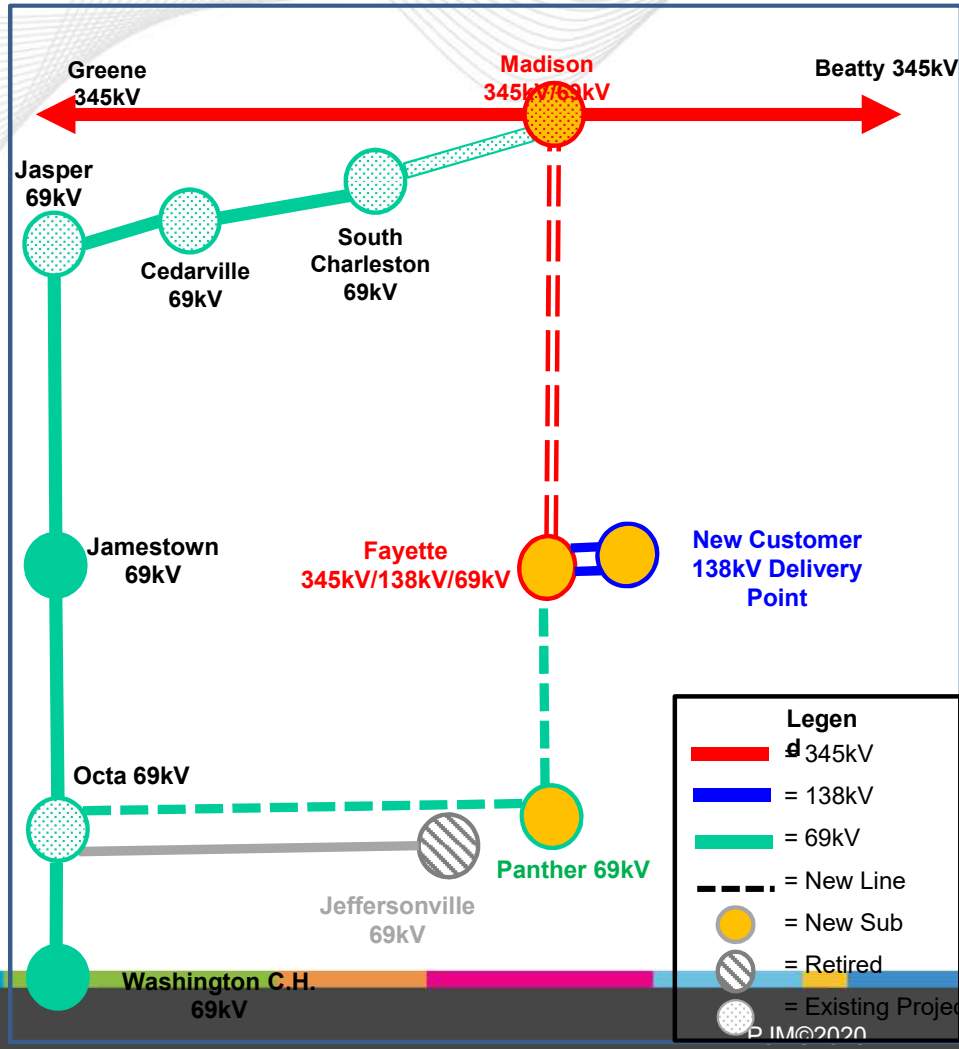
  Estimated Transmission Cost: $17.5M, ISD 12/31/2025

Total Cost : $145.10M

*Approximately $10M of this Solution will take the place of Supplemental Projects s0322 and s0323. The previous projects were scoped primarily to loop radial load and not serve major development.

Alternatives Considered:

- Madison 345/138kV Transformer & Madison-Fayette 1&2 138kV Lines
  Estimated Total Transmission Cost: $120.9M, ISD 8/1/2024
  Not selected due to putting primary transformation 12 miles from load center.
- Madison-Fayette 345kV Line & N. Wilmington 345kV line:
  Estimated Total Transmission Cost: $196.4M, ISD 8/1/2024
  Not selected due to higher cost.



Need Number: AEP-2021-IM034

Process Stage: Solution Meeting 12/16/2022

Previously Presented: 11/19/2021

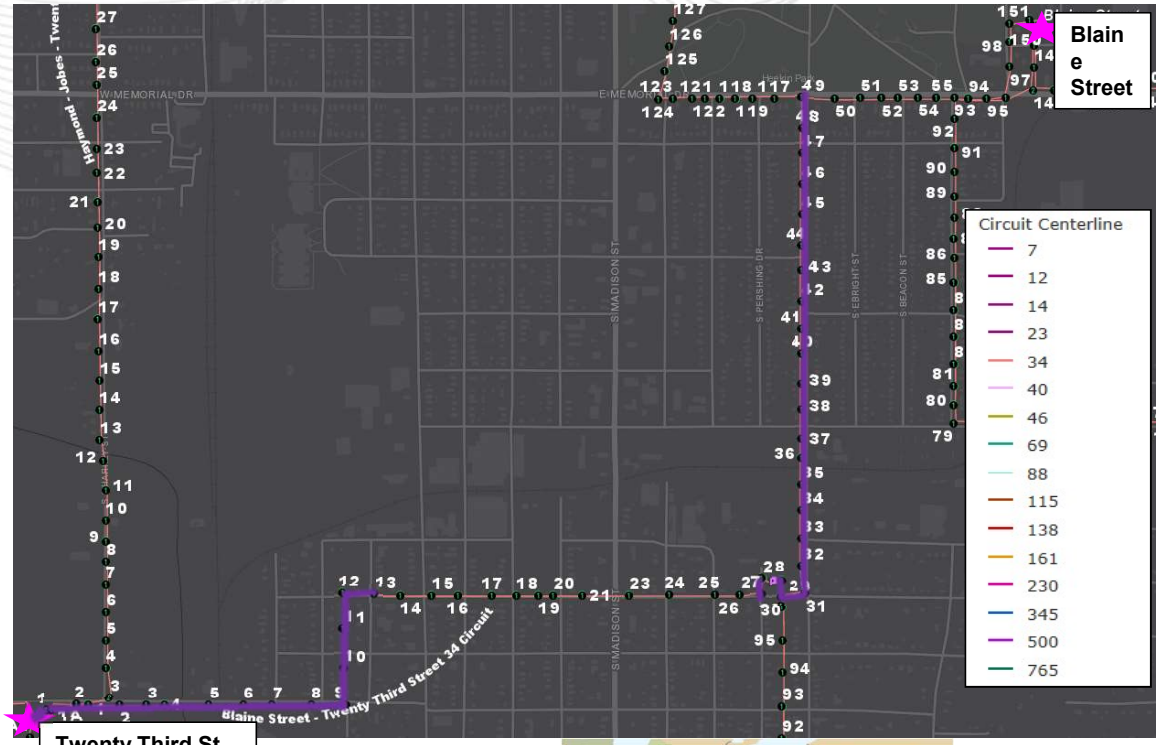
Project Driver: Equipment Material Condition, Performance and Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

Problem Statement:

Twenty Third Street – Blaine Street 34.5 kV (Vintage 1976)

- Length of Line: 1.20 miles
- Total structure count: 54 with 42 dating back to original installation.
- Original Line Construction Type: Wood pole structure with cross arm construction.
  - Porcelain vertical post insulators
- Conductor Type:
  - 556,500 CM ALUM/1350 19 Dahlia
  - 795,000 CM ALUM/1350
- Condition Summary
  - Number of open conditions: 5 structure open conditions
    - Open conditions include broken pole, shielding grounding improperly installed and missing ground lead wires.
    - Based on the ground crew assessment , for 30 structures, approximately 67% of the poles assessed have moderate to heavy shell damage, insect damage or woodpecker damage. Approximately 50% of the poles assessed have heart rot. Some structures are near buildings or railroad right of way. Access likely limited to railroad right of way that can result in restoration delays for access permission and flagging protection. Wires attachment and distribution equipment are heavy on some structures. Slow wood pole restoration.
    - The grounding method utilizes butt wraps on every other structure, providing reduced lightening protection for the line.



Need Number: AEP-2021-IM034

Process Stage: Solution Meeting 12/16/2022

Previously Presented: Needs Meeting 11/19/2021

Project Driver: Equipment Material Condition, Performance and Risk

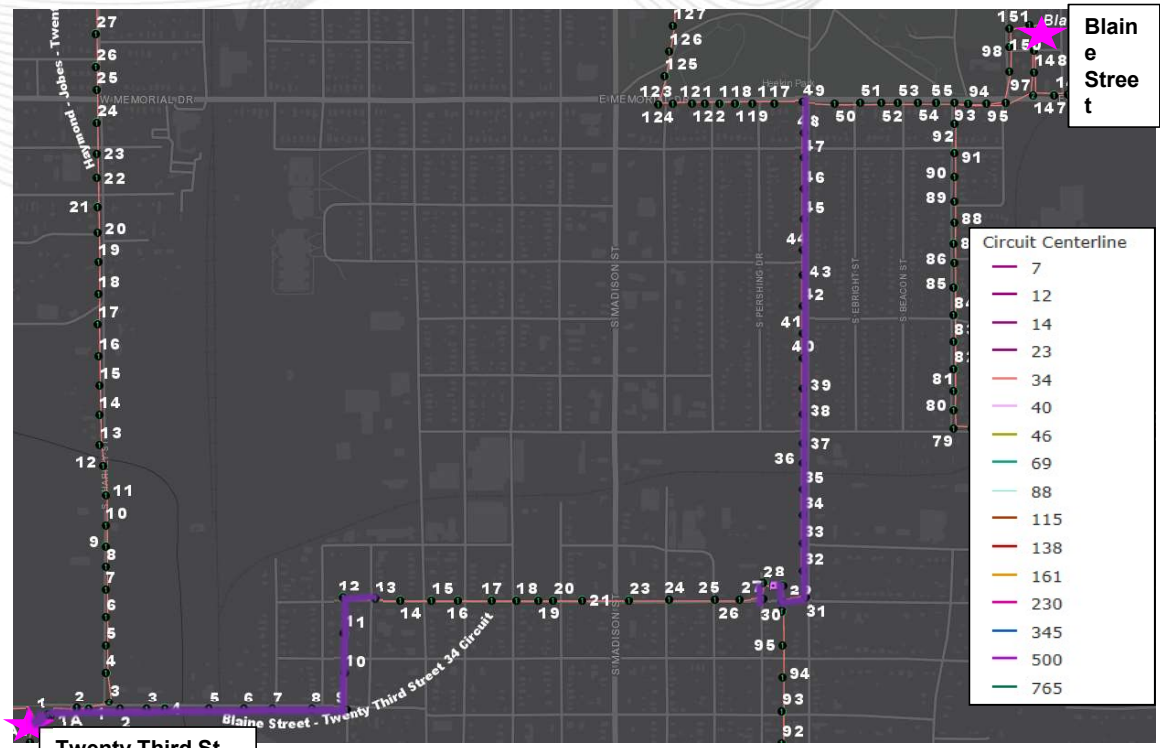
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

Problem Statement: Twenty Third Street 138/34.5 kV transformer #1:

- Install date: 1965
- Dielectric strength breakdown due to elevated moisture levels from gasket leaks or breakdown in oil or paper/pressboard insulation. This impairs the unit's ability to withstand electrical faults.
- Aging insulating paper material become brittle allowing for increased susceptibility of short circuit faults causing failure of the main tank.
- Bushings are at risk of failure due to aging bushings and changes of bushing dielectric data. Failure of the bushings may cause a failure or loss of service of the transformer.

Twenty Third Street 138/34.5 kV transformer #2:

- Install date: 1970
- Dielectric strength breakdown due to elevated moisture levels from gasket leaks or breakdown in oil or paper/pressboard insulation. This impairs the unit's ability to withstand electrical faults.
- Aging insulating paper material become brittle and recent trends on Ethane and Methane indicating overheating temperatures within the tank , will impair the unit's ability to withstand future short circuit
- All bushings showed major changes in bushing power factor from original values. The low side and tertiary bushings are GE Type U which have shown increased power factor over time and have been known to fail violently. Bushings are at risk of failure due to aging bushings and changes of bushing dielectric data. Failure of the bushings may cause a failure or loss of service of the transformer.



Need Number: AEP-2021-IM034

Process Stage: Solution Meeting 12/16/2022

Proposed Solution:

Twenty Third Street – Blaine Street 34.5 kV:

Rebuild ~1.20 miles of 34.5 kV line with 556.5 ACSR 26/7 Dove. The following cost includes the line rebuild, line removal, Telecom and ROW.
Cost: $7M

Twenty Third Street station:

Replace the Twenty Third Street 138/34.5 kV transformer #1 and transformer #2 with two 138/69/34.5 kV 90 MVA transformers. The following cost includes install and removal.

Cost: $5.36M

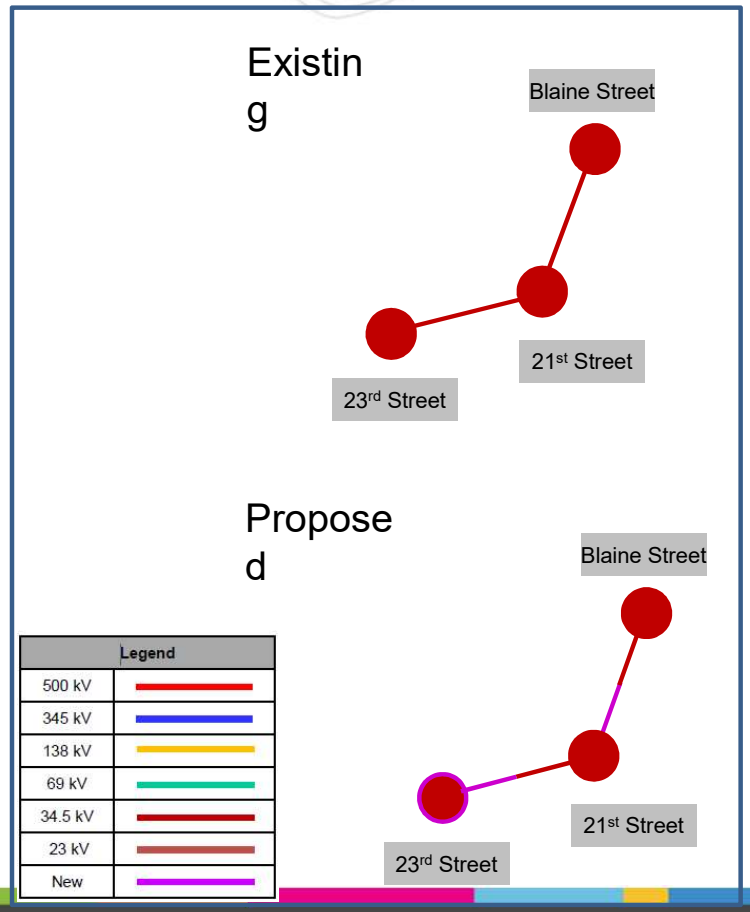
Total Cost: $12.36M

Alternatives considered:

Retiring the line is not an option as it serves the Twenty First Street load and there are no alternatives to serve it as it is located in a congested residential area. Additionally, installing one transformer at Twenty Third Street to replace the two 138/34 kV transformers is not the best option due to operational concerns and outage restrictions. Twenty Third Street station and Delaware station are the main sources for the distribution network in the Muncie area. Reducing the Twenty Third Street station to one transformer would be unfavorable due to the distribution system configuration. A forced outage on radialized transmission line would result in a large portion of the city of Muncie being outaged with no options for recovery.

Projected In-Service: 10/15/2026

Project Status: Scoping



Need Number: AEP-2021-OH040

Process Stage: Solutions Meeting 12/16/2022

Previously Presented:

Needs Meeting 7/16/2021,

Updated Needs Meeting 1/21/2022

Project Driver:

Customer Service

Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Kileville Delivery Point 138 kV:

- Buckeye Power Inc., on behalf of Union Rural Electric Cooperative Inc., has requested new transmission service in Plain City, Ohio.
- The delivery point will primarily be used to serve a large data center customer with high potential for rapid load growth. The Initial load will be 106 MW with a potential future peak load demand of ~~240~~ 258 MW.
- The customer recently communicated a much more aggressive load ramp/build out schedule that would put their peak load at approximately 160 MW by the middle of 2024 at the site.

AEP Transmission Zone M-3 Process
Union County, Ohio

Need Number: AEP-2021-OH040

Process Stage: Solutions Meeting 12/16/2022

Proposed Solution:

- **Kileville 138 kV Station**: Greenfield 138kV breaker and a half station configuration with 4 partial strings built initially due to physical arrangement of the station. Seven (7) 138kV 4000A 63kA circuit breakers will be installed initially. **Estimated Cost: $9.79 M**
- **Kileville Extension 138 kV**: Cut in to the existing Amlin – Hyatt 138 kV circuit and construct ~0.15 miles of new double circuit line to the proposed Kileville Station. Extend the telecom fiber into Innovation station for relaying/communication. **Estimated Cost: $5.33 M**
- **Kileville-Shire (Customer) 138 kV:** Two tie lines to the customer's facility. **Estimated Cost: $0.05 M**
- **Amlin & Hyatt 138 kV Stations:** Remote end relay settings work. **Estimated Cost: $0.677 M**
- **Temporary Kileville Skid Station:** Temporary customer power required. **Estimated Cost: $0.00 M**

Total Estimated Transmission Cost: $15.85 M

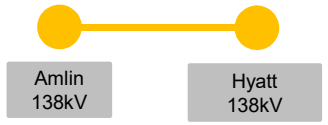
Alternatives Considered:
Considering the location and timing of the initial load request, no other viable alternates were identified.

Projected In-Service: 7/31/2023

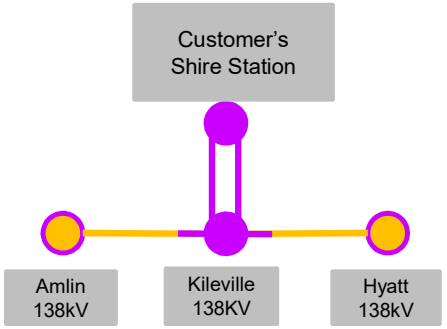
Project Status: Scoping/Engineering

Model: RTEP 2027

Existing:



Proposed:



AEP Transmission Zone M-3 Process
West Coshocton Station Upgrade

: AEP-2021-OH048

Process Stage: Solution Meeting 12/16/2022

Previously Presented: Need Meeting 9/17/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

West Coshocton Station:

138 kV Circuit Switcher "CS-1A"

- Breaker Age: 1975
- Interrupting Medium: SF6
- Fault Operations: 40 (manufacturer recommended limit is 10)
- Additional: The 138 kV Mark III circuit switcher CS – 1A have limited spare part availability and are no longer vendor supported. These models have experienced 47 recorded malfunctions from July 2001 to August 2019. Failed operational components including high contact resistance, gas loss, and interrupter failure represent the majority of these malfunctions. The expected life span of bushing gaskets and door inspection ports on these units based on AEP experience is only 25 years. The current age of this remaining fleet indicates that the existing gaskets and door inspection ports are at risk for increasing gas loss over time.

Transformer # 3 (138/69 kV, 50 MVA)

- Transformer Age: 1966
- Additional: The tertiary bushing needs replaced. The cooling fans are open cage, which is not OSHA rated. Pumps are leaking and rusted. There is no oil containment. Asbestos has been found in the internal wiring. The oil needs drained, gaskets on the radiators and pumps need replaced, and flange valves need repacked as they are leaking

Relaying

- Currently, 26 of the 27 relays (96% of all station relays) are in need of replacement. All 26 of these are of the electromechanical type which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack of vendor support.

AEP Transmission Zone M-3 Process
West Coshocton Station Upgrade

Need Number: AEP-2021-OH048

Process Stage: Solution Meeting 12/16/2022

Previously Presented: Need Meeting 9/17/2021

Proposed Solution:

Rebuild the West Coshocton 138-69kV station, with a 138kV 3-breaker ring bus, a new 138-69kV transformer (90 MVA nameplate), and a single 69kV breaker. A new control building will also be installed. Remove the existing station facilities. **Total Estimated Transmission Cost: $10.17M**

Alternatives Considered:

Keep a 138kV straight-bus design and replace equipment in the existing location. However, outage constraints and the availability of property on location allow for a build in the clear option to help with outage scheduling and maintaining clearance distances within the station.

Ancillary Benefits:

Addresses a 3-terminal line (Ohio Central-West Coshocton-Black Diamond 138kV) and multiple zones of protection at West Coshocton. Three-terminal lines are more difficult to reliably protect and more prone to misoperations.

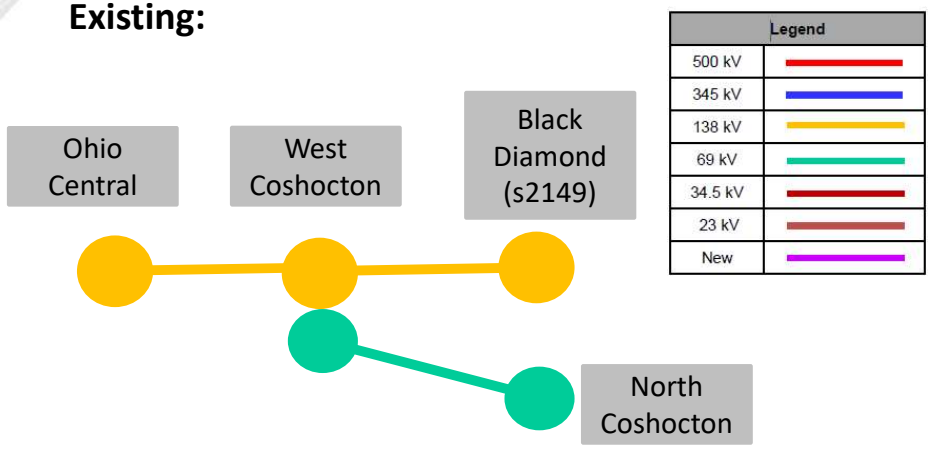
Projected In-Service:

12/1/2025

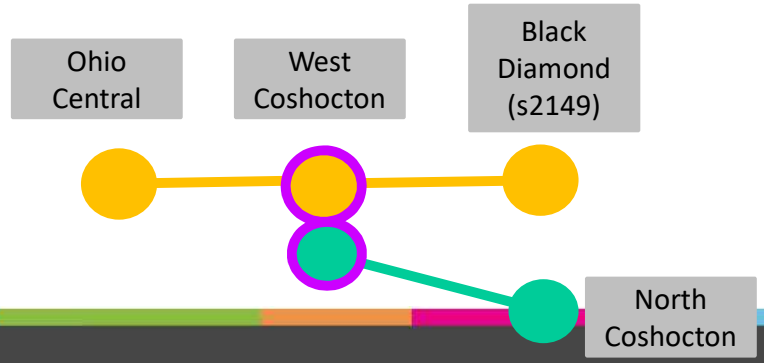
Project Status: Scoping

Model: 2027 PJM RTEP

Existing:



Proposed:



AEP Transmission Zone M-3 Process
Green Chapel

Need Number: AEP-2022-OH029

Process Stage: Solutions Meeting 12/16/2022

Previously Presented:
Need Meeting 04/22/2022

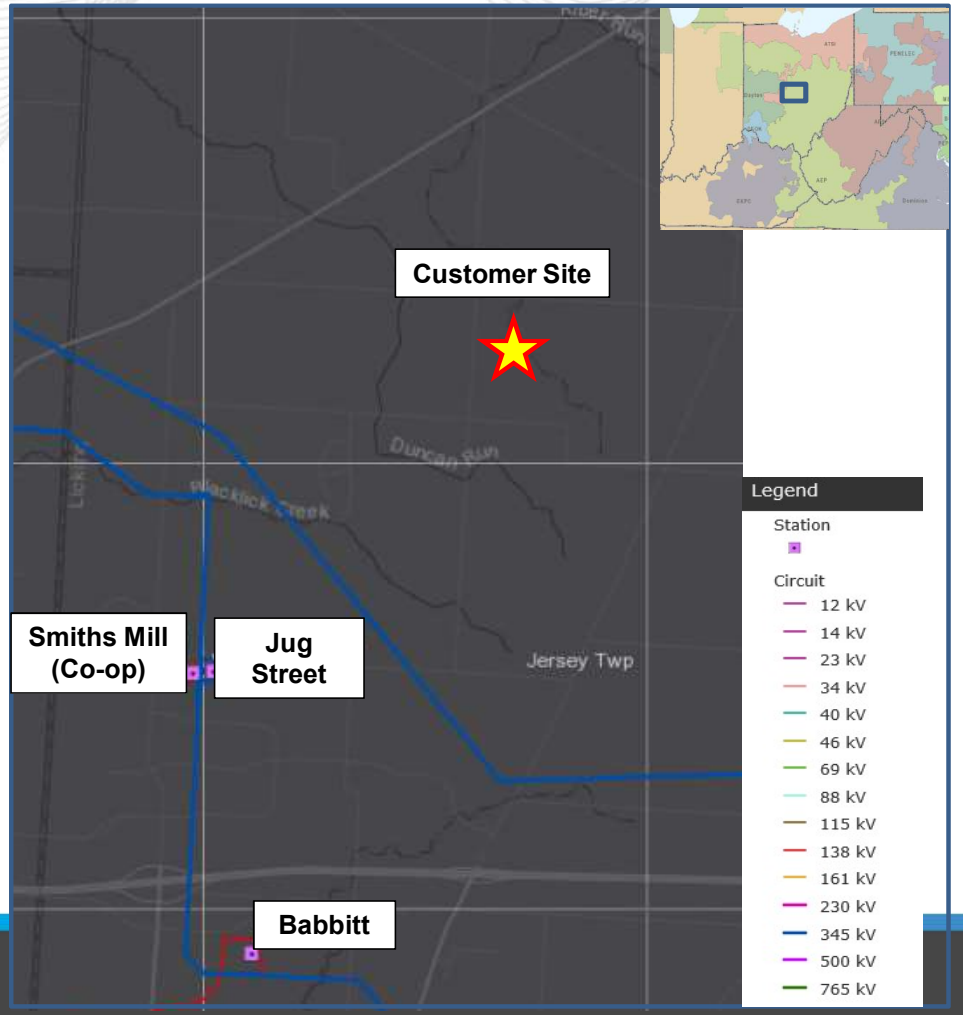
Project Driver:
Customer Service

Specific Assumption Reference:
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested distribution service at a site Northeast of AEP's existing Jug Street station in New Albany, OH.
- The customer has indicated an initial peak demand of ~~430~~ 440 MW with an ultimate capacity of up to ~~1,500~~ 1,560 MW at the site.
- The customer has a requested an in-service date of May 31st 2024.



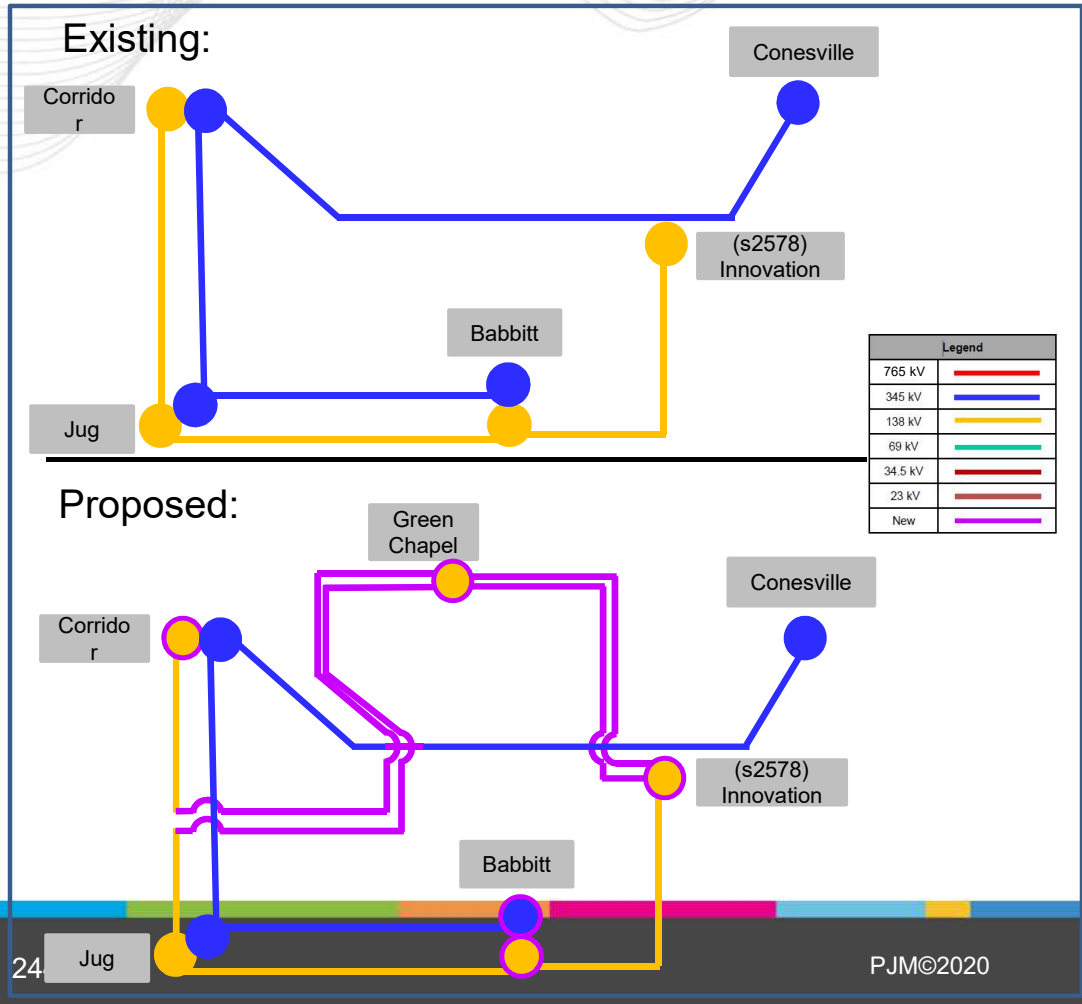
AEP Transmission Zone M-3 Process
Green Chapel

Need Number: AEP-2022-OH029

Process Stage: Solutions Meeting 12/16/2022

Proposed Solution:

- **Green Chapel 138 kV**: Construct a greenfield station with 19 - 138kV, 90 kA, 4000 A circuit breakers in breaker and half bus configuration. **Estimated Cost: $27.57 M**
- **Innovation 138 kV**: Build out the remaining 2 breaker & half strings at the station and install 4 - 138 kV 4000A 80kA circuit breakers. **Estimated Cost: $3.91 M**
- **Green Chapel – Innovation 138 kV**: Construct ~2.1 miles of double circuit 138kV transmission line from Innovation Station to Green Chapel Station utilizing 2-bundled ACSS Curlew 1033.5 (54/7) conductor SE rating 1123 MVA. **Estimate Cost: $12.6 M**
- **Green Chapel Extension 138 kV**: Construct ~2.6 miles of double circuit 138kV transmission line extending from Jug - Corridor 138 kV line to Green Chapel station utilizing 2-bundled ACSR Falcon 1590 (54/19) conductor SE rating 1118 MVA to match the existing conductor on the Corridor-Jug line. **Estimate Cost: $15.6 M**
- **Jug – Corridor 138/345 kV:** Additional structures and dead ends will be required on the existing Jug – Corridor double circuit line to accommodate the extension eastward to Green Chapel as the 138 kV circuit is on the west side of the structures. **Estimate Cost: $3.6 M**
- **Conesville - Corridor 345kV**: Modify the existing 345kV line structures to enable appropriate height for the new line to Green Chapel Station. **Estimate Cost: $1.97 M**



Green Chapel

Proposed Solution - continued:

- **Babbitt 345/138 kV**: Install a second 675 MVA, 345/138 kV transformer to address overloading Jug Street 345/138 kV transformer under N-1-1 contingencies as a result of this customer load interconnection. Cost: **$16.0 M**
- **Corridor 138 kV**: Replace 3000A breakers CB-104C & 104S with 4000 A breakers. This addresses N-1-1 overloading on those breakers as a result of this customer load interconnection. **Estimated Cost: $2.0M**
- **West Lancaster 138 kV**: Install high and low side sectionalizing on the two 138/69 kV transformers. This addresses, due to lack of sectionalizing, N-1-1 overloading on 69 kV lines as a result of this customer load interconnection. **Estimated Cost: $3.5 M**

Total Estimated Transmission Cost: $86.75M

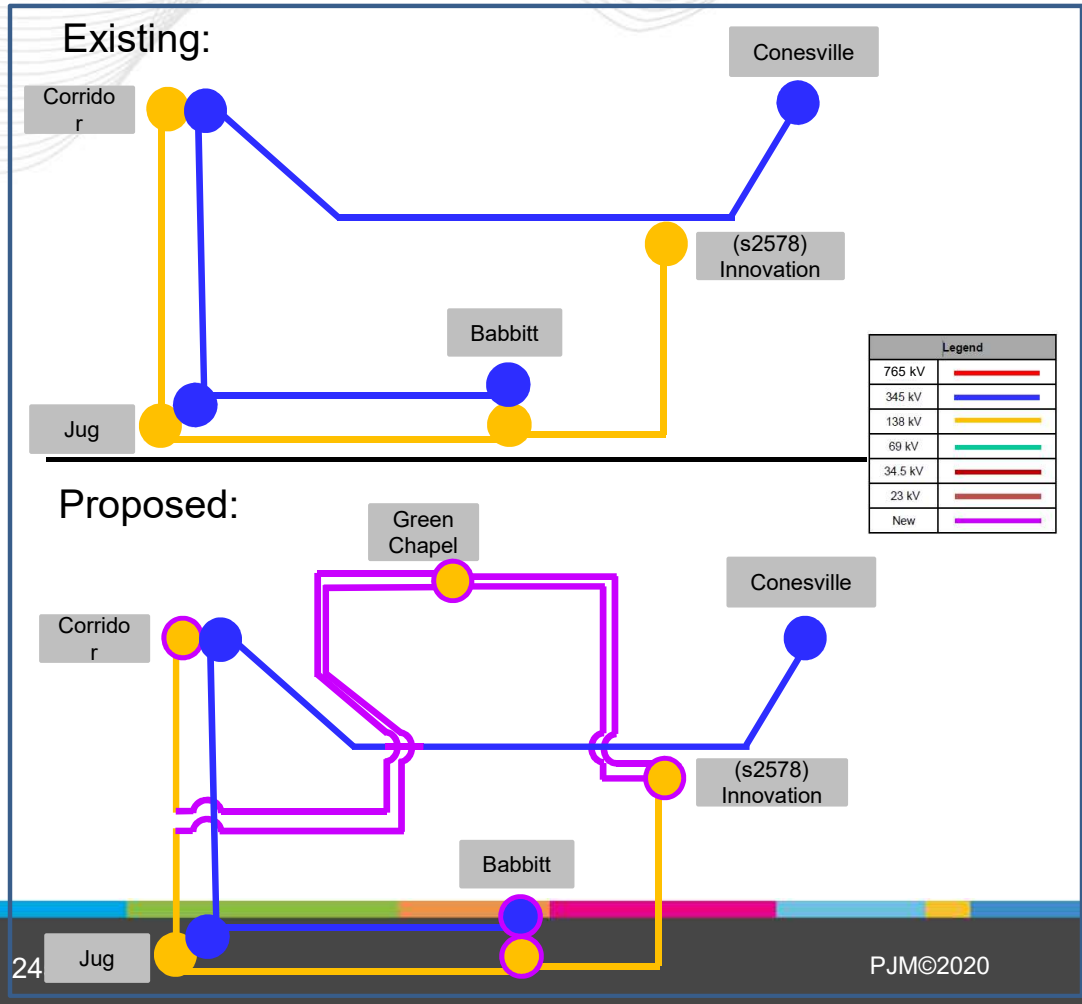
Alternatives Considered:

No other viable alternatives considered given the location and timing of the service request.

Projected In-Service: 5/31/2024

Project Status: Scoping/Engineering

Model: 2027 RTEP



AEP Transmission Zone M-3 Process
Jug Station Capacity Expansion

Need Number: AEP-2022-OH062

Process Stage: Solutions Meeting 12/16/2022

Previously Presented:

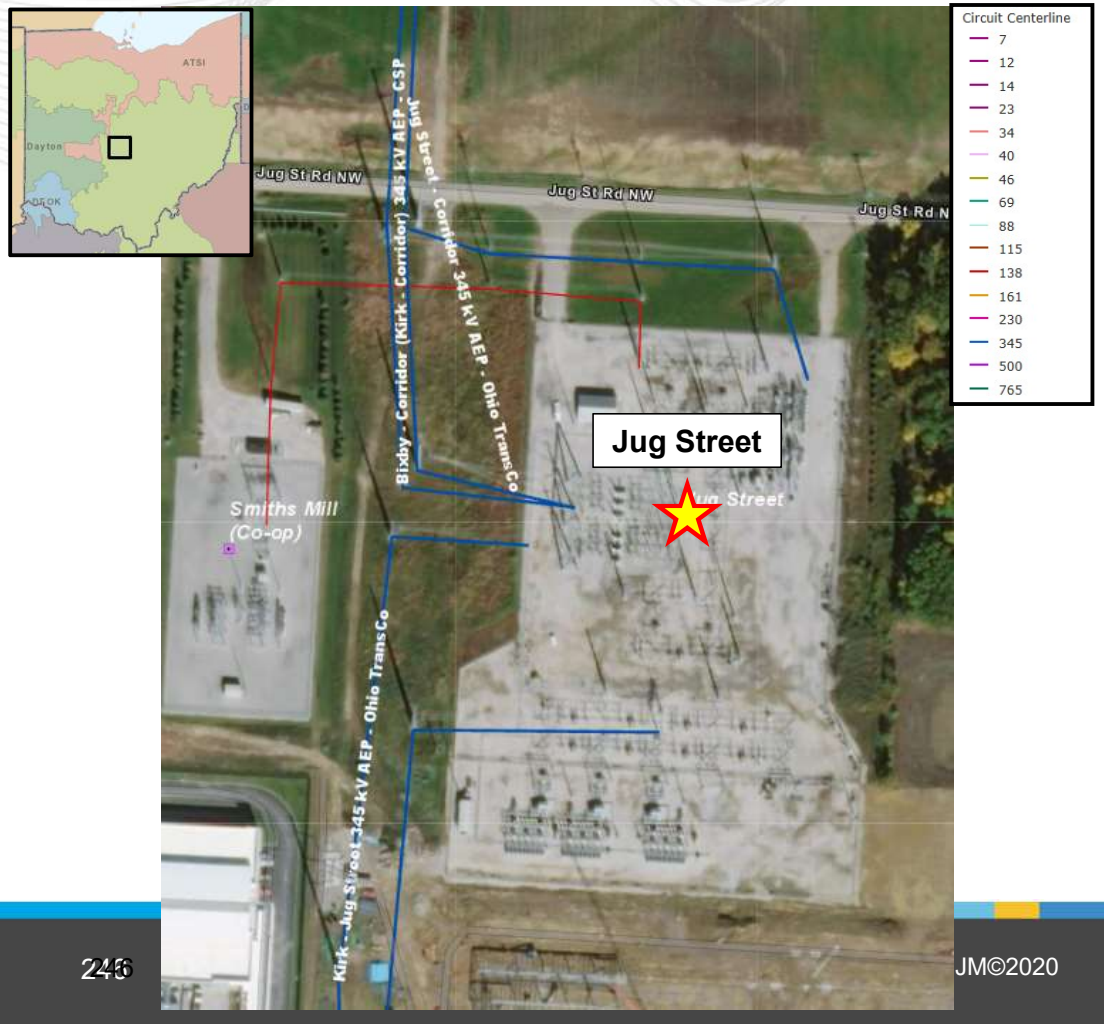
Need Meeting 08/19/2022

Project Driver: Customer Service

Service Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

AEP Ohio has requested to add capacity at Jug Street station, due to continuous load growth in the area. The anticipated peak load is approximately 58 MVA. The requested in-service date is June 2024.



AEP Transmission Zone M-3 Process
Jug Station Capacity Expansion

Need Number: AEP-2022-OH062

Process Stage: Solutions Meeting 12/16/2022

Proposed Solution:

- Jug station 138 kV: Install 1 - 138kV 80kA 4000A circuit breaker in the open F position on the ring bus to accommodate a new distribution transformer at the station. **Cost: $0.678 M**

Alternatives Considered:

- No cost-effective alternatives identified considering the location and timing of the request.

Projected In-Service: 06/01/2024

Project Status: Scoping/Engineering

Model: 2027 RTEP

Existing:

Proposed:

AEP Transmission Zone M-3 Process
Findlay, Ohio

Need Number: AEP-2022-OH065
Process Stage: Solutions Meeting 12/16/2022
Previously presented: Need Meeting 9/16/2022

Supplemental Project Driver:

Customer Service

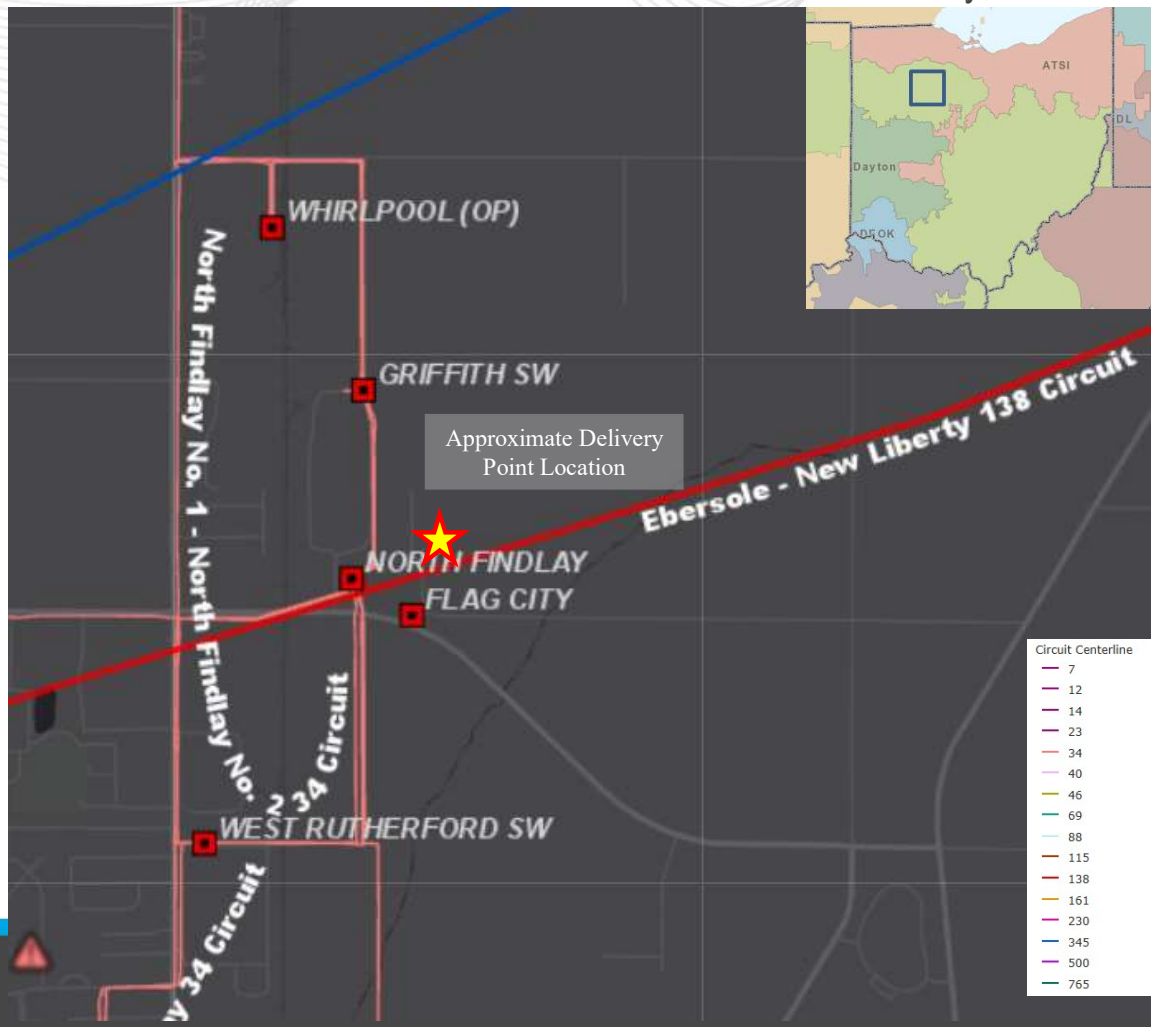
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site east of AEP's North Findlay site in Findlay, Ohio
- The customer has indicated an initial temporary load of 30MVA.
- The customer has requested an ISD of 12/23/2022



AEP Transmission Zone M-3 Process
North Findlay Customer Temp Service

Need Number: AEP-2022-OH065
Process Stage: Solutions Meeting 12/16/2022

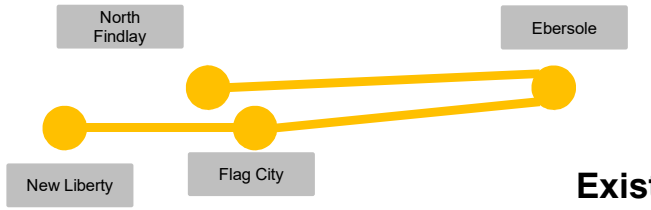
Proposed Solution:

- Install a hard tap on the North Findlay - Ebersol circuit near the customer's station. Install in-line dead ends to support sectionalizing around this hard tap. From the Hard tap structure install one span of radial 138kV line to the customer's station.

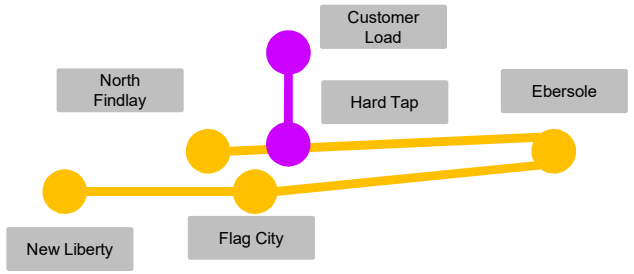
Total Estimated Transmission Cost: $0 (This work is fully reimbursable)

Alternatives Considered:
Due the accelerated in service date and temporary nature of the this load a hard tap is the most cost-effective temporary service plan.
Model: PJM 2027 RTEP case
Projected In-Service: 03/17/2023
Project Status: Scoping

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



Existing



Proposed

EKPC Transmission Zone M-3 Process
Hardin County New Customer Load

Need Number: EKPC-2022-007

Process Stage: Solutions Meeting – January 20, 2023

Previously Presented:

Need Meeting – December 16, 2022

Supplemental Project Driver:

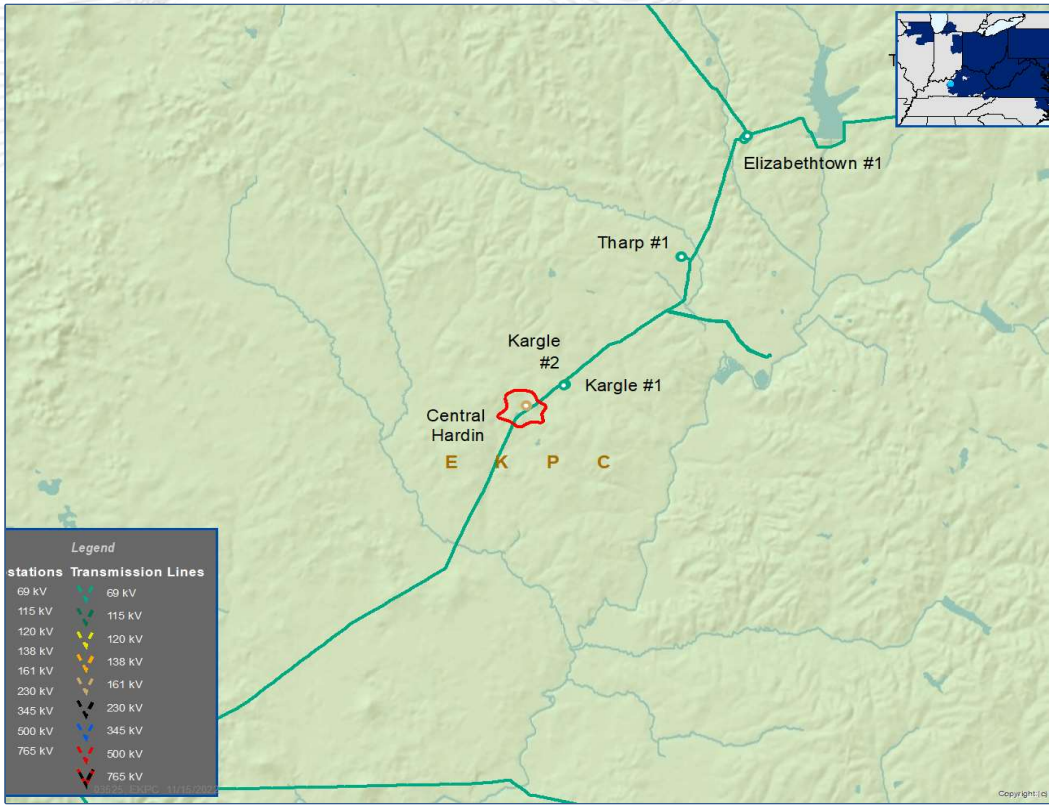
Customer Service

Specific Assumption Reference:

EKPC Assumptions Presentation Slide 15

Problem Statement:

A new customer has requested a new delivery point for a peak demand of 15.0 MW by 12/31/2023. The new delivery point is located in Hardin Co, KY adjacent to EKPC's Central Hardin 138/69 KV substation. The existing distribution infrastructure is not capable of serving this request.



Model: N/A

Need Number: EKPC-2022-007

Process Stage: Solutions Meeting – January 20, 2023

Proposed Solution:
Build a new 69-13.2kV 18/24/30 MVA distribution substation at Central Hardin.

Distribution Cost: $3.62M

Transmission Cost: $0.0M

Ancillary Benefits:

- None

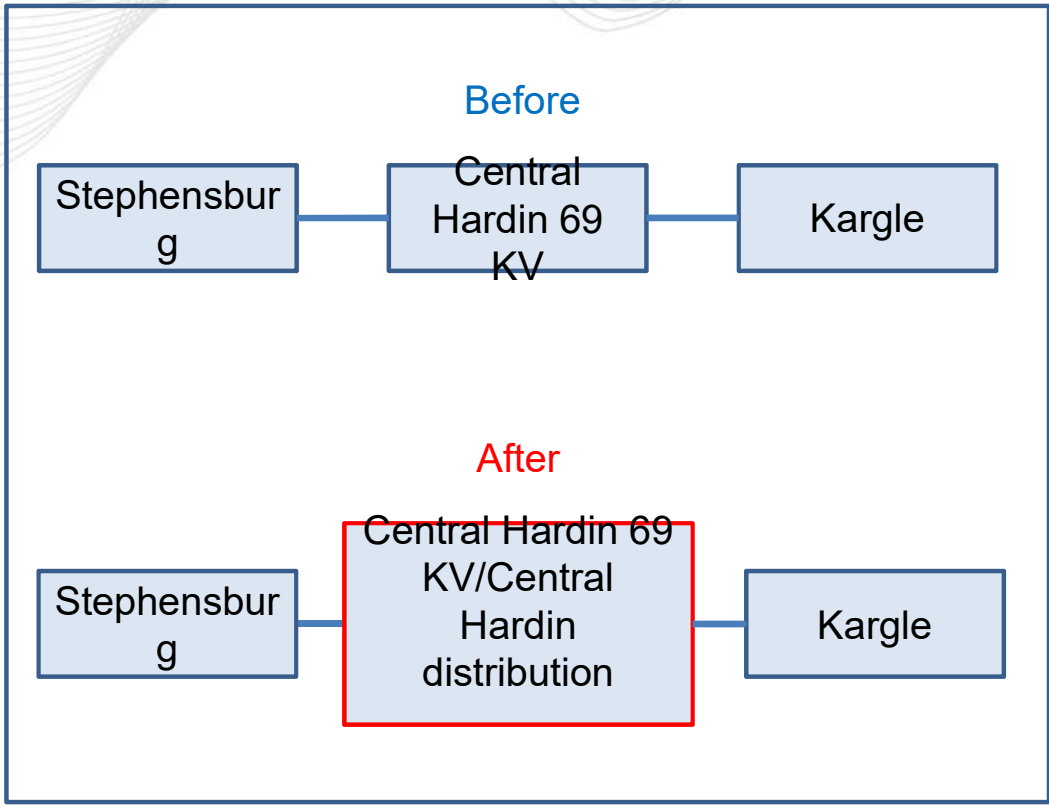
Alternatives Considered:

- None

Projected In-Service: 12/31/2023

Project Status: Engineering

Model: N/A



EKPC Transmission Zone M-3 Process
Richmond-Berea Area

Need Number: EKPC-2022-008

Process Stage: Solutions Meeting – January 20, 2023

Previously Presented:

Need Meeting – December 16, 2022

Supplemental Project Driver:

Customer Service

Specific Assumption Reference:

EKPC Assumptions Presentation Slides 15

Problem Statement:

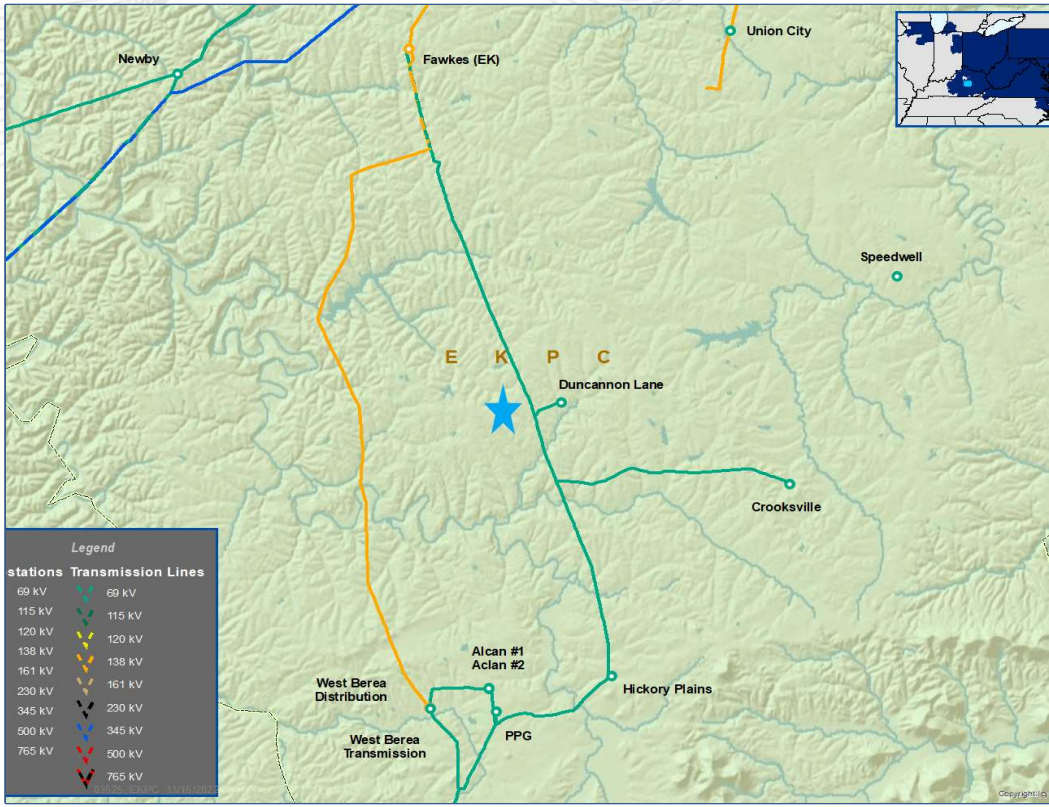
EKPC's Economic Development department has had large number of greater than 50 MW+ peak demand potential industrial facilities that have expressed interest in a new industrial site located in Madison County, KY. This industrial site is adjacent to Interstate 75 and the Duncannon Lane 69 KV tap point, indicated by blue mark on the map.

Due to the attractive geographic location of Richmond and Berea, and the availability of land in the area that can be developed for large industrial customers, there is a high likelihood for an increase in the electrical demand in the area.

The existing transmission system in the area can not serve a load of this magnitude. The Fawkes-West Berea 69 KV circuit has reached its maximum available capacity level and is highly depended upon the 138 KV connections in the area.

Alternatives will be developed to provide service to the site to adequately and reliably serve a large amount of load.

Model: N/A



Need Number: EKPC-2022-008

Process Stage: Solutions Meeting – January 20, 2023

Proposed Solution:

Modify the scope of (b3762) the Fawkes-Duncannon Lane Tap (7.2 mile) single-circuit 69 KV rebuild to rebuild this line as a double-circuit 138 KV & 69 KV line.

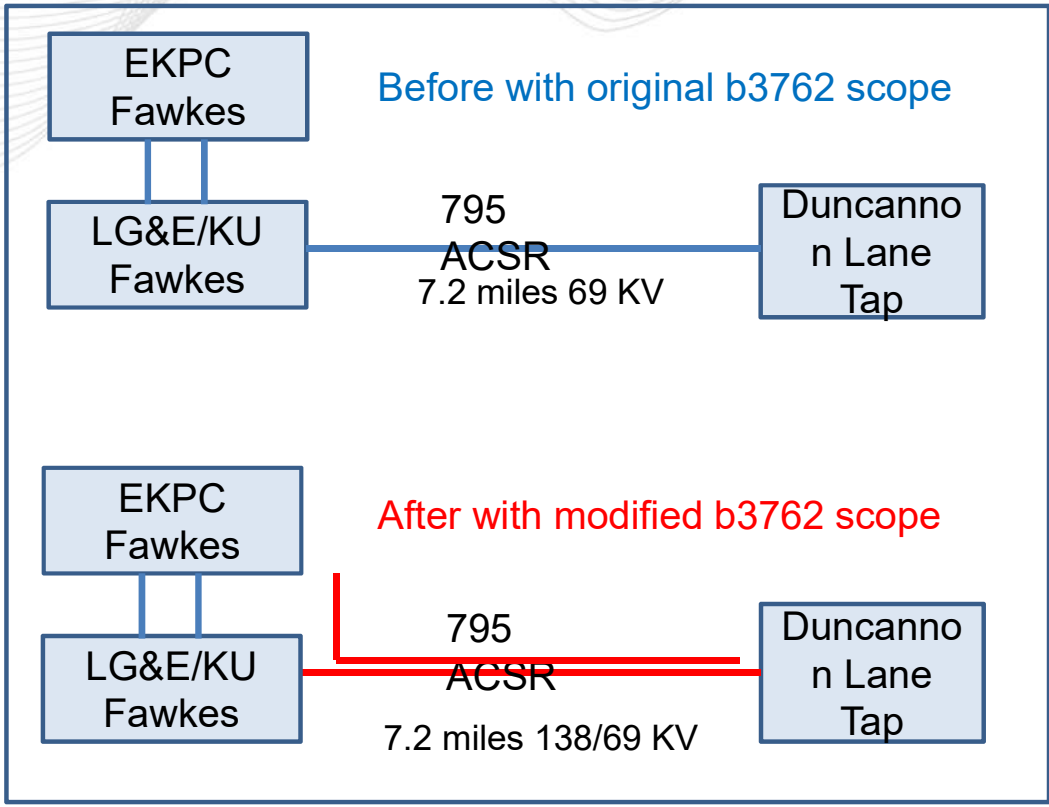
This will allow EKPC to take advantage of the existing rights-of-way to establish a new 138 KV path, as well as the efficiency of constructing both circuits simultaneously. EKPC plans to energize the 69 KV portion of the double-circuit as the replacement for the existing 69 kV line between the KU Fawkes and Duncannon Lane Tap terminating points to align with (b3762). The 138 KV portion of the double-circuit would not be terminated at either end until load growth, other future system changes in the area, or increased operational/reliability concerns drives the need for the 138 KV circuit to be connected to the system.

Distribution Cost: $0.0M
Transmission Cost: $10.5M

This is the estimated incremental cost of modifying the scope of the rebuild from a single-circuit 69 kV line to a double-circuit 138 & 69 kV line. The estimated total cost of this proposed project and (b3762) is $19.0M.

Ancillary Benefits:

- Unlike alternatives considered, EKPC will be able to terminate the new 138 KV circuit at each end relatively expediently when needed to provide additional support to the area, either for loads connecting to the existing 69 KV system or for a large load that would be served at 138 KV transmission voltage, or if EKPC determines that operational and/or reliability needs necessitate that the circuit should be energized.



Need Number: EKPC-2022-008

Process Stage: Solutions Meeting – January 20, 2023

Proposed Solution:

Modify the scope of (b3762) the Fawkes-Duncannon Lane Tap (7.2 mile) single-circuit 69 KV rebuild to rebuild this line as a double-circuit 138 KV & 69 KV line.

Alternatives Considered:

Alternative 1 – Build a new 138 KV transmission station ("Madison County") with associated breakers near the Duncannon Lane Tap location for termination of the new 138 KV (14.5 mile) transmission line from a new 138 KV switching station at Union City.

Distribution Cost: $0.0M
Transmission Cost: $32.9M

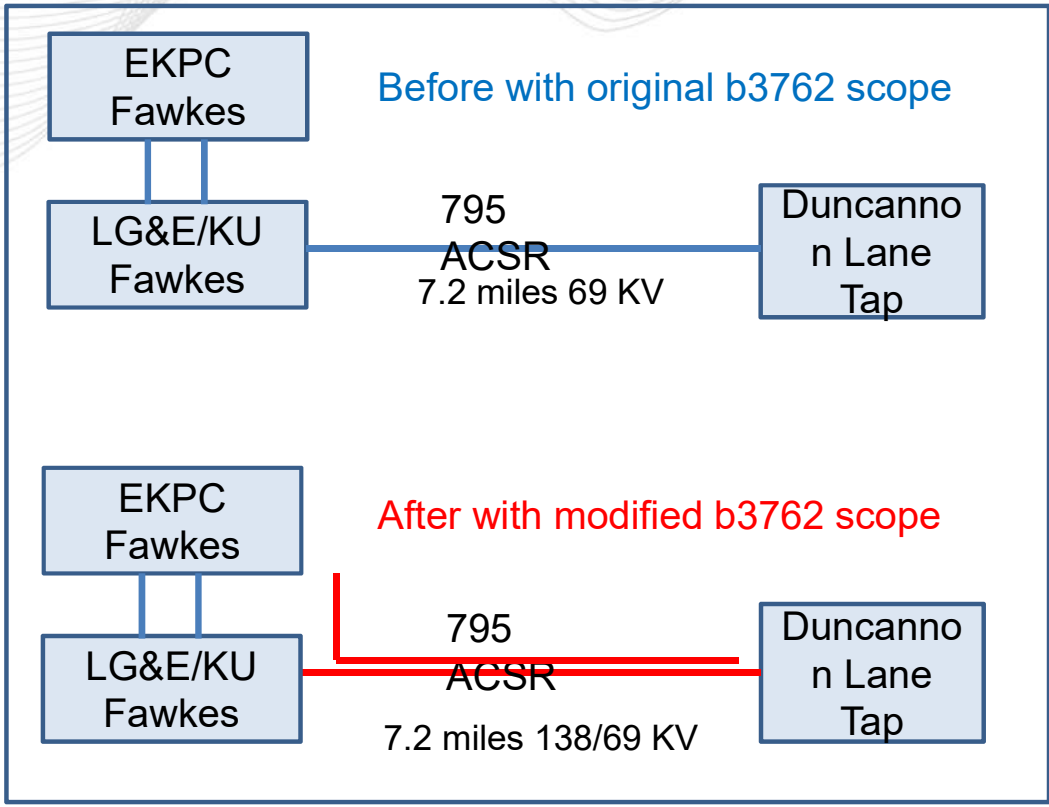
Alternative 2 – Build a new 138 KV transmission station ("Madison County") with associated breakers near the Duncannon Lane Tap location for termination of the new 138 kV (9.7 mile) line from Newby. Rebuild one of the two 11.1 mile double circuit Dale-Newby 69 KV lines as a 138 kV line using 795 MCM ACSR. Add necessary 138 kV terminal equipment at the Dale substation for termination of the new Dale-Newby-Madison County 138 kV line.

Distribution Cost: $0.0M
Transmission Cost: $29.6M

Projected In-Service: 12/31/2024

Project Status: Engineering

Model: N/A



AEP Transmission Zone M-3 Process
Columbus, Ohio

Need Number: AEP-2019-OH020

Process Stage: Solutions Meeting 1/20/2023

Previously Presented: Need Meeting 04/23/2019

Supplemental Project Driver:

Equipment Condition/Performance, Operational Flexibility and Efficiency, & Customer Service

Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs

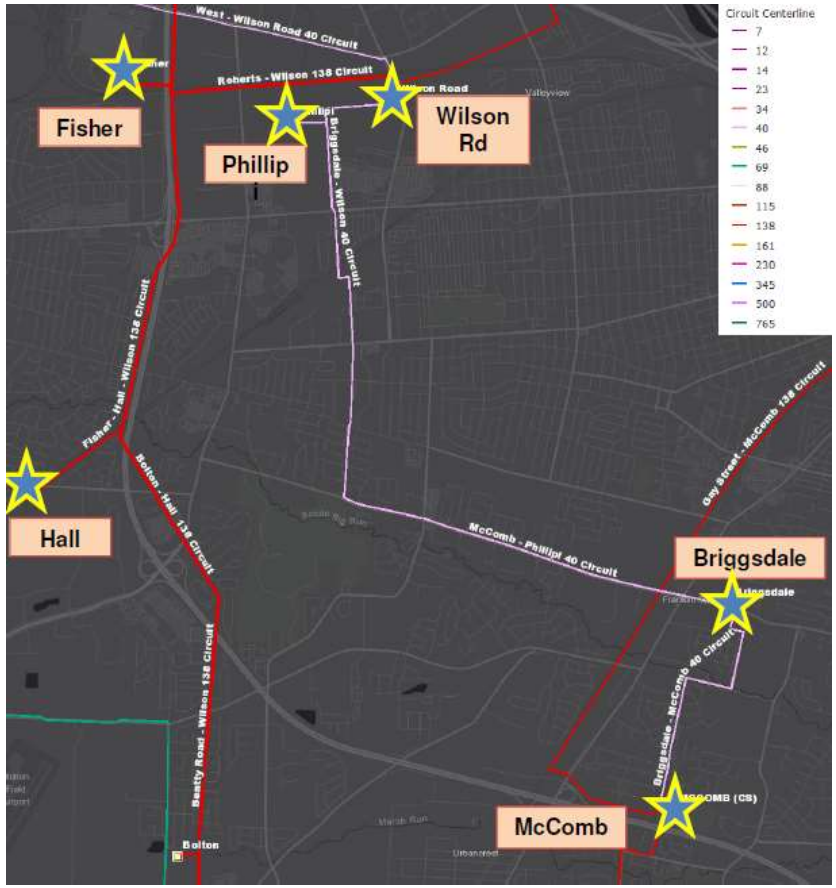
Problem Statement:

Equipment Material/Condition/Performance/Risk:

- The 40kV system is an obsolete voltage class and as a result is difficult to obtain replacement parts.

Wilson Road Station

- 1 – 40kV: CB-34 has 55 Fault Operations
- 1 – 40kV: CS-AA is an SF6 2030-69 model circuit switcher, which has been identified as needing replacement due lack of to spare part availability, historical reliability, and lack of vendor support.
- 3 – 40kV: (CBs 30,35, & 36) & 8 - 138kV: (CBs 2-9) are oil type breakers.
  - 7-138kV: (CBs 2-7) 1974 vintage FK oil breakers.
  - 2-138kV: (CBs 8 & 9) 1967 & 1968 vintage GM oil breakers.
  - 138 kV CB-4 has 17 Fault Operations.
  - 195 – Electromechanical relays: EM relays have limited spare part availability, a lack vendor support, no SCADA functionality, and no fault data collection ability.
- 13 – Microprocessor relays: The identified relays are obsolete, no longer supported, or have been identified as high risk of failures.
- 4 – Static relay: this type of relay has significant limitations with regard to fault data collection and retention.



AEP Transmission Zone M-3 Process
Columbus, Ohio

Need Number: AEP-2019-OH020

Process Stage: Solutions Meeting 1/20/2023

Problem Statement Continued:

McComb Station

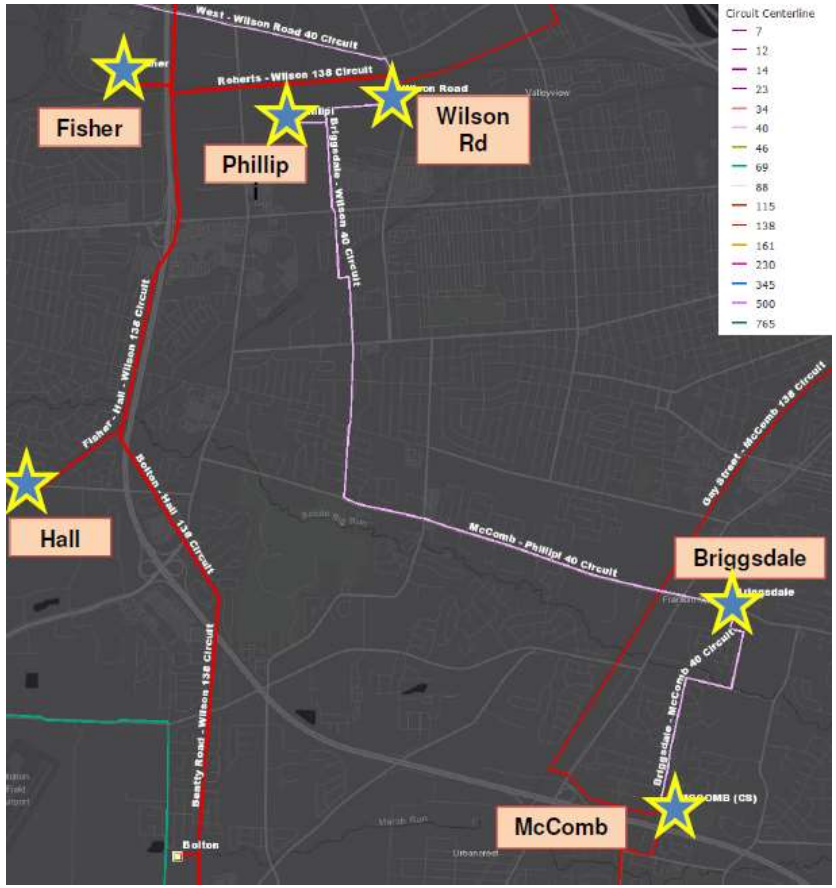
- 5 – 46kV: (CBs 41-45) oil type breakers
  - Fault Operations: (CB-42 = 15 & CB-43 = 26)
- 1 – 138kV CS-CC (Mark V): This model of switcher has been identified for replacement due to lack of spare part availability, historical reliability, and lack of vendor support. It also has 16 fault operations.
- 117 – Electromechanical relays: EM relays have limited spare part availability, a lack vendor support, no SCADA functionality, and no fault data collection ability.
- McComb Station utilizes either ground switch/MOAB's or MOAB's for high side transformer protection.

Operational Flexibility and Efficiency:

- There is currently a 3-terminal 138 kV hard tap between Wilson, Fisher Rd, and Hall Stations. 3-terminal lines are problematic because they limit sectionalizing and can cause mis-operations and over tripping. A single breaker failure will result in the loss of 5 transformers.

Customer Service:

- AEP-Ohio plans to replace the Briggsdale 40kV Station with a new Reaver 138 kV Station (s1606), which leaves Phillipi (customer owned station) on the local 40 kV system.



AEP Transmission Zone M-3 Process
Seneca County, Ohio

Need Number: AEP-2019-OH020

Process Stage: Solutions Meeting 1/20/2023

Proposed Solution:

- Install a new seven breaker 138 kV ring bus utilizing 3000A 63kA breakers to replace the existing Wilson Rd ring bus. Retire the 40kV equipment at Wilson Rd. **Estimated Cost: $8 M**
- Rebuild the existing 0.7 miles triple circuit line between structure 47 and Wilson Rd as double circuit using 1033 ACSR conductor. The third circuit that creates a three terminal point between Hall, Fisher, and Wilson will be permanently retired. The Hall Road – Fisher 138 kV circuit will remain. **Estimated Cost: $2.1 M**
- Convert Phillipi station to 138kV service to allow for the elimination of the 40kV system between McComb and Wilson Rd. stations. Majority of the station was originally built to 138 kV standards. **Estimated Cost: $0.51 M**
- Build a new 0.7 mile 138kV double circuit line to serve Phillipi at 138 kV off the Beatty – Wilson circuit. **Estimated Cost: $1.4 M**
- Retire the 5.45 mile 40kV circuit between Wilson and McComb. **Estimated Cost: $1.1 M**
- The 40kV breakers at McComb station are no longer needed once Phillipi is converted to 138kV and will be retired. **Estimated Cost: $0.59 M**

Total Estimated Transmission Cost: $13.7 M

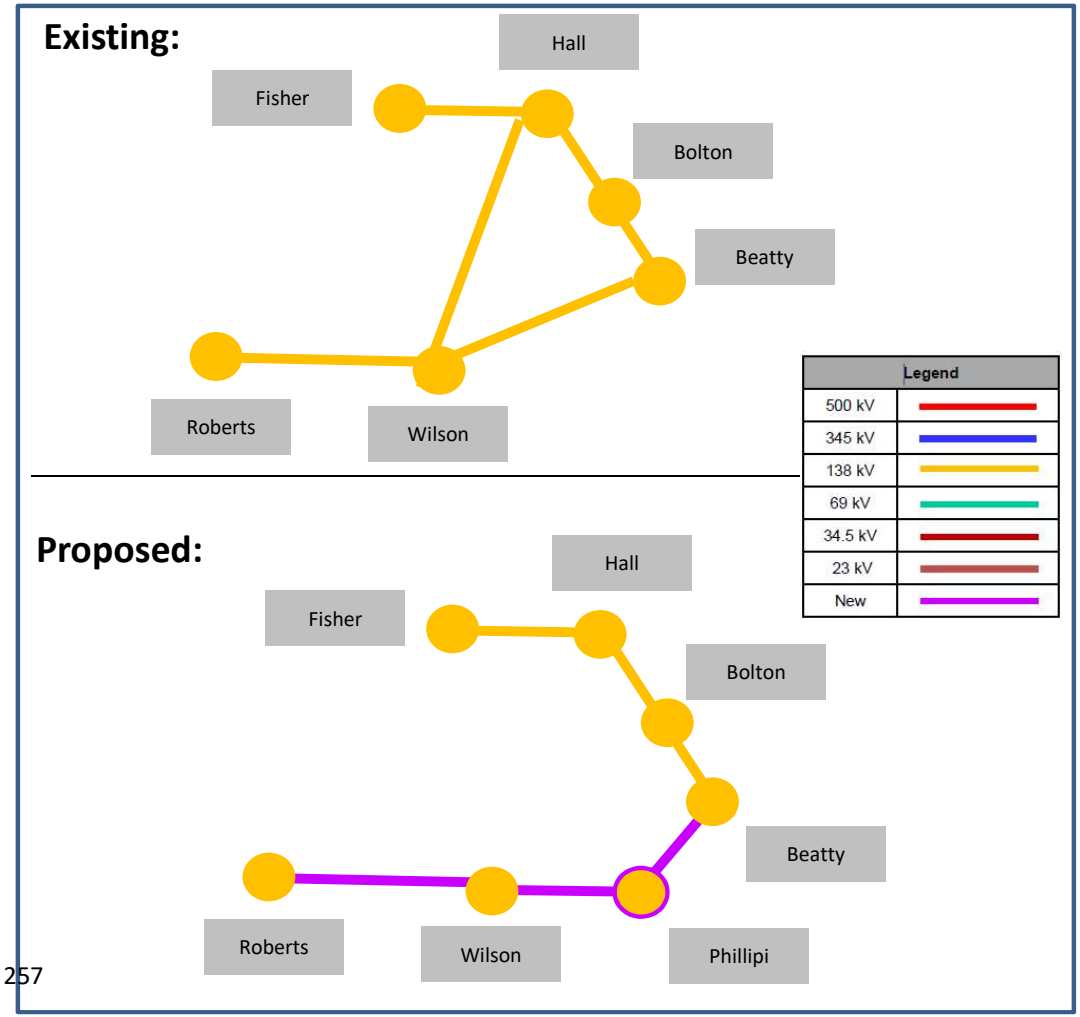
Alternatives Considered:

Rebuilding Wilson station in the clear was evaluated, but was determined to not be cost effective in part due to the significant cost of land in the highly congested urban area surrounding the station.

A breaker and a half configuration for the high side at Wilson was also evaluated, but was not feasible from a constructability perspective given the limitations of the existing station footprint.

Projected In-Service: 6/30/2025

Project Status: Engineering



AEP Transmission Zone M-3 Process
Natrium, West Virginia

Need Number: AEP-2021-OH016

Process Stage: Solution Meeting 01/20/2023

Previously Presented: Need Meeting 05/21/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Transmission Circuit Breakers (69 kV): C, E, & L

Distribution Circuit Breaker (12kV): P

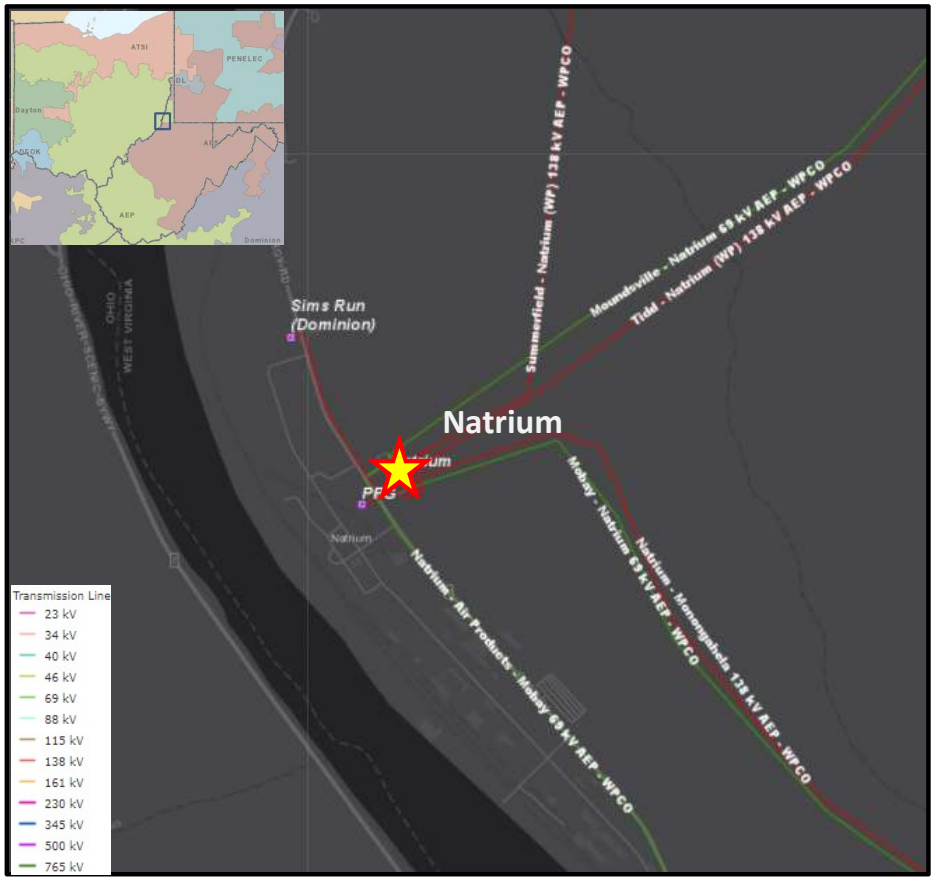
- Breaker Age:
  - 1960'-70's vintage
  - Interrupting Medium: (Oil)
- Fault Operations:
  - Number of Fault Operations: C: 2, E: 28, L: 8, P: 67
- These breakers are oil filled without oil containment; oil filled breakers have much more maintenance requirements due to oil handling that their modern, SF6 counterparts do not require.
- The 69kV breakers have experienced belt, pump, and motor failures in recent years.

Relaying:

- Currently, 102 of the 134 relays (76% of all station relays) are in need of replacement. All 102 of these are of the electromechanical and static type which have significant limitations with regards to spare part availability, fault data collection, and SCADA functionality. In addition, these relays lack of vendor support.
- Both 138kV bus 1 & 2, and 69kV bus 1A & 1B contain electromechanical bus protection relays without redundancy

RTU:

- The existing RTU installed at Natrium Substation are a legacy GE D200MEII/Ethernet unit and a Cooper SMP 16/CP Unit. The GE D200MEII/Ethernet unit is now beyond its warranty period, with limited to no spare parts availability and no vendor support



AEP Transmission Zone M-3 Process
Natrium, West Virginia

Need Number: AEP-2021-OH016

Process Stage: Solution Meeting 01/20/2023

Previously Presented: Need Meeting 05/21/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Yard & Facilities:

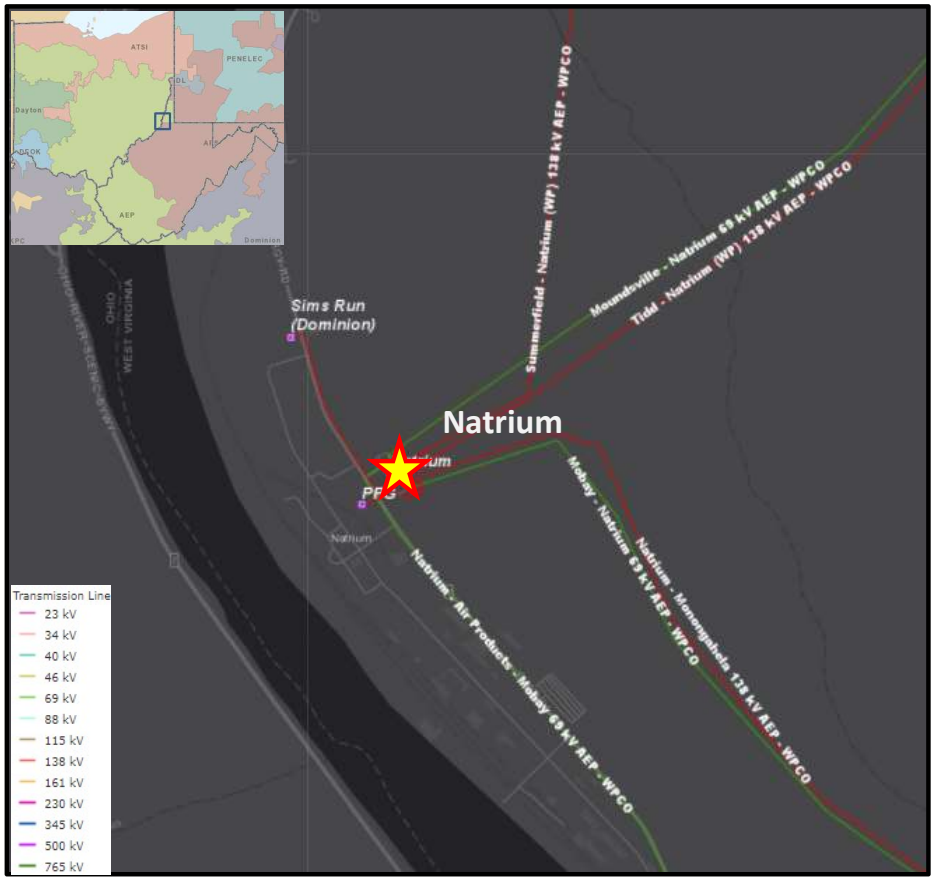
- The station contains two control houses. The older building (1947 vintage) has various issues: leaking roof, asbestos, access issues, broken HVAC, and completely full cable trenches.
- The station service for the 69kV & 12kV yard is from a corner-ground source, which is a safety concern.
- Yard cabinets and PT stands are heavily-rusted (adjacent to two chemical and industrial plants, leading to above-average contamination)

Electrical:

- 138kV bus 1 and 2, along with 69kV bus 1A & 1B are made with copper conductors of questionable structural integrity.
- Bus PT's have various oil leaks
- The 69kV station area is made of steel lattice that is heavily-rusted

Operational Concerns:

- Transformer #1 has no high-side fault-interrupting device, and instead requires clearing the entire 138kV bus 1 (4- breakers). Transformer #2 has the same issue, but has a future Baseline project to address.
- The single 138kV cap bank (29 MVAR) is undersized, due to the several large industrial customers served nearby. AEP Transmission Operations has requested an increase in MVAR size, or an additional cap bank, to better control real-time low voltages.



AEP Transmission Zone M-3 Process
Marshall County, West Virginia

Need Number: AEP-2021-OH036

Process Stage: Solution Meeting 01/20/2023

Previously Presented: Need Meeting 7/16/2021

Project Driver:

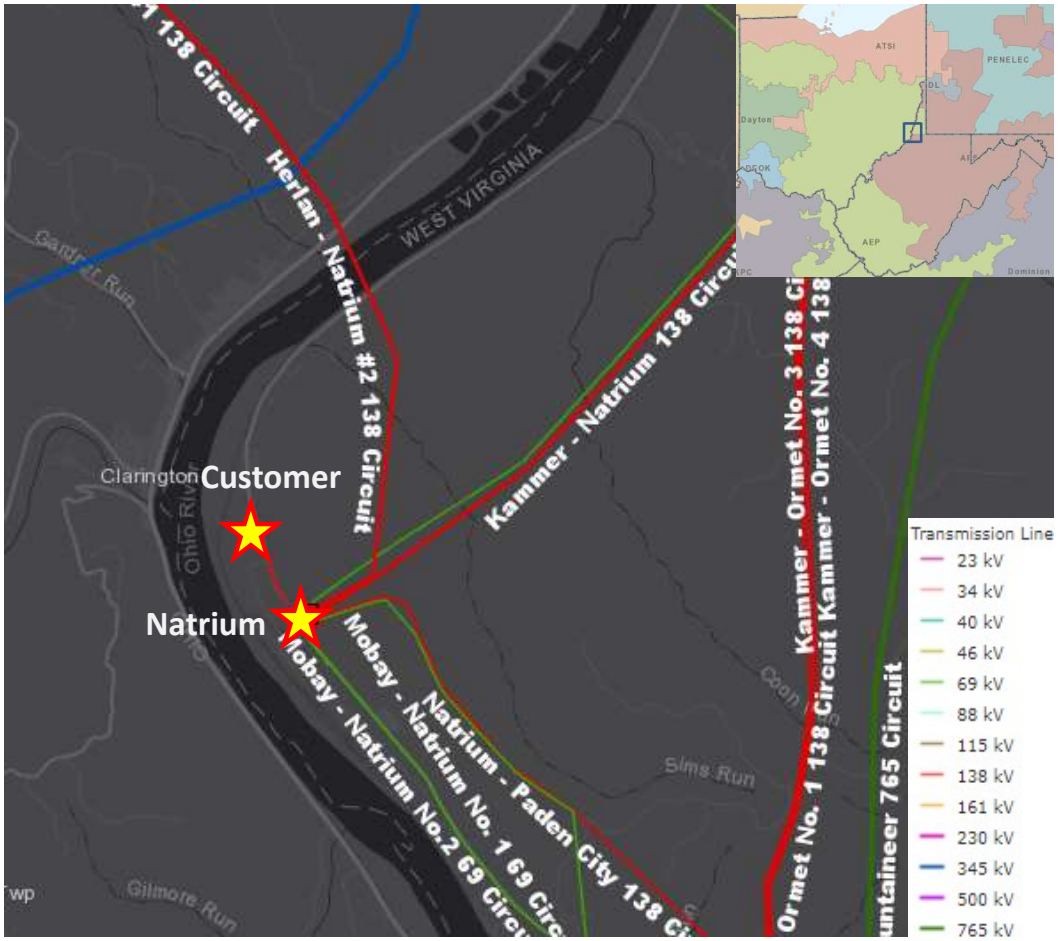
Operational Flexibility and Efficiency

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 14)

Problem Statement:

A 138kV transmission customer north of Natrium station is served via a 0.5-mile radial 138kV transmission circuit. The customer's operational peak demand is 132 MW (contract peak is 109 MW). The radial service presents single points of failure that could jeopardize reliability for the customer, which is one of the largest in West Virginia.



AEP Transmission Zone M-3 Process
Natrium Station Upgrade

Need Number: AEP-2021-OH016 and AEP-2021-OH036

Process Stage: Solution Meeting 01/20/2023

Proposed Solution:

Upgrade the Natrium 138-69kV station by completing the breaker-and-a-half design in the 138kV and 69kV portions of the station. Install a new control house in the 69kV yard and expand the newer 138kV control house. Remove the older control house and various 138kV & 69kV station structures. Install a 2nd 138kV capacitor bank (46 MVAR). $18.22 Million

Construct a new 138kV transmission line from Natrium to a customer station (0.5 mile), providing a 2nd source to the customer. $2.59 Million

Remote-end upgrades at Mobay 69kV station, to coordinate with the new fiber-based line relays at Natrium (2- 69kV circuits). A new transclosure will be installed to house the relays, RTU, and metering equipment. $1.26 Million

Total Transmission Cost: $22.07 Million

Alternatives Considered: Rebuild the 138kV & 69kV portion like-for-like in place, which may reduce project costs slightly. However, this is not a good long-term solution for a station as critical as Natrium. Keeping the straight bus design on the 138kV & 69kV at Natrium presents an increased chance of outages to customers and area circuits. In addition, it would be challenging and costly to try to rebuild in place, due to the lengthy and complex construction schedule. Building the 138kV & 69kV in-the-clear saves significant time and reduces safety hazards.

Ancillary Benefits: Greatly improves the operational and protection design of the station, by converting the 2- 138kV straight buses and 2- 69kV straight buses to a breaker-and-a-half design. This will improve the long-term reliability of the 138 & 69kV facilities served from Natrium, including several large industrial customers.

Projected In-Service: 12/1/2024

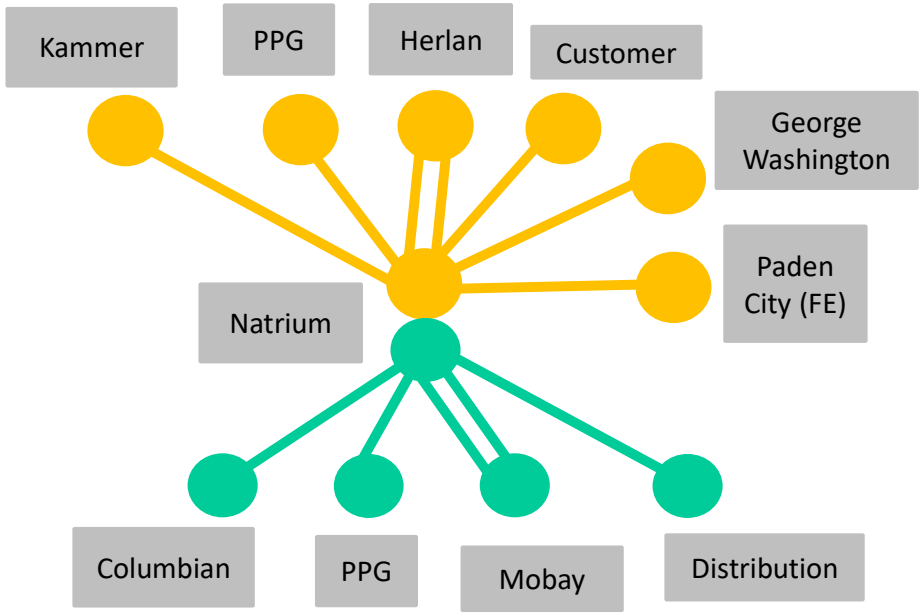
Project Status: Scoping

Model: 2027 PJM RTEP

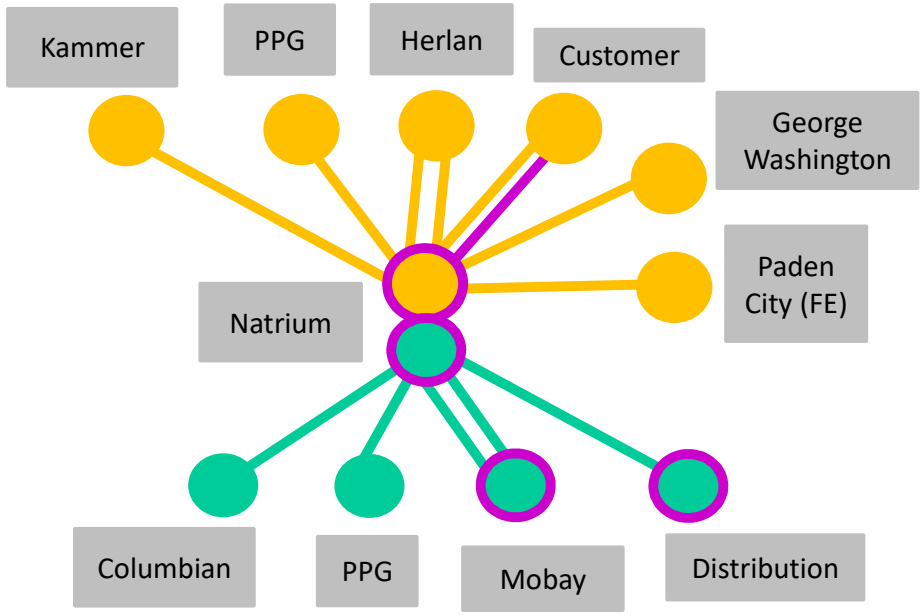
AEP Transmission Zone M-3 Process
Natrium Station Upgrade

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

Existing:



Proposed:

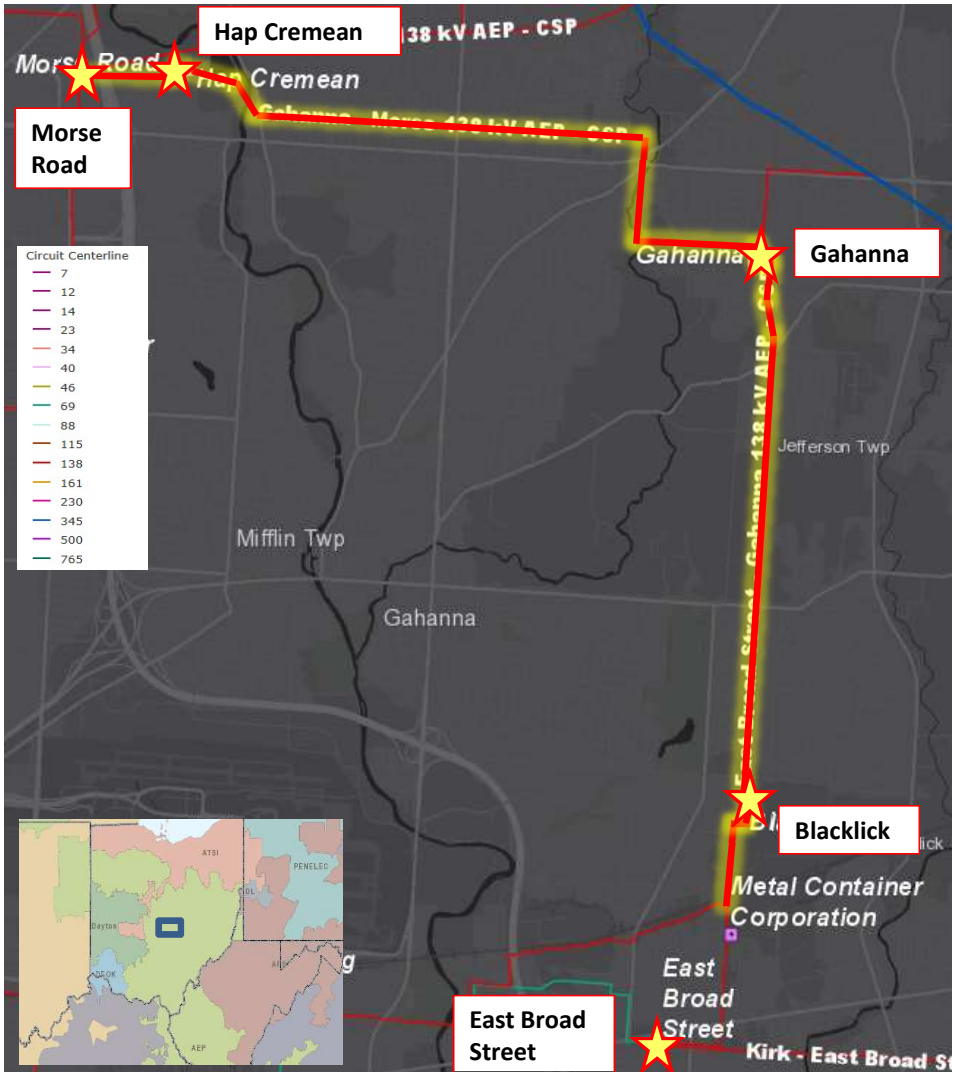


AEP Transmission Zone M-3 Process
Morse Road – Gahanna – East Broad Street 138 kV

Need Number: AEP-2021-OH057
Process Stage: Solution Meeting 1/20/2023
Previously Presented: Need Meeting 11/19/2021
Project Driver:
Equipment Material/Condition/Performance/Risk
Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (slide 13)
Problem Statement:
Equipment Material/Condition/Performance/Risk:

Gahanna-Hap Cremean (4.39 miles) & Hap Cremean-Morse Road (0.65 miles) 138 kV Single Circuit Line:

- The circuit conductor is 336 kCM ACSR 30/7 (1956)
- The structures are wood poles with vertical insulators (1950s).
- Currently, 36 structures have at least one open condition (36 out of 49), consisting of bowed crossarms, rot heart, rot top, rot pocket, woodpecker holes, insect damage and damaged poles
- The structures on the line do not meet the 2017 NESC Grade B loading criteria, AEP structural strength requirements, and the current ASCE structural strength requirements.
- The insulators on the line do not meet current AEP standards for CIFO and minimum leakage distance requirements.
- The grounding is inadequate for current AEP Standards. The shield angle on a typical tangent structure is inadequate for AEP current shield angle requirements.

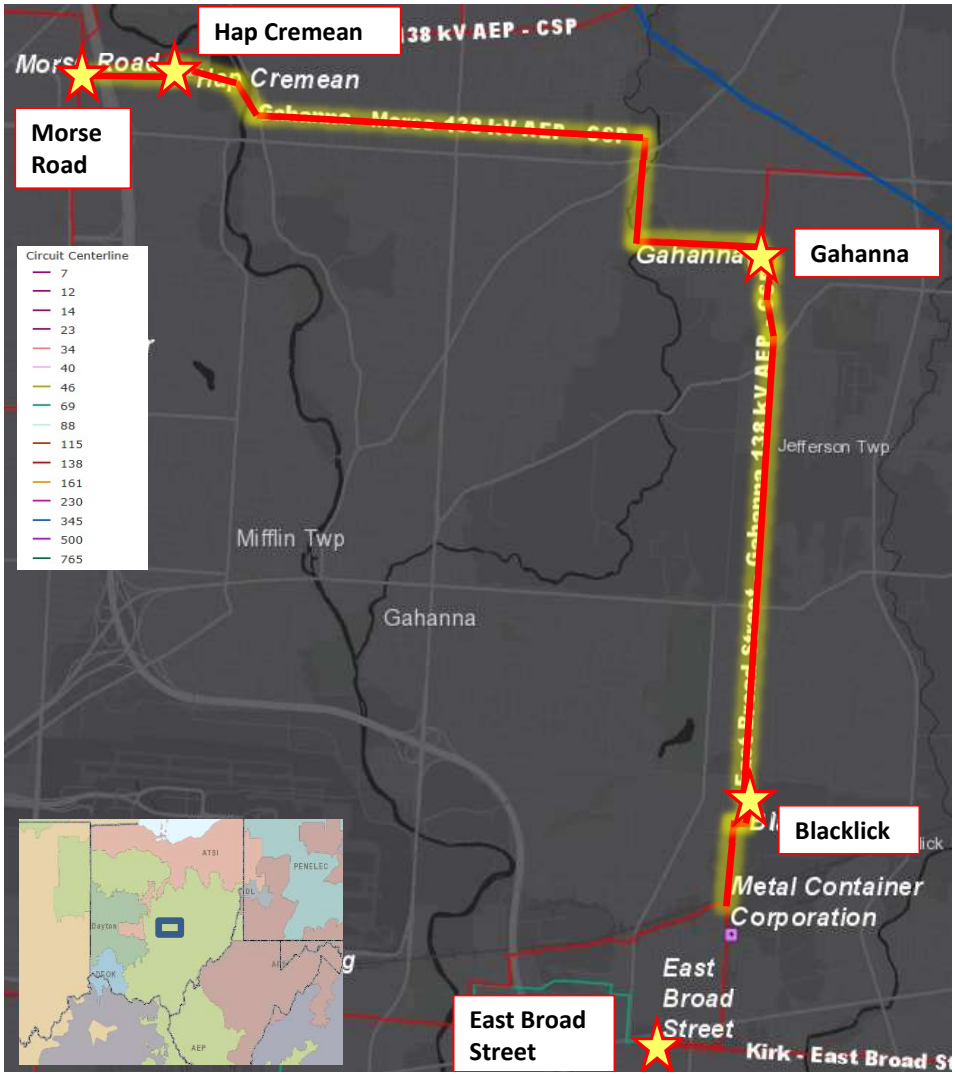


AEP Transmission Zone M-3 Process
Morse Road – Gahanna – East Broad Street 138 kV

Need Number: AEP-2021-OH057
Process Stage: Solution Meeting 1/20/2023
Previously Presented: Need Meeting 11/19/2021
Project Driver:
Equipment Material/Condition/Performance/Risk
Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (slide 13)
Problem Statement Continued:
Equipment Material/Condition/Performance/Risk:

Gahanna-Blacklick (3.32 miles) & Blacklick-East Broad Street (0.71 miles) 138 kV Single Circuit Line :

- The circuit conductor is primarily 336 kCM ACSR 30/7 (1952) with a short section of 636 kCM ACSR 26/7 (1952)
- The structures are wood poles with vertical insulators (1950s).
- Currently, there are 11 structures with at least one open condition (11 out of 37), consisting of rot top on poles and a crossarm and rot heart of a pole.
- The structures on the line do not meet the 2017 NESC Grade B loading criteria, AEP structural strength requirements, and the current ASCE structural strength requirements.
- The insulators on the line do not meet current AEP standards for CIFO and minimum leakage distance requirements.
- The grounding is inadequate for current AEP Standards. The shield angle on a typical tangent structure is inadequate for AEP current shield angle requirements.
- Line Historical Performance (2015-2020):
    - Blacklick - East Broad circuit, 2 momentary outages / 2 permanent outages.
    - Blacklick – Gahanna circuit, 3 momentary outages/ 1 permanent outage.



AEP Transmission Zone M-3 Process
Franklin County, Ohio

Need Number: AEP-2022-OH057

Process Stage: Solutions Meeting 1/20/2023

Proposed Solution:

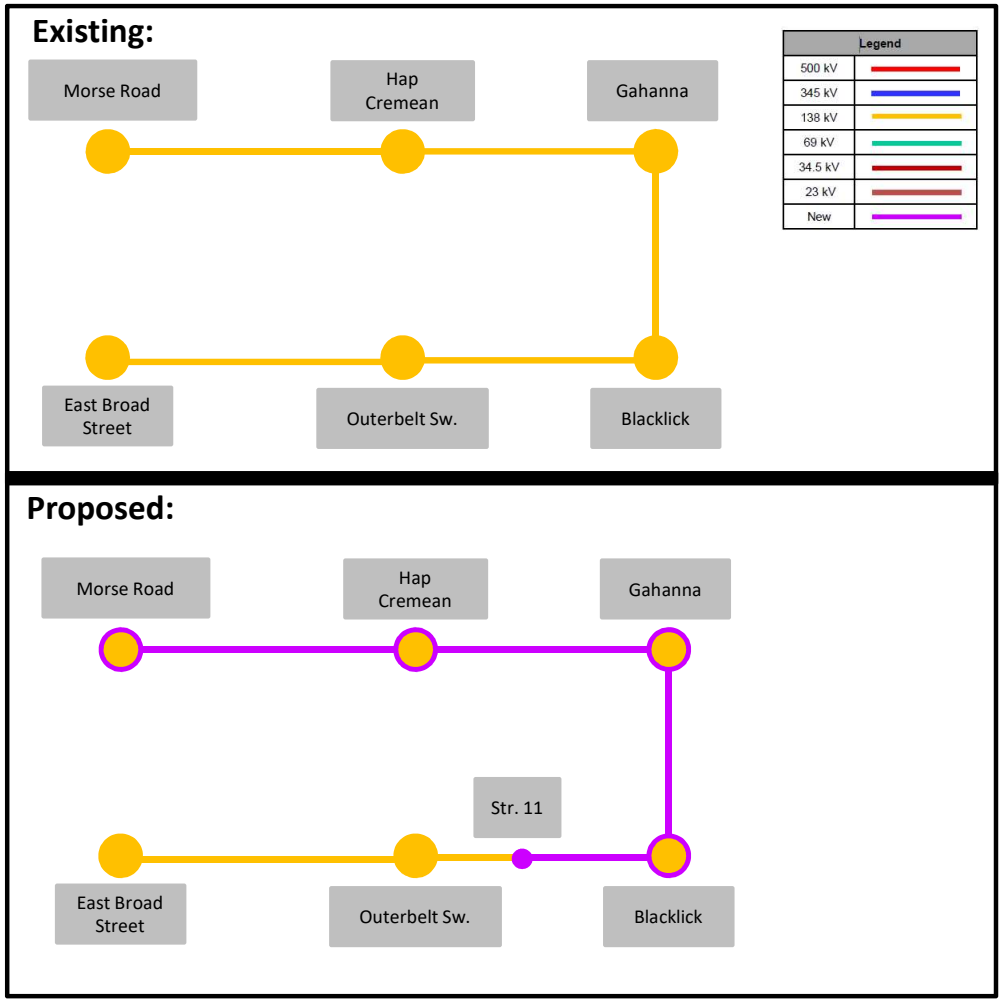
- Morse – Gahanna 138kV Line (Gahanna-Hap Cremean & Hap Cremean-Morse Road circuits): Rebuild the ~5.04 miles single circuit line with 795 kCM ACSR & install OPGW fiber on new line rebuild. **Estimated Cost: $ 13.62M**
- Gahanna – Blacklick 138kV Line: Rebuild the ~3.32 miles single circuit line with 795 kCM ACSR & install OPGW fiber on new line rebuild. **Estimated Cost: $ 11.68M**
- Blacklick Extension 138kV line: Partially rebuild the line from Blacklick to structure No. 11 ~0.71 mile single circuit line with 795 kCM ACSR & install OPGW fiber on new line rebuild. **Estimated Cost: $ 2.19M**
- Morse Road 138kV station: Telecom upgrades. **Estimated Cost: $ 0.025M**
- Hap Cremean 138kV station: Install remote end relay upgrades, CCVTs, telecom multiplexer, & remove wave trap. **Estimated Cost: $ 0.508M**
- Gahanna 138kV station: Install remote end relay upgrades, telecom multiplexer, & remove wave trap. **Estimated Cost: $ 0.497M**
- Blacklick 138kV station: Install remote end relay upgrades, CCVTs, Telecom Multiplexer, & remove wave trap. **Estimated Cost: $ 0.681M**
- East Broad Street 138kV station: Install remote end relay upgrades, telecom upgrades, CCVTs, & remove wave trap. **Estimated Cost: $ 0.482M**

Total Estimated Transmission Cost: $ 29.68M

Alternatives Considered: Considering the number and location of stations served from this line, no viable alternative was identified.

Projected In-Service: 6/1/2027 targeted ISD

Project Status: Scoping



AEP Transmission Zone M-3 Process
Dover, Ohio

Need Number: AEP-2022-OH031

Process Stage: Solution Meeting 01/20/2023

Previously Presented: Need Meeting 04/22/2022

Project Driver: Customer Service

Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

An industrial customer west of Dover, Ohio has requested new transmission service. The expected peak demand is 4 MW, with a requested in-service-date of ~~December 2022~~ mid-2023.

AEP Transmission Zone M-3 Process
West of Dover Customer Service

Need Number: AEP-2022-OH031

Process Stage: Solution Meeting 01/20/2023

Proposed Solution: Tap the East Dover – West Dover 69kV circuit to serve the new transmission customer.

- Install a 3-way motor-operated switch with SCADA functionality, to be called Purses Switch. $1.00 Million
- Extend a 0.4-mile radial 69kV transmission line to reach the customer's substation. $1.06 million
- Modify the East Dover-West Dover 69kV transmission line, to connect to the new 3-way switch. $0.81 Million

Total Estimated Transmission Cost: $2.87 Million

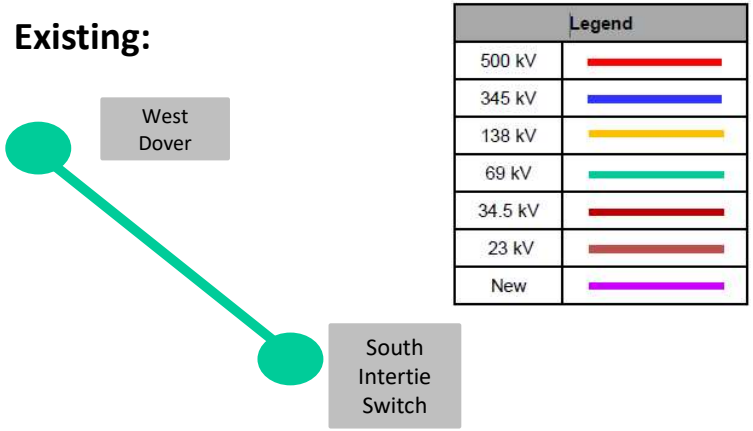
Alternatives Considered: Rather than install a 3-way switch pole, a new AEP 69kV substation with a box bay structure was also considered, which would also have contained the 69kV metering equipment. Estimated cost: $5M

Projected In-Service: 06/01/2023

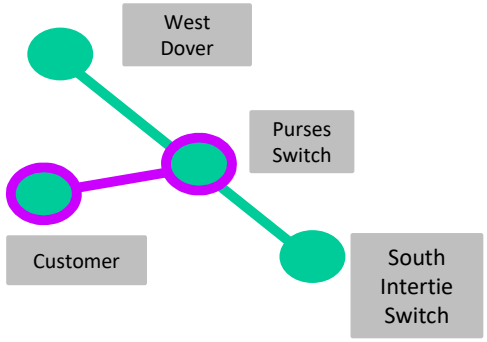
Project Status: Engineering

Model: 2027 PJM RTEP

Existing:



Proposed:



AEP Transmission Zone M-3 Process
Perry County, Ohio

Need Number: AEP-2022-OH032
Process Stage: Solution Meeting 1/20/2023

Previously Presented: Need Meeting 04/22/2022

Project Driver:

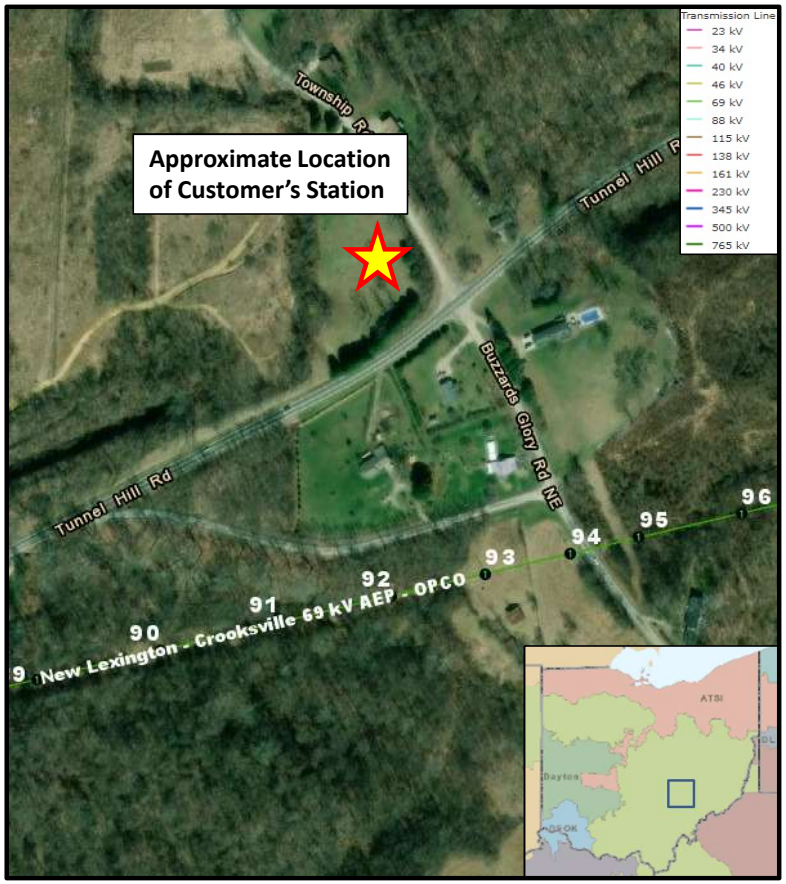
Customer Service

Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

A retail customer has requested a new 69 kV transmission service in Perry County, OH. The peak demand at this delivery point will be approximately 6 MW. They have requested an in service date of 12/1/2022.



AEP Transmission Zone M-3 Process
Perry County, Ohio

Need Number: AEP-2022-OH032

Process Stage: Solutions Meeting 1/20/2023

Proposed Solution:

- Install Buzzard Glory 3-way PoP MOAB switch off Crooksville – New Lexington 69 kV line **Estimated Cost: $ 0.95M**
- Cut-in to the Crooksville – New Lexington 69kV line and connect to the new phase over phase switch. **Estimated Cost: $ 0.66M**
- Construct ~0.2 miles of greenfield single circuit 69kV transmission line from new Buzzard Glory 3-way PoP 3-way MOAB Switch to the customer's station. **Estimated Cost: $ 0.52M**

Total Estimated Transmission Cost: $ 2.13M

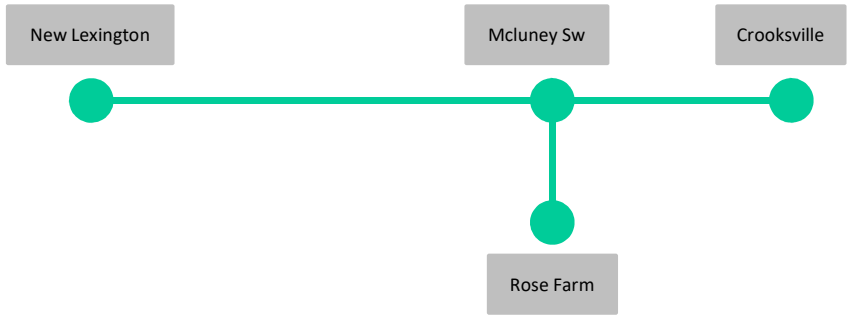
Alternatives Considered:

No other significant alternatives considered as the customer requested the delivery at a specific location.

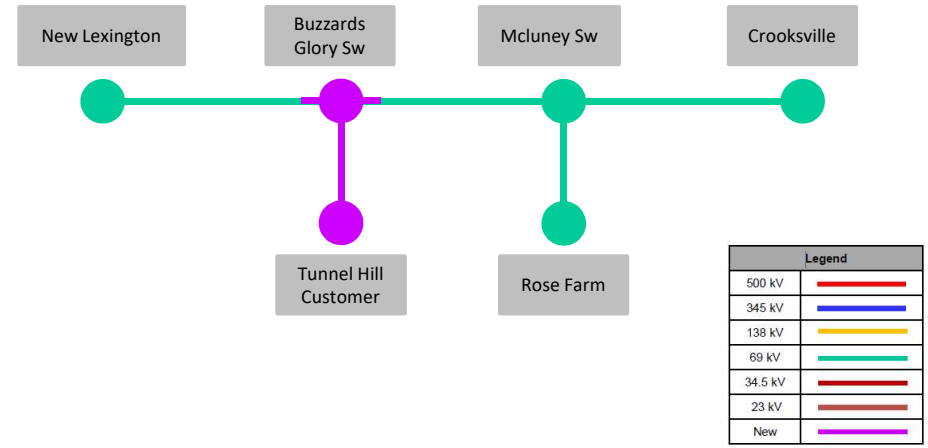
Projected In-Service: 5/18/2023 targeted ISD

Project Status: Scoping

Existing:



Proposed:



AEP Transmission Zone: Supplemental
Giles County, Virginia

Need Number: AEP-2020-AP003
Process Stage: Solutions Meeting 01/20/2023
Process Chronology: Needs Meeting 01/17/2020

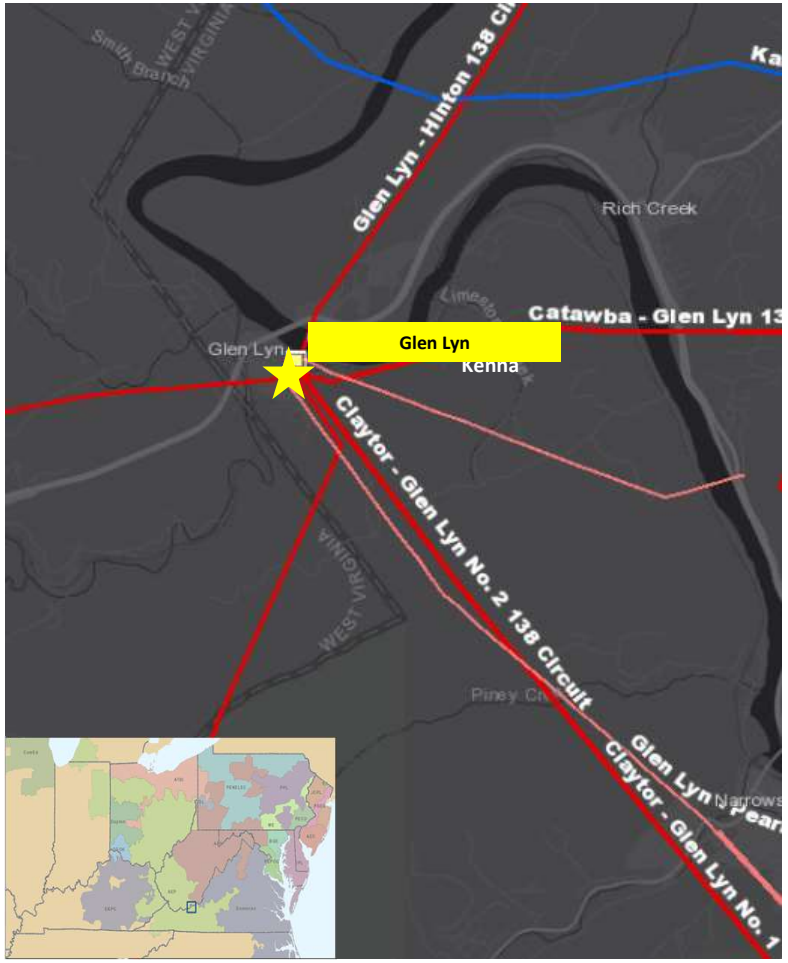
Supplemental Project Driver: Equipment Material/ Condition/Performance/Risk, Operational Flexibility and Efficiency

Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

Station Name: Glen Lyn

Circuit Breakers A, B, D, G, L & N (138 KV) Concerns:

- All of these breakers are 63 years old, oil filled without oil containment; oil filled breakers pose significant environmental risk associated with oil handling and leaks.
- Breakers A, B, D, L have experienced 55, 62, 11, 31 fault operations, respectively —exceeding manufacturer's recommended number of 10.
- Breakers A, B, D, G, and N are 5 of only 11 in the FGK-138-10000-3 model family remaining on the AEP system.
- Breaker L is 1 of 4 in the FGK-138-10000-7Y model family remaining on the AEP system.



AEP Transmission Zone: Supplemental
Giles County, Virginia

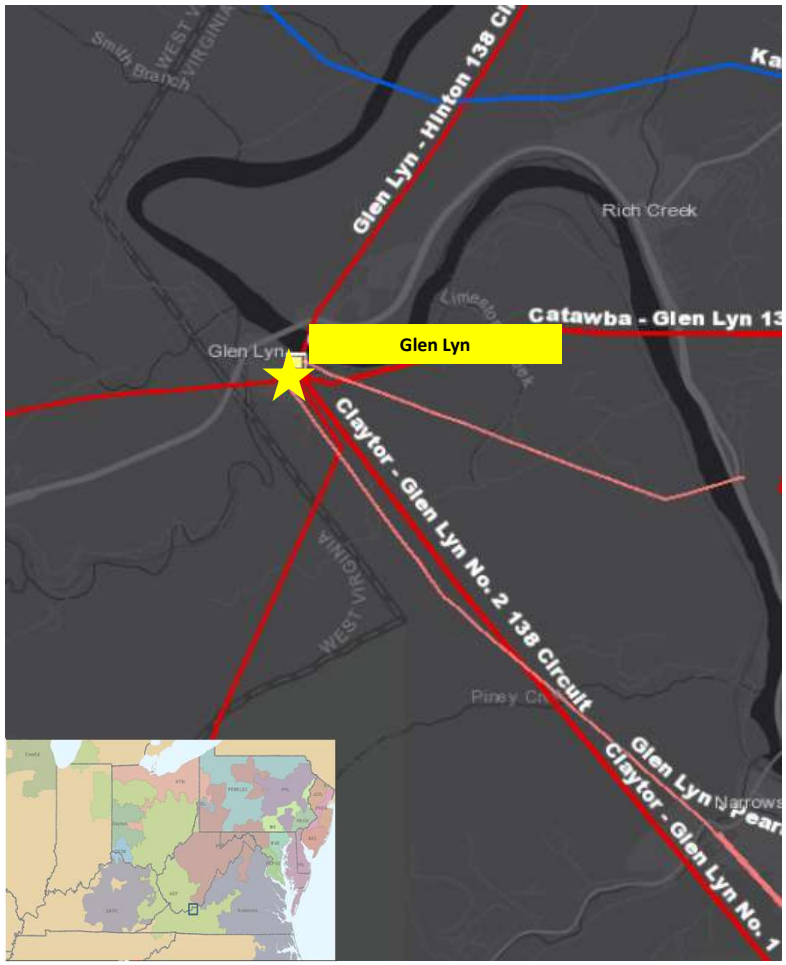
Station (continued)

Circuit Breakers AA, AC, AF (34 KV) Concerns:

- All of these breakers are oil filled without oil containment; oil filled breakers pose significant environmental risk associated with oil handling and leaks.
- CB AA is 71 years old, and is 1 of only 22 in the FK-339-1000 model family remaining on the AEP system. It has experienced 37 fault operations — exceeding manufacturer's recommended number of 10.
- CB AC is 42 years old, and is 1 of only 9 in the FK-439-34.5-1000-1 model family remaining on the AEP system. It has experienced 47 fault operations — exceeding manufacturer's recommended number of 10.
- CB AF is 71 years old, and is 1 of only 10 in the FK-339-1000-2 model family remaining on the AEP system.

Circuit Switchers BB, CC, DD & P (138 KV) Concerns

- CSs BB, CC, & DD are 40 years old. These circuit switchers belong to Mark V-138 model. There are numerous malfunction records on these units at Glen Lyn related to broken or malfunctioning operation counters. Failed operational components including high contact resistance, gas loss, and interrupter failure represent half of these malfunctions. Parts are expensive, especially because interrupters can only be replaced, not repaired, as they are hermetically sealed.
- CS DD has experienced 55 fault operations —exceeding manufacturer's recommended number of 10 during its in-service life.
- CS P has experienced 235 fault operations —exceeding manufacturer's recommended number of 10 during its in-service life.
- There are a total of 5 malfunction records since 2002 for CS CC and DD relating (combined) to loss of SF6.



AEP Transmission Zone: Supplemental
Giles County, Virginia

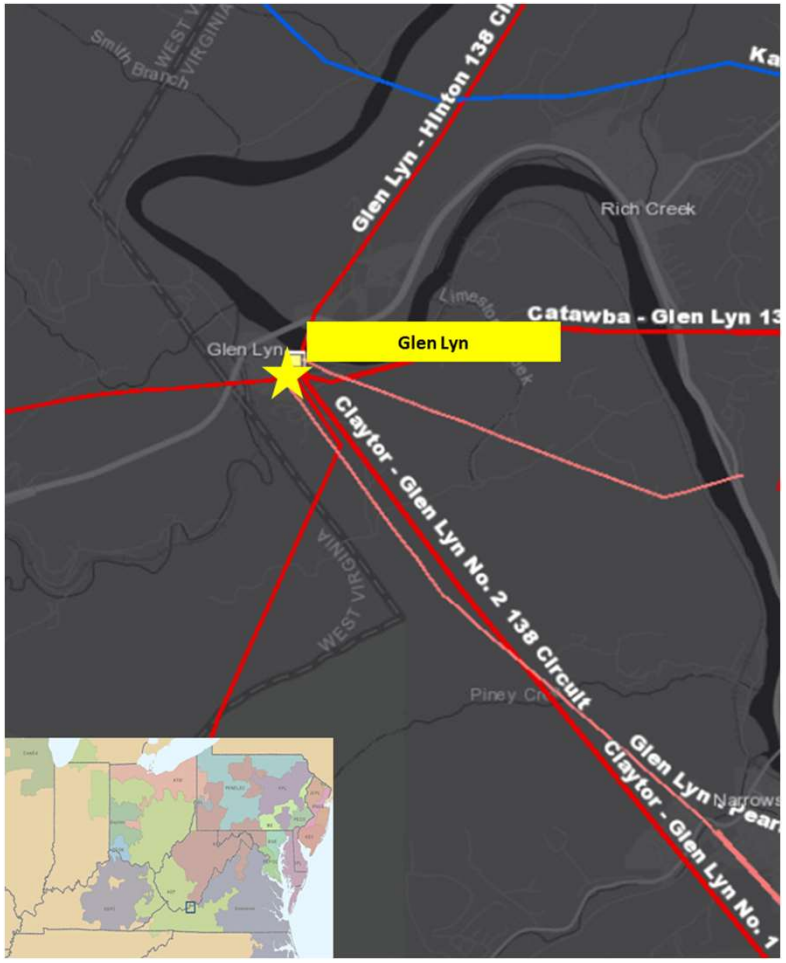
Station (continued)

Other station Specific equipment concerns:

- Notable steel member corrosion existing on the 138 kV bay structures constructed in 1944.
- All circuit breakers and circuit switchers foundations, along with station steel present concrete spalling and significant signs of deterioration beyond repair.
- Lower elevation levels in the station yard are in the 100-year flood plain of the nearby New River.
- No HVAC in 34.5 kV building reducing the life of digital equipment. Roof leaks in 34.5 kV building due to age and deterioration. 34.5 kV control house has only one entrance which does not meet current fire hazard protection standards.
- Asbestos and lead paint in both of the control buildings.
- The side of the fence has considerable corrosion and has an elevated risk of a slide occurring.
- The current station access limits vehicle accessibility and is hazardous due to proximity to the neighboring railroad crossing. Accessibility constraints make repairs very difficult and increase outage time.

Relay concerns:

- Currently, 81 of the 115 are in need of replacement. There are 71 electromechanical and 10 static type relays which have significant limitations with regards to spare part availability and fault data collection and retention in addition to lack of vendor support.
- There are 12 microprocessor based relays commissioned in from 1997 to 2008 with unsupported firmware. Two of the microprocessor relays have been previously identified to be replaced due to their elevated risk of failure in addition to obsolescence, lack of vendor support, and being out of warranty.



AEP Transmission Zone M-3 Process
Giles County, Virginia

Need Number(s): AEP-2020-AP003

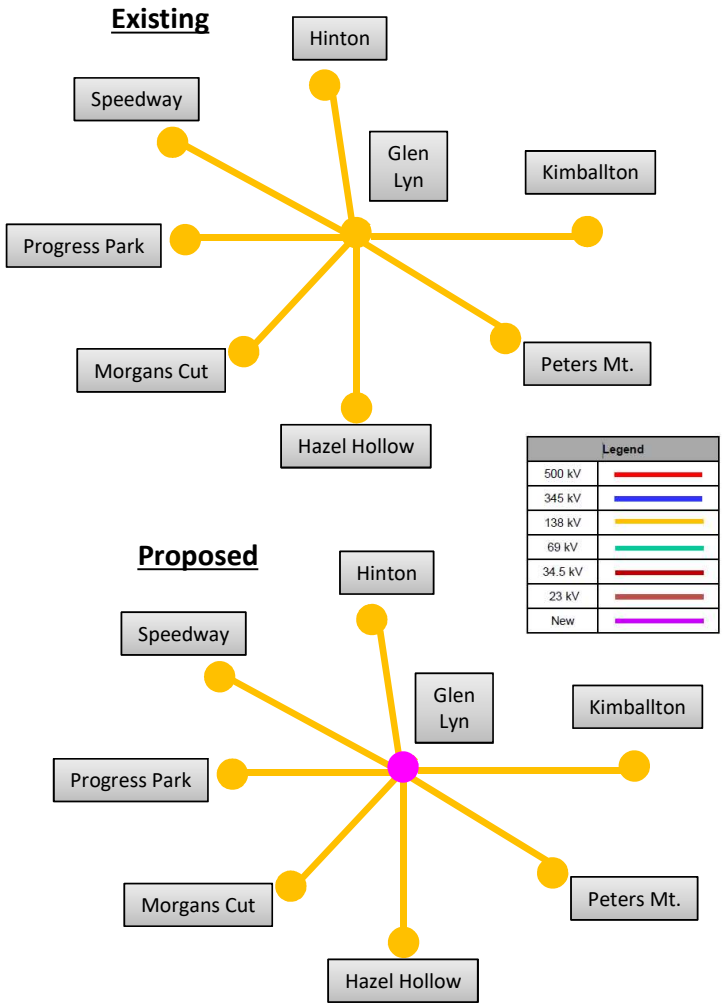
Process Stage: Solutions Meeting 1/20/2023

Proposed Solution:

- Construct a new brownfield, breaker and a half Glen Lyn station next to the existing station. The new station will contain eleven 138kV breakers with seven 138kV line exits creating four breaker and half strings. Two 138kV capacitor banks with circuit switchers. One 138/34.5kV Distribution bank with high side circuit switcher and four 34.5kV breakers. The high station cost is due to the need to raise the new station nearly 10 feet to relieve the flooding concern. Environmental cost is anticipated to be high to remove station equipment, asbestos abatement, building demolition, disposal of soils/TCI conduit/concrete/underground piping/underground transformer vaults. Remove the existing 138 and 34.5 kV yards. Estimated cost: $37.8M
- At Hinton station, remove the line trap. Install bus CCVTs and line arresters on the 138kV line to Glen Lyn. Upgrade relaying to coordinate to the new breakers. Estimated cost: $0.67
- Extend the Glen Lyn – Progress Park circuit ~0.4 miles of install to reconnect the circuit to the new Glen Lyn station. Estimated cost: $2.5M
- Extend the Glen Lyn – Morgans Cut and Glen Lyn – Hazel Hollow lines (double circuit construction) ~0.15 miles to reconnect the lines to the new Glen Lyn station. Estimated cost: $2.6M
- Extend the Glen Lyn – Kimballton and Glen Lyn – Peters Mountain lines (double circuit construction) ~0.25 miles to reconnect the lines to the new Glen Lyn station. Estimated cost: $2.1M
- Extend the Glen Lyn – Hinton circuit ~0.1 miles to reconnect the line to the new Glen Lyn station. Estimated cost: $1.8M
- Required work to connect the New Glen Lyn station to the existing fiber network. Estimated cost: $0.71M

Estimated Total Transmission Cost: $48.18 M

Ancillary Benefits: The current Glen Lyn station is configured as two straight buses with a third tie bus. This configuration is problematic when a bus outage is taken because all the 138kV lines connected to the bus are electrically disconnected. This project will completely rebuild Glen Lyn as a breaker and a half design which will allow bus outages without taking multiple 138kV lines out of service during the outage. This project will also address the flooding concerns and the age of the structural steel and foundations in the old Glen Lyn station by completely rebuilding the station adjacent to the existing station.



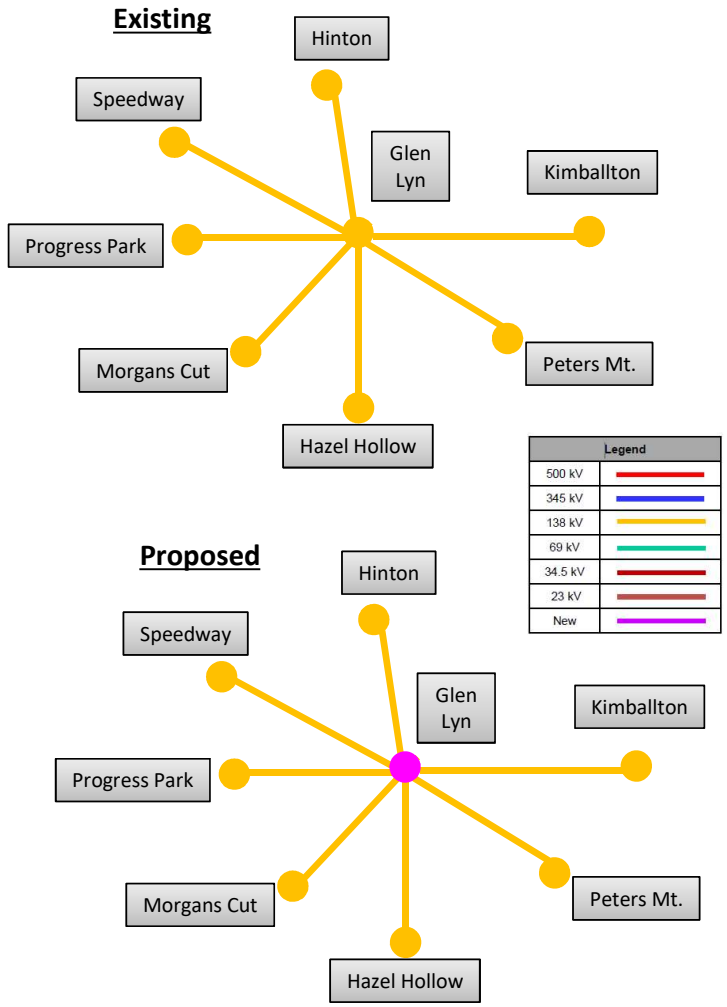
AEP Transmission Zone M-3 Process
Giles County, Virginia

Alternatives Considered: Replace existing equipment needs inside of the current station footprint. This option will not address the existing structural components and flooding concern. Also, the required outages would be difficult to attain due to Glen Lyn being a 138kV area hub.

Moving Glen Lyn was not an option due to the difficult area terrain and inability to find property big enough for a breaker and a half station. Other properties were to far away from the existing Glen Lyn station and the transmission line cost would make this option infeasible.

Projected In-Service: 6/1/2026

Project Status: Scoping



AEP Transmission Zone M-3 Process
Adams – Berne 69 kV structure replacements

Need Number: AEP-2022-IM008

Process Stage: Solution Meeting 01/20/2023

Previously Presented: Needs Meeting 2/18/2022

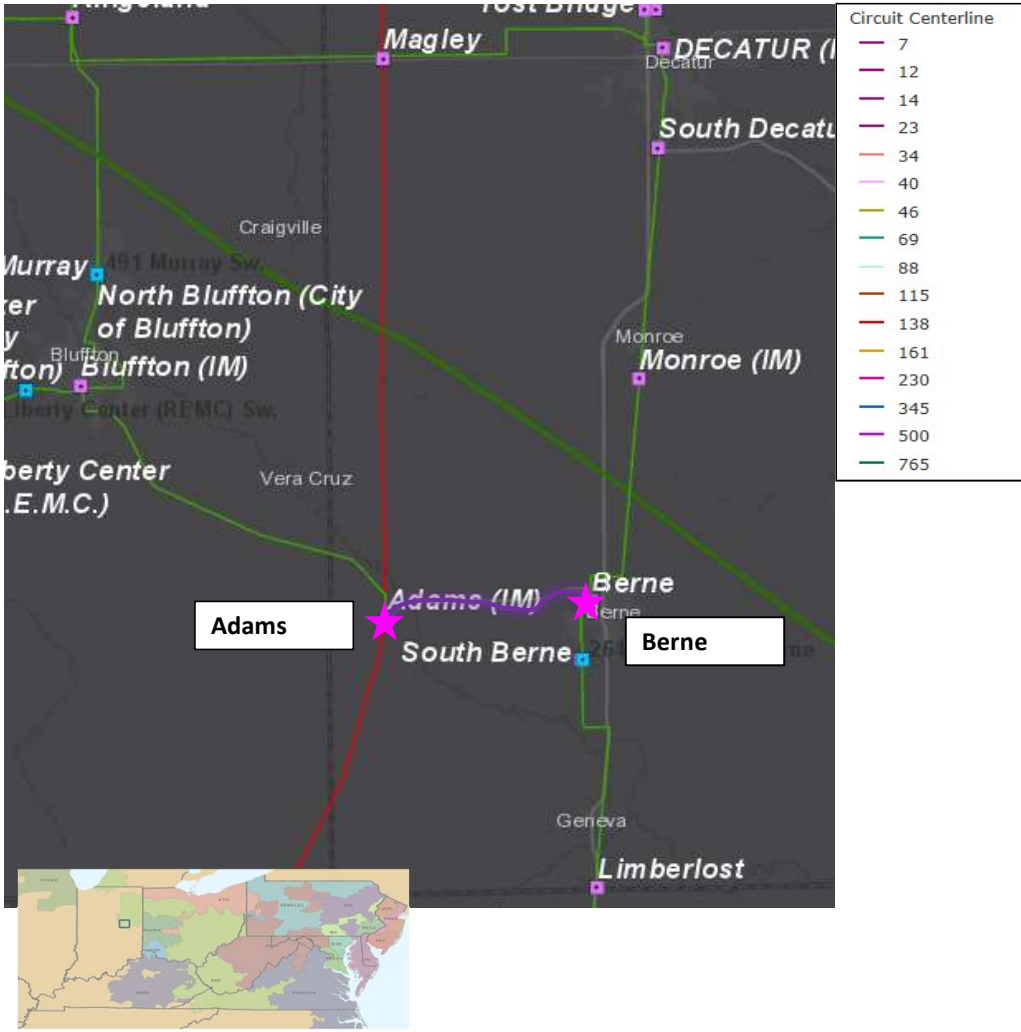
Project Driver: Equipment Material Condition, Performance and Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

Problem Statement:

Adams – Berne 69 kV (Vintage 1956)

- Length of Line: 4.90 miles
- Total structure count: 46 with 45 dating back to original installation.
- Line Construction Type:
  - Wood H-frames, guyed 3-pole wood structures, single wood poles
  - Legacy brown porcelain horizontal line post insulators which are prone to base or cap separation failures.
- Conductor Type:
  - 556,500 CM ALUM/1350 19 Dahlia (vintage 1995)
- Condition Summary
  - Momentary outages: 2
  - Number of open conditions: 17 structure open conditions with 6 structure related open conditions.
    - Open conditions include X-brace, knee brace, pole insect damage, broken poles, pole rot conditions and missing ground lead wire.
  - Ground crew and aerial drone assessment also identified:
    - Insect damage found at braces and arms.
    - Ground line heart and or shell rot found at 50% of the structures assessed by the crew. Cross arms are splitting or have decay pockets at 12% of the H-frame structures.
    - Broken ground down leads at 40% of the structures
    - Damaged horizontal posts due to flash-over
    - Moderate to advanced wood decay from insect and bird damage
  - The grounding method utilizes butt wraps on every other structure, providing reduced lightning protection for the line.



AEP Transmission Zone M-3 Process
Adams – Berne 69 kV structure replacements

Need Number: AEP-2022-IM008

Process Stage: Solution Meeting 01/20/2023

Proposed Solution:

Adams – Berne 69 kV: Replace ~4.9 miles of 69 kV line structures. The following cost includes the structure replacements, structure removals, ROW acquisitions, and station connections.
Total Estimated Transmission Cost: $12.8 M

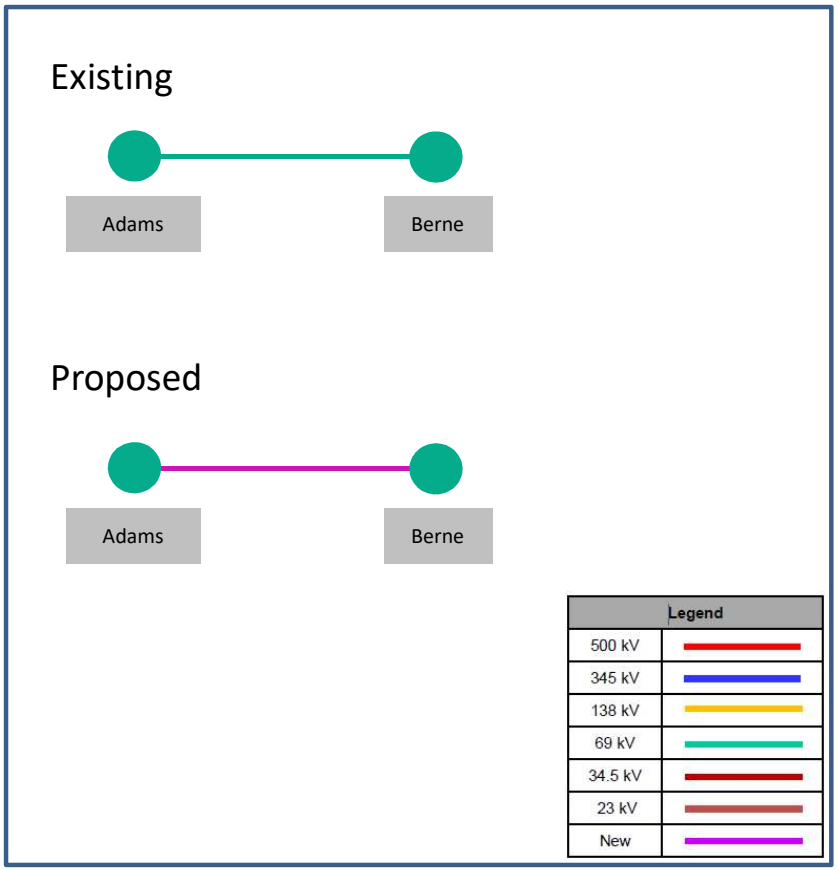
Alternatives considered:

Adams – Berne 69 kV line rebuild: Complete line rebuild was not considered as the conductor was installed in 1995 and it has not had any issues and is within its useful life. **Estimated Cost: $13.35 M**

Retire the Adams – Berne 69 kV line: This option was not selected as the retirement of the Adams – Berne 69 kV line and an N-1-1 outage of the Magley - Decatur 69 kV and Decatur - Lincoln 69 kV circuits and considering Wabash Valley's PJM need WVPA-2022-001 will cause thermal and voltage violations in the Portland, Berne and Decatur areas. **Estimated Cost: $12.15 M**

Projected In-Service: 11/01/2026

Project Status: Scoping



ComEd Transmission Zone M-3 Process
Franklin Park

Need Number: ComEd-2022-006

Process Stage: Solutions Meeting 2/17/2023

Previously Presented: Need Meeting 11/18/2022

Project Driver:

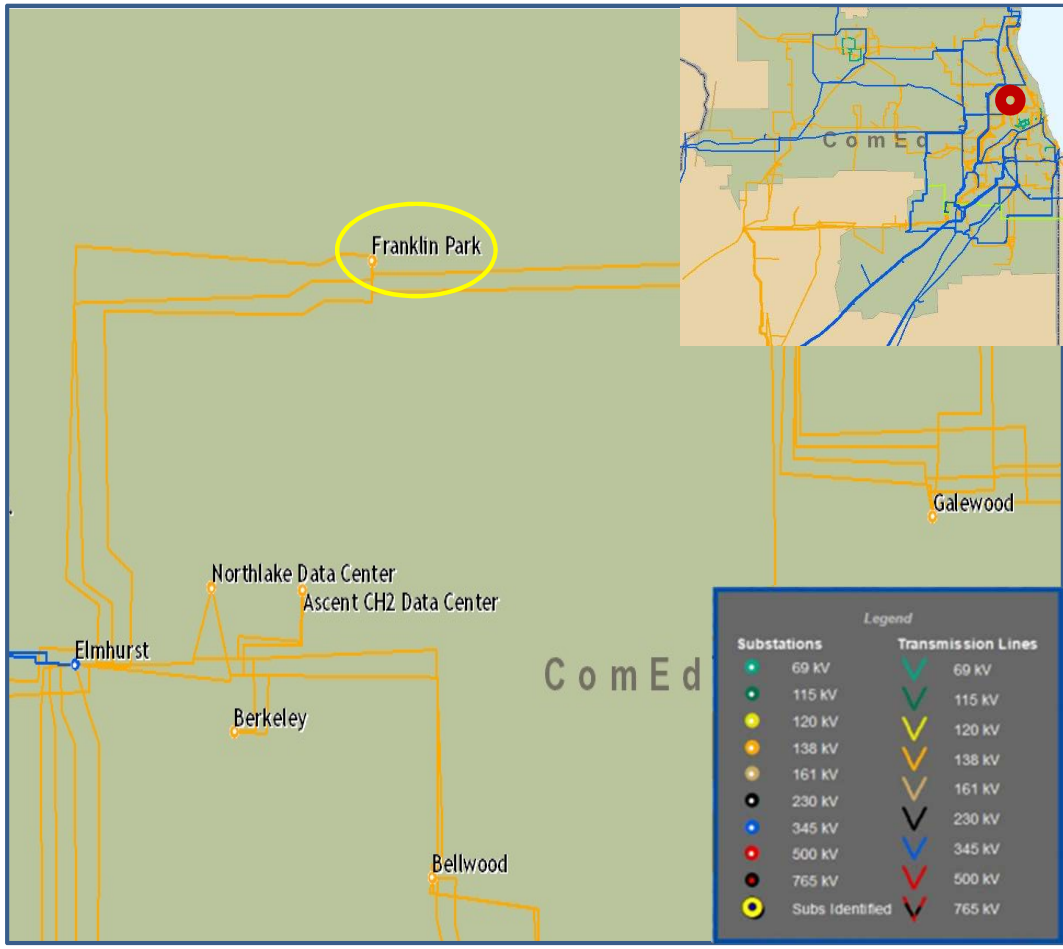
Operational Flexibility and Efficiency

Specific Assumption Reference:

- Enhancing system functionality, flexibility, visibility, or operability

Problem Statement:

There are three 138 kV lines from Elmhurst to Franklin Park. Two of the lines share a ring bus circuit breaker at Franklin Park resulting in the loss of two of the three lines for a stuck breaker contingency.



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ComEd Transmission Zone M-3 Process
Franklin Park

Need Number: ComEd-2022-006

Process Stage: Solutions Meeting 2/17/2023

Proposed Solution:

Install a new 138 kV CB between Bus 4 and existing BT 2-4 to create a new bus 6

Estimated Transmission Cost: $ 3.2 M

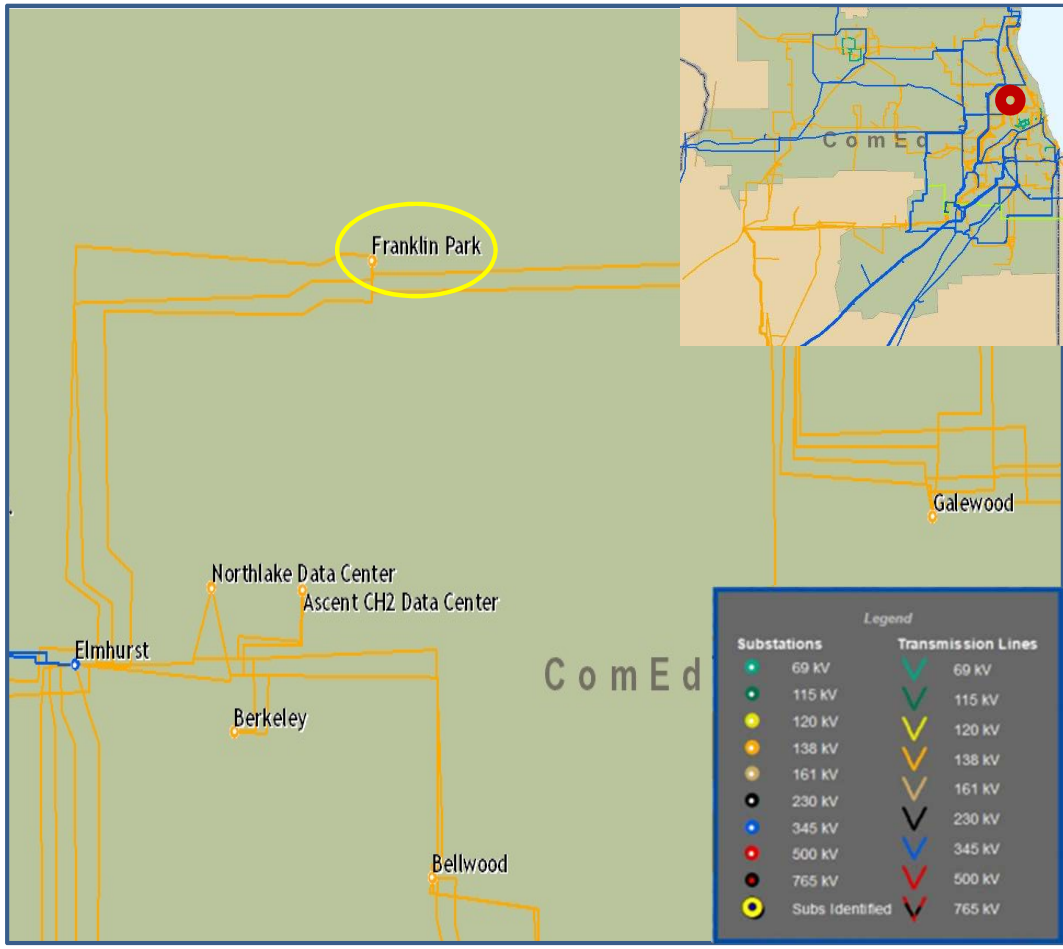
Alternatives Considered:

No feasible alternatives

Projected In-Service: 12/31/2023

Project Status: Conceptual

Model: RTEP 2027



ComEd Transmission Zone M-3 Process
Jefferson

Need Number: ComEd-2022-007

Process Stage: Solutions Meeting 2/17/2023

Previously Presented: Need Meeting 11/18/2022

Project Driver:

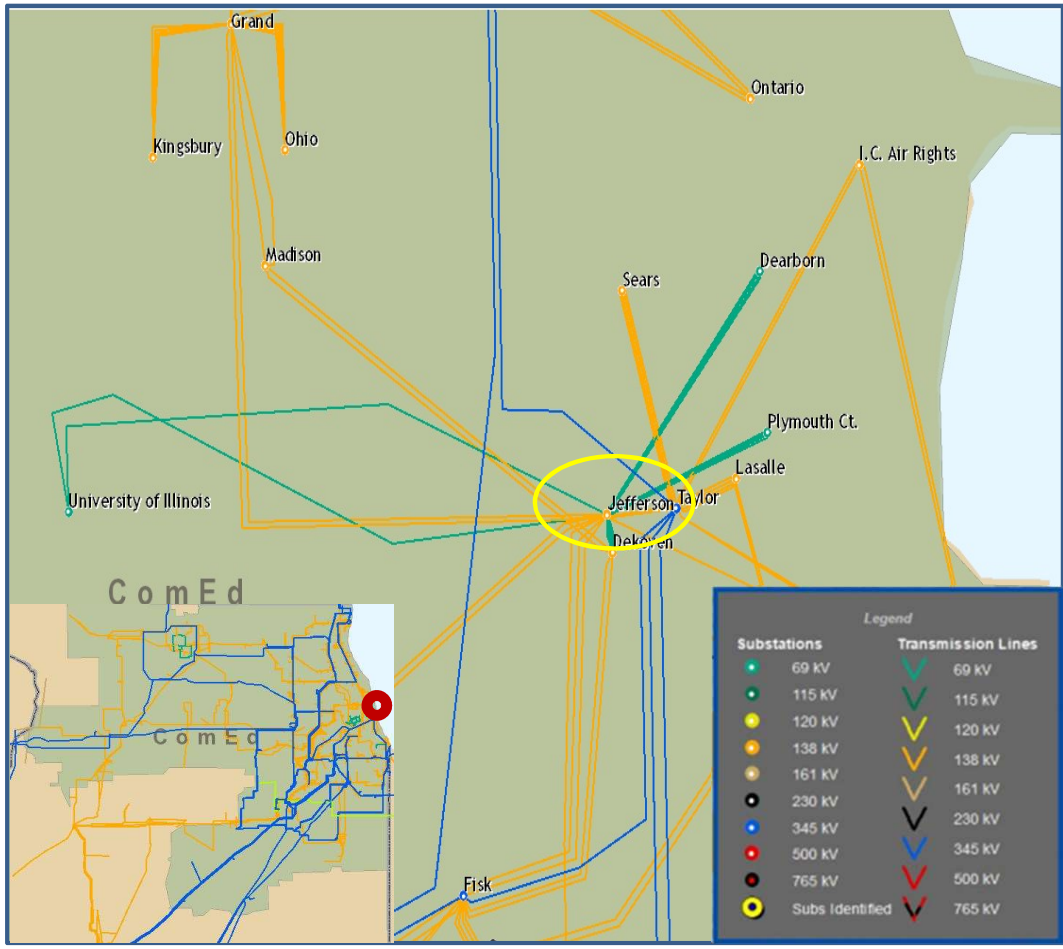
Customer Service

Specific Assumption Reference:

- Transmission System configuration changes due to new or expansion of existing distribution substations

Problem Statement:

ComEd Distribution has a need for an additional 138-12 kV transformer at Jefferson substation.



ComEd Transmission Zone M-3 Process
Jefferson

Need Number: ComEd-2022-007

Process Stage: Solutions Meeting 2/17/2023

Proposed Solution:

Install a new 138-12 kV transformer on bus 9 and move 138 kV Jefferson – Taylor line from bus 9 to Bus 8. Install 138 kV line breaker on 138 kV Jefferson – Taylor line.

Estimated Transmission Cost: $ 4.5M

Alternatives Considered:

Install new 138-12 kV transformer on bus 8.

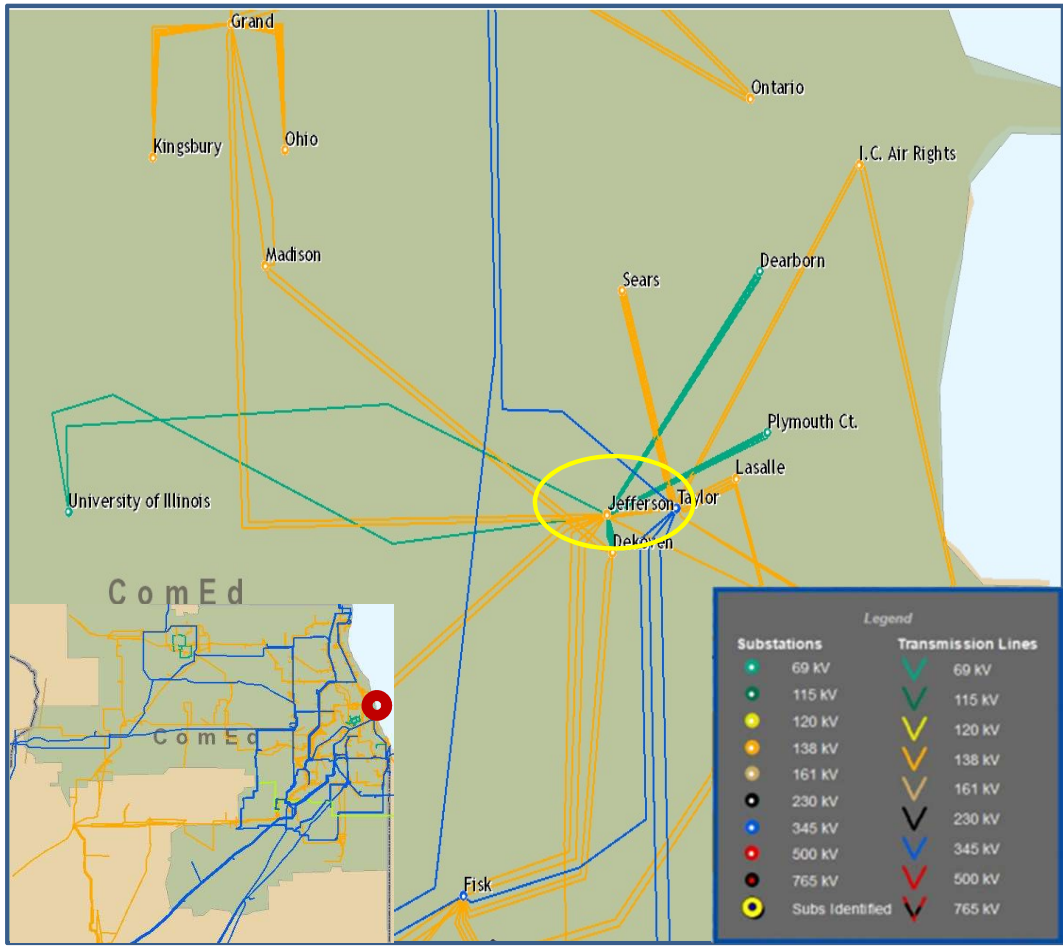
Estimated Transmission Cost: $0

This alternative was not chosen because the new transformer would share a bus position with an existing transformer feeding the same distribution load resulting in reduced reliability.

Projected In-Service: 6/1/2023

Project Status: Engineering

Model: RTEP 2027



DEOK Transmission Zone M-3 Process
Oakbrook

Need Number: DEOK-2022-009

Process Stage: Solutions Meeting 02-17-2022

Previously Presented: Needs Meeting 11-18-2022

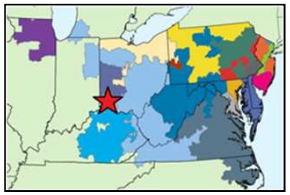
Project Driver: Customer Service

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 9

Problem Statement:

Due to continued commercial and industrial load growth in the area near the Cincinnati/Northern Kentucky International Airport, Duke Energy Distribution has requested the installation of a second 69/13 kV, 22 MVA transformer at Oakbrook substation. An additional 10 MVA of load is expected by Q4 2026.



345kV
138kV
69kV

DEOK Transmission Zone M-3 Process
Oakbrook

Need Number: DEOK-2022-009

Process Stage: Solutions Meeting 02-17-2022

Previously Presented: Needs Meeting 11-18-2022

Project Driver: Customer Service

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 9

Potential Solution:

Install a new 138/13 kV, 22 MVA transformer and 13 kV bus work for two feeder exits. Roll the incoming 138 kV feeder phases to align with the transformer installation.

Alternatives: none

Ancillary Benefits: Using 138 kV as the primary relieves the burden on the 69 kV circuit which is at its capacity limit.

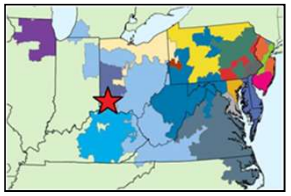
Estimated Transmission Cost: $40,965

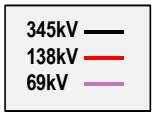
Proposed In-Service Date: 11-06-2025

Project Status: Engineering

Model: 2022 RTEP

Bubble Diagram Not Applicable
Station Modifications Only





AEP Transmission Zone M-3 Process
Coolville Loop

Need Number: AEP-2019-OH028

Process Stage: Solutions Meeting 02/17/2023

Previously Presented:

Needs Meeting 03/25/2019

Project Driver:

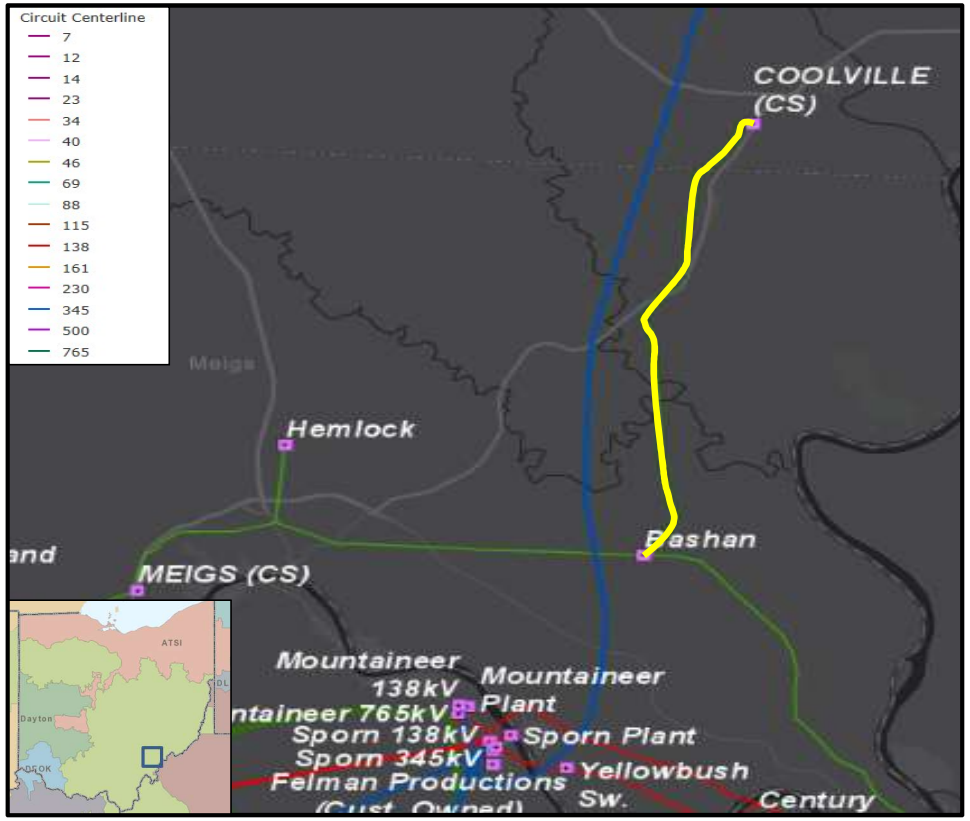
Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

Coolville 69kV station is radially served on a 1954 vintage line (~12.6 miles) utilizing 4/0 ACSR 6/1 (Penguin) conductor (50/63 MVA SN/WN). This radial line has 84 structures, 22 of which have pole related open conditions and 28 of which have ground lead wire issues/concerns. It has experienced 4.4 million CMI over the last three years. Radial lines restricts the ability to perform routine maintenance and restoration activities.



AEP Transmission Zone M-3 Process
Coolville Loop

Need Number: AEP-2020-OH010

Process Stage: Solutions Meeting 02/17/2023

Previously Presented:

Needs Meeting 02/21/2020

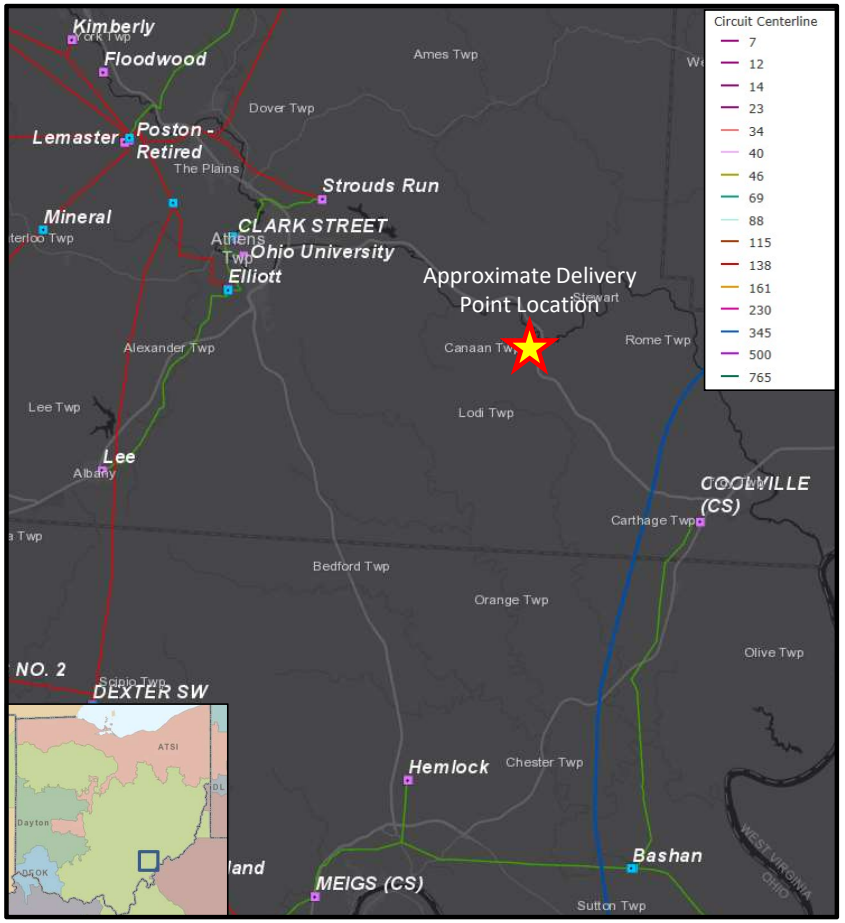
Supplemental Project Driver: Customer Service

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 7)

Problem Statement:

AEP Ohio has requested a new delivery point between Coolville and Elliott Stations. Anticipated peak load is approximately 7.5 MVA that will be transferred from nearby stations in the area.



AEP Transmission Zone M-3 Process
Coolville Loop

Need Number: AEP-2019-OH028 & AEP-2020-OH010

Process Stage: Solutions Meeting 02/17/2023

Proposed Solution:

- Guysville 69 kV: Install a in-out station with an 2000A auto sectionalizing MOAB switch towards Coolville and a 3000A 40kA circuit breaker towards Bryson. $1.73M
- Bryson - Guysville 69 kV: Construct a greenfield ~12.5-mile single circuit line using 556.5 ACSR (Dove) conductor (SE 142 MVA). $28.26M
- Coolville – Guysville 69 kV: Constructing a greenfield ~10.5-mile single circuit line using 556.5 ACSR (Dove) conductor (SE 142 MVA) $29.22M
- Coolville 69 kV: Upgrade to a in-out station with two 3000A 40kA circuit breakers on the through path. Existing wood structures will be replaced with a new steel box bay to accommodate new breakers. $3.08M
- Coolville – East Bashan 69 kV: Rebuild the existing single circuit ~12.6-mile line using 556.5 ACSR (Dove) conductor (SE 142 MVA). $29.61M
- West Bashan 69 kV: Remove switch going to Hemlock $0.02M
- Hemlock – West Bashan 69kV: Remove ~7.7 miles of single circuit line. $2.09M
- Hemlock 69 kV: Remove the circuit breaker going to West Bashan (CB C). $0.14M

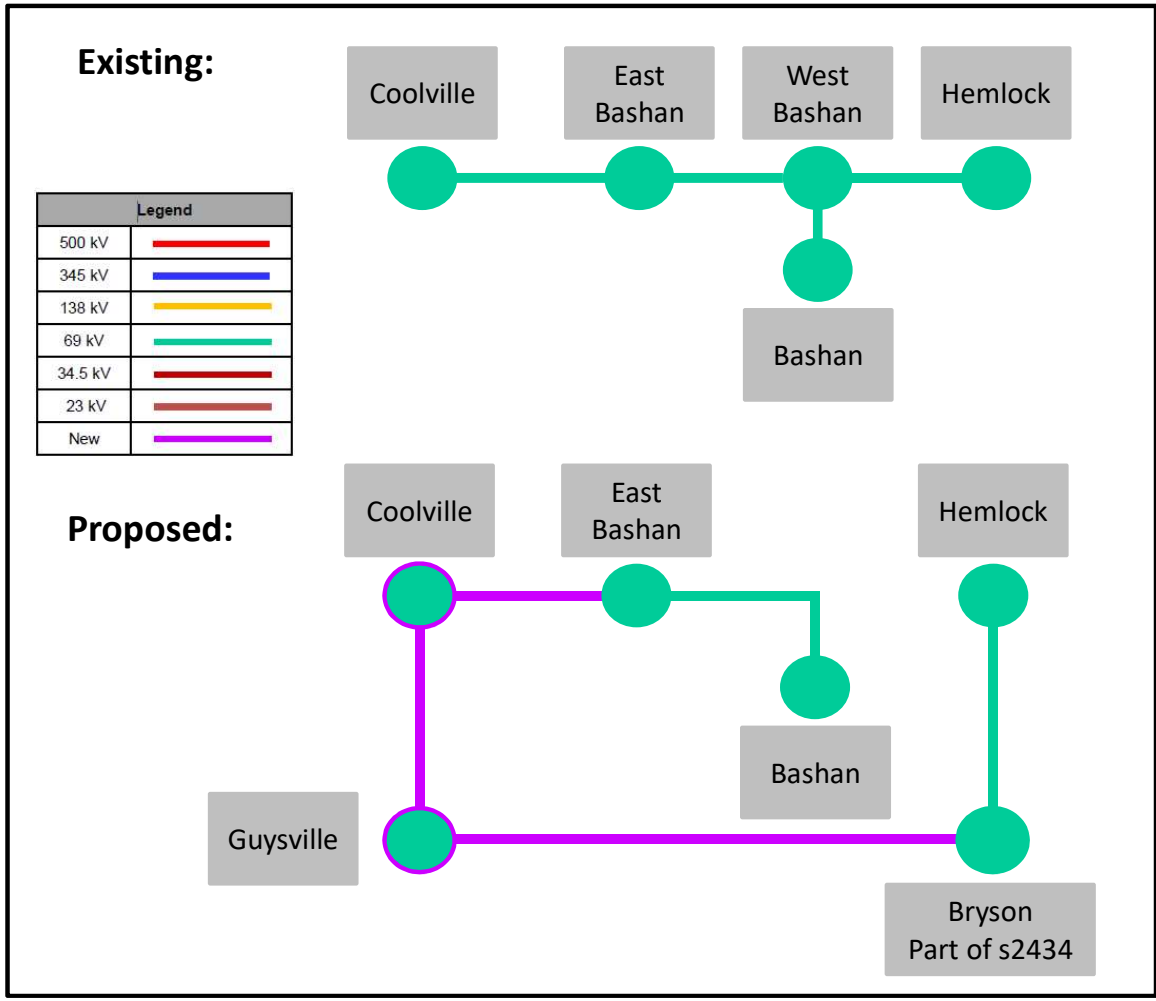
Estimated Total Cost: $94.15M

Ancillary Benefits: This project will also eliminate the 4.3 mile radial to customers served out of the proposed Bryson switch (s2434) and allows for the retirement of 7.7 miles of wood pole line between Hemlock and West Bashan that was originally constructed in the 1920's with structures that date back to the 1950's .

Alternatives Considered: Consideration given to a new interconnection being established off a 138 kV generation feed in the area to address the radial concern at Coolville, but after the requests for Guysville and Bryson were made this alternative did not fully address the other needs in the area.

Projected In-Service: 06/01/2025

Project Status: Scoping



Need Number: AEP-2021-AP017

Process Stage: Solutions Meeting 2/17/2023

Previously Presented: Needs Meeting 4/16/2021

Supplemental Project Driver: Customer Service

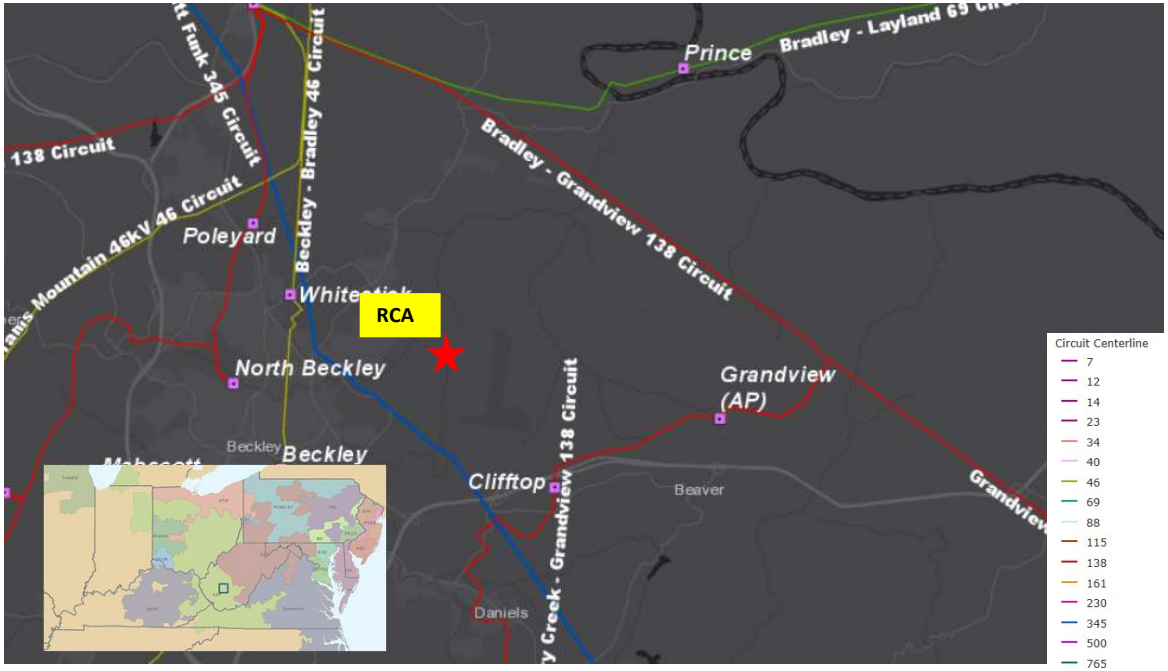
Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

APCO Distribution has requested a new transmission delivery point to serve a new load request. This station site also supports West Virginia Business Ready Sites Program (House Bill 144) located in Raleigh County, West Virginia.

Summer projected load: 16 MVA

Winter projected load: 16 MVA.



AEP Transmission Zone M-3 Process
Raleigh County Airport

Need Number: AEP-2021-AP017

Process Stage: Solutions Meeting 02/17/2023

Proposed Solution:

Cut in/out of the existing Cherry Creek – Clifftop 138 kV and construct a new 4 mile double circuit 138 kV line to a new 138/12 kV station at Raleigh County Airport (RCA) **Est. Trans Cost: $16.8M**

Install two 138 kV circuit breakers and a 138/12 kV 25 MVA transformer at the new Raleigh County Airport (RCA) Station **Est. Trans. Cost: $0.0M**

Remote end relaying work required at Grandview Station. **Est. Trans. Cost: $0.3M**

Estimated Total Trans. Cost: $17.1M

Ancillary Benefits: New station will offload the existing Clifftop Station transformer which is nearing it's max capability. Supports WV House Bill 144 to support Economic Development activities.

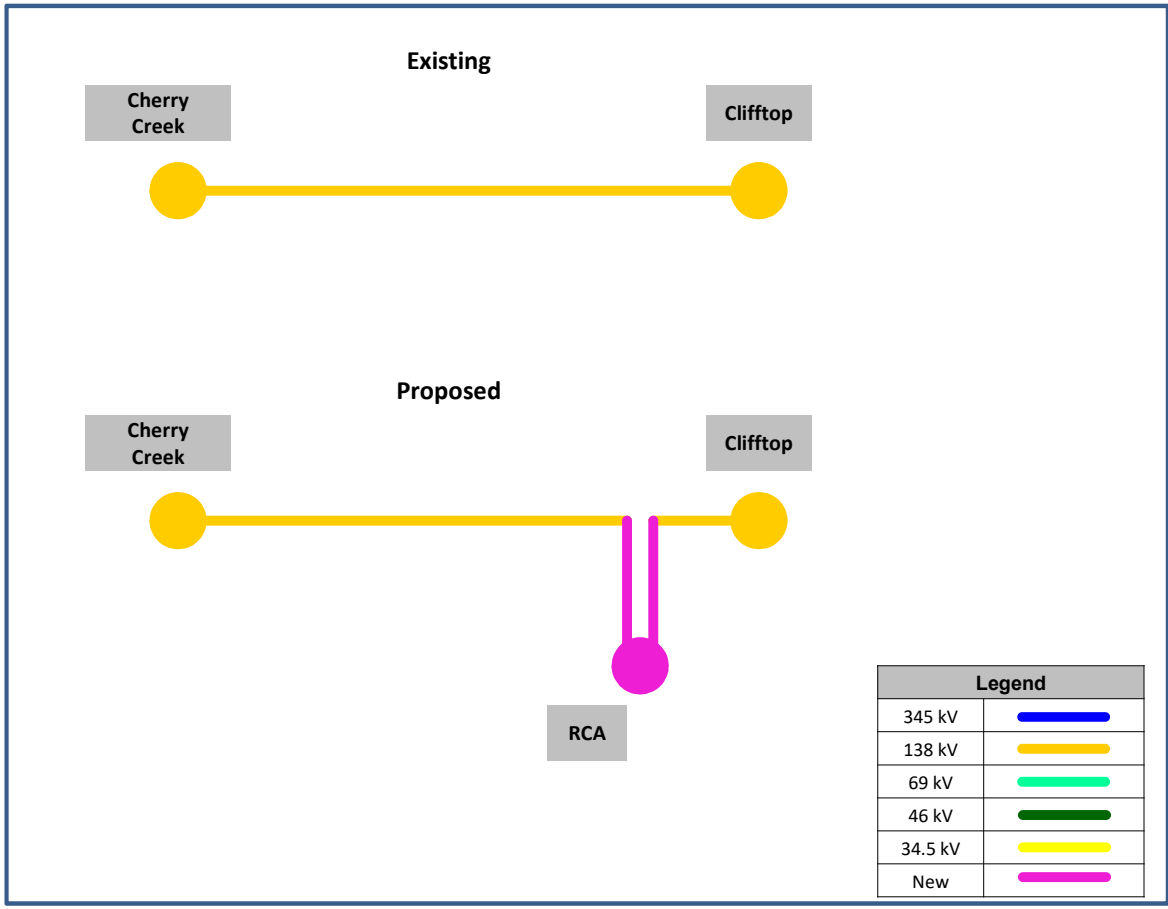
Alternatives Considered:

Multiple sites and line routes were considered; however due to line route restrictions related to the airport there were no other viable options in this area. The 46 kV network does not have the capacity to serve the request load nor any future load growth.

Projected In-Service: 3/14/2024

Project Status: Scoping

Model: 2027 RTEP



AEP Transmission Zone: Supplemental Kingsport, TN

Need Number: AEP-2021-AP024
Process Stage: Solutions Meeting 02/17/2023
Previously Presented: Needs Meeting 06/15/2021

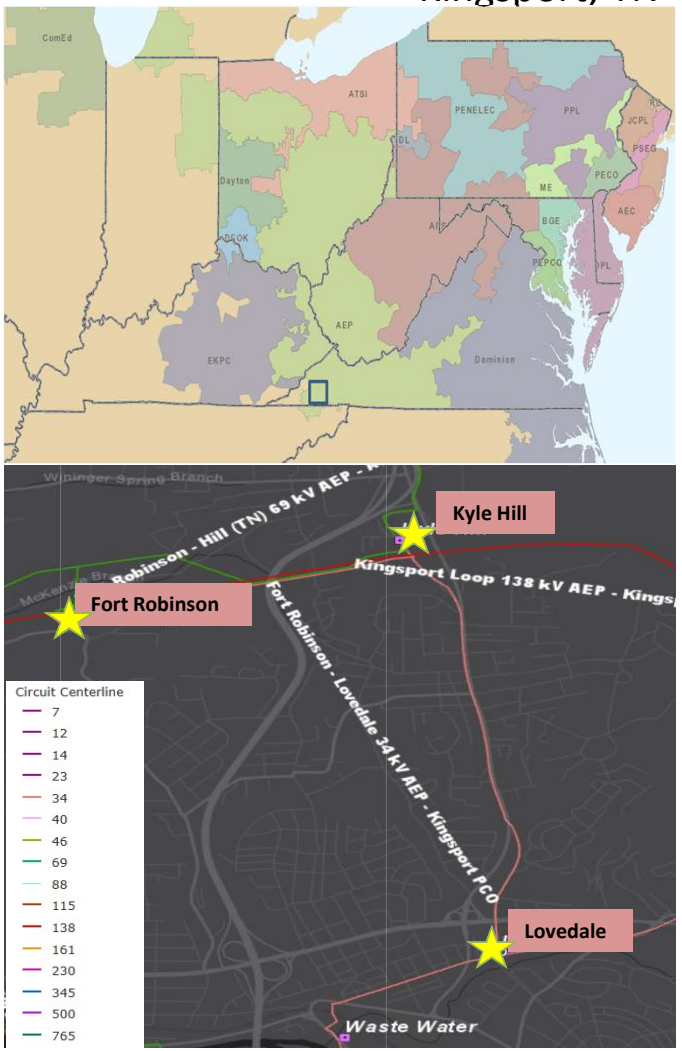
Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13,14,15)

Problem Statement:

Line:
Fort Robinson — Lovedale 34.5 KV (Installed in 1969)

- Length: ~3.57 Miles
- Original Construction Type: Vintage Wood Pole
- Original Conductor Type: 556 ACSR 26/7
- Permanent Outages: 3 (5 years)
- CMI: 107,429 (2015-2020)
- Total structure count: 88
- Number of open conditions: 19
  - Open conditions include broken conductor strands, broken/burnt insulators.
- Unique structure count with open conditions: 6 (7%)
- Structures on the line failed to meet 2017 NESC Grade B loading criteria, failed to meet current AEP structural strength requirements, and failed to meet current ASCE structural strength requirements.
- Additional Info on Wood Assessment, Insulator & Conductors:
  - Wood Assessment: The structures are in poor overall condition. Conditions include rot, pole top weathering, bowing, cracking, and woodpecker holes.
  - The insulators on the line do not meet current AEP standards for Critical Impulse Flashover CIFO (an insulator rating related to what level of flashover the insulator is expected to be able to withstand) and minimum leakage distance requirements.
- **Model:** N/A



AEP Transmission Zone: Supplemental Kingsport, TN

Need Number: AEP-2021-AP024

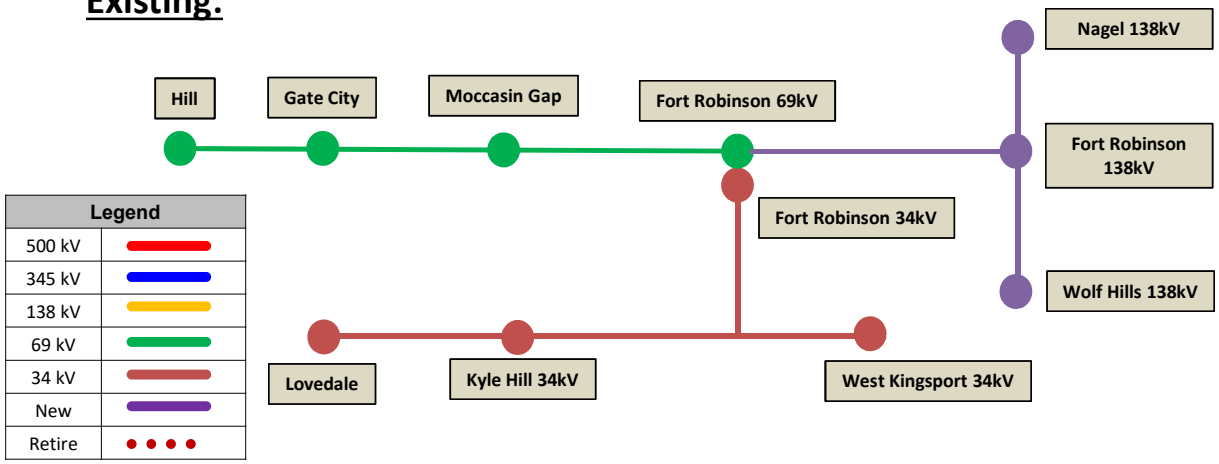
Process Stage: Solutions Meeting 02/17/2023

Proposed Solution:

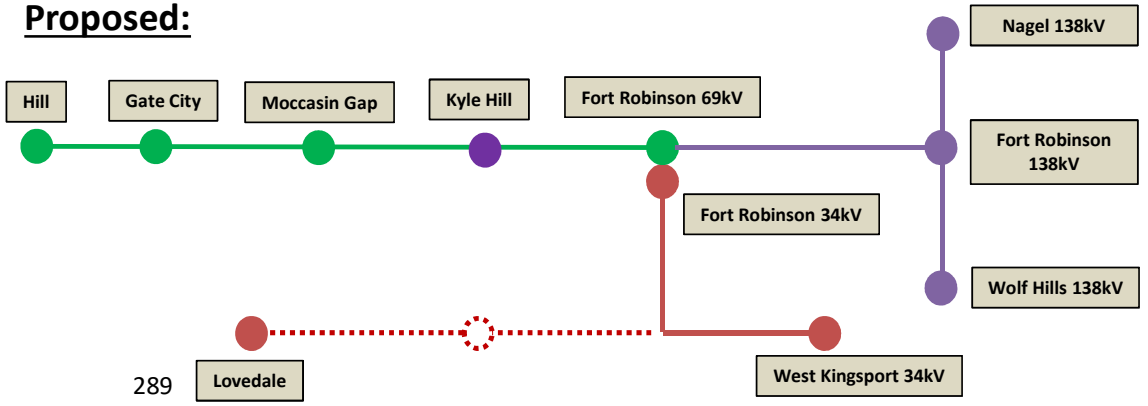
- Retire existing Kyle Hill Station. **Estimated Trans. Cost: $0 M**
- Kyle Hill Extension : New 0.07 miles double circuit in/out line from the Fort Robinson-Hill 69kV line to the new Kyle Hill 69kV Station. **Estimated Trans. Cost: $1.22 M**
- Build a new Kyle Hill Station behind the existing station. Establish a 69KV bus to allow a 69KV in/out from Fort Robinson – Hill 69KV line. Install one (1) 1200A 69KV rated line MOAB switches towards Hill station. Install one (1) 1200A 69KV rated line switches towards Fort Robinson station. Replace Ground MOAB with a high-side circuit switcher. Replace existing 34.5/12KV transformer #1 with 69/12KV transformer. Install new 12KV bus. Reuse existing Kyle Hill 12kV Breakers. Install 16x19 DICM. **Estimated Trans. Cost: $0 M**
- Retire approximately 3.41 miles of the Fort Robinson-Lovedale 34.5kV line. **Estimated Trans. Cost: $2.69 M Estimated**
- Remote end and Removal of Circuit Breaker J at Fort Robinson substation. **Estimated Trans. Cost: $0.197 M**
- Remote end and Removal of Circuit Breaker G at Lovedale substation. **Estimated Trans. Cost: $0 M**
- Retire 34.5 kV Echo Switch. **Estimated Trans. Cost: $0.095 M**
- Provide Transition Fiber for Kyle Hill Station. **Estimated Trans. Cost: $0.105 M**

Total Estimated Transmission Cost: $4.31 M

Existing:



Proposed:



AEP Transmission Zone: Supplemental Kingsport, TN

Need Number: AEP-2021-AP024

Process Stage: Solutions Meeting 02/17/2023

Alternatives Considered :

Convert Kyle Hill to 138kV substation. Construct new 138kV substation by tapping Nagel – Reedy Creek 138kV line. Install 138/12kV transformer along with 138kV circuit switcher and 12kV distribution breakers. Retire existing Kyle Hill substation and Echo switch. New substation would be a greenfield build at the bottom of the Hill. New 138kV double circuit extension. **Total Estimated Cost: $11.6 M**

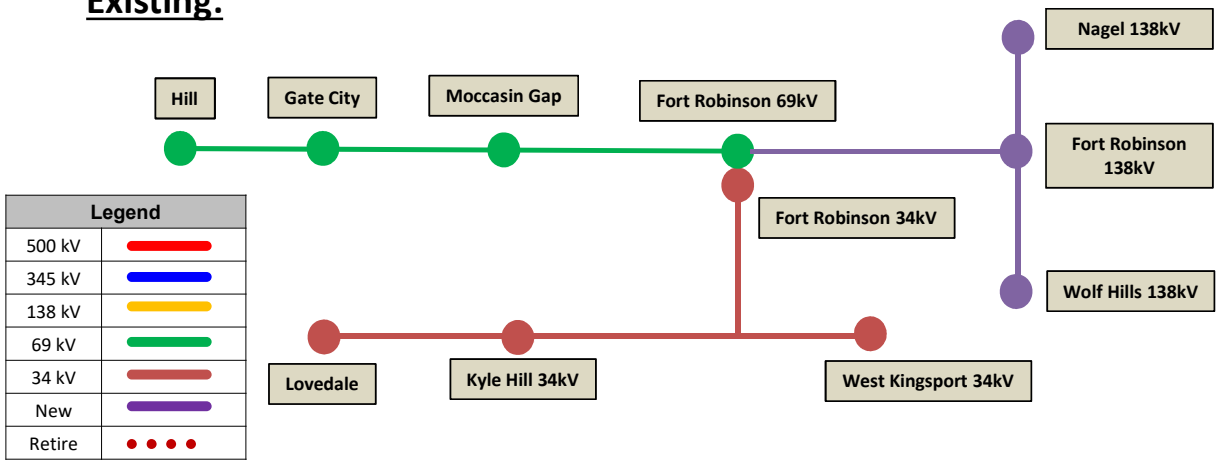
Rebuild Fort Robison – Lovedale 34.5KV line to 69 KV standard, operated at 34.5KV. Rebuild the highside for the Kyle Hill substation to accomodate IN/out t-line from Fort Robinson – Lovedale line. Retire Echo switch. **Total Estimated Cost: $11.9 M**

Projected In-Service: 07/01/2026

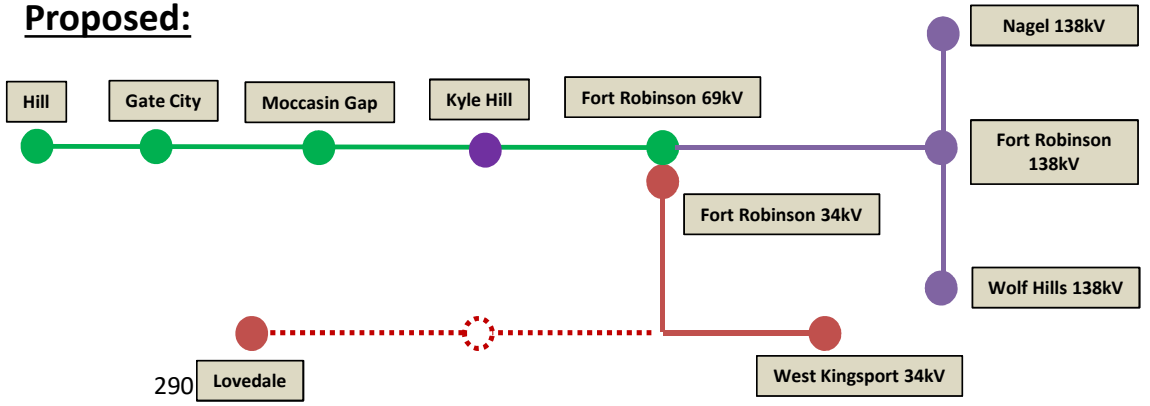
Project Status: Scoping

Model: 2027 RTEP

Existing:



Proposed:



AEP Transmission Zone M-3 Process
South Haven 69kV Delivery Point

Need Number: AEP-2022-IM016

Process Stage: Solution Meeting 2/17/2023

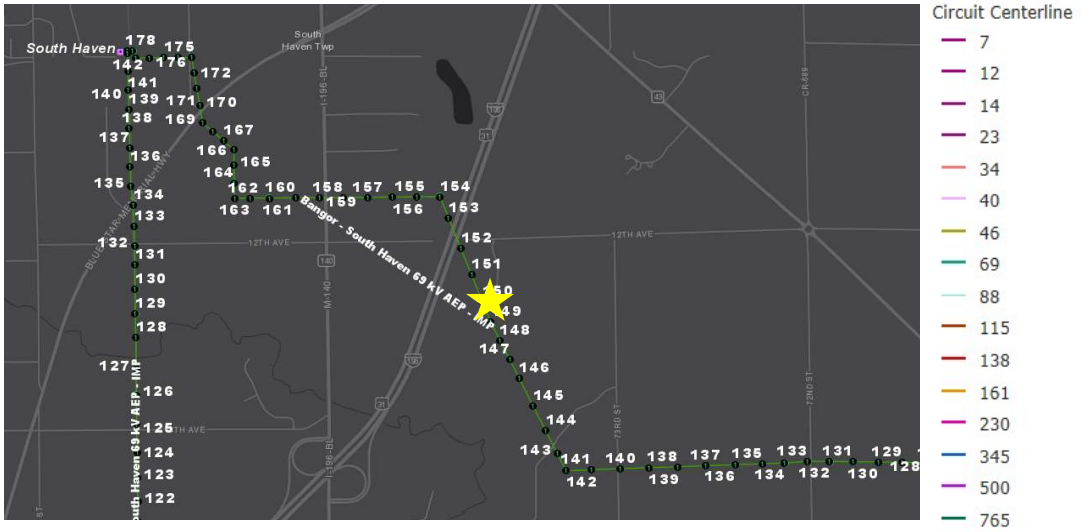
Previously Presented: Needs Meeting 9/16/2022

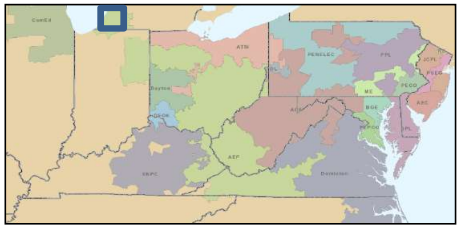
Project Driver: Customer Service

Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

The City of South Haven has requested a new 69kV delivery point in Hartford, Michigan by the end of May 2023. Anticipated load is approximately 8.5 MVA.





AEP Transmission Zone M-3 Process
South Haven 69kV Delivery Point

Need Number: AEP-2022-IM016

Process Stage: Solution Meeting 2/17/2023

Proposed Solution:

Deerlick Creek Switch 69kV: Install a new 69kV phase over phase switch on the South Haven – Phoenix Road Tap 69kV section of the Bangor – South Haven 69kV circuit. Fiber Cable extension for the new switch. **Estimated Cost: $1.27M**

Deerlick Creek Switch – 12th Avenue 69kV: Install ~0.06 mi of 69kV single circuit with the conductor size 795 ACSR 26/7 Drake (Cost includes ROW). **Estimated Cost: $0.5M**

12th Avenue station: Install metering and telecom upgrades. **Estimated Cost: $0.11M**

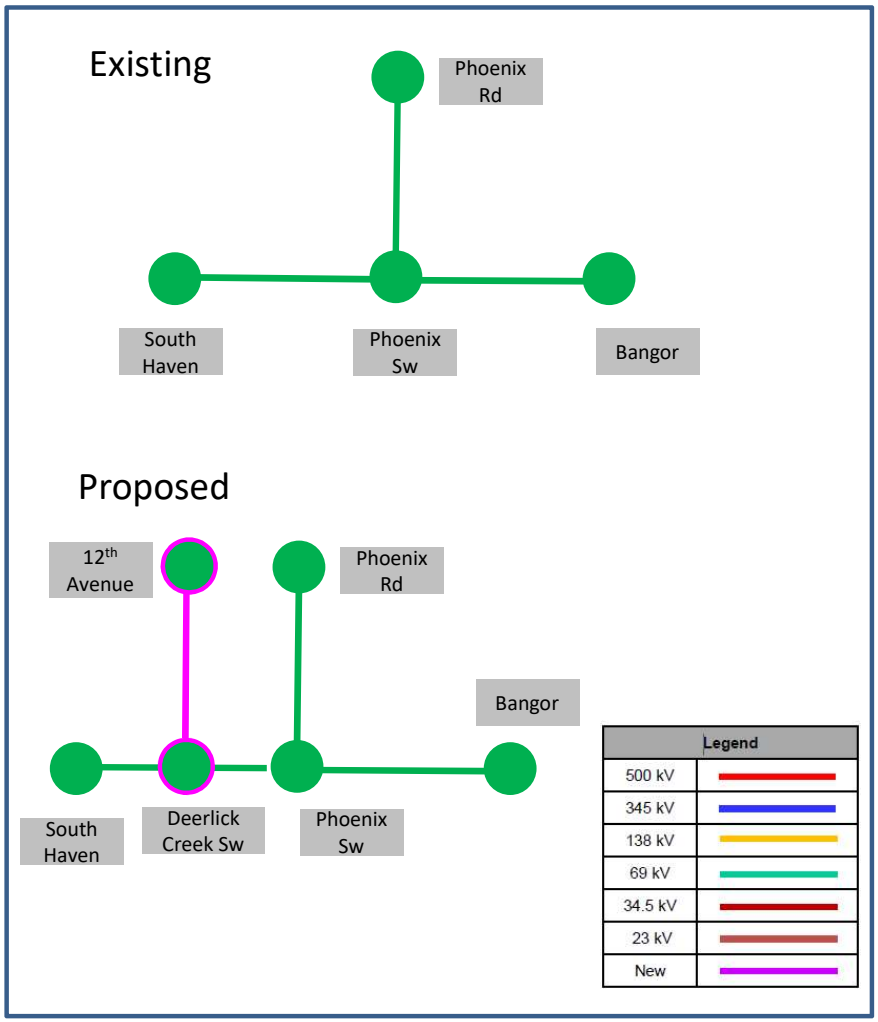
Total Estimated Transmission Cost: $1.88M

Alternative considered:

Considering the location and timing of the customer request, no other alternatives were identified.

Projected In-Service: 5/26/2023

Project Status: Scoping



AEP Transmission Zone M-3 Process
Morgan County, OH

Need Number: AEP-2022-OH026

Process Stage: Solutions Meeting 2/17/2023

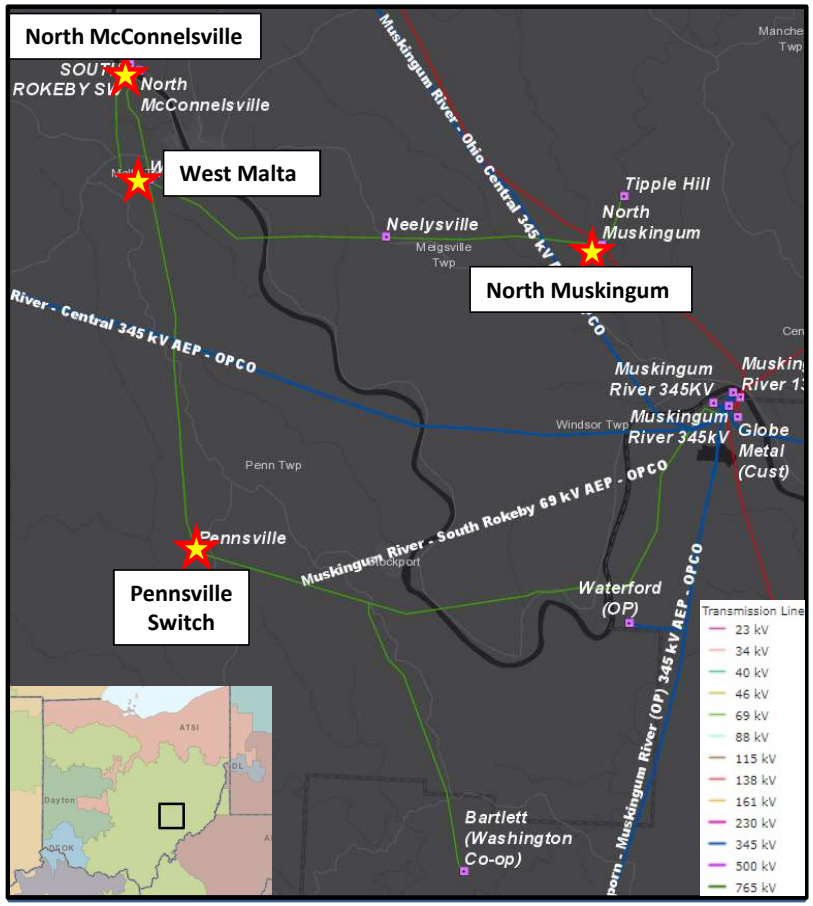
Previously Presented: Need Meeting 04/22/2022

Project Driver:
Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13-14)

Problem Statement:
North Muskingum – West Malta 69kV (1952):

- Length of Line: 8.40 Miles
- Total Structure Count: 57
  - 54 Wooden H Frame & Monopole structures
  - 3 Steel Monopole structures from 2015
- Conductor Type: 4/0 ACSR 6/1 (Penguin)
- Outage History: 6 Momentary and 3 Permanent Outages, CMI 84,450 from 1/2015 – 12/2021
- Open Conditions: There are 21 structures with at least one open condition, which relates to 37% of the structures on this line. There are currently 21 structure based open condition consisting of woodpecker holes, split poles, rot top, rot heart, bowed crossarm, vines on poles, rot top of a filler block and a loose knee/vee brace. There are currently 5 grounding based open conditions consisting of stolen ground lead wires. There are currently 9 hardware based open conditions consisting of burnt/broken insulators, loose guys and loose guy wires.
- The line fails to meet 2017 NESC Grade B loading criteria, fails to meet current AEP structural strength requirements, and fails to meet the current ASCE structural strength requirements. The line is insulated with porcelain between 4 and 5 bells which does not meet the current AEP standards for the CIFO and minimum leakage distance requirements. The line shielding angle on the typical tangent structure is measured at 25.49° degrees, which is inadequate for AEP current shield angle requirements and can lead to poor lightning performance.



AEP Transmission Zone M-3 Process
Morgan County, OH

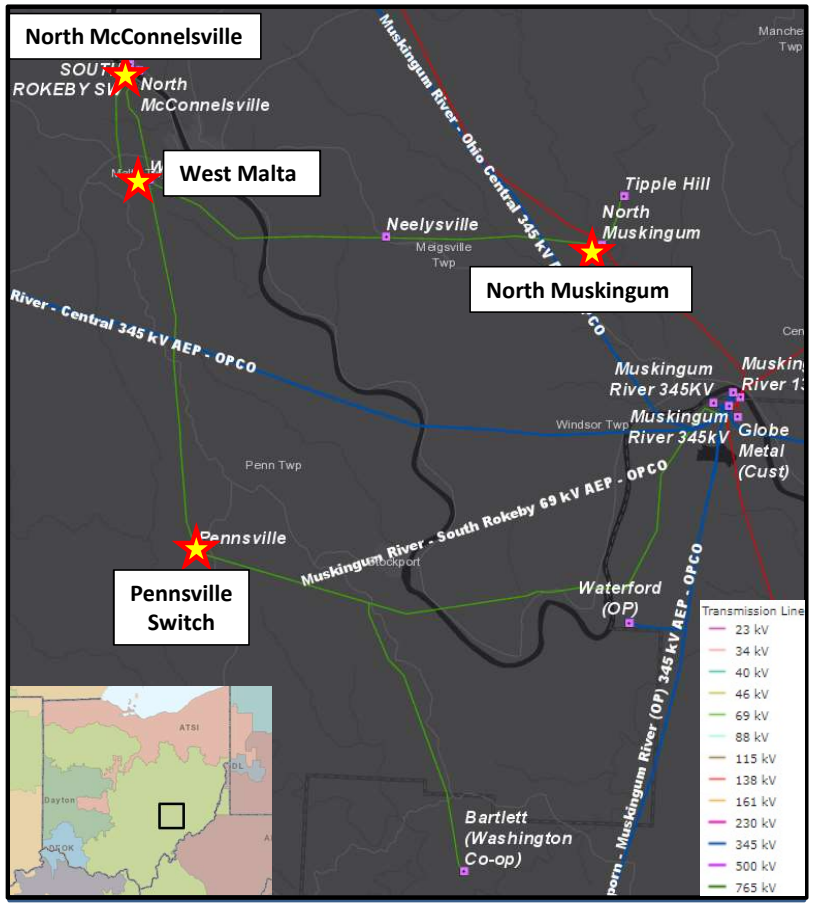
Problem Statement (continued):

West Malta – North McConnelsville 69kV (1966)

- Length of Line: 2.1 Miles
- Total Structure Count: 20 Wooden H Frame & Monopole structures
- Conductor Type: 4/0 ACSR 6/1 (Penguin)
- Outage History: 2 Momentary and 2 Permanent Outages, CMI 131,192 from 1/2015 – 12/2021
- Open Conditions: There are 11 structures with at least one open condition, which relates to 55% of this line. There are currently 7 structure based open conditions consisting of woodpecker holes, rot top and insect damage. There are currently 7 conductor based open conditions consisting of improper installation of a plp splice/dead ends and damaged conductors. There is currently 1 hardware based open condition consisting of a burnt insulator.
- The line fails to meet 2017 NESC Grade B loading criteria. The line is insulated with 4 bells ceramic and ceramic HP, which both do not meet the current AEP standards for the CIFO and minimum leakage distance requirements. The line shielding angle on the typical tangent structure is measured at 59.08° degrees, which is inadequate for AEP current shield angle requirements (due to one shield wire on H-frames).

North McConnelsville 69kV:

- North McConnelsville station is hard tapped to 69 kV line which causes customer outages during line outages where there is no flexibility for load transfer or sectionalizing.



AEP Transmission Zone M-3 Process
Washington & Morgan Counties, Ohio

Need Number: ~~AEP-2021-OH011~~ AEP-2021-OH062

Process Stage: Solutions Meeting 2/17/2023

Previously Presented: Need Meeting 03/19/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13-14)

Problem Statement:

Line Name: Muskingum – South Rokeby 69kV

Original Install Date (Age): 1965

Length of Line: ~~21.3~~ ~12.3 mi

Total structure count: ~~164~~ 90

Original Line Construction Type: Wood

Conductor Type: 4/0 ACSR 6/1, 336,400 CM ACSR 18/1, and 336,400 CM ACSR 30/7 Momentary/Permanent Outages and Duration:10 Momentary and 2 Permanent Outages

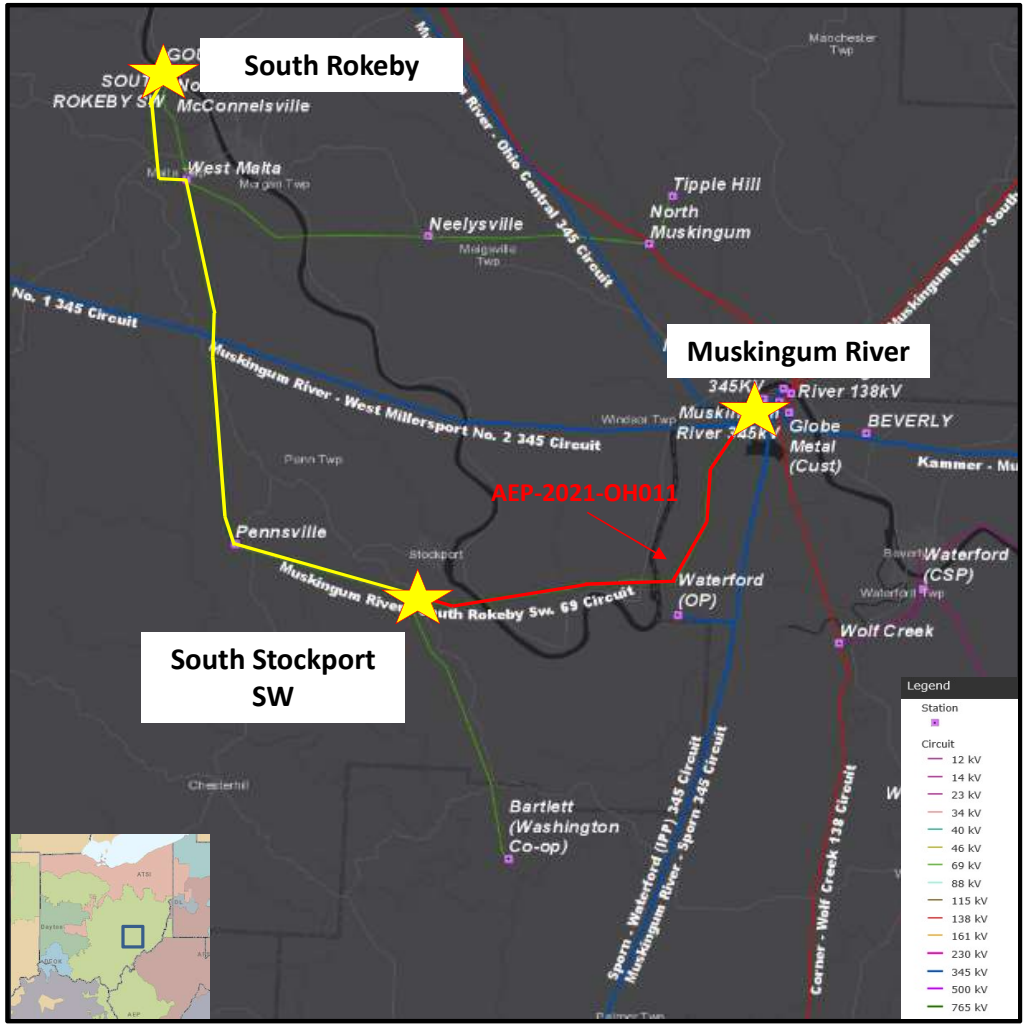
CMI: 315,751 (past five years)

Line conditions:

- ~~48~~ 26 structures with at least one open condition, 29% of the structures on this circuit.
- ~~45~~ 20 structure related open conditions impacting wooden poles, crossarms, braces, and filler blocks including rot, bowing, woodpecker holes, insect damage, cracked, split, and rot top
- ~~12~~ 2 open conditions related to conductor issues including broken strands
- ~~12~~ 4 hardware/shielding issues including open conditions related to burnt, broken, or chipped insulators.
- Structure Age: ~~72% 1960's, 15% 1970, 13% 1980's or newer~~ 63 structures from 1965, 25 structures from 1969, 1 structure from 1979, & 1 structure from 1983

Other:

- The line shielding angle does not meet AEP's current shielding angle requirements
- Line does not meet current NESC Grade B loading criteria or AEP's current structural strength requirements.
- ~~Washington Co-op's Bartlett Station is served radially from this line (~ 5.09 miles) with limited sectionalizing ability.~~



AEP Transmission Zone M-3 Process
Morgan County, OH

Need Number: AEP-2022-OH026 & AEP-2021-OH011

Process Stage: Solutions Meeting 2/17/2023

Proposed Solution:

Grace - South Rokeby 69 kV Line: Rebuild ~12.3 mi of line asset, the section between Grace – South Rokeby using 556 ACSR conductor & install telecom fiber. **Estimated Cost: $29.62M**

West Malta - North Muskingum 69 kV Line: Rebuild the whole ~8.4 mi line asset using 556 ACSR conductor & install telecom fiber. **Estimated Cost : $18.28M**

West Malta - North McConnelsville 69 kV Line: Rebuild the whole ~2.1 mi line asset using 556 ACSR conductor & install telecom fiber. **Estimated Cost : $6.08M**

South Rokeby – Gould No.1 & No. 2 69 kV Line: Rebuild both ~0.05 mi (each) line assets using 556 ACSR conductor & install telecom fiber. **Estimated Cost : $0.78M**

South Rokeby - North McConnelsville 69kV Line: ~0.25 miles rebuild on the South Rokeby – West Malta 69 kV Circuit & install telecom fiber. **Estimated Cost : $0.92M**

Buttermilk Hill Switch 69 kV: Install a new 69 kV, 1200A, 3-way POP switch outside the fence of North McConnelsville station and install auto-sectionalizing. **Estimated Cost : $0.73M**

Pennsville 69 kV POP Switch: Replace existing switch with 1200A, 3-way switch & install auto-sectionalizing. **Estimated Cost : $0.73M**

Total Estimated Cost: $57.15M

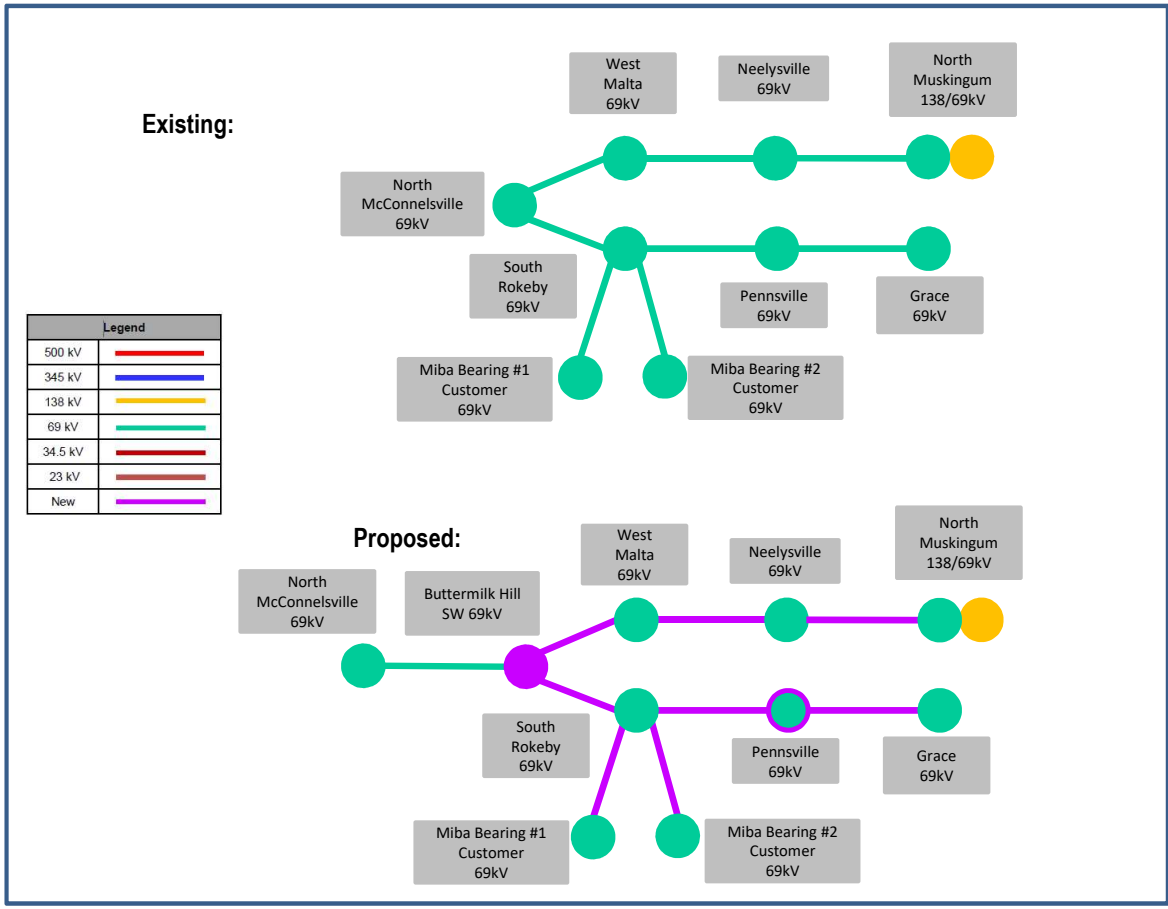
Alternatives Considered:

Considering the number of customers served and locations of existing stations on the line, retirement of this line is not possible. There are no other sources from which to serve the load in this area.

Projected In-Service: 10/1/2026

Project Status: Engineering

Model: 2027 RTEP



AEP Transmission Zone M-3 Process
Grove City, Ohio

Need Number: AEP-2022-OH061

Process Stage: Solution Meeting 2/17/2023

Previously Presented: Need Meeting 7/22/2022

Project Driver: Customer Service

Service Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

AEP Ohio has requested to add capacity at White Road station, due to continuous load growth in the area. The anticipated peak load is approximately 40-50 MVA. The requested in-service date is August 2023.

Model: 2027 RTEP

AEP Transmission Zone M-3 Process
Grove City, Ohio

Need Number: AEP-2022-OH061

Process Stage: Solutions Meeting 2/17/2023

Proposed Solution:

White Road 138kV: Close in the station ring bus with a vertical ring bus, install 3-138kV circuit breakers and associated relaying to accommodate new distribution source at the station. **Estimated Cost: $1.71M**

Re-terminate T-line 138kV: Install new 138kV structure just west of existing Str. 29. Re-terminate lines into new ring bus positions. **Estimated Cost: $0.36M**

Total Estimated Cost: $2.07M

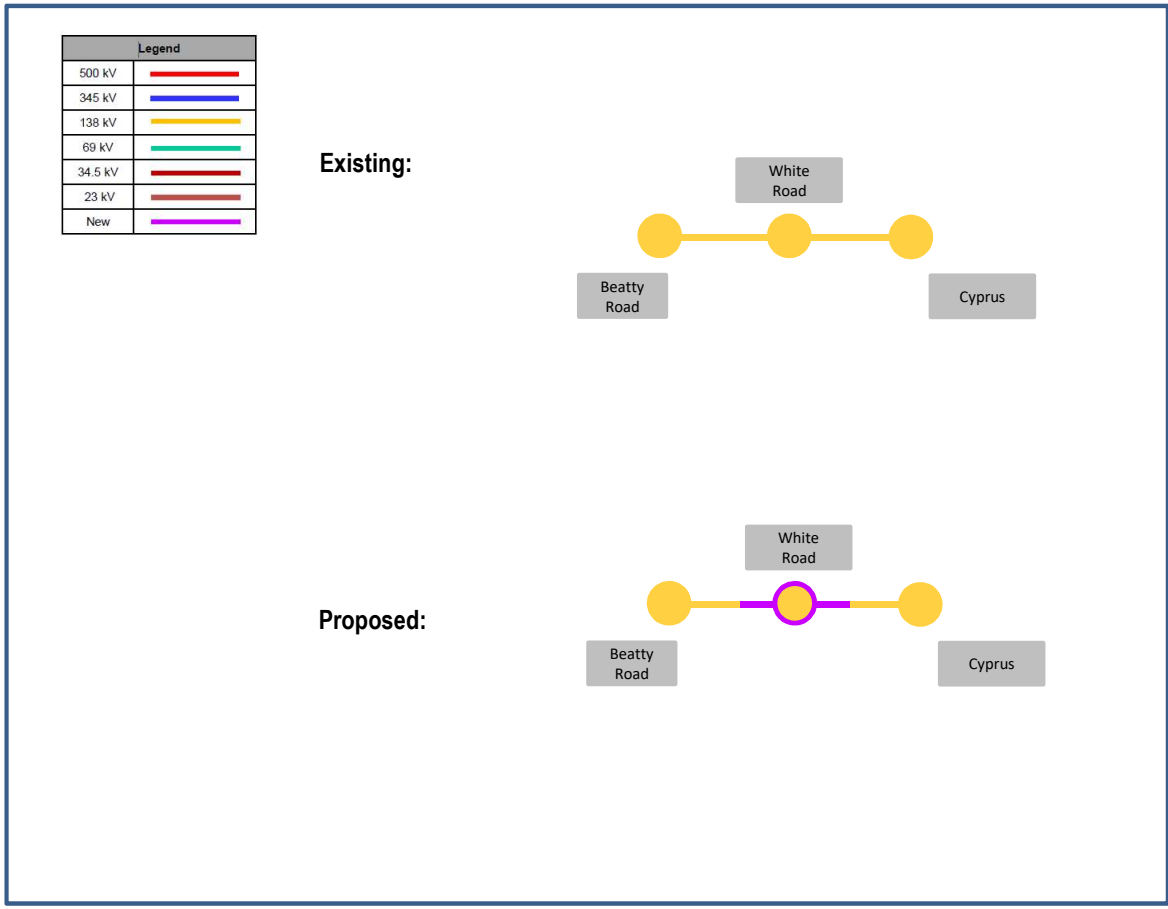
Alternatives Considered:

Considering the location and available space at the station location, no other alternatives were identified.

Projected In-Service: 08/08/2023

Project Status: Engineering

Model: 2027 RTEP



AEP Transmission Zone M-3 Process
Cambridge, Ohio

Need Number: AEP-2023-OH014

Process Stage: Solutions Meeting 2/17/2023

Previously Presented: Needs Meeting 1/20/2023

Supplemental Project Driver:

Customer Service

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

Problem Statement:

Guernsey – Muskingum Electrical Co-op customers served out of Cassel Junction switch have experienced 8 momentary and 6 permanent outages from 2018-2022. This has resulted in 3,079,440 minutes of customer interruption.

AEP Transmission Zone M-3 Process
Seneca County, Ohio

Need Number: AEP-2023-OH014

Process Stage: Solutions Meeting 2/17/2023

Proposed Solution:

- Reconfigure the existing East Cambridge- West Cambridge 69kV circuit to add in a replacement switch pole for Cassell Junction Sw that is capable of adding MOAB operation on the throughpath. This replacement structure will be one span down from the existing switch in order to comply with current ROW standards. **$0.89 M**
- Install a new 138kV three- way phase over phase switch named Cassell Junction Switch to serve the Cassell Junction Co-op station. $**0.68 M**
- Construct ~ 0.12 miles of new 69 kV line between the new Cassell Junction Switch and the Cassell Junction Co-op station using 556 ACSR conductor. **$0.66 M**
- Install new customer metering at Cassell Junction for Guernsey Muskingum Electric Cooperative. **$0.004 M**

Cost estimate: $2.234 M

Ancillary Benefits:

Provides Guernsey Muskingum Electric Cooperative the ability to have MOAB operation for additional protection in the case of momentary outages on the East Cambridge- West Cambridge 69kV circuit.

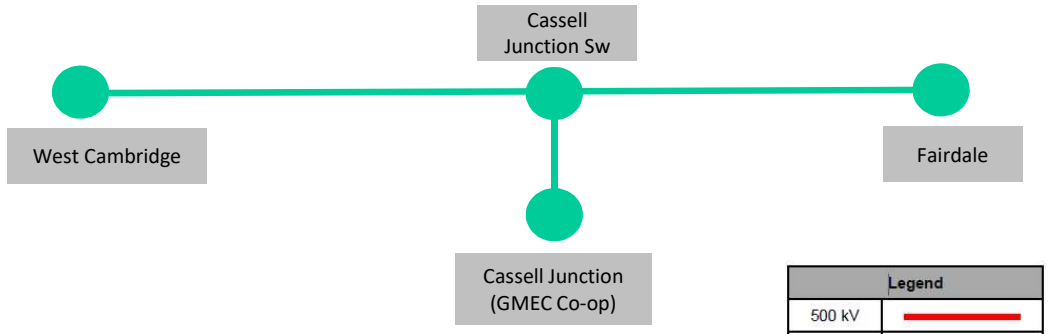
Alternatives Considered:

- Upgrade the existing structure to utilize MOABs and continue to use the same line toward Cassell Junction. This option was not feasible as the current switch structure is not capable of adding motor operators or automatic operation capability.

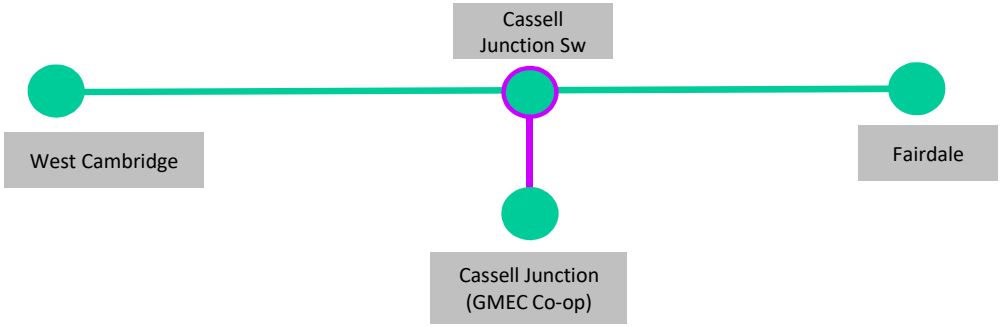
Projected In-Service: 12/31/2025

Project Status: Engineering

Existing:



Proposed:



APS Transmission Zone M-3 Process

Need Number: APS-2021-011

Process Stage: Solution Meeting 03/17/2023

Previously Presented: Need Meeting 06/15/2021

Project Driver:

Customer Service

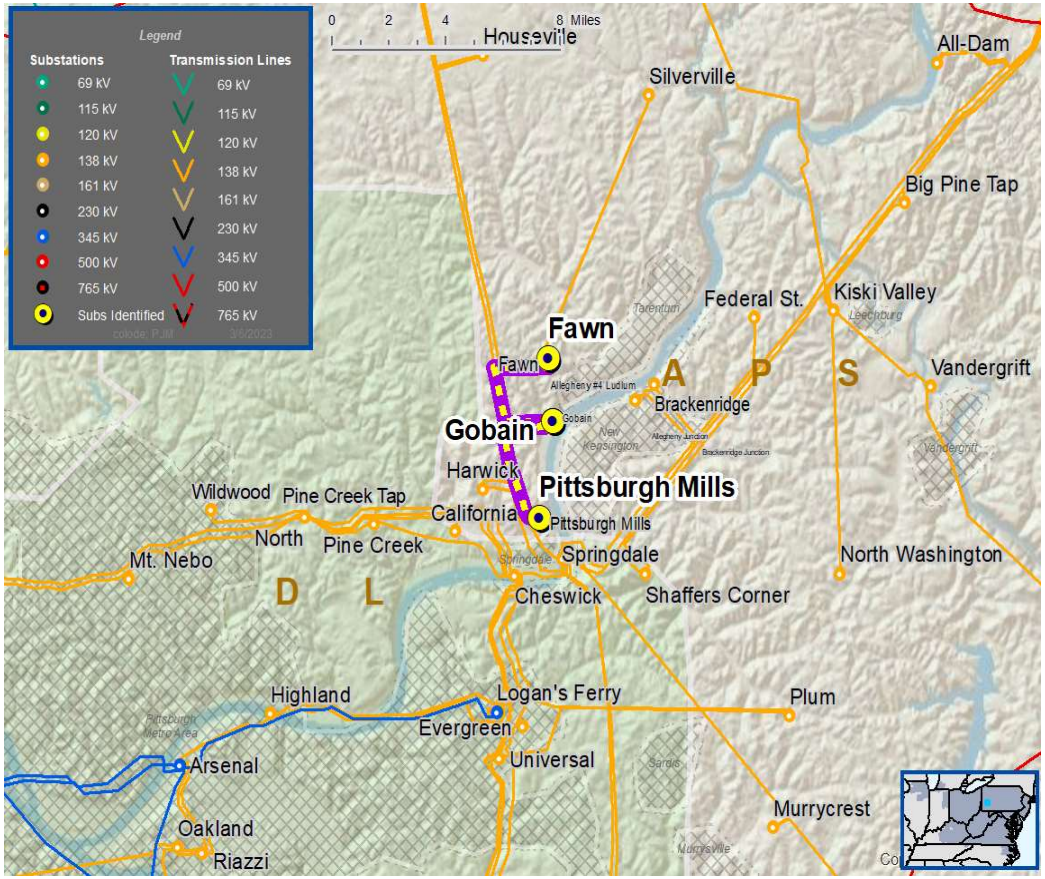
Specific Assumption Reference:

Customer request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement:

New Customer Connection – A customer requested 138 kV service to support 11 MVA of additional load at a site near Gobain 138 kV substation (New Kensington, PA) in the West Penn Power service territory.

Requested in-service date is 02/28/2023



APS Transmission Zone M-3 Process

Need Number: APS-2021-011

Process Stage: Solution Meeting 03/17/2023

Proposed Solution:

- Extend the Gobain 138 kV bus to provide a connection for a new distribution transformer

Alternatives Considered:

- Serve the customer via the 25 kV distribution system

Anticipated Rating Changes:

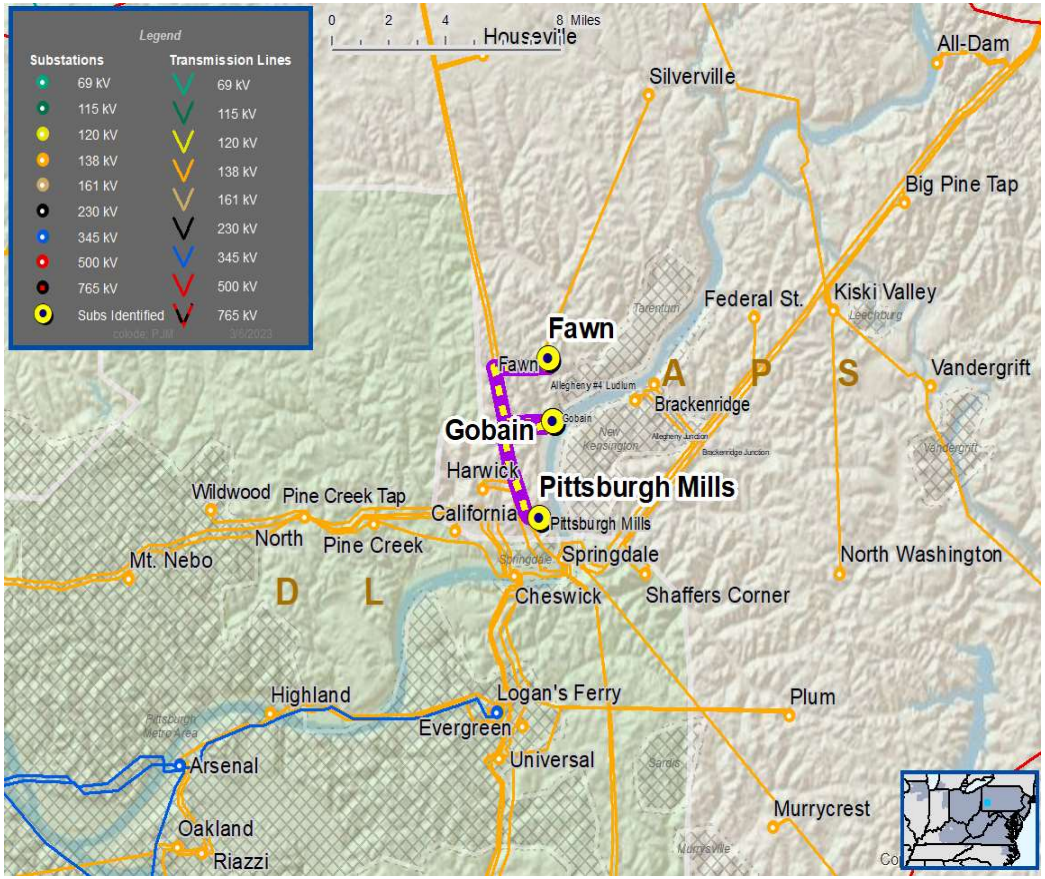
- None

Estimated Project Cost: $0.5M

Projected In-Service: 06/16/2023

Project Status: Engineering

Model: 2020 RTEP model for 2025 Summer (50/50)



DEOK Transmission Zone M-3 Process

Need Number: DEOK-2019-024

Process Stage: Solutions Meeting 03-17-2023

Previously Presented: Needs Meeting 11-22-2019

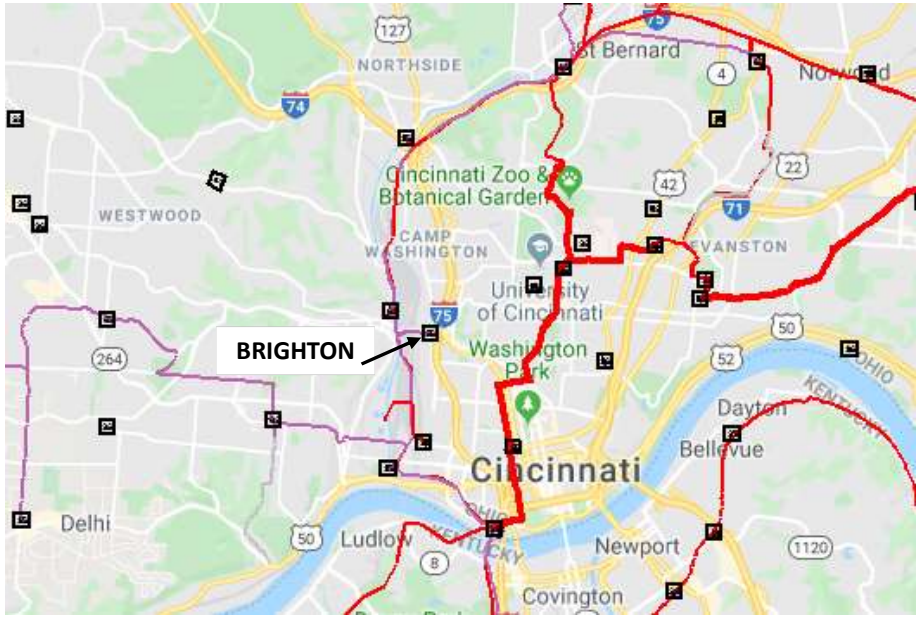
Project Driver: Other

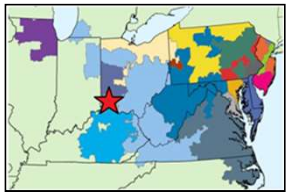
Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 11

Problem Statement:

The City of Cincinnati is planning to replace the Western Hills Viaduct. The new roadway will be constructed immediately south of the existing roadway. Brighton substation is in the path of the new roadway. Brighton serves 40MW of residential, commercial and light industrial load with two 69/13kV 35MVA transformers connected to five feeder exits each.





345kV
138kV
69kV

DEOK Transmission Zone M-3 Process

Need Number: DEOK-2019-024

Process Stage: Solutions Meeting 03-17-2023

Previously Presented: Needs Meeting 11-22-2019

Project Driver: Other

Specific Assumption Reference:
Duke Energy Ohio & Kentucky Local Planning Assumptions slide 11

Potential Solution:
Disconnect the 69 kV feeder loop connecting Brighton substation. Demolish and remove Brighton. Build Camp Washington, a new 3-breaker ring bus substation to serve area load formally served by Brighton. Install three 138/13 kV, 22 MVA transformers and switchgear for distribution feeders. Due to land constraints two of the ring positions in this small substation will also loop the South Fairmount-Metro Sewer 138 kV feeder through Camp Washington.

Alternatives: none

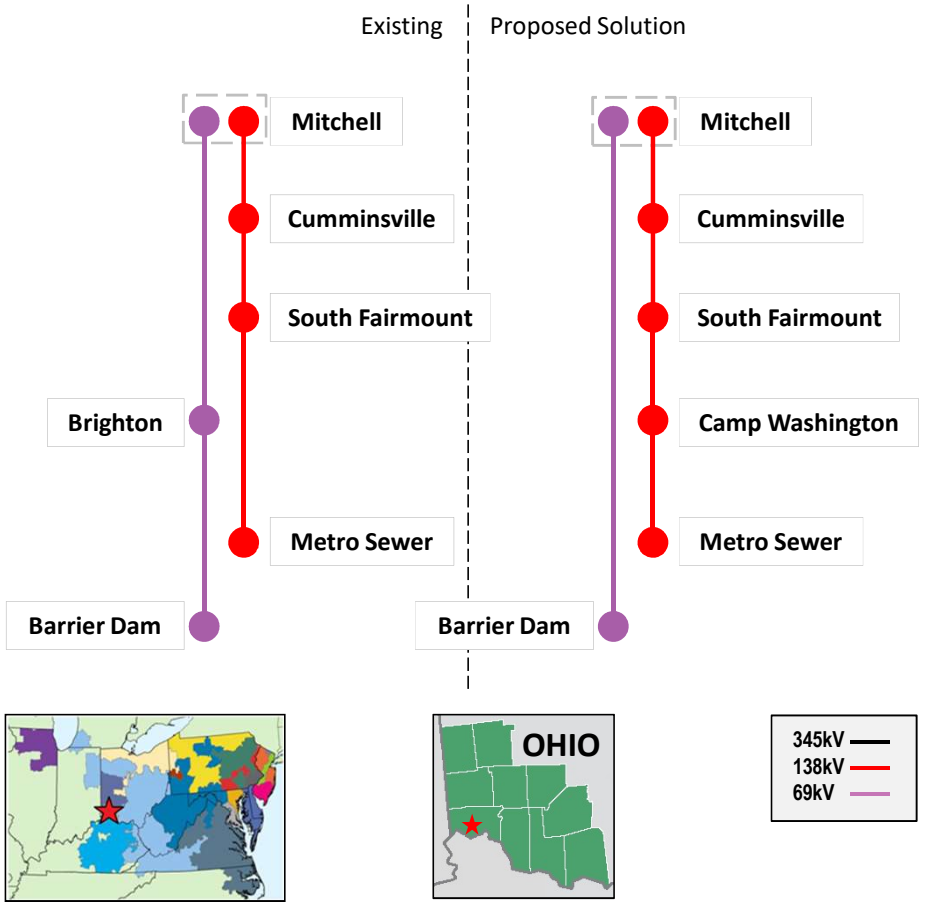
Ancillary Benefits: 138 kV is a stronger source for the area load. The 3-breaker ring allows more switching options and increases reliability and resilience.

Estimated Transmission Cost: $19.5MM

Proposed In-Service Date: 12-19-2025

Project Status: Scoping

Model: 2022 RTEP



DEOK Transmission Zone M-3 Process
Wilder

Need Number: DEOK-2023-002

Process Stage: Solutions Meeting 03/17/2023

Previously Presented: Needs Meeting 02/17/2023

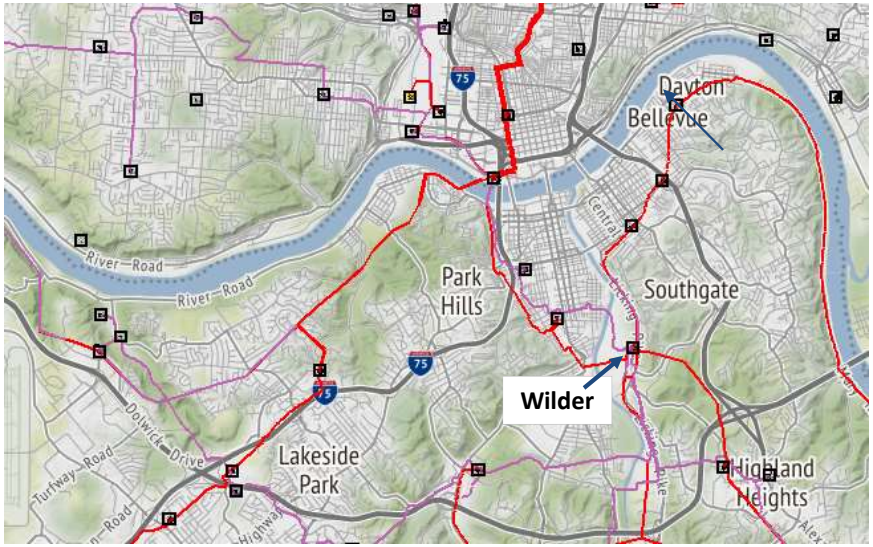
Project Driver: Equipment condition, performance and risk

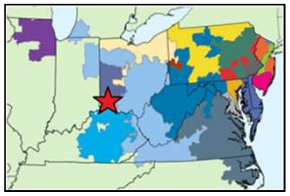
Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slides 6-7

Problem Statement:

Wilder 138 kV CB 836 is a vintage 1968 oil filled circuit breaker that is in deteriorating condition. The most recent service indicates the internal wear is exceeding its normal maintenance cycle and is trending towards costly repairs. This breaker also has type U bushings which are known to be prone to failure.





345kV
138kV
69kV

DEOK Transmission Zone M-3 Process
Wilder

Need Number: DEOK-2023-002

Process Stage: Solutions Meeting 03/17/2023

Previously Presented: Needs Meeting 02/17/2023

Project Driver: Equipment condition, performance and risk

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slides 6-7

Potential Solution:

Replace Wilder 138 kV CB 836, its bus and line disconnect switches, and drops from the switches to the breaker.

Alternatives: none

Ancillary Benefits: Removes the environmental hazard of the oil in the old breaker. The replacement of the drops raises the capacity of the circuit by 8 MVA.

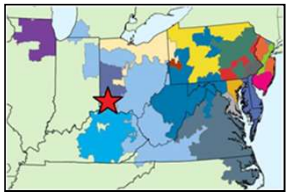
Estimated Transmission Cost: $655K

Proposed In-Service Date: 03-25-2024

Project Status: Scoping

Model: 2022 RTEP

Bubble Diagram Not Applicable
Station Modifications Only



345kV
138kV
69kV

ATSI Transmission Zone M-3 Process
Leroy Center - Mayfield Q3 138 kV

Need Number: ATSI-2021-016
Process Stage: Solution Meeting – 03/17/2023
Presently Presented: Need Meeting – 08/16/2021

Supplemental Project Driver(s):
Equipment Material Condition, Performance, and Risk
Infrastructure Resilience

Specific Assumption Reference(s):
Global Factors

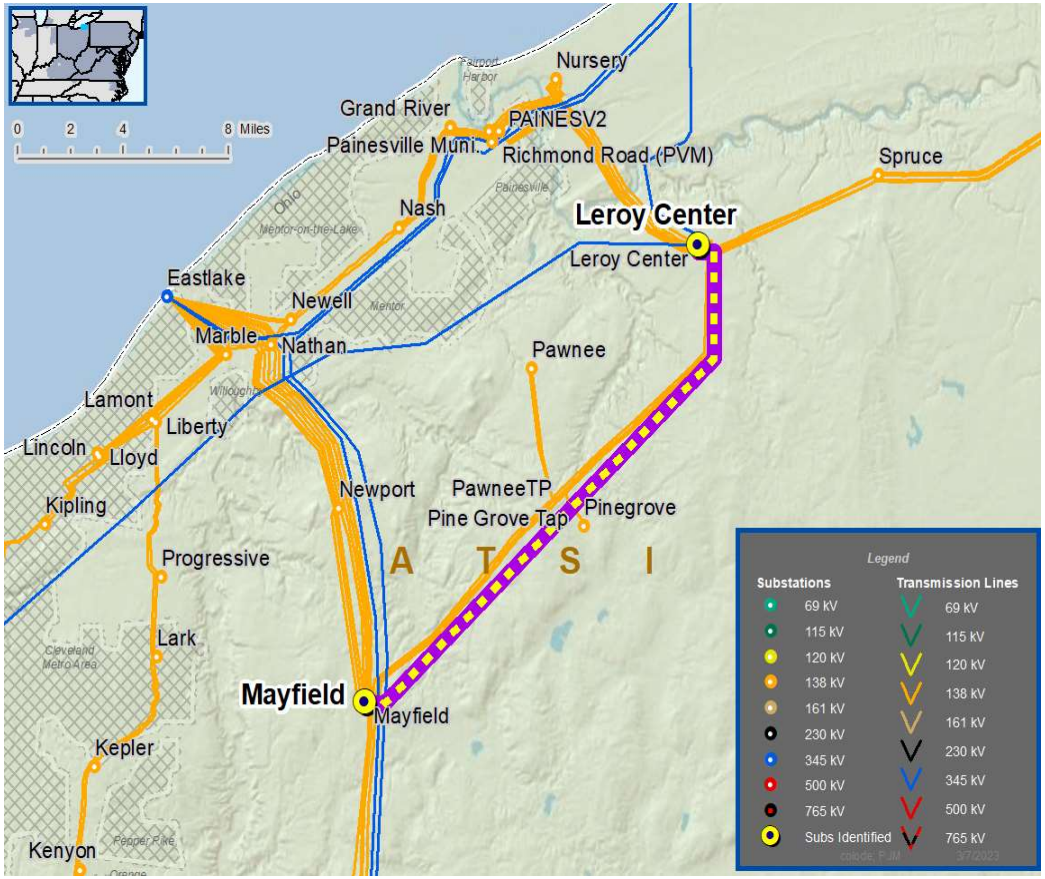
- System Reliability and Performance
- Load at risk in planning and operational scenarios
- Increase line loading limits
- Age/condition of transmission line conductors

Line Condition Rebuild/Replacement

- Transmission lines with loading at 80% or greater

Problem Statement

- The Leroy Center – Mayfield Q3 138 kV line loads to 89% under contingency conditions in the latest RTEP Case.
- The Leroy Center – Mayfield Q3 138 kV line feeds 4,938 customers and 21 MW at the Pinegrove Substation.
- The existing conductor is 4/0 CU and can cause protection issues due to not being able to handle the short circuit current for faults.
- Age/condition of transmission line conductors and hardware (mid 1940s).



ATSI Transmission Zone M-3 Process
Leroy Center - Mayfield Q3 138 kV

Need Number: ATSI-2021-016
Process Stage: Solution Meeting – 03/17/2023

Proposed Solution:

- Reconductor approximately 7.7 miles 138 kV line section from Mayfield to Pinegrove with 336 ACSS, insulators and cold end attachments will be replaced, as needed.
- Relay setting changes at Mayfield

Estimated Cost: $16.0M
Projected In-Service: 06/01/2025

- Reconductor approximately 8.1 miles 138 kV line section from Leroy Center to Pinegrove with 336 ACSS, insulators and cold end attachments will be replaced, as needed.
- Relay setting changes at Leroy Center

Estimated Cost: $15.7M
Projected In-Service: 06/01/2024

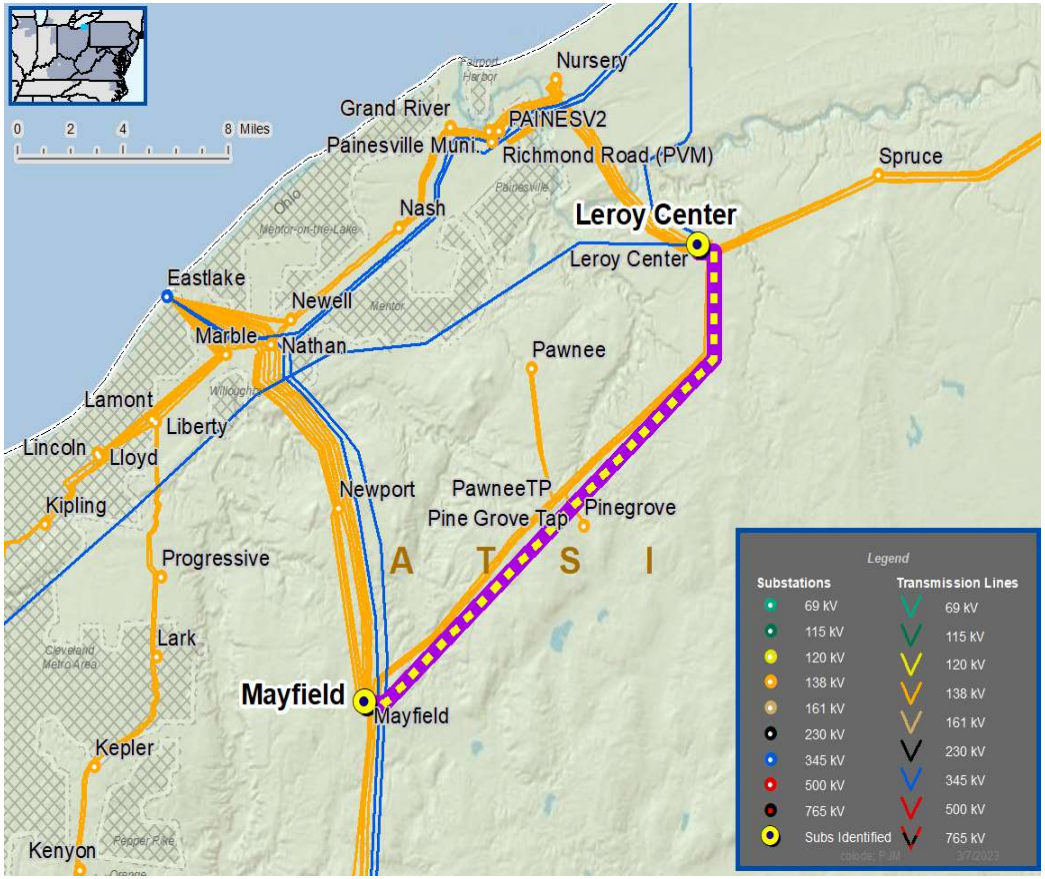
Transmission Line Ratings:

- Leroy Center – Mayfield 138 kV Line
  - Before Proposed Solution: 148 MVA SN/ 151 MVA SE
  - After Proposed Solution: 252 MVA SN / 291 MVA SE

Alternatives Considered:

- No alternatives considered for this project to reconductor the line

Total Estimated Project Cost: $31.7M
Status: Engineering
Model: 2020 Series 2025 Summer RTEP 50/50



ATSI Transmission Zone M-3 Process
Leroy Center - Mayfield Q1 138

Need Number: ATSI-2022-007
Process Stage: Solution Meeting – 03/17/2023
Presently Presented: Need Meeting – 03/18/2022

Supplemental Project Driver(s):
Equipment Material Condition, Performance, and Risk
Infrastructure Resilience

Specific Assumption Reference(s):
Global Factors

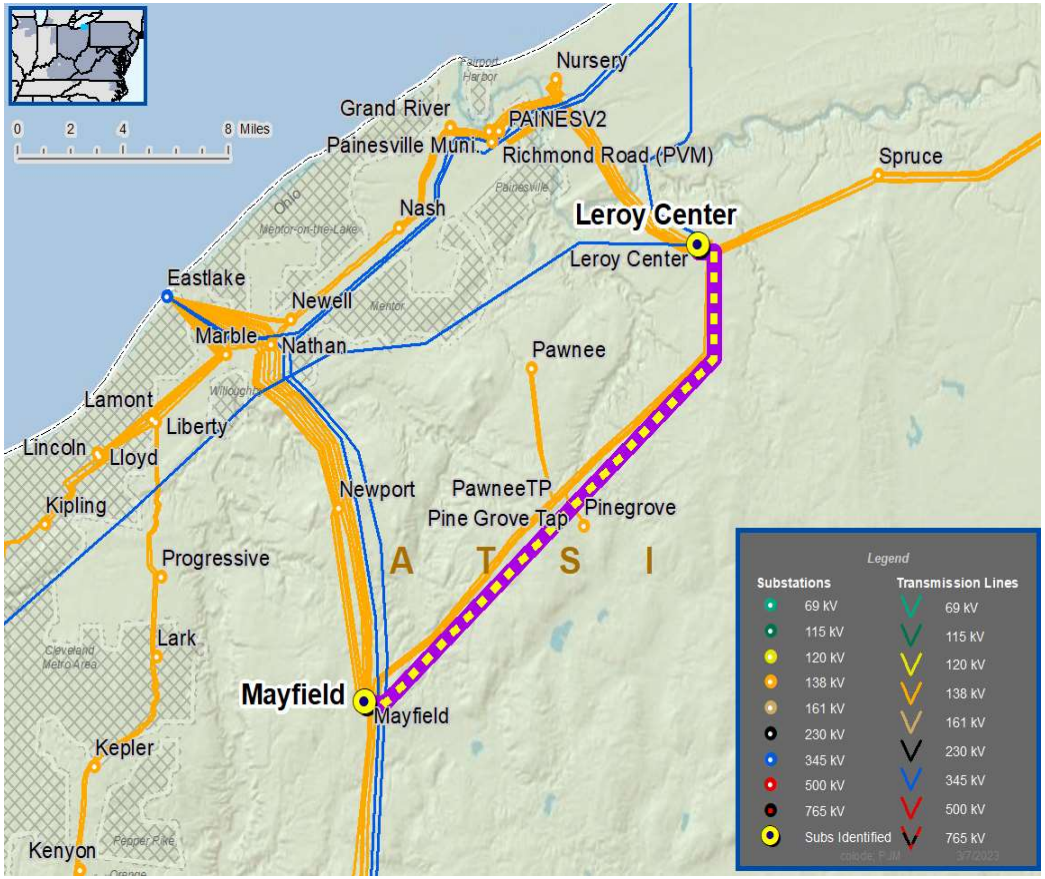
- System Reliability and Performance
- Increasing negative trend in maintenance findings
- Age/condition of transmission line conductors and hardware

Line Condition Rebuild/Replacement

- End of Life Methodology

Problem Statement

- The Leroy Center – Mayfield Q1 138 kV Line (~16.1 miles) originally constructed mid-1940's, and all structures are similar vintage.
- Leroy Center – Pawnee Tap Q1 138 kV line section (~8.4 miles) is being reconductored and addressed under RTEP# b3152
- Pawnee Tap – Mayfield Q1 138 kV line (~7.7 miles) section:
  - 71 of 119 structures inspected had measurable cold end attachment plate wear with instances of mounting holes being 75% worn.
  - Age/condition of transmission line conductors and hardware (mid 1940s).



ATSI Transmission Zone M-3 Process
Leroy Center - Mayfield Q1 138

Need Number: ATSI-2022-007
Process Stage: Solution Meeting – 03/17/2023

Proposed Solution:

- Reconductor approximately 7.7-mile 138 kV line section from Pawnee tap to Mayfield (Q1) with 336 ACSS. Replace tower structures, insulators and hardware as needed to address condition items and support new conductor.
- Revise relay settings at Mayfield, Leroy Center, and Pawnee
- Leroy Center – Pawnee Q1 138 kV line section is being reconductored under baseline project RTEP b3152

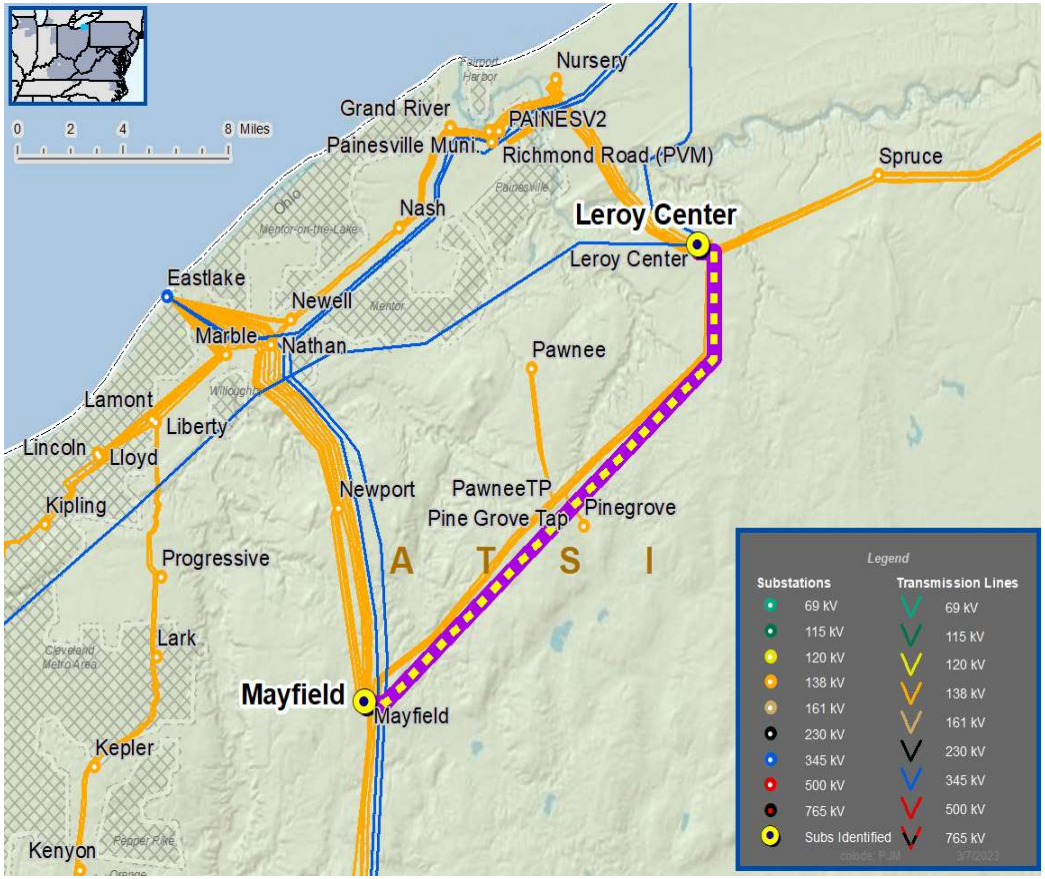
Transmission Line Ratings:

- Pawnee Tap - Mayfield Q1
  - Before Proposed Solution: 115 MVA SN/ 115 MVA SE
  - After Proposed Solution: 252 MVA SN / 291 MVA SE

Alternatives Considered:

- No alternatives considered for this project to reconductor the line

Estimated Project Cost: $15.2M
Projected In-Service: 06/01/2026
Status: Engineering
Model: 2020 Series 2025 Summer RTEP 50/50



ATSI Transmission Zone M-3 Process
Leroy Center - Mayfield Q4 138 kV

Need Number: ATSI-2022-008
Process Stage: Solution Meeting – 03/17/2023
Presently Presented: Need Meeting – 03/18/2022

Supplemental Project Driver(s):
Equipment Material Condition, Performance, and Risk
Infrastructure Resilience

Specific Assumption Reference(s):
Global Factors

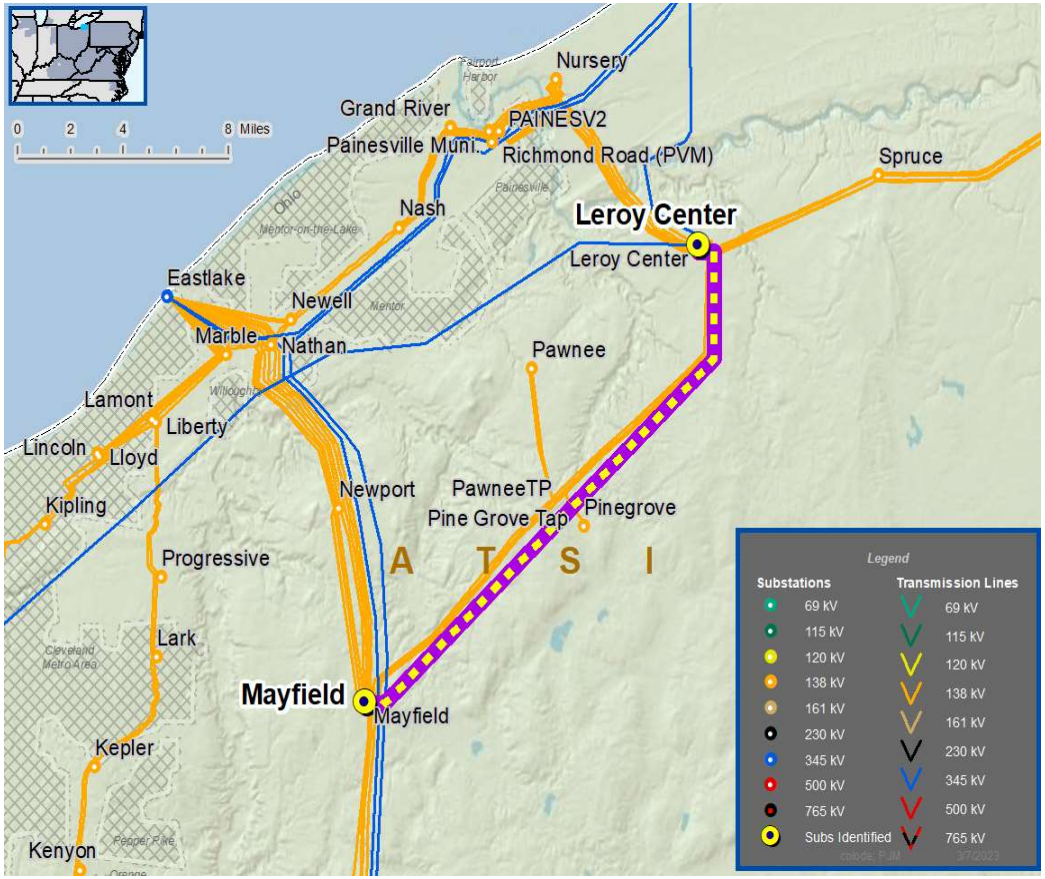
- System Reliability and Performance
- Increasing negative trend in maintenance findings
- Age/condition of transmission line conductors and hardware

Line Condition Rebuild/Replacement

- End of Life Methodology

Problem Statement

- The Leroy Center – Mayfield Q4 138 kV Line (~16.1 miles) originally constructed mid-1940's, and all structures are similar vintage:
  - 54 of 119 structures inspected had measurable cold end attachment plate wear with instances of mounting holes being 75% worn.
- Age/condition of transmission line conductors and hardware (mid 1940s).



ATSI Transmission Zone M-3 Process
Leroy Center - Mayfield Q4 138 kV

Need Number: ATSI-2022-008
Process Stage: Solution Meeting – 03/17/2023

Proposed Solution:

- Reconductor approximately 16.1 miles of the Leroy Center – Mayfield Q4 138 kV Line with 336 ACSS. Replace tower structures, insulators and hardware as needed to address condition items and support new conductor.
- Revise relay settings at Mayfield, Leroy Center, and Pinegrove

Transmission Line Ratings:

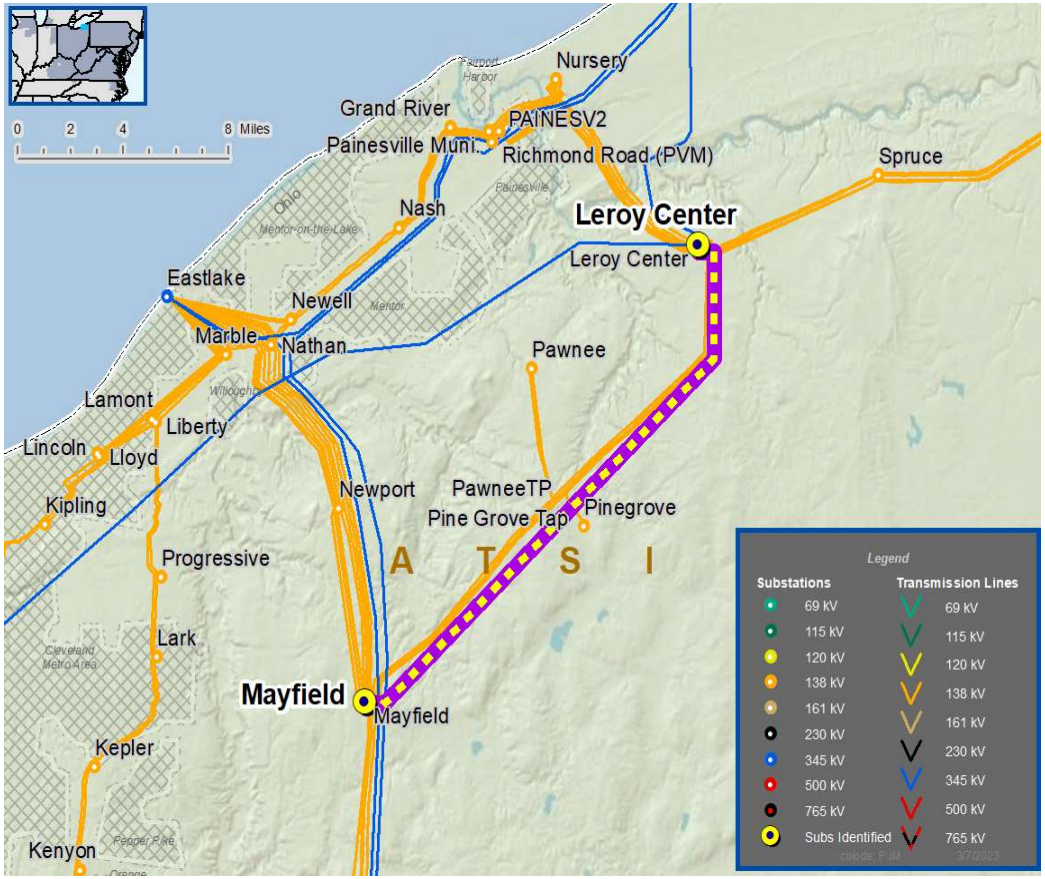
Leroy Center – Mayfield Q4 138 kV Line

- Before Proposed Solution: 148 MVA SN/ 151 MVA SE
- After Proposed Solution: 252 MVA SN / 291 MVA SE

Alternatives Considered:

- No alternatives considered for this project to reconductor the line

Estimated Project Cost: $33.5M
Projected In-Service: 03/01/2027
Status: Engineering
Model: 2020 Series 2025 Summer RTEP 50/50



ATSI Transmission Zone M-3 Process
Shenango 345/138 kV Transformers No. 1 and No. 2

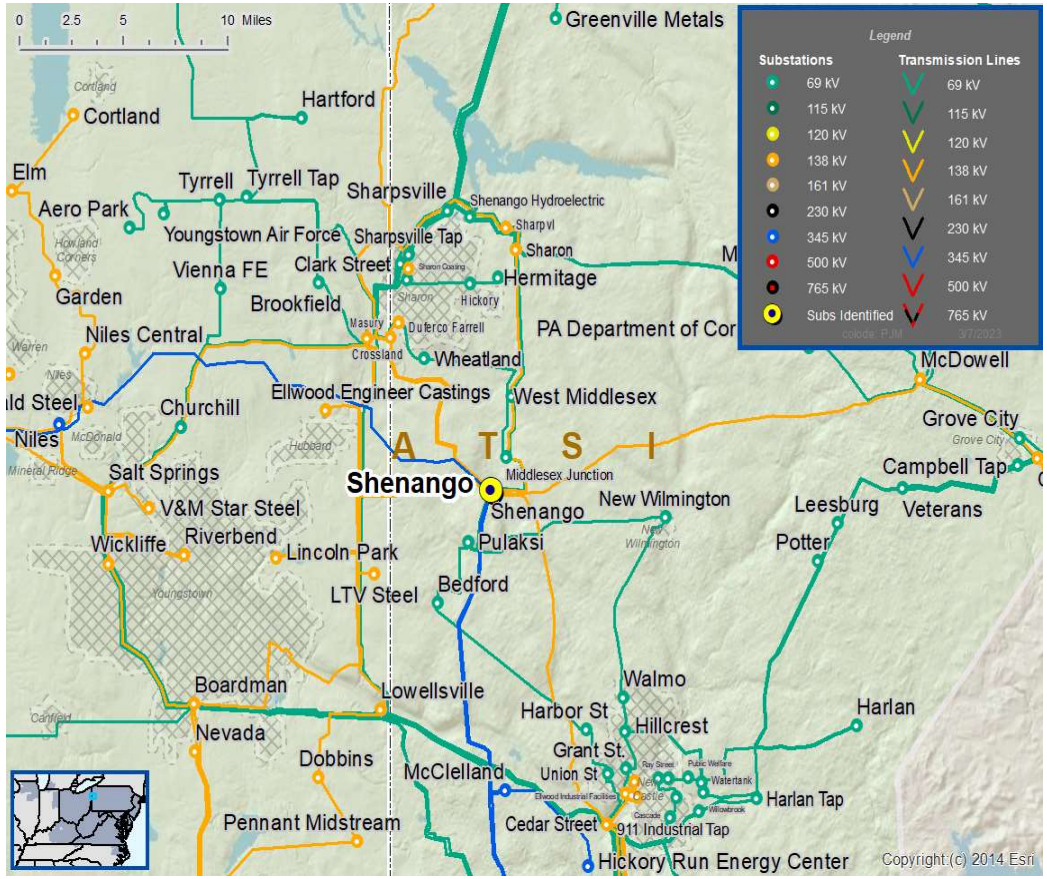
Need Number: ATSI-2021-024
Process Stage: Solution Meeting – 03/17/2023
Previously Presented: Need Meeting – 10/15/2021

Supplemental Project Driver(s):
Equipment Material Condition, Performance and Risk
Infrastructure Resilience

Specific Assumption Reference(s):
Global Factors
- System Reliability and Performance
- Substation/line Equipment Limits

Substation Equipment Replacement
- Circuit breakers and other fault interrupting devices
- Switches and relays

Problem Statement
- The existing protection scheme on the Shenango 345/138 kV Transformers No. 1 and No. 2 is sensitive to neutral overcurrent inrush, which may cause unnecessary trips.
- Transformer circuit ratings are limited by disconnect switches, CT's, breakers, and substation conductor.
- Approximately 1154 customers and 400 MVA of load served
- Since 2017, Shenango 138 kV lines had eight (8) sustained outages



ATSI Transmission Zone M-3 Process
Shenango 345/138 kV Transformers No. 1 and No. 2

Need Number: ATSI-2021-024
Process Stage: Solution Meeting – 03/17/2023

Proposed Solution:

Shenango Sub – Update TR No 1 and TR No 2 Relaying

- TR No 1 (345/138 kV):
  - Replace 345/138 kV transformer grounding relay with SEL-587
  - Replace 138 kV disconnect switch D1, D3, D4, D5 & D7 and breaker B2 with 3000A equipment.
  - Replace BFT relaying for breakers B2 and B6 with SEL-451
- TR No 2 (345/138 kV):
  - Replace 345/138 kV transformer grounding relay with SEL-587
  - Replace 138 kV disconnect switch D63, D65, D66, D67 & D69 with 3000A equipment.
  - Replace conductor from transformer bushing to disconnect switch
  - Modify relaying settings

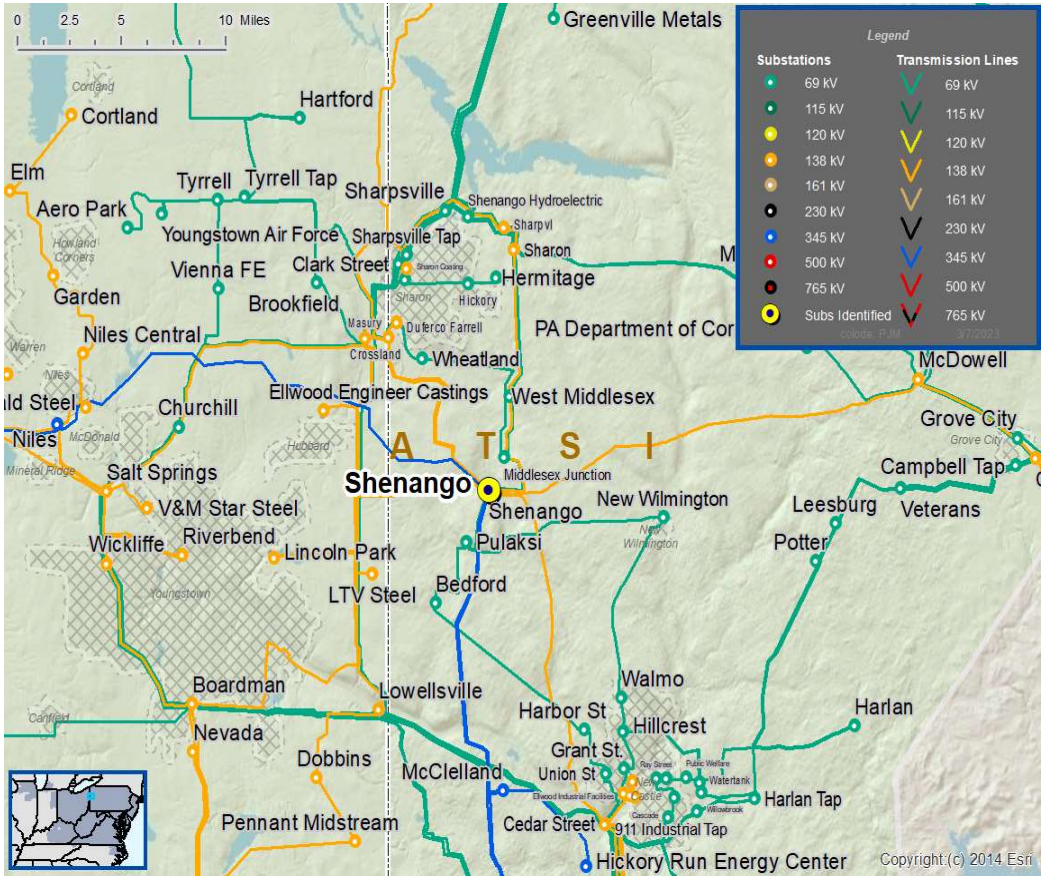
Transmission Transformer Ratings:

- TR No 1 (345/138KV):
  - Before Proposed Solution: 548 MVA SN / 688 MVA SSTE / 721 MVA WN / 826 MVA WSTE
  - After Proposed Solution: 623 MVA SN / 710 MVA SSTE / 768 MVA WN / 837 MVA WSTE
- TR No 2 (345/138KV):
  - Before Proposed Solution: 548 MVA SN / 659 MVA SSTE / 679 MVA WN / 753 MVA WE
  - After Proposed Solution: 620 MVA SN / 710 MVA SSTE / 743 MVA WN / 834 MVA WSTE

Alternatives Considered:

No alternatives considered for this relay protection replacement

Estimated Project Cost: $1.4 M
Projected In-Service: 12/30/2023
Project Status: Engineering
Model: 2020 Series RTEP Model for 2025 Summer



AEP Transmission Zone M-3 Process
East Lima

Need Number: AEP-2022-OHO06

Previously Presented: Need Meeting 1-21-2022

Process Stage: Solution Meeting 3/17/2023

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

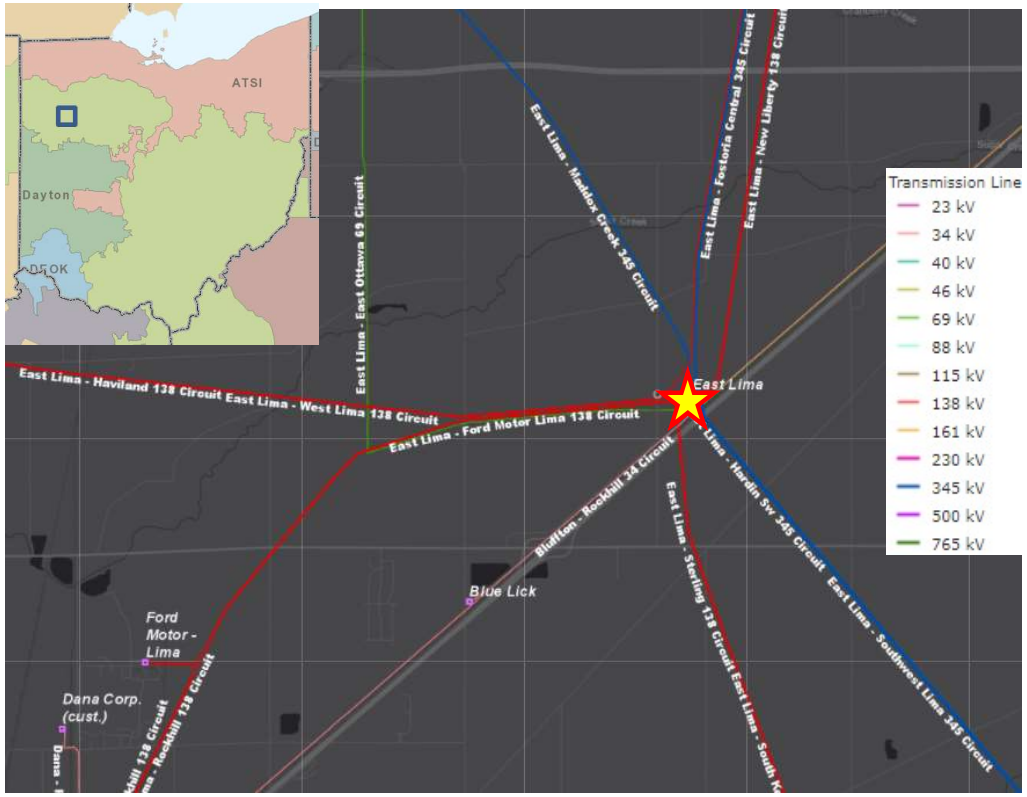
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

East Lima 69kV:

Circuit Breakers U,V:

- Breaker Age: U 1967, V 1967
- Interrupting Medium: (OIL)
- Fault Operations:
  - Number of Fault Operations: U 107, V 68
  - Manufacturer recommended Number of Operations: 10
- **Additional Breaker Information**: This breakers are CF-48-69-2500 type oil breaker. Manufacture support and spare parts have ended. Third party replacement parts are expensive. This model family uses the OA-3 hydraulic mechanism, which has been associated with several mis-operations across the AEP fleet.
- **Relays:** Currently, 70 of the 129 relays (54% of all station relays) are in need of replacement. 54 of these are of the electromechanical type and 2 of these are of the static type which have significant limitations with regards to spare part availability and fault data collection and retention. 14 relays are microprocessor type outside of their life expectancy
- **Overall Station Condition**: The station will need significant rehabilitation to replace vintage equipment and mitigate potential future environmental concerns.



AEP Transmission Zone M-3 Process
East Lima Upgrades Project

Need Number: AEP-2022-OHO06
Process Stage: Solutions Meeting 03/17/2023

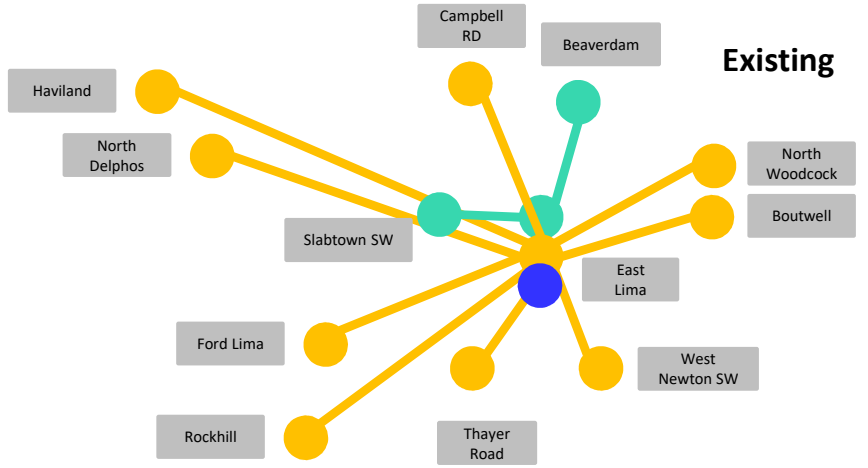
Proposed Solution:

- At East Lima 69kV breakers U and V will be replaced with 3000A 40kA breakers. The 69kV disconnect switches and sub-conductors will be upgraded. A DICM will be installed to replace the old control structure. Relay and breaker control voltages will be standardized. Environmental remediation at the station will be completed per federal requirements. Remediation will include the disposal of PCB-impacted soils, concrete, and a legacy oil processing facility including associated oil piping and equipment. **Estimated Cost $11.1M**
- Upgrade relays at West Lima, Ford Lima, Yellow Creek and Woodlawn to coordinate with the new protection and communication scheme tied out of East Lima. **Estimated Cost $1.0M**

Total Estimated Transmission Cost: $12.1M

Alternatives Considered:
East Lima station is a large station with 345 and 138 kV equipment in addition to the 69 kV equipment to be replaced. Relocating or rebuilding in the clear is not a viable option due to the amount of infrastructure required to be moved.

Projected In-Service: 12/01/2024
Project Status: Scoping



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

DUQUESNE LIGHT CO.

DLCO Transmission Zone M-3 Process
Pittsburgh, PA

Need Number: DLC-2023-001

Process Stage: Solutions Meeting – 4/21/2023

Previously Presented: Needs Meeting – 3/17/2023

Supplemental Project Driver(s):

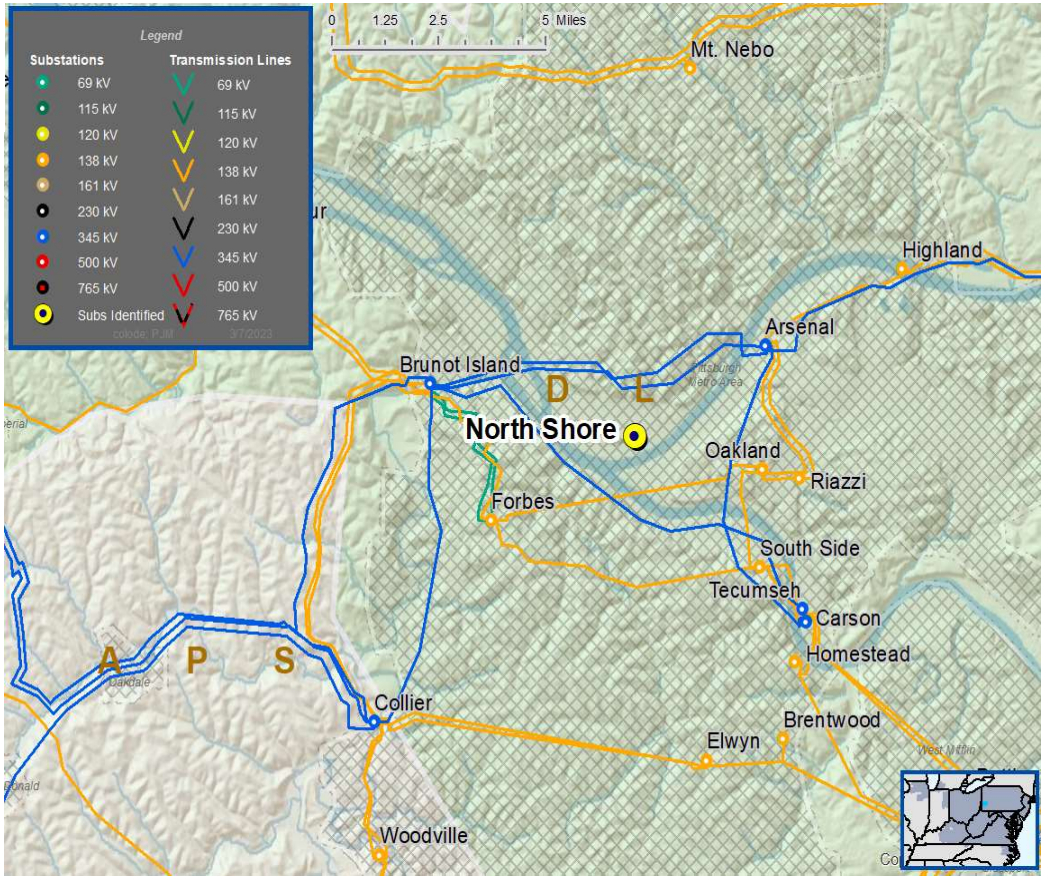
Customer Service and Infrastructure Resilience

Specific Assumptions Reference:

Slides 9 and 10 of the DLC 2023 Local Planning Assumptions.

Problem Statement:

Load growth in Pittsburgh's North Shore and surrounding areas driven by new customer connection requests have presented concerns regarding DLC's existing distribution infrastructure and its ability to serve its customers. There is also a need to add an additional transmission source to supply Pittsburgh's Downtown Network. As such, additional capacity and resiliency is needed to provide adequate distribution service to these areas.



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DUQUESNE LIGHT CO.

DLCO Transmission Zone M-3 Process
Pittsburgh, PA

Need Number: DLC-2023-001

Process Stage: Solutions Meeting – 4/21/2023

Previously Presented: Needs Meeting – 3/17/2023

Potential Solution:

Establish new Ridge 138kV substation in the Northside neighborhood of Pittsburgh. Ridge is to supply the immediate electrical demands of new customer connections and provide an additional transmission source for North Shore and Downtown Area customers. Ridge is planned to be a six (6) breaker ring bus with three (3) 138/23 kV transformers.

Alternatives Considered:

1. **No Changes/ Do Nothing** – This is not a recommended alternative. Failing to address the need would prevent DLC from providing service to the new customer connection requests and result in distribution system reliability/resiliency concerns with DLC's downtown area, including a number of critical customers. Estimated Alternative Solution #1 Cost: N/A

2. **Radial 138kV Solution** – DLC considered serving the new customer connections via new transmission sources from existing DLC substations. However, this would not address downtown resiliency needs and would be impractical due to city ROW constraints. Estimated Alternative Solution #2 Cost: N/A

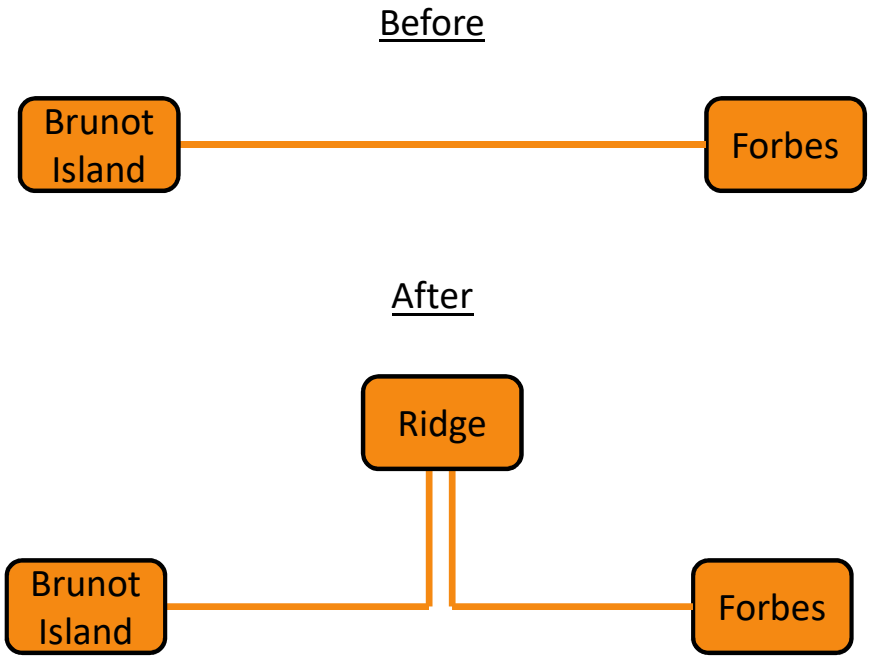
3. **Smaller ring bus** – DLC considered a smaller ring bus with two 138/23 kV transformers. This alternative would not meet reliability requirements for long-term capacity needs. Estimated Alternative Solution #3 Cost: $95M

Estimated Project Cost: $100M

Projected In-Service: 1/1/2026

Supplemental Project ID:

Project Status: Preliminary Engineering



EKPC Transmission Zone M-3 Process
Penn area

Need Number: EKPC-2023-001

Process Stage: Solutions Meeting – April 21, 2023

Previously Presented:

Need Meeting – March 17, 2023

Supplemental Project Driver:

Operational Flexibility and Efficiency; Customer Service

Specific Assumption Reference:

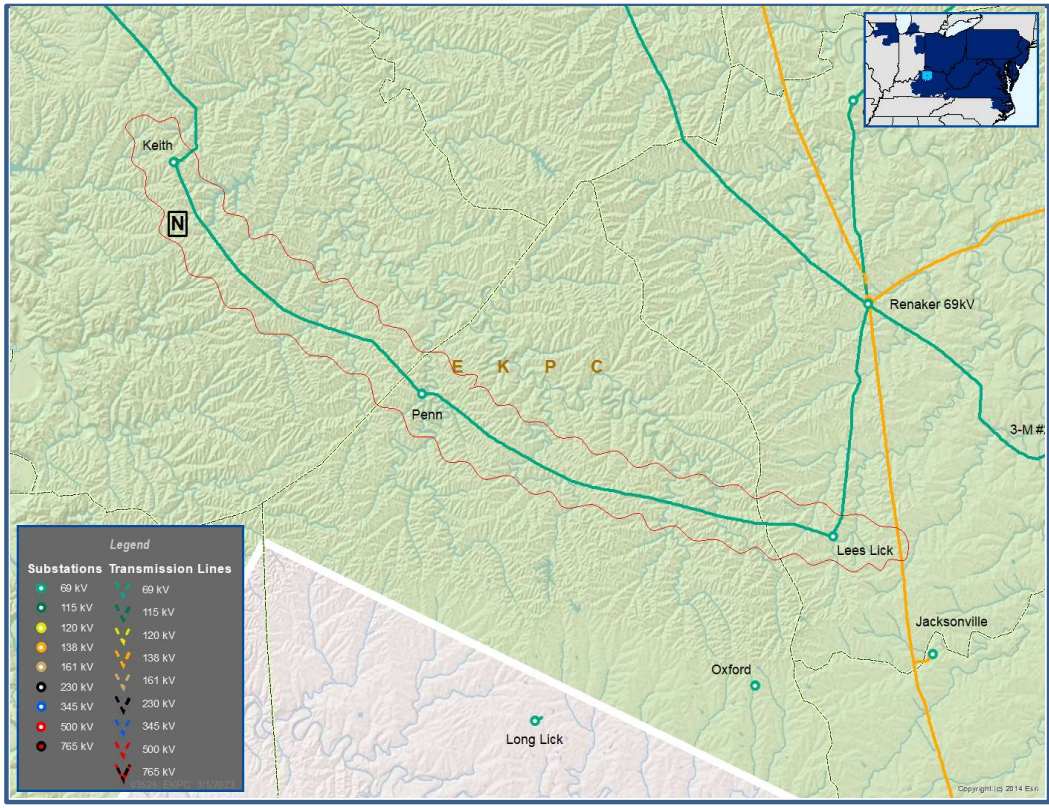
EKPC Assumptions Presentation Slides 14 & 15

Problem Statement:

During real time system operations, closing the normally open Keith-Penn 69 KV line section is utilized under various conditions. However, doing so creates a three terminal line section which causes system protection concerns. An internal EKPC study performed in 2017, showed the need for this line section to be operated normally closed under numerous N-1-1 conditions.

EKPC is currently rebuilding the Penn distribution substation due to aging condition issues.

Model: N/A



EKPC Transmission Zone M-3 Process
Penn Area

Need Number: EKPC-2023-001

Process Stage: Solutions Meeting – April 21, 2023

Proposed Solution:
Install 3, 69 KV breakers and associated equipment at the Penn distribution substation. Operate the Keith-Penn 69 KV line section as normally closed.

Transmission Cost: $3.7M

Distribution Cost: $0.0M

Ancillary Benefits:

- None

Alternatives Considered:

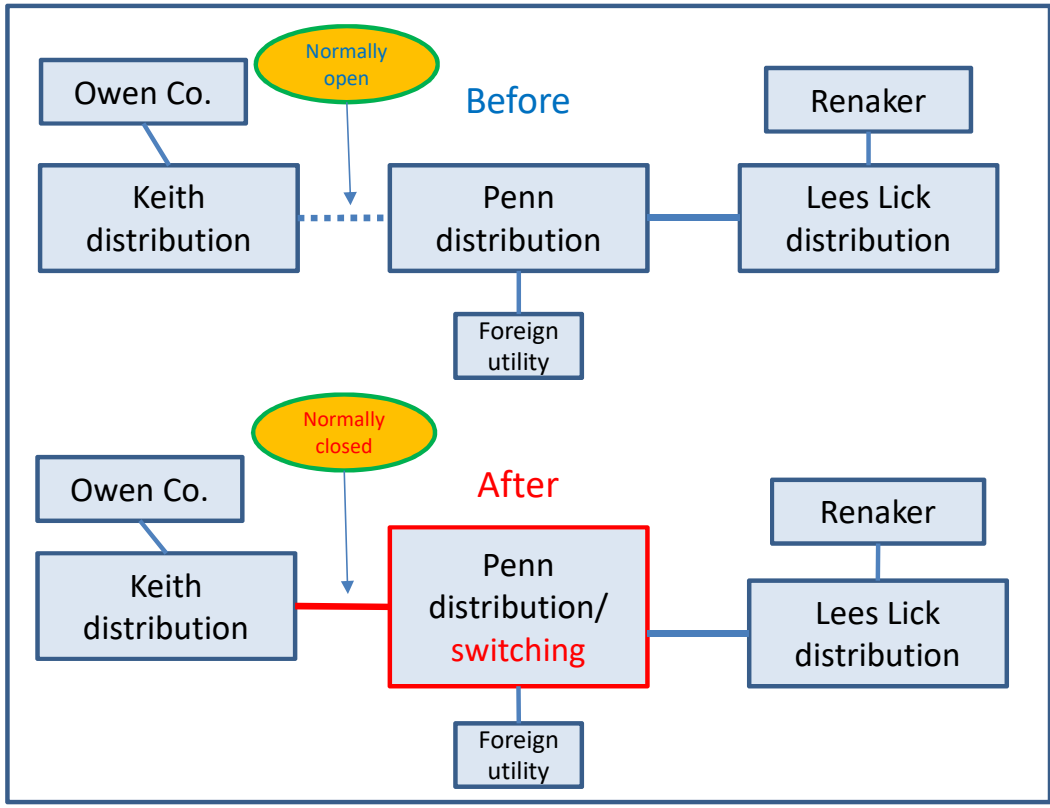
- Rebuild the Penn distribution substation and continue to operate the normally open switch associated with the Keith-Penn 69 KV line as needed.

Transmission Cost: $0.0M

Projected In-Service: 5/1/2023

Project Status: Under construction

Model: N/A



DEOK Transmission Zone M-3 Process
Greentree

Need Number: DEOK-2021-007

Process Stage: Solutions Meeting 04-21-2023

Previously Presented: Needs Meeting 06-15-2021

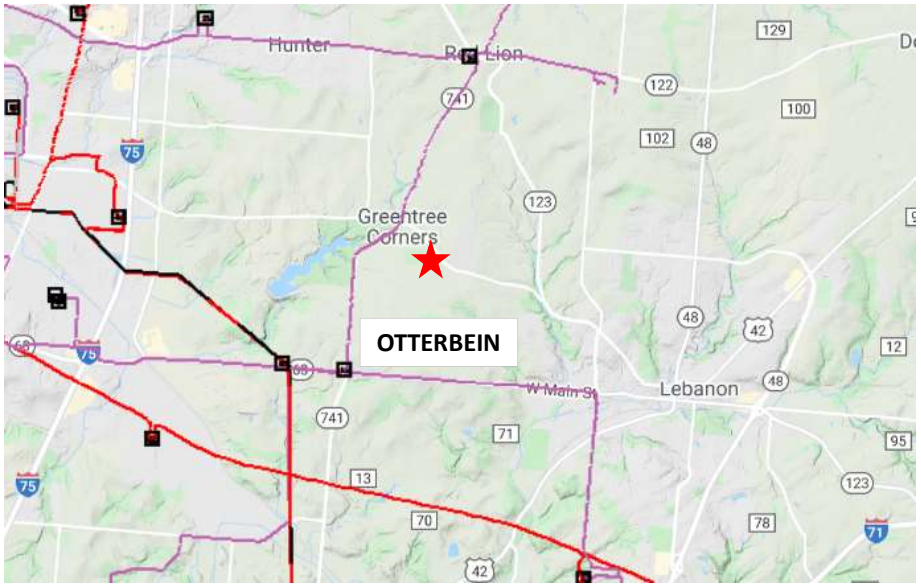
Project Driver: Customer Service

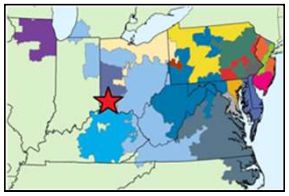
Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 9

Problem Statement:

Duke Energy Distribution has asked for a new delivery point near Greentree road in Warren County, Ohio. Phase 1 of a 4,500 unit residential and light commercial community is currently under construction. Load growth of 2 MW per year is expected. This will exceed the name plate capacity of the local distribution facilities at Otterbein in 2024.





345kV
138kV
69kV

DEOK Transmission Zone M-3 Process
Greentree

Need Number: DEOK-2021-007

Process Stage: Solutions Meeting 04-21-2023

Previously Presented: Needs Meeting 06-15-2021

Project Driver: Customer Service

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 9

Potential Solution:

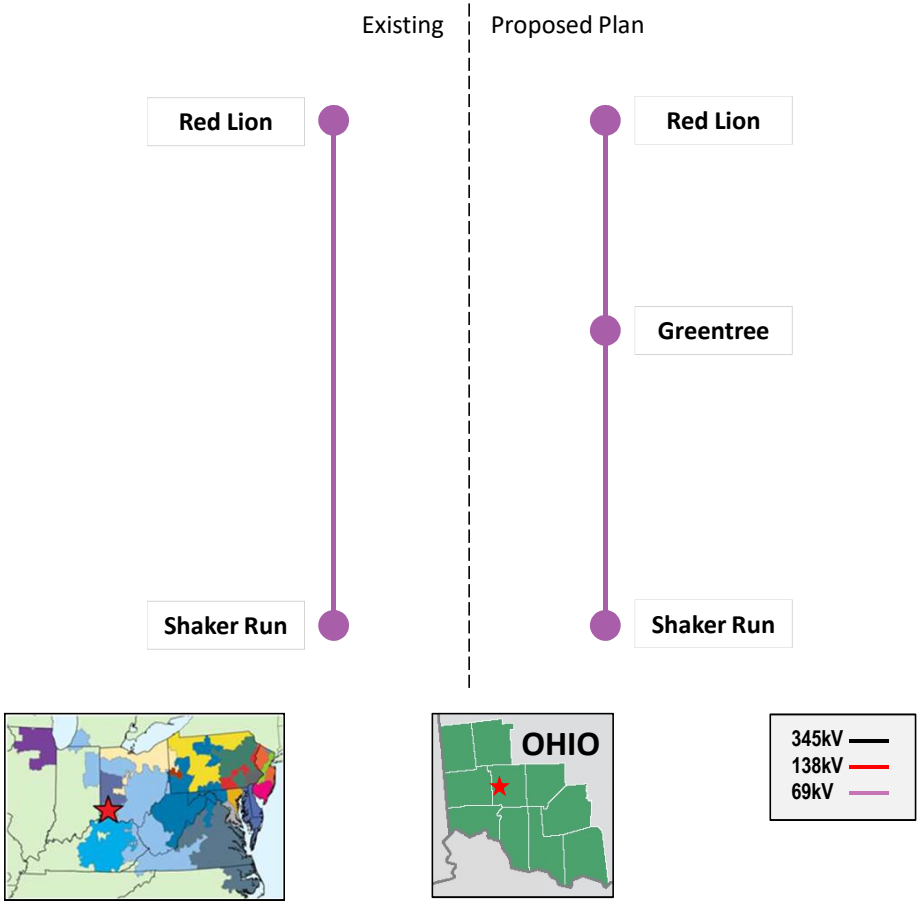
Build Greentree, a new 69 kV substation to serve the area load. Loop the Shaker Run – Red Lion feeder into/out of the substation. Greentree will have a straight bus design with line disconnects on each end controlled by an automatic throw-over scheme. A bus disconnect in series with a circuit switcher will connect a 69/13 kV, 22 MVA distribution transformer. Distribution bus work and breakers will be installed for two feeder exits.

Estimated Transmission Cost: $3.1MM

Proposed In-Service Date: 12-13-2024

Project Status: Engineering

Model: 2022 RTEP



Need Number: Dayton-2022-006

Process Stage: Need Meeting 9/16/2022

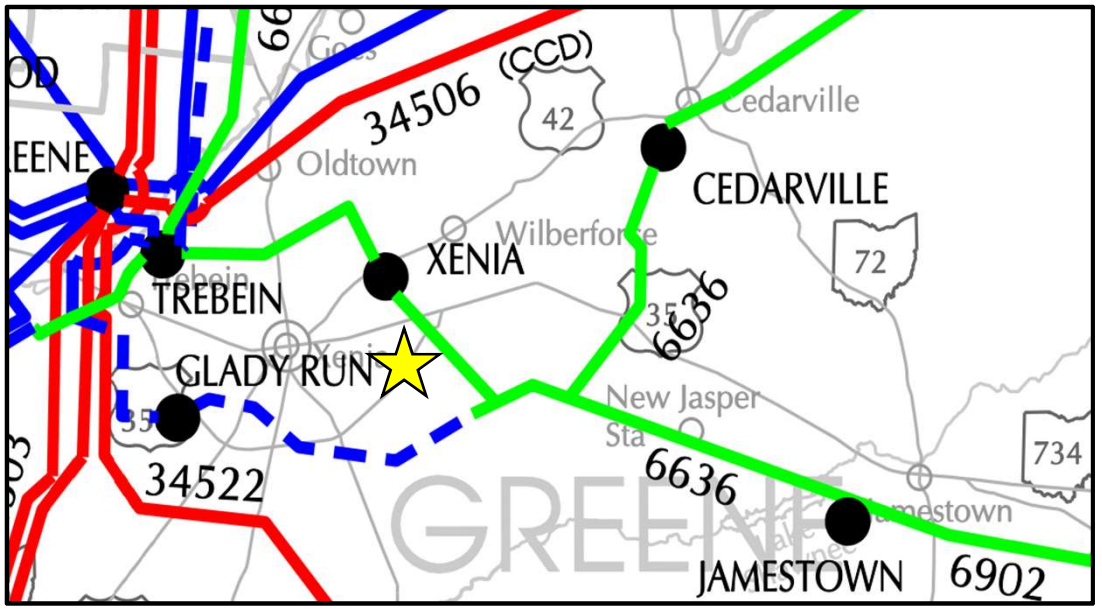
Project Driver: Customer Service

Specific Assumption Reference:
Dayton Local Plan Assumptions (Slide 5)

Problem Statement:

- AES has received a customer request to establish a new interconnect in the vicinity of Xenia substation
- Total MW load request, associated timelines & load totals

In-Service Date	Total New Connected Load
2022	1
2023	5.5
2026	11



Model: 2022 RTEP Series, 2027 Summer Case

= 345kV
= 138kV
= 69kV

Need Number: Dayton-2022-006
Previously Presented: Need Presented, 9/16/2022
Process Stage: Solution Meeting, 04/21/2023
Project Driver: Customer Service
Specific Assumption Reference: Dayton Local Plan Assumptions (Slide 5)

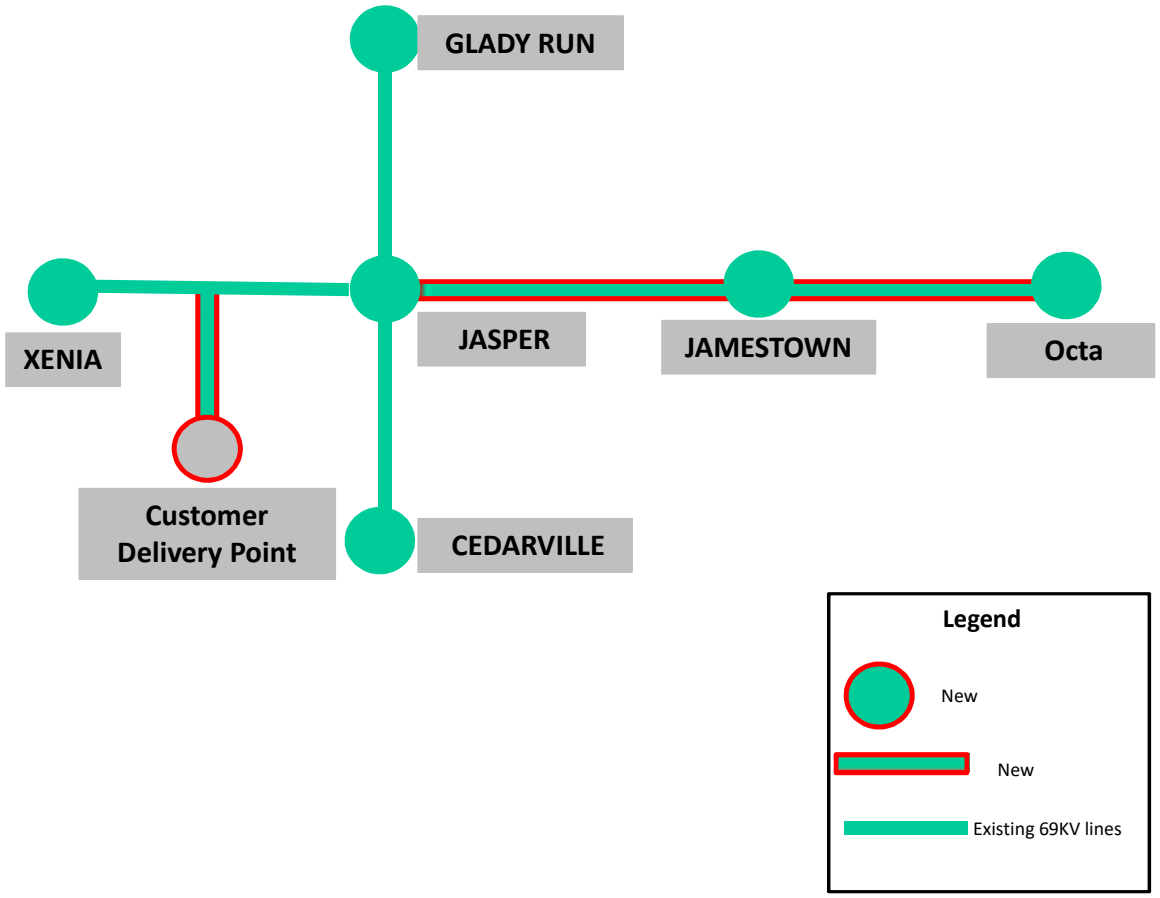
Selected Solution:

- **Customer Delivery Point Extension:**
  - Establish a new 69kV delivery point with auto sectionalizing motor operated air brake switches, extend a 0.4-mile 69kV single circuit extension off the Xenia – Jasper 69kV transmission line.

  Estimated Cost : $1.1 M, ISD 12/31/2023
- **Jasper-Octa Reconductor:**
  - Reconductor the 15.8-mile section of 2/0 conductor with 795 ACSR to improve capacity in the area. Inservice Date: Estimated cost:

  Estimated Cost : $6.0 M, ISD 12/31/2026
- **Total Estimated Transmission Cost :** $7.1 M
- **Projected In-Service:** 12/31/2026
- **Project Status:** Conceptual
- **Alternatives Considered:**
  - Direct Feed from new breaker position at Xenia Substation - $22.1M

Model: 2022 RTEP – 2027 Summer Case



Need Number: Dayton-2023-001

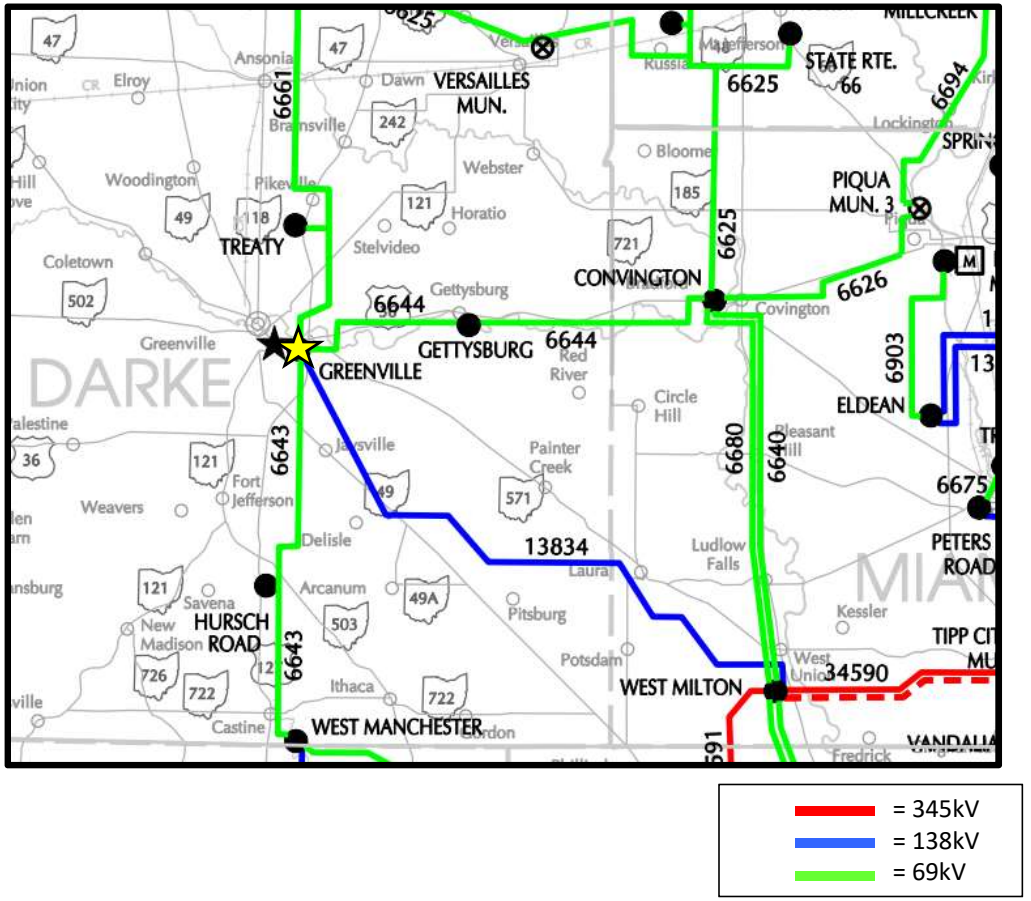
Process Stage: Need Meeting 2/17/2023

Project Driver: Operational Flexibility and Efficiency

Specific Assumption Reference: Dayton Local Plan Assumptions (Slide 5)

Problem Statement:

- Dayton and PJM planning have worked on local stability studies and identified an issue with the clearing time associated with certain Greenville 69kV circuit breakers.
- Critical clearing times for faults at Greenville 69kV resulting in additional loss of Greenville-West Milton 138kV and Greenville 69/12kV Bk-3 is approximately 6.5 cycles.
- The current breakers at Greenville are older oil breakers with a 7-cycle clearing time, Dayton's standard breaker is able to clear faults in 5 cycles.



Need Number: Dayton-2023-001

Previously Presented: Need Presented, 2/17/2023

Process Stage: Solution Meeting, 04/21/2023

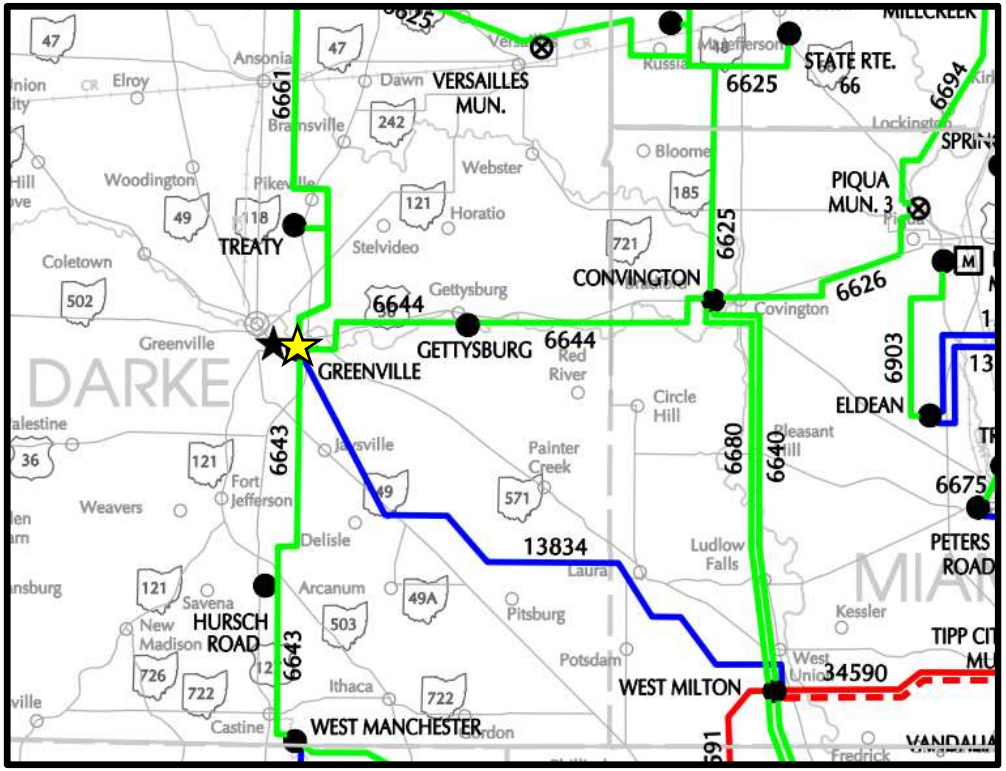
Project Driver: Operational Flexibility and Efficiency

Specific Assumption Reference: Dayton Local Plan Assumptions (Slide 5)

Selected Solution:

- **Breaker Replacement:**
  - Replace Greenville 69/12kV Bk-3 Breaker
- **Total Estimated cost :** $350k
- **Projected In-Service:** 12/31/2025
- **Project Status:** Conceptual

- **Alternatives Considered:** No alternatives considered due minimal scope and cost of selected solution.



Model: 2022 RTEP – 2027 Summer Case

ATSI Transmission Zone M-3 Process
Maysville 69 kV Area

Need Number: ATSI-2021-005
Process Stage: Solution Meeting – 04/21/2023
Previously Presented: Need Meeting – 10/15/2021

Supplemental Project Driver(s):
Operational Flexibility and Efficiency
Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)
Global Considerations

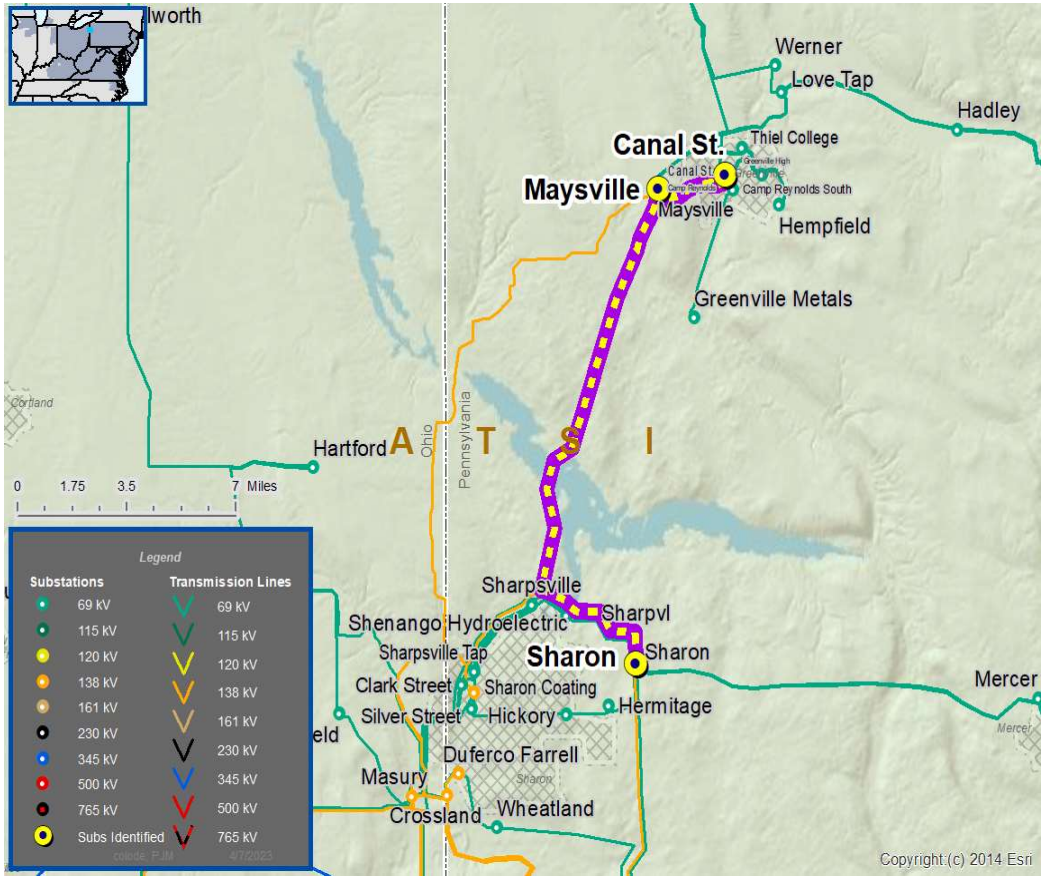
- System Reliability and Performance
- Substation/line equipment limits
- Reliability of Non-BES Facilities
- Load at risk in planning and operational scenarios.
- Load and/or customers at risk on single transmission lines

Network Radial Lines

- Load at risk and/or customers affected
- Proximity to other networked facilities

Build New Transmission Line

- Network radial lines



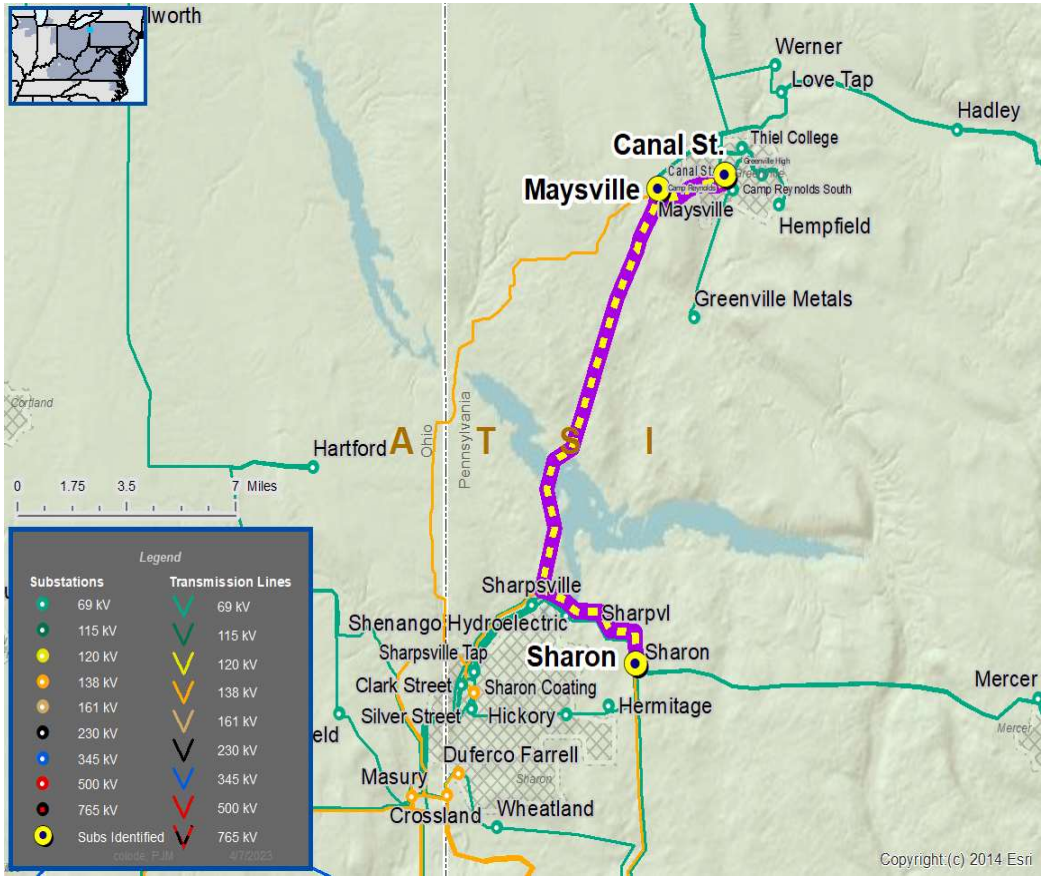
ATSI Transmission Zone M-3 Process
Maysville 69 kV Area

Need Number: ATSI-2021-005
Process Stage: Solution Meeting – 04/21/2023
Previously Presented: Need Meeting – 10/15/2021

Problem Statement

Canal (Maysville) 69 kV Line

- The Canal (Maysville) Y-79 69 kV Line serves 14 MW and 6,500 customers on a ~3.6 mile radial
- A P1-2 contingency for the loss of the Canal (Maysville) Y-79 69 kV Line will outage roughly 14 MW and 6,500 customers
- The Canal (Maysville) Y-79 69 kV Line has experienced 1 sustained outage the past 5 years
- The Maysville-Sharon Y-301 69 kV Line serves 18 MW and 2,600 customers at two delivery points served on a ~2.7-mile tap
- A P1-2 contingency for the loss of the Maysville-Sharon Y-301 69 kV Line will outage roughly 18 MW and 2,600 customers
- The Maysville-Sharon Y-301 69 kV Line has experienced 4 sustained outages the past 5 years



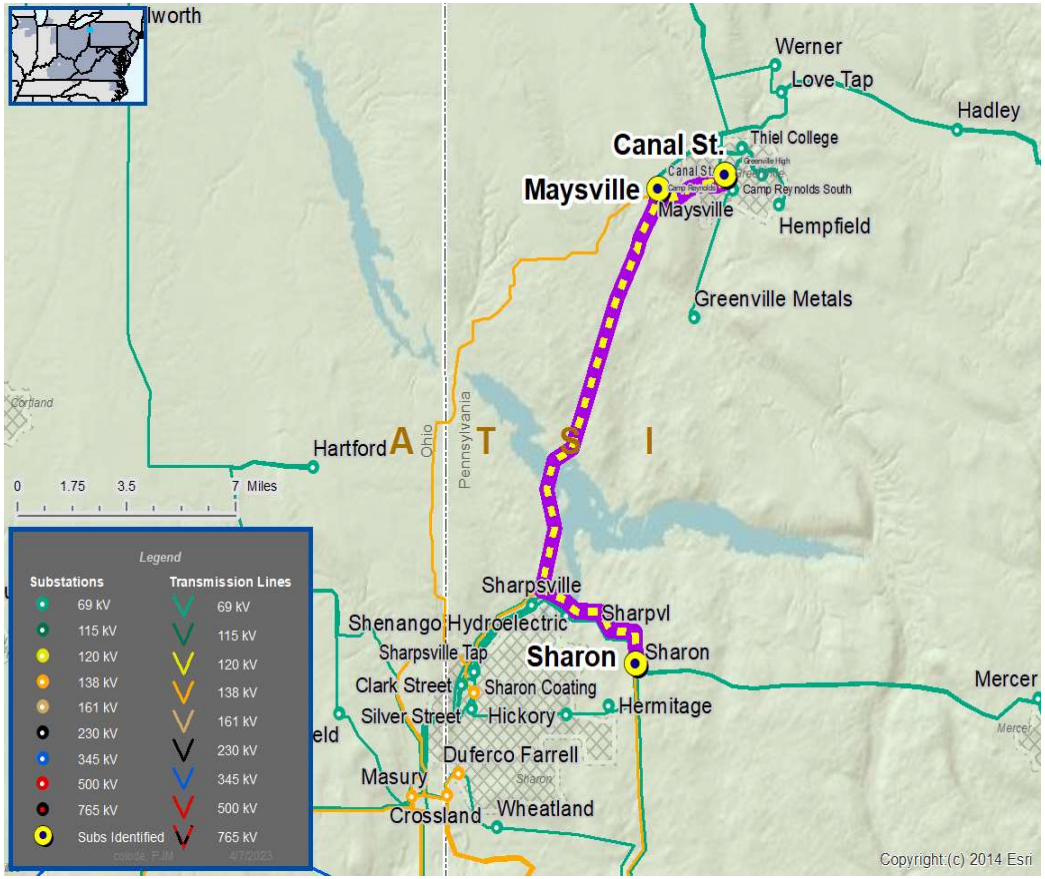
ATSI Transmission Zone M-3 Process
Maysville 69 kV Area

Need Number: ATSI-2021-005
Process Stage: Solution Meeting – 04/21/2023
Previously Presented: Need Meeting – 10/15/2021

Proposed Solution:

- Remove switches A118 and A119 on the Maysville-Sharon Y-301 69 kV Line
- De-energize roughly 3.6 miles of the Maysville-Sharon 69 kV line from Maysville to the Camp Reynolds tap location.
- Remove switches A2153, A23, A2151, A260, A261 and A2152 at Greenville
- Build approximately 3.0 mi of 69 kV line connecting the Camp Reynolds (near TY19) tap to the Canal Tap (near TY104)
- Add 69 kV line switches with SCADA at Camp Reynolds tap, Greenville Metal tap, and Canal tap
- Add one 69 kV line switch with SCADA at Trinity tap

- **Transmission Line Ratings:**
- Maysville-Sharon Y301 69 kV Line
  - Before Proposed Solution: 69 MVA SN / 72 MVA SE
- Canal-Greenville 69 kV Line
  - Before Proposed Solution: 47 MVA SN / 56 MVA SE
- Sharon-Greenville 69 kV Line
  - After Proposed Solution: 47 MVA SN / 56 MVA SE



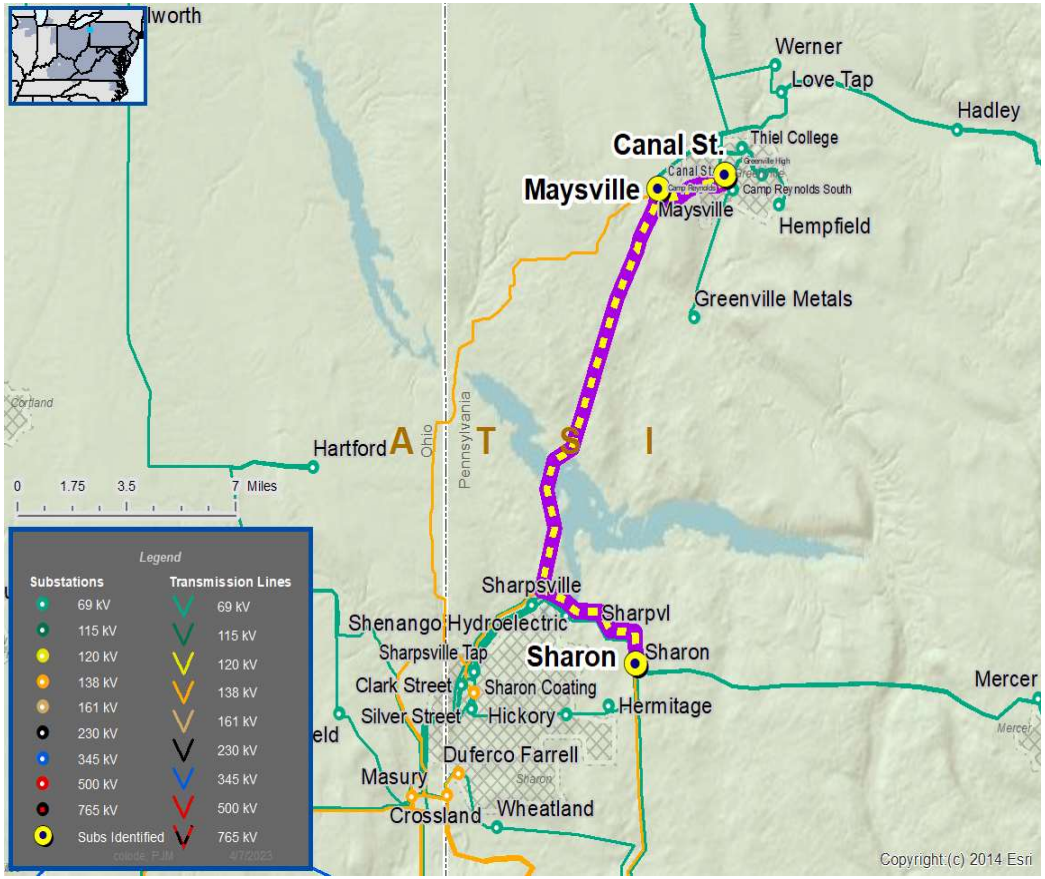
ATSI Transmission Zone M-3 Process
Maysville 69 kV Area

Need Number: ATSI-2021-005
Process Stage: Solution Meeting – 04/21/2023
Previously Presented: Need Meeting – 10/15/2021

Alternatives Considered:

There were no reasonable alternatives to network the two radial 69 kV lines to improve the reliability of service to the customers served from the radial lines.

Estimated Project Cost: $12.2 M
Projected In-Service: 6/1/2025
Project Status: Engineering
Model: 2022 Series 2027 Summer RTEP 50/50



ATSI Transmission Zone M-3 Process
Emily-Fox 138 kV Q14 Line

Need Number: ATSI-2022-023
Process Stage: Solution Meeting – 04/21/2023
Previously Presented: Need Meeting – 09/16/2022

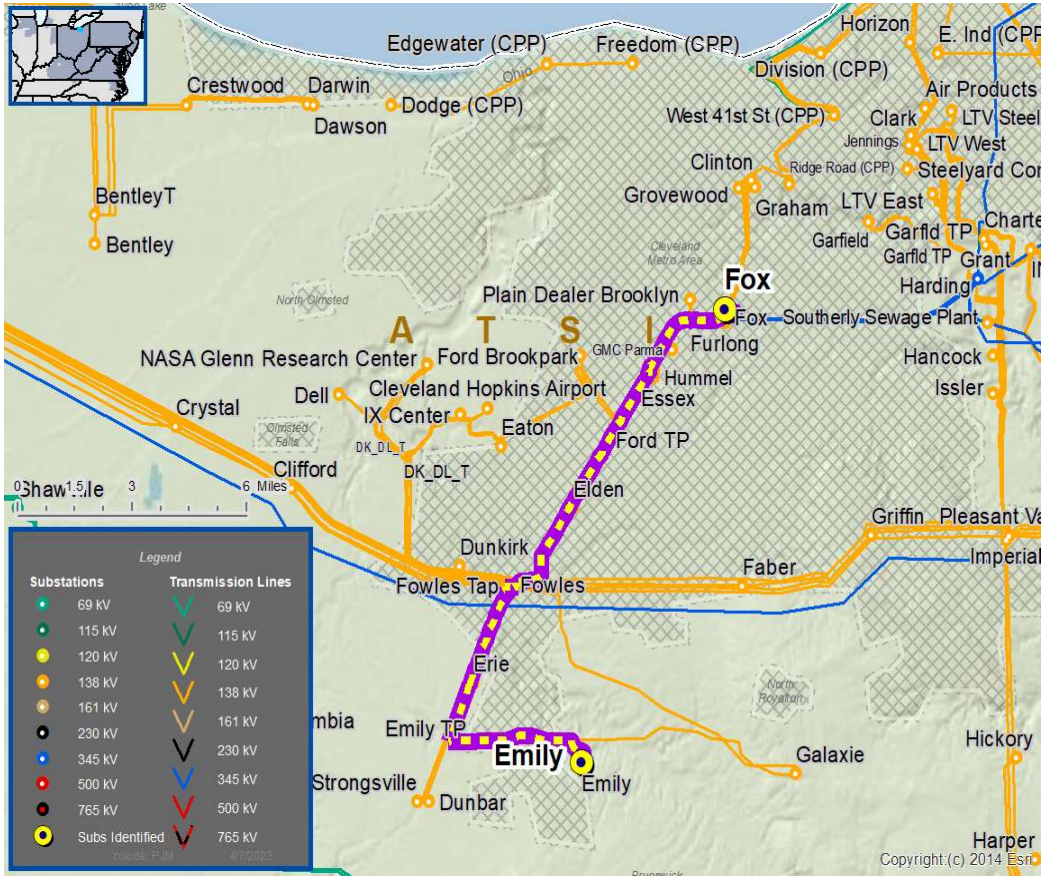
Supplemental Project Driver(s):
Equipment Material Condition, Performance, and Risk
Infrastructure Resilience

Specific Assumption Reference(s):
Global Factors

- System Reliability and Performance
- Increase line loading limits
- Age/condition of transmission line conductors
- Line Condition Rebuild/Replacement

Problem Statement

- During inspection of the Emily-Fox 138 kV Line (approximately 19 miles), seven (7) wood pole structures failed sound testing and/or decay has been noted, as well as miscellaneous broken insulators, missing or broken grounds, hardware, braces, climbing pegs, etc



ATSI Transmission Zone M-3 Process
Emily-Fox 138 kV Q14 Line

Need Number: ATSI-2022-023
Process Stage: Solution Meeting – 04/21/2023
Previously Presented: Need Meeting – 09/16/2022

Proposed Solution:

Fowles 138 kV Substation

- Replace existing 500 Cu strain bus at Fowles 138 kV (Emily – Fox 138 kV Line is routed through Fowles 138 kV Station)

Emily – Fox Q14 138 kV Line

- Replace and upgrade seven (7) wood pole structures on Emily – Fox 138 kV Q14 Line
- Replace damaged and worn insulators on ten (10) additional structures

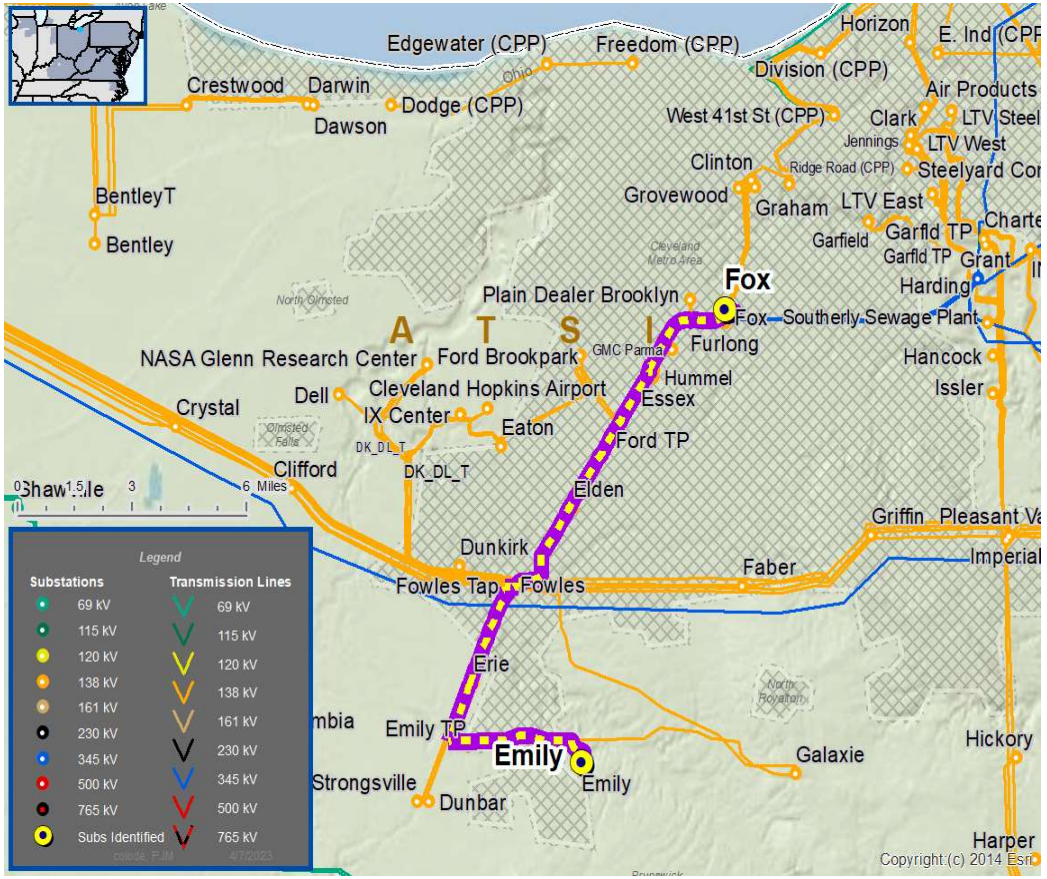
Transmission Line Ratings:

- Existing Galaxie – Hummel Tap line section rating: 176 SN / 229 SE / 253 WN / 284 WE
- New Galaxie – Hummel Tap line section rating: 347 SN / 423 SE / 393 WN / 501 WE

Alternatives Considered:

- Maintain existing condition and elevated risk of wood pole/insulator failures, increasing maintenance costs, and reduced transmission line loadability during peak conditions.

Estimated Project Cost: $1.1M
Projected In-Service: 12/31/2023
Status: Engineering
Model: 2022 Series 2027 Summer RTEP 50/50



APS Transmission Zone M-3 Process Misoperation Relay Project

Need Number: APS-2021-007
Process State: Solution Meeting 04/21/2023
Previously Presented: Need Meeting 08/16/2021

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:
Global Factors

- System reliability and performance
- Substation and line equipment limits
- Upgrade Relay Schemes
  - Relay schemes that have a history of misoperation
  - Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
  - Communication technology upgrades
  - Bus protection schemes

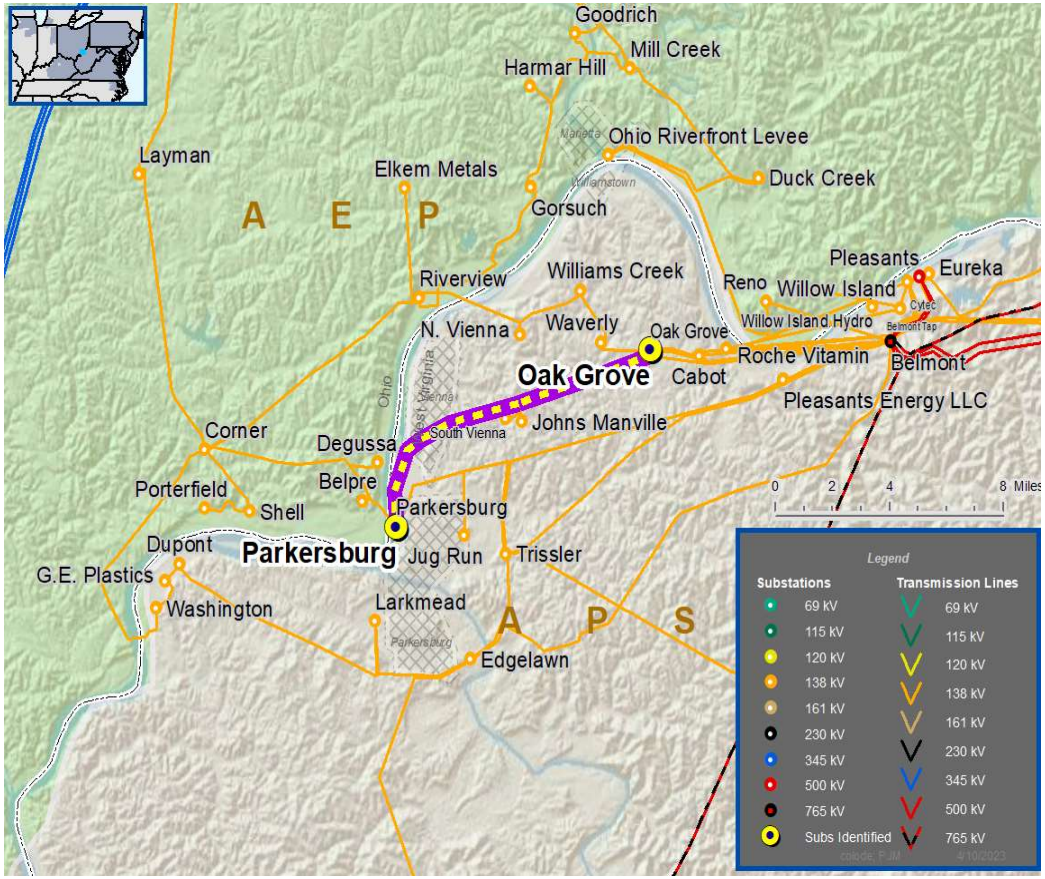
Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform properly together during a fault
- The identified protection equipment cannot be effectively repaired for reasons such as lack of replacement parts and available expertise in the outdated technology.
- Newer equipment provides better monitoring, enhances capability of system event analysis, and performs more reliably

- Transmission line ratings are limited by terminal equipment

Oak Grove – Parkersburg 638 138 kV Line (substation conductor)

- Existing line rating: 225 / 287 MVA (SN / SE)
- Existing Transmission conductor rating: 308 / 376 MVA (SN / SE)



APS Transmission Zone M-3 Process Misoperation Relay Project

Need Number: APS-2021-008
Process State: Solution Meeting 04/21/2023
Previously Presented: Need Meeting 08/16/2021

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:
Global Factors

- System reliability and performance
- Substation and line equipment limits
- Upgrade Relay Schemes
  - Relay schemes that have a history of misoperation
  - Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
  - Communication technology upgrades
  - Bus protection schemes

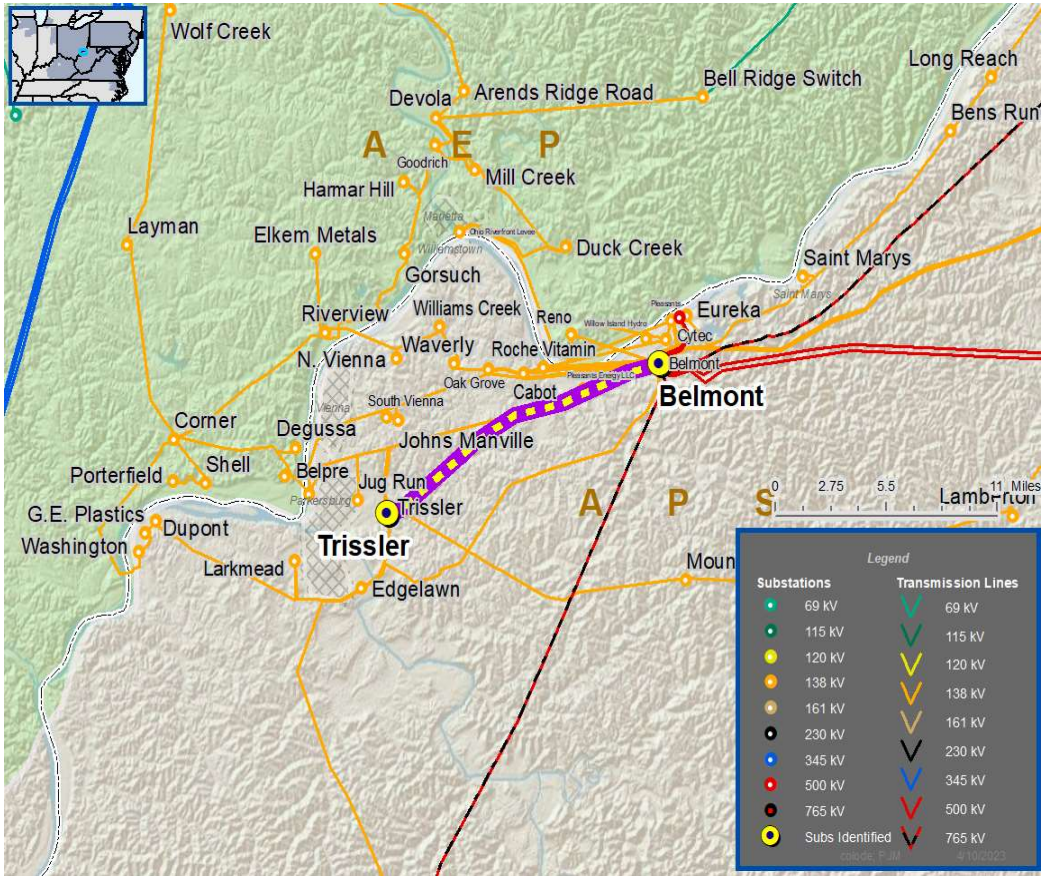
Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform properly together during a fault
- The identified protection equipment cannot be effectively repaired for reasons such as lack of replacement parts and available expertise in the outdated technology.
- Newer equipment provides better monitoring, enhances capability of system event analysis, and performs more reliably

- Transmission line ratings are limited by terminal equipment

Belmont – Trissler 648 138 kV Line (substation conductor)

- Existing line rating: 293 / 342 MVA (SN / SE)
- Existing Transmission conductor rating: 308 / 376 MVA (SN / SE)



APS Transmission Zone M-3 Process
Misoperation Relay Project

Need Number: APS-2021-009
Process State: Solution Meeting 04/21/2023
Previously Presented: Need Meeting 08/16/2021

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:
Global Factors

- System reliability and performance
- Substation and line equipment limits
- Upgrade Relay Schemes
  - Relay schemes that have a history of misoperation
  - Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
  - Communication technology upgrades
  - Bus protection schemes

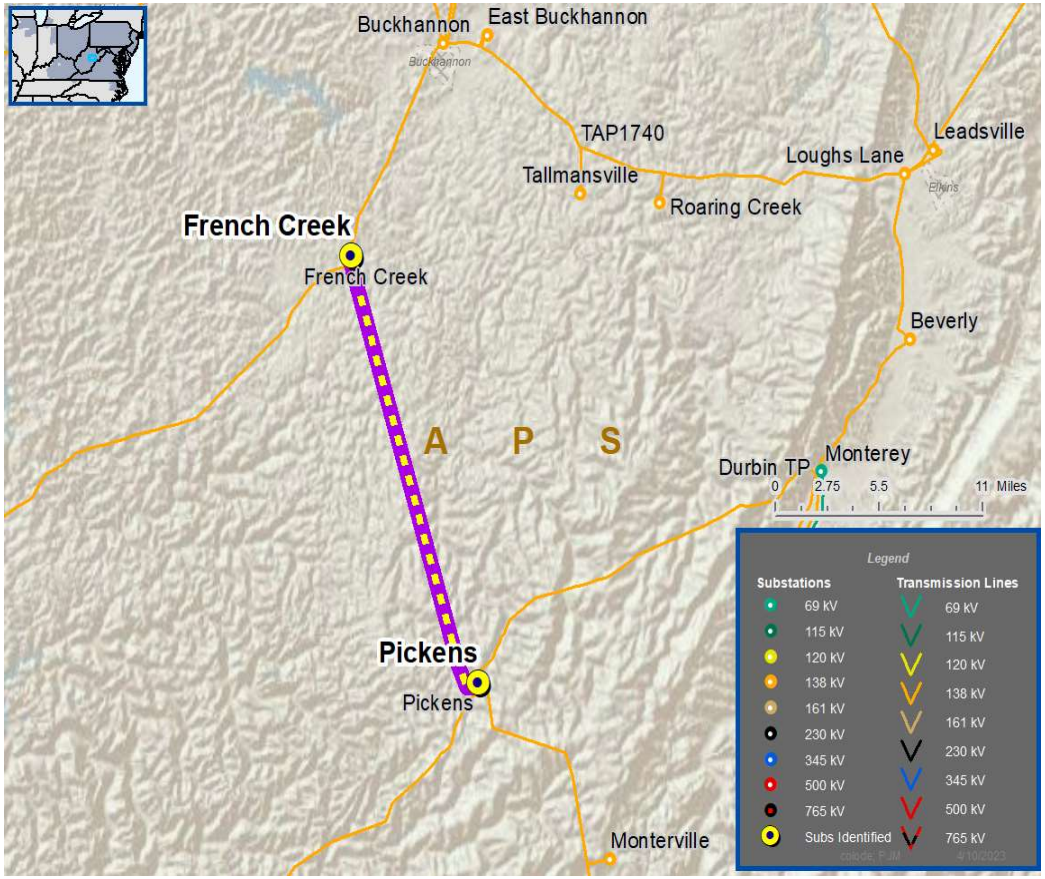
Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform properly together during a fault
- The identified protection equipment cannot be effectively repaired for reasons such as lack of replacement parts and available expertise in the outdated technology.
- Newer equipment provides better monitoring, enhances capability of system event analysis, and performs more reliably

- Transmission line ratings are limited by terminal equipment

French Creek - Pickens 56 138 kV Line (substation conductor)

- Existing line rating: 292 / 306 MVA (SN / SE)
- Existing Transmission conductor rating: 308 / 376 MVA (SN / SE)



APS Transmission Zone M-3 Process Misoperation Relay Projects

Need Number	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimated Cost ($ M)	Target ISD
APS-2021-007	Oak Grove – Johns Jct 138 kV Line	292 / 314	• Oak Grove 138 kV Substation – Replace substation conductor	$ 1.10 M	IN SERVICE
	Johns Jct – Parkersburg 138 kV Line	292 / 314	• Parkersburg 138 kV Substation – Replace substation conductor		
APS-2021-008	Belmont – Trissler 648 138 kV Line	308 / 376	• Belmont 138 kV Substation – Replace substation conductor and wave trap • Trissler 138 kV Substation – Replace substation conductor, circuit breaker, and wave trap	$ 2.08 M	IN SERVICE
APS-2021-009	French Creek – Pickens 138 kV Line	308 / 376	• French Creek 138 kV Substation – Replace substation conductor, circuit breaker, and wave trap • Pickens 138 kV Substation – Replace substation conductor, circuit breaker, and wave trap	$ 2.15 M	4/21/2023

Alternatives Considered: Maintain existing condition

Project Status: In construction

Model: 2022 RTEP model for 2027 Summer (50/50)

APS Transmission Zone M-3 Process

Need Number: APS-2023-003

Process Stage: Solution Meeting 4/21/2023

Previously Presented: Need Meeting 2/17/2023

Project Driver:

Customer Service

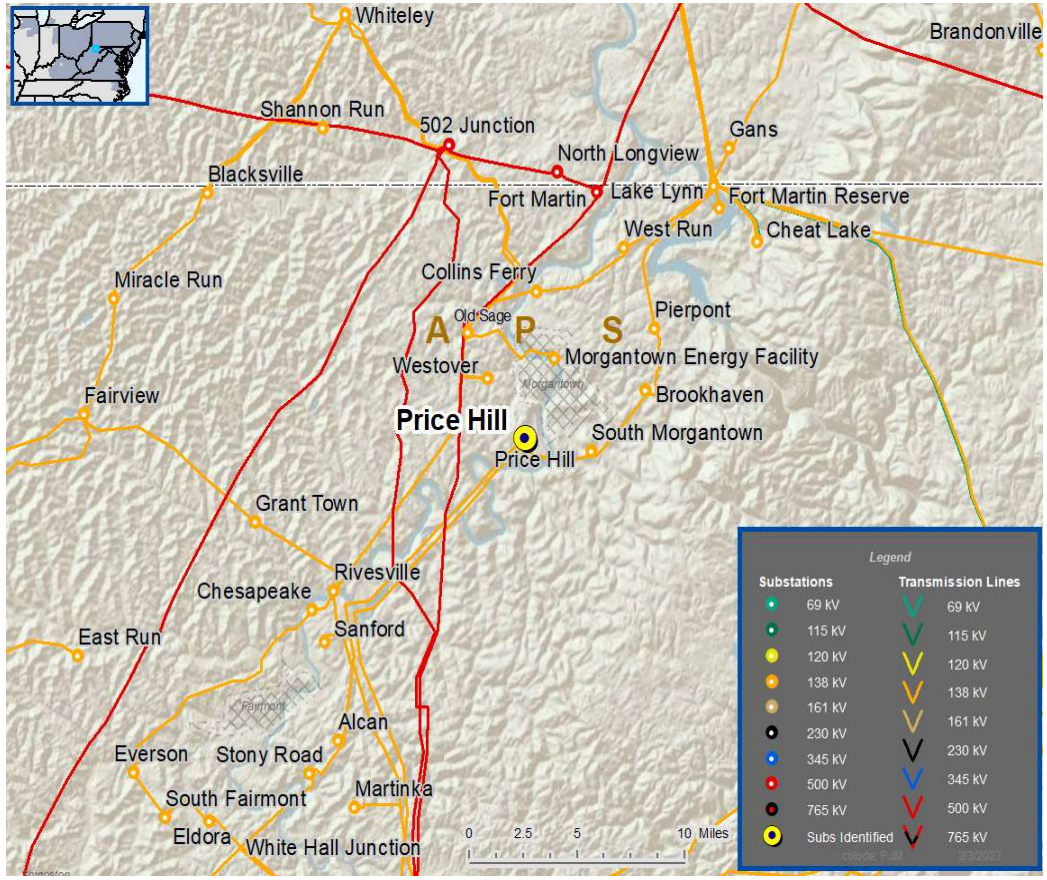
Specific Assumption Reference:

Customer request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement:

New Customer Connection – A customer requested 138 kV service to support 8 MVA of load at a site near Price Hill 138 kV substation in the Mon Power service territory.

Requested in-service date is 3/17/2023



APS Transmission Zone M-3 Process

Need Number: APS-2023-003

Process Stage: Solution Meeting 4/21/2023

Proposed Solution:

- Extend the Price Hill 138 kV bus by installing (1) 138 kV breaker and associated facilities to provide service to the Customer.

Alternatives Considered:

- Serve the customer via the 12 kV distribution system

Anticipated Rating Changes:

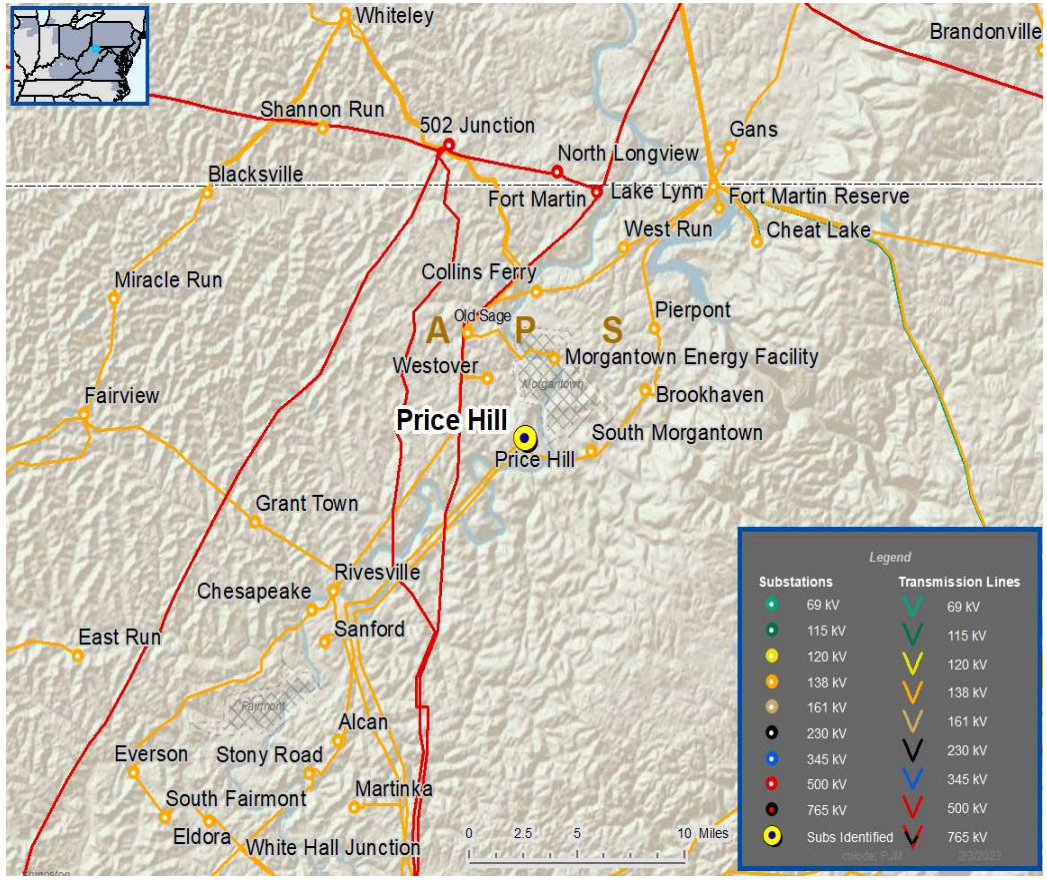
- None

Estimated Project Cost: $0.3M

Projected In-Service: 5/8/2023

Project Status: Under Construction

Model: 2022 RTEP model for 2027 Summer (50/50)



APS Transmission Zone M-3 Process

Need Number: APS-2023-004

Process Stage: Solution Meeting 04/21/2023

Previously Presented: Need Meeting 03/17/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

Line Condition Rebuild/Replacement

- Age/condition of wood pole transmission line structures
- System characteristics including lightning and grounding performance, galloping overlap, insulation coordination, structural capacity needs, clearance margins, and future needs (e.g., fiber path)

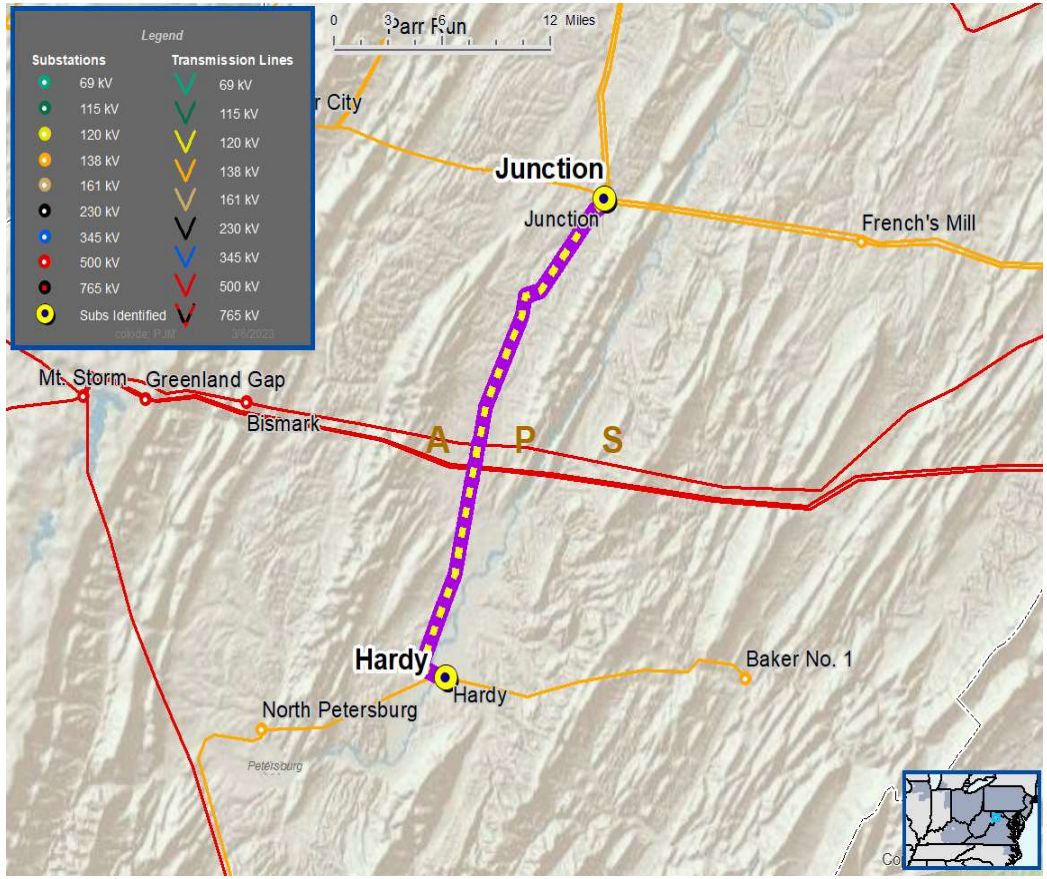
System Performance Projects Global Factors

- Substation/line equipment limits

Problem Statement:

The Hardy – Junction 138 kV line is exhibiting deterioration

- Total line distance is approximately 21.5 miles
- 157 of 164 structures failed assessment:
  - 145 structures are approaching expected end of life
  - 132 failed assessment due to multiple defects
  - 74 failed assessment due to decay
  - 132 failed assessment due to woodpecker holes



APS Transmission Zone M-3 Process

Need Number: APS-2023-004

Process Stage: Solution Meeting 04/21/2023

Proposed Solution:

- Rebuild the Junction-Hardy 138kV line, approximately 21.5 miles, with wood pole equivalent steel structures.
- Replace limiting substation conductor and disconnect switch at Junction 138 kV substation
- Replace limiting substation conductor at Hardy 138 kV substation

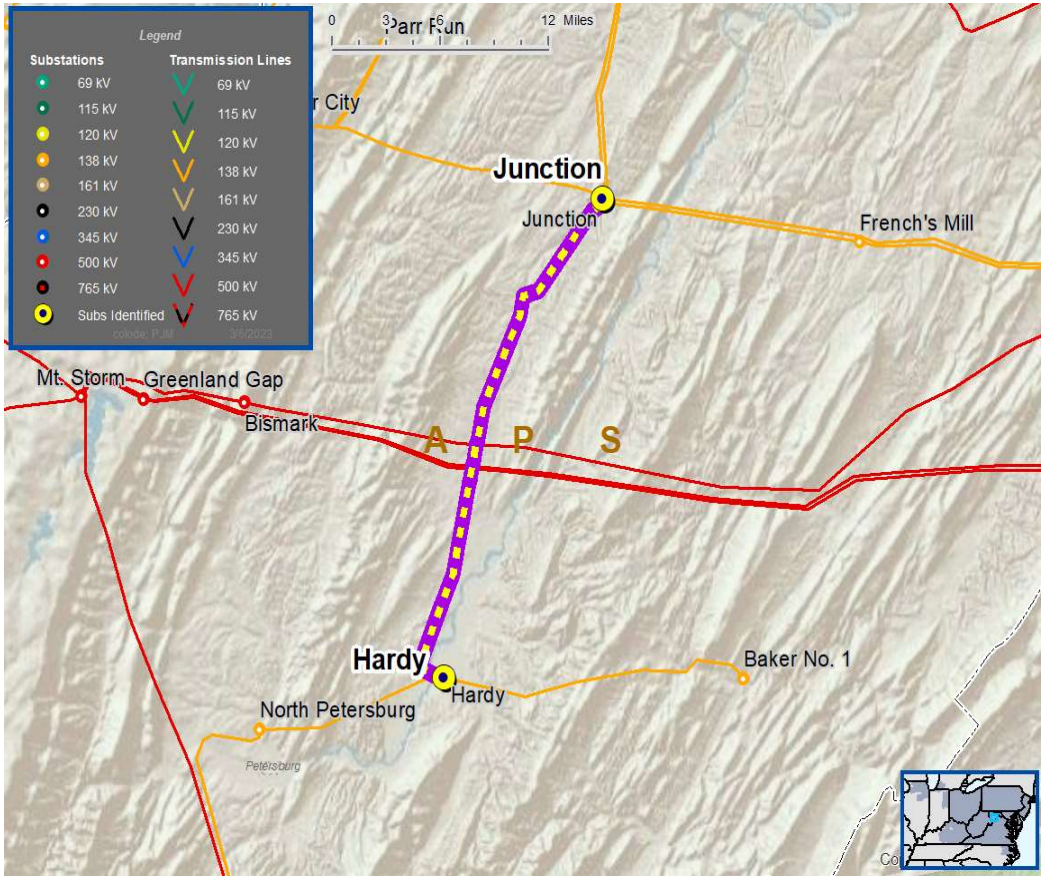
Transmission Line Ratings:

- Junction – Hardy 138 kV Line
  - Before Proposed Solution: 159 / 191 MVA (SN / SE)
  - After Proposed Solution: 221 / 268 MVA (SN / SE)

Alternatives Considered:

- Build a new greenfield line
- Maintain line in existing condition

Estimated Project Cost: $ 42.6 M
Projected In-Service: 12/1/2027
Project Status: Conceptual
Model: 2022 RTEP model for 2027 Summer (50/50)



APS Transmission Zone M-3 Process

Need Number: APS-2023-005

Process Stage: Solution Meeting 04/21/2023

Previously Presented: Need Meeting 03/17/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

Line Condition Rebuild/Replacement

- Age/condition of wood pole transmission line structures
- System characteristics including lightning and grounding performance, galloping overlap, insulation coordination, structural capacity needs, clearance margins, and future needs (e.g., fiber path)

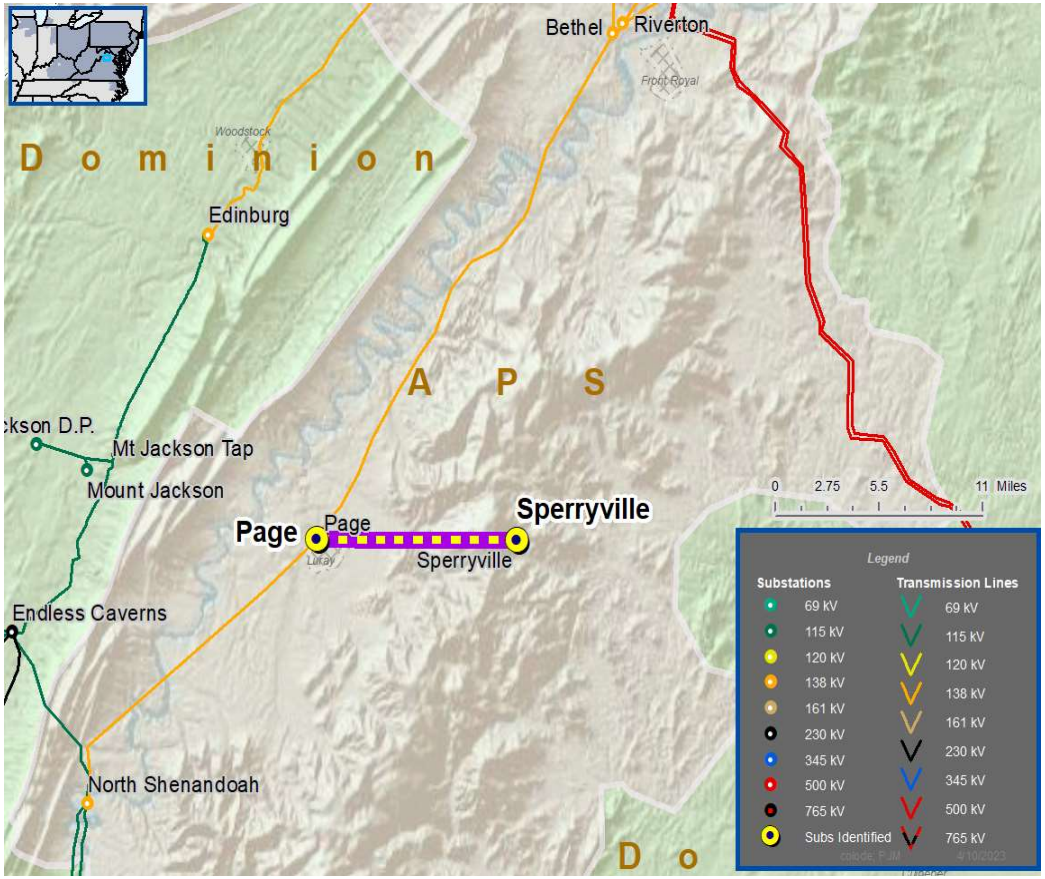
System Performance Projects Global Factors

- Substation/line equipment limits

Problem Statement:

The Page – Sperryville 138 kV line is exhibiting deterioration and has significant outage history

- Total line distance is approximately 13.8 miles.
- There is significant exposure to unplanned outages due to equipment failures and off ROW trees. Since 2014, there have been 15 outages including 5 equipment failures and 7 off ROW fall-ins
- Existing equipment is approaching expected end of life
- The terrain is extremely challenging, limiting access and extending outage durations to the supported municipal interconnection. The locations and design of structures further impedes repairs.



APS Transmission Zone M-3 Process

Need Number: APS-2023-005

Process Stage: Solution Meeting 04/21/2023

Proposed Solution:

- Rebuild the Page – Sperryville 138kV line, approximately 21.5 miles, with wood pole equivalent steel structures.
- Replace limiting substation conductor, wave trap, circuit breaker and relaying at Page 138 kV substation
- Replace limiting substation conductor, wave trap, and circuit switcher at Hardy 138 kV substation

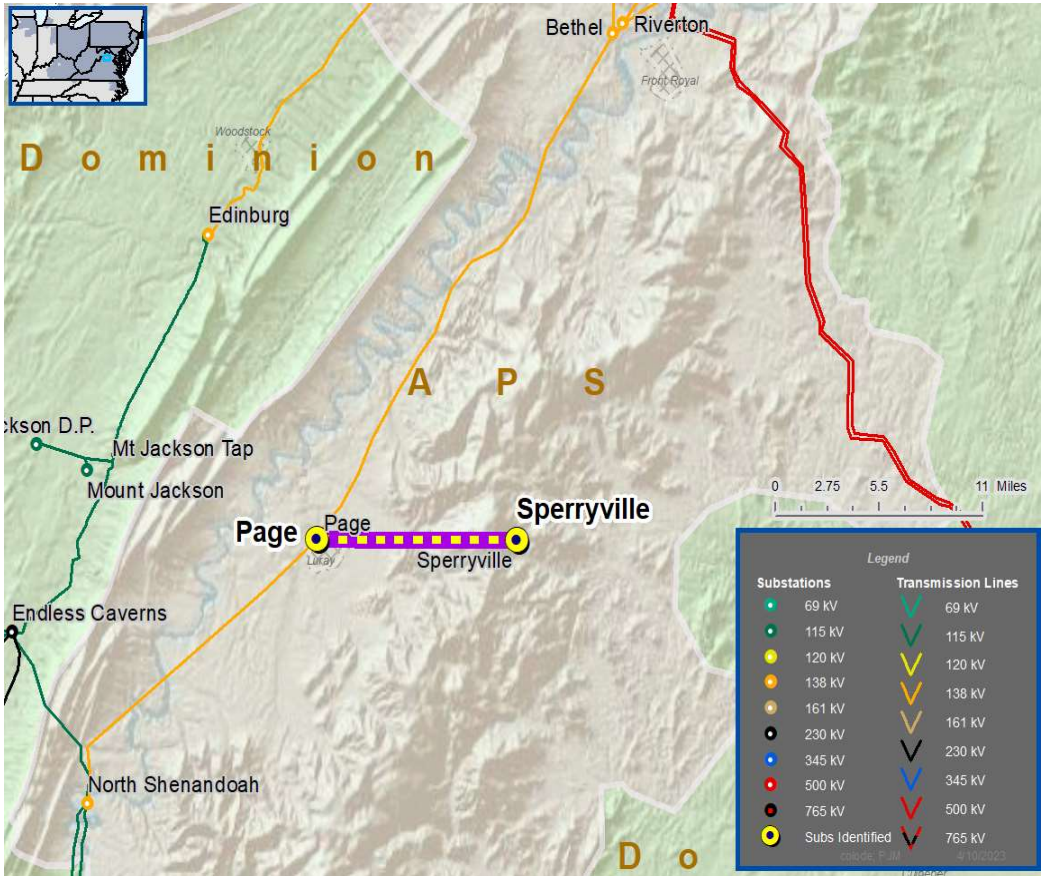
Transmission Line Ratings:

- Page – Sperryville 138 kV Line
  - Before Proposed Solution: 97 / 105 MVA (SN / SE)
  - After Proposed Solution: 309 / 376 MVA (SN / SE)

Alternatives Considered:

- Build a new greenfield line
- Maintain line in existing condition

Estimated Project Cost: $ 45.8 M
Projected In-Service: 6/1/2026
Project Status: Conceptual
Model: 2022 RTEP model for 2027 Summer (50/50)



AEP Transmission Zone M-3 Process
Coco Station Project

Need Number: AEP-2022-AP037

Process Stage: Solutions Meeting 4/21/2023

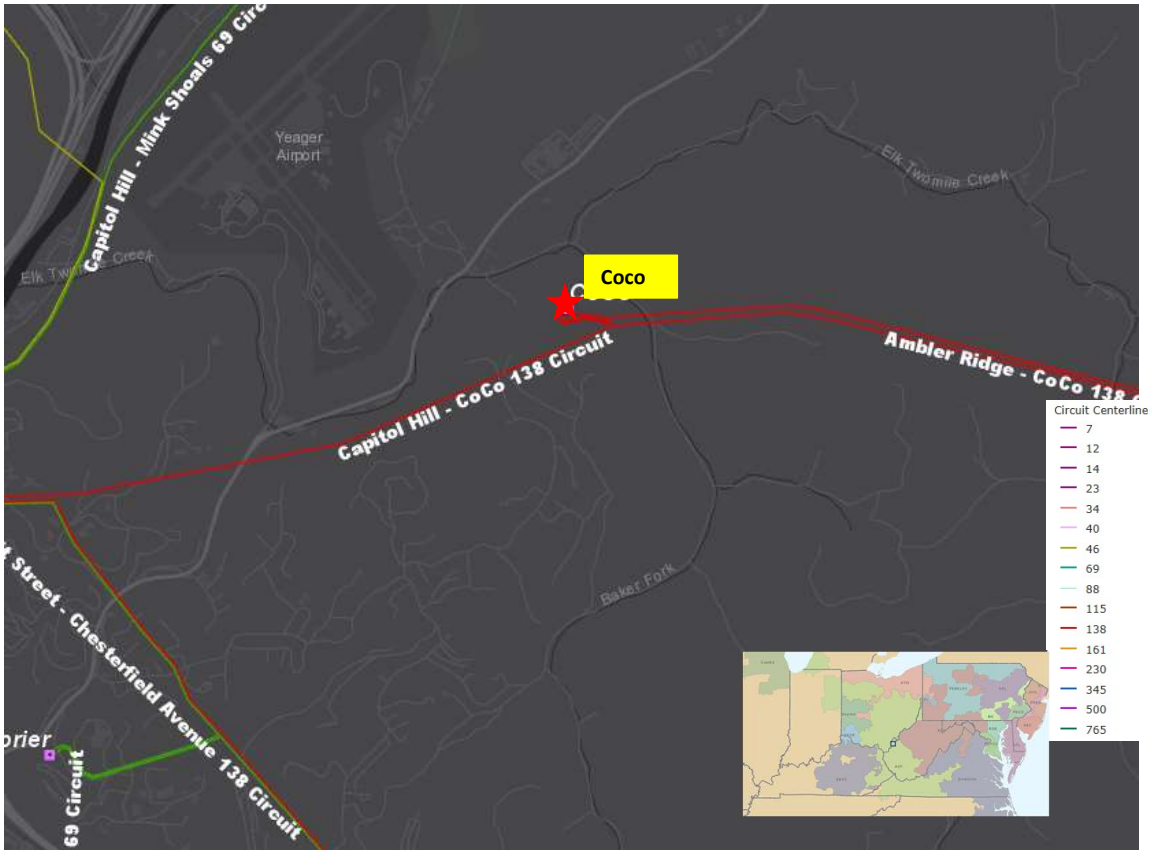
Previously Presented: Needs Meeting 9/16/2022

Supplemental Project Driver: Customer Service

Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

APCO Distribution has requested to install new distribution transformer at the existing Coco 138 kV Transmission Station to support load growth in the Meadowbrook, WV Area. The projected load at the new Coco transformer is 6.9 MVA and this is being transferred from Mink Shoals and Greenbriar stations.



AEP Transmission Zone M-3 Process
Coco Station Project

Need Number: AEP-2022-AP037

Process Stage: Solutions Meeting 4/21/2023

Proposed Solution:

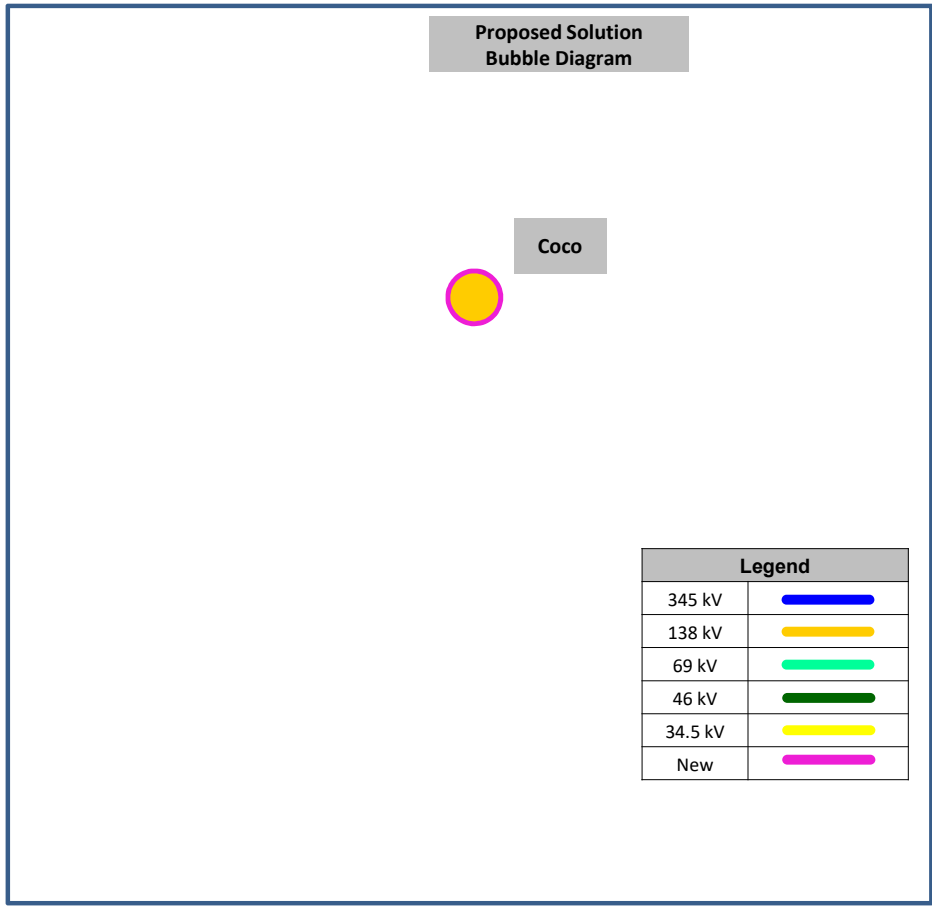
Install one new 138/12 kV XFR and one new 138 kV CB at the existing Coco Station. Estimated Trans Cost: $0.9M

Total Estimated Transmission Cost: $0.9M

Projected In-Service: 11/22/2023

Project Status: Scoping

Model: 2027 RTEP

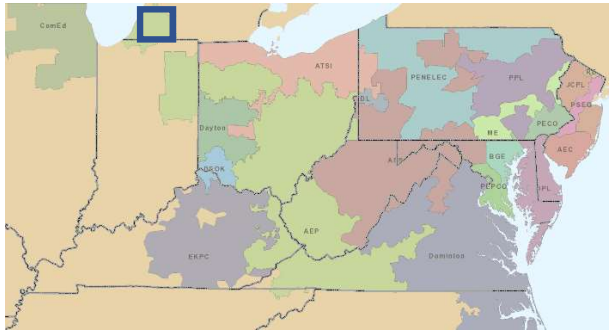


AEP Transmission Zone M-3 Process
Benton Harbor Area Improvements

Need Number: AEP-2022-IM004
Process Stage: Solution Meeting 4/21/2023
Previously Presented: Needs Meeting 1/21/2022
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Model: N/A
Problem Statement:

Hickory Creek – Main Street 138kV (~3.53 miles):

- 57 total structures (a mixture of wood and steel)
  - 44 were installed in 1968
  - 7 were installed in 1929
  - The remaining more recent
- The line consists of 1968 636 ACSR 26/7 Grosbeak conductor
- Since 2016
  - Main Street – Pletcher 138kV has experienced 2 momentary and 1 permanent outage
  - Main Street – Napier 34.5kV has experienced 1 permanent outage resulting in 739,134 customer minutes of interruption
- Structures fail NESC Grade B and AEP Strength requirements. Grounding methods utilize butt wraps on every other structure, which is inadequate for current AEP standards
- 40 representative structures were assessed by ground and drone
  - 50% have ground line heart and/or shell rot
  - High percentage of wood poles have woodpecker damage and moderate to advanced wood decay from insect and bird damage
- There are 11 structures with at least one documented open condition not included in the ground and aerial assessment.



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AEP Transmission Zone M-3 Process
Benton Harbor Area Improvements

Need Number: AEP-2022-IM004

Process Stage: Solution Meeting 4/21/2023

Project Summary: Rebuild the Main Street – Derby 138kV/Main Street – Napier – Hickory Creek 34.5kV double circuit line. This is the last section of line still built to 34.5kV standards in the area. The rebuild will allow for conversion to 69kV in the Benton Harbor area. AEP is moving away from the 34.5kV voltage class to improve operational efficiency and eliminate drop and pick switching scenarios.

Proposed Solution:

Main Street – Hickory Creek 138kV Line Asset: Rebuild ~3.47 miles of the Derby – Main Street 138kV circuit up to structure 125. Of that ~3.47 miles, the Main Street – Napier – Hickory Creek 34.5kV circuit is double circuited with Derby – Main Street 138kV circuit for ~2.84 miles, which will also be rebuilt and then energized to 69kV. Both lines will utilize the 795 ACSR 26/7 Drake conductor.

Estimated Cost: $16.2M

Main Street – Hickory Creek 34.5kV (via Pearl Street): Energize at 69kV.

Estimated Cost: $0M

Main Street: Energize circuit breakers J, K, and L to 69kV.

Estimated Cost: $0.91M

Hickory Creek: Retire 34.5kV circuit breaker BG and remaining 34.5kV equipment. Energize circuit breakers AQ, BE, and BH to 69kV. Breaker BH will be used as a bus tie breaker.

Estimated Cost: $1.18M

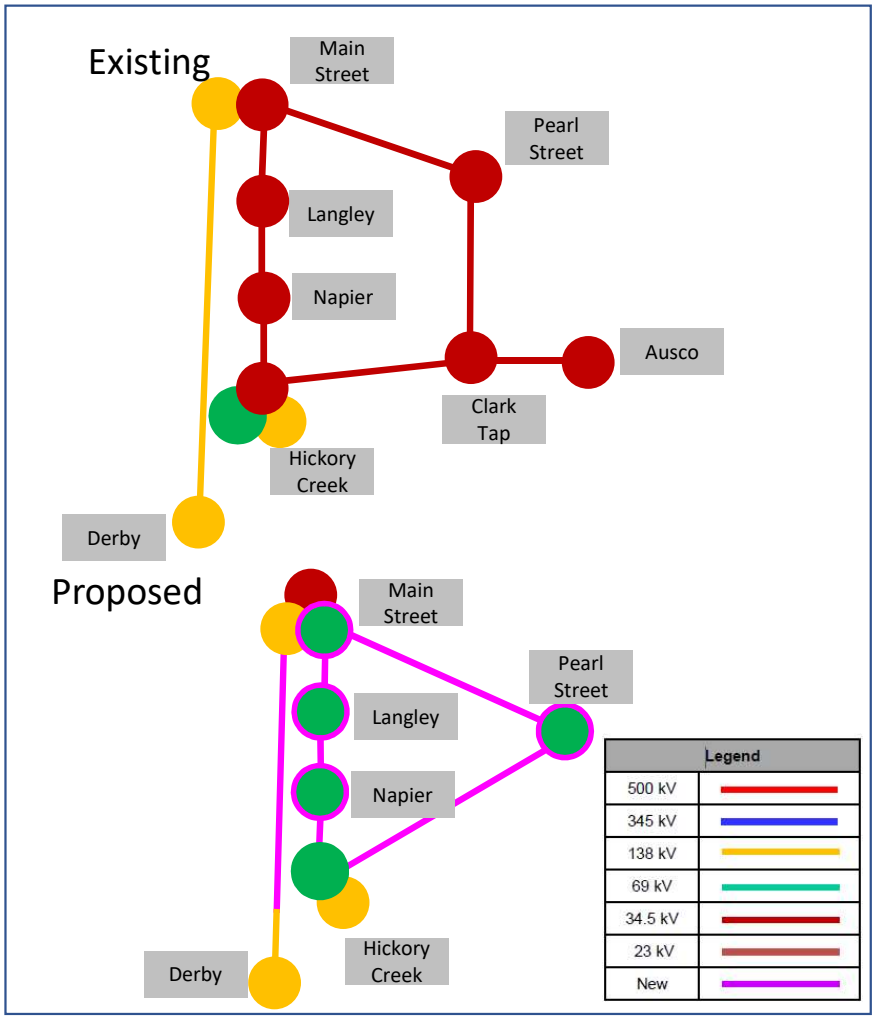
Pearl Street, Langley, and Napier: Energize to 69kV.

Estimated Cost: $0.41M

Ausco Radial 34.5kV: Retire the 34.5kV Ausco radial

Estimated Cost: $0.6M

Total Estimated Transmission Cost: $19.3M



AEP Transmission Zone M-3 Process
Benton Harbor Area Improvements

Need Number: AEP-2022-IM004

Process Stage: Solution Meeting 4/21/2023

Ancillary Benefits: Moving to 69kV will improve operational flexibility and eliminate the problem of the drop and pick issues that the 34.5kV voltage class experiences.

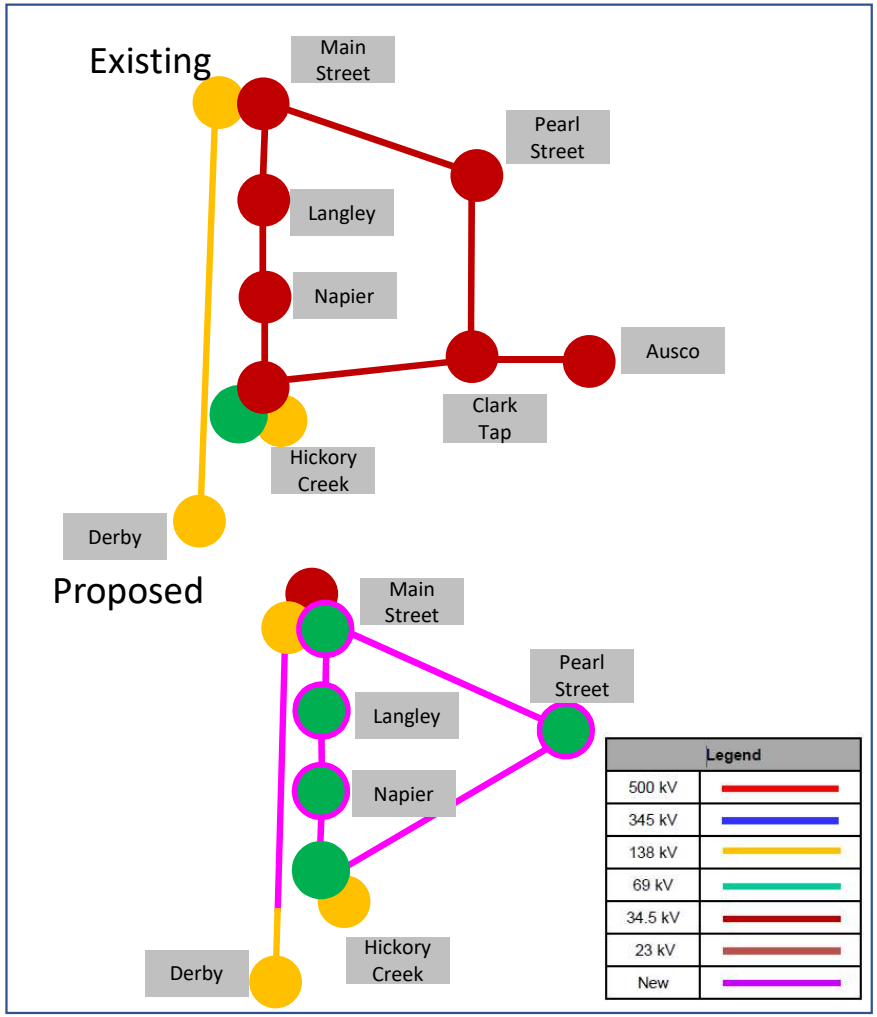
Alternative Considered:

Rebuild ~3.47 miles of the Derby – Main Street 138kV circuit up to structure 125. Of that ~3.47 miles, the Main Street – Napier – Hickory Creek 34.5kV circuit is double circuited with Derby – Main Street 138kV circuit for ~2.84 miles, which would also be rebuilt but keep this and the rest of the area operating at 34.5kV. This would not take into account the opportunity to convert majority of the remaining 34.5kV lines to 69kV in the Benton Harbor area, keeping a drop-and-pick scheme in place for outages on the system in order to transfer load. The remaining 34.5 kV lines in the area have already been rebuilt to 69 kV capability.

Estimated Cost: $16.2M

Projected In-Service: 5/7/2027

Project Status: Scoping



AEP Transmission Zone M-3 Process
Magley-Decatur 69kV line rebuild

Need Number: AEP-2022-IM015

Process Stage: Solutions Meeting 4/21/2023

Previously Presented: Needs Meeting 9/16/2022

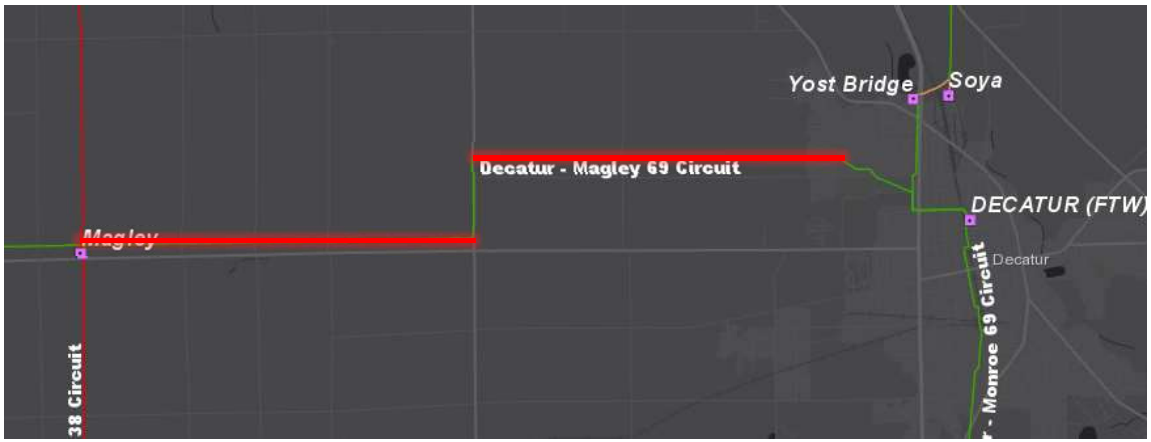
Project Driver: Equipment Material Condition, Performance and Risk

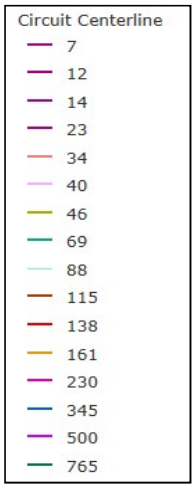
Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

Problem Statement:

Magley – Decatur 69 kV (Vintage 1957/1966)

- Length of line: 5.88 miles
- Total structure count: 24 dating back to 1957, 1 installed in 1965 and 45 installed in 1966.
- Line construction Type:
  - Wood pole and H frame structures
  - 5/16" steel shield wire which has history of failure
- Conductor Type:
  - 6 wired, 4/0 ACSR 6/1 Penguin (1957): 3.16 miles
  - 336,400 CM ACSR 30/7 Oriole (1966): 2.72 miles
- Momentary/Permanent Outages: 7 Momentary and 1 Permanent
- Condition Summary:
  - Number of open conditions: 6 structures have at least one open condition. 43 structures were assessed by drone and 10 assessed by a ground crew and the following were identified
    - H Frame structures had moderate shell damage with some heavy checking.
    - Wood structures on this line are subject to high number of woodpecker and insect damage.
    - Multiple instances of decay, pole split, rot top, crossarm split, pole cavity, brace splitting and flashed/split insulator.
  - Structures fail NESC Grade B, ASCE structural strength requirements, AEP grounding standards, AEP structural strength requirements and the H Frame portions fail AEP shielding angle standards.





AEP Transmission Zone M-3 Process
Magley-Decatur 69kV line rebuild

Need Number: AEP-2022-IM015

Process Stage: Solution Meeting 4/21/2023

Proposed Solution:

Rebuild 5.88 miles of the 6.36 mile circuit from Magley-Decatur with 795 ACSR. The rebuild will consist of all 1957 and 1966 vintage poles, towers with failed strength requirements, as well as the 4/0 and 336 ACSR conductor.
Total Estimated Transmission Cost: $12.48 M

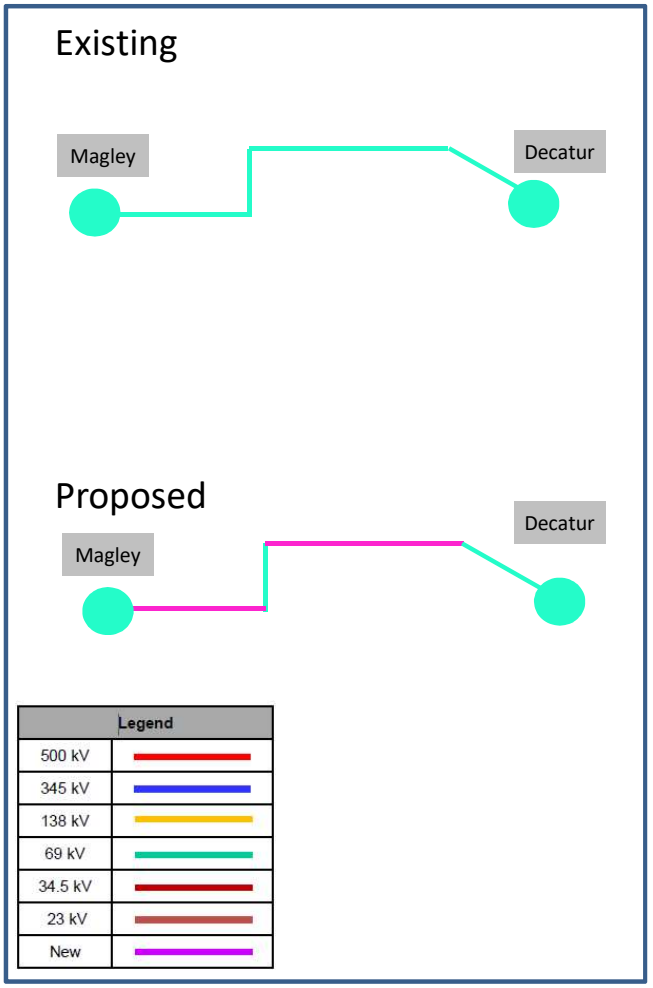
Alternative considered:

Retire Decatur – Magley 69kV line. This would require a new transformer at Lincoln station and a larger cap bank at Berne station. Without the Magley-Decatur 69kV line supporting the area, in N-1-1 conditions load on the 69kV network would be separated by 30+ miles from a 69kV source. This solution does not work if the southern Fort Wayne 69kV region grows by just 6MW. Due to sensitivity to the area and heavy loading of lines in N-1-1 conditions this solution was not chosen.

Total Cost: $3.11M

Projected In-Service: 08/01/2028

Project Status: Scoping



AEP Transmission Zone M-3 Process
Wheeling, West Virginia

Need Number: AEP-2022-OH060

Process Stage: Solution Meeting 04/21/2023

Previously Presented: Need Meeting 07/22/2022

Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

<u>69 kV Circuit Breakers A, B, & K:</u>

- Breaker Age: A & B 1965, K 1966
- Interrupting Medium: (Oil)
- Number of Fault Operations: These circuit breakers have exceeded the manufacturer's designed number (10) of fault operations.
  - A: 34, B: 53, K: 30
- Additional Information:
  - These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require.
  - Circuit Breakers A & B are part of the CF family. The manufacturer provides no support for the CF/CG/CGH/CH family of circuit breakers and spare parts are increasingly more difficult to obtain. This model family has experienced major malfunctions associated with their OA-3 hydraulic mechanism, which includes low-pressure readings, hydraulic leaks, pump lockouts, and failure to shut off. These mechanism malfunctions have led to several failures to close and other types of mis-operations across the AEP fleet.
  - Circuit Breaker K is part of the FK family. The manufacturer provides no support for this fleet of circuit breakers and spare parts are increasingly more difficult to obtain; components are often taken from out of service units with remaining usable parts. A common failure mode documented in AEP malfunction records are compressor failures and valve defects, which cause low pressure and oil leaks. Another failure mode includes trip or reclose failures, caused primarily by spring latching and charging motor component failures. In addition, the vacuum oil and oil breakers have a lot of oil contamination from aging gaskets allowing moisture and other particle ingress.

<u>Relays:</u>

Currently, 23 of the 27 relays (85% of all station relays) need replacement. 21 of these are of the electromechanical type which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack vendor support. There are also 2 DPU type units. Out of the 366 relays of this family in the AEP system, 97 of them have had at least one malfunction record documented. This relates to 27% of the DPU fleet. The DPU relays pose a potential safety risk to persons performing breaker operation because the DPUs are mounted directly on the circuit breaker without a delay for opening and closing the breaker.

AEP Transmission Zone M-3 Process
Warwood Station Upgrade

Need Number: AEP-2022-OH060
Process Stage: Solution Meeting 04/21/2023
Previously Presented: Need Meeting 07/22/2022

Proposed Solution:

Replace the 3- 69kV oil circuit breakers with new SF6 gas breakers. Replace the electromechanical 69kV line relays and bus differential relays with microprocessor-based relays.

Total Estimated Transmission Cost: $1.49M

Alternatives Considered:

No viable alternatives due to the many equipment conditions at the station. The station can't be relocated to a greenfield site due to its central location for serving distribution customers north of Wheeling.

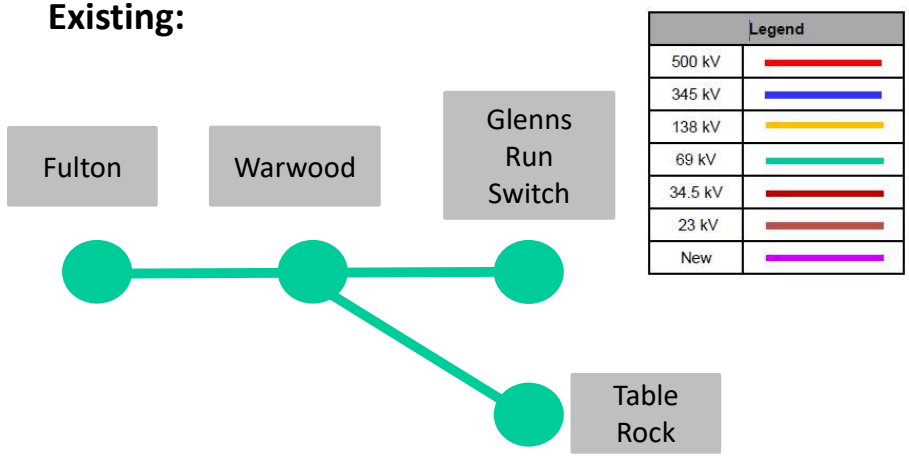
Ancillary Benefits:

This project will greatly expand the SCADA capabilities at Warwood, which serves as a transmission hub on the local 69kV system. This will provide enhanced switching capabilities and situational awareness for AEP System Operations personnel.

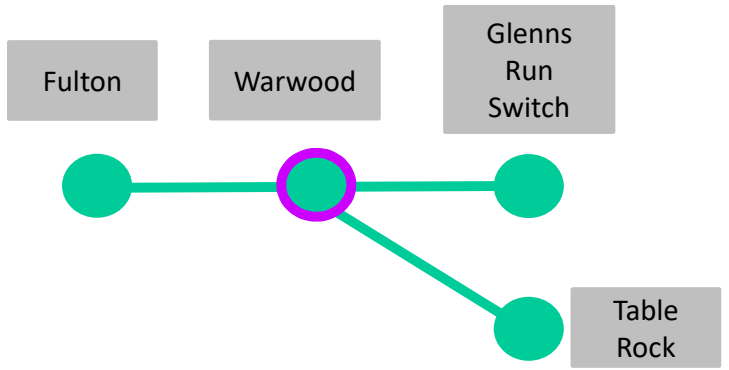
Projected In-Service: 10/1/2024

Project Status: Scoping

Existing:



Proposed:



DEOK Transmission Zone M-3 Process
Aicholtz

Need Number: DEOK-2019-005

Process Stage: Solutions Meeting 05-19-2023

Previously Presented: Needs Meeting 03-25-2019

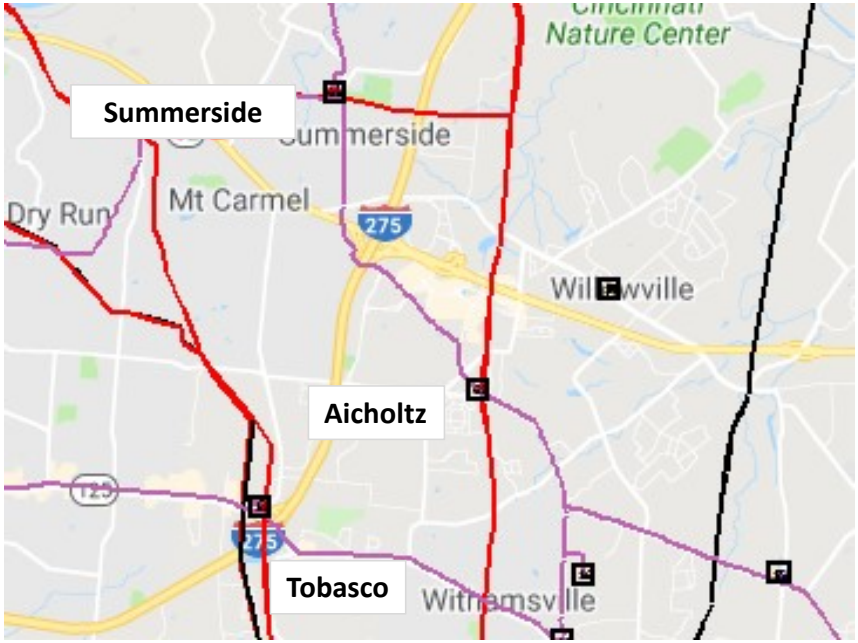
Project Driver: Customer Service

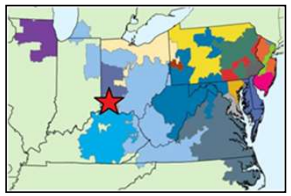
Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 5

Problem Statement:

Duke Energy Distribution has requested a new delivery point at Aicholtz substation. The two 69/13kV 10.5MVA transformers at Aicholtz are currently loaded to 86%. There are plans for new subdivisions and a new Medical Center in this area. Distribution Planning projects predicts the transformers at Aicholtz will be loaded to 95% by 2020. Subsequent commercial development is expected.





345kV
138kV
69kV

DEOK Transmission Zone M-3 Process
Aicholtz

Need Number: DEOK-2019-005

Process Stage: Solutions Meeting 05-19-2023

Previously Presented: Needs Meeting 03-25-2019

Project Driver: Customer Service

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 5

Potential Solution:

Disconnect the 69 kV feeders from the substation. Remove 69 kV bus, switches and the 69/13 kV transformers. Refeed the substation with the immediately adjacent Beckjord – Summerside 138 kV circuit. Expand the substation and install bus work with two 2000A air-break switches to create positions for three transformers. Install two 2000A motor operated line disconnects with an automatic throw over (ATO) scheme. Install two 138/13 kV, 22 MVA transformers connected with circuit switchers to the 138 kV bus. Install 13 kV switchgear to connect the existing distribution feeders.

Alternatives: Keeping the station fed by 69 kV was considered. However, the current substation is not configured for additional transformers. It's 61 years old, has cap and pin insulators with copper bus, and has had problems with the manual line switches dropping open. Seeing the substation would need to be rebuilt to reconfigure, the amount of land in the area available for development, and the area growth rapidly restarting after COVID, it was decided to refeed the station with 138 kV.

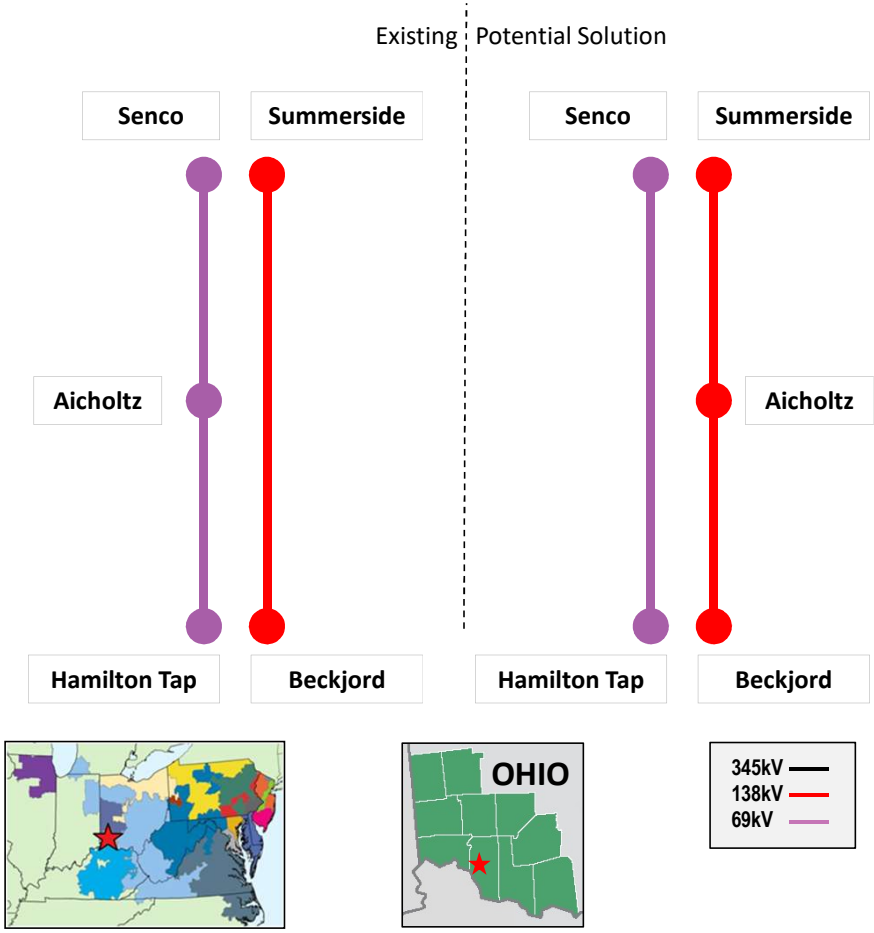
Ancillary Benefits: Connecting to the 138 kV circuit and creating a third transformer position allows for future capacity delivery to this area. The throw over scheme reduces outage recovery time.

Estimated Transmission Cost: $6.7MM

Proposed In-Service Date: 03-06-2026

Project Status: Engineering

Model: 2022 RTEP



Need Number: Dayton-2023-002

Process Stage: Submission of Supplemental Need, 2/17/2023

Project Driver: Equipment Material Condition, Performance and Risk; Operational Flexibility and Efficiency

Specific Assumption Reference: Dayton Local Plan Assumptions (Slide 5)

Problem Statement:

- Greenfield sub is currently a two-breaker substation that services two transmission lines (6662 and 6649) and two distribution delivery points
  - The existing breakers at Greenfield are legacy oil breakers from the 1950's that have a history of poor reliability
  - Currently a single breaker failure at Greenfield sub can result in the loss of one transmission line and service to both distribution delivery points
- AES Ohio's 6649 transmission line is 13.43-mile 69kV line built in 1967 with wood poles.
  - This line has a history of poor reliability
  - There have been a total of 10 permanent outages over the last 5 years
- AES Ohio's 6662 transmission line is 4.56-mile 69kV line built in 1967 with wood poles.

Model: 2022 RTEP – 2027 Summer Case

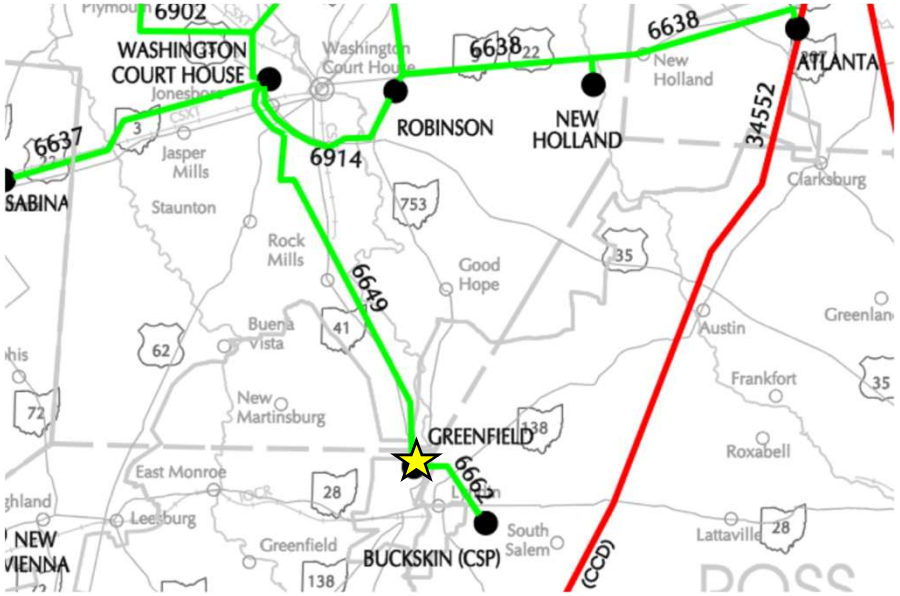


Figure 1 : Area Map

Dayton Transmission Zone M-3 Process
Greenfield, OH

Need Number: Dayton-2023-002

Previously Presented: Need Presented, 2/17/2023

Process Stage: Solution Meeting, 05/19/2023

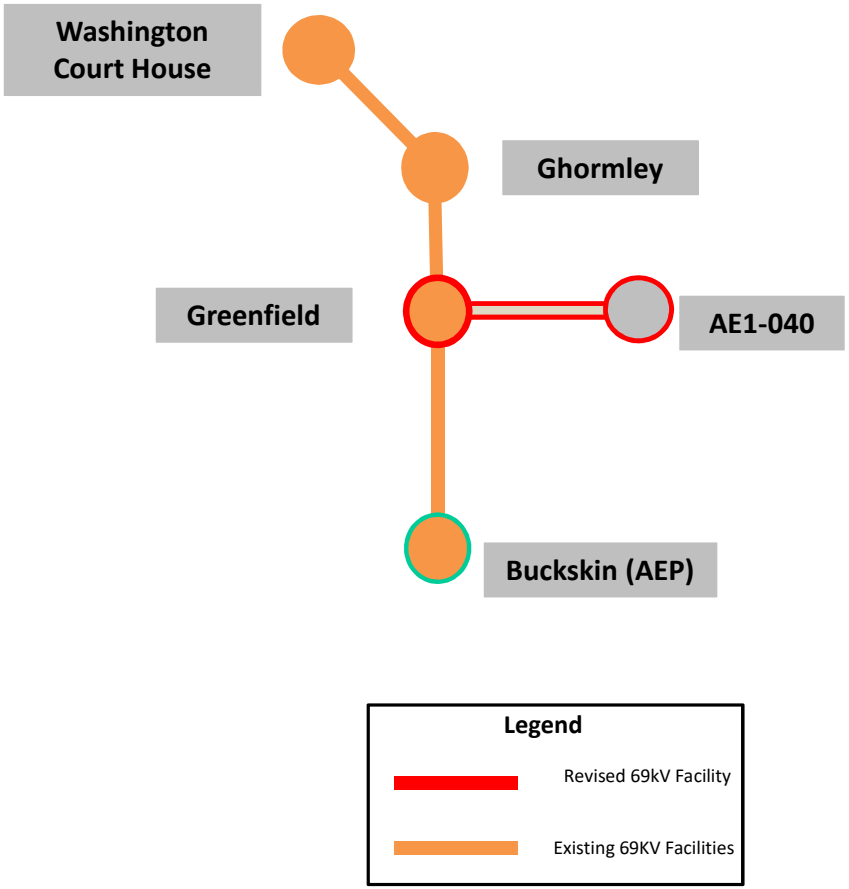
Project Driver: Equipment Material Condition, Performance and Risk; Operational Flexibility and Efficiency

Specific Assumption Reference: Dayton Local Plan Assumptions (Slide 5)

Selected Solution:

- **Greenfield Substation Expansion:**
  - AES will replace two (2) oil 69 kV breakers with gas breakers. AES will convert the sub from a single bus to a double bus with redundant ties, requiring the addition of 2 new 69kV breakers and reconfiguration of the bus.
  - This will be completed along side work required to interconnect AE1-040.
- **Total Estimated Transmission Cost :** $2.4 M
- **Projected In-Service:** 12/31/2026
- **Project Status:** Engineering
- **Alternatives Considered:**
  - AE1-040 Scope only : Single Breaker connection to the substation would not address existing configuration and equipment needs which need addressed.

Model: 2022 RTEP – 2027 Summer Case



AEP Transmission Zone M-3 Process
East Elkhart – Menges Ditch 138kV

Need Number: AEP-2019-IM045

Process Stage: Solution Meeting 5/19/2023

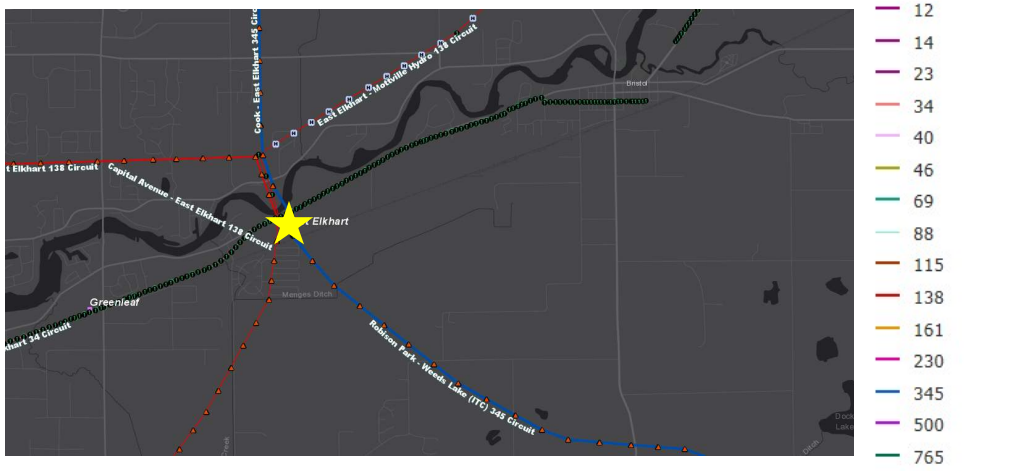
Previously Presented: Needs Meeting 11/22/2019

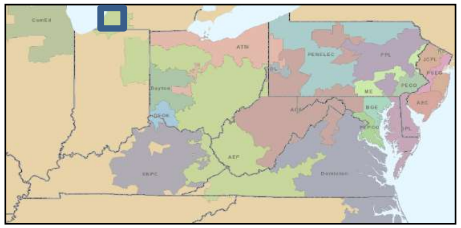
Project Driver: Customer Service

Specific Assumption Reference: AEP Interconnection Guidelines (AEP Assumptions Slide 7)

Problem Statement:

Request from NIPSCO for two (2) new 138kV interconnections at East Elkhart.





AEP Transmission Zone M-3 Process
East Elkhart – Menges Ditch 138kV

Need Number: AEP-2019-IM045

Process Stage: Solution Meeting 5/19/2023

Proposed Solution:

East Elkhart 138kV: Install a new 138kV breaker string with 3 3000A 40kA circuit breakers to accommodate two new feeds to the NIPSCO station. Relocate the 345/138kV transformer #2 feed to the new string. Install metering on both exits out of East Elkhart towards NIPSCO'S Menges Ditch station. **Estimated Cost: $0.00M**

East Elkhart – Menges Ditch 138kV #1 and #2: Install the first span and structure outside of East Elkhart, one exiting to the north and the other to the south, utilizing 2 bundle 795 ACSR 26/7 DRAKE conductor creating a new AEP-NIPSCO interconnection and PJM-MISO seam.

Estimated Cost: $0.00M

Total Estimated Transmission Cost: $0.00M

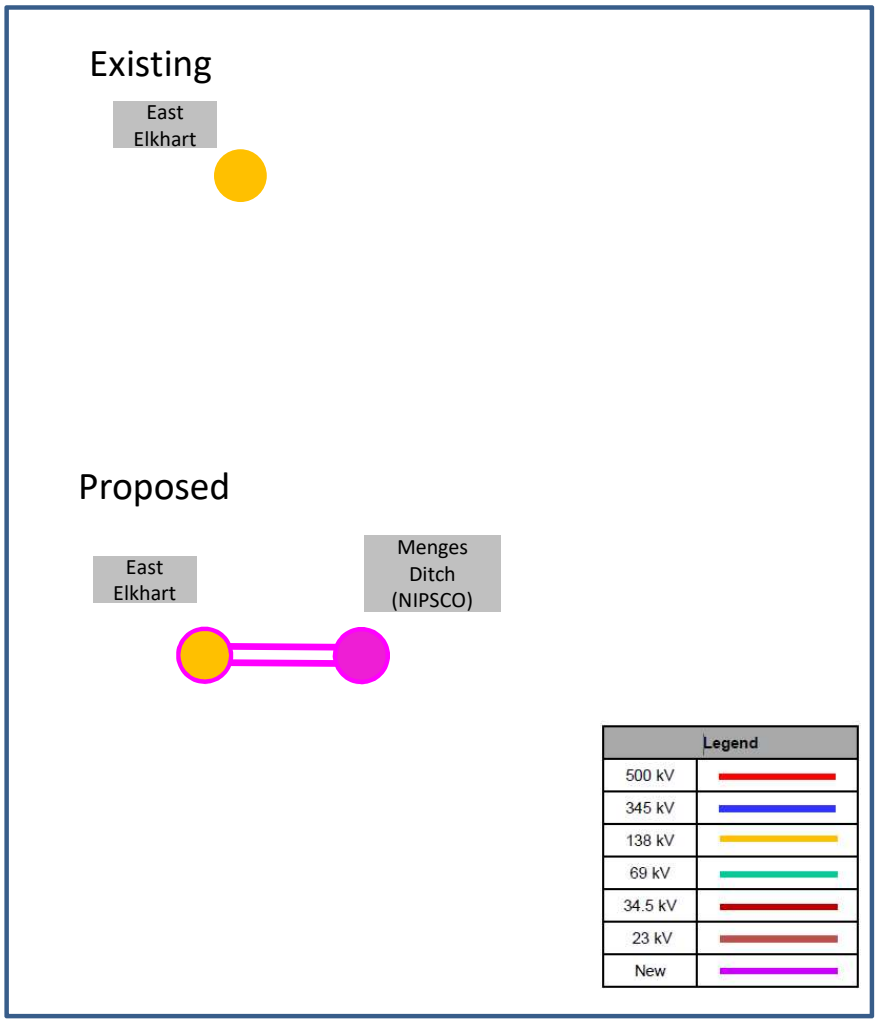
Alternative considered:

As this was a NIPSCO requested connection point, no viable alternatives were identified.

Projected In-Service: 12/1/2025

Project Status: Scoping

This project is fully funded by NIPSCO in MISO.



ATSI Transmission Zone M-3 Process

Krendale-Maple 138 kV New Customer

Need Number: ATSI-2023-001
Process Stage: Solution Meeting – 05/19/2023
Previously Presented: Need Meeting – 3/17/2023

Project Driver(s):
Customer Service

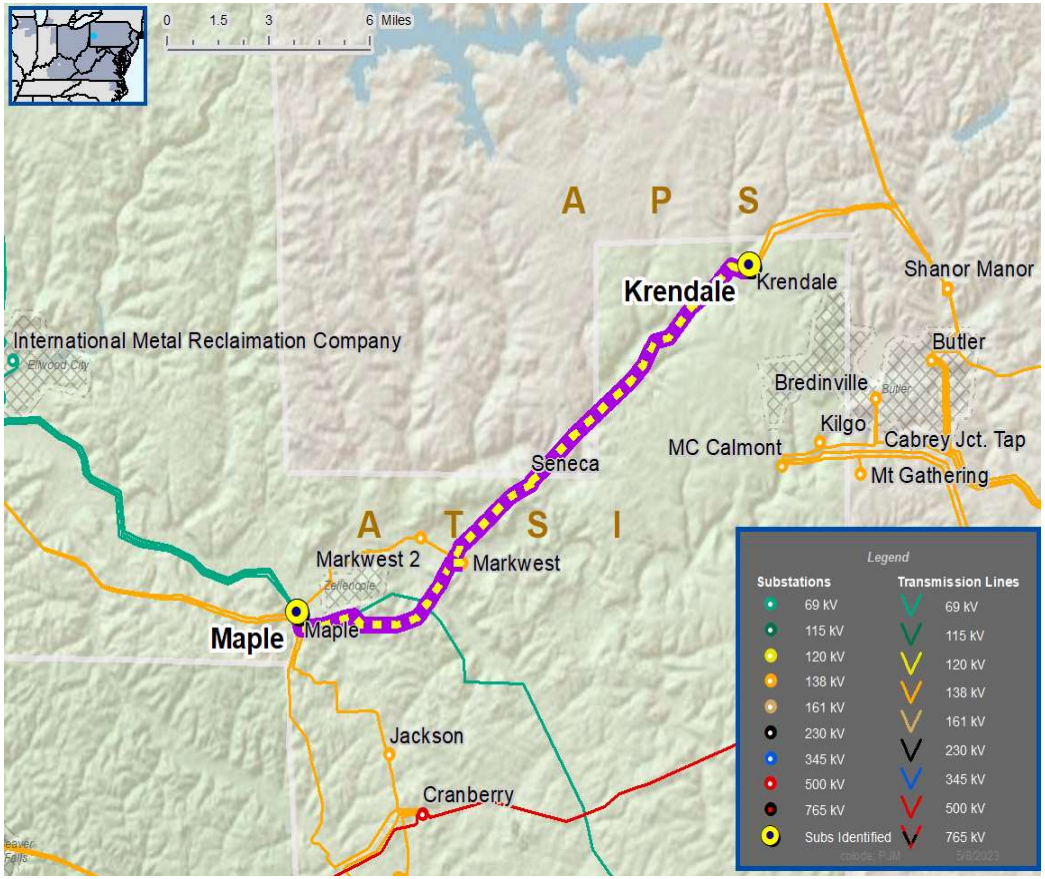
Specific Assumption Reference(s)

New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement

New Customer Connection - Penn Power Distribution has requested a new 138 kV delivery point near the Krendale-Maple 138 kV line. The anticipated load of the new customer connection is 11 MVA.

Requested in-service date is 06/01/2024.



ATSI Transmission Zone M-3 Process

Krendale-Maple 138 kV New Customer

Need Number: ATSI-2023-001
Process Stage: Solution Meeting – 05/19/2023
Previously Presented: Need Meeting – 3/17/2023

Proposed Solution:

138 kV Transmission Line Tap

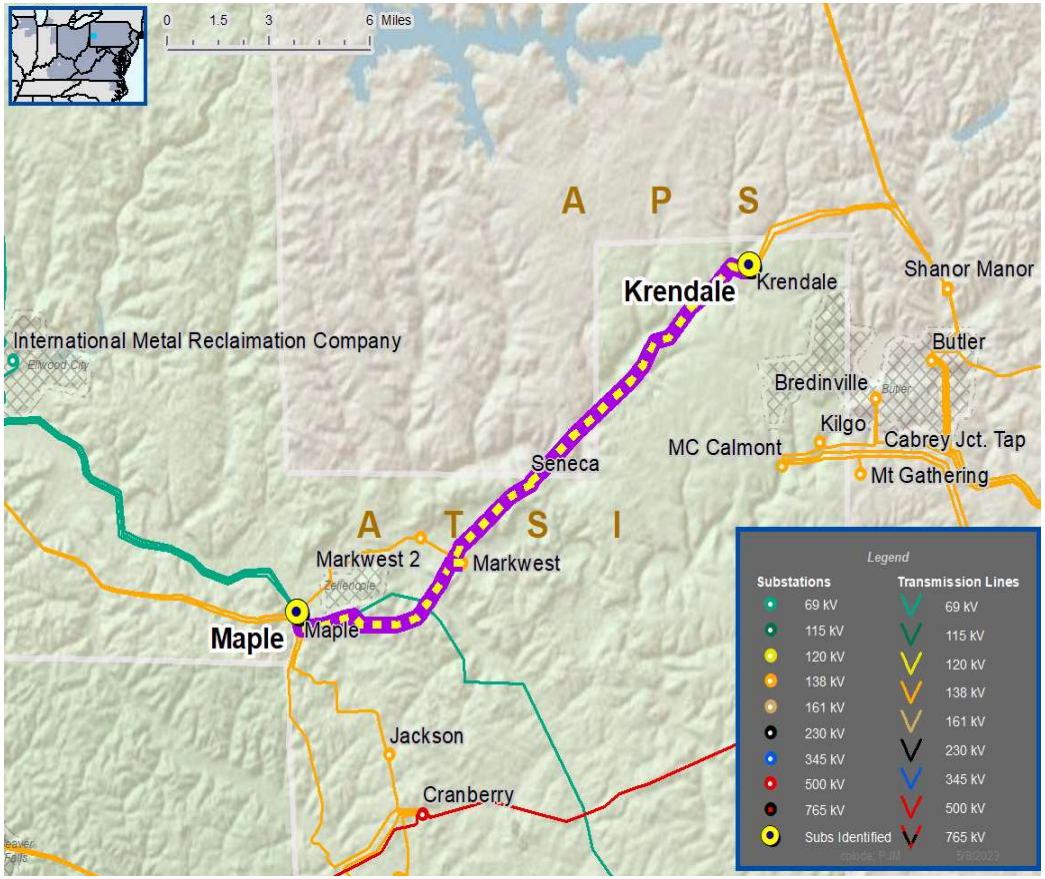
- Install three SCADA controlled transmission line switches
- Construct 0.1 miles of 954 ACSR 48/7 transmission line
- Adjust relay settings at Maple substation
- Install tie line interchange revenue metering at Krendale

Alternatives Considered:

- No feasible alternatives to meet customer's request

Estimated Project Cost: $1.7M

Projected In-Service: 06/01/2024
Status: Engineering



ATSI Transmission Zone M-3 Process
London - Tangy 138 kV Line Customer Connection

Need Number: ATSI-2023-004
Process Stage: Solution Meeting – 05/19/2023
Previously Presented: Need Meeting – 3/17/2023

Project Driver(s):
Customer Service

Specific Assumption Reference(s)
Customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
Modified Customer Connection – Ohio Edison Distribution has requested to provide a second 138 kV service to an existing delivery point served from the London-Tangy 138 kV line due to load growth in the area. The anticipated load is approximately 14 MVA.

Requested in-service date is 6/1/2024

ATSI Transmission Zone M-3 Process
London - Tangy 138 kV Line Customer Connection

Need Number: ATSI-2023-004
Process Stage: Solution Meeting – 05/19/2023
Previously Presented: Need Meeting – 3/17/2023

Proposed Solution:

138 kV Transmission Line Tap

- Install one SCADA controlled switch
- Relocate one existing main-line SCADA controlled switch
- Construct approximately 0.1 miles of 795 kcmil 26/7 ASCR transmission line
- Adjust relay settings at London and Tangy substations

Alternatives Considered:

- No feasible alternatives to meet customer's request

Estimated Project Cost: $0.8M

Projected In-Service: 06/01/2024
Status: Engineering

APS Transmission Zone M-3 Process
Dutch Fork-Washington 138 kV New Customer

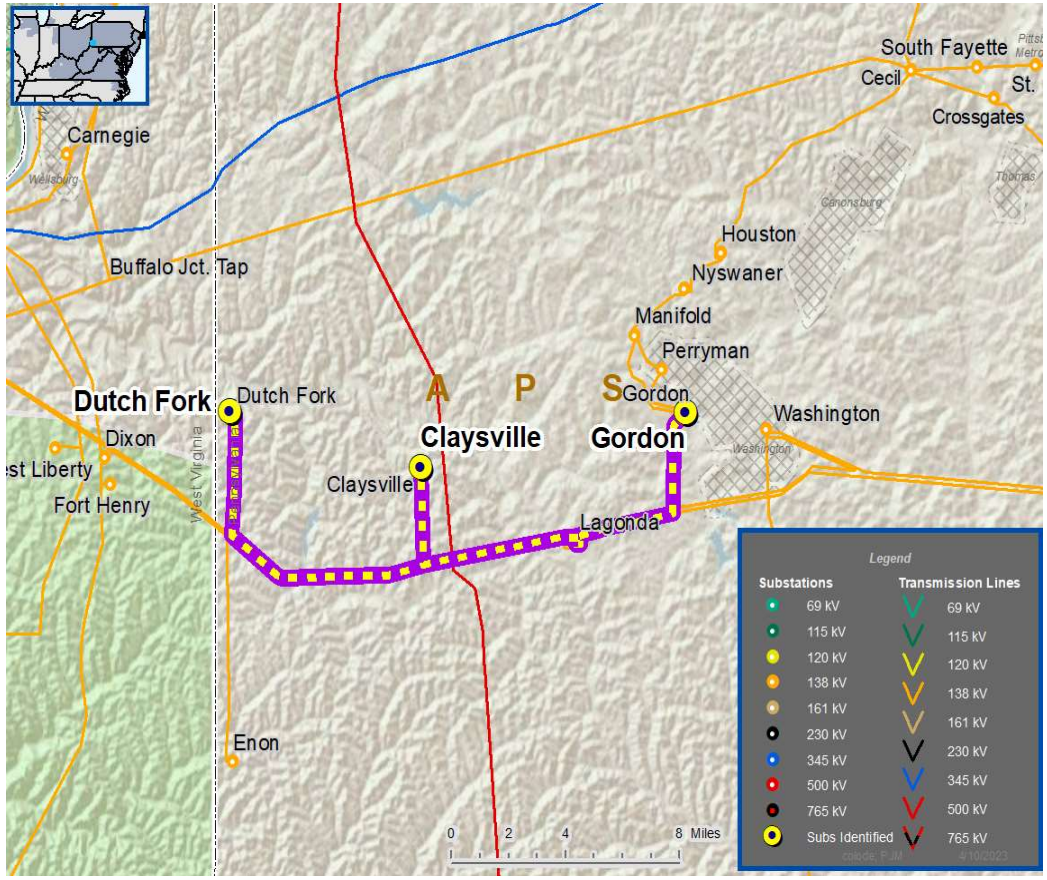
Need Number: APS-2023-007
Process Stage: Solution Meeting –5/19/2023
Previously Presented: Need Meeting – 4/21/2023

Project Driver(s):
Customer Service

Specific Assumption Reference(s)
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
New Customer Connection - has requested a new 138 kV delivery point near the Dutch Fork-Washington 138 kV line. The anticipated load of the new customer connection is 25 MVA.

Requested in-service date is 07/10/2024.



APS Transmission Zone M-3 Process
Dutch Fork-Washington 138 kV New Customer

Need Number: APS-2023-007
Process Stage: Solution Meeting –5/19/2023
Previously Presented: Need Meeting – 4/21/2023

Proposed Solution:

138 kV Transmission Line Tap

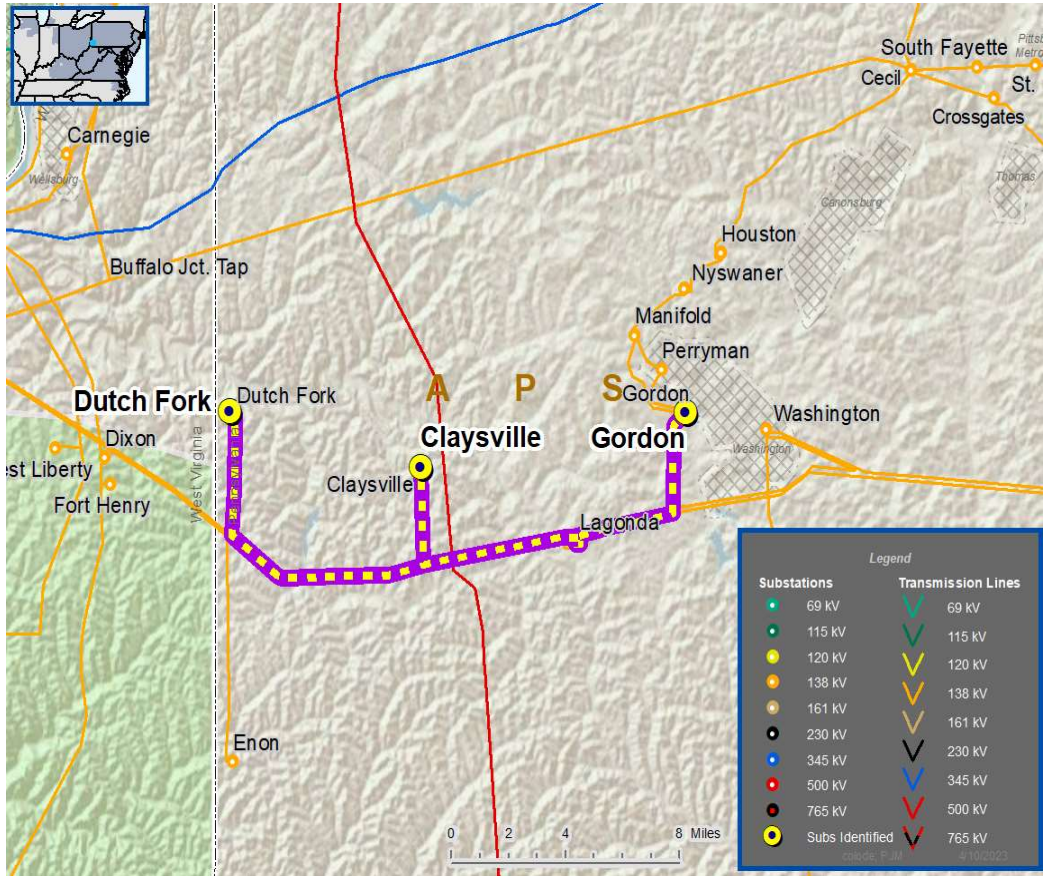
- Install three SCADA controlled transmission line switches
- Construct approximately 1.0 mile of transmission line using 1024.5 24/13 ACAR from tap point to customer substation
- Install one 138 kV revenue metering package at customer substation
- Adjust relay settings at remote end substations Dutch Fork and Washington

Alternatives Considered:

- No feasible alternatives

Estimated Project Cost: $7.1m

Projected In-Service: 07/10/2024
Status: Engineering



APS Transmission Zone M-3 Process
Stoner Junction 138 kV Misoperation Relays

Need Numbers: APS-2023-011

Process Stage: Solution Meeting 05/19/2023

Previously Presented: Need Meeting 04/21/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

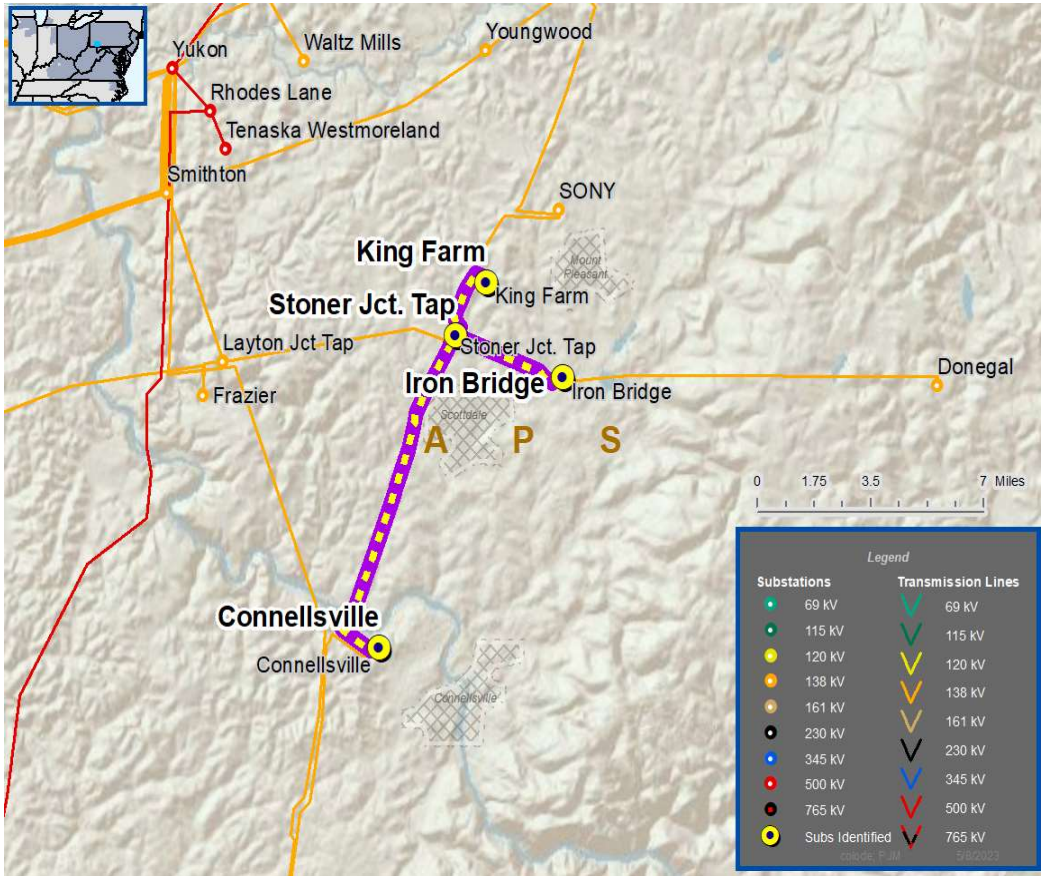
- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.



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APS Transmission Zone M-3 Process
Stoner Junction 138 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-011	Connellsville – Stoner Junction 138 kV	160 / 192	160 / 192	Substation Conductor, Wave Trap, Relaying
	Stoner Junction – King Farm 138 kV	293 / 343	308 / 376	Substation Conductor, Circuit Breaker, Wave Trap, Relaying
	Stoner Junction – Iron Bridge 138 kV	210 / 250	221 / 268	Substation Conductor, Circuit Breaker, Wave Trap, Relaying

APS Transmission Zone M-3 Process
Stoner Junction 138 kV Misoperation Relays

Need Number: APS-2023-011

Process Stage: Solution Meeting 05/19/2023

Proposed Solution:

- Replace limiting substation conductor, wave trap, and relaying at Connellsville 138 kV substation
- Replace limiting substation conductor, wave trap, circuit breaker, and relaying at King Farm 138 kV substation
- Replace limiting substation conductor, wave trap, circuit breaker, and relaying at Iron Bridge 138 kV substation

Need #	Transmission Line	Existing Line Rating (SN / SE)	Post Project Line Rating (SN / SE)
APS-2023-011	Connellsville – Stoner Junction 138 kV	160 / 192	160 / 192
	Stoner Junction – King Farm 138 kV	293 / 343	308 / 376
	Stoner Junction – Iron Bridge 138 kV	210 / 250	221 / 268

Alternatives Considered:

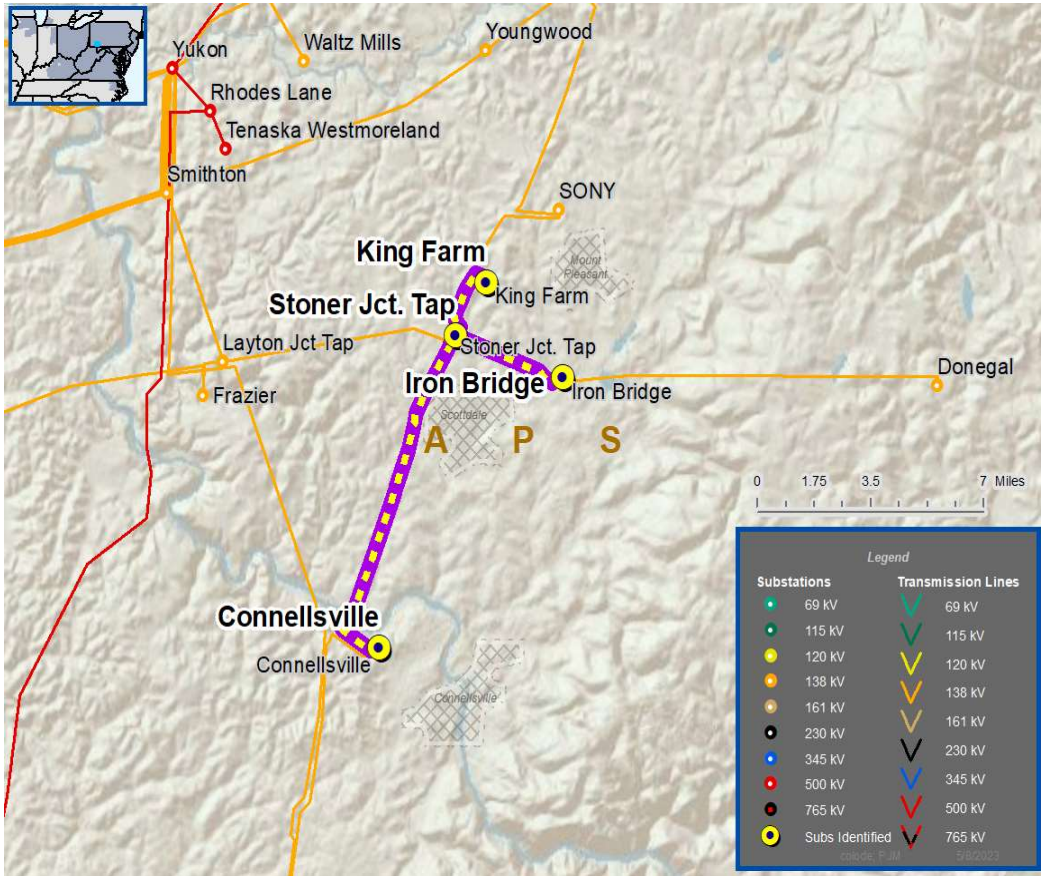
- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: $ 1.9 M

Projected In-Service: 12/15/2023

Project Status: Engineering

Model: 2022 RTEP model for 2027 Summer (50/50)



ComEd Transmission Zone M-3 Process
Customer in Itasca

Need Number: ComEd-2023-003

Process Stage: Solutions Meeting 6/16/2023

Previously Presented: Need Meeting 4/21/2023

Project Driver:

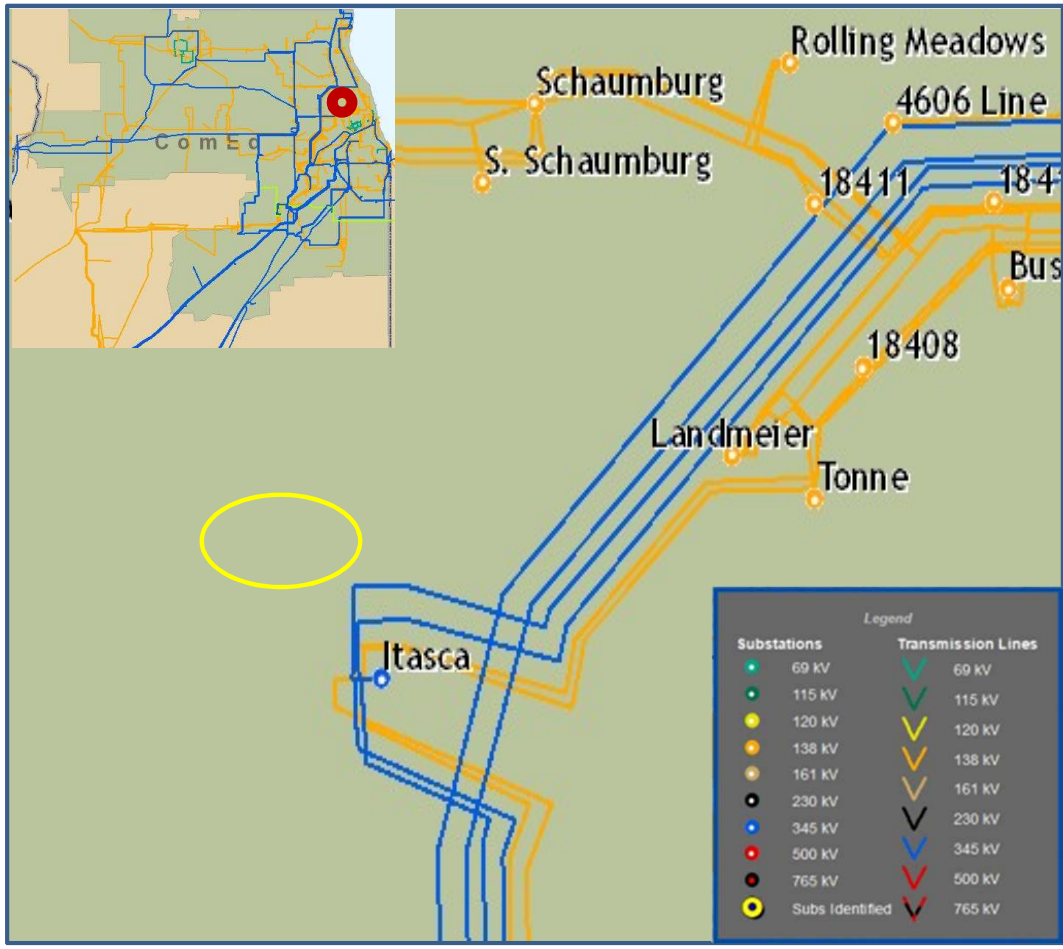
Customer Service

Specific Assumption Reference:

- New transmission customer interconnections or modification to an existing customer

Problem Statement:

New customer is looking for transmission service in Itasca. Initial loading is expected to be 117 MW in 2026, 218 MW in 2028, with an ultimate load of 299 MW.



ComEd Transmission Zone M-3 Process
Customer in Itasca

Need Number: ComEd-2023-003

Process Stage: Solutions Meeting 6/16/2023

Previously Presented: Need Meeting 4/21/2023

Preferred Solution:

- New customer will be radially served with 2 new 1 mile 138 kV lines from Itasca. Customer substation will be double ring bus configuration with 4 – 138 kV to 34 kV transformers.
- Additionally, at Itasca, 138 kV line Itasca – Lombard will be moved from Bus 1 to its own position on new Bus 15. BT 3-4 CB will be installed at Itasca.

Estimated transmission cost: $8M

Alternatives Considered:

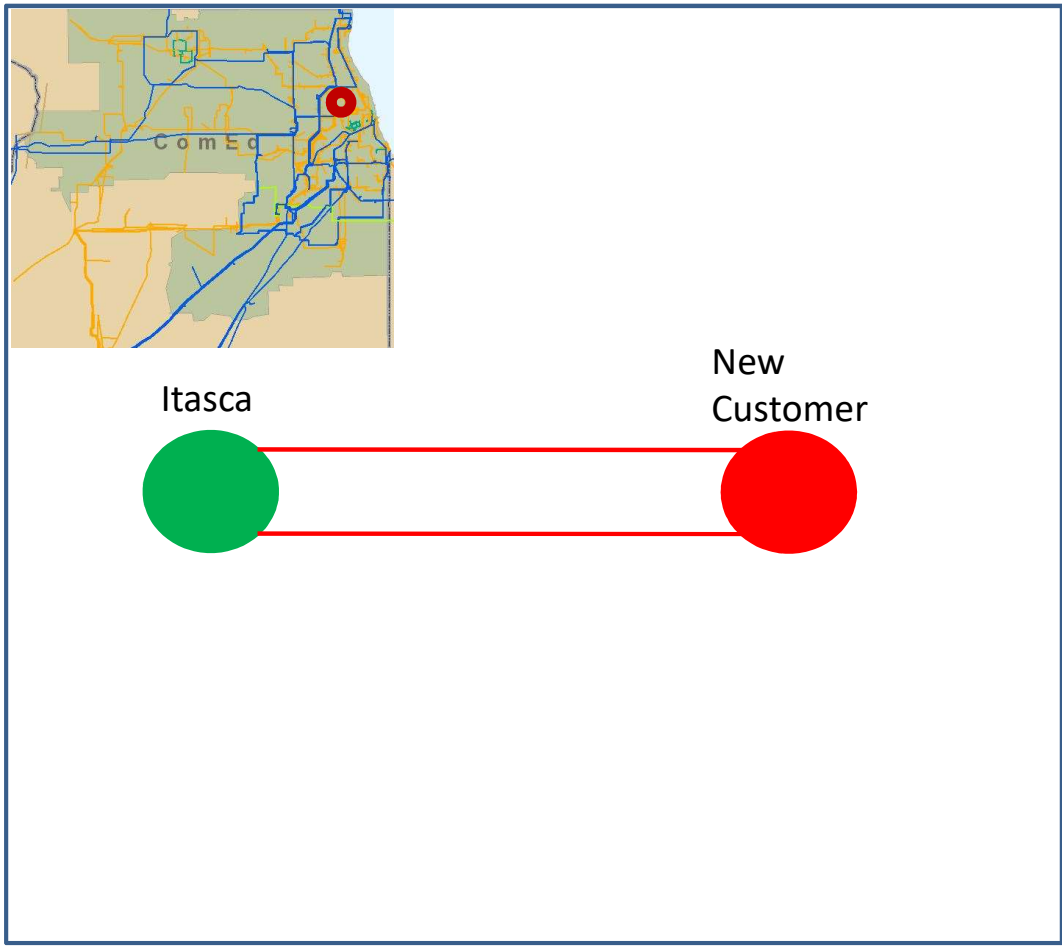
Cut into 138 kV lines Tonne – Itasca. Extend 138 kV lines 1 mile to customer location to connect to new double ring bus substation. This alternative was not selected due to higher cost.

Estimated transmission cost: $50M

Projected In-Service: 6/1/26

Project Status: Conceptual

Model: 2027 RTEP



AEP Transmission Zone M-3 Process
Scio, Ohio

Need Number: AEP-2023-OH064

Process Stage: Solution Meeting 06/16/2023

Previously Presented: Need Meeting 04/21/2023

Project Driver: Customer Service; Equipment Material/Condition/ Performance/Risk

Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12); AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

AEP Ohio's Scio distribution station does not have any SCADA functionality, limiting the ability of T & D operations personnel to properly monitor real-time conditions at the station. It can also lead to lengthier outage times for customers.

In addition, it has an outdated ungrounded 69 kV capacitor bank (9.6 MVAR) that has been prone to malfunction. The capacitor was manufactured in 1989. This cap bank is a manually switched bank with no SCADA control of the switcher.

AEP Transmission Zone M-3 Process
Scio Cap Bank Removal

Need Number: AEP-2023-OH064

Process Stage: Solution Meeting 06/16/2023

Proposed Solution:

Remove the 69kV cap bank and cap switcher at Scio. A new RTU will be added along with standard SCADA functionality for transmission & distribution equipment.

Total Transmission Cost: $0.1M

Alternatives Considered: The obsolete 69kV cap bank and cap-switcher could be upgraded with new equipment. However, the area has plentiful cap banks on the transmission system for voltage support, so this unit is no longer needed.

Alternative Cost = $1.2 Million

Projected In-Service: 12/01/2024

Project Status: Scoping

Model: 2027 PJM RTEP Load-Flow Model

69kV capacitor bank removal only. Bubble diagram not applicable.

APS Transmission Zones M-3 Process

Need Numbers: APS-2022-006, 007, 008, 009, 010, 011, 012, and 013

Process State: Solution Meeting 06/16/23

Previously Presented: Need Meeting 11/18/2022

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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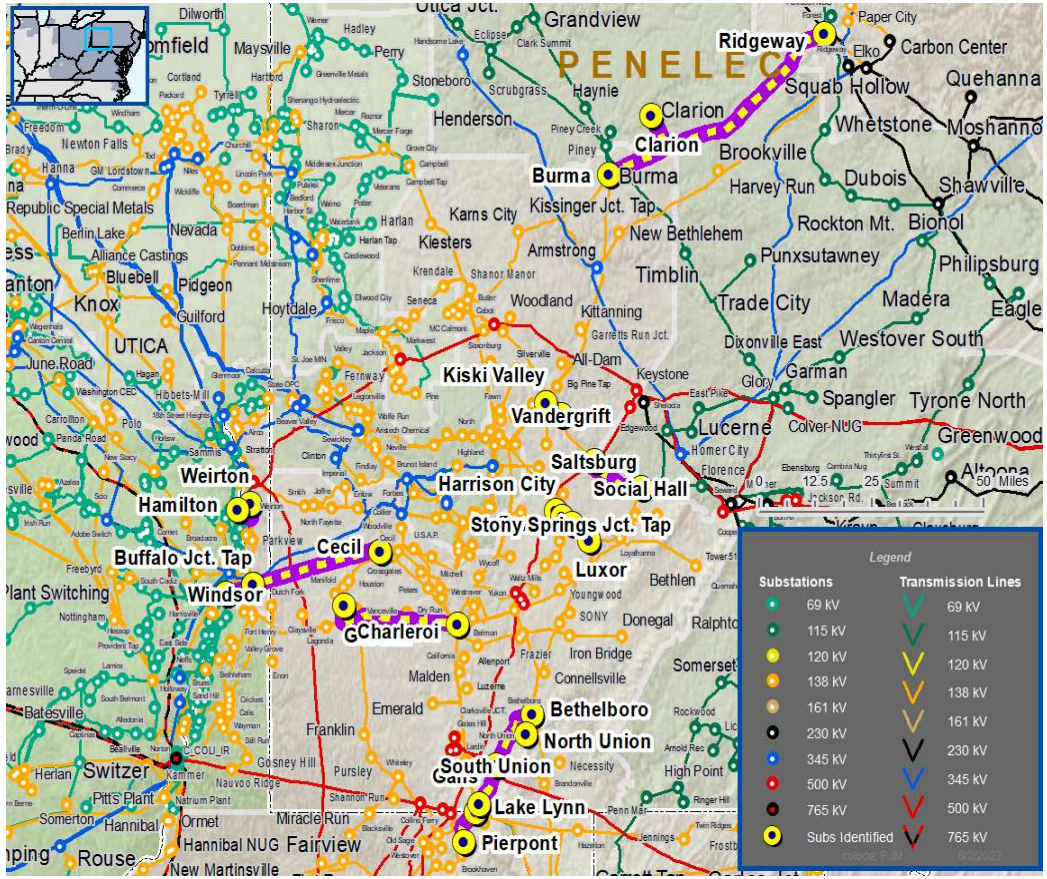

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2022-006	Cecil – Buffalo JCT 138 kV	224/229	297/365	SS Conductor, Line Trap, Relaying
	Windsor – Buffalo JCT 138 kV	225/256	297/365	SS Conductor, Line Trap
APS-2022-007	Kiski Valley – Vandergrift 138 kV Line	225/229	297/365	SS Conductor, Line Trap, and Relaying
APS-2022-008	Charleroi – Gordon 138 kV Line	206/229	308/376	SS Conductor, Wave Trap, Relaying, and CT
APS-2022-009	Lake Lynn – Pierpoint 138 kV Line	292/314	308/376	Wave Trap, SS conductor, and Circuit Breaker
APS-2022-010	Burma – Clarion 138 kV Line	292/314	308/376	Wave Trap, SS conductor
	Clarion – Ridgway 138 kV Line	292/314	308/376	Circuit Breaker. Wave Trap, SS Conductor
APS-2022-011	Saltsburg – Social Hall 138 kV	172/172	283/349	Relay, SS Conductor, CT
APS-2022-012	Harrison City – Penn 138 kV Line	242/297	308/376	Substation Conductor
	Stony Springs – Luxor 138 kV Line	225/287	296/302	Substation Conductor and Relaying
APS-2022-013	Bethelboro North Union 2 138 kV Line	292/314	297/365	Wave Trap
	Gans – Lake Lynn 138 kV Line	292/314	300/358	Wave Trap SS conductor
	North Union 2 T – North Union 138 kV Line	295/365	297/365	Substation Conductor
	North Union 2 T – South Union 138 kV Line	308/376	309/376	Substation Conductor
	South Union – Gans 138 kV Line	287/342	309/376	Line Switcher

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APS Transmission Zones M-3 Process

Need Number	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimated Cost ($ M)	Target ISD
APS-2022-006	Cecil – Buffalo JcT 138 kV	297/365	• Cecil - Replace line relaying, breaker, switches, substation conductor, line trap, current transformer	$4.11 M	11/17/2023
	Windsor – Buffalo JcT 138 kV	297/365	• Windsor - Replace line relaying, breaker, switches, substation conductor, line trap		10/20/2023
	Weirton – Hamilton JcT 138 kV	308/376	• Weirton - Replace line relaying, breaker, switches, substation conductor, line trap, current transformer		
APS-2022-007	Kiski Valley – Vandergrift 138 kV	297/365	• Kiski - Replace line relaying, substation conductor, line trap • Vandergrift - Replace line relaying, breaker, switches, substation conductor, line trap, current transformers	$2.99 M	12/15/2023
APS-2022-008	Charleroi – Gordon 138 kV	308/376	• Charleroi - Replace line relaying, line trap, current transformer • Gordon - Replace line relaying, breaker, switch, line trap, current transformer	$1.57 M	12/15/2023
APS-2022-009	Lake Lynn – Pierpont 138 kV	308/376	• Lake Lynn - Replace line relaying, substation conductor, current transformers • Pierpont - Replace line relaying, breakers, switch, substation conductor, line trap, current transformers	$2.33 M	11/15/2023
APS -2022-010	Burma – Clarion 138 kV	308/376	• Burma - Replace line relay, breaker, switches, substation conductor, line trap, current transformer • Clarion - Replace substation conductor	$2.64 M	11/17/2023
	Clarion – Ridgway 138 kV	308/376	• Ridgway - Replace line relaying, breaker, switches, substation conductor, line trap, current transformer		

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APS Transmission Zones M-3 Process

Need Number	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimated Cost ($ M)	Target ISD
APS-2022-011	Saltsburg – Social Hall 138 kV	283/349	• Saltsburg - Replace line relaying, breakers, switches, line trap, current transformers • Social Hall - Replace line relaying, breaker, switches, substation conductor, line trap, current transformer	$2.98 M	11/4/2023
APS-2022-012	Harrison City – Penn 138 kV	308/376	• Harrison City - Replace line relaying, substation conductor, current transformer	$4.90 M	12/29/2023
	North Greensburg – Hempfield 138 kV	308/376	• Hempfield - Replace line relaying, breaker, switch, substation conductor, current transformer		
	Stony Springs JcT – Luxor 138 kV	296/302	• Luxor - Replace line relaying, breaker, switch, substation conductor, current transformer		
APS-2022-013	Bethelboro – North Union 2 T 138 kV	308/376	• Bethelboro - Replace line relaying, breaker, switch, substation conductor, line trap, current transformer	$3.32 M	12/15/2023
	Gans – Lake Lynn 138 kV	308/376	• Lake Lynn - Replace line relaying, breaker, switch, substation conductor, line trap, current transformer		

Alternatives Considered: Maintain existing condition
Project Status: Engineering
Model: 2022 RTEP model for 2027 Summer (50/50)

APS Transmission Zone M-3 Process

Need Number: APS-2023-001

Process Stage: Solution Meeting 6/16/2023

Previously Presented: Need Meeting 2/17/2023

Project Driver:

Operational Flexibility and Efficiency

Specific Assumption Reference:

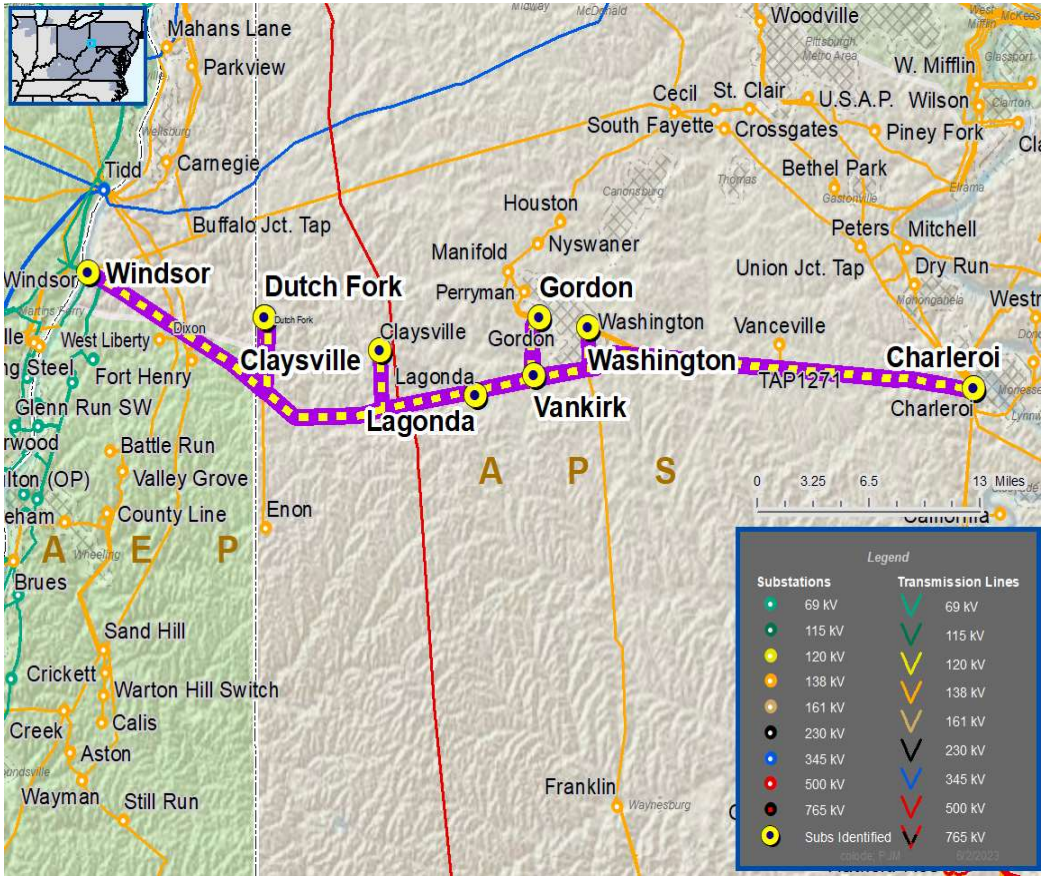
- Global
- System reliability and performance
- Load at risk in planning and operational scenarios
- System losses
- Add/Expand Bus Configuration
- Capability to perform substation maintenance

Problem Statement:

An N-1 loss of the Dutch Fork - Windsor 138 kV Line results in Enon, Dutch Fork, and Claysville substations being fed radially out of Washington Substation. The radial line serves approximately 110 MW of load at peak conditions and over 4,539 customers.

A subsequent N-1 loss of the Whitely - Pursley 138 kV Line adds Washington, Vanceville, Franklin, and Pursley substations to the radial line now served out of Charleroi Substation. This adds an additional 67 MW of load and 13,379 customers served from the radial line.

This radial line has approximately 177 MW and 17,918 customers. In this configuration Enon Substation has 73 miles of line exposure.



APS Transmission Zone M-3 Process

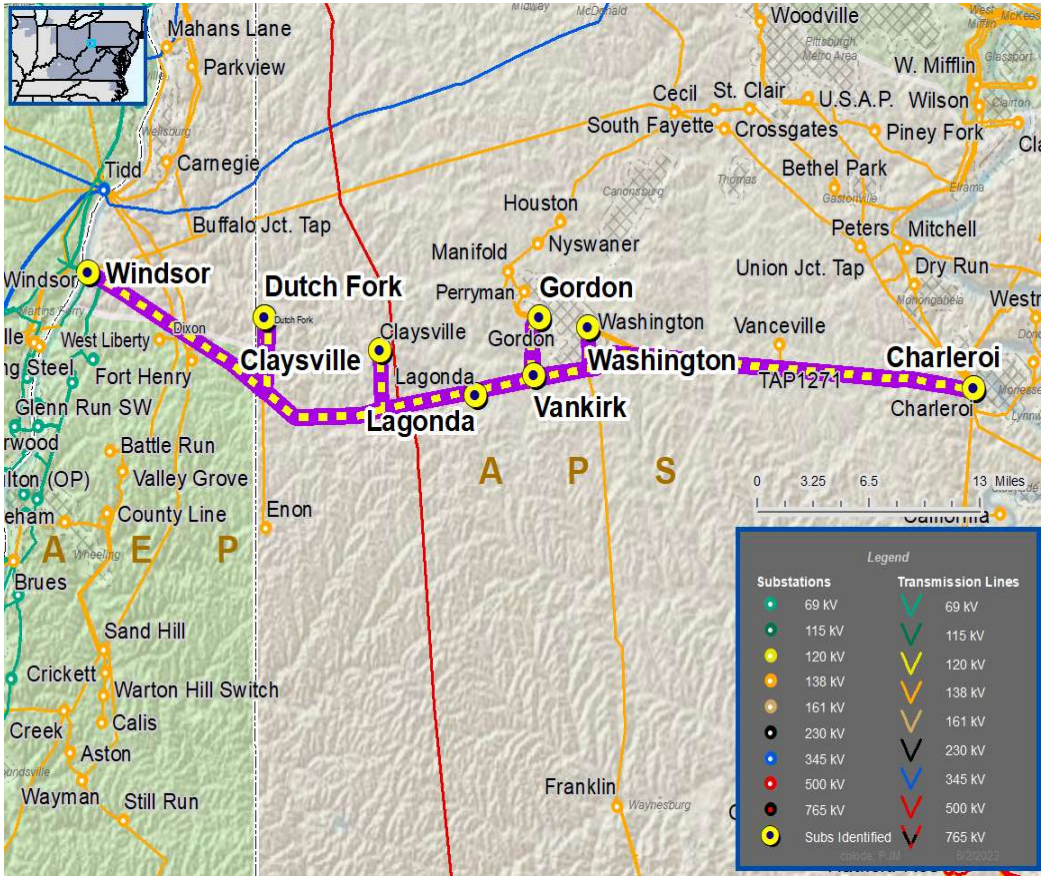
Need Number: APS-2023-001

Process Stage: Solution Meeting 6/16/2023

Previously Presented: Need Meeting 2/17/2023

Proposed Solution:

- Create the Vankirk Substation:
  - Construct a new 10 breaker 138 kV breaker-and-a-half substation
  - Loop in the Dutch Fork – Washington 138 kV Line
  - Loop in the Gordon – Lagonda 138 kV Line
  - Loop in the Gordon – Charleroi 138 kV Line
- At Washington:
  - Replace limiting substation conductor and wave trap
- At Dutch Fork:
  - Replace limiting substation conductor
- At Gordon:
  - Replace limiting substation conductor, relaying, and wave trap
- At Claysville:
  - Replace limiting substation conductor
- At Charleroi:
  - Replace limiting substation conductor and wave trap



Transmission Line Ratings:

Vankirk – Gordon East 138 kV (New line)
- Before Proposed Solution: N/A
- After Proposed Solution: 308/376 MVA (SN/SE)

Vankirk – Gordon West 138 kV (New line)
- Before Proposed Solution: N/A
- After Proposed Solution: 308/376 MVA (SN/SE)

Lagonda – Vankirk 138 kV (New line)
- Before Proposed Solution: N/A
- After Proposed Solution: 308/376 MVA (SN/SE)

Dutch Fork – Claysville 138 kV
- Before Proposed Solution: 216/270 MVA (SN/SE)
- After Proposed Solution: 297/365 MVA (SN/SE)

Claysville – Vankirk 138 kV (New line)
- Before Proposed Solution: N/A
- After Proposed Solution: 297/365 MVA (SN/SE)

Vankirk – Washington 138 kV (New line)
- Before Proposed Solution: N/A
- After Proposed Solution: 297/365 MVA (SN/SE)

Charleroi – Vankirk 138 kV (New line)
- Before Proposed Solution: N/A
- After Proposed Solution: 308/376 MVA (SN/SE)

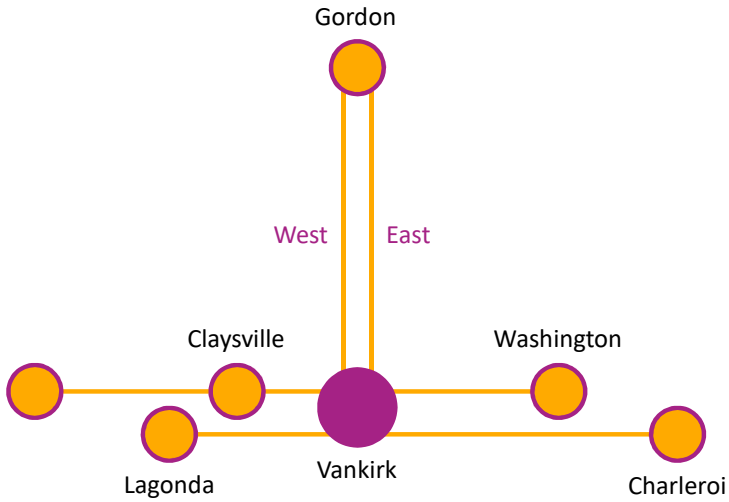
Alternatives Considered
- Build a new 138 kV line from Enon – Whiteley, which requires 21 miles of new RoW.

Estimated Project Cost: $31.7M

Projected In-Service: 12/31/2025

Project Status: Conceptual

Model: 2020 RTEP model for 2025 Summer (50/50)



Legend	
500 kV	
345 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process
Chrysler-Maclean 138 kV New Customer

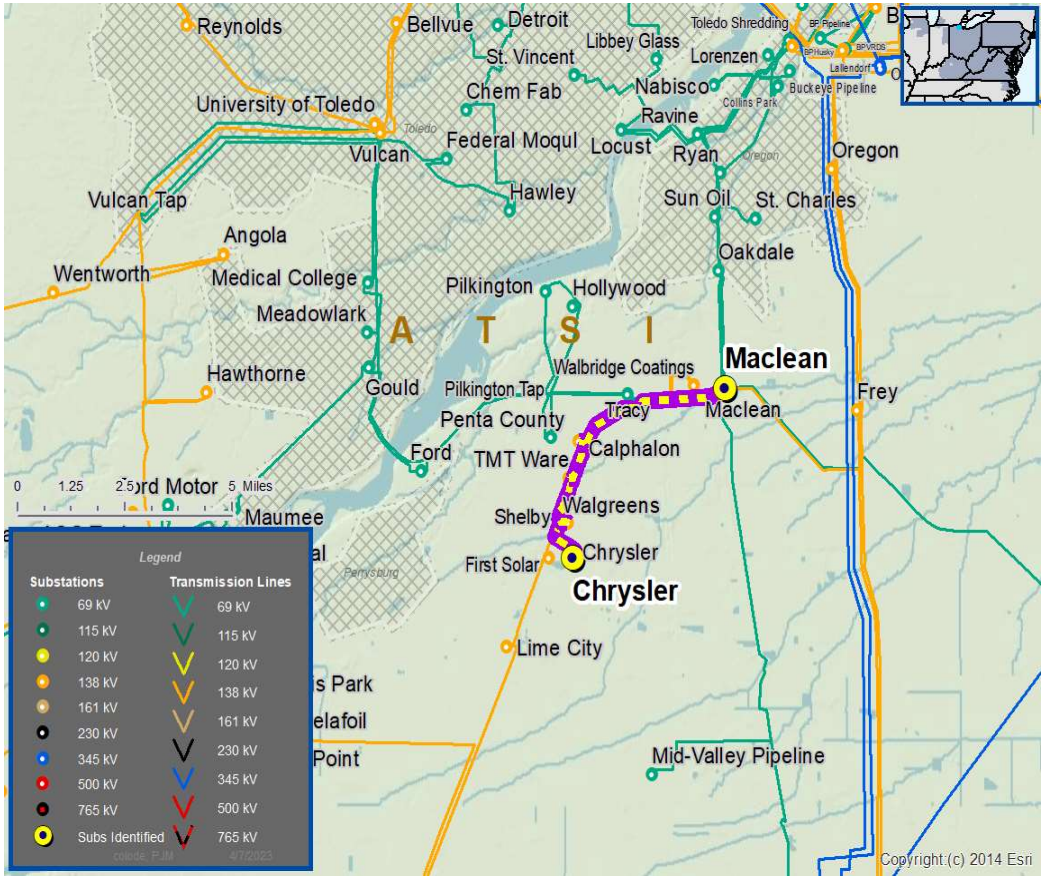
Need Number: ATSI-2023-003
Process Stage: Solution Meeting –6/16/2023
Previously Presented: Need Meeting – 4/21/2023

Project Driver(s):
Customer Service

Specific Assumption Reference(s)
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
New Customer Connection – Customer has requested a new 138 kV delivery point near the Chrysler-Maclean 138 kV line. The anticipated load of the new customer connection is 30 MVA.

Requested in-service date is 10/01/2024.



ATSI Transmission Zone M-3 Process
Chrysler-Maclean 138 kV New Customer

Need Number: ATSI-2023-003
Process Stage: Solution Meeting –6/16/2023
Previously Presented: Need Meeting – 4/21/2023

Proposed Solution:

138 kV Transmission Line Tap

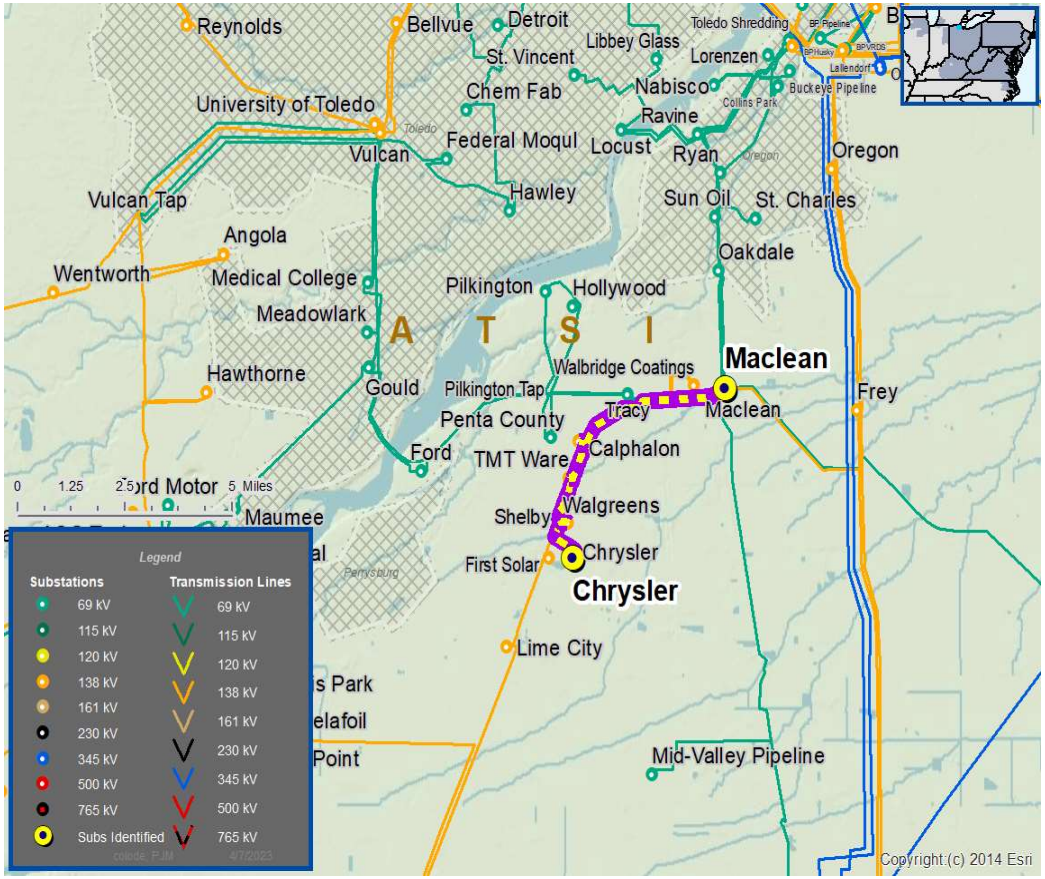
- Install three SCADA controlled transmission line switches
- Construct approximately 250 ft of transmission line using 954 45/7 ACSR from tap point to the customer substation

Alternatives Considered:

- No feasible alternatives to meet customer's request

Estimated Project Cost: $0.9M

Projected In-Service: 10/1/2024
Status: Engineering



EKPC Transmission Zone M-3 Process
Frenchburg

Need Number: EKPC-2023-002

Process Stage: Solutions Meeting – July 21, 2023

Previously Presented:

Need Meeting – June 16, 2023

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk

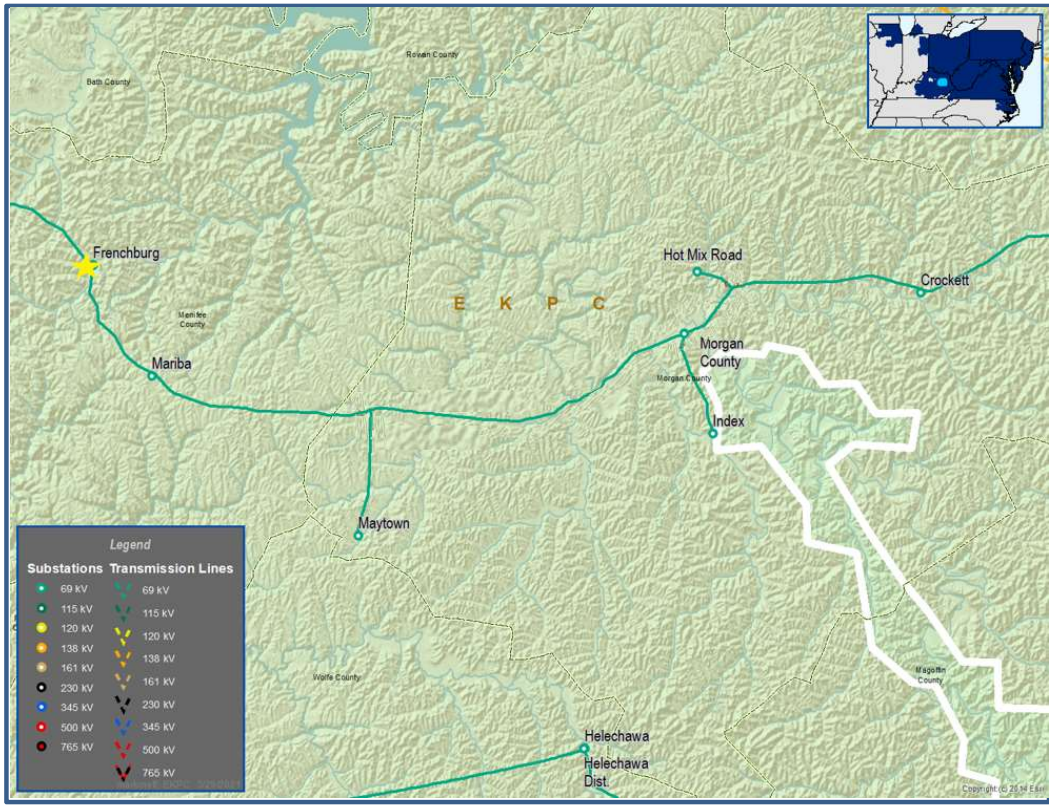
Specific Assumption Reference:

EKPC Assumptions Presentation Slide 13

Problem Statement:

Options have been evaluated to address aging condition issues of the Frenchburg distribution substation. It has been determined that more space is needed to achieve EKPC's standard substation design requirements. EKPC's planning department has been asked to evaluate the ongoing need of the Frenchburg 10.8 MVAR capacitor bank due to space limitations at the site.

Model: N/A



EKPC Transmission Zone M-3 Process
Frenchburg

Need Number: EKPC-2023-002

Process Stage: Solutions Meeting – July 21, 2023

Proposed Solution:

It has been determined that the Frenchburg capacitor bank is no longer needed for voltage support in the area. The 10.8 MVAR capacitor bank will be removed during construction. The removal of the capacitor bank will provide the additional space needed to achieve EKPC's standard substation design requirements, enabling the substation to be rebuilt on the existing property.

Transmission Cost: $0.0M

Ancillary Benefits:

- None

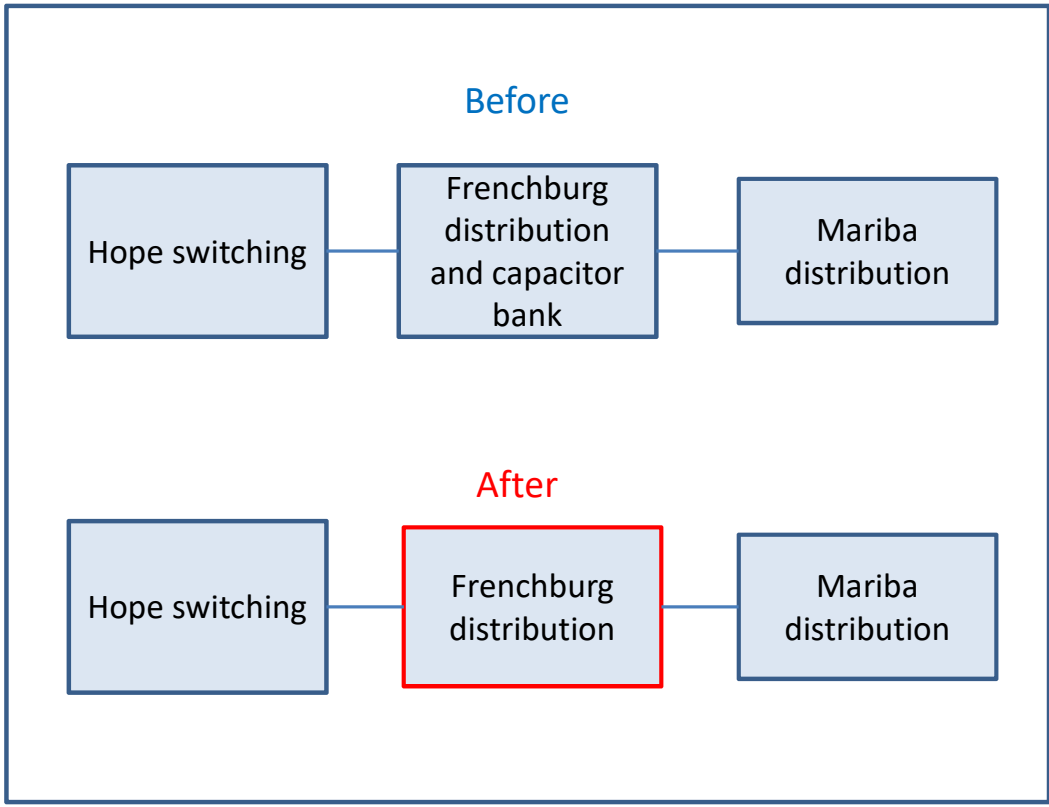
Alternatives Considered:

- None

Projected In-Service: 12/31/2023

Project Status: Engineering

Model: N/A



DEOK Transmission Zone M-3 Process
Brewer

Need Number: DEOK-2021-009

Process Stage: Solutions Meeting 07-21-2023

Process Stage: Needs Meeting 07-16-2021

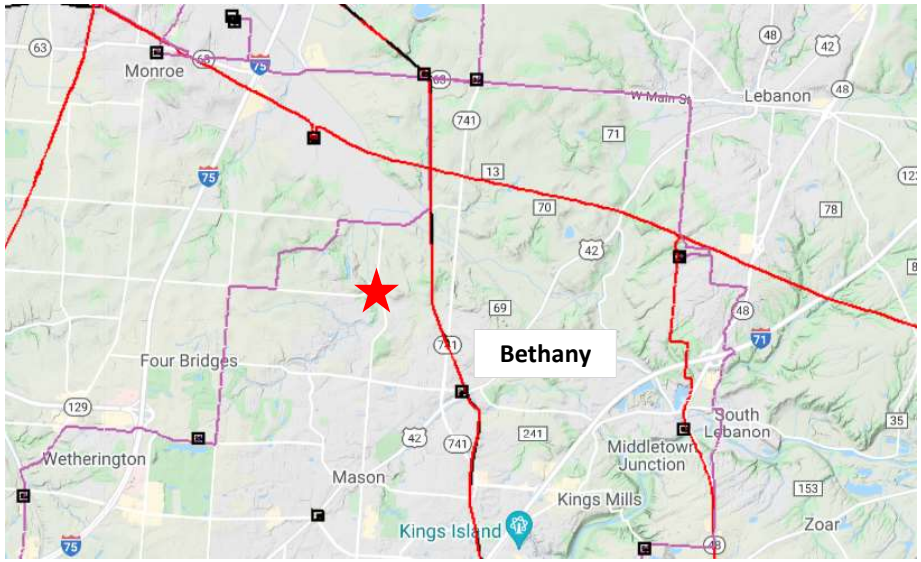
Project Driver: Customer service

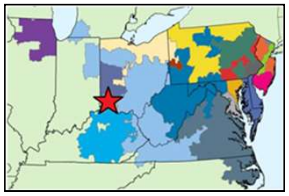
Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 9

Problem Statement:

Duke Energy Distribution has requested a new delivery point on Brewer Road in Mason, Ohio. The city is developing a 400-acre research and development park. The expected 2 MW per year of load growth will exceed the capacity of local distribution facilities at Bethany by 2025.





345kV
138kV
69kV

DEOK Transmission Zone M-3 Process
Brewer

Need Number: DEOK-2021-009

Process Stage: Solutions Meeting 04-21-2023

Process Stage: Needs Meeting 07-16-2021

Project Driver: Customer service

Specific Assumption Reference:
Duke Energy Ohio & Kentucky Local Planning Assumptions slide 9

Potential Solution:
Build Brewer, a new distribution substation. Brewer will have a straight bus configuration with positions for two distribution transformers. Install one 69/13 kV, 22 MVA transformer with a circuit swithcher on the high side. The low side will be connected to 13 kV bus work with two feeder exits. Loop the Shaker Run – Liberty feeder into/out of the substation, switch connected with an automation throw over scheme (ATO).

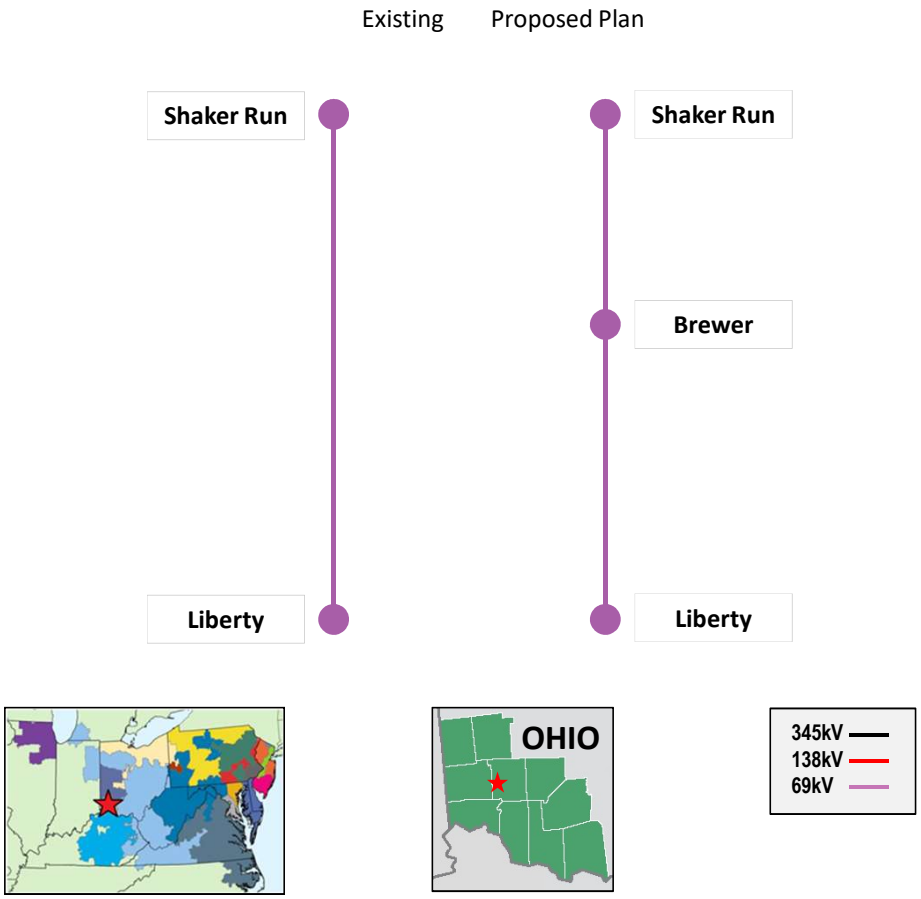
Ancillary Benefits: The new substation is close to the load center. The ATO will increase reliability with the ability to switch between feeders in the event of a loss of either feeder. The Shaker Run – Liberty feeder is lightly loaded so has capacity to accommodate future load growth.

Estimated Transmission Cost: $2.4MM

Proposed In-Service Date: 12-18-2025

Project Status: Engineering

Model: 2022 RTEP



DEOK Transmission Zone M-3 Process
Wilder

Need Number: DEOK-2022-007

Process Stage: Solutions Meeting 07-21-2023

Previously Presented: Needs Meeting 07-22-2022

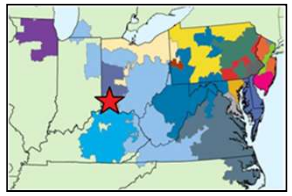
Project Driver: Equipment Condition, Performance and Risk

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slides 5 & 6

Problem Statement:

138/69/34 kV Transformer 2 at Wilder is in deteriorating condition. It's 66 years old, is overheating during summer months during normal operating conditions, and shows elevated Ethane and Ethylene levels. The coolers have continuing issues and require more frequent maintenance. Spare parts availability for the cooling pump and fans is limited.



345kV
138kV
69kV

DEOK Transmission Zone M-3 Process
Wilder

Need Number: DEOK-2022-007

Process Stage: Solutions Meeting 07-21-2023

Previously Presented: Needs Meeting 07-22-2022

Project Driver: Equipment Condition, Performance and Risk

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slides 5 & 6

Potential Solution:

Remove 138/69/34 kV Transformer 2. Install a 138/69 kV, 150 MVA transformer to feed the 69 kV bus and a 138/34 kV, 33 MVA transformer to feed the 34 kV bus. Install a circuit switcher for the new high side connection to the 138/34 kV transformer. Expand the substation and relocate transmission lines and structures to accommodate the new equipment.

Ancillary Benefits: The 138/69 kV transformer can deliver an additional 50 MVA to the 69 kV system. The 138/34 kV transformer isolates the transmission system from faults on the distribution system.

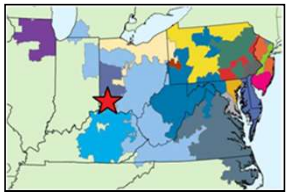
Estimated Transmission Cost: $10,991,229

Proposed In-Service Date: 05-08-2026

Project Status: Scoping

Model: 2022 RTEP

Bubble Diagram Not Applicable
Station Modifications Only



DEOK Transmission Zone M-3 Process
Decoursey

Need Number: DEOK-2023-004

Process Stage: Solutions Meeting 07/21/2023

Previously Presented: Needs Meeting 04/21/2023

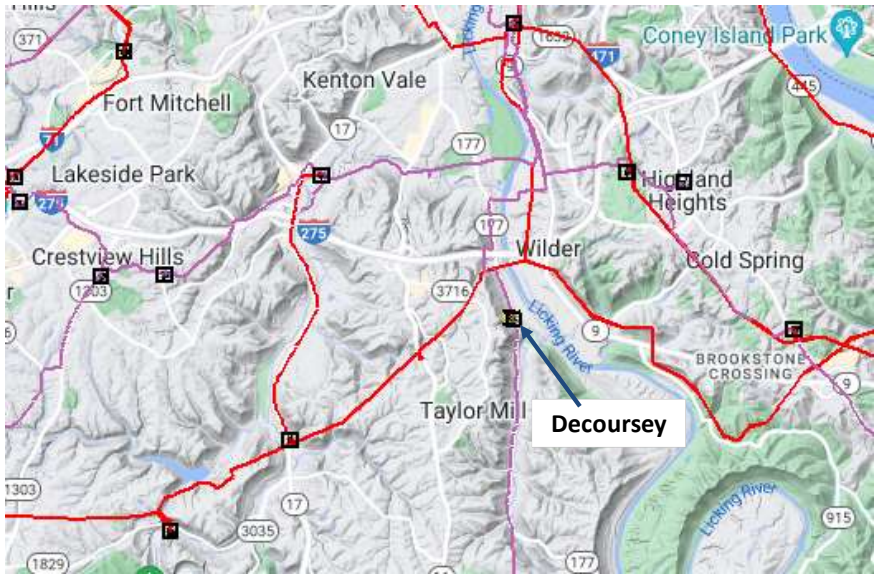
Project Driver: Equipment condition, performance and risk

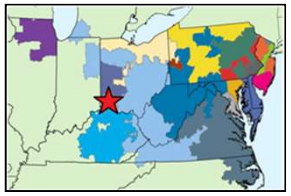
Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slides 6-7

Problem Statement:

Decoursey substation was originally constructed in the 1940's as a 33-4 kV substation. The electrical equipment was converted to 69-13 kV in 1970, but the structural supports were never modified to accommodate the higher voltages. Pole-mounted switches are utilized outside the station fence and a series of hydraulic and electronic reclosers currently provide circuit protection. There is no SCADA; outage notification is only provided by customer call. The single 69/13 kV, 10 MVA transformer that serves 2069 customers is routinely operated at or exceeding its rated capacity. There is no station breaker and not enough space to install one on the existing steel which is rusted. The station layout does not meet minimum approach distance standards. This land-locked station is on a hillside and has no room for expansion.





345kV
138kV
69kV

DEOK Transmission Zone M-3 Process
Decoursey

Need Number: DEOK-2023-004

Process Stage: Solutions Meeting 07/21/2023

Previously Presented: Needs Meeting 04/21/2023

Project Driver: Equipment condition, performance and risk

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slides 6-7

Potential Solution:

Retire Decoursey substation. Build Taylor Mill, a new substation on adjacent land. Install two H-frame take-off structures with motor operated line disconnect switches to loop through the 69 kV feeder, voltage sensors for an automatic throw over scheme (ATO), and 69 kV bus separated with a tie switch in the center. Install a circuit switcher to connect a new 69/13 kV, 22 MVA distribution transformer, and 13 kV bus, circuit breakers and regulators for two feeder exits.

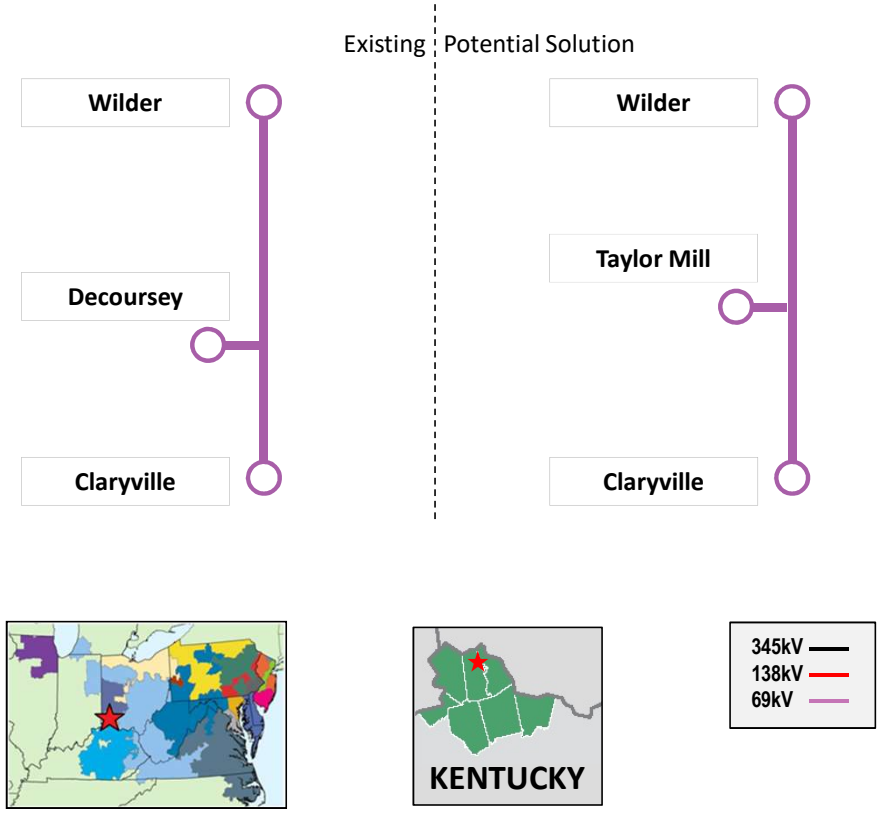
Ancillary Benefits: The ATO will isolate faults for faster service restoration. The circuit switcher will protect the 69 kV feeder from faults on the 13 kV system. The 69 kV tie switch creates a position for a second transformer.

Estimated Transmission Cost: $2,989,794

Proposed In-Service Date: 11-22-2024

Project Status: Scoping

Model: 2022 RTEP



ATSI Transmission Zone M-3 Process
Carlisle - Woodford 69 kV Line Customer Connection

Need Number: ATSI-2023-005
Process Stage: Solution Meeting – 07/21/2023
Previously Presented: Need Meeting – 5/19/2023

Project Driver(s):
Customer Service

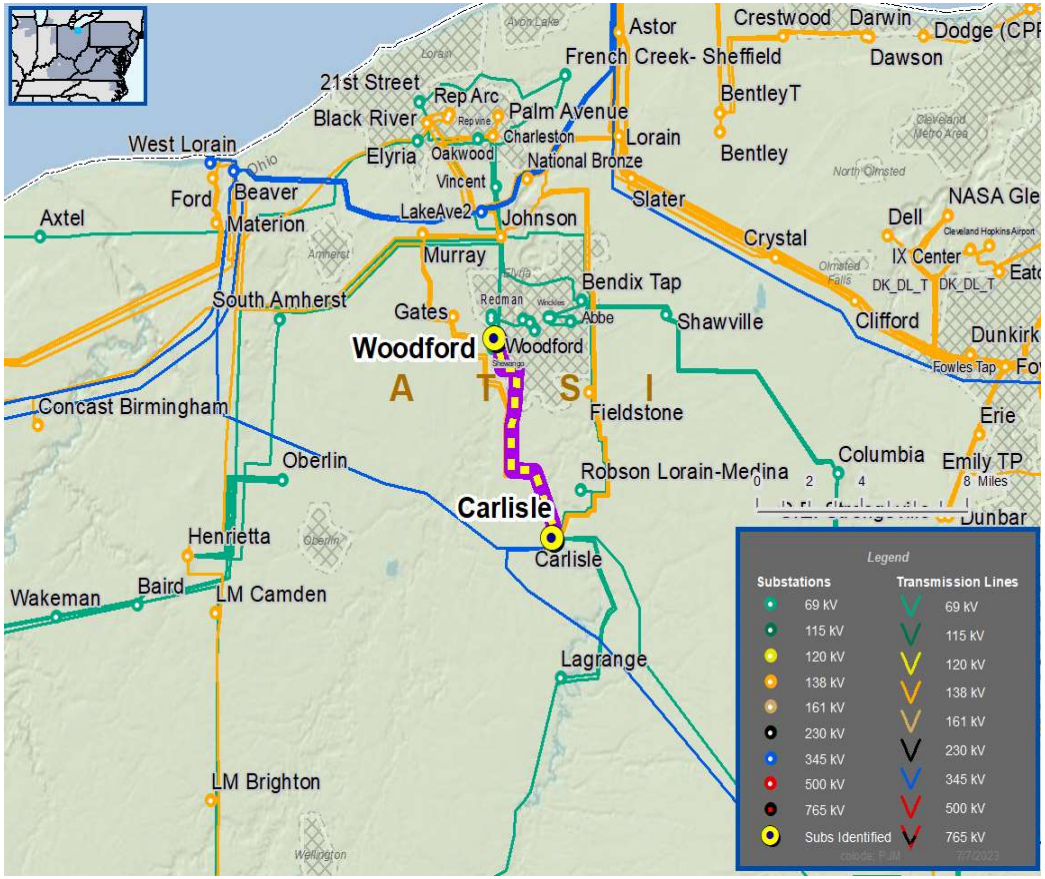
Specific Assumption Reference(s)

Customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement

Customer Connection – Customer is requesting to reconnect service at an existing 69 kV delivery point on the Carlisle – Woodford 69 kV Line. The anticipated load of the new customer connection is 6 MVA.

Requested in-service date is 11/17/2023



ATSI Transmission Zone M-3 Process
Carlisle - Woodford 69 kV Line Customer Connection

Need Number: ATSI-2023-005
Process Stage: Solution Meeting – 07/21/2023
Previously Presented: Need Meeting – 5/19/2023

Proposed Solution:

69 kV Transmission Line Tap Reconnection

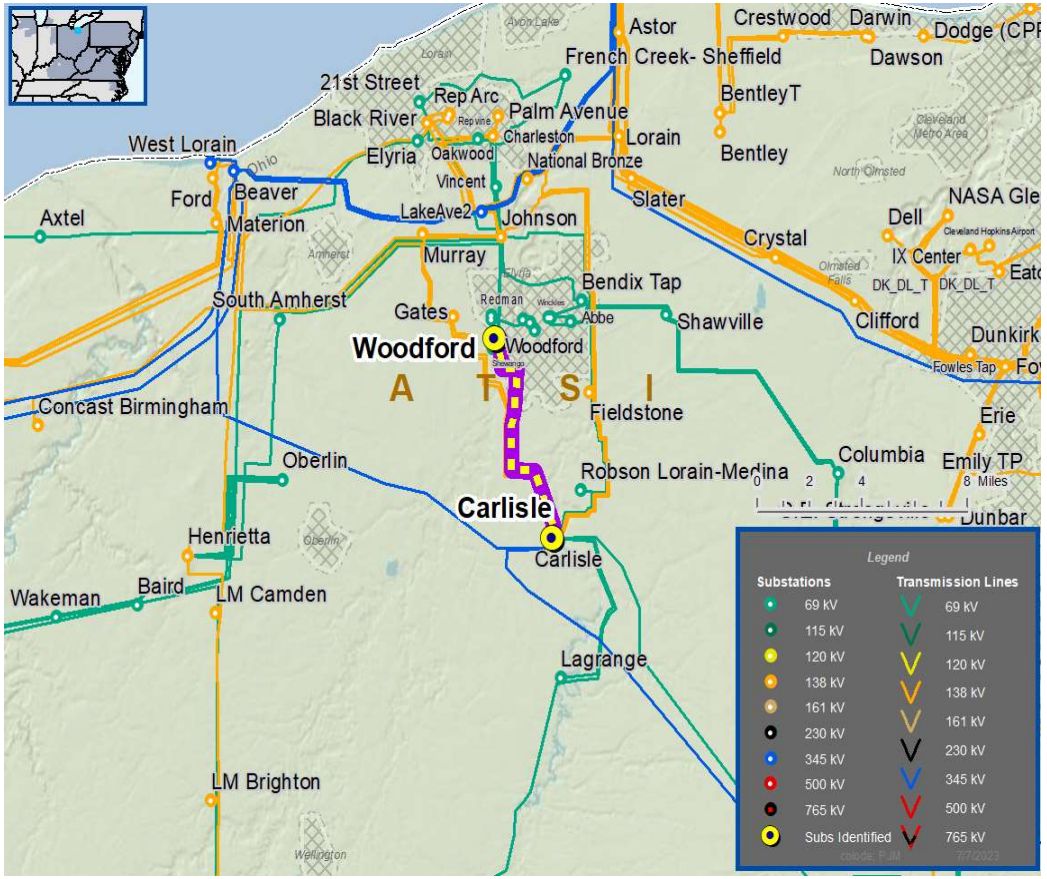
- Install two main-line SCADA controlled switch
- Install one tap-line SCADA controlled switch

Alternatives Considered:

- No feasible alternatives to meet customer's request

Estimated Project Cost: $1.3M

Projected In-Service: 11/17/2023
Status: Engineering



ATSI Transmission Zone M-3 Process
Campbellsport – Ravenna No 1 69 kV Line New Customer

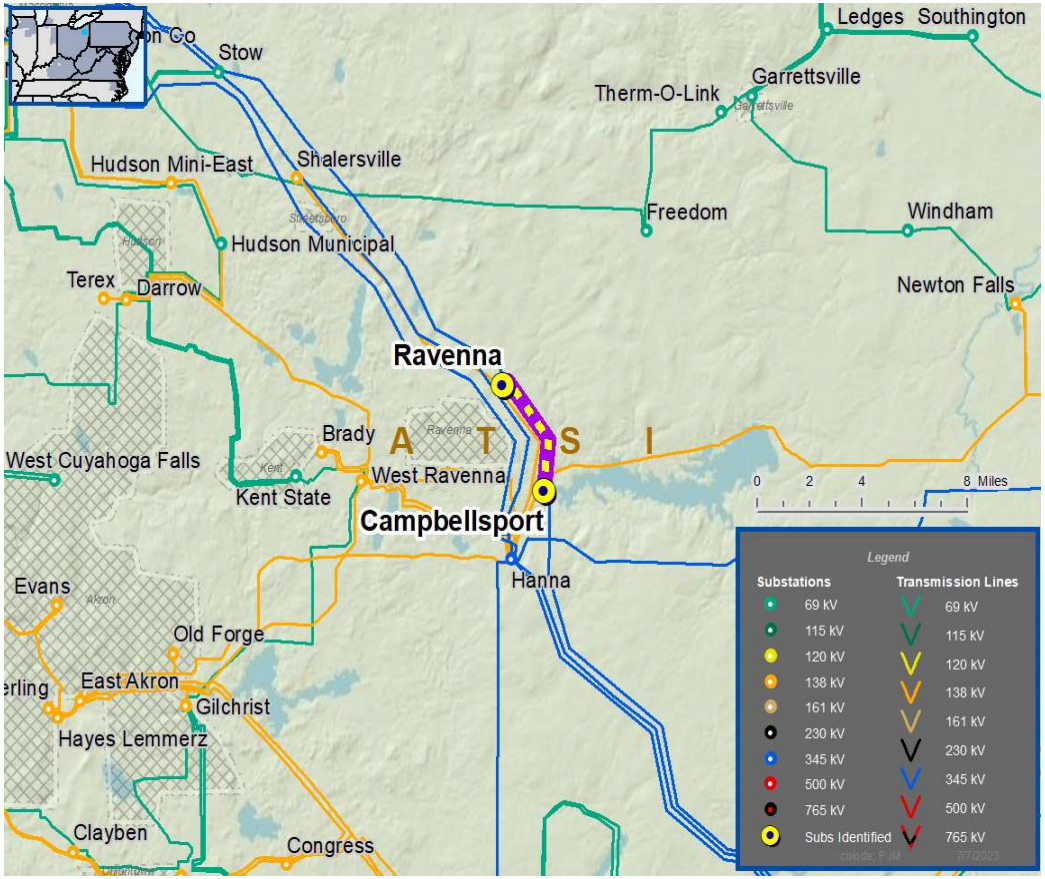
Need Number: ATSI-2023-006
Process Stage: Solution Meeting – 07/21/2023
Previously Presented: Need Meeting – 05/19/2023

Supplemental Project Driver(s):
Customer Service

Specific Assumption Reference(s):
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
New Customer Connection – Customer requested 69 kV transmission service for approximately 9.6 MVA of total load near the Campbellsport – Ravenna No 1 69 kV Line.

Requested In-Service Date:
April 28, 2024



ATSI Transmission Zone M-3 Process
Campbellsport – Ravenna No 1 69 kV Line New Customer

Need Number: ATSI-2023-006
Process Stage: Solution Meeting – 07/21/2023
Previously Presented: Need Meeting – 05/19/2023

Proposed Solution:

69 kV Transmission Line Tap

- Install three SCADA controlled load-break switches
- Construct approximately 0.4 miles of transmission line using 477 kcmil ACSR 26/7 conductor from tap point to Customer substation
- Relay settings revised at Ravenna and Campbellsport

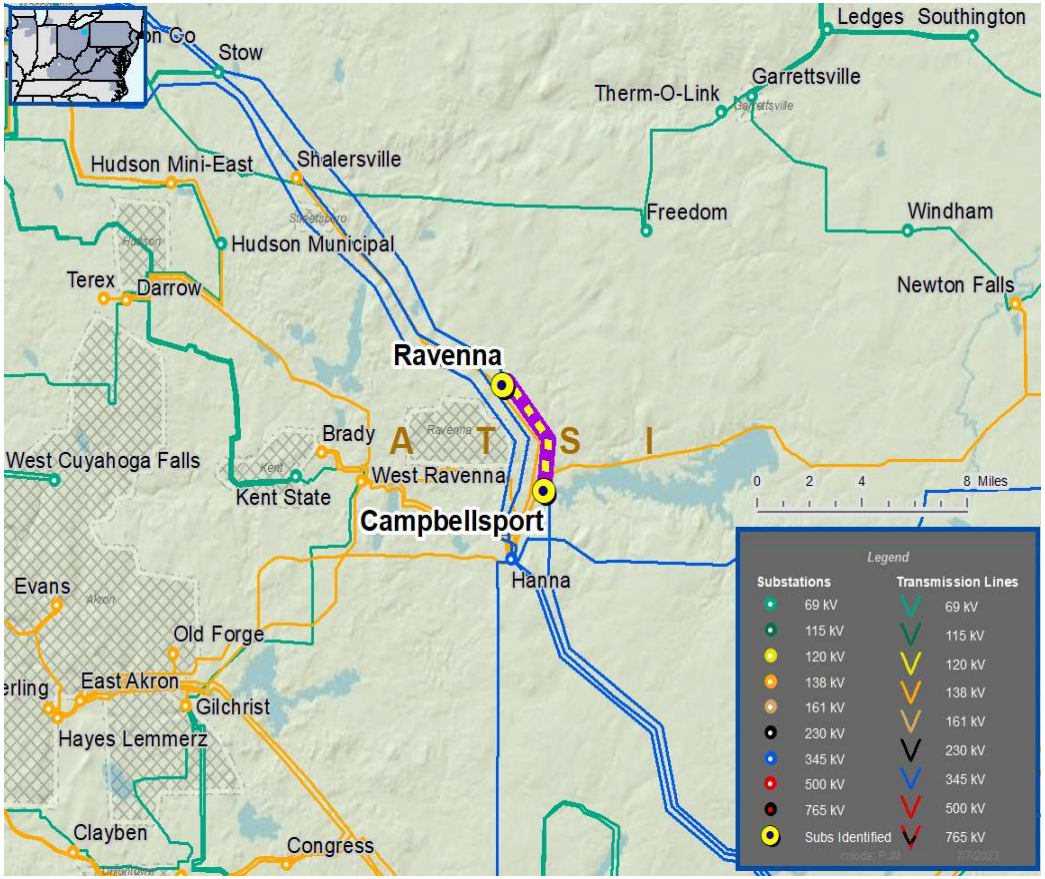
Alternatives Considered:

- No alternative solutions

Estimated Project Cost: $0.8M

Projected In-Service: 04/08/2024

Status: Project Initiation



APS Transmission Zone M-3 Process
Stoner Junction 138 kV Misoperation Relays

Need Numbers: APS-2023-011

Previously Presented: Need Meeting 04/21/2023, Solution Meeting 05/19/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

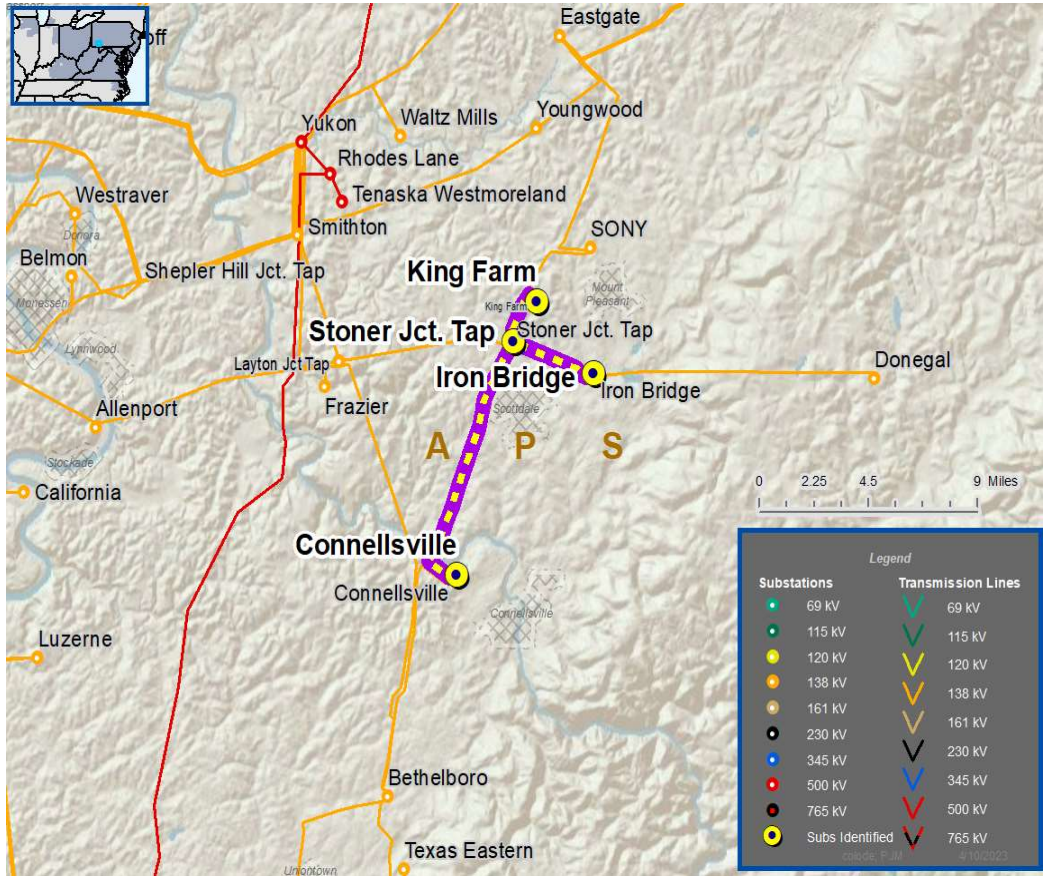
- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.



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APS Transmission Zone M-3 Process
Stoner Junction 138 kV Line

Need Number: APS-2023-006

Previously Presented: Need Meeting 04/21/2023

Process Stage: Solution Meeting 07/21/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

Line Condition Rebuild/Replacement

- Age/condition of wood pole transmission line structures
- System characteristics including lightning and grounding performance, galloping overlap, insulation coordination, structural capacity needs, clearance margins, and future needs (e.g., fiber path)

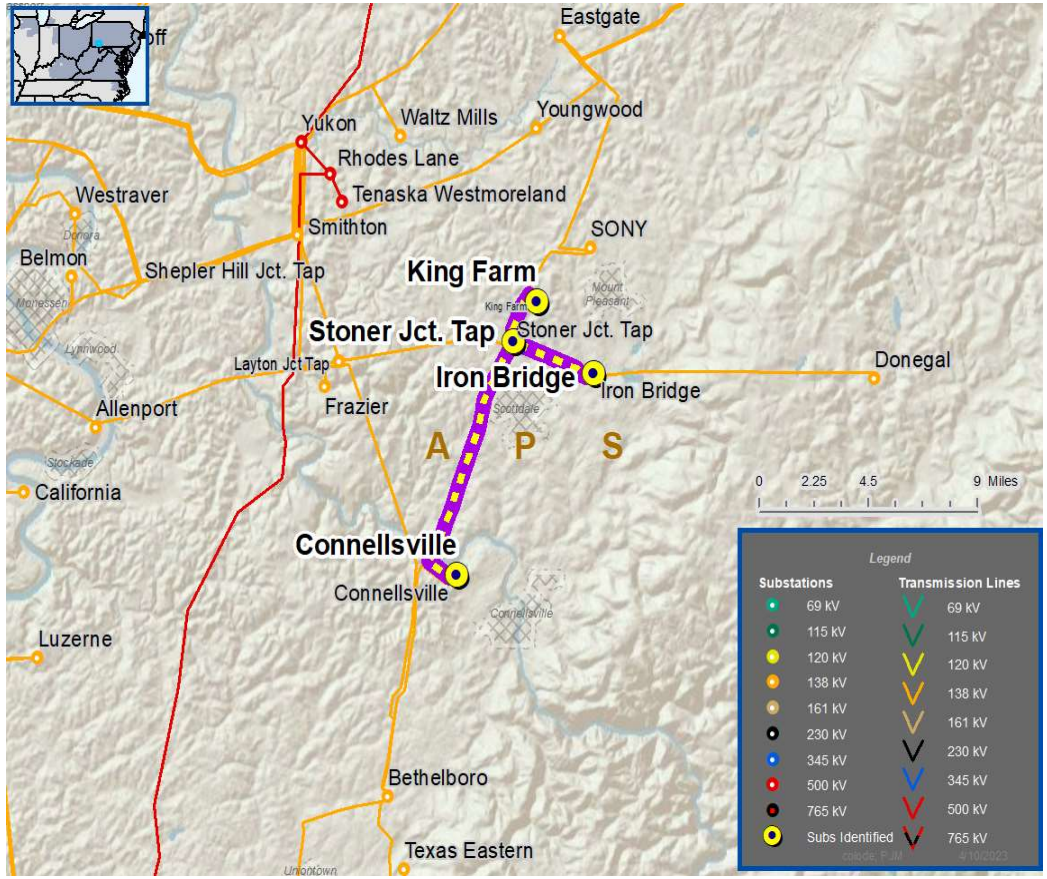
System Performance Projects Global Factors

- Substation/line equipment limits

Problem Statement:

The Connellsville – Iron Bridge – King Farm (Stoner Junction) 138 kV line is exhibiting deterioration and has significant outage history

- Approximately 15 miles of this line is on wood structures nearing end of life. They are recommended for rebuild.
- 78% of structures (89 of 114) did not meet one or more assessment criteria.
- The 4.3-mile balance of line is on lattice towers where 15 of 21 had correctable defects.
- The original conductor is 336.4 26/7 ACSR with original and maintenance splices and should be considered for replacement.
- There are 31 recent maintenance conditions, primarily due to wood pole conditions or rusted hardware. Conditions are expected to deteriorate as equipment approaches end of life.



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FirstEnergy

APS Transmission Zone M-3 Process
Stoner Junction 138 kV Line

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-006 & APS-2023-011	Connellsville – Stoner Junction 138 kV	160 / 192	160 / 192	
	Stoner Junction – King Farm 138 kV	293 / 343	308 / 376	
	Stoner Junction – Iron Bridge 138 kV	210 / 250	221 / 268	

APS Transmission Zone M-3 Process
Stoner Junction 138 kV Misoperation Relays

Need Number: APS-2023-011

Previously Presented: Solution Meeting 05/19/2023

Proposed Solution:

- Replace limiting substation conductor, wave trap, and relaying at Connellsville 138 kV substation
- Replace limiting substation conductor, wave trap, circuit breaker, and relaying at King Farm 138 kV substation
- Replace limiting substation conductor, wave trap, circuit breaker, and relaying at Iron Bridge 138 kV substation

Need #	Transmission Line	Existing Line Rating (SN / SE)	Post Project Line Rating (SN / SE)
APS-2023-011	Connellsville – Stoner Junction 138 kV	160 / 192	160 / 192
	Stoner Junction – King Farm 138 kV	293 / 343	308 / 376
	Stoner Junction – Iron Bridge 138 kV	210 / 250	221 / 268

Alternatives Considered:

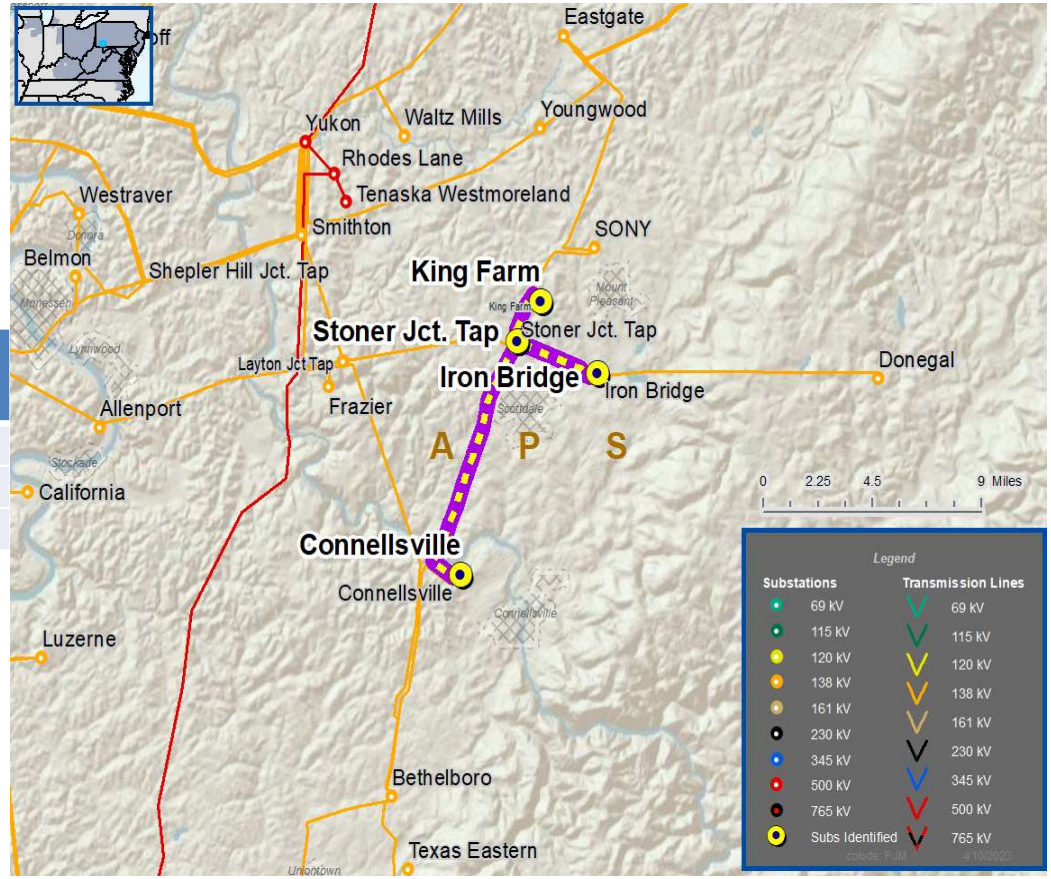
- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: $ 1.9 M

Projected In-Service: 12/15/2023

Project Status: Engineering

Model: 2022 RTEP model for 2027 Summer (50/50)



APS Transmission Zone M-3 Process
Stoner Junction 138 kV Line

Need Number: APS-2023-006

Process Stage: Solution Meeting 07/21/2023

Proposed Solution:

- Rebuild/rehab the Connellsville – Stoner Junction 138 kV Line. Replace existing transmission line conductor with larger size.
- Rebuild/rehab the Stoner Junction – King Farm 138 kV Line.
- Rebuild/rehab the Stoner Junction – Iron Bridge 138 kV Line. Replace existing transmission line conductor with larger size.

Need #	Transmission Line	Existing Line Rating (SN / SE)	Post Project Line Rating (SN / SE)
APS-2023-006	Connellsville – Stoner Junction 138 kV	160 / 192	308 / 376
	Stoner Junction – King Farm 138 kV	308 / 376	308 / 376
	Stoner Junction – Iron Bridge 138 kV	221 / 268	308 / 376

Alternatives Considered:

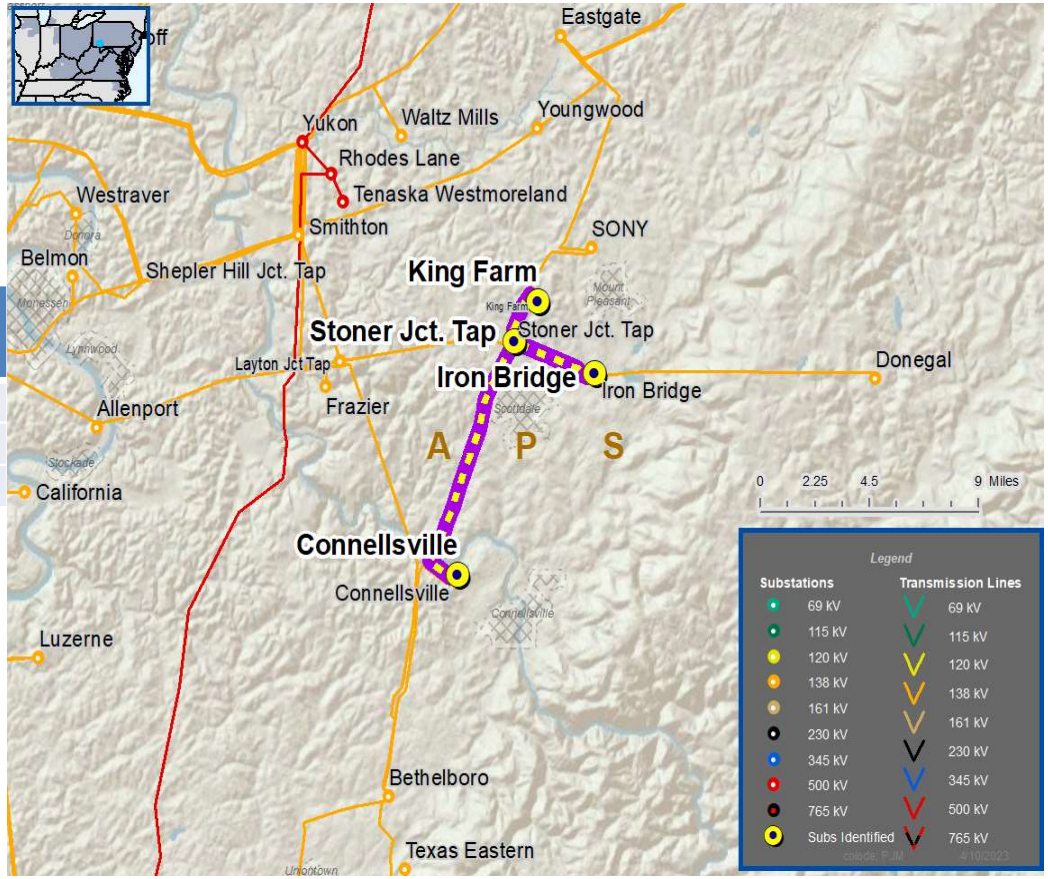
- Maintain line in existing condition

Estimated Project Cost: $ 31.5 M

Projected In-Service: 12/31/2025

Project Status: Engineering

Model: 2022 RTEP model for 2027 Summer (50/50)



APS Transmission Zone M-3 Process
Penn-North Oakford 138 kV New Customer

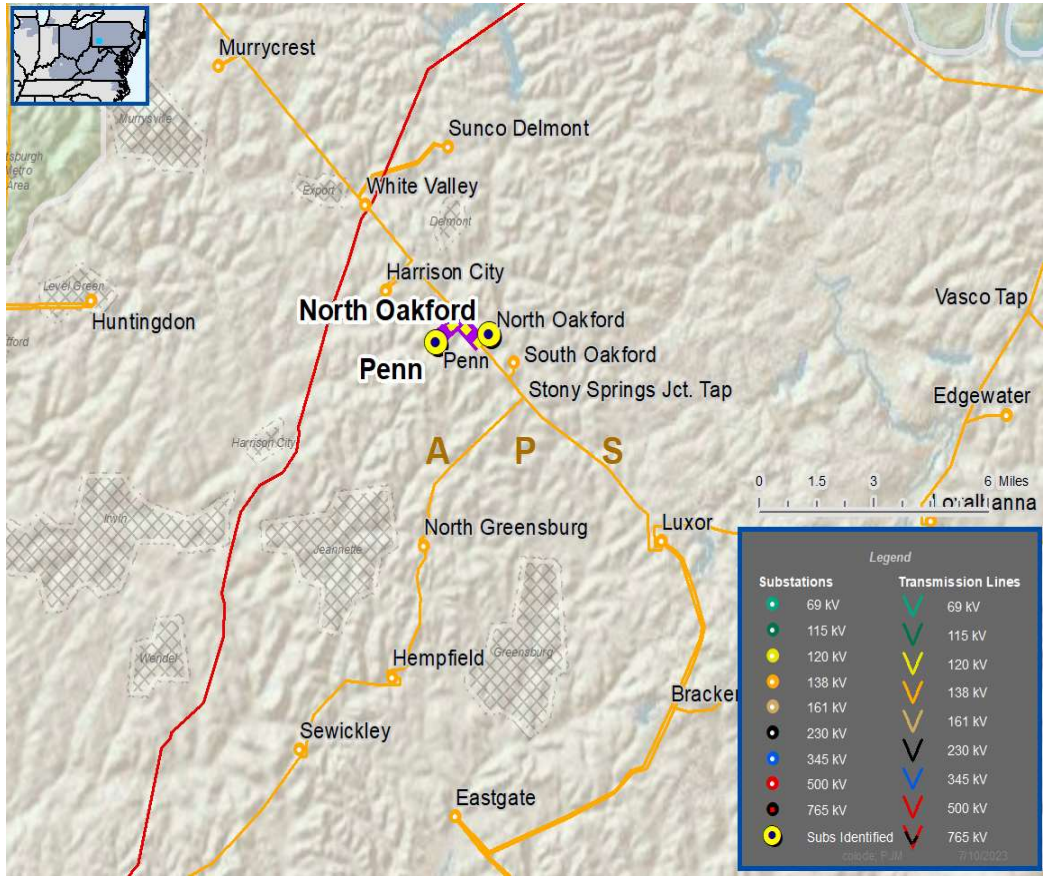
Need Number: APS-2023-008
Process Stage: Solution Meeting – 7/21/2023
Previously Presented: Need Meeting – 4/21/2023

Project Driver(s):
Customer Service

Specific Assumption Reference(s)
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
New Customer Connection - has requested a new 138 kV delivery point near the Penn-North Oakford 138 kV line. The anticipated load of the new customer connection is 100 MVA.

Requested in-service date is 12/31/2024.



APS Transmission Zone M-3 Process
Penn-North Oakford 138 kV New Customer

Need Number: APS-2023-008
Process Stage: Solution Meeting – 7/21/2023

Proposed Solution:

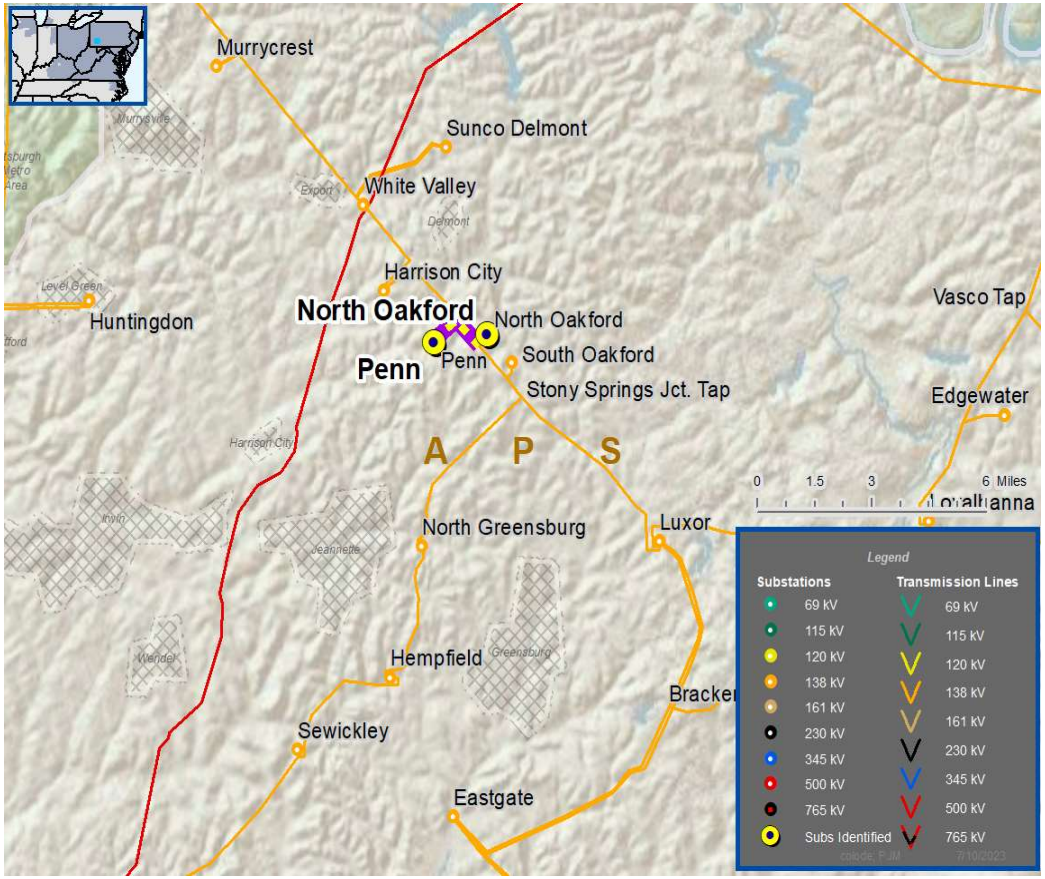
138 kV Transmission Line Tap

- Install three SCADA controlled transmission line switches
- Construct approximately 0.75 miles of transmission line using 1590 ACSR 45/7 from tap point to customer substation
- Install one 138 kV revenue metering package at customer substation

Alternatives Considered:

- No other feasible alternatives to provide service

Estimated Project Cost: $5.4m
Projected In-Service: 12/31/2024
Status: Engineering



PE Transmission Zone M-3 Process
Greenwood-Redbud 138 kV New Customer

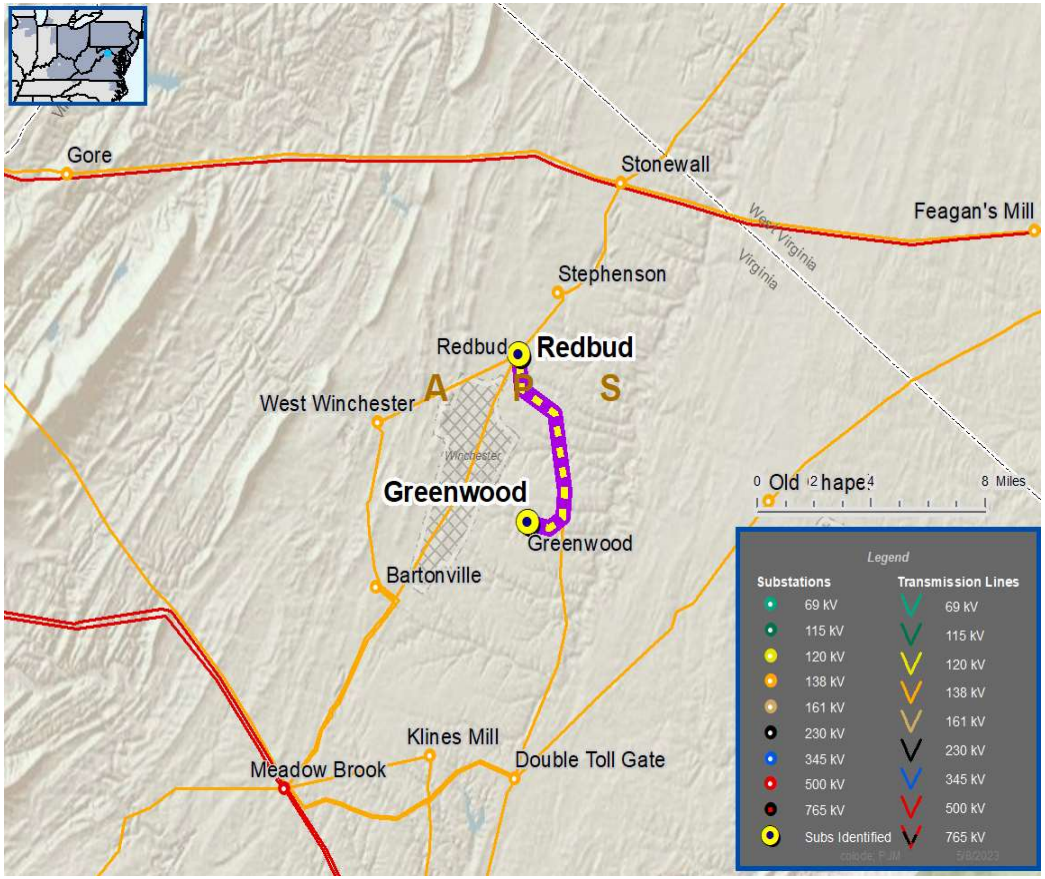
Need Number: APS-2023-013
Process Stage: Solution Meeting – 07/21/2023
Previously Presented: Need Meeting – 05/19/2023

Project Driver(s):
Customer Service

Specific Assumption Reference(s)
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
New Customer Connection - has requested a new 138 kV delivery point near the Greenwood-Redbud 138 kV line. The anticipated load of the new customer connection is 35 MVA.

Requested in-service date is 05/3/2024.



PE Transmission Zone M-3 Process
Greenwood-Redbud 138 kV New Customer

Need Number: APS-2023-013

Process Stage: Solution Meeting – 07/21/2023

Proposed Solutions:

138 kV Transmission Line Tap

- Install a three-switch tap along the Greenwood – Redbud 138 kV Line with three 1200 A SCADA load break switches
- Install 138 kV line extension from the three-switch tap to the Customer's substation
- Install 138 kV revenue metering in Customer's substation
- Modify line relay settings in Greenwood and Redbud substations

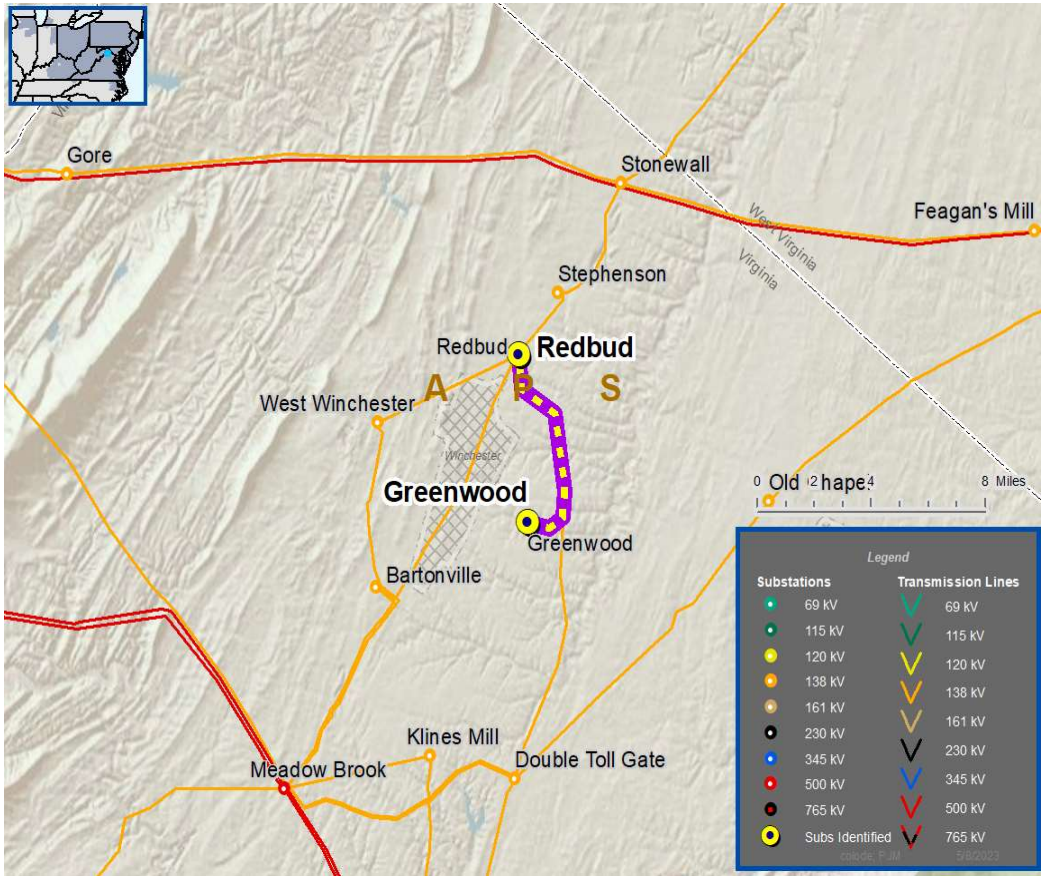
Alternatives Considered:

- No other feasible transmission solutions

Estimated Project Cost: $1.6M

Projected In-Service: 05/3/2024

Status: Project Initiation



PE Transmission Zone M-3 Process
Page-Riverton 138 kV New Customer

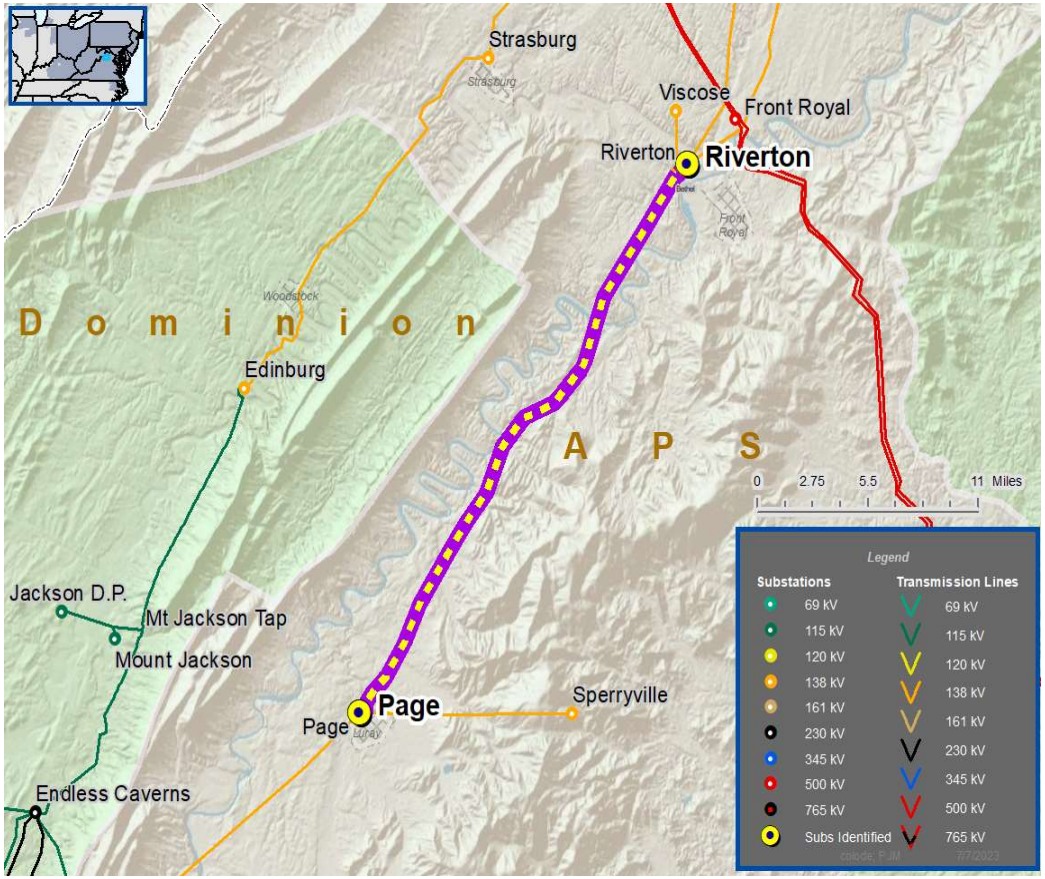
Need Number: APS-2023-014
Process Stage: Solution Meeting – 07/21/2023
Previously Presented: Need Meeting – 05/19/2023

Project Driver(s):
Customer Service

Specific Assumption Reference(s)
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
New Customer Connection - has requested a new 138 kV delivery point near the Page-Riverton 138 kV line. The anticipated load of the new customer connection is 35 MVA.

Requested in-service date is 05/30/2025.



PE Transmission Zone M-3 Process
Page-Riverton 138 kV New Customer

Need Number: APS-2023-014

Process Stage: Solution Meeting – 07/21/2023

Proposed Solution:

138 kV Transmission Line Tap

- Install a new 4-breaker ring bus named Catlett Mountain near 85 Russ Johnson Rd, Front Royal, VA 22630
- Cut the Page – Riverton RLU 138 kV Line near pole RLU-154 and extend 0.3-mile line in and out of the new Catlett Mountain substation
- Protection/terminal end relay settings review required
- Install revenue metering in Customer's facilities

Line Ratings:

Catlett Mountain – Page 138 kV Line

After project completion 160 MVA SN/ 192 MVA SE

Catlett Mountain – Riverton 238 kV Line

After project completion 153 MVA SN/ 153 MVA SE

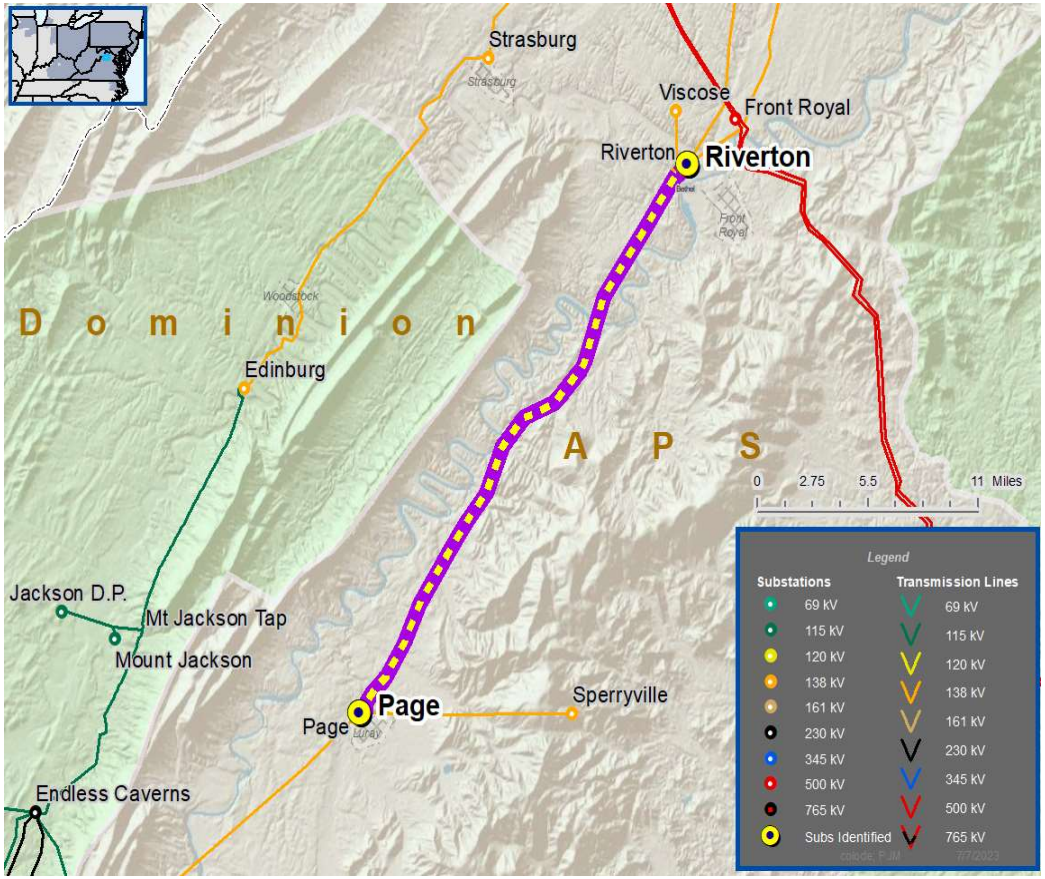
Alternatives Considered:

- No other feasible transmission alternatives

Estimated Project Cost: $16M

Projected In-Service: 05/30/2025

Status: Project Initiation



APS Transmission Zone M-3 Process
Messick Road – Morgan 138 kV New Customer

Need Number: APS-2023-015
Process Stage: Solution Meeting 07/21/2023
Previously Presented: Need Meeting 05/19/2023

Project Driver(s):

Customer Service

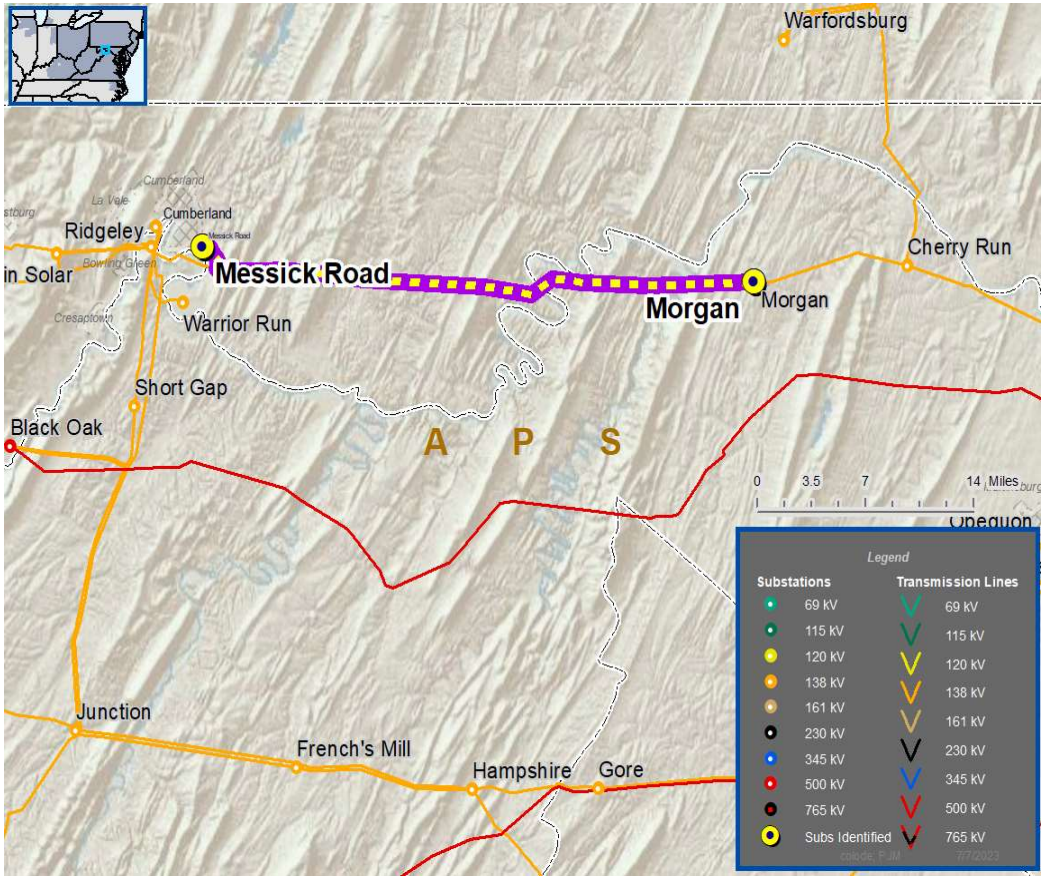
Specific Assumption Reference(s):

Customer request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement:

A customer has requested a new 138 kV delivery point near the Messick Road – Morgan 138 kV line. The anticipated load of the new customer connection is 5 MW.

Requested in-service date is 12/31/2024.



APS Transmission Zone M-3 Process
Messick Road – Morgan 138 kV New Customer

Need Number: APS-2023-015
Process Stage: Solution Meeting – 07/21/2023

Proposed Solutions:

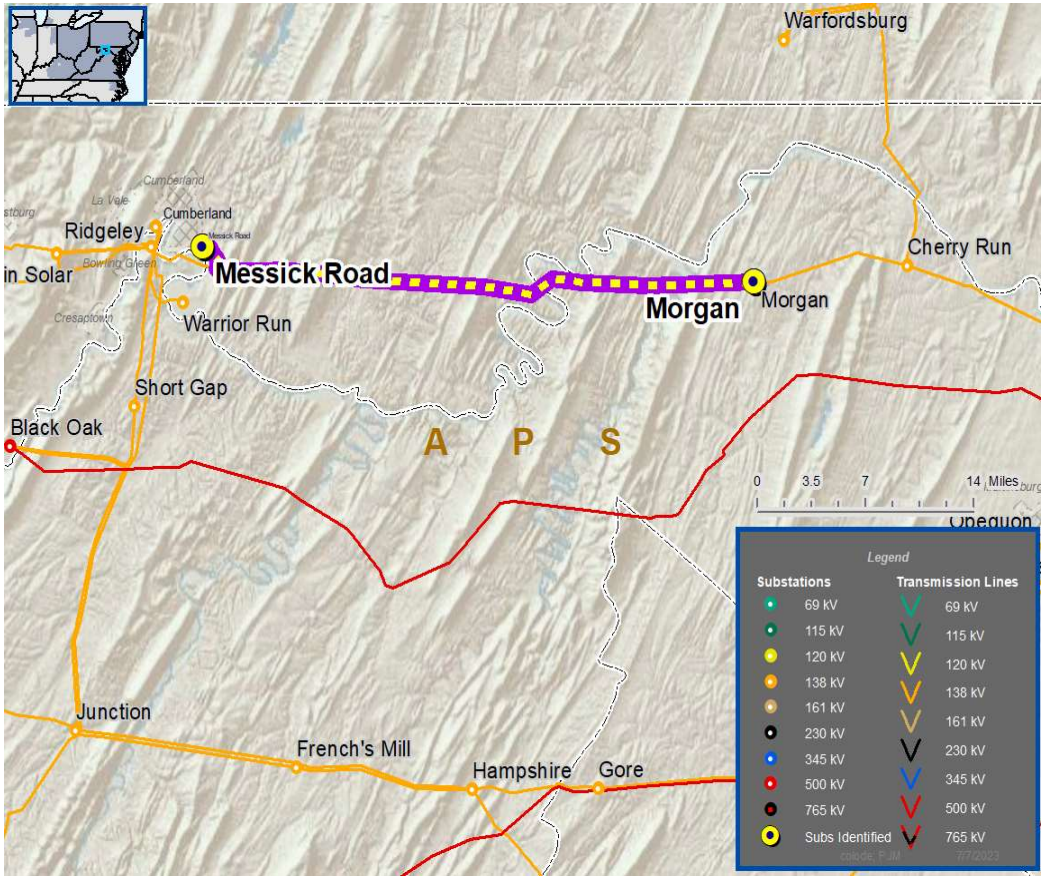
138 kV Transmission Line Tap

- Install three-way tap using three 2000 A SCADA switches
- Construct 0.1 miles of 556 ACSR 26/7 from tap location to new substation

Alternatives Considered:

- No other feasible transmission solutions

Estimated Project Cost: $1.8M
Projected In-Service: 12/31/2024
Status: Project Initiation



AEP Transmission Zone M-3 Process
Mason County Industrial Park

Need Number: AEP-2021-AP019

Process Stage: Solutions Meeting 7/21/2023

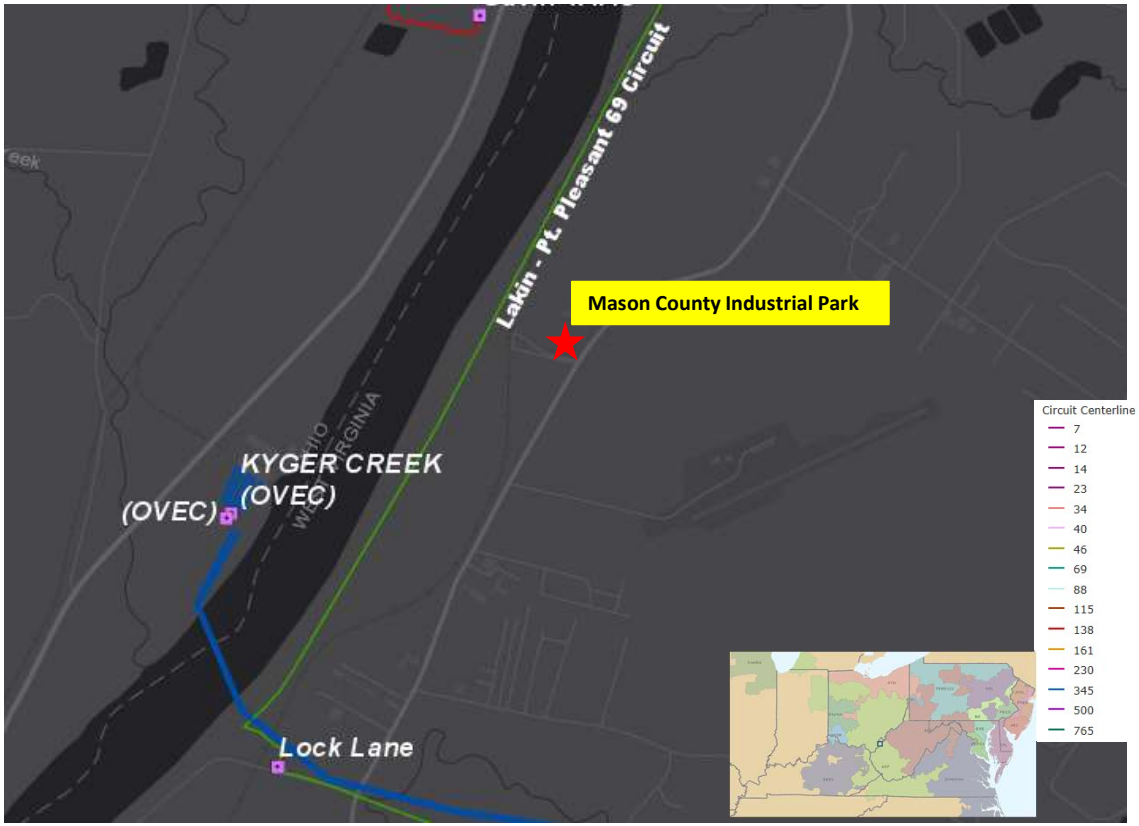
Previously Presented: Needs Meeting 5/21/2021

Supplemental Project Driver: Customer Service

Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

APCO Distribution has requested a new distribution station located in Raleigh County, West Virginia. Approximately 2 MVA of load will be transferred to this site from existing distribution sources. Multiple inquiries continue to be evaluated for additional new load at this location. This site has been approved by the state as a development location supporting West Virginia Business Ready Sites Program (House Bill 144).



AEP Transmission Zone M-3 Process
Mason County Industrial Park

Need Number: AEP-2021-AP019

Process Stage: Solutions Meeting 7/21/2023

Proposed Solution:

Cut in/out of the existing Lakin – Lock Lane 69 kV line and construct a new double circuit 69 kV line in/out to the new Mason County Industrial Park Station (approx. 0.25 mi) **Est. Trans Cost: $2.1M**

Install two 69 kV circuit breakers and a 69/12 kV 25 MVA transformer at the new Mason County Industrial Park Station (York Station) **Est. Trans. Cost: $0.0M**

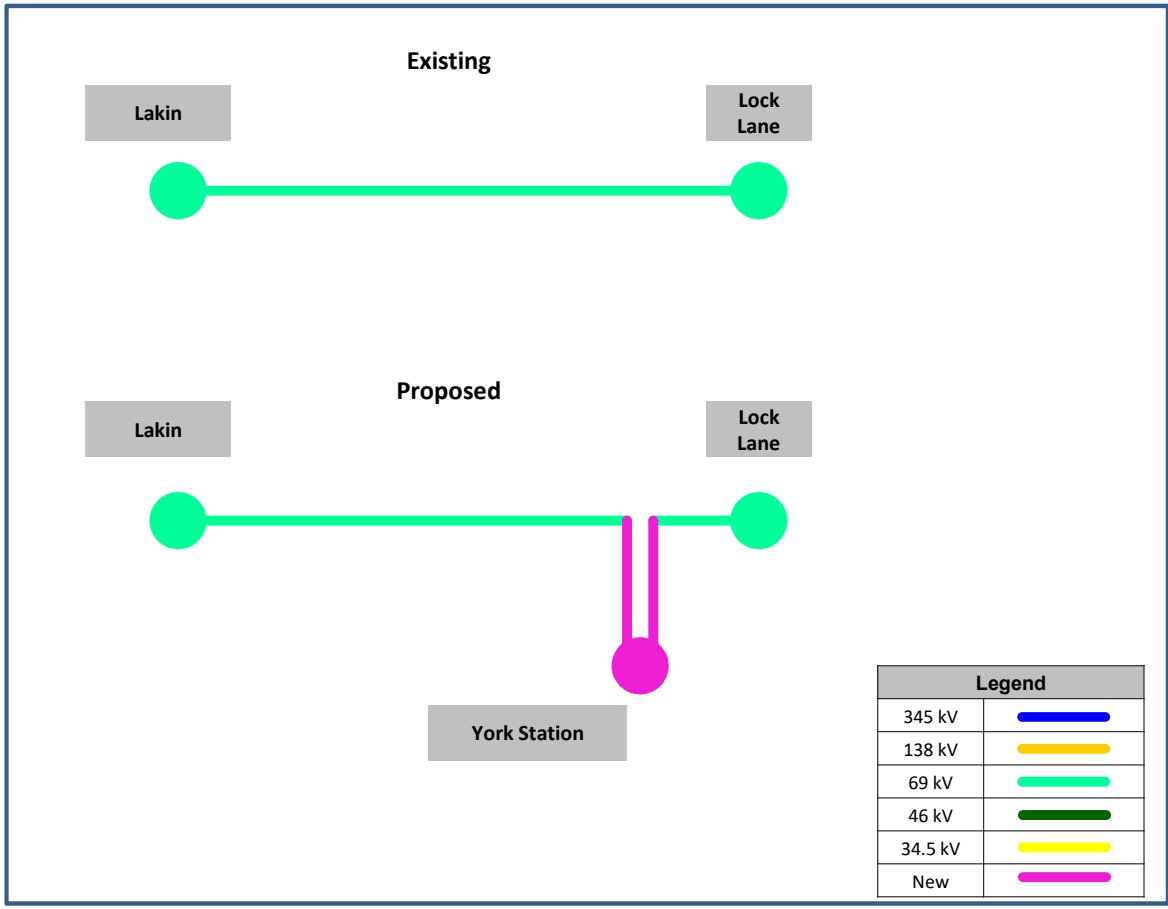
Estimated Total Trans. Cost: $2.1M

Alternatives Considered: No viable transmission alternatives due to the site's proximity to the existing infrastructure

Projected In-Service: 5/1/2024

Project Status: Engineering

Model: 2027 RTEP



AEP Transmission Zone M-3 Process
Kenton, OH

Need Number: AEP-2022-OH007

Process Stage: Solutions Meeting 7/21/2023

Previously Presented: Need Meeting 1/21/2022

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

South Kenton 138/69kV

Circuit Breakers :

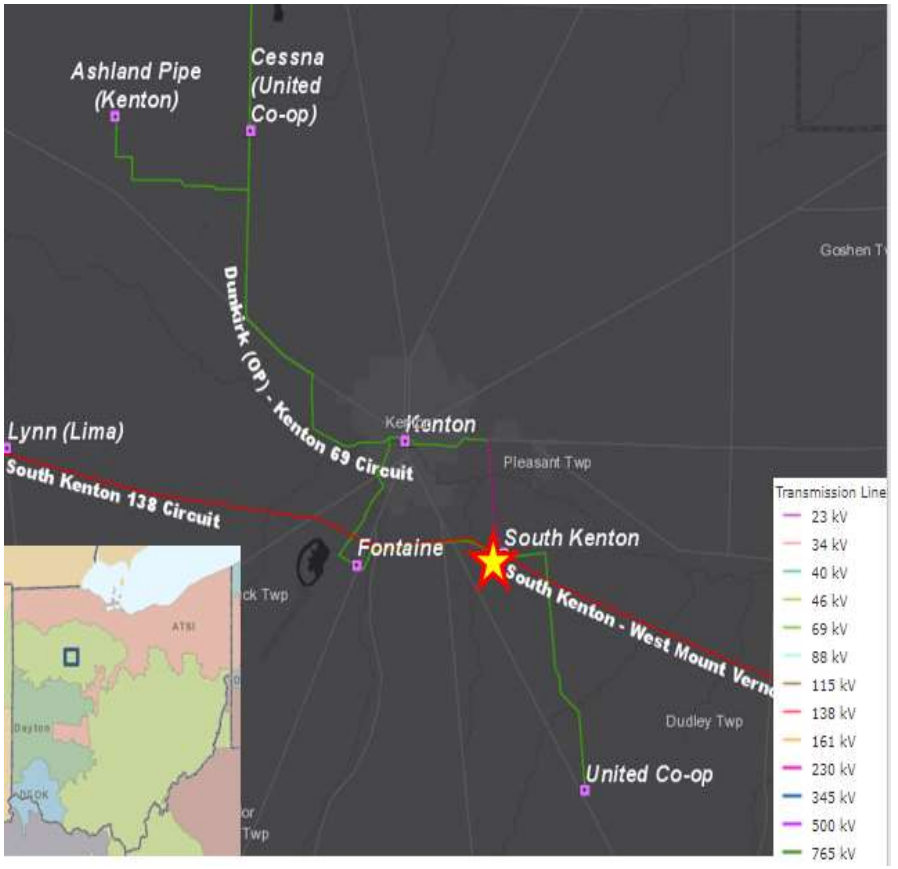
- Breaker Age: A 1953 (138 kV), B 1952 (138 kV), E 1954 (69 kV)
- Interrupting Medium: (Oil)
- Fault Operations:
  - Number of Fault Operations: A 42, B 49,E 26
  - Manufacturer recommended Number of Operations: 10
- Additional Breaker Information: These breakers are FK-439. These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling. Manufacture support and spare parts are not available.

Relays: Currently, 56 of the 61 relays (92% of all station relays) are in need of replacement. These relays are the electromechanical type which have significant limitations with regards to spare part availability, fault data collection, and data retention. Station also utilized legacy pilot wire schemes.

Transformers: The 138/69kV 15MVA transformer #3 & #2 (both 1962 vintage) are recommended for replacement due to short circuit strength breakdown and dielectric strength breakdown of the oil, reducing the ability of the units to withstand through fault current. These transformers have horizontal bushings which increase the difficulty of routine station maintenance. The transformers are currently operated in parallel with one another.

Operational Flexibility and Efficiency:

Transformers #2, #3, and the 138 kV bus are all in the same zone of protection due to lack of sectionalizing on the transformers.



AEP Transmission Zone M-3 Process
South Kenton Upgrades Project

Need Number: AEP-2022-OH007
Process Stage: Solutions Meeting 07/21/2023

Proposed Solution:

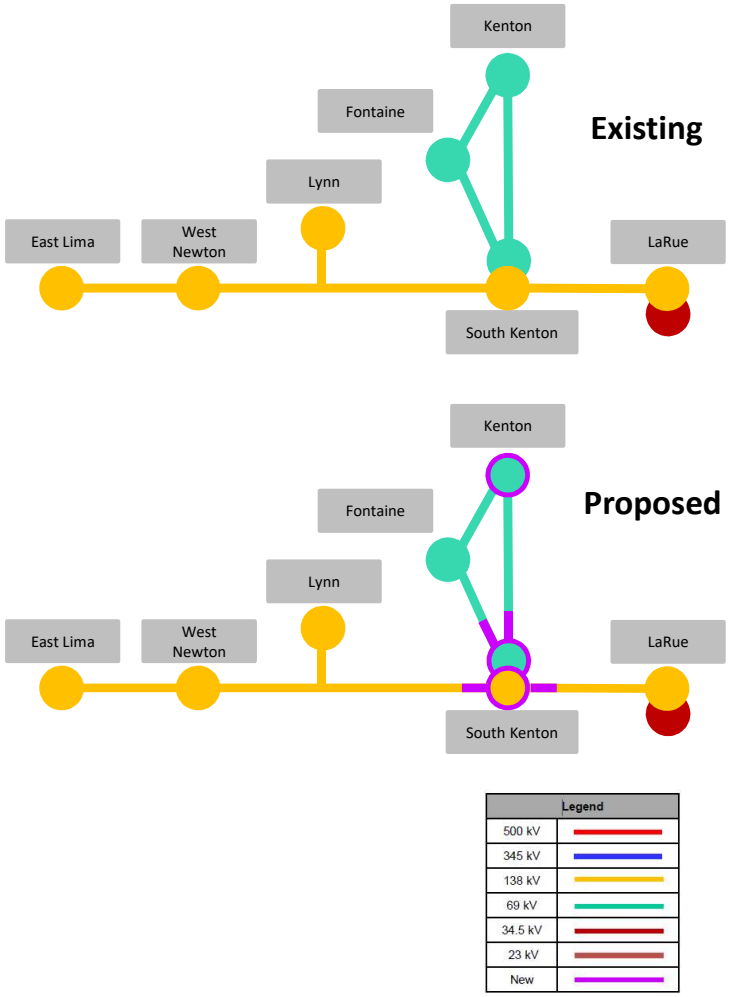
- **South Kenton**. Rebuild the 138kV bay as a four breaker ring bus using 3000A 40kA breakers. Replace transformers two and three with a single 90MVA unit. Install a DICM and replace the EM relays. Replace the 69kV bus and breakers C and E. **Estimated Cost $12.7M**
- Re-terminate the East Lima - South Kenton 138 kV and South Kenton - Larue 138kV circuits into the new South Kenton ring bus. **Estimated Cost $3.64M**
- Re-terminate the South Kenton - Kenton #1 69kV and South Kenton - Kenton #2 69kV circuits into the station. Install fiber between South Kenton and Kenton, retire the pilot wire scheme **Estimated Cost $1.45 M**
- At Kenton station, replace MOABS X,Z with 69kV 3000A 40kA breakers. Install a DICM **Estimated Cost $3.80M**
- Upgrade telecom equipment at Rangeline and Gunn Road stations **Estimated cost $94.4K**

Total Estimated Transmission Cost: $21.70M

Alternatives considered

- Consideration was given to keeping the existing MOAB line sectionalizing scheme at Kenton. In order to replace the pilot wire scheme between the stations, a custom protection scheme would be required. Installing line breakers allows a much simpler protection and control scheme while also providing ancillary benefits that MOABs do not.
- South Kenton is an important source for the NW Ohio 69kV network. Retiring transformers two and three without replacement is not a viable option. Installing only one transformer to replace the parallel does not reduce the area's reliability because the banks could not be sectionalized.

Projected In-Service: 06/01/2025
Project Status: Scoping



AEP Transmission Zone M-3 Process
Delphos, OH

Need Number: AEP-2022-OH019

Process Stage: Solutions Meeting 7/21/2023

Previously Presented:

Need Meeting 4/22/2022

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

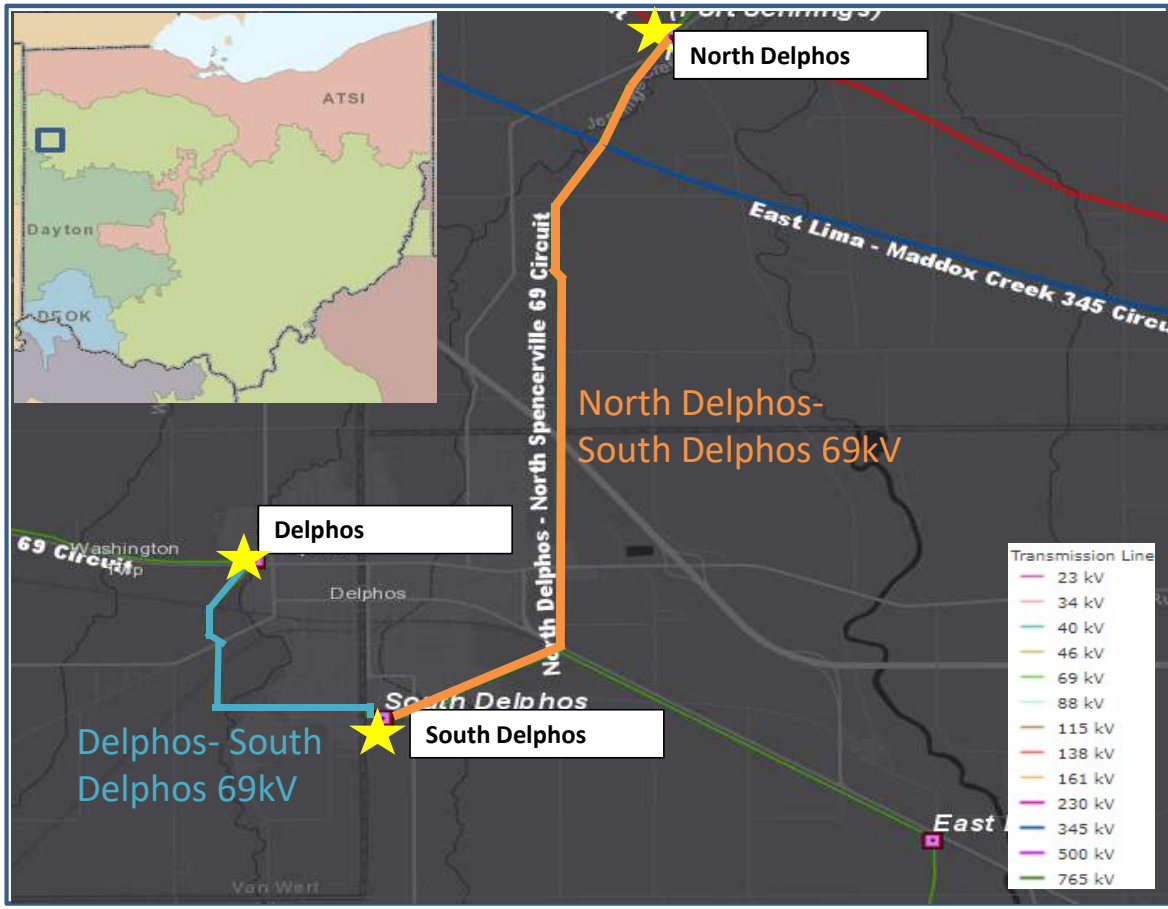
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Delphos – South Delphos 69kV Line (1961 vintage):

- Length of Line: 2.0 Miles
- Total Structure Count: 39
    - Wooden Monopole Structures
- Conductor Types: 336.4 ACSR 18/1 (Merlin), 4/0 ACSR 6/1 (Penguin)
- Outage History: 7 Momentary and 2 Permanent outages – average duration of 24.6 hours, 1.177M CMI between 2017 and 2022.
- Open Conditions: 10 open conditions on 6 unique structures, including burnt insulators, conductor splice issues, and pole rot and insect damage

The South Delphos – Delphos line does not meet 2017 NESC Grade B loading criteria or current AEP structural strength requirements. The line is insulated with horizontal post insulators which do not meet current AEP standards for CIFO and minimum leakage distance requirements.



AEP Transmission Zone M-3 Process
Delphos, OH

Problem Statement (continued):

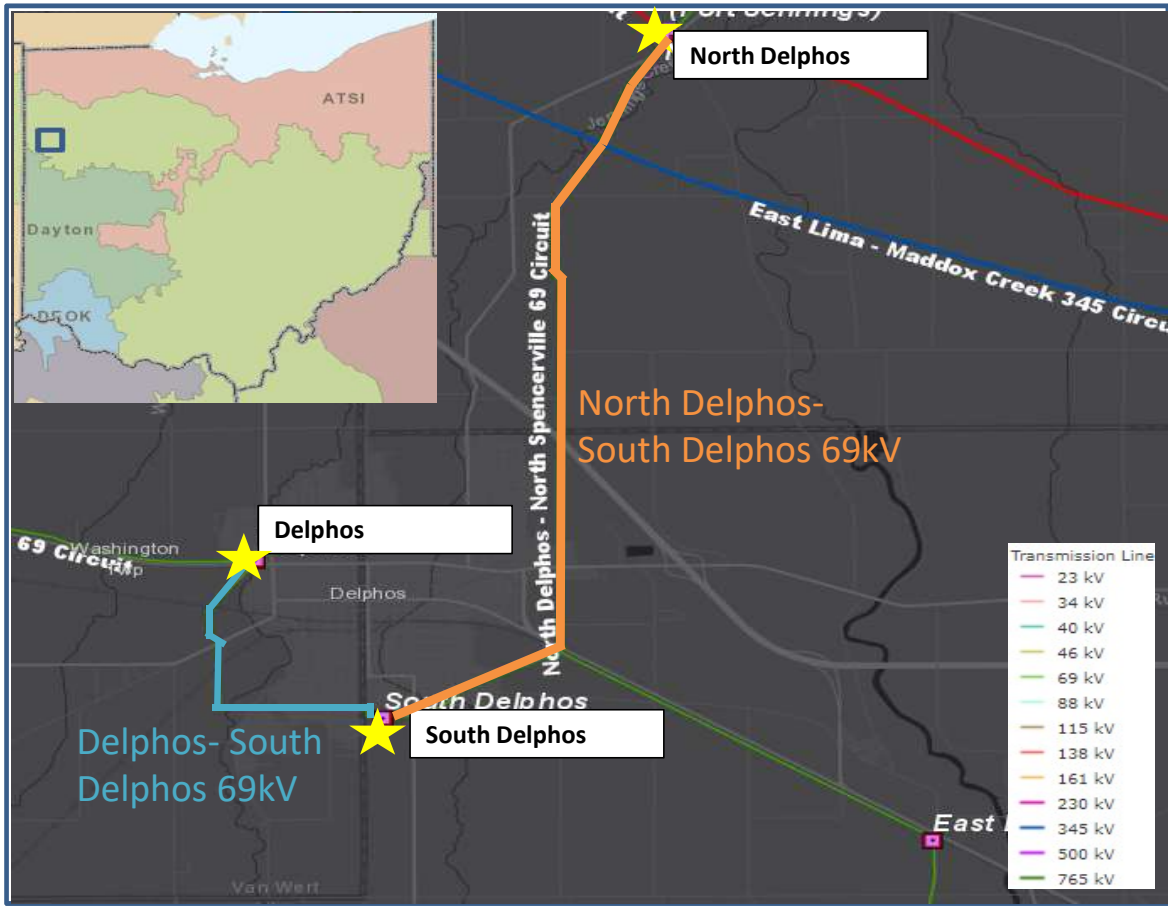
North Delphos – South Delphos 69kV Line(1943) :

- Length of Line: 5.22 Miles
- Total Structure Count: 226
    - Wooden Monopoles
    - Vertical post insulators
- Conductor Types: 336.4 ACSR 18/1 (Merlin), 4/0 COOPER, 4/0 ACSR 6/1 (Penguin) 2/0 COOPER
- Outage History: North Delphos- Van Wert: 7 Momentary and 2 Permanent outages – average duration of 24.64 hours. North Delphos – North Spencerville: 3 Momentary and 1 Permanent outages- average duration of 40 hours. Combined CMI: 2,982,794 for the 2017-2022 timeframe
- Open Conditions: 36, including broken ground lead wire and rot, split, woodpecker, and bowed poles and crossarms

The North Delphos – South Delphos fails to meet 2017 NESC Grade B loading criteria, current AEP structural strength requirements and fails to meet the current ASCE structural strength requirements. The line is insulated with vertical post insulators that do not meet current AEP standards for CIFO and minimum leakage distance requirements.

North Delphos 69kV Circuit Breakers A & C:

- Breaker Age: A 1962, C 1965
- Interrupting Medium: (oil)
- Fault Operations:
    - Number of Fault Operations: A 93, C 166
    - Manufacturer recommended Number of Operations: 10
- Additional Breaker Information: These breakers are FK-69 type oil breaker. Manufacture support and spare parts are no longer available. This type of breaker experiences common failures of the compressor, valves, and trip/reclose mechanism. These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require.



AEP Transmission Zone M-3 Process
Delphos, OH

Need Number: AEP-2022-OH019

Process Stage: Solutions Meeting 7/21/2022

Proposed Solution:

North Delphos: Replace 69kV circuit breakers A & C and Install DICM. **Cost: $3.3M**

Van Wert: Upgrade line relays. **Cost: $0.7M**

South Delphos – Delphos: Rebuild 2.7 miles of 69kV with 556 ACSR conductor. **Cost: $7.8M**

North Delphos - South Delphos: Rebuild 4.33 miles of 69kV with dove 556 ACSR. 1.1 miles will be double circuit (part of the in and out to North Delphos not covered under b3346) and 3.2 miles will be single circuit. **Cost: $ 11.7M**

Total Estimated Cost: $23.5M

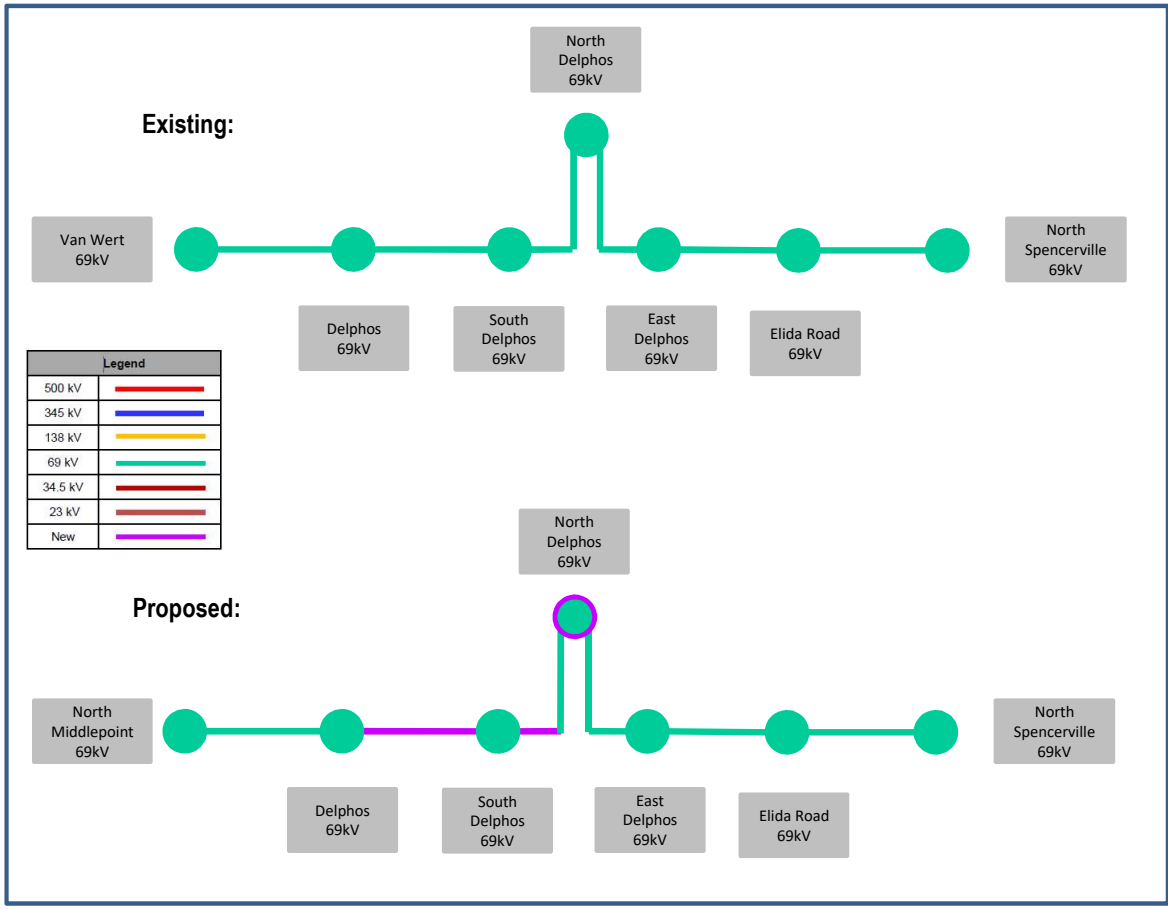
This project will be worked in coordination with projects B3346 which is proposing to rebuild the other 7.3 mile of the South Delphos – Delphos and North Delphos – South Delphos 69 kV lines.

Alternatives Considered:

Given that portions of the line assets are already being rebuilt under B3346 and the fact that they directly serve stations in the area, rebuilding the assets was the only viable alternative identified.

Projected In-Service: 6/1/2026

Project Status: Conceptual



AEP Transmission Zone M-3 Process
Paulding Co., OH

Need Number: AEP-2022-OH042

Previously Presented: Need Meeting 07/22/2022

Process Stage: Solution Meeting 7/21/2023

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Haviland - Paulding 69kV Line (1951 vintage):

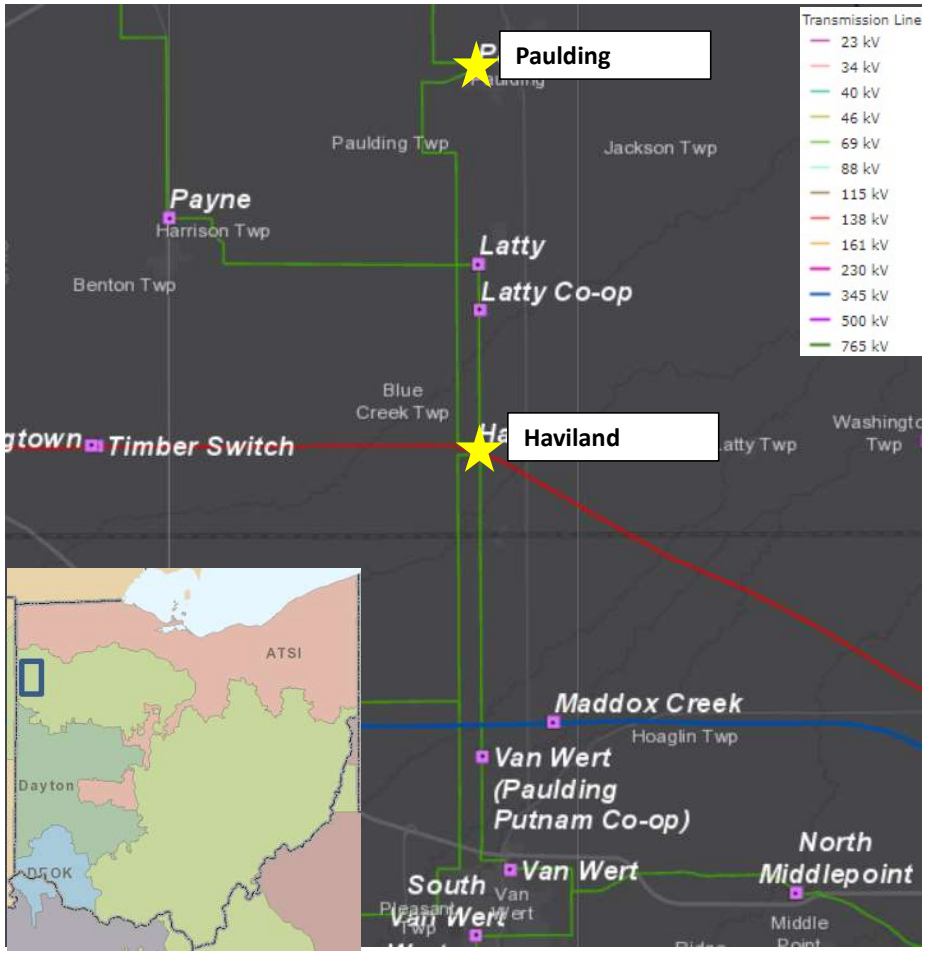
- Length of Line: 10.73 Miles
- Total Structure Count: 175
    - Wooden, Steel Monopole Structures
- Conductor Types: 4/0 ACSR 6/1 (Penguin), 336.4 ACSR 18/1 (Merlin),
- Outage History: 7 Momentary and 3 Permanent outages – average duration of 24.6 hours, 1.185M CMI between 2015 and 2020.
- Open Conditions: 16 open conditions on 14 unique structures, including burnt insulators, conductor splice issues, broken/missing ground leads and pole rot.

The Haviland- Paulding line does not meet 2017 NESC Grade B loading criteria or current AEP structural strength requirements. The line is insulated with mix of insulator types, many which do not meet current AEP standards for CIFO and minimum leakage distance requirements.

14 representative structures were assessed by a ground grew. 58% of those structures had reported conditions, which included the following: one structure had flashed insulators and a broken "S" downlead, one structure had a split shell near the center phase, one structure had a push-brace structure separating, one structure had brown porcelain insulators with AL bases + caps (failure risk), one structure had spliced conductors, one structure had a broken "S" downlead, one structure had anchor damage and a slacking top down guy, and one structure had a bowed pole at the distribution underbuild.

Additional Information:

During the 2012 Derecho storm Haviland - Paulding experienced multiple cascading pole failure events. These failed structures were replaced with steel monopole type structures. There are 30 newer steel structures, representing 17% of the structures on the line.



AEP Transmission Zone M-3 Process
Paulding-Haviland Rebuild

Need Number: AEP-2022-OH042

Process Stage: Solution Meeting 7/21/2023

Proposed Solution:

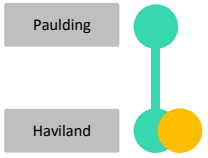
Haviland - Paulding 69kV: Rebuild the existing 10.73 mile-long line using 795 ACSR Drake conductor. **Estimated Cost $18.74M**

Paulding: Perform remote end work **Estimated Cost $1.40M**

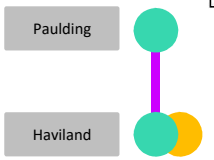
Haviland: Perform remote end work **Estimated Cost $1.03M**

Total Estimated Transmission Cost: $21.189M

Existing



Proposed



Alternatives Considered:

Consideration was given to rebuilding the Haviland - Paulding and Haviland - Payne line as double circuit from Haviland to near Latty switch. Modification of previously submitted Haviland - South Hicksville project S2394 would have been required. Rebuilding the line as double circuit would require retiring the newer steel monopole structures installed during storm restoration (30+). Because of these reasons the decision was made to proceed forward instead with the proposed solution.

Model: PJM 2027 RTEP

Projected In-Service: 1/1/2026

Project Status: Scoping

AEP Transmission Zone M-3 Process
Licking County, Ohio

Need Number: AEP-2023-OH013

Process Stage: Solutions Meeting 7/21/2023

Previously Presented: Need Meeting 1/20/2023

Project Driver: Customer Service

Service Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

AEP Ohio has requested to add capacity at Mink station, due to continuous load growth in the area. The load requests have exhausted existing capacities at Mink station as well as Etna (OP) station. The anticipated peak load is approximately ~~30~~ 50 MVA. The requested in-service date is ~~November~~ March 2025.

Model: 2025 RTEP

AEP Transmission Zone M-3 Process
Licking County, Ohio

Need Number: AEP-2023-OH013

Process Stage: Solutions Meeting 7/21/2023

Proposed Solution:

At Mink station, install 2 – 138kV, 3000 A, 63 kA breakers in the breaker and half configuration and associated work to terminate two new distribution transformers. Estimated Cost: **$ 2.7M**

Total Estimated Transmission Cost: $ 2.7M

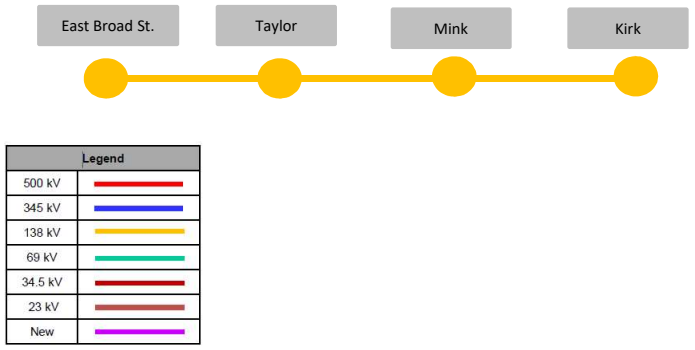
Alternatives Considered: No viable transmission alternatives identified to add distribution sources in the area considering the available space at Mink station.

Projected In-Service: 3/28/2025

Project Status: Engineering

Model: 2027 RTEP

Existing:



Proposed:

AEP Transmission Zone M-3 Process
Van Wert County, Ohio

Need Number: AEP-2022-OH004

Process Stage: Solutions Meeting 7/21/2023

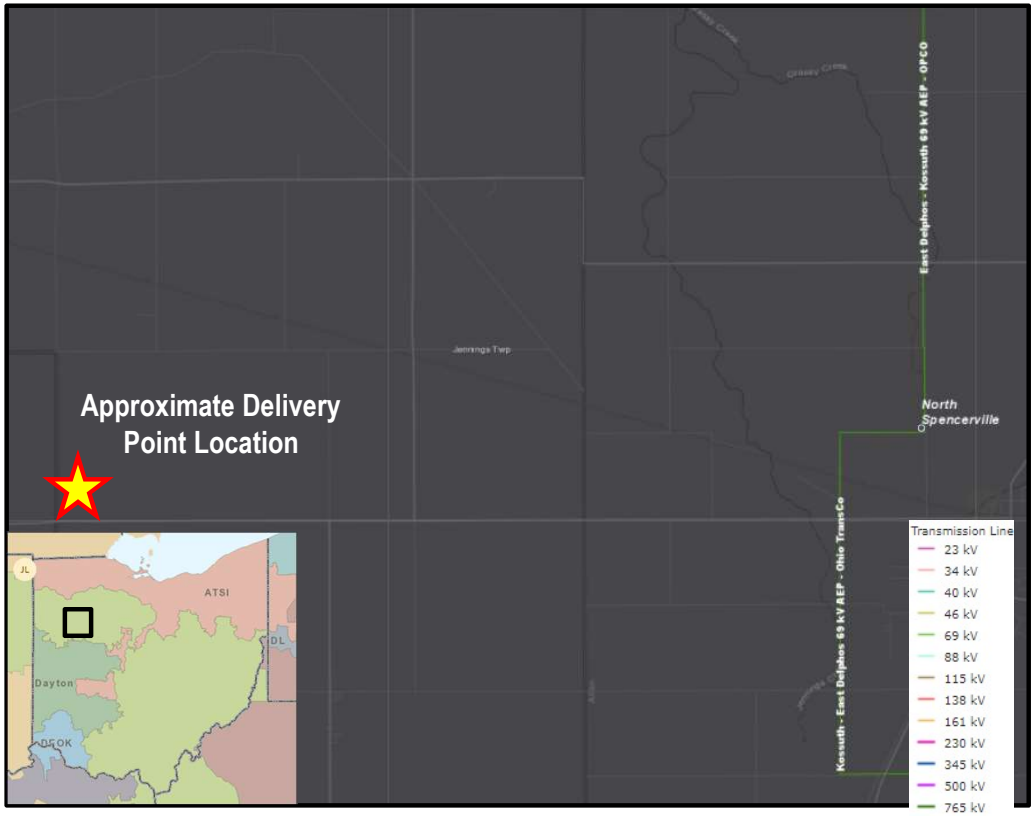
Previously Presented: Need Meeting 1/21/2022

Project Driver: Customer

Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)

Problem Statement:

Buckeye Power has requested a new 69kV delivery point in Van Wert county Ohio on behalf of Midwest Electric, Inc. The projected demand at the delivery point is 3.3 MW with an expected annual growth rate of 1.0%. Emergency loading is projected to be 4.9 MW



AEP Transmission Zone M-3 Process
Van Wert, Ohio

Need Number: AEP-2022-OH004

Process Stage: Solutions Meeting 7/21/2023

Proposed Solution:

Elgin – North Spencerville: Construct approximately 5 miles of 69kv single circuit. Install ADSS. Cost: $12.13M

North Spencerville: Install a DCIM expansion and new 69kv circuit breaker. Install bypass switch called West Spencerville Cost: $0.5M

Kossuth-E Delphos: Install ~0.05 miles of 69kv single circuit. $0.31M

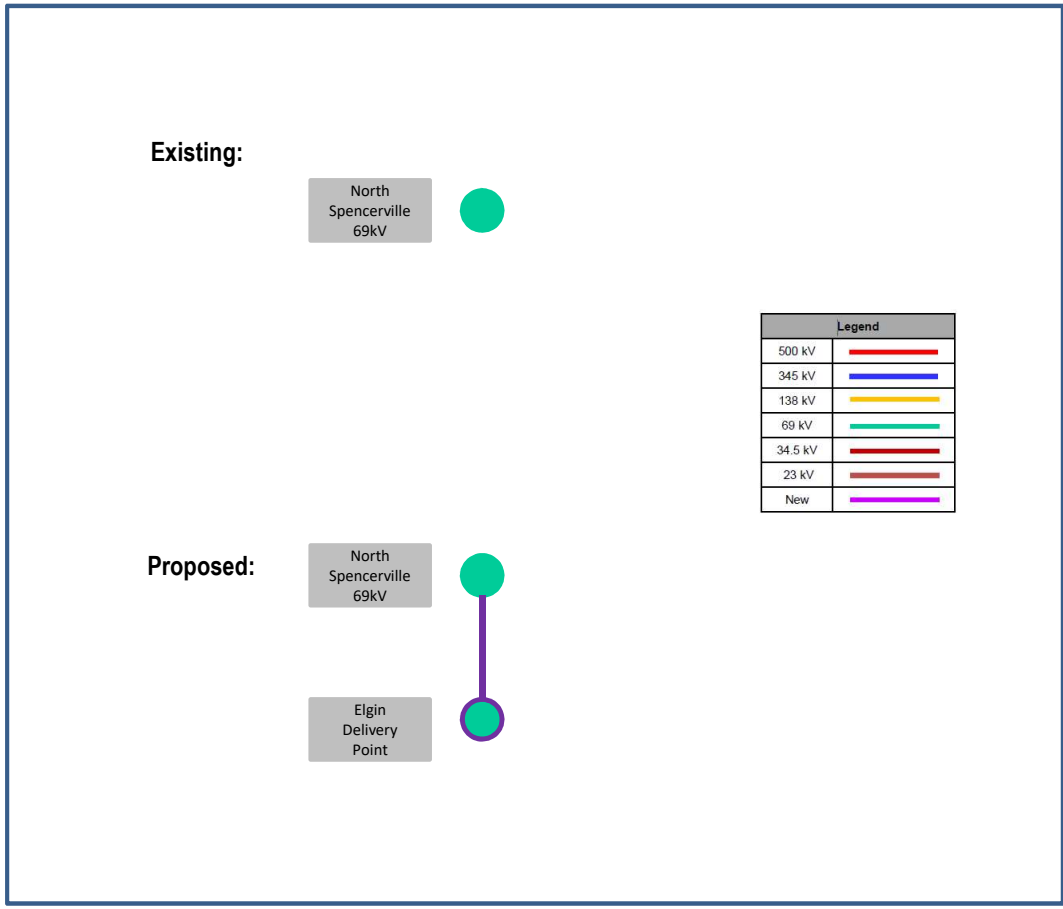
Alternatives Considered:

Due to the lack of existing transmission infrastructure in the area and the delivery's anticipated load, serving the load from the 69 kV was the only viable transmission option.

Projected In-Service: 12/01/2024

Project Status: Functional

Model: RTEP 2024



ComEd Transmission Zone M-3 Process
Customer in Elk Grove

Need Number: ComEd-2023-002

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 4/21/2023

Project Driver:

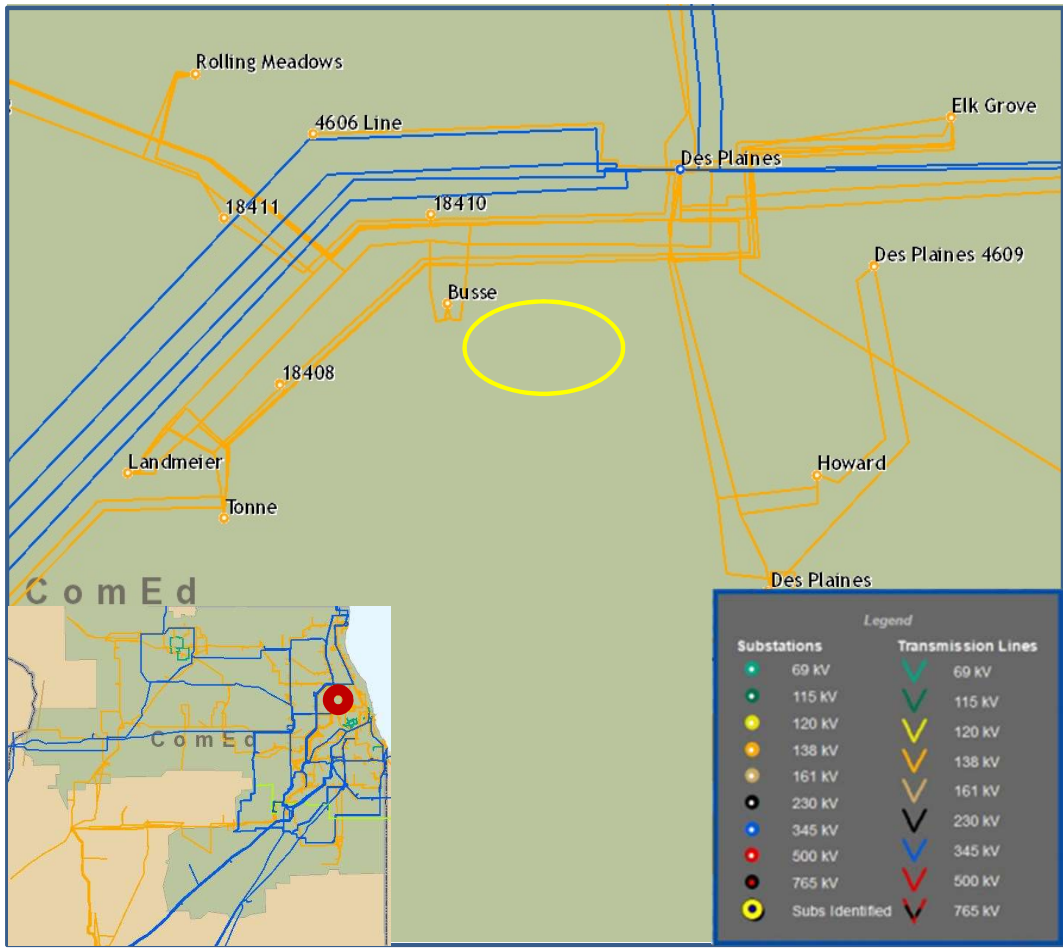
Customer Service

Specific Assumption Reference:

- New transmission customer interconnections or modification to an existing customer

Problem Statement:

New customer is looking for transmission service in Elk Grove. Initial loading is expected to be 9.6 MW in June 2026, 30.7 MW in 2028, with an ultimate load of 288 MW.



ComEd Transmission Zone M-3 Process
Customer in Elk Grove

Need Number: ComEd-2023-002

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 4/21/2023

Preferred Solution:

New customer will be radially served with 2 new, two mile 138 kV lines from Elk Grove. Customer substation will be double ring bus configuration with 4 – 138 kV to 34 kV transformers. Expand Elk Grove to accommodate new line positions.

Estimated transmission cost: $18M

Alternatives Considered:

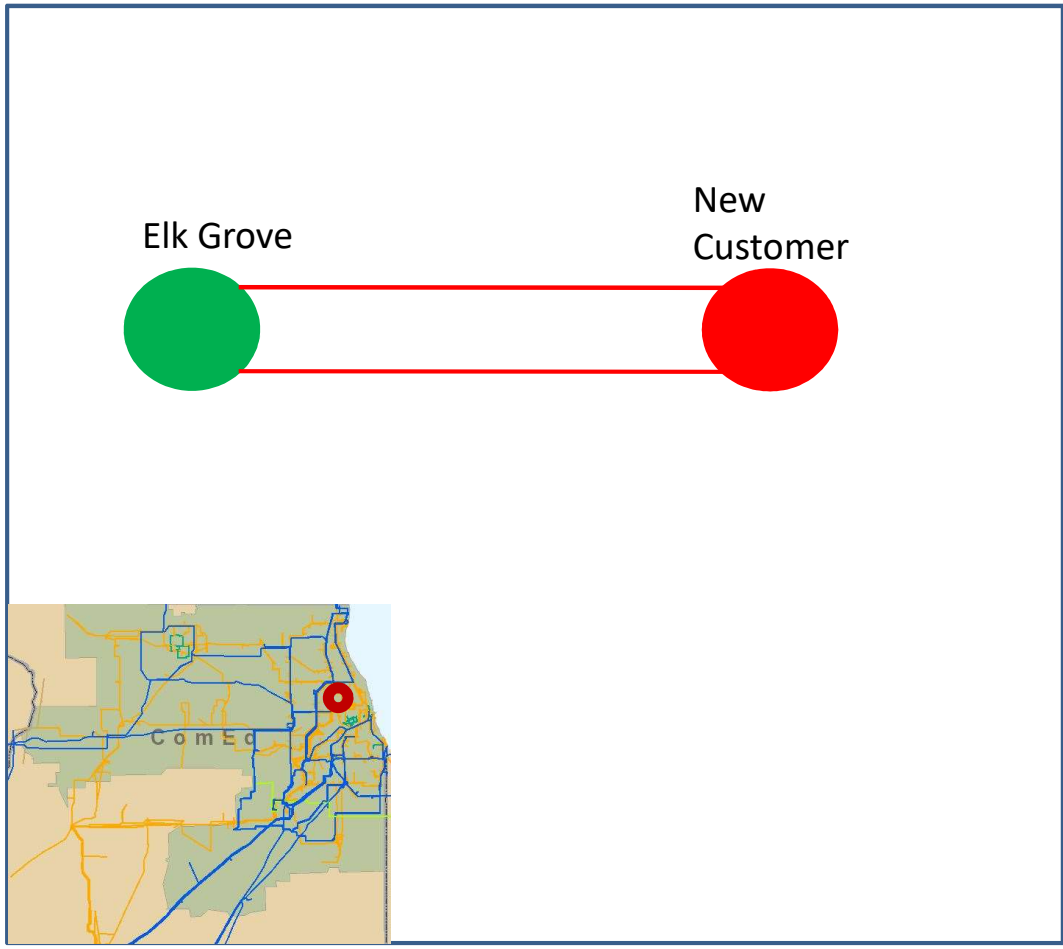
Feed customer substation radially from Des Plaines with 2 new 3.5 mile 138 kV lines. This alternative was not considered due to longer distance and rebuild of Des Plaines 138 kV bus to accommodate new line positions.

Estimated transmission cost: $100M

Projected In-Service: 12/31/25

Project Status: Conceptual

Model: 2027 RTEP



ATSI Transmission Zone M-3 Process
Napoleon – Campbell Soup 69 kV Line Customer Connection

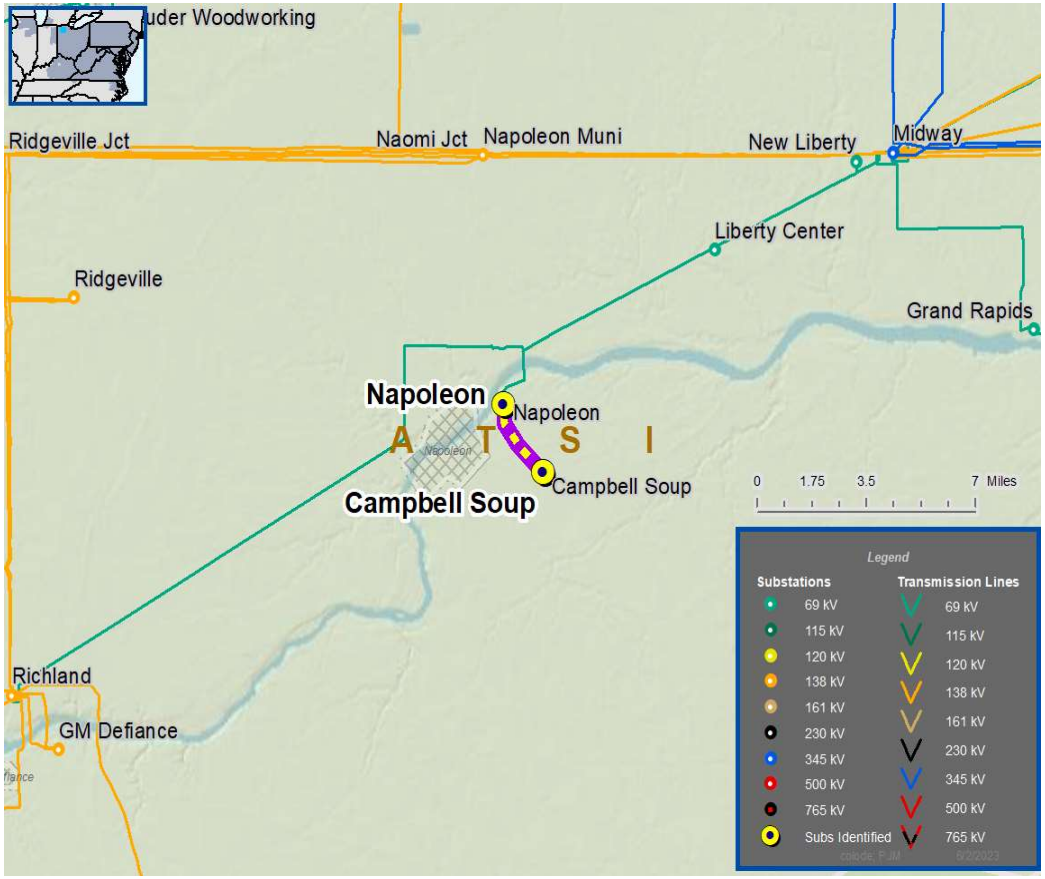
Need Number: ATSI-2023-007
Process Stage: Solution Meeting –08/18/2023
Previously Presented: Need Meeting – 06/16/2023

Supplemental Project Driver(s):
Customer Service

Specific Assumption Reference(s):
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
Customer Connection – Customer is requesting to retire an existing 69 kV delivery point on the Napoleon – Campbell Soup 69 kV Line. In addition, the customer is requesting a new 69 kV delivery point along the same transmission line to replace the retired delivery point which will have an anticipated load of 25 MVA.

Requested In-Service Date:
03/31/2024



ATSI Transmission Zone M-3 Process
Napoleon – Campbell Soup 69 kV Line Customer Connection

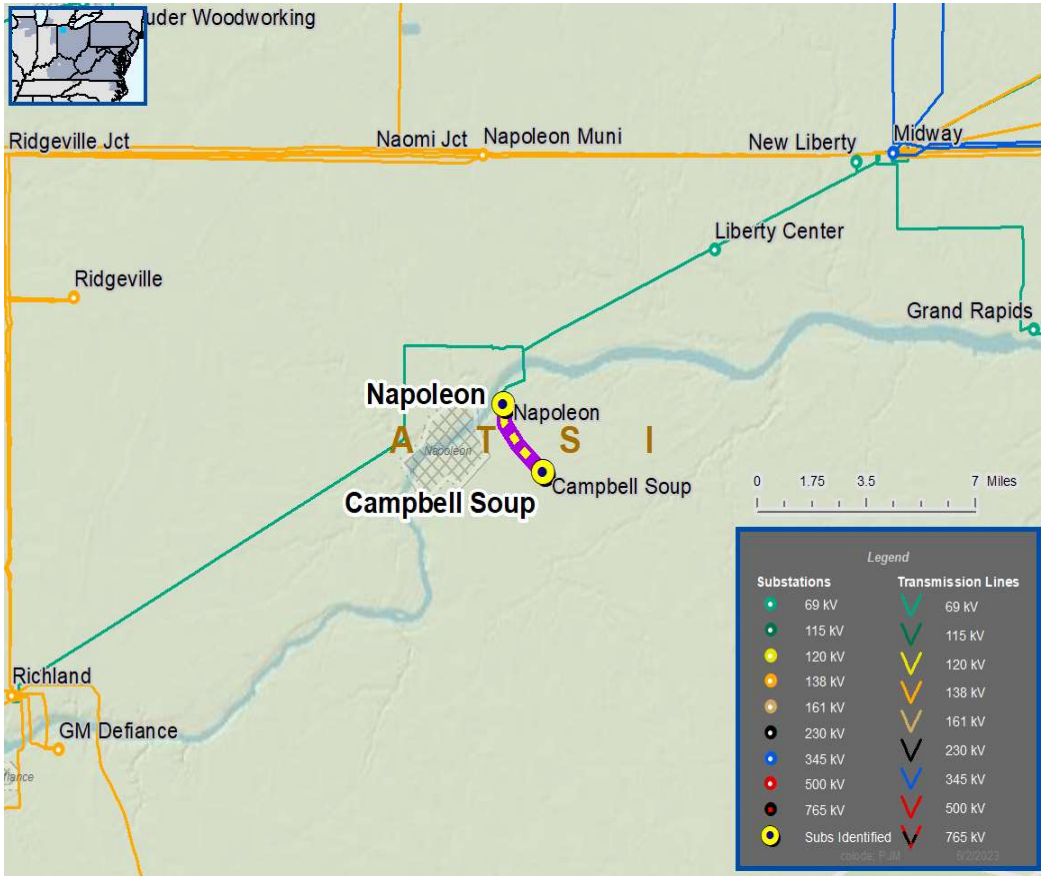
Need Number: ATSI-2023-007
Process Stage: Solution Meeting –08/18/2023
Previously Presented: Need Meeting – 06/16/2023

Proposed Solution:
69 kV Transmission Line Tap
- Install one SCADA controlled transmission line switch
- Construct approximately 1-2 spans of transmission line using 336.4 26/7 ACSR from tap point to the customer substation
- Retire and remove all distribution owned assets from Campbell Soup #1 substation along with transmission line portion from new interconnection to existing substation.

Alternatives Considered:
- No feasible alternatives to meet customer's request

Estimated Project Cost: $0.0M

Projected In-Service: 3/31/2024
Status: Project Initiation



APS Transmission Zone M-3 Process
Marlowe 138 kV Substation

Need Number: APS-2023-027
Process Stage: Solution Meeting 8/18/2023
Previously Presented: Need Meeting 7/21/2023

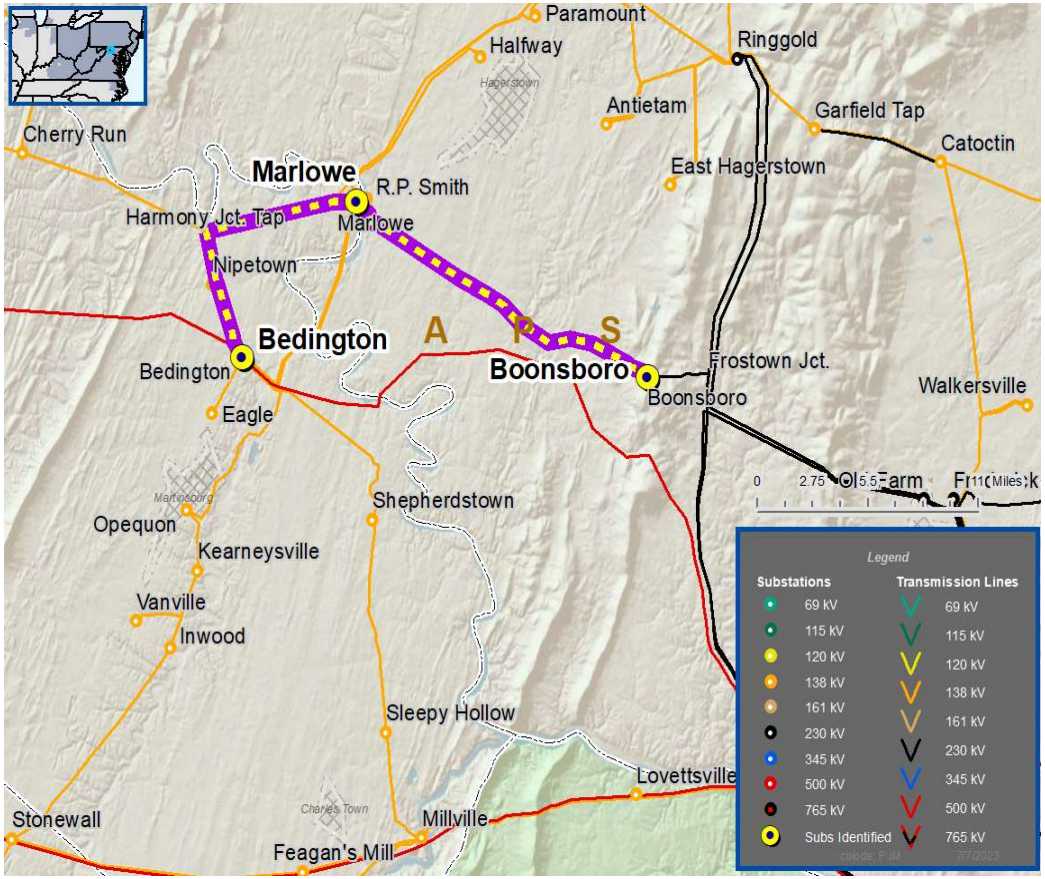
Project Driver(s):
- *Equipment Material Condition*
- *Performance and Risk*

Specific Assumption Reference(s)
- Substation Condition Rebuild/Replacement
- Substation/line equipment limits

Problem Statement
- Existing switches are beyond reliable operation.
  - Severe alignment issues result in improper closures, requiring a hammer to manually close, resulting in a safety issues
  - Switch mounting insulators often break during this process, resulting in live parts falling, creating a potential accidents and system faults.

The Boonsboro – Marlowe 138 kV line is limited by Substation conductor
- Existing line rating:
  - 300/358/349/410 MVA (SN/SE/WN/WE)

The Bedington – Marlowe 138 kV line is limited by Substation conductor
- Existing line rating:
  - 265/349/349/410 MVA (SN/SE/WN/WE)



APS Transmission Zone M-3 Process
Marlowe 138 kV Substation

Need Number: APS-2023-027

Process Stage: Solution Meeting 08/18/2023

Proposed Solution:

- At Marlowe Substation:
  - On the Boonsboro 138 kV line exit, replace:
    - 1200 A manual disconnect switches with (2) 2000 A motor-operated disconnect switches
    - Limiting substation conductor
  - On the Bedington BMA 138 kV line exit, replace:
    - 1200 A manual disconnect switches with (2) 2000 A motor-operated disconnect switches
    - Limiting substation conductor

Transmission Line Ratings:

- Boonsboro – Marlowe 138 kV Line
  - Before Proposed Solution: 300 / 358 / 349 / 410 MVA (SN / SE / WN / WE)
  - After Proposed Solution: 300 / 358 / 369 / 410 MVA (SN / SE / WN / WE)
- Bedington – Marlowe BMA 138 kV Line
  - Before Proposed Solution: 265 / 349 / 349 / 410 MVA (SN / SE / WN / WE)
  - After Proposed Solution: 265 / 349 / 349 / 435 MVA (SN / SE / WN / WE)

Alternatives Considered:

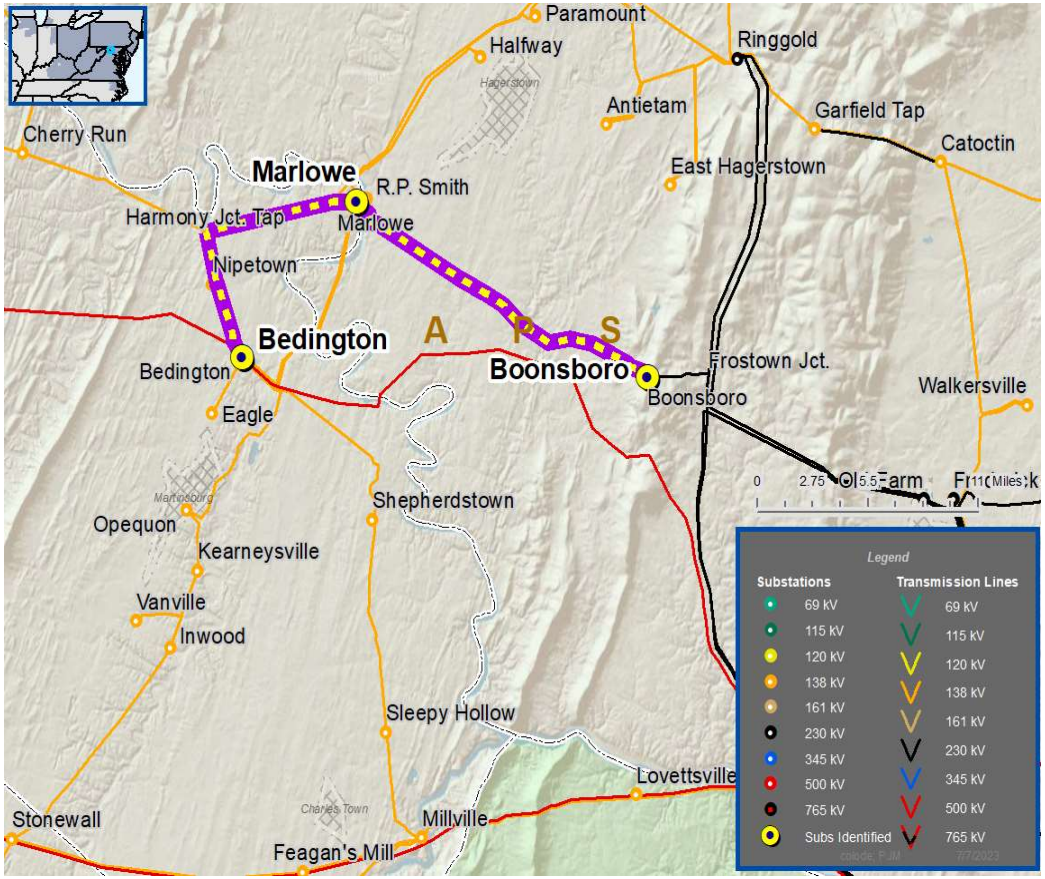
- No other solutions considered.

Estimated Project Cost: $ 0.3 M

Projected In-Service: 10/27/2023

Project Status: Construction

Model: 2022 RTEP model for 2027 Summer (50/50)



AEP Transmission Zone M-3 Process
Southern Fort Wayne

Need Number: AEP-2022-IM012
Process Stage: Solutions Meeting 8/18/2023
Previously Presented: Needs Meeting: 6/15/2022
Supplemental Project Driver: Customer Need
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Model: N/A
Problem Statement:

AEP I&M distribution has requested a new delivery point on the southern side of Fort Wayne to serve 13MW of load, transferred from McKinley station. The requested in service date is 6/1/2025

AEP Transmission Zone M-3 Process
Kekionga Station

Need Number: AEP-2022-IM012

Process Stage: Solution Meeting 08/18/2023

Proposed Solution:

Install a 138kV/12kV distribution station named Kekionga on the Mckinley-Ellison Road 138kV line. Install 138kV line extension from Mckinley-Ellison 138kV line with fiber (~0.15 miles from the 138kV line), install 138kV bus with 2-138kV switches and 138kV MOAB.
Total Estimated Transmission Cost: $4.4 M

Alternative considered:

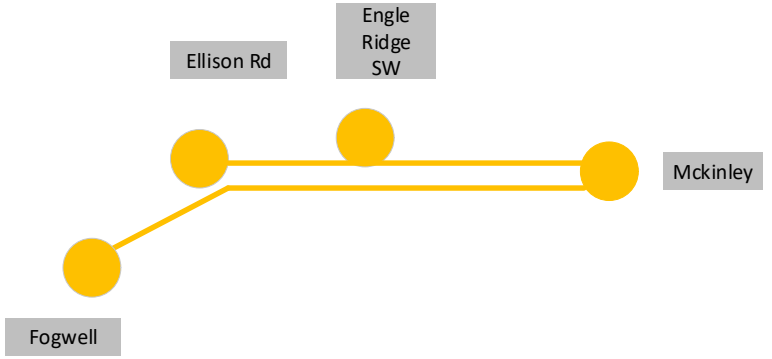
Install a 138kV/12kV distribution station on the Mckinley-Fogwell 138kV line. Install 138kV line extension from Mckinley-Fogwell 138kV line with fiber, install 138kV bus with 2X 138kV switch and 138kV MOAB. Since the location of the new station location is on the north side of the 138kV circuit, this alternate was not chosen.

Total Cost: $4.4M

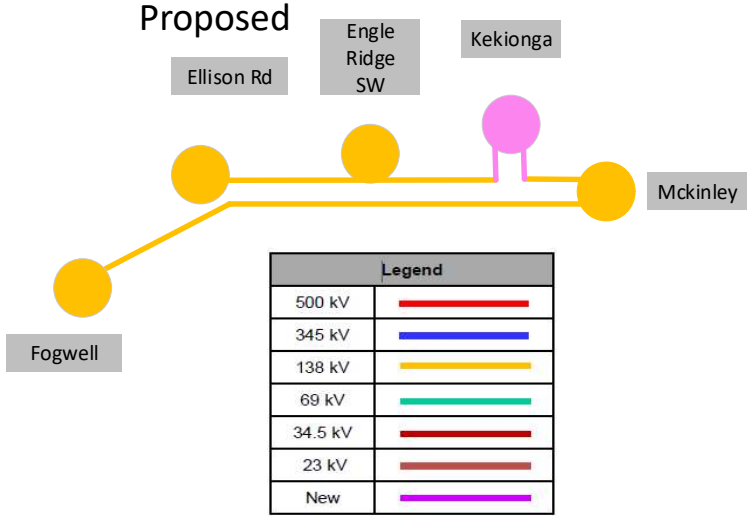
Projected In-Service: 11/12/2025

Project Status: Scoping

Existing



Proposed



AEP Transmission Zone M-3 Process
East Liverpool, Ohio

Need Number: AEP-2022-OH041

Process Stage: Solution Meeting 08/18/2023

Previously Presented: Need Meeting 09/16/2022

Project Driver:

Equipment Material/Condition/Performance/Risk; Operational Flexibility and Efficiency

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (slides 13-14)

Problem Statement:

Equipment Material/Condition/Performance/Risk:

- The East Liverpool – Second Street 69kV circuit protection uses electromechanical relays and a legacy pilot wire communications channel. These relays have significant limitations with regard to spare part availability, SCADA functionality, and fault data collection and retention. In addition, these relays lack vendor support. Pilot wire cables are showing increased rates of failure and signal degradation across the AEP system.
- The 138kV tie-line to FirstEnergy uses electromechanical relays. The power-line-carrier equipment at East Liverpool was installed in 1962, presenting a failure risk. FE has indicated a future project is planned to upgrade relays on their side.
- The 138-69kV transformer protection system also utilizes outdated electromechanical relays.
- The 1962-vintage control house has various issues of concern: lead-based paints, asbestos, no air conditioning or exhaust fans, and small roof leaks.
- The station PT's are original to the station (1962) and are in poor condition with rusting. The AC station service system is in poor condition and uses a corner-ground connection which is a safety concern.
- There is a broken 69kV hook-stick disconnect switch needing replaced.

AEP Transmission Zone M-3 Process
East Liverpool, Ohio

Need Number: AEP-2022-OH041

Process Stage: Solution Meeting 08/18/2023

Previously Presented: Need Meeting 09/16/2022

Project Driver:

Equipment Material/Condition/Performance/Risk; Operational Flexibility and Efficiency

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (slides 13-14)

Problem Statement:

Operational Flexibility and Efficiency:

- The 138-69kV transformer lacks a high-side fault-interrupting device and only has a MOAB/ground-switch scheme. This requires remote-end fault clearing at FirstEnergy's Wylie Ridge and Arroyo 138kV stations (3-terminal source). This remote-end fault clearing zone also drops FE's South Chester station and distribution customers in the process.
- Due to the lack of circuit breakers at the station, there are 3 overlapping zones of protection: 69kV bus, 138-69kV transformer, and 138kV line. These dissimilar zones of protection can cause over tripping and mis-operations.

AEP Transmission Zone M-3 Process
East Liverpool Station Upgrade

Need Number: AEP-2022-OH041

Process Stage: Solution Meeting 08/18/2023

Proposed Solution:

- At East Liverpool station, replace the 138kV MOAB/ground switch system with a circuit breaker and new relays. Install a 69kV breaker on the low side of the 138-69kV transformer. Upgrade tie-line metering, relays, and expand SCADA functionality at the station. Replace the control house with a new prefabricated control building. $3.0 Million
- At the 69kV remote end station of Second Street, replace the electromechanical relays and pilot wire communications with microprocessor-based relays, to coordinate with East Liverpool. Install new 69kV CCVT's. $0.3 Million

Total Transmission Cost: $3.3 Million

Alternatives Considered: Considering the availability of space and outages at the existing station, a greenfield option was not prudent.

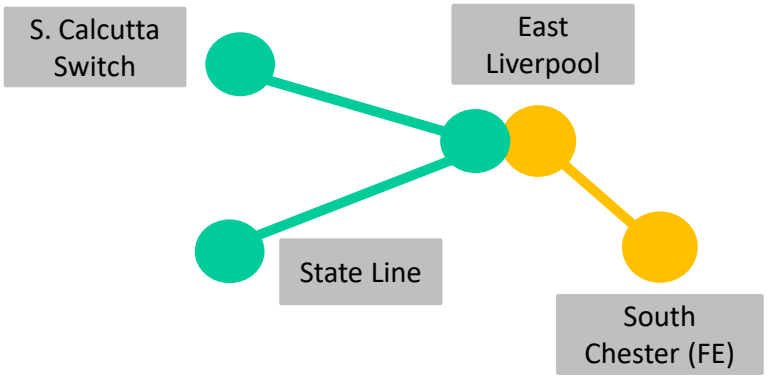
Projected In-Service: 5/1/2025

Project Status: Scoping

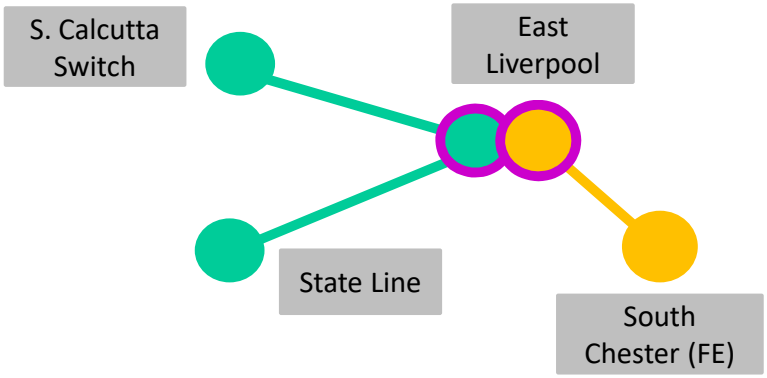
Model: 2027 PJM RTEP Models

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

Existing:



Proposed:



AEP Transmission Zone M-3 Process
Wayne County, WV

Need Number: AEP-2023-AP005

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Needs Meeting 2/17/2023

Supplemental Project Driver: Customer Service and Operational Flexibility

Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12, 14)

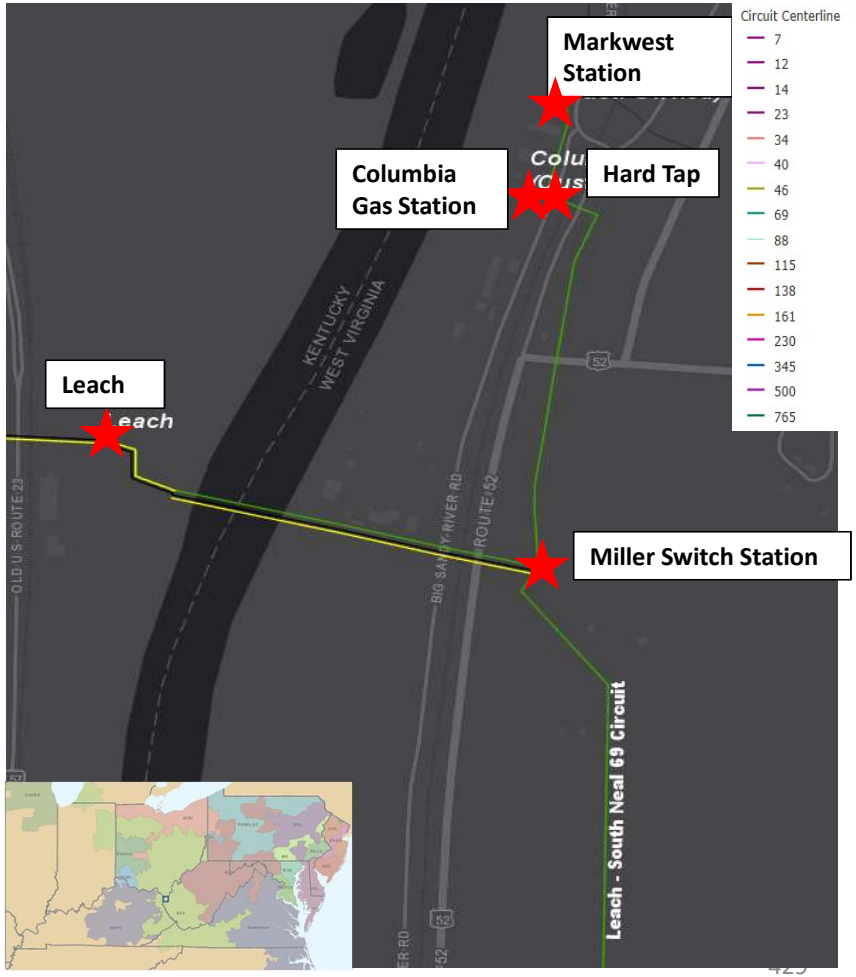
Problem Statement:

Miller Switch Station, on the existing Leach – South Neal 69 kV line currently serves two separate customers off of a 0.5 mile radial 69 kV line. Total existing load served off this line is approximately 8 MW. Radial lines complicate maintenance activities due to the customers needing to be taken out of service in order to perform any work on the line.

TC Energy – Kenova has requested a 12 MW load increase at their existing Columbia Gas Station delivery point served off the radial from Miller Switch. This load is currently served from a hard tap on the radial extension, which greatly complicates restoration activities and extend outages. This configuration also affects the customer served at the Markwest station as they are also fed from the radial line.

Summer projected load: 16 MVA

Winter projected load: 16 MVA.



AEP Transmission Zone M-3 Process
Wayne County, WV

Need Number: AEP-2023-AP005

Process Stage: Solutions Meeting 8/18/2023

Proposed Solution:

Cut in/out of the existing South Neal – Leach 69 kV line, install a new double circuit 69 kV 0.6 mile line which will replace the existing 69 kV radial tap line currently serving both Markwest and Columbia Gas. Build single circuit less than 0.1 mile back to Markwest from Sweet Run S.S. and to Columbia Gas from Pipeline S.S. Miller Switch Station will also be removed upon completion of the new line construction. Estimated Trans. Cost: $5.6M

Replace existing hard tap serving Columbia gas with a new 3-way phase over phase switch. Estimated Trans. Cost: 1.1M

Install a new 3-way phase over phase switch on the new line outside of the existing Markwest delivery point. Estimated Trans. Cost: 1.1M

Total Estimated Transmission Cost: $7.8M

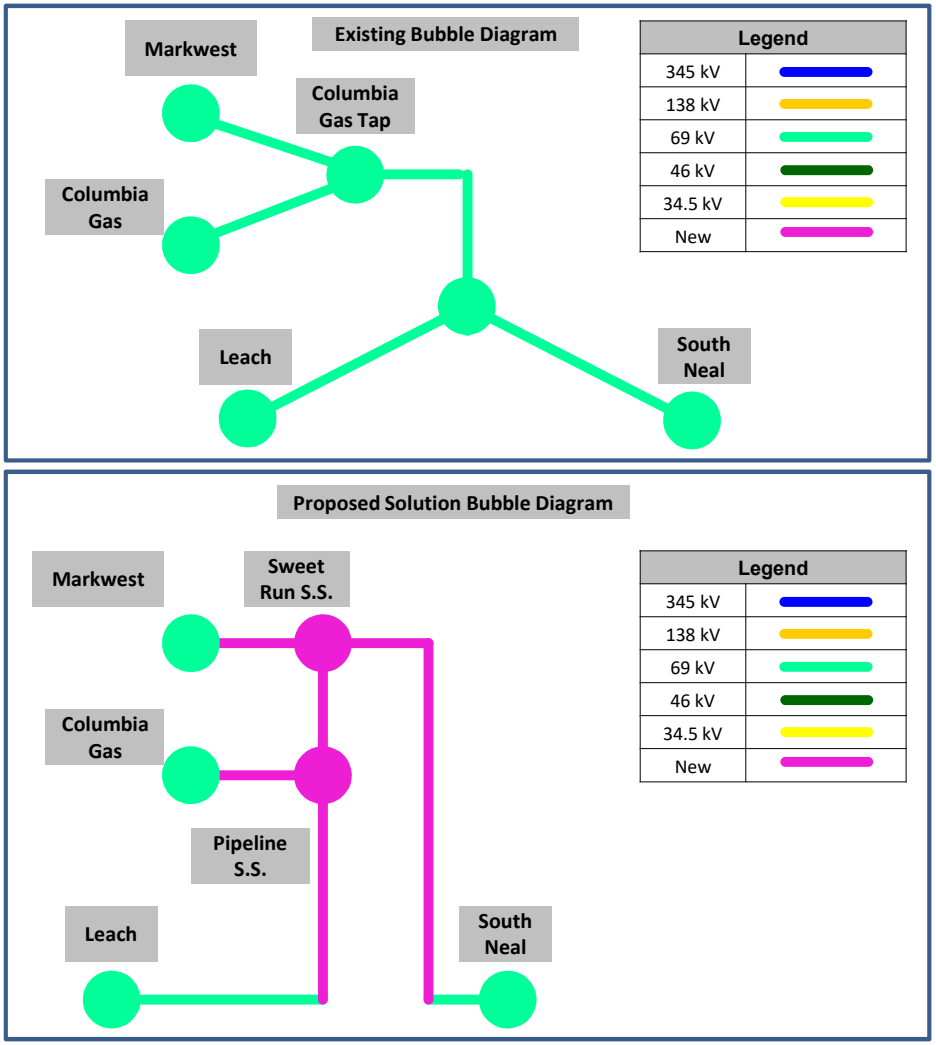
Alternate:

Replace existing hard tap with a new switch (Pipeline S.S.), install a new switch outside of Markwest (Sweet Run S.S.). Construct a new single circuit 69 kV line to Sweet Run S.S. in order to loop the existing single circuit radial 69 kV line. Remove existing Miller Switch. During the initial scoping for this project, it was determined that the existing line serving the customers cannot remain in its current location due to accessibility and terrain concerns. Therefore, the double circuit replacement option was chosen.

Projected In-Service: 6/1/2024

Project Status: Scoping

Model: 2028 RTEP



AEP Transmission Zone M-3 Process
Pike County, Kentucky

Need Number: AEP-2022-AP007

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 2/18/2022

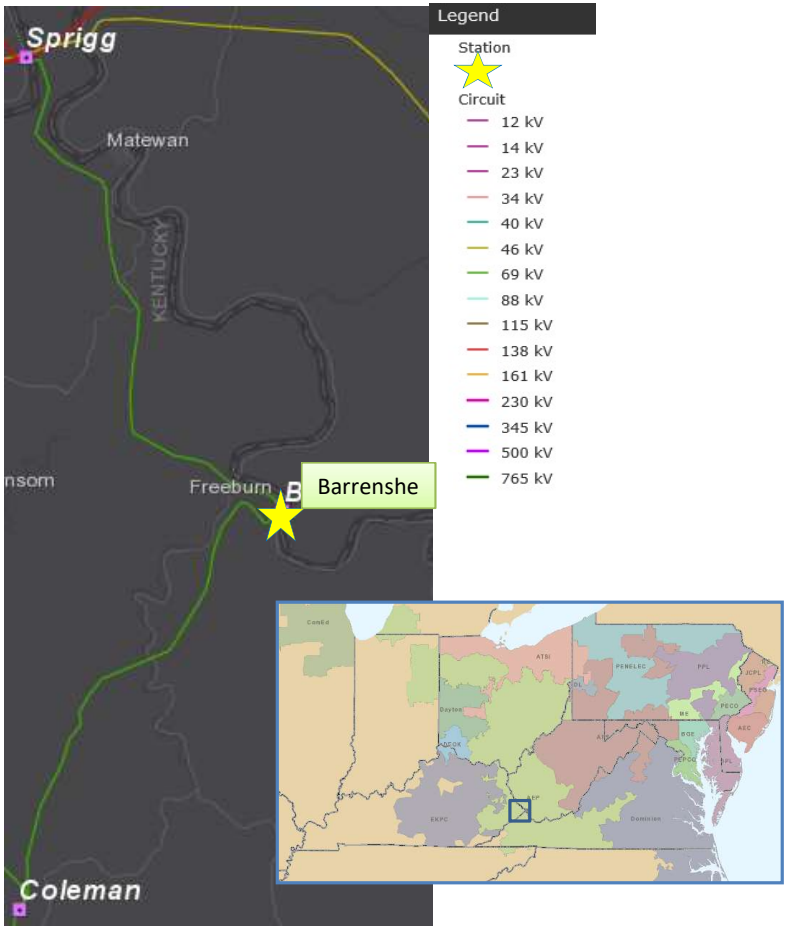
Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Barrenshe Station:

- All 15 relays at Barrenshe station are in need of replacement. There are 11 electromechanical relays which have significant limitations with regards to fault data collection and retention. These relays lack vendor support and have little to no access to spare parts. Also, the remaining 4 microprocessor relays were commissioned from 2006-2007 and are at the end of their useful life.
- The station bay was constructed using wood poles that were installed in 1953. The poles are very rotten and there is concern that any type of stress on the poles could cause the station to fail completely. The poles closest to the transformer are leaning and have twisted the bus.
- In 1977, flood waters were over 3/4 up the control cabinet. There has been repeated wash out in the rear of the station causing the fence post foundations to wash away. The station lies in the 100 year flood plain between mountainous terrain and highway 194 making expansion at the existing site extremely difficult.
- 69 kV MOAB W is 1973 vintage and needs replaced due to wear and lack of available parts.



AEP Transmission Zone M-3 Process
Pike County, Kentucky

Need Number: AEP-2022-AP008

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 2/18/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Coleman – Sprigg 69 kV:

Original Install Date: 1926

Length of Line: ~13 mi

Total structure count: 101

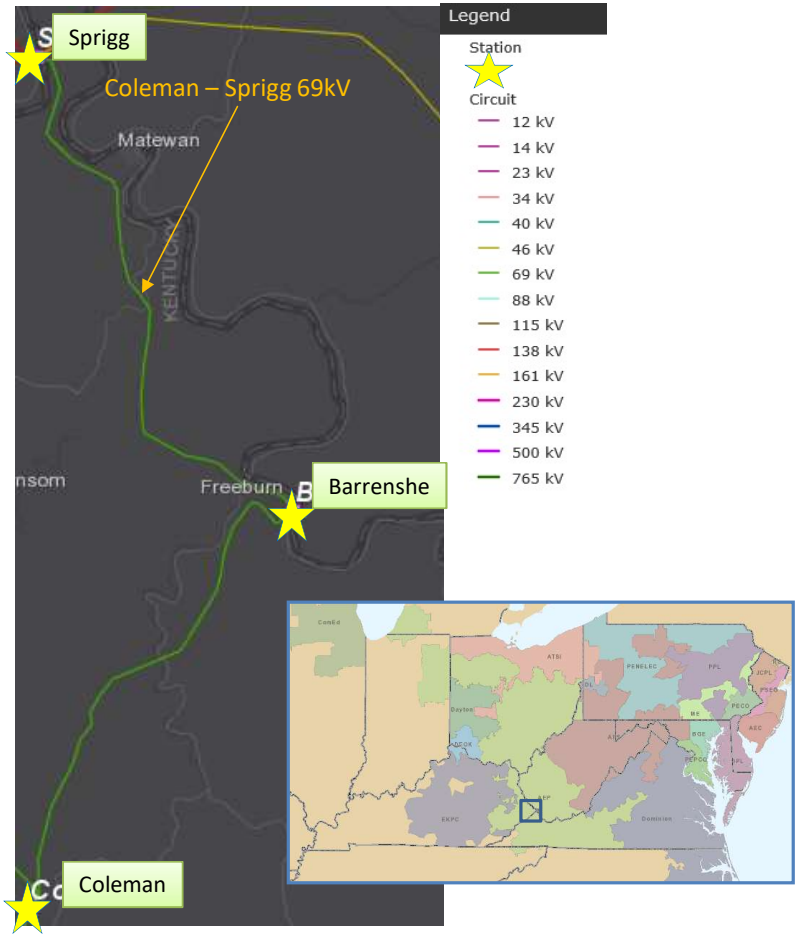
Original Line Construction Type: Wood

Conductor Type: 2/0 Copper, 176,900 ACSR, 556,500 ACSR, 795,000 ACSR

Momentary/Permanent Outages: 11 Momentary and 10 Permanent

Line Conditions:

- The 10 permanent outages caused 2.6M minutes of interruption for distribution customers
- The line structures fail to meet 2017 NESC Grade B loading criteria, current AEP structural strength requirements, and the current ASCE structural strength requirements.
- Currently, there are 44 structures with at least one open condition, which relates to 43% of the structures on the circuit specifically affecting the crossarm, knee/ vee brace, or pole including rot, damaged, insect damage, and bowed conditions.
- 39 of 101 (39%) structures are 1920s vintage
- 53 of 101 (52%) are 1970s vintage. The Barrenshe – Coleman segment was rebuilt in the early 1970s. On the Sprigg – Barrenshe segment, 17 structures were also rebuilt in the 1970s. These 1970s structures are also showing signs of pole cracking, weathering, rot, and woodpecker damage. The crossarms and braces show signs of mold as well as signs of rot, cracking, splitting, bowing, and weathering.



AEP Transmission Zone M-3 Process
Pike County, Kentucky

Need Number: AEP-2022-AP008

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 2/18/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

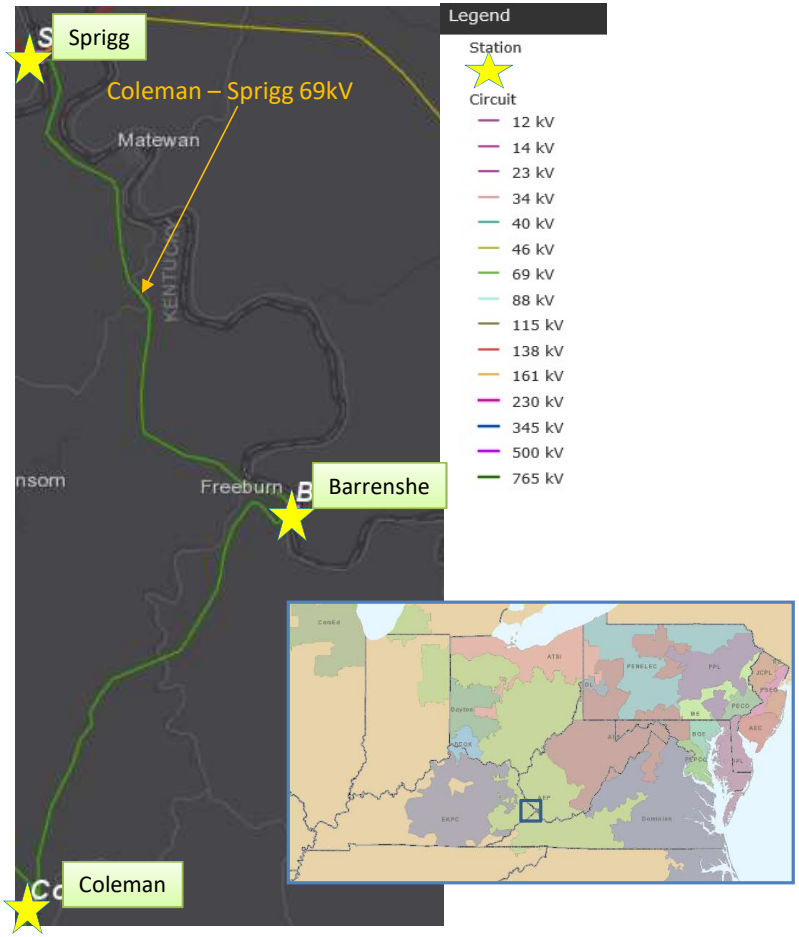
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Coleman – Sprigg 69 kV Continued:

Line Conditions Con't:

- The 4-bell porcelain insulators on the line do not meet current AEP standards for CIFO and minimum leakage distance requirements.
- There is no shielding present on the Sprigg – Barrenshe segment, which is inadequate for AEP's current shielding requirements and leads to poor lightening performance for the circuit.
- The butt wrap grounding is inadequate per current AEP Standards and causes poor lightning performance. The current grounding system, poor shielding angle, and the electrical strength of the insulators do not meet current AEP and industry accepted criteria, making the line susceptible momentary and permanent outages, affecting customer reliability.
    - The inadequate grounding limits the available path to ground during any type of line fault, increasing the intensity the conductor and related hardware have to withstand during the fault. The reduced electrical strength of the insulators could lead to electrical damage to structures and hardware during a fault if the insulator were to fail from elevated electrical stresses.
    - The line serves a peak load of 12.5 MVA at Barrenshe station.



AEP Transmission Zone M-3 Process
Pike County, Kentucky and Mingo County, West Virginia

Need Number: AEP-2022-AP009

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 2/18/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Sprigg – Wharncliffe 46 kV:

Original Install Date (Age): 1929

Length of Line: ~18 mi

Total structure count: 120

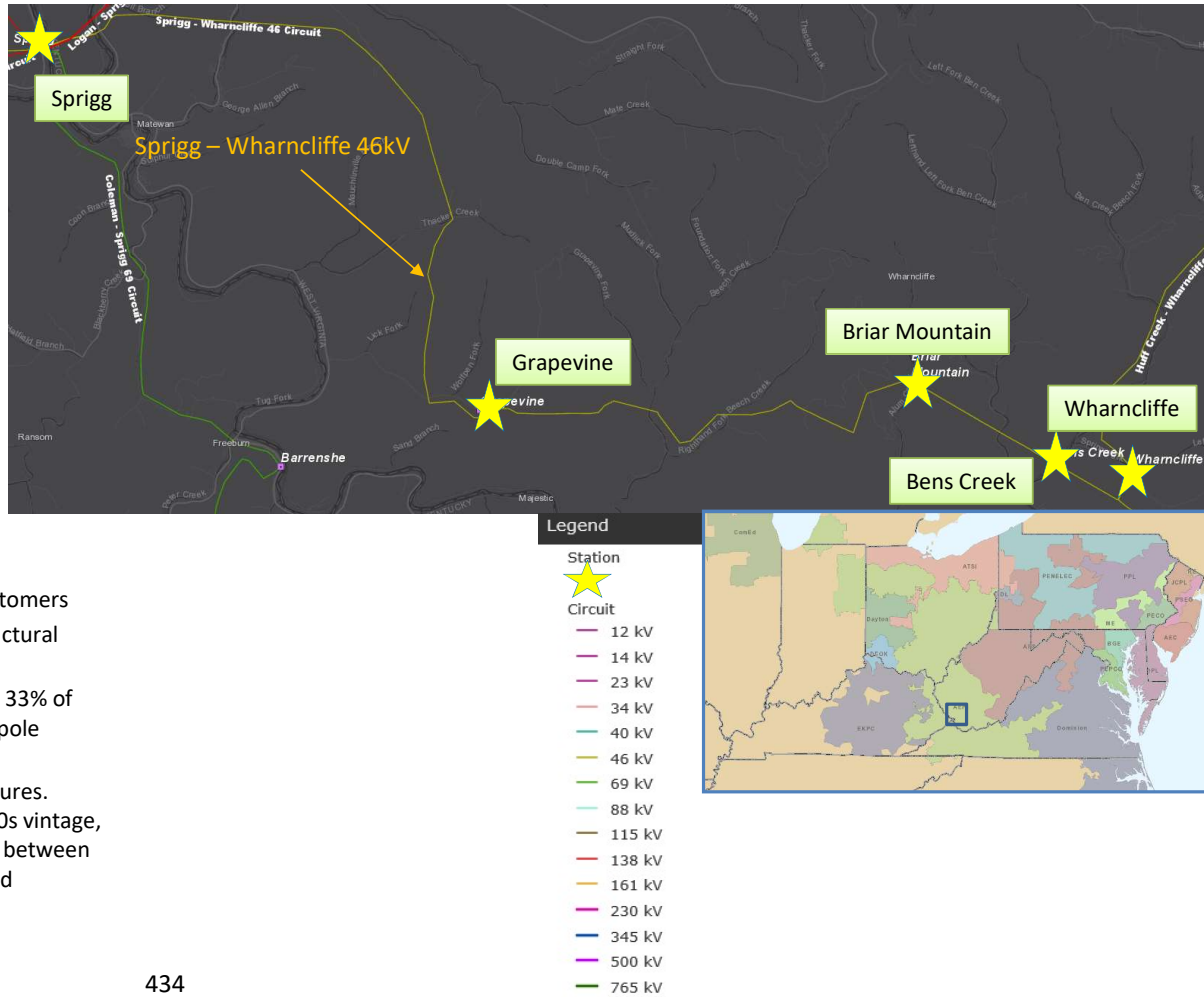
Original Line Construction Type: Wood

Conductor Type: 1/0 Copper, 176,900 ACSR, 336,400 ACSR, 556,500 ACSR

Momentary/Permanent Outages: 27 Momentary and 10 Permanent

Line Conditions:

- The 10 permanent outages caused 481k minutes of interruption for distribution customers
- The line structures fail to meet 2017 NESC Grade B loading criteria, current AEP structural strength requirements, and the current ASCE structural strength requirements.
- Currently, there are 39 structures with at least one open condition, which relates to 33% of the structures on the circuit specifically affecting the crossarm, knee/ vee brace, or pole including rot, damaged, insect damage, woodpecker holes, and bowed conditions.
- 32 of the 120 structures are 1930s vintage or older accounting for 27% of the structures. Another 33 of the 120 structures are split almost evenly between 1940s, 50s, and 60s vintage, accounting for 28% of the structures. An additional 22 of 120 structures are spread between the 1970s and 90s (18%). The described structures, including 11% more are all wood structures, with only 16% of the line made up of steel structures.



AEP Transmission Zone M-3 Process
Pike County, Kentucky and Mingo County, West Virginia

Need Number: AEP-2022-AP009

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 2/18/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

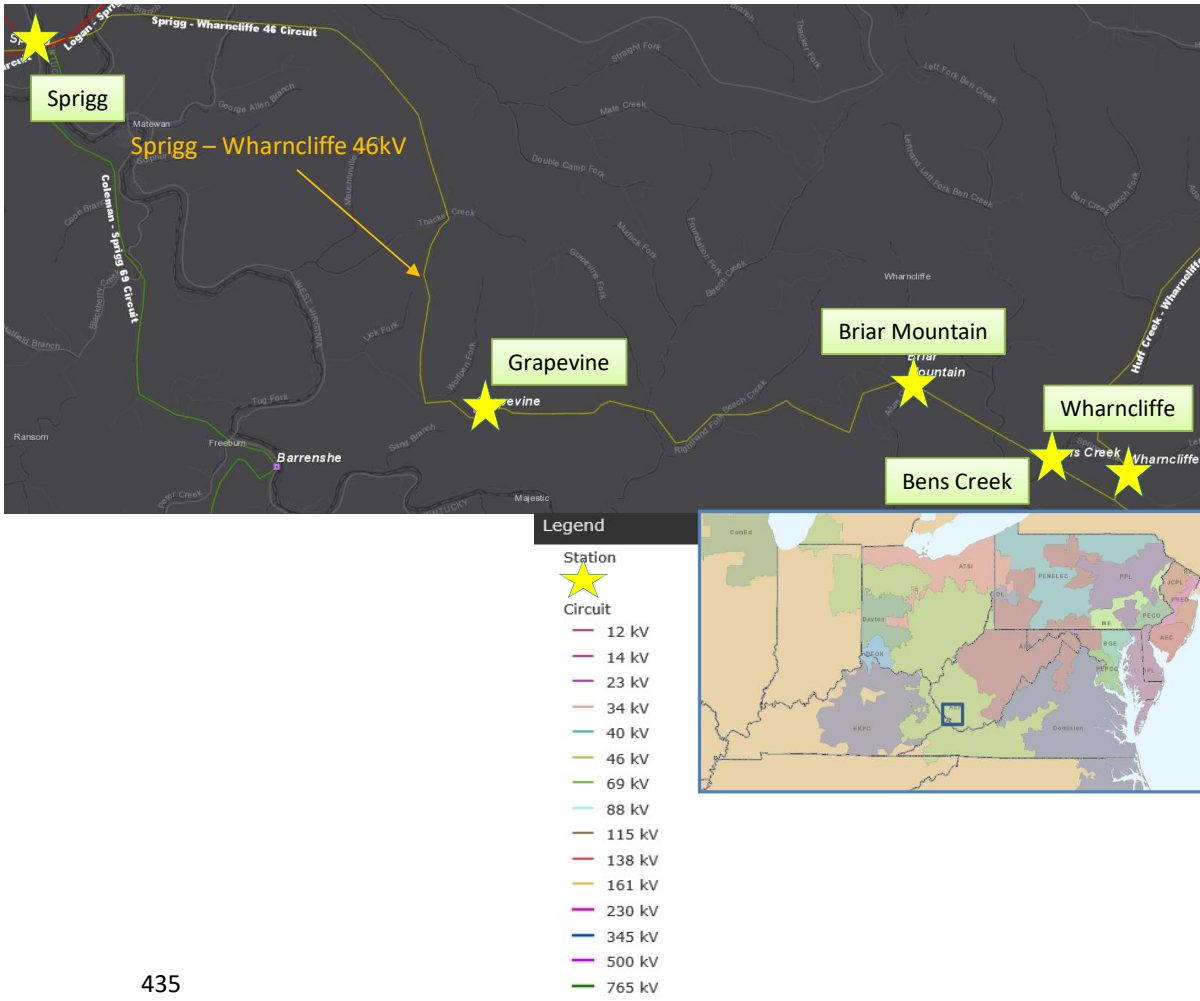
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Sprigg – Wharncliffe 46 kV Continued:

Line Conditions Con't:

- The 4-bell porcelain insulators on the line do not meet current AEP standards for CIFO and minimum leakage distance requirements.
- The majority of the line has no static wire, making it inadequate for AEP current shielding angle requirements and results in poor lightening performance.
- The butt wrap grounding and typical shield angle is inadequate per current AEP Standards and can cause poor lightning performance. The current grounding system, poor shielding angle, and the electrical strength of the insulators do not meet current AEP and industry accepted criteria, making the line susceptible momentary and permanent outages, affecting customer reliability.
    - The inadequate grounding limits the available path to ground during any type of line fault, increasing the intensity the conductor and related hardware have to withstand during the fault. The reduced electrical strength of the insulators could lead to electrical damage to structures and hardware during a fault if the insulator were to fail from elevated electrical stresses.
    - The line serves a peak load of 6 MVA at Grapevine, Briar Mountain, and Bens Creek stations.



AEP Transmission Zone M-3 Process
Mingo and McDowell County, West Virginia

Need Number: AEP-2022-AP010

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 2/18/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Jim Branch – Wharncliffe 46 kV:

Original Install Date (Age): 1925 and 1930

Length of Line: ~25 mi

Total structure count: 162

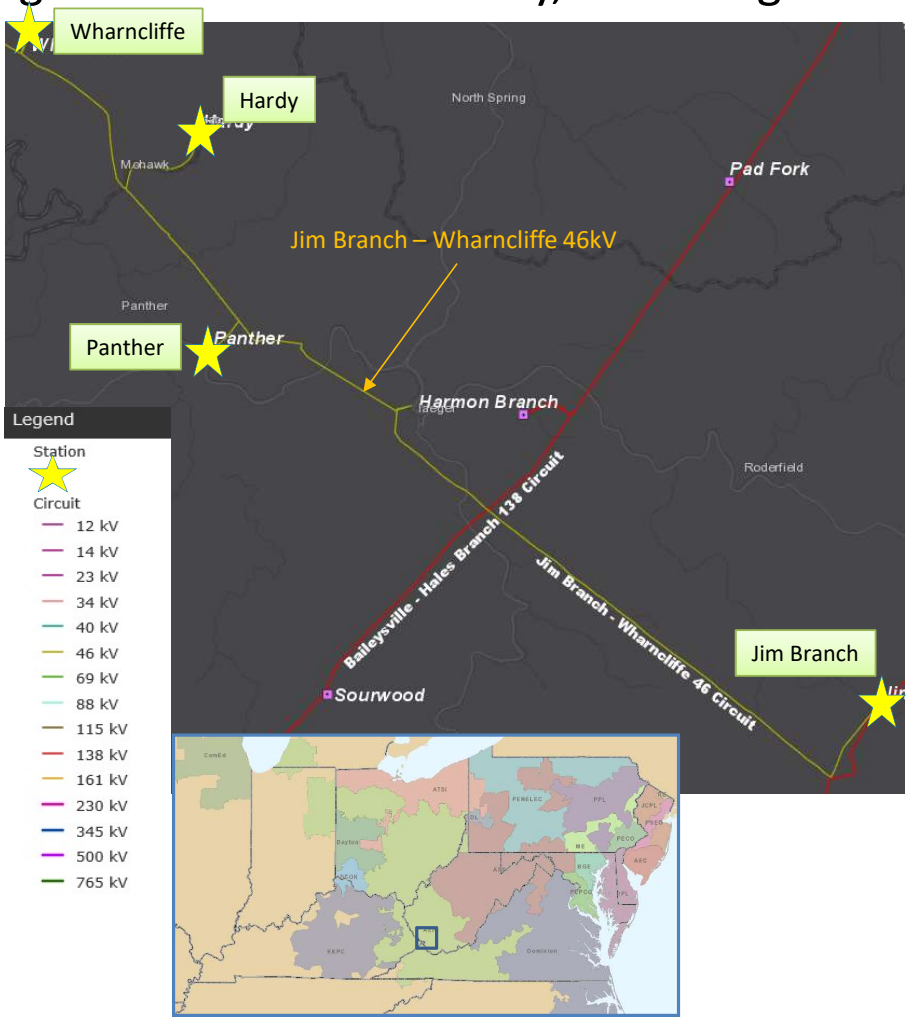
Original Line Construction Type: Wood

Conductor Type: 1/0 Copper, 2/0 Copper, #2 ACSR, 4/0 ACSR, 176,900 ACSR, 556,500 ACSR

Momentary/Permanent Outages: 29 Momentary and 20 Permanent

Line Conditions:

- The momentary outages were attributed to lightning (24), wind (3), relay mis-operation (1), unknown (1), and distribution (1) causes. The permanent outages attributed to vegetation contacts from outside the AEP ROW (12), lightning (4), pole failure (1), failed insulator (1), ice/snow (1), and relay mis-operation (1) causes. The large number of lightning caused outages is due to 65% of the circuit lacking shield wire.
- The permanent outages caused 2.62M minutes of interruption for 11,744 customers at Panther and Hardy substations.
- The line structures fail to meet 2017 NESC Grade B loading criteria, current AEP structural strength requirements, and the current ASCE structural strength requirements.
- 134 of the 162 structures are 1930s vintage or older accounting for 83% of the structures. These structures have conditions like top rot, Woodpecker damage, split top, heart rot, base rot, bowing, and corroded hardware.



AEP Transmission Zone M-3 Process
Mingo and McDowell County, West Virginia

Need Number: AEP-2022-AP010

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 2/18/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

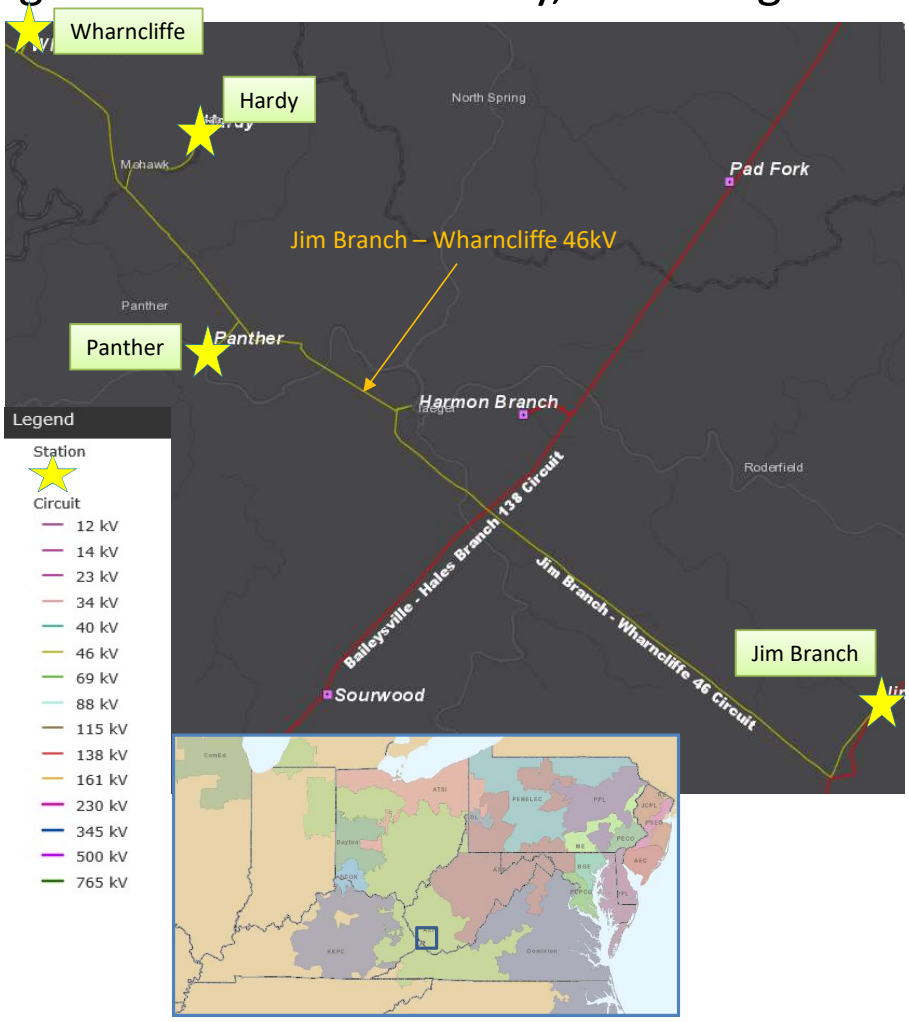
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Jim Branch – Wharncliffe 46 kV Continued:

Line Conditions Con't:

- The majority of the line has no static wire, making it inadequate for AEP current shielding angle requirements.
- The butt wrap grounding and typical shield angle is inadequate per current AEP Standards and can cause poor lightning performance. The current grounding system, poor shielding angle, and the electrical strength of the insulators do not meet current AEP and industry accepted criteria, making the line susceptible momentary and permanent outages, affecting customer reliability.
    - The inadequate grounding limits the available path to ground during any type of line fault, increasing the intensity the conductor and related hardware have to withstand during the fault. The reduced electrical strength of the insulators could lead to electrical damage to structures and hardware during a fault if the insulator were to fail from elevated electrical stresses.
    - The line serves a peak load of 7 MVA at Hardy and Panther stations.



AEP Transmission Zone M-3 Process
Mingo County, West Virginia

Need Number: AEP-2022-AP011

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 2/18/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Sprigg Station:

138/69 – 46kV Transformer #1

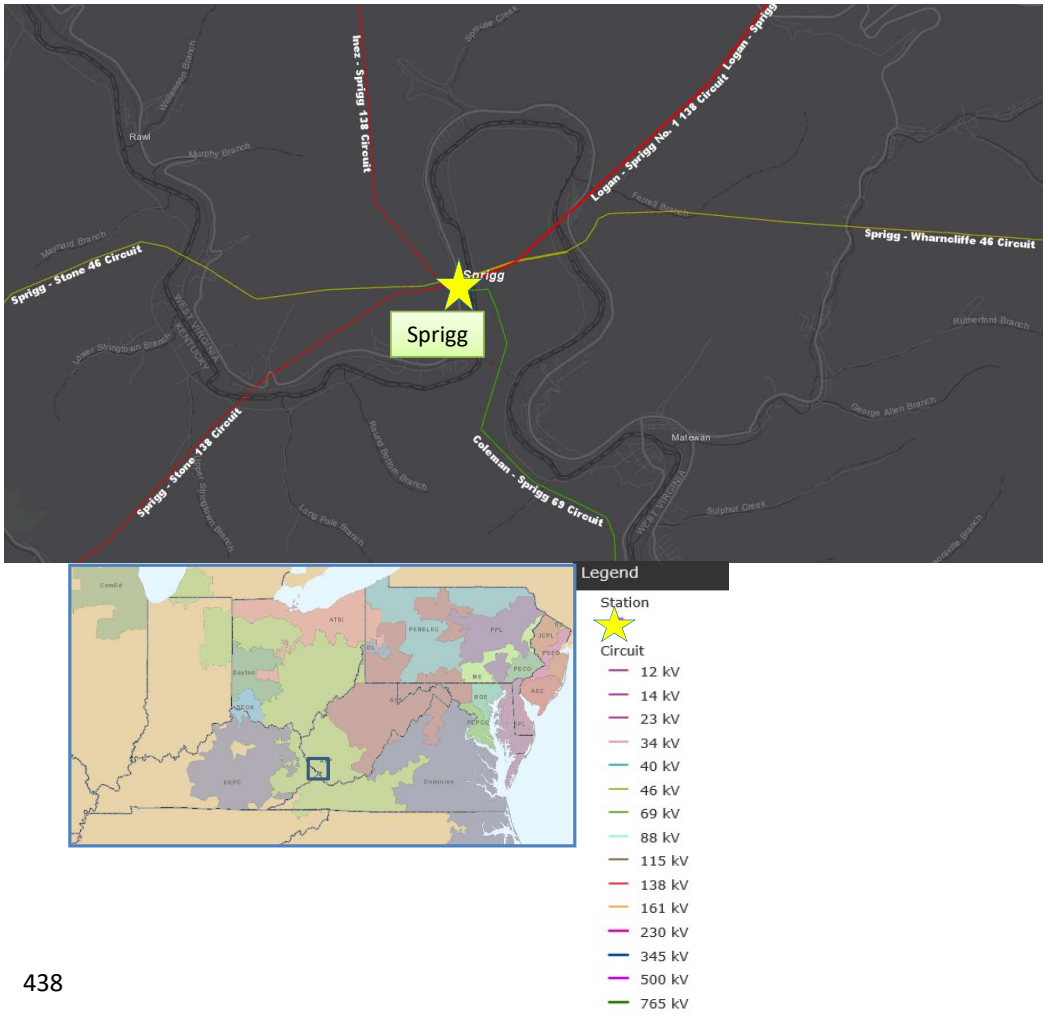
- 1971 Vintage Transformer
- The presence of Ethane, along with the indication of overheating faults, indicates decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault events.
- The dielectric is driven by the upward trend in insulation power factor, which indicates an increase in particles within the oil.
- The transformer has elevated moisture levels that are a result of gasket leaks or breakdown in oil or paper/pressboard insulation.

46/7.2kV GND Bank

- 1972 Vintage Transformer
- The elevated levels of Acetylene indicate increased decomposition of the paper insulating materials. The dielectric is driven by the upward trend in insulation power factor, which indicates an increase in particles within the oil.
- The transformer has elevated moisture levels that are a result of gasket leaks or breakdown in oil or paper/pressboard insulation.

Relays

- There are 82 electromechanical and 3 static relays which have significant limitations with regards to fault data collection and retention. These relays lack vendor support and have little to no access to spare parts.



AEP Transmission Zone M-3 Process
Mingo County, West Virginia

Need Number: AEP-2022-AP011

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 2/18/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Sprigg Station Continued:

138kV Circuit Breakers A, B, C, D, and S

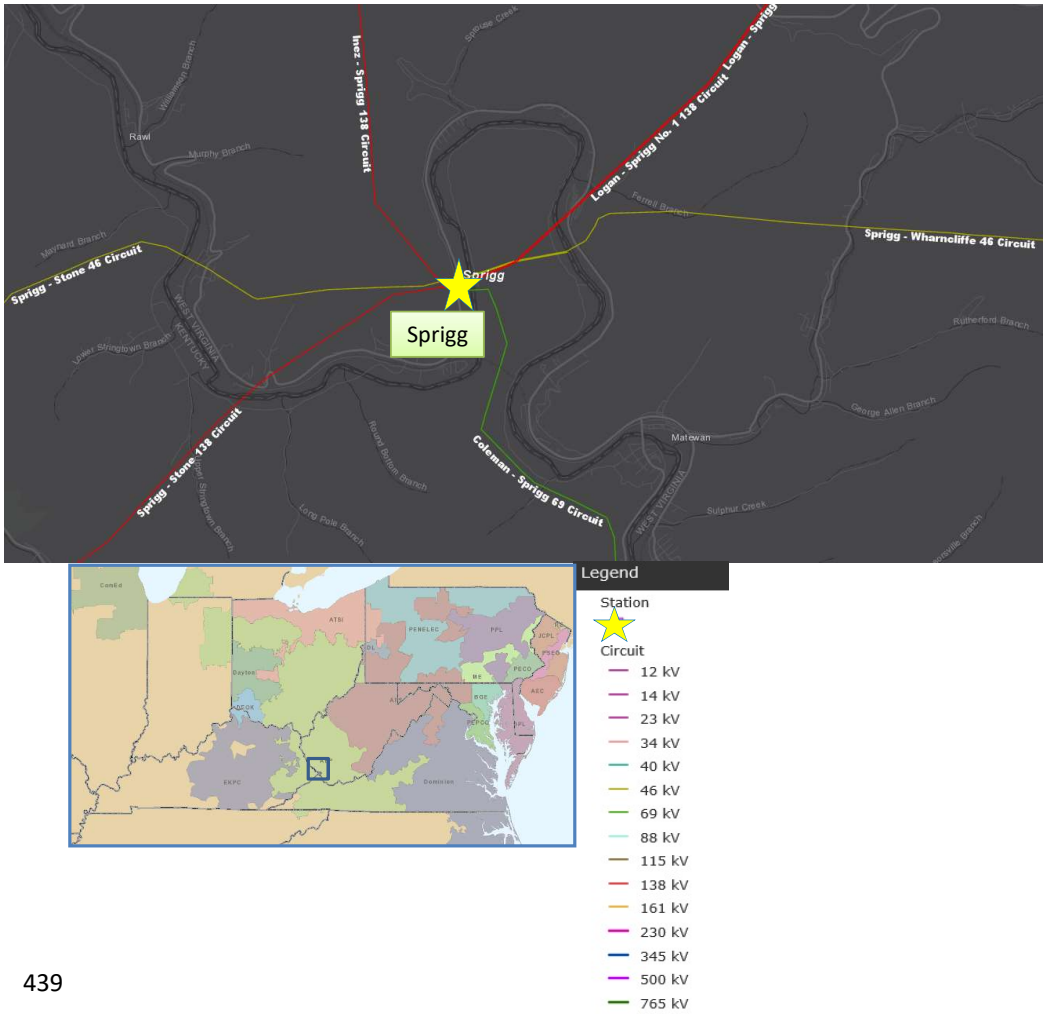
- A, B, C, and D are 1987 vintage and S is 1990 vintage SF6 filled circuit breakers.
- The manufacturer provides no support for these types of breakers and there are no spare parts available for these breakers.
- Circuit Breaker A, B, C, & D, have each exceeded the manufacturer's recommended number of fault operations. Circuit Breaker S has experienced 6 low gas level malfunctions since December 2013. The age of the seals are causing the SF6 leaks to happen more frequently.

46kV Circuit Breakers H and N, 69kV Circuit Breaker T

- Circuit breaker H is 1960 vintage and N and T are 1972 vintage with all being oil filled without containment. The manufacturer provides no support for this fleet of circuit breakers and spare parts are not available. The breakers have oil contamination from aging gaskets allowing moisture and other particles to ingress.
- Circuit Breaker H, N and T have each exceeded the manufacturer's recommended number of fault operations.

Station conditions and Flooding

- The Station and Control House has experienced many floods in the past (1957, 1963, 1977 and 2002).
- Foundations are crumbling in the 46kV yard and the 138kV yard.



AEP Transmission Zone M-3 Process
McDowell County, West Virginia

Need Number: AEP-2022-AP028

Process Stage: Solutions Meeting 8/18/2023

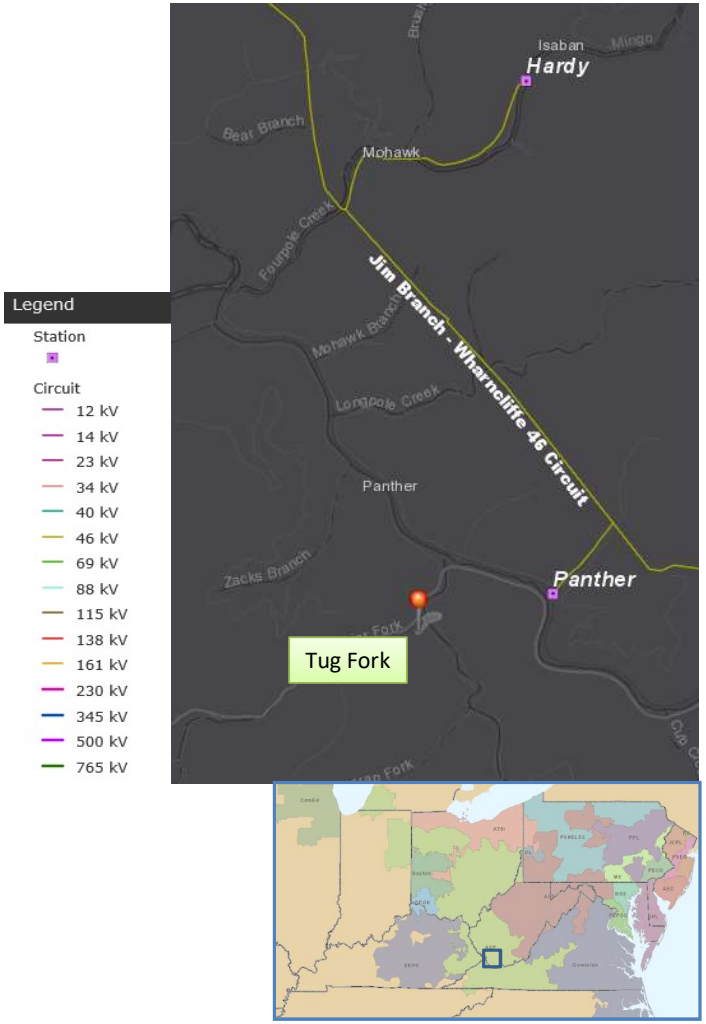
Previously Presented: Need Meeting 4/22/2022

Supplemental Project Driver: Customer Service

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 12)

Problem Statement:

- AEP Distribution has requested a new delivery point (Tug Fork) to serve initially 5 MVA.
- Hardy station has no room for expansion. Hardy station is located directly in front of a church and the church parking making expansion difficult in any direction. Roads to the station are single lane making it challenging to bring large equipment to the station.
- The Distribution transformers at Hardy station are 1940s vintage and based on the age of the units' insulating materials, the paper insulation is becoming increasingly brittle. In addition, the units lack thermally upgraded paper insulation. PHs A and B have high levels of Ethylene which is indicative of high decomposition of the paper insulating materials and high temperature thermal faults. In addition, PH C has high levels of Carbon Dioxide and Ethane which is indicative of excessive decomposition of the paper insulating materials and overheating.
- Panther station is a compact station and is located between a main road and a hill side which doesn't allow for expansion. Wash out is a major concern with the station being built next to the hill side. Roads and bridges to the station are narrow making it difficult to bring large equipment to the station.
- The Distribution transformers at Panther station are 1940s vintage and based on the age of the units' insulating materials, the paper insulation is becoming increasingly brittle. In addition, the units lack thermally upgraded paper insulation. The units have poor dielectric strength, decreasing the ability of the oil to withstand fault events which can damage the paper insulation.
- Neither Hardy or Panther stations have mobile access to pick up the loads in case of any transformer failure or outage.



AEP Transmission Zone M-3 Process
Buchanan County, Virginia

Need Number: AEP-2023-AP010

Process Stage: Solutions Meeting 8/18/2023

Previously Presented: Need Meeting 4/21/2023

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement Hurley Station:

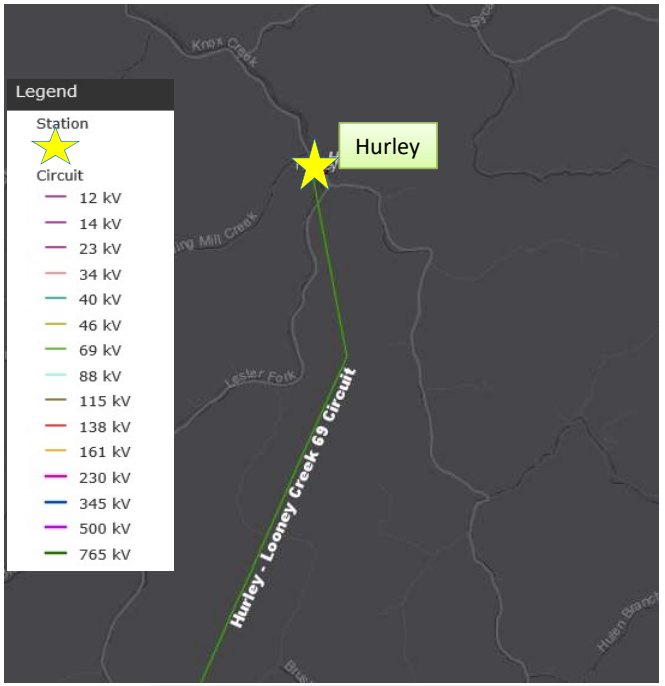
69/12kV TR-1

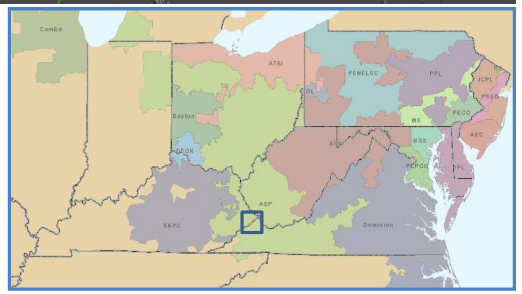
- 1977 Vintage Transformer
- The elevated and rising levels of acetylene indicate high decomposition of the paper insulating materials.
- The transformer has elevated moisture level which can be the result of gasket leaks or breakdown in the oil or paper/pressboard insulation. The decreasing and low level of dielectric strength, indicates an increase in particles within the oil, which in turn decreases the dielectric strength of the oil to withstand fault events. This can ultimately damage the paper insulation. The values of moisture and oil dielectric strength indicate the dielectric strength of the insulation system (oil and paper) is in poor condition.
- The condition of the transformer's wood tie foundation is unknown because it lies under the legacy asphalt oil containment.

Relay

- There are currently 7 electromechanical type relays which have significant limitations with regard to spare part availability and fault data collection and retention. In addition, these relays lack vendor support. 9 of the 11 relays (82% of all station relays) are in need of replacement.

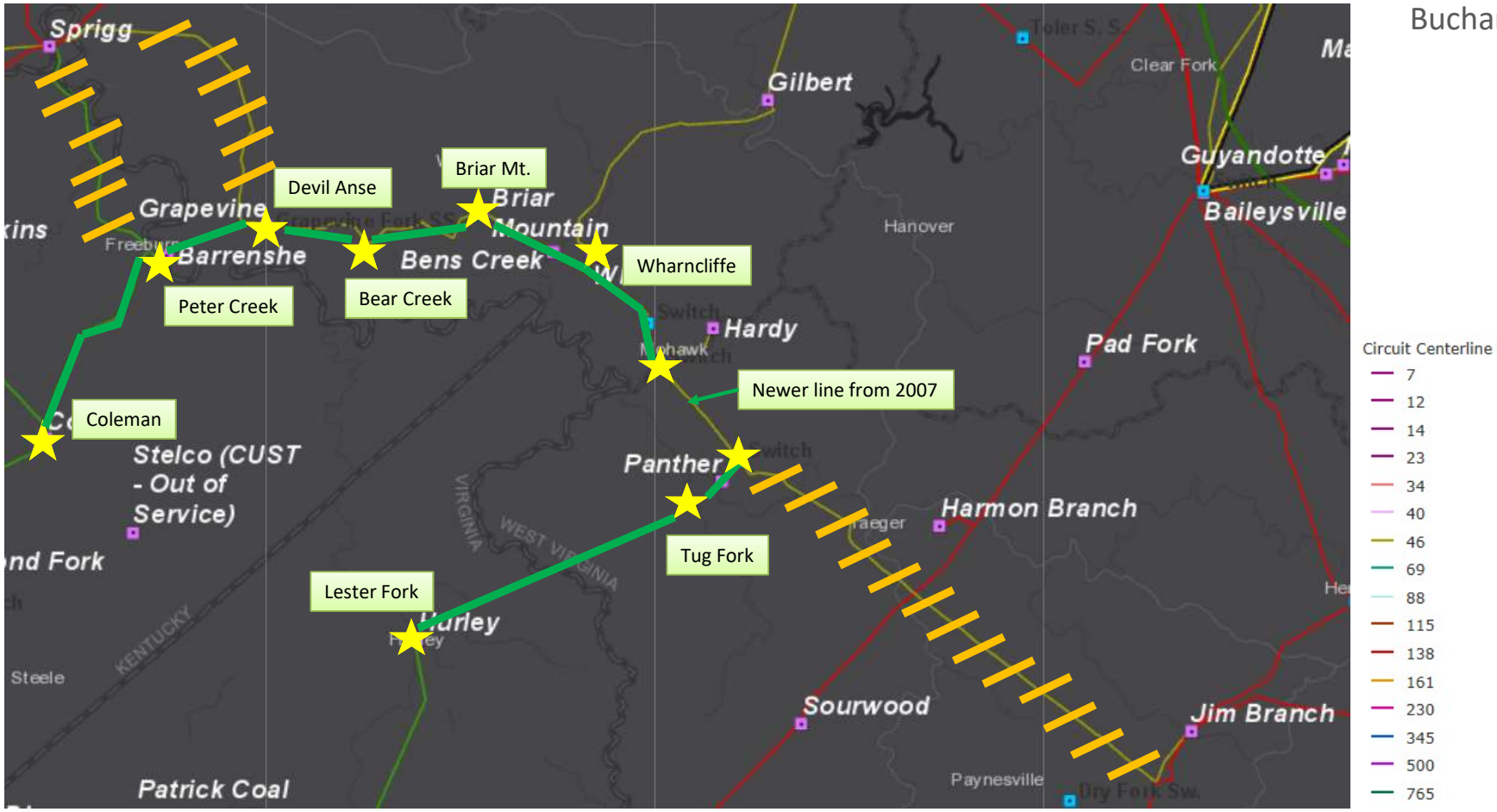
- Station exists within the 100-year floodplain. This site has flooded multiple times, most recently in 2021.
- Low side expansion is not feasible due to proximity of the station to the road and high side expansion would be difficult without major earthwork due to the station being against a hillside.
- One 69kV line outage on the Hurley – Looney Creek 69kV circuit from 2017 to 2022 caused 863,000 CMI for distribution customers at Hurley due to being on a radial 69kV service and Distribution not having any transferable capability. The radial 69kV line is 10.1 miles long and the Distribution load is 12.5 MVA.
- Limited access off the road for station ingress/egress.





Overview Map

AEP Transmission Zone M-3 Process
Pike County, KY and Mingo & McDowell Counties, WV
Buchanan County, VA



AEP Transmission Zone M-3 Process
Pike County, KY
Mingo & McDowell Counties, WV
Buchanan County, VA

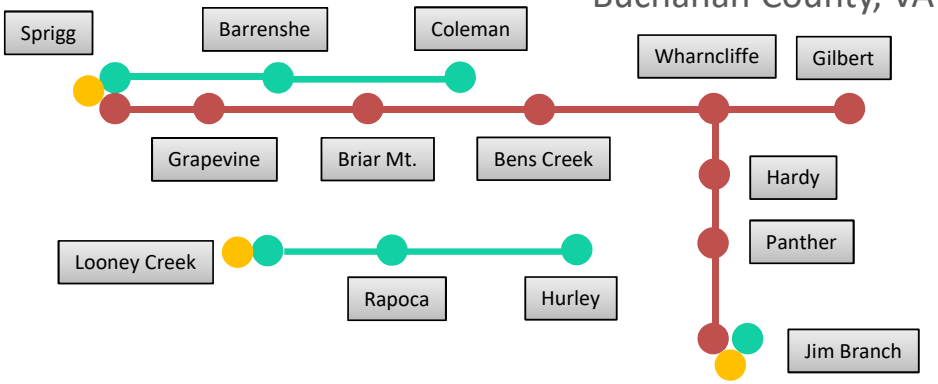
Need Number(s): AEP-2022-AP007, AEP-2022-AP008, AEP-2022-AP009, AEP-2022-AP010, AEP-2022-AP011, AEP-2022-AP028, AEP-2023-AP010

Process Stage: Solutions Meeting 08/18/2023

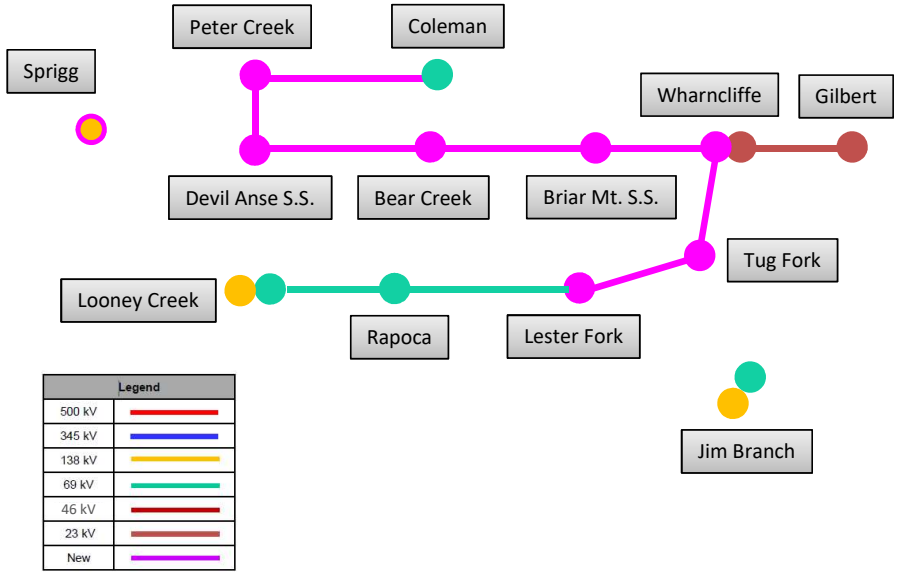
Proposed Solution:

- Coleman - Peter Creek 69kV line - Install new 69kV line with OPGW from Coleman station to Peter Creek Station. Total line length 5.8 miles. Rebuilding within the existing ROW, but some new ROW will be required to get from Coleman station to Peter Creek station. **Estimated Cost: $19.2 M**
- Peter Creek - Wharncliffe 69kV line - Install new 69kV line with OPGW from the KY/WV State Line to Peter Creek Station. Total line length 0.1 miles. New ROW will be required to get from the WV/KY state line to Peter Creek station. **Estimated Cost: $0.3 M**
- Peter Creek - Wharncliffe 69kV line - Install new 69kV line with OPGW from the KY/WV State Line to Wharncliffe Station. Intermediate station includes Bear Creek. Includes switching structures Devil Anse and Briar Mt. for Transmission customers and their delineation poles. Total line length 12.7 miles. Rebuilding within the existing ROW, but some new ROW will be required to get from the WV/KY state line to Devil Anse S.S. **Estimated Cost: $44.7 M**
- Devi Anse S.S. Metering - One 69kV meter for the Transmission customer and one 69kV meter facing the WV/KY state line. **Estimated Cost: $0.5 M**
- Briar Mt. S.S. Metering - One 69kV metering structure for the Transmission customer. **Estimated Cost: $0.9 M**
- Huff Creek - Wharncliffe 46kV line - The remove the span into the takeoff and the first structure 556-109 then re-terminate the line into the new station takeoff structure on the Huff Creek – Wharncliffe 46kV line. **Estimated Cost: $0.25 M**
- Tug Fork - Wharncliffe 69kV line - Install a new single circuit 69kV with OPGW line from existing Wharncliffe station to Tug Fork station totaling 5.9 miles long. Also reusing 2.3 miles of the Jim Branch – Wharncliffe line asset at 69kV that was rebuilt in 2007. Create 2.2 miles of greenfield ROW and reuse 3.7 miles of existing ROW from Tug Fork to Wharncliffe stations. **Estimated Cost: $24.3 M**
- Lester Fork - Tug Fork 69kV line - Install a new single circuit 69kV with OPGW line from Lester Fork to Tug Fork stations crossing the VA/WV state border totaling 8.0 miles long. Create greenfield ROW from Lester Fork to Tug Fork stations crossing the VA/WV state border. **Estimated Cost: $33.9 M**
- Looney Creek - Lester Fork 69kV line - Install new 69kV line with OPGW from structure 343-1A to the new Lester Fork Station at 0.25 miles. Remove structure 343-1 and the span into the Hurley Station at 0.1 miles. Create greenfield ROW from structure 343-1A to Lester Fork station at 0.25 miles. **Estimated Cost: $2.51 M**
- Rapoca 69kV Customer - Replace the Rapoca Station hard tap from the Hurley - Looney 69kV circuit with a Phase over Phase switch. **Estimated Cost: $0.7 M**
- Bear Creek Station - Two 69kV MOABs that are automatic, and SCADA controlled for the Bear Creek 69kV work. **Estimated Cost: $0.9 M**

Existing



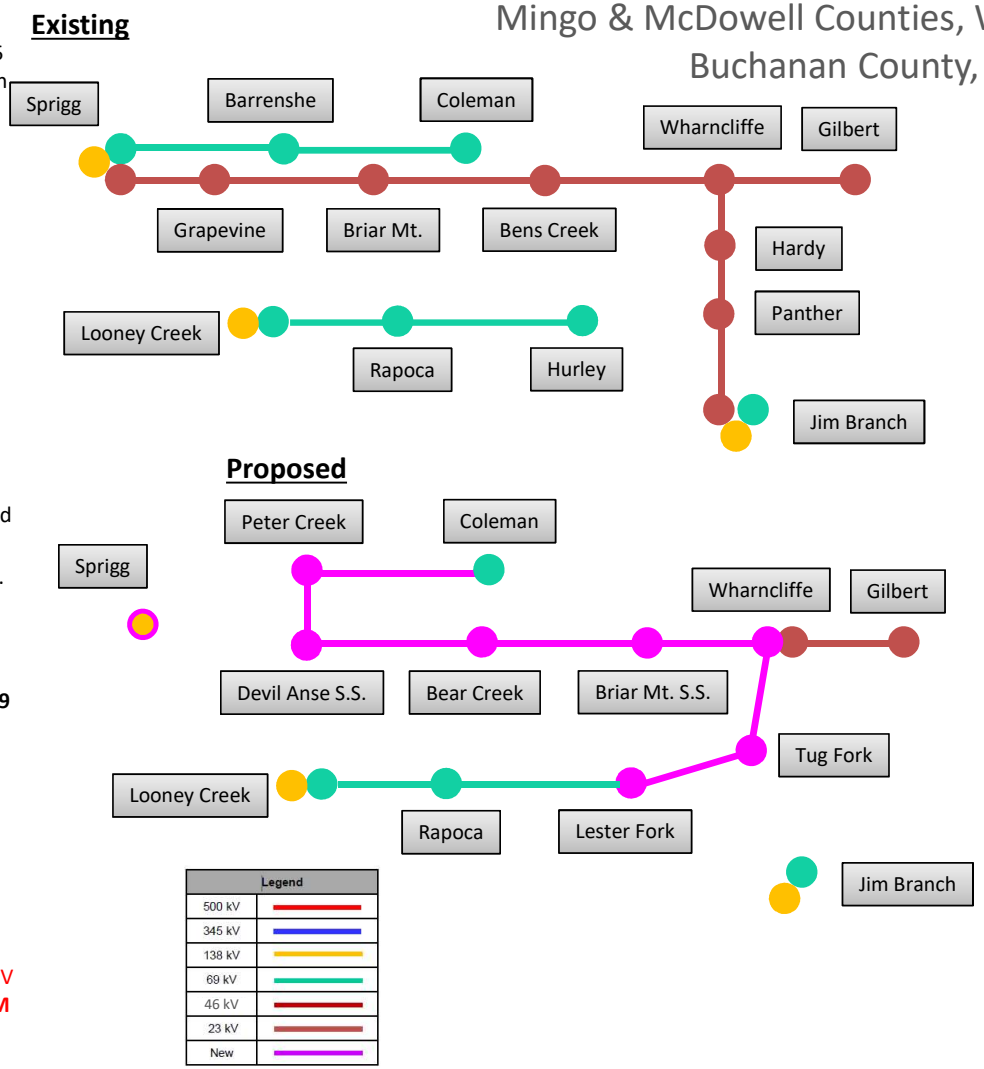
Proposed



AEP Transmission Zone M-3 Process
Pike County, KY
Mingo & McDowell Counties, WV
Buchanan County, VA

Proposed solution Continued:

- Wharncliffe Station - Upgrade the existing Wharncliffe station to 69kV. One 69kV Capacitor bank that is 11.5 MVAR and circuit switcher. One 69/46kV 50 MVA transformer and one 46kV circuit breaker facing Gilbert on the low side of the transformer. Reusing the existing three Transmission circuit breaker for the high side of the transformer and lines facing Tug Fork and Briar Mt. S.S. **Estimated Cost: $5.9 M**
- Tug Fork Station - Two 69kV circuit breakers with one facing Wharncliffe and the other facing Lester Fork stations. Includes 69kV bus work. **Estimated Cost: $2.1 M**
- Lester Creek Station - One 69kV meter facing Tug Fork for the state line crossing. **Estimated Cost: $0.3 M**
- Looney Creek Station - Replace the existing 69kV MOAB facing Lester Fork with a 69kV circuit breaker. **Estimated Cost: $1.2 M**
- Sprigg - Barrenshe 69kV line - Remove approximately 6.9 miles of Sprigg - Barrenshe 69kV line. **Estimated Cost: $0.024 M**
- Barrenshe – Coleman 69kV line - Remove approximately 6.2 miles of Barrenshe - Coleman 69kV line. **Estimated Cost: $0.024 M**
- Sprigg - Wharncliffe 46kV line - Remove approximately 1.29 miles of Sprigg - Wharncliffe 46kV line in KY. **Estimated Cost: $1.1 M**
- Sprigg - Wharncliffe 46kV line - Remove approximately 18.3 miles of Sprigg - Wharncliffe 46kV line in WV and remove the Grapevine Switching Structure. **Estimated Cost: $14.2 M**
- Jim Branch - Wharncliffe 46kV line - Remove approximately 19.7 miles of Jim Branch - Wharncliffe 46kV line. **Estimated Cost: $15.3 M**
- Hardy Tap 46kV line - Remove approximately 2.0 miles of the Hardy Tap 46kV line and remove the Hardy Switching Structure. **Estimated Cost: $1.9 M**
- Panther Tap 46kV line - Remove approximately 0.7 miles of the Panther Tap 46kV line. **Estimated Cost: $0.69 M**
- Briar Mt. Tap 46kV line - Remove approximately 0.1 miles of the Briar Mt. Tap 46kV line. **Estimated Cost: $0.12 M**
- Grapevine Tap 46kV line - Remove approximately 0.1 miles of the Grapevine Tap 46kV line. **Estimated Cost: $0.45 M**
- Jim Branch station Removal - Remove the 46kV Circuit Breaker P facing Panther and the Grounding Bank. **Estimated Cost: $0.087 M**
- Sprigg Station ~~Removal~~ - Remove all the 46kV bus and attached equipment. Remove the 138/69 – 46kV transformer and the 46/7.2KV GND Bank. Remove the 69kV bus and attached equipment. Remove the 138kV equipment. Rebuild the station as a four 138kV circuit breaker ring bus station. **Estimated Cost: ~~$1.1 M~~ $5M**

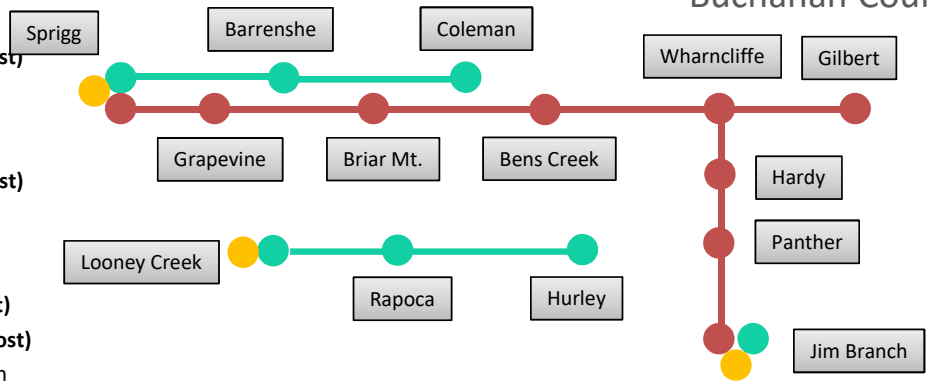


Proposed solution Continued:

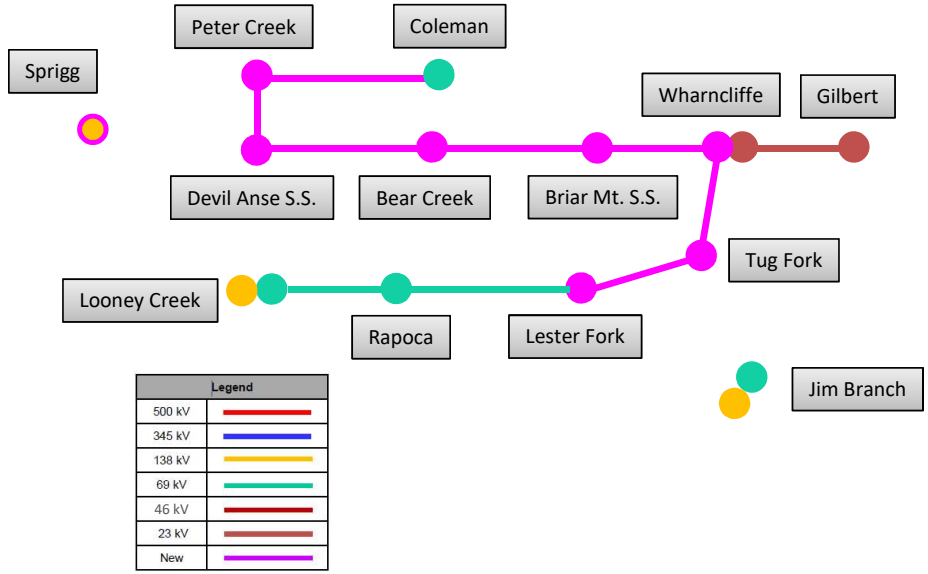
- Coleman Station - Replace 69kV circuit breaker H towards Peter Creek and risers. **Estimated Cost: $0 (Distribution Cost)**
- Barrenshe Station - Removal of the Distribution station and equipment. **Estimated Cost: $0 (Distribution Cost)**
- Peter Creek Station - A new Distribution station that is replacing Barrenshe station that has a MOAB that is Scada controlled facing Coleman and a 69kV circuit breaker facing Devil Anse S.S. One 69kV circuit switcher and a 20 MVA 69/12kV Transformer and 4 Distribution feeders. **Estimated Cost: $0 (Distribution Cost)**
- Grapevine Station - Removal of the Distribution station and equipment. **Estimated Cost: $0 (Distribution Cost)**
- Bear Creek Station - A new Distribution station that is replacing Grapevine station that has one 69kV circuit switcher and a 20 MVA 69/34kV Transformer and two Distribution feeder. Also helping to break up a large Distribution circuit out of Pigeon Creek station. **Estimated Cost: $0 (Distribution Cost)**
- Briar Mt. Station - Removal of the Distribution station and equipment. **Estimated Cost: $0 (Distribution Cost)**
- Bens Creek Station - Removal of the Distribution station and equipment. **Estimated Cost: $0 (Distribution Cost)**
- Wharncliffe Station - Add one 69kV circuit switcher and a 20 MVA 69/12kV transformer and one Distribution feeder to pick up the load from the retired Bens Creek and Briar Mt. stations. **Estimated Cost: $0 (Distribution Cost)**
- Tug Fork Station - A new Distribution station that is replacing Hardy and Panther stations that has one 69kV circuit switcher and a 20 MVA 69/12kV Transformer and three Distribution feeder. **Estimated Cost: $0 (Distribution Cost)**
- Hardy and Panther Stations - Removal of the Distribution stations and equipment. **Estimated Cost: $0 (Distribution Cost)**
- Lester Fork Station - A new Distribution station that is replacing Hurley station that has two MOABs that are Scada controlled, one 69kV circuit switcher and a 20 MVA 69/12kV Transformer and three Distribution feeder. **Estimated Cost: $0 (Distribution Cost)**
- Hurley Station - Removal of the Distribution station and equipment. **Estimated Cost: $0 (Distribution Cost)**
- Build 2 fiber station transitions using OPGW at Coleman and Peter Creek stations. **Estimated Cost: $0.2 M**
- Build 4 fiber station transitions using OPGW at Devil Anse S.S. Bear Creek, Briar Mt. S.S. and Wharncliffe. **Estimated Cost: $0.7 M**
- Lester Fork – Wharncliffe Fiber - Build 3 fiber station transitions using OPGW at Tug Fork, Wharncliffe and Lester Fork. Remove one of the existing shield wires and replace it with an OPGW at 2.3 miles on the Jim Branch – Wharncliffe line asset that is being reused from 2007. **Estimated Cost: $5.1 M**

Total Estimated Transmission Cost: ~~$178.66 M~~ $182.56 M

Existing



Proposed



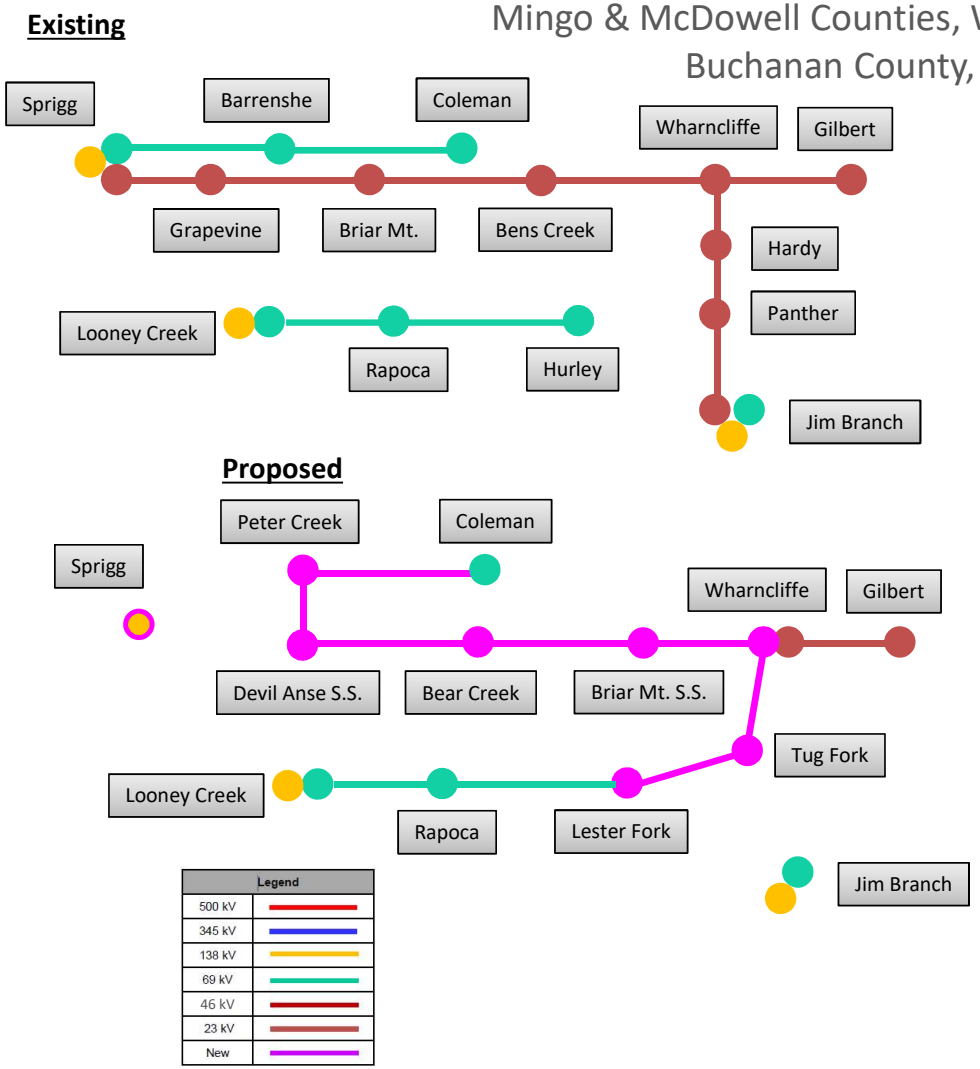
Proposed solution Continued:

Ancillary Benefits: The greenfield stations and new 69kV line addresses asset concerns on stations and lines that were in the flood plain, had aging equipment, tight clearances, and little to no room for vehicle pull off. The project will provide better sectionalizing to Distribution and Transmission customers. The project will retire roughly 40 miles of legacy 46kV lines and replace with less overall line milage (31 miles). The project will bring looped Transmission service to the Distribution customer served from the old Hurley station. Hurley station exceeds the 75 MVA * mile guideline.

Alternatives Considered:
An Alternative that was examined was a straight rebuild of the existing assets but operated at 69kV. Hardy and Panther would still be replaced with the new Tug Fork station. Wharncliffe station would still require a 69/46 transformer and two new circuit breakers. This option was not selected due to the longer line mileage of the straight rebuild at 57 miles vs the proposed solution of ~31 miles. This option also did not bring looped Transmission service to Hurley station. This option would have continued to use the existing stations that have space constraints making circuit breaker sectionalizing difficult to add. This option has a conceptual estimate of $248 Million.

Projected In-Service: 6/1/2030

Project Status: Scoping



ComEd Transmission Zone M-3 Process
State Distribution

Need Number: ComEd-2023-006

Process Stage: Solution Meeting 9/15/2023

Previously Presented: Need Meeting 8/18/2023

Project Driver:

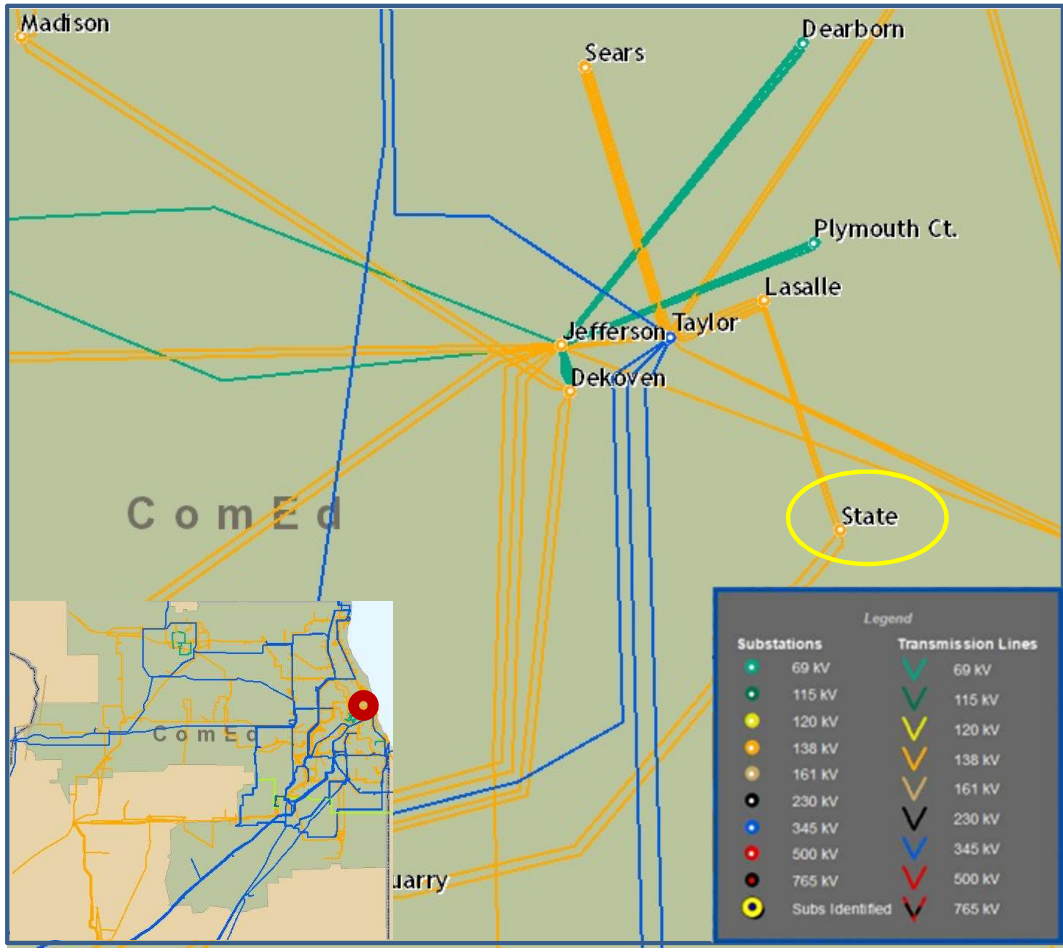
Customer Service

Specific Assumption Reference:

- Transmission System configuration changes due to new or expansion of existing distribution substations

Problem Statement:

ComEd Distribution has a need for an additional 138-12 kV transformer at State substation.



ComEd Transmission Zone M-3 Process
State Distribution

Need Number: ComEd-2023-006

Process Stage: Solution Meeting 9/15/2023

Previously Presented: Need Meeting 8/18/2023

Preferred Solution:

Install a new 50 MVA 138-12 kV distribution transformer and 138 kV BT 4-5 CB at State substation.

Estimated transmission cost: $2M

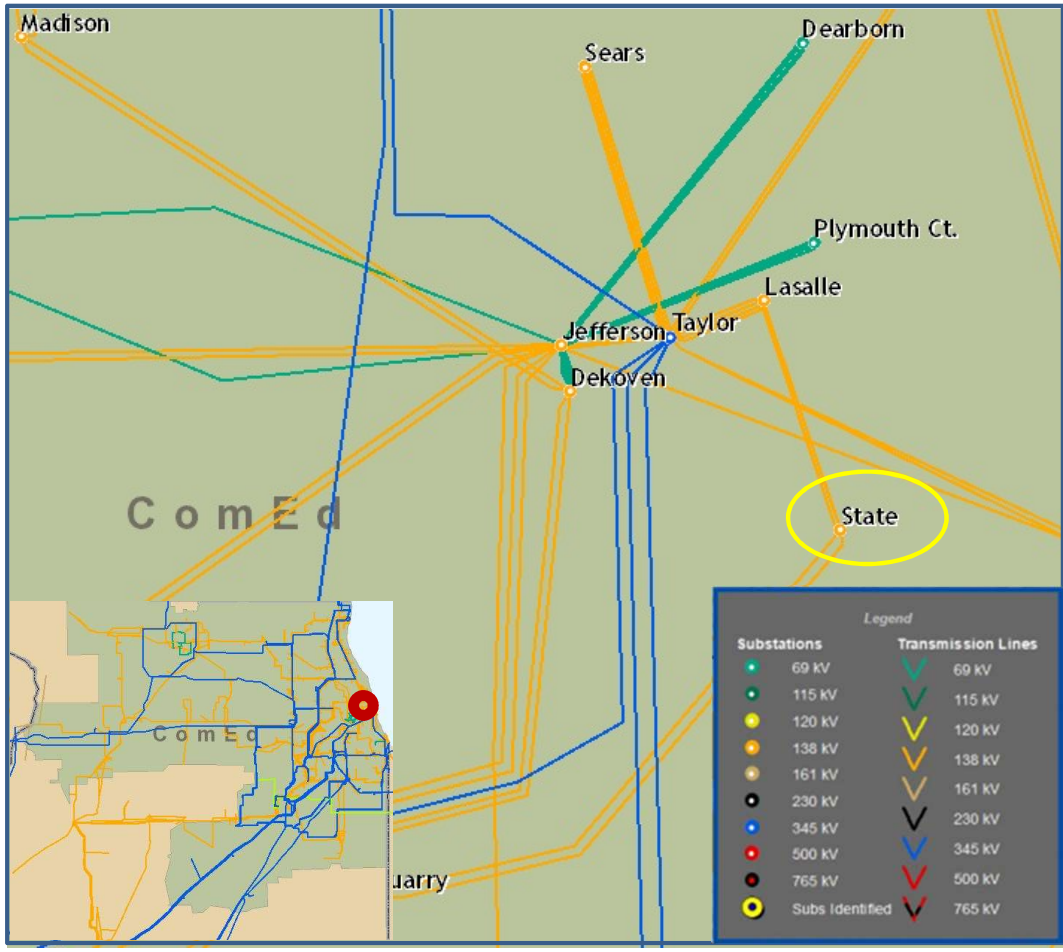
Alternatives Considered:

No feasible alternatives.

Projected In-Service: 6/1/24

Project Status: Conceptual

Model: 2027 RTEP



ComEd Transmission Zone M-3 Process
Customer in Itasca

Need Number: ComEd-2023-009

Process Stage: Solutions Meeting 10/20/2023

Previously Presented: Need Meeting 9/15/2023

Project Driver:

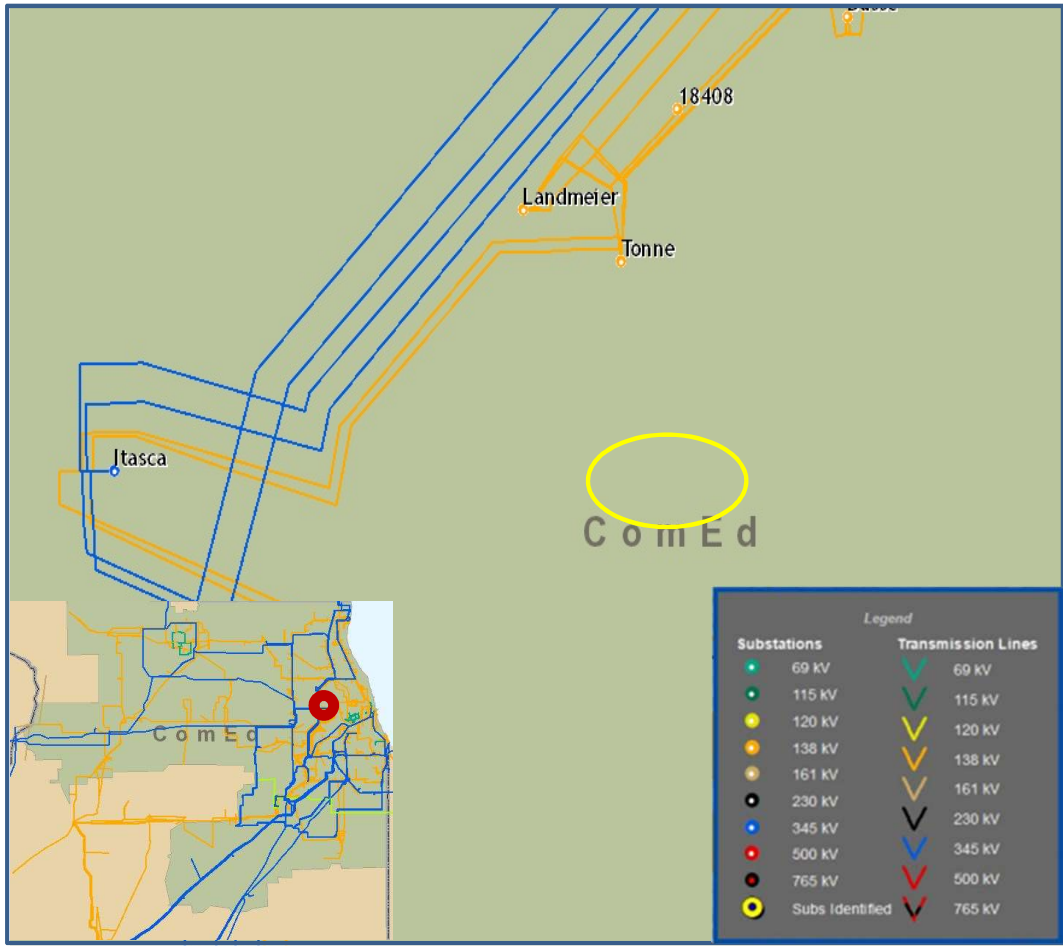
Customer Service

Specific Assumption Reference:

- New transmission customer interconnections or modification to an existing customer

Problem Statement:

New customer is looking for transmission service in the Itasca area. Initial loading is expected to be 83 MW in June 2026, 113 MW in 2028, with an ultimate load of 113 MW.



ComEd Transmission Zone M-3 Process
Customer in Itasca

Need Number: ComEd-2023-009

Process Stage: Solutions Meeting 10/20/2023

Previously Presented: Need Meeting 9/15/2023

Preferred Solution:

- New customer will be radially served by expanding the bus at Itasca with 2 new bays to connect 2 new 3 mile 138 kV lines from Itasca to the customer site. Customer substation will be double ring bus configuration with 4 – 138 kV to 34 kV transformers.

Estimated transmission cost: $8M

Alternatives Considered:

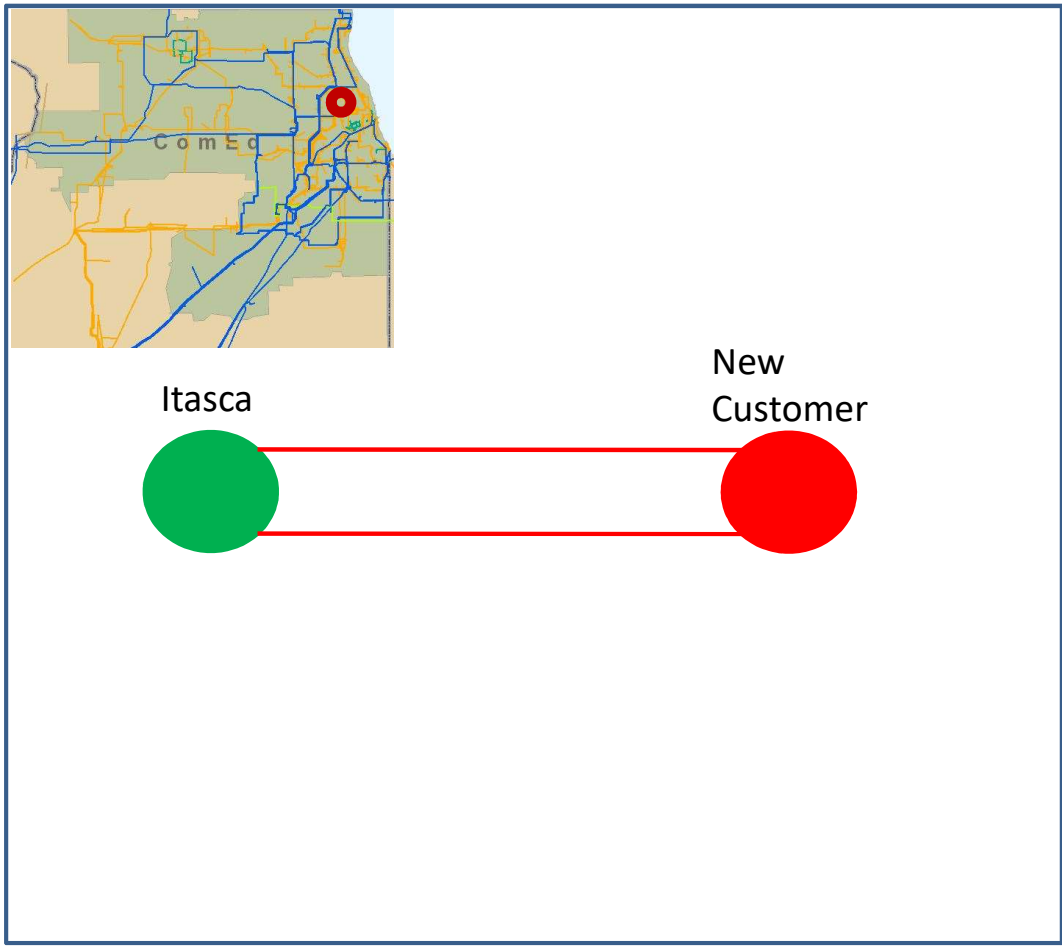
Cut into 138 kV lines Tonne – Itasca. Extend 138 kV lines 3 mile to customer location to connect to new double ring bus substation. This alternative was not selected due to higher cost.

Estimated transmission cost: $50M

Projected In-Service: 6/1/26

Project Status: Conceptual

Model: 2027 RTEP



DEOK Transmission Zone M-3 Process
Dayton Technologies, Worthington Steel

Need Number: DEOK-2023-007

Process Stage: Solutions Meeting 10/20/2023

Previously Presented: Needs Meeting 08/18/2023

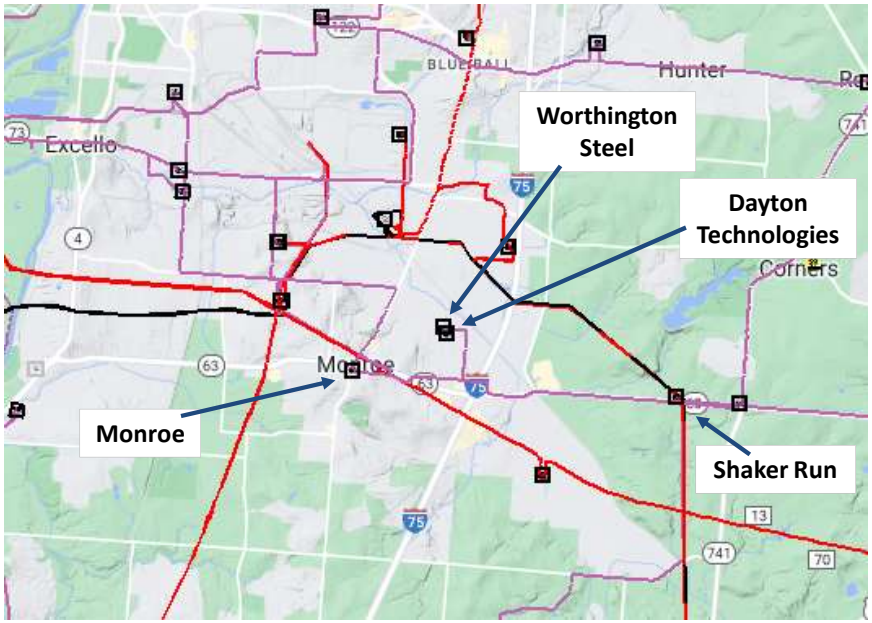
Project Driver: Operational Flexibility and Efficiency

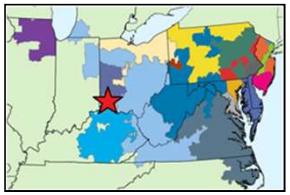
Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 8

Problem Statement:

Dayton Technologies and Worthington Steel substations supply industrial customers. They are fed from a 69 kV line tapped into the Monroe – Shaker Run feeder. Damage to the tap line or the feeder results in the inability to supply the customers for the time required to repair the damage. Scheduled work requires coordination of outage windows with both customers. In the past it's been necessary to perform maintenance work with the line energized due the inability of the customers to take an outage.





345kV
138kV
69kV

DEOK Transmission Zone M-3 Process
Dayton Technologies, Worthington Steel

Need Number: DEOK-2023-007

Process Stage: Solutions Meeting 10/20/2023

Previously Presented: Needs Meeting 08/18/2023

Project Driver: Operational Flexibility and Efficiency

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slide 8

Potential Solution:

Tap into the 69 kV Todhunter-Monroe feeder. Replace a 600A switch between Todhunter and the new tap with a 2000A switch to increase the capacity of the feeder. Install 0.9 miles of feeder from the new tap to Dayton Technologies using 17 steel poles with 954 ACSR conductor. Install a tap with a switch and drop to connect Worthington Steel. This configuration allows Worthington Steel and Dayton Technologies to be fed from either direction and the isolation of both individually.

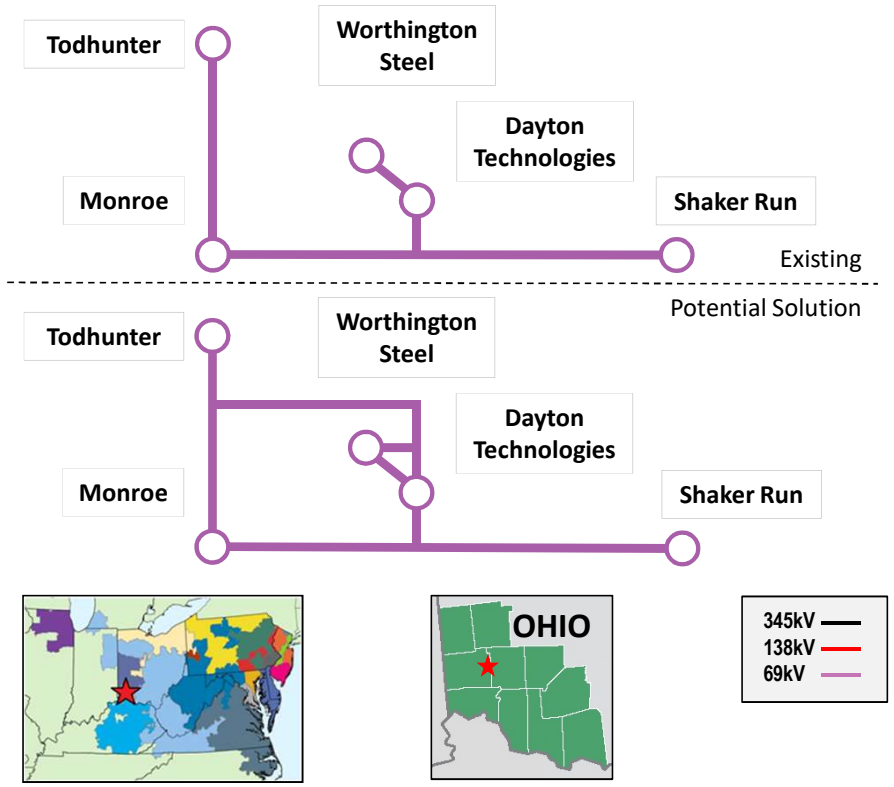
Ancillary Benefits: Loop flow between Todhunter and Shaker Run is maintained when maintenance is required at Monroe.

Estimated Transmission Cost: $5,733,438

Proposed In-Service Date: 12-31-2025

Project Status: Scoping

Model: 2023 RTEP



DEOK Transmission Zone M-3 Process
Carlisle

Need Number: DEOK-2022-008

Process Stage: Solutions Meeting 10-20-2023

Previously Presented: Needs Meeting 11-18-2022

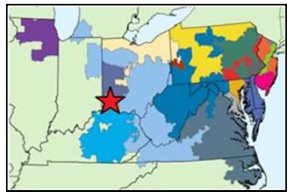
Project Driver: Equipment Condition, Performance and Risk, and Infrastructure Resilience

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slides 5, 6, & 8

Problem Statement:

138/69/13 kV Transformer TB2 at Carlisle feeds two distribution buses through a tertiary winding. This exposes the transformer to faults on the distribution system. 2000A, 69 kV breakers 619, 621, 622 and 623 are 39 years old and oil filled, requiring more maintenance due to oil handling. The mechanisms, linkages, & interrupters of these breakers are worn to the point where proper measurements are difficult to obtain & maintain. This often leads to mis-operations which could jeopardize system reliability. Spare parts for these older oil breakers are becoming difficult to find and are no longer available from the vendor. 39.6 MVAR, 69 kV Capacitor 2 is 31 years old and has reached the end of its useful life. Replacement of this fused-barrel type capacitor is recommended after 25 years.



345kV
138kV
69kV

DEOK Transmission Zone M-3 Process
Carlisle

Need Number: DEOK-2022-008

Process Stage: Solutions Meeting 10-20-2023

Previously Presented: Needs Meeting 11-18-2022

Project Driver: Equipment Condition, Performance and Risk, and Infrastructure Resilience

Specific Assumption Reference:

Duke Energy Ohio & Kentucky Local Planning Assumptions slides 5, 6, & 8

Potential Solution:

Disconnect the 13 kV tertiary winding on TB2. Install a new 138/13 kV, 22.4 MVA transformer to feed the distribution buses. Replace 69 kV breakers 619, 621, 622 and 623 with 2000A breakers. Replace Capacitor 2 with a non-fused, rack style 36.9 MVAR capacitor. Install two new 138 kV breakers to form a ring bus with the one existing breaker.

Ancillary Benefits: The 138 kV ring bus configuration provides operational options for switching, provides more options to deal with non-standard operating conditions, improves the system's ability to absorb and recover from an interruption, and reconfigures infrastructure to limit load loss.

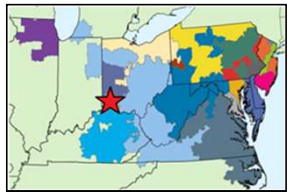
Estimated Transmission Cost: $10,239,263

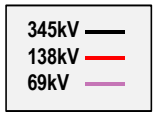
Proposed In-Service Date: 04-24-2026

Project Status: Scoping

Model: 2022 RTEP

Bubble Diagram Not Applicable
Station Modifications Only





ATSI Transmission Zone M-3 Process
Cloverdale 138 kV Customer Connection

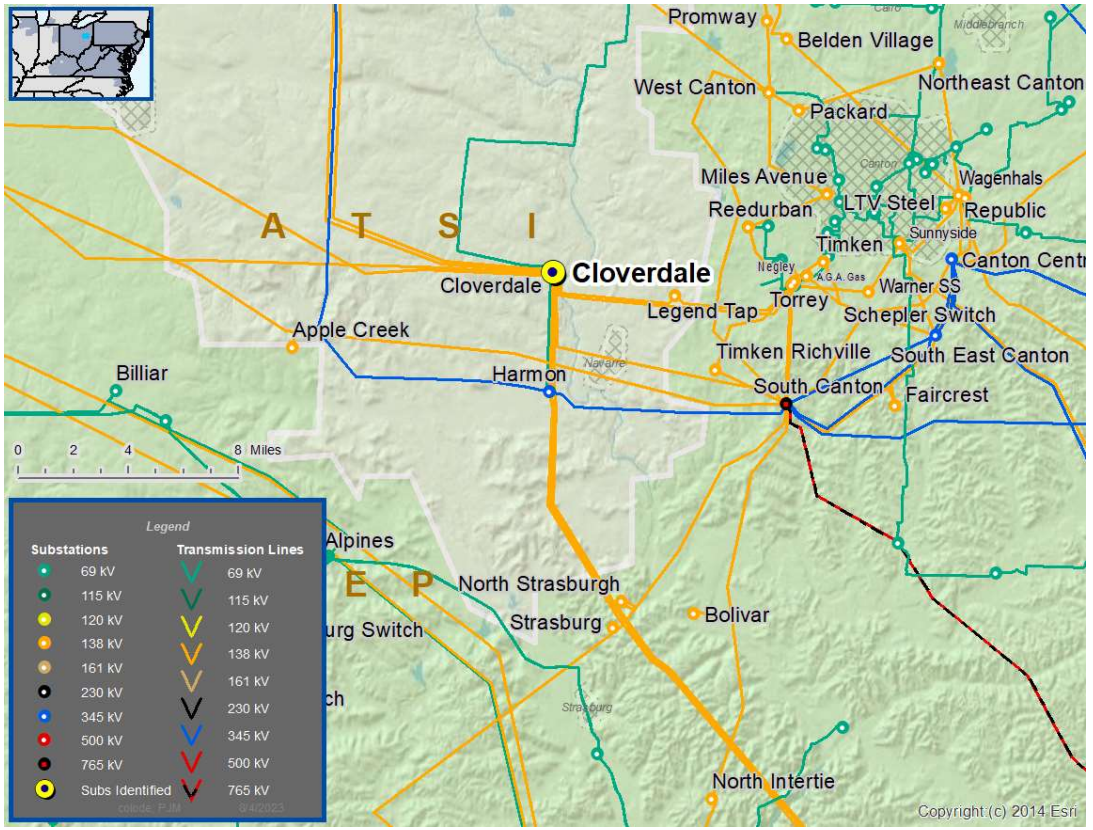
Need Number: ATSI-2023-022
Process Stage: Solution Meeting – 10/20/2023
Previously Presented: Need Meeting – 8/18/2023

Supplemental Project Driver(s):
Customer Service

Specific Assumption Reference(s):
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
New Customer Connection – has requested a new 138 kV delivery point from the Cloverdale 138 kV Substation. The anticipated load of the new customer connection is 200 MVA.

Requested In-Service Date:
October 1, 2022



ATSI Transmission Zone M-3 Process
Cloverdale 138 kV Customer Connection

Need Number: ATSI-2023-022
Process Stage: Solution Meeting – 10/20/2023
Previously Presented: Need Meeting – 8/18/2023

Proposed Solution:

138 kV Direct Substation Delivery Point

- Install a 138 kV circuit breaker at the Cloverdale 138 kV North bus.
- Construct approximately 0.1 miles of transmission line from the Cloverdale Substation to the customer substation.
- Install one SCADA controlled transmission line switch.

Alternatives Considered:

- No other feasible alternatives to serve the customer's load.

Estimated Project Cost: $0.0

Projected In-Service: 12/1/2025
Status: Engineering

EKPC Transmission Zone M-3 Process
Fayette-Baker Lane

Need Number: EKPC-2023-004

Process Stage: Solutions Meeting – October 20, 2023

Previously Presented:

Need Meeting – September 15, 2023

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk
Operational Flexibility and Efficiency & Infrastructure Resilience

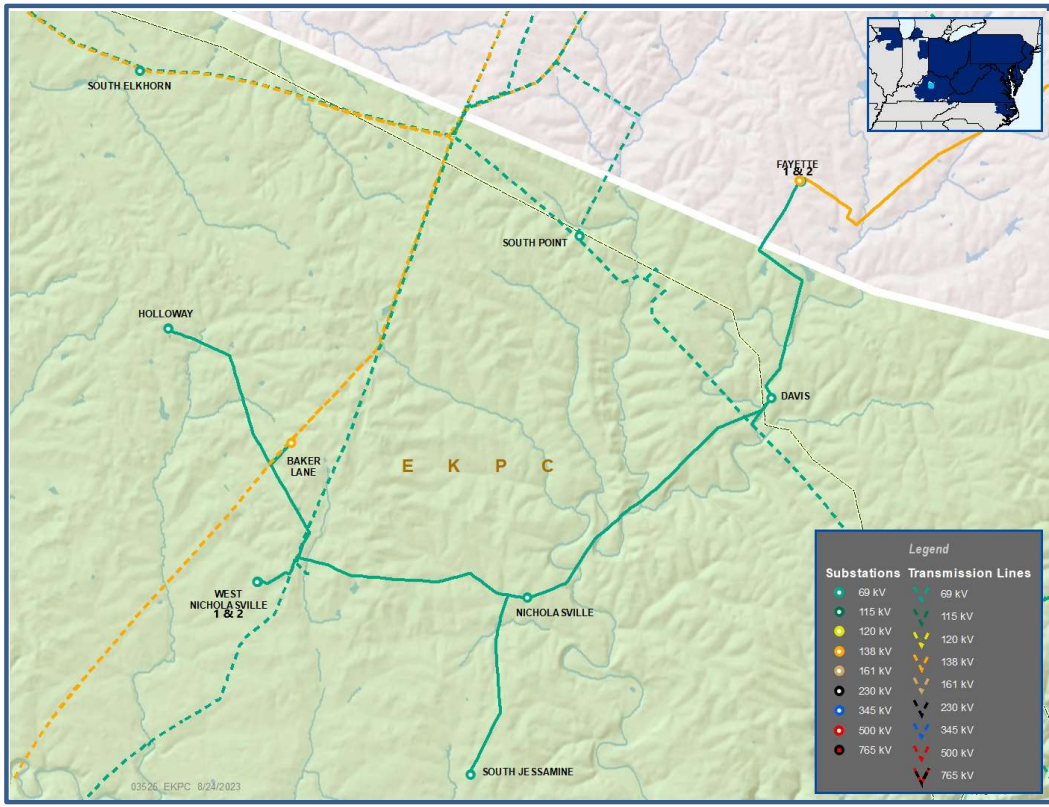
Specific Assumption Reference:

EKPC Assumptions Presentation Slides 13, 14 & 16

Problem Statement:

The 12 mile, Fayette-Baker Lane 69 KV transmission line is 1966 to 1989 vintage wood pole construction with sections of 266.8 and 556.5 conductor. This line currently serves 8 distribution substation with 15,864 customers, which is the highest number of customers of any circuit on EKPC's system. This line section exhibits wood deterioration and overloaded structures. This combination creates a high risk for structure failures. Additionally, the makeup of this 12 mile circuit with the long tap lines for South Jessamine and Holloway substations, this creates system protection issues with the 69 KV relays reaching into the 138 KV system during certain outages. The EKPC Reliability team is evaluating alternatives to address these aging infrastructure and structure overload issues, system protection issues and to reduce the number of distribution substations between breakers.

Model: N/A



EKPC Transmission Zone M-3 Process
Fayette-Baker Lane

Need Number: EKPC-2023-004

Process Stage: Solutions Meeting – October 20, 2023

Proposed Solution:

Rebuild the 12 mile, Fayette-Baker Lane 69 KV circuit using 556.5 conductor and steel pole construction. Expand the scope of a current project to rebuild the Nicholasville distribution substation to include a new 69 KV double bay switching station and control building.

Transmission Cost: $17.5M

Distribution Cost: $4.5M

Ancillary Benefits:

- Reduces cost by expanding scope of an existing project versus doing as a separate project.

Alternatives Considered:

- No feasible alternatives

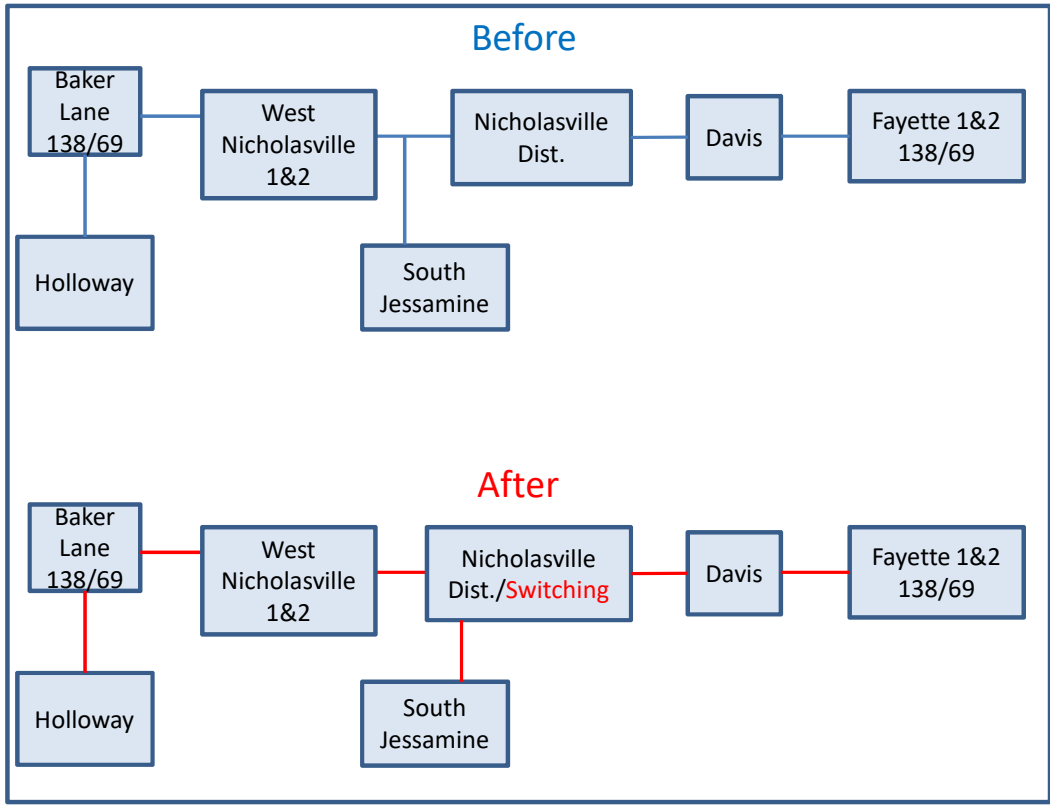
Projected In-Service:

Breaker station: 4/15/2024

T-Line rebuilds: 12/2025 – 12/2029

Project Status: Engineering

Model: N/A



EKPC Transmission Zone M-3 Process
North Lebanon

Need Number: EKPC-2023-005

Process Stage: Solutions Meeting – October 20, 2023

Previously Presented: Need Meeting – September 15, 2023

Supplemental Project Driver:

Customer Service

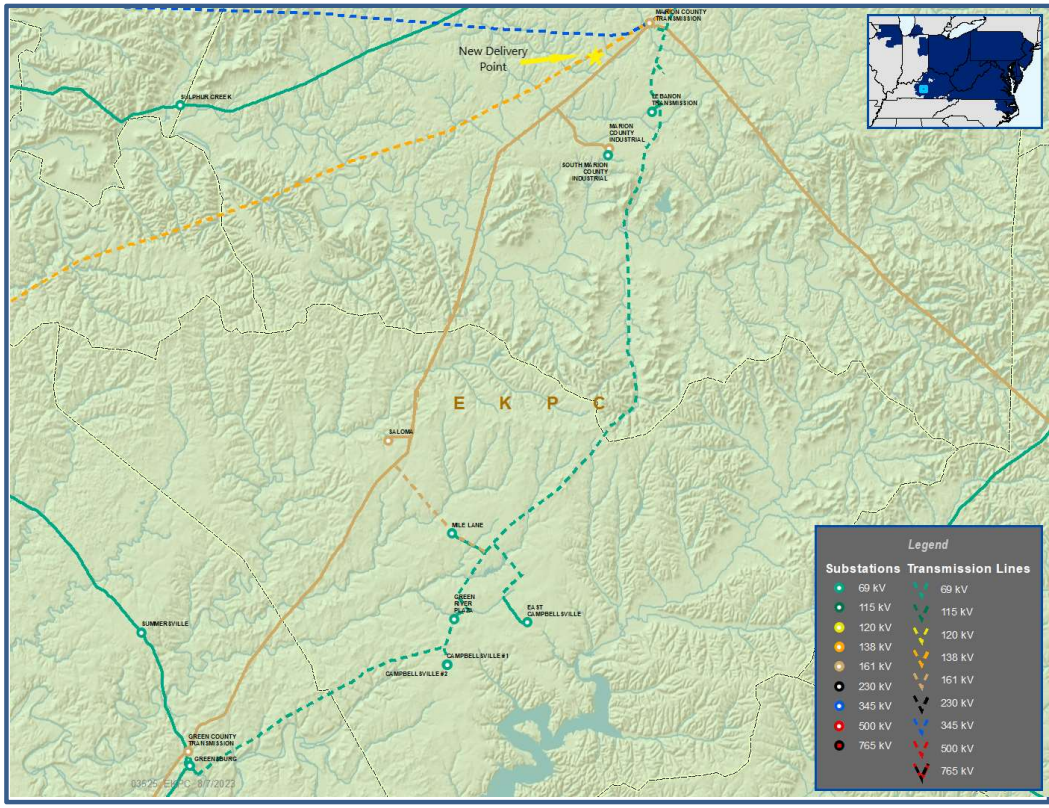
Specific Assumption Reference:

EKPC Assumptions Presentation Slide 15

Problem Statement:

A new customer has requested a delivery point for a peak demand of 18 MW by 4/1/2024. The new delivery point is located in Lebanon, KY approximately 2 mile southwest of the EKPC's Marion County substation. The existing distribution infrastructure is not capable of serving this request.

Model: N/A



EKPC Transmission Zone M-3 Process
North Lebanon

Need Number: EKPC-2023-005

Process Stage: Solutions Meeting – October 20, 2023

Proposed Solution:

Construct a new 161-13.8 KV distribution substation and associated 0.25 mile 161 KV double circuit tap line. This new delivery point will tap the existing EKPC Marion County-Green County 161 KV transmission circuit approximately 2 mile southwest of the Marion County substation.

Transmission Cost: $9.46K

Distribution Cost: $8.15M

Ancillary Benefits:

- None

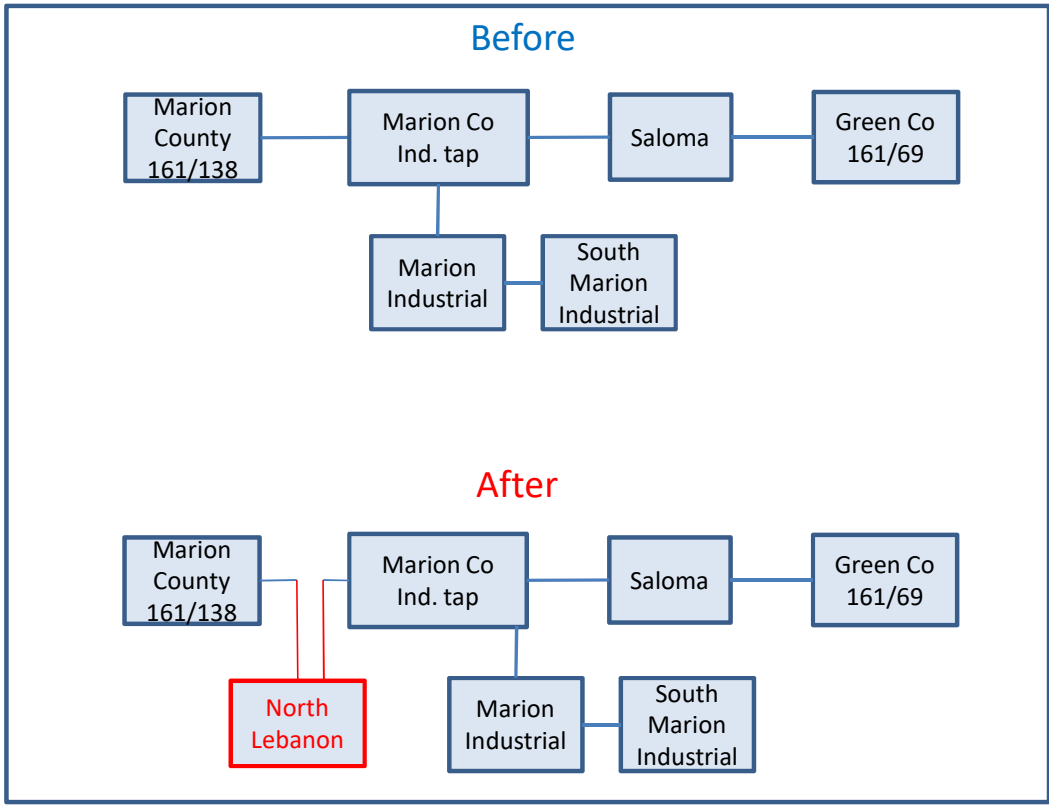
Alternatives Considered:

- No feasible alternatives

Projected In-Service: 4/1/2024

Project Status: Engineering

Model: N/A



EKPC Transmission Zone M-3 Process
Gordon Lane

Need Number: EKPC-2023-006

Process Stage: Solutions Meeting – October 20, 2023

Previously Presented: Need Meeting – September 15, 2023

Supplemental Project Driver:

Customer Service

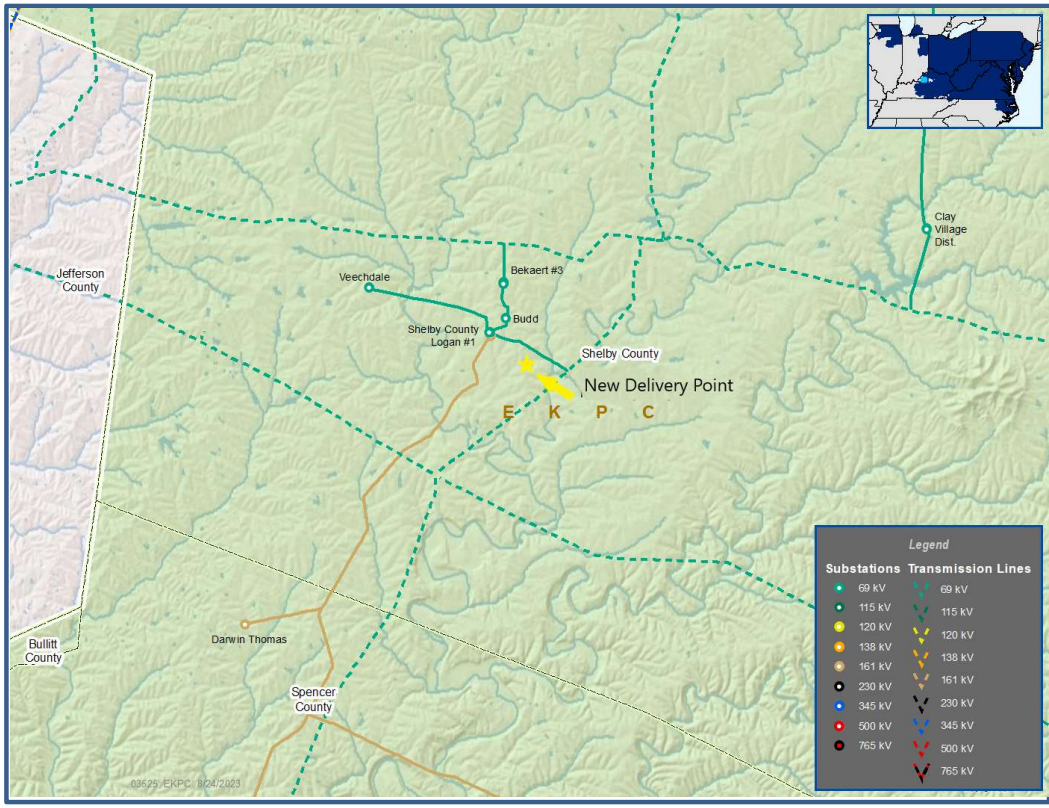
Specific Assumption Reference:

EKPC Assumptions Presentation Slide 15

Problem Statement:

A new customer has requested a delivery point for a peak demand of 9 MW by 9/1/2024. The new delivery point is located in Shelbyville, KY approximately 1.5 mile southeast of the EKPC's Shelby County substation. The existing distribution infrastructure is not capable of serving this request.

Model: N/A



EKPC Transmission Zone M-3 Process
Gordon Lane

Need Number: EKPC-2023-006

Process Stage: Solutions Meeting – October 20, 2023

Proposed Solution:
Construct a new 69-26.4 KV, 18/24/30 MVA distribution substation and associated 1.4 mile 69 KV tap line. The tap line will be constructed using 556.5 conductor and steel pole construction. This new station will be served from the EKPC Shelby County substation.

Transmission Cost: $0.0M
Distribution Cost: $6.3M

Ancillary Benefits:

- None

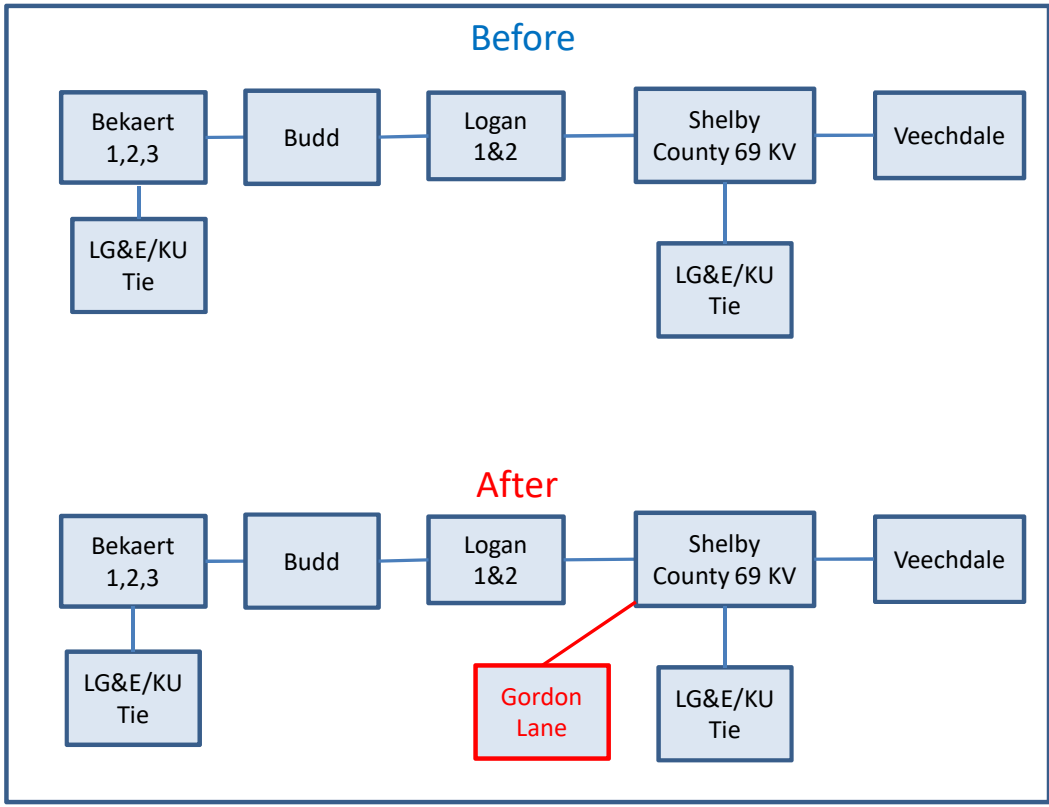
Alternatives Considered:

- No feasible alternatives

Projected In-Service: 4/1/2024

Project Status: Engineering

Model: N/A



EKPC Transmission Zone M-3 Process
Clay Village-New Castle

Need Number: EKPC-2023-008

Process Stage: Solutions Meeting – October 20, 2023

Previously Presented: Need Meeting – September 15, 2023

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk

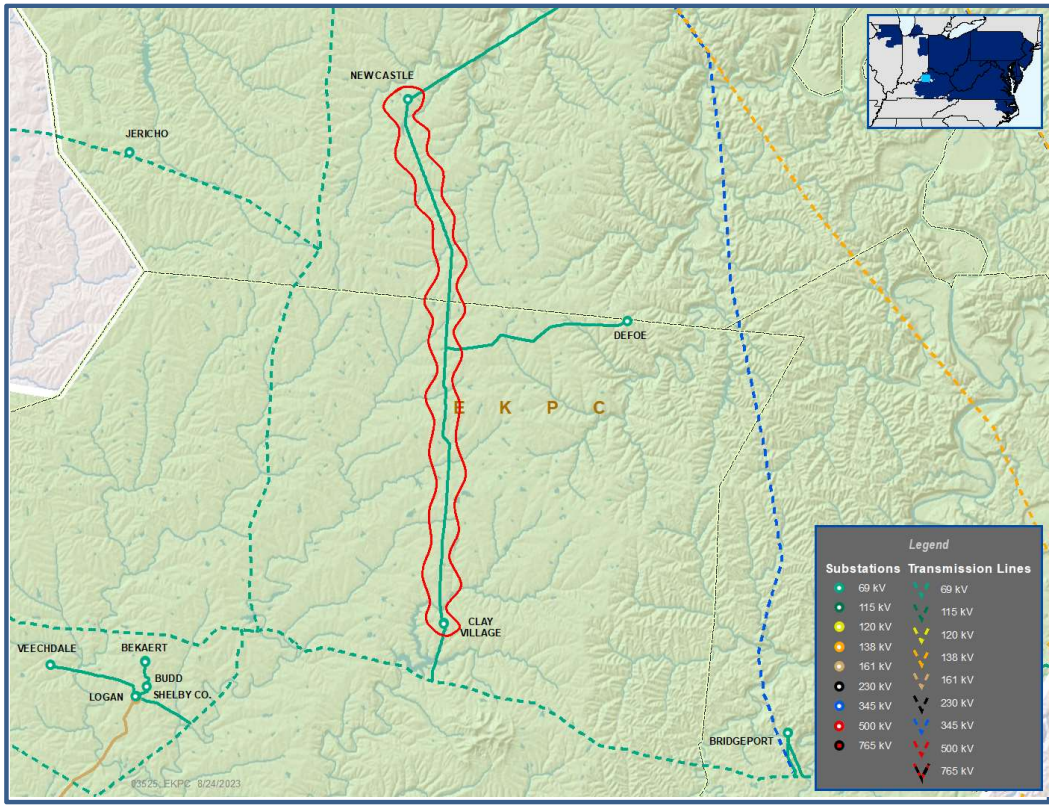
Specific Assumption Reference:

EKPC Assumptions Presentation Slide 13

Problem Statement:

The 14.29 mile, Clay Village-New Castle 69 KV is 1954 vintage wood pole construction with 1/0 conductor. This line section is expected to have condition issues such as conductor steel core and static wire deterioration, rust, pitting and possible broken strands. These condition issues have been exhibited by other 1/0 lines with similar age and environmental conditions. There are currently 36 open work orders with 17 being structure issues such as degraded poles, or cross arm issues. Based on this information, the EKPC Reliability team has concluded that this line is at or near end of life and should be addressed due to the condition.

Model: N/A



EKPC Transmission Zone M-3 Process
Clay Village-New Castle

Need Number: EKPC-2023-008

Process Stage: Solutions Meeting – October 20, 2023

Proposed Solution:

Rebuild the 14.29 mile, Clay Village-New Castle 69 KV line using 556.5 conductor and steel pole construction.

Transmission Cost: $10.77M

Distribution Cost: $0.0M

Ancillary Benefits:

- Supports future load growth in the area.

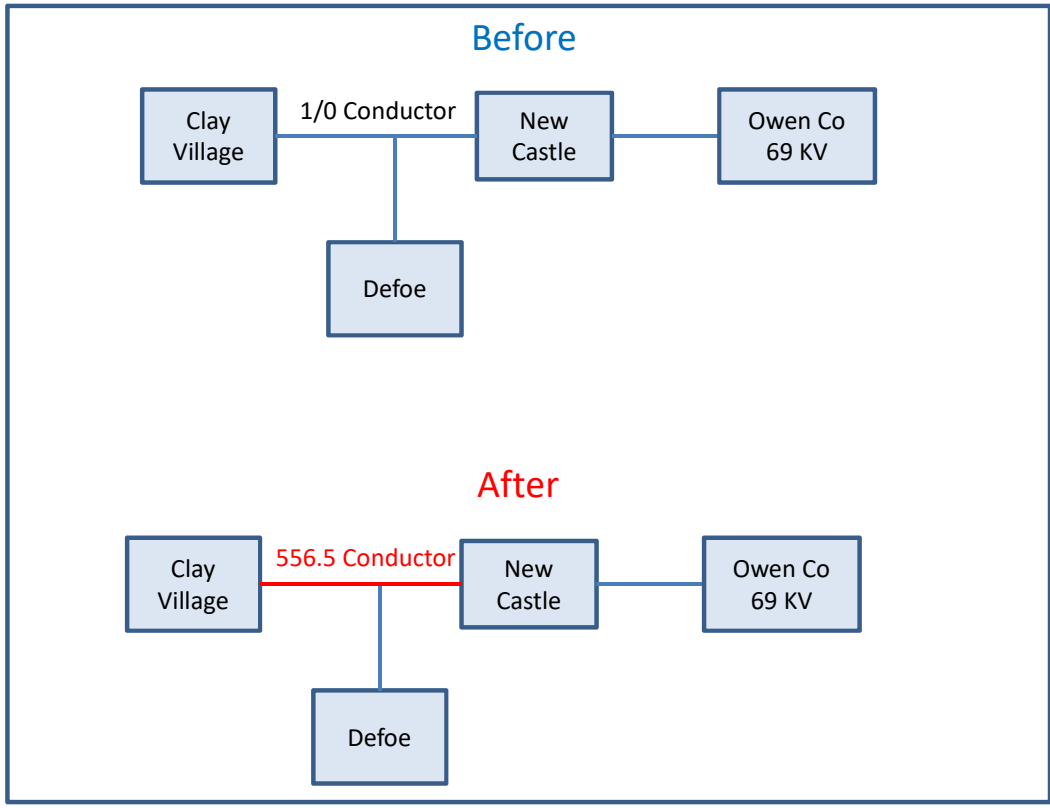
Alternatives Considered:

- Replace/repair as need, deemed not a feasible alternative.

Projected In-Service: 5/1/2025

Project Status: Engineering

Model: N/A



APS Transmission Zone M-3 Process
Buckhannon-Pruntytown 138 kV New Customer

Need Number: APS-2021-012

Process Stage: Solution Meeting – 10/20/2023

Previously Presented: Need Meeting – 08/15/2021

Project Driver(s):

Customer Service

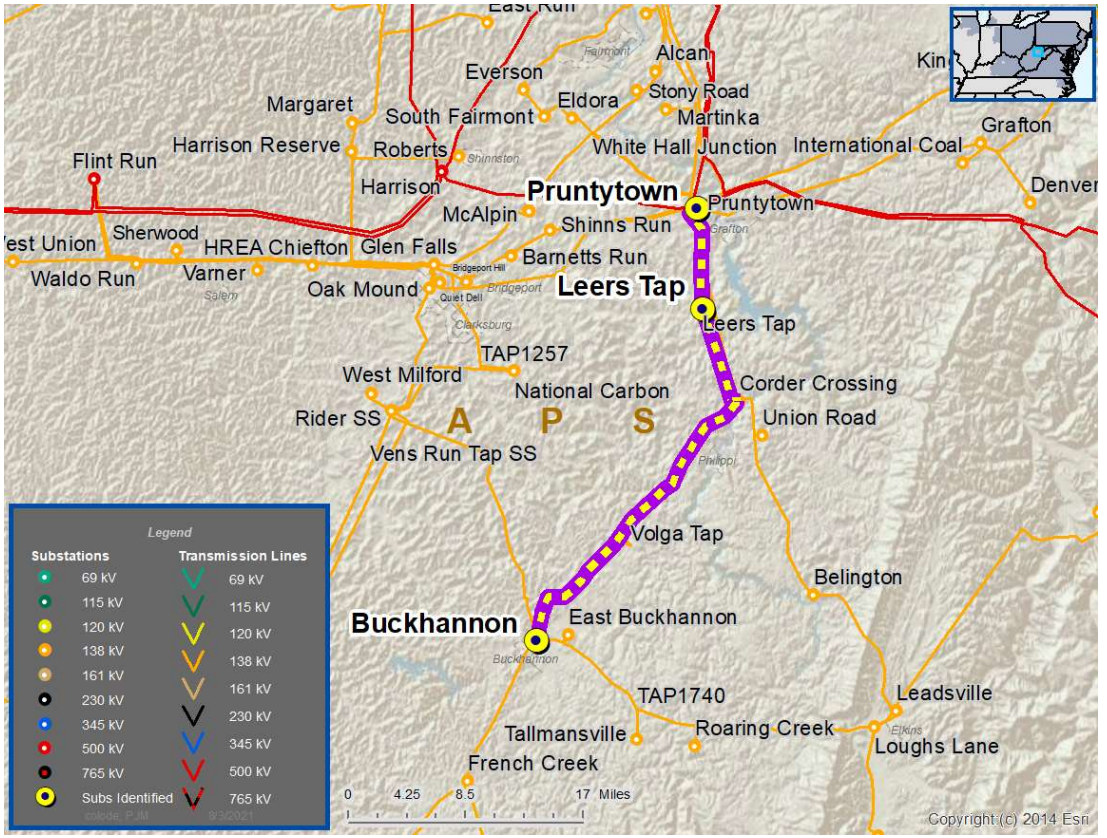
Specific Assumption Reference(s):

Customer request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement:

A customer has requested a new 138 kV delivery point near the Buckhannon – Pruntytown (PR-BKH-12) 138 kV Line. The anticipated load of the new customer connection is 40 MW.

Requested in-service date is 7/2/2025.



APS Transmission Zone M-3 Process
Buckhannon-Pruntytown 138 kV New Customer

Need Number: APS-2021-012
Process Stage: Solution Meeting – 10/20/2023

Proposed Solutions:

138 kV Transmission Line Tap

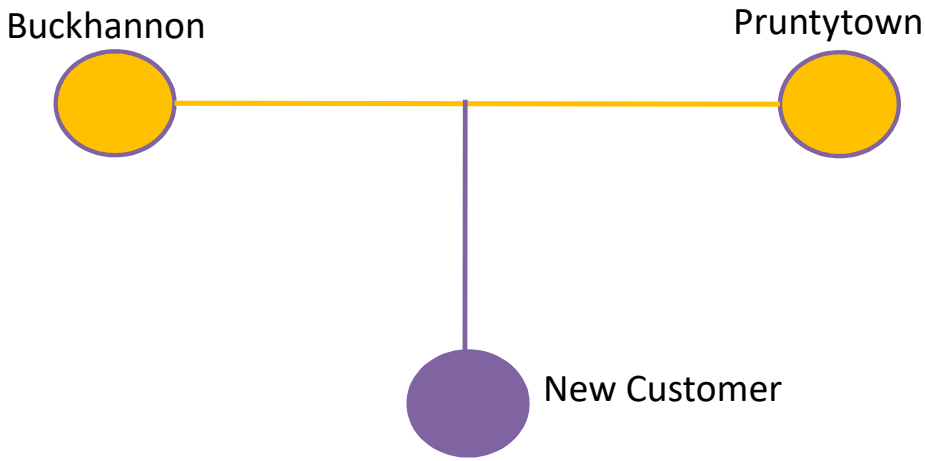
- Install three-way tap using three switches
- Construct 1 mile of 138 kV line from tap location to new delivery point
- Install revenue metering in Customer's facilities
- Revise remote end relay settings at Buckhannon Substation and Pruntytown Substation

Alternatives Considered:

- No other feasible alternatives to serve the customer's load

Estimated Project Cost: $5.0M

Projected In-Service: 07/02/2025
Status: Engineering



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

APS Transmission Zone M-3 Process
Ethel Springs – Bethlen 138 kV Network

Need Number: APS-2023-009

Process Stage: Solution Meeting – 10/20/2023

Previously Presented: Need Meeting – 4/21/2023

Project Driver(s):

- *Equipment material condition, performance and risk*
- *Operational Flexibility and Efficiency*

Specific Assumption Reference(s)

System Performance

- Network radial lines

Operational Flexibility

Problem Statement

The are two radial feeds: one to Bethlen and one to Ethel Spring.

A fault on the Loyalhanna - Social Hall 138 kV line will outage multiple 138 kV stations, which puts significant stress on the networked distribution system.

A fault on the Loyalhanna - Social Hall 138 kV line will outage radial load at Ethel Springs, and a fault on the Bethlen – Loyalhanna 138 kV line will outage radial load at Bethlen. Ethel Springs serves 6,105 customers and 14.43 MW, and Bethlen serves 5,110 customers and 11.76 MW.

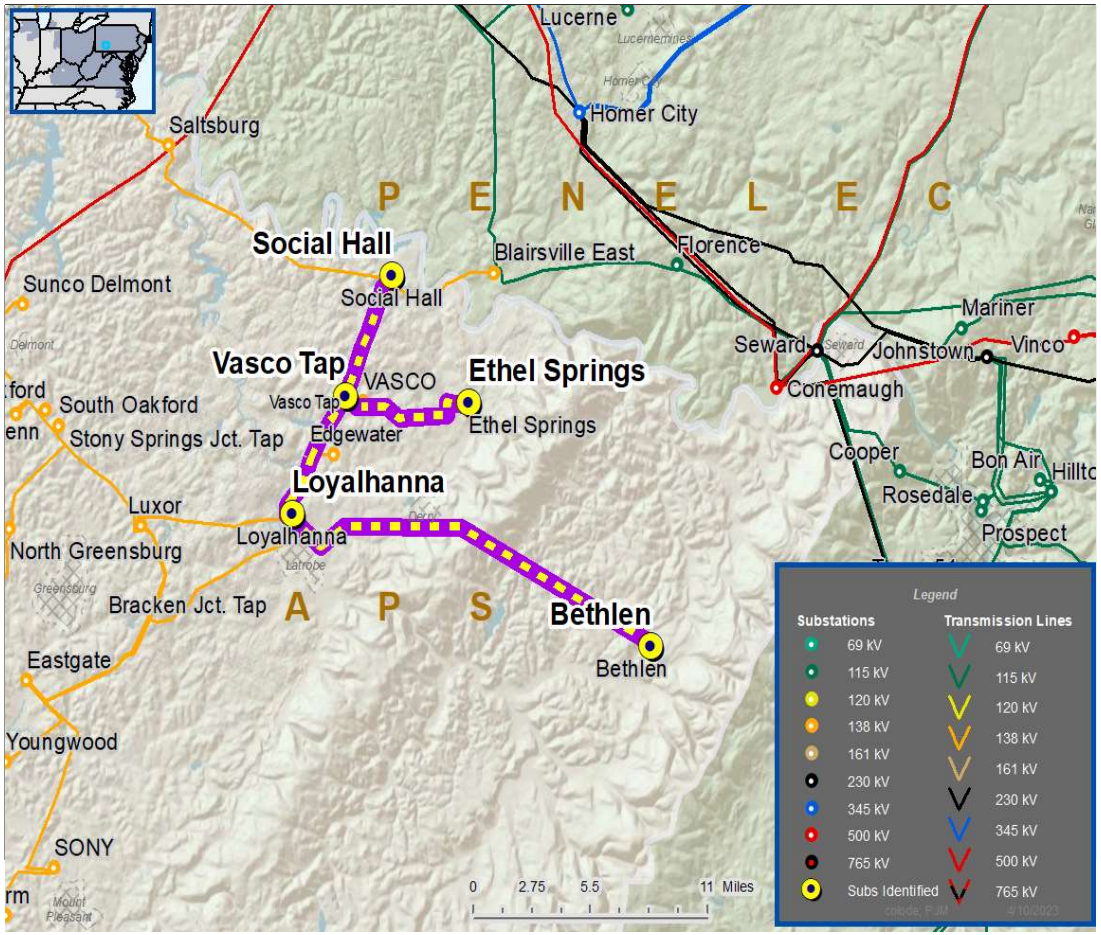
Transmission line ratings are limited by terminal equipment.

Vasco Tap – Social Hall 138 kV:

- Existing line rating: 225 / 287 MVA (SN / SE)
- Existing conductor rating: 297 / 365 MVA (SN / SE)

Bethlen – Loyalhanna 138 kV:

- Existing line rating: 205 / 242 MVA (SN / SE)
- Existing conductor rating: 309 / 376 MVA (SN / SE)



APS Transmission Zone M-3 Process
Ethel Springs – Bethlen 138 kV Network

Need Number: APS-2023-009

Process Stage: Solution Meeting – 10/20/2023

Previously Presented: Need Meeting – 4/21/2023

Proposed Solution:

Construct a new 8-mile 138 kV line between Ethel Springs and Bethlen substations using 954 ACSR conductor. The following work will be performed at neighboring substations:

- At Social Hall:
  - Replace substation conductor, wave trap, and circuit breaker
- At Vasco:
  - Construct a 4-breaker 138 kV ring bus
- At Edgewater Tap:
  - Install (3) SCADA controlled switches
- At Loyalhanna:
  - Replace substation conductor on the Bethlen 138 kV line terminal
- At Ethel Springs:
  - Convert the 138 kV yard into a 4-breaker ring bus
- At Bethlen:
  - Convert the 138 kV yard into a 3-breaker ring bus

New line ratings:

- Vasco Tap – Social Hall 138 kV: 297 / 365 MVA (SN / SE)
- Bethlen – Loyalhanna 138 kV: 309 / 376 MVA (SN / SE)
- Bethlen – Ethel Springs: 308 / 376 MVA (SN / SE)

Alternatives Considered

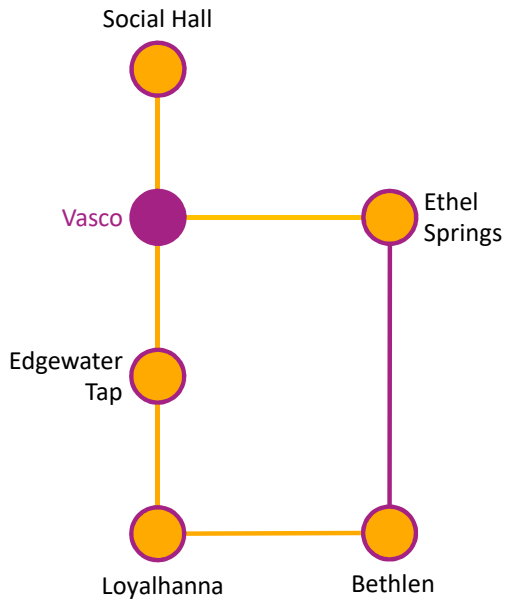
- Maintain line in existing configuration, putting distribution customers/load at risk

Estimated Project Cost: $59.6 M

Projected In-Service: 12/31/2025

Project Status: Conceptual

Model: 2022 RTEP model for 2027 Summer (50/50)



Legend	
500 kV	
345 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
34.5 kV	
23 kV	
New	

APS Transmission Zone M-3 Process Misoperation Relay Projects

Need Numbers: APS-2023-018, APS-2023-019, APS-2023-020

Process State: Solution Meeting – 10/20/2023

Previously Presented: Need Meeting 6/16/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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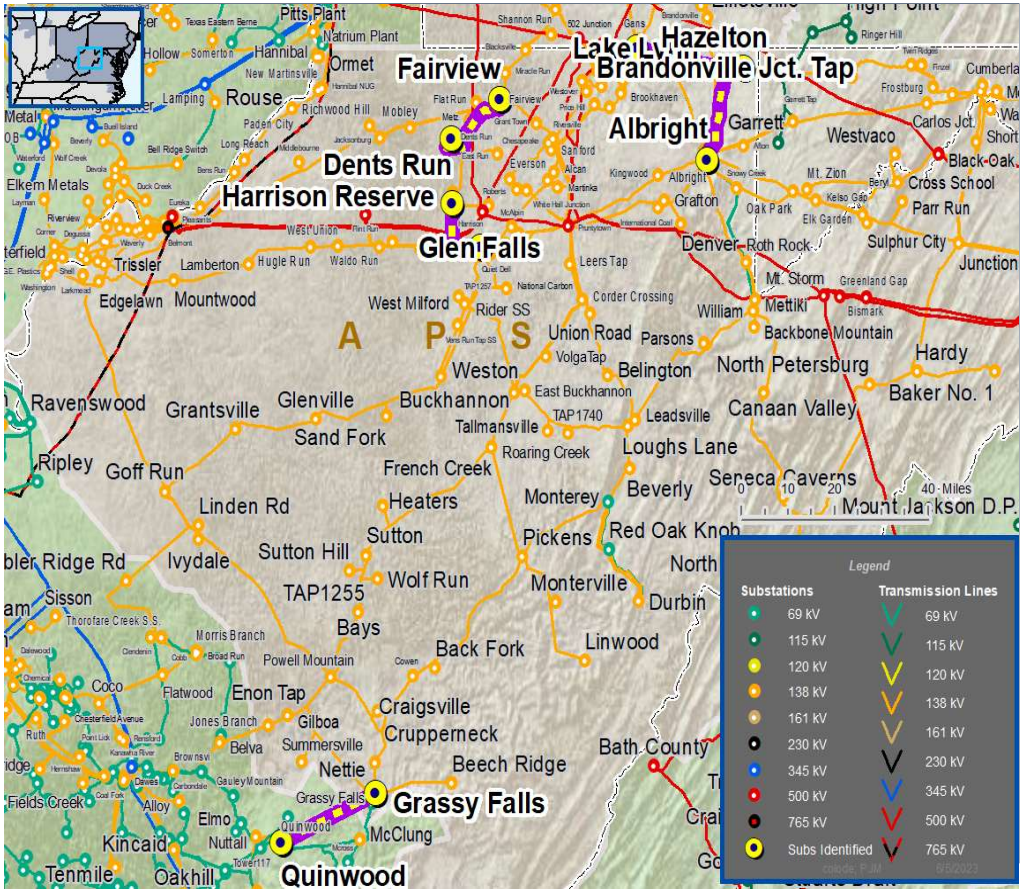

APS Transmission Zone M-3 Process
Misoperation Relay Projects

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-018	Albright – Brandonville Junction 138 kV	141 / 182	181 / 225	
	Brandonville Junction – Hazelton 138 kV	261 / 311	308 / 376	
	Brandonville Junction – Lake Lynn 138 kV	219 / 271	308 / 376	
APS-2023-019	Grassy Falls – Quinwood 138 kV	282 / 314	282 / 376	
APS-2023-020	Fairview – Dents Run Tap 138 kV	175 / 191	221 / 268	
	Harrison Reserve Tap – Glen Falls 138 kV	191 / 191	221 / 268	

APS Transmission Zone M-3 Process Misoperation Relay Projects

Proposed Solution:

Need Number	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimated Cost ($ M)	Target ISD
APS-2023-018	Albright – Brandonville Junction 138 kV	181 / 225	• At Albright, replace wave trap, substation conductor, & relaying	$1.3 M	12/1/2025
	Brandonville Junction – Hazelton 138 kV	308 / 376	• At Hazelton, replace substation conductor & relaying		
	Brandonville Junction – Lake Lynn 138 kV	308 / 376	• At Lake Lynn, replace substation conductor & relaying	$1.5 M	12/1/2025
APS-2023-019	Grassy Falls – Quinwood 138 kV	282 / 376	• At Grassy Falls, replace wave trap, circuit breaker, substation conductor, & relaying		
APS-2023-020	Fairview – Dents Run Tap 138 kV	221 / 268	• At Fairview, replace wave trap, disconnect switches, substation conductor, & relaying	$2.5 M	11/22/2023
	Harrison Reserve Tap – Glen Falls 138 kV	221 / 268	• At Glen Falls, replace wave trap, disconnect switch, & relaying		

Alternatives Considered: Maintain equipment in existing condition

Project Status: Engineering/Construction

Model: 2022 RTEP model for 2027 Summer (50/50)

APS Transmission Zone M-3 Process
Misoperation Relay Projects

Need Numbers: APS-2023-023 … APS-2023-025
Process State: Solution Meeting – 10/20/2023
Previously Presented: Need Meeting – 7/21/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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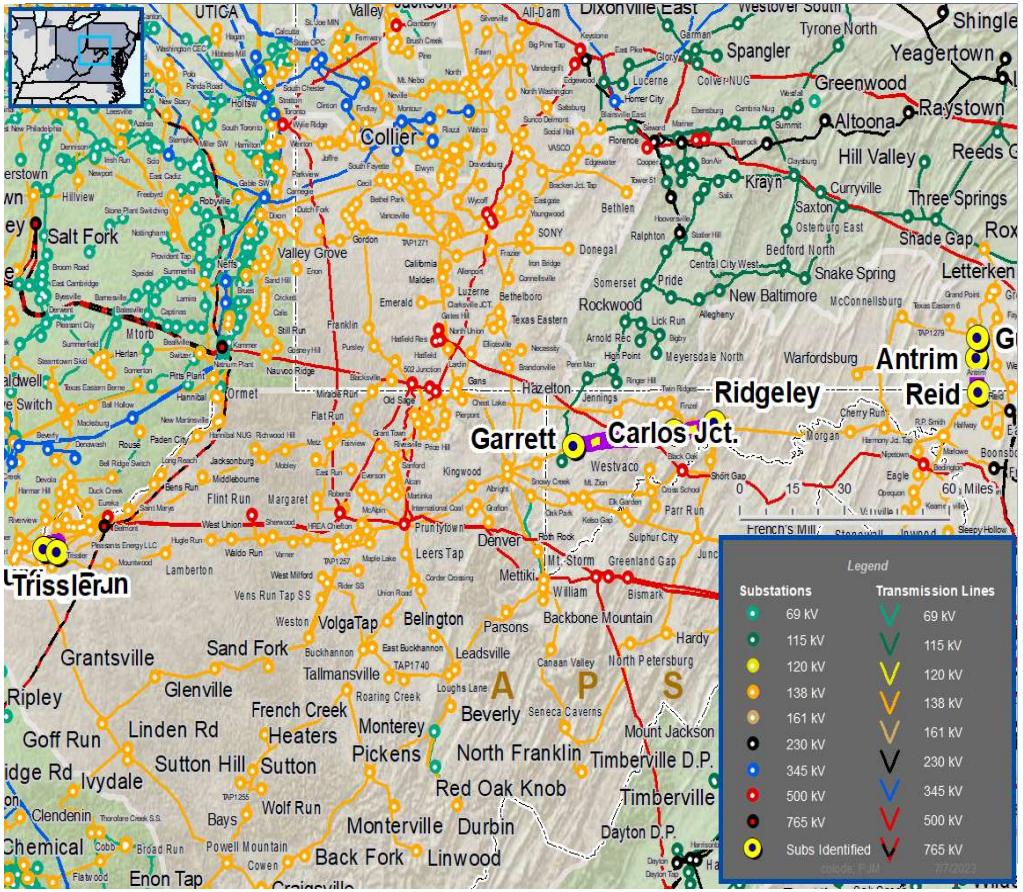


APS Transmission Zone M-3 Process Misoperation Relay Projects

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-023	Parkersburg – Jug Run 138 kV Line	225/295	308/376	
	Jug Run – Trissler 138 kV Line	292/314	308/376	
APS-2023-024	Guilford – Antrim 138 kV Line	292/314	308/376	
	Antrim – Reid 138 kV Line	292/314	308/376	
APS-2023-025	Garrett – Carlos Junction 138 kV Line	164/206	221/268	
	Carlos Junction – Ridgeley 138 kV Line	141/182	221/268	

APS Transmission Zone M-3 Process Misoperation Relay Projects

Proposed Solution:

Need Number	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimated Cost ($ M)	Target ISD
APS-2023-023	Parkersburg – Jug Run 138 kV Line	308 / 376	• At Parkersburg, replace circuit breaker, wave trap, disconnect switch, substation conductor, & relaying	$3.2 M	11/17/2023
	Jug Run – Trissler 138 kV Line	308 / 376	• At Trissler, replace circuit breaker, wave trap, disconnect switch, substation conductor, & relaying		
APS-2023-024	Guilford – Antrim 138 kV Line	308 / 376	• At Guilford, replace circuit breaker, wave trap, disconnect switch, substation conductor, & relaying	$2.8 M	05/15/2024
	Antrim – Reid 138 kV Line	308 / 376	• At Reid, replace wave trap, disconnect switches, substation conductor, & relaying		
APS-2023-025	Garrett – Carlos Junction 138 kV Line	164 / 206	• At Garrett, replace wave trap & relaying	$4.2 M	04/26/2024
	Carlos Junction – Ridgeley 138 kV Line	164 / 206	• At Ridgeley, replace wave trap, disconnect switches, substation conductor, & relaying		

Alternatives Considered: Maintain equipment in existing condition

Project Status: Engineering/Construction

Model: 2022 RTEP model for 2027 Summer (50/50)

APS Transmission Zone M-3 Process
Bedington – Marlowe BMA 138 kV Line New Customer

Need Number: APS-2023-030

Process Stage: Solution Meeting – 10/20/2023

Previously Presented: Need Meeting – 8/18/2023

Supplemental Project Driver(s):

Customer Service

Specific Assumption Reference(s):

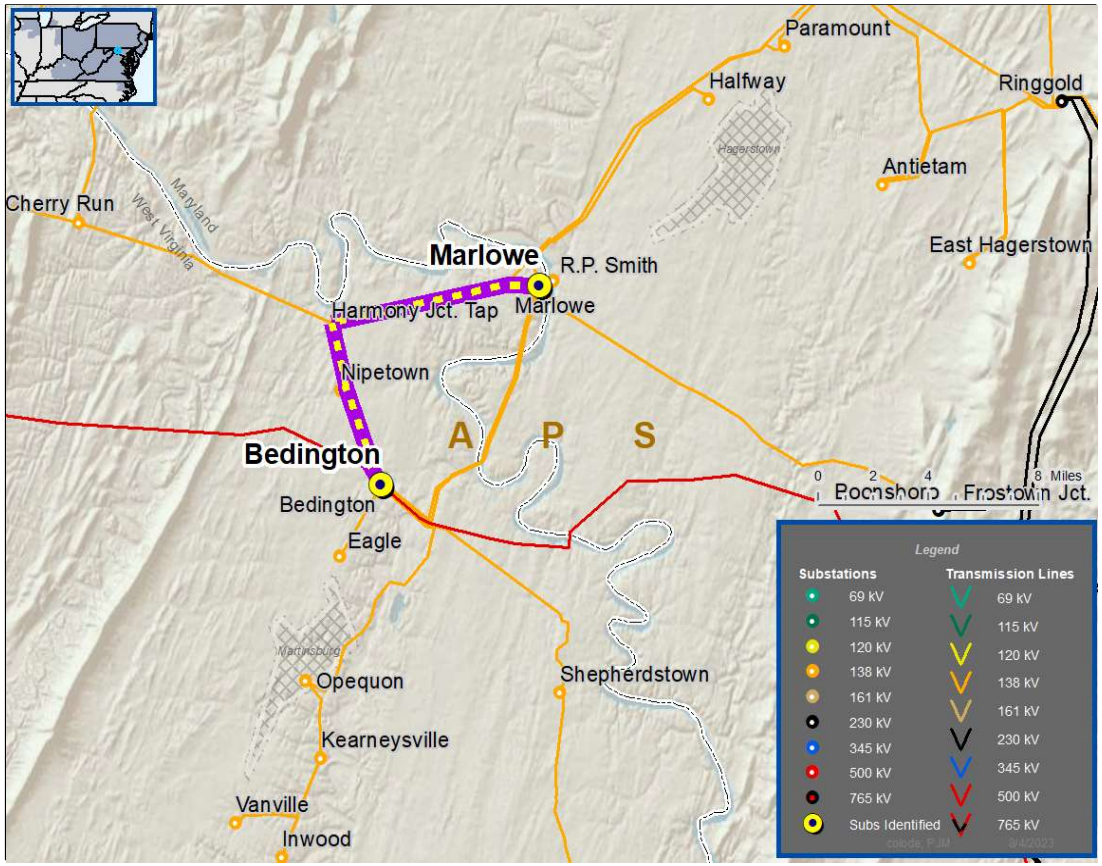
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement

New Customer Connection – Customer requested 138 kV transmission service for approximately 64 MVA of total load near the Bedington – Marlowe BMA 138 kV Line.

Requested In-Service Date:

2/28/2025



APS Transmission Zone M-3 Process
Bedington – Marlowe BMA 138 kV Line New Customer Phase 1

Need Number: APS-2023-030
Process Stage: Solution Meeting – 10/20/2023
Previously Presented: Need Meeting – 8/18/2023

Proposed Solutions:

Phase 1 (Temporary Configuration): 138 kV Line Transmission Taps

- Install two 2000 A load-break air switches on the Bedington – Marlowe BMA 138 kV Line
- Build approximately 2.2 miles of double circuit 138 kV Line to the point of interconnection with Customer
- Revise relay settings at Bedington and Marlowe substations

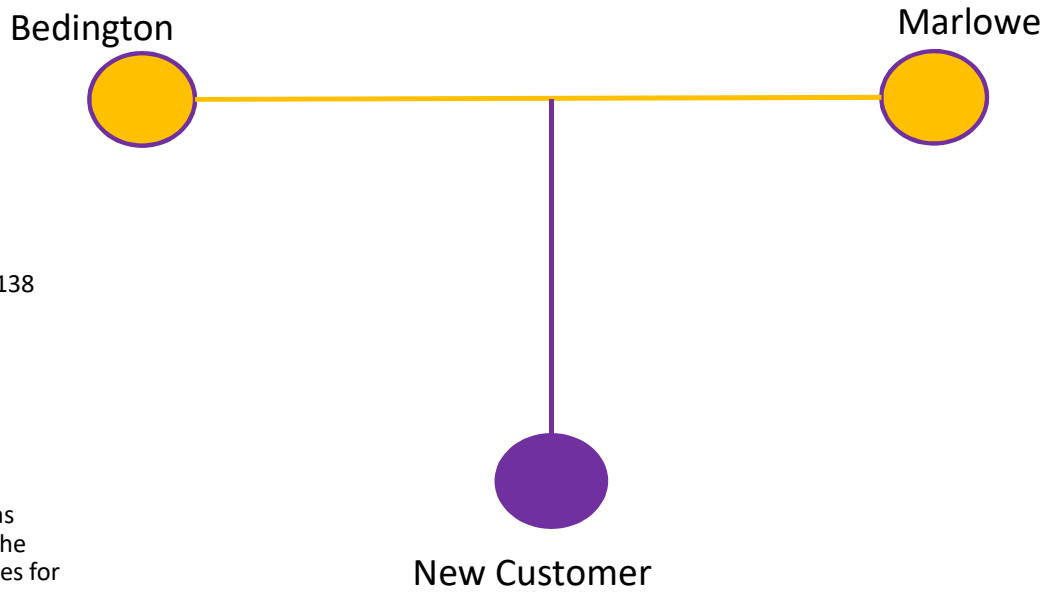
Alternatives Considered:

- Providing transmission service by looping the Bedington – Reid 138 kV line was considered. However, this was deemed as not the preferred solution due to the length of line required (approximately 3.3 miles), cost, and feasibility challenges for a new transmission route to be built to the Customer site location by traversing a densely populated area.

Estimated Project Cost: $11.9M

Projected In-Service: 2/28/2025

Status: Engineering



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

APS Transmission Zone M-3 Process
Bedington – Marlowe BMA 138 kV Line New Customer Phase 1

Need Number: APS-2023-030
Process Stage: Solution Meeting – 10/20/2023
Previously Presented: Need Meeting – 8/18/2023

Proposed Solutions:

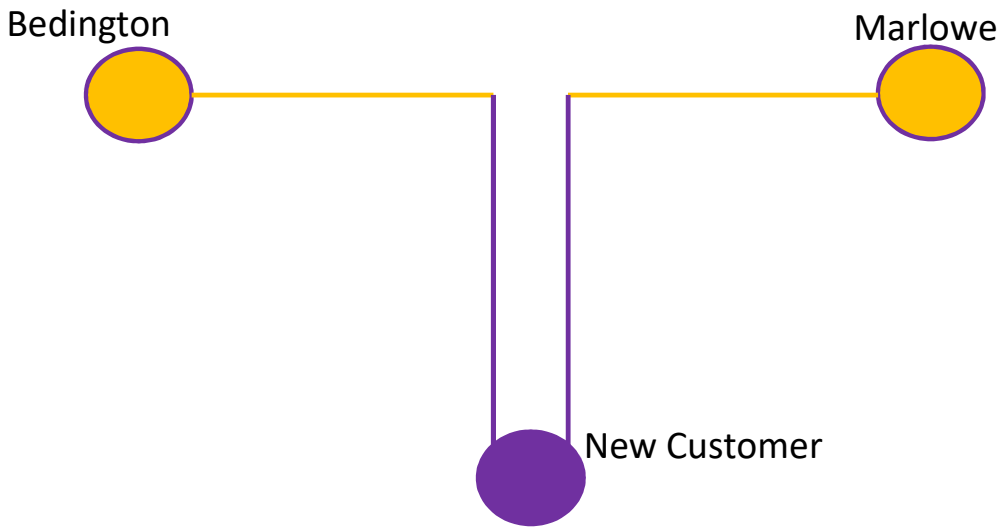
Phase 2 (Final Configuration): 138 kV Line Transmission Tap

- Build a new three-breaker 138 kV ring bus substation.
- Replace two breakers and relay panels at Bedington Substation
- Replace one breaker and relay panel at Marlowe Substation.
- Terminate the two tap lines from Phase 1 into the new ring bus substation.
- Customer to connect directly to the ring bus substation.

Alternatives Considered:

- Please see previous slide for alternative considered

Estimated Project Cost: $18.5M
Total Estimated Project Cost (Phase 1 + Phase 2): $30.4M
Projected In-Service: 6/30/2026
Status: Pre-Engineering



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

APS Transmission Zone M-3 Process
Inwood – Stonewall 138 kV Line New Customer

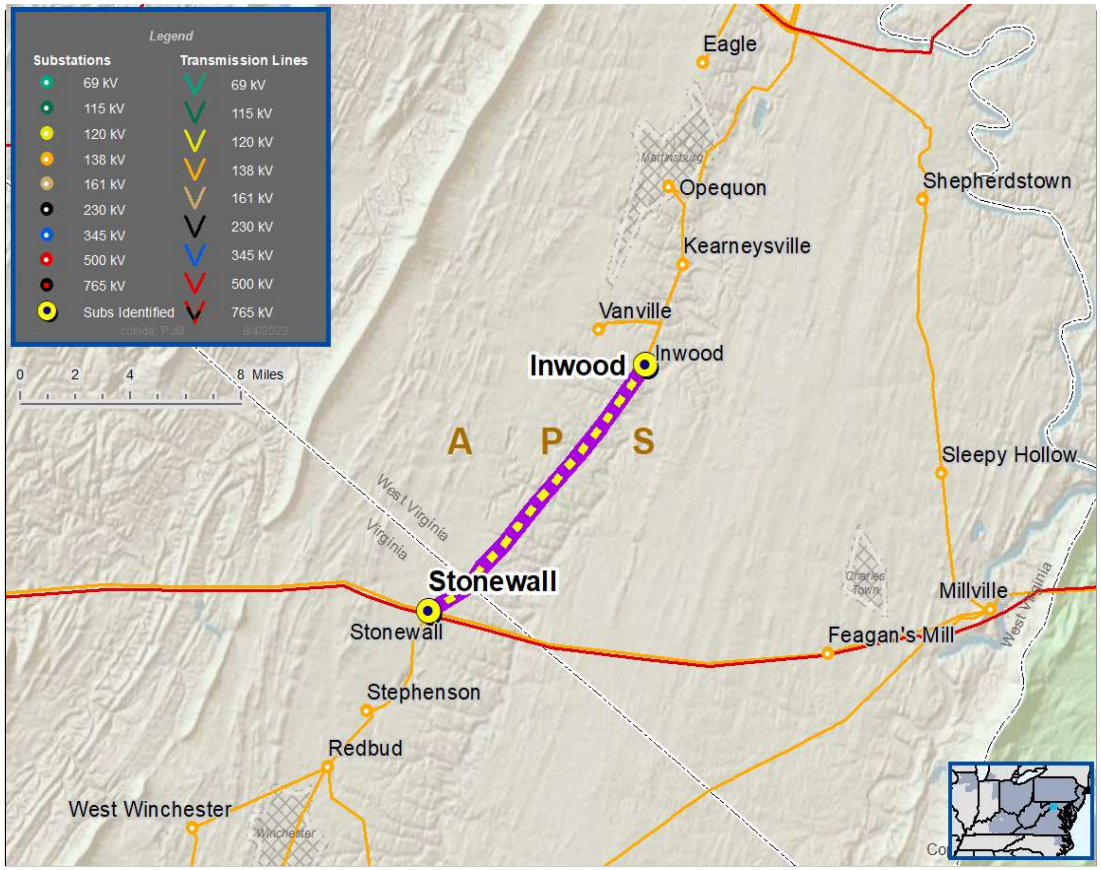
Need Number: APS-2023-039
Process Stage: Solution Meeting – 10/20/2023
Previously Presented: Need Meeting – 8/18/2023

Supplemental Project Driver(s):
Customer Service

Specific Assumption Reference(s):
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement
New Customer Connection – Potomac Edison Distribution has requested a new 138 kV delivery point near the Inwood – Stonewall 138 kV Line. The anticipated load of the new customer connection is 12 MVA.

Requested In-Service Date:
2/23/2024



APS Transmission Zone M-3 Process
Inwood – Stonewall 138 kV Line New Customer

Need Number: APS-2023-039

Process Stage: Solution Meeting – 10/20/2023

Previously Presented: Need Meeting – 8/18/2023

Proposed Solutions:

138 kV Transmission Line Tap

- Install a three-switch tap along the Inwood – Stonewall 138 kV Line with three 1200 A SCADA load break switches
- Install 1-2 spans of transmission line from tap point to Customer substation
- Install a 138 kV wave trap

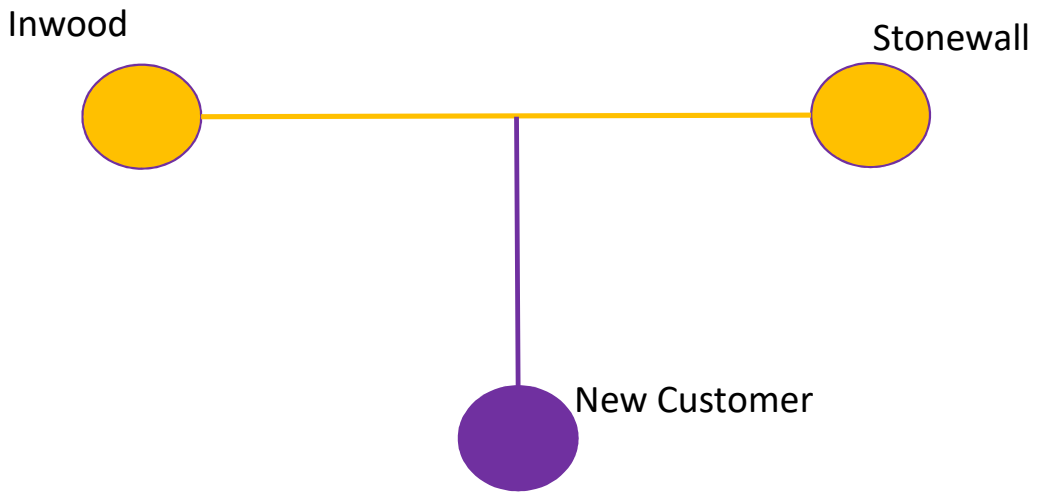
Alternatives Considered:

- The next nearest transmission line facility to serve the Customer's load is at least two miles away from the Customer's site. As a result, the nearby Inwood-Stonewall 138 kV Line was selected as the preferred solution.

Estimated Project Cost: $1.1M

Projected In-Service: 4/17/2024

Status: Engineering



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

APS Transmission Zone M-3 Process
Millville 138 kV Substation

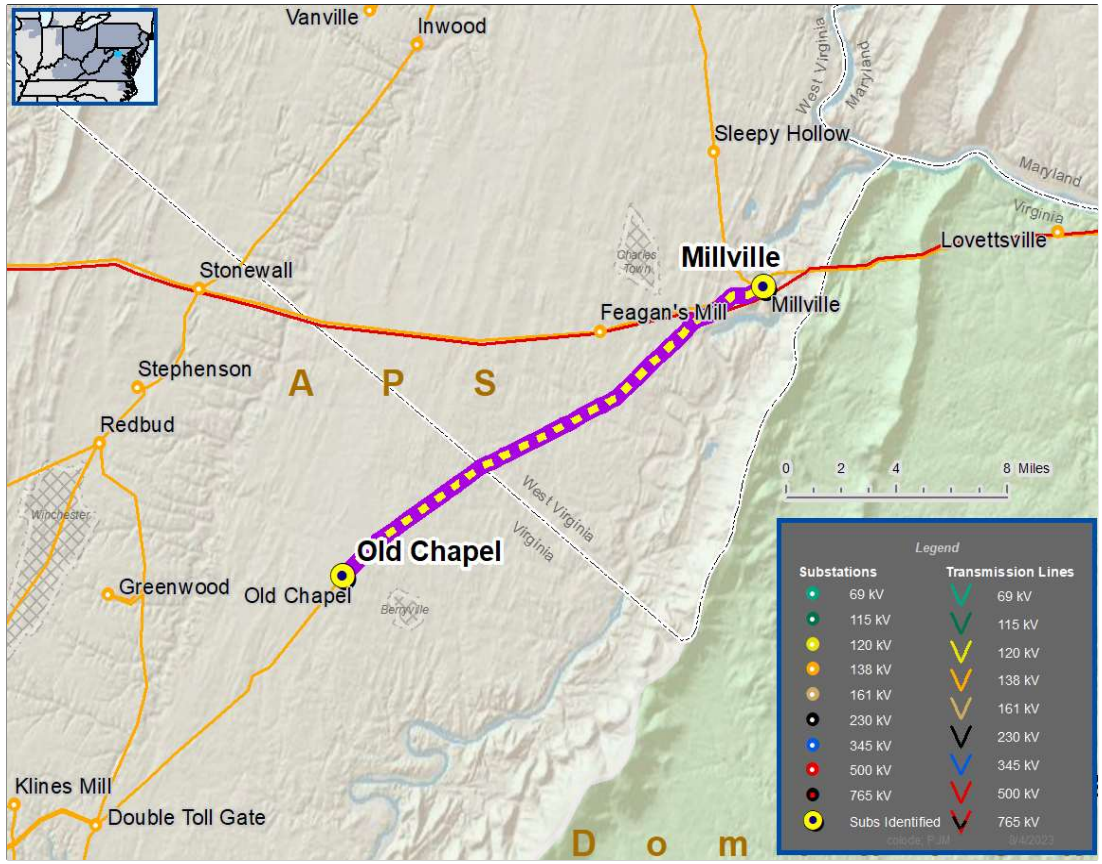
Need Number: APS-2023-040
Process Stage: Solution Meeting 10/20/2023
Previously Presented: Need Meeting 8/18/2023

Project Driver(s):
- *Equipment Material Condition*
- *Performance and Risk*

Specific Assumption Reference(s)
- Substation Condition Rebuild/Replacement
- Substation/line equipment limits

Problem Statement
- Existing switches at Millville Substation cannot be operated reliably.
  - Severe alignment issues result in improper closures, requiring a hammer to manually close, resulting in a safety issues
  - Switch mounting insulators often break during this process, resulting in live parts falling, creating potential safety incidents and system faults.

The Old Chapel – Millville 138 kV line is limited by terminal equipment
- Existing line rating:
  - 299/358/353/410 MVA (SN/SE/WN/WE)
- Existing conductor rating:
  - 353/406/353/428 MVA (SN/SE/WN/WE)



APS Transmission Zone M-3 Process
Millville 138 kV Substation

Need Number: APS-2023-040

Process Stage: Solution Meeting 10/20/2023

Proposed Solution:

- At Millville Substation:
  - On the Old Chapel 138 kV line exit, replace:
    - 1200 A manual disconnect switches with (2) 2000 A motor-operated disconnect switches
    - Limiting substation conductor

Transmission Line Ratings:

- Millville – Old Chapel 138 kV Line:
  - Before Proposed Solution: 299 / 358 / 353/ 410 MVA (SN / SE / WN / WE)
  - After Proposed Solution: 299 / 360 / 353/ 422 MVA (SN / SE / WN / WE)

Alternatives Considered:

- No other feasible solutions.

Estimated Project Cost: $0.7 M

Projected In-Service: 04/15/2024

Project Status: Engineering

Model: 2022 RTEP model for 2027 Summer (50/50)

Legend	
500 kV	
345 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
34.5 kV	
23 kV	
New	

AEP Transmission Zone M-3 Process
Coshocton, Holmes, & Wayne Counties, Ohio

Need Number: AEP-2021-OH025

Process Stage: Solution Meeting 10/20/2023

Previously Presented: Need Meeting 5/21/2021

Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

South Coshocton – Wooster 138 kV Transmission Line: is 39.7 miles long and consists of mostly wooden H-frame structures with vertical insulators, originally installed in 1957 with 477,000 CM ACSR 26/7 (Hawk) conductor. The line asset comprises 22.8 miles of the Ohio Central-West Millersburg circuit, 15.2 miles of the West Millersburg-Wooster circuit (entirety), and 1.7 miles of the Ohio Central-South Coshocton circuit.

Total Structure Count: 214

Outage History:

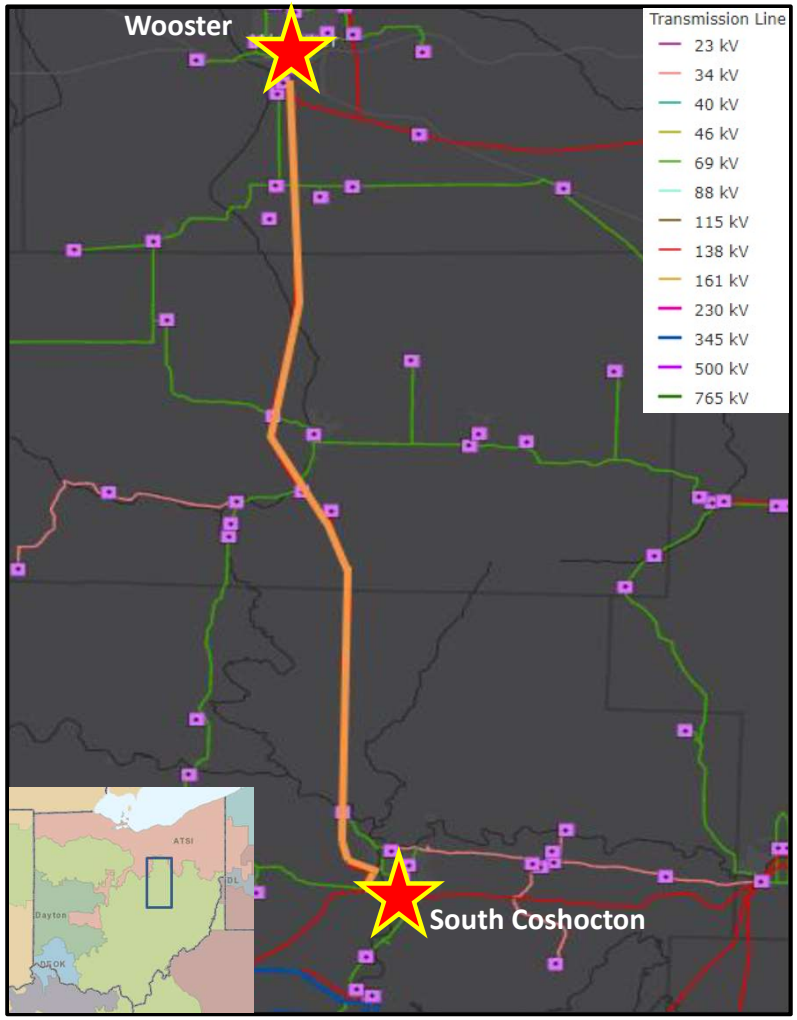
- Momentary (10) & Permanent Outages (7)
- CMI: 545,905 (Past Five Years)

Open Conditions:

- 54 structures with at least one open condition, which equates to 25.4% of the structures on this line.
- 40 structure-based open conditions consisting of broken structures, insect damage, rot heart, rot top, woodpecker holes, rot pocket, split poles and rot top on filler blocks.
- 1 conductor-based open condition consisting of a damaged conductor.
- 4 grounding-based open conditions consisting of broken ground lead wires and broken structure grounds.
- 9 hardware-based open conditions consisting of broken/burnt insulators.
- Structure Age: 79% 1950's, 4% 1960's, 1% 1970's, 16% 1980's, 1% 1990's, 4% 2000's

Operational Concerns:

- The 138kV pathway provides a 138kV source for 4- sub-transmission source stations (South Coshocton, West Coshocton, West Millersburg, and Wooster).
- The 138kV pathway serves customers at two Holmes-Wayne Co-op stations and two AEP Ohio distribution stations.
- The 138kV pathway has experienced real-time PCLLRW overload alerts during heavy west-to-east and south-to-north system transfer periods.



AEP Transmission Zone M-3 Process
South Coshocton – Wooster Rebuild

Need Number: AEP-2021-OH025

Process Stage: Solution Meeting 10/20/2023

Proposed Solution:

Wooster – South Coshocton: The 37.7-mile line will be rebuilt using 795 ACSR DRAKE to alleviate identified asset renewal conditions. This includes the 15.2-mile West Millersburg – Wooster 138kV circuit as well a portion of the 30.9-mile single circuit Ohio Central – West Millersburg 138kV circuit up to structure 13 outside Ohio Central station. **Estimated Cost $96.5M**

Perform remote end work at Wooster **Estimated Cost $0.501M**

Perform remote end work at West Millersburg **Estimated Cost $0.503M**

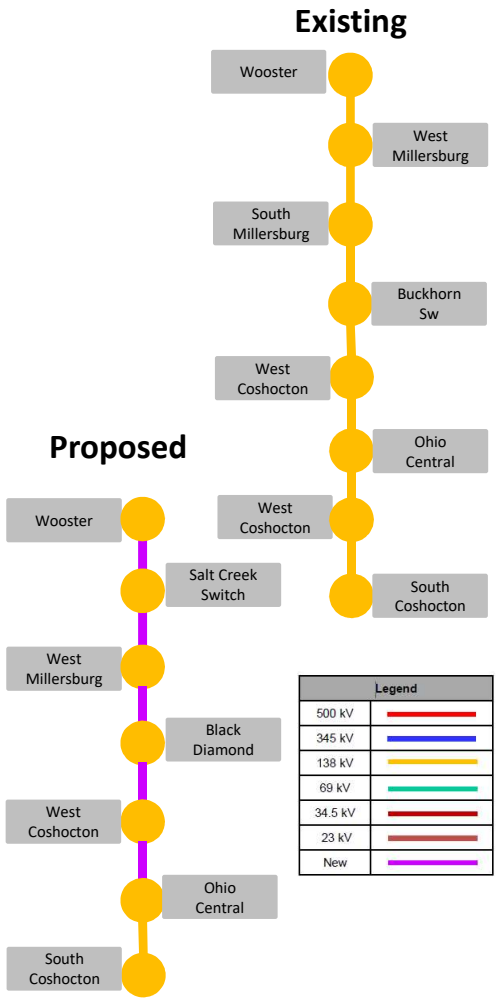
Total Estimated Transmission Cost: $97.54M

Alternatives Considered:

- Rebuild South Coshocton – Wooster in the clear acquiring new ROW. Due to portions of the line not in need of rebuild and other projects affecting the topology in the area, this option was not selected. Estimated cost: $127.6M

Projected In-Service: 10/31/2026

Project Status: Scoping



AEP Transmission Zone M-3 Process
Paulding & Van Wert Co., OH

Need Number: AEP-2022-OH043

Previously Presented: Need Meeting 07/22/2022

Process Stage: Solution Meeting 10/20/2023

Project Driver:

Equipment Material/Condition/Performance/Risk

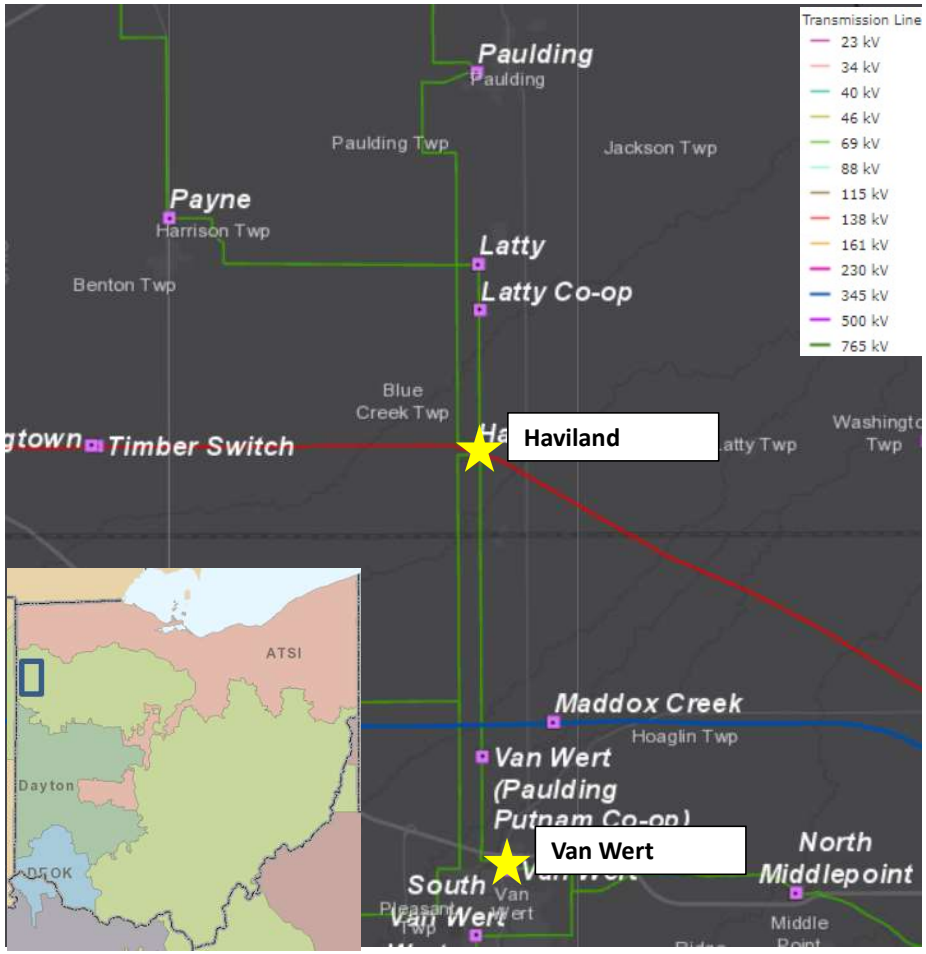
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Van Wert - Haviland 69kV Line(1926) :

- Length of Line: 10.06 Miles
- Total Structure Count: 249
    - Wooden, Steel Monopole Structures
    - Vertical post insulators
- Conductor Types: 556.5 ACSR 18/1 (Osprey), 4/0 COOPER, 556.5 ALUMINUM 19 (Dahlia),795 ACSR 26/7 (Drake)
- Outage History: 1 Momentary and 2 Permanent outages – average duration of 38.72 hours, 66.6K CMI between 2015 and 2020
- Open Conditions: 19, including splice/dead end conductor issues, damaged/missing ground lead wires, broken shield wire, disconnected grounding mat and chipped insulators
- The Van Wert - Haviland line fails to meet 2017 NESC Grade B loading criteria, current AEP structural strength requirements, and the current ASCE structural strength requirements. The line is insulated with vertical post insulators that do not meet current AEP standards for CIFO and minimum leakage distance requirements.



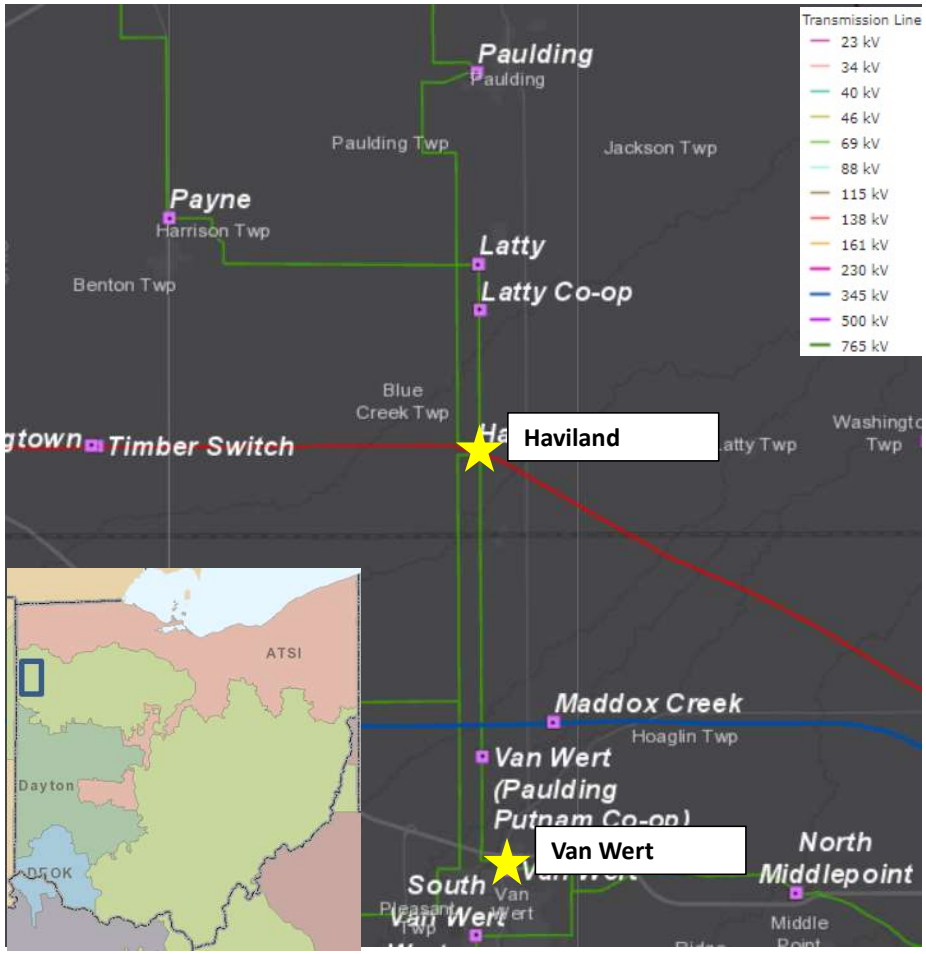
AEP Transmission Zone M-3 Process
Paulding & Van Wert Co., OH

Problem Statement continued:

- 15 structures were further assessed by a ground crew. 73% of those structures had reported conditions, which included the following: one structure had PLP deadends in the shield wire, one structure had pole top decay and a twisted crossarm, one structure had pole top decay, a PLP splice in the shield wire, brown porcelain tie-top post insulators with aluminum bases (failure risk) and an insulator with broken skirts, one structure had insect damage to a crossarm, a twisted crossarm, spliced conductors, a PLP splice in the shield wire and a 2-pole brace structure with a bent anchor, one structure had a compression splice in the shield wire, one structure had a stolen "S" downlead, one structure had brown porcelain tie-top insulators (failure risk), one structure had crossarm splitting and rotting, one structure had un-guyed distribution primary lateral that is deflecting the pole, one structure had a distribution secondary that is deflecting the pole and one structure had a PLP splice in the shield wire.

Additional Information:

During the 2012 Derecho and 2017 straight-line wind storms Van Wert- Haviland experienced multiple cascading pole failure events. These failed structures were replaced with steel monopole type structures. There are 55 newer steel structures, representing 22% of the structures on the line.



AEP Transmission Zone M-3 Process
Van Wert Co., OH

Need Number: AEP-2023-OH065

Previously Presented: Need Meeting 04/21/2023

Process Stage: Solution Meeting 10/20/2023

Project Driver: Customer Service

Specific Assumption Reference:

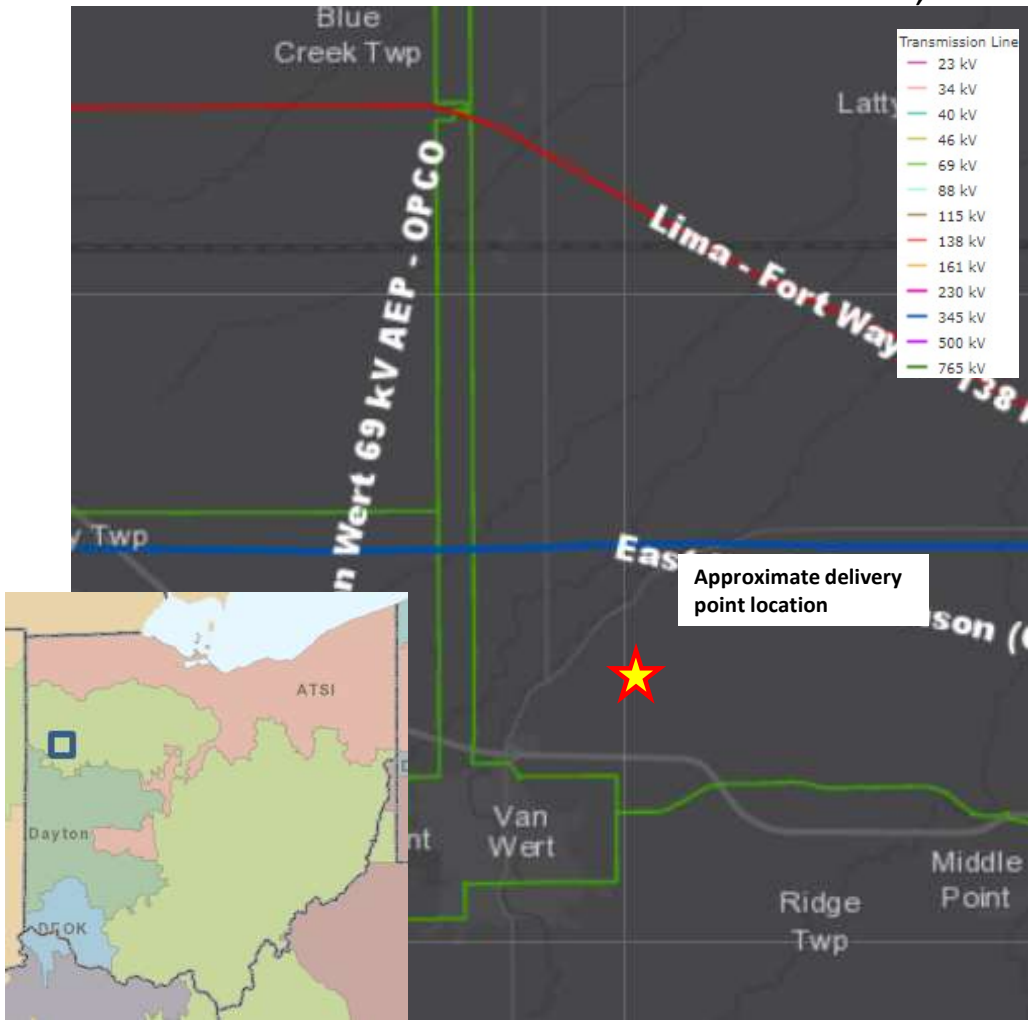
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 12)

Problem Statement:

Van Wert Mega Site:

The Van Wert Mega industrial site is located north of Van Wert in Van Wert County Ohio. The site is approximately one mile east of AEP's Van Wert - Haviland 69kV circuit. The site has been heavily targeted by regional and state economic development efforts and will continue to be. The site is highlighted by JobsOhio and its partner Regional Growth Partnership as its top available property for EV manufacturing. From January 2022 to March 2023 AEP Economic Development has had 32 requests for electric service plans at the site. The prospective customer's electric demand ranged from 5MW to 760MW. Around the industrial site, significant investment has been performed to prepare the site for manufacturing industry development, including installation of a rail spur.

Many of these prospective customers cannot be connected to the existing Van Wert area 69kV network without significant upgrades.



AEP Transmission Zone M-3 Process
Haviland-Van Wert Rebuild

Need Number: AEP-2022-OH043, AEP-2023-OH065

Process Stage: Solution Meeting 10/20/2023

Proposed Solution:

Haviland - Van Wert: Rebuild the line to double circuit 138kV design using 1033 Curlew ACSR conductor. The line will be six wired and operated at 69kV. The rebuild will include a 2.6-mile greenfield section to route the line near several new industrial sites. The overall line length will be 10.8 miles. Newer installed poles will be re-used elsewhere. **Estimated Cost $27.8M**

Modify the b3359 scope from single circuit 69kV construction to double circuit 1033 Curlew at 138kV design **Estimated Cost $2.89M**

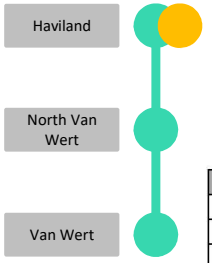
Perform remote end work at Haviland **Estimated Cost $1.03M**

Perform remote end work at Van Wert **Estimated Cost $0.635M**

Upgrade telecom equipment at South Van Wert, Logtown, Maddox Creek, Timber Switch and North Delphos stations **Estimated Cost $0.194M**

Total Estimated Transmission Cost: $32.57M

Existing



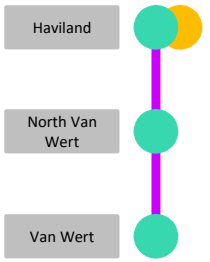
Proposed

Ancillary benefits:

- Upgrading the maximum possible line voltage with double circuit construction allows flexibility for future Van Wert area projects. The proposed solution can be used as part of the service plan for loads at the Van Wert Mega site with less greenfield construction. The Van Wert area does not currently have facilities greater than 69kV. This 138kV double circuit design allows AEP to use the exiting ROW to establish a new 138kV path to the load site. In the future, the circuits could be split and operated independently to support planning needs, load growth or operational concerns while maintaining the 69 kV network.

Alternatives Considered:

- Rebuild Haviland - Van Wert using single circuit 69kV design construction. This option was not selected due to the lack of ancillary benefits and future flexibility to serve load. Estimated cost: $23M
- Rebuild the line and re-utilize the newer failure replaced poles. This would require single pole dead ends before and after the continuous segments of new poles.
  Estimated Initial cost: $32.17M
  Additional cost needed to convert to 138kV in the future: 5.78M



Model: PJM 2027 RTEP

Projected In-Service: 1/1/2026

Project Status: Scoping

AEP Transmission Zone M-3 Process
Pulaski County, Virginia

Need Number: AEP-2023-AP011

Process Stage: Solution Meeting 10/20/2023

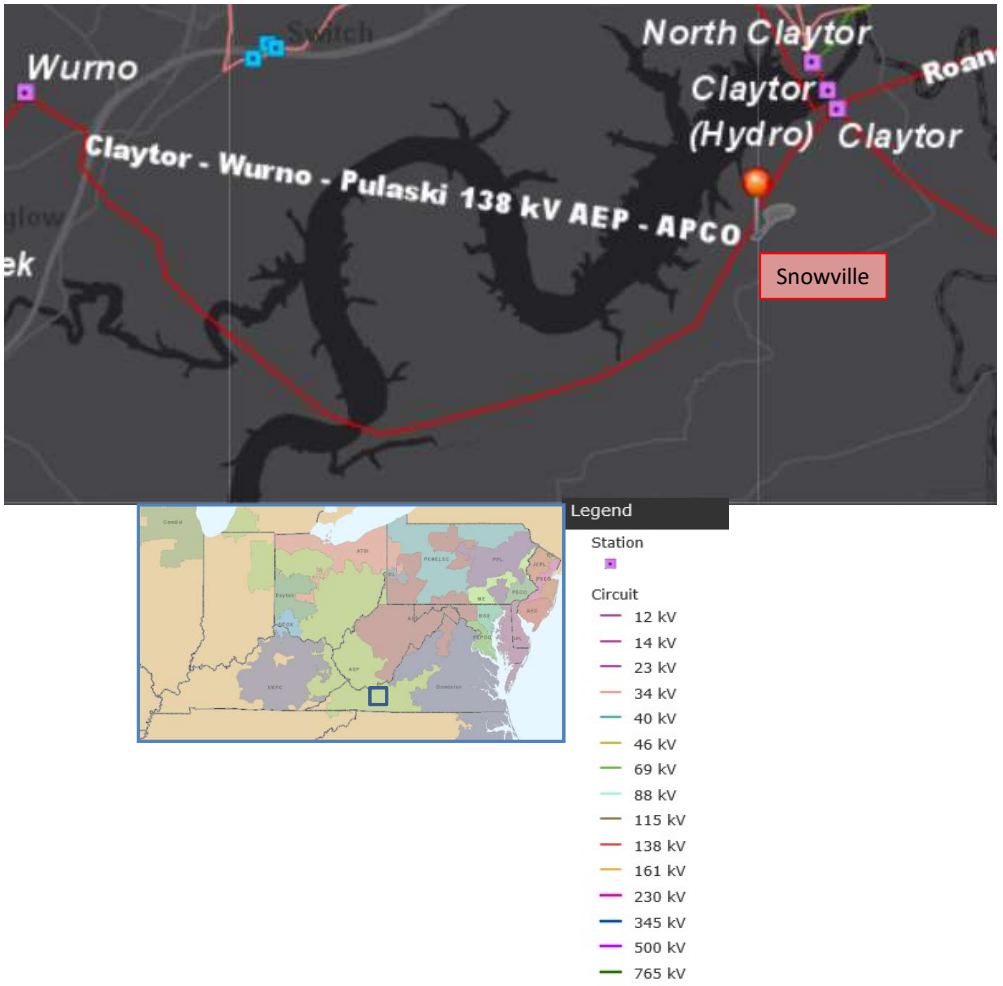
Previously Presented: Need Meeting 4/21/2023

Supplemental Project Driver: Customer Service

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 12)

Problem Statement:

- AEP Distribution has requested a new delivery point (Snowville).
- The Distribution customers south of Claytor Lake are fed by one 34.5kV distribution circuit out of Wurno station and the circuit has one lake crossing. This circuit is currently 187-line miles long and has no other 34.5kV distribution circuit ties. Over the past five years, there were 223 distribution outages resulting in 5.9 million CMI.
- The greenfield Snowville station will pick up 6.5 MVA from Wurno station.



AEP Transmission Zone M-3 Process
Pulaski County, Virginia

Need Number(s): AEP-2023-AP011

Process Stage: Solutions Meeting 10/20/2023

Proposed Solution:

Snowville Station

- The greenfield station will contain a 138/34.5 kV 30 MVA transformer with high side circuit switcher. There will be two 34.5 kV feeders from the station. The 138 kV side will be a straight bus with two 138 kV MOABs. **Estimated Cost: $0 (Distribution cost)**

Snowville 138kV Line Extension

- The line extension will tap the Claytor – Wurno - Pulaski 138kV line and bring the line in and out of the greenfield Snowville station by building 0.1 miles of greenfield double circuit 138kV line. **Estimated Cost: $1.48M**

Snowville Fiber Line Extension

- Build 2.0 miles of 144 ADSS Telecom underbuilt cable to connect Snowville station to Claytor station. **Estimated Cost: $0.5M**

Estimated Total Transmission Cost: $1.98 M

Ancillary Benefits: Distribution customers are currently served from Wurno station on the other side of the lake, causing a lot of outages due to one lake crossing. Snowville station will reduce outages for Distribution customers due to having a reliable source on their side of the lake.

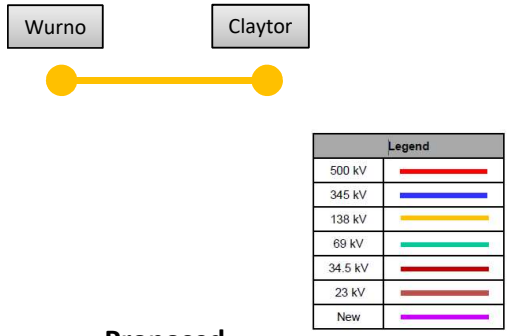
Alternatives Considered: Considering the location of the request and the proximity to the existing 138 kV line, no other transmission solutions were considered to provide additional reliability to the distribution network.

Projected In-Service: 10/31/2025

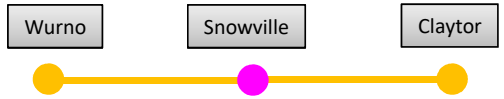
Project Status: Scoping

Model: 2028 RTEP

Existing



Proposed



Dominion Transmission Zone: Supplemental Do No Harm Analysis

Need Number: DOM-2020-0026-DNH (Rollins Ford)
Process Stage: Solution Meeting 02/07/2023 – DNH Update
Previously Presented: Solution Meeting 06/08/2021
Existing Supplemental: s2340.1; s2340.2

Problem Statement:

PJM has identified a N-1 Generator Deliverability contingency that results in an overload of both segments of Line 2114 (Remington CT to Elk Run; Elk Run to Rollins Ford) during the 2021 Do-No-Harm analysis.

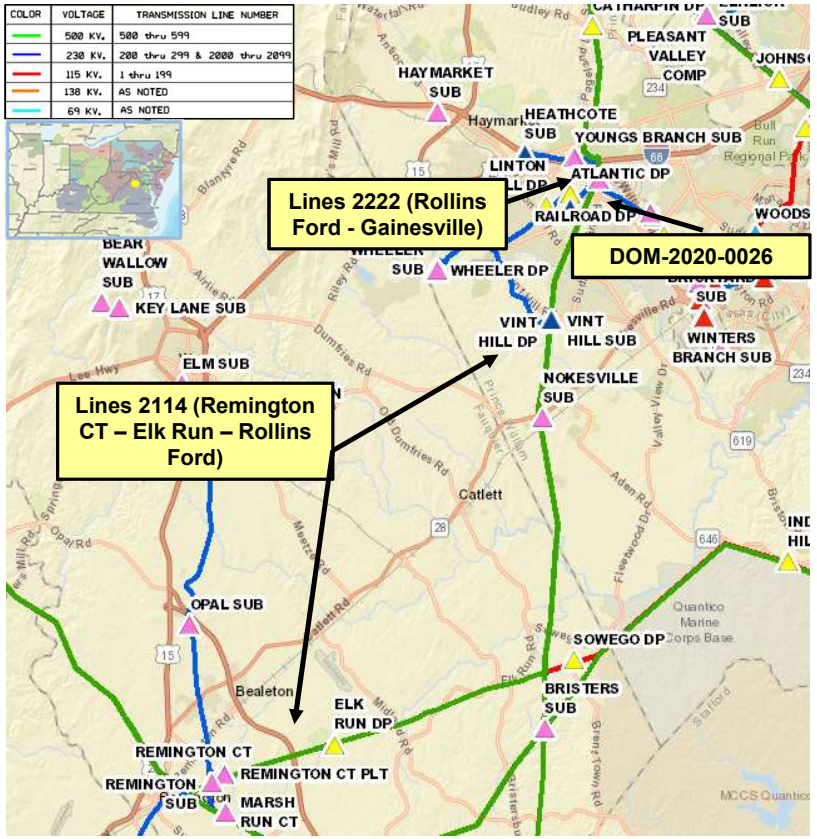
For example, the loss of Line 569 (Loudoun – Morrisville) under contingency DVP-P1-2: LN 569 creates overloads of:

- Line 2114 (Remington CT to Elk Run) – Current rating 1047 MVA
- Line 2114 (Elk Run to Rollins Ford) – Current rating 1047 MVA

The violations are caused by previously presented Supplemental Project DOM-2020-0026 in the Dominion Zone.

Updated Criteria Evaluation:

PJM had also identified overlapping thermal violations in the 2026 Summer RTEP model from Remington CT to Gainesville. The reconductor portion of the previously proposed supplemental solution was submitted and approved as a part of the PJM 2021 Reliability Open Window #1 (b3689.1).



Dominion Transmission Zone: Supplemental Do No Harm Analysis

Previous Solution (Approved as baseline b3689.1):

Solution Approved as Baseline b3689.1:

Re-conductor the segments of 230kV Line 2114 from Remington CT to Elk Run (approx. 3.46 miles) and Elk Run to Rollins Ford (approx. 19.71 miles) using a higher capacity conductor to achieve an expected rating of 1573 MVA.

Re-conductor approx. 1.11 miles of 230kV Line 2222 from Rollins Ford to Gainesville using a higher capacity conductor to achieve an expected rating of 1573 MVA.

Proposed Solution:

At Remington CT, upgrade (2) 230 kV circuit breakers and terminal equipment (switches, leads, etc.) to 4000 A 230 kV standards.

At Gainesville, upgrade (2) 230 kV circuit breakers and terminal equipment (switches, leads, etc.) to 4000 A 230 kV standards.

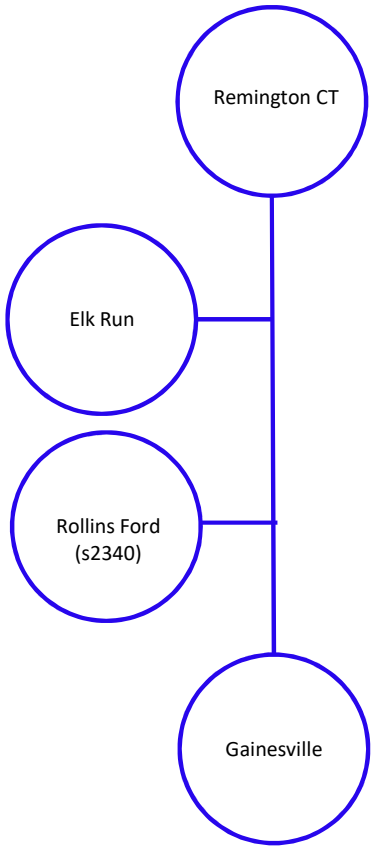
Estimated cost:

At Remington CT (s2340.1) - $1.5M (Previously $35.0M for Line #2114)

At Gainesville (s2340.2) - $8.0M (Previously $2.0M for Line #2222)

Projected In-service Date: 12/31/2026 (Previously 12/31/2025)

Project Status: Conceptual



AEP Transmission Zone M-3 Process
Conesville – Bixby 345 kV

Need Number: AEP-2022-OH039
Process Stage: Solution Meeting 02/07/2023

Previously Presented: Need Meeting 4/12/2022

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

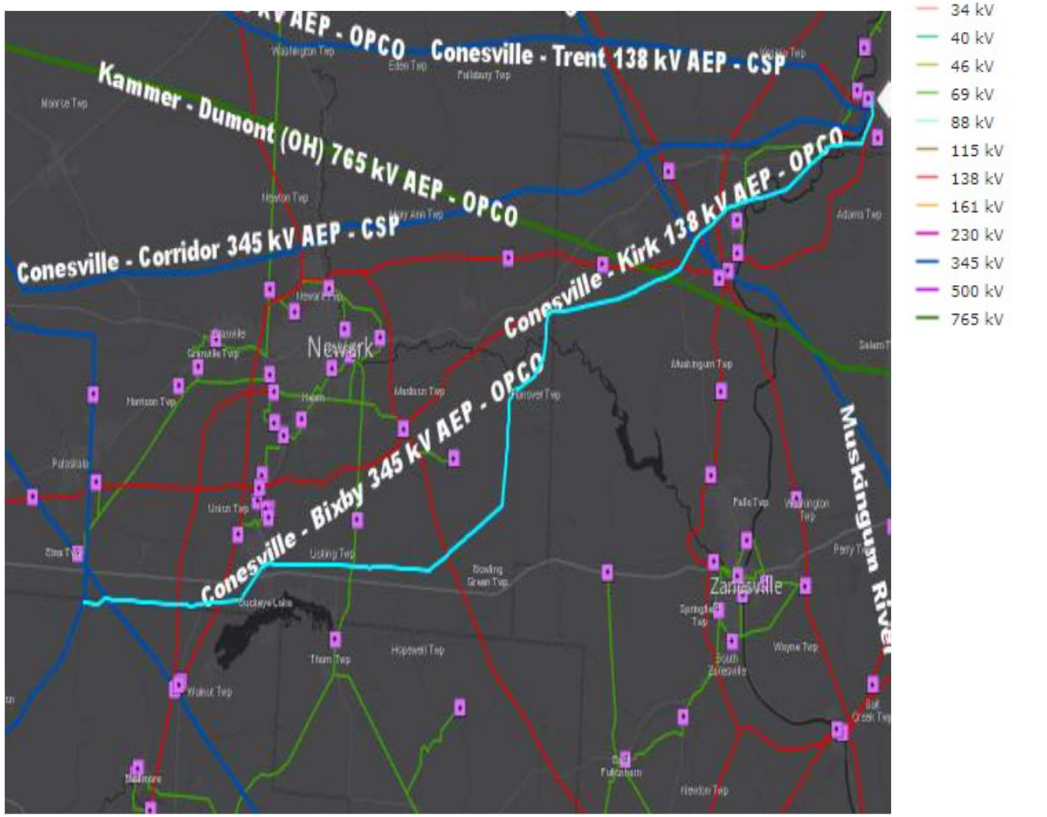
Conesville – Bixby

- Length of Line: 51.10 Miles
- Total Structure Count: 342
    - ~73% of the structures are wood structures from the early 1970's.
    - ~25% of the structures are steel structures installed between 2010 and 2021. Replacements were performed proactively mostly at and along major interstates
    - The remaining ~2% are steel structures installed in the early 1970's.
- Conductor Types: 954 ACSR 45/7, 954 ACSR 54/7
- Outage History: 5 Momentary and 5 Permanent outages since 2015
- Open Conditions:

There are currently 30 structure based open conditions consisting of rot heart, rot shell, broken knee/vee brace, heavy rust, broken/burnt/damaged poles, leaning transverse poles sitting in water, and woodpecker damage. There are additional concerns over delamination of crossarms on the line as detailed in the next slides.

There are currently 12 hardware based open conditions consisting of loose clamps, missing bolts, burnt, chipped and gunshot damage to insulators.

The line fails to meet current AEP structural strength requirements and utilizes inadequate shielding angles for current AEP lightning protection standards.



AEP Transmission Zone M-3 Process
Conesville – Bixby 345 kV

Need Number: AEP-2022-OH039
Process Stage: Solution Meeting 02/07/2023

Previously Presented: Need Meeting 4/12/2022

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Conesville - Bixby

When the 345 kV line was constructed in the 1970's, it was done so utilizing an H-frame design with wood poles that involved the use of laminated crossarms rather than solid wood crossarms. Recent inspections have revealed signs of noticeable deterioration of the laminated crossarms. The green decay and orange rot as shown in the pictures is irreversible wood decay on the laminated crossarms.

There are limited inspection techniques available to identify areas of concern in laminated crossarms before a loss in functionality occurs and causes a permanent outage. Various industry organizations have attempted to analyze the stages of crossarm decay with varying degrees of success. This is the last line left on AEP's eastern footprint with this type of crossarm design.

AEP's experience with these laminated cross arms is that over time, due to the decay and delamination issues associated with the crossarm design, along with limitations to determine loss of functionality, failures on the line have historically been catastrophic in nature.

AEP Transmission Zone M-3 Process
Conesville – Bixby 345 kV

AEP Transmission Zone M-3 Process
Conesville – Bixby 345 kV

Need Number: AEP-2022-OH039

Process Stage: Solutions Meeting 02/07/2023

Proposed Solution:

- Conesville-Bixby 345kV Line (Bixby-Ohio Central & Ohio Central-Conesville Circuits): Rebuild ~46.1 miles of the ~51.1 miles of line using 954 kCM ACSR bundled conductor & install OPGW fiber on new line rebuild. Newer steel poles on the line will not be replaced.
  Estimated Cost: $ 154.53M

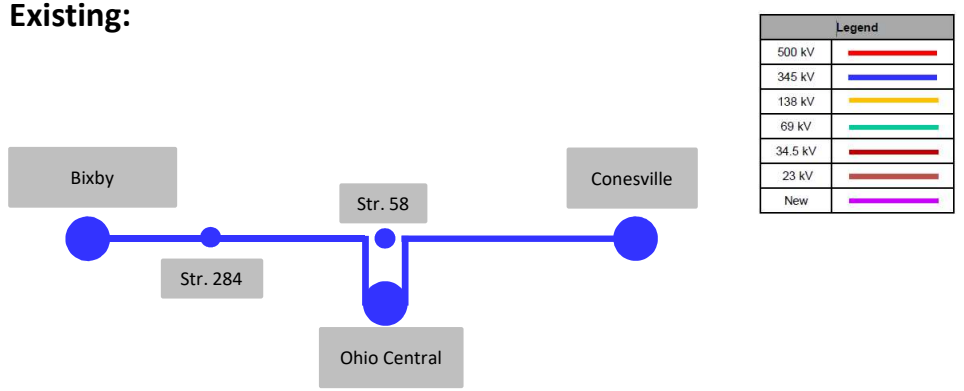
Total Estimated Transmission Cost: $ 154.53M

Alternatives Considered: No viable alternative to address the issues on this transmission line. Retirement of this line is not an option due to this being a major source into the greater Columbus area, which is experiencing multiple new load connection requests.

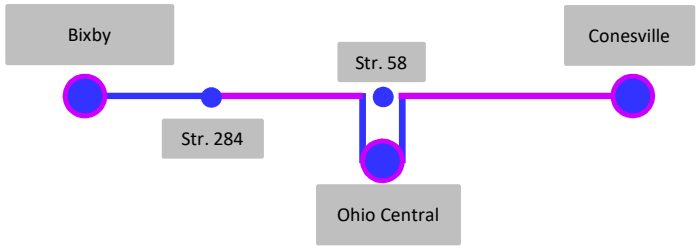
Projected In-Service: 9/1/2026 targeted ISD

Project Status: Scoping

Existing:



Proposed:



M-3 Process PECO Transmission Zone

Peach Bottom North Generating Unit #3 MOD/Relay Replacement

Need Number: PE-2023-001

Process Stage: Solutions Meeting 3/7/23

Previously Presented: Need Meeting 2/7/23

Project Driver:

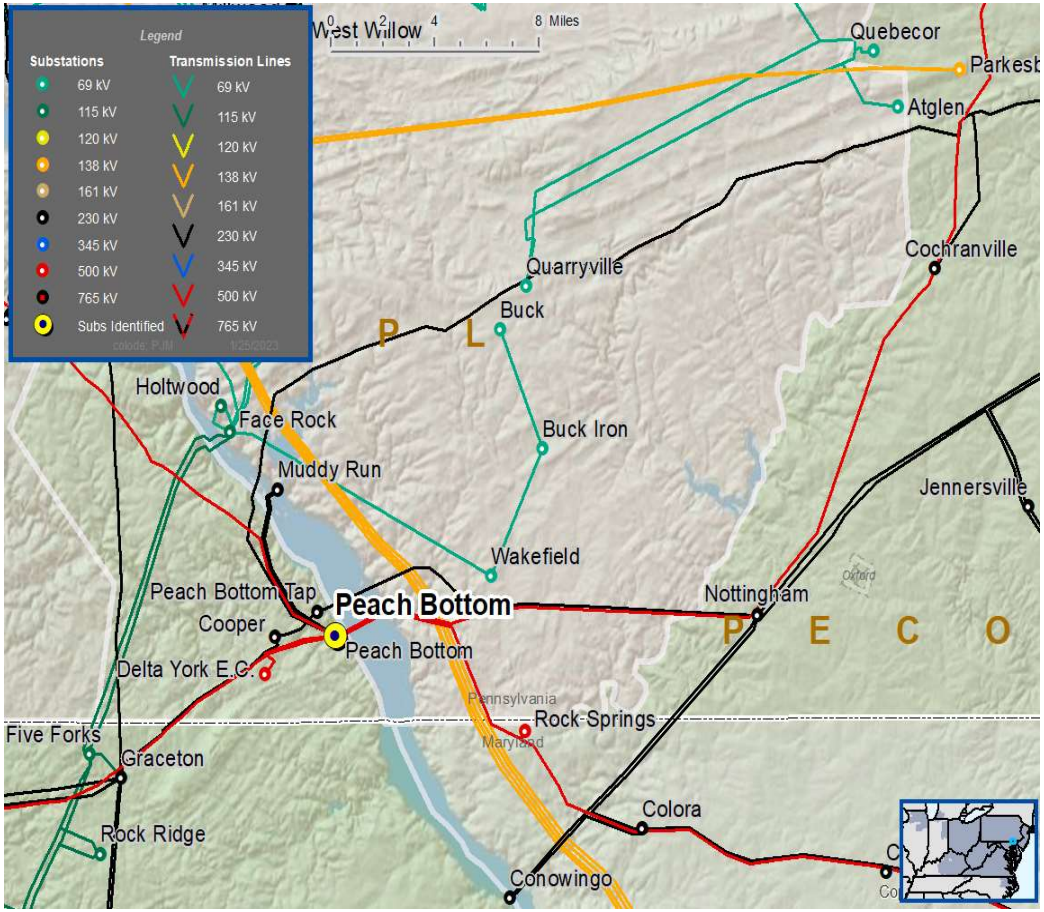
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

- Transmission infrastructure replacements (EOL/condition/obsolescence) that are consistent with efficient asset management decisions
- Programmatic review and/or replacement of breakers, relays, wood poles, etc.

Problem Statement:

- There are obsolete relays on Peach Bottom North Generating Unit #3. It is becoming difficult to service existing electromechanical relays.
- Peach Bottom #67 motor operated disconnect has lack of vendor support and has become obsolete.



M-3 Process PECO Transmission Zone

Peach Bottom North Generating Unit #3 MOD/Relay Replacement

Need Number: PE-2023-001

Process Stage: Solution Meeting 3/7/23

Proposed Solution:

Upgrade primary & backup relays, communication, and replace #67 motor operated disconnect on Peach Bottom North Generating Unit #3

#67 MOD Ratings:

Existing rating 2500A, 70kA

New rating 4000A and 63kA

Existing ratings (MVA):	SN/SE	WN/WE
Peach-Bottom #3 GSU Lead	2477/2598	2598/2598
Proposed ratings (MVA):	SN/SE	WN/WE
Peach-Bottom #3 GSU Lead	2598/3016	2598/3118

Estimated cost: $1.04M

Alternatives Considered: No feasible alternatives

Projected In-Service: 11/3/2023

Project Status: Engineering

Model: 2027 RTEP

M-3 Process PECO Transmission Zone
Concord 230 kV Circuit Breaker #565 Replacement

Need Number: PE-2023-002

Process Stage: Solution Meeting 3/7/2023

Previously Presented: Need Meeting 2/7/23

Project Driver:

Equipment Material Condition, Performance, and Risk

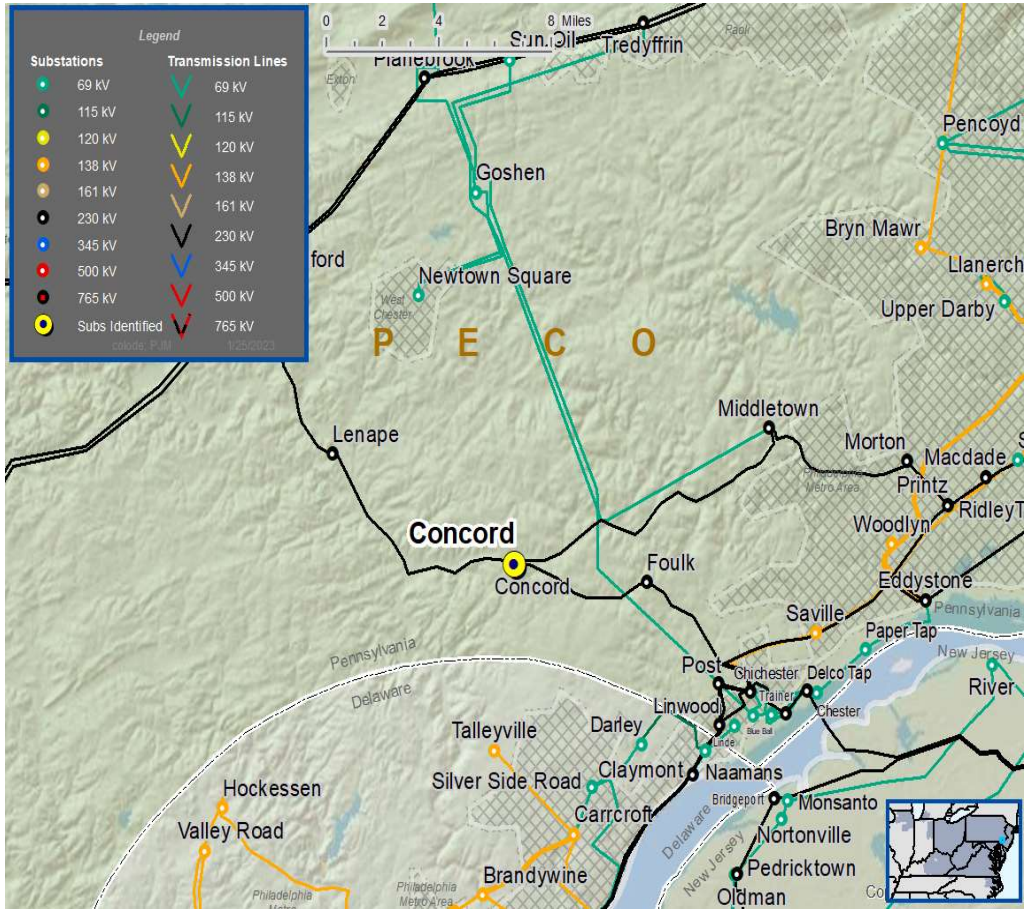
Specific Assumption Reference:

•Transmission infrastructure replacements (EOL/condition/obsolescence) that are consistent with efficient asset management decisions

•Programmatic review and/or replacement of breakers, relays, wood poles, cables, etc.

Problem Statement:

Concord 230 kV circuit breaker #565, installed in 1974, is in deteriorating condition, has lack of replacement parts, and elevated maintenance cost.



M-3 Process PECO Transmission Zone
Concord 230 kV Circuit Breaker #565 Replacement

Need Number: PE-2023-002

Process Stage: Solution Meeting 3/7/23

Proposed Solution:

Replace Concord 230 kV circuit breaker #565

Existing rating 3000A, 50kA

New rating 3,000A and 63kA

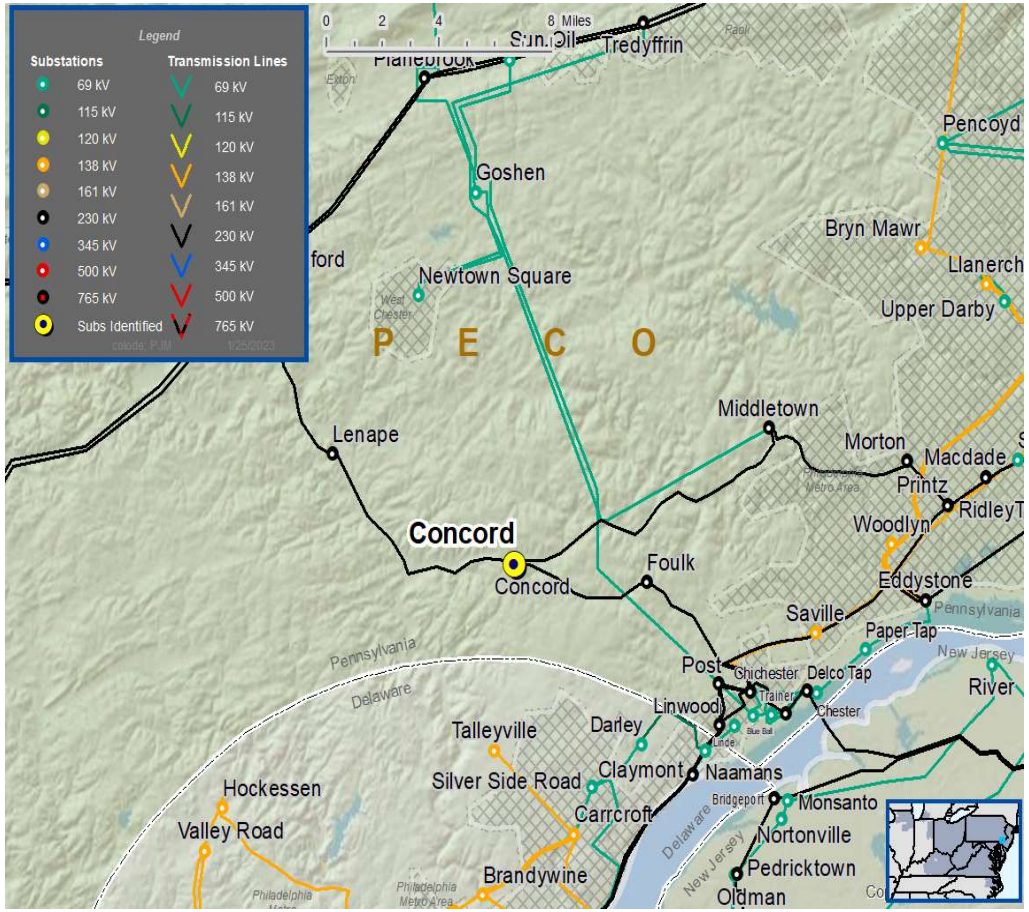
Estimated cost: $0.85M

Alternatives Considered: No feasible alternatives

Projected In-Service: 11/11/2023

Project Status: Engineering

Model: 2027 RTEP



M-3 Process PECO Transmission Zone
Limerick 500 kV Circuit Breaker #355 Replacement

Need Number: PE-2023-004

Process Stage: Solution Meeting 3/7/2023

Previously Presented: Need Meeting 2/7/23

Project Driver:

Equipment Material Condition, Performance, and Risk

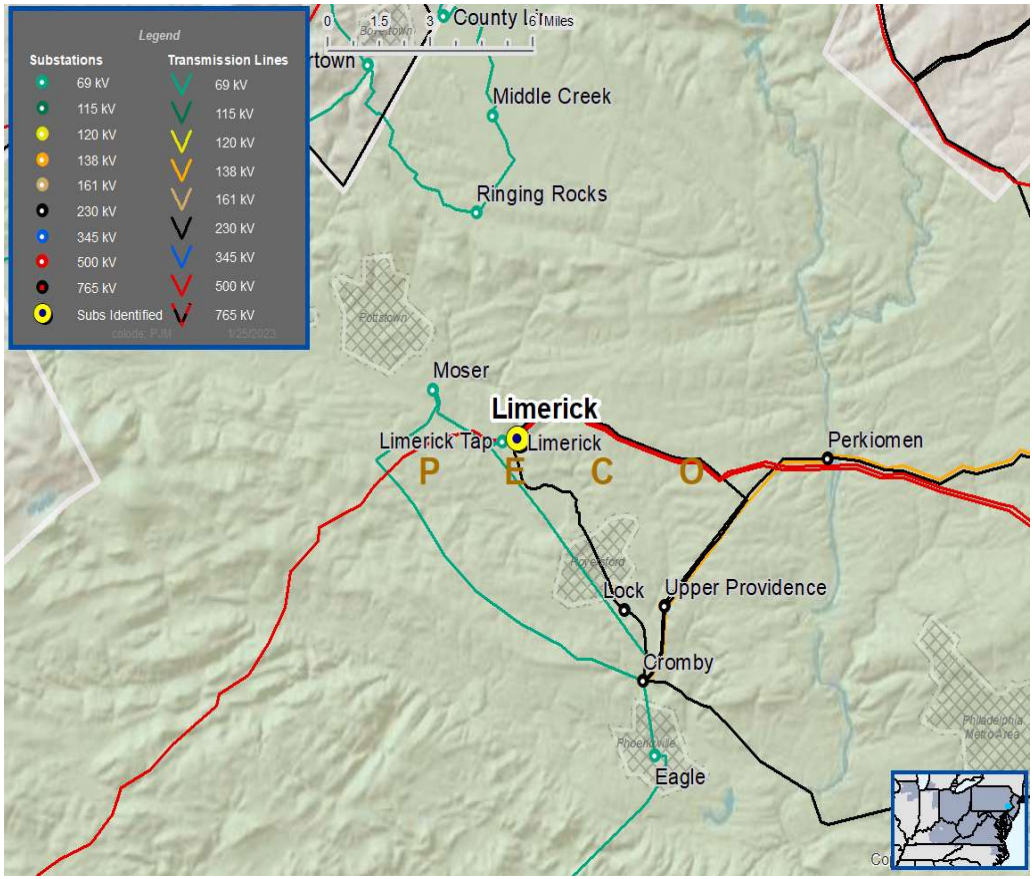
Specific Assumption Reference:

•Transmission infrastructure replacements (EOL/condition/obsolescence) that are consistent with efficient asset management decisions

•Programmatic review and/or replacement of breakers, relays, wood poles, cables, etc.

Problem Statement:

Limerick 500 kV circuit breaker #355, installed in 1992, is in deteriorating condition, has lack of replacement parts, and elevated maintenance cost.



M-3 Process PECO Transmission Zone
Limerick 500 kV Circuit Breaker #355 Replacement

Need Number: PE-2023-004

Process Stage: Solution Meeting 3/7/23

Proposed Solution:

Replace Limerick 500 kV circuit breaker #355

Existing rating 3000A, 40kA

New rating 4000A and 63kA

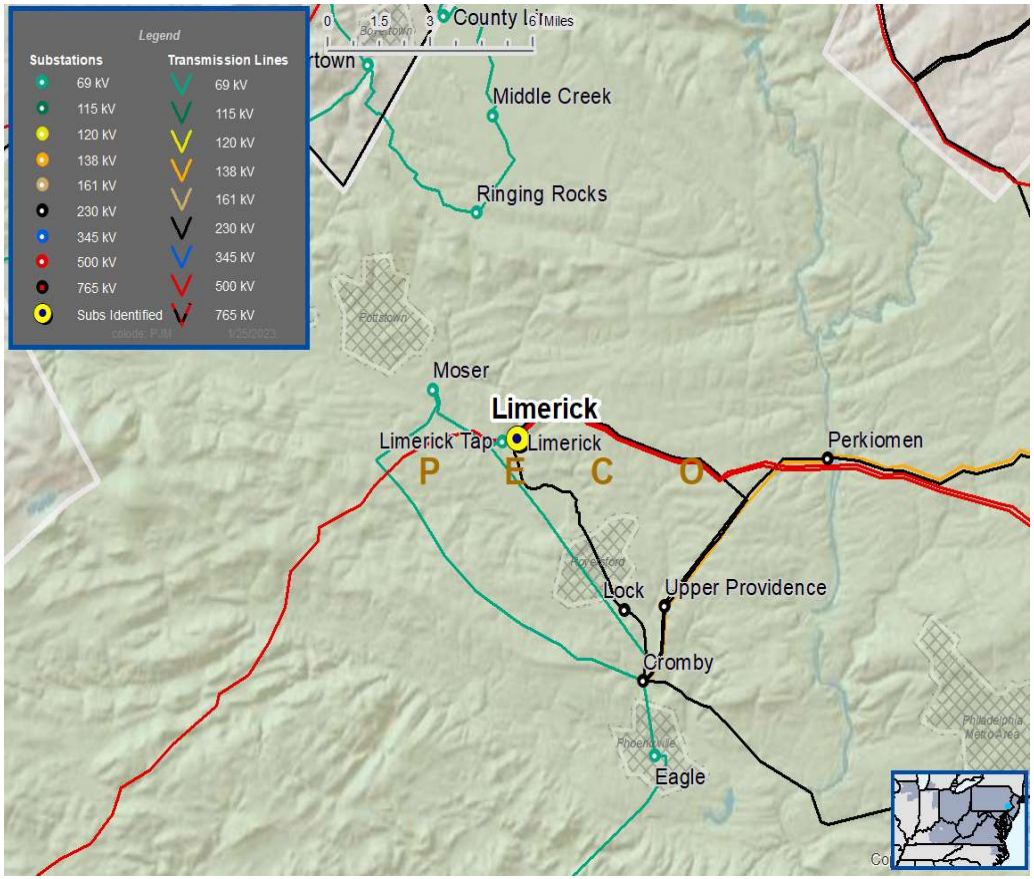
Estimated cost: $0.78M

Alternatives Considered: No feasible alternatives

Projected In-Service: 05/1/2023

Project Status: Engineering

Model: 2027 RTEP



ComEd Transmission Zone M-3 Process
TSS Wayne 345 kV Line 11126

Need Number: ComEd-2023-001

Process Stage: Solutions Meeting 4/11/2023

Previously Presented: Need Meeting 2/7/2023

Project Driver:

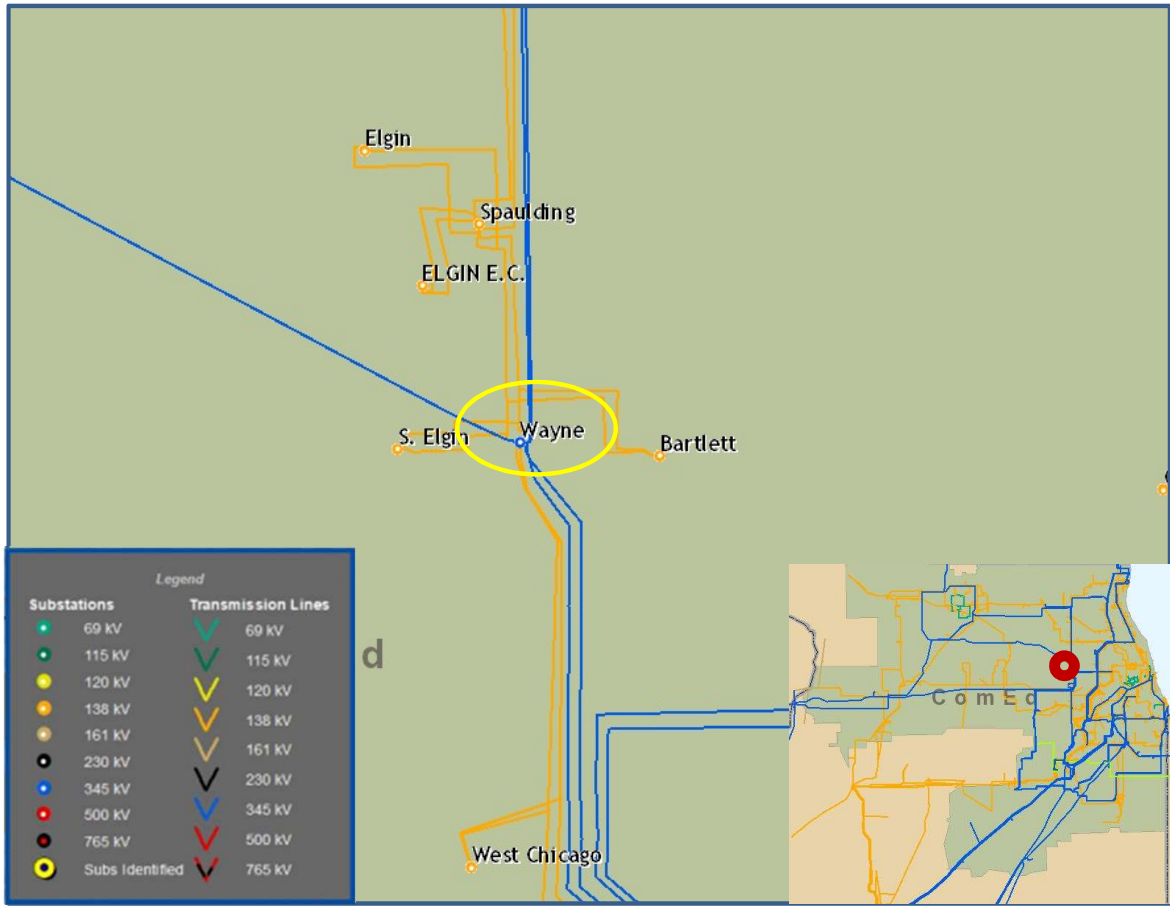
- Operational Flexibility and Efficiency

Specific Assumption References:

- Enhancing system functionality, flexibility, visibility, or operability

Problem Statement:

- In the current configuration at Wayne, 345 kV Line 11126 (Electric Junction – Wayne) does not have its own position on the ring bus. This makes maintenance outages difficult to obtain.



ComEd Transmission Zone M-3 Process
TSS Wayne 345 kV Line 11126

Need Number: ComEd-2023-001

Process Stage: Solutions Meeting 4/11/2023

Preferred Solution:

Move 345 kV Line 11126 (Electric Junction – Wayne) to Bus 6 and install 345 kV Bus Tie 5-6 CB.

Estimated transmission cost: $10M

Alternatives Considered:

Install a 345 kV line breaker on Line 11126 (Electric Junction – Wayne).

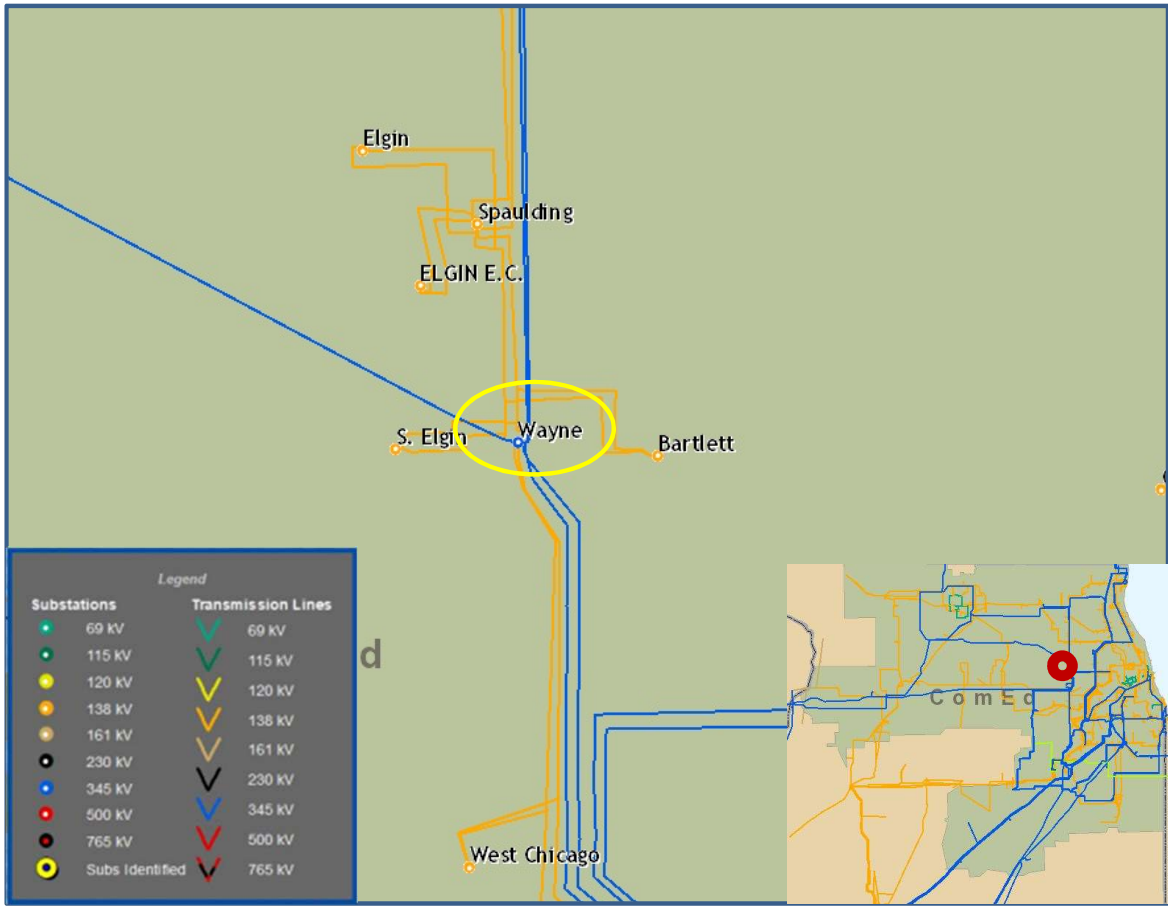
- This alternative was not selected since a bus fault would still outage multiple elements.

Estimated transmission cost: $10M

Projected In-Service: 12/31/25

Project Status: Conceptual

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2022-0032

Process Stage: Solutions Meeting 04/11/2023

Previously Presented: Need Meeting 06/07/2022

Project Driver: Customer Service

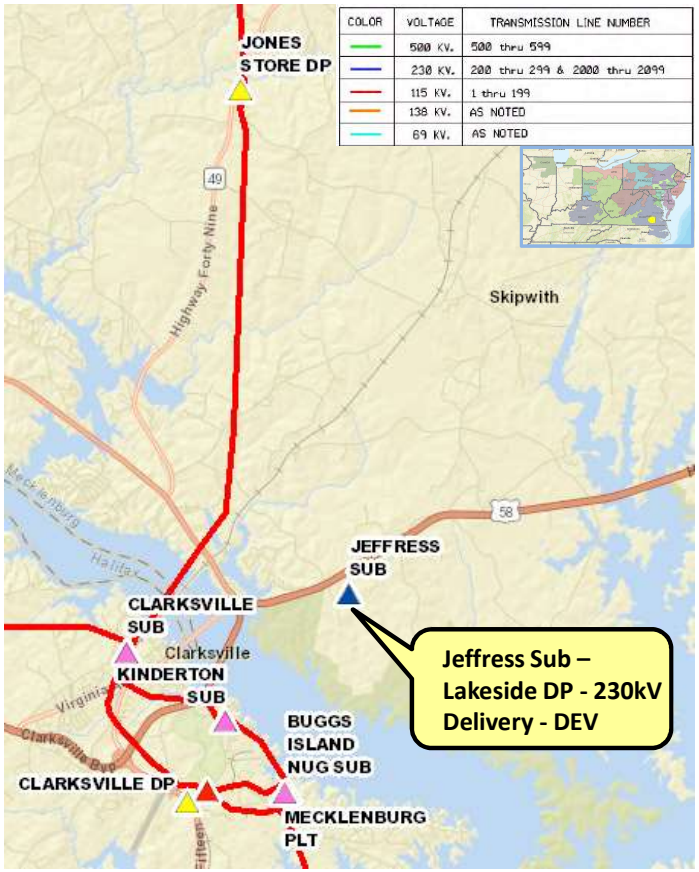
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

ODEC on behalf of Mecklenburg Electric Coop (MEC) has submitted a delivery point request (Lakeside DP) for a new delivery point to serve a data center customer in Clarksville, VA. The total load is in excess of 100 MW. The customer requests service by Jan 1, 2025.

Initial In-Service Load	Projected 2028 Load
Summer: 12.0 MW	Summer: 103.0 MW



Dominion Transmission Zone: Supplemental Jeffress 230kV Delivery - MEC

Need Number: DOM-2022-0032

Process Stage: Solutions Meeting 04/11/2023

Proposed Solution:

The project will need to be built in 2 stages due to the timeframe associated with obtaining a CPCN and extend 230kV into the area. The 115kV Station will help meet the initial load target date.

Stage 1: Interconnect the new substation by cutting and extending Line #36 (Chase City– Buggs Island) to the proposed Jeffress 115kV Substation. The substation and line equipment used to interconnect Jeffress 115 kV with the transmission system will be same as 230kV substation. The projected in-service date for Stage 1 is January 1, 2025.

Stage 2: Construct two 230kV single circuits from Finneywood 500/230kV sub to the proposed Jeffress 230kV Substation. Once conversion from 115kV to 230kV substation is complete, remove Jeffress 115kV tap and reconnect Line #36 Chase City– Buggs Island. The projected in-service date for Stage 2 is July 1, 2026.

Estimated Project Cost: $120.0 M (Total)

Transmission Line	$90M
115kV Substation	$15M
230kV Substation	$15M

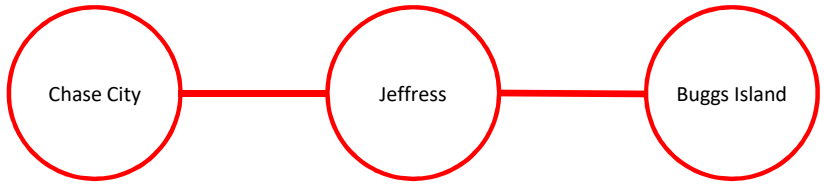
Alternatives Considered:

No feasible alternatives – 115kV system not adequate to support area data center growth.

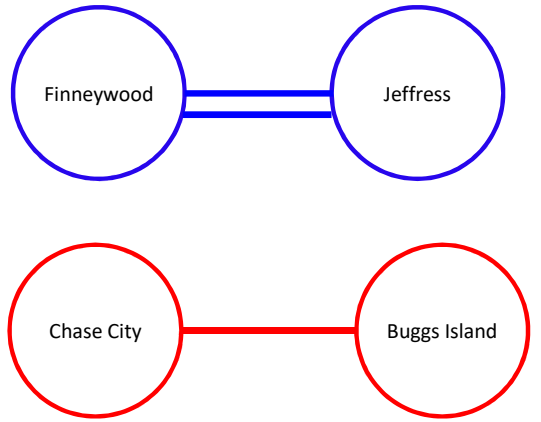
Projected In-service Date: 07/01/2026 (Stage 2)

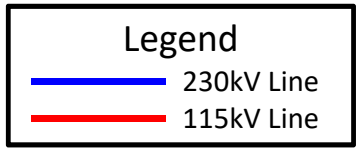
Project Status: Engineering

Stage 1: Jeffress 115kV Sub



Stage 2: Jeffress 230kV Sub





Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0007

Process Stage: Solutions Meeting 04/11/2023

Previously Presented: Need Meeting 03/07/2023

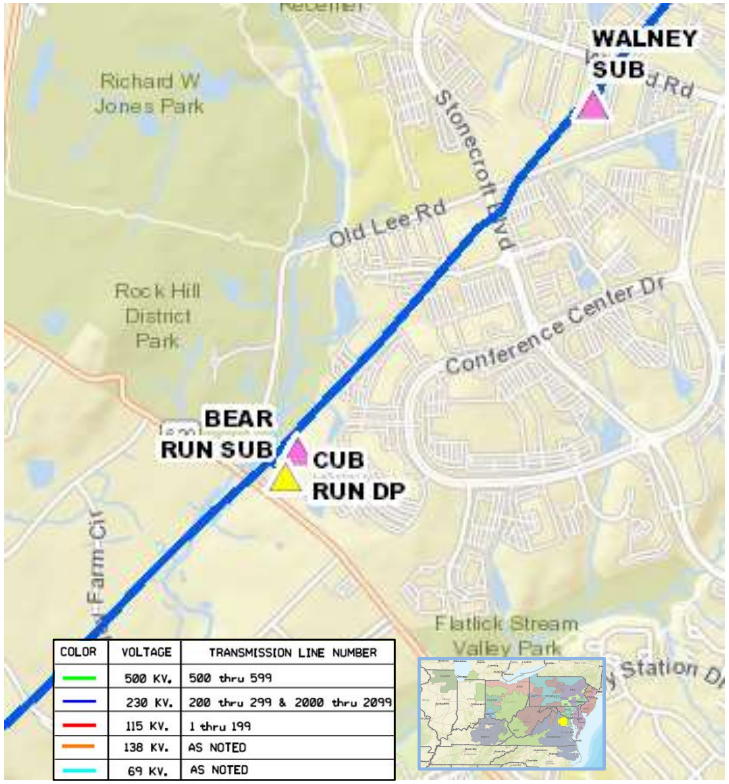
Project Driver: Customer Service

Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

NOVEC has submitted a Delivery Point (DP) Request stating that it is expanding Cub Run Substation in Fairfax County and the total load will exceed 100MW. Requested in-service date is 3/15/2024.



Initial In-Service Load	Projected 2028 Load
Summer: 45.0 MW	Summer: 90.0 MW

Dominion Transmission Zone: Supplemental Bear Run 230kV Delivery - DEV

Need Number: DOM-2023-0007

Process Stage: Solutions Meeting 04/11/2023

Proposed Solution:
Interconnect the new substation by cutting and extending Line #265 (Bull Run - Sully) to the proposed Bear Run Substation. Lines to terminate in a 230kV four-breaker ring arrangement with an ultimate arrangement of a six-breaker ring.

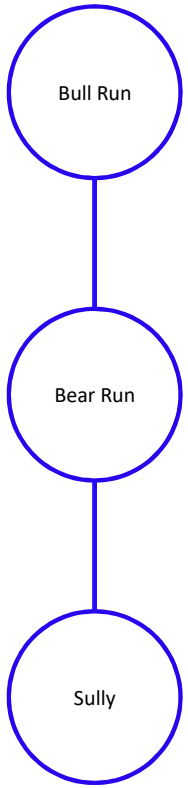
Estimated Project Cost: $24.5 M

Alternatives Considered:
None – adjacent to existing transmission line.

Projected In-service Date: 03/15/2024

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0015

Process Stage: Solutions Meeting 04/11/2023

Previously Presented: Need Meeting 03/07/2023

Project Driver: Customer Service

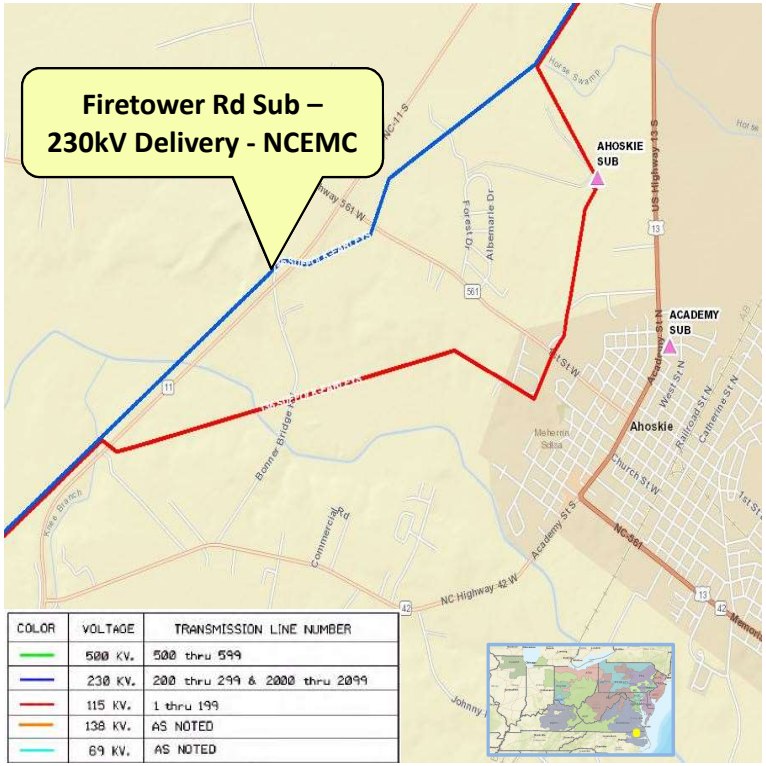
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

NCEMC has submitted a delivery point request for a new substation (Firetower Rd) to serve a gas compression facility in Ahoskie, NC. The total load is less than 100 MW. The customer requests service by December 31, 2023.

Initial In-Service Load	Projected 2028 Load
Winter: 8.1 MW	Summer: 8.1 MW



Dominion Transmission Zone: Supplemental Firetower Rd 230kV Delivery - DEV

Need Number: DOM-2023-0015

Process Stage: Solutions Meeting 04/11/2023

Proposed Solution:

Tap Line #246 (Earleys – Suffolk) near structure 246/290 and extend a single circuit 230kV line to Firetower Road sub.

Estimated Project Cost: $5.0 M (Total)

Transmission Line $4M

230kV Substation $1M

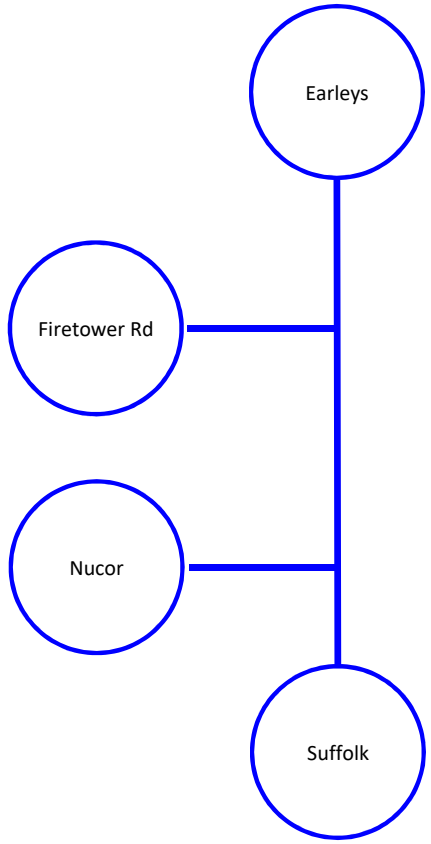
Alternatives Considered:

None – adjacent to existing transmission line.

Projected In-service Date: 12/31/2023

Project Status: Engineering

Model: 2027 RTEP



AEP Transmission Zone M-3 Process
Cyprus

Need Number: AEP-2022-OH071

Process Stage: Solution Meeting 5/9/2023

Previously Presented: Need Meeting 10/14/2022

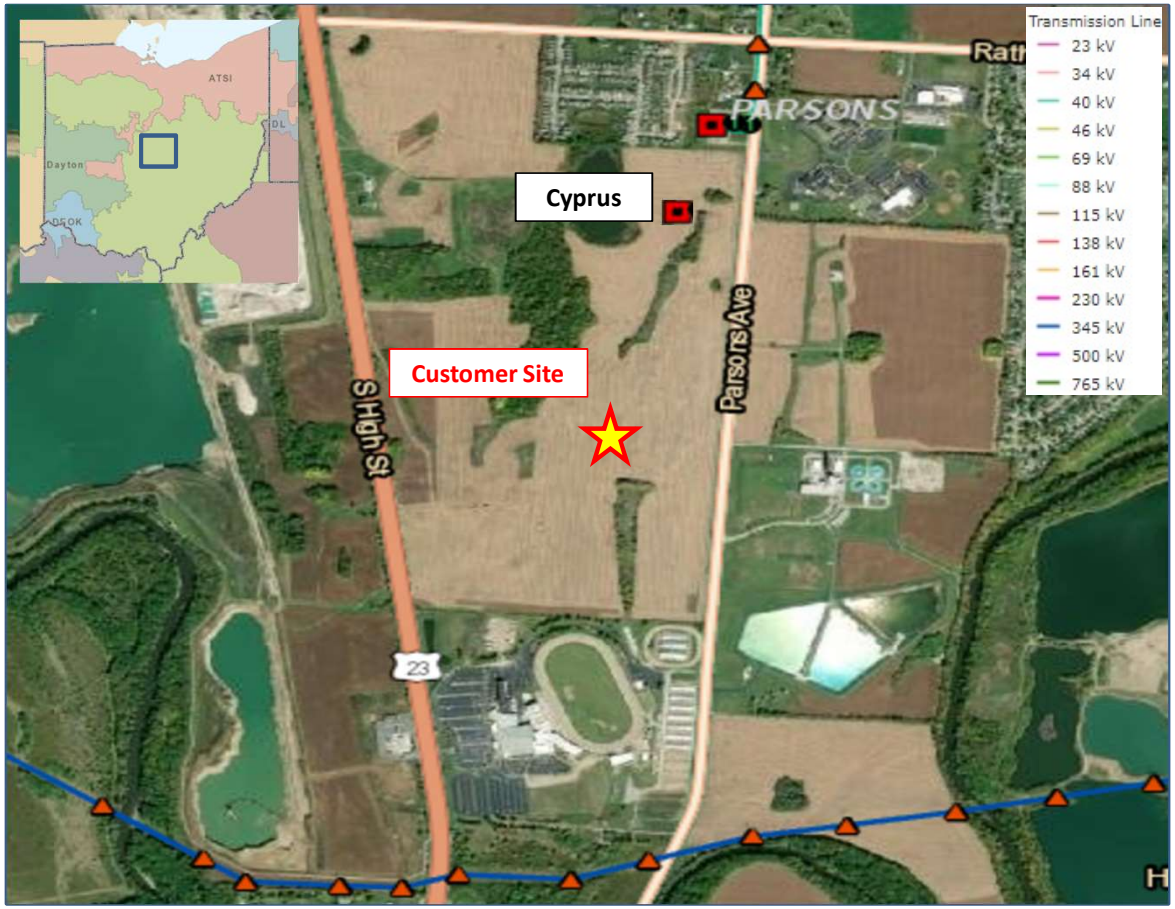
Project Driver: Customer Service

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

- A customer has requested additional 138 kV deliveries to their site in Columbus, Ohio near AEP's proposed Cyprus station (s2526).
- The initial peak demand at these new delivery points will be approximately 200 MW and the ultimate capacity of the customer will be up to 675 MW at the site.



AEP Transmission Zone M-3 Process
South Columbus, OH

Need Number: AEP-2022-OH071

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following work is all direct connect facilities to physically connect demand to the grid.

- **Cyprus 345/138 kV:** Cyprus is the station that was originally developed (s2526) to serve 675 MW of demand with room for 345 kV expansion based on LOA with the customer. Cut into the Beatty – Bixby 345 kV circuit and construct ~1.6 miles of double circuit line, utilizing 2-bundled ACSR Bittern 1272 conductor, SE rating 2278 MVA, to a new 345 kV ring bus at Cyprus station with (4) 5000 A, 63kA circuit breakers, (2) 345/138/34.5 kV, 675 MVA transformers, (12) 4000 A, 63kA, 138 kV circuit breakers, (1) 69.1 MVAR 138 kV Cap bank. Construct (2) 138 kV single circuit, ~0.4 miles, & (2) double circuit, ~0.9 miles, tie lines to the customers dead end structures utilizing ACSR Drake 795 (26/7) conductor SE 360 MVA. Modify the existing Cyprus 138kV Extension & Parsons 138kV circuits #1 & 2 structures to accommodate a fence relocation. Remote end relay upgrades are required at Beatty & Bixby 345 kV stations. Cost: **$46.9 M**
- **Parsons 138 kV:** Install (1) 69.1 MVAR cap bank to resolve N-1-1 voltage issues. Cost: **$2.0 M**


MCCOMB (CS)
LSII
Bolton
Jackson Twp
White Road
Grove City
Beatty Road
Parsons
Cyprus
Obetz
Walnut
Obetz (SCP)
Beatty - Bixby 345 kV
AEP - OPCO
Zuber
Legend
Station
Circuit
12 kV
14 kV
23 kV
34 kV
40 kV
46 kV
69 kV
88 kV
115 kV
138 kV
161 kV
230 kV
345 kV
500 kV
765 kV

AEP Transmission Zone M-3 Process
South Columbus, OH

Need Number: AEP-2022-OH071

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following components are system reinforcements required to serve the load and meet applicable TPL-001, PJM, and AEP planning criteria:

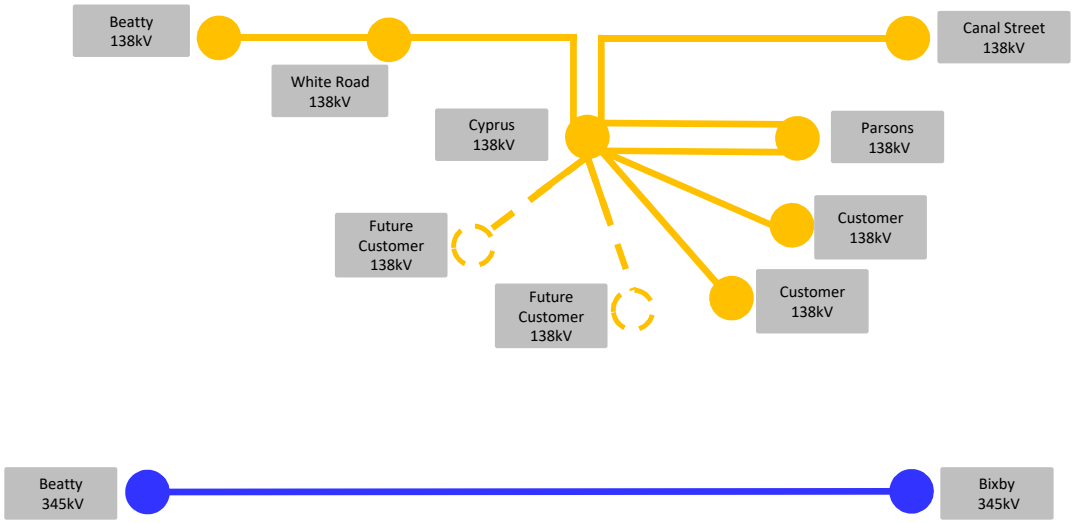
- **Beatty – Canal 138 kV line Sag Re-rate:** The Beatty – Canal 138 kV line flagged as overloading under N-1-1 scenarios after the addition of the new load at Cyprus. The line will be flown to address sag issues that are limiting its current rating. It is anticipated that several structures will need to be replaced in order to rase the rating of the line. Cost: **$5.5 M**
- **Waverly Reactor 138 kV:** Install a 4% series reactor towards Rozelle at Waverly station to address a N-1-0 scenario related to the loss of a nearby 345 kV line. Cost: **$3.0 M**
- **Saint Clair Avenue Reactor 138 kV:** Adjust tap settings on reactors towards Mound and Clinton stations to 3%. Cost: **$0.0 M**
- **Marion Station:** Replace switch and line riser at Marion station towards Obetz to address loading concern under certain N-1-1 scenario related to customer interconnections in the area. **$0.1M**

System Upgrades: $8.6M

Direct Connect Facilities: $48.9M

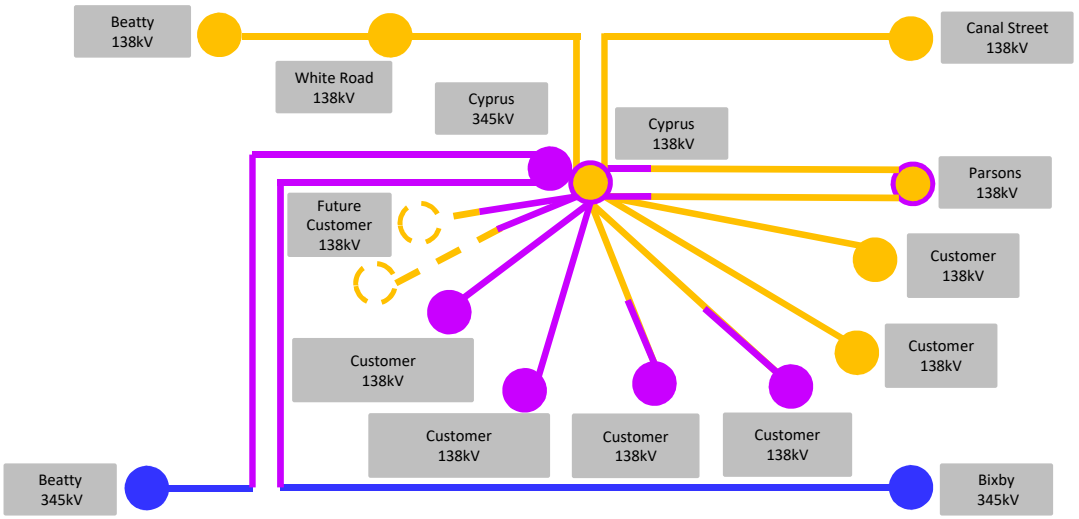
Total Estimated Transmission Cost: $57.5M

Existing:



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

Proposed:


Legend
765 kV
345 kV
138 kV
69 kV
34.5 kV
23 kV
New
Beatty 138kV
White Road 138kV
Cyprus 345kV
Cyprus 138kV
Canal Street 138kV
Parsons 138kV
Future Customer 138kV
Customer 138kV
Customer 138kV
Customer 138kV
Customer 138kV
Customer 138kV
Customer 138kV
Beatty 345kV
Bixby 345kV

AEP Transmission Zone M-3 Process
Jerome

Need Number: AEP-2021-OH049

Process Stage: Solution Meeting 5/9/2023

Previously Presented: Needs Meeting 7/16/2021, Need Meeting 9/17/2021 & Need Meeting 2/17/2023

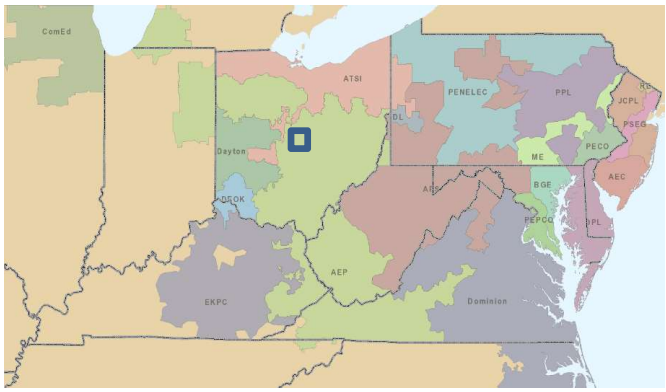
Project Driver: Customer Service

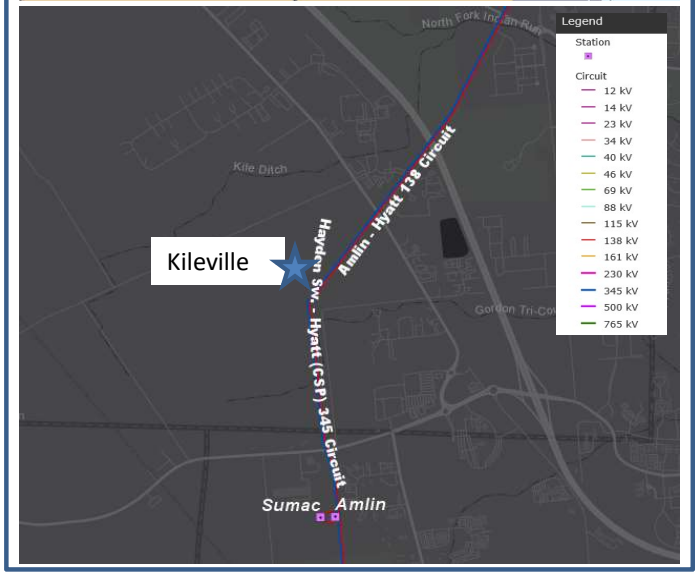
Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Jerome Delivery Point (AEP) 138 kV:

- A customer has requested new transmission service in Plain City, Ohio.
- The delivery point will be used to serve a customer with high potential for rapid load growth. The initial load will be 106 MW with a potential future peak load demand of 203 MW.
- Service is requested by June 2024.
- The customer communicated a much more aggressive load ramp/build out schedule that would put their peak load at approximately 160 MW by early 2025 at the site.
- This Need was originally presented as a Buckeye Power request; The customer has since requested service from AEP Ohio at the site. As part of this request, the customer has indicated the need for additional feeds at the delivery which will bring the load amount up to 203 MW.





AEP Transmission Zone M-3 Process
Dublin & Hilliard, OH

Need Number: AEP-2021-OH049

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following scope of work is all direct connect facilities to physically connect demand to the grid.

- **Jerome 138 kV**: Construct a greenfield Jerome station with (11) 138kV 63kA 4000A circuit breakers in breaker and half bus configuration. Construct ~ 2.5 miles of double circuit 138kV transmission line extending from Celtic & Kileville stations utilizing 2-bundled ACSS Cardinal 954 (45/7) conductor, SE rating 1061 MVA. Construct ~1.6 miles of double circuit 138kV transmission line extending from Jerome to cut-in back to Hyatt – Amlin line utilizing 2-bundled ACSS Cardinal 954 (45/7) conductor, SE rating 1061 MVA. Construct (4) 138 kV tie lines to the customers dead end structures ~0.05 miles utilizing ACSR Dove 556.5 (26/7) conductor SE 284 MVA. Customers will be directly connected at this station. Cost: **$30 M**

AEP Transmission Zone M-3 Process
Beacon

Need Number: AEP-2022-OH024

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Need Meeting 2/18/2022

Project Driver: Customer Service

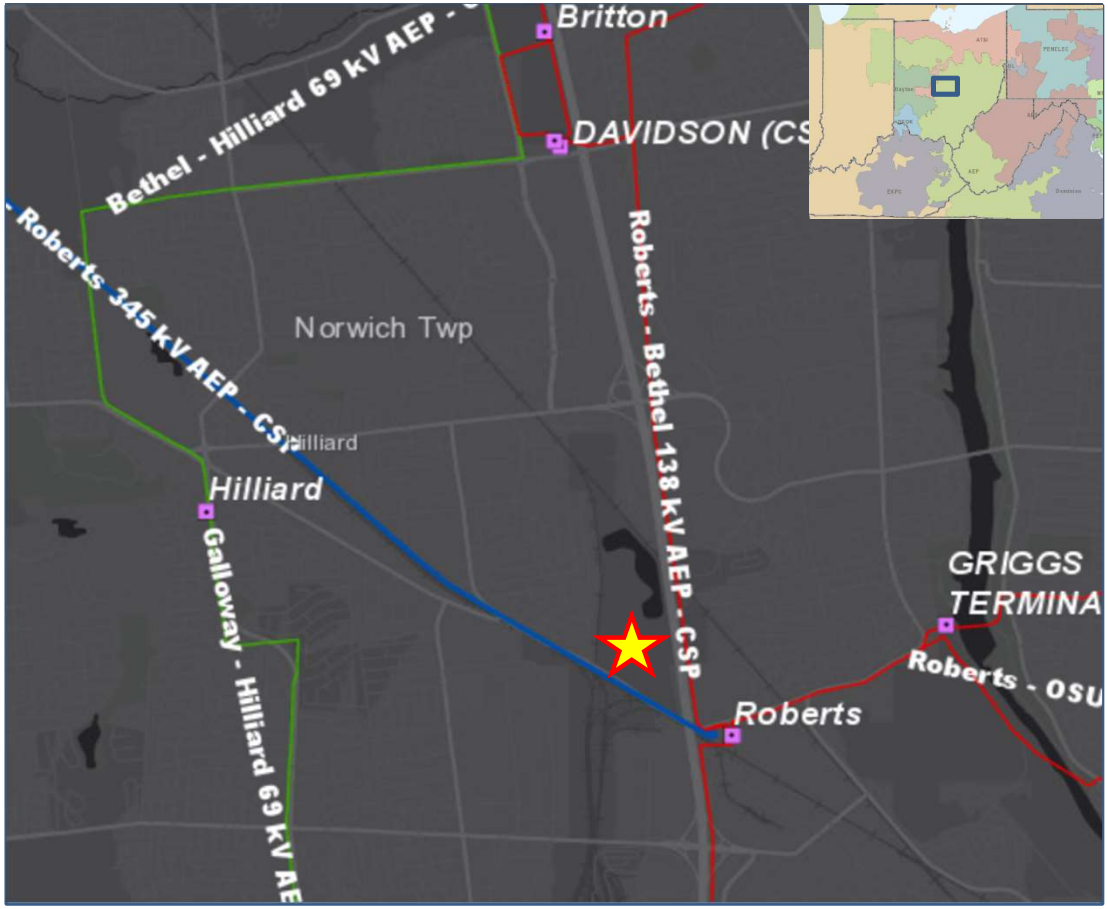
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site North of AEP's existing Roberts station in Columbus, OH.
- The customer has indicated an initial peak demand of ~~90~~ 125 MW with an ultimate capacity of up to ~~360~~ 328 MW at the site.
- Initial customer requested in-service date of June 1, 2024.



AEP Transmission Zone M-3 Process
Dublin & Hilliard, OH

Need Number: AEP-2022-OH024

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following scope of work is all direct connect facilities to physically connect demand to the grid.

- **Beacon 345 kV**: Construct a greenfield station with (8) 5000 A, 345 kV, 63 kA circuit breakers & & (1) 158.4 MVAR 345 kV Cap bank in a breaker and a half configuration. Cut into the 345 kV Hayden – Roberts No. 2 circuit with two single circuit 345 kV lines ~0.2 miles terminating into Beacon station; utilizing 2-bundle ACSR Rail 954 (45/7) conductor SE 1887 MVA. A structure will need be installed to raise the Hayden – Roberts No 1 circuit. Construct three single circuit lines ~0.1 miles, between Beacon and the customer; utilizing 2-bundle ACSR Drake 795 (26/7) conductor SE 1800 MVA. Cost: **$40.0 M**

AEP Transmission Zone M-3 Process
Cosgray

Need Number: AEP-2022-OH035

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Need Meeting 4/22/2022

Project Driver: Customer Service

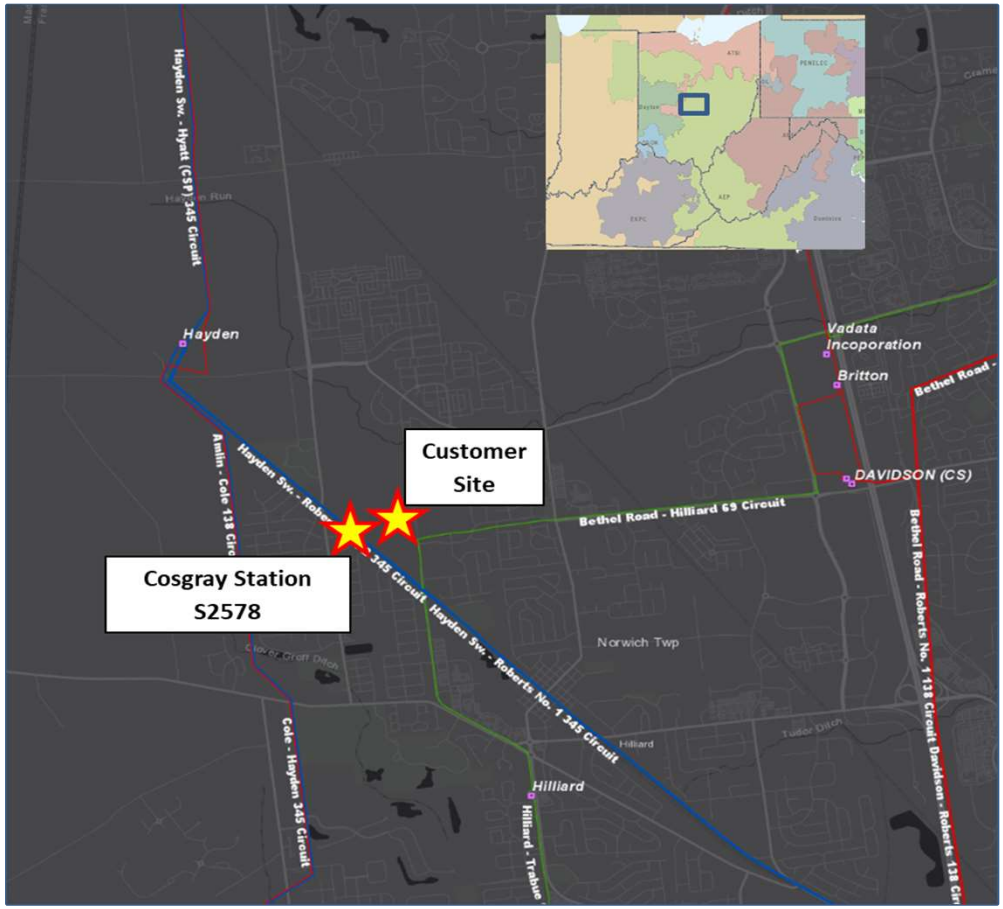
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- The customer Served out of Cosgray station (S2653) has requested additional transmission service to their existing site southeast of AEP's existing Hayden station in Hilliard, OH.
- The customer has indicated a peak demand of ~~250~~ 218 MW at the site.
- The customer has requested an ISD of 4/1/2024



AEP Transmission Zone M-3 Process
Dublin & Hilliard, OH

Need Number: AEP-2022-OH035

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following scope of work is all direct connect facilities to physically connect demand to the grid.

- **Cosgray 345 kV:** Expand the existing Cosgray ring bus (originally proposed under s2653) station by installing (2) 5000 A, 63 kA, 345 kV circuit breakers. Construct two ~0.06 miles single circuit lines to connect the new customer deliveries to Cosgray. Cost: **$5.1 M**

AEP Transmission Zone M-3 Process
Kileville

Need Number: AEP-2023-OH041

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Needs Meeting 2/17/2023

Project Driver: Customer Service

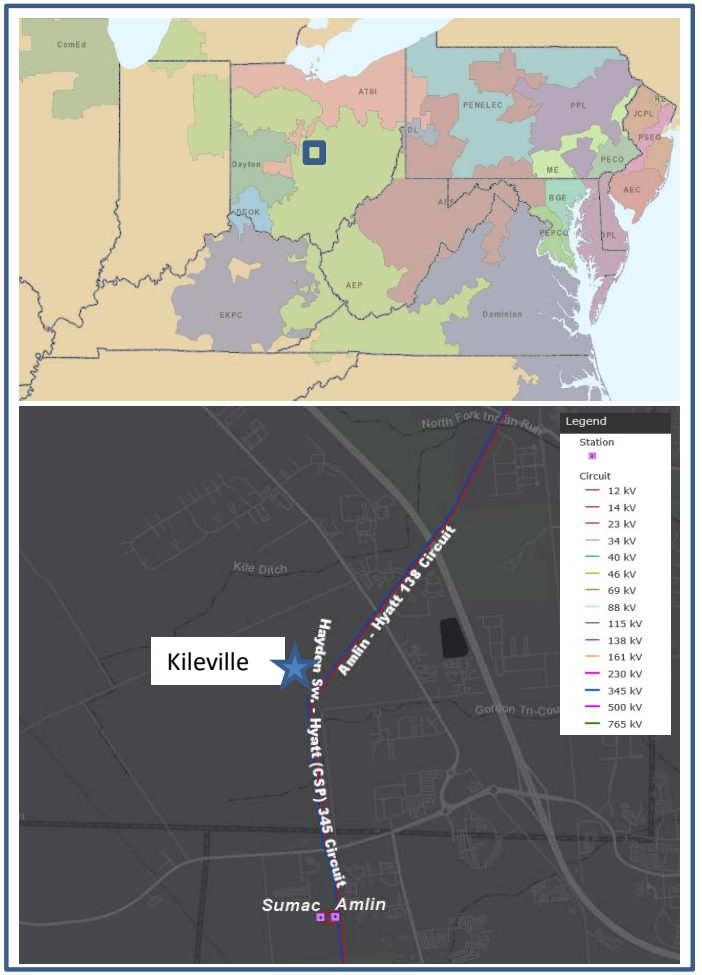
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- An existing customer planned to be served out of AEP's proposed Kileville Station in Union Count, OH, has requested service for an incremental bulk load addition of 96 MW. This will bring the total & ultimate load for the customers site to ~~256~~ 258 MW.
- Customer requested in-service date of 4/1/2024.



AEP Transmission Zone M-3 Process
Dublin & Hilliard, OH

Need Number: AEP-2023-OH041

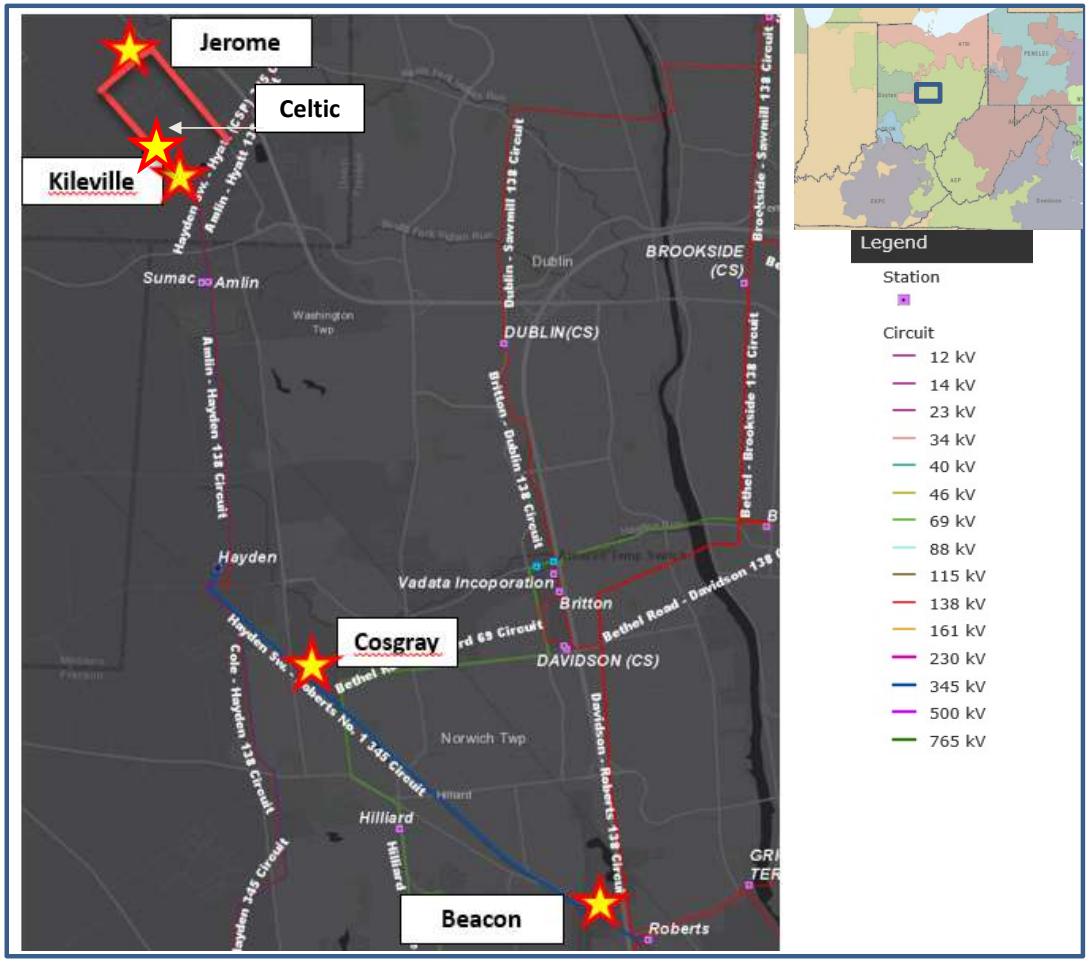
Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following scope of work is all direct connect facilities to physically connect demand to the grid.

- **Celtic 345/138 kV:** Originally, Kileville is the station that was envisioned (s2855) to serve 461 MW of demand with room for 345 kV expansion based on LOAs with the customer. However, land in the area of the proposed Kileville station was not available for expansion to install 345/138 kV transformation. Therefore, a new station site called Celtic is being proposed to serve as the 345 kV source for the 461 MW of load to be served in this area. Cut into the Hayden – Hyatt 345 kV circuit, reroute ~0.8 miles of the circuit and extend ~1.1 miles of new double circuit line, utilizing 2-bundled ACSR Pheasant 1272 (54/19) conductor, SE rating 2413 MVA, to the greenfield Celtic 345/138 kV station with (4) 345 kV, 63 kA, 5000 A breakers laid out as ring bus configuration on high side. Install two 675MVA-345/138 kV power transformers. Install (6) 138kV, 63 kA, 4000 A breakers & (2) 69.1 MVAR 138 kV Cap bank on low side configured as ring bus with provisions for future breaker and half configuration. The proposed Kileville – Jerome 138 kV circuit will be brought in and out of the station. Cost: **$60 M**
- **Kileville 138 kV**: Expand Kileville station (originally proposed under s2855) with (4) additional 63 kA, 4000A circuit breakers in breaker and half bus configuration. Construct (2) 138 kV tie lines to the customers dead end structures ~0.05 miles utilizing ACSR Dove 556.5 (26/7) conductor SE 284 MVA. Customers will be directly connected at this station. Cost: **$4.1 M**

AEP Transmission Zone M-3 Process
Dublin & Hilliard, OH



AEP Transmission Zone M-3 Process
Dublin & Hilliard, OH

Need Number: AEP-2021-OH049, AEP-2022-OH024, AEP-2022-OH035, AEP-2023-OH041

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following components are system reinforcements required to serve the load and meet applicable TPL-001, PJM, and AEP planning criteria:

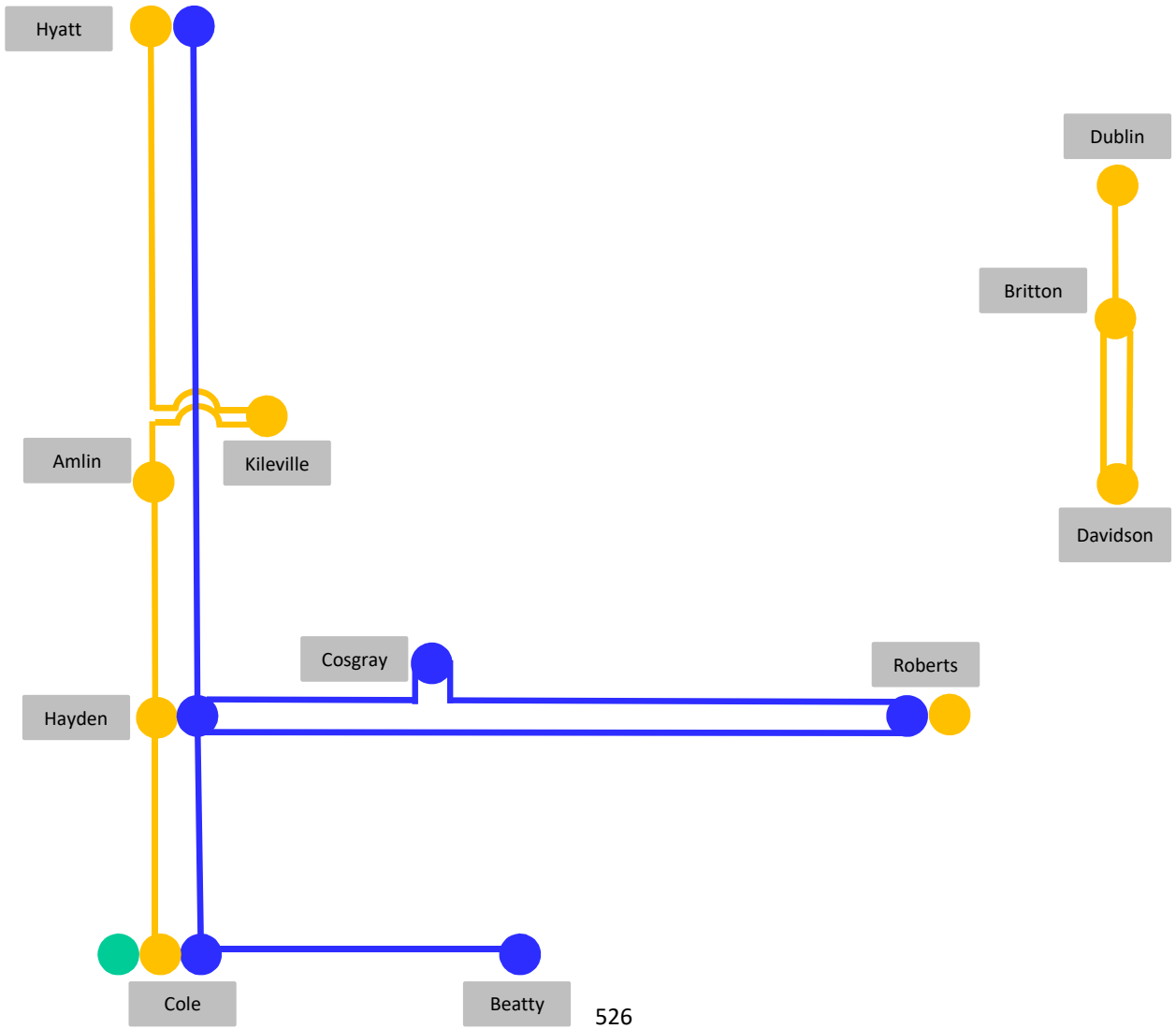
- **Beatty – Wilson 138 kV line Sag Re-rate:** Due to new customer interconnections in the area the Beatty – Wilson, Beatty – Bolton, Bolton – Hall and Hall - Wilson 138 kV circuits will overload for certain N-1-1 scenarios. Structures will be replaced on the line to address distribution clearance issue in order to allow the lines to operate to their conductor's designed maximum operating temperature. Cost: **$1.5 M**
- **Dublin Reactor 138 kV:** Install a 4% series reactor towards Sawmill at Dublin station to address a N-1-1 scenario as a result of the new load interconnections in the area. Cost: **$3.0 M**

System Upgrades: $4.5M

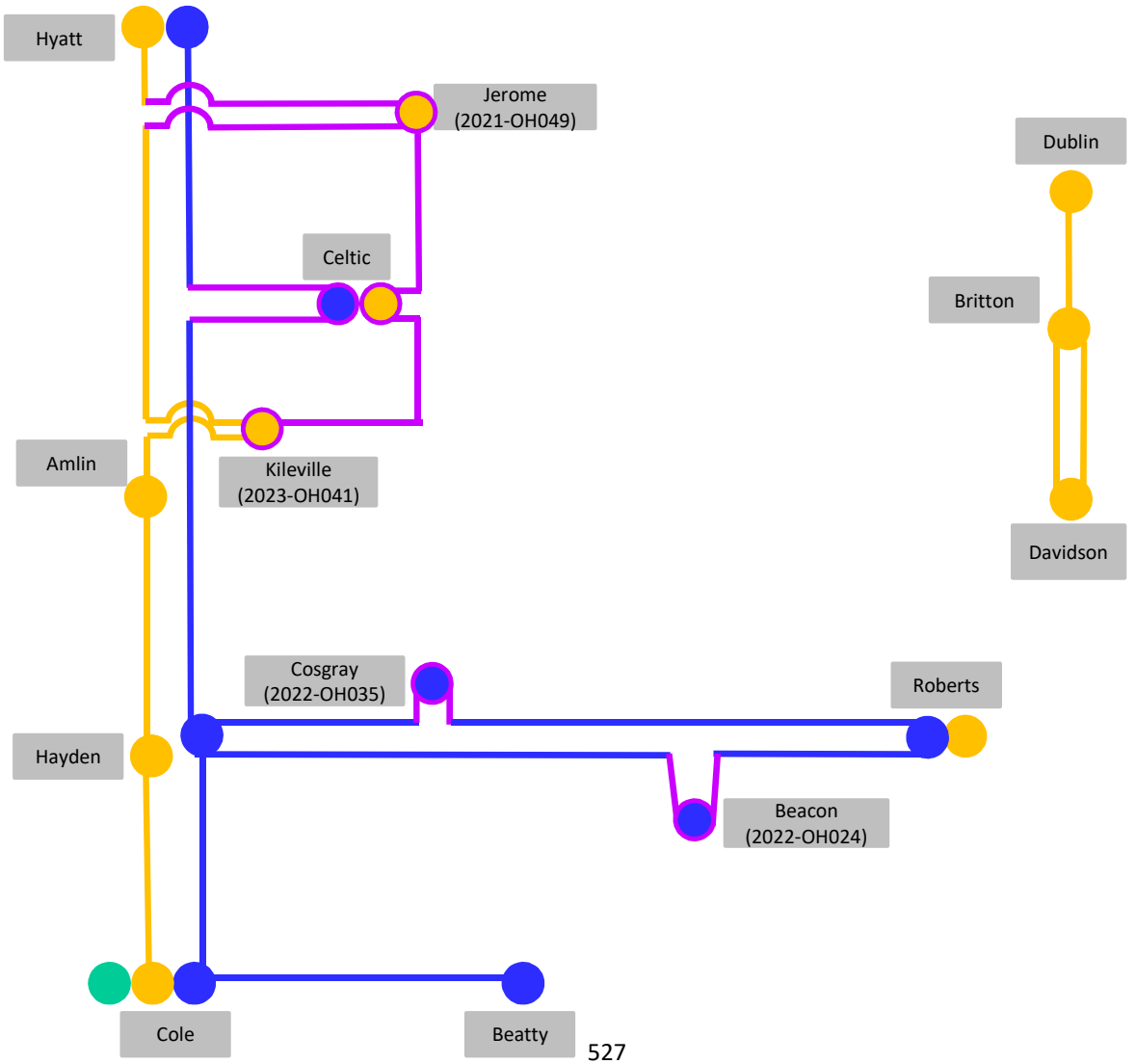
Direct Connect Facilities: $139.2M

Total Estimated Transmission Cost: $143.7M

Existing:


Hyatt
Dublin
Britton
Amlin
Kileville
Davidson
Cosgray
Roberts
Hayden
Cole
Beatty
Legend
765 kV
345 kV
138 kV
69 kV
34.5 kV
23 kV
New
Existing:

Proposed:



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

Proposed:

AEP Transmission Zone M-3 Process
Badger

Need Number: AEP-2022-OH023

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Need Meeting 2/18/2022

Project Driver: Customer Service

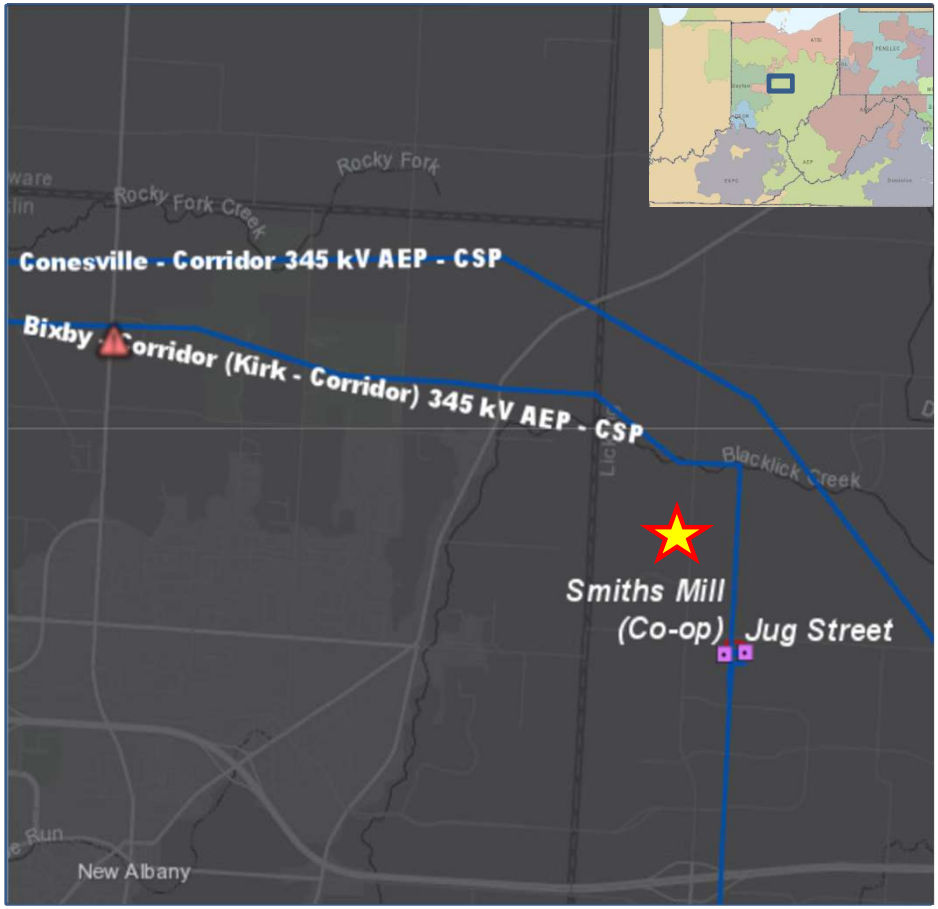
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site North of AEP's existing Jugg Street station in Columbus, OH.
- The customer has indicated an initial peak demand of ~~90~~ 125 MW with an ultimate capacity of up to ~~360~~ 290 MW at the site.
- Initial customer requested in-service date of June 1, 2024.



AEP Transmission Zone M-3 Process
New Albany, OH

Need Number: AEP-2022-OH023

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following work is all direct connect substation to physically connect demand to the grid.

- **Badger 138 kV:** Cut into the Green Chapel – Jug 138 kV circuit and extend ~ 0.1 miles of new double circuit line, utilizing 2-bundled ACSR Falcon 1590 (54/19) conductor, SE rating 1118 MVA , to the greenfield Badger station with (10) 80 kA, 4000 A breakers & (1) 69.1 MVAR 138 kV Cap bank, laid out as breaker and a half for future expansion to 6 strings. Construct 4 - 138 kV tie lines to the customers dead end structures ~.05 miles utilizing ACSR Dove 556.5 (26/7) conductor SE 284 MVA. Cost: **$18.43 M**

AEP Transmission Zone M-3 Process
QTS North

Need Number: AEP-2022-OH034

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Need Meeting 4/22/2022

Project Driver: Customer Service

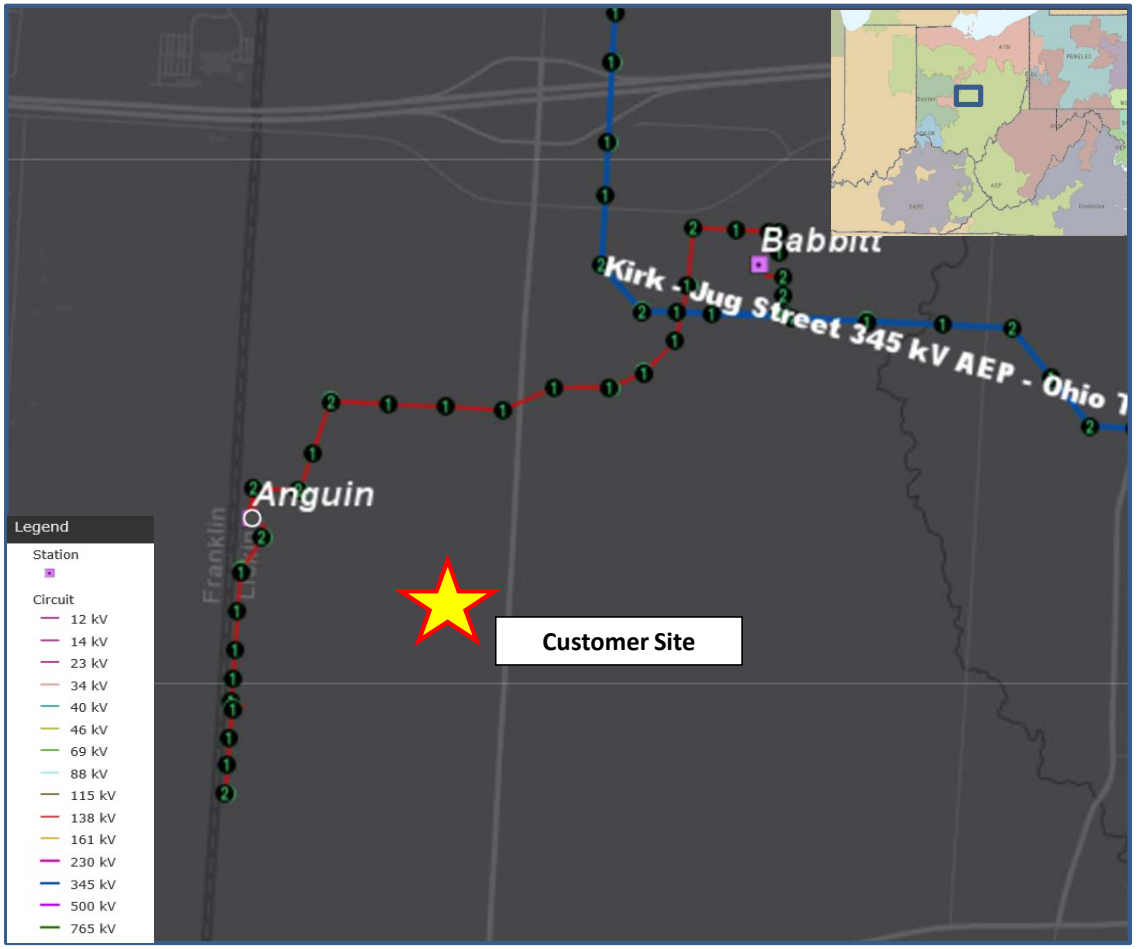
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site East of AEP's existing Anguin station in New Albany, OH.
- The customer has indicated a peak demand of ~~144~~ 216 MW at the site.
- The customer has requested an ISD of 5/31/2023



AEP Transmission Zone M-3 Process
New Albany, OH

Need Number: AEP-2022-OH034

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following work is all direct connect substations to physically connect demand to the grid.

- **QTS North 138 kV**: Construct ~0.3 miles of double circuit & a single circuit radial 138 kV tie lines from Anguin station to QTS Customer's site dead-end structures serving transformers #1, #2 # 3, each utilizing ACSR Dove 556.5 (26/7) conductor SE 284 MVA. Cost: **$1.8 M**

AEP Transmission Zone M-3 Process
Innovation Build Out

Need Number: AEP-2022-OH036

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Need Meeting 04/22/2022

Project Driver: Customer Service

Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- The customer served out of Innovation station (S2578) has requested additional transmission service at their existing site just south of the existing Conesville – Corridor 345 kV circuit in New Albany, OH.
- The customer has indicated a peak demand of ~~286.5~~ 247 MW at the site.
- The customer has requested an ISD of 4/1/2024

AEP Transmission Zone M-3 Process
New Albany, OH

Need Number: AEP-2022-OH036

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following work is all direct connect substations to physically connect demand to the grid.

- **Innovation 345/138 kV:** Cut into the Corridor - Conesville 345 kV circuit and construct ~0.1 miles of double circuit line, utilizing 2-bundled ACSR Bittern 1272 conductor, SE rating 2278 MVA, to a new 345 kV ring bus at Innovation station (s2578) with (4) 5000 A, 63kA circuit breakers, (2) 345/138/34.5 kV, 675 MVA transformers, (15) 4000 A, 80, kA, 138 kV circuit breakers, (2) 69.1 MVAR, 138 kV Cap banks. Upgrade the line protection relays at Conesville & Corridor 345 kV. Construct (2) 138 kV tie lines to the customers dead end structures ~0.04 miles utilizing ACSR Dove 556.5 (26/7) conductor SE 284 MVA. Cost: **$53.7 M**

AEP Transmission Zone M-3 Process Horizon

Need Number: AEP-2022-OH045

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Need Meeting 06/15/2022

Project Driver: Customer Service

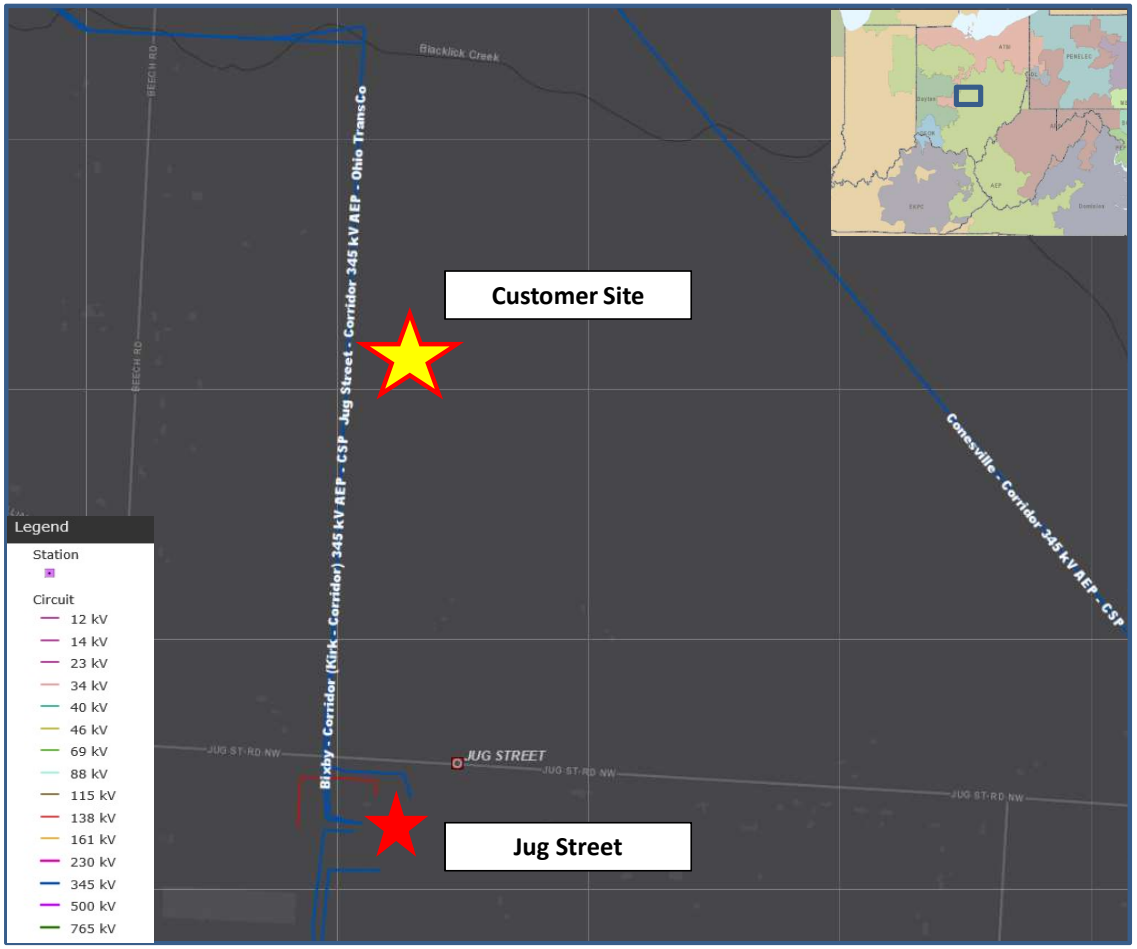
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested distribution service at a site North of AEP's existing Jug Street station in New Albany, OH. In addition, AEP Ohio has requested an additional delivery point from this location.
- The customer has indicated their initial load demand of 50 MW with an ultimate peak demand of 200 MW at the site.
- The customer has requested an ISD of 4/30/2024



AEP Transmission Zone M-3 Process
New Albany, OH

Need Number: AEP-2022-OH045

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following work is all direct connect substations to physically connect demand to the grid.

- **Horizon 138 kV**: Construct a greenfield station with (8) 80 kA, 4000 A circuit breakers in breaker and half bus configuration. Construct ~ 0.05 miles of double circuit 138kV transmission line extending from the Jug St.- Green Chapel 138 kV circuit to Horizon station utilizing 2-bundled ACSR Falcon 1590 (54/19) conductor, SE rating 1118 MVA. Cost: **$10.81 M**

AEP Transmission Zone M-3 Process
Jorden

Need Number: AEP-2022-OH046

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Need Meeting 6/15/2022

Project Driver: Customer Service

Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site East of AEP's existing Jug Street station in New Albany, OH.
- The customer has indicated their initial demand of 50 MW with an ultimate peak demand up to ~~400~~ 270 MW in the future.
- The customer has requested an ISD of 6/28/2024

AEP Transmission Zone M-3 Process
New Albany, OH

Need Number: AEP-2022-OH046

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following work is all direct connect substations to physically connect demand to the grid.

- **Jorden 138 kV**: Cut into the Innovation – Kirk 138 kV circuit with two single circuit 138 kV lines ~0.35 miles terminating into Jorden station, utilizing 2-bundled ACSS Curlew 1033.5 (54/7) conductor, SE rating 1123 MVA, to Construct a greenfield 138 kV 4-CB ring bus station, configurable to 4-strings breaker and half station in future, with (4) 4000 A, 80 kA circuit breakers. Construct two single circuit 138kV lines ~0.1 miles, between Jorden and the customer. Cost: **$12.5 M**

AEP Transmission Zone M-3 Process
QTS South

Need Number: AEP-2022-OH075

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Needs Meeting 12/6/2022

Project Driver: Customer Service

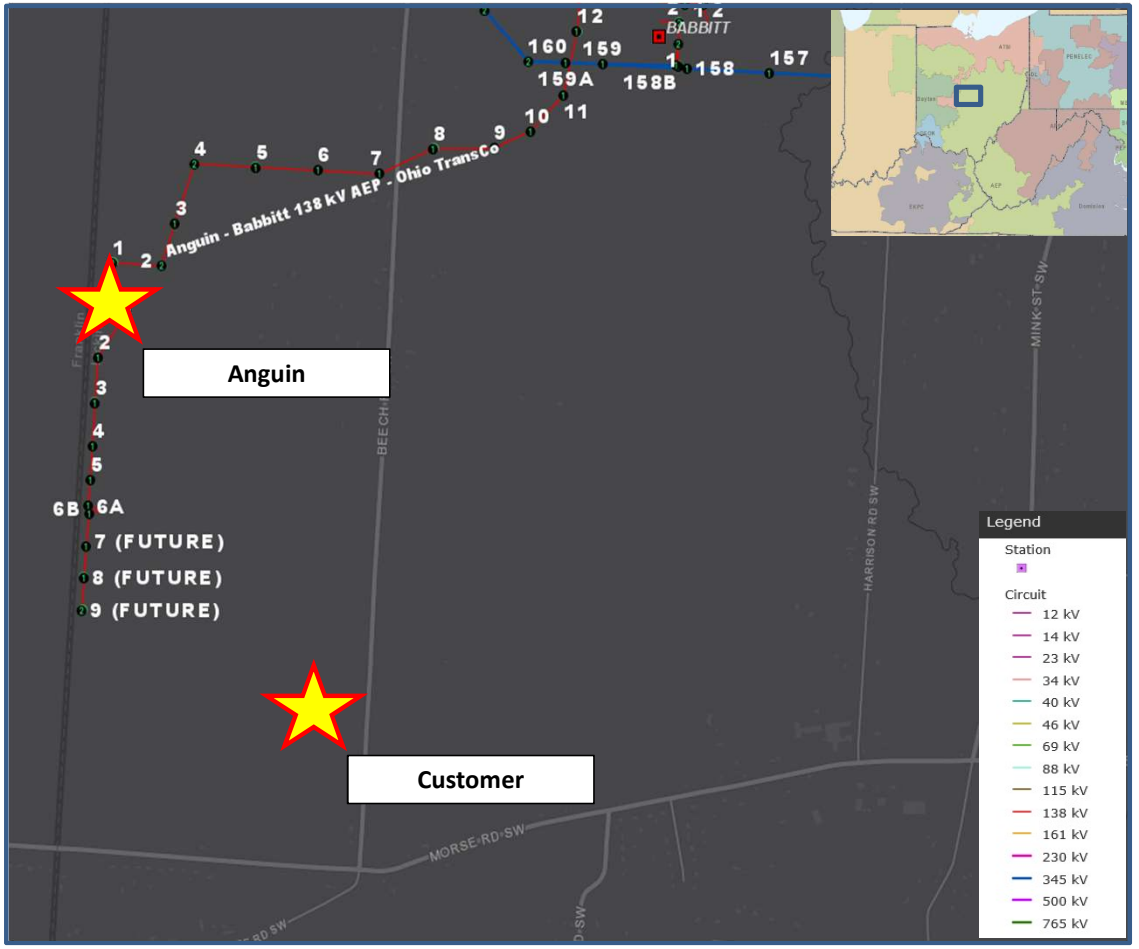
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site Southeast of AEP's existing Anguin station in New Albany, OH.
- The customer has indicated a peak demand of ~~100~~ 125 MW at the site.
- The customer has requested an ISD of 8/1/2024



AEP Transmission Zone M-3 Process
New Albany, OH

Need Number: AEP-2022-OH075

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following work is all direct connect substations to physically connect demand to the grid.

- **QTS South 138 kV**: Cut into one of the circuits of Anguin – Brie 138 kV line and extend ~0.1 miles of two single circuit lines, utilizing 2-bundled ACSS Curlew 1033.5 (54/7) conductor, SE rating 1123 MVA , to the greenfield Macy station with (4) 80 kA, 4000 A breakers laid out as 4-CB ring bus. Construct (2) 138 kV tie lines to the customers dead end structures ~0.04 miles utilizing ACSR Dove 556.5 (26/7) conductor SE 284 MVA. Cost: **$9.54 M**
- **Brie – Innovation 138 kV Tie**: Construct a greenfield ~1.75 mile of double circuit line, utilizing 2-bundled ACSS Curlew 1033.5 (54/7) conductor, connecting Brie and Innovation stations as well as re-establish the Babbitt - Kirk 138 kV circuit. At Brie 138 kV station will install four 138 kV circuit breakers in two partial strings breaker and half configuration along with a 69.1 MVAR capacitor. Perform remote end work at Innovation, Babbitt, and Kirk 138 kV stations. This project addresses a consequential (for a N-1-1 contingency) load drop event of more than 300 MW for the loads served out of AEP's Anguin and Brie stations while also addressing an overload on the Babbitt – Innovation 138 kV circuit in relation to new customer interconnections in the area. Cost: **$10.8 M**

AEP Transmission Zone M-3 Process
Curleys

Need Number: AEP-2022-OH077

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Needs Meeting 12/6/2022

Project Driver: Customer Service

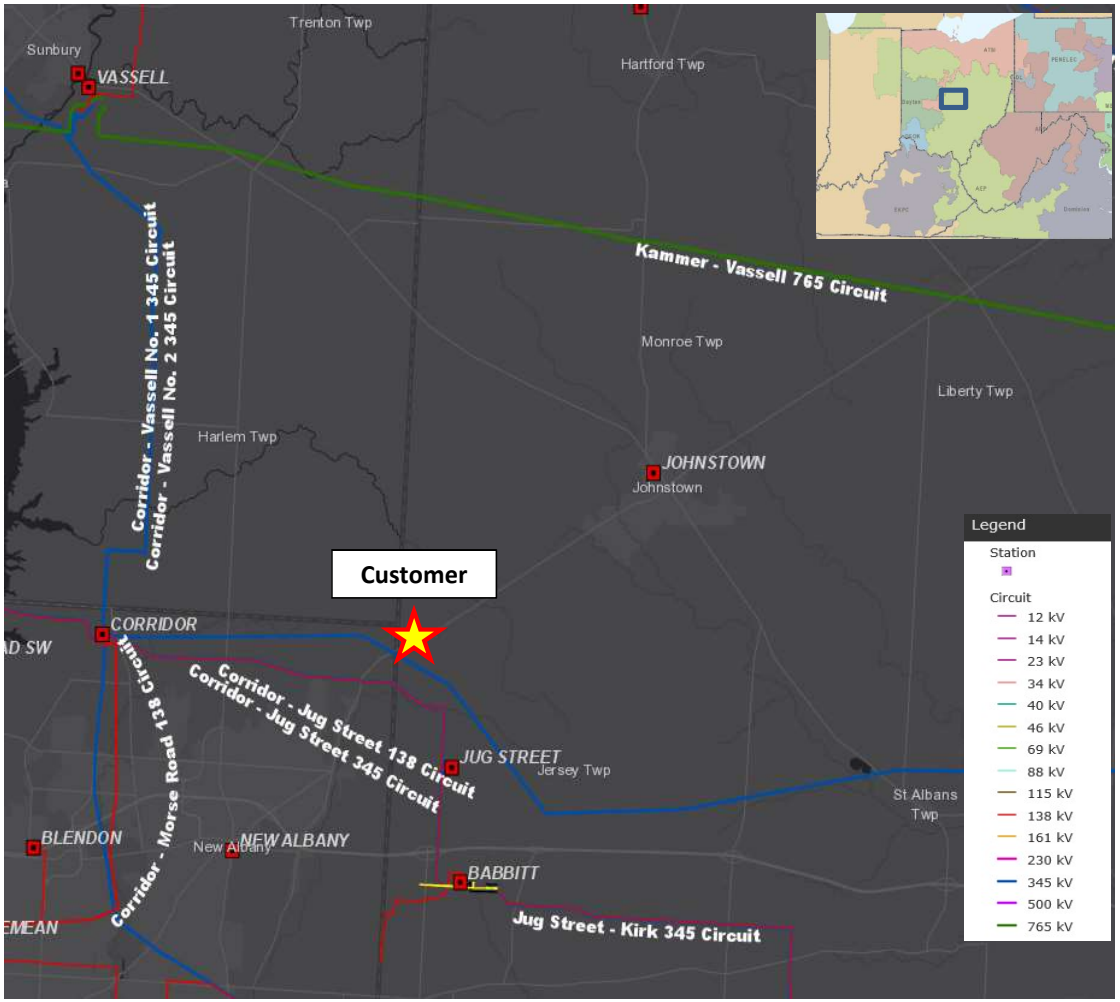
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site north of AEP's existing Jug Street station in New Albany, OH.
- The customer has indicated an initial peak demand of 226 MW with an ultimate capacity of up to ~~1065~~ 968 MW at the site.
- The customer has requested an ISD of 5/1/2026



AEP Transmission Zone M-3 Process
New Albany , OH

Need Number: AEP-2022-OH077

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution (continued):

The following work is all direct connect facilities to physically connect demand to the grid.

- **Curleys 345 kV**: Cut into the rerouted Corridor – Innovation 345 kV circuit, utilizing 2-bundled ACSR Falcon 1590 (54/19) conductor, SE rating 2278 MVA, to a new 345 kV Curleys station with (14) 5000 A, 63kA circuit breakers & (1) 158.4 MVAR 345 kV Cap bank, laid out as breaker and a half for future expansion to 3 strings with future configurations to build up to total (10) breaker and half strings. Construct four single circuit lines ~0.1 miles, between Curleys station and the customer; utilizing 2-bundle ACSR Drake 795 (26/7) conductor SE 1800 MVA. The rerouted line, built as double circuit, will establish two 345 kV ties between Bermuda and Curleys stations. Cost: **$55.2 M**

AEP Transmission Zone M-3 Process
Souder

Need Number: AEP-2023-OH016

Process Stage: Solutions Meeting 5/9/2023

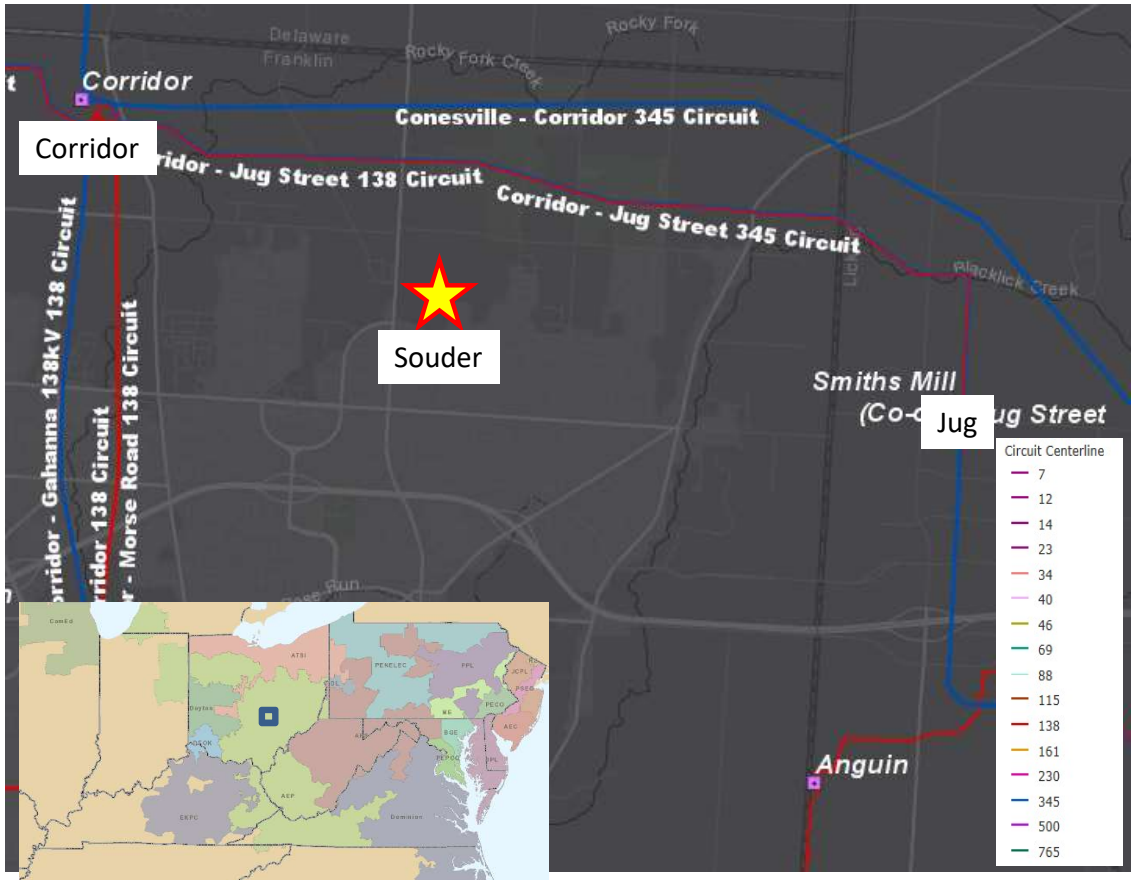
Previously Presented: Need Meeting 2/17/2023

Supplemental Project Driver: Customer Service

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

AEP Ohio is requesting a new 138kV delivery point near the Corridor - Jug 138kV circuit by June 2025 to support continued growth in and around the New Albany, Ohio area. Initial load is anticipated to be approximately 24.0 MVA with a future projected load of approximately ~~79~~ 100 MVA.



AEP Transmission Zone M-3 Process
New Albany, OH

Need Number: AEP-2023-OH016

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution:

The following work is all direct connect substations to physically connect demand to the grid.

- **Souder 138 kV:** Cut into the Corridor – Green Chapel 138 kV circuit and extend ~1.0 mile of new double circuit line, utilizing 2-bundled ACSR Falcon 1590 (54/19) conductor, SE rating 1118 MVA , to the greenfield Souder station with (5) 80 kA, 4000 A breakers laid out as 5-CB ring bus for future expansion to 6-CB ring. Cost: **$14.31 M**

AEP Transmission Zone M-3 Process
Bermuda

Need Number: AEP-2023-OH019

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Needs Meeting 2/7/2023

Project Driver: Customer Service

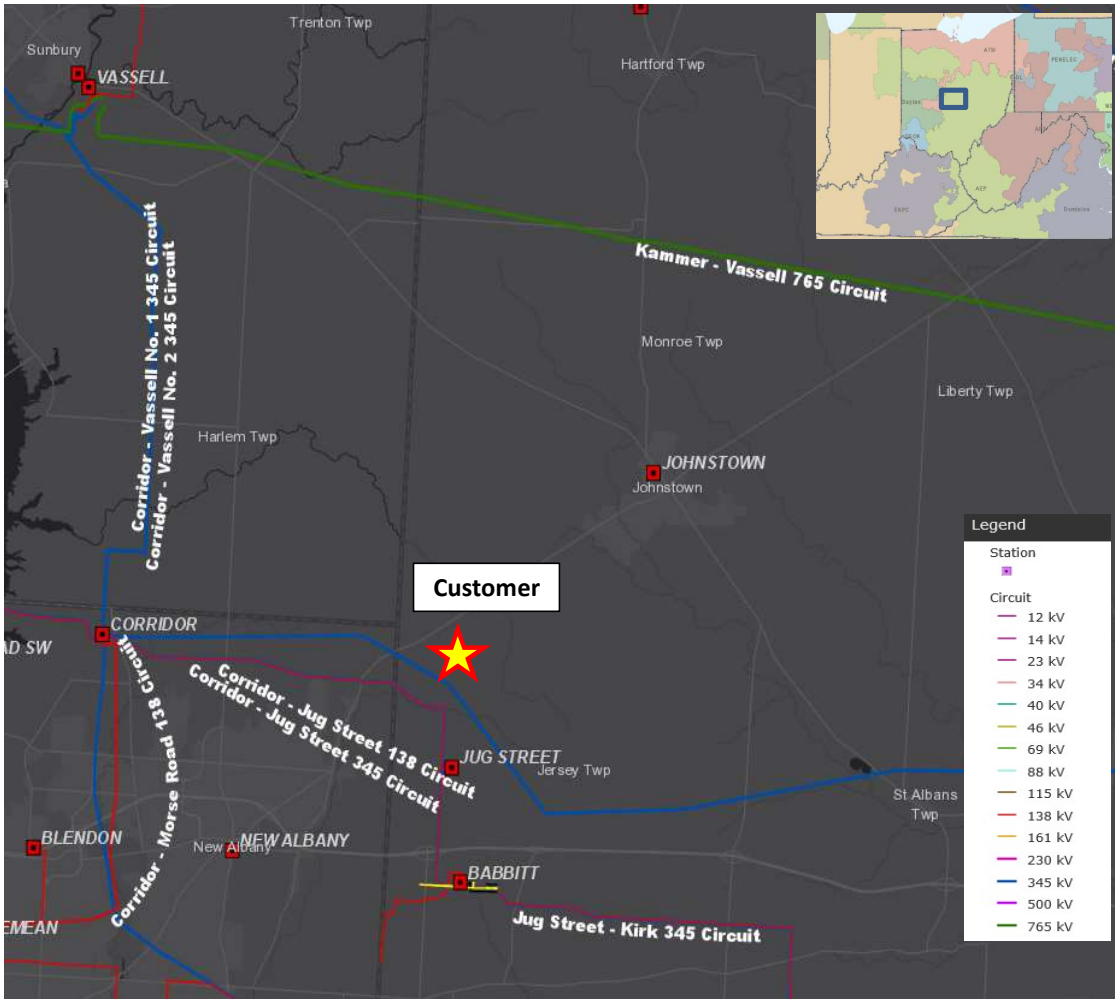
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site north of AEP's existing Jug Street station in New Albany, OH.
- The customer has indicated that their initial and ultimate peak demand will be 337 MW at the site.
- The customer has requested an ISD of 12/15/2025



AEP Transmission Zone M-3 Process
New Albany , OH

Need Number: AEP-2023-OH019

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution (continued):

The following work is all direct connect facilities to physically connect demand to the grid.

- **Bermuda 345 kV**: Reroute the Corridor – Innovation 345 kV circuit across the customer's site utilizing 2-bundled ACSR Falcon 1590 (54/19) conductor, built with double circuit structures, SE rating 2278 MVA, to a new 345 kV Bermuda station with (11) 5000 A, 63kA circuit breakers & (1) 158.4 MVAR 345 kV Cap bank, laid out as breaker and a half configuration. Construct four single circuit lines ~0.1 miles, between Bermuda station and the customer; utilizing 2-bundle ACSR Drake 795 (26/7) conductor SE 1800 MVA. Cost: **$60.3 M**

AEP Transmission Zone M-3 Process Fiesta

Need Number: AEP-2023-OH032

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Needs Meeting 2/17/2023

Project Driver: Customer Service

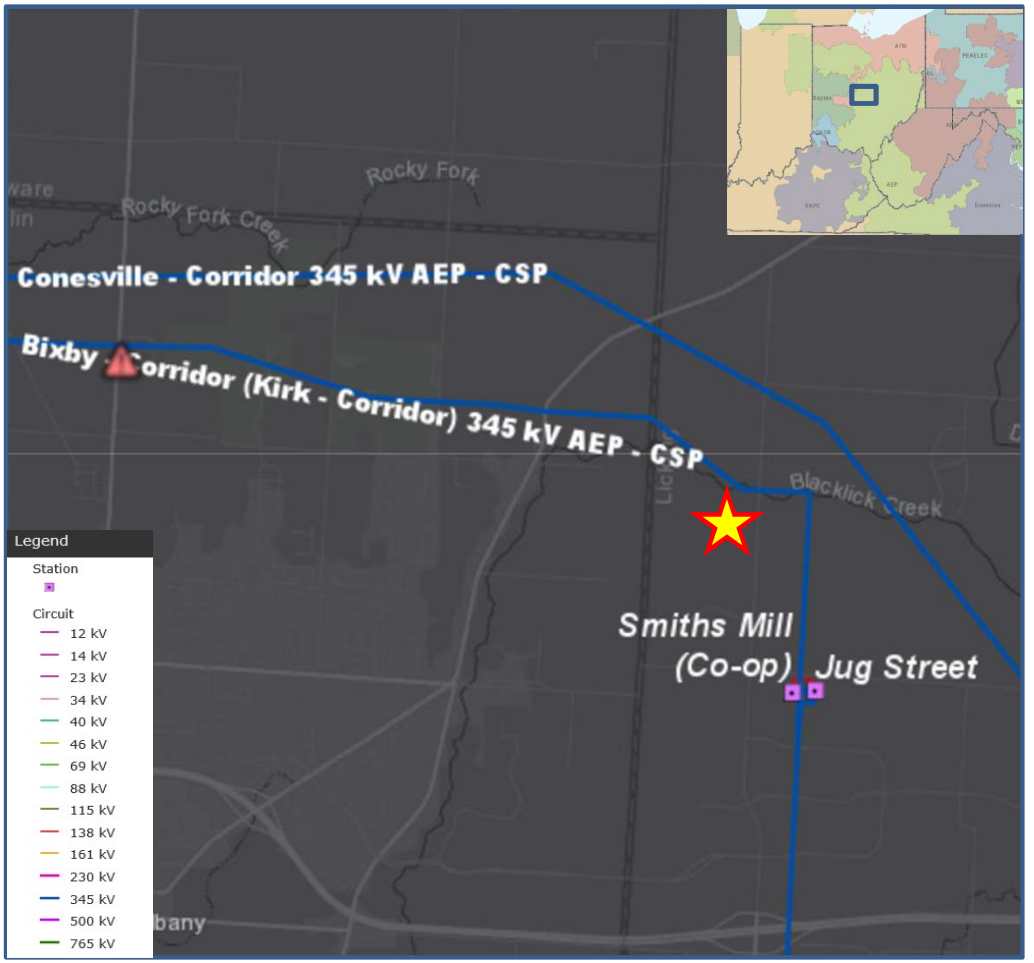
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site North of AEP's existing Jug Street station in Columbus, OH.
- The customer has indicated an initial peak demand of 50 MW with an ultimate capacity of up to 300 MW at the site.
- Initial customer requested in-service date of January 1, 2026



AEP Transmission Zone M-3 Process
New Albany , OH

Need Number: AEP-2023-OH032

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution (continued):

The following work is all direct connect facilities to physically connect demand to the grid.

- **Fiesta 138 kV:** Cut into the Corridor – Green Chapel 138 kV circuit and extend ~ 0.75 miles of new double circuit line, utilizing 2-bundled ACSR Falcon 1590 (54/19) conductor, SE rating 1118 MVA , to the greenfield Fiesta station with (10) 80 kA, 4000 A breakers laid out as breaker and a half for future expansion to 6 strings. Construct 4 - 138 kV tie lines to the customers dead end structures ~0.05 miles utilizing ACSR Drake 795 (26/7) conductor SE 360 MVA. Cost: **$22.3 M**

AEP Transmission Zone M-3 Process
Rockhopper

Need Number: AEP-2023-OH040

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Need Meeting 2/17/2023

Project Driver: Customer Service

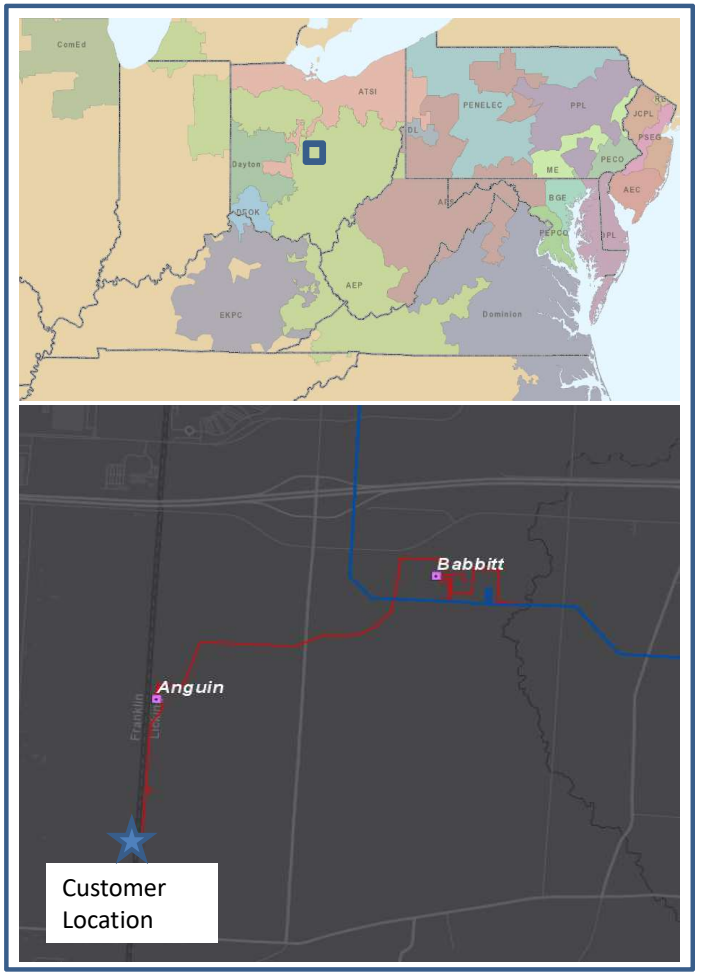
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- An existing customer served out of AEP's Anguin Station in New Albany, OH, has requested an additional service for a new bulk load addition of 100 MW. This will bring the total load for the customers site to 350 MW with an ultimate capacity of up to 720 MW.
- Customer requested in-service date of 5/31/2023.



AEP Transmission Zone M-3 Process
New Albany , OH

Need Number: AEP-2023-OH040

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution (continued):

The following work is all direct connect facilities to physically connect demand to the grid.

- **Anguin – Rockhopper 138 kV**: Reconfigure existing Anguin station and install (10) 138 kV, 4000A, 80 kA circuit breakers to feed customer stations at Penguin and QTS North. Build out strings G & H and construct a new greenfield ~0.6 miles double circuit line to customer's Rockhopper station. Install (2) 69.1 MVAR cap banks at Anguin station Cost: **$13.2 M**

AEP Transmission Zone M-3 Process
Tasjan

Need Number: AEP-2023-OH044

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Needs Meeting 3/17/2023

Project Driver: Customer Service

Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

- A customer has requested service to a new delivery point in New Albany Ohio, just east of Jug Street Station.
- The projected demand for the site is 54 MW with an ultimate capacity of up to 150 MW.
- Customer requested in-service date of 12/19/2025.

AEP Transmission Zone M-3 Process
New Albany , OH

Need Number: AEP-2023-OH044

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution (continued):

The following work is all direct connect facilities to physically connect demand to the grid.

- **Tasjan 138 kV:** Cut into the Innovation – Green Chapel 138 kV circuit #1 and extend ~ 0.75 miles of new double circuit line, utilizing 2-bundled ACSS Curlew 1033.5 (54/7) conductor, SE rating 1123 MVA, to the greenfield Tasjan station with (4) 80 kA, 4000 A breakers laid out 4-CB ring bus. Construct (2) 138 kV tie lines to the customers dead end structures ~0.05 miles utilizing ACSR Drake 795 (26/7) conductor SE 360 MVA. Cost: **$18.95 M**

AEP Transmission Zone M-3 Process
Penguin NBY-5A

Need Number: AEP-2023-OH052

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Needs Meeting 4/21/2023

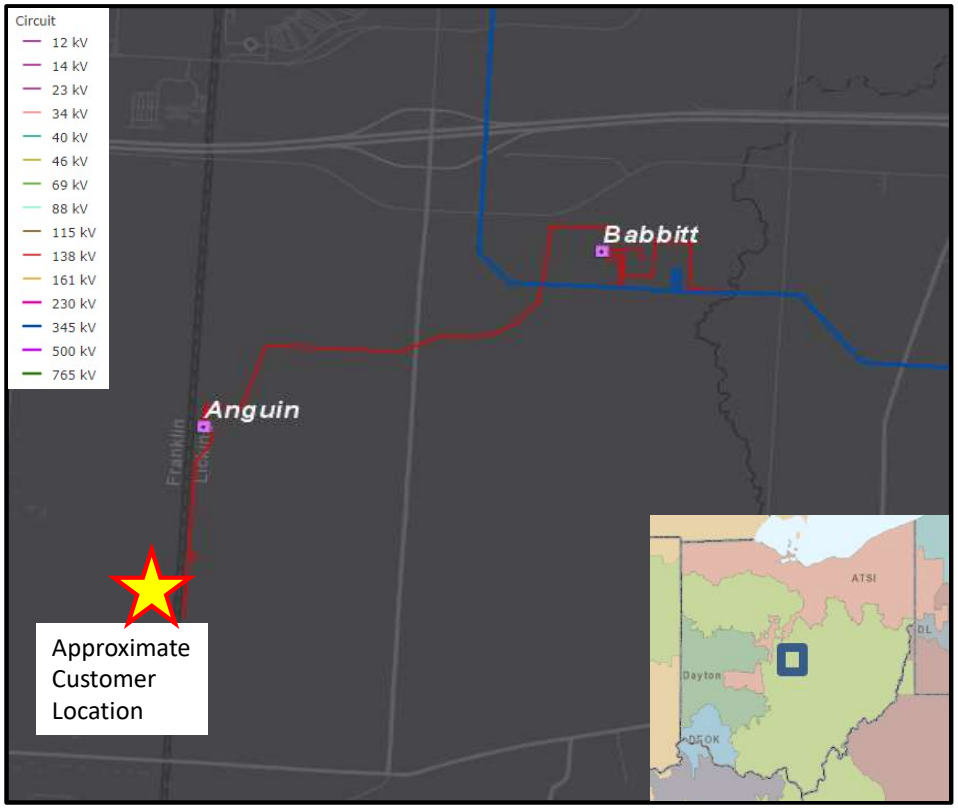
Project Driver: Customer Service

Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

- An existing customer served out of AEP's Anguin Station in New Albany, OH, has requested an additional service for a new bulk load addition of 100 MW. This will bring the total load for the customers site to 450 MW with an ultimate capacity of up to 720 MW.
- Customer requested in-service date of 3/31/2024.



AEP Transmission Zone M-3 Process
New Albany , OH

Need Number: AEP-2023-OH052

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution (continued):

The following work is all direct connect facilities to physically connect demand to the grid.

- **Anguin – Chinstrap 138 kV**: Extend the 138 kV double circuit line to Rockhopper by ~0.22 miles to the new Chinstrap (customer) station. Cost: **$1.01 M**

AEP Transmission Zone M-3 Process
Penguin NBY-6A

Need Number: AEP-2023-OH063

Process Stage: Solutions Meeting 5/9/2023

Previously Presented: Needs Meeting 4/21/2023

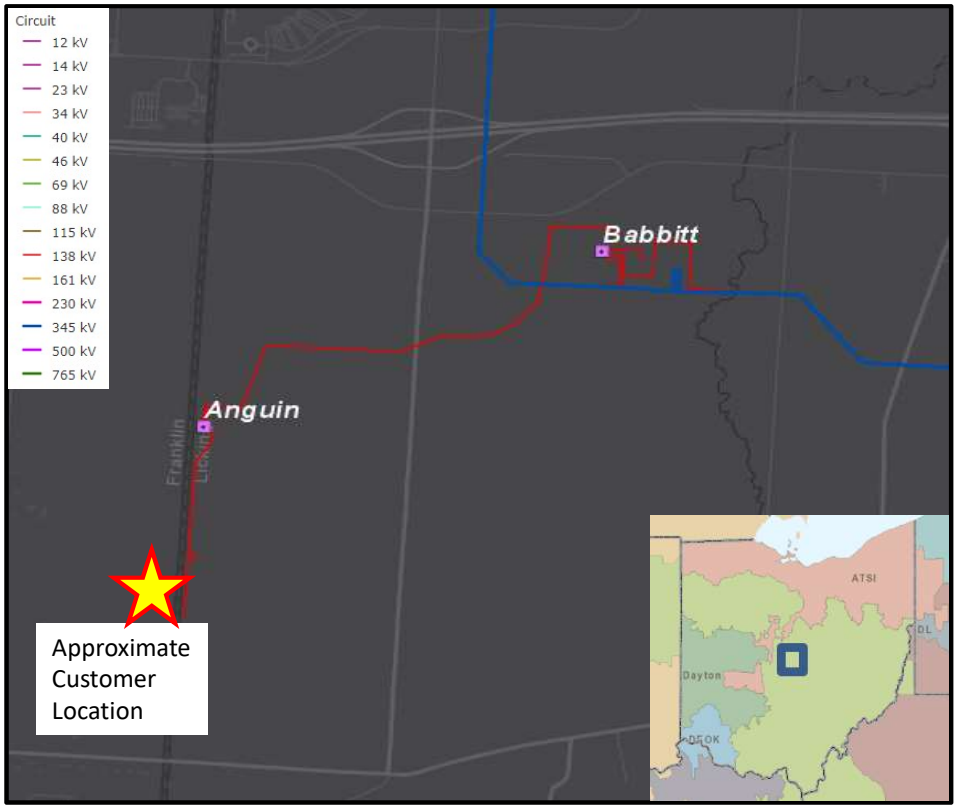
Project Driver: Customer Service

Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

- An existing customer served out of AEP's Anguin Station in New Albany, OH, has requested an additional service for a new bulk load addition of 100 MW. This will bring the total load for the customers site to 550 MW with an ultimate capacity of up to 720 MW.
- Customer requested in-service date of 7/31/2024.



AEP Transmission Zone M-3 Process
New Albany , OH

Need Number: AEP-2023-OH063

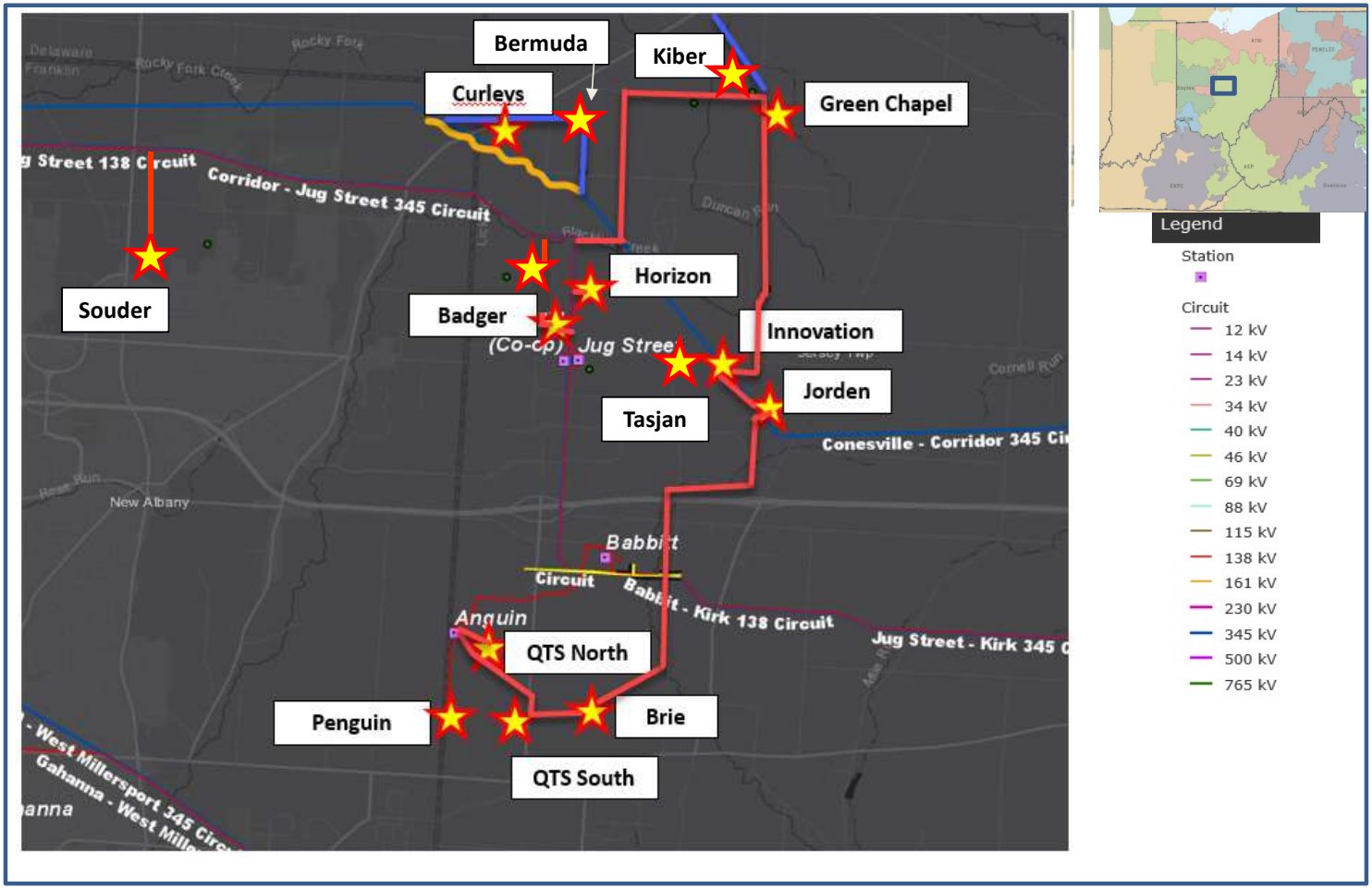
Process Stage: Solutions Meeting 5/9/2023

Proposed Solution (continued):

The following work is all direct connect facilities to physically connect demand to the grid.

- **Anguin – NBY-6A 138 kV**: Install (3) 138 kV, 4000A, 80 kA circuit breakers and construct a new greenfield ~0.9 miles double circuit line to customer's new NBY-6A station. Cost: **$6.92 M**

AEP Transmission Zone M-3 Process
New Albany, OH



AEP Transmission Zone M-3 Process
Central/NW OH, Indiana.

Need Number: AEP-2022-OH023, AEP-2022-OH034, AEP-2022-OH036, AEP-2022-OH045, AEP-2022-OH046, AEP-2022-OH075, AEP-2022-OH077, AEP-2023-OH016, AEP-2023-OH019, AEP-2023-OH032, AEP-2023-OH040, AEP-2023-OH044, AEP-2023-OH052, AEP-2023-OH063

Process Stage: Solutions Meeting 5/9/2023

Proposed Solution (continued):

The following components are system reinforcements required to serve the load and meet applicable TPL-001, PJM, and AEP planning criteria:

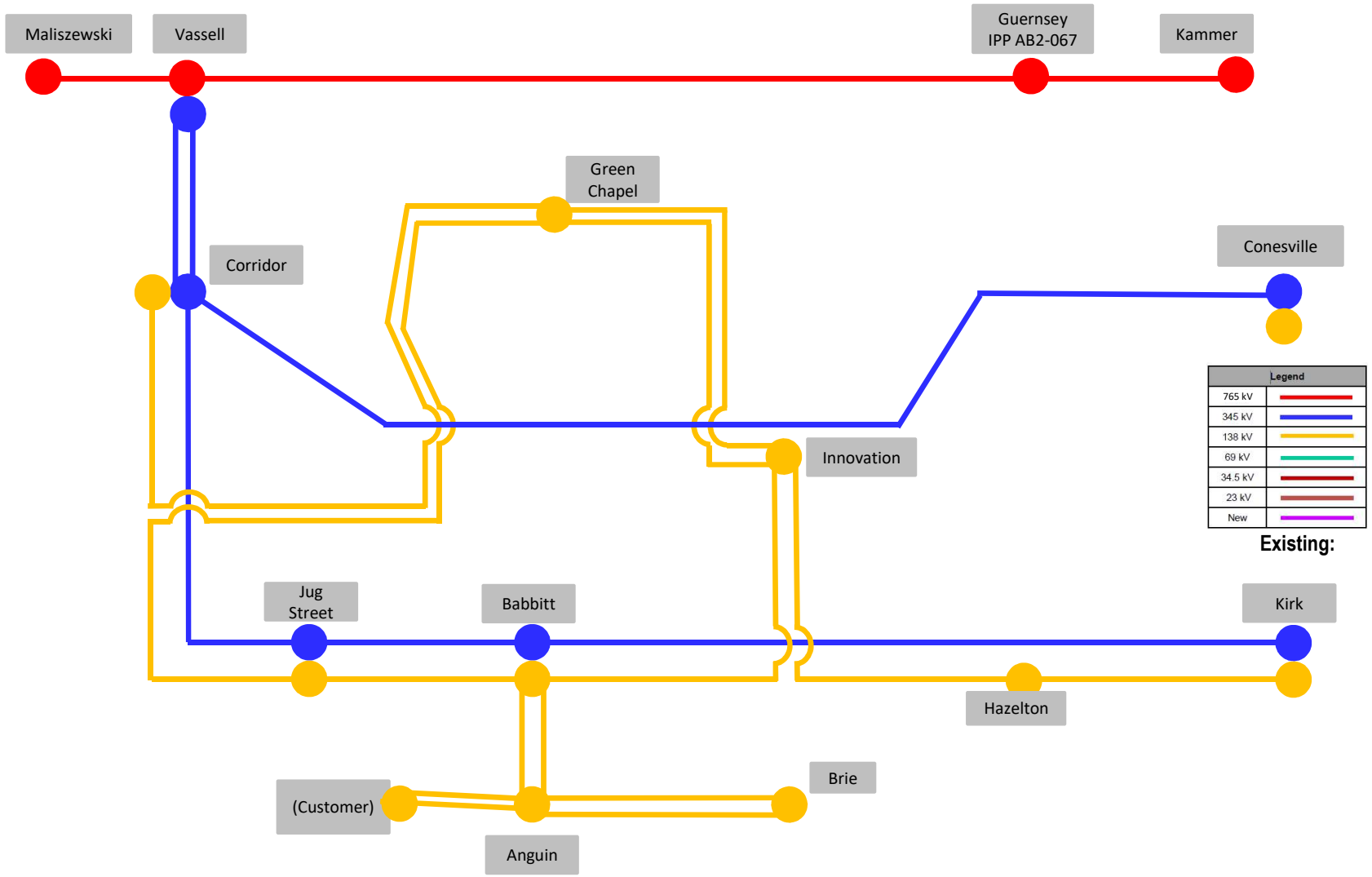
- **Corridor – Vassell 345 kV #1 & #2 Circuits Sag Re-rate:** Replace two structures to mitigate sag issues on the line in order to allow the line to operate to its conductor's designed maximum operating temperature. Cost: **$1.88 M**
- **Kiber Station 138 kV:** Cut-into Green Chapel – Corridor 138 kV circuit to a new Kiber station with (3) 80 kA 138 kV circuit breakers operated in a ring but laid out in a breaker and a half arrangement to install a 300 MVAR STATCOM to support the significant amount of load added to the area. Cost: **$35 M**
- **Green Chapel Cap Banks 138 kV:** Upgrade proposed cap banks at Green Chapel station from (2) 69.1 MVAR to (2) 115.2 MVAR. Cost: **$3.6 M**
- **Corridor 138 kV:** Replace (12) 63 kA circuit breakers & cap breakers with 80 kA circuit breakers to improve interrupting capabilities as a result of the new sources in the area. Cost: **$12.6 M**
- **Babbitt 138 kV:** Replace (2) 63 kA bus-tie circuit breakers with 80 kA circuit breakers to improve interrupting capabilities as a result of the new sources in the area. Cost: **$2.15 M**
- **Jug Street**: Replace CB-C which is an existing 40 kA breaker with a 4000A 80kA 138 kV breaker to address interrupting capability concerns related to the introduction of the new 345 kV source at Innovation. Cost: **$0.8 M**
- **Anchor Hocking – Lancaster 69 kV line Rebuild:** Rebuild ~1.16 miles of 69 kV line utilizing ACSR Dove 556.5 (26/7) conductor, SE 142 MVA. As a result of the new customer interconnections in the area, this line will overload under certain N-1-1 scenarios. Cost: **$2.5 M**
- **Newark Center 138 kV:** Install high and low side sectionalizing on the 138/69 kV transformer to address overloading of 69 kV lines in the area related to the new customer interconnections under certain N-1-1 scenarios. Cost: **$2.5 M**
- **Fremont – West Fremont Sag re-rate 138 kV:** Sag re-rate the 138 kV circuit & upgrade 1200 A switches at Fremont to address a Generation deliverability violation related to the new customer interconnections in the area. Cost: **$2.0 M**
- **Fremont – Fremont Center Sag re-rate 138 kV:** Sag re-rate the 138 kV circuit to address a Generation deliverability violation related to the new customer interconnections in the area. Cost: **$1.5 M**
- **Dumont 765 kV:** Replace 3000 A circuit breaker at Dumont to address a generation deliverability violation on the Dumont – Sorenson 765 kV branch related to the new customer interconnections in the area. Cost: **$4.0 M**

System Upgrades: $68.53M

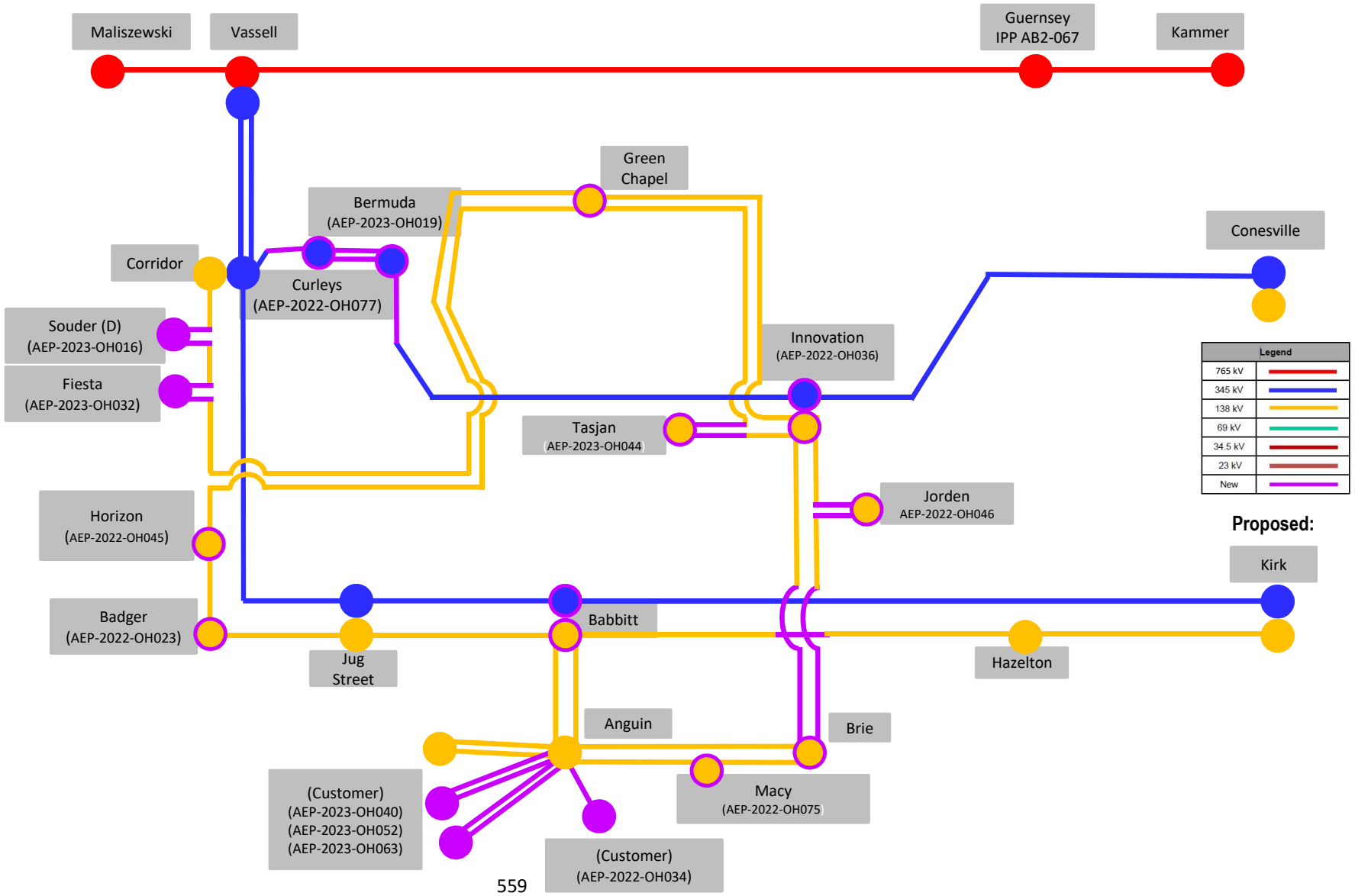
Direct Connection Cost: $309.77M

Total Estimated Transmission Cost: $378.3M

Existing:


Maliszewski
Vassell
Guernsey
IPP AB2-067
Kammer
Green
Chapel
Corridor
Conesville
Innovation
Legend
765 kV
345 kV
138 kV
69 kV
34.5 kV
23 kV
New
Existing:
Jug
Street
Babbitt
Kirk
Hazelton
Brie
(Customer)
Anguin

Proposed:


Maliszewski
Vassell
Guernsey
IPP AB2-067
Kammer
Green
Chapel
Bermuda
(AEP-2023-OH019)
Conesville
Corridor
Curleys
(AEP-2022-OH077)
Souder (D)
(AEP-2023-OH016)
Fiesta
(AEP-2023-OH032)
Innovation
(AEP-2022-OH036)
Tasjan
(AEP-2023-OH044)
Jorden
AEP-2022-OH046
Horizon
(AEP-2022-OH045)
Badger
(AEP-2022-OH023)
Babbitt
Jug
Street
Hazelton
Kirk
Anguin
Brie
(Customer)
(AEP-2023-OH040)
(AEP-2023-OH052)
(AEP-2023-OH063)
Macy
(AEP-2022-OH075)
(Customer)
(AEP-2022-OH034)
Legend
765 kV
345 kV
138 kV
69 kV
34.5 kV
23 kV
New
Proposed:

AEP Transmission Zone M-3 Process
New Albany, Dublin & Hilliard, OH

Process Stage: Solutions Meeting 5/9/2023

Alternatives Considered:

These alternates are only for consideration for system upgrades. The direct connect facilities, considering the location of the customer requests, do not have any alternates that would allow AEP to meet the requested timeframe.

- Beacon station: Serving the customer load via a new 138kV breaker and a half station and tying into the Bethel- Roberts 138kV double circuit line was considered vs. providing service at 345 kV. The site is located in a densely populated area just west of Columbus. The 138 kV facilities are located across a major interstate from the site whereas the existing 345 kV crosses the site today. Two separate double circuit lines would have been required to cross the interstate to serve the initial customer load. Tying into the 138 kV would have also required significantly more upgrades to support the upper end of the customer's projected load at the site in the future. Because of these reasons the decision was made to move forward with serving the site at 345 kV.
- Brie – Innovation 138 kV: Rather than reconfiguring the line already proposed extension to Innovation to tie into the new line extension from Brie just cutting into the Kirk – Innovation or Babbitt – Innovation circuit was considered. Analysis showed that these alternative configurations would have led to the 138 kV towards Babbitt overloading.
- Celtic 345/138 kV: Consideration was given to cutting into the nearby First Energy owned London – Tangy line into Jerome station to offset the need for the 345/138 kV source at Celtic but the analysis showed that the line could not support the load and the proposed Celtic 345/138 kV station would be required regardless.
- A new 765 kV source into the area was not deemed to be a feasible alternative to the installation of a second 765/345 kV transformer at Vassell station as it would be cost prohibitive. Vassell station is already set up to accommodate a second transformer. Any new 765 kV source will have to be sourced from Kammer station, which is 115 miles away from the New Albany area.

  Total Proposed Alternate Costs: $2.0B

AEP Transmission Zone M-3 Process
New Albany, Dublin & Hilliard, OH

Need Number: AEP-2022-OH023, AEP-2022-OH034, AEP-2022-OH036, AEP-2022-OH045, AEP-2022-OH046, AEP-2022-OH075, AEP-2022-OH077, AEP-2023-OH016, AEP-2023-OH019, AEP-2023-OH032, AEP-2023-OH040, AEP-2023-OH044, AEP-2023-OH052, AEP-2023-OH063, AEP-2021-OH049, AEP-2022-OH024, AEP-2022-OH035, AEP-2023-OH041, AEP-2022-OH071

Process Stage: Solutions Meeting 5/9/2023

Total Direct Connection Costs: $497.87M

Total System Upgrade Costs: $81.63M

Total Estimated Transmission Costs: $579.5M

Projected In-Service: 12/1/2026

Project Status: Scoping/Engineering

Model: 2027 RTEP

Dominion Transmission Zone: Supplemental Customer Load Request

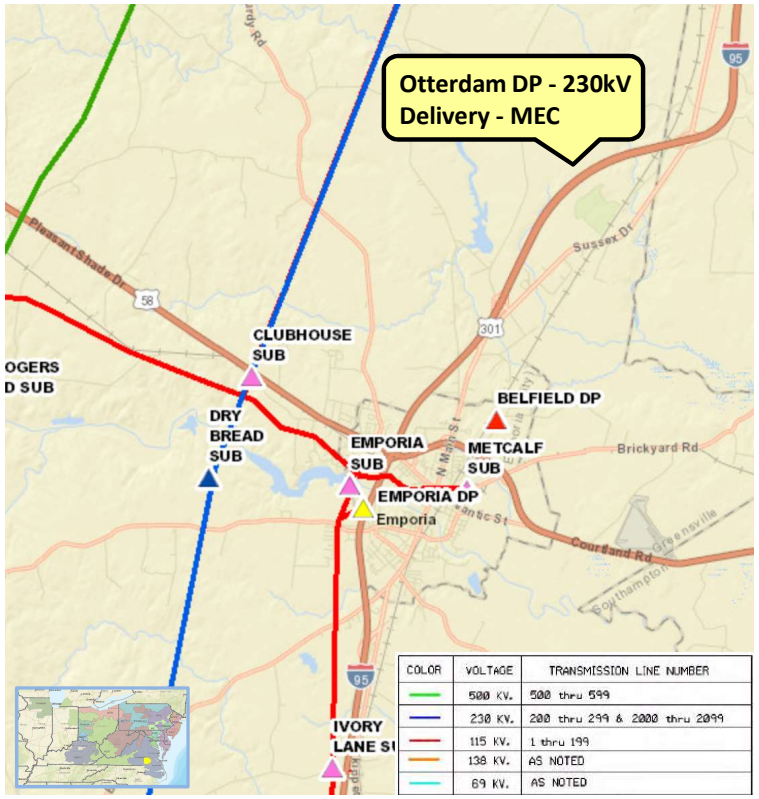
Need Number: DOM-2023-0027
Process Stage: Solutions Meeting 05/09/2023
Previously Presented: Need Meeting 04/11/2023
Project Driver: Customer Service

Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

ODEC on behalf of Mecklenburg Electric Cooperative (MEC) has submitted a delivery point request for a new delivery point at the MAMaC site in Greensville County, VA. MEC is requesting to construct a transmission line under the economic development legislative pilot program for business parks. The total load is in excess of 100 MW. The customer requests service by December 31, 2026.



Initial In-Service Load	Projected 2028 Load
Summer: 30.0 MW	Summer: 80.0 MW

Dominion Transmission Zone: Supplemental Otterdam 230kV Delivery - MEC

Need Number: DOM-2023-0027
Process Stage: Solutions Meeting 05/09/2023

Proposed Solution:

- Split Line #238 (Clubhouse - Carson) near structure 238/11 and extend double circuit 230kV lines for approx. 3 miles to the proposed Otterdam Substation.
- Terminate the two 230kV lines into 4 breaker ring bus to create a Clubhouse - Otterdam line and a Carson - Otterdam line.

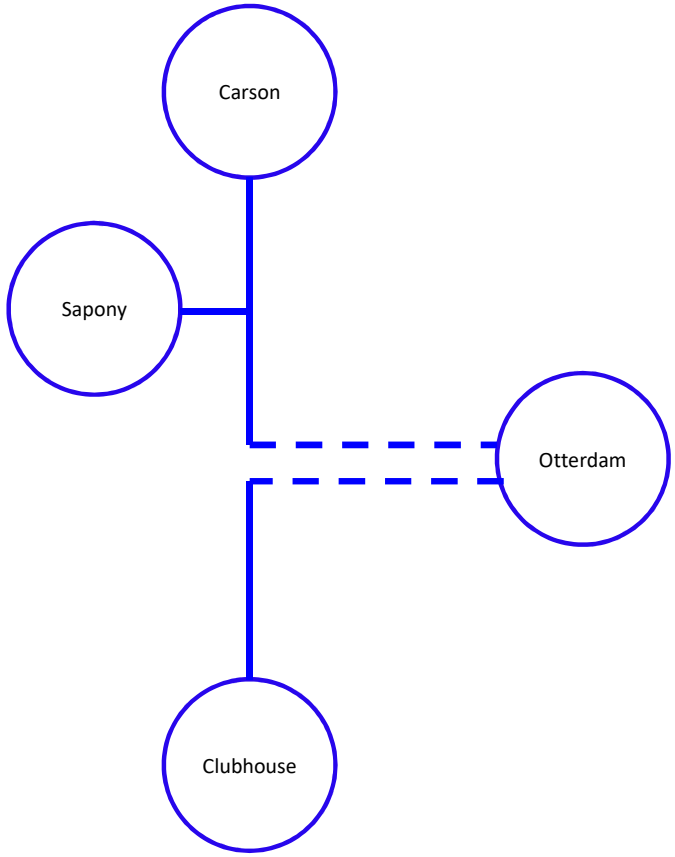
Estimated Project Cost: $25.0 M (Total)

Transmission Line	$13M
Substation	$12M

Alternatives Considered:

None – The 115kV system in the area is inadequate.

Projected In-service Date: 12/31/2026
Project Status: Engineering
Model: 2027 RTEP



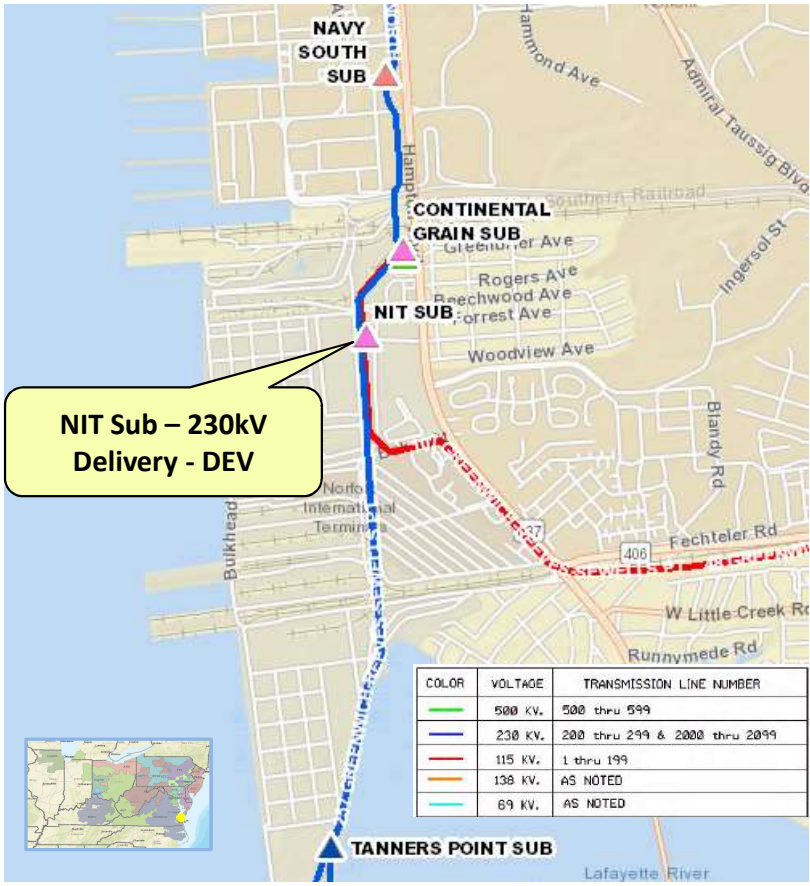
Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0006
Process Stage: Solutions Meeting 05/09/2023
Previously Presented: Need Meeting 03/07/2023
Project Driver: Customer Service

Specific Assumption References:
Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:
DEV Distribution has submitted a delivery point request for a new substation (NIT) in Norfolk, VA with a total load less than 100MW. The customer requests service by June 1, 2025.

Initial In-Service Load	Projected 2028 Load
Summer: 49.3 MW Winter: 49.3 MW	Summer: 49.3 MW Winter: 49.3 MW



Dominion Transmission Zone: Supplemental NIT Substation 230kV Delivery - DEV

Need Number: DOM-2023-0006

Process Stage: Solutions Meeting 05/09/2023

Proposed Solution:

Tap Line #257 (Sewells Point - Churchland) near structure 257/56,2099/56 and extend a single circuit 230kV tap to NIT substation.

Estimated Project Cost: $5.7 M (Total)

Transmission Line $4.5M

230kV Substation $1.2M

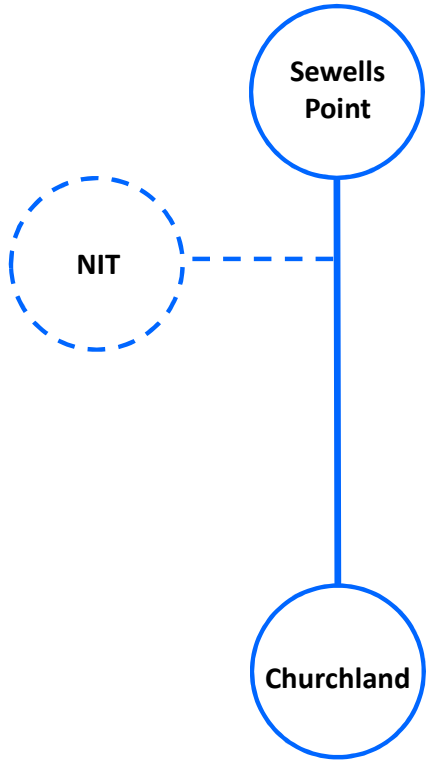
Alternatives Considered:

None – The new substation is adjacent to an existing transmission line.

Projected In-service Date: 6/01/2025

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

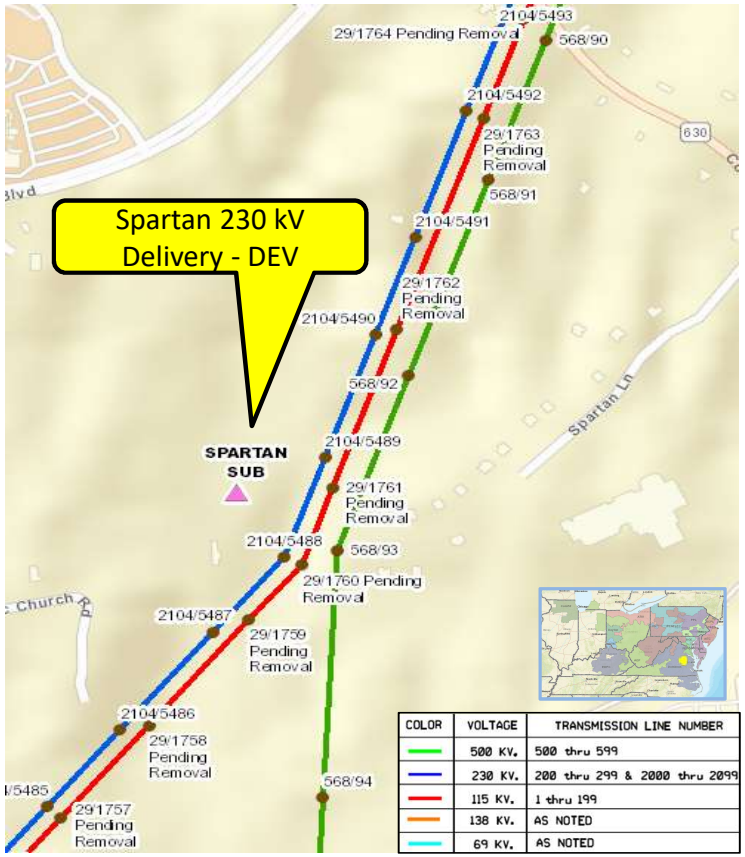
Need Number: DOM-2023-0018
Process Stage: Solutions Meeting 05/09/2023
Previously Presented: Need Meeting 04/11/2023
Project Driver: Customer Service

Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a DP Request for a new substation (Spartan) to serve a new data center in Stafford County with a total load in excess of 100 MW. The requested in-service date is 05/02/2025.



Initial In-Service Load	Projected 2028 Load
Summer: 69.0 MW Winter: 0.0 MW	Summer: 110.0 MW Winter: 105.0 MW

Dominion Transmission Zone: Supplemental Spartan 230kV Delivery Point

Need Number: DOM-2023-0018

Process Stage: Solutions Meeting 05/09/2023

Proposed Solution:

Interconnect the new substation by cutting and extending Line #2104 to the proposed Spartan Substation. Lines to terminate in a 230kV four-breaker ring arrangement with an ultimate arrangement of a six-breaker ring.

Estimated Project Cost: $48 M

Transmission Cost: $12 M

Substation Cost: $36 M

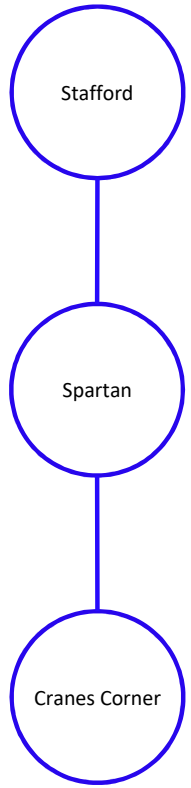
Alternatives Considered:

None – The new substation is adjacent to an existing transmission line.

Projected In-service Date: 05/02/2025

Project Status: Engineering

Model: RTEP2027



Dominion Transmission Zone: Supplemental Customer Load Request

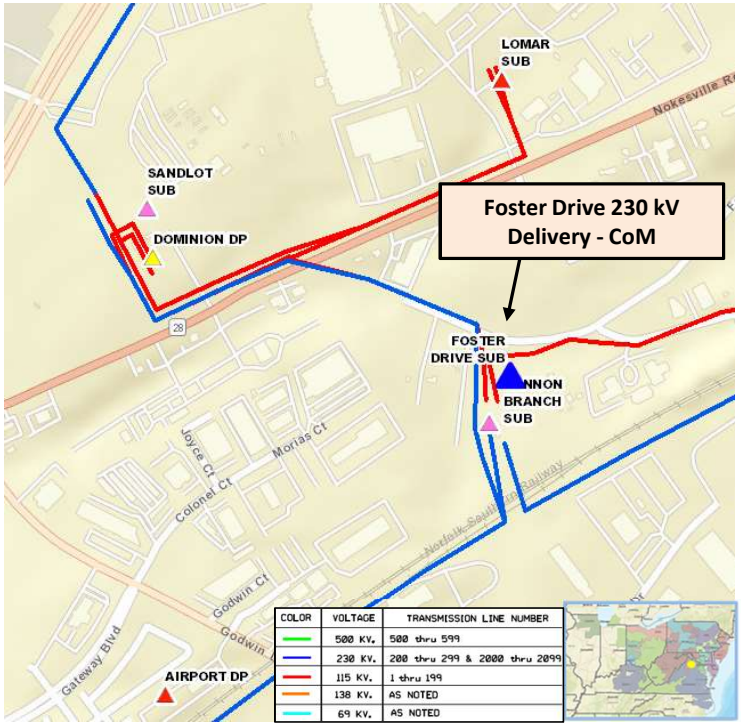
Need Number: DOM-2023-0008
Process Stage: Solutions Meeting 05/09/2023
Previously Presented: Need Meeting 03/07/2023
Project Driver: Customer Service

Specific Assumption References:
Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:
The City of Manassas has submitted a DP Request for a new substation (Foster Drive) to serve a data center complex in Manassas with a total load in excess of 100 MW.

Requested in-service date is 03/31/2025.

Initial In-Service Load	Projected 2028 Load
Summer: 100.0 MW Winter: 100.0 MW	Summer: 260.0 MW Winter: 260.0 MW



Dominion Transmission Zone: Supplemental Foster Drive 230kV Delivery - CoM

Need Number: DOM-2023-0008

Process Stage: Solutions Meeting 05/09/2023

Proposed Solution:
Interconnect the new substation by cutting and extending Line #2243 (Sandlot – Cannon Branch) to the proposed Foster Drive Substation. Lines to terminate into a 230 kV four-breaker ring arrangement with an ultimate arrangement of a six-breaker ring.

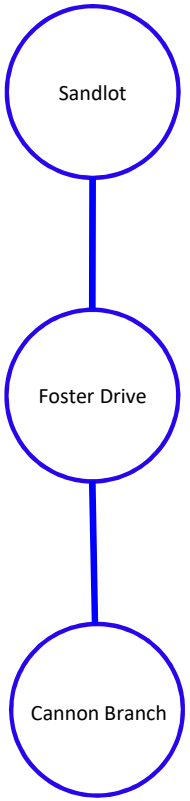
Estimated Project Cost: $15.3M
Transmission Cost: $0.3M
Substation Cost: $15M

Alternatives Considered:
The new substation is adjacent to a 230kV source. 115kV in this area is being phased out.

Projected In-service Date: 03/31/2025

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0014
Process Stage: Solutions Meeting 05/09/2023
Previously Presented: Need Meeting 03/07/2023
Project Driver: Customer Service

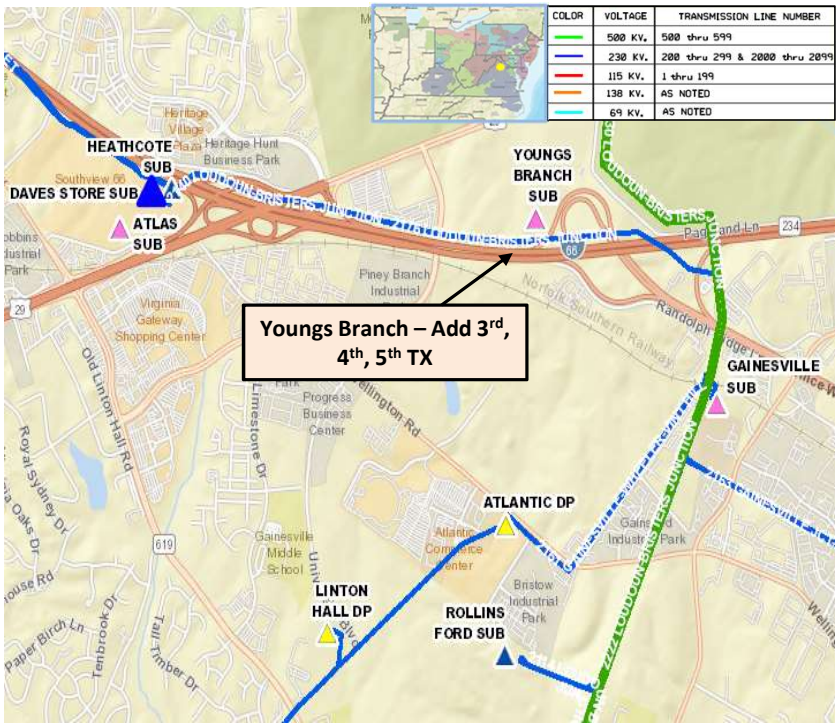
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a DP Request to add a 3rd, 4th, and 5th distribution transformer at Youngs Branch Substation in Gainesville. The new transformers are being driven by significant area load growth.

Requested in-service date is 07/01/2024.



Initial In-Service Load	Projected 2028 Load
Summer: 204.0 MW Winter: 117.0 MW	Summer: 270.0 MW Winter: 270.0 MW

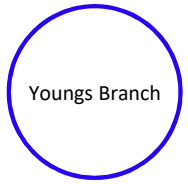
Dominion Transmission Zone: Supplemental Youngs Branch - Add 3rd, 4th, and 5th TX - DEV

Need Number: DOM-2023-0014
Process Stage: Solutions Meeting 05/09/2023

Proposed Solution:
Install (3) 1200 Amp, 50kAIC circuit switchers and associated equipment (bus, relaying, etc.) to feed the new transformers at Youngs Branch.

Estimated Project Cost: $3.0 M

Alternatives Considered:
None – this is an existing substation



Projected In-service Date: 07/01/2024
Project Status: Engineering
Model: 2027 RTEP

APS Transmission Zone M-3 Process

Need Number: APS-2023-002
Process Stage: Solution Meeting 06/06/2023
Previously Presented: Need Meeting 03/07/2023

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

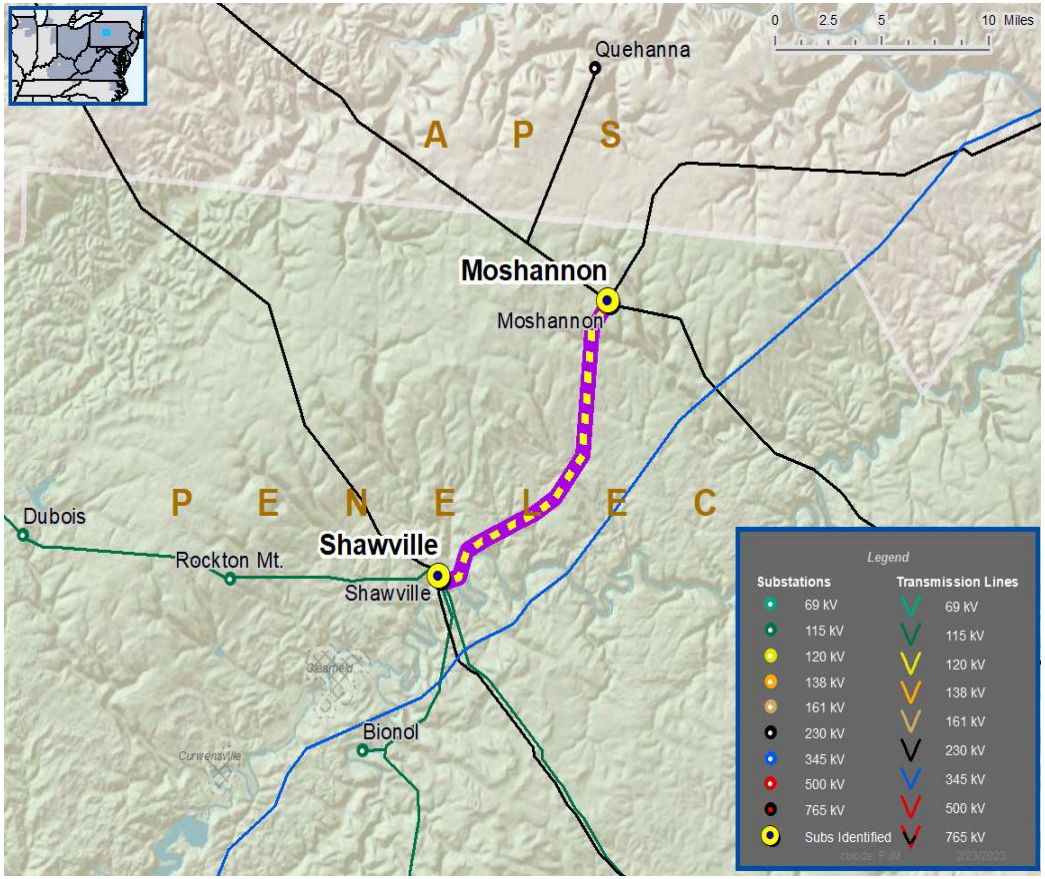
Global Factors

- System reliability and performance
- Substation and line equipment limits
- Upgrade Relay Schemes
  - Relay schemes that have a history of misoperation
  - Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
  - Communication technology upgrades
  - Bus protection schemes

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform properly together during a fault
- The identified protection equipment cannot be effectively repaired for reasons such as lack of replacement parts and available expertise in the outdated technology.
- Newer equipment provides better monitoring, enhances capability of system event analysis, and performs more reliably
- Transmission line ratings are limited by terminal equipment

Shawville – Moshannon 230 kV Line
  – Existing line rating: 445 / 587 MVA (SN / SE)
    - Existing Transmission Conductor Rating: 546 / 666 MVA (SN / SE)



APS Transmission Zone M-3 Process

Need Number: APS-2023-002

Process Stage: Solution Meeting 06/06/2023

Proposed Solution:

- Replace limiting substation conductor and relaying at Moshannon

Transmission Line Ratings:

- Moshannon – Shawville 230 kV Line
  - Before Proposed Solution: 445 / 587 MVA (SN / SE)
  - After Proposed Solution: 546 / 666 MVA (SN / SE)

Alternatives Considered:

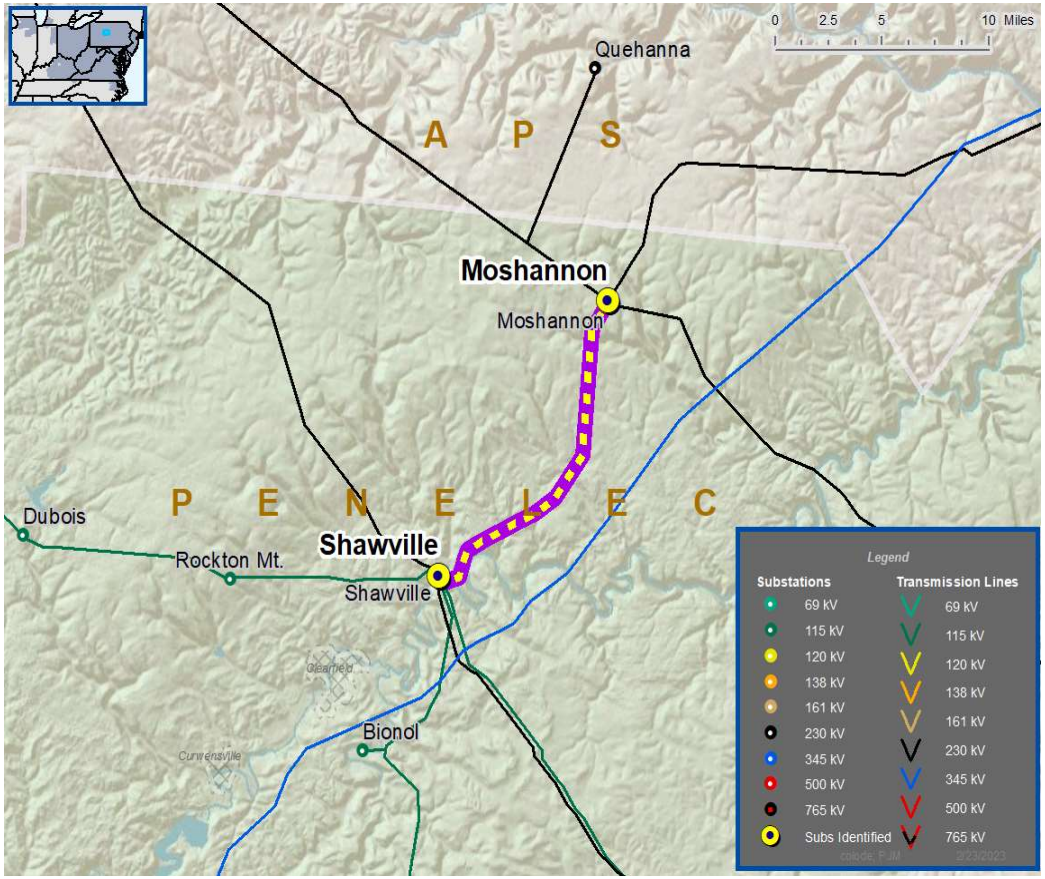
- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: $ 0.55M

Projected In-Service: 12/8/2023

Project Status: Engineering

Model: 2022 RTEP model for 2027 Summer (50/50)

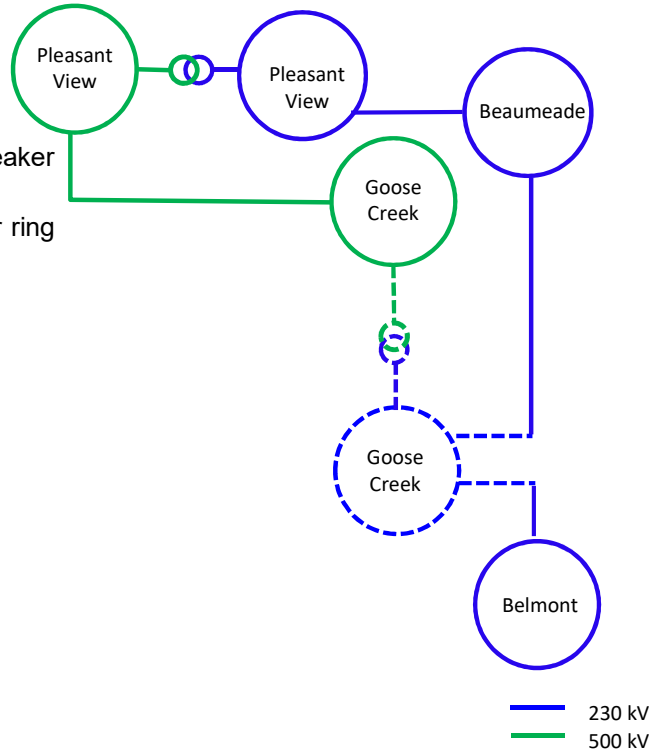


Dominion Transmission Zone: Supplemental Do No Harm Analysis

Need Number: DOM-2021-0016-DNH Update
Process Stage: Solutions Meeting 06/06/2023
Previously Presented: Solutions Meeting 11/30/2021

Pleasant View 500-230kV Transformer

- Install (1) ~~1440~~ **840** MVA 500-230 kV transformer at Goose Creek Substation.
  - Extend the existing 500kV ring bus at Goose Creek Substation to be set up for a future six-breaker ring arrangement. One breaker to be installed initially creating a five-breaker ring bus.
  - Install a new 230kV ring bus at Goose Creek Substation to be set up for a future four-breaker ring arrangement. Three 230kV breakers to be installed initially.
- Cut and extend line #227 (Belmont to Beaumeade) into Goose Creek Substation.



Estimated Project Cost: $40.0 M
Transmission Line Cost: $5.0 M
Substation Cost: $35 M

Alternatives Considered:
No feasible alternatives

Projected In-service Date: ~~12/15/2026~~ 12/15/2023
Project Status: Engineering
Model: 2025 RTEP
Reason for change:

- Inability to procure 1440 MVA transformer to address real-time operational constraints.
- Provide operational flexibility for securely operating the system under various outage scenarios.

Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2022-0043

Process Stage: Solutions Meeting 06/06/2023

Previously Presented: Need Meeting 06/07/2022

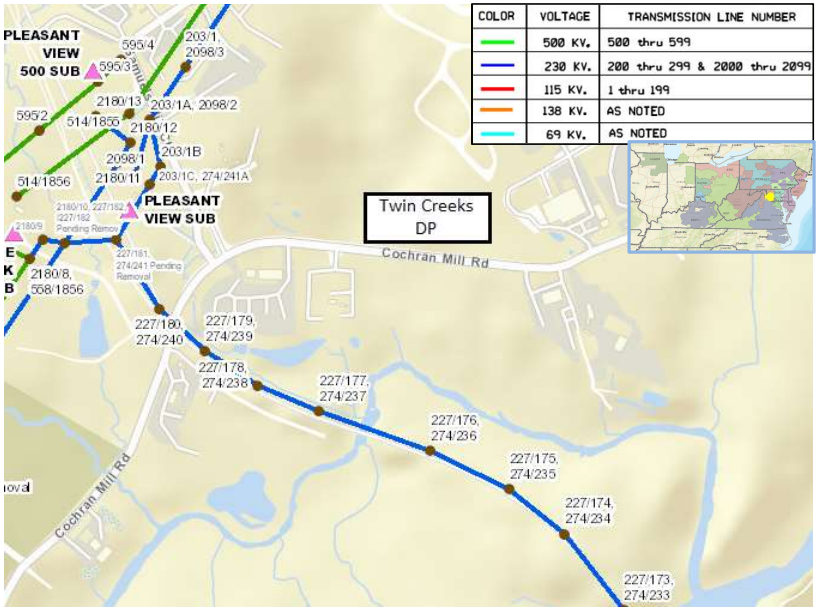
Project Driver: Customer Service

Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV has submitted a DP Request for a new substation (Twin Creeks) in Loudoun County with a total load in excess of 100MW. Requested in-service date is 12/31/2024.



Initial In-Service Load	Projected 2028 Load
Summer: 84.0 MW Winter: 36.0 MW	Summer: 209.2 MW Winter: 183.0 MW

Dominion Transmission Zone: Supplemental Twin Creeks 230kV Delivery - DEV

Need Number: DOM-2022-0043

Process Stage: Solutions Meeting 06/06/2023

Proposed Solution:
Interconnect the new substation by cutting and extending Line #203 (Pleasant View – Edwards Ferry) to the proposed Twin Creeks Substation. Lines to terminate in a 230kV six-breaker ring arrangement.

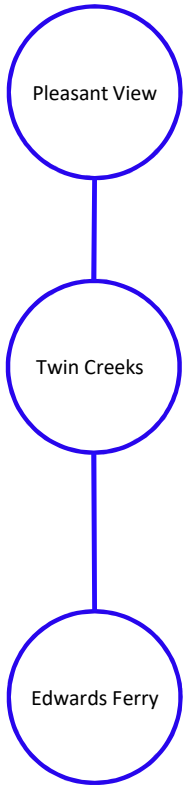
Estimated Project Cost: $20.0 M

Alternatives Considered:
No feasible alternatives

Projected In-service Date: 12/31/2024

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2022-0042

Process Stage: Solutions Meeting 06/06/2023

Previously Presented: Need Meeting 06/07/2022

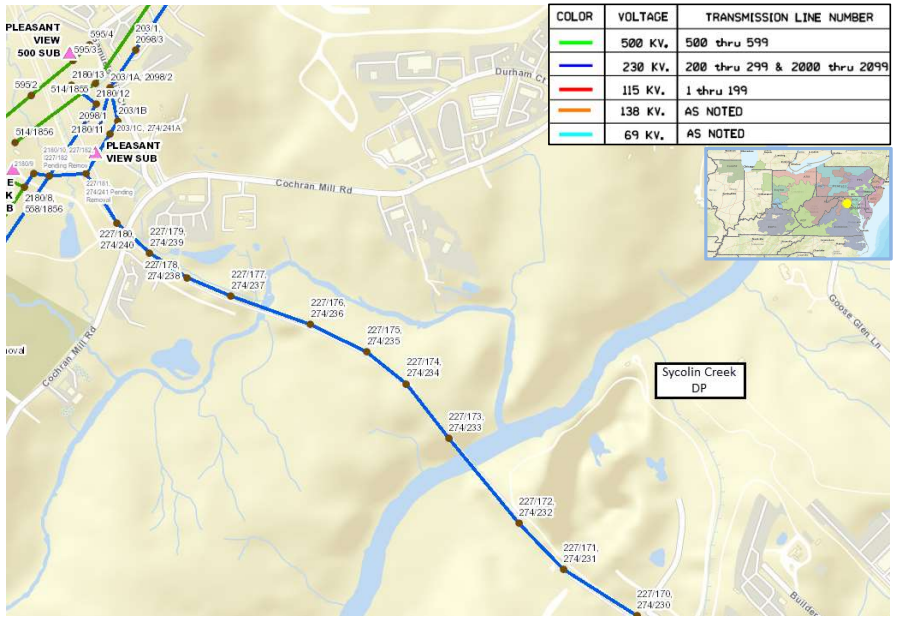
Project Driver: Customer Service

Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV has submitted a DP Request for a new substation (Sycolin Creek) in Loudoun County with a total load in excess of 100MW. Requested in-service date is 06/15/2026.



Initial In-Service Load	Projected 2028 Load
Summer: 12.0 MW Winter: 0.0 MW	Summer: 136.0 MW Winter: 100.0 MW

Dominion Transmission Zone: Supplemental Sycolin Creek 230kV Delivery - DEV

Need Number: DOM-2022-0042

Process Stage: Solutions Meeting 06/06/2023

Proposed Solution:
Interconnect the new substation by constructing two 230kV lines approximately 1.0 mile from Twin Creeks Substation to proposed Sycolin Creek Substation.
Lines to terminate in a 230kV six-breaker ring arrangement.

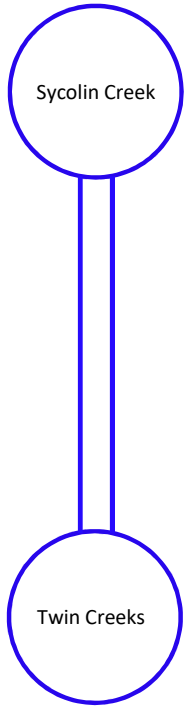
Estimated Project Cost: $28.0 M

Alternatives Considered:
No feasible alternatives

Projected In-service Date: 06/15/2026

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0017
Process Stage: Need Meeting 03/07/2023
Project Driver: Customer Service

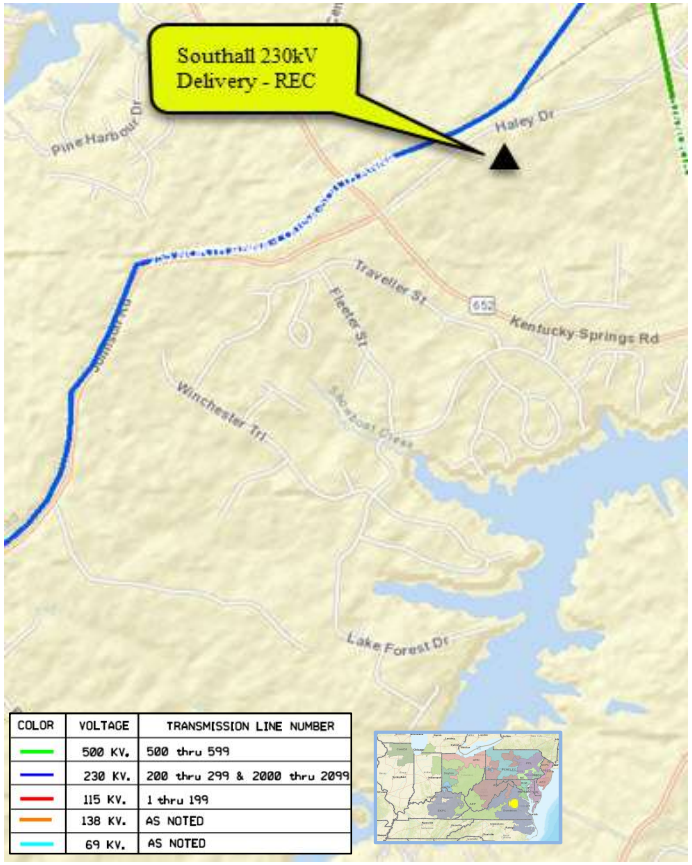
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

Rappahannock Electric Cooperative (REC) has submitted a DP Request for a new substation (Southall) to serve a data center in Louisa County with a total load in excess of 100 MW. The requested in-service date is 05/01/2025.

Initial In-Service Load	Projected 2028 Load
Summer: 11.0 MW Winter: 11.0 MW	Summer: 220.0 MW Winter: 193.0 MW



Dominion Transmission Zone: Supplemental Southall 230kV Delivery - REC

Need Number: DOM-2023-0017
Process Stage: Solutions Meeting 06/06/2023

Proposed Solution:
Interconnect the new substation by cutting and extending Line #255 (North Anna - Desper) to the proposed Southall Substation. Lines to terminate in a 230kV four-breaker ring arrangement with an ultimate arrangement of a six-breaker ring.

Estimated Project Cost: $55 M

Alternatives Considered:
None – The switching station is next to Line #255.

Projected In-service Date: 05/01/2025
Project Status: Engineering
Model: 2027 RTEP

Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0022

Process Stage: Need Meeting 03/07/2023

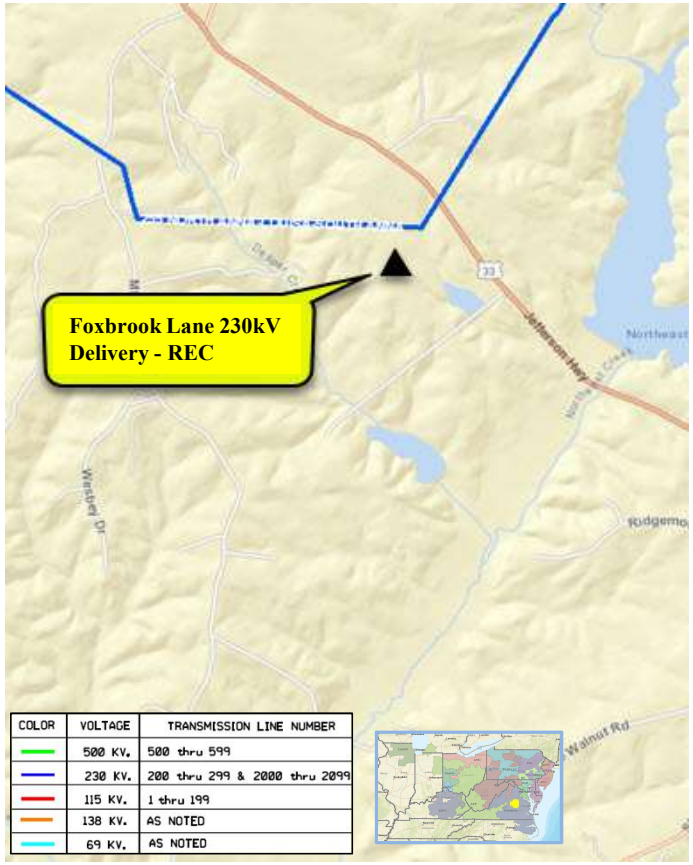
Project Driver: Customer Service

Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

Rappahannock Electric Cooperative (REC) has submitted a DP Request for a new substation (~~Central Louisa~~ Foxbrook Lane) to serve a data center in Louisa County with a total load in excess of 100 MW. The requested in-service date is 05/01/2026.



Initial In-Service Load	Projected 2028 Load
Summer: 11.0 MW Winter: 11.0 MW	Summer: 138.0 MW Winter: 105.0 MW

Dominion Transmission Zone: Supplemental Foxbrook Lane 230kV Delivery - REC

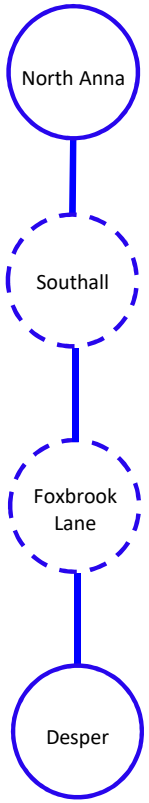
Need Number: DOM-2023-0022
Process Stage: Solutions Meeting 06/06/2023

Proposed Solution:
Interconnect the new substation by cutting and extending Line #255 (North Anna - Desper) to the proposed Foxbrook Lane Substation. Lines to terminate in a 230kV four-breaker ring arrangement with an ultimate arrangement of a six-breaker ring.

Estimated Project Cost: $55 M

Alternatives Considered:
None – The switching station is next to line #255.

Projected In-service Date: 05/01/2026
Project Status: Engineering
Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0012
Process Stage: Solutions Meeting 06/06/2023
Previously Presented: Need Meeting 03/07/2023
Project Driver: Customer Service

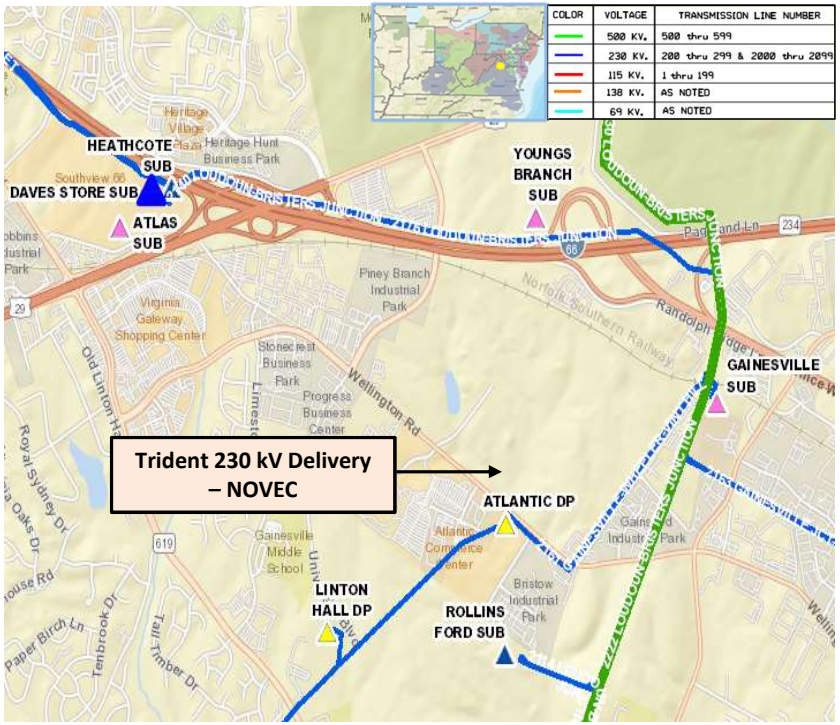
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

NOVEC has submitted a DP Request for a new substation (Trident) to serve a data center complex in Bristow with a total load in excess of 100 MW.

Requested in-service date is 09/01/2025.



Initial In-Service Load	Projected 2028 Load
Summer: 3.75 MW Winter: 3.75 MW	Summer: 153.3 MW Winter: 125.3 MW

Dominion Transmission Zone: Supplemental Trident 230kV Delivery - NOVEC

Need Number: DOM-2023-0012
Process Stage: Solutions Meeting 06/06/2023

Proposed Solution:
Interconnect the new substation by cutting and extending Line #2161 (Gainesville – Wheeler) to the proposed Trident Substation. Lines to terminate into a 230 kV six-breaker ring arrangement.

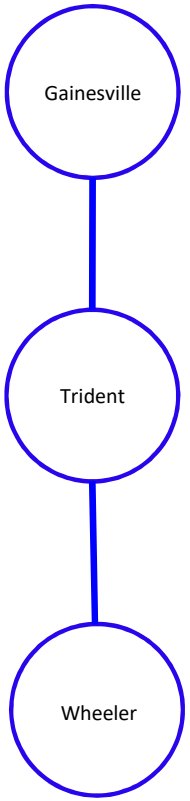
Estimated Project Cost: $15.75 M
Transmission Cost: $0.75M
Substation Cost: $15M

Alternatives Considered:
No feasible alternatives

Projected In-service Date: 09/01/2025

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0009
Process Stage: Solutions Meeting 06/06/2023
Previously Presented: Need Meeting 03/07/2023
Project Driver: Customer Service

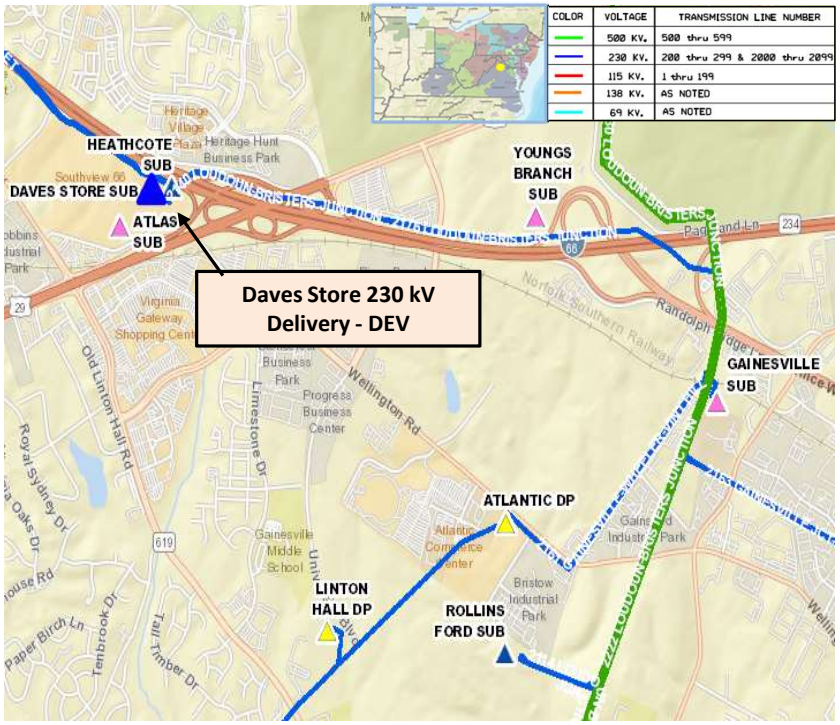
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a DP Request for a new substation (Daves Store) to serve a data center complex in Gainesville with a total load in excess of 100 MW.

Requested in-service date is 06/01/2025.



Initial In-Service Load	Projected 2028 Load
Summer: 90.0 MW Winter: 0.0 MW	Summer: 264.0 MW Winter: 228.0 MW

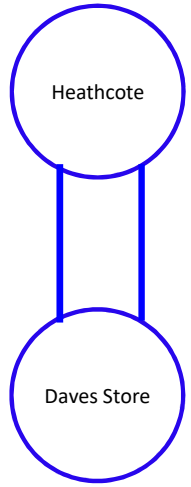
Dominion Transmission Zone: Supplemental Daves Store 230kV Delivery - DEV

Need Number: DOM-2023-0009

Process Stage: Solutions Meeting 06/06/2023

Proposed Solution:

Interconnect the new substation by extending approximately 300' of 230 kV GIL from the existing Heathcote substation to the proposed Daves Store Substation. Lines to terminate into a GIS 230 kV four-breaker arrangement expandable to an ultimate of eight 230 kV GIS breakers in a breaker-and-a-half scheme.



Estimated Project Cost: $40.0 M

Alternatives Considered:

Extend (2) OH 230 kV lines from Heathcote to the proposed Daves Store Substation.

- Not chosen due to spatial requirements to expand onto non-Dominion owned property. Surrounding properties contained significant environment challenges which would delay construction target date.

Projected In-service Date: 06/01/2025

Project Status: Engineering

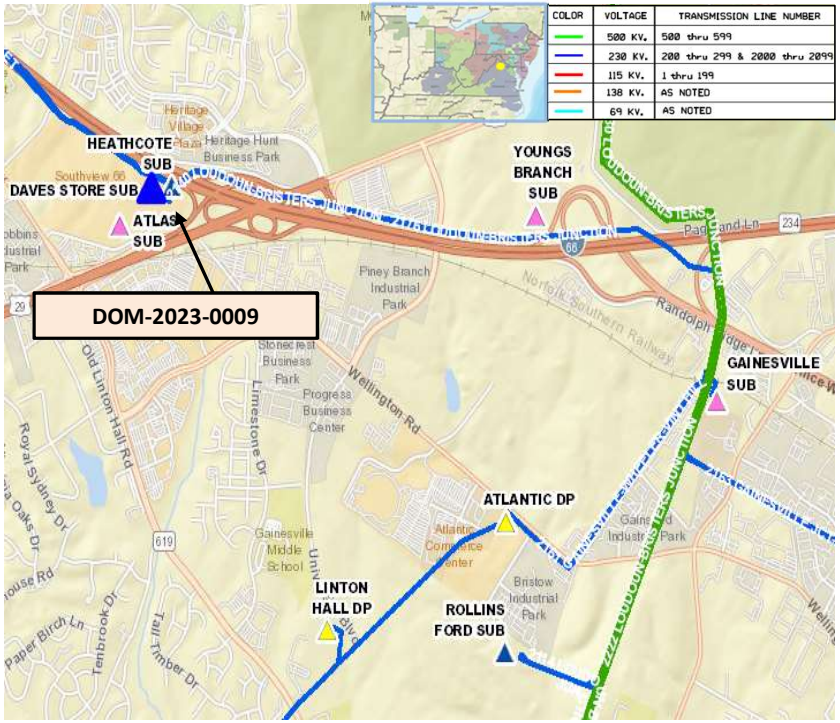
Model: 2027 RTEP

Dominion Transmission Zone: Supplemental Do No Harm Analysis

Need Number: DOM-2023-0009-DNH

Process Stage: Solutions Meeting 06/06/2023

Project Driver: Do No Harm Analysis



Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

PJM has identified a 300 MW load drop violation due to the loss of two separate facilities in the 2023 Do-No-Harm analysis:

- Daves Store + Youngs Branch + Catharpin DP

The violations are caused by previously presented Supplemental Project DOM-2023-0009 in the Dominion Zone.

Dominion Transmission Zone: Supplemental Do No Harm Analysis

Need Number: DOM-2023-0009-DNH

Process Stage: Solutions Meeting 06/06/2023

Proposed Solution:

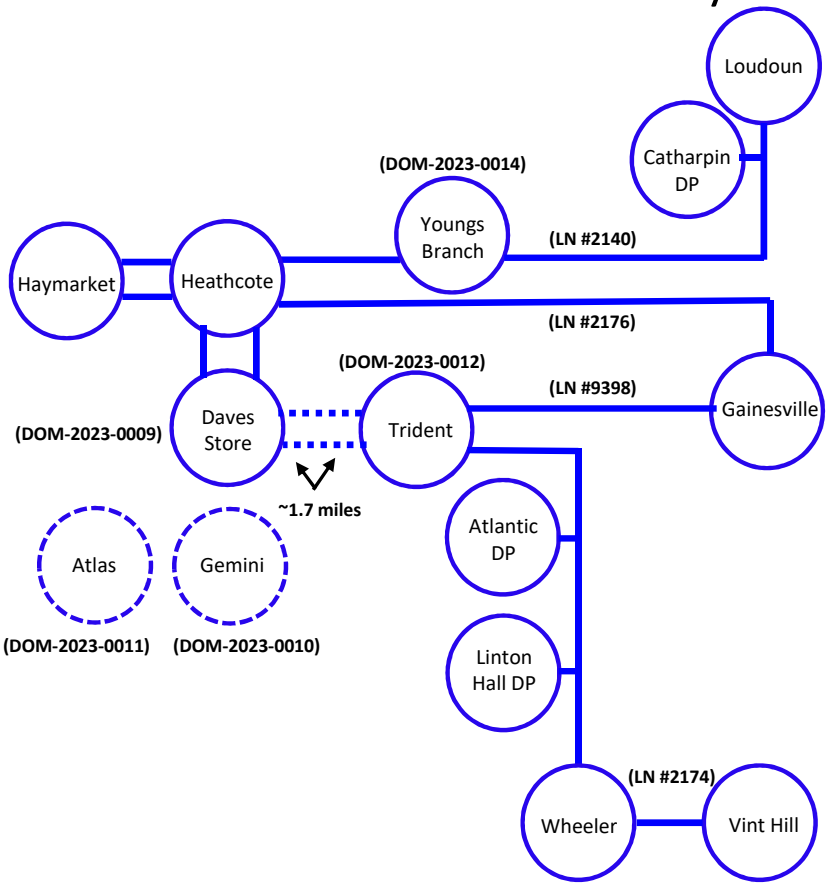
- Extend approximately 1.7 miles of double-circuit 230 kV lines from Trident to Daves Store Substation.
- Install associated 230 kV terminal equipment at Trident and Daves Store.
- New ROW will be required.

Estimated Project Cost: $33.5M (Total)
Transmission Line Cost: $13.5M
Real Estate Cost: $18.5M
Substation Cost: $1.5M

Alternatives Considered:
Extend approximately 1.7 miles of single-circuit 230 kV only from Trident to Daves Store Substation.

- Not chosen due to avoidance of:
  - Future thermal capacity constraints of a single conductor

Projected In-service Date: 12/31/2026
Project Status: Conceptual
Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0010
Process Stage: Solutions Meeting 06/06/2023
Previously Presented: Need Meeting 03/07/2023
Project Driver: Customer Service

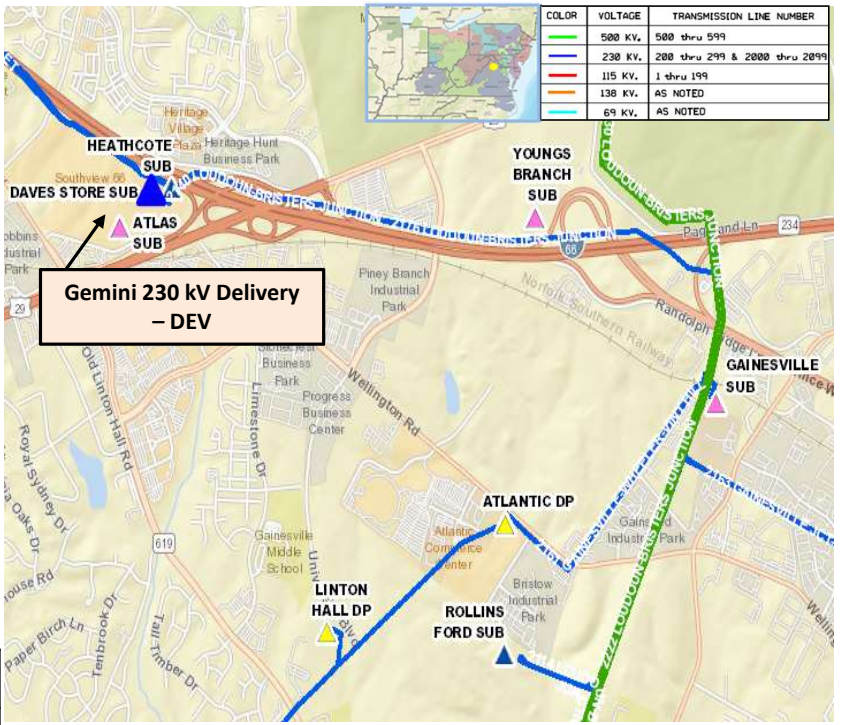
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a DP Request for a new substation (Gemini) to serve a data center complex in Gainesville with a total load in excess of 100 MW.

Requested in-service date is 08/01/2026.

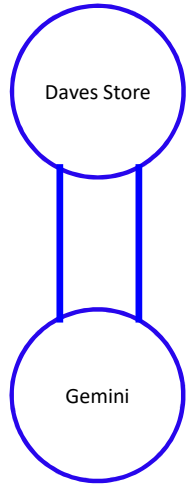


Initial In-Service Load	Projected 2028 Load
Summer: 75.0 MW Winter: 0.0 MW	Summer: 258.0 MW Winter: 210.0 MW

Dominion Transmission Zone: Supplemental Gemini 230kV Delivery - DEV

Need Number: DOM-2023-0010
Process Stage: Solutions Meeting 06/06/2023

Proposed Solution:
Interconnect the new substation by extending approx. 600’ of (2) new 230 kV lines from Daves Store to the proposed Gemini Substation. Lines to terminate into a 230 kV four-breaker arrangement with an ultimate of six.



Estimated Project Cost: $15.3M
Transmission Cost: $0.3M
Substation Cost: $15M

Alternatives Considered:
No feasible alternatives

Projected In-service Date: 08/01/2026

Project Status: Engineering

Model: 2027 RTEP

Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0011
Process Stage: Solutions Meeting 06/06/2023
Previously Presented: Need Meeting 03/07/2023
Project Driver: Customer Service

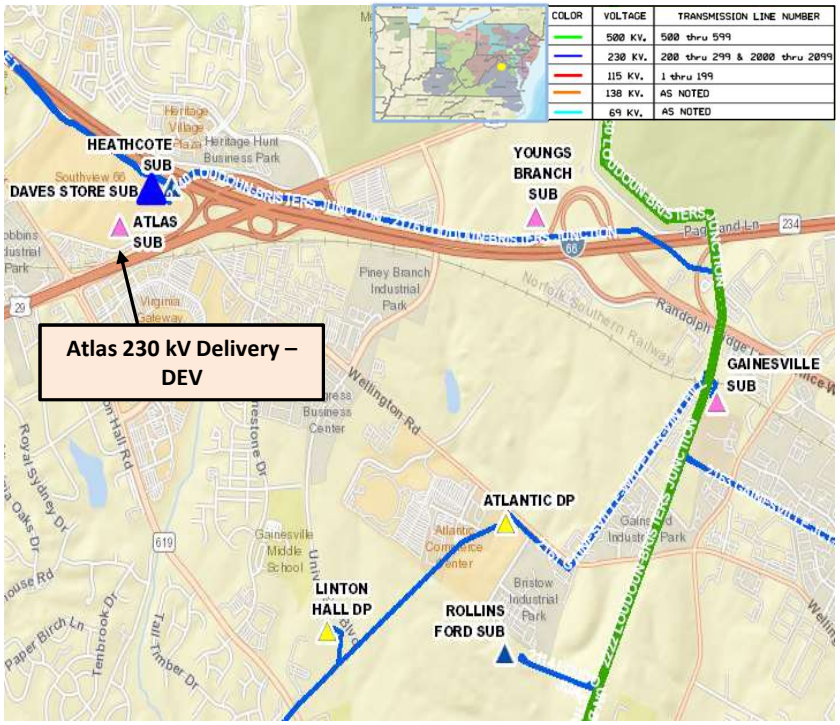
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a DP Request for a new substation (Atlas) to serve a data center complex in Gainesville with a total load in excess of 100 MW.

Requested in-service date is 04/01/2028.



Initial In-Service Load	Projected 2028 Load
Summer: 70.0 MW Winter: 0.0 MW	Summer: 70.0 MW Winter: 0.0 MW

Dominion Transmission Zone: Supplemental Atlas 230kV Delivery - DEV

Need Number: DOM-2023-0011

Process Stage: Solutions Meeting 06/06/2023

Proposed Solution:

Interconnect the new substation by extending approx. 450' of (1) new 230 kV line from Gemini to the proposed Atlas Substation. Re-terminate (1) of the 230 kV segments from Daves Store to Trident (DOM-2023-0009-DNH) into Atlas, extending the segment by approx. 1200'. The 230 kV lines will terminate into a 230 kV four-breaker arrangement expandable to an ultimate of six.

Estimated Project Cost: $15.4 M

Transmission Cost: $0.4M

Substation Cost: $15M

Alternatives Considered:

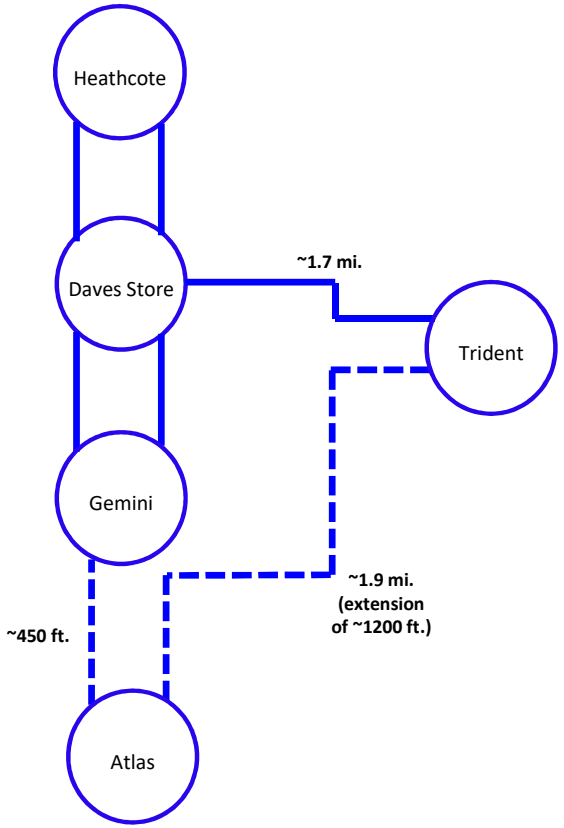
Extend (2) 230 kV lines from Gemini to the proposed Atlas Substation.

- Not chosen due to avoidance of future 300 MW load drop violation (Gemini + Atlas via L/O (2) 230 kV lines from Daves Store to Gemini)

Projected In-service Date: 04/01/2028

Project Status: Engineering

Model: 2027 RTEP



PE Transmission Zone M-3 Process
Sage 230 kV Customer Load Increase

Need Number: APS-2023-017

Process Stage: Need Meeting –6/6/2023

Project Driver(s):

Customer Service

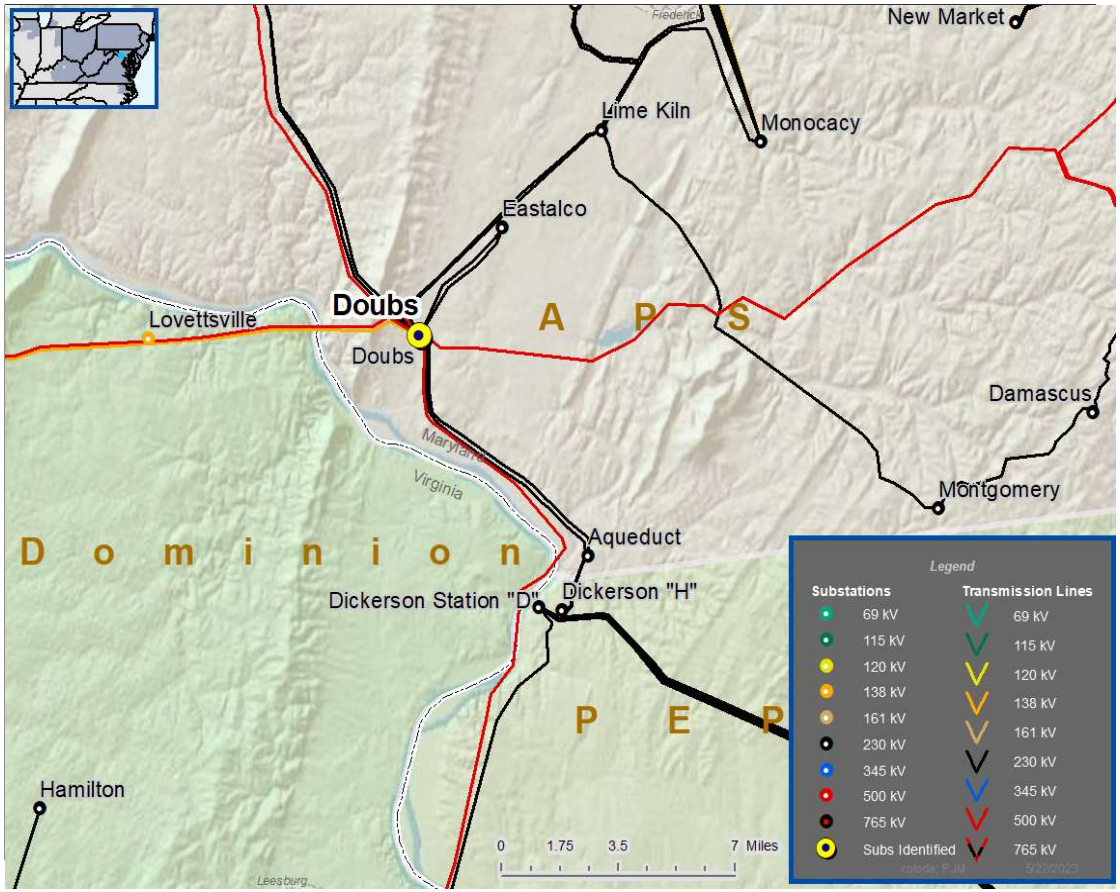
Specific Assumption Reference(s)

New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement

Existing Customer Connection load increase - has requested a load addition to the 230 kV delivery point Sage Substation (s2881). The anticipated load increase is 336 MW with a total site load of 576 MW.

Requested in-service date is 02/13/2026.



APS Transmission Zone M-3 Process
Sage 230 kV Customer Load Increase- Solution Phase 2

Need Number: APS-2023-017
Process Stage: Solution Meeting –7/11/2023
Previously Presented: Need Meeting – 6/6/2023

Proposed Solution 1 of 3:

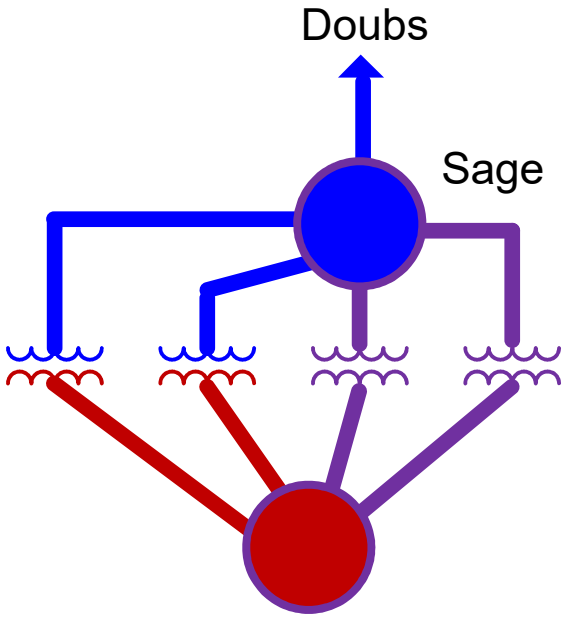
230 kV Transmission substation Expansion

- Expand the existing three-breaker ring bus into a six-breaker, breaker-and-a-half substation by installing three new 230 kV circuit breakers
- Install two 230-34.5 kV transformers
- Construct two 34.5 kV busses on the low side of transformers

Alternatives Considered:

- No feasible alternatives to meet customer's request at requested load level

Estimated Project Cost: $1.5M
Projected In-Service: 10/01/2025
Status: Engineering
Model: 2022 RTEP Model for 2027 Summer (50/50)



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

APS Transmission Zone M-3 Process
Sage 230 kV Customer load addition- Solution Phase 3

Need Number: APS-2023-017
Process Stage: Solution Meeting –7/11/2023
Previously Presented: Need Meeting – 6/6/2023
Proposed Solution 2 of 3 :

230 kV Transmission substation Expansion

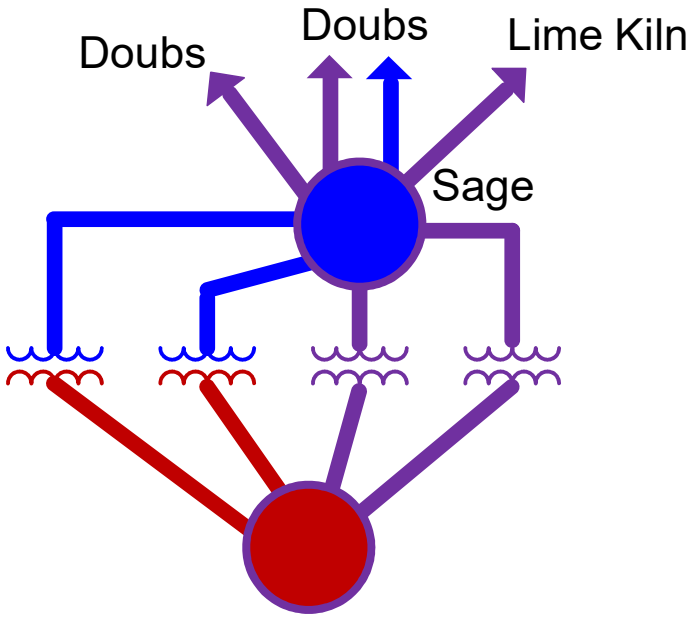
(Addresses load loss criteria violation and voltage concerns in area)

- Expand the six-breaker, breaker-and-a-half substation to 15 breakers by adding nine 230 kV circuit breakers.
- Terminate the Doubs-Eastalco 206 230 kV Line into the Sage 230 kV Substation
- Loop in the Doubs-Lime Kiln 207 230 kV Line into the Sage 230 kV Substation

Alternatives Considered:

- No feasible alternatives to meet reliability criteria violations due to customer's load increase. The 206 and 207 lines are near and adjacent to the Sage Substation.

Estimated Project Cost: $25M
Projected In-Service: 12/31/2027
Status: Project Initiation



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

APS Transmission Zone M-3 Process
Sage 230 kV Customer load addition- Solution

Need Number: APS-2023-017
Process Stage: Solution Meeting –7/11/2023
Previously Presented: Need Meeting – 6/6/2023

Proposed Solution 3 of 3 :

Bartonville-Meadow Brook 138 kV Line upgrades

(Addresses thermal violation on transmission line)

- Replace one 1200 A Wave Trap at Meadow Brook Substation
- Revise relay settings

Line Ratings

- 292 MVA SN/314 MVA SE (Before Proposed Solution)
- 329 MVA SN/413 MVA SE (After Proposed Solution)

Alternatives Considered:

- None

Estimated Project Cost: $0.7M
Projected In-Service: 03/01/2025
Status: Project Initiation

Solution provided assumes the following project is completed:

- RTEP # b3772: Reconductor 27.3 miles of the Messick Rd – Morgan 138 kV Line (Projected In-Service date 6/1/2027)

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

Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2022-0054

Process Stage: Solutions Meeting 07/11/2023

Previously Presented: Need Meeting 10/04/2022

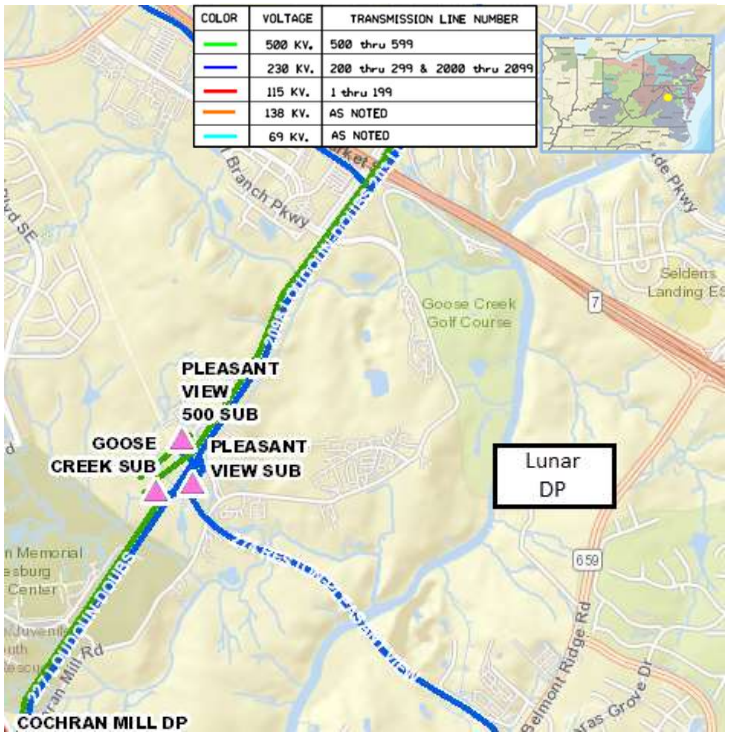
Project Driver: Customer Service

Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV has submitted a DP Request for a new substation (Lunar) in Loudoun County with a total load in excess of 100MW. Requested in-service date is 08/01/2026.



Initial In-Service Load	Projected 2028 Load
Summer: 12.0 MW Winter: 0.0 MW	Summer: 188.0 MW Winter: 140.0 MW

Dominion Transmission Zone: Supplemental Lunar 230kV Delivery - DEV

Need Number: DOM-2022-0054

Process Stage: Solutions Meeting 07/11/2023

Proposed Solution:
Interconnect the new substation by constructing two 230kV lines from Sycolin Creek Substation to proposed Lunar Substation. Lines to terminate in a 230kV six-breaker ring arrangement.

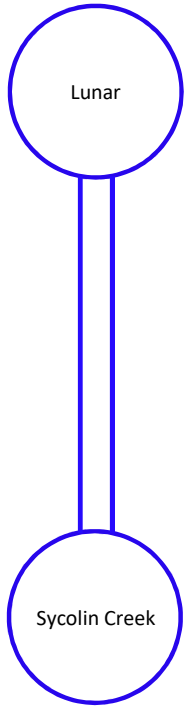
Estimated Project Cost: $28.0 M

Alternatives Considered:
No feasible alternatives

Projected In-service Date: 08/01/2026

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0001

Process Stage: Solutions Meeting 07/11/2023

Previously Presented: Need Meeting 01/10/2023

Project Driver: Customer Service

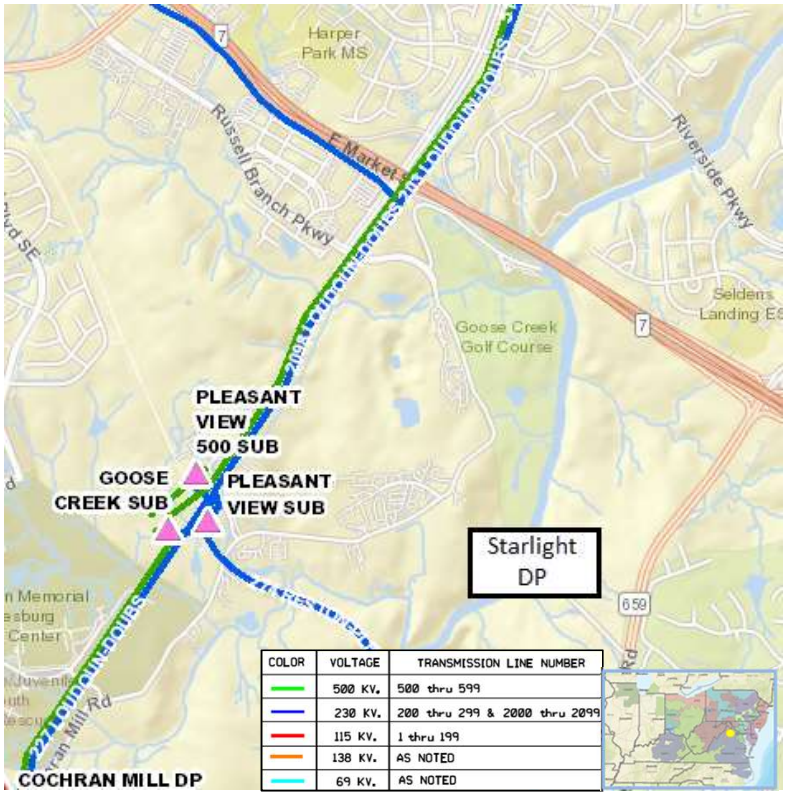
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV has submitted a DP Request for a new substation (Starlight) in Loudoun County with a total load in excess of 100MW. Requested in-service date is 06/01/2028.

Initial In-Service Load	Projected 2038 Load
Summer: 10.0 MW Winter: 0.0 MW	Summer: 158.0 MW Winter: 158.0 MW



Dominion Transmission Zone: Supplemental Starlight 230kV Delivery - DEV

Need Number: DOM-2023-0001

Process Stage: Solutions Meeting 07/11/2023

Proposed Solution:
Interconnect the new substation by cutting two 230kV lines from Sycolin Creek Substation to Lunar Substation into proposed Starlight Substation. Lines to terminate in a 230kV six-breaker ring arrangement.

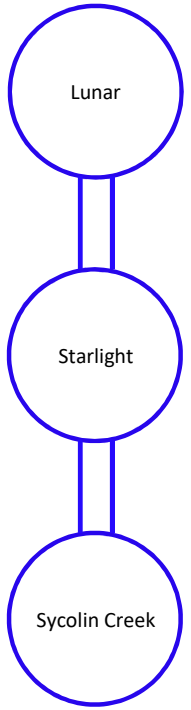
Estimated Project Cost: $28.0 M

Alternatives Considered:
No feasible alternatives

Projected In-service Date: 06/01/2028

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2022-0055

Process Stage: Solutions Meeting 07/11/2023

Previously Presented: Need Meeting 11/01/2022

Project Driver: Customer Service

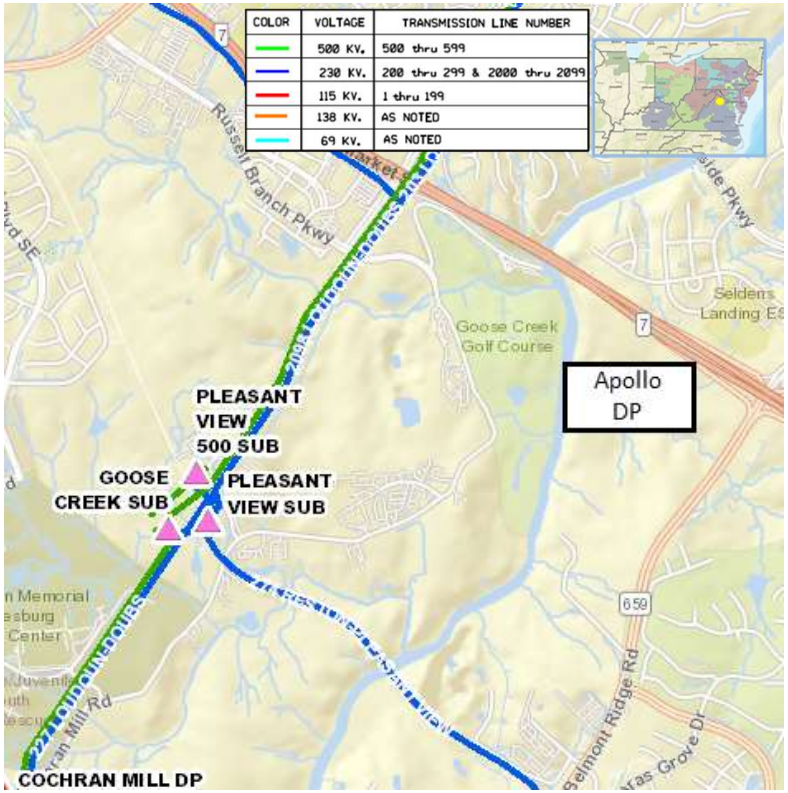
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV has submitted a DP Request for a new substation (Apollo) in Loudoun County with a total load in excess of 100MW. Requested in-service date is 1/1/2027.

Initial In-Service Load	Projected 2028 Load
Summer: 27.0 MW Winter: 0.0 MW	Summer: 111.0 MW Winter: 69.0 MW



Dominion Transmission Zone: Supplemental Apollo 230kV Delivery - DEV

Need Number: DOM-2022-0055

Process Stage: Solutions Meeting 07/11/2023

Proposed Solution:
Interconnect the new substation by constructing two 230kV lines from Lunar Substation to proposed Apollo Substation. Lines to terminate in a 230kV six-breaker ring arrangement.

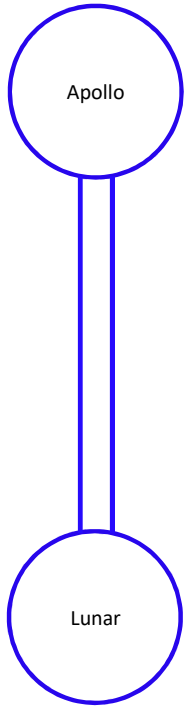
Estimated Project Cost: $28.0 M

Alternatives Considered:
No feasible alternatives – Extending from closest source

Projected In-service Date: 01/01/2027

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0005

Process Stage: Solutions Meeting 07/11/2023

Previously Presented: Need Meeting 02/07/2023

Project Driver: Customer Service

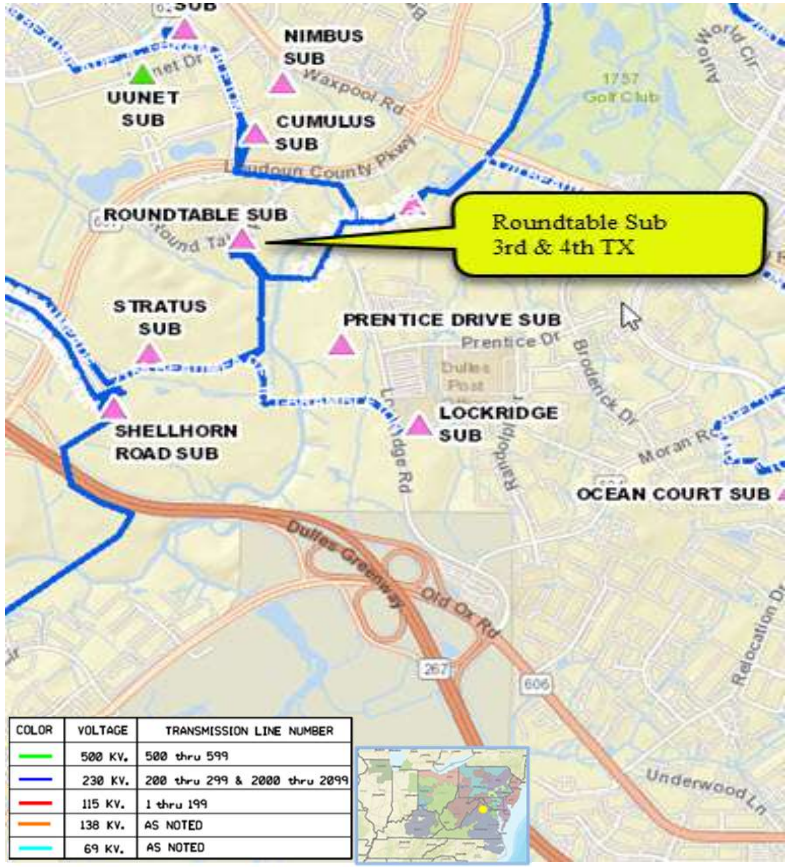
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a DP Request to add the 3rd and 4th distribution transformers at Roundtable Substation in Loudoun County. The new transformers are being driven by continued load growth in the area and contingency loading for loss of one of the existing transformers. Requested in-service date is 12/15/2024.

Initial In-Service Load	Projected 2028 Load
Summer: 124.5 MW Winter: 118.5 MW	Summer: 141.0 MW Winter: 138.0 MW



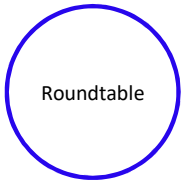
Dominion Transmission Zone: Supplemental Roundtable - Add 3rd and 4th TX - DEV

Need Number: DOM-2023-0005

Process Stage: Solutions Meeting 07/11/2023

Proposed Solution:
Install (2) 1200 Amp, 50kAIC circuit switchers and associated equipment (bus, relaying, etc.) to feed the new transformers at Roundtable.

Estimated Project Cost: $1.0 M



Alternatives Considered:
No feasible alternatives – Existing substation

Projected In-service Date: 12/15/2024

Project Status: Engineering

Model: 2027 RTEP

Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0019

Process Stage: Solutions Meeting 07/11/2023
Previously Presented: Need Meeting 03/07/2023
Project Driver: Customer Service

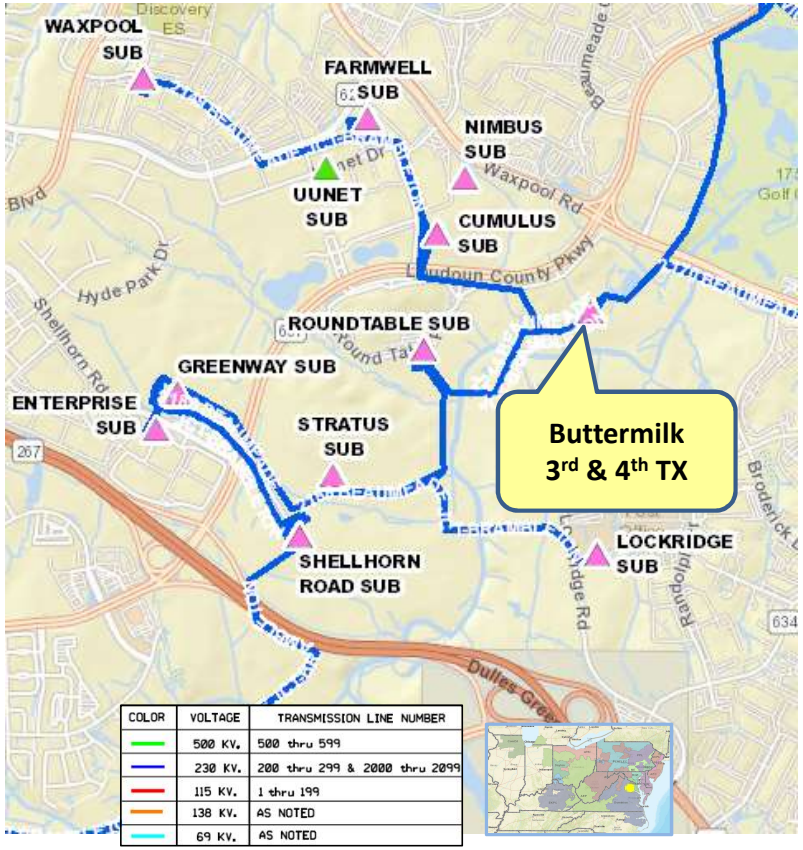
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a DP Request to add the 3rd and 4th distribution transformers at Buttermilk Substation in Loudoun County. The new transformers are being driven by continued load growth in the area. Requested in-service date is 12/15/2024.

Initial In-Service Load	Projected 2028 Load
Summer: 128.0 MW Winter: 120.0 MW	Summer: 147.0 MW Winter: 146.0 MW



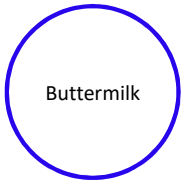
Dominion Transmission Zone: Supplemental Buttermilk - Add 3rd and 4th TX - DEV

Need Number: DOM-2023-0019

Process Stage: Solutions Meeting 07/11/2023

Proposed Solution:
Install (2) 1200 Amp, 50kAIC circuit switchers and associated equipment (bus, relaying, etc.) to feed the new transformers at Buttermilk.

Estimated Project Cost: $1.0 M



Alternatives Considered:
No feasible alternatives – Existing substation

Projected In-service Date: 12/15/2024

Project Status: Engineering

Model: 2027 RTEP

Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0032

Process Stage: Solution Meeting 07/11/2023

Previously Presented: Need Meeting 06/06/2023

Project Driver: Customer Service

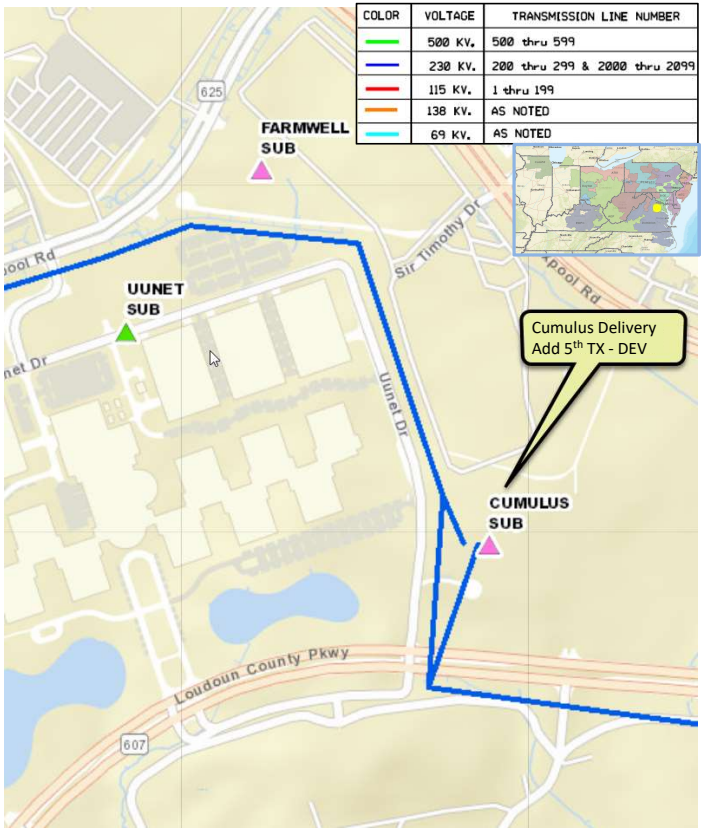
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a DP Request to add a 5th distribution transformer at Cumulus Substation in Loudoun County. The new 84 MVA transformer is being driven by continued load growth in the area and contingency loading for loss of one of the existing transformers. Requested in-service date is 06/01/2025.

Initial In-Service Load	Projected 2028 Load
Summer: 130.4 MW Winter: 90.4 MW	Summer: 268.2 MW Winter: 260.3 MW



Dominion Transmission Zone: Supplemental Cumulus 230kV Delivery- Add 5th TX - DEV

Need Number: DOM-2023-0032

Process Stage: Solutions Meeting 07/11/2023

Proposed Solution:
Install a 1200 Amp, 50kAIC circuit switcher and associated equipment (bus, switches, relaying, etc.) to feed the new transformer at Cumulus.

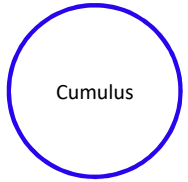
Estimated Project Cost: $0.50 M

Alternatives Considered:
No feasible alternatives – Existing substation

Projected In-service Date: 06/01/2025

Project Status: Engineering

Model: 2027 RTEP

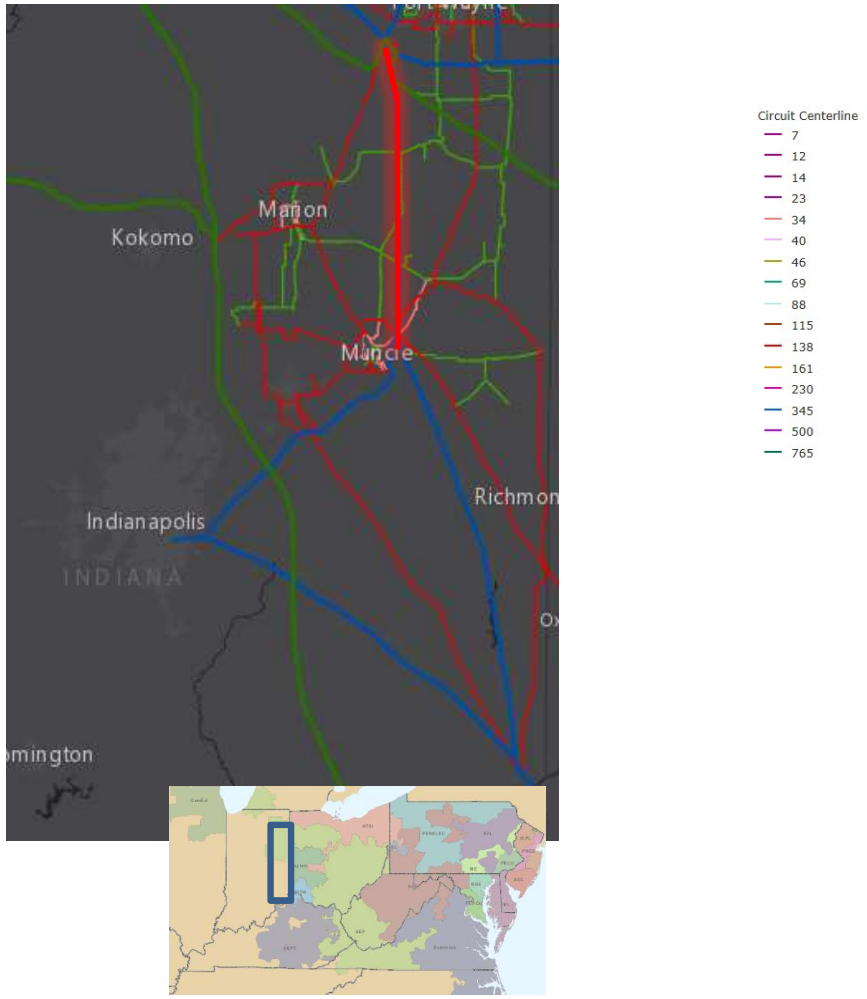


AEP Transmission Zone M-3 Process
Sorenson – Desoto 345kV

Need Number: AEP-2021-IM028
Process Stage: Solutions Meeting 08/08/2023
Previously Presented: Needs Meeting: 9/17/2021
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Model: N/A
Problem Statement:

Desoto – Sorenson 345kV line (51.8 miles):

- Majority (211/216) structures are original 1952 Steel Lattice
- Majority (51.8 miles) of Conductor is 1952 vintage paper expanded conductor on the Sorenson – Desoto, Sorenson – Keystone and Keystone – Desoto circuits.
- Since 2014 there have been 22 momentary and 12 permanent outages across this line asset.
- The Paper Expanded conductor is difficult to splice during repairs due to the unavailability of like for like replacement conductor.
- Line is prone to galloping and causes issues for sensitive customers in the Marion and Ft Wayne area.
- 19 structures on the full Tanners Creek – Desoto – Sorenson asset were investigated at the ground and 38 structures were assessed by drone.
    - 20 of these structures had rust or galvanizing
    - 11 had broken/flashes or rusted insulators
    - 6 had sliding/bent or damaged dampers
    - 1 had broken spacers
- With 211 open conditions total, 124 of the 216 structures have at least one open condition. These open conditions include but are not limited to the following.
    - Loose braces; damaged, loose, or rust heavy lacing; rusty legs; broken, damaged, or gunshot conductor; broken or corroded shield wire; and significant hardware issues.



AEP Transmission Zone M-3 Process
Sorenson – Desoto 345kV

Need Number: AEP-2021-IM028
Process Stage: Solutions Meeting 08/08/2023

Proposed Solution:

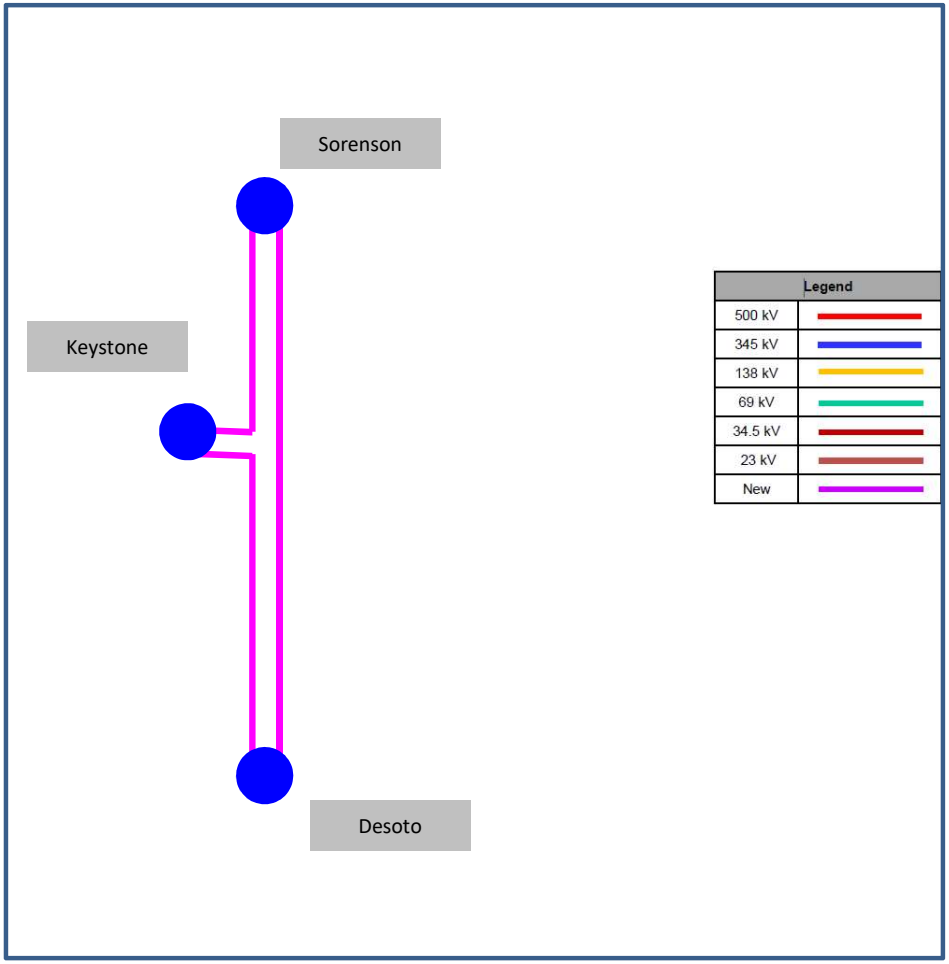
Sorenson – Desoto 345kV:
Rebuild the ~51.5 mile line as is using double circuit 345kV construction. Replace jumpers at Sorenson and Desoto to accommodate the new structure entrances at the stations.

Existing Conductor, Circuit Ratings: 1275 and 1350 ACSR/PE, 2303 ACAR, 897/897/1138/1138 SN/SE/WN/WE MVA

New Conductor, Circuit Ratings: 2-954 ACSR, 1025/1318/1298/1522 SN/SE/WN/WE MVA
Estimated Cost: $202.4M

Alternatives Considered:
Alternate 1
Rebuild this line as a single circuit 345kV line. Due to the 11 IPP's currently in the queue to connect to both sides of this double circuit corridor and this being the only corridor connecting the Fort Wayne system to the Tanners Creek 345kV hub this was not considered.
Cost: $187.4M

Projected In-Service: 06/10/2027
Project Status: Scoping



PE Transmission Zone M-3 Process
Sage 230 kV Customer Load Increase

Need Number: APS-2023-017

Process Stage: Need Meeting –6/6/2023

Project Driver(s):

Customer Service

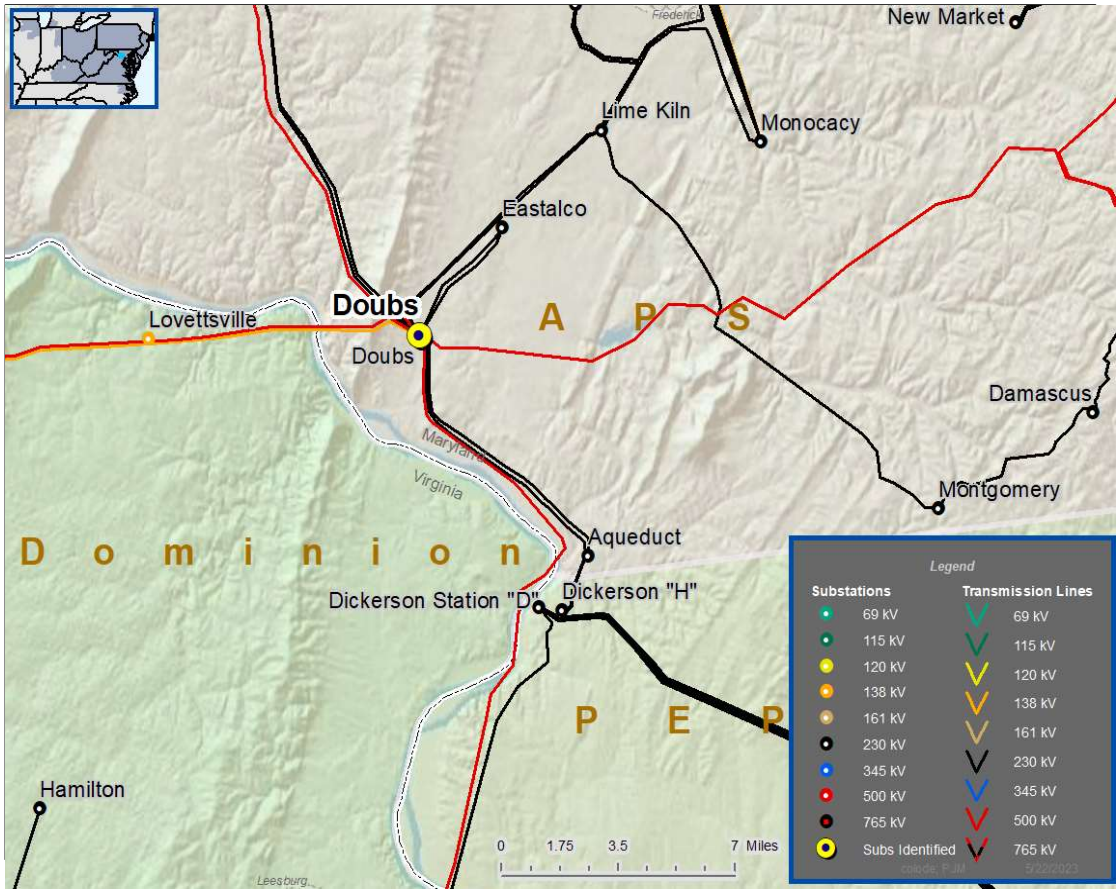
Specific Assumption Reference(s)

New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement

Existing Customer Connection load increase - has requested a load addition to the 230 kV delivery point Sage Substation (s2881). The anticipated load increase is 336 MW with a total site load of 576 MW.

Requested in-service date is 02/13/2026.



APS Transmission Zone M-3 Process
Sage 230 kV Customer Load Increase- Solution Phase 2

Need Number: APS-2023-017
Process Stage: Solution Meeting –8/8/2023
Previously Presented: Need Meeting – 6/6/2023

Proposed Solution 1 of 3:

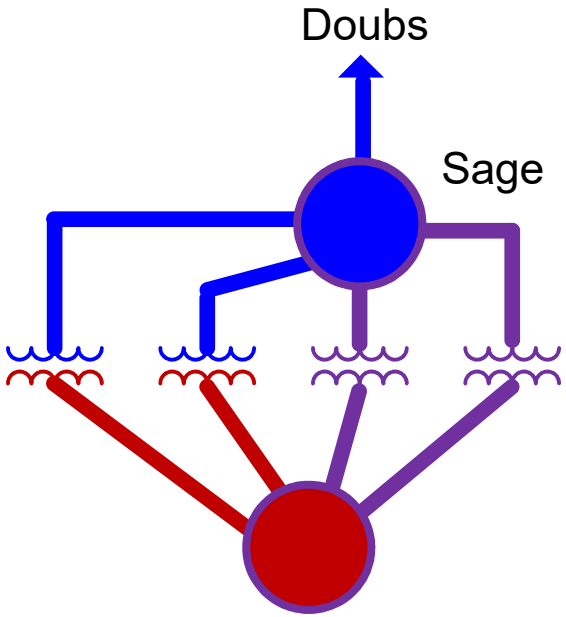
230 kV Transmission substation Expansion

- Expand the existing three-breaker ring bus into a six-breaker, breaker-and-a-half substation by installing three new 230 kV circuit breakers
- Install two 230-34.5 kV transformers
- Construct two 34.5 kV busses on the low side of transformers

Alternatives Considered:

- No feasible alternatives to meet customer's request at requested load level

Estimated Project Cost: $1.5M
Projected In-Service: 10/01/2025
Status: Engineering
Model: 2022 RTEP Model for 2027 Summer (50/50)



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

APS Transmission Zone M-3 Process
Sage 230 kV Customer load addition- Solution Phase 3

Need Number: APS-2023-017
Process Stage: Solution Meeting –8/8/2023
Previously Presented: Need Meeting – 6/6/2023
Proposed Solution 2 of 3 :

230 kV Transmission substation Expansion

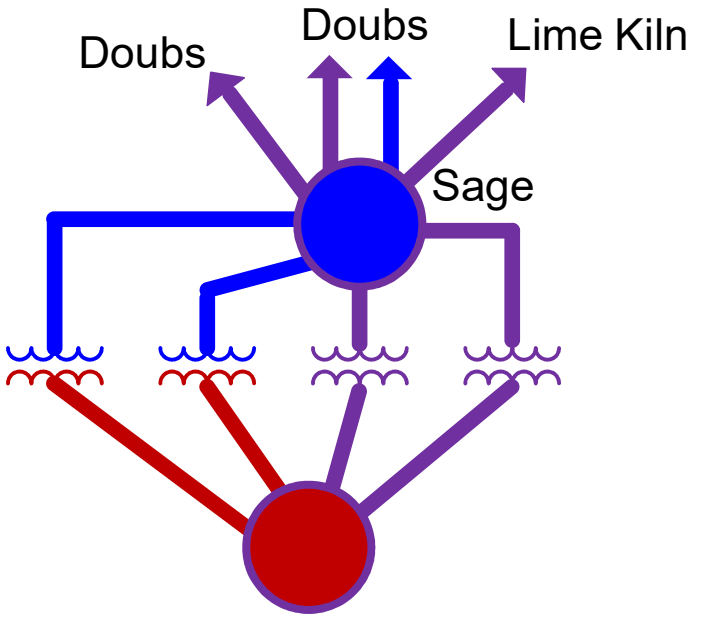
(Addresses load loss criteria violation and voltage concerns in area)

- Expand the six-breaker, breaker-and-a-half substation to 15 breakers by adding nine 230 kV circuit breakers.
- Terminate the Doubs-Eastalco 206 230 kV Line into the Sage 230 kV Substation
- Loop in the Doubs-Lime Kiln 207 230 kV Line into the Sage 230 kV Substation

Alternatives Considered:

- No feasible alternatives to meet reliability criteria violations due to customer's load increase. The 206 and 207 lines are near and adjacent to the Sage Substation.

Estimated Project Cost: $25M
Projected In-Service: 12/31/2027
Status: Project Initiation



APS Transmission Zone M-3 Process
Sage 230 kV Customer load addition- Solution

Need Number: APS-2023-017
Process Stage: Solution Meeting –8/8/2023
Previously Presented: Need Meeting – 6/6/2023

Proposed Solution 3 of 3 :

Bartonville-Meadow Brook 138 kV Line upgrades

(Addresses thermal violation on transmission line)

- Replace one 1200 A Wave Trap at Meadow Brook Substation
- Revise relay settings

Line Ratings

- 292 MVA SN/314 MVA SE (Before Proposed Solution)
- 329 MVA SN/413 MVA SE (After Proposed Solution)

Alternatives Considered:

- None

Estimated Project Cost: $0.7M
Projected In-Service: 03/01/2025
Status: Project Initiation

Solution provided assumes the following project is completed:

- RTEP # b3772: Reconductor 27.3 miles of the Messick Rd – Morgan 138 kV Line (Projected In-Service date 6/1/2027)

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

Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2022-0003

Process Stage: Solutions Meeting 08/08/2023

Previously Presented: Need Meeting 06/07/2022

Project Driver: Customer Service

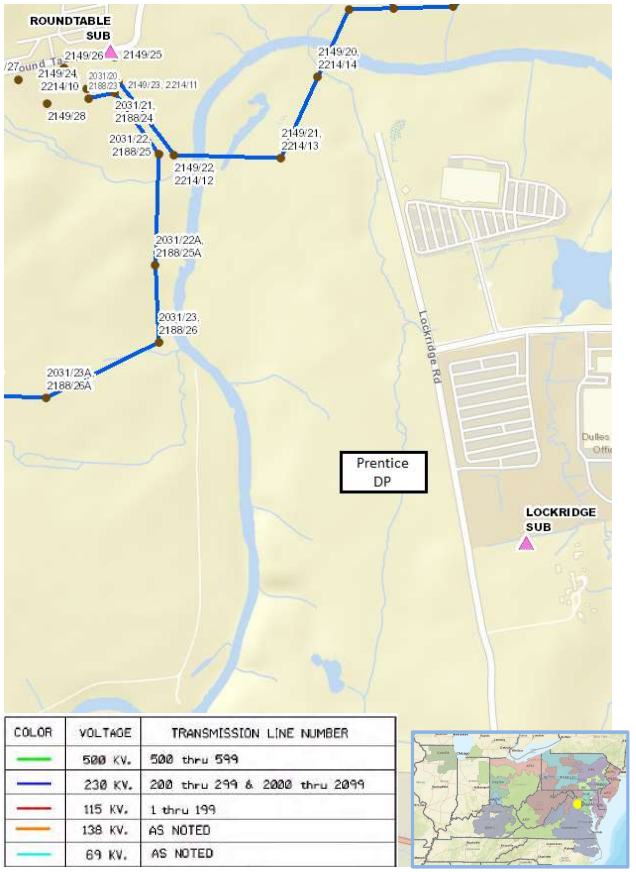
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV has submitted a DP Request for a new substation (Prentice) in Loudoun County with a total load in excess of 100MW. Requested in-service date is 12/30/2024.

Initial In-Service Load	Projected 2028 Load
Summer: 5.0 MW Winter: 0.0 MW	Summer: 160.0 MW Winter: 145.7 MW



Dominion Transmission Zone: Supplemental Prentice Drive 230kV Delivery - DEV

Need Number: DOM-2022-0003

Process Stage: Solutions Meeting 08/08/2023

Proposed Solution:
Interconnect the new substation by cutting and extending Line #2188 (Lockridge – Shellhorn) to the proposed Prentice Drive Substation. Lines to terminate in a 230kV six-breaker ring arrangement.

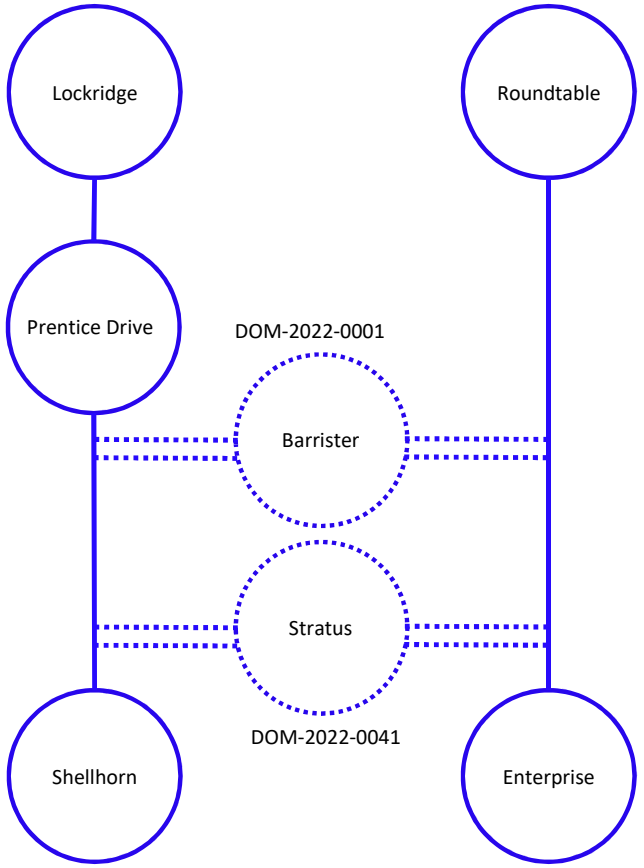
Estimated Project Cost: $20.0 M

Alternatives Considered:
None. Tapping closest source.

Projected In-service Date: 12/30/2024

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2022-0056

Process Stage: Solutions Meeting 08/08/2023

Previously Presented: Need Meeting 10/04/2022

Project Driver: Customer Service

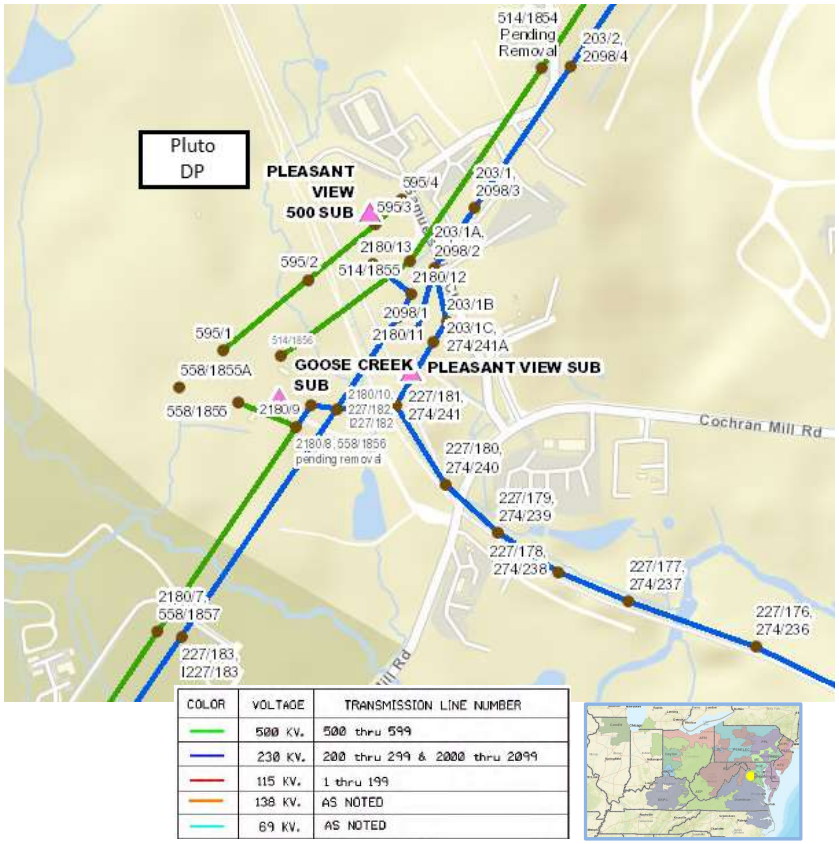
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV has submitted a DP Request for a new substation (Pluto) in Loudoun County with a total load in excess of 100MW. Requested in-service date is 06/1/2026.

Initial In-Service Load	Projected 2028 Load
Summer: 3.0 MW Winter: 0.0 MW	Summer: 110.0 MW Winter: 72.0 MW



Dominion Transmission Zone: Supplemental Pluto 230kV Delivery - DEV

Need Number: DOM-2022-0056

Process Stage: Solutions Meeting 08/08/2023

Proposed Solution:
Interconnect the new substation by cutting and extending Line #2180 (Pleasant View – Belmont) to the proposed Pluto Substation. Lines to terminate in a 230kV four-breaker ring arrangement.

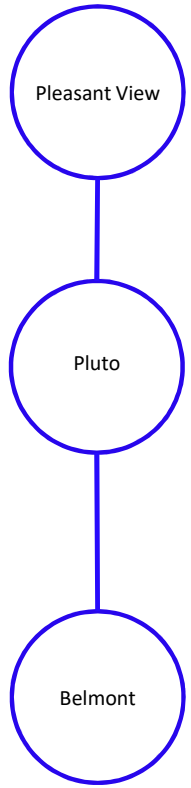
Estimated Project Cost: $20.0 M

Alternatives Considered:
None. Tapping closest source.

Projected In-service Date: 06/01/2026

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

Need Number: DOM-2023-0020

Process Stage: Solution Meeting 08/08/2023

Previously Presented: Need Meeting 03/07/2023

Project Driver: Customer Service

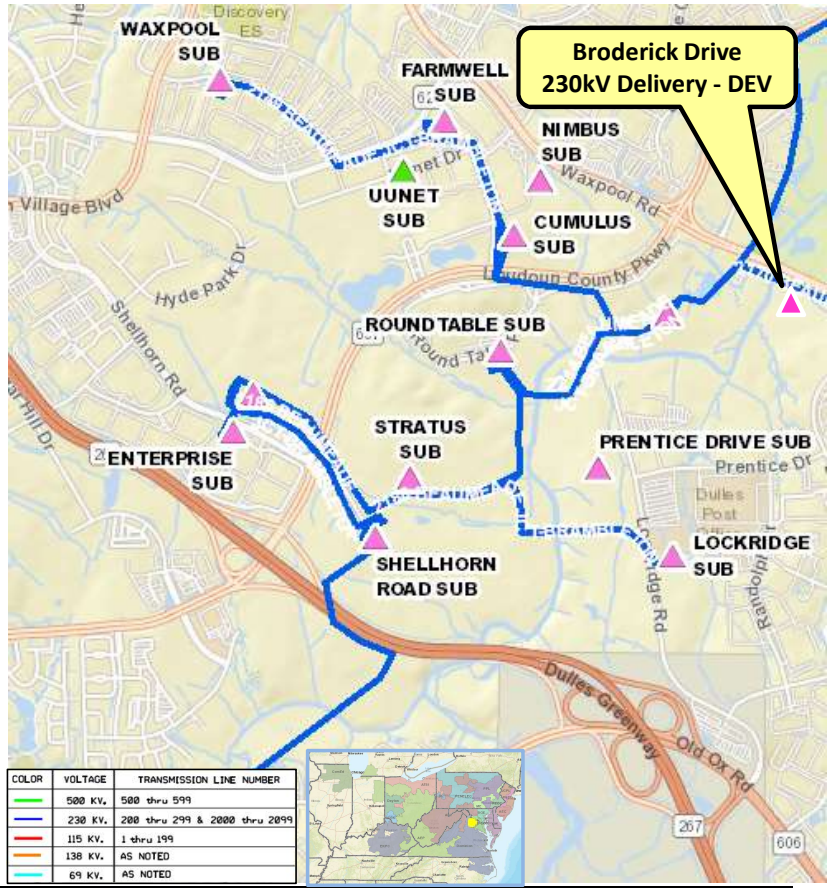
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a DP Request for a new substation (Broderick Drive) to serve a data center campus in Loudoun County with a total load in excess of 100 MW. Requested in-service date is 03/01/2026.

Initial In-Service Load	Projected 2028 Load
Summer: 8.0 MW Winter: 0.0 MW	Summer: 112.0 MW Winter: 72.0 MW



Dominion Transmission Zone: Supplemental Broderick Drive 230kV Delivery - DEV

Need Number: DOM-2023-0020

Process Stage: Solutions Meeting 08/08/2023

Proposed Solution:
Interconnect the new substation by cutting and extending Line #2170 (Buttermilk-Pacific) to the proposed Broderick Drive Substation. Lines to terminate in a 230kV four-breaker ring arrangement.

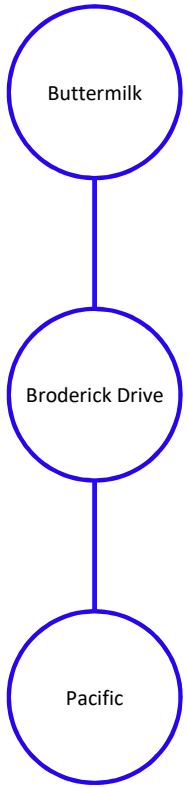
Estimated Project Cost: $24.5 M

Alternatives Considered:
No feasible alternatives

Projected In-service Date: 03/01/2026

Project Status: Engineering

Model: 2027 RTEP



Dominion Transmission Zone: Supplemental Equipment Material Condition, Performance and Risk

Need Number: DOM-2021-0047

Process Stage: Solution Meeting 08/08/2023

Previously Presented: Solution Meeting 08/09/2022, Need Meeting 06/08/2021

Project Driver: Equipment Material Condition, Performance and Risk

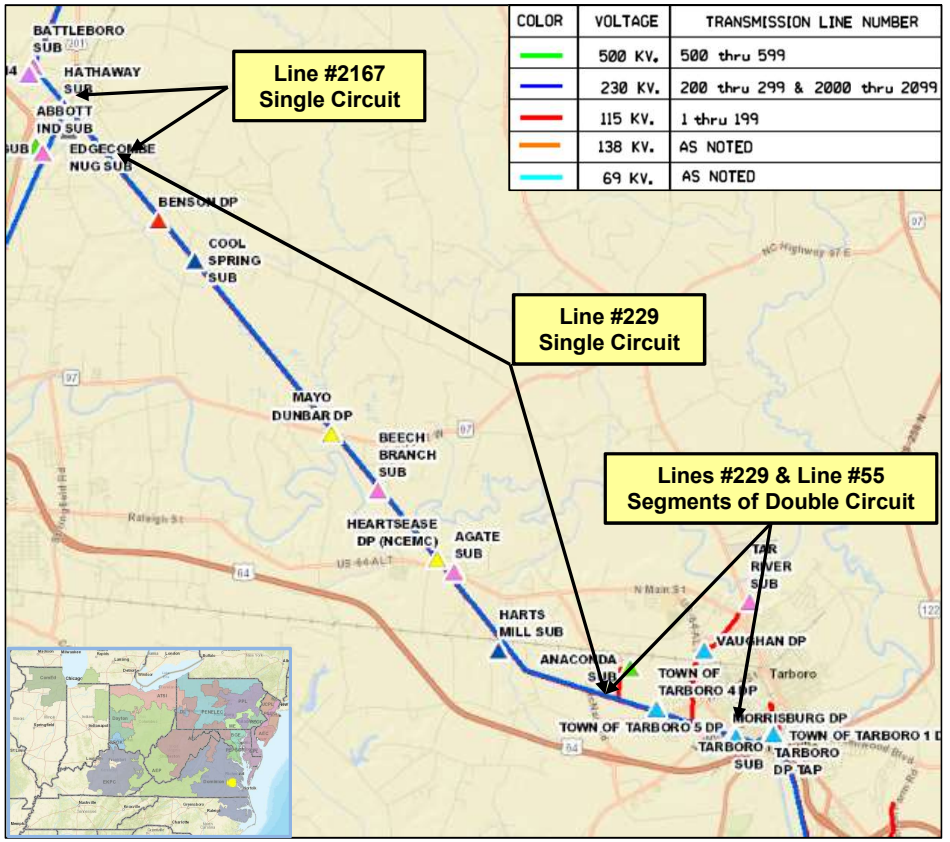
Specific Assumption References:

See details on Equipment Material Condition, Performance and Risk in Dominion's Planning Assumptions presented in December 2020.

Problem Statement:

Dominion Energy has identified a need to replace approximately 0.73 miles of 230kV Line #2167 (Hathaway to Edgecombe NUG), and 16.9 miles of 230kV Line #229 (Tarboro to Edgecombe NUG) which includes 2.1-mile segments of double circuit with Line #55 (Tarboro to Anaconda) and 0.95 miles single circuit segments of Line #55 based on the Company's End of Life criteria.

- Double-circuit is on steel towers and single-circuit is on 2-pole wood H-frame structures all dating back to 1967. Conductor is ACSR.
- A field-condition assessment indicated woodpecker damage and broken insulators.
- Industry guidelines indicate equipment life for steel structures is 40-60 years, wood structures 35-55 years, conductor and connectors are 40-60 years, and porcelain insulators are 50 years.



Dominion Transmission Zone: Supplemental Line #229 and Line #55 Partial Rebuild

Need Number: DOM-2021-0047

Process Stage: Solutions Meeting 08/08/2023 - update

Proposed Solution:

Rebuild ~~entire~~ Line #2167 Edgecombe NUG Tap – Hathaway (approximately ~~0.73~~ 0.4 miles) to current 230kV standards with appropriate structures. The minimum normal summer conductor rating of this line will be 1573 MVA.

Rebuild ~~entire~~ Line #229 Edgecombe NUG Tap – Tarboro (approximately ~~16.9~~ 16.6 miles) to current 230kV standards with appropriate structures. The minimum normal summer conductor rating of the line will be 1573 MVA.

Line #2167 rebuilt section will be connected to Line #229 at the Edgecombe NUG Tap and will be renumbered to Line #229. Line #229 becomes Tarboro to Hathaway and the double-circuit line from Edgecombe NUG Tap to Edgecombe NUG will be disconnected and made idle.

Rebuild approximately 3 miles from Tarboro to Str 55/133 of Line #55 Tarboro – Harts Mill to current 115kV standards with appropriate structures. The minimum normal summer conductor rating of the line will be 393 MVA.

Terminal equipment will be upgraded as necessary.

Estimated Project Cost: $ ~~40~~ 43M

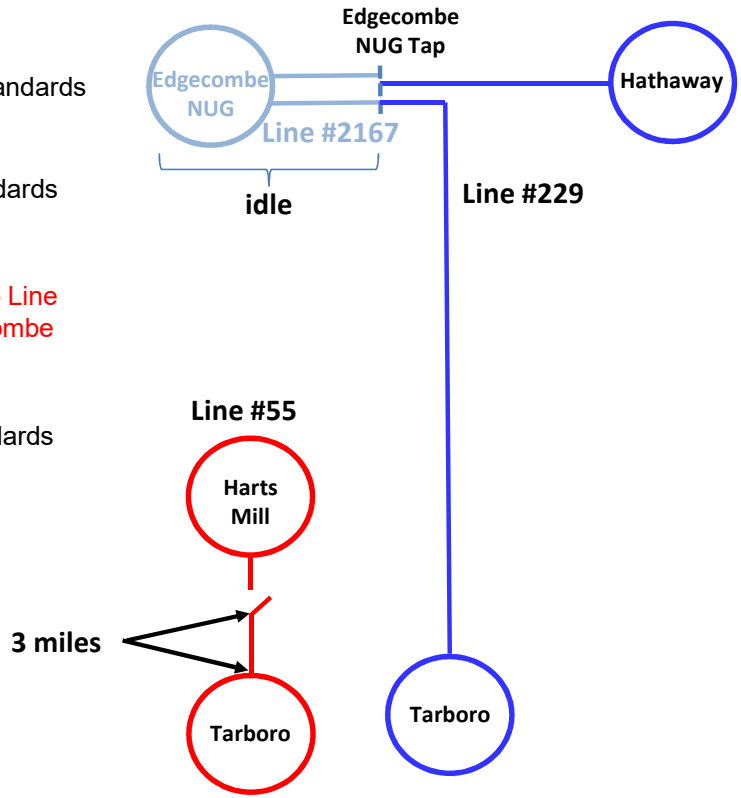
Alternatives Considered:

No feasible alternatives

Project Target In-service Date: 12/31/2023

Project Status: ~~Conceptual~~ Construction

Model: 2025 RTEP



Dominion Transmission Zone: Supplemental Edgecombe NUG Sub – 230kV Delivery- DEV

Need Number: DOM-2022-0049 - cancelled

Process Stage: Cancellation Meeting 08/08/2023

Need Meeting 08/09/2022, Solutions Meeting 09/06/2022

Project Driver: Customer Service

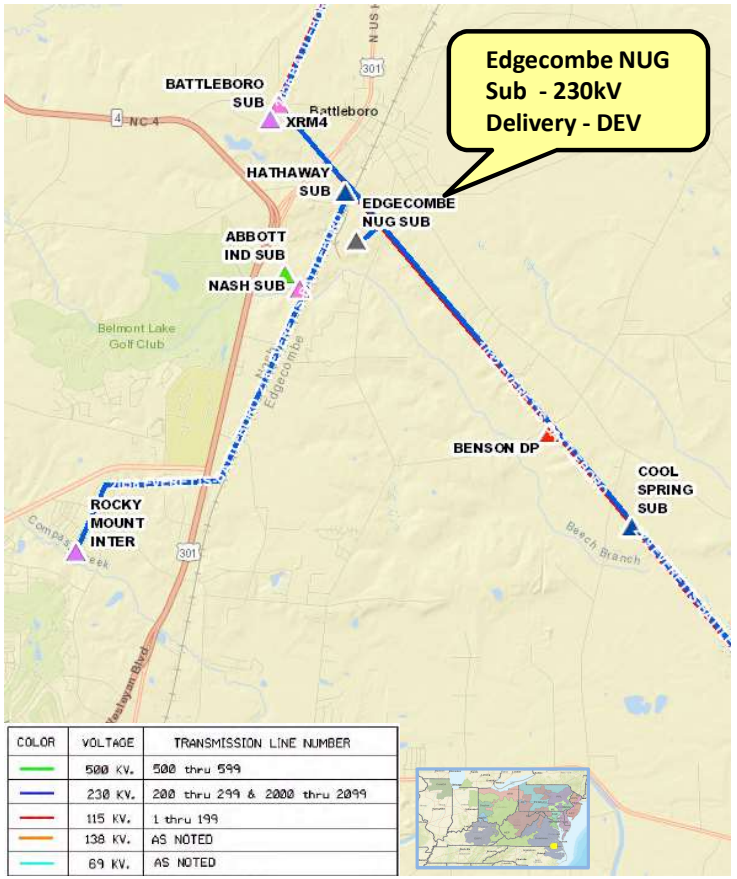
Specific Assumption References:

Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:

DEV Distribution has submitted a delivery point request to serve a crypto mining customer in Battleboro, NC. The total load is less than 100 MW. The customer requests service by December 30, 2022.

Initial In-Service Load	Projected 2027 Load
Winter: 95.0 MW	Summer: 95.0 MW



APS Transmission Zones M-3 Process
Damascus – Mount Airy 230 kV Misoperation Relays

Need Numbers: APS-2023-026

Process State: Solution Meeting 09/05/2023

Previously Presented: Need Meeting 07/11/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

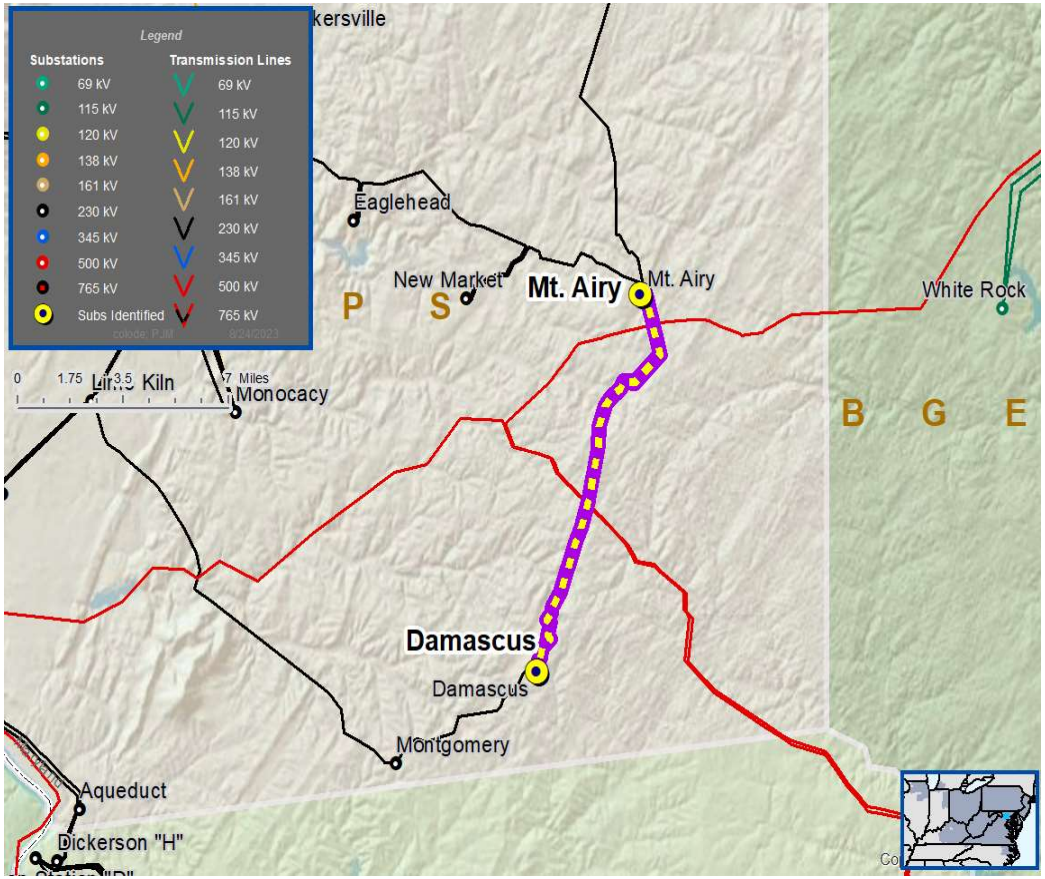
- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.



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APS Transmission Zones M-3 Process
Damascus – Mount Airy 230 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-026	Damascus – Mount Airy 230 kV	478/523	617/754	

APS Transmission Zones M-3 Process
Damascus – Mount Airy 230 kV Misoperation Relays

Need Numbers: APS-2023-026

Process Stage: Solution Meeting 09/05/2023

Proposed Solution:

- Replace circuit switcher and limiting substation conductor at Damascus
- Replace wave trap, disconnect switches, and limiting substation conductor at Mount Airy

Transmission Line Ratings:

- Damascus – Mount Airy 230 kV Line
  - Before Proposed Solution: 478 / 523 MVA (SN / SE)
  - After Proposed Solution: 617 / 754 MVA (SN / SE)

Alternatives Considered:

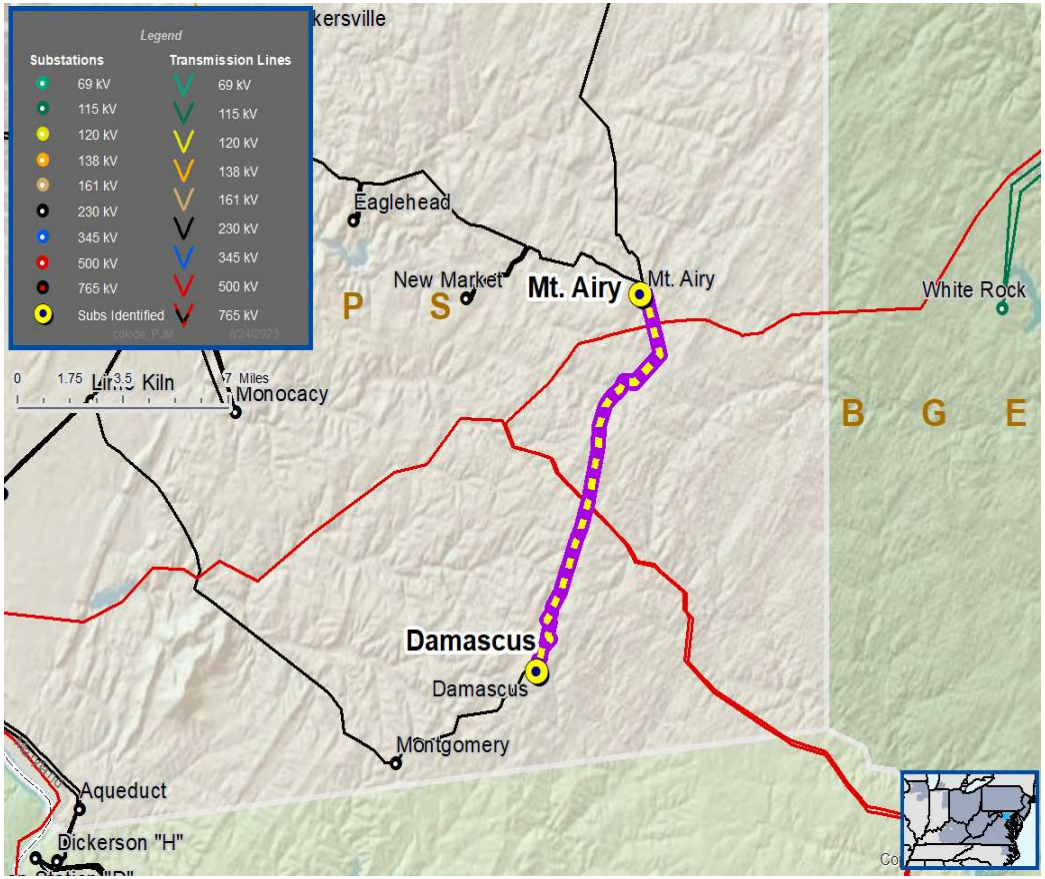
- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: $ 2.2 M

Projected In-Service: 12/22/2023

Project Status: Engineering

Model: 2022 RTEP model for 2027 Summer (50/50)



AEP Transmission Zone: Supplemental
Apple Grove, WV

Need Number: AEP-2022-AP014

Process Stage: Solutions Meeting 10/3/2023

Previously Presented: Needs Meeting 2/18/2022

Supplemental Project Driver: Customer Service

Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

A new industrial customer has requested service near Apple Grove, WV by the end of ~~2024~~ 2025.

Projected load: 450 MW

AEP Transmission Zone: Supplemental
Apple Grove, WV

Need Number: AEP-2022-AP014

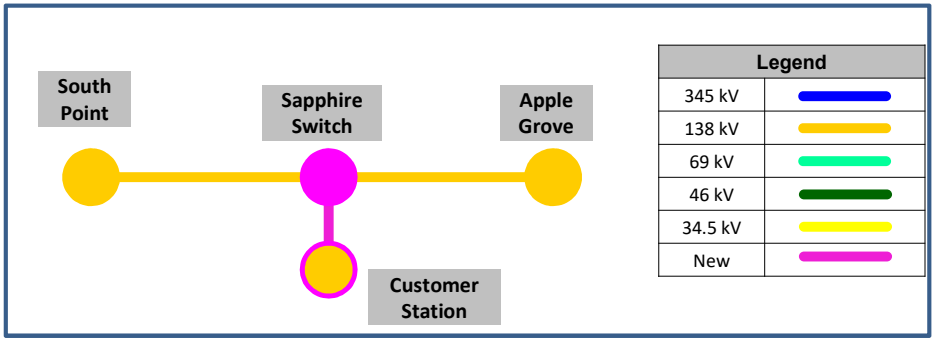
Process Stage: Solutions Meeting 10/3/2023

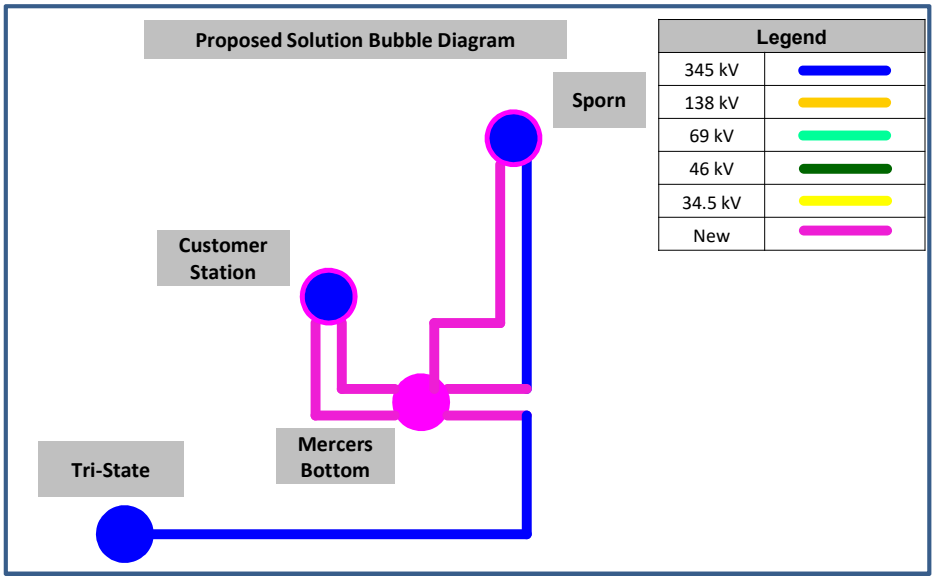
Proposed Solution

Phase 1:

- Cut in/out of the existing Sporn – Tri-State 345 kV line and construct two single circuit 345 kV line extensions to a new 345 kV Station (Mercers Bottom) **Estimated Trans. Cost: $19.7M**
- Construct a new 345 kV Station (Mercers Bottom) with 8 - 5000 A, 63 kA circuit breakers **Estimated Trans. Cost: $30.8M**
- Remote end station work required at Sporn 345 kV **Estimated Trans. Cost: $0.8M**
- Construct two single circuit 345 kV feeds, approximately 0.75 miles each from Mercers Bottom 345 kV Station to the customer's 345 kV Station. **Estimated Trans. Cost: $12.4M**
- Cut into the existing Apple Grove – South Point 138 kV line and install a new 3-way Phase over Phase switch. Install a single circuit 0.1 mi 138 kV extension to the customer station. Install 138 kV metering at the new switch. **Estimated Trans. Cost: $7.1M**

Phase 1 Estimated Transmission Cost: $70.8M





AEP Transmission Zone: Supplemental
Apple Grove, WV

Need Number: AEP-2022-AP014

Process Stage: Solutions Meeting 10/3/2023

Proposed Solution

Phase 2:

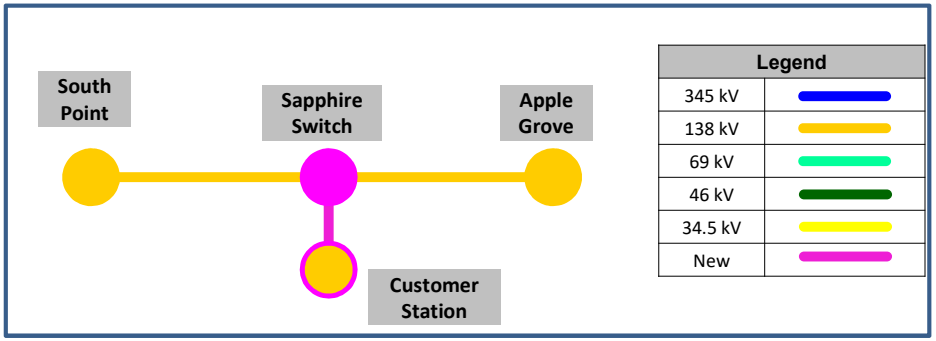
- In order to meet the required short circuit strength needs of the customer under N-1 scenarios, construct a new 345 kV line from Sporn 345 kV Station to Mercers Bottom 345 kV Station, approximately 26 miles. **Estimated Trans. Cost: $143.0M**
- Install a new 345 kV circuit breaker at Sporn to accommodate the new 345 kV line. **Estimated Trans. Cost: $2.0M**

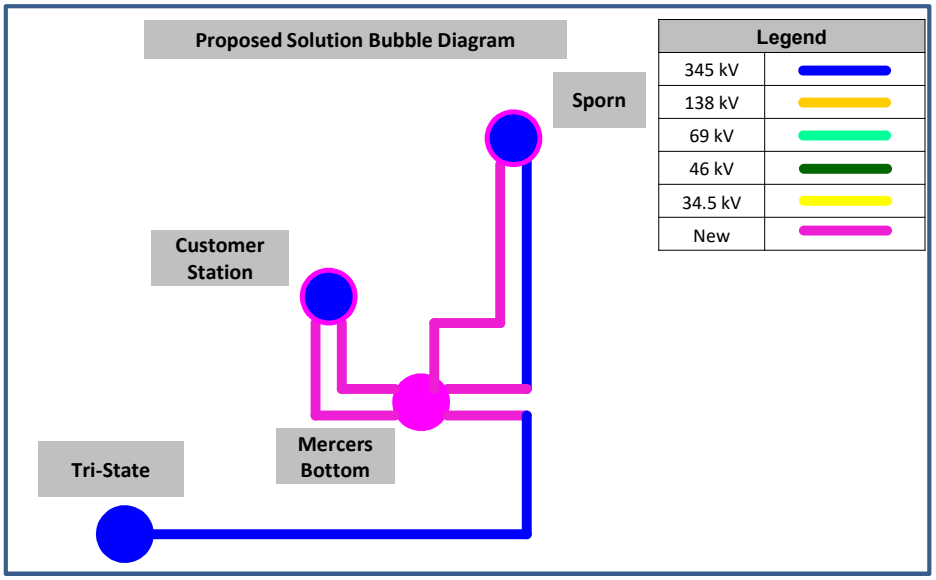
Phase 2 Estimated Cost: $145M

Total Estimated Transmission Cost: $215.8M

Projected In-Service: Phase 1 – 12/15/2025, Phase 2 – 12/15/2029

Project Status: Scoping

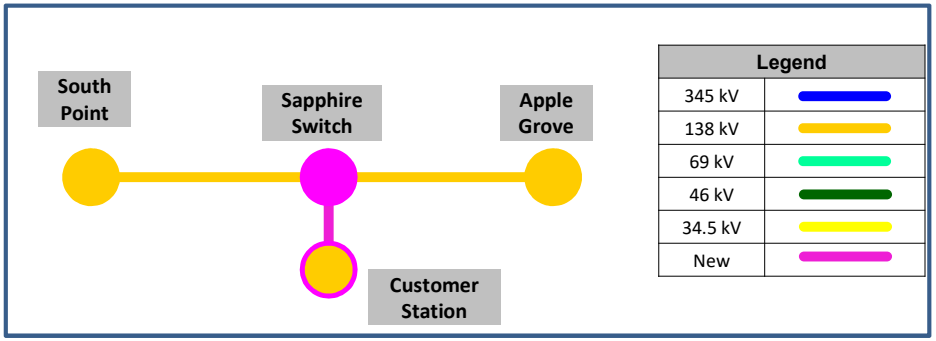


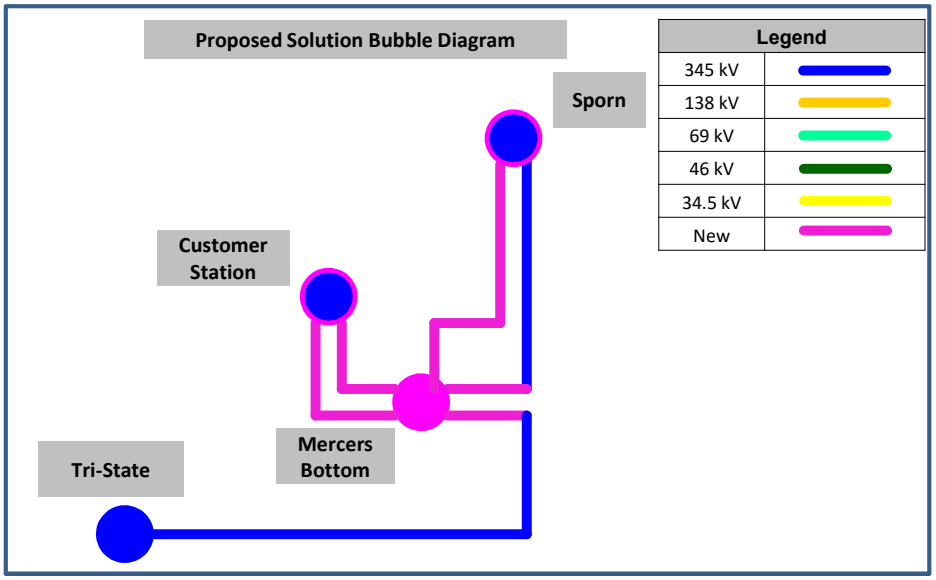


AEP Transmission Zone: Supplemental
Apple Grove, WV

Alternate:

- Phase 1 work would remain the same **Estimated Trans. Cost: $70.8M**
- Phase 2 Alternate:
  - Cut in/out of the existing Culloden – Gavin 765 kV line and construct two single circuit 765 kV lines approximately 2 miles into a new 765/345 kV station at North Buffalo Site. **Estimated Cost: $37.0M**
  - Construct a new 345 kV line approximately 12 mi from North Buffalo to Mercers Bottom. **Estimated Cost: $67.0M**
  - Construct a new 765/345 kV station **Estimated Cost: $121.3M**
    - Install three 765 kV breakers in a double bus/double breaker configuration.
    - Install one 765/345 kV 1500 MVA transformer (3 – 500 MVA phases and switchable spare).
    - Install one 345 kV circuit breaker, layout the 345 kV station for future expansion.
    - Install one 3-100 MVAR 765 kV shunt reactors on the Gavin line coming into North Buffalo Station
- **Total Estimated Alternate Cost: $283.7M**





APS Transmission Zones M-3 Process
Meadow Brook Substation

Need Numbers: APS-2023-037

Previously Presented: Need Meeting 09/05/2023

Process Stage: Solution Meeting 10/03/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

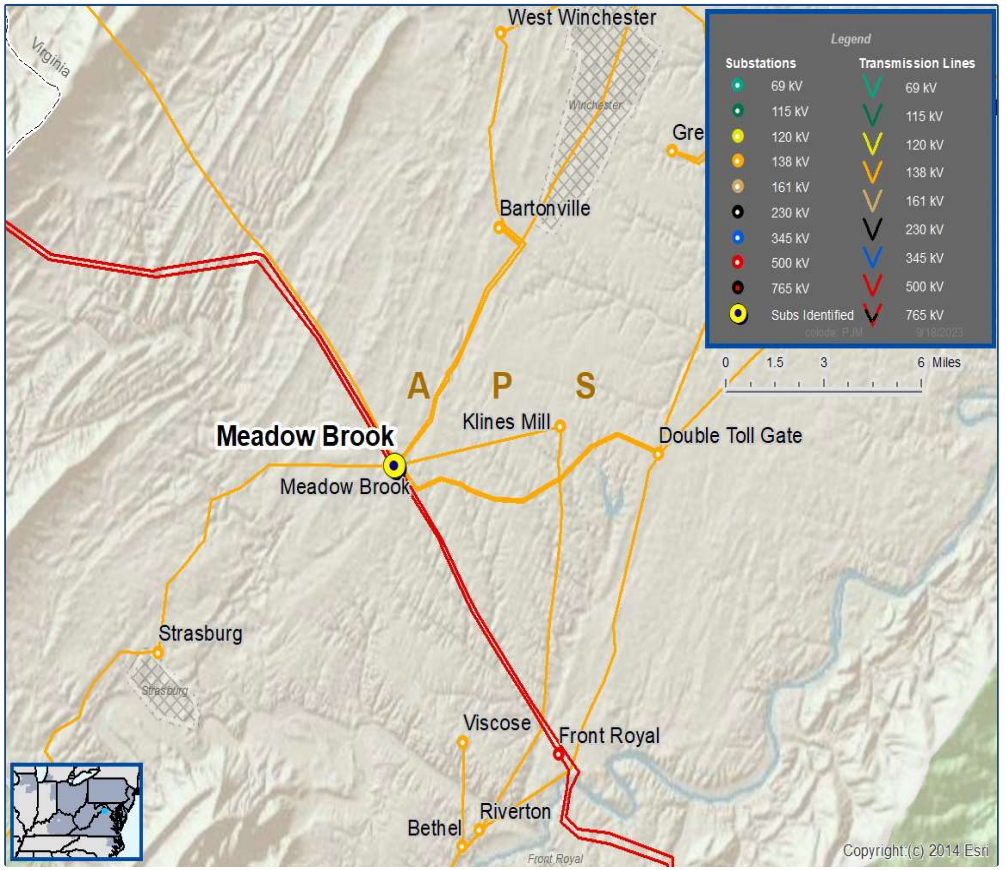
Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits
- Upgrade Relay Schemes

Problem Statement:

- The protective equipment on the Meadow Brook No. 1 500/138 kV and Meadow Brook No. 4 500/138 kV transformers are electro-mechanical and vintage.
  - The protective equipment cannot be easily repaired due to a lack of replacement parts and available expertise in the outdated technology.
- FirstEnergy has identified operational constraints when a single breaker is out of service for maintenance.
- The Meadow Brook No. 1 500/138 kV transformer is limited by terminal equipment:
  - Normal Ratings: 470/567/579/612 MVA (SN/SSTE/WN/WSTE)
  - Single Breaker Outage: 306/306/306/306 MVA (SN/SSTE/WN/WSTE)
- The Meadow Brook No. 4 500/138 kV transformer is limited by terminal equipment:
  - Normal Ratings: 461/567/539/611 MVA (SN/SSTE/WN/WSTE)
  - Single Breaker Outage: 306/306/306/306 MVA (SN/SSTE/WN/WSTE)



APS Transmission Zones M-3 Process
Meadow Brook Substation

Need Number: APS-2023-037

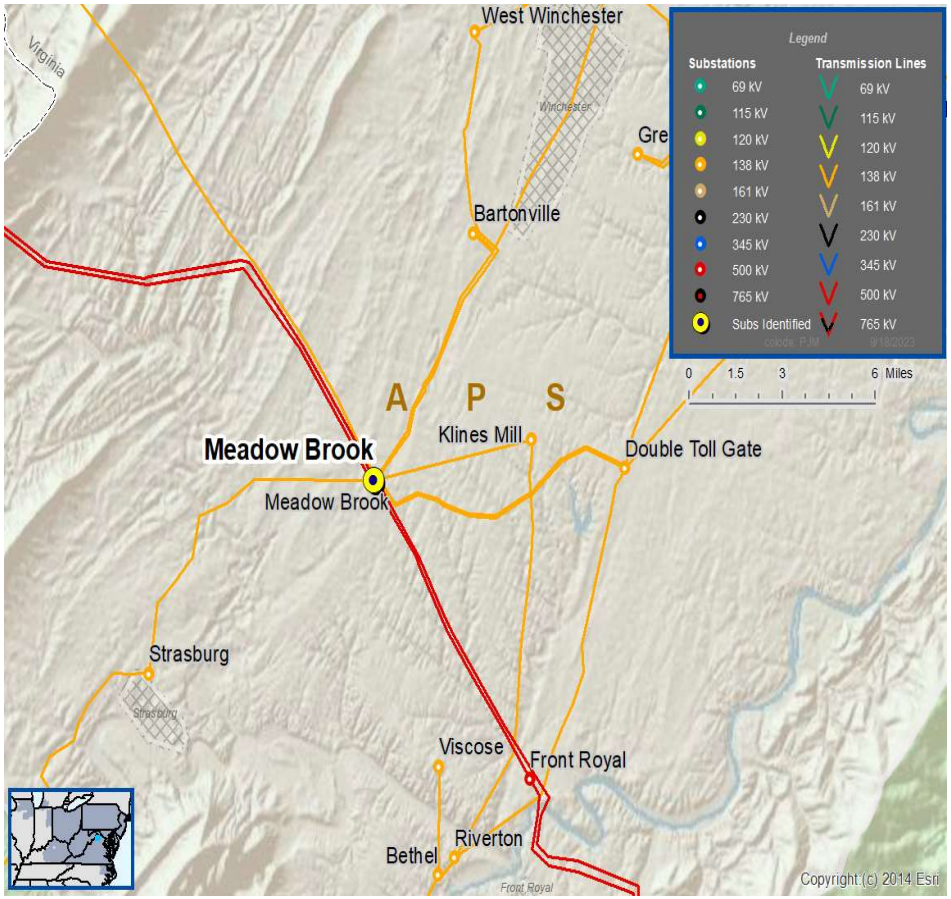
Process Stage: Solution Meeting 10/03/2023

Proposed Solution:

- At Meadow Brook Substation:
  - On the No. 1 500/138 kV Transformer Circuit, replace:
    - Circuit Breakers
    - Relaying
    - Limiting substation conductor
  - On the No. 4 500/138 kV Transformer Circuit, replace:
    - Relaying
    - Limiting substation conductor

Transformer Ratings:

- No. 1 500/138 kV Transformer
  - Before Proposed Solution:
    - Normal Ratings: 470/567/579/612 MVA (SN/SSTE/WN/WSTE)
    - Single Breaker Outage: 306/306/306/306 MVA (SN/SSTE/WN/WSTE)
  - After Proposed Solution:
    - Normal Ratings: 519/592/621/702 MVA (SN/SSTE/WN/WSTE)
    - Single Breaker Outage: 519/592/621/702 MVA (SN/SSTE/WN/WSTE)
- No. 4 500/138 kV Transformer
  - Before Proposed Solution:
    - Normal Ratings: 461/567/539/611 MVA (SN/SSTE/WN/WSTE)
    - Single Breaker Outage: 306/306/306/306 MVA (SN/SSTE/WN/WSTE)
  - After Proposed Solution:
    - Normal Ratings: 461/571/539/611 MVA (SN/SSTE/WN/WSTE)
    - Single Breaker Outage: 461/571/539/611 MVA (SN/SSTE/WN/WSTE)



APS Transmission Zones M-3 Process
Meadow Brook Substation

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Alternatives Considered:

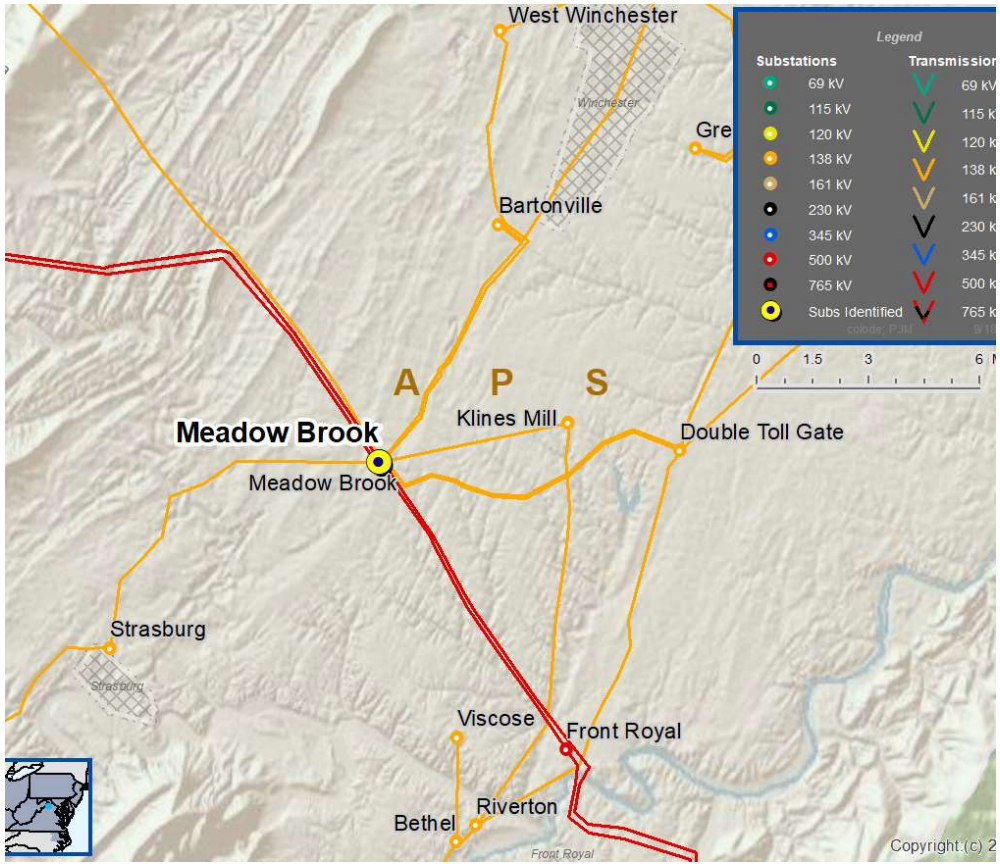
- Maintain equipment in existing condition.

Estimated Project Cost: $ 2.3 M

Projected In-Service: 12/20/2024

Project Status: Engineering

Model: 2022 RTEP model for 2027 Summer (50/50)



ComEd Transmission Zone M-3 Process
345 kV Line 2105

Need Number: ComEd-2023-007

Process Stage: Solutions Meeting 10/3/2023

Previously Presented: Need Meeting 9/5/2023

Project Driver:

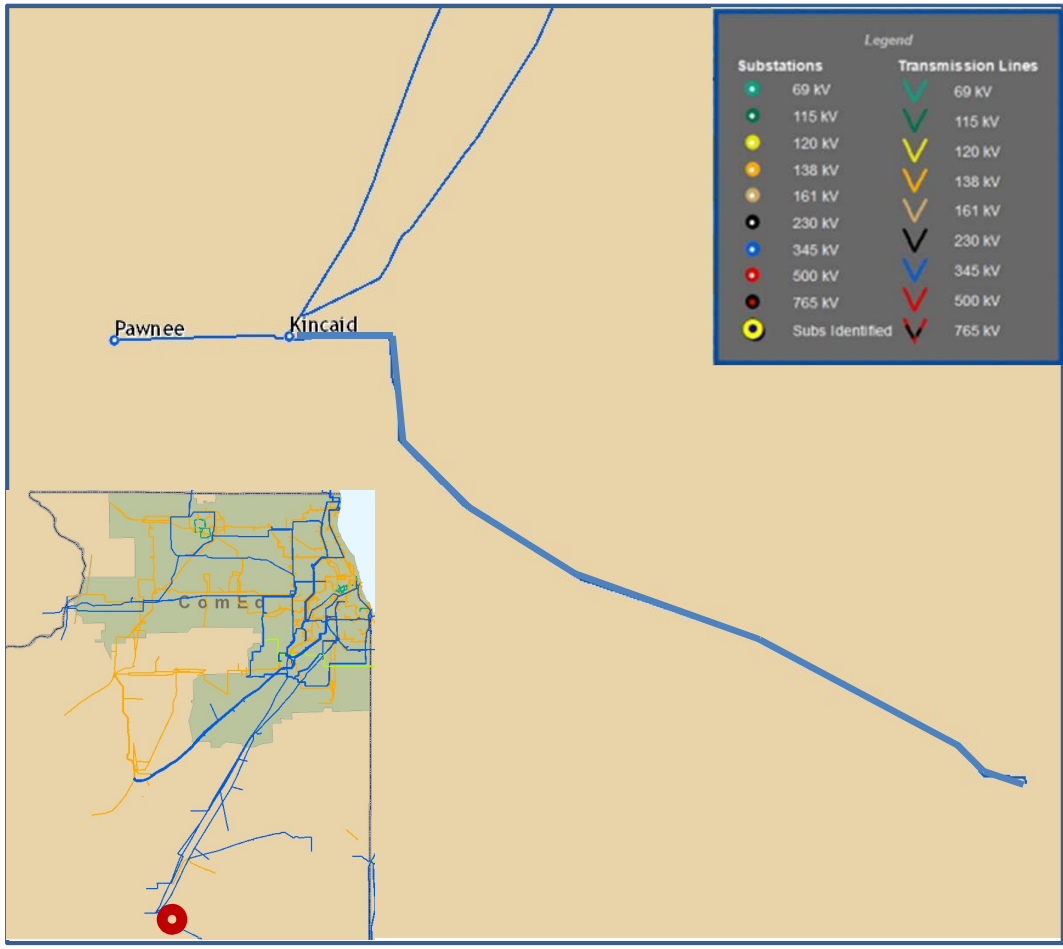
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

- Transmission infrastructure replacements (EOL/condition/obsolescence) that are consistent with efficient asset management decisions

Problem Statement:

- 345 kV line 2105 Kincaid – Pana(Ameren) is a 26.4 mile line with 2338 ACAR and 2156 ACSR conductor on 56-year-old wood H-frame structures.
- The wood components are at end-of-life, with many plank arms deteriorating which lead to dropping conductor. In 2022, there were outages on the line due to broken crossarms on clear weather days.
- Several of the wood poles and components are also suffering from woodpecker damage.
- The line has significant stretches of tangent structures without modern anti-cascade provisions.
- Inspections identified multiple locations of corona damaged 9-inch insulators on this line.
- L2105 contains small static wire and is a poor performer against lightning which has caused static wire failure in the past.



ComEd Transmission Zone M-3 Process
345 kV Line 2105

Need Number: ComEd-2023-007

Process Stage: Solutions Meeting 10/3/2023

Preferred Solution:

Rebuild approx. 26.4 miles with new structures, OPGW, and 2-1277 ACAR conductor.

	SN/SE (MVA)	WN/WE (MVA)
Old rating	1201/1201	1497/1497
New rating	1679/1793	1793/1793

Estimated transmission cost: $149M

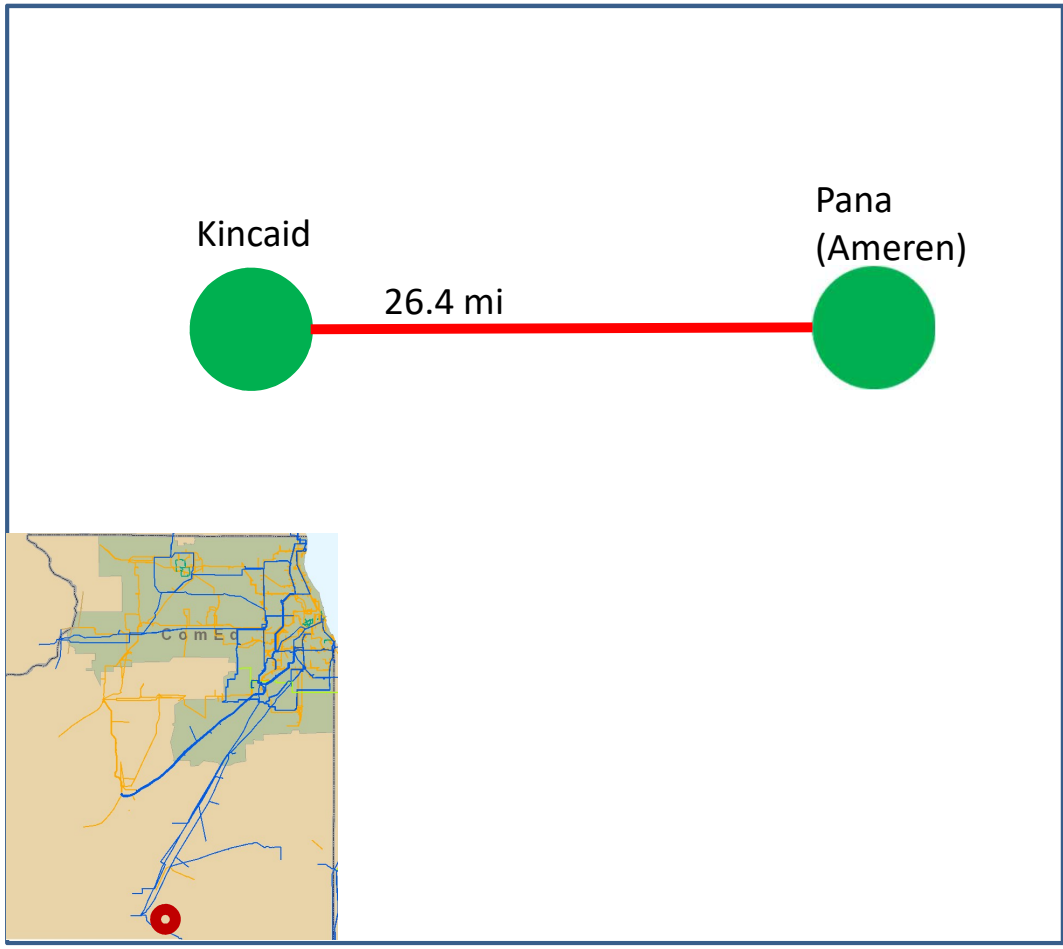
Alternatives Considered:

No feasible alternatives.

Projected In-Service: 12/31/26

Project Status: Conceptual

Model: 2028 RTEP



ComEd Transmission Zone M-3 Process
Goodings Grove 345 kV

Need Number: ComEd-2023-004

Process Stage: Solutions Meeting 10/3/2023

Previously Presented: Need Meeting 7/11/2023

Project Driver:

Operational Flexibility and Efficiency

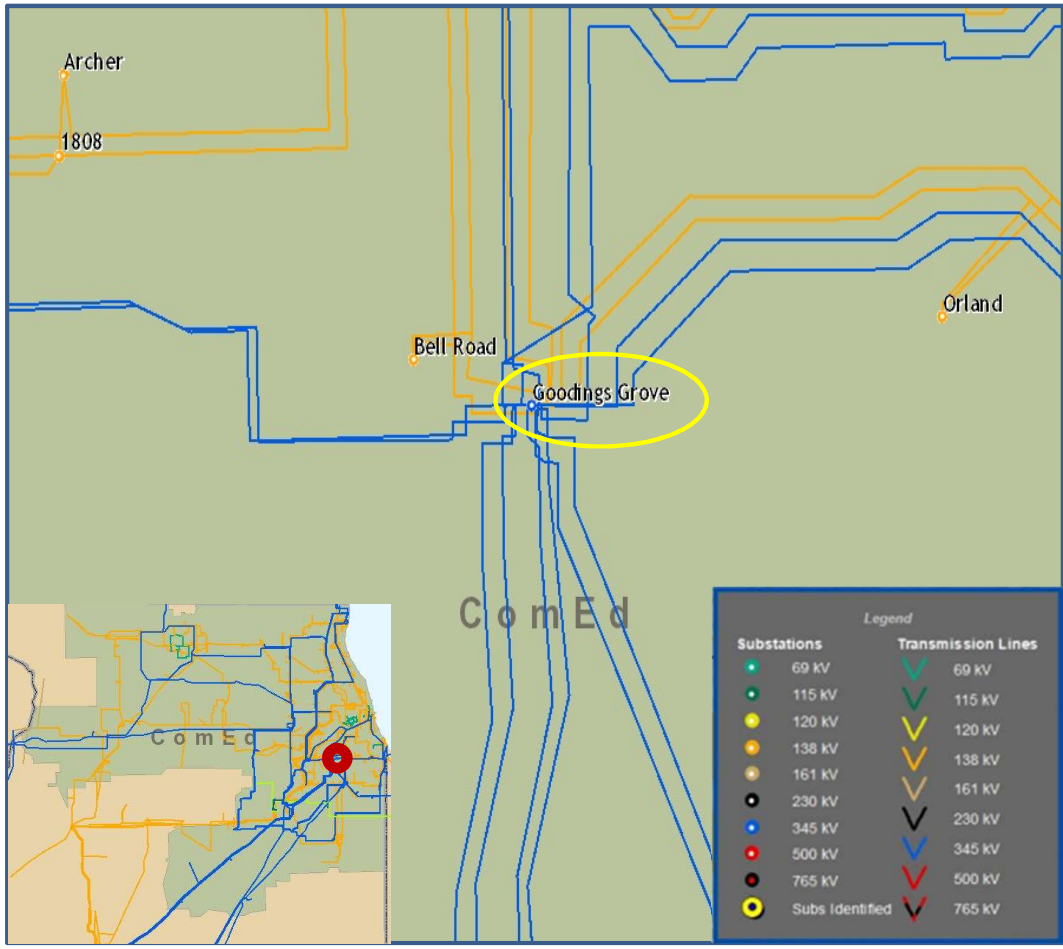
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

- Enhancing system functionality, flexibility, visibility, or operability
- Transmission infrastructure replacements (EOL/condition/obsolescence) that are consistent with efficient asset management decisions

Problem Statement:

- The 345 kV layout at Goodings Grove consists of a straight bus configuration with three 345 kV bus-ties, four autotransformers, and fourteen 345 kV lines. A single breaker failure can take out seven 345 kV lines and two autotransformers.
- Fourteen of the nineteen breakers are oil circuit breakers ranging in age from 44 to 57 years old and are in deteriorating condition.
- Two of the four autotransformers do not have high-side circuit breakers
- A portion of the 345 kV bus is strain bus
- A fault on Tr. 81 or Tr.83 will temporarily interrupt 3 lines.
- The existing fault current at Goodings Grove is nearing 60kA.



ComEd Transmission Zone M-3 Process
Goodings Grove 345 kV

Need Number: ComEd-2023-004

Process Stage: Solutions Meeting 10/3/2023

Preferred Solution:

Replace 345 kV open air straight bus with GIS in a breaker and half configuration (34 Circuit Breakers) at Goodings Grove with 80kA capability.

Estimated transmission cost: $264M

Alternatives Considered:

Replace existing 345 kV open air straight bus with 345 kV open air bus in a breaker and a half configuration (34 Circuit Breakers).

- This alternative was not pursued due to real estate constraints.

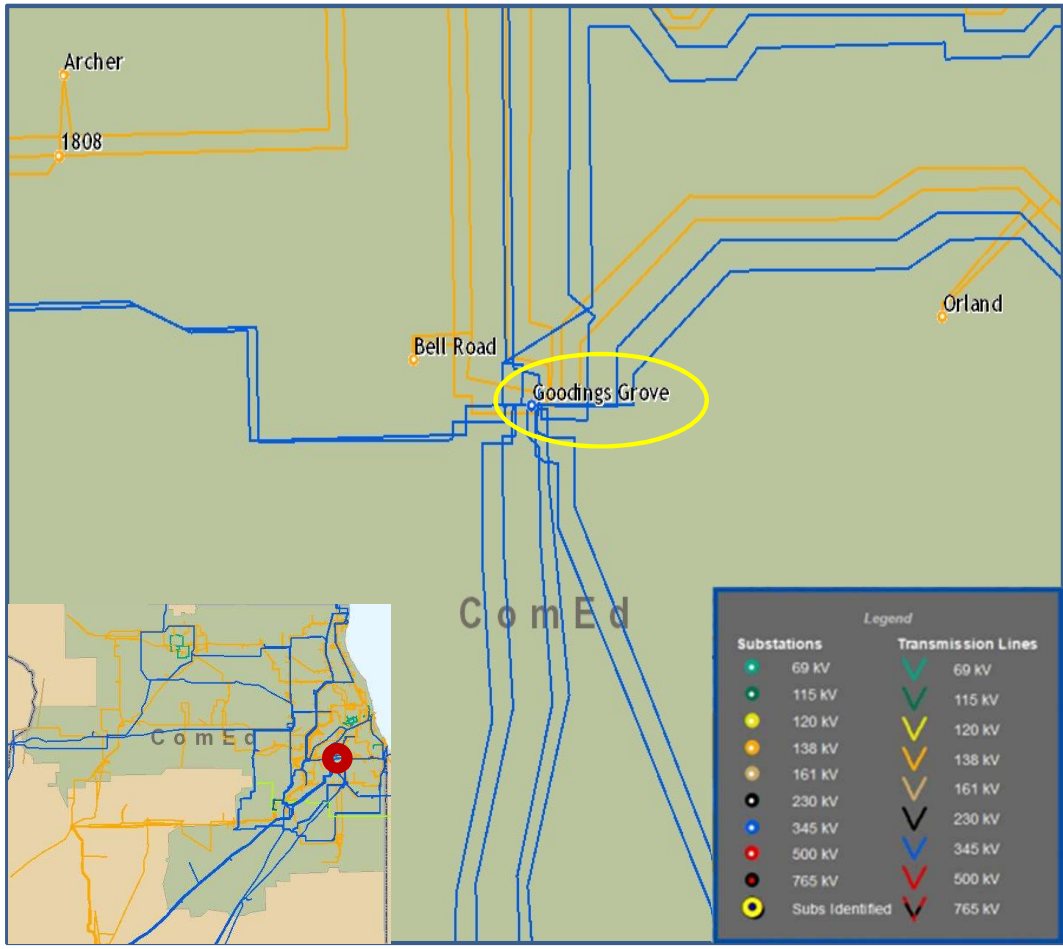
Replace existing 345 kV breakers with 80kA SF6 breakers.

- This alternative was not pursued since it does not address the straight bus configuration at Goodings Grove.

Projected In-Service: 12/31/28

Project Status: Conceptual

Model: 2028 RTEP



APS Transmission Zone M-3 Process
Doubs Substation

Need Number: APS-2023-016
Process Stage: Solution Meeting 10/31/2023
Previously Presented: Need Meeting 6/6/2023

Project Driver(s):

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference(s):

System Performance Projects Global Factors

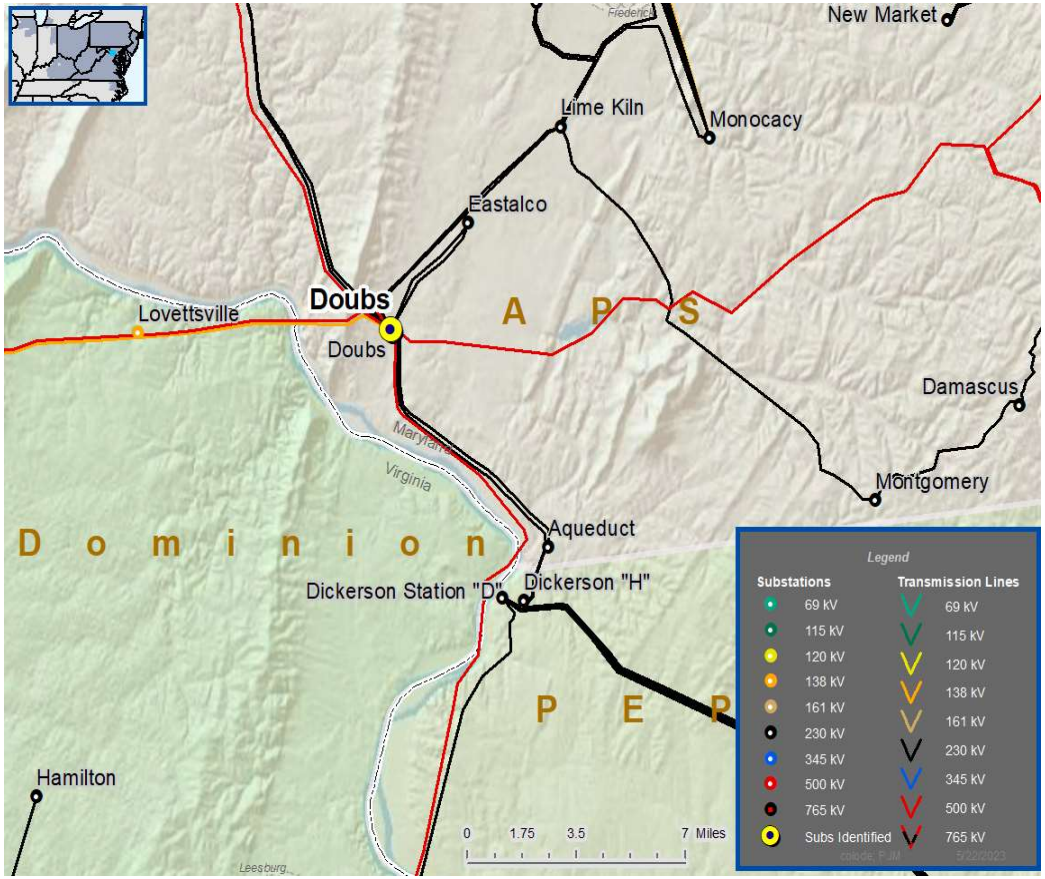
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The 230/138 kV No. 5 Transformer at Doubs was installed 60 years ago and is approaching end of life.
- The transformer exhibits multiple maintenance issues including:
  - Elevated levels of methane and ethane gases
  - Wet oil
  - Low dielectric
- Existing TR Ratings:
  - 257 / 338 MVA (SN / SSTE)



APS Transmission Zone M-3 Process
Doubs Substation

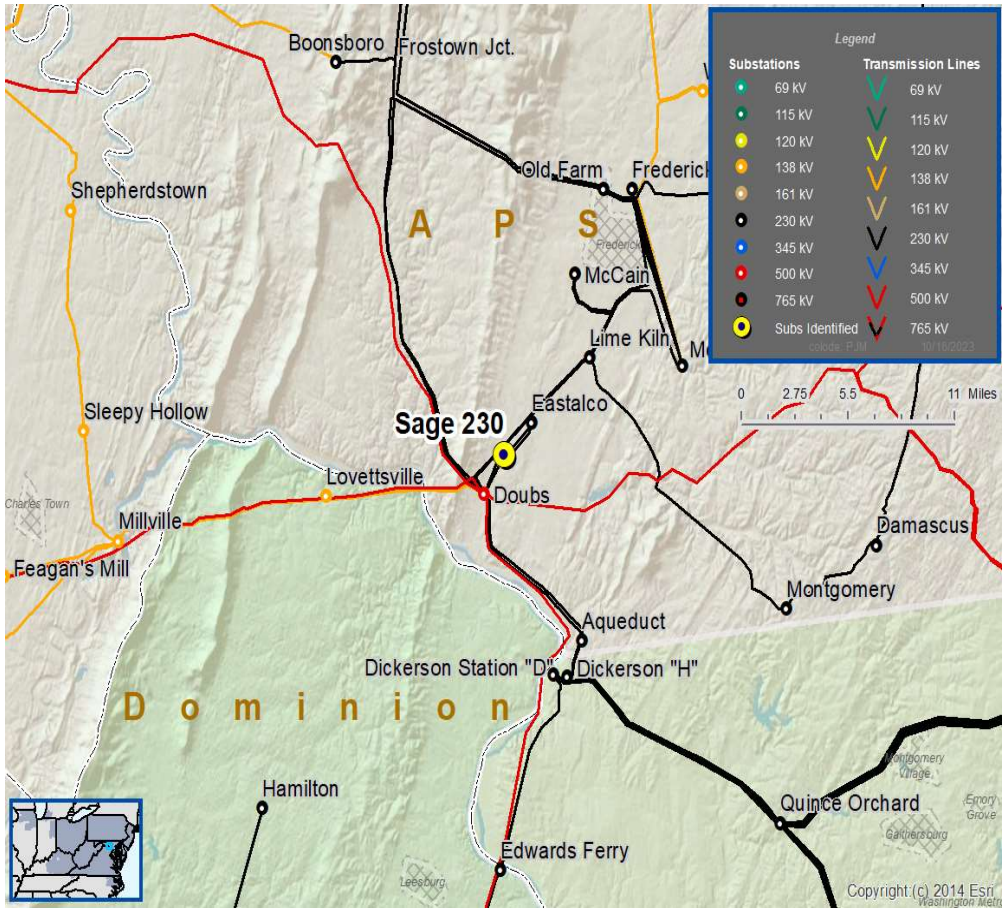
Need Number: APS-2023-016
Process Stage: Solution Meeting – 10/31/2023

Proposed Solutions:
- Replace 230/138 kV No. 5 transformer at Doubs with a 225 MVA unit
- Upgrade transformer relaying

Need #	Substation	Existing XFMR Rating (SN / SE)	Post Project XFMR Rating (SN / SE)
APS-2023-016	Doubs	257 /338	303 /384

Alternatives Considered:
- Maintain existing condition and increasing risk of failure

Estimated Project Cost: $5.43M
Projected In-Service: 06/07/2024
Status: Engineering
Model: 2023 RTEP model for 2028 Summer (50/50)



APS Transmission Zone M-3 Process
Doubs-Sage #206 230 kV New Customer

Need Number: APS-2023-029

Process Stage: Solution Meeting – 10/31/2023

Previously Presented: Need Meeting – 7/11/2023

Project Driver(s):

Customer Service

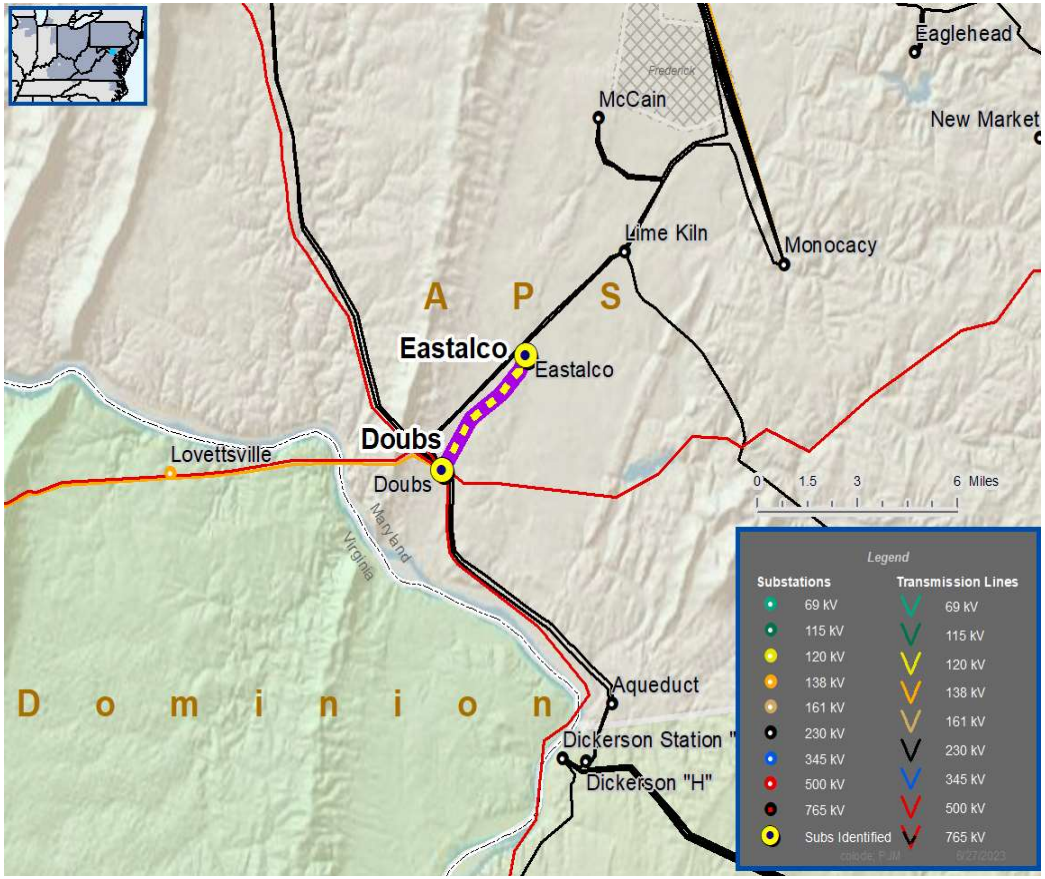
Specific Assumption Reference(s)

New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement

New Customer Connection- A customer has requested 230 kV transmission service for approximately 300 MW of load near the Doubs-Sage #206 230 kV line.

Requested In-Service Date: May 15, 2025



APS Transmission Zone M-3 Process
Doubs-Sage #206 230 kV New Customer

Need Number: APS-2023-029
Process Stage: Solution Meeting – 10/31/2023
Previously Presented: Need Meeting – 7/11/2023

Proposed Solution:
230 kV Transmission Substation
- Build a six breaker, two bay (expandable to four bays), breaker-and-a-half 230 kV substation
- Loop the Doubs – Sage #206 230 kV Line in and out of the new substation
- Modify line relay settings at Doubs and Sage substations
- Provide two 230 kV feeds to the customer facility

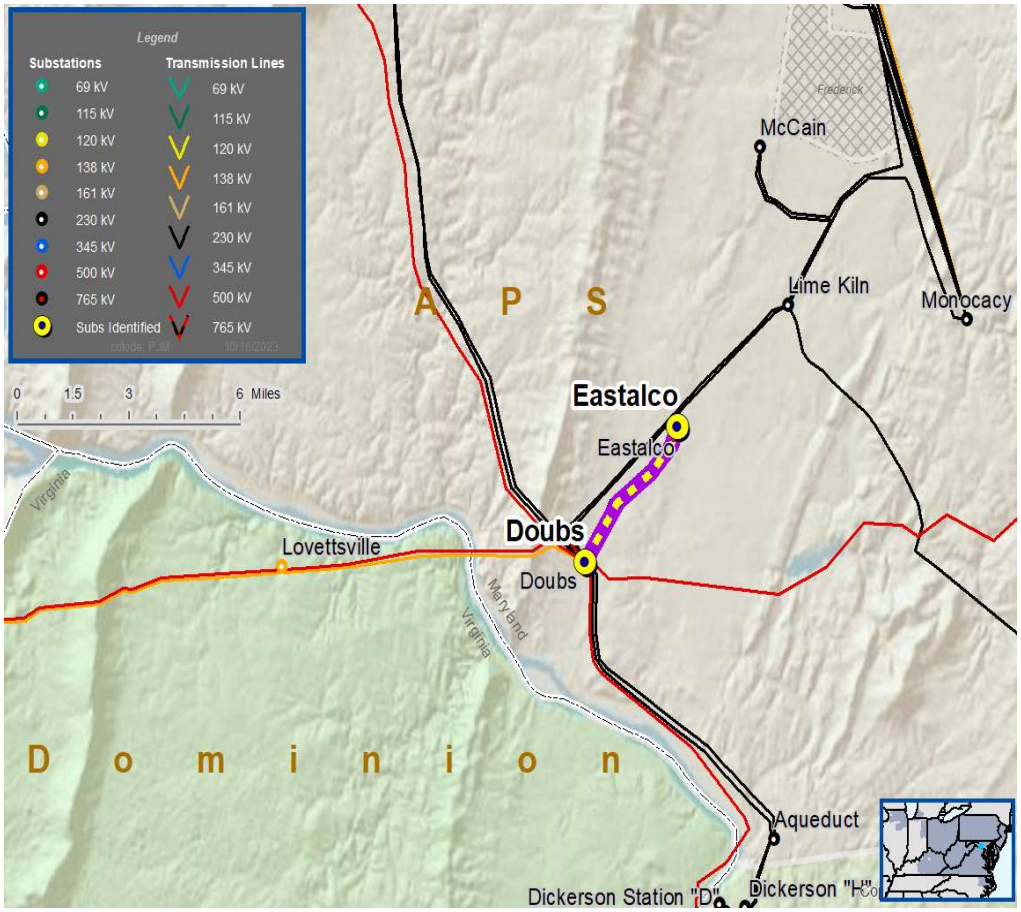
Violations Identified during load study:
- Thermal violation on the Doubs-Sage #206 230 kV Line
- Thermal violation on the #1, #2, and #4 500/230 kV transformers at Doubs Substation
- Thermal violation on the Doubs-Lime Kiln #207 230 kV Line

Alternatives Considered:
- No other feasible alternatives to serve the customer's load

Estimated Project Cost: $20.8M

Projected In-Service: 3/3/2025

Status: Pre-Engineering
Model: 2023 RTEP model for 2028 Summer (50/50)



APS Transmission Zone M-3 Process
Doubs – Lime Kiln 230 kV #231 Line New Customer

Need Number: APS-2023-031

Process Stage: Solution Meeting – 10/31/2023

Previously Presented: Need Meeting – 09/05/2023

Supplemental Project Driver(s):

Customer Service

Specific Assumption Reference(s):

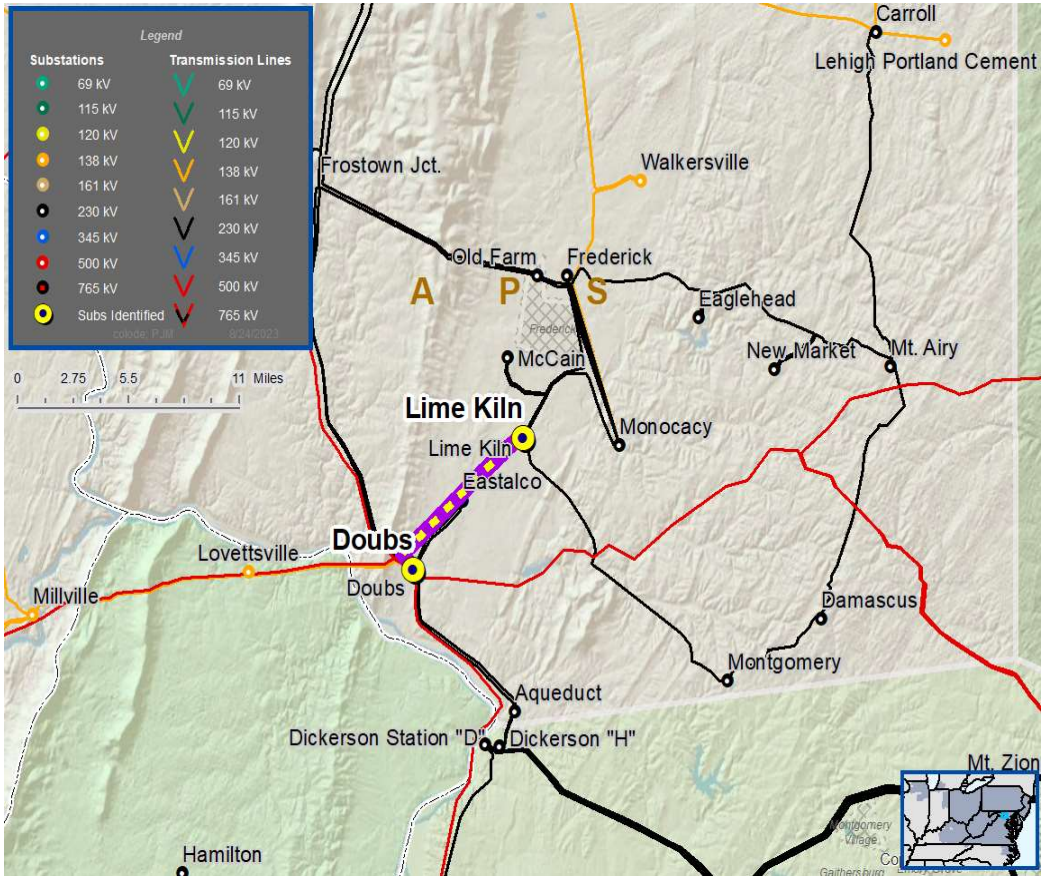
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement

New Customer Connection – Customer requested 230 kV transmission service for approximately 360 MW of total load near the Doubs – Lime Kiln 230 kV 231 Line.

Requested In-Service Date:

December 31, 2025



APS Transmission Zone M-3 Process
Doubs – Lime Kiln 230 kV #231 Line New Customer

Need Number: APS-2023-031
Process Stage: Solution Meeting – 10/31/2023
Previously Presented: Need Meeting – 09/05/2023

Proposed Solutions 1 of 3:

230 kV Transmission Substation

- Build a new eleven (future fifteen) breaker, breaker-and-a-half 230 kV substation
- Cut and loop the Doubs – Lime Kiln 230 kV #231 and #207 230 kV Lines in and out of the new substation
- Modify relay settings in Doubs and Lime Kiln substations
- Provide three 230 kV feeds to customer facility

Violations Identified during load study:

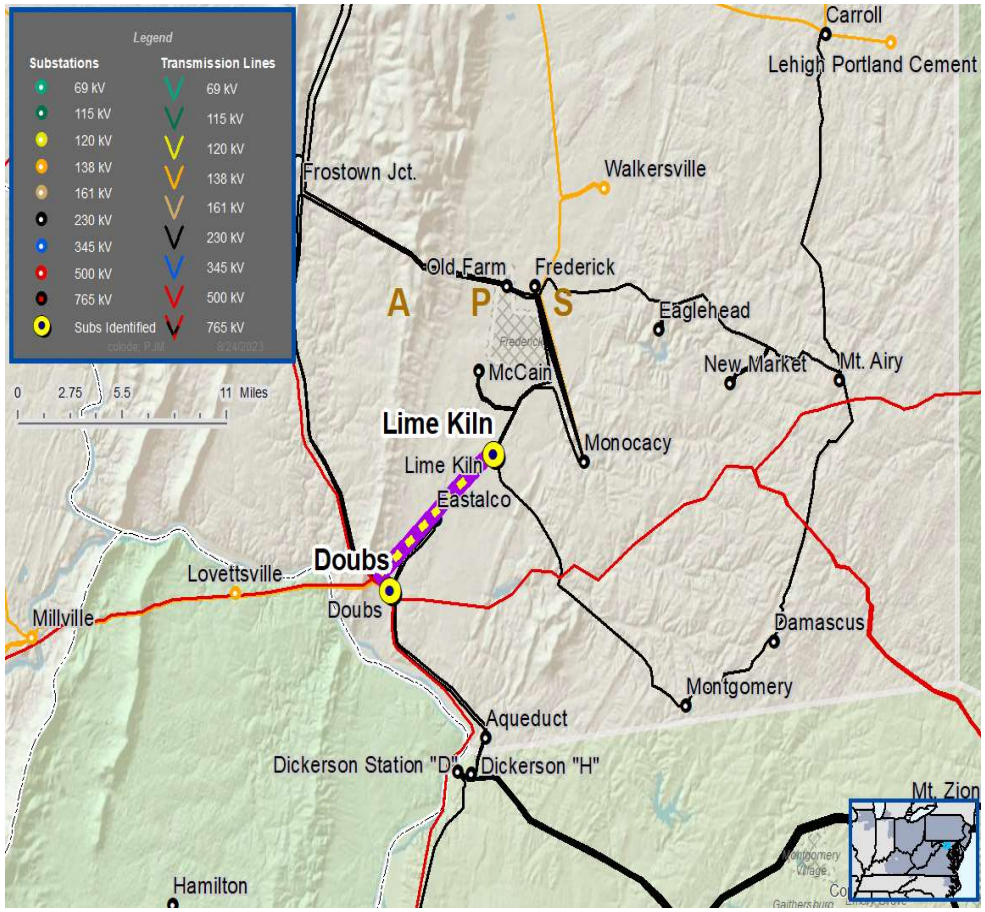
- Thermal violation on the Albright-Cross School AFA 138 kV Line
- Thermal violation on the Doubs-Lime Kiln #231 230 kV Line

Alternatives Considered:

- No other feasible alternatives to serve the customer's load

Estimated Project Cost: $28.7M

Projected In-Service: 12/31/2025
Status: Pre-Engineering
Model: 2023 RTEP model for 2028 Summer (50/50)



APS Transmission Zone M-3 Process
Black Oak - Hatfield 500 kV Misoperation Relays

Need Numbers: APS-2023-038

Process Stage: Solution Meeting 10/31/2023

Previously Presented: Need Meeting 10/03/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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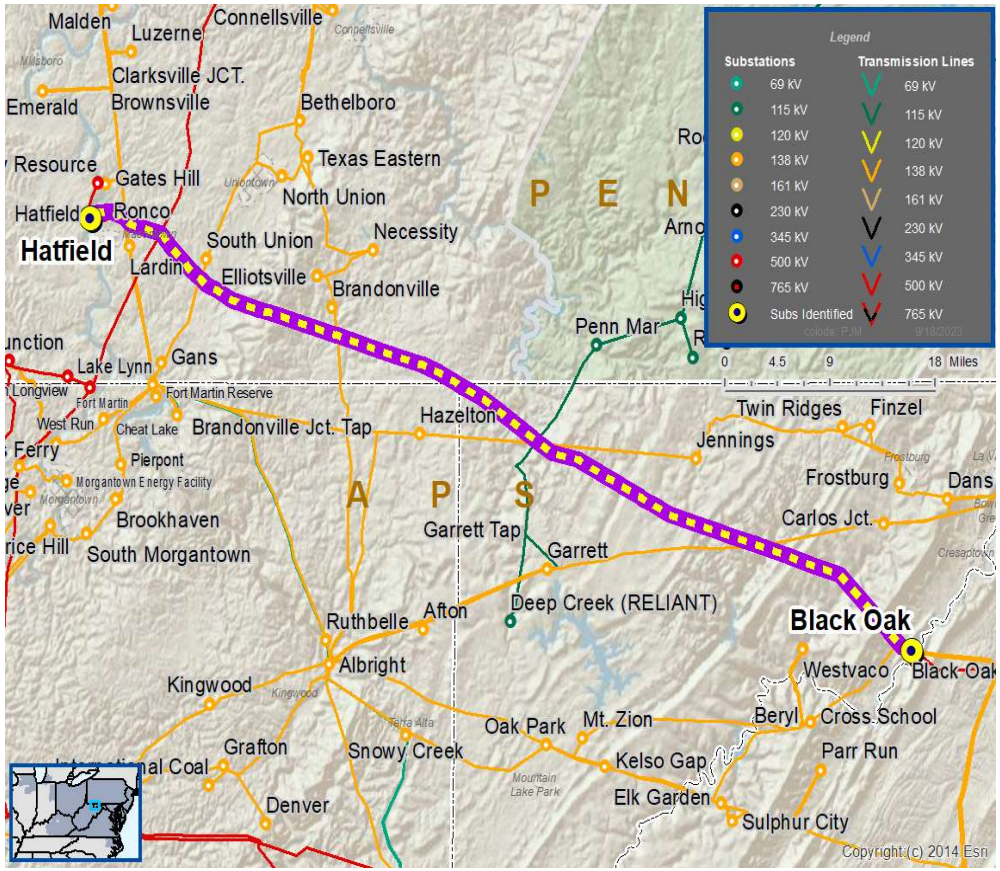


APS Transmission Zone M-3 Process
Black Oak - Hatfield 500 kV Misoperation Relays

Need Number: APS-2023-038

Process Stage: Solution Meeting 10/31/2023

Proposed Solution:

- Replace limiting substation conductor, wave trap, disconnect switch, and relaying at Black Oak 500 kV substation
- Replace limiting substation conductor, wave trap, disconnect switch, circuit breaker, and relaying at Hatfield 500 kV substation

Need #	Transmission Line	Existing Line Rating (SN / SE)	Post Project Line Rating (SN / SE)
APS-2023-038	Black Oak – Hatfield 500 kV	3526 / 3792	3573 / 4379

Alternatives Considered:

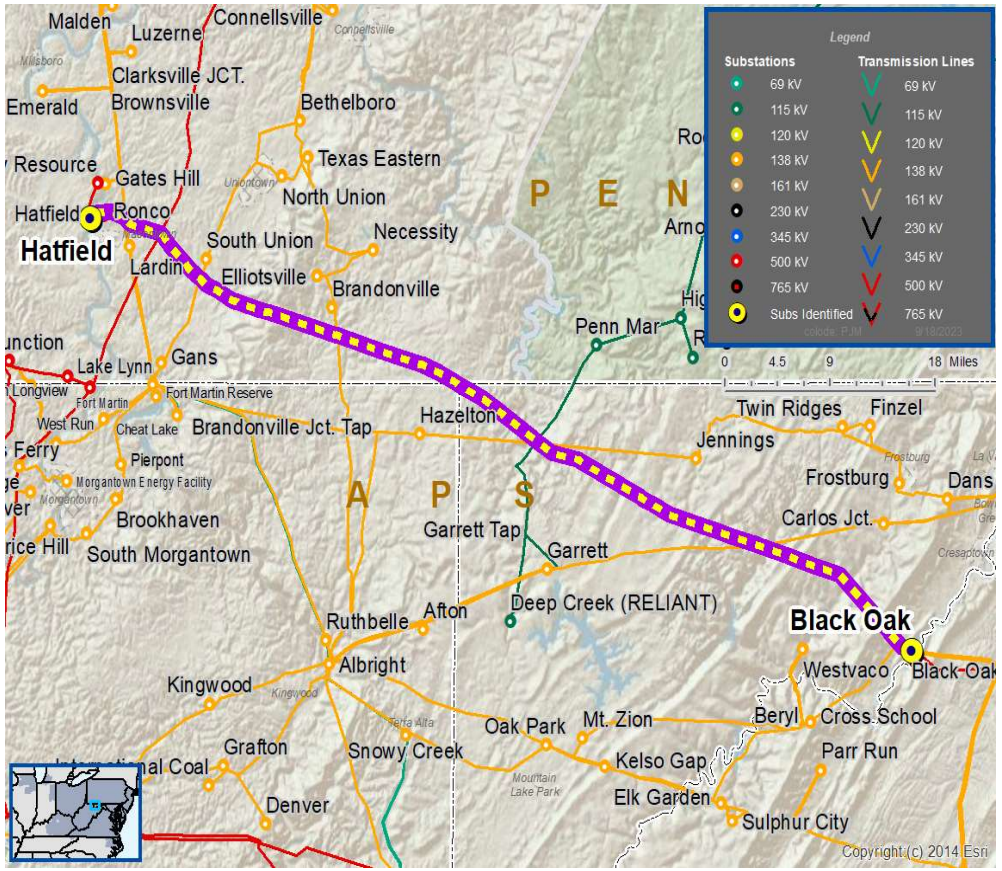
- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: $ 11.8 M

Projected In-Service: 4/27/2026

Project Status: Engineering

Model: 2023 RTEP model for 2028 Summer (50/50)



ComEd Transmission Zone M-3 Process
Wilton Center 345 kV CBs

Need Number: ComEd-2023-010

Process Stage: Solution Meeting 10/31/2023

Previously Presented: Need Meeting 10/3/2023

Project Driver:

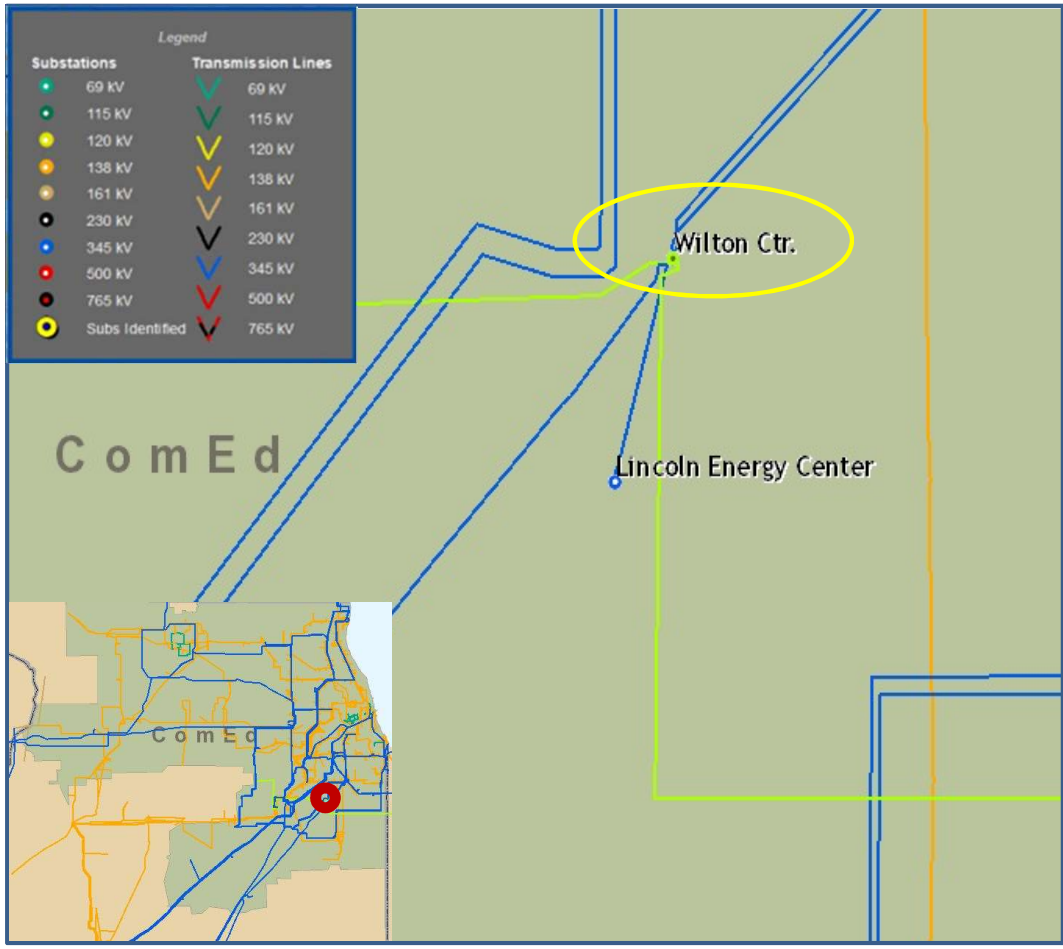
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

- Transmission infrastructure replacements (EOL/condition/obsolescence) that are consistent with efficient asset management decisions

Problem Statement:

- 345 kV oil circuit breakers BT2-3, BT3-4,BT4-5, BT5-6, BT6-7 at Wilton Center substation were installed in 1970. They are in deteriorating condition, lack replacement parts, and have elevated maintenance cost.



ComEd Transmission Zone M-3 Process
Wilton Center 345 kV CBs

Need Number: ComEd-2023-010

Process Stage: Solution Meeting 10/31/2023

Proposed Solution:

Replace existing 345 kV oil BT2-3, BT3-4, BT4-5, BT5-6, BT6-7 CBs with new 345 kV SF6 CBs.

Existing Breaker Ratings: 2000 A, 50 kA

New Breaker Ratings: 3000 A, 63 kA

345 kV Wilton – Loretto Line	SN/SE (MVA)	WN/WE (MVA)
Old Rating	1364/1528	1590/1781
New Rating	1679/2058	2091/2340

Estimated transmission cost: $12.7M

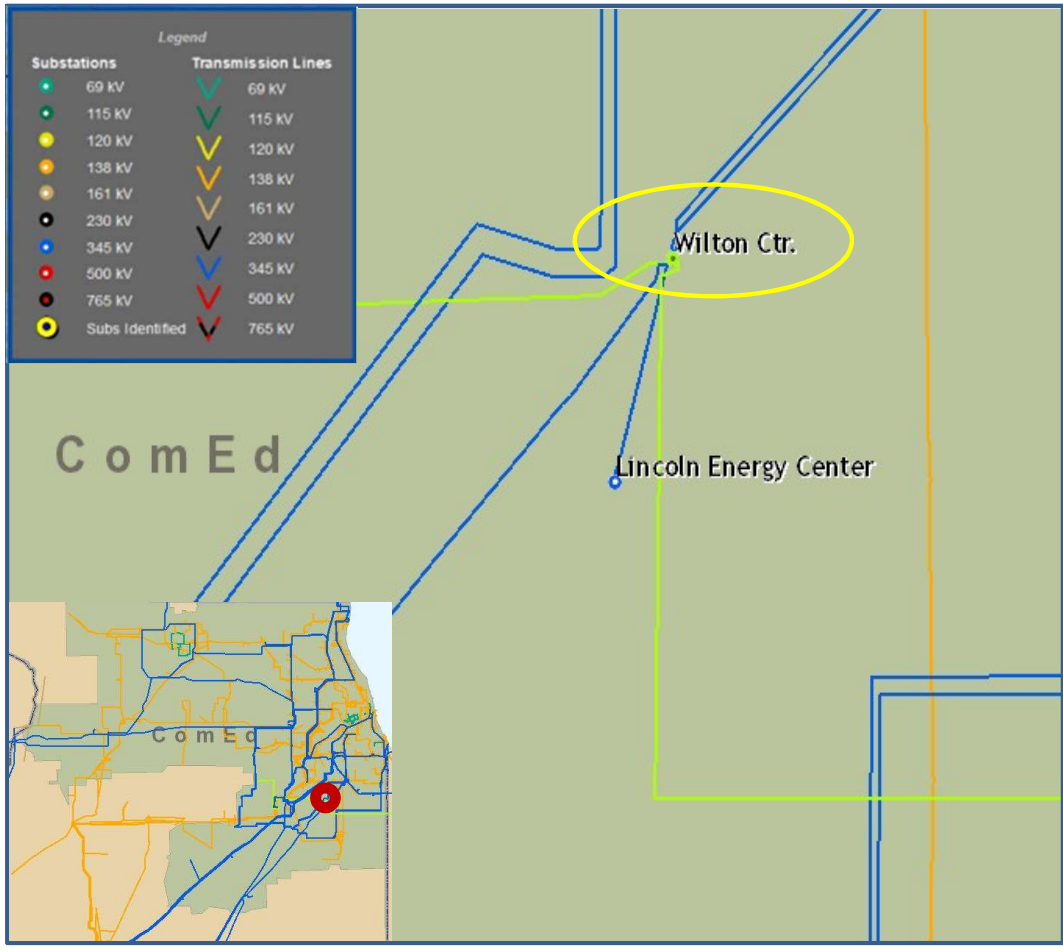
Alternatives Considered:

No feasible alternatives.

Projected In-Service: 12/31/24

Project Status: Engineering

Model: 2028 RTEP



ComEd Transmission Zone M-3 Process
Des Plaines 345/138 kV Transformer 83

Need Number: ComEd-2023-011

Process Stage: Solution Meeting 10/31/2023

Previously Presented: Need Meeting 10/3/2023

Project Driver:

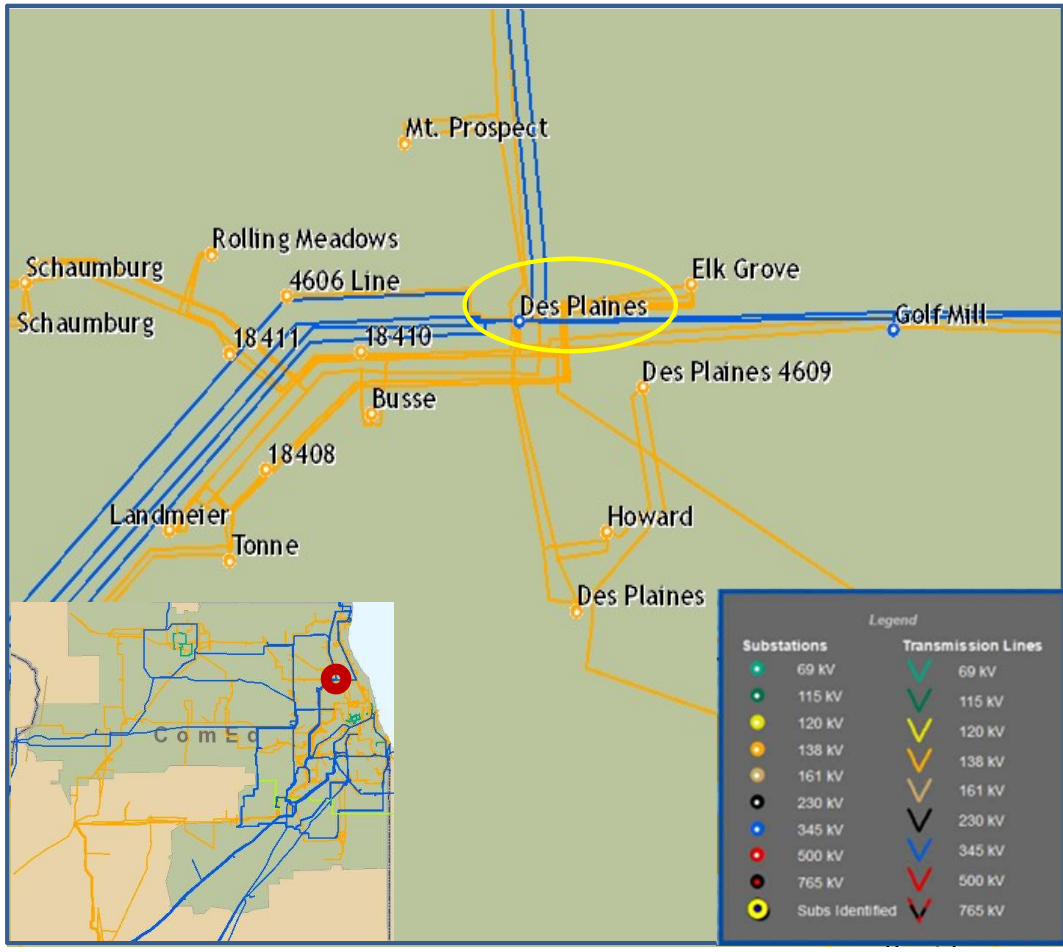
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

- Transmission infrastructure replacements (EOL/condition/obsolescence) that are consistent with efficient asset management decisions

Problem Statement:

- 345 -138 kV autotransformer 83 was installed in 1993. It is one of five similar transformers purchased by ComEd. Two have failed in service and one other is being replaced on supplemental project S2266.
- Undersized core allows for overexcitation during loading causing overheating of metal, partial discharge, and circulating currents.
- Due to the hydrogen levels, the transformer must be taken out of service periodically and degasified.
- 138 kV TR 83 CB was installed in 1974. It is deteriorating condition, has a lack of replacement parts, and has elevated maintenance costs.



ComEd Transmission Zone M-3 Process
Des Plaines 345/138 kV Transformer 83

Need Number: ComEd-2023-011

Process Stage: Solution Meeting 10/31/2023

Proposed Solution:

Replace 345/138 kV autotransformer with a new standard autotransformer. Replace tertiary capacitor bank with a new 138 kV capacitor bank on new 138 kV bus. Replace 138 kV TR 83 oil CB with a new 138 kV SF6 CB.

TR 83	SN/SE (MVA)	WN/WE (MVA)
Old Rating	400/465	400/465
New Rating	420/480	420/480

Estimated transmission cost: $24.1M

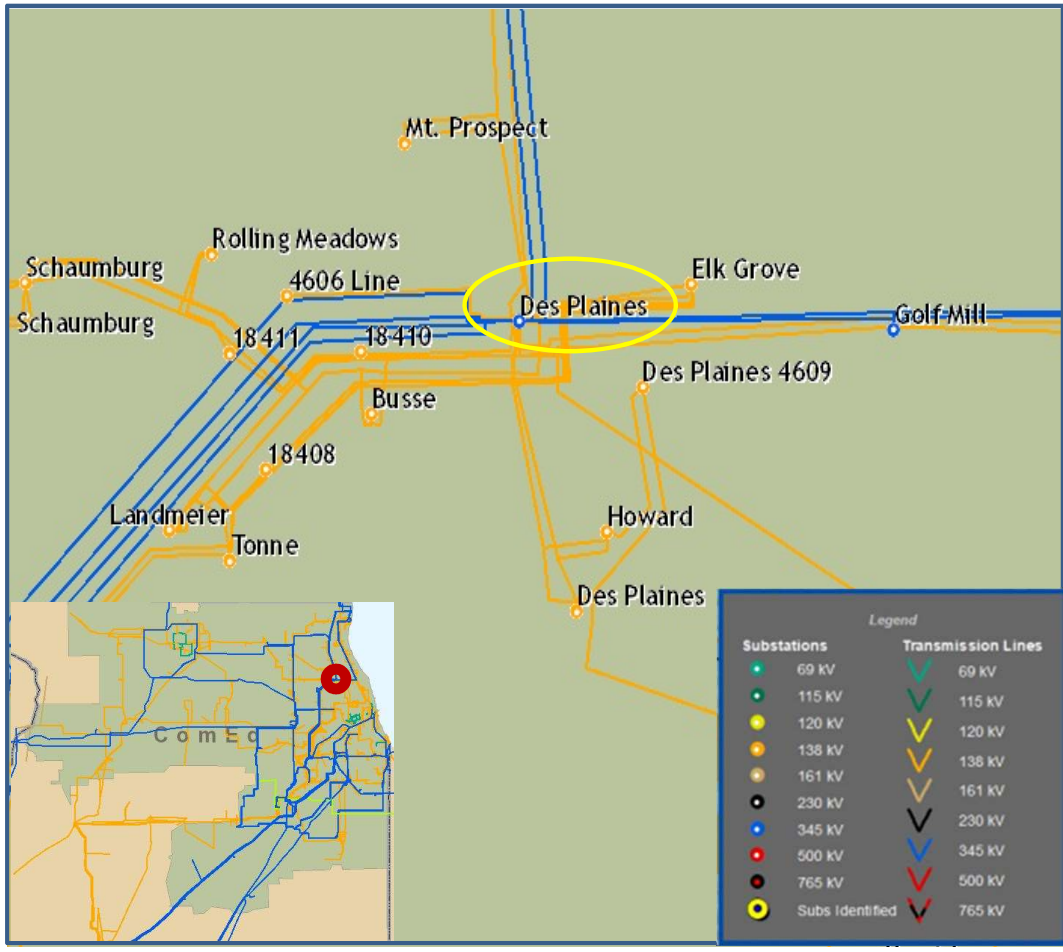
Alternatives Considered:

No feasible alternatives.

Projected In-Service: 12/31/25

Project Status: Conceptual

Model: 2028 RTEP



Dominion Transmission Zone: Supplemental Customer Load Request

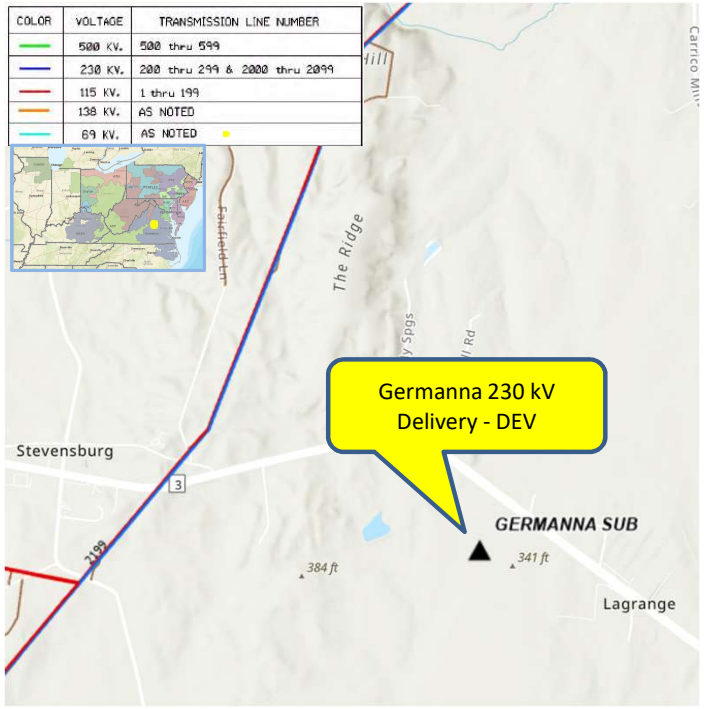
Need Number: DOM-2022-0033 (Update)

Process Stage: Solution Meeting 10/31/2023
Previously Presented: Solution Meeting 09/06/2022

Project Driver: Customer Service

Specific Assumption References:
Customer load request will be evaluated per Dominion's Facility Interconnection Requirements Document and Dominion's Transmission Planning Criteria.

Problem Statement:
DEV distribution has submitted a DP Request for a new 230kV substation (Germanna) to serve a data center complex in Culpeper County with a total projected load of 124 MW. Requested in-service date is 04/16/2026.



Initial In-Service Load	Projected 2028 Load
Summer: 23 MW Winter: 0 MW	Summer: 108 MW Winter: 87 MW

Dominion Transmission Zone: Supplemental Germanna 230kV Delivery Point - DEV

Need Number: DOM-2022-0033

Process Stage: Solutions Meeting 10/31/2023
Previously presented: Solutions Meeting 09/06/2022

Proposed Solution:
Interconnect the new substation by cutting and extending Line #2199 (Cirrus-Gordonsville) to the proposed Germanna Substation. Lines to terminate in a 230kV four-breaker ring arrangement with an ultimate arrangement of a six-breaker ring.

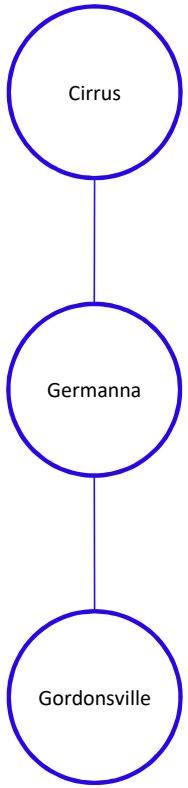
Estimated Project Cost: $55 M

Alternatives Considered:
No feasible alternatives – Line #2199 is the only 230kV source in the area

Projected In-service Date: 04/16/2026

Project Status: Engineering

Model: RTEP 2028



AEP Transmission Zone M-3 Process
Central Ohio

Need Number: AEP-2023-OH072

Process Stage: Solutions Meeting 10/31/2023

Previously Presented: Need Meeting 05/09/2023

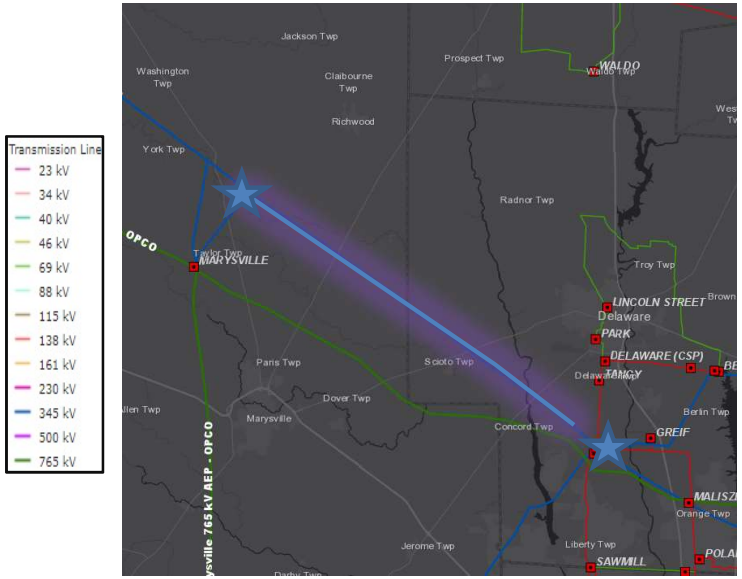
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Paper Expanded/Air Expanded (PE/AE) Lines in AEP

- The specific conductors of concern are as follows:
  - 1,275,000 CM ACSR/PE 54/19
  - 1,414,000 CM ACSR/AE 62/19
  - 1,414,000 CM ACSR/PE 62/19 (Falbo)
  - 1,708,000 CM ACSR/AE 66/19
  - 1.75 ACSR AE
- There are approximately 570 miles of PE/AE lines throughout AEP's 345kV footprint. Many of the PE/AE lines are built on double circuit towers making the conductor miles approximately 1,114 miles on the AEP system
- The Centre for Energy Advancement through Technological Innovation (CEATI) Report No. T144700-3257: Statistical Data and Methodology for Estimating the Expected Life of Transmission Line Components provides a timeframe of anticipated useful life of the various transmission line equipment as guided by industry experience. The CEATI estimated expected life of conductor is 40-80 years. AEP focuses on evaluating the condition and performance of each asset and the risk that the failure of each poses to the system, connected customers, personnel, and the public.
- The PE/AE conductor types are no longer standard conductor types used by AEP and the general utility industry.
  - Vendors do not have this conductor type readily available for purchase. This conductor type requires specialized splices and assemblies, which are not readily available for purchase from vendors. Special orders are required to obtain this equipment, causing long lead times for materials.
- AEP has concerns of increased core corrosion on the PE/AE conductor fleet. These concerns are based on the review of conductor samples following recovery events.



Central Ohio

AEP Transmission Zone M-3 Process
Central Ohio

Need Number: AEP-2023-OH072

Process Stage: Solutions Meeting 10/31/2023

Previously Presented: Need Meeting 05/09/2023

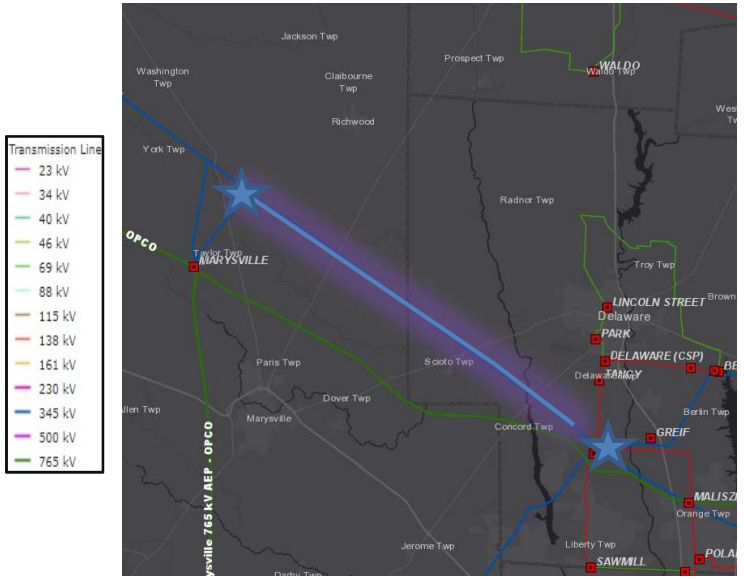
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Paper Expanded/Air Expanded (PE/AE) Lines in AEP

- Corrosion related conditions are an indicator of the elevated risk of conductor or equipment failure.
- The degraded state of corroded conductor cores result in significant loss of tensile strength and potential risk to the public if the conductor were to fail and fall to the ground. This can also lead to unplanned outages on the 345kV circuits.
- Due to the lack of conductor availability, standard conductor is spliced in when needed. Each conductor type has different weights, which can affect ratings and structure overloads. When the weight of the wire is increased, the existing structures can be overloaded.
- AEP anticipates a timeline of over 20 years to address the imminent needs of the 570 line miles of 345kV. This timeline was created assuming best scenario and could be impacted if there are any ROW concerns, material acquisition concerns or operational limitations. Limitations of 345kV outages in the summers are expected
  - If AEP addresses 2 of these lines at a time this could impact 4x 345kV circuits. Taking several outages on the 345kV system at once could have operational challenges
- In order to address these needs within the next 20+ years, AEP needs to begin planning solutions for PE/AE lines today
- Even though the conductor needs to be evaluated for each line, it is possible that we will be able to use existing structures where feasible. Each of these circuits will need to be evaluated individually and recommended solutions will be shared with stakeholders in accordance with M-3 provisions



Central Ohio

AEP Transmission Zone M-3 Process
Central Ohio

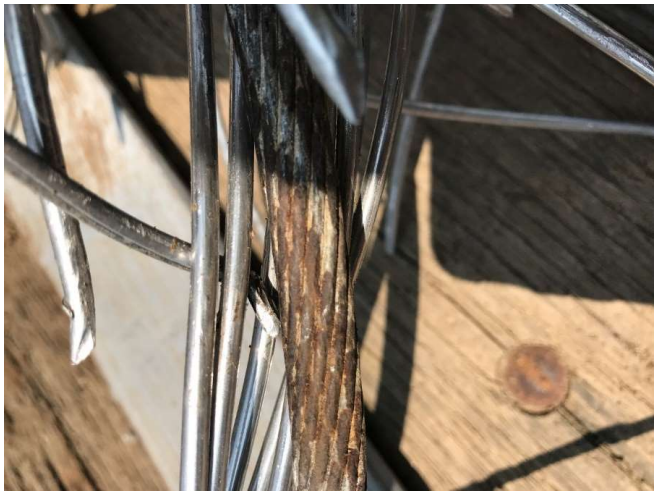
Need Number: AEP-2023-OH072

Process Stage: Solutions Meeting 10/31/2023

Previously Presented: Need Meeting 5/9/2023

Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Paper Expanded conductor samples were observed following the 2019 Memorial Day Tornados in the Indiana and Michigan footprint. Corrosion of the cores can be seen in the pictures below.



AEP Transmission Zone M-3 Process
Central Ohio

Need Number: AEP-2023-OH072

Process Stage: Solutions Meeting 10/31/2023

Previously Presented: Need Meeting 5/9/2023

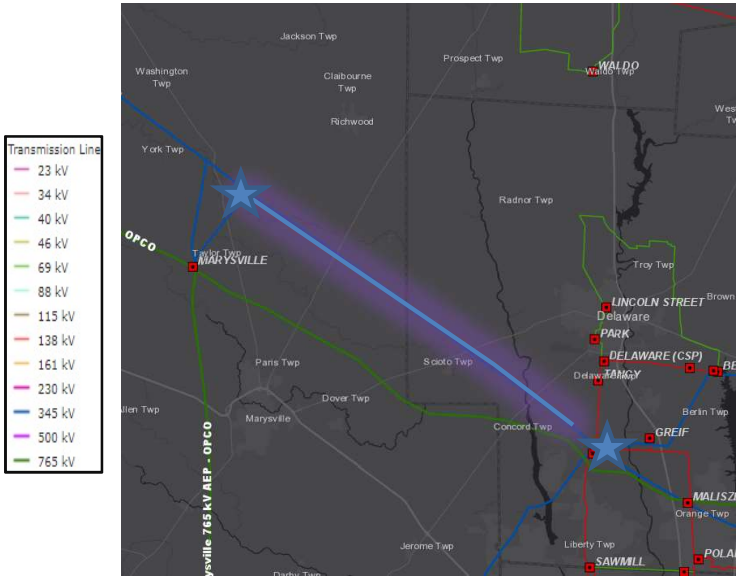
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement: Paper Expanded/Air Expanded (PE/AE) Lines in AEP

Marysville- Hyatt 345kV Line PE Conductor Need

- Marysville-Hyatt is a 345kV double circuit line. The majority of structures (78%) are 1955 vintage lattice steel type. Conductors on the Marysville-Tangy-Hyatt 345kV line:
  - 14.05 miles of 1,275,000 CM ACSR/PE Conductor
  - 5.14 miles of 1,414,000 CM ACSR/PE Conductor
  - 0.04 miles of 1,414,000 CM ACSR/PE Conductor
- Since 2018, there have been 3 momentary and 2 permanent outages on the Marysville – Tangy 345kV circuit.
- Currently, there are 16 structures with at least one open hardware condition, which relates to 20% of the structures on the line segment. There are currently 18 open hardware conditions specifically affecting dead end insulators, suspension insulators, and a corona ring including burnt, broken, and chipped.



Central Ohio

AEP Transmission Zone M-3 Process
Central Ohio

Need Number: AEP-2023-OH072
Process Stage: Solutions Meeting 10/31/2023

Proposed Solution:

Marysville – Hyatt 345 kV Line: Rebuild approximately 19.0 miles of the double circuit 345 kV line using 4-bundled 795 ACSR conductor BOLD construction.

Existing ratings: Marysville – Tangy (FE): 897/1301/1138/1452, Hyatt – Tangy (FE): 971/1419/1234/1585, Hyatt – Marysville: 1166/1376/1481/1639

Proposed ratings: Marysville – Tangy (FE): 1409/1887/1766/2078, Hyatt – Tangy (FE): 1560/1900/1766/1912, Hyatt – Marysville: 1409/1655/1781/1970

Total Estimated Transmission Cost: $116.7M

Alternatives Considered:

- Reconductoring the line section was considered and evaluated. The engineering feedback received was that the 1950's structures that make up the line could not support a more modern (bundled) conductor. The Marysville – Hyatt line is one of the primary sources into Central Ohio, an area that has continued to see significant amounts of load growth. Moving forward with the proposed rebuild in lieu of making a significant investment into the structures that will be over 70 years old by time the work is completed is the more prudent solution.

  Estimated Transmission Cost of Alternative: $50M

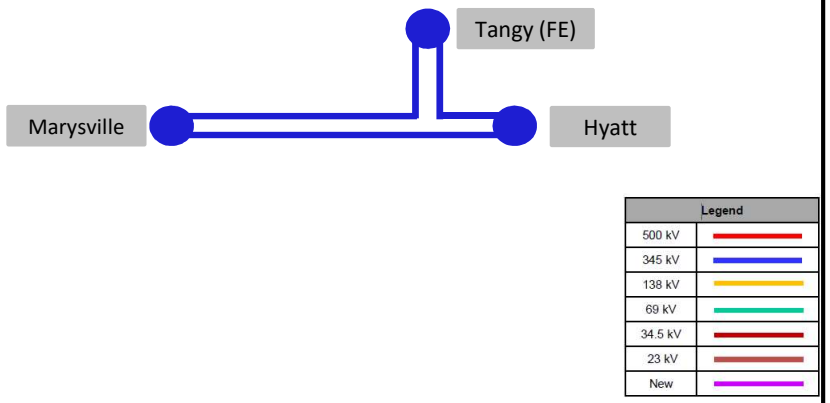
- Retiring the line was not deemed to be a viable alternative as the Marysville – Hyatt 345 kV line is one of the main sources from the 765 kV system into the Central Ohio area.

Projected In-Service: 6/1/2027

Project Status: Scoping

Model: 2027 RTEP

Existing:



Proposed:

AMPT Projects in ATSI Transmission Zone M3 Process
Pioneer, OH

Need Number: AMPT-2022-002

Process Stage: Solution Meeting – 11/17/2023

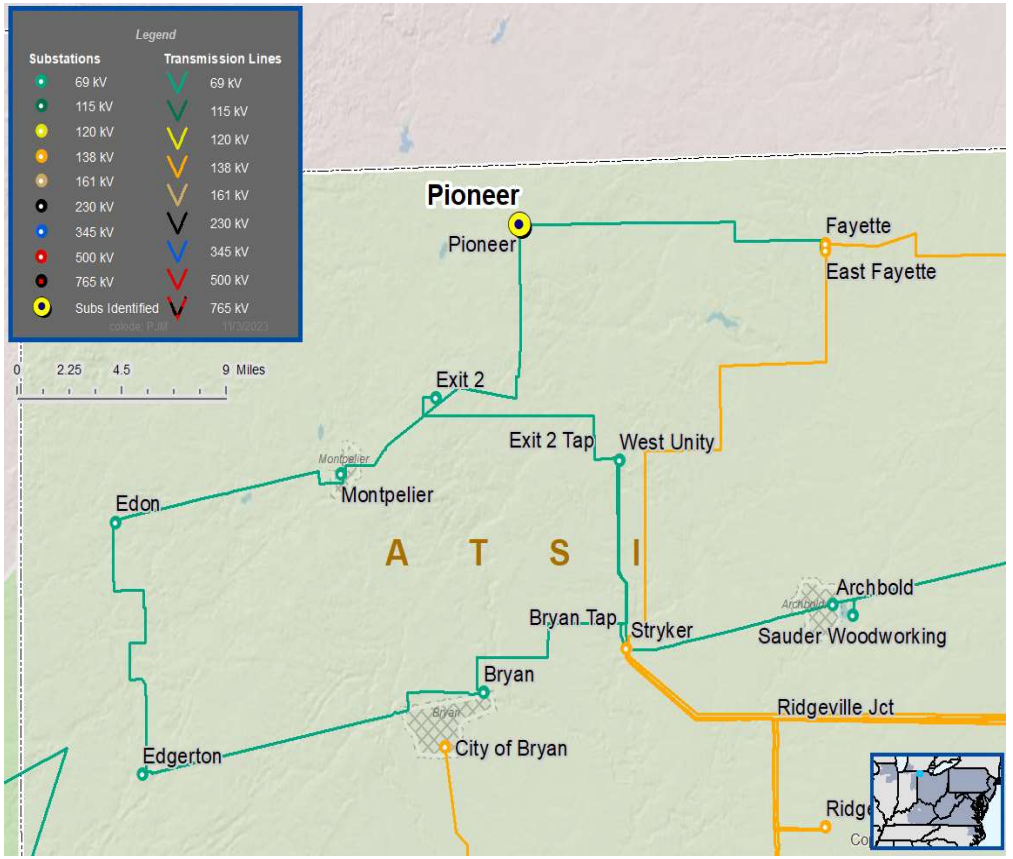
Process Stage: Need Meeting – 2/18/2022

Supplemental Project Driver(s): Customer Service

Specific Assumption Reference(s): AMPT's "Transmission Facilities Interconnection Requirements" document.

Problem Statement:
The existing interconnection is an approximately 2 mile radial 69 kV tap off ATSI's East Fayette-Exit 2 69 kV line which supplies the Pioneer 69/12 kV substation.

The current peak load at Pioneer is 8 MW. A 2nd supply is needed per AMPT interconnection requirements criteria. The radial supply presents a single point of failure that jeopardizes reliability for the village.



AMPT Projects in ATSI Transmission Zone M3 Process
Pioneer, OH

Need Number: AMPT-2022-002

Process Stage: Solution Meeting – 11/17/2023

Supplemental Project Driver(s): Customer Service

Proposed Solution:

AMPT Identified Scope **($13.9 M)**

- At Kexon Substation - Install two (2) additional 69kV circuit breakers and associated substation disconnect switches. These additional breakers will be used to terminate the new Kexon – Snyder #1 and Kexon – East Fayette 69kV lines. **($2.1 M)**
- Build approximately 2.5 miles of new double circuit 69kV line using 795 ACSR Drake conductor from Kexon station to a point on the existing AMPT owned Kidston Tap. Rebuild approximately 1 mile of the existing Kidston Tap to a double circuit 69kV line using 795 ACSR Drake conductor from a point on the existing Kidston Tap to a point on the FE owned East Fayette-Snyder 69 kV line. **($9.2 M)**
- Extend the existing normally open circuit out of AMPT's Kidston station to connect into FE's Snyder 69kV station. This will require the construction of approximately 1 mile of greenfield single circuit 69kV line using 795 ACSR Drake conductor. **($2.6 M)**

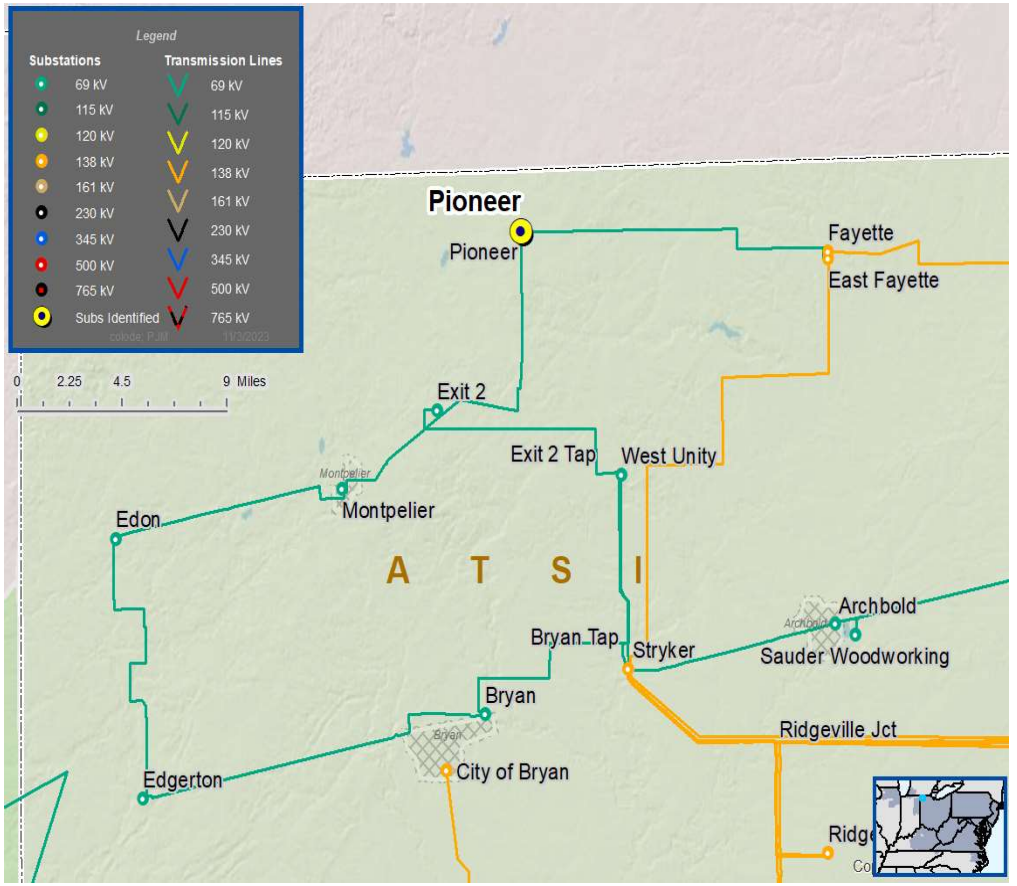
ATSI Identified Scope **($12.6 M)**

Snyder 69 kV substation

- Expand the Snyder Substation from five to a six-breaker ring bus by adding one 69 kV circuit breaker to accommodate the Kexon-Bruce R. Kidston-Snyder 69 kV Line terminal (i.e., Kexon-Snyder #2) and install a dead-end structure just outside Snyder Substation to provide a termination point for the new line.
- Revise line relay settings to Kexon (formerly E Fayette exit)
- Install standard BES line relay panel with on the new line exit for the Kexon-Snyder #2 69 kV Line

Stryker

- Install 2nd 138/69 kV transformer, adjust all 69 & 138 kV relays as required, integrate the new transformer protection to the system.



AMPT Projects in ATSI Transmission Zone M3 Process
Pioneer, OH

- Install one 138 kV bus tie breaker

East Fayette-Snyder 69 kV Line
- Split the E Fayette-Snyder 69 kV Line between structure # 191 & 192 to loop in the AMPT Kexon Substation.
- Revise relay settings at E Fayette and Snyder substations
- Install a jumper between the new E. Fayette-Kexon & Snyder-Kexon #1 69 kV Line with inline normally open SCADA controlled switch

Need Number: AMPT-2022-002

Process Stage: Solution Meeting – 11/17/2023

Supplemental Project Driver(s): Customer Service

Ancillary Benefits:
Solution provides reliability improvements for n-1-1 contingency on non-BES ATSI owned facilities (both voltage and thermal).

Alternatives Considered:

- Build a 138/69kV yard at Kexon and construct a 16 mile 138kV line from the existing East Fayette 138kV station to the new Kexon 138kV station. **($31 M)**

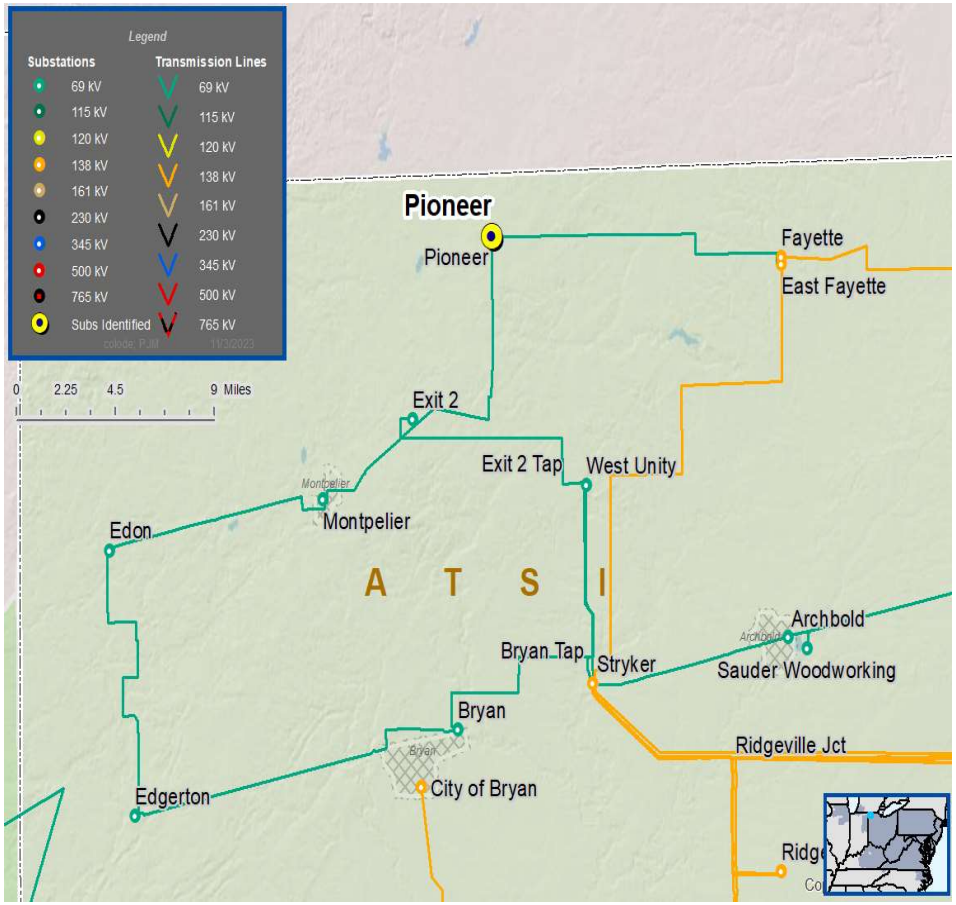
Less cost effective than the proposed solution for the reasons noted above.

Total Estimated Transmission Cost: $26.5 M

Projected In-Service: 5/31/2027

Project Status:

- Conceptual (AMPT), Conceptual (ATSI)



ATSI Transmission Zone M-3 Process
Masury 138 kV Misoperation Relays

Need Numbers: ATSI-2023-019

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 09/15/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits
- Upgrade Relay Schemes
- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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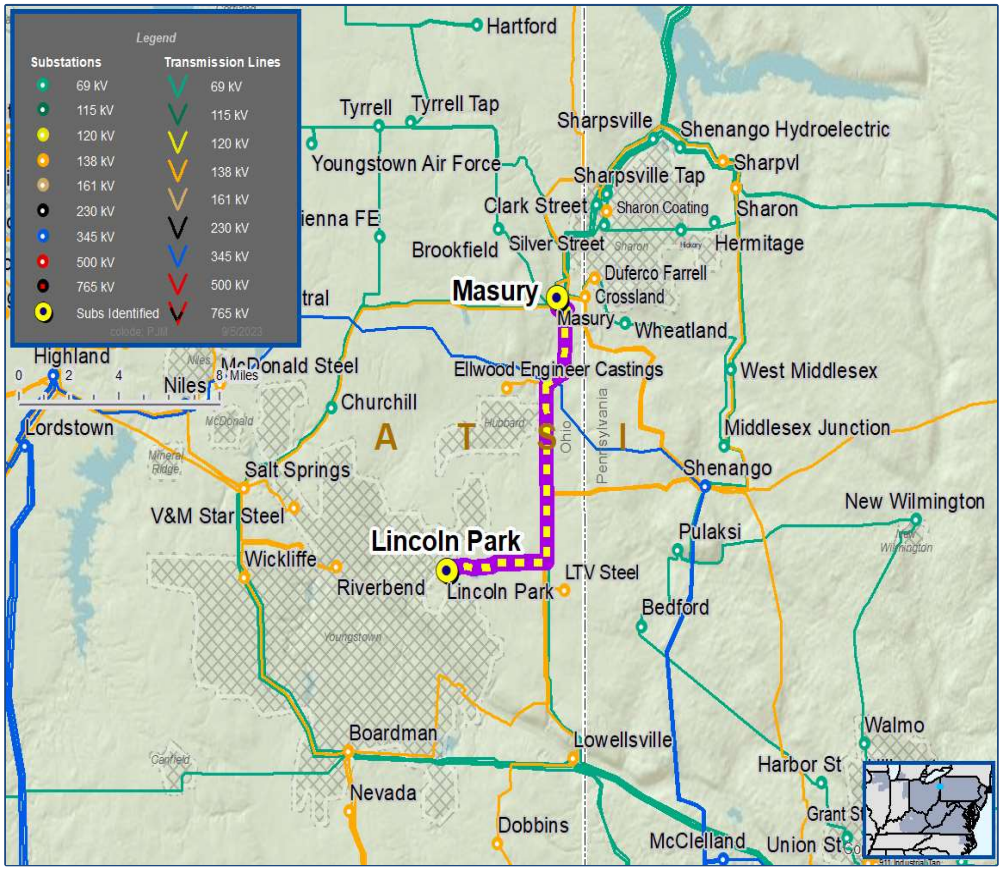


ATSI Transmission Zone M-3 Process
Masury 138 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)
ATSI-2023-019	Masury – Elwood Tap 138 kV Line	164 / 191	187 / 191
	Lincoln Park – Elwood Tap 138 kV Line	155 / 155	187 / 191

ATSI Transmission Zone M-3 Process
Masury 138 kV Misoperation Relays

Need Numbers: ATSI-2023-019

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 09/15/2023

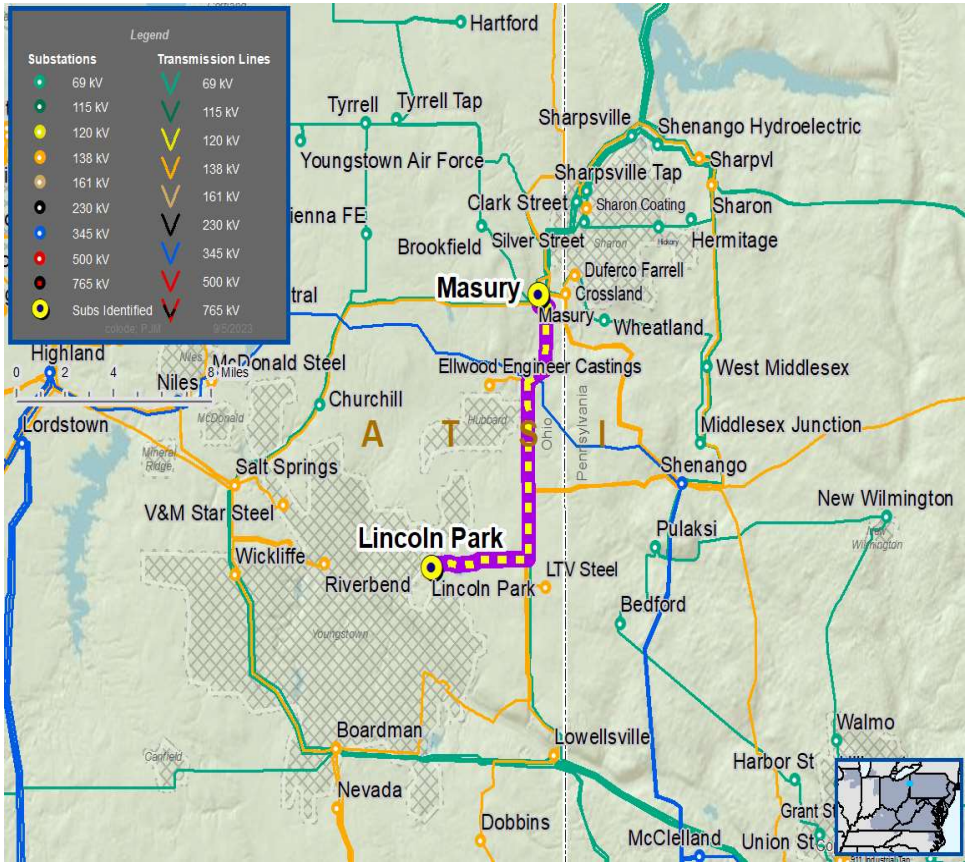
Proposed Solution:

Masury Substation

- Replace relaying on Lincoln Park line terminal with microprocessor relays.
- Replace (2) 138 kV breakers for Lincoln Park and Shenango lines.
- Replace (2) associated disconnect switches.

Lincoln Park Substation

- Replace relaying on Masury line terminal with microprocessor relays.
- Replace (2) 138 kV breakers for Masury Line.
- Replace (4) associated disconnect switches.



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ATSI Transmission Zone M-3 Process
Masury 138 kV Misoperation Relays

Need Numbers: ATSI-2023-019

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 09/15/2023

Transmission Line Ratings:

Need #	Transmission Line / Substation Locations	Existing Line Ratings (SN / SE / WN / WE)	New Line Ratings (SN / SE / WN / WE)
ATSI-2023-019	Masury – Elwood Tap 138 kV Line Section	164 / 191 / 211 / 211	187 / 191 / 211 /211
	Lincoln Park – Elwood Tap 138 kV Line Section	155 / 155 / 155 / 155	187 / 191 / 211 /211

Alternatives Considered:

- Maintain existing condition and risk of misoperation of protective relays.

Estimated Project Cost: $3.4M

Projected In-Service: 12/31/2025

Status: Conceptual

ATSI Transmission Zone M-3 Process
Gilchrist - Hartville 69 kV Misoperation Relays

Need Numbers: ATSI-2023-020

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/20/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits
- Upgrade Relay Schemes
- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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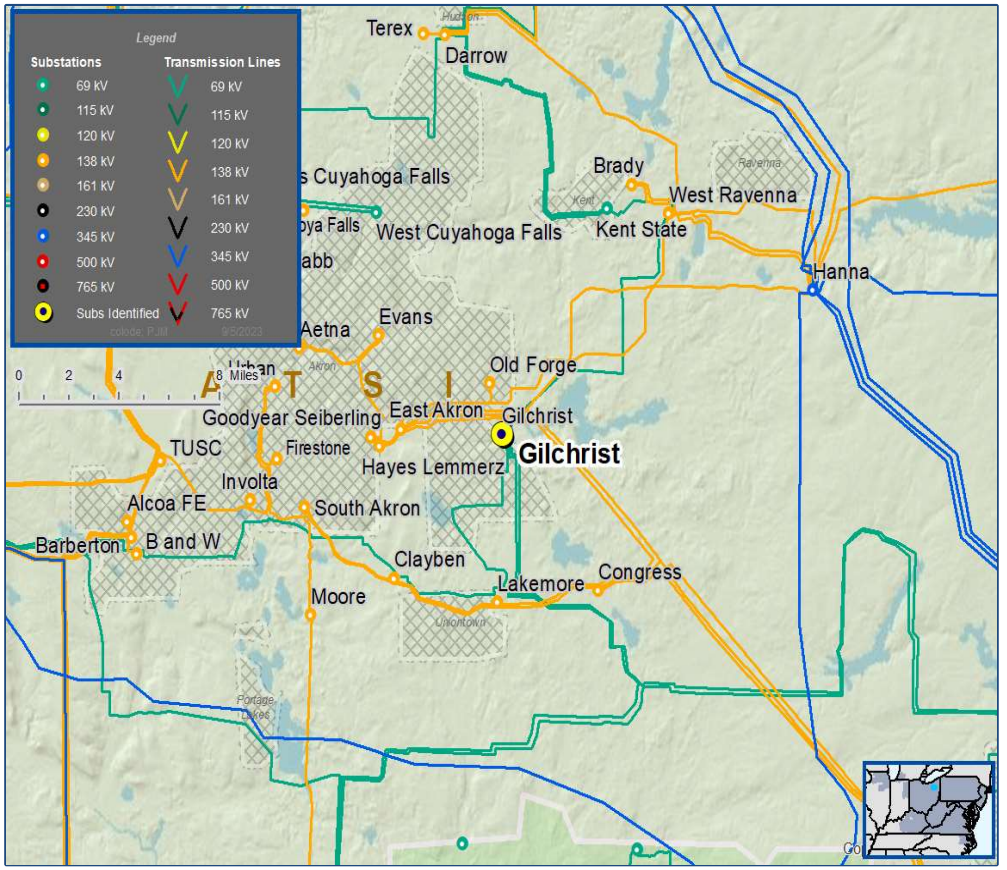


FirstEnergy

ATSI Transmission Zone M-3 Process
Gilchrist - Hartville 69 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)
ATSI-2023-020	Hartville – Trelleborg Tap 69 kV Line	76 / 76	76 / 92
ATSI-2023-020	Gilchrist - Burger-Rubbermaid Tap 69 kV Line	76 / 92	76 / 92

ATSI Transmission Zone M-3 Process
Gilchrist - Hartville 69 kV Misoperation Relays

Need Numbers: ATSI-2023-020

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/15/2023

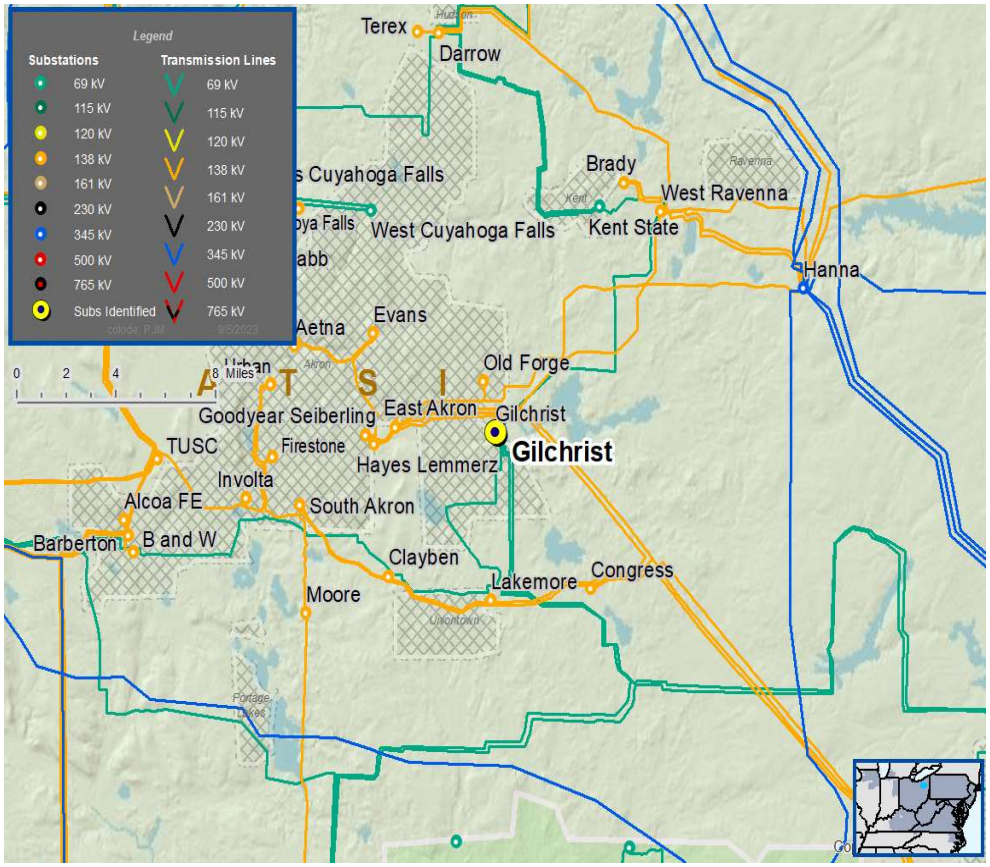
Proposed Solution:

Gilchrist Substation

- Replace one circuit breaker, associated disconnect switches and relaying for Hartville line terminal.

Hartville Substation

- Replace one circuit breaker, associated disconnect switches and relaying for Gilchrist line terminal.



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ATSI Transmission Zone M-3 Process
Gilchrist - Hartville 69 kV Misoperation Relays

Need Numbers: ATSI-2023-020

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 09/15/2023

Transmission Line Ratings:

Need #	Transmission Line / Substation Locations	Existing Line Ratings (SN / SE / WN / WE)	New Line Rating (SN / SE / WN / WE)
ATSI-2023-020	Hartville – Trelleborg Tap 69 kV Line	76 / 76 / 76 / 76	76 / 92 / 87 / 111
	Gilchrist - Burger-Rubbermaid Tap 69 kV Line	76 / 92 / 87 / 101	76 / 92 / 87 / 111

Alternatives Considered:

- Maintain existing condition and risk of misoperation of protective relays.

Estimated Project Cost: $1.6M

Projected In-Service: 6/1/2026

Status: Conceptual

ATSI Transmission Zone M-3 Process
Vulcan 138/69 kV Transformer

Need Number: ATSI-2023-023
Process Stage: Solution Meeting –11/17/2023
Previously Presented: Need Meeting – 10/20/2023

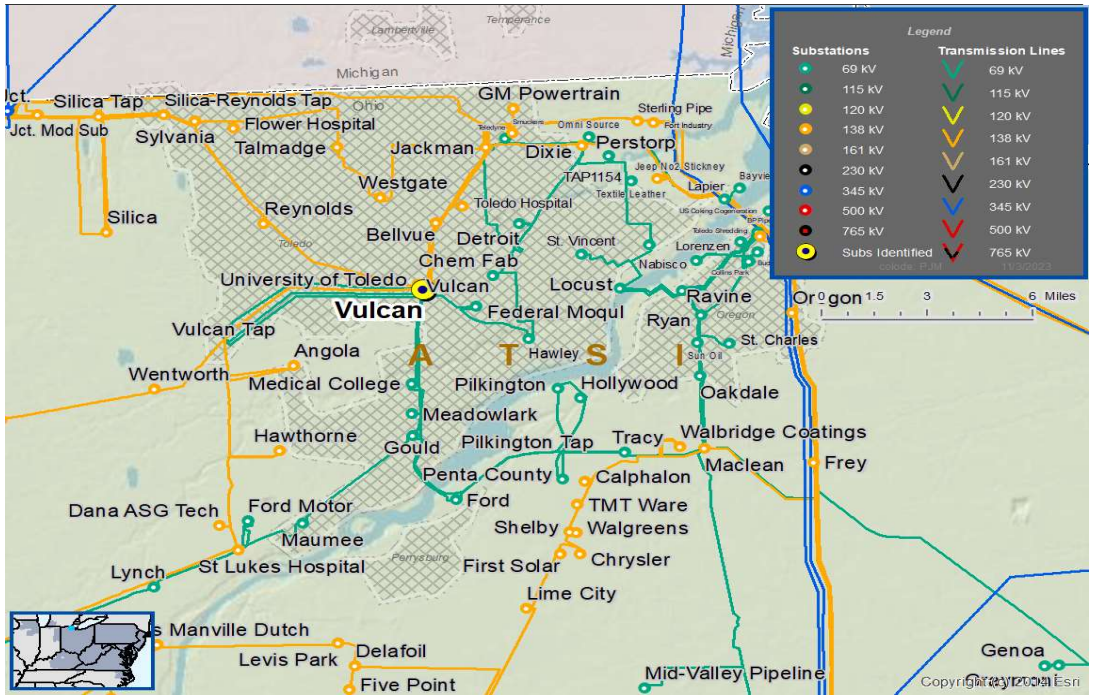
Supplemental Project Driver(s):
Equipment Material Condition, Performance, and Risk
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

- Substation / Line equipment limits
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Problem Statement

The Vulcan 138/69 kV Transformer has been experiencing increased loading during the summer peak seasons requiring Transmission System Operators to mitigate the risk of thermal violations through operational switching.



ATSI Transmission Zone M-3 Process
Vulcan 138/69 kV Transformer

Need Number: ATSI-2023-023
Process Stage: Solution Meeting –11/17/2023
Previously Presented: Need Meeting – 10/20/2023

Proposed Solution:

Vulcan 138/69 kV Transformer Terminal Upgrades

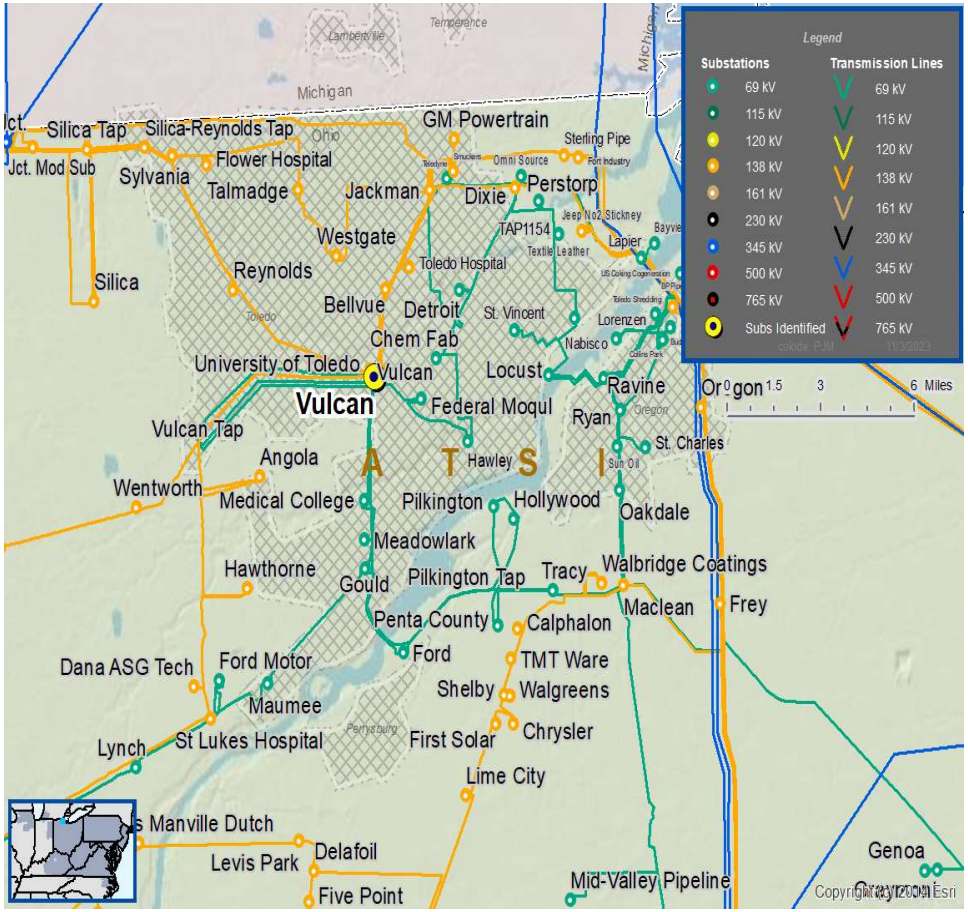
- Replace substation conductor including the breaker leads and transformer leads

Alternatives Considered:

- Maintain existing condition and continue to rely on Transmission Operators to manage the loading on the transformer through operational switching.

Estimated Project Cost: $1.0M

Projected In-Service: 3/28/2024
Status: Engineering



ATSI Transmission Zone M-3 Process
Carlisle – Johnson 138 kV Misoperation Relays

Need Numbers: ATSI-2023-029

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/20/2023

Project Driver:

Equipment Material Condition, Performance and Risk

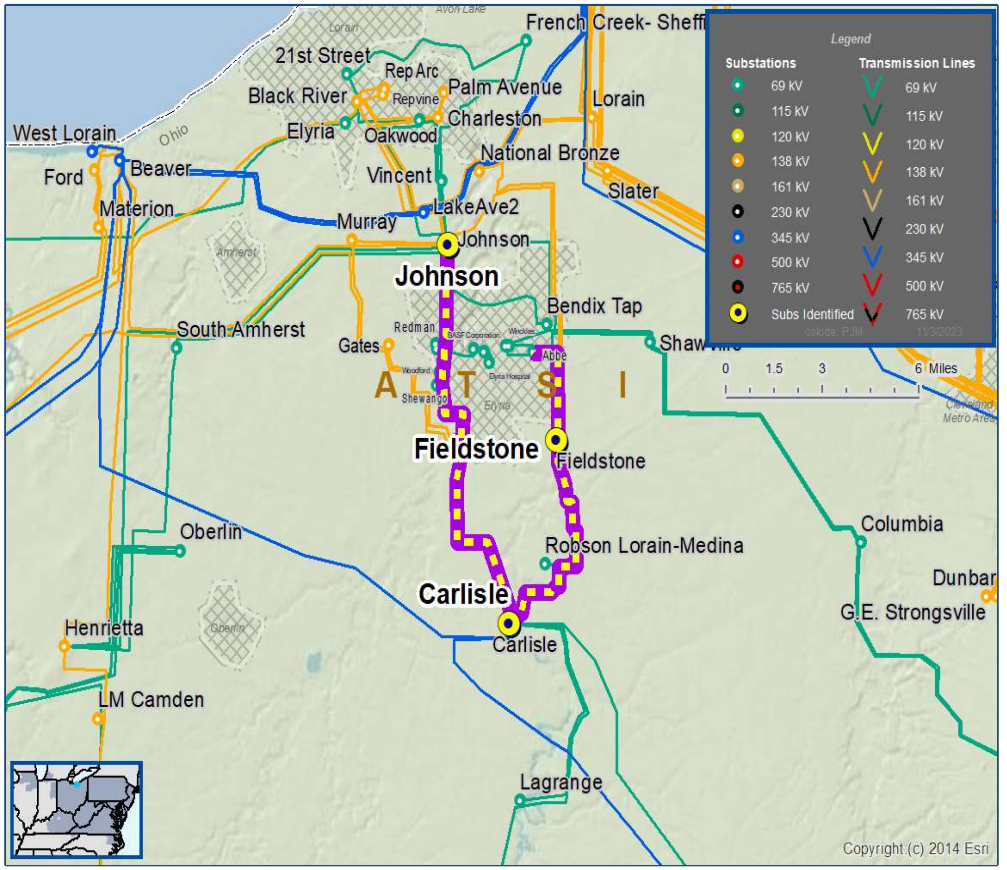
Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits
- Upgrade Relay Schemes
- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.



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FirstEnergy

ATSI Transmission Zone M-3 Process
Carlisle – Johnson 138 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Circuit Ratings (SN / SE / WN / WE)	Existing Conductor Ratings (SN / SE / WN / WE)
ATSI-2023-029	Carlisle – Fieldstone Tap 138 kV Line Section	233 / 282 / 263 / 333	233 / 282 /263 / 333
	Fieldstone Tap – Johnson 138 kV Line Section	225 / 282 / 263 / 333	233 / 282 / 263 / 333

ATSI Transmission Zone M-3 Process
Carlisle – Johnson 138 kV Misoperation Relays

Need Numbers: ATSI-2023-029

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/20/2023

Proposed Solution:

At Carlisle Substation

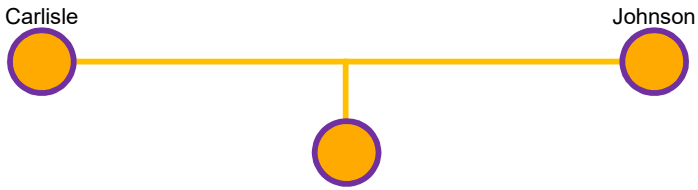
- Replace (1) 138 kV Oil Circuit Breaker.
- Replace (3) 138 kV disconnect switches.
- Replace associated relaying with microprocessor relays.
- Remove wave-trap and replace power line carrier communications with fiber communications.

At Fieldstone Substation

- Remove wave-trap.

At Johnson Substation

- Replace (1) 138 kV disconnect switch.
- Remove wave-trap and replace power line carrier communications with fiber communications.
- Connect fiber to existing microprocessor relays.



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

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ATSI Transmission Zone M-3 Process
Carlisle – Johnson 138 kV Misoperation Relays

Need Numbers: ATSI-2023-029

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/20/2023

Transmission Line Ratings:

Need #	Transmission Line / Substation Locations	Existing Circuit Ratings (SN/ SE / WN / WE)	New Circuit Ratings (SN / SE / WN / WE)
ATSI-2023-029	Carlisle – Fieldstone Tap 138 kV Line Section	233 / 282 / 263 / 333	233 / 282 / 263 / 333
	Fieldstone Tap – Johnson 138 kV Line Section	225 / 282 / 263 / 333	233 / 282 / 263 / 333

Alternatives Considered:

- Maintain existing condition and risk of misoperation of protective relays.

Estimated Project Cost: $2.2M

Projected In-Service: 6/30/2025

Status: Engineering

ATSI Transmission Zone M-3 Process
Firestone – Urban 138 kV Misoperation Relays

Need Numbers: ATSI-2023-041

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/20/2023

Project Driver:

Equipment Material Condition, Performance and Risk

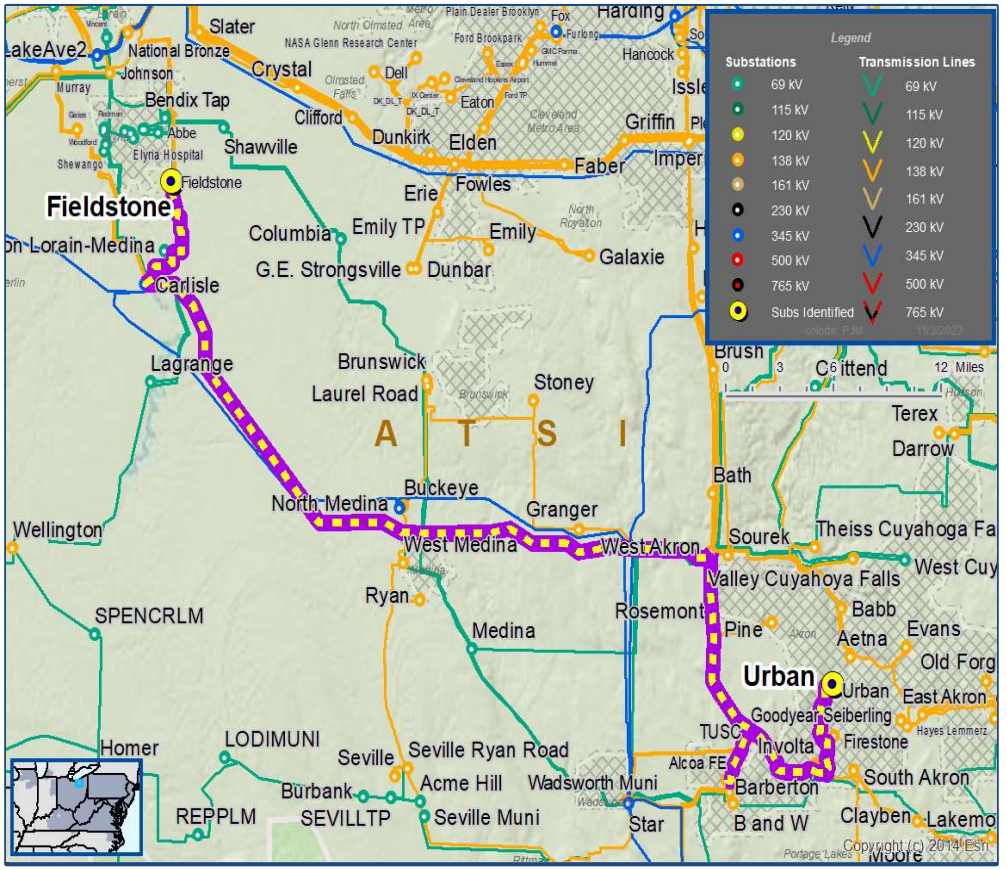
Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits
- Upgrade Relay Schemes
- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.



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FirstEnergy

ATSI Transmission Zone M-3 Process
Firestone – Urban 138 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Circuit Ratings (SN / SE / WN / WE)	Existing Conductor Ratings (SN / SE / WN / WE)
ATSI-2023-041	Firestone – Urban 138 kV Line	189 / 241 / 237 / 249	233 / 282 / 263 /333

ATSI Transmission Zone M-3 Process
Firestone – Urban 138 kV Misoperation Relays

Need Numbers: ATSI-2023-041

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/20/2023

Proposed Solution:

At Firestone Substation

- Replace associated relaying with microprocessor relays.
- Replace wave-trap and power line carrier equipment.

At Urban Substation

- Replace (1) 138 kV Oil Circuit Breaker.
- Replace (3) 138 kV disconnect switches.
- Replace associated relaying with microprocessor relays.
- Replace wave-trap and power line carrier equipment.

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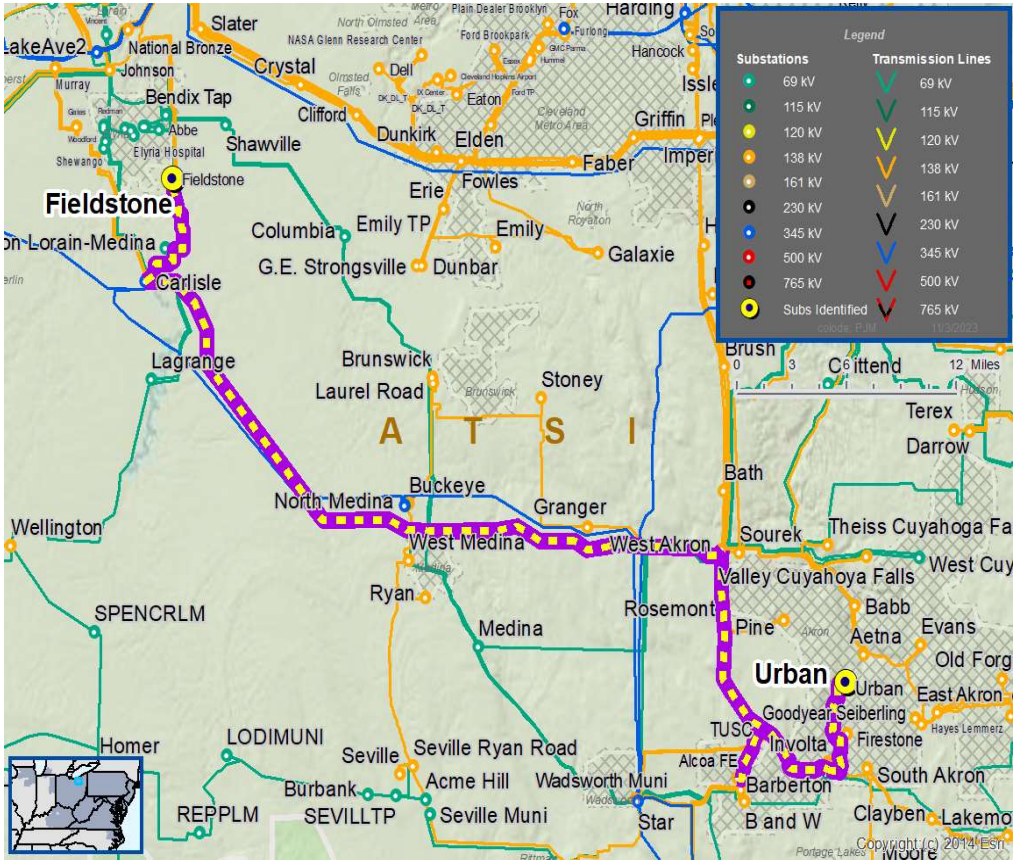


ATSI Transmission Zone M-3 Process
Firestone – Urban 138 kV Misoperation Relays

Need Numbers: ATSI-2023-041

Process State: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/20/2023

Transmission Line Ratings:

Need #	Transmission Line / Substation Locations	Existing Circuit Ratings (SN/ SE / WN / WE)	Existing Conductor Ratings (SN / SE / WN / WE)
ATSI-2023-041	Firestone – Urban 138 kV Line	189 / 241 / 237 / 249	233 / 282 / 263 / 333

Alternatives Considered:

- Maintain existing condition and risk of misoperation of protective relays.

Estimated Project Cost: $2.5M

Projected In-Service: 5/15/2026

Status: Engineering

EKPC Transmission Zone M-3 Process
Hickory Plains

Need Number: EKPC-2023-010

Process Stage: Solutions Meeting – November 17, 2023

Previously Presented:

Need Meeting – October 20, 2023

Supplemental Project Driver:

Customer Service

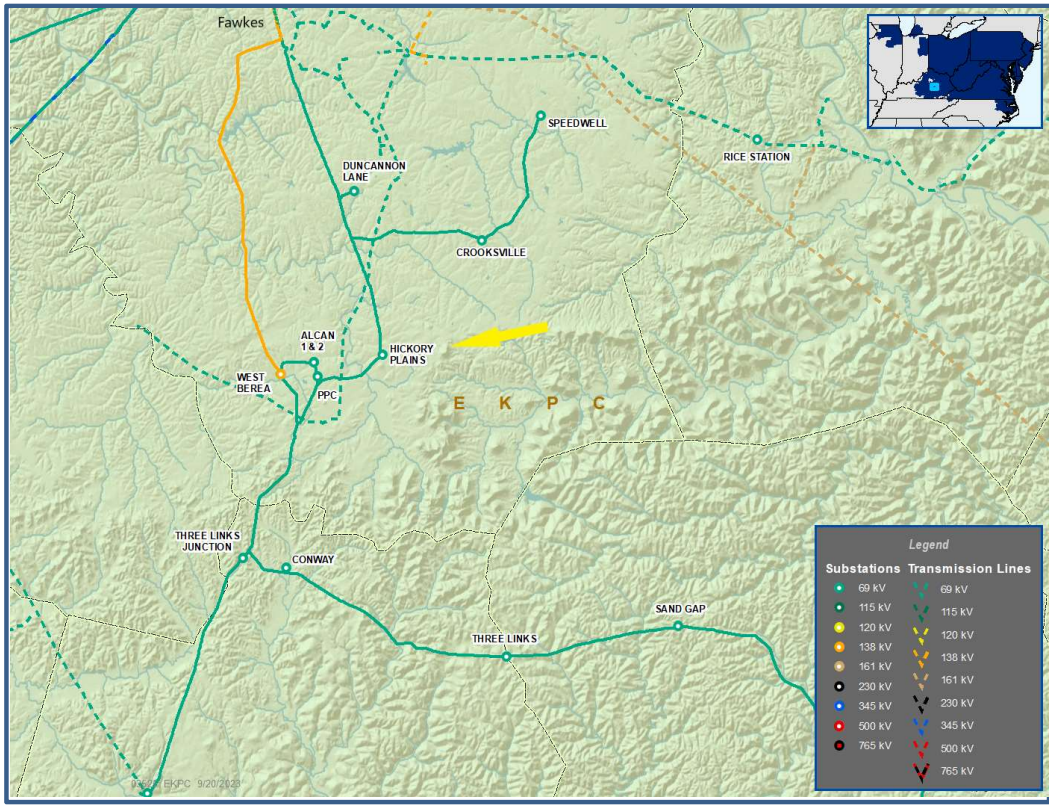
Specific Assumption Reference:

EKPC Assumptions Presentation Slide 15

Problem Statement:

The Hickory Plains distribution substation currently serves the highest numbers of customers of any distribution substation on EKPC system. Base on load forecast and steady growth in the area, the Hickory Plains 25 MVA distribution transformer is forecasted to overload in 2025/26 winter. Additionally due to the load growth, the distribution system forecasts feeder overloads and voltage constraints. Alternatives will be developed to address the transformer loading and distribution system issues.

Model: N/A



EKPC Transmission Zone M-3 Process
Big Hill

Need Number: EKPC-2023-010

Process Stage: Solutions Meeting – November 17, 2023

Proposed Solution:
Build a new 69-13.2 kV, 12/16/20 MVA distribution substation (Big Hill), install an 9 MVAR capacitor bank and 8.6 mile 69 KV tap line using 266.8 conductor. Tap point will be 1.2 mile from Three Link towards Sand gap, tapping the Three Link-Sand Gap 69 KV line section.

Transmission Cost: $0.0M
Distribution Cost: $12.0M

Ancillary Benefits:

- Reduces loading on the Fawkes-West Berea 69 KV transmission line.

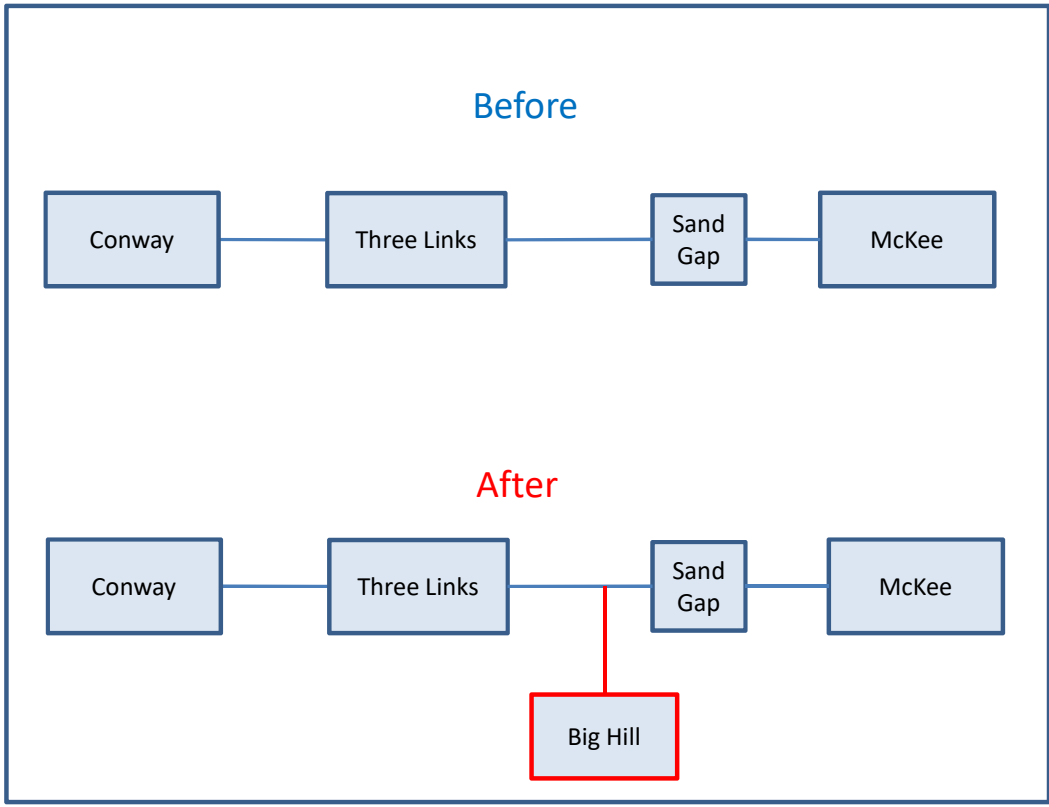
Alternatives Considered:

- No feasible alternatives

Projected In-Service: 6/1/2025

Project Status: Engineering

Model: N/A



EKPC Transmission Zone M-3 Process
North Springfield-Loretto

Need Number: EKPC-2023-011

Process Stage: Solutions Meeting – November 17, 2023

Previously Presented:

Need Meeting – October 20, 2023

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

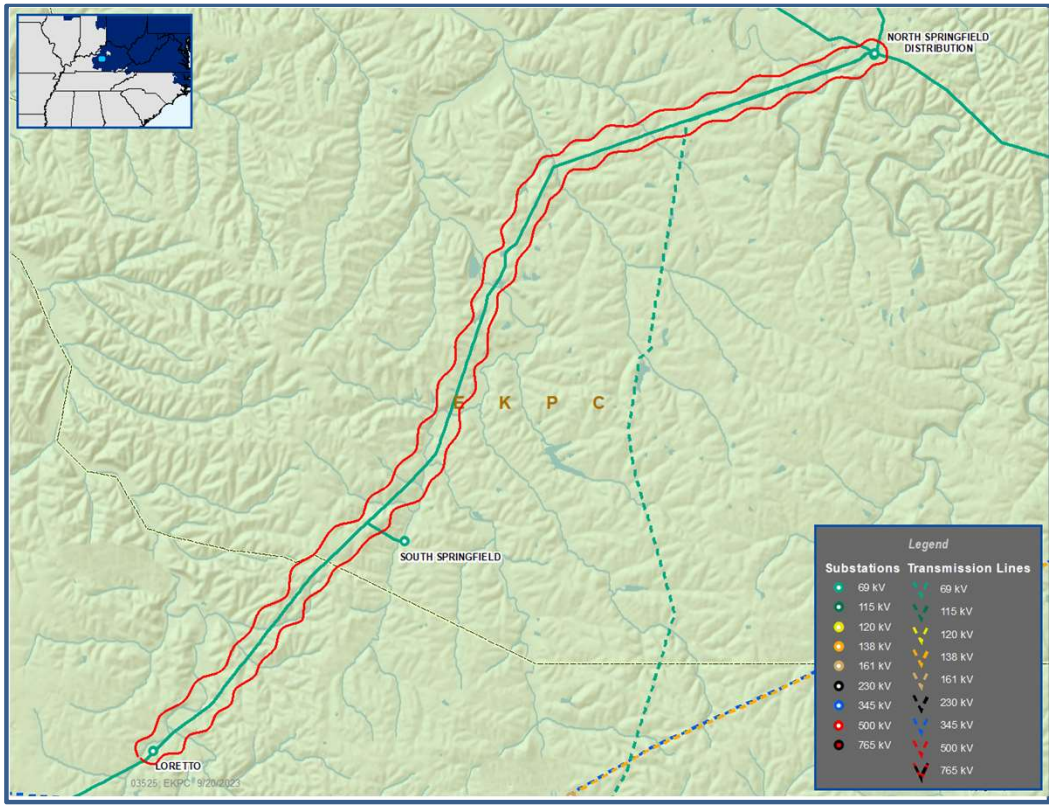
EKPC Assumptions Presentation Slide 13

Problem Statement:

The 14.11 mile, North Springfield-Loretto 69 KV line section is 1952 vintage wood pole construction with 4/0 conductor. This line section is expected to have condition issues such as, conductor steel core and static wire deterioration including rusting, pitting and possible broken strands. These condition issues have been exhibited by other 4/0 conductors with similar age and environmental conditions. There are currently 17 open work orders associated with structure issues such as degraded poles and insulator issues.

The EKPC Reliability team has concluded, that this line is at or near end of life and should be addressed due to the condition.

Model: N/A



EKPC Transmission Zone M-3 Process
North Springfield-Loretto

Need Number: EKPC-2023-011

Process Stage: Solutions Meeting – November 17, 2023

Proposed Solution:
Rebuild the 14.11 mile, North Springfield-Loretto 69 KV line using 556.5 conductor and steel pole construction.

Transmission Cost: $12.97M
Distribution Cost: $0.0M

Ancillary Benefits:

- Increases transmission line ratings

Alternatives Considered:
1. Build a new line from Marion County-S Springfield at 69kV. Rebuild Loretto-S Springfield & EKPC portion of N Springfield-Springfield KU using 556 ACSR, retire S Springfield-N Springfield
Transmission Cost: $19.8M
Distribution Cost: $0.0M

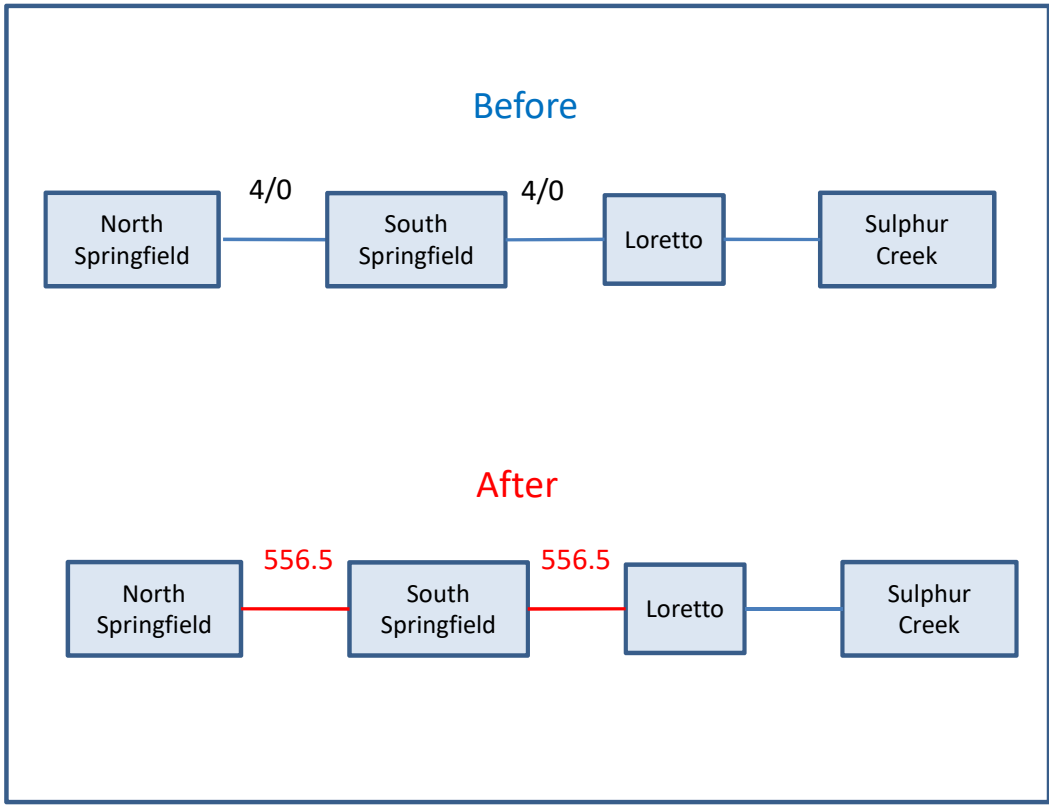
2. Build a new line from Marion County-S Springfield at 161kV. Rebuild Loretto-S Springfield & EKPC portion of N Springfield-Springfield KU using 556 ACSR, retire S Springfield-N Springfield
Transmission Cost: $20.8M
Distribution Cost: $0.0M

3. Build a new N.O. line from S Springfield-KU Springfield. Rebuild Loretto-S Springfield & EKPC portion of N Springfield-Springfield KU using 556 ACSR, retire S Springfield-N Springfield
Transmission Cost: $12.2M
Distribution Cost: $0.0M

Projected In-Service: 6/1/2025

Project Status: Engineering

Model: N/A



EKPC Transmission Zone M-3 Process
Snow Tap-North Albany

Need Number: EKPC-2023-012

Process Stage: Solutions Meeting – November 17, 2023

Previously Presented:

Need Meeting – October 20, 2023

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

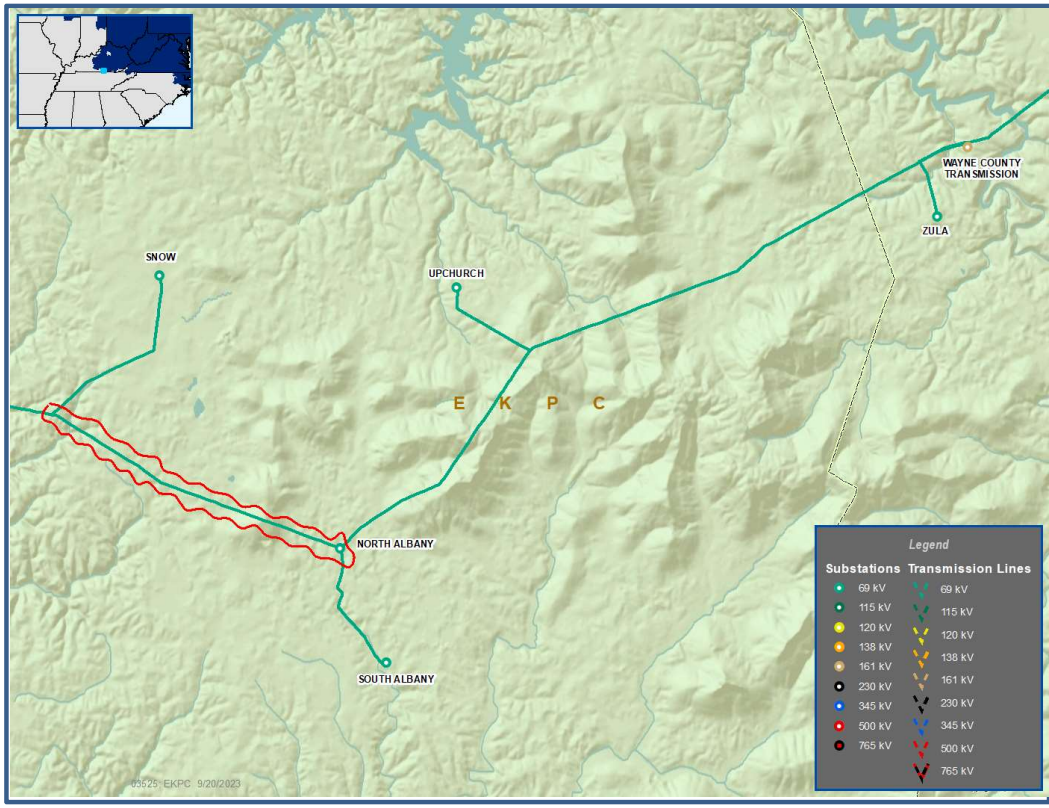
EKPC Assumptions Presentation Slide 13

Problem Statement:

The 4.4 mile, 69 kV Snow Tap-North Albany line section is 1954 vintage wood pole construction with 4/0 conductor. This line section is expected to have condition issues such as conductor steel core and static wire deterioration including rusting, pitting and possible broken strands. These condition issues have been exhibited by other 4/0 lines with similar age and environmental conditions. There are currently 12 open work orders associated with structure issues such as degraded poles.

The EKPC Reliability team has concluded, that this line is at or near end of life and should be addressed due to the condition.

Model: N/A



EKPC Transmission Zone M-3 Process
Snow Tap-North Albany

Need Number: EKPC-2023-012

Process Stage: Solutions Meeting – November 17, 2023

Proposed Solution:
Rebuild the 4.4 mile, Snow Tap-North Albany 69 KV line using 556.5 conductor and steel pole construction.

Transmission Cost: $4.6M
Distribution Cost: $0.0M

Ancillary Benefits:

- Increases transmission line ratings

Alternatives Considered:
1. Build a new line from Snow Tap to the Albany-South Albany line and retire Snow Tap-Albany.
Transmission Cost: $5.6M
Distribution Cost: $0.0M

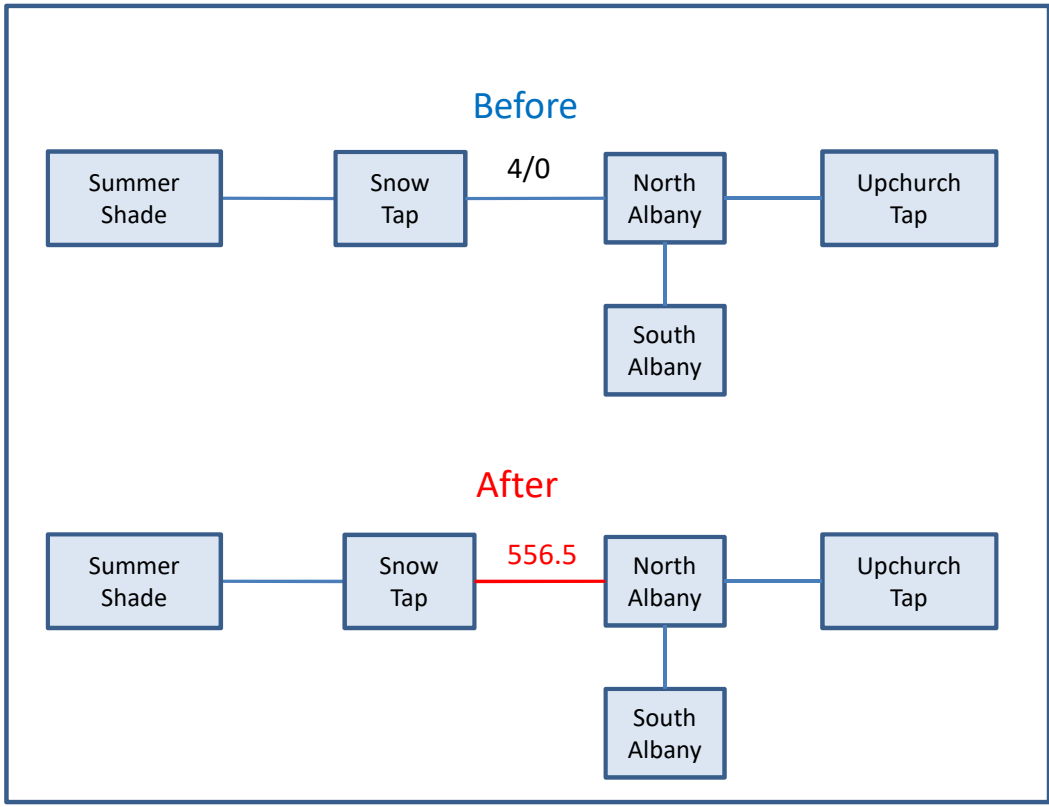
2. Build a new line from Snow-Upchurch and retire Snow Tap-Albany.
Transmission Cost: $6.3M
Distribution Cost: $0.0M

3. Build a new line from Snow-Albany and retire Snow Tap-Albany.
Transmission Cost: $5.8M
Distribution Cost: $0.0M

Projected In-Service: 7/1/2026

Project Status: Engineering

Model: N/A



EKPC Transmission Zone M-3 Process
Shepherdsville & Brooks

Need Number: EKPC-2023-013

Process Stage: Need Meeting – October 20, 2023

Supplemental Project Driver:

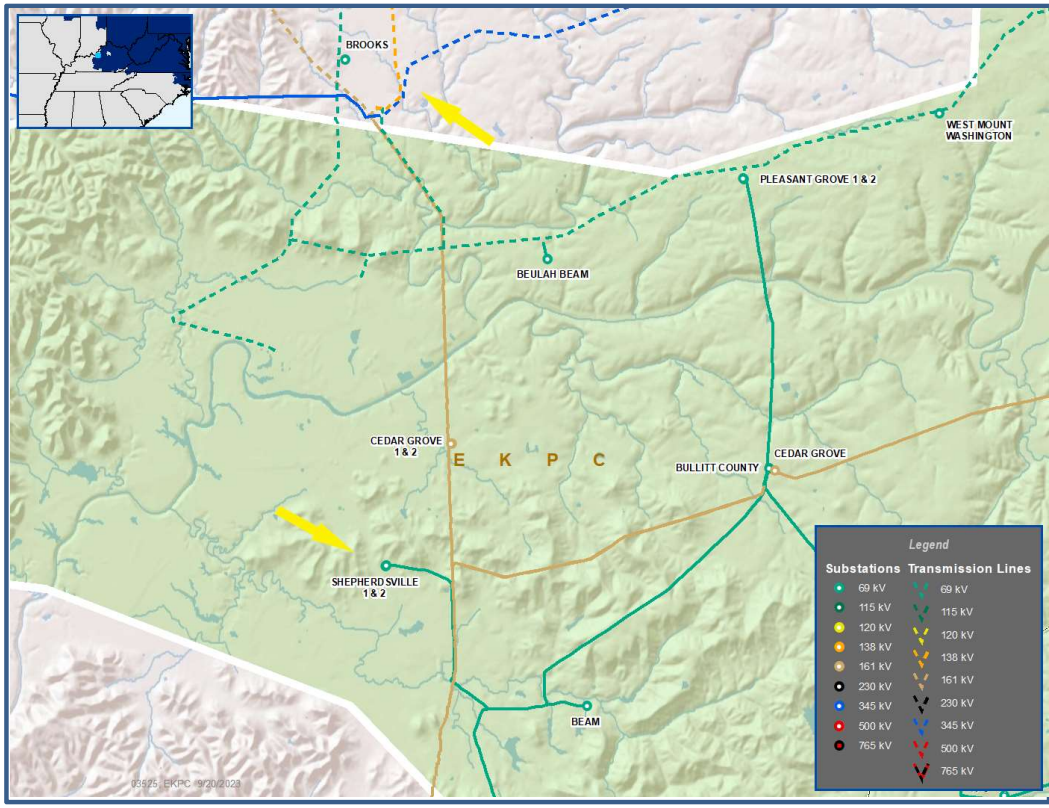
Customer Service

Specific Assumption Reference:

EKPC Assumptions Presentation Slide 15

Problem Statement:

Based on load forecast, the Brooks 69-12.5 kV, 15/20/25 MVA distribution transformer and the Shepherdsville #2 69-12.5 kV, 11.2/14 MVA distribution transformers are forecasted to overload during the upcoming summer peak periods. Additionally in 2022 summer, the Shepherdsville #2 transformer experienced actual loading greater than its summer rating. Alternatives will be developed to address these transformer loading issues.



Model: N/A

EKPC Transmission Zone M-3 Process
West Shepherdsville

Need Number: EKPC-2023-013

Process Stage: Solutions Meeting – November 17, 2023

Proposed Solution:

Construct a new West Shepherdsville 69-13.2 kV, 12/16/20 MVA substation with an associated 4.0-mile 69 kV tap line from the existing Shepherdsville substation tap.

Transmission Cost: $0.0M
Distribution Cost: $9.8M

Ancillary Benefits:

- Eliminates a distribution feeder upgrade between Brooks and Shepherdsville.
- Shifts load from the LG&E/KU transmission system (at Brooks) to the EKPC transmission system.

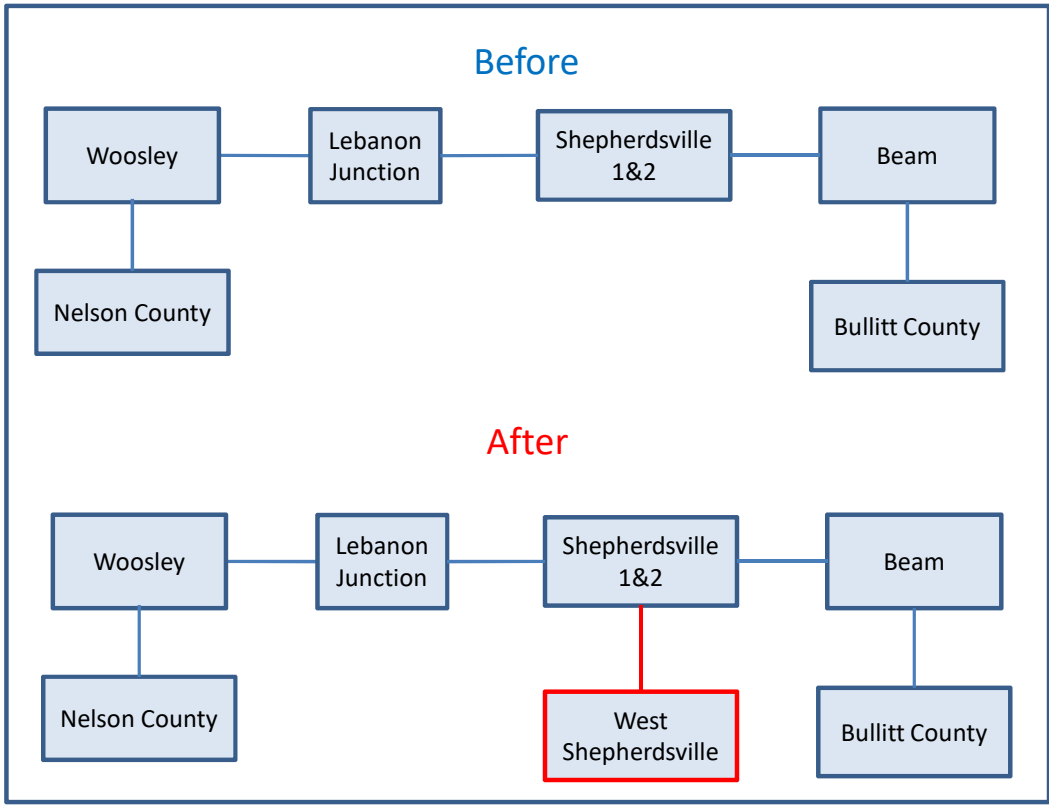
Alternatives Considered:

1. Upgrade the Brooks substation transformer using a 24/32/40 MVA unit and purchase a spare transformer. Upgrade the Shepherdsville #2 substation transformer to a 12/16/20 MVA unit.
Transmission Cost: $0.0M
Distribution Cost: $5.4M

2. Construct a new West Shepherdsville 69-13.2 kV, 12/16/20 MVA substation with an associated 3.9-mile 69 kV tap line from the existing Shepherdsville substation tap; construct 2.85 miles of 69 kV line parallel to the existing Shepherdsville substation tap to loop into the Bullitt County-Nelson County 69 kV line.
Transmission Cost: $3.3M
Distribution Cost: $7.9M

3. Construct a new West Shepherdsville 161-13.2 kV, 12/16/20 MVA substation with an associated 4.4-mile 161 kV tap line from the EKPC portion of the Cedar Grove Industrial-Bullitt County 161 kV line.
Transmission Cost: $7.5M
Distribution Cost: $5.4M

4. Construct a new Brooks South 69-13.2 kV, 12/16/20 MVA substation near the Sabert industrial facility with an associated 1-mile 69 kV tap line from the LG&E/KU Blue Lick-Conestoga 69 kV line. Upgrade the Shepherdsville #2 substation transformer to a 12/16/20 MVA unit.
Transmission Cost: $0.0M
Distribution Cost: $7.4M



Projected In-Service: 6/1/2025

Project Status: Engineering

Model: N/A

EKPC Transmission Zone M-3 Process
Lebanon

Need Number: EKPC-2023-014

Process Stage: Need Meeting – October 20, 2023

Supplemental Project Driver:
Customer Service

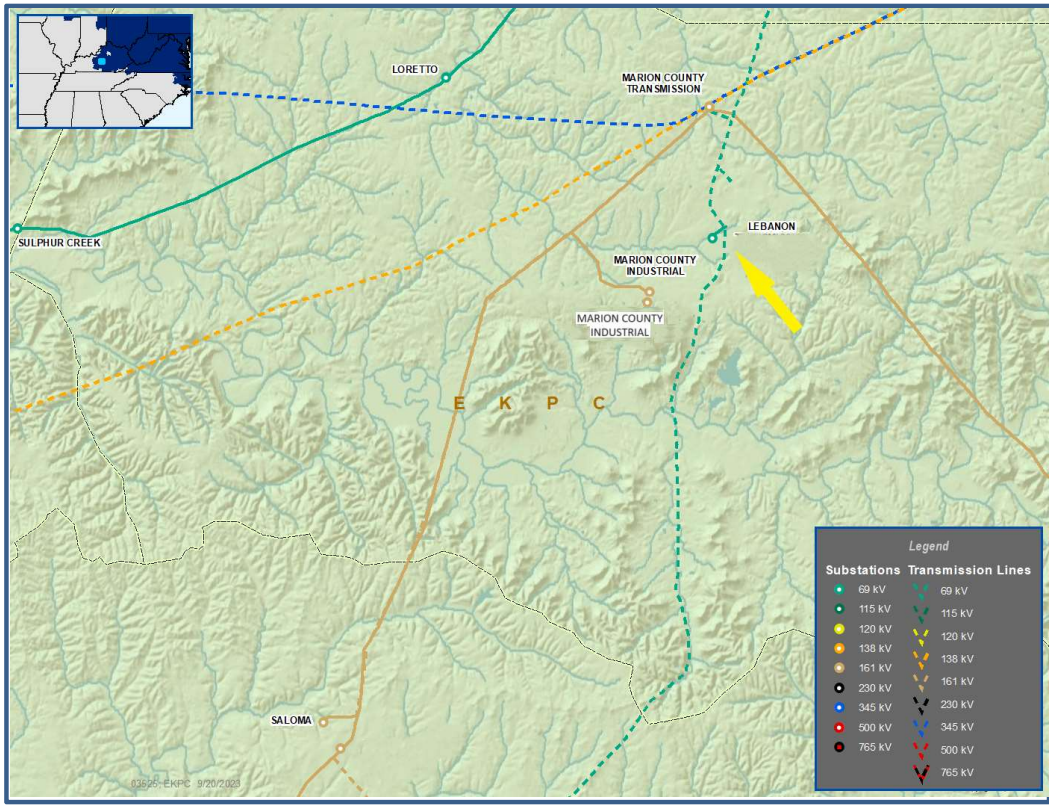
Specific Assumption Reference:
EKPC Assumptions Presentation Slide 15

Problem Statement:

The Lebanon distribution substation is located in Lebanon, KY and is served from the LG&E/KU 69 KV transmission system. Base on load forecast, the Lebanon 69-25 kV, 11.2/14 MVA distribution transformer is forecasted to overload in 2026/27 winter. Additionally, the distribution circuits in the area are experiencing high loading issues. Load transfers to a nearby substation has been utilized historically to reduce loading but have been exhausted due to the distribution circuit loading in the area.

Alternatives will be developed to address the transformer loading and distribution system issues in the area.

Model: N/A



EKPC Transmission Zone M-3 Process
Metts Dr

Need Number: EKPC-2023-014

Process Stage: Solutions Meeting – November 17, 2023

Proposed Solution:

Construct a new Metts Drive 161-25 kV, 12/16/20 MVA distribution substation. New substation will be served by extending the Marion County Industrial Park 161 KV tap line by 0.9 miles. Construct a new 2.28 mile, parallel 161 kV line section extending from the existing Marion County Industrial tap point to the South Marion County Industrial distribution substation. Install normally open switch at the existing Marion County Industrial tap point.

Transmission Cost: $2.95M
Distribution Cost: $5.4M

Ancillary Benefits:

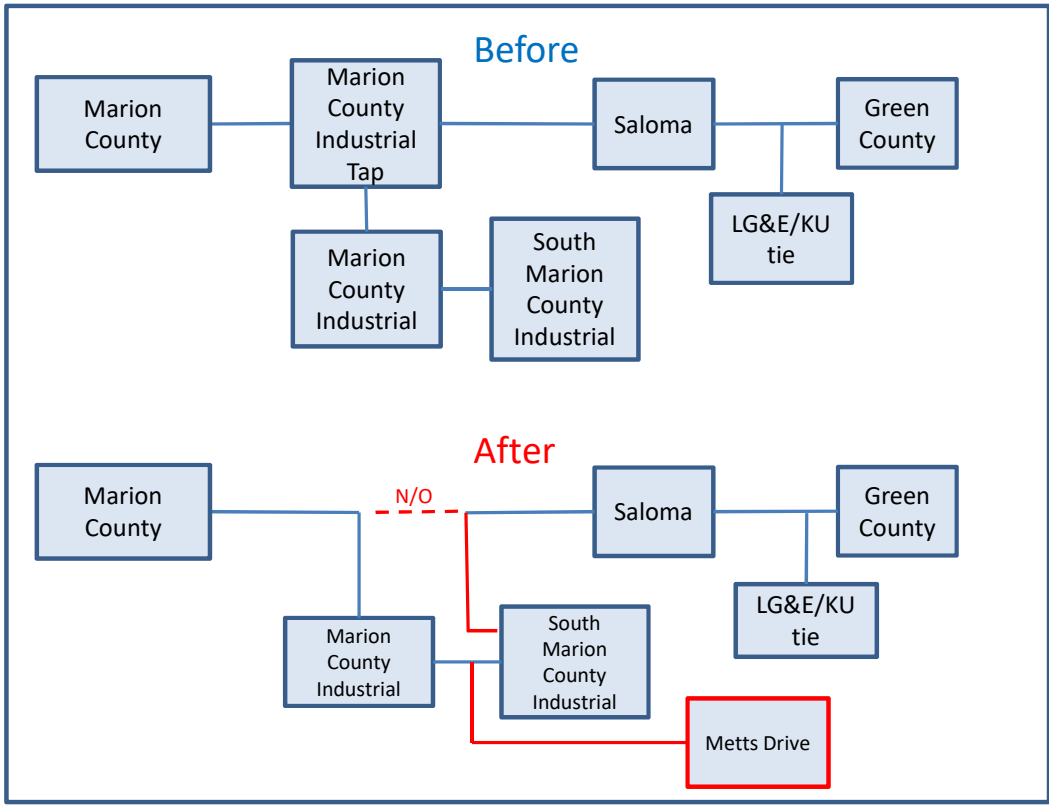
- Shifts load from the LG&E/KU transmission system to the EKPC transmission system.

Alternatives Considered:

1. Build a new 161 KV, 12/16/20 MVA distribution substation, parallel new 161 kV line section extending from the existing Marion County Industrial tap point (1.6 mi). New substation will tap the existing Marion County Industrial/ South Marion County Industrial 161 KV tap line 1.6 miles from the tap point. Keep the existing Lebanon substation as is.
Transmission Cost: $2.7M
Distribution Cost: $7.1M

2. Build a new 161 KV, 12/16/20 MVA distribution substation. New substation will tap the Marion County-Green County 161 KV line. Tap point will be ~0.85 mile from the Marion County Industrial/ South Marion County Industrial 161 KV tap point towards Green County. Keep the existing Lebanon substation as is.
Transmission Cost: $0.0M
Distribution Cost: $7.1M

3. Build a new KU 69 kV, 12/16/20 MVA distribution substation. New substation will tap the Taylor County - Lebanon KU 69 kV line. Tap point will be ~0.5 mile south from the KU Lebanon South substation. Retire Lebanon substation.
Transmission Cost: $0.0M
Distribution Cost: $6.4M



Projected In-Service: 6/1/2027

Project Status: Engineering

Model: N/A

EKPC Transmission Zone M-3 Process
KU Fawkes-West Berea

Need Number: EKPC-2023-015

Process Stage: Need Meeting – October 20, 2023

Supplemental Project Driver:
Equipment Material Condition, Performance and Risk
Operational Flexibility and Efficiency & Infrastructure Resilience

Specific Assumption Reference:
EKPC Assumptions Presentation Slide 13, 14 & 16

Problem Statement:

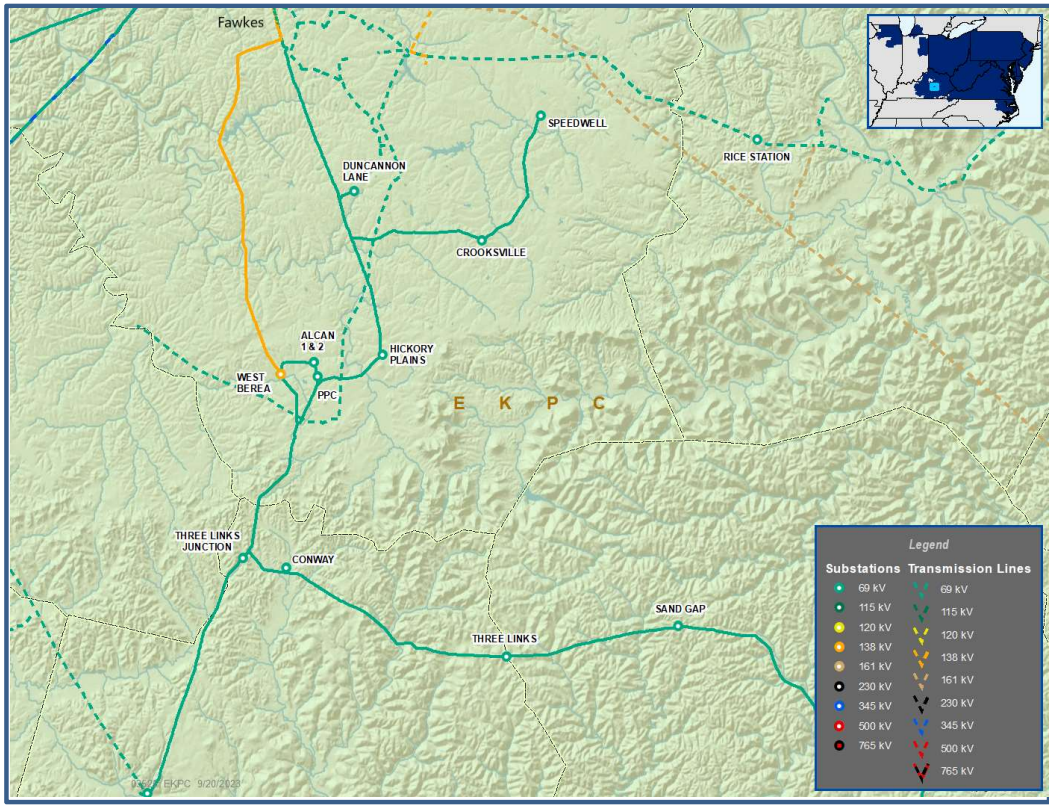
The 20.5 mile (not including tap lines), KU Fawkes-West Berea 69 KV transmission circuit currently serves nearly 6,000 customers including several industrial customers via 7 distribution substation.

This circuit currently has 16.3 miles of transmission and tap lines with reliability concerns, including wood pole deterioration, multiple identified structural loading issues as well as many recurring maintenance activities related to leaning structures/poles and cross arms failures. There are currently 66 open work orders associated with structure issues such as degraded poles.

The 9.1 mile, Speedwell 69 KV tap line creates system protection issues resulting in slow operations for faults near the Speedwell distribution substation. This does not adhere to EKPC's setting criteria which leads to sequential tripping and remote coordination issues.

Alternatives are being evaluated to address all issues listed above.

Model: N/A



EKPC Transmission Zone M-3 Process
KU Fawkes-West Berea

Need Number: EKPC-2023-015

Process Stage: Solutions Meeting – November 17, 2023

Proposed Solution:

Rebuild the 16.3 mile, Duncannon Lane Tap-West Berea 69 KV line sections using 795 conductor and steel pole construction. Construct a new Madison County 69 KV switching station near the Duncannon Lane Tap point. This project will also include a new section of 69 kV double circuit line between the Crooksville Tap point and the Madison County switching station (approximately 1.3 miles) to serve Crooksville and Speedwell radially from the new Madison County switching station. Additionally, Duncannon Lane will be served radially from the new switching station.

Transmission Cost: $15.5M
Distribution Cost: $3.0M

Ancillary Benefits:

- Supports local load growth

Alternatives Considered:

1. Perform structure replacements from Duncannon Lane Tap-West Berea 69 KV line sections. Build a new 69 KV switching station in the vicinity of Crooksville/Speedwell Tap. Expand the Union City 138 KV substation to step down to 69 KV, build a new 5 mile 69 KV line from Union City to Speedwell. Rebuild Crooksville Tap-Crooksville using 795 conductor.
Transmission Cost: $28.5M
Distribution Cost: $0.0M

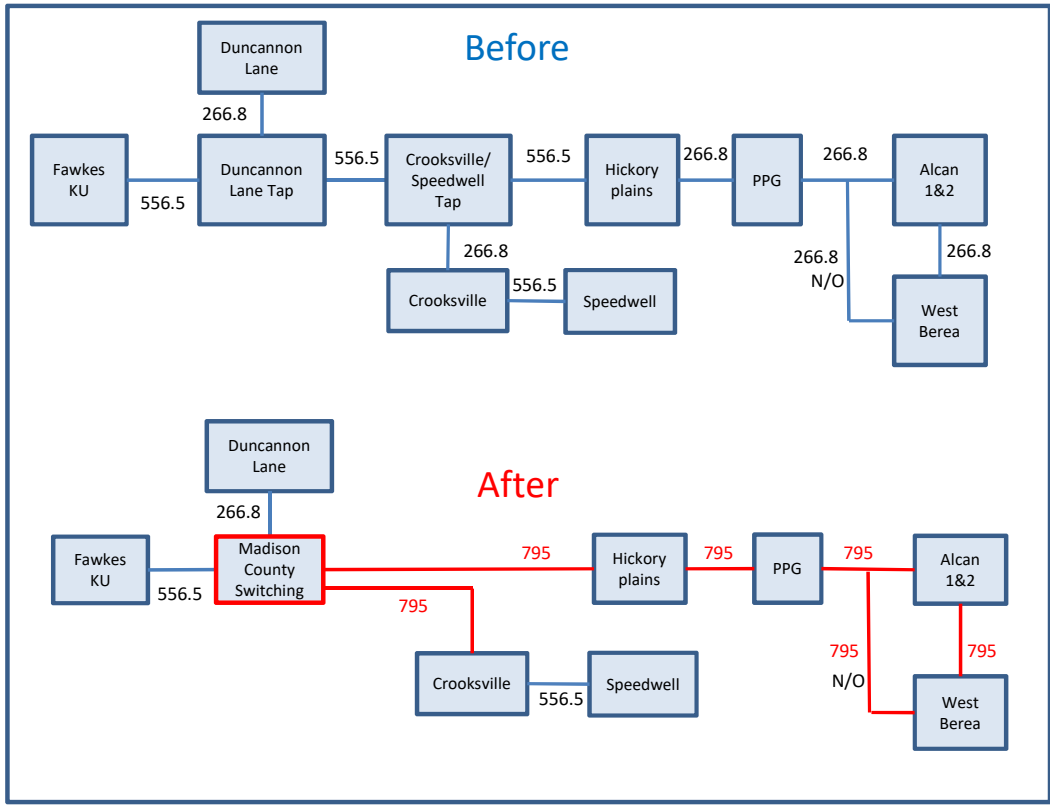
2. Perform structure replacements from Duncannon Lane Tap-West Berea 69 KV line sections. Build a new 69 KV switching station in the vicinity of Crooksville/Speedwell Tap. Replace all wood pole structures/framing w/ steel pole structures/framing along the Crooksville Tap-Crooksville line section while energized.
Transmission Cost: $14.6M
Distribution Cost: $3.6M

3. Perform structure replacements from Duncannon Lane Tap-West Berea 69 KV line sections. Build a new 69 KV switching station in the vicinity of Crooksville/Speedwell Tap. Construct a new 69 KV line parallel to the existing Crooksville Tap-Crooksville line and retire the existing line.
Transmission Cost: $13.8M
Distribution Cost: $4.2M

Projected In-Service: 7/1/2026

Project Status: Engineering

Model: N/A



APS Transmission Zone M-3 Process
Misoperation Relay Projects

Need Numbers: APS-2023-036, APS-2023-041 to APS-2023-043, APS-2023-045 to APS-2023-049

Process Stage: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/20/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

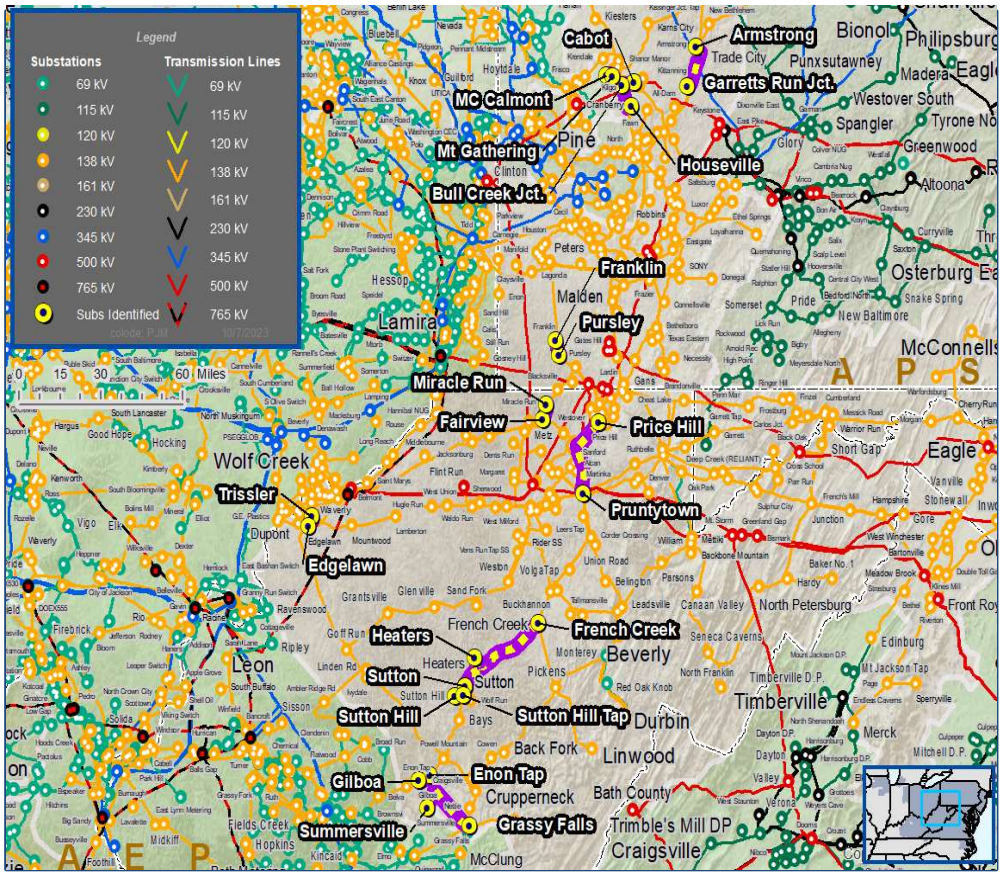
- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.



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FirstEnergy

APS Transmission Zone M-3 Process Misoperation Relay Projects

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)
APS-2023-036	Franklin – Pursley 138 kV	287 / 314	308 / 376
APS-2023-041	Fairview – Miracle Run Tap 138 kV	175 / 228	308 / 376
APS-2023-042	Armstrong – Garretts Run Junction 138 kV	294 / 350	308 / 376
APS-2023-043	Trissler– Edgelawn 90 138 kV	225 / 295	308 / 376
APS-2023-045	Heaters Tap – Sutton 138 kV	97 / 105	107 / 128
APS-2023-046	Gilboa – 304 Junction 138 kV	229 / 229	278 / 339
	Grassy Falls – Summersville 138 kV	229 / 229	309 / 376
APS-2023-047	Price Hill – Pruntytown 138 kV	221 / 268	221 / 268
APS-2023-048	Cabot – Bull Creek Junction 138 kV	308 / 376	308 / 376
	Bull Creek Junction – Houseville 138 kV	294 / 350	297 / 365
	Mountain Gathering – McCalmont 138 kV	267 / 352	297 / 365
APS-2023-049	Sutton Hill Tap – Sutton 138 kV	85 / 105	85 / 106
	Sutton Hill Tap – Sutton Hill 138 kV	89 / 96	107 / 128

APS Transmission Zone M-3 Process
Misoperation Relay Projects

Proposed Solution:

Need #	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimated Cost	Target ISD
APS-2023-036	Franklin – Pursley 138 kV	308 / 376	• At Franklin Substation, replace circuit breaker, disconnect switches, line trap, substation conductor and relaying • At Pursely Substation, replace substation conductor and relaying	$2.2 M	11/29/2024
APS-2023-041	Fairview – Miracle Run Tap 138 kV	308 / 376	• At Fairview Substation, replace circuit breaker, disconnect switches, substation conductor and relaying	$2.8 M	06/16/2023
APS-2023-042	Armstrong – Garretts Run Junction 138 kV	308 / 376	• At Armstrong Substation, replace disconnect switches, substation conductor and relaying	$2.5 M	05/26/2023
APS-2023-043	Trissler– Edgelawn 90 138 kV	294 / 350	• At Trissler Substation, replace wave trap, disconnect switches and relaying • At Edgelawn Substation, replace circuit breaker, line trap and relaying	$3.3 M	12/01/2022
APS-2023-045	Heaters Tap – Sutton 138 kV	107 / 128	• At Sutton Substation, replace line trap and relaying	$1.5 M	05/10/2024
APS-2023-046	Gilboa – 304 Junction 138 kV	278 / 339	• At Gilboa Substation, replace circuit breaker, disconnect switches, line trap and relaying	$4.3 M	12/01/2023
	Grassy Falls – Summersville 138 kV	309 / 376	• At Grassy Falls Substation, replace circuit breaker, disconnect switches, line trap and relaying		

APS Transmission Zone M-3 Process
Misoperation Relay Projects

Proposed Solution:

Need #	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimated Cost	Target ISD
APS-2023-047	Price Hill – Pruntytown 138 kV	221 / 268	• At Pruntytown Substation, replace line trap and relaying • At Price Hill Substation, replace line trap and relaying	$2.3 M	12/19/2023
APS-2023-048	Cabot – Bull Creek Junction 138 kV	308 / 376	• At Cabot Substation, replace circuit breakers, disconnect switches, substation conductor and relaying	$5.3 M	12/15/2023
	Bull Creek Junction – Houseville 138 kV	297 / 365	• At Houseville Substation, replace circuit breaker, disconnect switches, substation conductor and relaying		
	Mountain Gathering – McCalmont 138 kV	297 / 365	• At McCalmont Substation, replace circuit breaker, disconnect switches, line trap, substation conductor and relaying		
APS-2023-049	Sutton Hill T – Sutton 138 kV	85 / 106	• At Sutton Substation, replace circuit breaker, line trap and relaying	$1.8 M	01/29/2024

Alternatives Considered: Maintain equipment in existing condition and risk of misoperation of protective relays.

Project Status: In construction/Engineering

Model: 2023 RTEP model for 2028 Summer (50/50)

APS Transmission Zone M-3 Process
Cumberland Substation

Need Numbers: APS-2023-051

Process Stage: Solution Meeting 11/17/2023

Previously Presented: Need Meeting 10/20/2023

Project Driver:
- *Equipment Material Condition*
- *Performance and Risk*
- *Infrastructure resilience*

Specific Assumption Reference:
- Substation Condition Rebuild/Replacement
  - Age/condition of structural components
- System Performance Projects Global Factors
  - System reliability and performance

Problem Statement:
- Existing switches at Cumberland Substation are beyond reliable operation.
  - Severe alignment issues result in improper closures, requiring a hammer to manually close, resulting in a safety issues
  - Switch mounting insulators often break during this process, resulting in live parts falling, creating a potential for accidents and system faults.

The Short Gap – Cumberland 138 kV Line is limited by substation conductor
- Existing line rating:
  - 299/358/349/410 MVA (SN/SE/WN/WE)
- Existing conductor rating:
  - 308/376/349/445 MVA (SN/SE/WN/WE)

Legend	
500 kV	
345 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
34.5 kV	
23 kV	
New	

APS Transmission Zone M-3 Process
Cumberland Substation

Need Number: APS-2023-051

Process Stage: Solution Meeting 11/17/2023

Proposed Solution:

- At Cumberland Substation:
  - Replace conductor and disconnect switches on Short Gap 138 kV line terminal

Transmission Line Ratings:

- Cumberland – Short Gap 138 kV Line:
  - Before Proposed Solution: 299 / 358 / 349 / 410 MVA (SN / SE / WN / WE)
  - After Proposed Solution: 299 / 360 / 349 / 422 MVA (SN / SE / WN / WE)

Alternatives Considered:

- Maintain existing condition with risk of switch not operating properly when needed.

Estimated Project Cost: $ 0.4 M

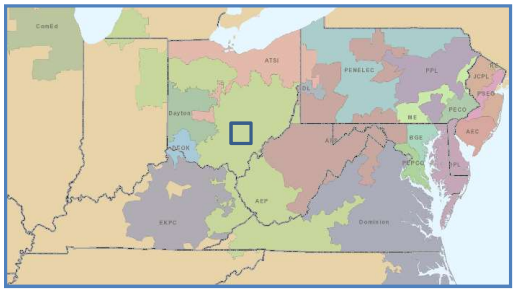
Projected In-Service: 12/31/2023

Project Status: Construction

Model: 2023 RTEP model for 2028 Summer (50/50)

Legend	
500 kV	
345 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
34.5 kV	
23 kV	
New	

AEP Transmission Zone M-3 Process
Lancaster Area Improvements



Need Number: AEP-2020-OH026
Process Stage: Solutions Meeting 11/17/2023
Previously Presented: Need Meeting 04/20/2020
Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

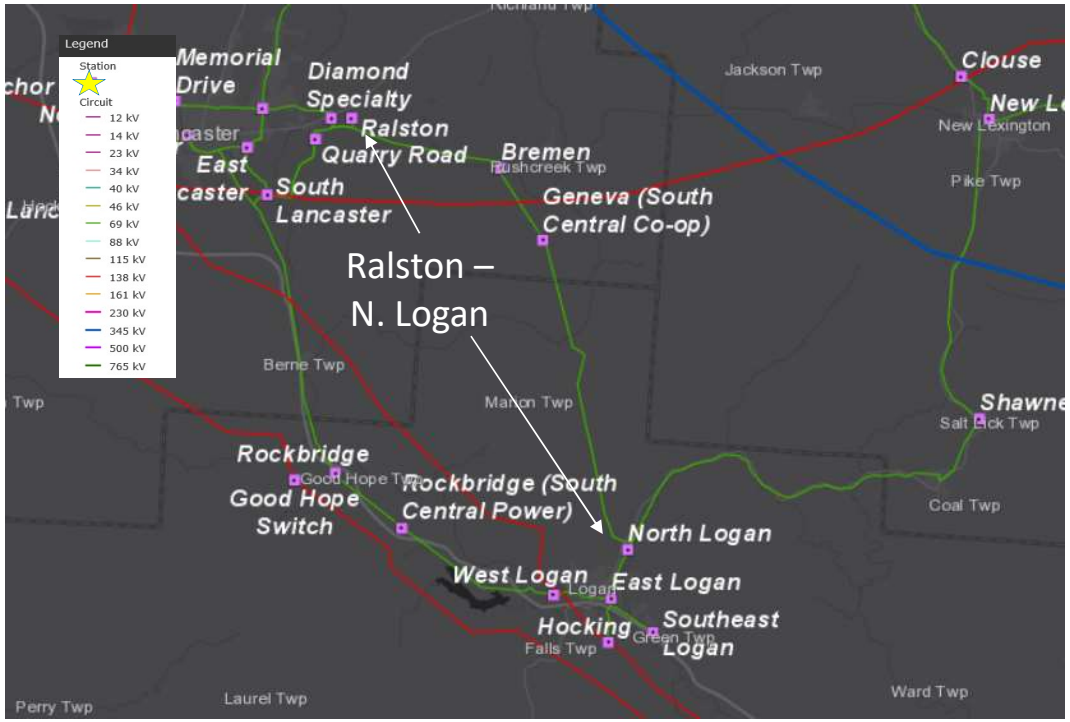
Ralston – North Logan 69 kV

- Original Install Date (Age): 1950's and 1960's
- Length of Line: 15.3 miles
- Total structure count: 148
- Original Line Construction Type: Wood
- Conductor Type: 336.4 ACSR 30/7
- Momentary/Permanent Outages and Duration: 13 Momentary and 5 Permanent outages
- CMI (last 5 years only): 1,496,000

Line Condition Summary:

Ralston – North Logan line section:

- 84 structures with at least one open condition.
- 59 structure related open conditions including broken crossarms, insect damage, rot heart, rot top, split poles and crossarms, and woodpecker holes
- 9 open conditions related to the conductor, including broken strands
- 7 open conditions related to the shielding wire and grounding, including broken shield wire strands
- 30 hardware related open conditions related to insulator, conductor hardware, or shield wire hardware, including broken, burnt, or chipped insulators



AEP Transmission Zone M-3 Process
Lancaster Area Improvements

Need Number: AEP-2021-OH026
Process Stage: Solutions Meeting 11/17/2023
Previously Presented: Need Meeting 05/21/2021
Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Problem Statement:

Section of the Lancaster Junction – Ralston 69kV Line, Single Circuit (Lancaster Junction – Str 273):

- Age: 1955
- Length of Line Section: ~0.02 Miles
- Structure Count: 2
  - Structure Type: Wood
- Conductor Type: 556,500 CM ACSR 18/1 (Osprey)
- Outage History: 12 Momentary and 4 Permanent outages with a total CMI of 3,113,139.
- This is currently a three terminal line, which can cause miss-operations and over-tripping of the line.
- Section of the South Lancaster – East Lancaster 69kV Line, Single Circuit (East Lancaster - Str 310):
- Age: 1965
- Length of Line Section: ~0.01 Miles
- Structure Count: 1
  - Structure Type: Wood
- Conductor Type: 556,500 CM ACSR 18/1 (Osprey)
- Outage History: 8 Momentary and 2 Permanent outages
- This is currently a three terminal line, which can cause miss-operations and over-tripping of the line.

Clouse – West Lancaster 138kV, Double Circuit:

- Age: 1942
- Line Length: ~22.78 Miles
- Total Structures: 106
  - Structure Type: Steel Lattice
- Conductor Type: 397,500 CM ACSR 30/7 (Lark)
- Outage History: 6 momentary and 3 permanent outages with a total CMI of 208,134
- Open conditions: 60 total open conditions; 9 out of 106 structures have at least 1 open condition 8.5% of structures.
- Junction City Switch (2005): SCP has backup capability for Junction City, but only during light loading conditions. During peak loading, they cannot back feed their load.

AEP Transmission Zone M-3 Process
Lancaster Area Improvements

Need Number: AEP-2021-OH027
Process Stage: Solutions Meeting 11/17/2023
Previously Presented: Need Meeting 05/21/2021
Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

West Lancaster Station

Circuit Breakers: D & E (138 kV)

- Breaker Age: 1991: D & E
- Interrupting Medium: (SF6)
- Fault Ops: D: 40 & E: 8 (Manufactured recommended number of fault ops is 10)
- Additional Info: This type of breaker has had 411 malfunction records (mostly gas leaks and contact resistance concerns) and most problems reported with loss of SF6 and miss-operations.

Circuit Breakers: C & J (69 kV)

- Breaker Age: 1966: C & 1963: J
- Interrupting Medium: (Oil)
- Fault Ops: C: 87 & J: 5 (Manufactured recommended number of fault ops is 10)

Additional Info: . These breakers are McGraw-Edison CF/CG/CGH/CH family of oil filled breakers without oil containment; Oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require. This model family has experienced major malfunctions associated with their OA-3 hydraulic mechanism, which includes low-pressure readings, hydraulic leaks, pump lockouts, and failure to shut off. These mechanism malfunctions have led to several failures to close and other types of mis-operations across the AEP fleet.

Circuit Switcher: BB (69 kV)

- Switcher Age: 1989
- Interrupting Medium: (SF6)
- Additional Info: This switcher is a Mark V type that has no gas monitor and currently in-service units on the AEP system have experienced 110 malfunctions from May 2000 to August 2019. Failed operational components including high contact resistance, gas loss, and interrupter failure represent half of these malfunctions. Two malfunctions of note were catastrophic equipment failures involving failures to trip.

AEP Transmission Zone M-3 Process
Lancaster Area Improvements

Need Number: AEP-2021-OH027
Process Stage: Solutions Meeting 11/17/2023

Problem Statement Continued:

West Lancaster - continued

138/69kV Transformer 2 (60 MVA)

- Age: 1966
- Overheating events indicate decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault.
- No oil containment.
- High side disconnect switches need replaced.
- Additional Info.: Currently no sectionalizing on either side of Transformer 1 & 2, there are three dissimilar zones of protection (138 kV Bus, Transformer & 69 kV Bus) .

Relaying:

Currently, 40 of the 74 relays (54% of all station relays) are in need of replacement. There are 38 of the electromechanical type and 2 of the static type which have significant limitations with regards to fault data collection and retention. These relays lack vendor support and have little to no access to spare parts.

Control House:

- Asbestos on walls, roof and cables
- Structural Integrity is in question – this needs replaced as soon as possible.
- Relays systems are not set up for dual battery configuration
- Cable entrance is 100% full

AEP Transmission Zone M-3 Process
Lancaster Area Improvements

Need Number: AEP-2020-OH026, AEP-2021-OH026, AEP-2021-OH027
Process Stage: Solutions Meeting 11/17/2023

Proposed Solution:

Ralston - North Logan 69 kV Line : Retire the line section between North Logan – Geneva Switch (~9.0 miles) between Str. 70 – 147 and rebuild a portion as double circuit from Geneva Sw up to Str. 70/71 (~1.15 miles). Cost: $9.67M

East Logan – Shawnee 69 kV Line : Six-wire the 69 kV line between N. Logan – E. Logan (Str. 2-43) and terminate the E. Logan – New Lexington 69 kV circuit into the now vacated Ralston – N. Logan 69 kV line position at N. Logan station at/near structure 44 to form the new N. Logan – New Lex. 69 kV circuit. Remove sections between Str. 43 – 44 and Str. 2 – E. Logan (CB-L). Cost: $1.28M

Clouse - West Lancaster 138 kV: Rebuild ~23 miles of 138 kV line between West Lancaster and Clouse stations. The existing double circuit line will be rebuilt as double circuit between West Lancaster and just east of South Lancaster station along with the section between structure 96 and Clouse station. The remaining ~5.6 miles of the line will be rebuilt as single circuit. The section between structure 96 and Clouse will have one circuit of the double circuit operated at 69 kV to form the South Lancaster – Clouse circuit to allow for the retirement of the Ralston – North Logan line south. 69 kV and 138 kV line extensions will be installed into Clouse station, using 795 ACSR conductor SE 360 MVA. Cost: $65.81M

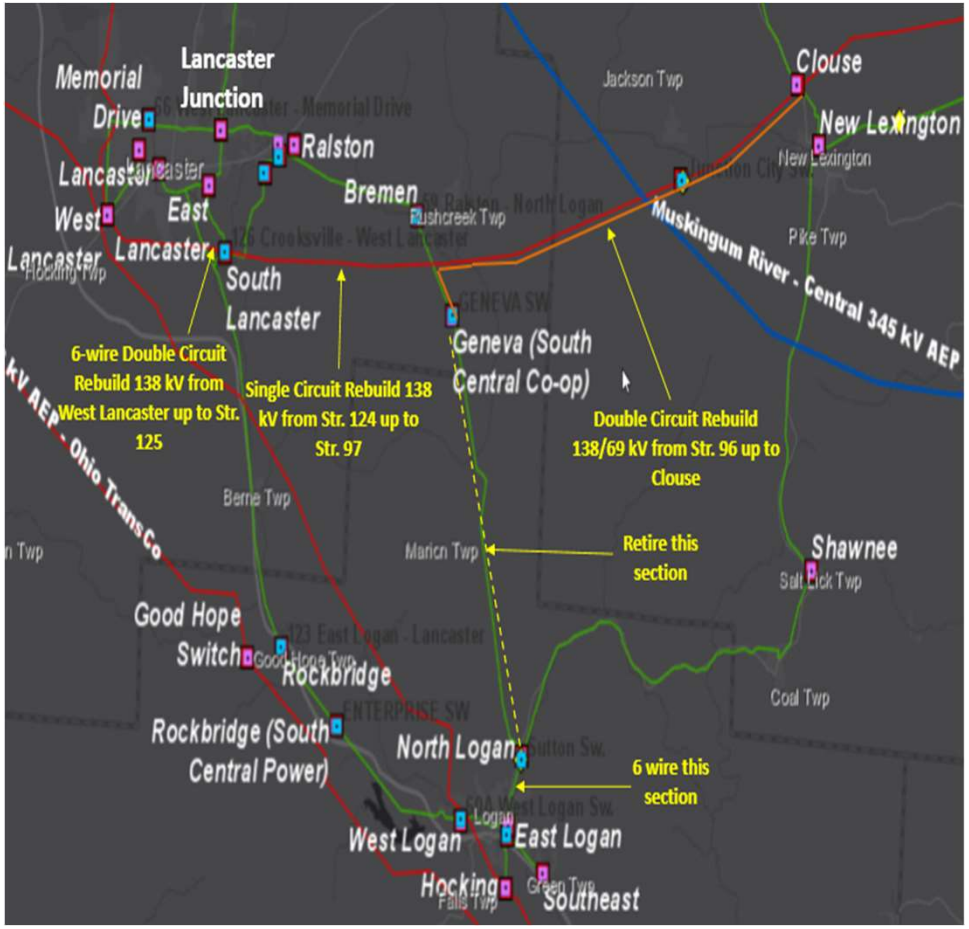
East Logan – South Lancaster 69 kV Line : Re-terminate this line at East Logan to utilize CB-P, which is a newer vintage breaker in better health than existing breaker M. Cost: $0.72M

East Logan 69 kV: Retire 69 kV CB-M and repurpose CB-P for re-terminating the South Lancaster circuit. Cost: $0.77M

Clouse 138 kV & 69 kV: Add a 138 kV, 3000 A, 63 kA breaker to accommodate the new 138 kV line from Crooksville. Add a 69 kV, 3000 A, 40 kA breaker to accommodate the new 69 kV line from South Lancaster (thru Geneva Sw). Install all associated attachment facilities. DICM expansion will likely be required. Cost: $1.67M

Geneva Sw 69 kV: Replace & relocate the existing PoP Switch with a 3-way 1200A PoP Switch. Cost: $0.95M

Junction City 138 kV: Replace the existing 2-way POP with a 3-way 2000A POP. Cost: $1.15M



AEP Transmission Zone M-3 Process
Lancaster Area Improvements

Need Number: AEP-2020-OH026, AEP-2021-OH026, AEP-2021-OH027
Process Stage: Solutions Meeting 11/17/2023

Proposed Solution Continued:

West Lancaster 138 kV & 69 kV: Replace T2 with a 90MVA bank. Replace 138 kV CB-D with 1 - 138 kV, 3000 A, 40 kA circuit breaker, 69 kV CB-C & CB-J with 2 – 69kV 3000 A, 40 kA circuit breakers, 69 kV CS-BB with 1 – 69 kV 2000A 31.5 kA circuit breaker and, the control building with DICM & new relays. Retire 138 kV CB-E. Replace 69 kV Bus 1 PT's. Cost: $10.83M. **Note: Work will be coordinated with previously proposed upgrades at station captured under S2857.9.**

South Lancaster 138 kV & 69 kV: Add 2 - 69 kV, 3000 A, 40 kA and 2- 138 kV, 3000 A, 40 kA circuit breakers to the low and high sides of T1 and T2. Upgrade transformers' protection. Cost: $3.22M

Lancaster – E. Lancaster – S. Lancaster 69 kV: In order to mitigate the 3-terminal line, 0.2 miles of 69 kV double circuit line, including several dead end and turning structures, will be constructed to loop the circuit into East Lancaster station. Cost: $2.39M

East Lancaster 69 kV: Extend the bus to accommodate a new line. Install one new 69 kV, 3000 A, 40 kA breaker and all associated attachment facilities (relays, bus work, risers, and switches). Retire the 69 kV cap bank. Cost: $1.04M

Lancaster Jct – E. Lancaster – Ralson 69 kV : In order to mitigate the 3-terminal line, 0.2 miles of 69 kV double circuit line will be constructed to loop the circuit into Lancaster Junction station. There will be associated telecom work performed as well. Cost: $1.65M

Lancaster Junction 69 kV: Add three 69 kV, 3000 A, 40 kA line breakers at Lancaster Junction and all associated attachment facilities (relays, bus work, risers, and switches). Expand the Station to include two box bays. Retire 69 kV Line & Bus tie switches. Cost: $5.03M

Anchor Hocking, Lancaster, North Logan, New Lexington 69 kV: Remote end PCE work will be performed to accommodate project in area. Cost: $0.69M

Total Estimated Transmission Cost: $108.77

Alternatives Considered:

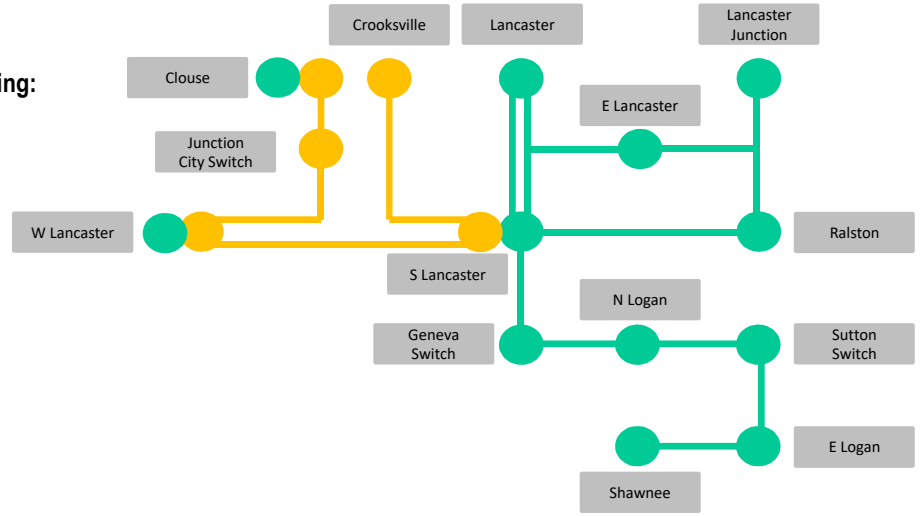
- Rebuild the existing assets as they exist today, including the 9 miles of proposed 69 kV retirement. After discussing needs in the area with AEP Ohio and South Central Power, it was determined that the reconfiguration of the lines still served the needs of the loads and resulted in a lower cost solution. Estimated Cost: $150M

Projected In-Service: 3/1/2029

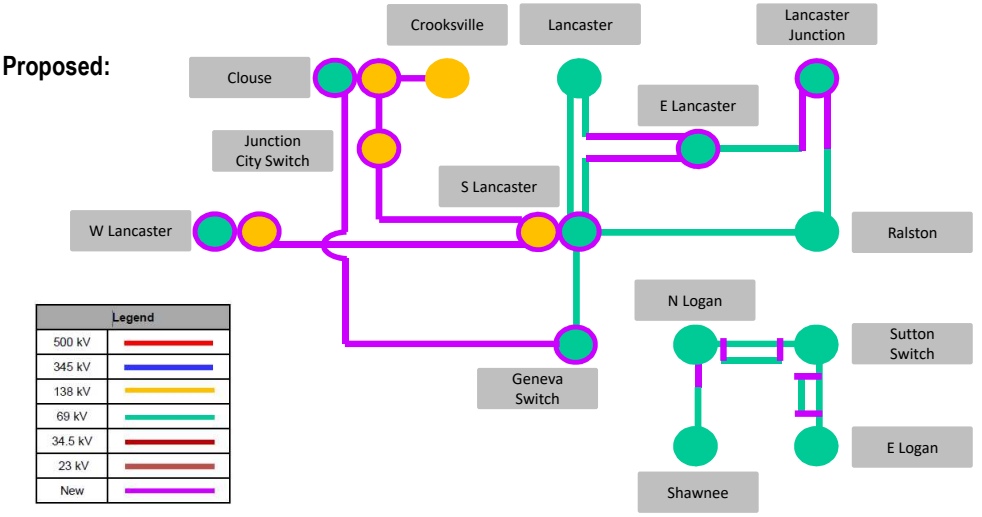
Project Status: Engineering

Model: 2028 RTEP

Existing:



Proposed:



AEP Transmission Zone M-3 Process
Carroll County, VA

Need Number: AEP-2021-AP009

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 3/19/2021

Supplemental Project Driver: Customer Request

Specific Assumptions Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

- A customer has requested service for the establishment of a new distribution station located at the Wildwood Commerce Park site in Hillsville, VA.
- This station is the result of VA House Bill 1840 (HB1840) (Electric Utilities: Pilot Programs for Transmission Facilities Serving Business Parks).

AEP Transmission Zone M-3 Process
Carroll County, VA

Need Number(s): AEP-2021-AP009

Process Stage: Solutions Meeting 11/17/23

Proposed Solution:

Wildwood 138 kV Station ($0 M - Distribution)

- Construct a 138 kV straight bus with 2 MOABs that are SCADA controlled
- Install a 138/34.5 kV, 30 MVA Distribution transformer with two 34.5kV circuit breakers

Wildwood 138 kV Extension ($20.8M)

- Install a new 138kV 3 pole custom tap structure on the Jacksons Ferry – Huffman 138 kV circuit. Construct approximately 4.0 miles of new double circuit 138 kV line with OPGW from the tap location to the new Wildwood substation. The higher cost is due to access road and restoration costs in the state of Virginia. The right of way for this 138kV extension travels in different directions due to hard to obtain easements causing higher line cost. Install ADSS fiber along existing Huffman-Jacksons Ferry line.

Estimated Total Transmission Cost: $20.8 M

Ancillary Benefits:
Establishing a new 138 kV station near the Wildwood Commerce Park will allow for future interconnection opportunities and economic development in the area. This project is the result of VA House Bill 1840 (HB1840) (Electric Utilities: Pilot Programs for Transmission Facilities Serving Business Parks).
At present, AEP/APCO economic development and partners are supporting requests from prospective business inquiries to Wildwood Commerce Park. The Blue Ridge Crossroads Economic Development Authority is in late-stage negotiations with a prospective customer seeking to locate to Wildwood Commerce Park. This project is a confidential/unannounced prospective business opportunity, with initial demand needs forecasted to exceed available distribution system capacity upon completion/full buildout. This prospect is anticipated to make a public announcement in 2024; date for public announcement is pending completion of formal/final stage project review processes.

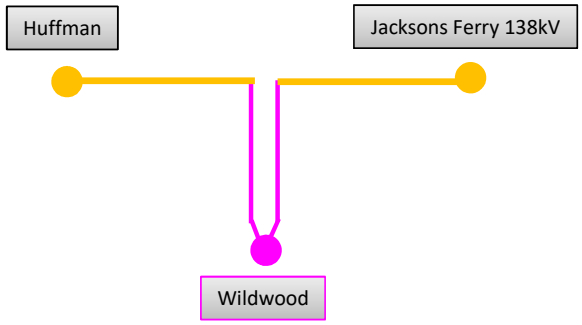
Alternatives Considered: Other 138kV lines were looked at but the Jacksons Ferry – Huffman 138kV circuit was picked due to its proximity to the Wildwood site.

Projected In-Service: 11/15/2024

Project Status: Engineering

Existing

Proposed



Need Number: AEP-2021-AP014

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 03/19/2021

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12, 14)

Problem Statement:

Line Name: Garden Creek – Skeggs Branch – Richlands 69kV

Original Install Date (Age): 1935,1962,1970

Length of Line: ~21 mi

Total structure count: 180

Original Line Construction Type: Wood and Lattice Steel

Conductor Type: 3/0 ACSR 6/1 (Pigeon), 556,500 CM ACSR 26/7 (Dove), and 336,400 CM ACSR 30/7 (Oriole)

Momentary/Permanent Outages: 26 Momentary and 6 permanent Outages

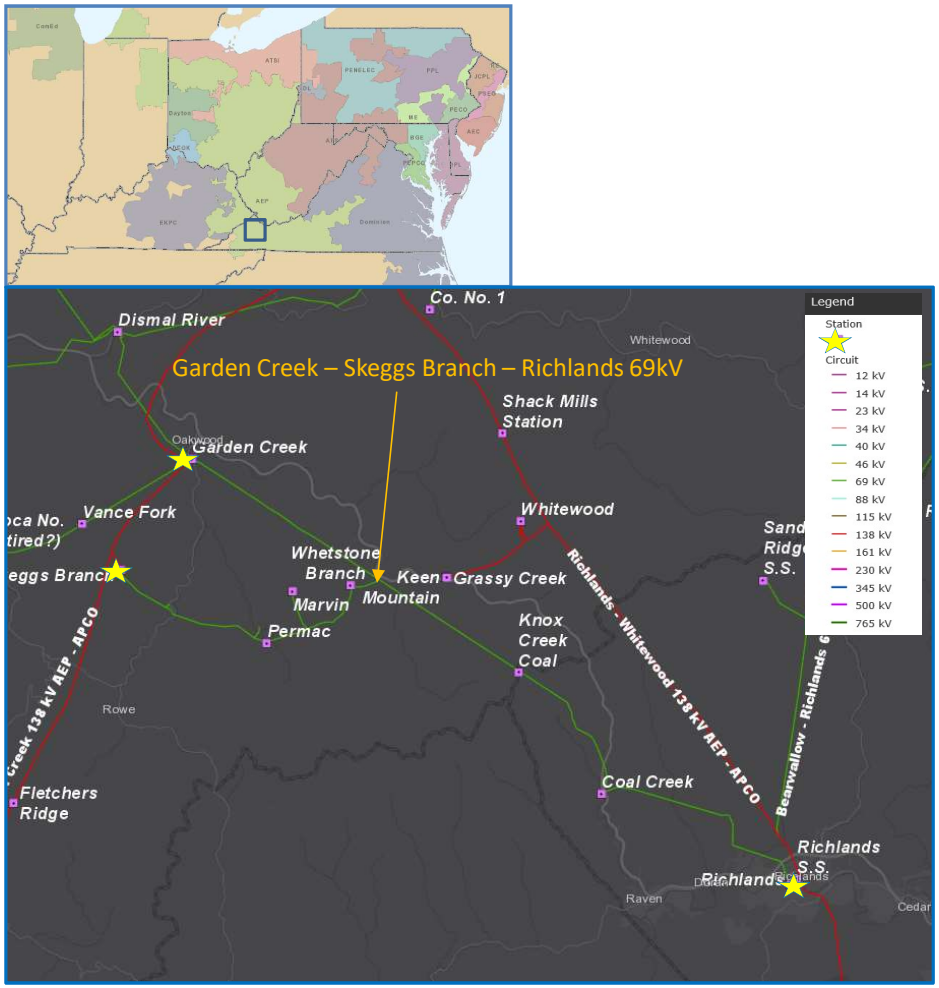
CMI (last 5 years only): 0

Line conditions:

- 42 structures with at least one open structural condition, 23% of the structures on this circuit.
- 73 structure related open conditions impacting wooden poles, lattice steel towers, crossarms, braces, and filler blocks including rot, bowing, woodpecker holes, insect damage, cracked, split, and heavy rust/corrosion.
- 1 open conditions related to broken strands
- 8 hardware related open conditions related to broken or chipped insulators and a buried guy.

Other:

- This circuit is operated normally open at Permac station
- Lack of sectionalizing capability due to multiple stations (Twin Valley SS, Marvin, Clell) being hard tapped to 69kV Line or operated radially
- Whetstone Branch is a 3 terminal switching station with no 69 kV line breakers.
- Only 11.6 miles of this line are currently shielded.



AEP Transmission Zone M-3 Process
Buchanan County & Tazewell County, VA

Need Number: AEP-2021-AP014

Process Stage: Solutions Meeting 11/17/2023

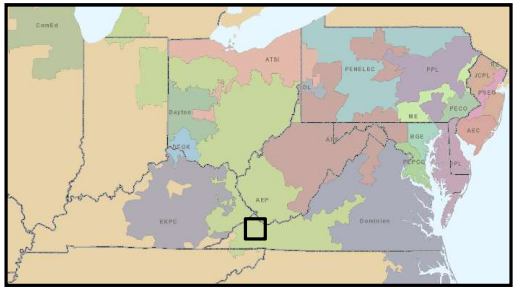
Previously Presented: Needs Meeting 03/19/2021

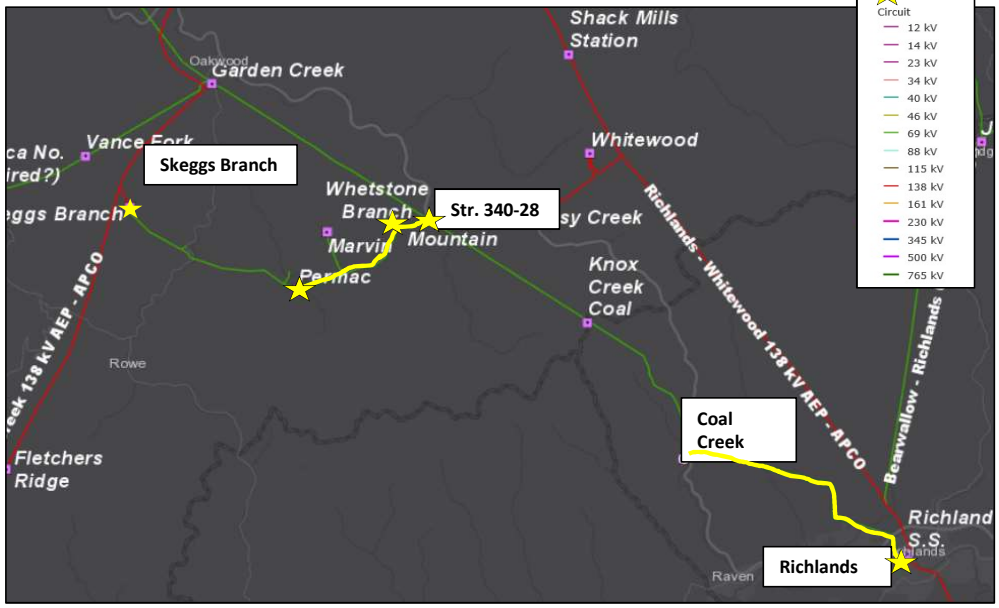
Supplemental Project Driver: Equipment Condition/Performance/Risk

Proposed Solution:

- Rebuild ~2.6 mi portion of the existing Garden Creek - Richlands - Skeggs Branch 69kV Line from the existing Permac station to the existing tap structure 340-28 on the Garden Creek – Skeggs Branch - Richlands. Rebuild ~4.6 mi of the existing Garden Creek - Richlands - Skeggs Branch 69kV Line from the existing Coal Creek to Richlands substation. **Estimated Transmission Cost: $27.2 M**
- At Whetstone Branch Station, replace circuit switcher "AA" with a new, standard, 69kV circuit switcher, replace all metering CTs and PTs with CT/PT combo metering units, and replace the existing single phase CCVT with a new standard three phase CCVT. **Estimated Transmission Cost: $1.55 M**
- At Coal Creek substation, reconductor the 69kV bus, replace 600A Switchers with new MOAB switches on new steel structures. Switch "33" towards the customer will be replaced to allow for the new structure to fit into the existing station footprint. **Estimated Transmission Cost: $0 M**
- Remote end work at Richlands substation. **Estimated Transmission Cost: $0.05 M**
- Provide transition fiber on the Garden Creek - Richlands - Skeggs Branch 69kV Line for connectivity at Mount Heron Station and at Whetstone Branch Station to support CES networking and SCADA connectivity. **Estimated Transmission Cost: $0.40 M**

Total Estimated Transmission Cost: $29.2 M





Need Number: AEP-2021-AP014

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 03/19/2021

Supplemental Project Driver: Equipment Condition/Performance/Risk

Proposed Solution:

Ancillary Benefit:

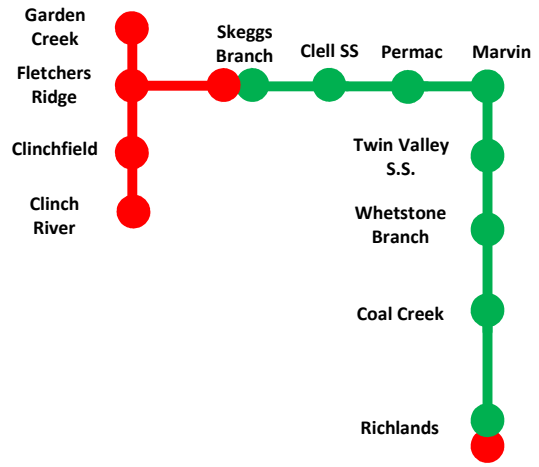
In conjunction with B3333, which proposes to rebuild sections of Garden Creek - Skeggs Branch – Coal Creek line and retire part of the line, this project proposes to rebuild rest of the 69kV line and thus addressing remaining needs of AEP-2021-AP014.

Alternatives Considered:

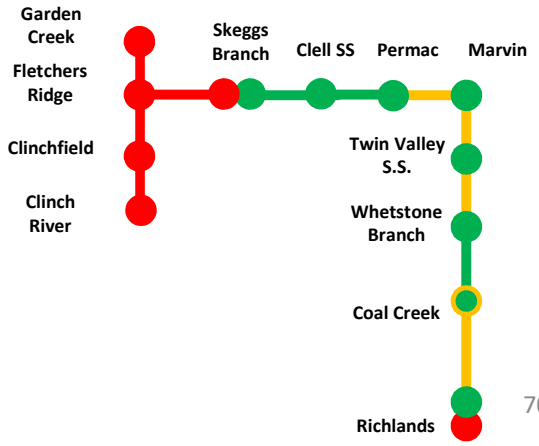
- An alternative of converting the Skeggs Branch – Richlands – Garden Creek line to 138kV was considered. However, this alternative would warrant all the delivery points on the line to be converted to 138kV. This alternative would also amend the baseline line work under B3333. The cost of the 138kV conversion and the challenge of outages, finding properties for the new facilities under the aggressive timeline for the baseline work this alternative was not deemed prudent.

Projected In-Service: 10/30/2027

Bubble Diagram (Existing)



Bubble Diagram (Proposed)



Legend	
345 kV	
138 kV	
69 kV	
46 kV	
New	

AEP Transmission Zone M-3 Process
Rothadew Area Improvements

Need Number: AEP-2022-IM013

Process Stage: Solution Meeting 11/17/2023

Previously Presented: Need meeting 6/15/2022

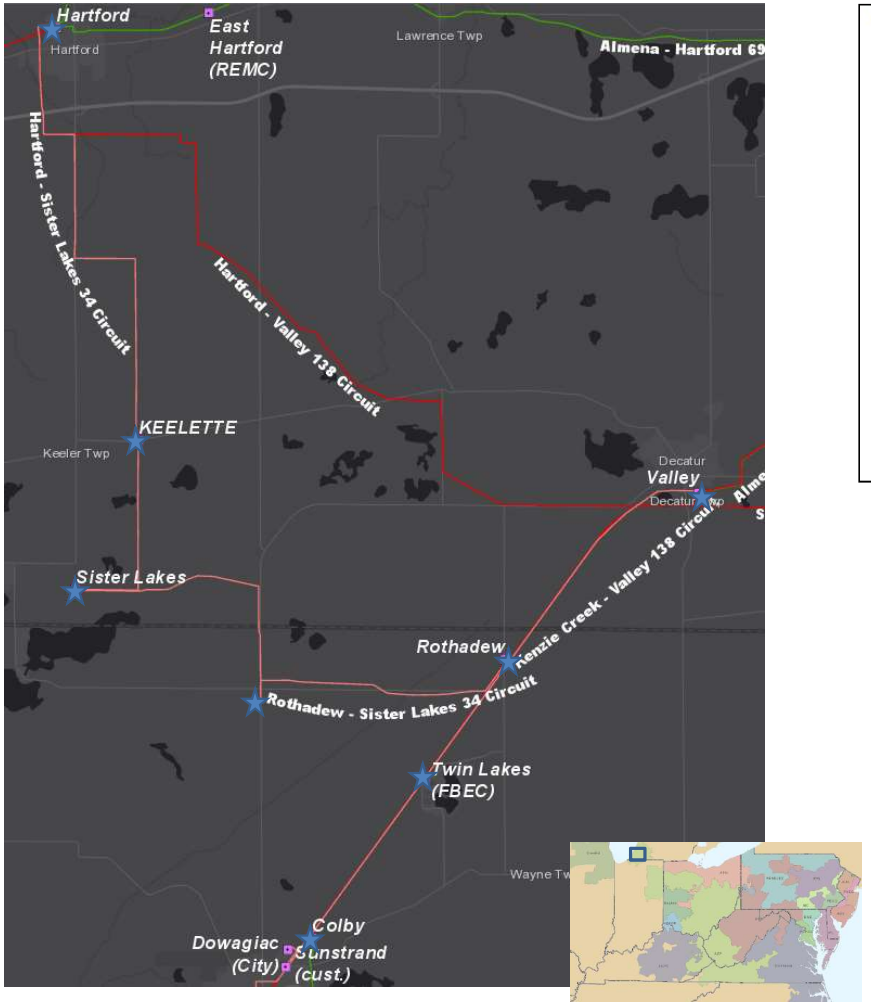
Project Driver: Equipment Material Condition, Performance and Risk

Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

Problem Statement:

Dowagiac Customer Growth

- The customer served from Rudy Tap 34.5kV Sw has requested a load increase.
- The customer has indicated a demand of 28MW at their existing delivery point with plans to expand and increase load significantly



AEP Transmission Zone M-3 Process
Rothadew Area Improvements

Need Number: AEP-2022-IM013

Process Stage: Solution Meeting 11/17/2023

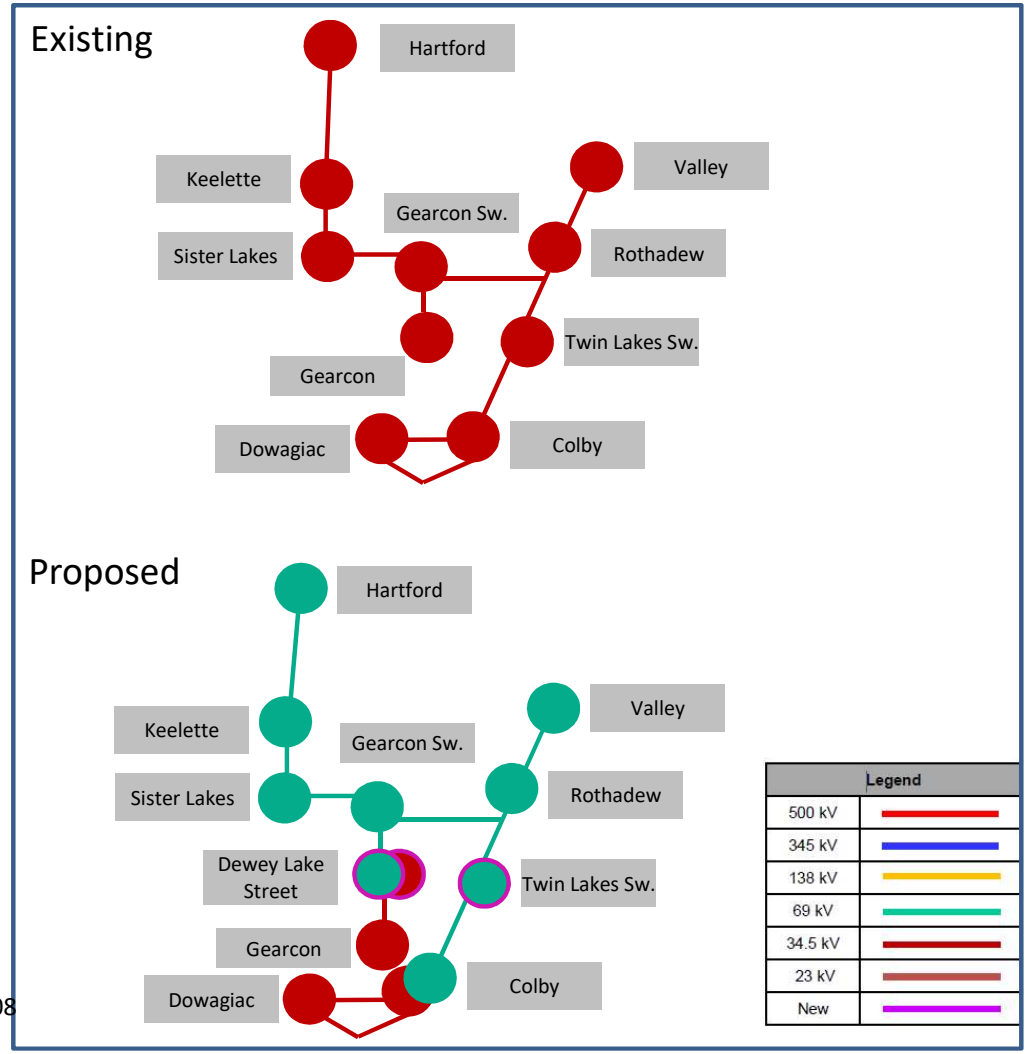
Previously Presented: 6/15/2022

Project Summary: With the 28MW load increase request at Dowagiac, there are several issues that arise on the existing 34.5 kV system under N-1-1 loss of both the transformers at Colby station that include the following:

- Rothadew – Twin Lakes 34.5kV loads to 123% of its summer emergency rating
- Colby – Twin Lakes 34.5kV loads to 121% of its summer emergency rating
- Hartford 138/69/34.5kV transformer loads to 203% of its summer emergency rating
- The 34.5kV area experiences low voltages at Keelette, Sister Lakes, Gearcon, Valley, Twin Lakes, Dowagiac, and Sunstrand with the lowest being 0.42 per unit

In order to address the issues listed above with the increased load, the best path forward would be to convert the area to 69kV. The majority of the lines in the area are already constructed to 69 kV standards; therefore, the scope of work required to convert to 69 kV is limited. The delivery point at Dowagiac is already configured to accommodate the 28 MW request.

Further, AEP is moving away from the 34.5kV transmission voltage class where there are issues with drop and pick operations. The 34.5kV voltage delivery points are out of phase from delivery at 69kV or 138kV and switching load from one 34.5kV source to another, higher voltage source requires the customers to be dropped and then picked up from the new source. Utilizing 69 or 138 kV as a standard delivery voltage eliminates the initial drop requirement for the load.



AEP Transmission Zone M-3 Process
Rothadew Area Improvements

Need Number: AEP-2022-IM013

Process Stage: Solution Meeting 11/17/2023

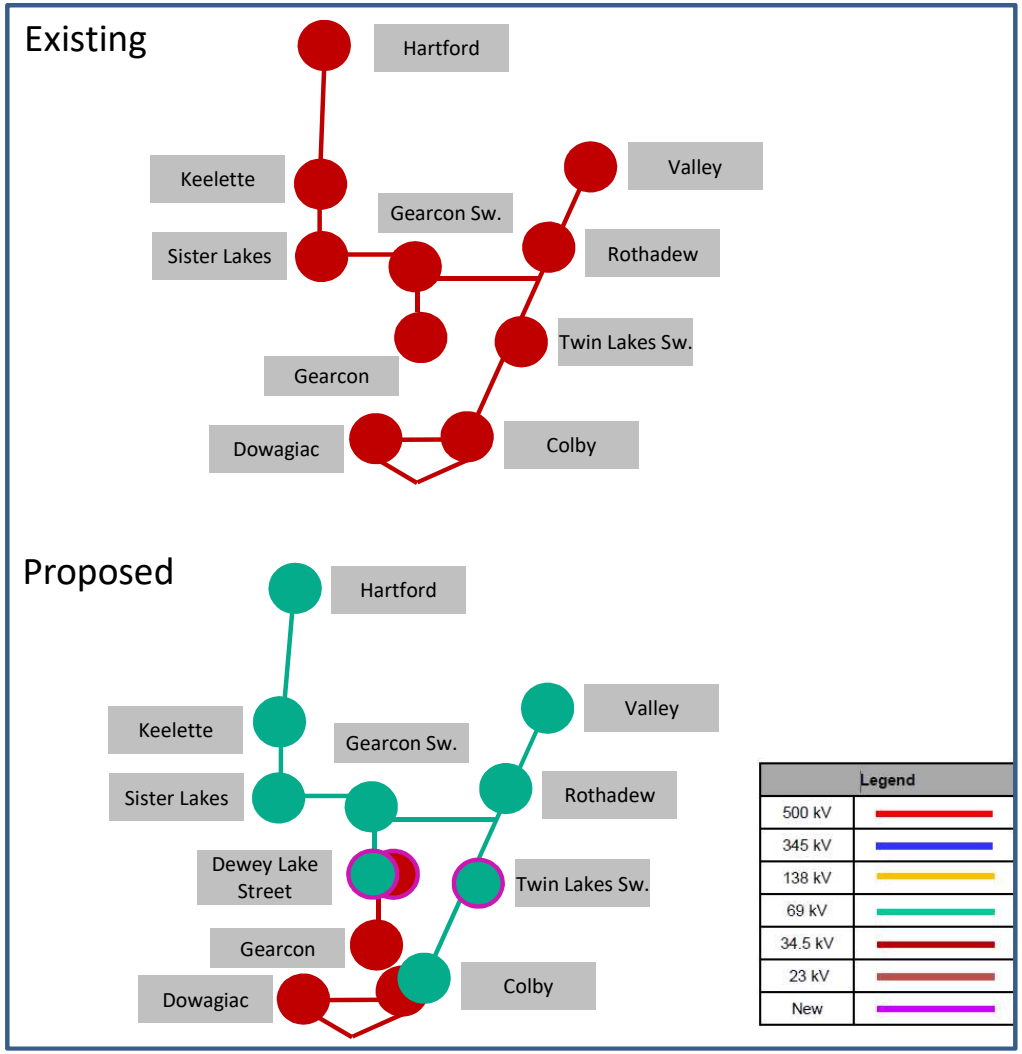
Previously Presented: 6/15/2022

Proposed Solution:

- **Hartford Station:** Install a 69kV breaker and remove the 34.5kV equipment. Station Service will be relocated closer to the transformer. **Estimated Transmission Cost: $0.59M**
- **Sister Lakes:** Replace both transformers with 9.375MVA 69/12kV units and install a high side switcher on transformer 1. **Estimated Transmission Cost: $0M**
- **Dewey Lake Street:** Install a new 7.5 MVA 69/34.5kV transformer with low side breaker and high side fuse. This will be located close to Gearcon Switch. **Estimated Transmission Cost: $1.72M**
- **Valley:** Install a 69/34.5kV 12.5MVA transformer and retermniate the Rothadew line to the 69kV bus. **Estimated Transmission Cost: $3.63M**
- **Colby:** Move the Rothadew line to the 69kV bus. **Estimated Transmission Cost: $0.11M**
- **Twin Lakes Sw.:** Replace Switch. **Estimated Transmission Cost: $0.83M**
- **Keelette, Sister Lakes, Gearcon Sw., Rothadew,:** Energize to 69kV. **Estimated Transmission Cost: $1.01M**

Total Estimated Transmission Cost: $7.89M

Ancillary Benefits: Moving to 69kV will improve operational flexibility and eliminate the problem of the drop and pick issues that the 34.5kV voltage class experiences. Scope of work is limited due to lines already constructed to 69 kV design.



AEP Transmission Zone M-3 Process
Rothadew Area Improvements

Need Number: AEP-2022-IM013

Process Stage: Solution Meeting 11/17/2023

Previously Presented: 6/15/2022

Alternative considered:

Serve the customer at the 138kV voltage.

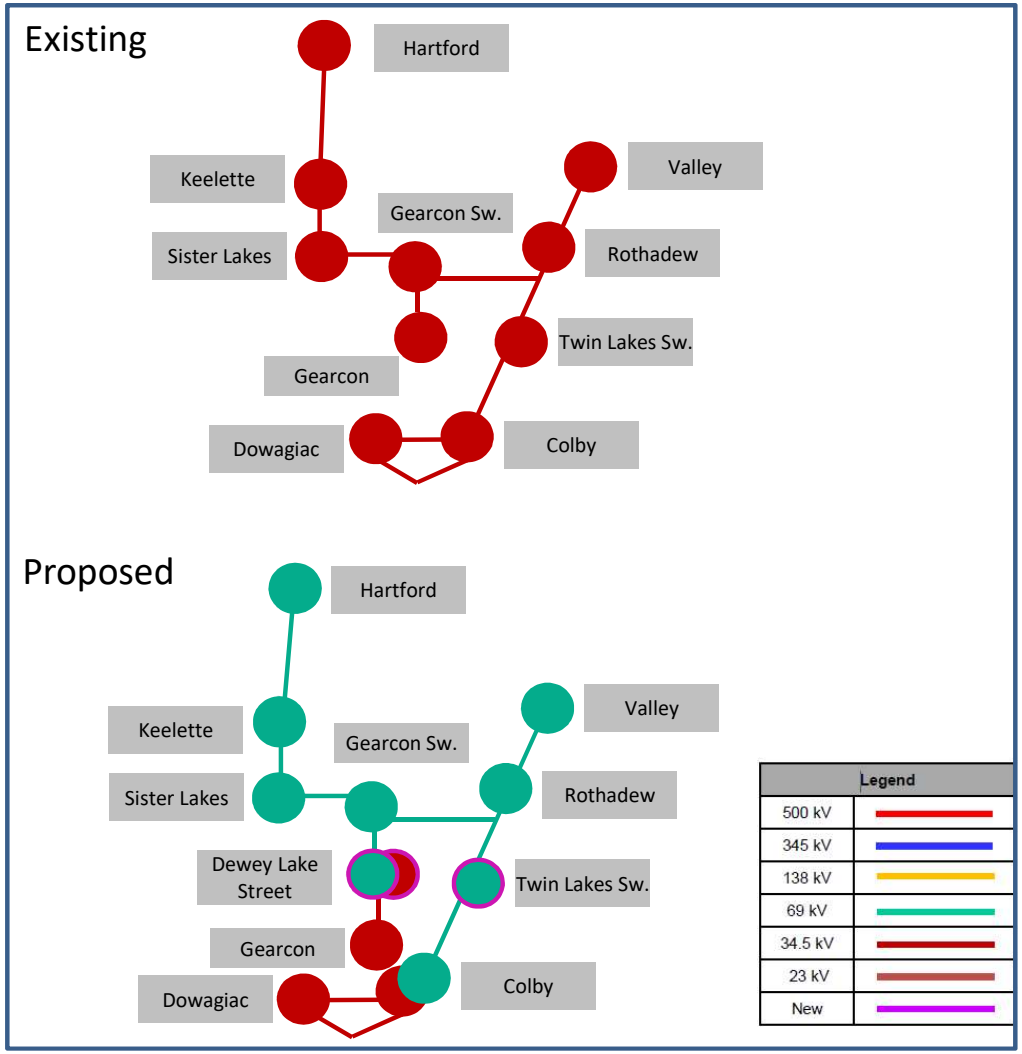
This would require a 0.75 mile 138kV radial feed served from Colby and a dedicated 138/34.5kV drop down station to serve the customer at their existing delivery. This new feed would require a railroad crossing along with forested and wetland areas. Previous work in this area has also uncovered endangered habitats. With all these risks, the feed would likely not be able to be in serviced in time to meet the customer's timeline.

The existing 34.5kV network being proposed for upgrade to 69kV operation is ready for conversion. The conversion to 69kV will remove the drop and pick operating procedure which heavily impacts the local customers. The related PJM project IDs that have previously completed this work are b2345 and s1297. b2345 rebuilds from Rothadew to Keelette and constructs Hartford – Keelette to 69kV standards. S1297 rebuilds Rothadew – Valley to 69kV standards. Colby – Rothadew was constructed to 69kV standards in 1993.

Estimated Alternate Cost: $10M

Projected In-Service: 7/27/2027

Project Status: Scoping



AEP Transmission Zone M-3 Process
Jackson County, WV

Need Number: AEP-2023-AP021

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 8/18/2023

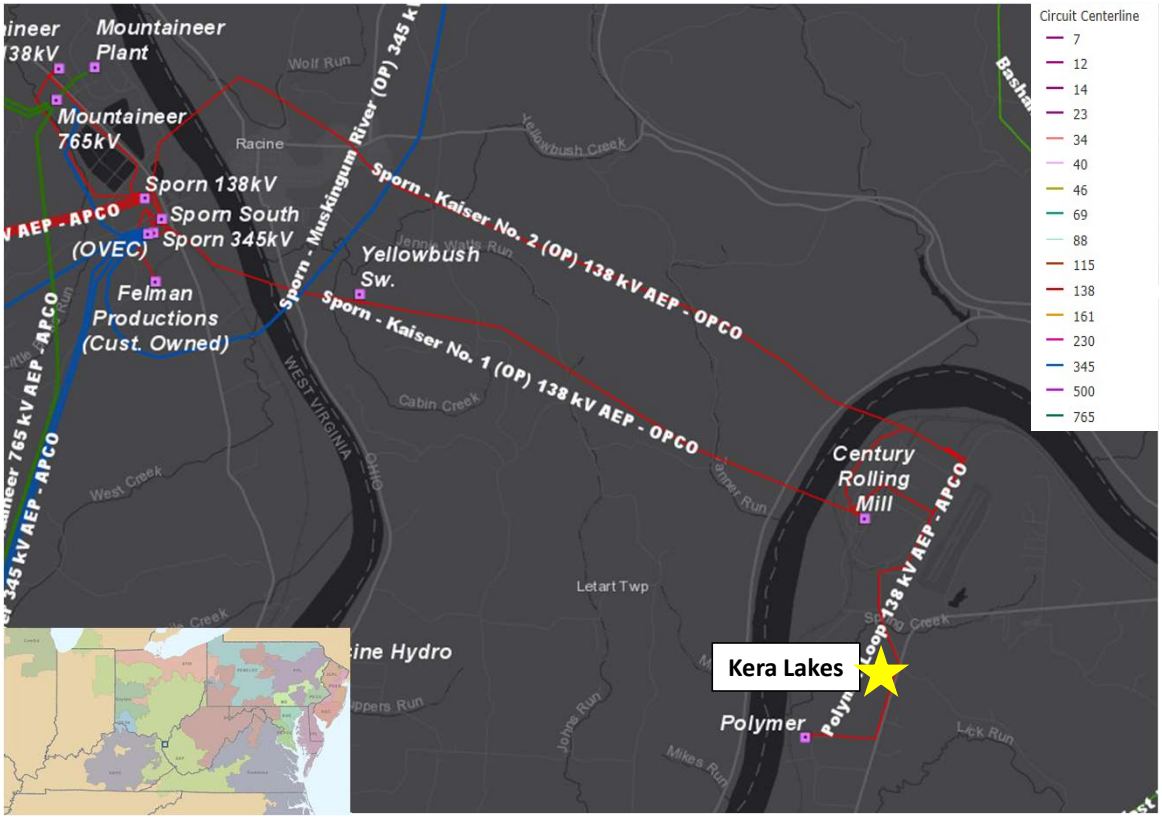
Supplemental Project Driver: Customer Service

Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

A new industrial customer has requested service in Jackson County, WV by the end of 2024.

Projected load: 30 MVA initial load, upwards to a maximum of 80 MVA



AEP Transmission Zone M-3 Process
Jackson County, WV

Need Number: AEP-2023-AP021

Process Stage: Solutions Meeting 11/17/2023

Proposed Solution:

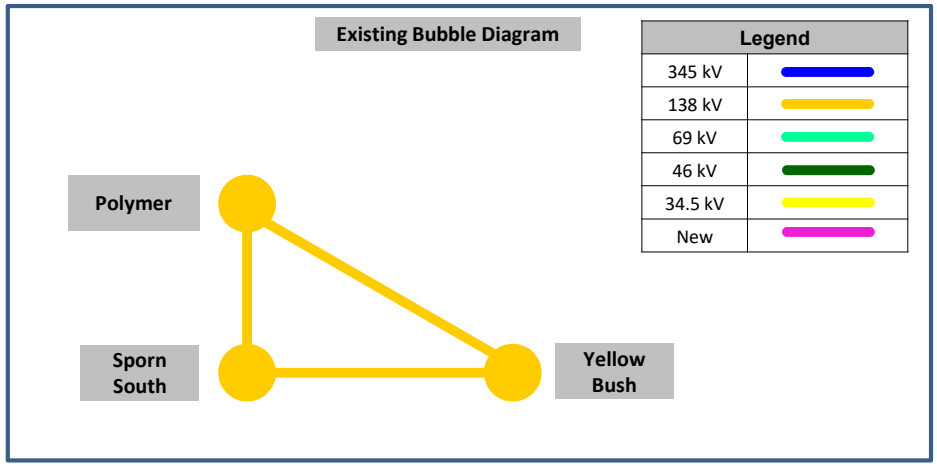
- Cut in/out of the existing Yellow Bush – Polymer 138 kV line, install a new double circuit 138 kV 0.1 mile line to the new 138 kV station (Kera Lakes). **Estimated Trans. Cost: $0**
- Construct a new 138 kV station (Kera Lakes) with 4 – 3000A, 40 kA circuit breakers in a ring bus configuration with two feeds to the customer. **Estimated Trans. Cost: $0**
- Network fiber support work at Cottageville Station. **Estimated Trans. Cost: $0**

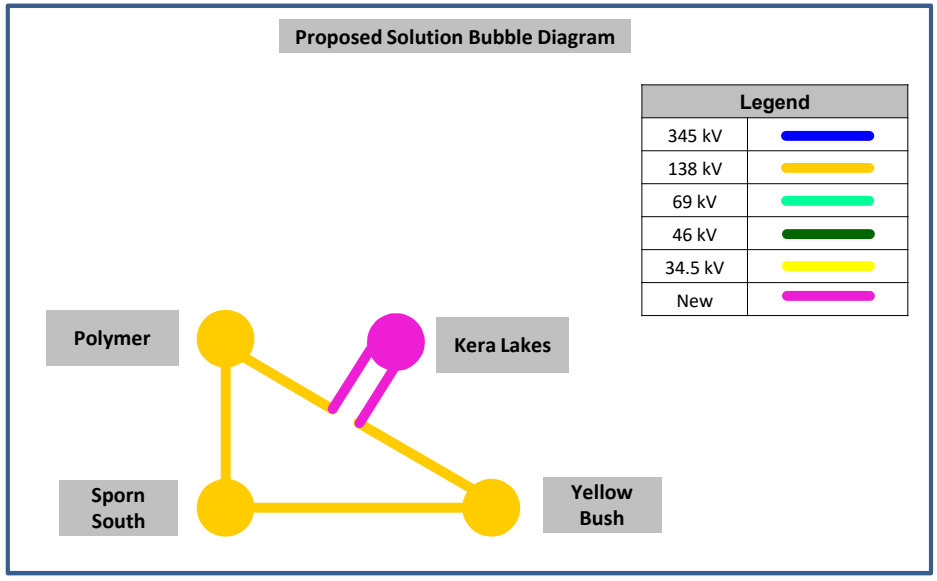
Total Estimated Transmission Cost: $0

Projected In-Service: 12/13/2024

Project Status: Scoping

Model: 2028 RTEP





AEP Transmission Zone M-3 Process
Licking County, OH

Need Number: AEP-2023-OH012

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 1/20/2023

Project Driver:

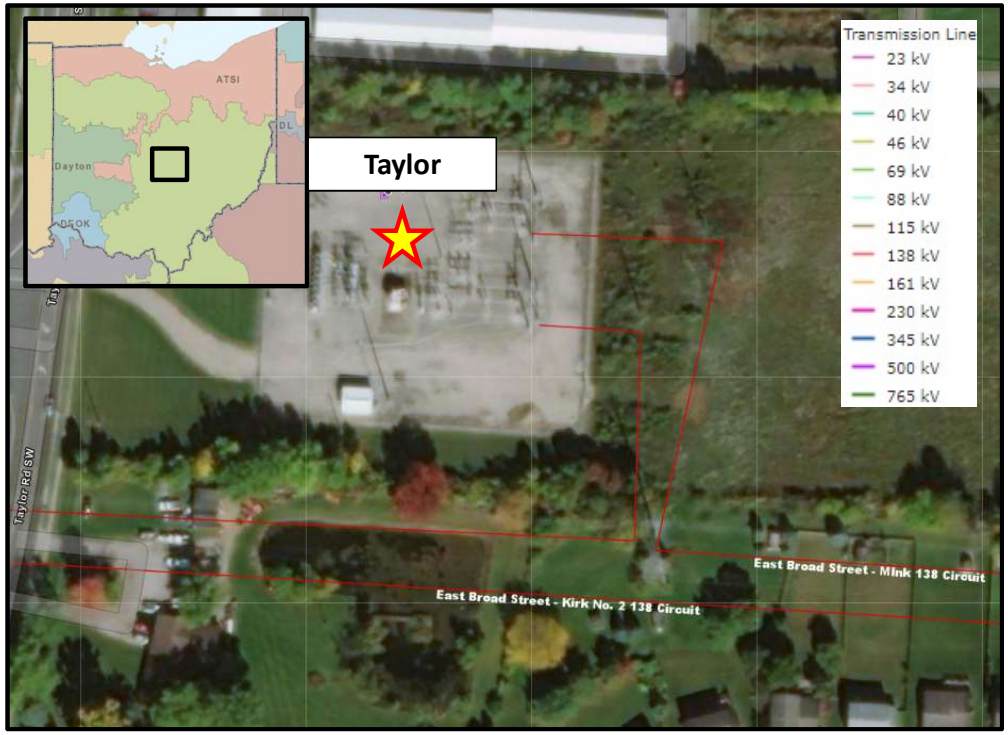
Customer Service

Service Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

AEP Ohio has requested to add capacity at Taylor station, due to continuous load growth in the area and to address concerns AEP Ohio has about reliability and contingency constraints. The anticipated peak load is approximately 42 MVA. The requested in-service date is December 2024.

Model: 2027 RTEP



AEP Transmission Zone M-3 Process
Taylor Station

Need Number: AEP-2023-OH012

Process Stage: Solutions Meeting 11/17/2023

Proposed Solution:

- At Taylor station, install 1-138 kV 40 kA 3000 A bus tie circuit breaker and 1-138 kV 3000 A 40 kA GOAB beaker disconnect switch to accommodate a new distribution transformer. Estimated Transmission Cost: $ 1.26M.

Alternatives Considered:

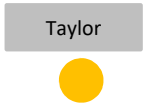
- No cost-effective alternatives identified considering the location and timing of the request.

Projected In-Service: 12/31/2024

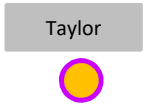
Project Status: Engineering

Model: 2027 RTEP

Existing:



Proposed:



AEP Transmission Zone: Supplemental
Beckley, WV

Need Number: AEP-2022-AP015

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 2/18/2022

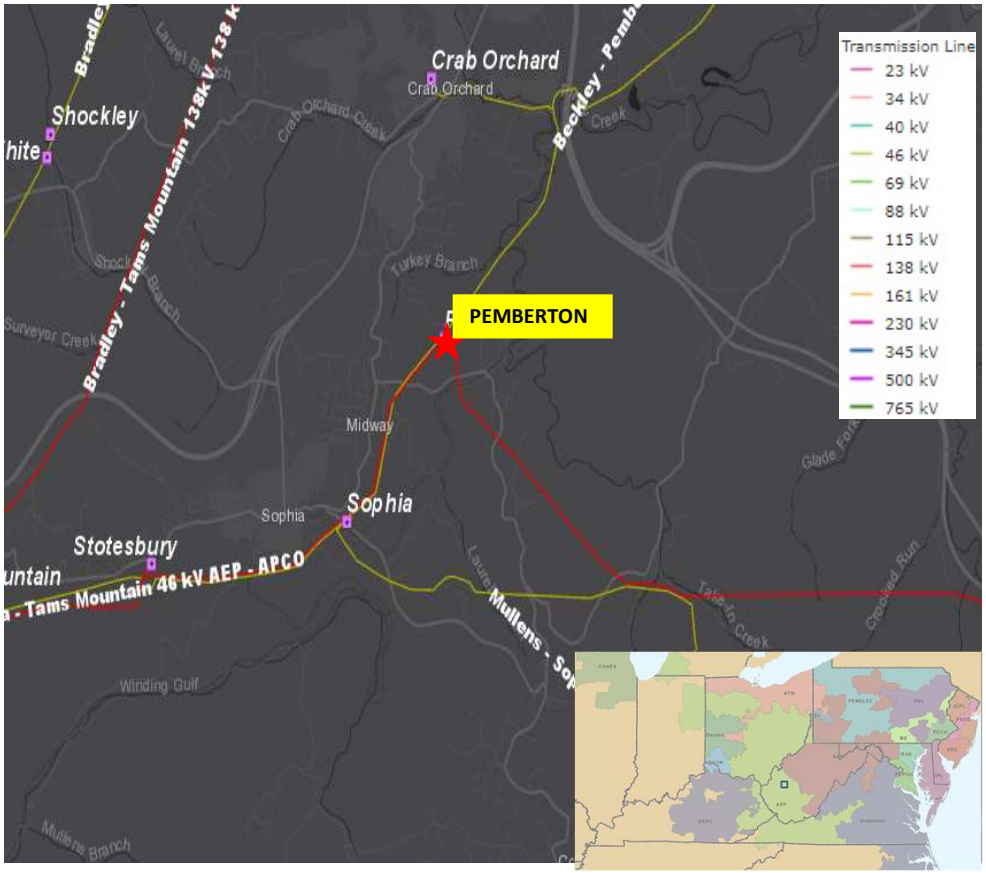
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Pemberton Station

- 46kV circuit breakers B and C are an CG type oil filled breaker, without oil containment.
  - 1984 vintage
  - Oil filled breakers need more maintenance due to the oil handling required
  - These breakers have exceeded the manufacturer's recommended number of fault operations
  - The manufacturer does not provide support for this type of breaker and spare parts are not available.
  - Oil spills can result in significant mitigation costs.
- 138/46 kV XFR
  - 1984 vintage
  - Multiple oil and nitrogen leaks
  - Bushings are in poor physical condition
  - Cooling controls, cooling fans and internal wiring are obsolete and in need of replacement
  - No secondary oil containment installed on the unit
- 11 of the 25 relays at the station are in need of replacement
  - 4 relays are electromechanical type which have significant limitations with regards to fault data collection and retention.
  - 7 microprocessor relays with legacy firmware



AEP Transmission Zone: Supplemental
Beckley, WV

Need Number: AEP-2022-AP016

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 2/18/2022

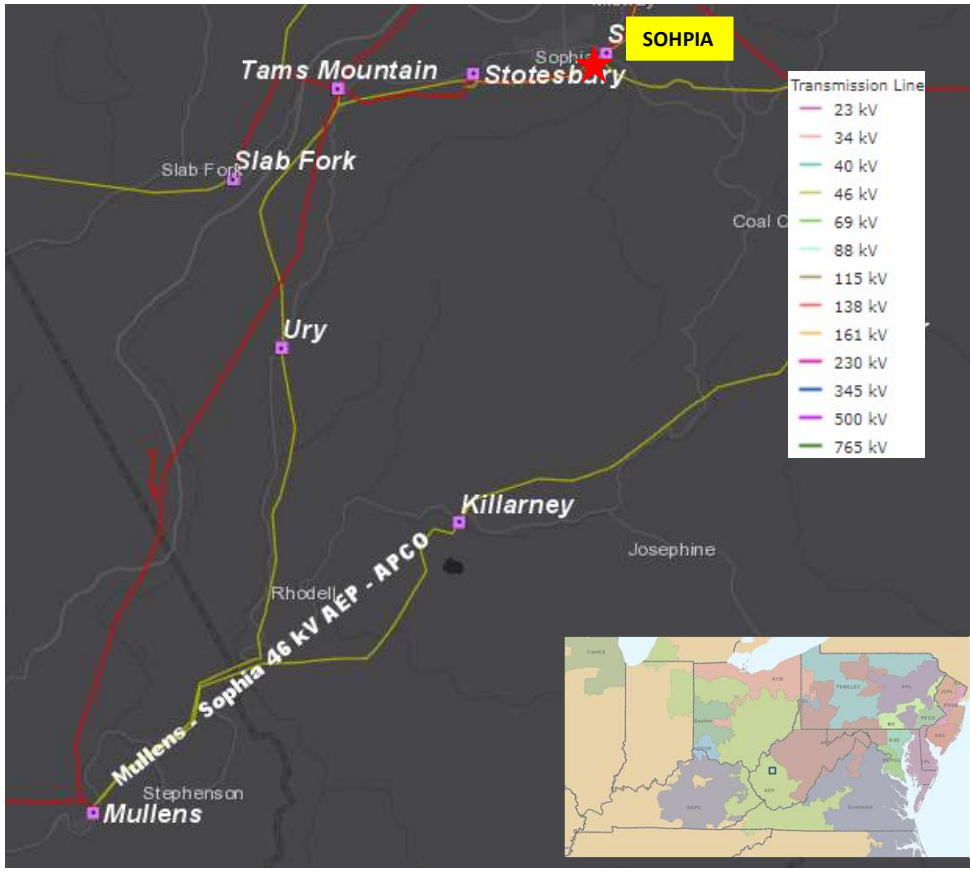
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Sophia Station

- 46kV circuit breakers B, C and D are FK type oil filled breaker, without oil containment.
  - 1965 vintage
  - Oil filled breakers need more maintenance due to the oil handling required
  - These breakers have exceeded the manufacturer's recommended number of fault operations
  - The manufacturer does not provide support for this type of breaker and spare parts are not available.
  - Oil spills can result in significant mitigation costs.
- 23 of the 33 relays at the station are in need of replacement
  - 16 relays are electromechanical type which have significant limitations with regards to fault data collection and retention.
  - 7 microprocessor relays with unsupported firmware.



AEP Transmission Zone: Supplemental
Beckley, WV

Need Number: AEP-2022-AP017

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 2/18/2022

Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13), AEP Presentation on 1930s Lines

Problem Statement:

Mullens – Sophia 46 kV (~18 miles)

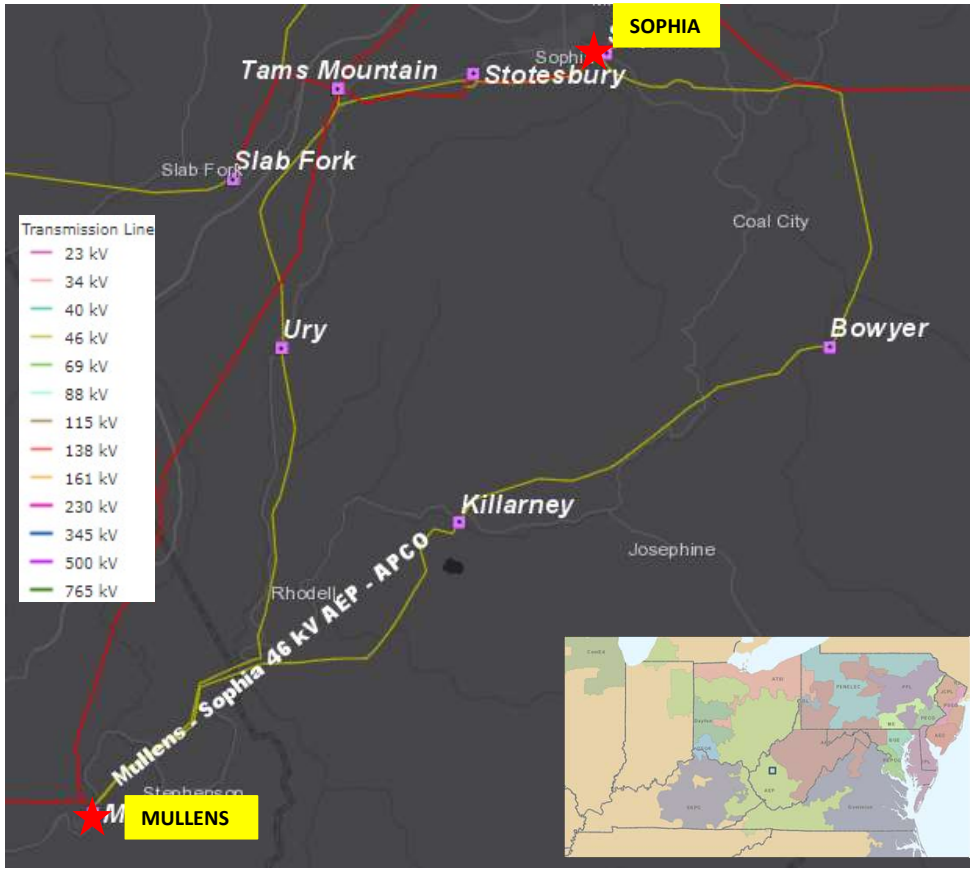
- Originally constructed in 1914
- Primarily consists of 1914 vintage wood poles (79%) and lattice steel structures (4%)
- Conductor primarily consists of 1951 vintage copper conductor and 1951 vintage 3/0 ACSR conductor
- Since 2015, there have been 19 momentary and 8 permanent outages on the Mullens – Sophia 46 kV circuit.
  - Momentary outages due to lightning, wind, ice/snow, vegetation fall-in outside AEP ROW.
  - Permanent outages due to vegetation fall-in outside AEP ROW, ice/snow, crossarm failure and distribution
  - Outages resulted in 348k CMI
- Currently there are 50 structures (30% of the line) with at least one open structural condition
  - Currently 77 structural open conditions including rotted poles, crossarms, brace, insect damaged poles, crossarms, brace and woodpecker damaged poles.

Condition & Impacts of the Degraded pre-1930s Era System

- These transmission line assets are clearly in the accelerated deterioration phase of their life.
- Significant deterioration results in loss of strength and performance posing a significant risk of failure under conditions the assets should be able to withstand.
  - May cause frequent and extended outages
  - May create significant economic losses
  - May endanger public safety

Conditions of System for the Pre 1930s Lattice Line

- Towers: Typical life of galvanizing is 70 years. The towers are all supported by steel grillage foundations buried in the ground. The tower leg is subject to significant risk of corrosion where it enters the ground. Lattice tower structures have little structural redundancy. A failure of one member of the structure will impact the integrity of the structure and may cause the entire tower to collapse.
- Insulator & Hardware Corrosion: The connecting elements including the tower attachment hole and the insulator hook have experienced serious section loss due to corrosion and wear. This loss of metal cross-section significantly reduces the capacity of the connection. The insulator caps and connecting hardware have experienced heavy to complete loss of galvanizing. When the protective galvanized coating is gone or is significantly compromised, the bare steel corrodes at an accelerated rate.
- Broken Insulators: Broken, cracked and otherwise damaged insulators lead to premature flashover causing permanent outages. When the insulator assembly breaks, the wire falls to the ground potentially damaging other conductors, and presents an increased public safety concern.
- Conductor: Aluminum Conductor Steel Reinforced (ACSR) conductor consists of aluminum strands wrapped around a core of galvanized steel strands. The steel provides the structural strength. Like other steel elements, the strands of the core have also lost the galvanized coating and steel section. The degraded state results in significant loss of tensile strength and potential risk to the public if the conductor was to fail and fall to the ground. Conductor damage is usually not visible in a field inspection. Specific conductor samples, from the belly of the sag (lowest point) and/or inside the clamps at the insulators, have confirmed significant corrosion. During the restoration or construction activities, conductors often break at adjacent locations due to handling, introducing a potential safety risk and increase public safety concern.



AEP Transmission Zone: Supplemental
Beckley, WV

Need Number: AEP-2022-AP018

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 2/18/2022

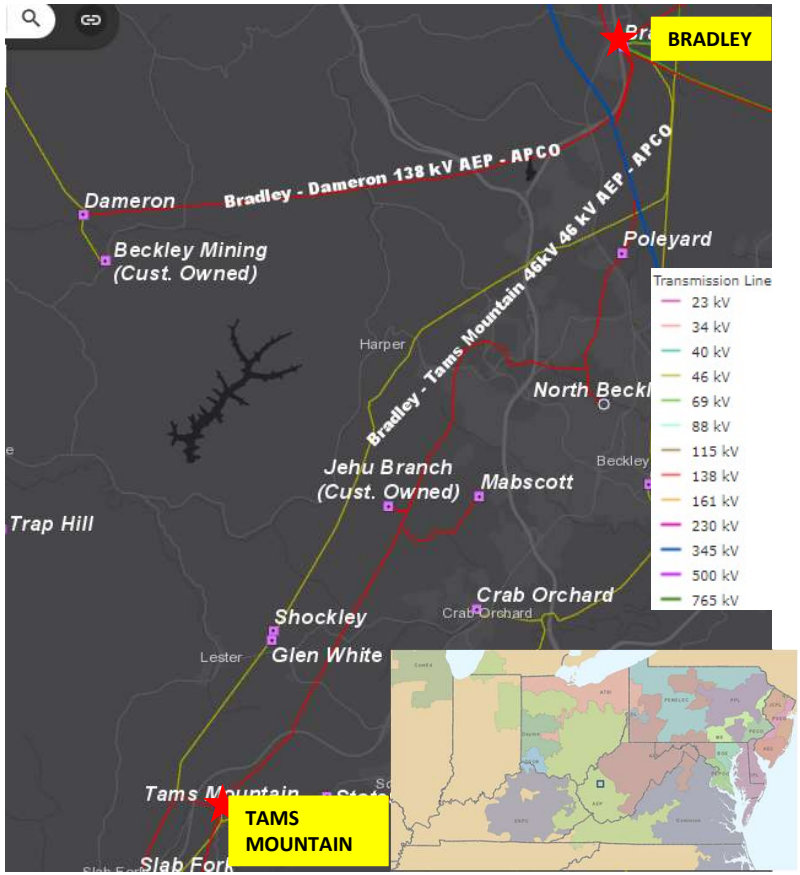
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Bradley – Tams Mountain 46 kV (~15 miles)

- Originally constructed in 1920
- Consists primarily of wood pole structures of 1920 (42%), 1950s (13%) and 2002 (20%) vintages
- Conductor consists primarily of 1920 #2 Copper, 336 ACSR, 4/0 ACSR, and 3/0 ACSR
- Since 2015, there have been 13 momentary and 13 permanent outages on the Bradley – Tams Mountain 46 kV circuit.
  - Momentary outages due to lightning, wind, ice/snow, distribution and wind
  - Permanent outages due to vegetation fall-in outside AEP ROW, lightning, ice/snow, non-AEP tree removal, splice failure and vandalism
  - Outages resulted in a total of 980k CMI
- Currently there are 30 structures (19% of the line) with at least one open condition
  - 64 Open conditions affecting poles, crossarms, knee braces, woodpecker holes, insect damage, rot
  - 4 hardware conditions related to broken insulators



AEP Transmission Zone: Supplemental
Beckley, WV

Need Number: AEP-2022-AP019

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 2/18/2022

Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13), AEP Presentation on 1930s Lines

Problem Statement:

Beckley – Pemberton 46 kV (~6 miles)
- Originally constructed in 1913
- Consists of 1913 vintage steel lattice towers (74%) and 1913 wood poles (23%)
- Conductor consists of 1913 vintage 2/0 Copper, 3/0 Copper, 3/0 ACSR and 556 ACSR

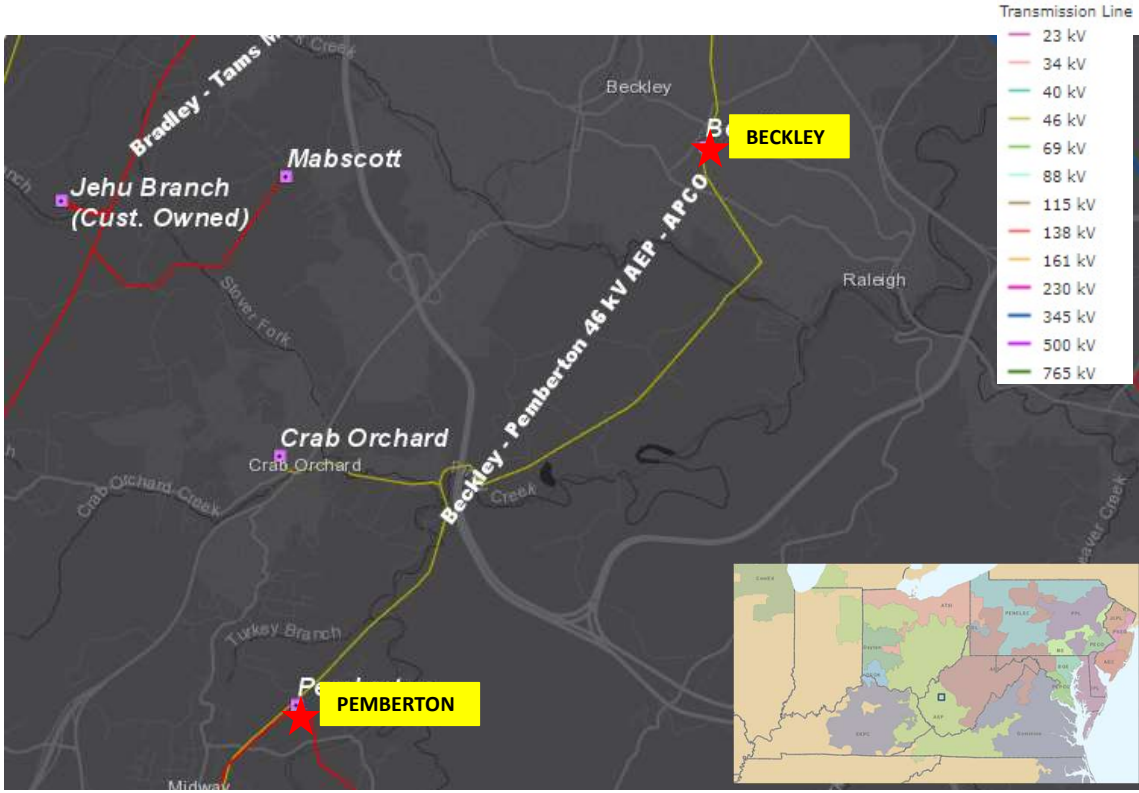
Condition & Impacts of the Degraded pre-1930s Era System
- These transmission line assets are clearly in the accelerated deterioration phase of their life.
- Significant deterioration results in loss of strength and performance posing a significant risk of failure under conditions the assets should be able to withstand.
  - May cause frequent and extended outages
  - May create significant economic losses
  - May endanger public safety

Conditions of System for the Pre 1930s Lattice Line
- Towers: Typical life of galvanizing is 70 years. The towers are all supported by steel grillage foundations buried in the ground. The tower leg is subject to significant risk of corrosion where it enters the ground. Lattice tower structures have little structural redundancy. A failure of one member of the structure will impact the integrity of the structure and may cause the entire tower to collapse.
- Insulator & Hardware Corrosion: The connecting elements including the tower attachment hole and the insulator hook have experienced serious section loss due to corrosion and wear. This loss of metal cross-section significantly reduces the capacity of the connection. The insulator caps and connecting hardware have experienced heavy to complete loss of galvanizing. When the protective galvanized coating is gone or is significantly compromised, the bare steel corrodes at an accelerated rate.
- Broken Insulators: Broken, cracked and otherwise damaged insulators lead to premature flashover causing permanent outages. When the insulator assembly breaks, the wire falls to the ground potentially damaging other conductors, and presents an increased public safety concern.
- Conductor: Aluminum Conductor Steel Reinforced (ACSR) conductor consists of aluminum strands wrapped around a core of galvanized steel strands. The steel provides the structural strength. Like other steel elements, the strands of the core have also lost the galvanized coating and steel section. The degraded state results in significant loss of tensile strength and potential risk to the public if the conductor was to fail and fall to the ground. Conductor damage is usually not visible in a field inspection. Specific conductor samples, from the belly of the sag (lowest point) and/or inside the clamps at the insulators, have confirmed significant corrosion. During the restoration or construction activities, conductors often break at adjacent locations due to handling, introducing a potential safety risk and increase public safety concern.

Crab Orchard 46 kV Tap (~1 mile)
- Originally constructed in 1946
- Consists primarily of wood pole structures of 1946 vintage (94%)
- Conductor consists of 1946 3/0 ACSR

Since 2014, there have been 6 momentary and 3 permanent outages on the Beckley – Pemberton 46 kV circuit (includes Crab Orchard Tap).
- Momentary outages due to lightning, wind, ice/snow, distribution,
- Permanent outage due to vegetation fall-in outside AEP ROW and lightning.
- Outages resulted in a total of 248k CMI

Currently there are 7 structures (10% of the line) with at least one open condition
- 2 conditions related to rust on lacing and leg, 1 condition affecting broken strand on conductor, 5 conditions related broken insulators and 2 forestry related conditions



AEP Transmission Zone: Supplemental
Beckley, WV

Need Number: AEP-2022-AP020

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 2/18/2022

Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13), AEP Presentation on 1930s Lines

Problem Statement:

Sophia – Tams Mountain 46 kV (~4 miles)

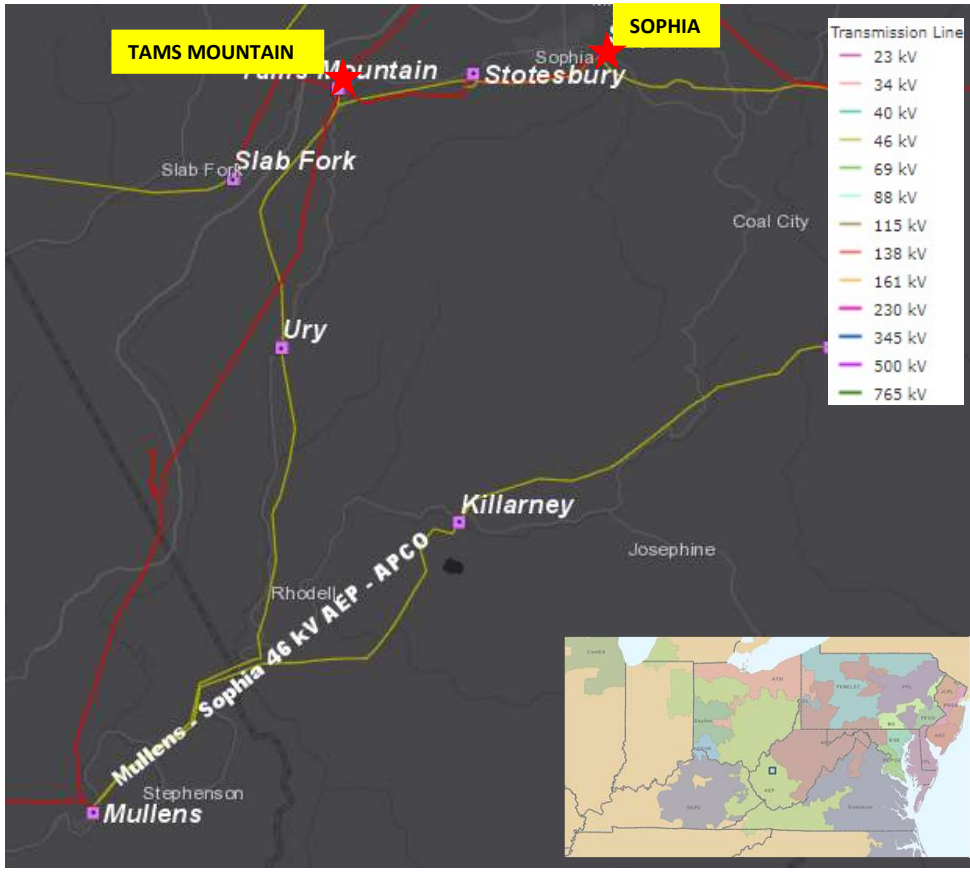
- Originally constructed in 1915
- Consists of 1915 vintage wood (65%) and steel lattice structures (33%)
- Conductor consists of 1915 vintage copper conductor and 556 ACSR
- Since 2014, there have been 2 momentary and 1 permanent outages on the Sophia – Tams Mountain 46 kV circuit.
  - Momentary outages due to ice/snow
  - Permanent outage due to lightning
- Currently there are 6 structures (15% of the line) with at least one open structural condition
  - 6 structural open conditions affecting pole, knee/vee brace and crossarms including corroded, broke, split and rot top

Condition & Impacts of the Degraded pre-1930s Era System

- These transmission line assets are clearly in the accelerated deterioration phase of their life.
- Significant deterioration results in loss of strength and performance posing a significant risk of failure under conditions the assets should be able to withstand.
  - May cause frequent and extended outages
  - May create significant economic losses
  - May endanger public safety

Conditions of System for the Pre 1930s Lattice Line

- Towers: Typical life of galvanizing is 70 years. The towers are all supported by steel grillage foundations buried in the ground. The tower leg is subject to significant risk of corrosion where it enters the ground. Lattice tower structures have little structural redundancy. A failure of one member of the structure will impact the integrity of the structure and may cause the entire tower to collapse.
- Insulator & Hardware Corrosion: The connecting elements including the tower attachment hole and the insulator hook have experienced serious section loss due to corrosion and wear. This loss of metal cross-section significantly reduces the capacity of the connection. The insulator caps and connecting hardware have experienced heavy to complete loss of galvanizing. When the protective galvanized coating is gone or is significantly compromised, the bare steel corrodes at an accelerated rate.
- Broken Insulators: Broken, cracked and otherwise damaged insulators lead to premature flashover causing permanent outages. When the insulator assembly breaks, the wire falls to the ground potentially damaging other conductors, and presents an increased public safety concern.
- Conductor: Aluminum Conductor Steel Reinforced (ACSR) conductor consists of aluminum strands wrapped around a core of galvanized steel strands. The steel provides the structural strength. Like other steel elements, the strands of the core have also lost the galvanized coating and steel section. The degraded state results in significant loss of tensile strength and potential risk to the public if the conductor was to fail and fall to the ground. Conductor damage is usually not visible in a field inspection. Specific conductor samples, from the belly of the sag (lowest point) and/or inside the clamps at the insulators, have confirmed significant corrosion. During the restoration or construction activities, conductors often break at adjacent locations due to handling, introducing a potential safety risk and increase public safety concern.



AEP Transmission Zone: Supplemental
Beckley, WV

Need Number: AEP-2022-AP021

Process Stage: Solutions Meeting 11/17/2023

Previously Presented: Needs Meeting 2/18/2022

Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13), AEP Presentation on 1930s Lines

Problem Statement:

Beckley – Bradley 46 kV (~7 miles)

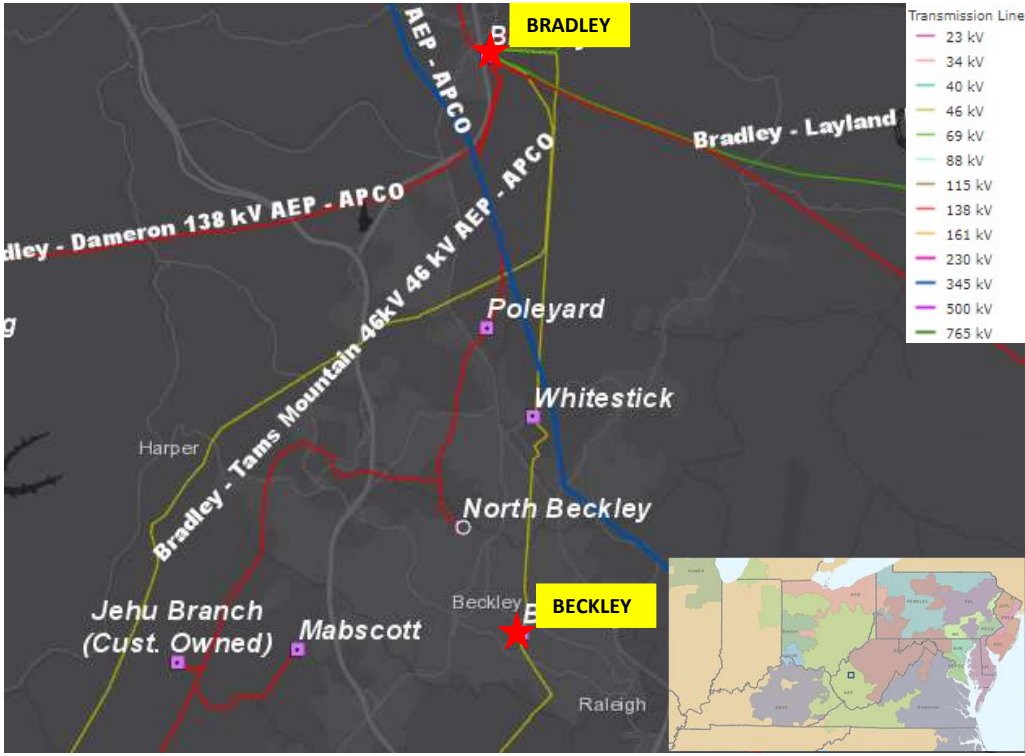
- Originally constructed in 1913
- Consists of 1913 vintage steel lattice towers and wood poles (40%) and 2002 wood poles (56%)
- Conductor consists of 1913 vintage 3/0 Copper (92%) and some 2005 vintage 556 ACSR
- Since 2015, there have been 43 momentary and 1 permanent outages on the Beckley – Bradley 46 kV circuit.
  - Momentary outages due to lightning, wind, ice/snow, distribution, relay misoperation, vegetation fall-in outside AEP ROW.
  - Permanent outage due to Distribution
  - Peak Load Impact: 21.68 MVA

Condition & Impacts of the Degraded pre-1930s Era System

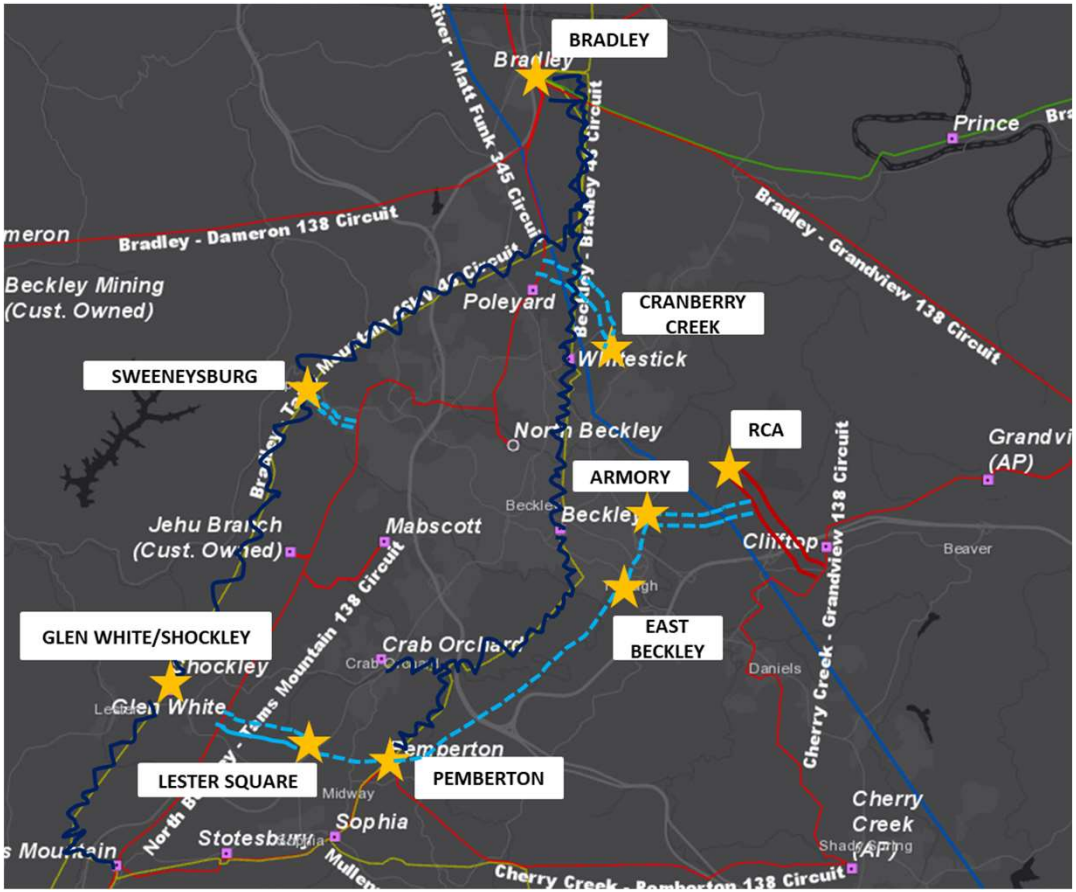
- •These transmission line assets are clearly in the accelerated deterioration phase of their life.
- •Significant deterioration results in loss of strength and performance posing a significant risk of failure under conditions the assets should be able to withstand.
  - May cause frequent and extended outages
  - May create significant economic losses
  - May endanger public safety

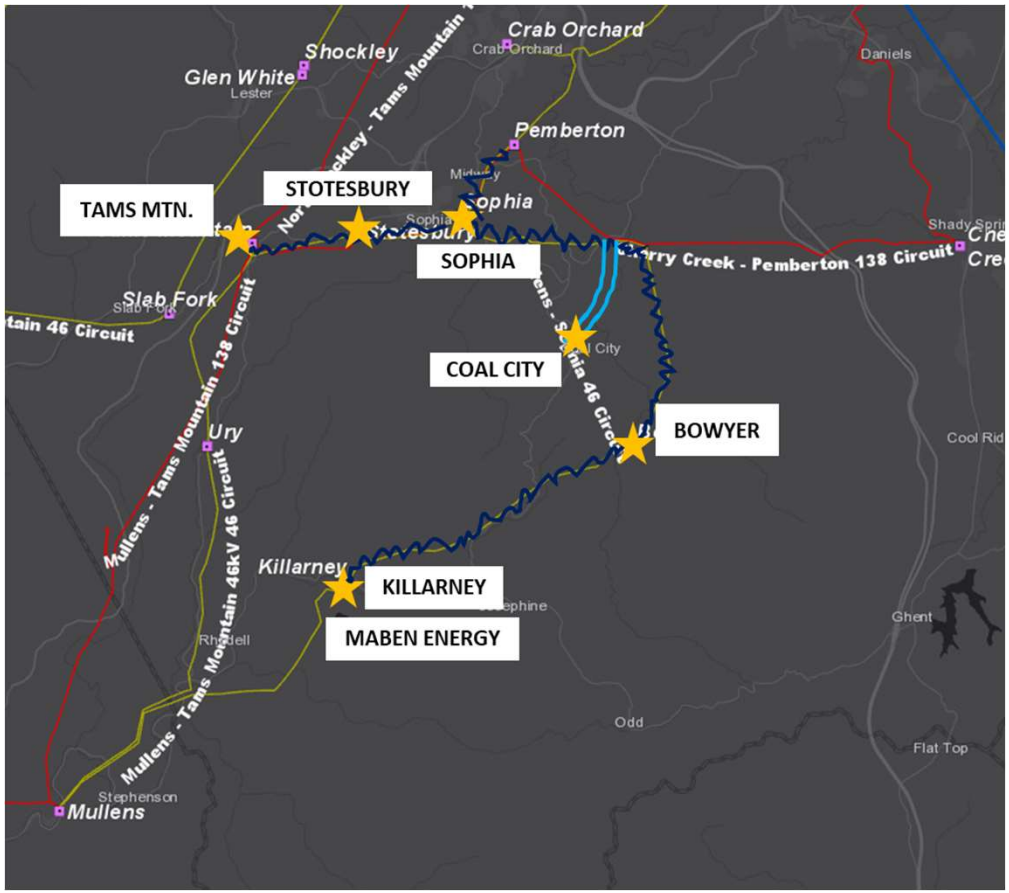
Conditions of System for the Pre 1930s Lattice Line

- •Towers: Typical life of galvanizing is 70 years. The towers are all supported by steel grillage foundations buried in the ground. The tower leg is subject to significant risk of corrosion where it enters the ground. Lattice tower structures have little structural redundancy. A failure of one member of the structure will impact the integrity of the structure and may cause the entire tower to collapse.
- •Insulator & Hardware Corrosion: The connecting elements including the tower attachment hole and the insulator hook have experienced serious section loss due to corrosion and wear. This loss of metal cross-section significantly reduces the capacity of the connection. The insulator caps and connecting hardware have experienced heavy to complete loss of galvanizing. When the protective galvanized coating is gone or is significantly compromised, the bare steel corrodes at an accelerated rate.
- •Broken Insulators: Broken, cracked and otherwise damaged insulators lead to premature flashover causing permanent outages. When the insulator assembly breaks, the wire falls to the ground potentially damaging other conductors, and presents an increased public safety concern.
- •Conductor: Aluminum Conductor Steel Reinforced (ACSR) conductor consists of aluminum strands wrapped around a core of galvanized steel strands. The steel provides the structural strength. Like other steel elements, the strands of the core have also lost the galvanized coating and steel section. The degraded state results in significant loss of tensile strength and potential risk to the public if the conductor was to fail and fall to the ground. Conductor damage is usually not visible in a field inspection. Specific conductor samples, from the belly of the sag (lowest point) and/or inside the clamps at the insulators, have confirmed significant corrosion. During the restoration or construction activities, conductors often break at adjacent locations due to handling, introducing a potential safety risk and increase public safety concern.

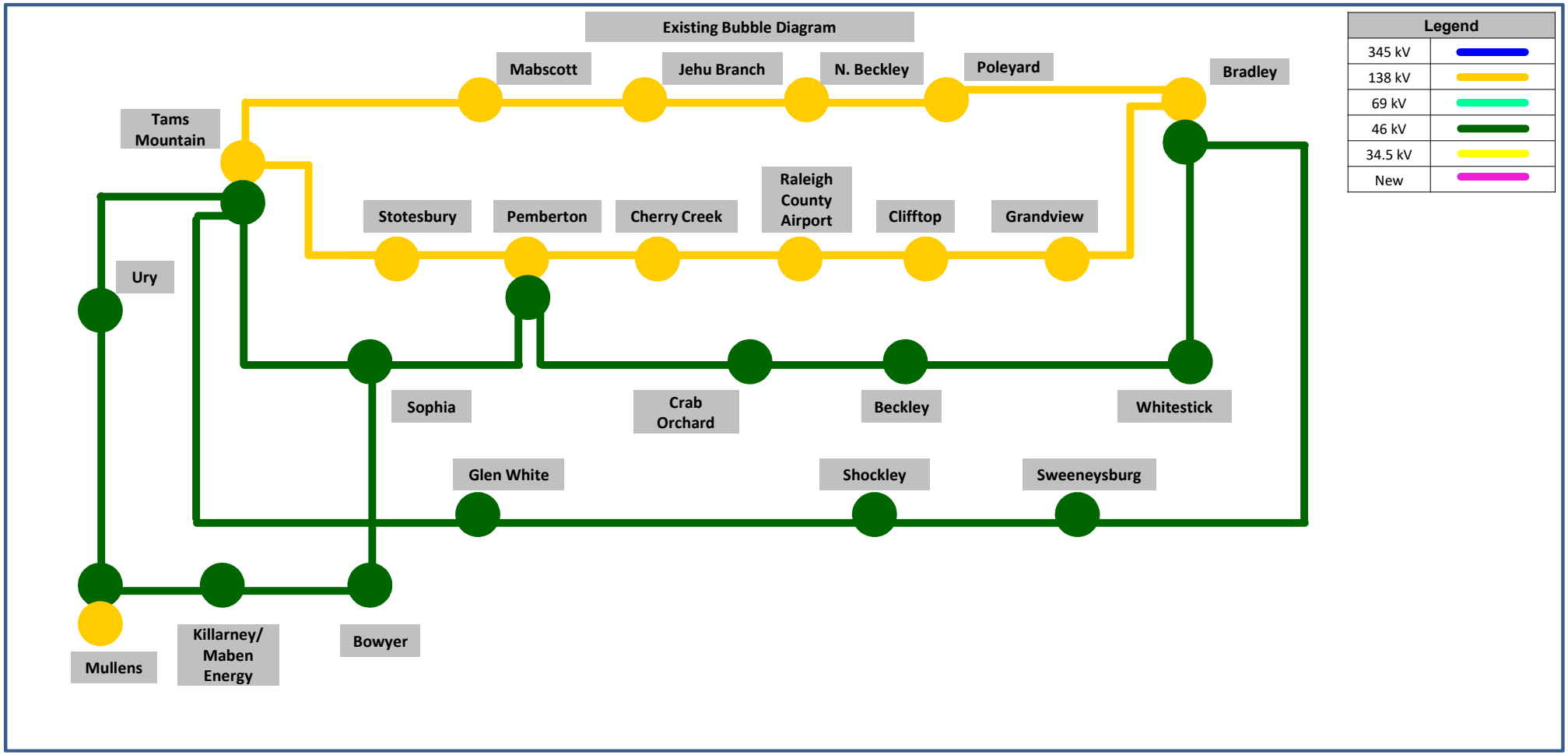


AEP Transmission Zone: Supplemental
Beckley , WV

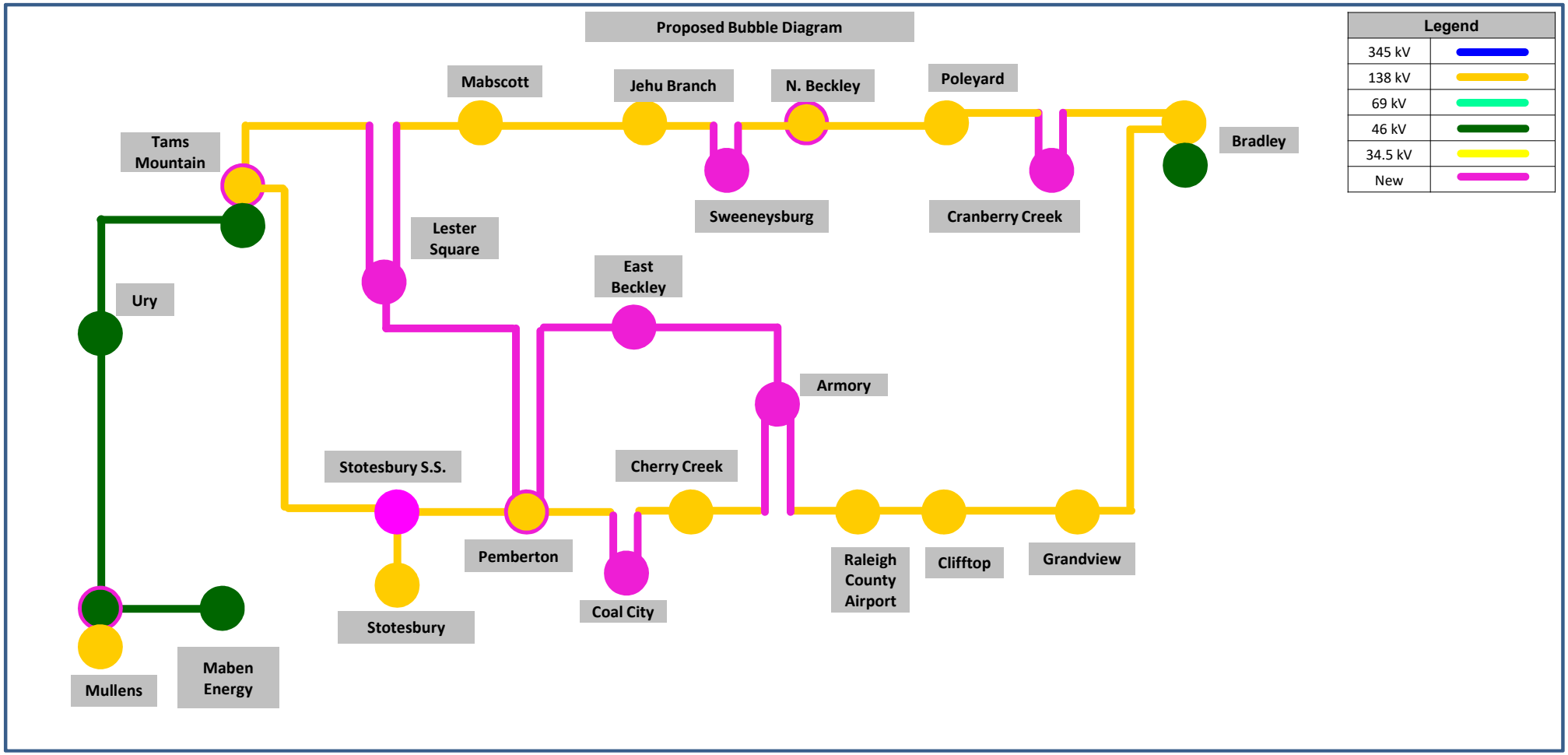




AEP Transmission Zone: Supplemental
Beckley , WV



AEP Transmission Zone: Supplemental
Beckley , WV



AEP Transmission Zone: Supplemental
Beckley , WV

Need Number: AEP-2022-AP015, AEP-2022-AP016, AEP-2022-AP017, AEP-2022-AP018, AEP-2022-AP019, AEP-2022-AP020, AEP-2022-AP021

Process Stage: Solutions Meeting 11/17/2023

Proposed Solution

- Construct a new double circuit 138 kV line (approx. 1 miles) by tapping the existing Cherry Creek – Pemberton 138 kV and building in/out to a new 138 kV station near Coal City. **Estimated Trans. Cost: $5.4M**
    - Retire existing 46 kV line from Sophia – Maben Energy. **Estimated Trans. Cost: $11.5M**
    - Retire existing Sophia – Tams Mountain 46 kV line **Estimated Trans. Cost: $4.7M**
    - Retire existing Pemberton – Sophia 46 kV line. **Estimated Trans. Cost: $3.3M**
- New Coal City Station: Install two 138 kV line MOABs, one 138/12 kV 20 MVA XFR with high side circuit switcher and two 12 kV feeders **Estimated Trans. Cost: $1.0M**
- Retire Sophia 46 kV Station **Estimated Trans. Cost: $1.4M**
- Pemberton Station: Install a new 138/46 kV XFR with a high side circuit switcher and new metering. This will feed the customer currently served out of Sophia Station. Construct a new 1 mile 46 kV line from Pemberton to the customer. Install two new 138 kV circuit breakers . Retire 138/46 kV XFR, 46 kV CB-A, 46 kV CB-C and 4 kV distribution equipment. Install one new 138 kV circuit breaker. Retire 46 kV CB-B **Estimated Trans. Cost: $10.7M**
- Stotesbury: Replace existing hard tap with a new 3-way phase over phase switch **Estimated Trans. Cost: $1.8M**
- Retire Killarney 46 kV Station **Estimated Trans. Cost: $0.0M**
- Retire Bowyer 46 kV Station **Estimated Trans. Cost: $0.0M**
- Tams Mountain: Remove 46 kV CB-N2 and 46 kV CB M **Estimated Trans. Cost: $1.1M**

Proposed Solution Bubble Diagram

SEE PREVIOUS SLIDES

Legend	
345 kV	
138 kV	
69 kV	
46 kV	
34.5 kV	
New	

AEP Transmission Zone: Supplemental
Beckley , WV

Need Number: AEP-2022-AP015, AEP-2022-AP016, AEP-2022-AP017, AEP-2022-AP018, AEP-2022-AP019, AEP-2022-AP020, AEP-2022-AP021

Process Stage: Solutions Meeting 11/17/2023

Proposed Solution

- Construct a new double circuit 138 kV line in/out (approx. 1 mile) to the existing Sweeneysburg Switch Station **Estimated Trans. Cost: $3.8M**
- Construct a new 138 kV double circuit line (approx. 2 miles) by tapping the existing North Beckley – Tams Mountain 138 kV line and building in/out to a new 138 kV station (Lester Square Station) **Estimated Trans. Cost: $9.9M**
- Construct a new 138 kV single circuit line (approx. 1.2 miles) from the new Lester Square Station to the existing Pemberton 138 kV station. **Estimated Trans. Cost: $6.6M**
- Retire Glen White Station **Estimated Trans. Cost: $0.0M**
- Retire Shockley Station **Estimated Trans. Cost: $0.1M**
- Retire Bradley – Tams Mountain 46 kV line: **Estimated Trans. Cost: $20.3M**
- Sweeneysburg Switch: Convert to 138 kV **Estimated Trans. Cost: $0.1M**
- Lester Square: Install five 138 kV CBs in a ring configuration, install one 23 MVAR capacitor bank with a circuit switcher, install a new 138/12 kV 20 MVA XFR with two 12 kV feeders. Install a new 138/46 kV XFR to feed the customer previously served from Shockley Station. Construct a new 46 kV line from Lester Square to the customer previously served at Shockley Station. **Estimated Trans. Cost: $5.9M**
- North Beckley Station: Remote End work required due to the new line cut in to Lester Square Station. **Estimated Trans. Cost: $0.6M**
- Bradley Station: Remove 46 kV CB-F, Retire 46 kV CB-J **Estimated Trans. Cost: $0.8M**

Proposed Solution Bubble Diagram

SEE PREVIOUS SLIDES

Legend	
345 kV	
138 kV	
69 kV	
46 kV	
34.5 kV	
New	

AEP Transmission Zone: Supplemental
Beckley , WV

Need Number: AEP-2022-AP015, AEP-2022-AP016, AEP-2022-AP017, AEP-2022-AP018, AEP-2022-AP019, AEP-2022-AP020, AEP-2022-AP021

Process Stage: Solutions Meeting 11/17/2023

Proposed Solution

- Construct a new 138 kV double circuit line (approx. 1.5 miles) tapping the existing Bradley – North Beckley 138 kV line and building in/out to a new 138 kV station (Cranberry Creek) **Estimated Trans. Cost: $7.9M**
- Construct a new single circuit 138 kV line (approx. 5.1 miles) from Pemberton to a new 138 kV station (East Beckley) **Estimated Trans. Cost: $15.7M**
- Construct a new single circuit 138 kV line (approx. 1.7 mile) from the new East Beckley 138 kV Station to a new 138 kV station (Armory Station) **Estimated Trans. Cost: $8.0M**
- Construct a new double circuit 138 kV line (approx. 1.0 miles) by tapping the Raleigh County 138 kV Extension line and building in/out to the new Armory 138 kV Station. **Estimated Trans. Cost: $4.5M**
- Retire Bradley – Beckley 46 kV line **Estimated Trans. Cost: $9.6M**
- Retire Beckley – Pemberton 46 kV line and Crab Orchard 46 kV tap line **Estimated Trans. Cost: $7.0M**
- Retire Whitestick 46 kV Station **Estimated Trans. Cost: $0.0M**
- Retire Beckley 46 kV Station **Estimated Trans. Cost: $0.0M**
- Retire Crab Orchard 46 kV Station: **Estimated Trans. Cost: $0.0M**
- Armory Station: Install three 138 kV circuit breakers, 23 MVAR capacitor bank with circuit switcher, install one new 138/12 kV 25 MVA XFR with high side circuit switcher and three 12 kV feeders **Estimated Trans. Cost: $4.2M**
- East Beckley: Install two 138 kV MOABs, install one new 138/12 kV 25 MVA XFR with a high side circuit switcher and three 12 kV feeders **Estimated Trans. Cost: $1.2M**
- Cranberry Creek: Install one 138 kV circuit breaker, one 138 kV line MOAB, one 138/12 kV 25 MVA XFR with a high side circuit switcher and three 12 kV feeders **Estimated Trans. Cost: $2.2M**
- Cherry Creek Station: Remote end work due to the the Armory Extension cut-in. **Estimated Trans. Cost: $0.0M**
- North Beckley Station: Install one 138/12 kV 25 MVA XFR with three 12 kV feeders. Install one new 138 kV circuit breaker, replace existing ground switch MOAB on XFR #1 with a new 138 kV circuit switcher. Replace existing ground switch MOAB on 138/34.5 kV XFR #2 and replace existing 34.5 kV circuit breakers G and H. **Estimated Trans. Cost: $1.6M**

Total Combined Estimated Trans. Cost: $150.9M

Proposed Solution Bubble Diagram

Legend	
345 kV	
138 kV	
69 kV	
46 kV	
34.5 kV	
New	

SEE PREVIOUS SLIDES

Need Number: AEP-2022-AP015, AEP-2022-AP016, AEP-2022-AP017, AEP-2022-AP018, AEP-2022-AP019, AEP-2022-AP020, AEP-2022-AP021

Process Stage: Solutions Meeting 11/17/2023

Alternate:

- Rebuild the existing Mullens – Sophia 46 kV line (approx. 17 miles), Rebuild the existing Sophia – Tams Mountain 46 kV line (approx. 4 miles). Replace three 46 kV circuit breakers and one 46 kV circuit switcher at Sophia Station. **Estimated Cost: 88.7M**
- Rebuild existing Bradley – Tams Mountain 46 kV line (approx. 16 miles). **Estimated Cost: 67.2M**
- Rebuild existing Bradley – Beckley 46 kV line (approx. 8 miles), rebuild existing Beckley – Pemberton 46 kV line (approx. 5 miles), rebuild existing Crab Orchard 46 kV tap line (approx. 1 mile). Replace one existing 46 kV circuit breaker and the existing 138/46 kV transformer at Pemberton Station. **Estimated Cost: 63.7**
- Total Alternate Estimated Cost: $219.6M

Ancillary Benefits: Alternate consists of 51 total miles of line needing to be rebuilt. The proposed solution consists of a total of 14.5 miles of greenfield line. Additionally, as part of the proposed solution the following deteriorating Distribution station equipment will be retired: Beckley Station 3 – 12 kV CBs, 2 – 46/12 kV XFRs, 25 EM relays, 1 RTU. Whitestick Station 3 – 12 kV CBs, 1 – 46/12 kV XFR, 18 EM relays. Crab Orchard Station 1 – 46/12 kV XFR, 1 RTU. Pemberton Station 1 – 46/4 kV XFR. Killarney Station 1 – 46/7.2 kV XFR. Bowyer Station 1 – 46/12 kV XFR. Glen White Station 1 – 46/12 kV XFR, 4 EM Relays

Projected In-Service: 6/10/2031

Project Status: Scoping

Model: 2028 RTEP

APS Transmission Zones M-3 Process
Bedington Substation

Need Number: APS-2023-028

Process Stage: Solution Meeting – 12/05/2023

Previously Presented: Need Meeting – 09/05/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

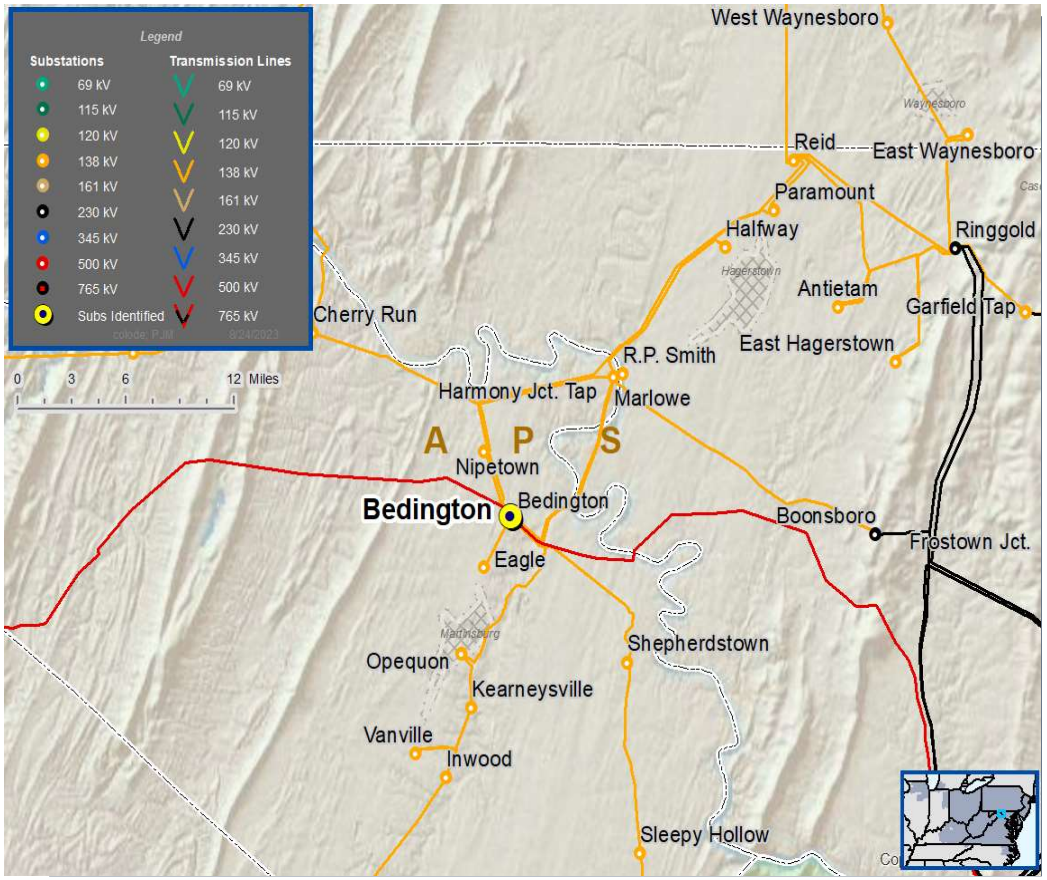
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The 500/138 kV No. 1 Transformer at Bedington was manufactured 47 years ago and is approaching end of life.
  - 500 kV and 138 kV protective devices are ~50 years old which produces reliability and safety concerns.
- The transformer exhibits multiple maintenance issues including:
  - Elevated methane and ethane gas levels compared with IEEE Standards
  - Equipment degradation and obsolete replacement parts
  - Oil leaks
- Existing TR Ratings:
  - 485 / 619 MVA (SN / SSTE)



APS Transmission Zones M-3 Process
Bedington Substation

Need Number: APS-2023-028

Process Stage: Solution Meeting 12/05/2023

Proposed Solution:

- Replace the Bedington No. 1 500/138 kV Transformer with a 425 MVA unit
- Upgrade transformer relaying

Transformer Ratings:

- Bedington No. 1 500/138 kV Transformer:
  - Before Proposed Solution: 485 / 619 MVA (SN / SSTE)
  - After Proposed Solution (anticipated): 576 / 699 MVA (SN / SSTE)

Alternatives Considered:

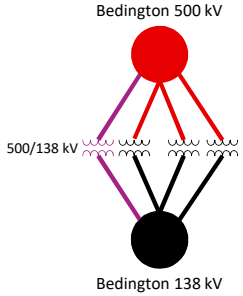
- Maintain transformer in existing condition & replace upon failure

Estimated Project Cost: $21.8M

Projected In-Service: 06/01/2027

Project Status: Engineering

Model: 2023 RTEP model for 2028 Summer (50/50)



Legend	
500 kV	
345 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
34.5 kV	
23 kV	
New	

APS Transmission Zone M-3 Process
Bedington – Doubs 500 kV Misoperation Relays

Need Numbers: APS-2023-057

Process Stage: Solution Meeting 12/05/2023

Previously Presented: Need Meeting 10/31/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

- System Performance Projects Global Factors
- System reliability and performance
- Substation/line equipment limits
- System Condition Projects
- Substation Condition Rebuild/Replacement
- Upgrade Relay Schemes
- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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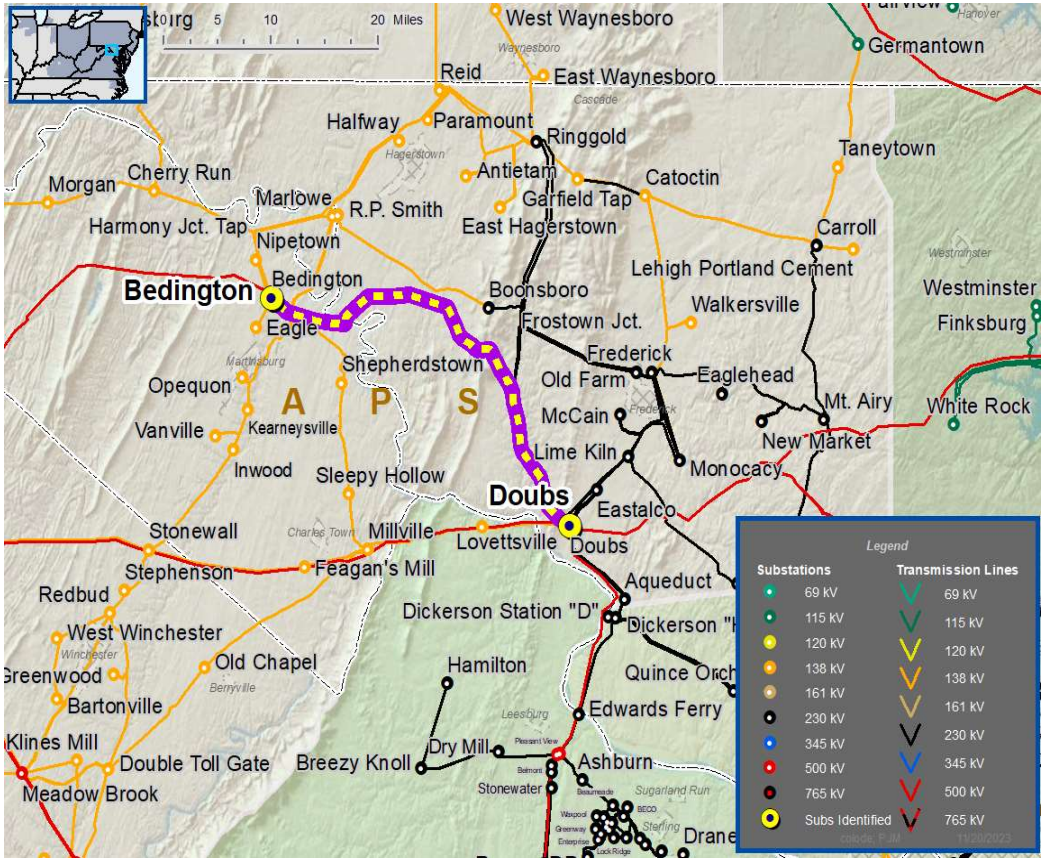

APS Transmission Zone M-3 Process
Bedington – Doubs 500 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)
APS-2023-057	Bedington – Doubs 500 kV	3526 / 3792	3573 / 4379

APS Transmission Zone M-3 Process
Bedington – Doubs 500 kV Misoperation Relays

Need Number: APS-2023-057

Process Stage: Solution Meeting 12/05/2023

Proposed Solution:

- Replace circuit breakers, disconnect switches, line trap, substation conductor and relaying at Bedington Substation
- Replace circuit breakers, disconnect switches, line trap, substation conductor and relaying at Doubs Substation

Transmission Line Ratings:

- Bedington – Doubs 500 kV Line:
  - Before Proposed Solution: 3526 / 3792 / 3928 / 4140 MVA (SN / SE / WN / WE)
  - After Proposed Solution: 3573 / 4379 / 4050 / 5194 MVA (SN / SE / WN / WE)

Alternatives Considered:

- Maintain line and vintage relay schemes with risk of misoperation

Estimated Project Cost: $ 6.95 M

Projected In-Service: 02/28/2025

Project Status: Engineering

Model: 2023 RTEP model for 2028 Summer (50/50)

Legend	
500 kV	
345 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
34.5 kV	
23 kV	
New	

APS Transmission Zone M-3 Process
Misoperation Relay Projects

Need Numbers: APS-2023-064 to APS-2023-066, APS-2023-069

Process Stage: Solution Meeting 12/15/2023

Previously Presented: Need Meeting 11/17/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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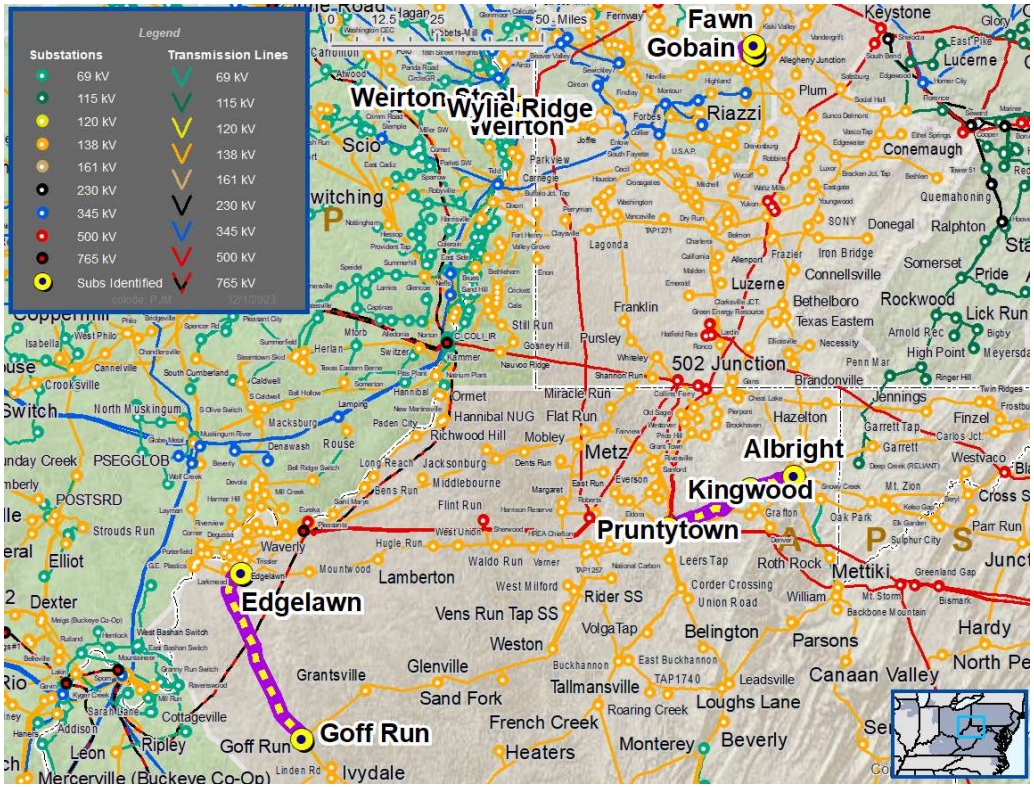


APS Transmission Zone M-3 Process
Misoperation Relay Projects

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE / WN / WE)	Existing Conductor Rating (SN / SE / WN / WE)
APS-2023-064	Weirton – Weirton JCT 138 kV	292 / 314 / 325 / 343	308 / 376 / 349 / 445
	Weirton JCT – Wylie Ridge 138 kV	292 / 314 / 325 / 343	308 / 376 / 349 / 445
APS-2023-065	Edgelawn – Goff Run 138 kV	195 / 209 / 217 / 229	221 / 268 / 250 / 317
APS-2023-066	Albright – Kingwood 138 kV	187 / 209 / 217 / 229	221 / 268 / 250 / 317
	Kingwood – Pruntytown 138 kV	221 / 268 / 250 / 287	221 / 268 / 250 / 317
APS-2023-069	Fawn – Gobain 138 kV	287 / 287 / 287 / 287	297 / 365 / 345 / 441

APS Transmission Zone M-3 Process
Misoperation Relay Projects

Proposed Solution:

Need #	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE / WN / WE)	Scope of Work	Estimated Cost ($ M)	Target ISD
APS-2023-064	Weirton – Weirton JCT 138 kV	308 / 376 / 349 / 445	• At Weirton Substation, replace line trap and relaying	$1.7	06/01/2024
	Weirton JCT – Wylie Ridge 138 kV	308 / 376 / 349 / 445	• At Wylie Ridge Substation, replace circuit breaker, disconnect switches, line trap and relaying		
APS-2023-065	Edgelawn – Goff Run 138 kV	221 / 268 / 250 / 317	• At Edgelawn Substation, replace disconnect switches, line trap, substation conductor and relaying • At Goff Run Substation, replace line trap, substation conductor and relaying	$2.1	07/31/2024

APS Transmission Zone M-3 Process Misoperation Relay Projects

Proposed Solution:

Need #	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE / WN / WE)	Scope of Work	Estimated Cost ($ M)	Target ISD
APS-2023-066	Albright – Kingwood 138 kV	221 / 268 / 250 / 317	• At Albright Substation, replace disconnect switches, line trap, substation conductor and relaying • At Kingwood Substation, replace disconnect switches and relaying	$3.9	10/09/2024
	Kingwood – Pruntytown 138 kV	221 / 268 / 250 / 317	• At Pruntytown Substation, replace disconnect switches, line trap, substation conductor and relaying • At Kingwood Substation, replace disconnect switches and relaying		
APS-2023-069	Fawn – Gobain 138 kV	297 / 365 / 345 / 441	• At Fawn Substation, replace circuit breaker, disconnect switches, line trap, substation conductor and relaying • At Gobain Substation, replace circuit breaker, disconnect switches, line trap, substation conductor and relaying	$3.5	10/31/2025

Alternatives Considered: Maintain equipment in existing condition with elevated risk of equipment misoperation

Project Status: Engineering

Model: 2023 RTEP model for 2028 Summer (50/50)

EKPC Transmission Zone M-3 Process
Stephensburg-Bonnieville

Need Number: EKPC-2023-017

Process Stage: Need Meeting – November 17, 2023

Supplemental Project Driver:
Equipment Material Condition, Performance and Risk

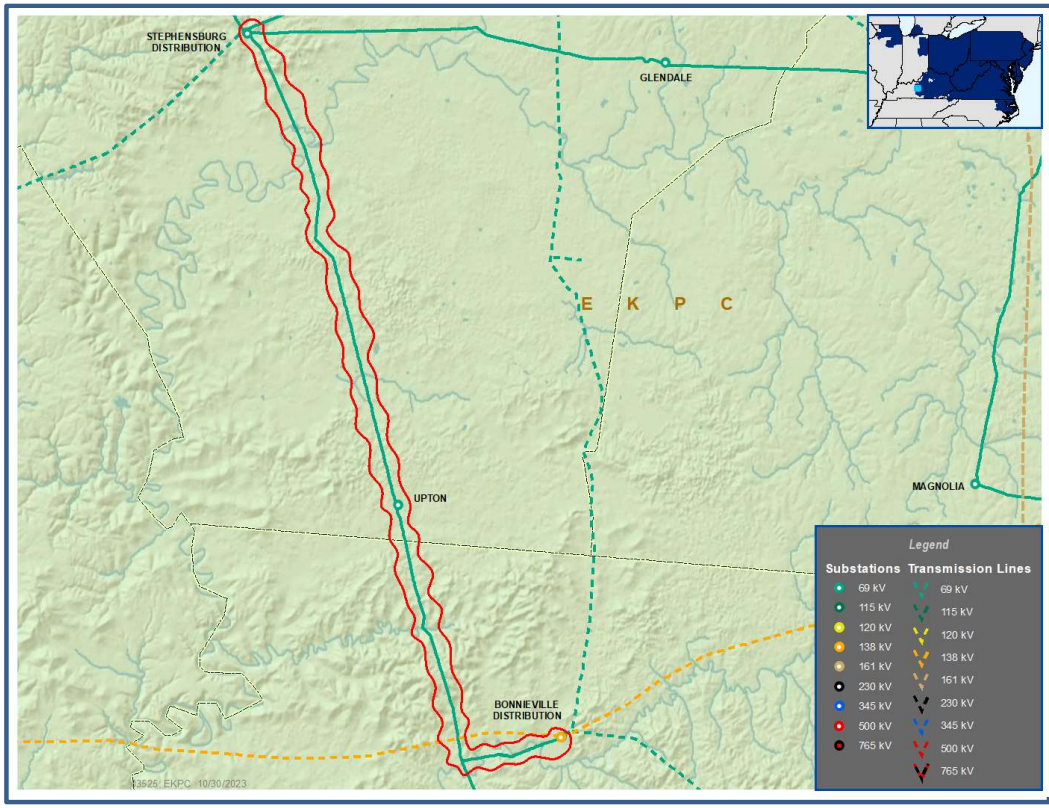
Specific Assumption Reference:
EKPC Assumptions Presentation Slide 13

Problem Statement:

The 16.42 mile, Stephensburg-Bonnieville 69 KV transmission line is 1955 vintage wood pole construction with 4/0 conductor. This line section has reliability concerns related to aging wood poles as well as conductor steel core and static wire deterioration including, rusting, pitting and possible broken strands.

The EKPC Reliability team has concluded, that this line is at or near end of life and should be addressed due to the condition.

Model: N/A



EKPC Transmission Zone M-3 Process
Stephensburg-Bonnieville

Need Number: EKPC-2023-017

Process Stage: Solutions Meeting – December 15, 2023

Proposed Solution:

Rebuild the 16.42 mile, Stephensburg-Bonnieville 69 KV line using 556.5 conductor and steel pole construction.

Transmission Cost: $12.4M
Distribution Cost: $0.0M

Ancillary Benefits:

- Increases transmission line ratings

Alternatives Considered:

1. Rebuild the 7.9 mile, Bonnieville - Upton Tap 69 KV line section as double-circuit 556 ACSR. Retire the 10.8 mile, Stephensburg - Upton Tap 69 KV line section.
Transmission Cost: $11.9M
Distribution Cost: $0.0M

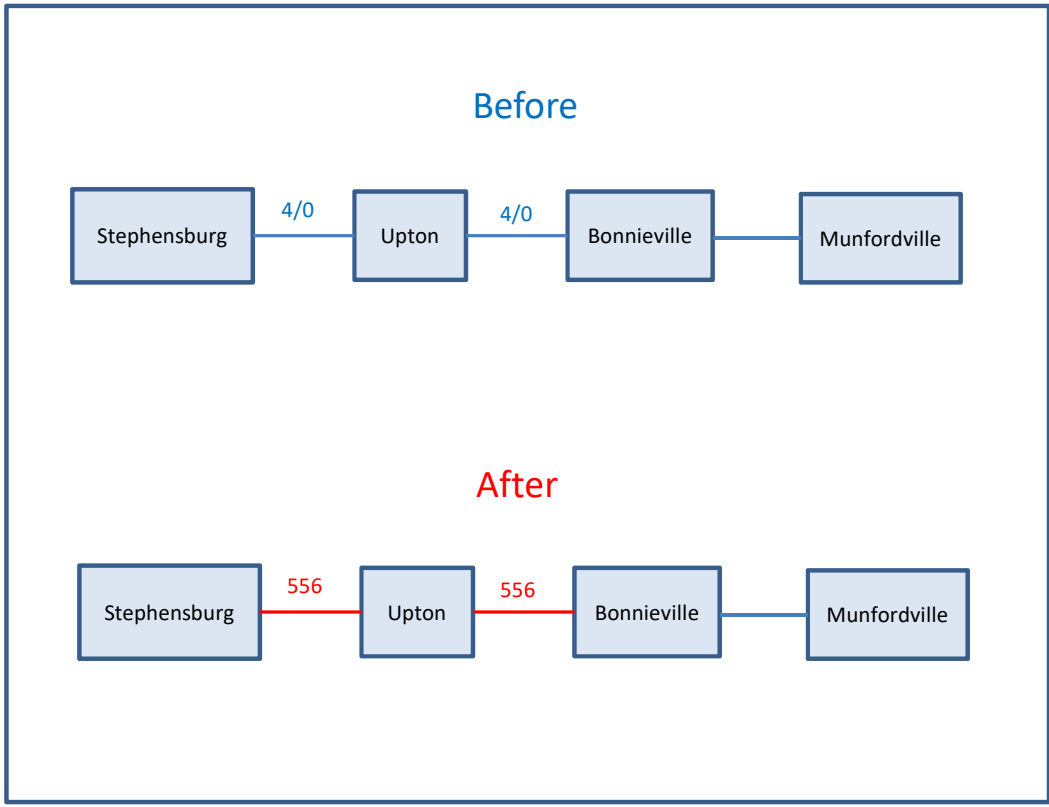
2. Construct a new 69 kV breaker station between the LG&E/KU Sonora Tap and Bonnieville KU substaions. Construct a new 4.6 mile, 69 KV line from the new breaker station to Upton Tap. Rebuild the 7.9 mile, Bonnieville - Upton Tap 69 KV line section using 556 ACSR. Retire the 10.8 mile, Stephensburg - Upton Tap 69 kV line section.
Transmission Cost: $23.4M
Distribution Cost: $0.0M

3. Create a new normally-open connection to LG&E/KU by constructing a new 4.6 mile, 69 KV line using 556 ACSR to the KU Sonora Tap - Bonnieville KU line section. Rebuild the 7.9 mile, 69 KV Bonnieville - Upton Tap line section using 556 ACSR. Retire the 10.8 mile, Stephensburg - Upton Tap 69 kV line section.
Transmission Cost: $14.5M
Distribution Cost: $0.0M

Projected In-Service: 3/1/2027

Project Status: Scoping

Model: N/A



EKPC Transmission Zone M-3 Process
Green County/Coburg Junction Area

Need Number: EKPC-2023-018

Process Stage: Need Meeting – November 17, 2023

Supplemental Project Driver:
Operational Flexibility and Efficiency

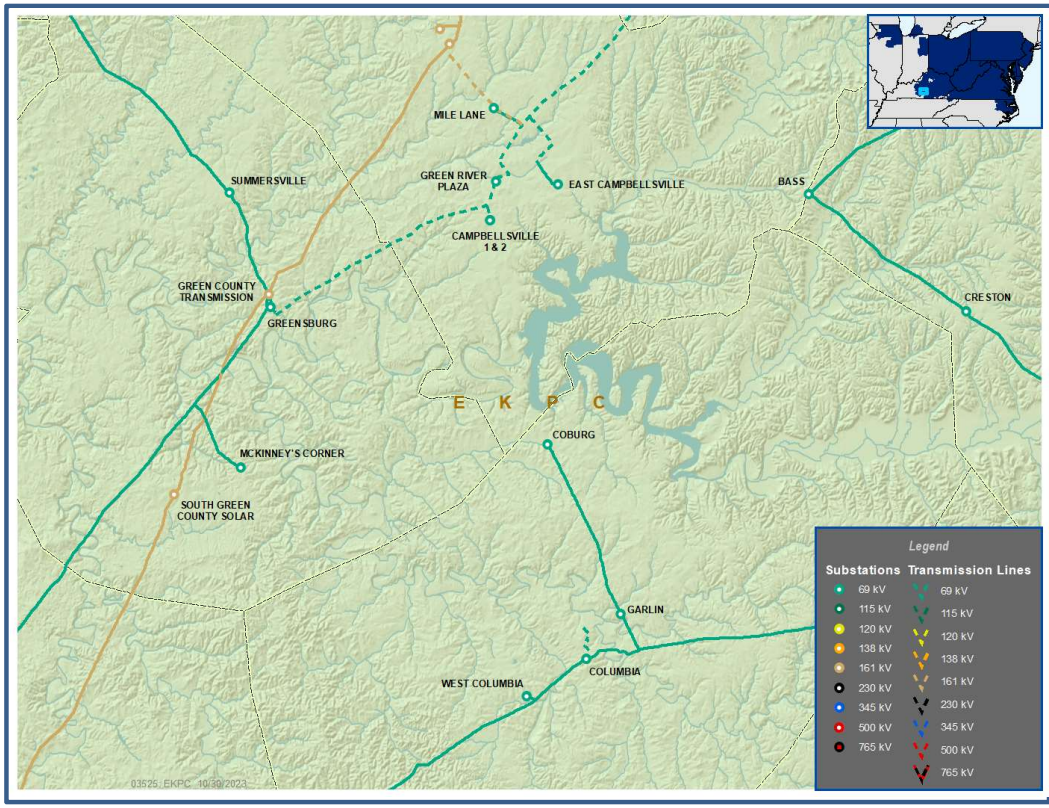
Specific Assumption Reference:
EKPC Assumptions Presentation Slide 14

Problem Statement:

System operation issues exist for, pre-existing outages of either the Green County 161/69 kV transformer or the LG&E/KU Taylor County 161/69 kV transformer (or 69 kV line sections between Taylor County and Green County), followed by another outage of one of these facilities in the area. This outage combination can result in low voltage limit violations in the area, as well as potential thermal loading violations for the Summer Shade-Green County 69 kV line. The system is often configured in a radial configuration, to segment load when an outage is occurring in the area to prevent voltage collapse and/or the thermal loading issue for a subsequent outage. Numerous PCLLRWs have been issued related to this area for potential operational violations in the area for a subsequent contingency.

Alternative will be developed to relieve the system operation concerns for this area.

Model: N/A



EKPC Transmission Zone M-3 Process
Green County/Coburg Junction Area

Need Number: EKPC-2023-018

Process Stage: Solutions Meeting – December 15, 2023

Proposed Solution:

Establish a new free flowing interconnection with LG&E/KU, by constructing a new 10.0 mile Coburg-Heartland 69kV line using 556 conductor and steel pole construction. Construct a new LG&E/KU owned ring bus configuration substation near Campbellsville and a new breaker station at Coburg Junction. Additionally, increase the Coburg capacitor bank to 17 MVAR and the Green River Plaza capacitor bank to 27 MVAR.

Transmission Cost: $22.1M
Distribution Cost: $0.0M

Ancillary Benefits:

- Shifts load from the LG&E/KU transmission system (at Campbellsville and Heartland) to the EKPC transmission system.

Alternatives Considered:

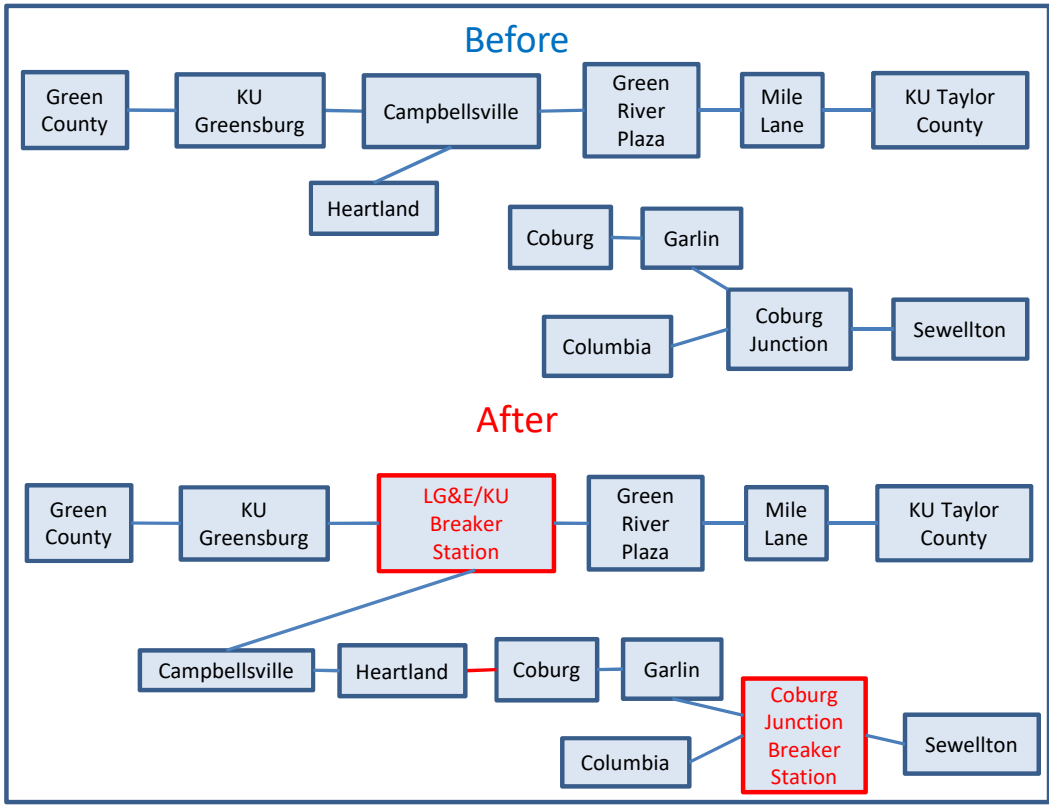
1. Construct a new 10.0 mile, 69kV line from Bass-East Campbellsville to create a new normally closed tie with LG&E/KU and upgrade the LG&E/KU Taylor County substation to serve their Campbellsville Industrial tap directly from Taylor County. Build a new 10.0 mile, 69kV line from Coburg-Heartland with a LG&E/KU owned ring bus near Campbellsville. Add a new breaker station at Coburg Junction.
Transmission Cost: $41.0M
Distribution Cost: $0.0M

2. Construct a new 12.75 mile, Coburg-Green County 69kV line and a new 69kV breaker station at Coburg Junction.
Transmission Cost: $20.1M
Distribution Cost: $0.0M

Projected In-Service: 12/31/2026

Project Status: Scoping

Model: N/A



EKPC Transmission Zone M-3 Process
Elizabethtown-Central Hardin-Stephensburg

Need Number: EKPC-2023-019

Process Stage: Need Meeting – November 17, 2023

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

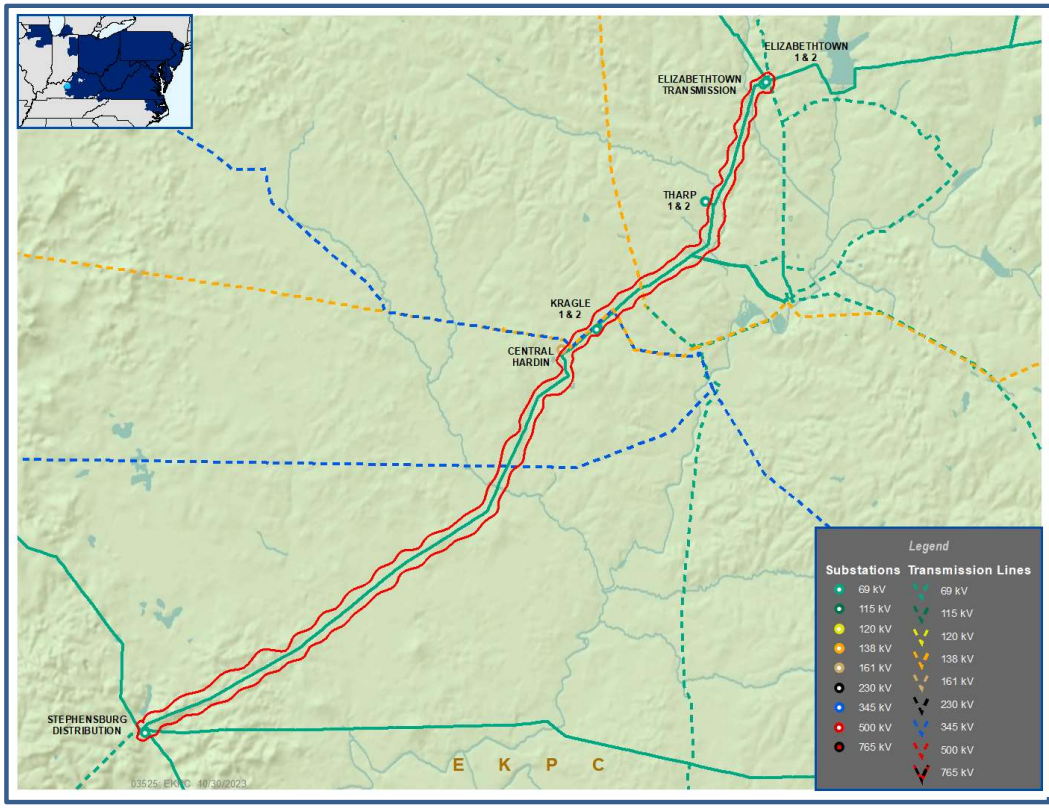
EKPC Assumptions Presentation Slide 13

Problem Statement:

The EKPC reliability team has been working to identify transmission lines sections, with single wood pole structures and 556.5 ACSR wire or larger that are known to have structural design issues. Most of the structures on these lines are believed to be over 100% capacity if the structure was new, based on EKPC current design standards. Many of the lines have been re-conductored with larger wire and very little structure design was performed at the time of the re-conductor.

The 11.7 mile, Elizabethtown-Central Hardin-Stephensburg 69 KV line sections has been identified from the above to be addressed. Alternatives will be developed to address these structural loading concerns.

Model: N/A



EKPC Transmission Zone M-3 Process
Elizabethtown-Central Hardin-Stephensburg

Need Number: EKPC-2023-019

Process Stage: Solutions Meeting – December 15, 2023

Proposed Solution:
Rebuild the 11.7 mile, Elizabethtown-Central Hardin-Stephensburg 69 KV line sections using existing conductor size and steel pole construction.

Transmission Cost: $10.7M
Distribution Cost: $0.0M

Ancillary Benefits:

- None

Alternatives Considered:
1. Rebuild the 7.25 mile, Stephensburg - Central Hardin with 795 conductor at 138 KV construction and operate at 69 KV. Rebuild Central Hardin-Elizabethtown using existing conductor sizes.
Transmission Cost: $15.5M
Distribution Cost: $0.0M

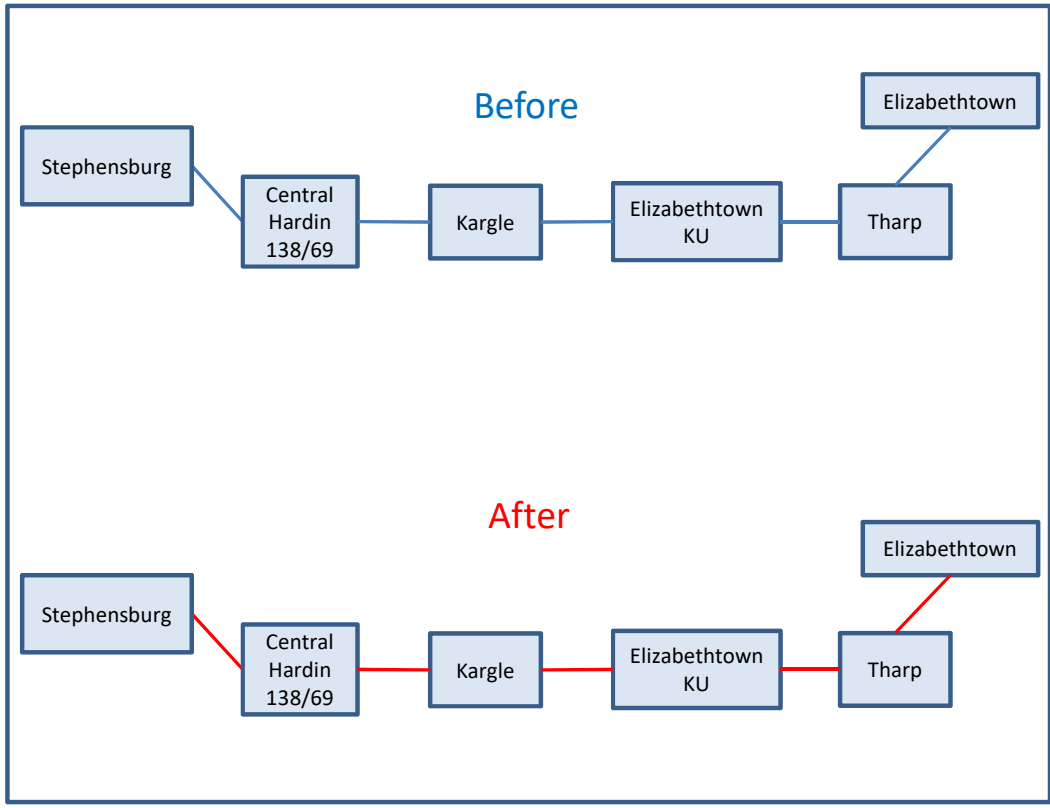
2. Retire the 7.25 mile, Stephensburg - Central Hardin line section. Rebuild Central Hardin-Elizabethtown using existing conductor sizes.
Transmission Cost: $5.1M
Distribution Cost: $0.0M

3. Retire the 7.25 mile, Stephensburg - Central Hardin line section. Construct a new 9.4 mile, Vertree-Rineyville 69 KV line section. Rebuild Central Hardin-Elizabethtown using existing conductor sizes.
Transmission Cost: $16.4M
Distribution Cost: $0.0M

Projected In-Service: 8/1/2028

Project Status: Scoping

Model: N/A



EKPC Transmission Zone M-3 Process
Elizabethtown-Patriot Parkway-Vine Grove

Need Number: EKPC-2023-020

Process Stage: Need Meeting – November 17, 2023

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

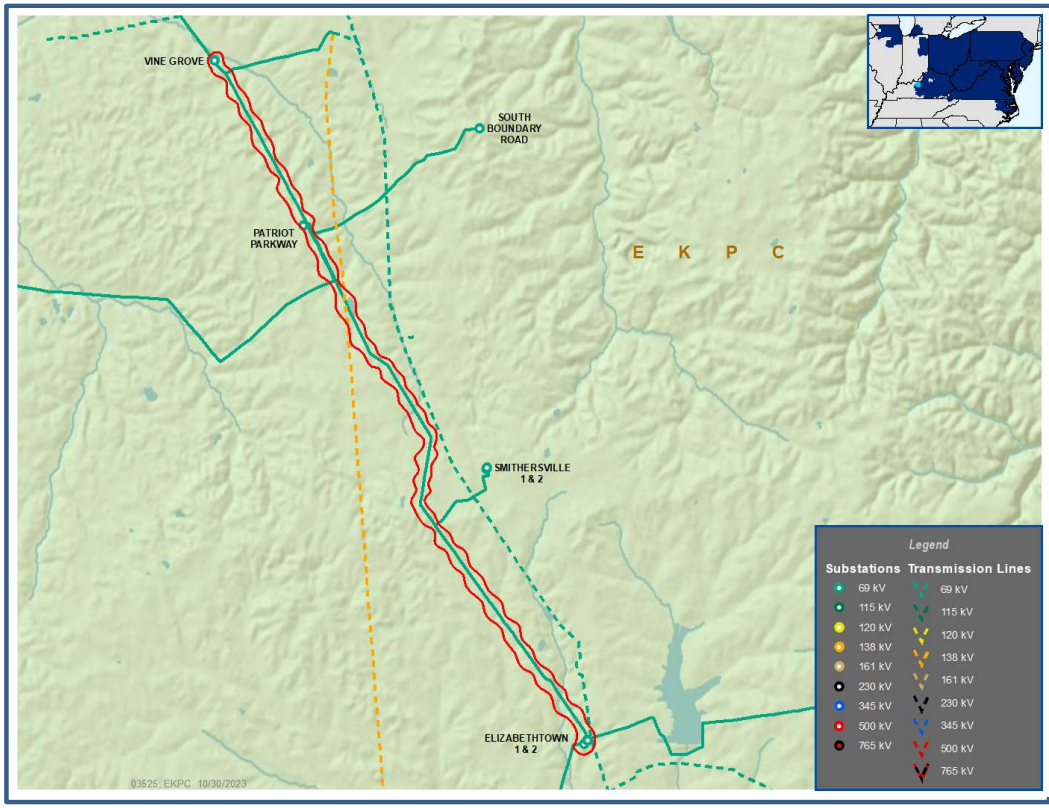
EKPC Assumptions Presentation Slide 13

Problem Statement:

The EKPC reliability team has been working to identify transmission lines sections, with single wood pole structures and 556.5 ACSR wire or larger that are known to have structural design issues. Most of the structures on these lines are believed to be over 100% capacity if the structure was new, based on EKPC current design standards. Many of the lines have been re-conductored with larger wire and very little structure design was performed at the time of the re-conductor.

The 7.45 mile, Elizabethtown-Patriot Parkway-Vine Grove 69 KV line sections has been identified from the above to be addressed. Alternatives will be developed to address these structural loading concerns.

Model: N/A



EKPC Transmission Zone M-3 Process
Elizabethtown-Patriot Parkway-Vine Grove

Need Number: EKPC-2023-020

Process Stage: Solutions Meeting – December 15, 2023

Proposed Solution:

Rebuild the 7.45 mile, Elizabethtown-Patriot Parkway-Vine Grove 69 KV line sections using existing conductor size and steel pole construction.

Transmission Cost: $5.2M
Distribution Cost: $0.0M

Ancillary Benefits:

- None

Alternatives Considered:

1. Build a new 4.6 mile, 69 KV line from Rineyville to Vine Grove using 556 conductor. Retire 1.56 mile, Rogersville Junction-Patriot Parkway 69 KV line. Rebuild Vine Grove-Rogersville Junction and Elizabethtown-Patriot Parkway using 556 conductor.

Transmission Cost: $10.2M
Distribution Cost: $0.0M

2. Build a new 2.5 mile, 69 KV line from Vine Grove to the Rineyville-Patriot Parkway line using 556 conductor. Retire the 1.56 mile, Rogersville Junction-Patriot Parkway 69 KV line. Rebuild Vine Grove-Rogersville Junction and Elizabethtown-Patriot Parkway using 556 conductor.

Transmission Cost: $7.7M
Distribution Cost: $0.0M

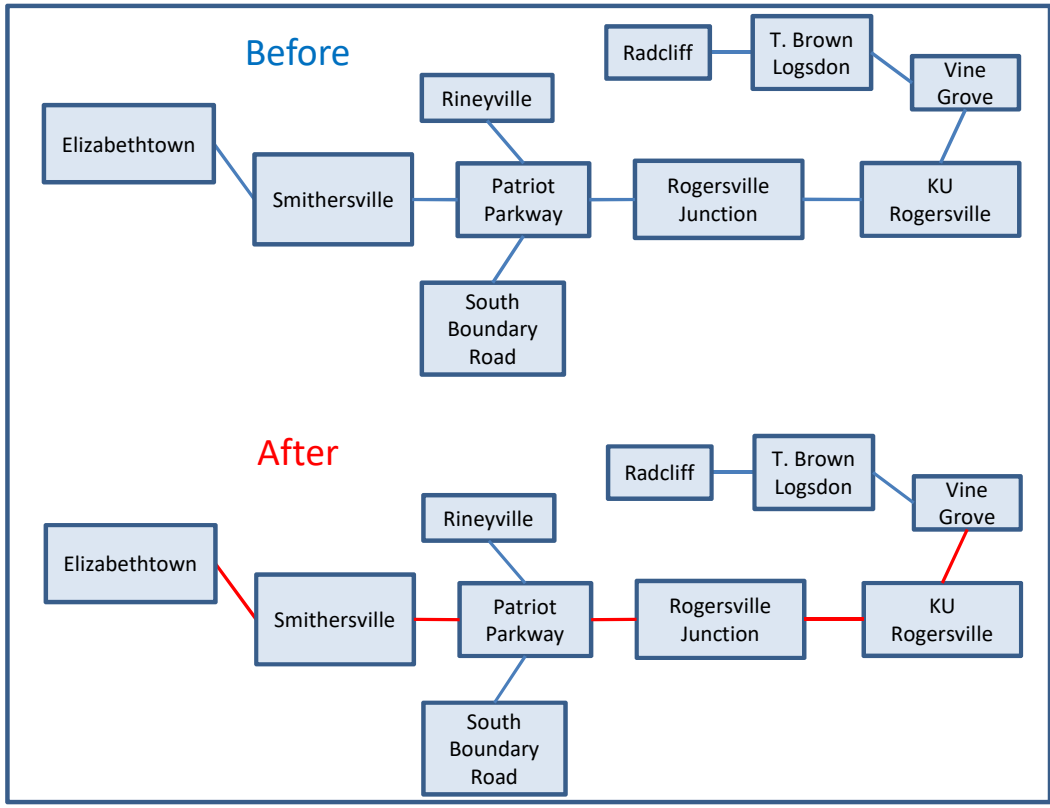
3. Build a new 5.75 mile, 69 KV line from Rineyville to Radcliff using 556 conductor. . Retire the 1.56 mile, Rogersville Junction-Patriot Parkway 69 KV line. Rebuild Vine Grove-Rogersville Junction, Elizabethtown-Patriot Parkway and Radcliff-Vine Grove using 556 conductor.

Transmission Cost: $13.8M
Distribution Cost: $0.0M

Projected In-Service: 8/1/2027

Project Status: Scoping

Model: N/A



EKPC Transmission Zone M-3 Process
Penn-Renaker

Need Number: EKPC-2023-021

Process Stage: Need Meeting – November 17, 2023

Supplemental Project Driver:
Equipment Material Condition, Performance and Risk

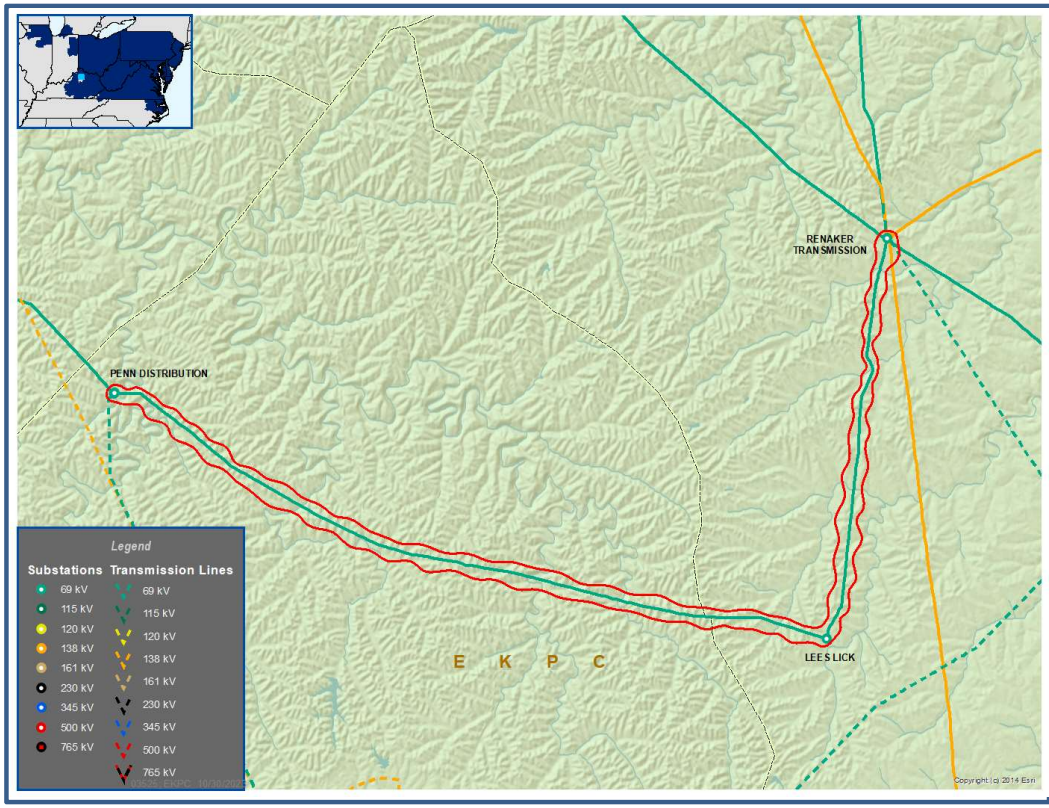
Specific Assumption Reference:
EKPC Assumptions Presentation Slide 13

Problem Statement:

The 20.79 mile, Penn-Renaker 69 KV transmission line is 1955 vintage wood pole construction with 2/0 conductor. This line section has reliability concerns related to aging wood poles as well as conductor steel core and static wire deterioration including, rusting, pitting and possible broken strands.

The EKPC Reliability team has concluded, that this line is at or near end of life and should be addressed due to the condition.

Model: N/A



EKPC Transmission Zone M-3 Process
Penn-Renaker

Need Number: EKPC-2023-021

Process Stage: Solutions Meeting – December 15, 2023

Proposed Solution:

Rebuild the 20.79 mile, Renaker-Penn 69 KV line sections using 556 conductor and steel pole construction.

Transmission Cost: $16.4M

Distribution Cost: $0.0M

Ancillary Benefits:

- Increases transmission line ratings

Alternatives Considered:

1. Convert Lees Lick to 138 KV, construct a new 2.0 mile tap line to connect to the Renaker-Avon 138 KV line. Retire the 20.79 mile, Renaker-Penn 69 KV line section.

Transmission Cost: $1.1M

Distribution Cost: $5.5M

2. Establish a new 1.5 mile, 69 KV normally open connection to the LG&E/KU Cynthiana Switch-Adams line. Retire the 7.2 mile, Renaker-Lees Lick line section. Rebuild the 13.6 mile, Penn-Lees Lick line section.

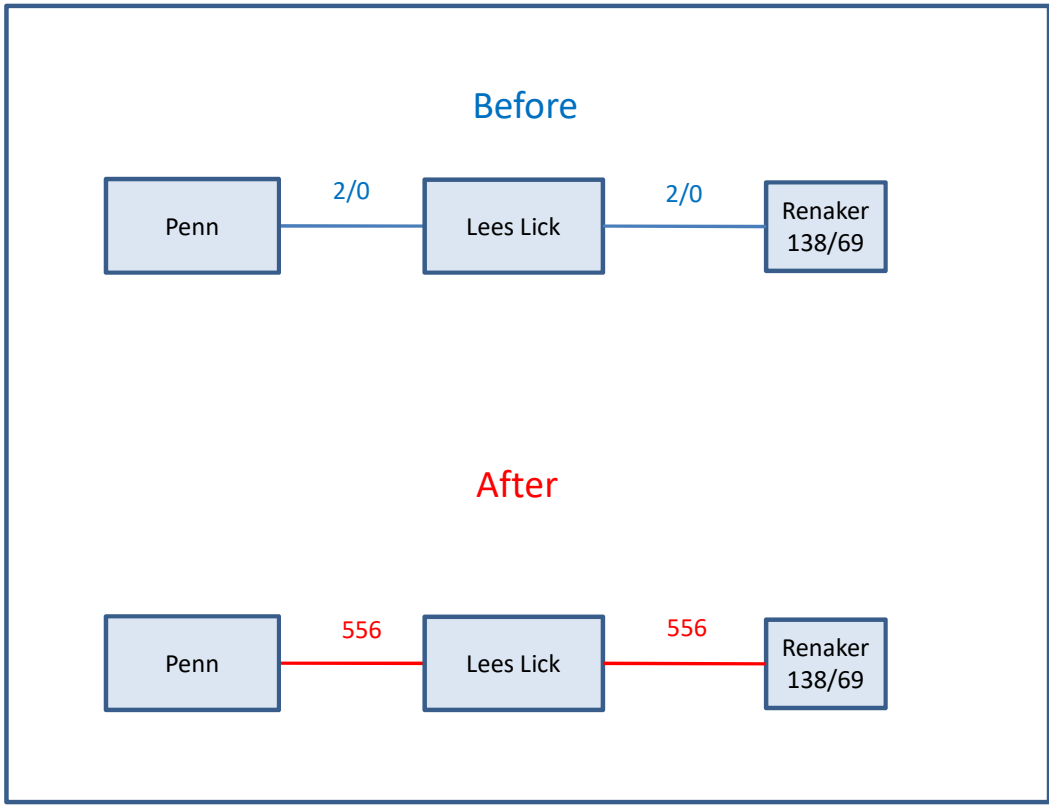
Transmission Cost: $17.1M

Distribution Cost: $0.0M

Projected In-Service: 12/1/2027

Project Status: Engineering & Procurement

Model: N/A



EKPC Transmission Zone M-3 Process
Windsor-Somerset

Need Number: EKPC-2023-022

Process Stage: Need Meeting – November 17, 2023

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

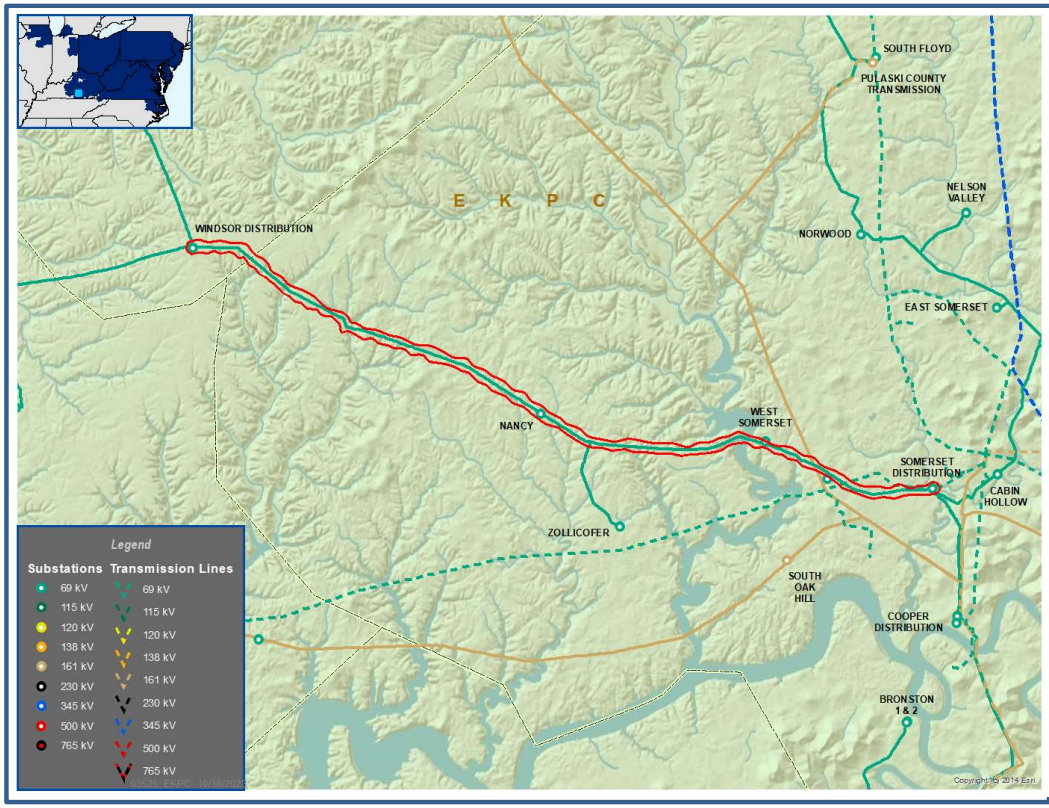
EKPC Assumptions Presentation Slide 13

Problem Statement:

The EKPC reliability team has been working to identify transmission lines sections, with single wood pole structures and 556.5 ACSR wire or larger that are known to have structural design issues. Most of the structures on these lines are believed to be over 100% capacity if the structure was new, based on EKPC current design standards. Many of the lines have been re-conductored with larger wire and very little structure design was performed at the time of the re-conductor.

The 18.97 mile, Windsor-Somerset 69 KV line sections has been identified from the above to be addressed. Alternatives will be developed to address these structural loading concerns.

Model: N/A



EKPC Transmission Zone M-3 Process
Windsor-Somerset

Need Number: EKPC-2023-022

Process Stage: Solutions Meeting – December 15, 2023

Proposed Solution:

Rebuild the 18.97 mile, Windsor-Somerset 69 KV line sections using existing conductor size and steel pole construction.

Transmission Cost: $17.0M
Distribution Cost: $0.0M

Ancillary Benefits:

- None

Alternatives Considered:

1. Establish new 69kV free flowing interconnection with LG&E/KU, constructing a new 0.6 mile line from Zollicofer to their Waitsboro-Union Underwear line section. Retire the 9.27 mile, Nancy-Windsor line section and rebuild the 1.31 mile Nancy - Zollicofer as a double circuit. Rebuild the remaining Zollicofer - Somerset line sections.

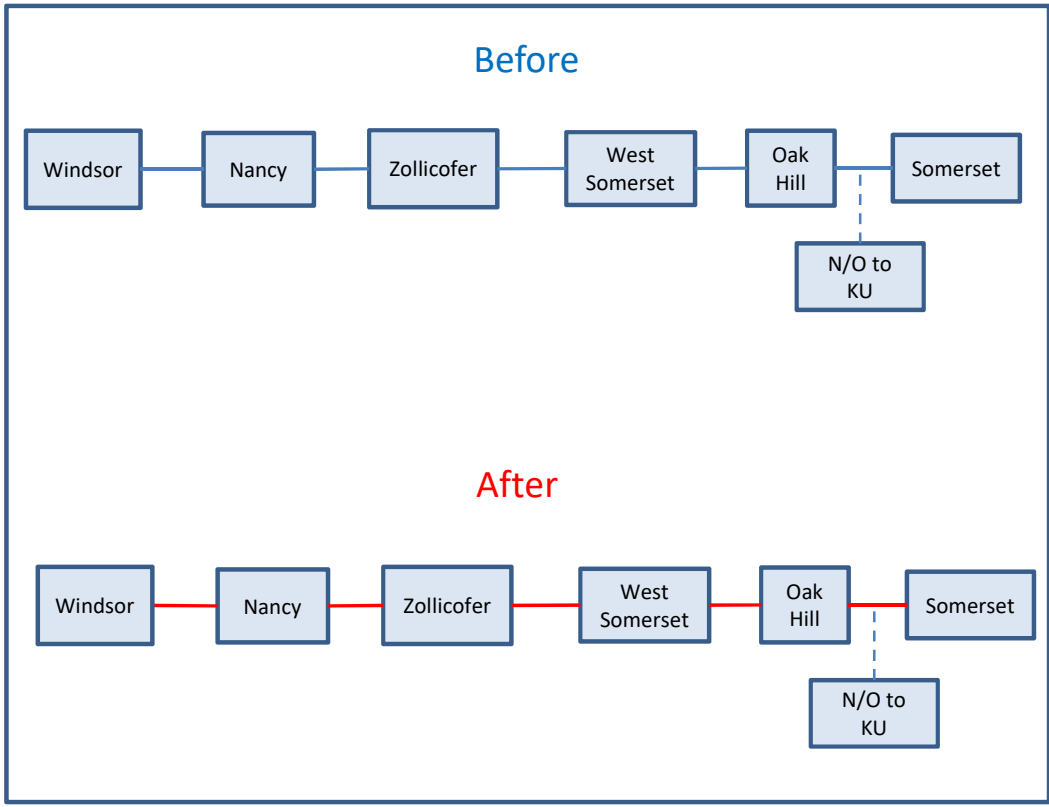
Transmission Cost: $20.7M
Distribution Cost: $0.0M

2. Construct a new Pulaski Co. Junction 161/69kV substation, build a new 6.1 mile 69 KV line to Nancy. Retire the 9.27 mile, Nancy-Windsor line section. . Rebuild the remaining Zollicofer - Somerset line sections.

Transmission Cost: $26.3M
Distribution Cost: $0.0M

3. Construct a new 161/69 kV transmission station near Oak Hill, build a new 0.18 mile 69 KV line to Oak Hill. Retire the Somerset-Oak Hill NO and Oak Hill Tap-Oak Hill NO line sections. Rebuild the remaining Windsor – Oak Hill Tap line sections.

Transmission Cost: $23.9M
Distribution Cost: $0.0M



Projected In-Service: 12/1/2027

Project Status: Scoping

Model: N/A