

Sub Regional RTEP Committee: Western AEP Supplemental Projects

January 20, 2023

Needs

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

AEP Transmission Zone M-3 Process Winesburg, Ohio Need Cancellation

Need Number: AEP-2020-OH005

Process Stage: Need Cancellation 01/20/2023

Previously Presented: Need Meeting 2/21/2020

Supplemental Project Driver: Customer Service

Specific Assumption Reference:

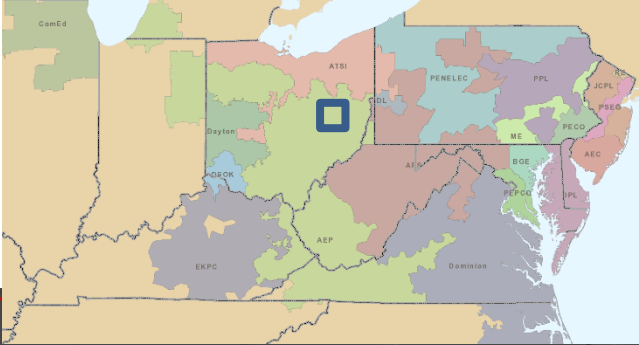
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)

Problem Statement:

- Holmes-Wayne Electric Cooperative has requested service for a new delivery point near Winesburg, Ohio.
- The anticipated new load is 8 MW.

Model: PJM 2024 RTEP Base Case

Reason for Cancellation: This customer request was already addressed by the solution to need # AEP-2019-OH035 (supplemental project S2534, the Alpine-Winesburg-Trail 69kV area upgrade).



AEP Transmission Zone M-3 Process Grayson County, Virginia

Need Number: AEP-2023-AP001

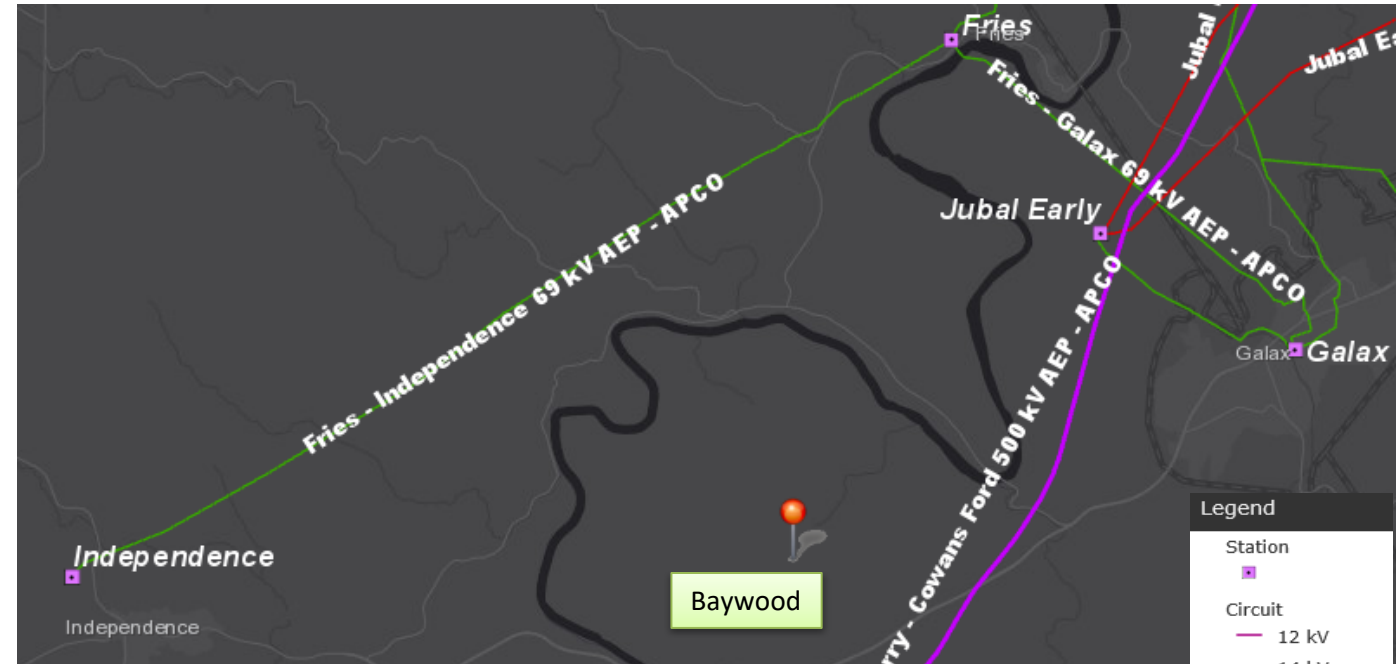
Process Stage: Need Meeting 1/20/2023

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 (Baywood).
- Baywood Station will establish distribution ties between Galax station and Independence station reducing exposure on the existing 12kV feeders in the area. The current 12kV feeder out of Galax has 86-line miles and the current 12kV feeder out of Independence has 148-line miles. Baywood will help to break up these feeders by serving 4.3 MVA from Galax and 2.7 MVA from Independence.



AEP Transmission Zone M-3 Process Grayson County, VA

Need Number: AEP-2023-AP002

Process Stage: Needs Meeting 1/20/2023

Supplemental Project Driver: Customer Service
Equipment Material/Condition/Performance/Risk

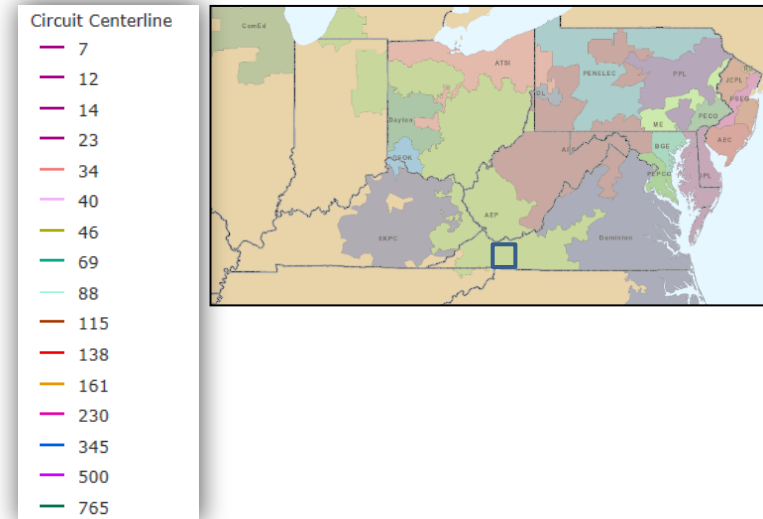
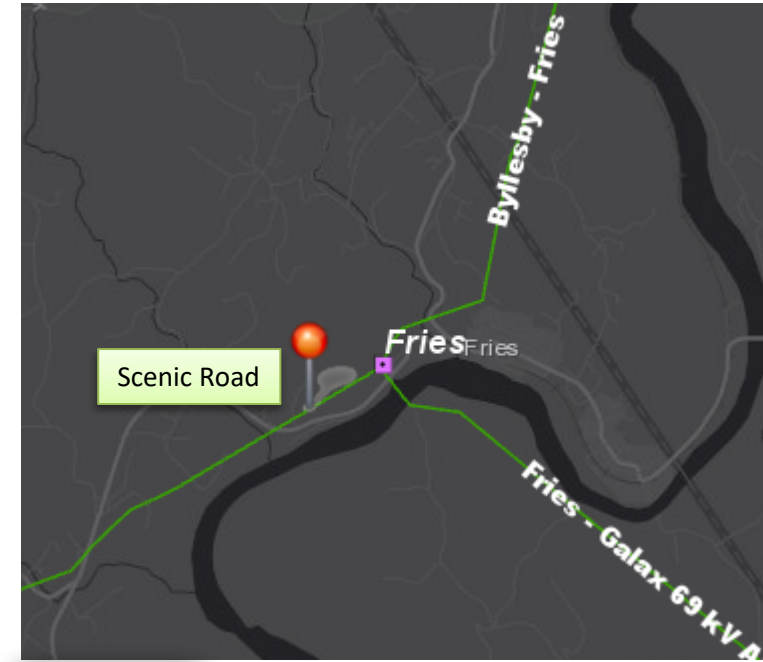
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 12 and 13)

Problem Statement:

- AEP Distribution has requested a new delivery point (Scenic Road) to replace Fries station.

Fries Station:

- 69/12 kV Transformer #1A and #1B
 - Both are 1964 vintage Transformer
 - The presence of ethane in unit #1A, along with the indication of overheating faults, shows the decomposition of the increasingly brittle, non-thermally upgraded paper insulation, impairing the unit’s ability to withstand future short circuit or through fault events.
 - The values of moisture and IFT in unit #1B indicate the dielectric strength of the insulation system (oil and paper) are in poor condition. The current and historical presence of acetylene confirms the insulation system (oil and paper) is in poor condition and also indicates electrical discharges of high energy have occurred within the main tank, causing electrical breakdown of the unit.
- There is one 69kV circuit breaker at Fries station and is 1965 vintage. The breaker is oil filled without oil containment. The circuit breaker has exceeded the manufacturer’s designed number of full fault operations and spare parts are increasingly more difficult to obtain.
- Currently, 26 of the 28 relays (93% of all station relays) are in need of replacement. Of these, 24 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 is a small creek along the west side of the station that has caused washout issues and hampered access to the west entrance gate. There are erosion concerns along the entire access road. There is also a hill on the north side of the station. It is not feasible to expand the station in its current location.



AEP Transmission Zone M-3 Process Putnam County, WV

Need Number: AEP-2023-AP003

Process Stage: Need Meeting 1/20/2023

Project Driver: Equipment Condition/Performance/Risk

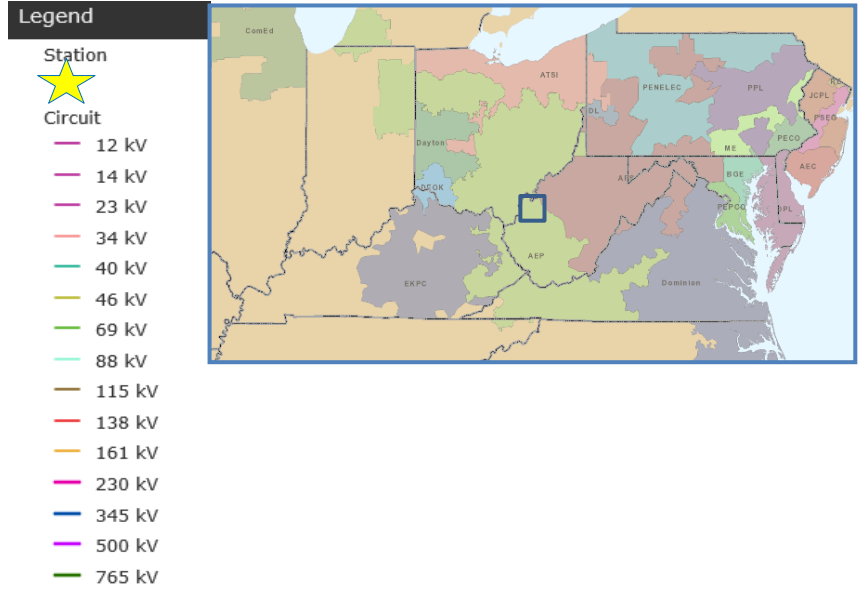
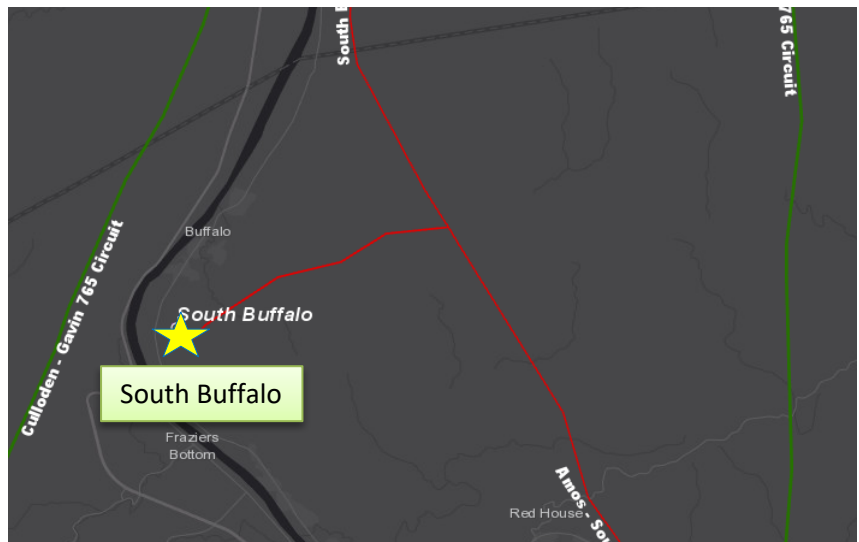
Specific Assumption Reference:

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

Problem Statement:

South Buffalo Station

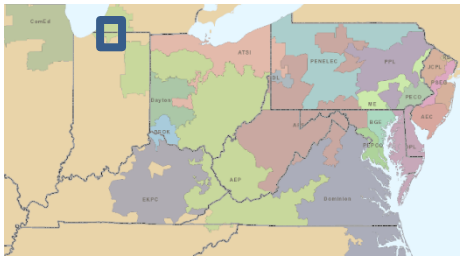
- 138 kV Circuit Breakers A, B & C
 - Circuit breakers B and C are 1997 vintage and circuit breaker A is 2001 vintage. All three breakers are SF6 filled and their model family has a high occurrence of SF6 gas leaks. These breakers have 215 malfunction records of “Low Gas” or “Adding SF6”. Circuit breakers A and B have exceeded the manufacturer’s designed number of full fault operations.
- South Buffalo Substation currently deploys 72 relays, implemented to ensure the adequate protection and operation of the substation. Currently, 32 of the 72 relays (44% of all station relays) are in need of replacement. There are 31 electromechanical type and 1 static 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 currently 38 microprocessor relays at the station.
- At South Buffalo station there are no line disconnect switches for South Buffalo-Sporn 138 kV circuit or Amos-South Buffalo 138 kV circuit



Need Number: AEP-2023-IM003
Process Stage: Needs Meeting: 01/20/2023
Supplemental Project Driver: Customer Need
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Problem Statement:

Conant 34.5kV Station:
Conant station is expected to achieve a loading of 29.8MVA by summer of 2024 due to recently announced block load additions, which is 114% of the transformer’s capacity.

Because of this, I&M Distribution has requested upgrades to the Conant delivery point.



AEP Transmission Zone M-3 Process Licking County, OH

Need Number: AEP-2023-OH012

Process Stage: Need Meeting 1/20/2023

Project Driver:

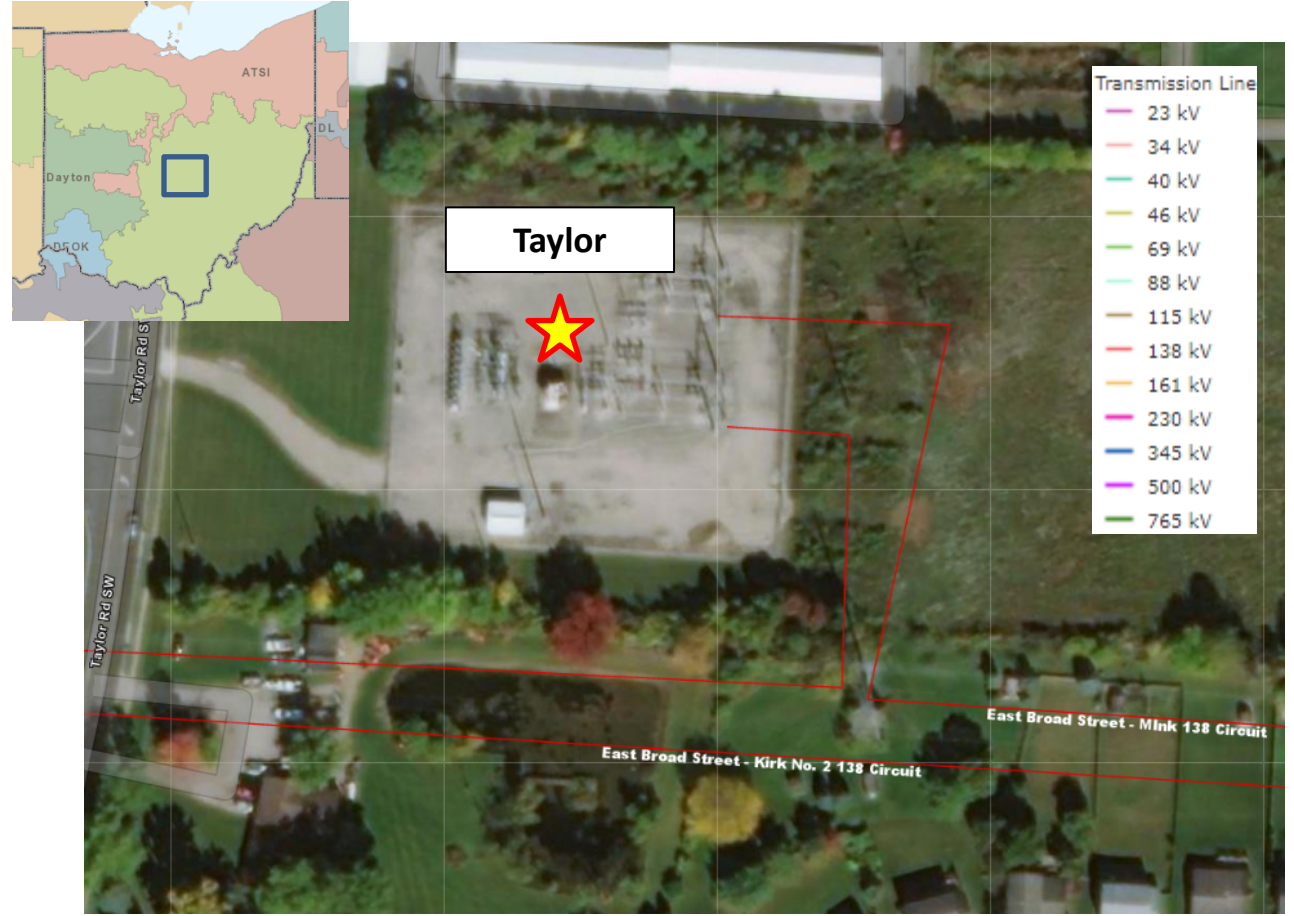
Customer Service

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 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 Licking County, Ohio

Need Number: AEP-2023-OH013

Process Stage: Need Meeting 1/20/2023

Project Driver: Customer Service

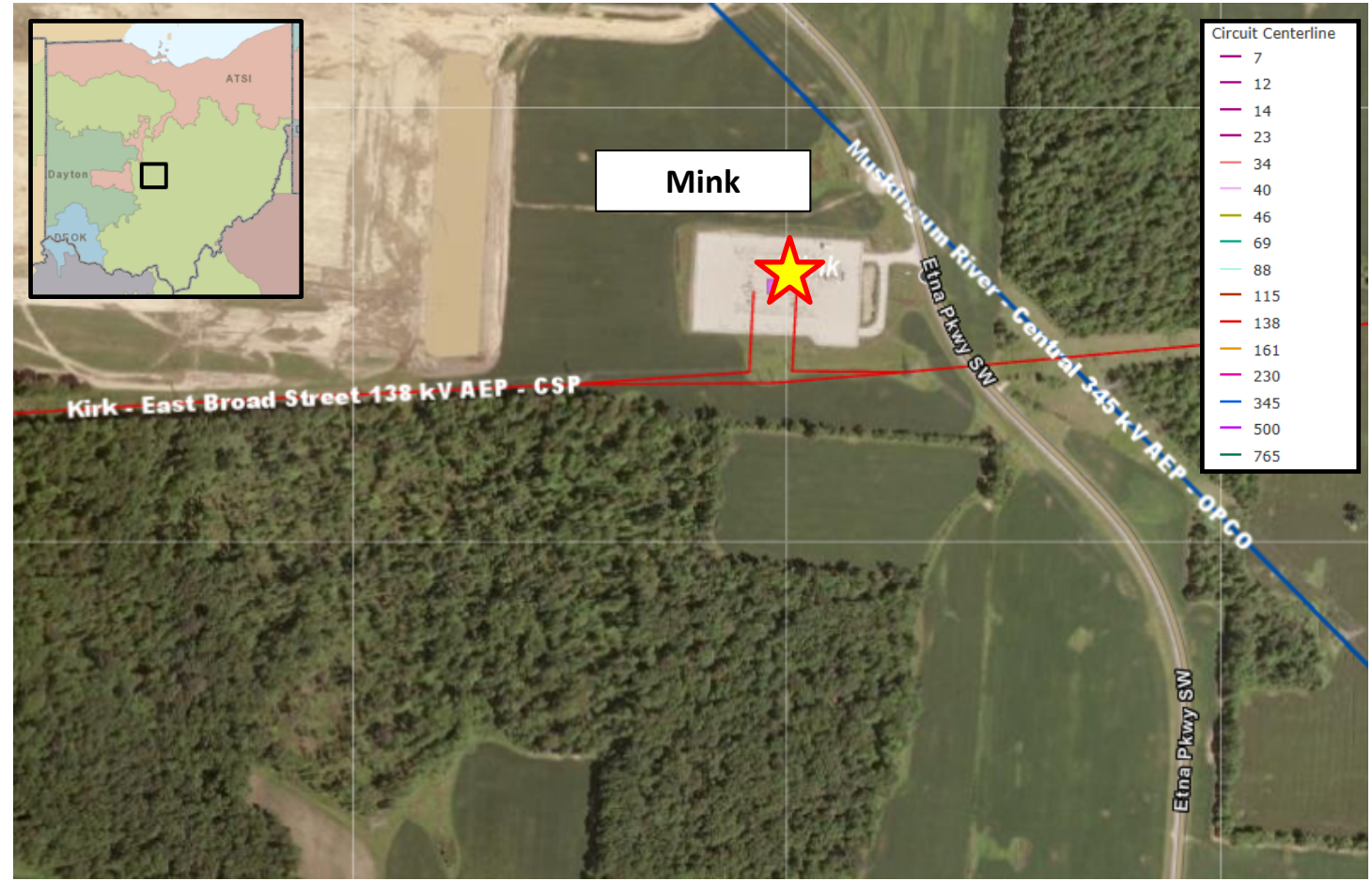
Service Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

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 40 MVA.

The requested in-service date is November 2025.

Model: 2025 RTEP



Need Number: AEP-2023-OH014

Process Stage: Solutions Meeting 1/20/2023

Supplemental Project Driver:

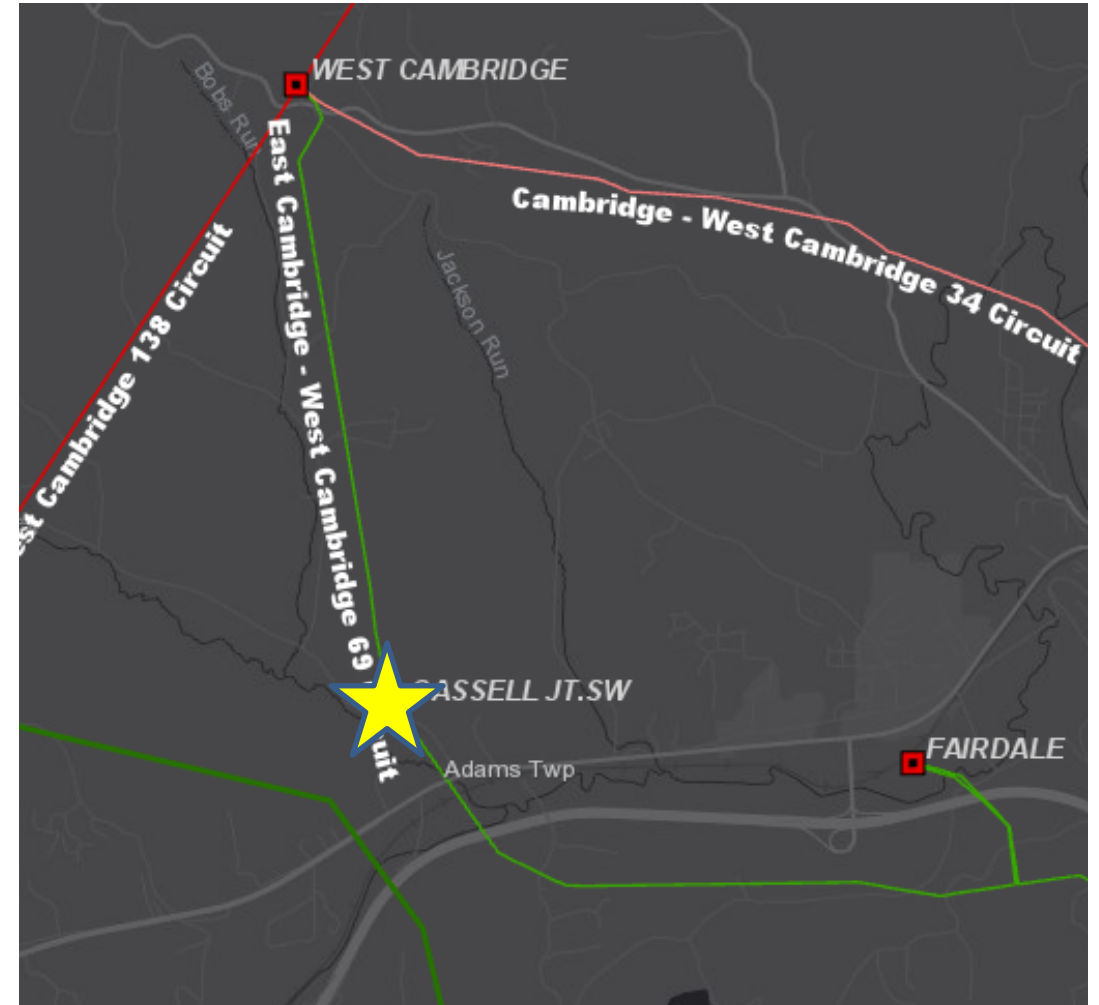
Customer Service

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 due to the lack of sectionalizing on the line, which drops customers served at this location for any line outage. This has resulted in 3,079,440 minutes of customer interruption.



Need Number: AEP-2023-OH004

Process Stage: Need Meeting 1/20/2023

Project Driver:

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

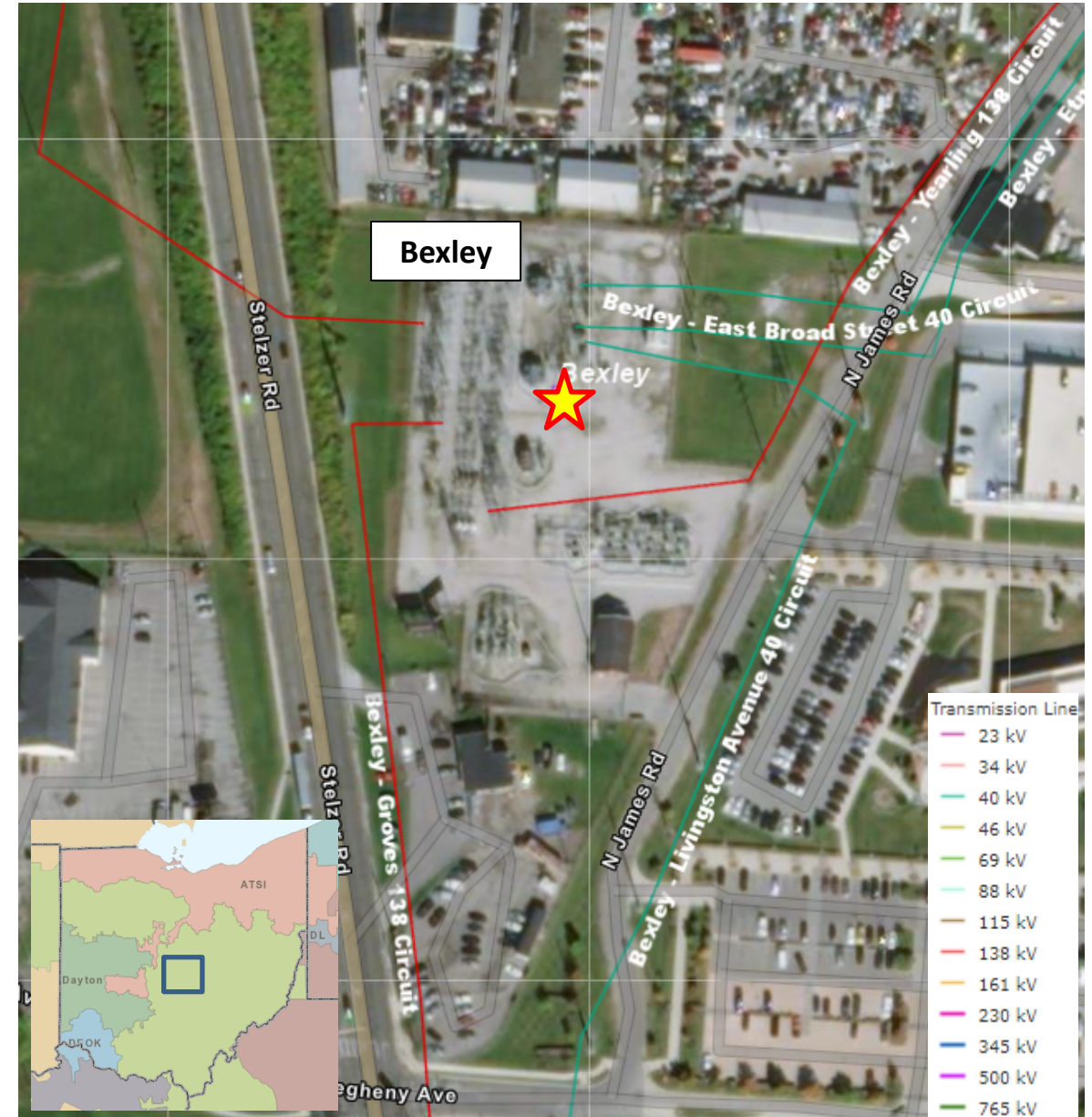
Specific Assumption Reference:

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

Problem Statement:

Bexley Station 138kV:

- AEP Ohio has indicated they have equipment rehabilitation needs at the station.
- 2 – 138/39.4/13.8kV: (TR 1 & 2) Westinghouse Vintage 1955 rated 41.66 MVA transformers.
 - TR 1 & 2 do not have arresters on the 40 kV or 13kV windings
 - Several small oil leaks and nitrogen leaks on TR1 and TR2
 - No oil containment on any of the transformers
 - Bus A, Phase A and B exit cable switches are hot on TR1
- 5 – 40kV: (CBs 41, 42, 43, 44, & 47) & 2 - 138kV: (CBs 105 & 106) are oil type breakers.
 - 2-138kV: (CBs 105 & 106) 1970s vintage FK & ALP oil breakers.
 - 5-40kV: (CBs 41, 42, 43, 44, & 47) 1960s & 1970s vintage GE & Westinghouse oil breakers.
 - 1-40kV: CB-42 has 14 Fault Operations (Manufacture recommended: 10)
- 1 – 40kV: (CB 45) is a SF6 type breaker has limited spare part availability, and poor historical reliability
- 1 – 40kV: CS-Bank 3 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.
- The 40kV system is an obsolete voltage class and as a result is difficult to obtain replacement parts.



Need Number: AEP-2023-OH004

Process Stage: Need Meeting 1/20/2023

Project Driver:

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

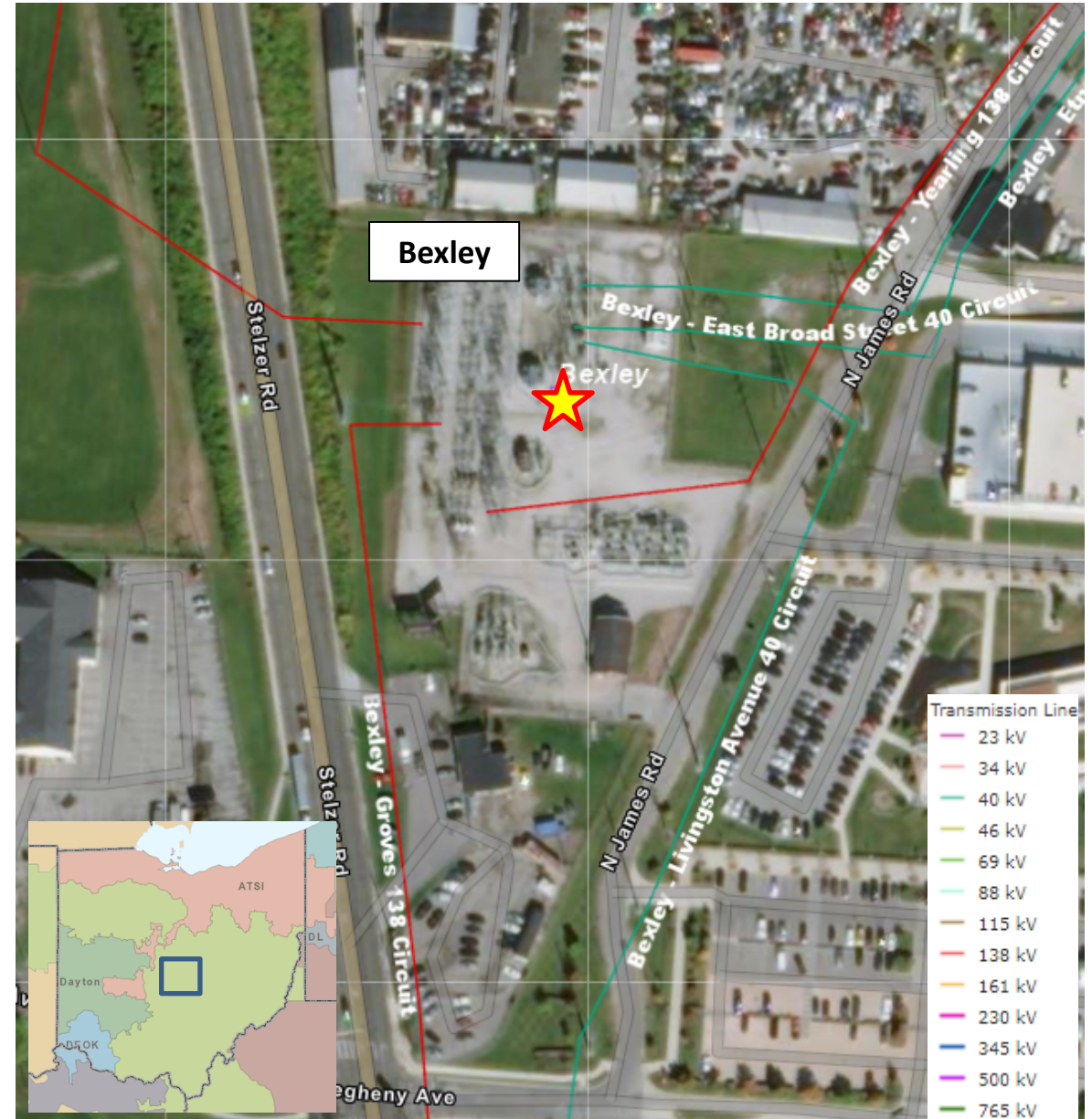
Specific Assumption Reference:

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

Problem Statement:

Bexley Station 138kV:

- 30 – Microprocessor relays: The identified relays are obsolete, no longer supported, or have been identified as high risk of failures.
- 124 – Electromechanical relays: EM relays have limited spare part availability, a lack vendor support, no SCADA functionality, and no fault data collection ability.
- 1 – Static relay: this type of relay has significant limitations with regard to fault data collection and retention.
- The station has experienced 6 outages between 2017 – 2022 with a CMI of 2,595,064.



Solutions

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

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

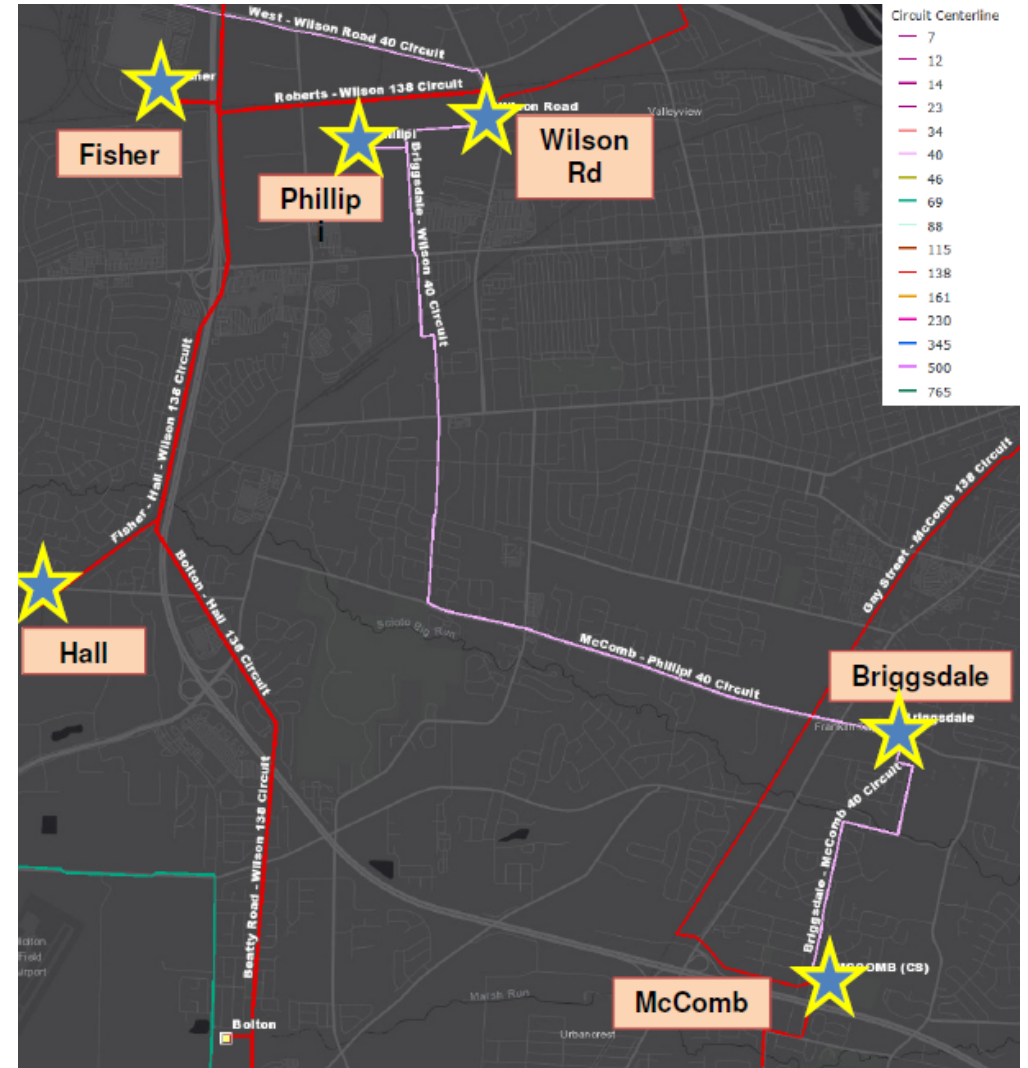
Problem Statement:

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

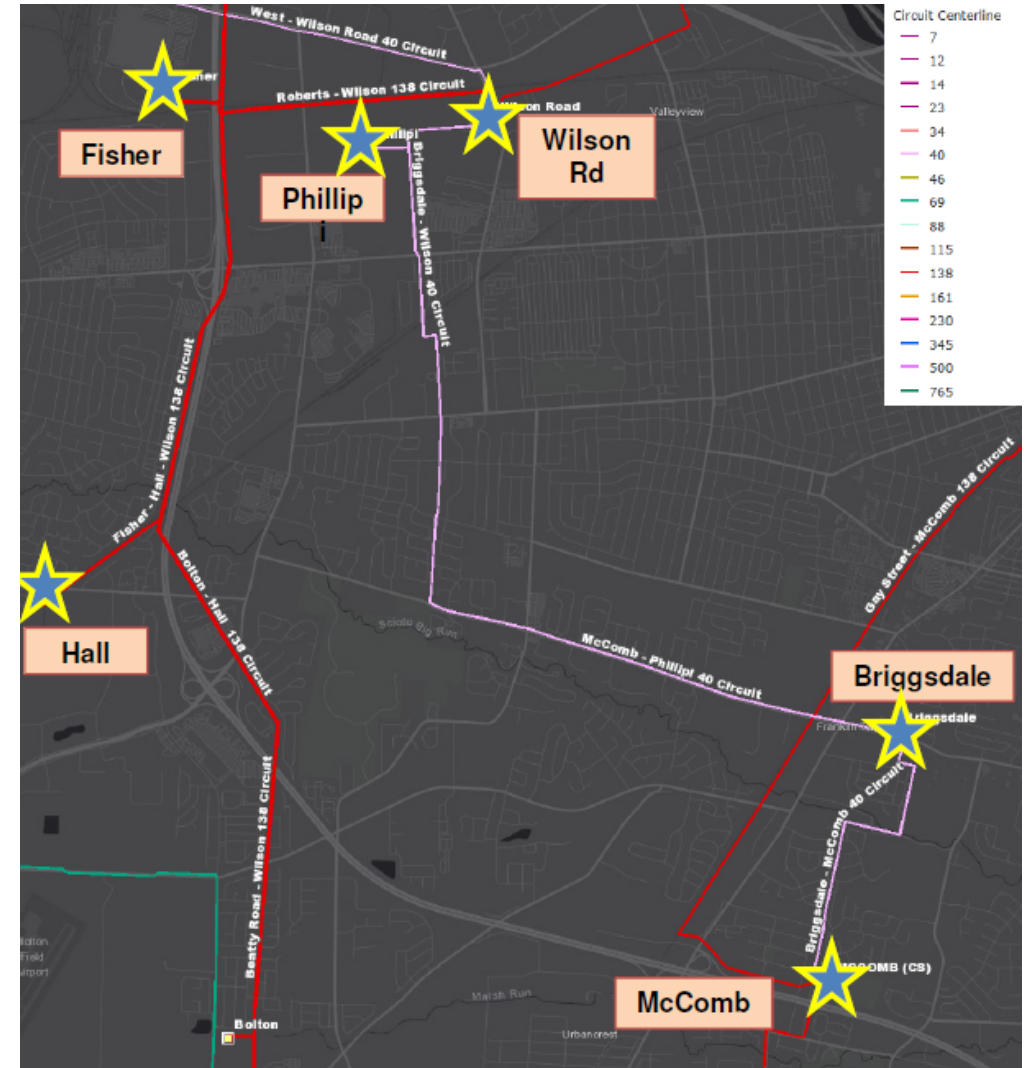
- 5 – 46kV: (CBs 41-45) oil type breakers
 - Fault Operations: (CB-42 = 15 & CB-43 = 26)
- 1 – 138kV CS-CC (Mark V): This model of switcher has been identified for replacement due to lack of spare part availability, historical reliability, and lack of vendor support. It also has 16 fault operations.
- 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

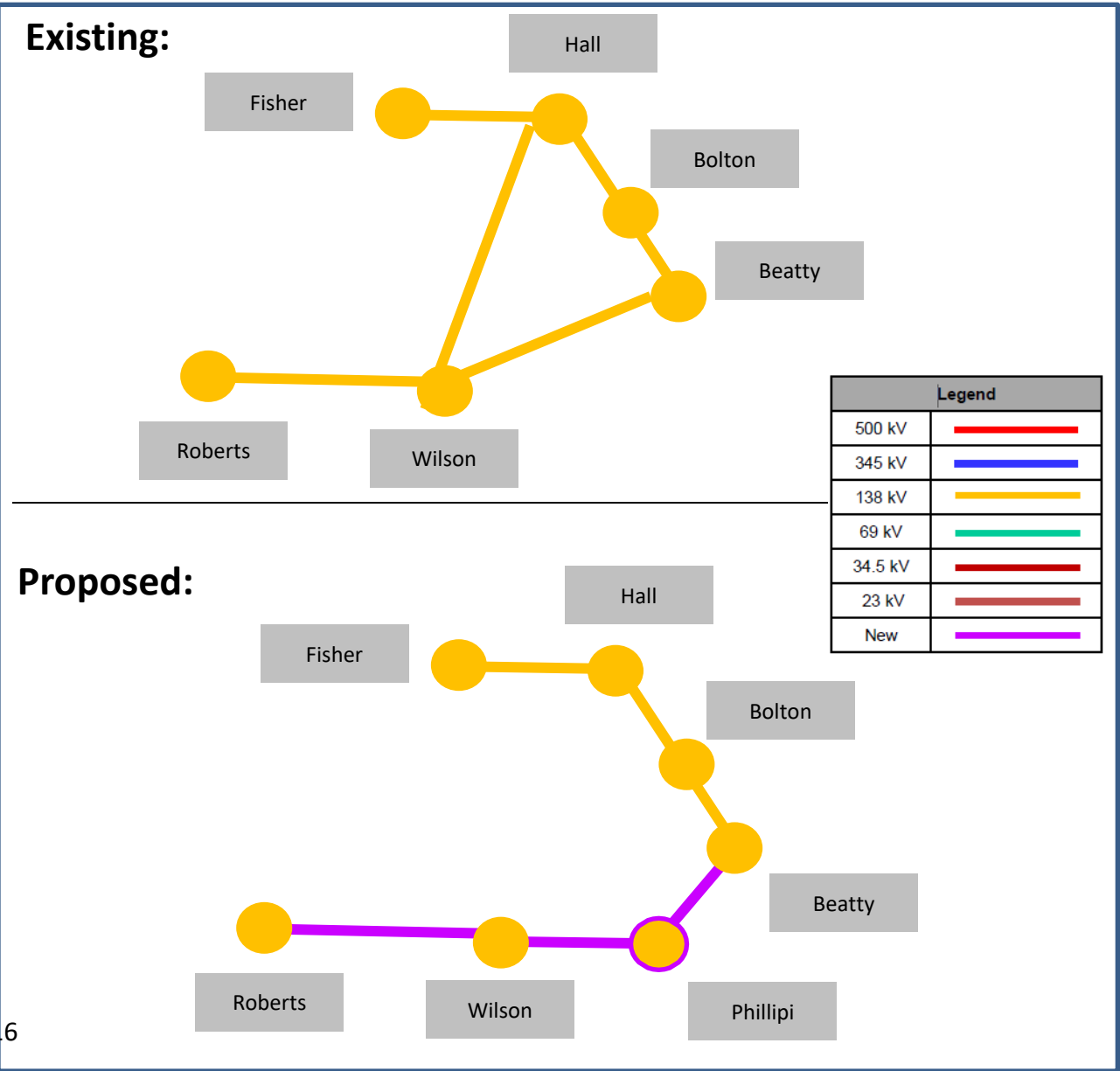
Alternatives Considered:

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

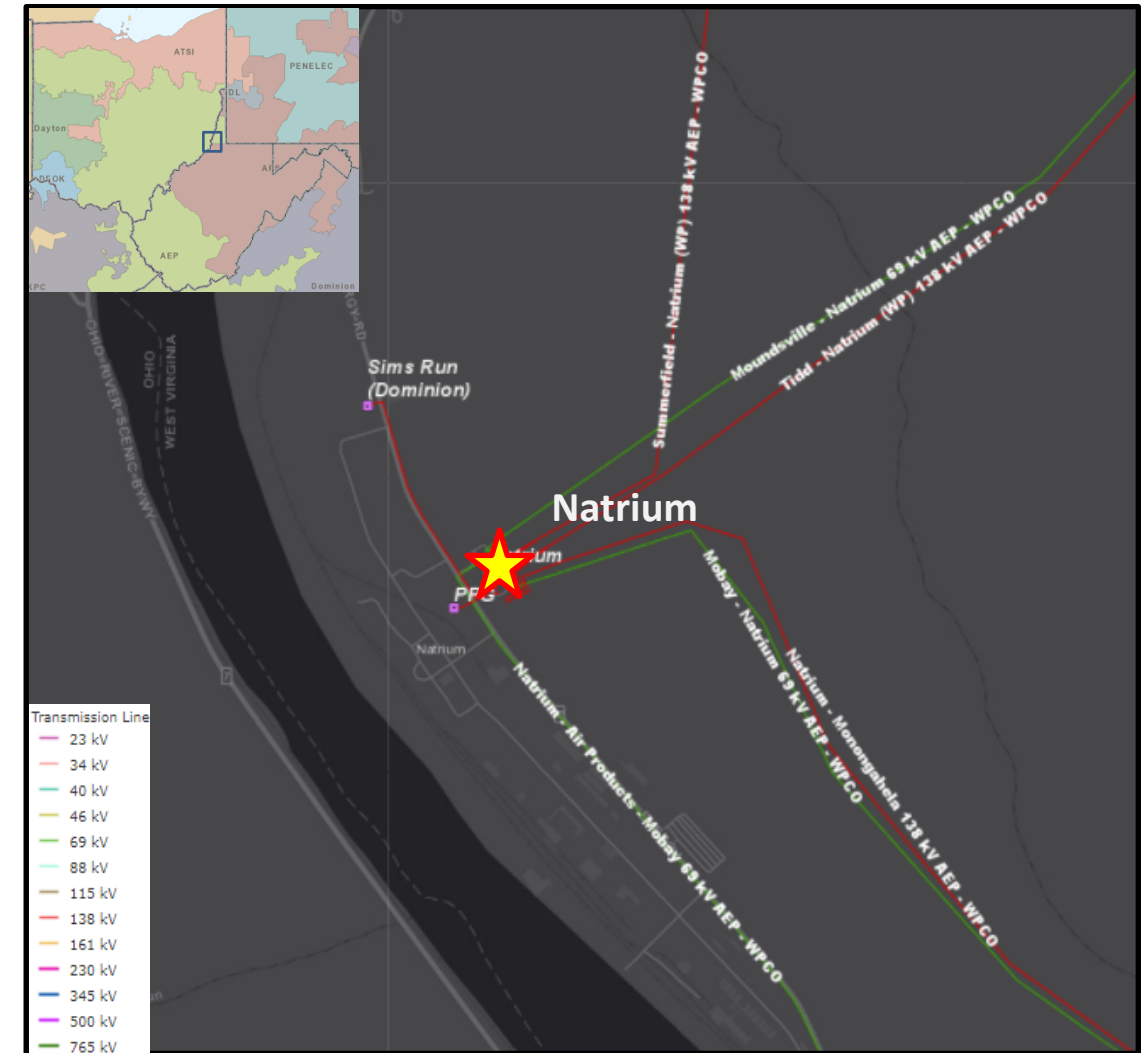
- These breakers are oil filled without oil containment; oil filled breakers have much more maintenance requirements due to oil handling that their modern, SF6 counterparts do not require.
- The 69kV breakers have experienced belt, pump, and motor failures in recent years.

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



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:

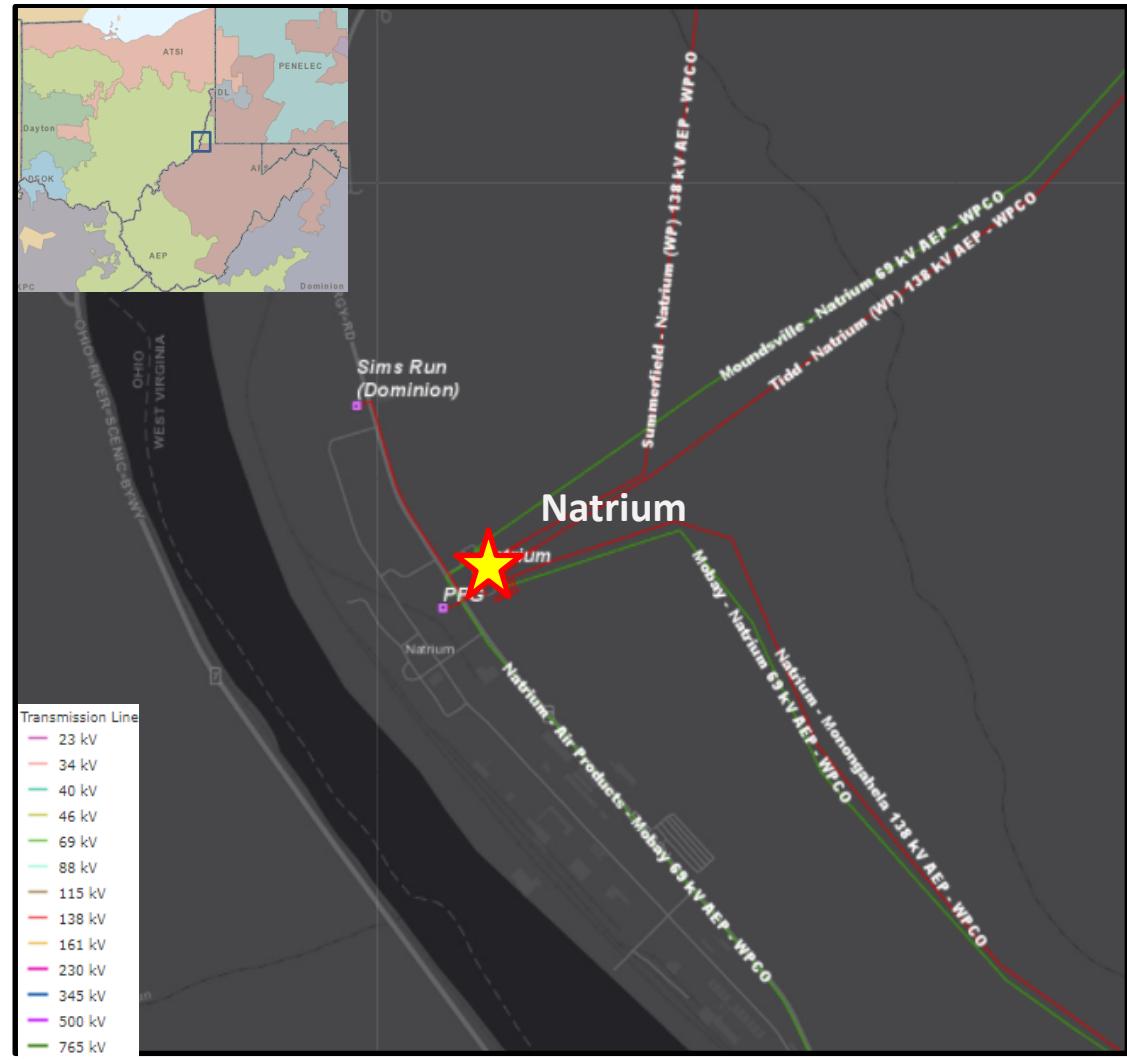
- The station contains two control houses. The older building (1947 vintage) has various issues: leaking roof, asbestos, access issues, broken HVAC, and completely full cable trenches.
- The station service for the 69kV & 12kV yard is from a corner-ground source, which is a safety concern.
- Yard cabinets 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:

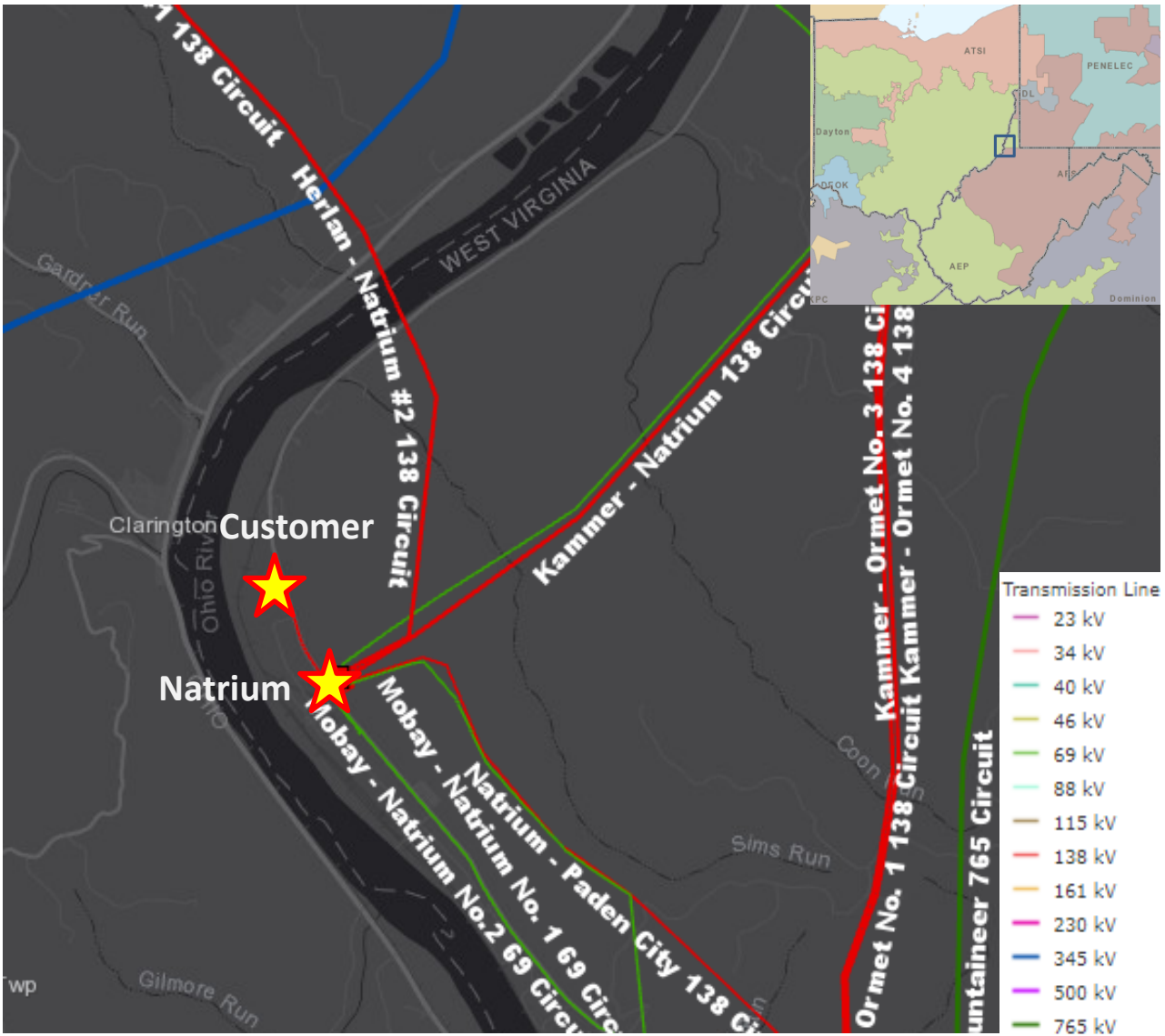
Operational Flexibility and Efficiency

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

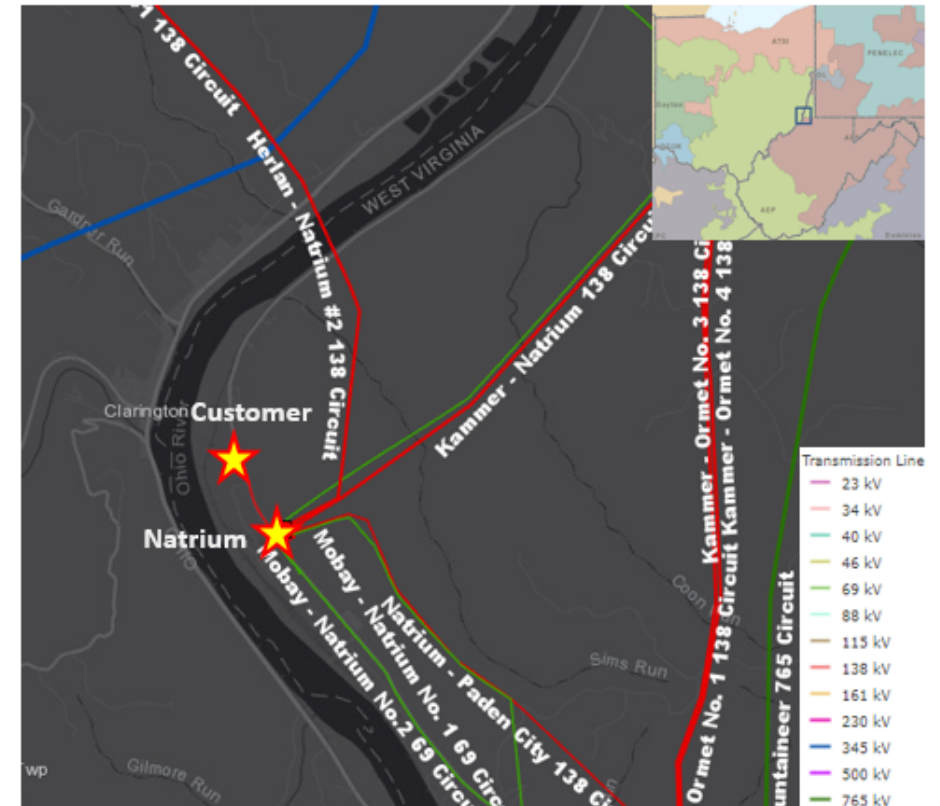
Alternatives Considered: Rebuild the 138kV & 69kV portion like-for-like in place, which may reduce project costs slightly. However, this is not a good long-term solution for a station as critical as Natrium. Keeping the straight bus design on the 138kV & 69kV at Natrium presents an increased chance of 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

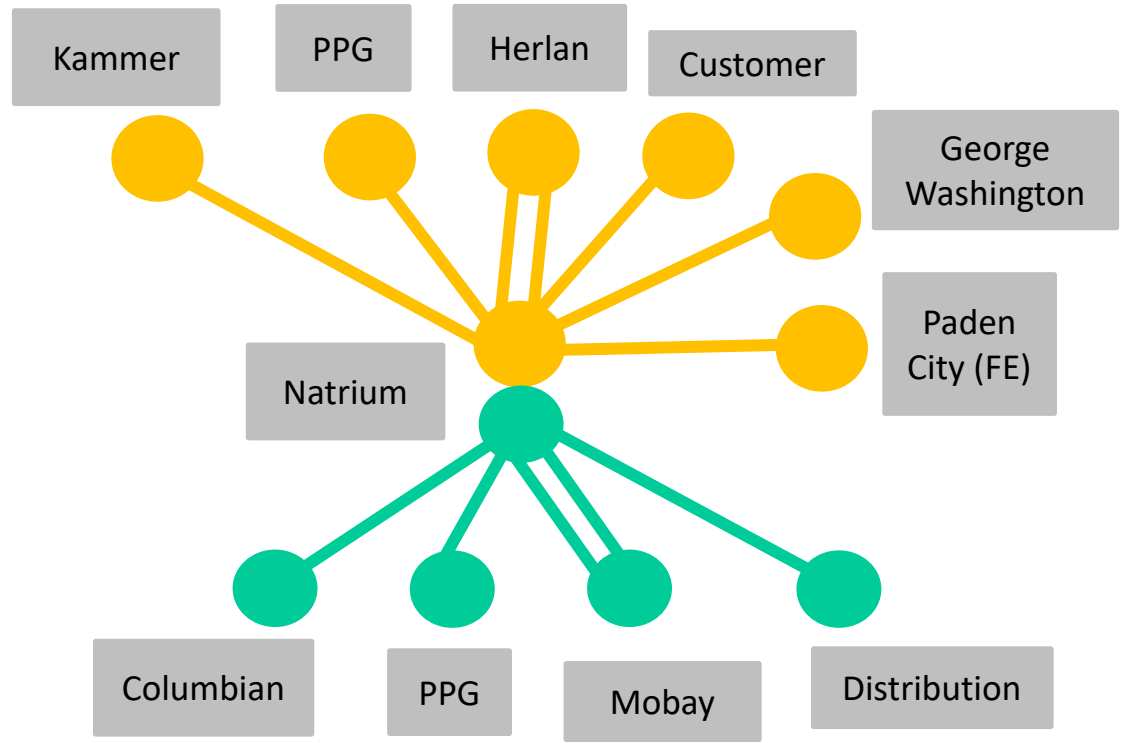
Model: 2027 PJM RTEP



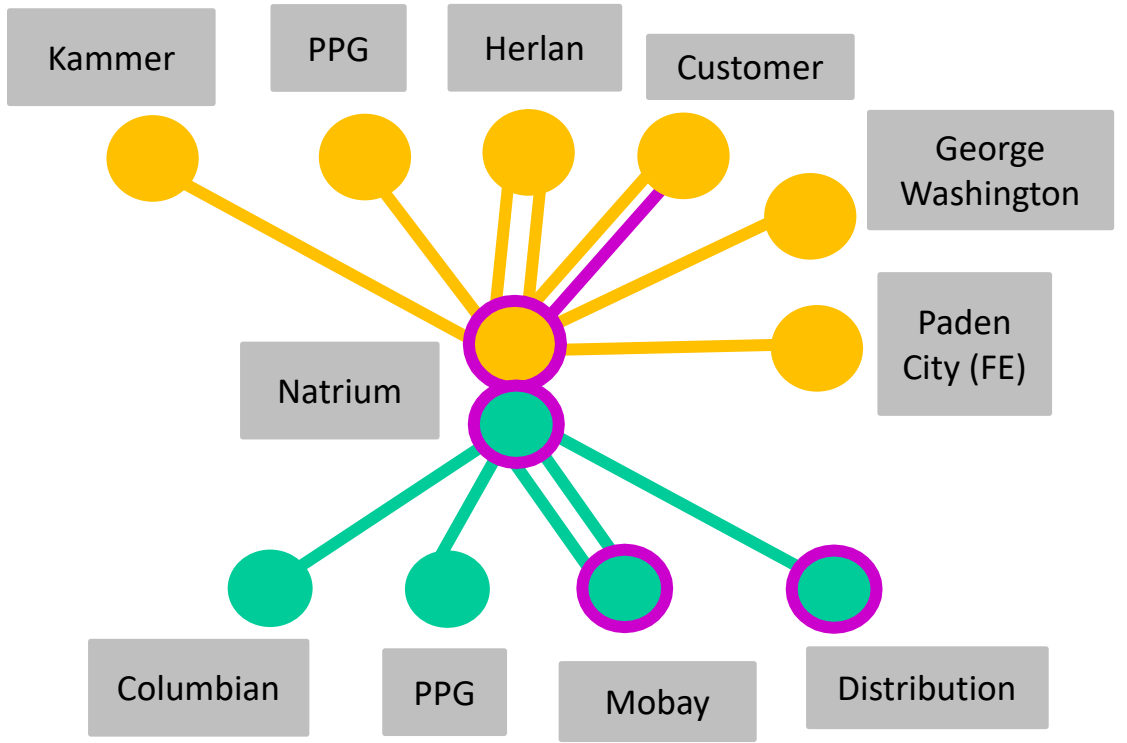
AEP Transmission Zone M-3 Process Natrium Station Upgrade

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:

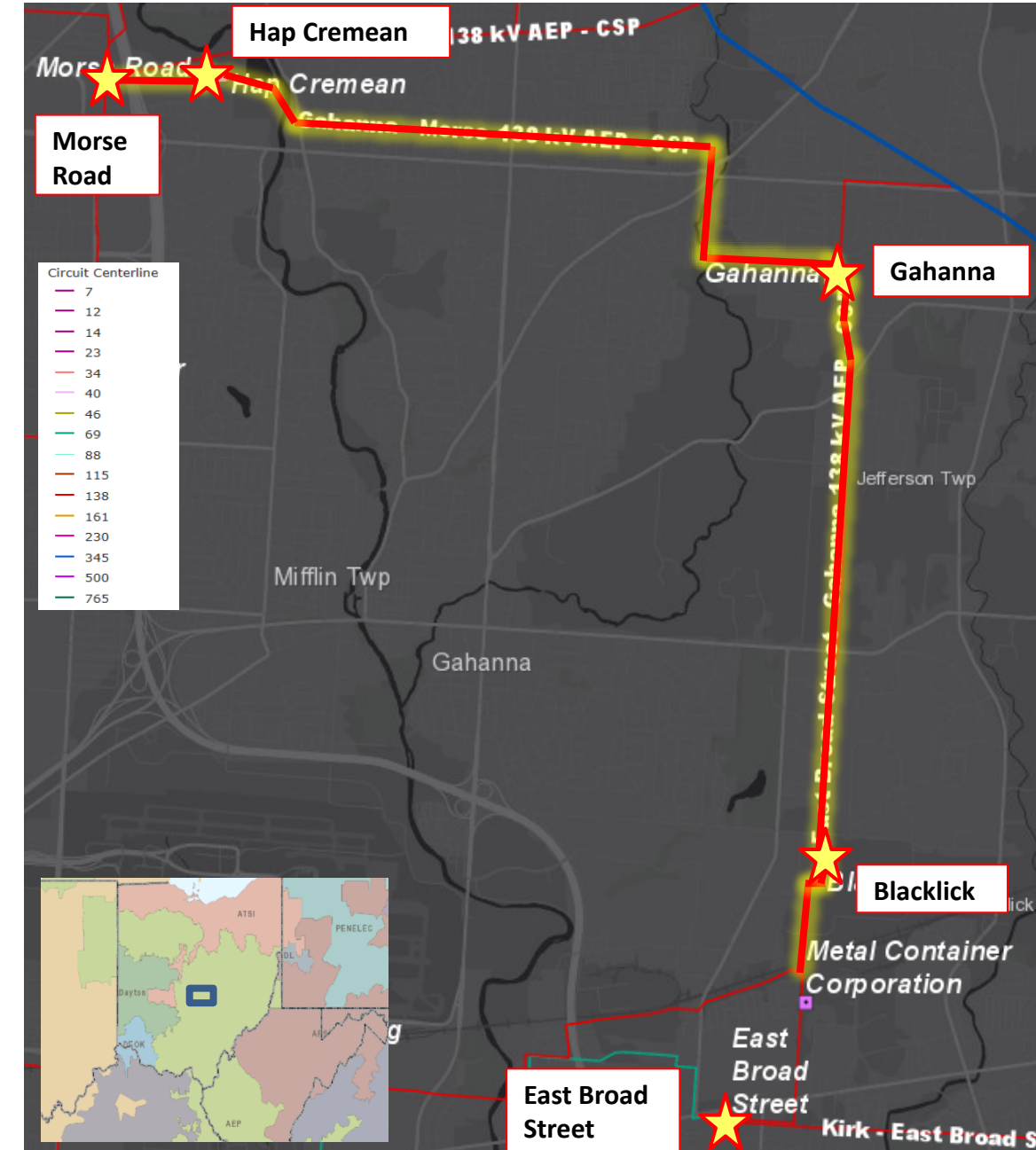
AEP Guidelines for Transmission Owner Identified Needs (slide 13)

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:

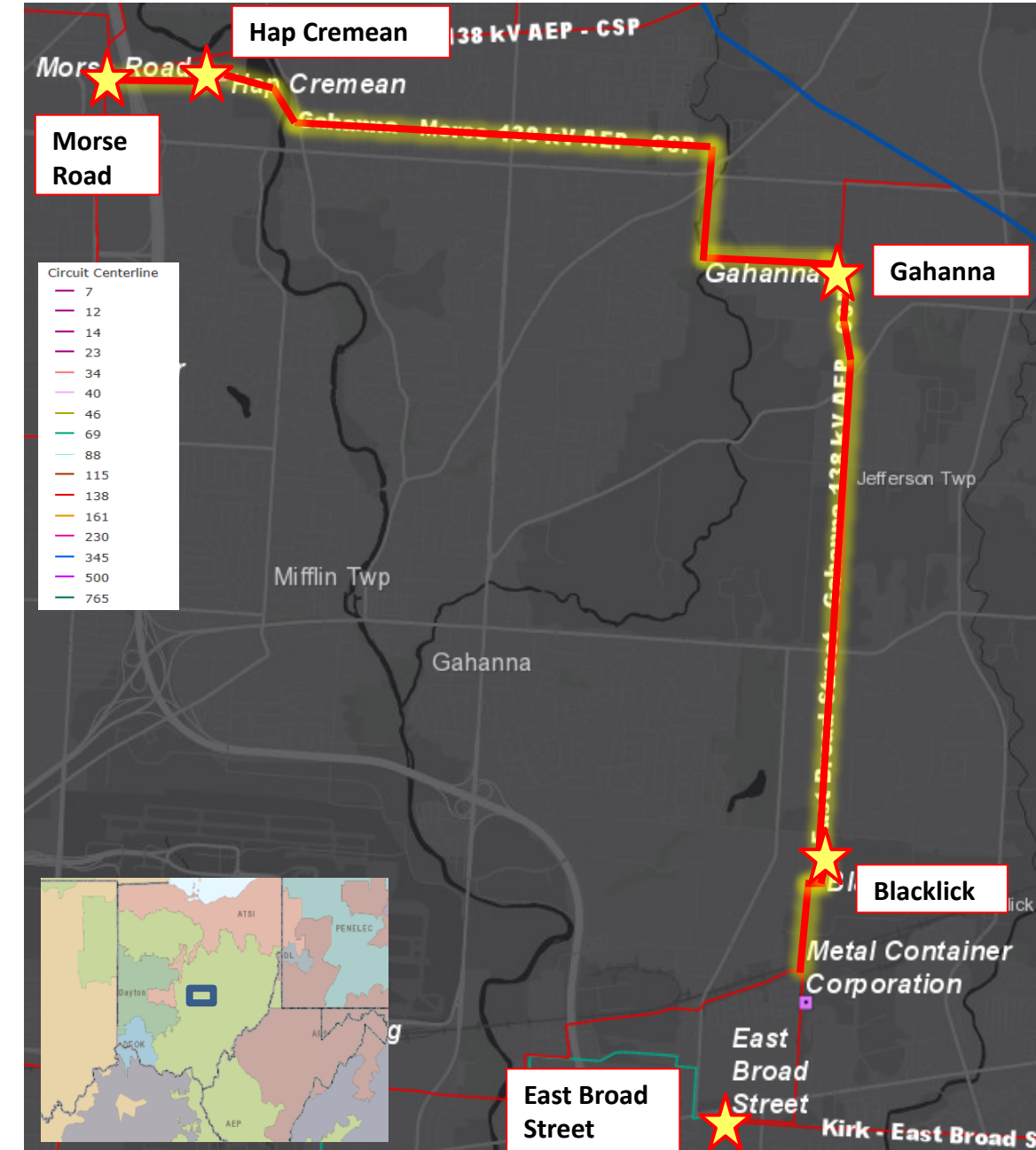
AEP Guidelines for Transmission Owner Identified Needs (slide 13)

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:

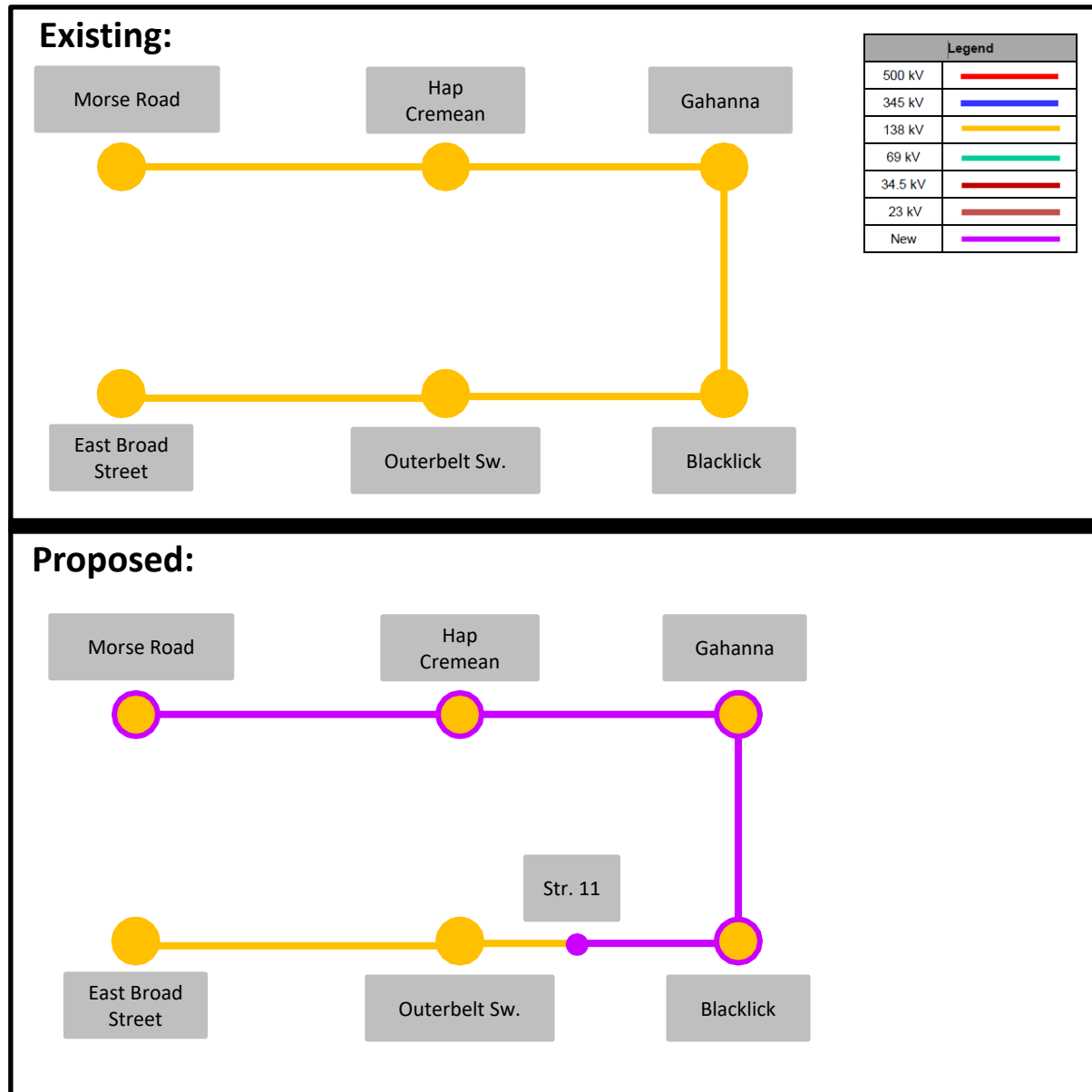
- Morse – Gahanna 138kV Line (Gahanna-Hap Cremean & Hap Cremean-Morse Road circuits): Rebuild the ~5.04 miles single circuit line with 795 kCM ACSR & install OPGW fiber on new line rebuild. **Estimated Cost: \$ 13.62M**
- Gahanna – Blacklick 138kV Line: Rebuild the ~3.32 miles single circuit line with 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

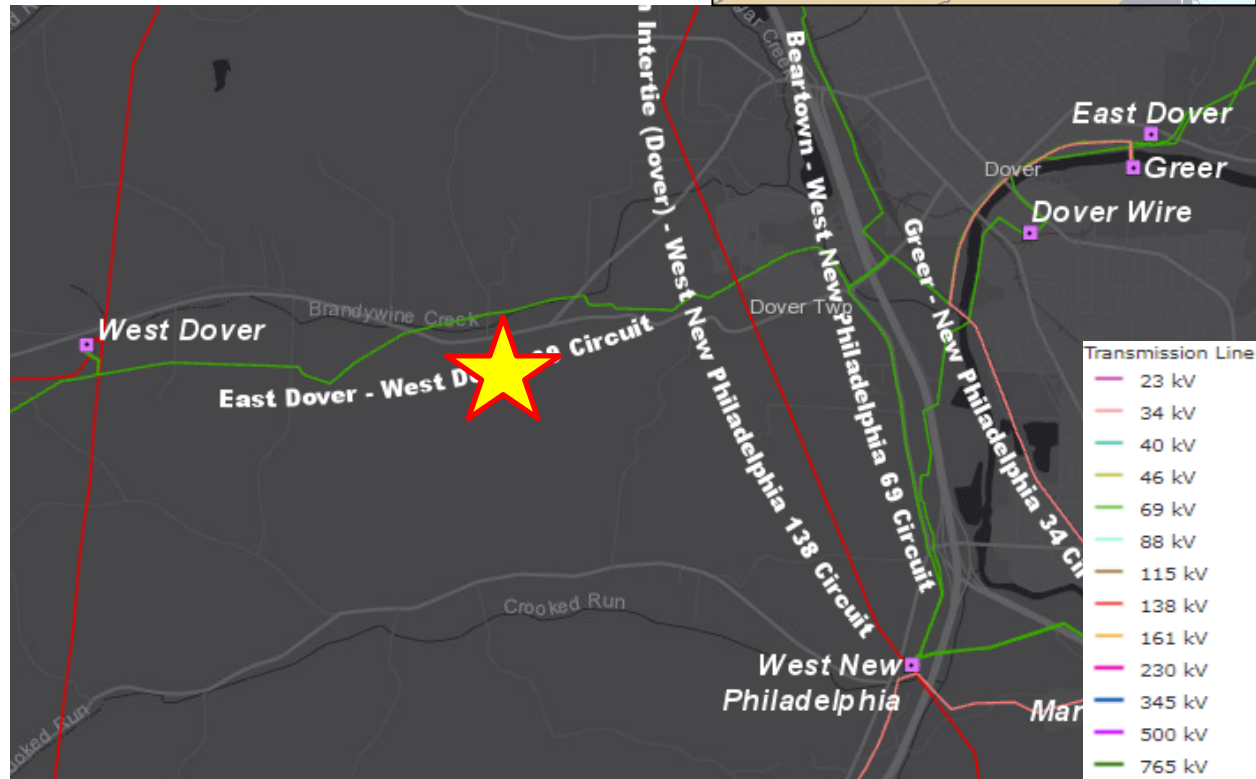
Previously Presented: Need Meeting 04/22/2022

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

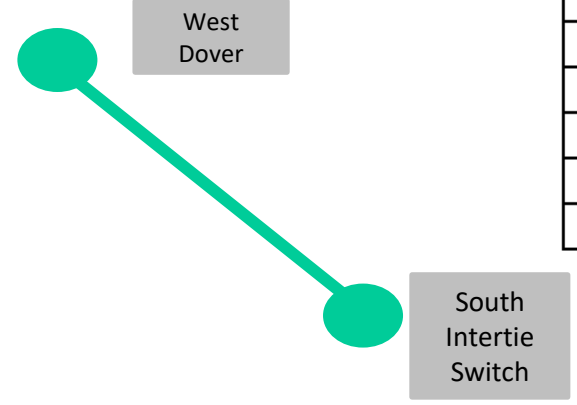
Alternatives Considered: Rather than install a 3-way switch pole, a new AEP 69kV substation with a box bay structure was also considered, which would also have contained the 69kV metering equipment. Estimated cost: \$5M

Projected In-Service: 06/01/2023

Project Status: Engineering

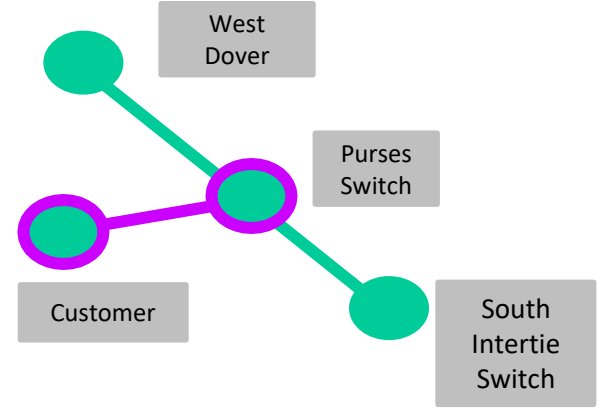
Model: 2027 PJM RTEP

Existing:



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

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:

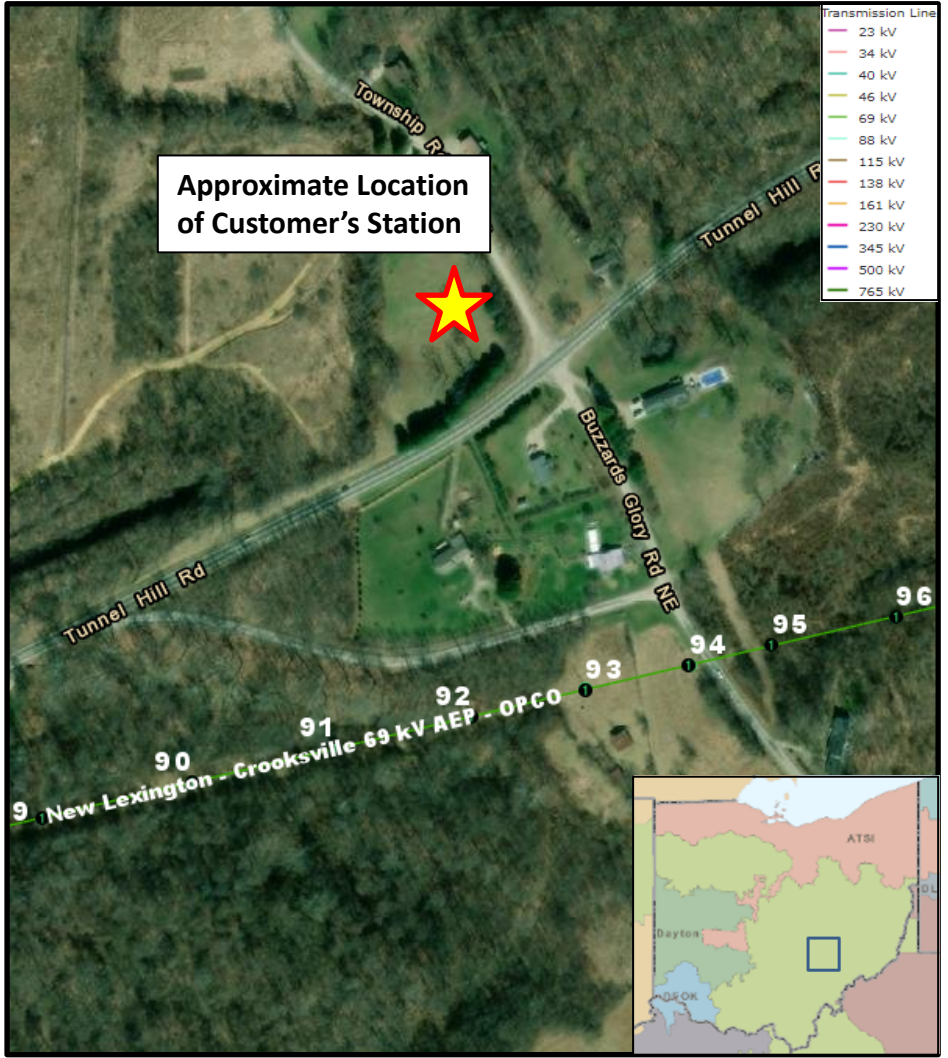
Customer Service

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**

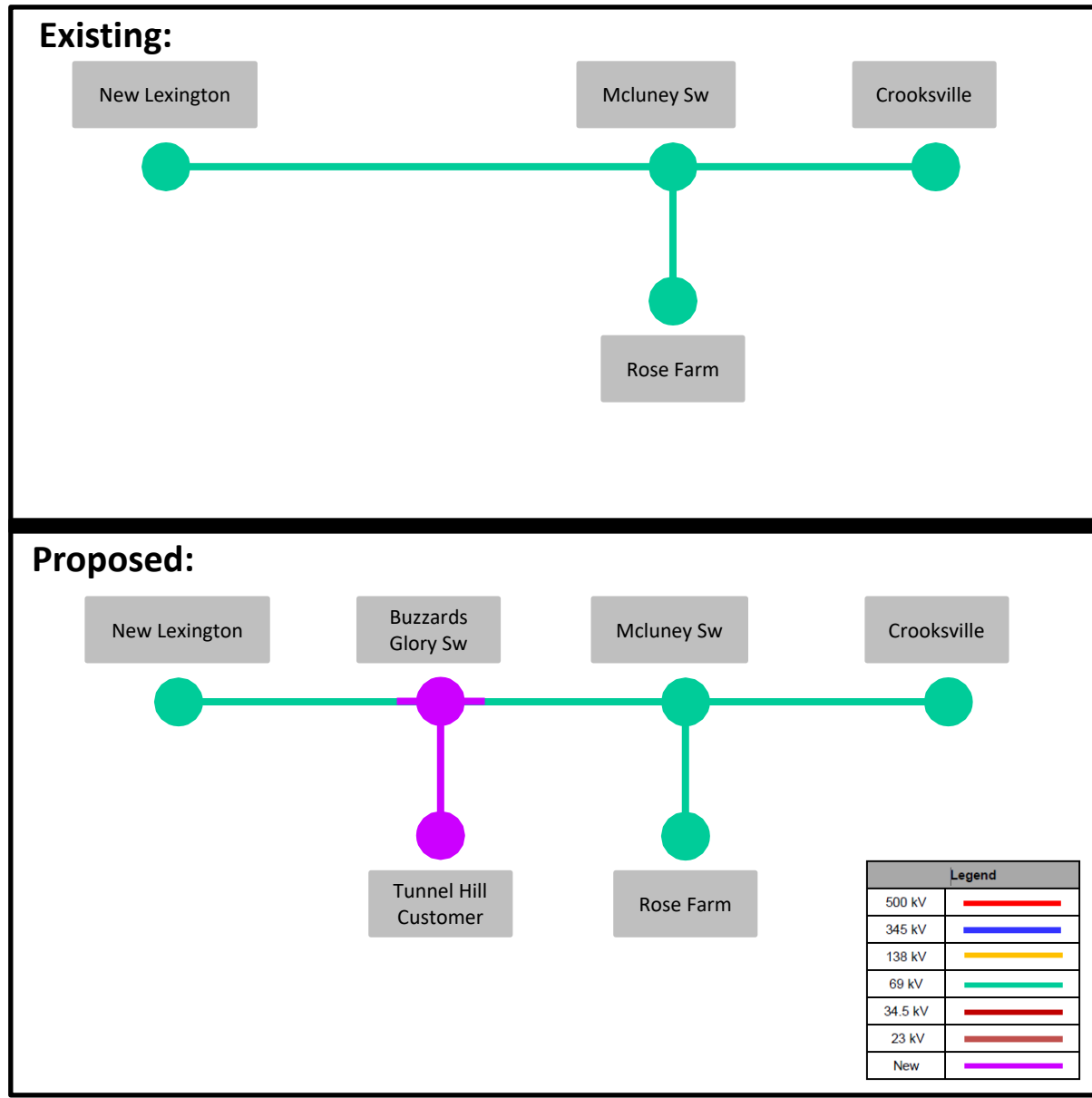
Total Estimated Transmission Cost: \$ 2.13M

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



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

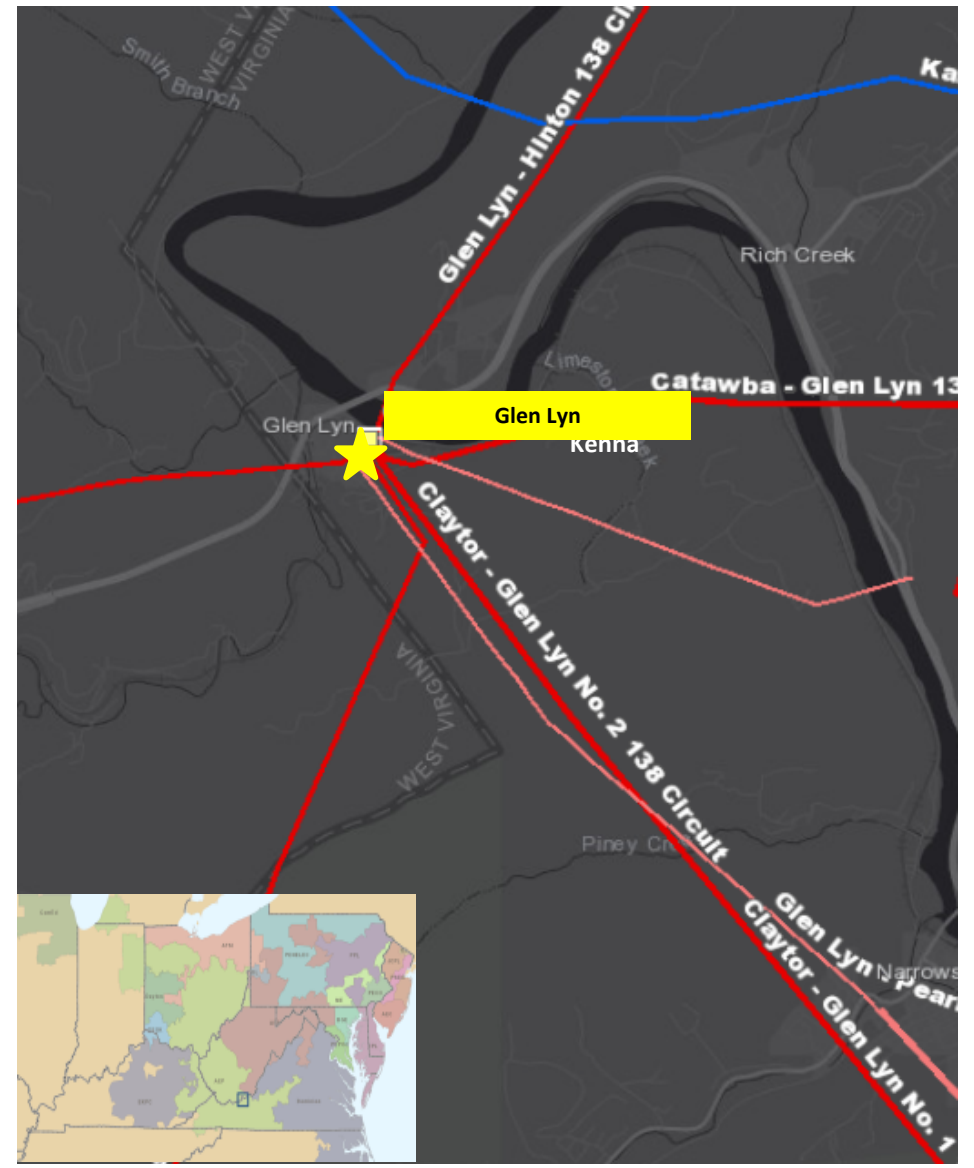
Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

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.



Station (continued)

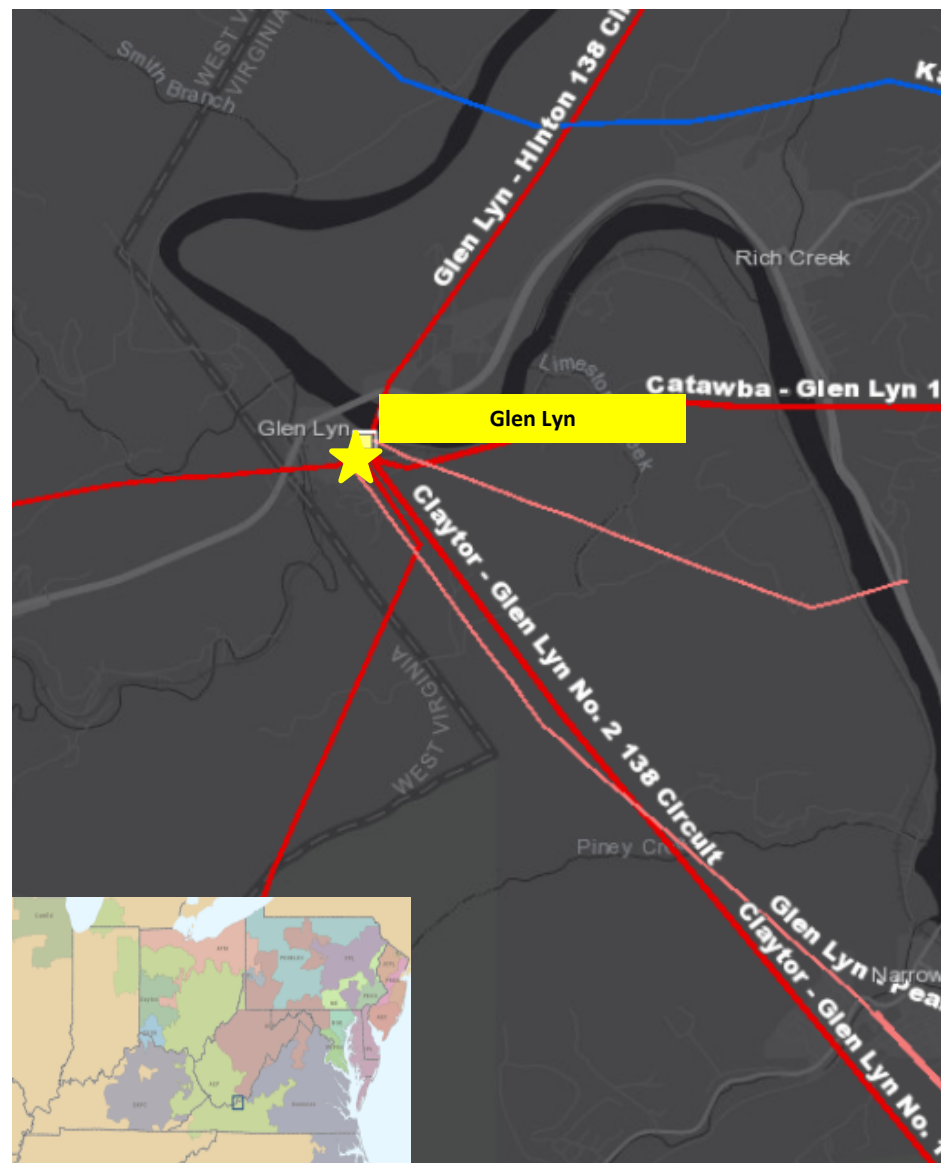
Circuit Breakers AA, AC, AF (34 KV) Concerns:

- 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



AEP Transmission Zone: Supplemental Giles County, Virginia

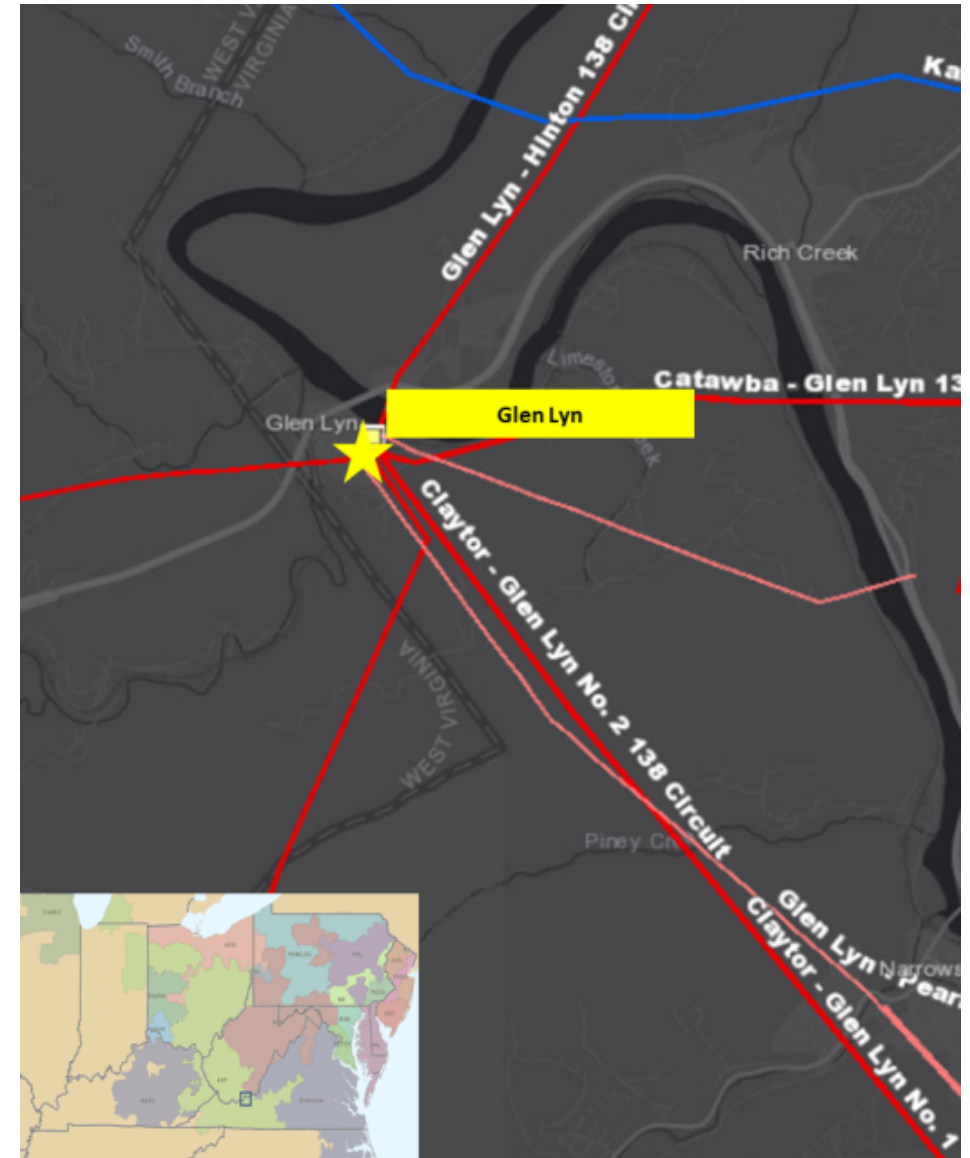
Station (continued)

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

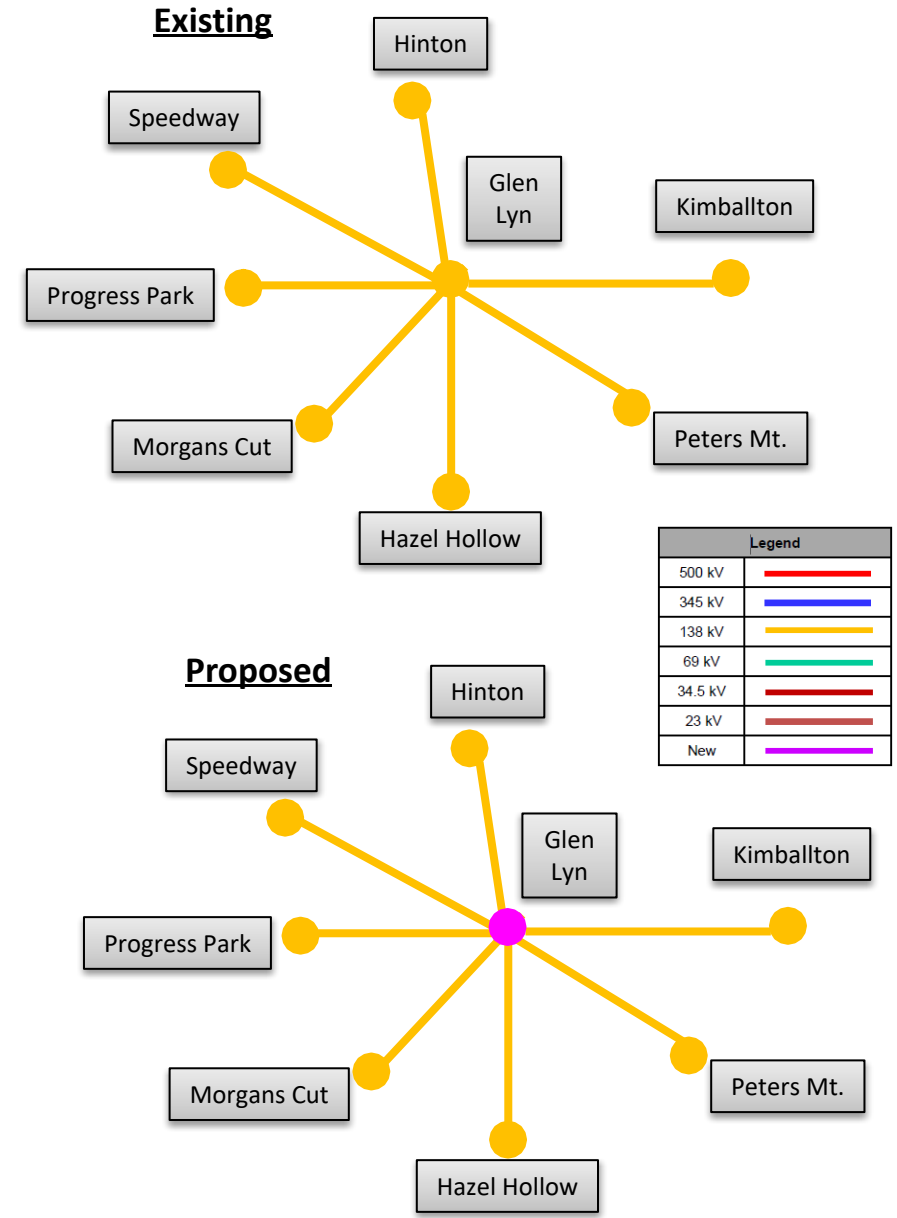
Process Stage: Solutions Meeting 1/20/2023

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.



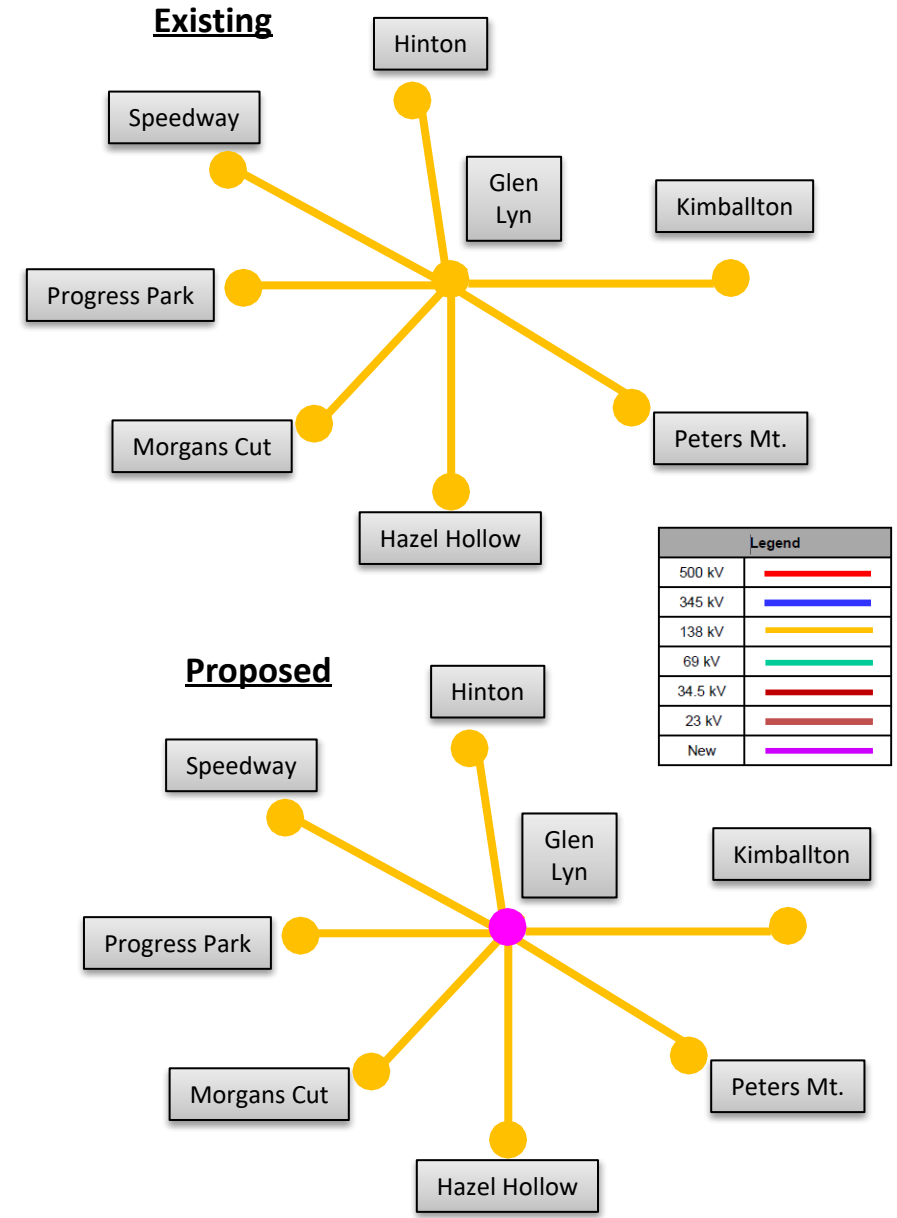
AEP Transmission Zone M-3 Process Giles County, Virginia

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 too 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

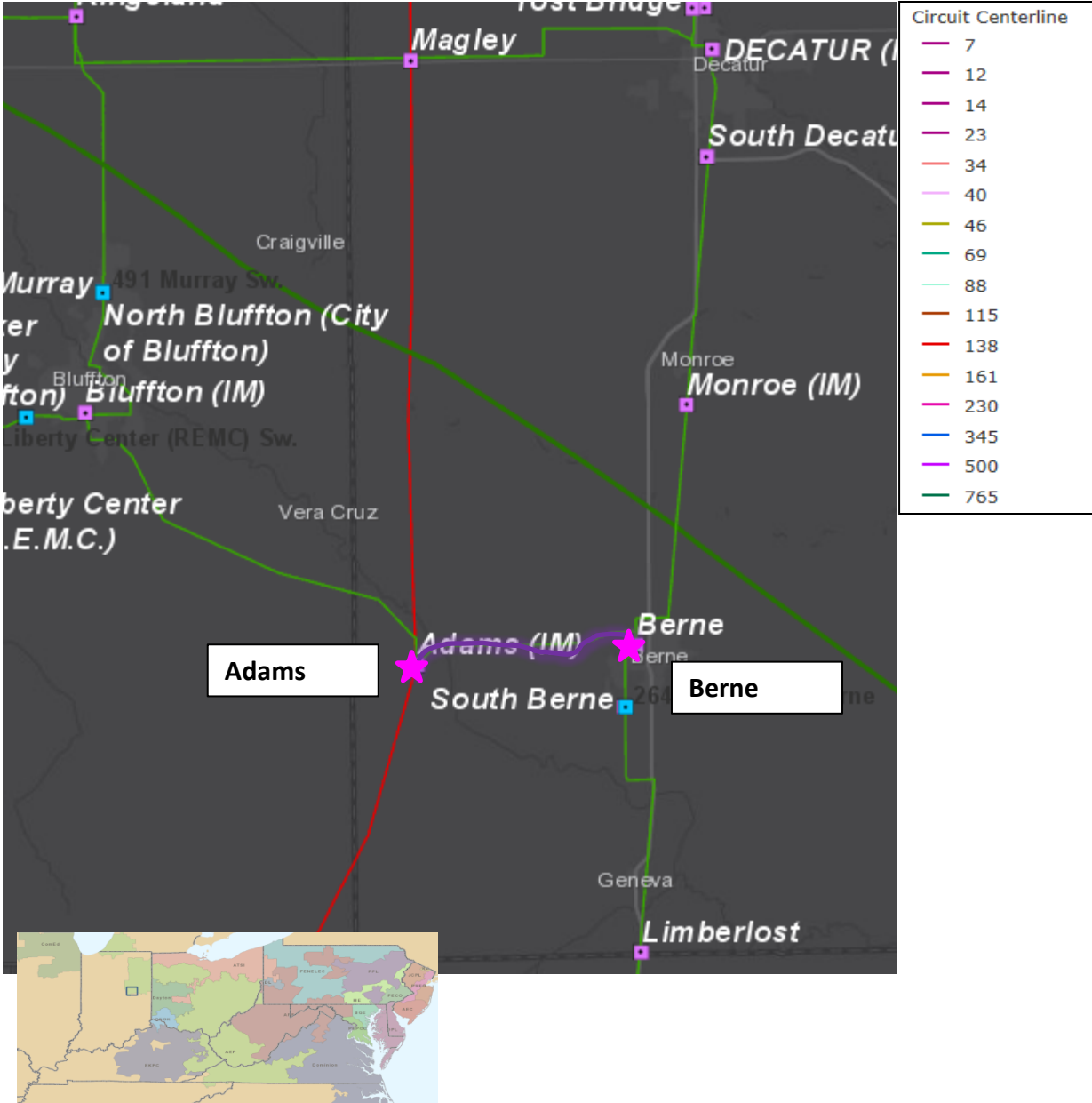
Project Driver: Equipment Material Condition, Performance and Risk

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

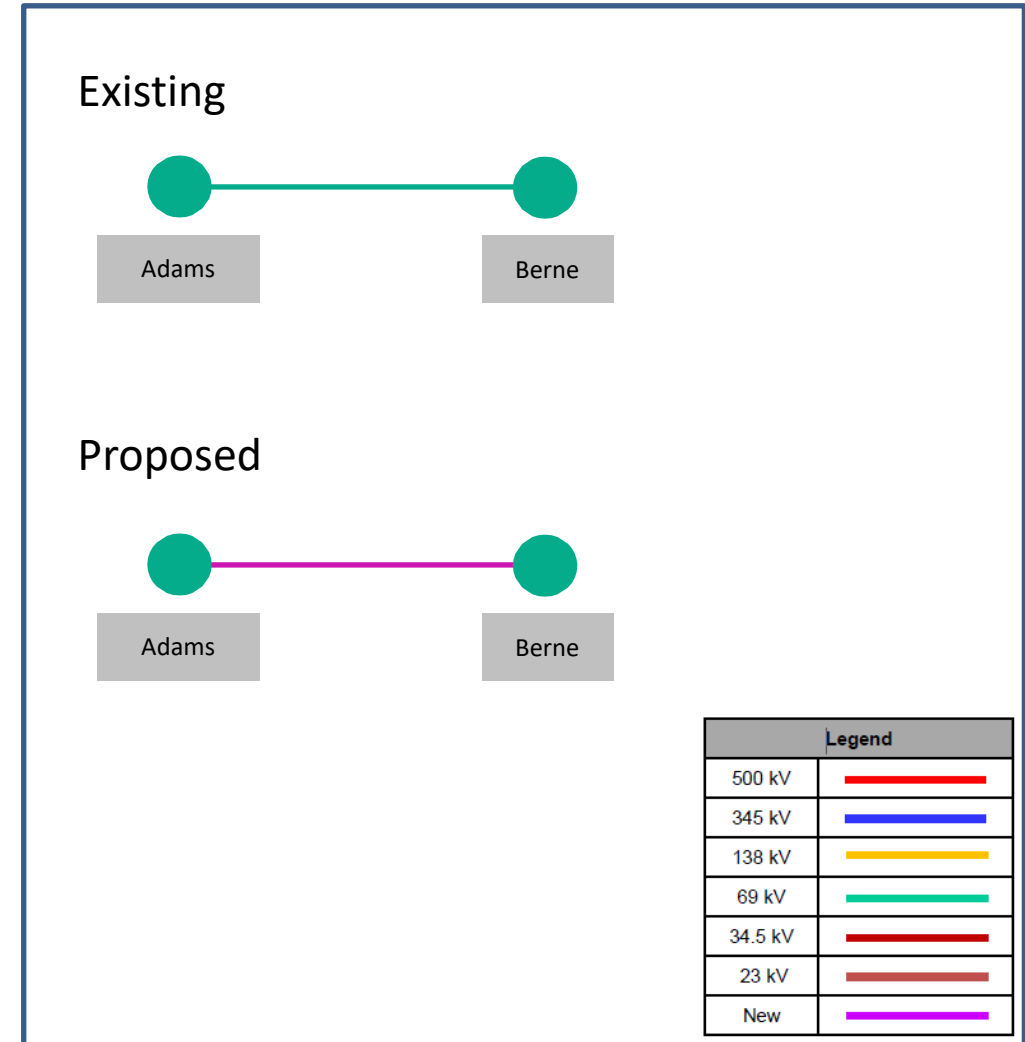
Alternatives considered:

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



Appendix

High Level M-3 Meeting Schedule

Assumptions	Activity	Timing
	Posting of TO Assumptions Meeting information	20 days before Assumptions Meeting
	Stakeholder comments	10 days after Assumptions Meeting
Needs	Activity	Timing
	TOs and Stakeholders Post Needs Meeting slides	10 days before Needs Meeting
	Stakeholder comments	10 days after Needs Meeting
Solutions	Activity	Timing
	TOs and Stakeholders Post Solutions Meeting slides	10 days before Solutions Meeting
	Stakeholder comments	10 days after Solutions Meeting
Submission of Supplemental Projects & Local Plan	Activity	Timing
	Do No Harm (DNH) analysis for selected solution	Prior to posting selected solution
	Post selected solution(s)	Following completion of DNH analysis
	Stakeholder comments	10 days prior to Local Plan Submission for integration into RTEP
	Local Plan submitted to PJM for integration into RTEP	Following review and consideration of comments received after posting of selected solutions

Revision History

1/10/2022– V1 – Original version posted to pjm.com