# Submission of Supplemental Projects for Inclusion in the Local Plan

# AMPT Projects in ATSI/AEP Transmission Zone M3 Process Brewster, OH

**Need Number:** AMPT-2021-006

**Process Stage:** Solution Meeting – 8/19/2022

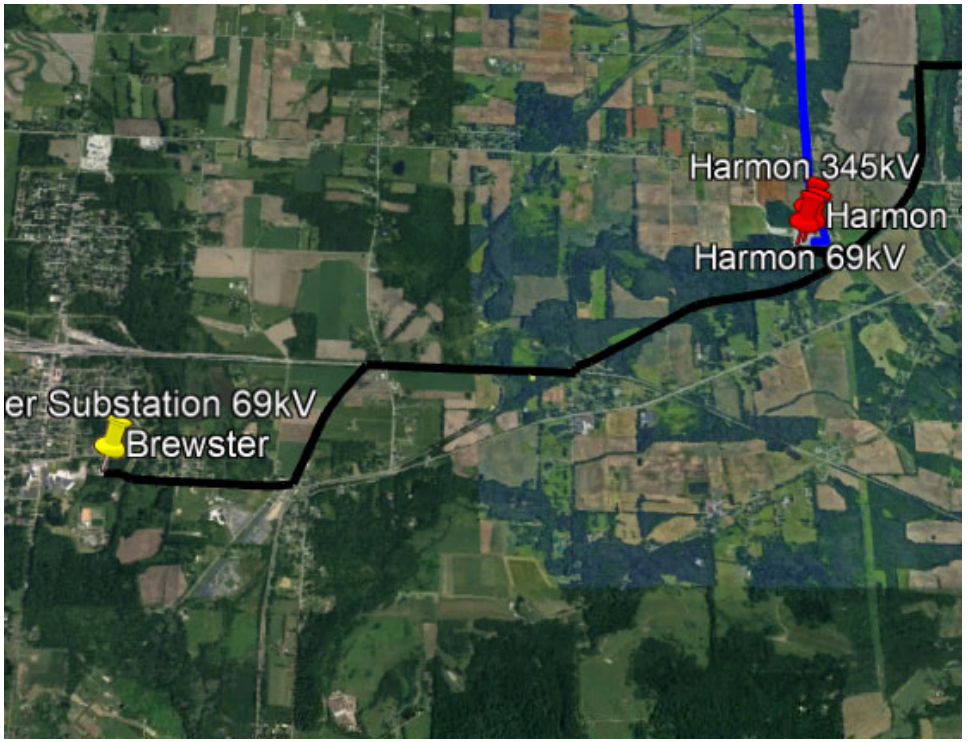
**Process Stage:** Need Meeting – 12/17/2021

**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 3.5 mile radial 69 kV line from ATSI's Harmon substation. Current peak load at Brewster is 9 MW.

The village of Brewster has requested a 2nd supply to support the load. The radial supply presents a single point of failure that could jeopardize reliability for the village. AMPT Interconnection requirements specify a need for a second source for loads 5 MW and above.



# AMPT Projects in ATSI/AEP Transmission Zone M3 Process Brewster, OH

**Need Number:** AMPT-2021-006

**Process Stage:** Solution Meeting – 8/19/2022

**Supplemental Project Driver(s):** Customer Service

**Proposed Solution:**

*AMPT Identified Scope* **($18.0 M)**

- Construct a greenfield 69 kV single circuit transmission line for approximately 5.5 miles using 795 26/7 ACSR conductor from AMPT's Brewster 69 kV substation to a structure outside of AEP's Alpine 69 kV ring bus station. **($9.8 M)**
- Build a four (4) CB 69kV ring station at the existing Brewster Substation location. The new ring bus will be used to re-terminate the existing 69 kV Brewster-Harmon (FE) line, terminate the new 69 kV Alpine-Brewster (AEP) line, and tie with two (2) existing terminals feeding the existing Brewster 69/12 kV transformation. **($8.2 M)**

AEP Identified Scope **($1.81 M)**

- Modify AEP's proposed Alpine 69 kV ring bus station (s2534.8) by adding an additional 69 kV circuit position to Brewster. Install one (1) 69 kV circuit breaker, protective relaying, and tie-line metering. **($1.03 M)**
- Construct a 0.1 mile segment of 69 kV transmission line using 795 ACSR 26/7 conductor leaving Alpine station to connect to AMPT's transmission line toward Brewster. **($0.78 M)**

*FE Identified Scope* **($0.63 M)**

- At FE's Harmon substation provide fiber termination. AMPT is responsible for the fiber path on the Brewster-Harmon 69 kV line.
- At FE's Harmon 69 kV substation replace two (2) SEL-421s primary and backup relay with two (2) SEL-411Ls and connect to the fiber, retain existing SEL-501 breaker failure relay.
- Adjust relay settings at Cloverdale

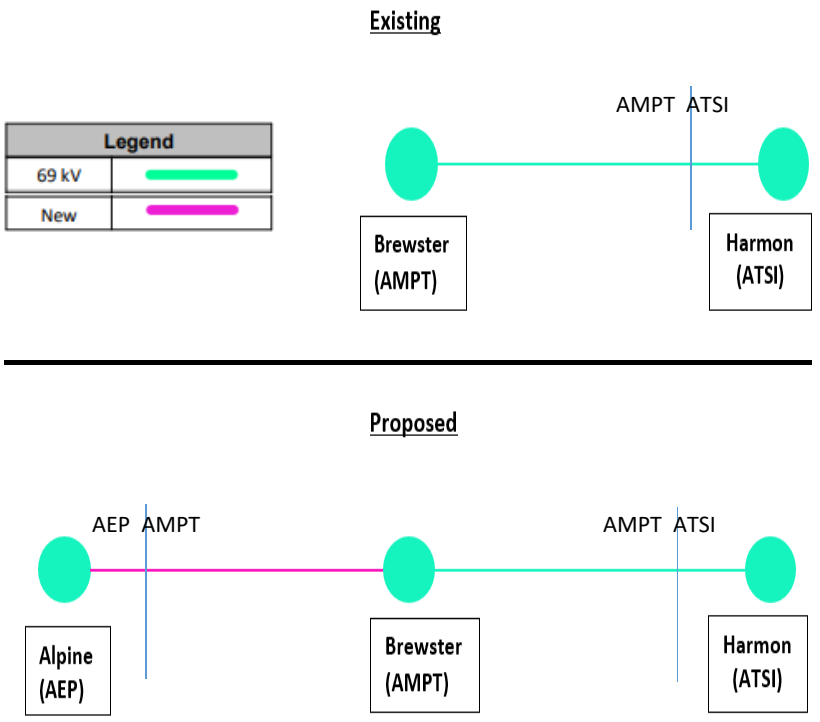
**Total Estimated Transmission Cost: $20.45 M**

**Projected In-Service:** 6/1/2025

**Supplemental Project ID:** s2807.1 (AMPT); s2807.2 (AEP); s2807.3 (ATSI)

**Project Status:**

- Conceptual (AMPT), Conceptual (AEP), Conceptual (ATSI)



# AMPT Projects in ATSI/AEP Transmission Zone M3 Process
# Brewster, OH

**Alternatives Considered:**

- Build a greenfield 69 kV switchyard to tap the existing West Wilmot-Beartown 69 kV line. The new 69 kV switchyard will involve a three-breaker ring configuration. Build a 6 mile-long greenfield 69 kV line from the existing Brewster 69 kV substation to the new switchyard. Expand Brewster 69 kV yard into a four-breaker ring arrangement to accommodate the new line. **($22.2 M)**

  **Similar in scope to the proposed solution however is less cost effective than the proposed solution with the installation of a new 3-CB ring bus.**

- Expand the 69 kV yard at the existing Harmon substation to accommodate a new 69 kV line terminal. Build a 4 mile-long greenfield 69 kV line from the existing Brewster 69 kV substation to the existing Harmon substation. Expand Brewster 69 kV yard into a four-breaker ring arrangement to accommodate the new line. **($14.8 M)**

  **This alternative does not comport with AMPT's criteria for a geographically diverse path for a 2nd source, when possible.**

- Build a greenfield 138/69 kV substation to tap the existing Cloverdale-Yager 138 kV line. The new 138/69 kV substation will involve a 138 kV three-breaker ring configuration, a 138-69 kV transformer (130 MVA) and a breaker on the low side of the transformer. Build a 5 mile-long 69 kV transmission line from the existing Brewster 69 kV substation to the new substation. Expand Brewster 69 kV yard into a four-breaker ring arrangement to accommodate the new line. **($33.6 M)**

  **Less cost effective than the proposed solution for the reasons noted above.**

- Build a greenfield 138/69 kV substation to tap the existing Cloverdale – E. Wooster 138 kV line. The new 138/69 kV substation will involve a 138 kV three-breaker ring configuration, a 138-69 kV transformer (130 MVA) and a breaker on the low side of the transformer. Build a 5 mile-long 69 kV transmission line from the existing Brewster 69 kV substation to the new substation. Expand Brewster 69 kV yard into a four-breaker ring arrangement to accommodate the new line. **($33.6 M)**

  **Less cost effective than the proposed solution for the reasons noted above.**

- Build a greenfield 138/69 kV substation to tap the South Canton – Apple Creek 138 kV line. The new 138/69 kV substation will involve a 138 kV four-breaker ring configuration, a 138-69 kV transformer (130 MVA) and a breaker on the low side of the transformer. Build a 4.2 mile-long greenfield 69 kV line from Brewster station to the new substation. Expand Brewster 69 kV yard into a four-breaker ring arrangement to accommodate the new line. **($33.2 M)**

  **Less cost effective than the proposed solution for the reasons noted above.**

- Build a greenfield 345/69 kV substation to tap the Harmon – Star 345 kV line. The new 345/69 kV substation will involve a 345 kV four-breaker ring configuration, a 345-69 kV transformer (130 MVA) and a breaker on the low side of the transformer. Build a 3 mile-long greenfield 69 kV line from the existing Brewster 69 kV substation to the new substation. Expand Brewster 69 kV yard into a four-breaker ring arrangement to accommodate the new line. **($37.7 M)**

  **Less cost effective than the proposed solution for the reasons noted above.**

# AEP Transmission Zone M-3 Process
# Edison Breaker Replacement

**Need Number:** AEP-2022-IM009

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previously Presented:**
Solution Meeting 8/19/2022
Needs Meeting 2/18/2022

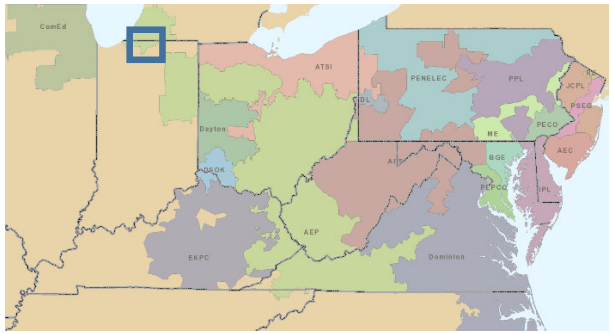
**Supplemental Project Driver:** Equipment Material/Condition/Performance/Risk

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

**Problem Statement:**

**Edison 138kV**

- Circuit breakers A, B, and C are 1988 138kV 145-PA type breakers.
  - The 145-PA Type breakers are experiencing marked increases in malfunctions. There have been 437 recorded malfunctions of this model type on the AEP system. The most common issues are related to loss of SF6 gas and mis-operations. The expected life of the bushing gaskets and door inspection port seals is 25 years. Seals that are no longer adequate can cause SF6 leaks to become more frequent. Low SF6 pressure in the breaker reduces the ability of the breaker to correctly interrupt a fault. Additionally, low pressure alarms and SF6 leaks lead to increased maintenance costs. The manufacturer provides no support or parts for this model of circuit breakers. Finally, SF6 leaks impact the environment.
  - Circuit breaker C has experienced 12 fault operations, which is over the manufacturer's recommendation of 10.

# AEP Transmission Zone M-3 Process
# Edison Breaker Replacement

**Need Number:** AEP-2021-IM009

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

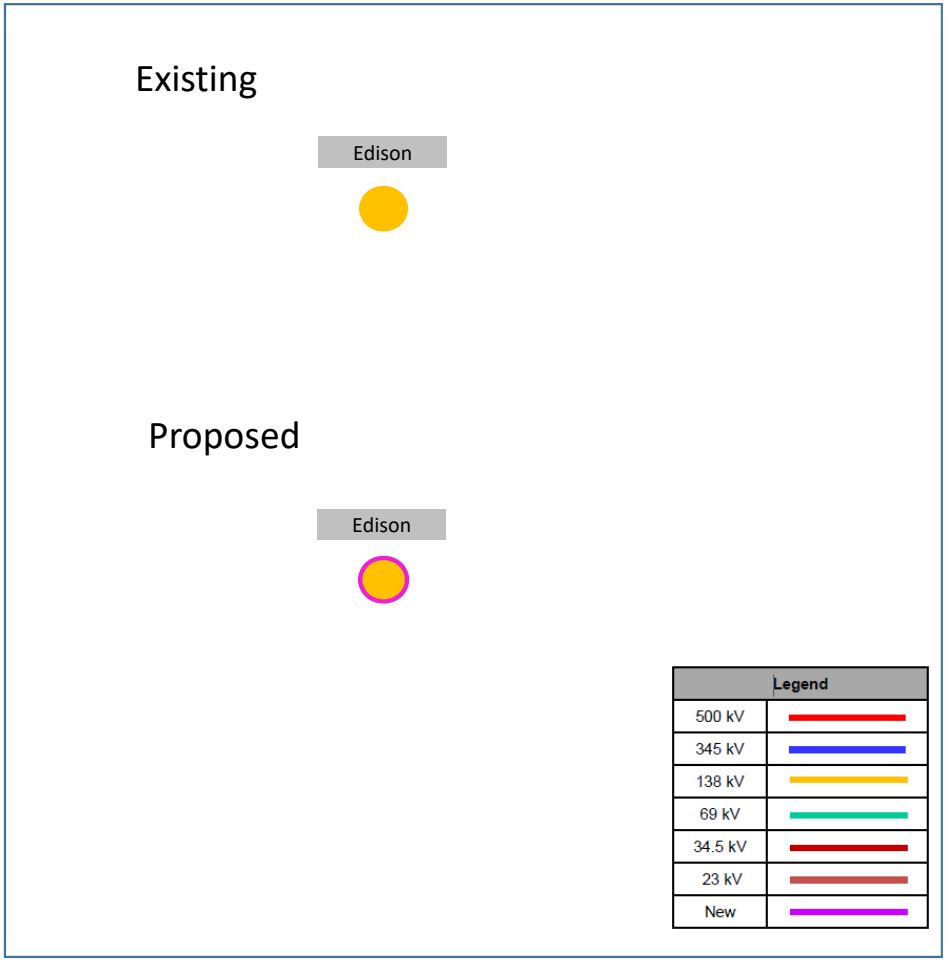
**Solution:**

Replace 138kV circuit breakers A, B, and C with 3000A 40kA breakers at Edison station.
**Estimated Cost: $1.18M**

**Projected In-Service:** 3/31/2027

**Supplemental Project ID:** s2810

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Fremont, Ohio

**Need Number:** AEP-2021-OH021

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previously Presented:**
Solutions Meeting 8/19/2022
Needs Meeting 11/19/2021

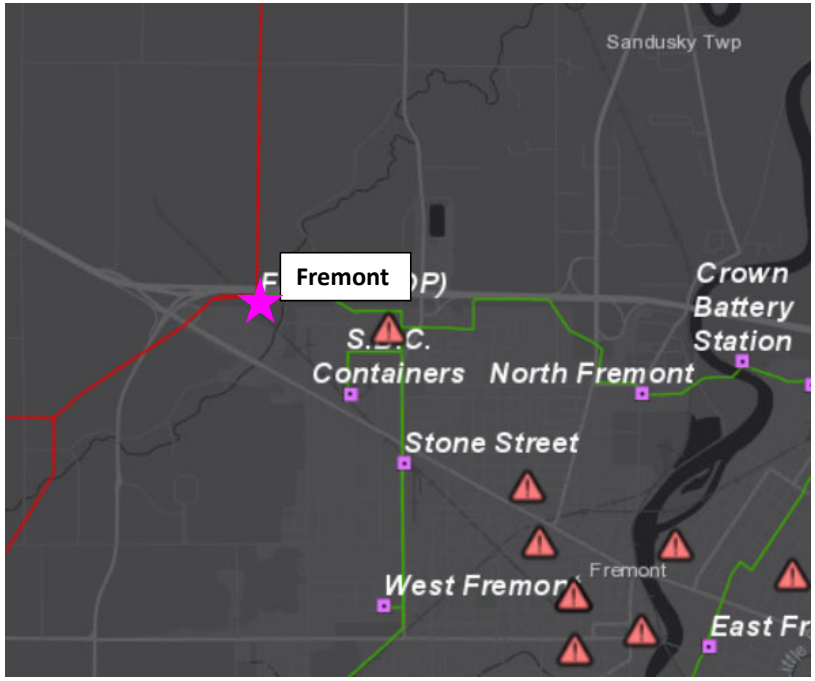
**Supplemental Project Driver:** Operational Flexibility, and Customer Service

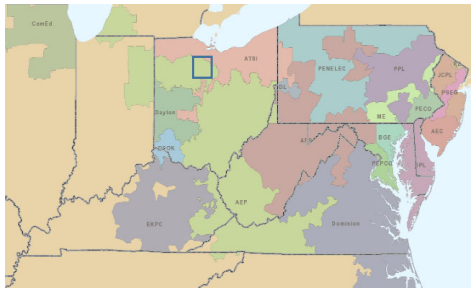
**Specific Assumption Reference:**
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 8)

**Problem Statement:**

Circuit Breaker: C

- Breaker Age:
  - 1988
- Interrupting Medium: (Oil)
- Fault Operations:
  - Number of Fault Operations: 43
  - Manufacturer recommended Number of Operations: 10
- Additional Breaker 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
  - The manufacturer provides no support for this family of circuit breakers and spare parts are increasingly more difficult to obtain. This model family has experienced major malfunctions associated with their hydraulic mechanism, including 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 system.
- The 138kV line MOAB "W" toward West Fremont is in need of replacement due to obsolete contacts and a broken insulator.



# AEP Transmission Zone M-3 Process
# Richland, Ohio

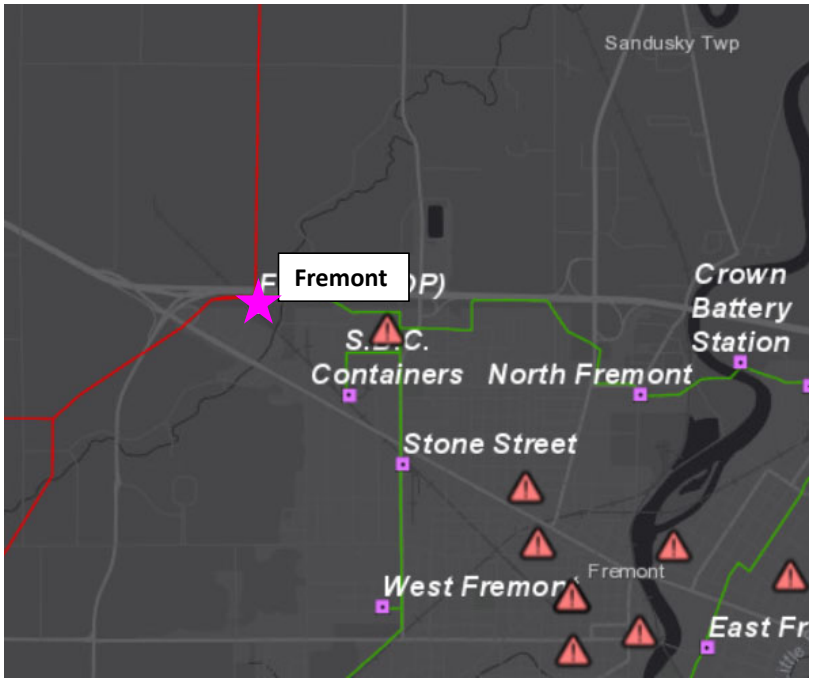
**Need Number:** AEP-2021-OH021

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Problem Statement Continued:**

Relays:

- 52 of the 60 relays (87% of all station relays) are in need of replacement. 42 of these are of the electromechanical type and 1 of the static 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. There are 8 microprocessor based relays commissioned between 2004 and 2011 and one DPU unit with firmware that is no longer supported.



# AEP Transmission Zone M-3 Process
# Fremont, Ohio

**Need Number:** AEP-2021-OH021

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution:**

- Install a new 69 kV 3000A 40kA breaker to replace breaker C and associated terminal equipment at Fremont on the line towards the City of Clyde. Install a new 138kV 1200A MOAB switch to replace MOAB W toward West Fremont. Install new DICM. Station will need to be expanded to accomplish work. **$3.48 M**

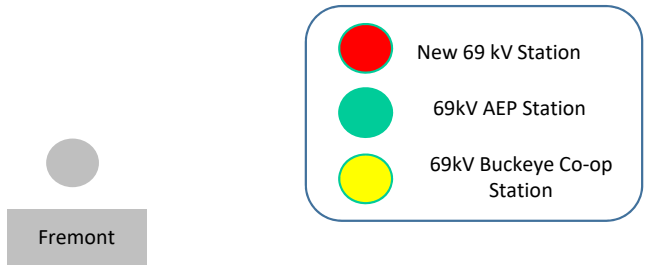
**Cost estimate: $3.48 M**

**Projected In-Service:** 6/1/2025

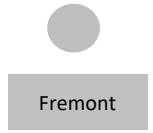
**Supplemental Project ID:** s2811

**Project Status:** Engineering

**Existing:**




**Proposed:**



# AEP Transmission Zone M-3 Process
# Findlay, OH

**Need Number:** AEP-2021-OH030

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previously presented:**

Solution Meeting 08/19/2022

Need Meeting 05/21/2021

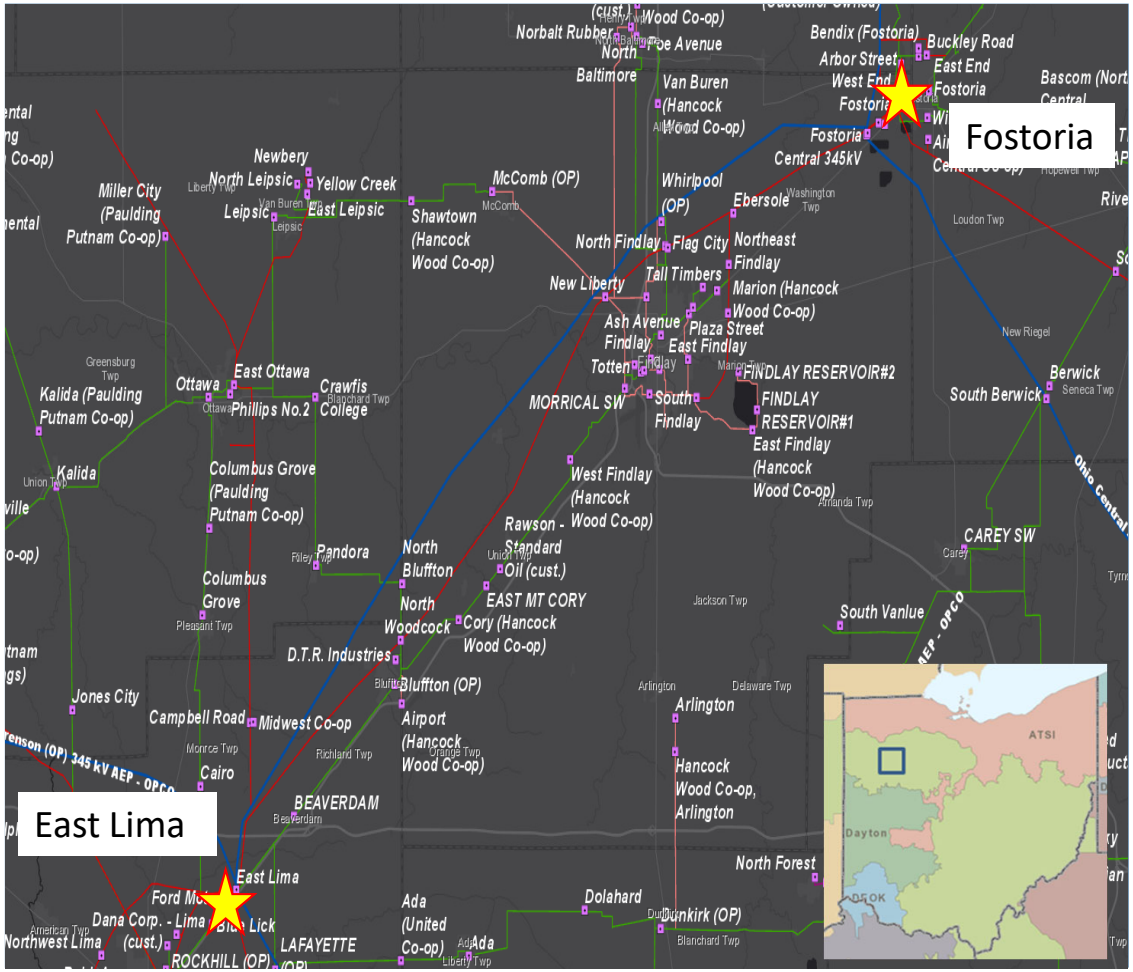
**Project Driver:** Equipment Material/Condition/Performance/Risk

**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13), AEP Presentation on Pre-1930s Lines

**Problem Statement:**

Fostoria – East Lima 138kV

- **Original Construction Date:** 1924
- **Length:** 41.26 miles
- **Total structure count:** 205
- **Original Line Construction Type:** Double circuit steel lattice towers with vertical insulators
- **Conductor Types**: 397,500 CM ACSR 30/7 (Lark) & 336,400 CM ACSR 30/7 (Oriole)
- **Outage History:** Since 2015, there have been 2 permanent outages and 6 momentary outages. The Ebersole – New Liberty Circuit has accounted for 19,640 customer minutes of interruption for 326 distribution customers at the Flag City Substation.
- **Condition Summary**: Currently, there are 44 structures with at least one open condition, which relates to 22% of the structures on this line.



# AEP Transmission Zone M-3 Process
# Findlay, OH

**Need Number:** AEP-2021-OH030

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

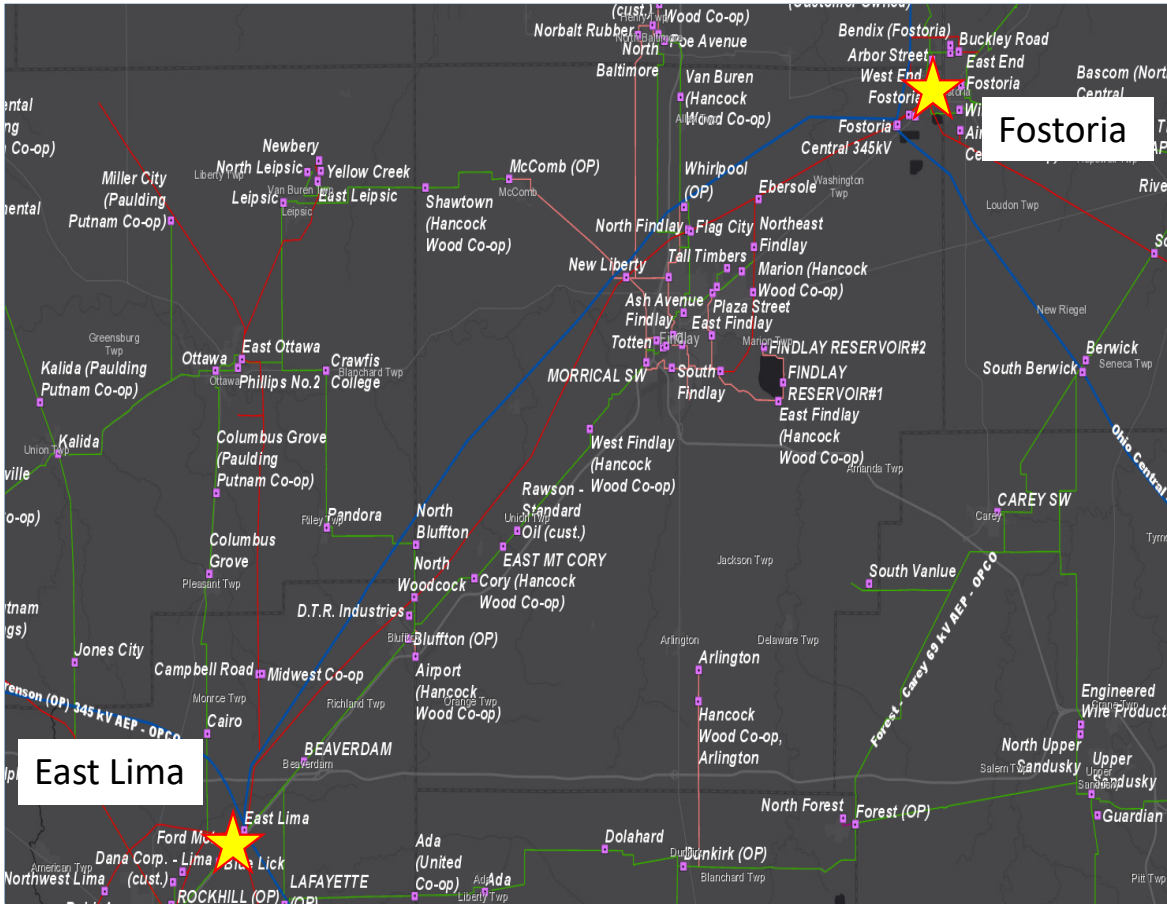
**Problem Statement (contd.):**

**Additional Information**: Multiple issues are starting to emerge on this line indicating accelerated deterioration phase of its life. Structures inspected either aerially or by ground crews showed heavy visible corrosion on conductors and shield wire, surface rust on towers, insulator end fittings and dampers.

Additional Info on Insulator & Hardware Corrosion:

- Section Loss: The connecting elements including the tower attachment hole and the insulator hook have experienced serious cross-section loss due to corrosion and wear. This loss of metal cross-section significantly reduces the capacity of the connection
- Corrosion: The insulator caps and connecting hardware have experienced heavy to complete loss of galvanizing. When the protective galvanized coating is gone or significantly compromised, the bare steel corrodes at an accelerated rate
- Tower members with corrosion and damage. 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.

- **Customer Impact:** This double-circuit line provides significant support to the Findlay area 34.5 kV and 69 kV systems via transformers at North Woodcock, New Liberty, North Findlay, and Ebersole and Flag City. Simultaneous outages at both ends of the double-circuit line would likely lead to a major area-wide outage.
- **Risk:** 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



# AEP Transmission Zone M-3 Process
# Fostoria - East Lima Rebuild Project

**Need Number:** AEP-2021-OHO30

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution:**

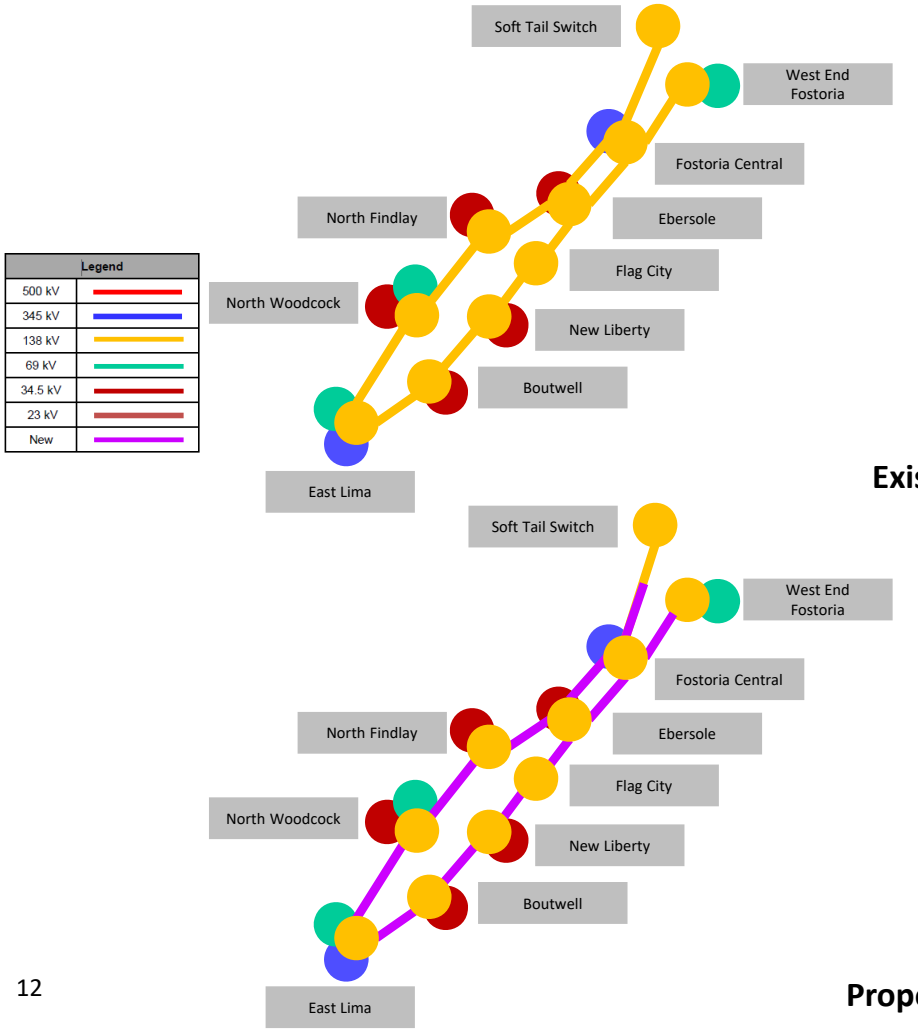
- **Fostoria - East Lima 138:** The 41.3 mile long line will be rebuilt using double circuit 795 ACSR Drake conductor. OPGW shield wire will be installed. Approximately one mile of line is being considered for greenfield construction to avoid encroachments and ROW challenges. The Boutwell, Flag City and Ebersole stations were installed recently, these line cut-ins will not be rebuilt. **Estimated Cost: $95.9M (s2812.1)**
- **North Findlay - N Main & North Findlay - Findlay 69kV lines:** The North Findlay - N Main and North Findlay - Findlay 69kV lines will be modified for the Fostoria - East Lima 138kV line crossing. **Estimated Cost: $0.08M (s2812.2)**

**Total Estimated Transmission Cost:$95.98M**

**Projected In-Service:** 09/15/2026

**Supplemental Project ID:** s2812.1-.2

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Johnson County, Kentucky

**Need Number:** AEP-2022-AP004

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previously Presented:**

Solutions Meeting 08/19/2022

Needs Meeting 02/18/2022

**Supplemental Project Driver:** Equipment Condition/Performance/Risk

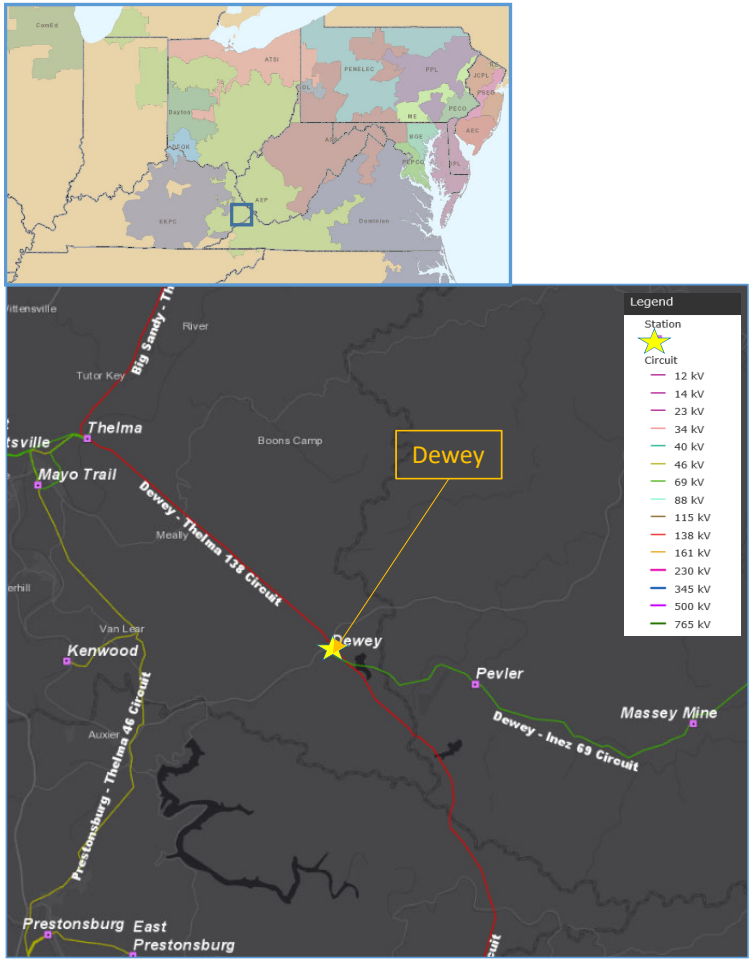
**Specific Assumption Reference:**

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

**Problem Statement:**

Dewey substation Needs:

- 138kV Circuit Breaker B:
  - 1992 Vintage, number of fault ops: 55
  - The 138kV transmission owned circuit breaker, CB-B, is a 145-PA-40-20B type, SF6 filled breaker. As of May 11, 2020, there have been 437 recorded malfunctions of this 145-PA model family on the AEP System. The most common issues are related to loss of SF6 gas and mis-operations. The expected life of the bushing gaskets and door inspection port seals is 25 years; this unit has reached this age. Seals that are no longer adequate cause SF6 leaks to become more frequent. SF6 leaks impact the environment. The manufacturer provides no support for this family of circuit breakers and spare parts are not available.
- Relaying
  - Currently, 21 of the 34 relays (62% of all station relays) are in need of 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.



# AEP Transmission Zone M-3 Process
# Johnson County, Kentucky

**Need Number:** AEP-2022-AP004

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution:**

At Dewey substation:

- Replace 138kV CB B towards Thelma with new 138kV 40kA circuit breaker. Provide new DICM with new relays for all equipment at station so that existing control house can be removed. Upgrade station service. **Estimated Cost: $2.40 M (s2813.1)**
- Provide Transition fiber via underground from the existing Control House to the new DICM at Dewey Station. Retire existing fiber. **Estimated Cost: $0.18 M (s2813.2)**

At Thelma substation,

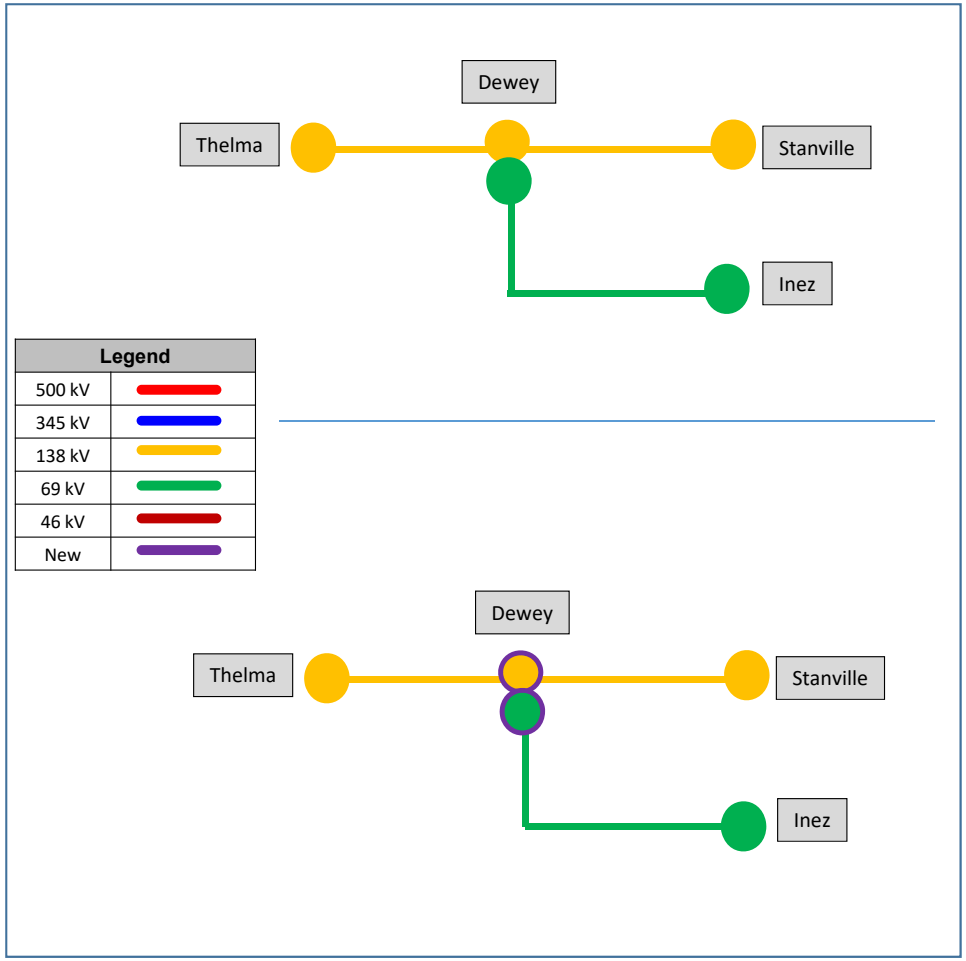
- Remote end relaying to replace line protection for Breaker A towards (Dewey) to match upgrade at Dewey Station. Provide MOS on existing 138kV HS of transformer XF #1 & #3 to provide additional control to stability system. **Estimated Cost: $0.40 M (s2813.3)**

**Total Estimated Transmission Cost: $2.98 M**

**Projected In-Service:** 12/01/2025

**Supplemental Project ID:** s2813.1-.3

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Johnson County, Kentucky

**Need Number:** AEP-2022-AP005

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previous Stage:**
Solution Meeting 08/19/2022
Needs Meeting 02/18/2022

**Supplemental Project Driver:** Equipment Condition/Performance/Risk

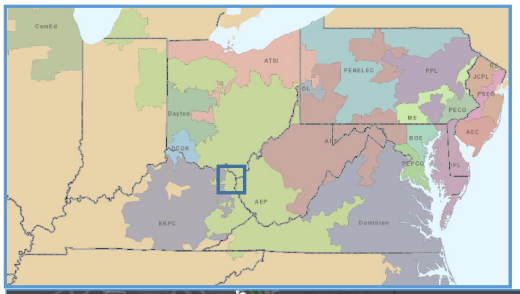
**Specific Assumption Reference:**

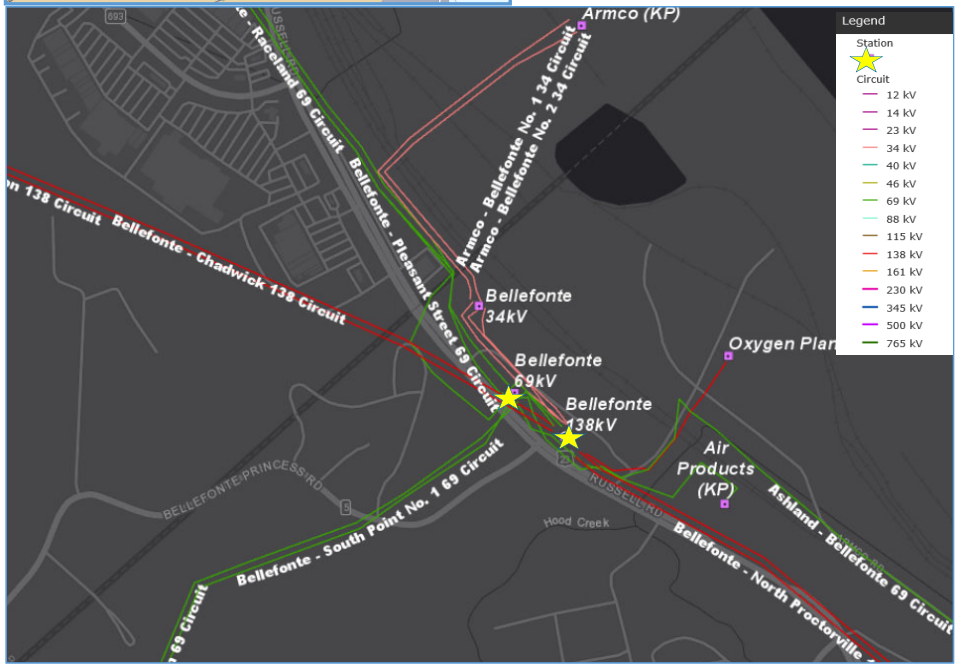
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**Problem Statement:**

<u>Bellefonte 138kV Yard:</u>

- 138/34kV 45MVA Bank #1:
  - 1950s Vintage, originally manufactured in 1951,
  - The dielectric strength of the overall insulation system (oil and paper) is in poor condition, which impairs the unit's ability to withstand electrical faults.
  - The rising and elevated levels of carbon dioxide, indicate increased decomposition of the paper insulation materials. The presence of carbon dioxide indicates decomposition of the increasingly brittle, non-thermally upgraded paper insulation that impairs the unit's ability to withstand future short circuit or through fault events.
  - The high side bushings have seen increased capacitance, indicative of capacitive layer deterioration. The low side bushings lack sufficient dielectric testing data and were commissioned in 1996. The low side bushings are on the recommended replacement list due to the population being advanced in age and degradation, leading to high risk of violent failures from arcing through the ground sleeve.
  - The majority of this family of bushings were manufactured pre-1952. As a bushing ages, O-rings, gaskets, and seals may become more brittle, which may result in moisture ingress. The change in high side bushing dielectric data, the low side bushing type, and the age of all the bushings indicates these bushings are at a greater risk of failure. Failure of a bushing may cause a failure or loss of service of the transformer.
  - Active Oil leaks.
- 138/69-34kV 196 MVA Bank #2:
  - 1970s Vintage, originally manufactured in 1970,
  - Low side bushings have Capacitive layer deterioration.
  - This unit has severe nitrogen leaks. There are racks installed with manifolds in order to keep the nitrogen pressure on this transformer. This unit also has active oil leaks. One third of the fans on this unit have failed.





# AEP Transmission Zone M-3 Process
## Johnson County, Kentucky

**Need Number:** AEP-2022-AP005

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Problem Statement Continued:**

Bellefonte 138kV Yard (cont):

- 138/69-34kV 115MVA Bank #5:
  - 1960s Vintage, originally manufactured in 1961,
  - Unit's paper insulation and lack of thermally upgraded paper insulation indicate higher Short circuit. As the insulating paper materials age, they become brittle. This increasingly brittle, non-thermally upgraded paper insulation impairs the unit's ability to withstand future short circuit or through fault events.
  - Elevated levels of acetylene indicates increased decomposition of the paper insulating materials. The presence of acetylene indicates electrical discharge faults of low energy have occurred within the main tank causing electrical breakdown of the unit.
  - This unit has severe nitrogen leaks. There are racks installed with manifolds in order to keep the nitrogen pressure on this transformer. This unit also has active oil leaks.
- 138/12kV 20MVA Bank #6:
  - 1970s Vintage, originally manufactured in 1971,
  - Unit's paper insulation and lack of thermally upgraded paper insulation indicate higher Short circuit. As the insulating paper materials age, they become brittle. This increasingly brittle, non-thermally upgraded paper insulation impairs the unit's ability to withstand future short circuit or through fault events.
  - There is an upward trend in the insulation power factor indicating an increase in particles within the oil. The overall dielectric strength of the insulation system (oil and paper) is in declining health, which impairs the unit's ability to withstand electrical faults.
  - This unit has active oil leaks. One quarter of the fans on this unit have failed.
- Relaying 138 kV Yard:
  - 97 of the 110 (88%) relays at the 138kV yard station are in need of replacement.
  - 76 are electromechanical, 3 are static and 18 relays are microprocessor type.
  - The electromechanical type and Static type relays that have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack vendor support. Where as the microprocessor relays that are of legacy design and/or utilize legacy firmware

# AEP Transmission Zone M-3 Process
# Johnson County, Kentucky

**Need Number:** AEP-2022-AP005

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Problem Statement Continued:**

Bellefonte 69kV Yard:

69kV circuit breakers AB, C, G, I, JJ and Z are FK type oil filled breaker, without oil containment.

- As of May 25, 2021, there are 20 remaining FK-72.5-27000-10 circuit breakers on the AEP System, including the 6 at this station. GE 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. Oil filled breakers need more maintenance due to the oil handling required.
- 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, these oil breakers have a lot of oil contamination from aging gaskets allowing moisture and other particle ingress.
- Circuit Breakers AB, C, G, I, JJ, and Z are 1970s vintage, manufactured in 1971, with Fault Ops: 1, 23, 8, 60, 57, 17 respectively

69kV circuit breakers H and T CF-48-69-2500 type oil filled breaker, without oil containment.

- Bus Tie Breaker H: 1960s vintage, Manufactured in 1965, Type: Oil , Fault Ops: 3,
- Circuit Breaker T: 1960s vintage, Manufactured in 1967, Type: Oil , Fault Ops: 1,

- There is no vendor support for this 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.

69kV circuit switcher KK is a Mark V type , without gas monitor. The neutral shift device is heavily corroded.

# AEP Transmission Zone M-3 Process
## Johnson County, Kentucky

**Need Number:** AEP-2022-AP005

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Problem Statement Continued:**

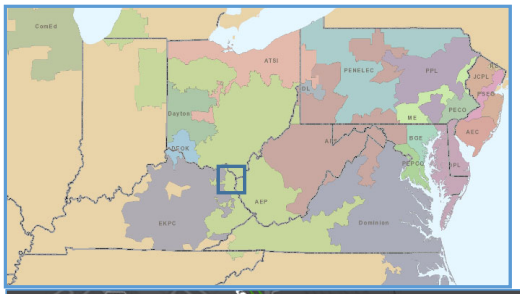
Bellefonte 69kV Yard (cont):

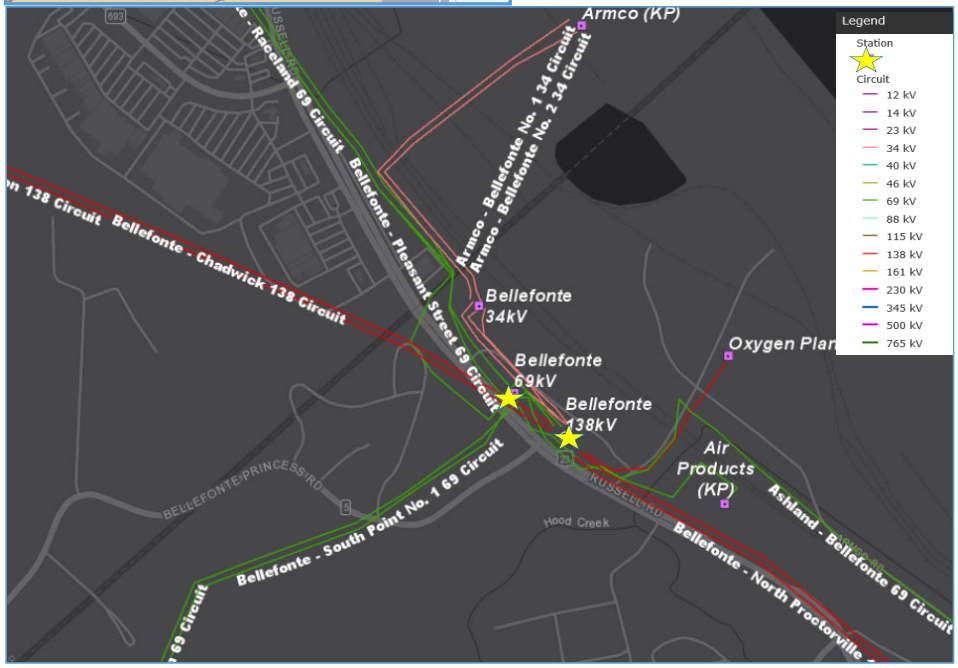
Relaying:

- 44 of the 52 (85%) relays at the 69kV yard station are in need of replacement.
- 41 are electromechanical, 2 are static and 1 relay is microprocessor type.
- The electromechanical type and Static type relays that have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack vendor support. Where as the microprocessor relays that are of legacy design and/or utilize legacy firmware

Others:

- Flooding occurs frequently during heavy rains at the 138kV and 69kV control houses.
- Transite (asbestos) paneling is present on the interior walls of the control house.
- The HVAC Systems are inadequate for providing proper air circulation for the relays, batteries, and chargers inside the buildings. Free standing space heaters are used.
- Cable entrances are at full capacity.
- The perimeter fences and gates are in need of replacement due to excessive corrosion.
- The two legacy 138kV bus PTs for Buses #1 and #2 have elevated PCB concentrations. These PTs are leaking oil.
- The 69kV capacitor Bank KK is installed on the Raceland 69kV line instead of the 69kV Bus.





# AEP Transmission Zone M-3 Process
# Johnson County, Kentucky

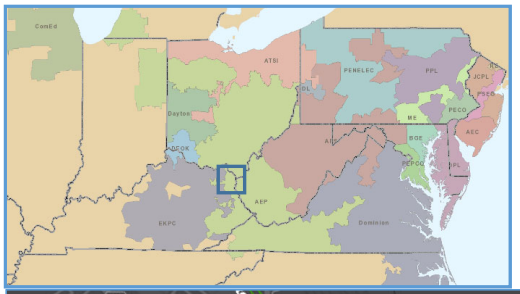
**Need Number:** AEP-2022-AP005

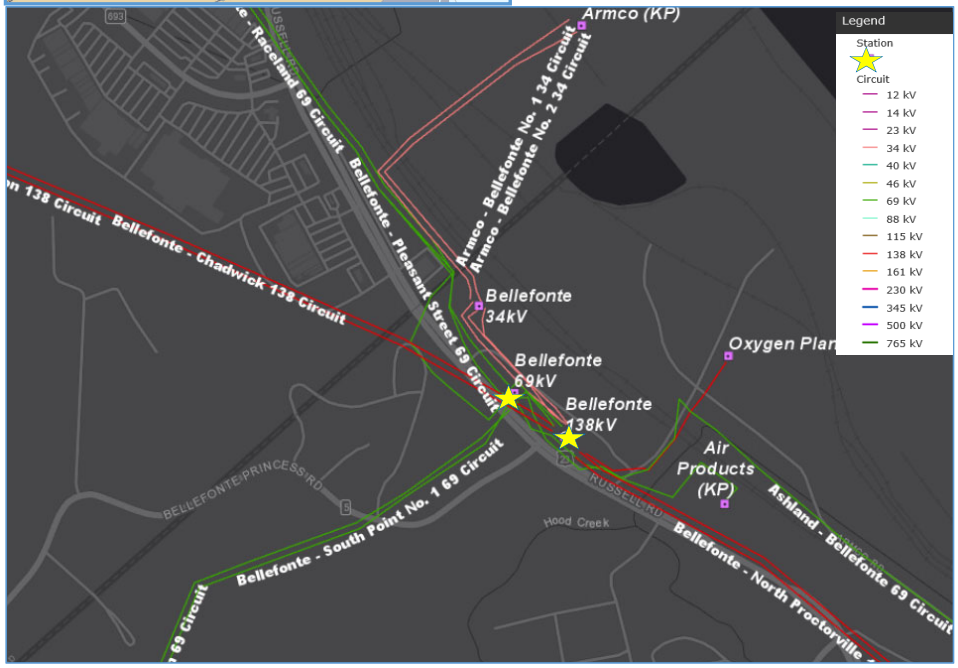
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Problem Statement Continued:**

Bellefonte 34kV Yard:

- 34.5kV Circuit Breakers E, F, K, M:
  - The four 34.5kV transmission owned circuit breakers E, F, K, and M are FK-family model type, oil filled breakers. These breakers are of 1950's and 1970's vintages. These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, vacuum counterparts do not require.
  - As of October 7, 2021, there are 13 remaining FK-339-34.5-2500 circuit breakers on the AEP System, including the 3 (E, F, & K) at this station. Also as of October 7, 2021, there are 8 remaining FKA-38-22000-5Y circuit breakers on the AEP System, including the 1 (M) at this station. There is no vendor 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 oil breakers have a lot of oil contamination from aging gaskets allowing moisture and other particle ingress.
  - Circuit Breaker E: 1950s vintage, Manufactured in 1953, Type: Oil , Fault Ops: 3, Circuit Breaker F: 1950s vintage, Manufactured in 1953, Type: Oil , Fault Ops: 3, Bus Tie circuit Breaker K: 1950s vintage, Manufactured in 1952, Type: Oil , Fault Ops: 7, Bus Tie circuit Breaker M: 1970s vintage, Manufactured in 1971, Type: Oil , Fault Ops: 2,
- Relaying:
  - 34 of the 34 relays at the station are in need of replacement
  - All 34 relays are electromechanical type which have significant limitations with regards to fault data collection and retention.
  - The existing RTU installed at Bellefonte 34.5kV Metering Station is a legacy TLG DOS unit which has high failure and malfunction rates, lacks telecom infrastructure compatibility, lacks software compatibility, lacks vendor support, lacks spare parts availability, lacks vendor supplied training, lacks an active warranty, and has poor RTU resource utilization. This particular unit has experienced 5 recorded malfunction over its in-service life including loss of communication and being down.





# AEP Transmission Zone M-3 Process
# Johnson County, Kentucky

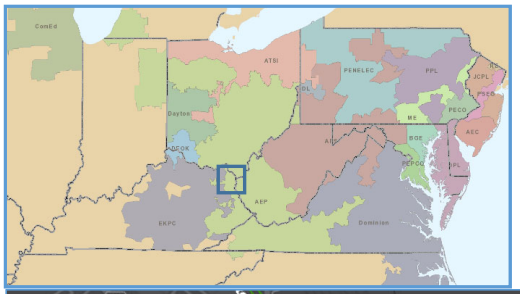
**Need Number:** AEP-2022-AP005

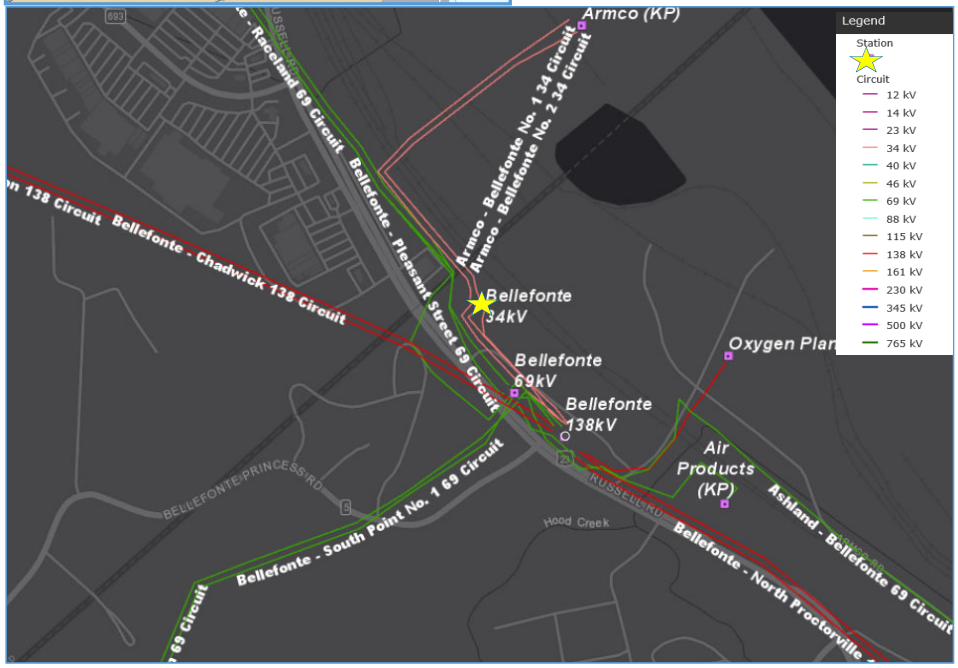
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Problem Statement Continued:**

Bellefonte 34kV Yard (cont):

- 34.5/2.5kV kV Grounding Transformer #7:
  - 1950s Vintage, originally manufactured in 1951,
  - Increased decomposition of the paper insulation materials. Electrical discharges of high energy have occurred within the main tank. The low and declining levels of IFT (interfacial Tension) indicates that sludge has formed and is hardening and layering; in addition, this indicates that the insulation is shrinking and weakening.
  - Oil interfacial tension is strongly indicating an aged oil with polar contaminants and oxidation byproducts. This is a contaminated oil favoring accelerated aging of the insulation and formation of sludge which will impair proper oil circulation. Dielectric strength levels are also low and declining.
  - The presence of acetylene confirms the insulation system (oil and paper) is in poor condition and also indicates electrical discharge faults of high energy have occurred within the main tank causing electrical breakdown of the unit.
- 34.5/2.5kV kV Grounding Transformers #8 (three single phase units):
  - 1950s Vintage, originally manufactured in 1945,
  - The low and declining levels of IFT (interfacial Tension) indicates that sludge is dissolved in Oil (phase #1) or that the sludge is in the radiator, core and coil (for phase #2 & Phase #3).
  - Oil interfacial tension is strongly indicating an aged oil with polar contaminants and oxidation byproducts. This is a contaminated oil favoring accelerated aging of the insulation and formation of sludge which will impair proper oil circulation. Dielectric strength levels are also low and declining.
  - The presence of acetylene in GRD Bank-8 300 (phase #1) confirms the insulation system (oil and paper) of that unit is in poor condition and also indicates mixtures of electrical and thermal faults have occurred within the main tank causing electrical breakdown of the unit.
  - The presence of acetylene in GRD Bank-8 300 (phase #1) indicate increased decomposition of the paper insulation materials.
  - The lack of thermally upgraded paper insulation. As the insulating paper materials age, they become brittle. These characteristics of brittleness and lack of a thermal upgrade diminishes of the unit's ability to withstand future short circuit or through fault events due to the state of the paper insulation.
- 34.5/2.5kV kV Grounding Transformer #9:
  - 1980s Vintage, originally manufactured in 1984,
  - The elevated levels of carbon dioxide and carbon monoxide indicate excessive decomposition of the paper insulating materials. The presence of carbon dioxide and carbon monoxide indicate decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault events.





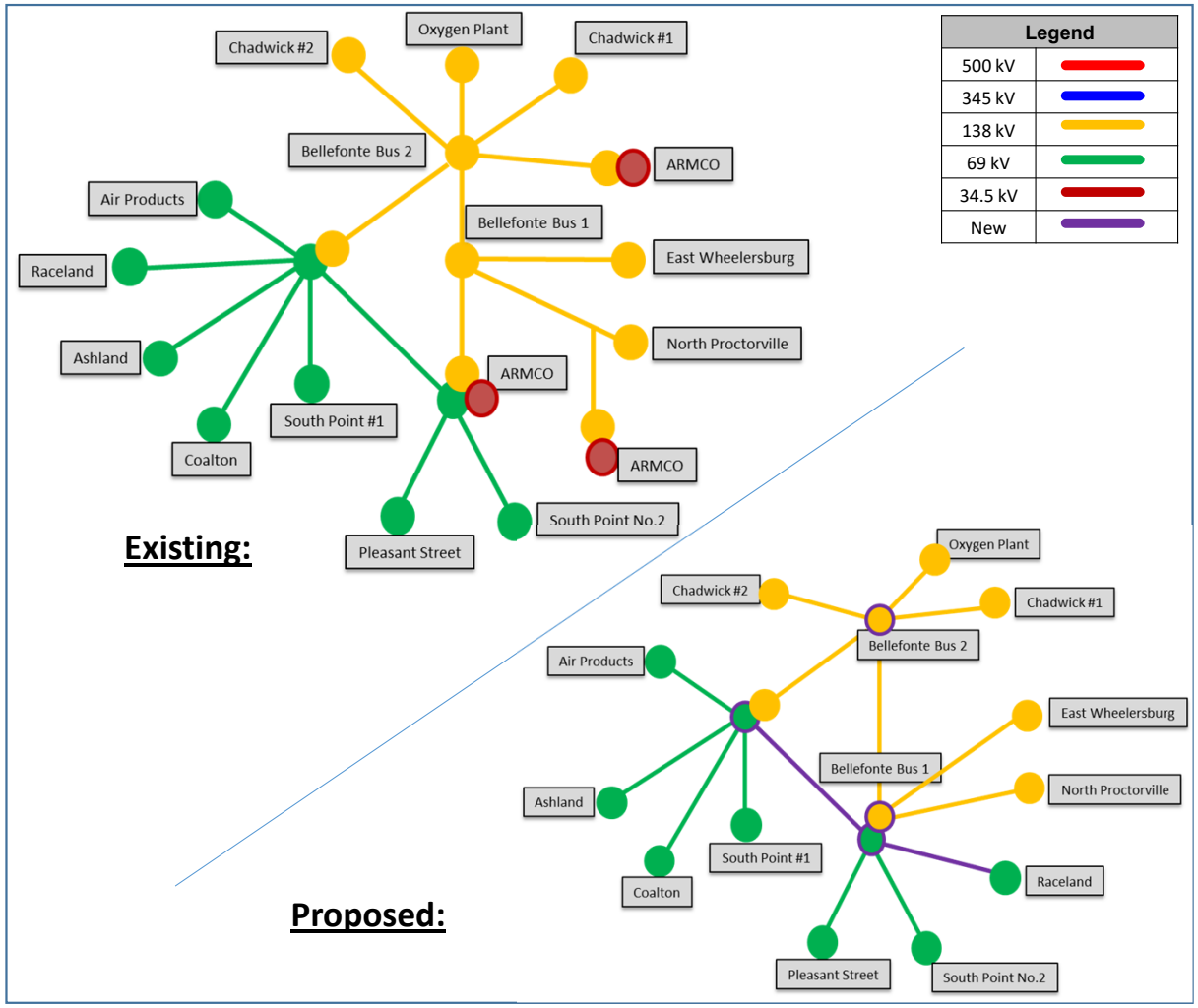
# AEP Transmission Zone M-3 Process
## Johnson County, Kentucky

**Need Number:** AEP-2022-AP005

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution:**

- Replace XFR #2 with a 200MVA Auto unit and retire XFR #1 & #5. The U/G feeder for XFR #3 69kV riser is getting reconductored under B3349. Reconductor sections of 138kV Bus #1 and 138kV Bus #2. Replace remaining oil PTs connected to Bus #1 and Bus #2. Upgrade Primary and back up station service.
- Replace 69kV bus tie breaker H. Replace the hook stick disconnects switches for the tie breaker H and 69kV tie breaker location will be relocated one bay south of the existing location and 69kV buses will be reconfigured. Replace the hook stick disconnects switches for Raceland breaker D. Relocate the Raceland feeder to bus #1 after extending the 69kV bus #1. The cap bank switcher/moab Mark 5 combo unit will get replaced with 69kV breaker and set of breaker disconnects and relocated to bus #1. 69kV breaker is needed instead of circuit switcher due to the high fault current. Relocate the cap bank to bus #1 after extending the 69kV bus #1. 69kV Air Products line MOABs will be replaced with 2000A SW. Replace hook-stick switches for Oil CB – AB, JJ, I, G, Z, T and C. These Breakers are replaced as part of B3350. Install 16'x48' DICM for 69kV Yard and a 16'x48' DICM for the 138kV Yard. Replace cable trench, single phase AC system & cable work, entire fence replacement and ground grid extension for 100'X10' expansion toward the Northwest of the 69kV yard. Both 138kV and 69kV control house will be retired. **Estimated Cost: $12.59 M (s2814.1)**



# AEP Transmission Zone M-3 Process
## Johnson County, Kentucky

**Need Number:** AEP-2022-AP005

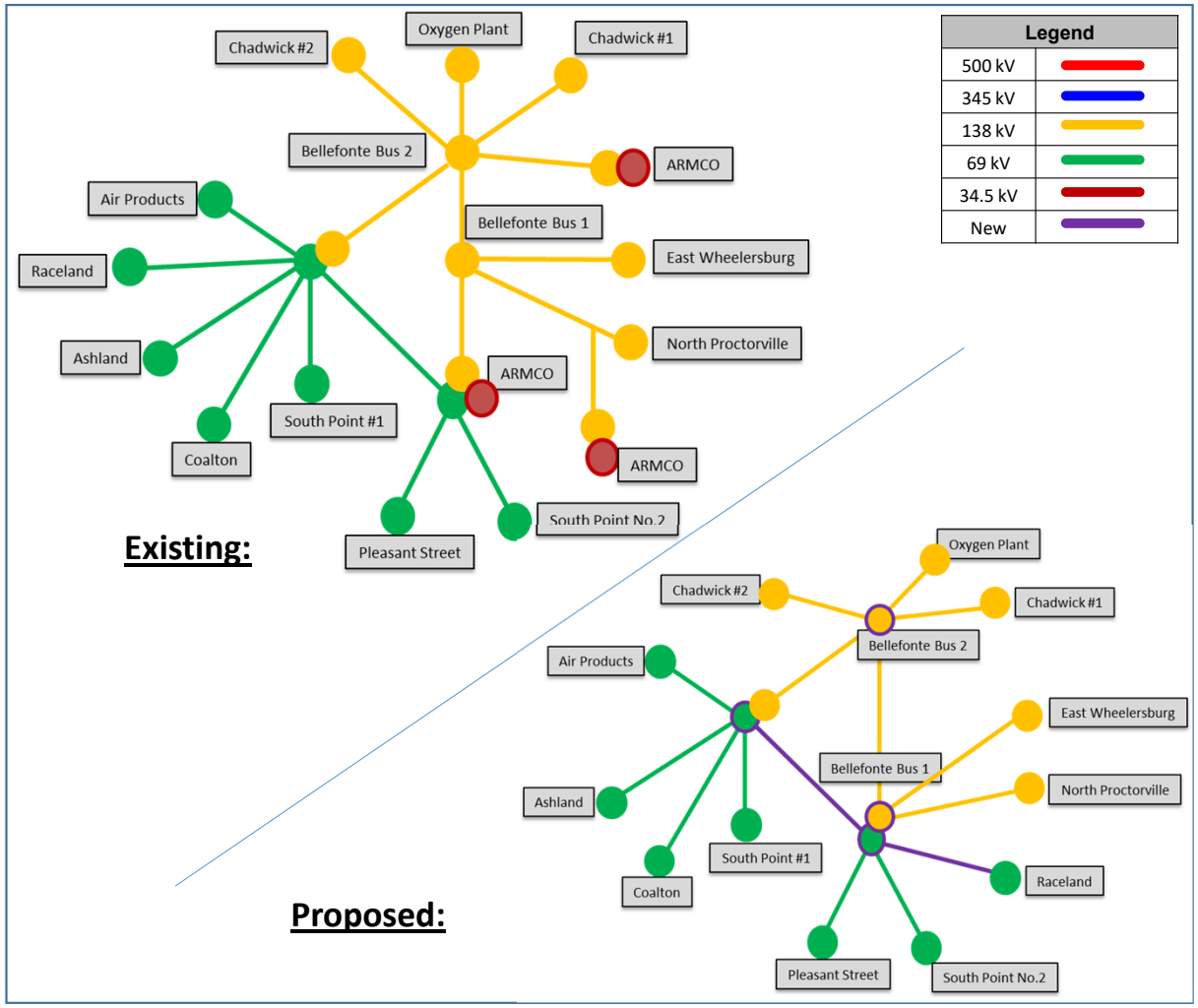
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution (Cont.):**

- The customer served out of 34.5 kV Yard has plans for demolition of their facilities. Retire entire 34kV Yard, contingent on the timing of the customer being removed from service. **Estimated Cost: $2.67 M (s2814.2)**
- Retirement of the Bellefonte 34.5kV Bus Tie Line that connects the Bellefonte 138kV Station to the Bellefonte 34kV Station. This removal involves removing 3- Double Circuit Lattice Towers, 1-Triple Circuit Lattice Towers, and 1 Single Wood Pole Structure. **Estimated Cost: $0.46 M (s2814.3)**
- Retire the existing Bellefonte – Armco 34.5kV operated line. The major removal work involves removing 4 lattice steel towers, 1 H-Frame wood structure, and 2 single wood poles. The line being removed is approximately 0.55 miles long. **Estimated Cost: $1 M (s2814.4)**
- Remote end relaying at Raceland substation to install 2 new CCVTs on a custom two-phase single column stand for the Bellefonte 69kV line exit. The existing CCVT mounted on a single phase CCVT stand will be reused and will remain as it is. **Estimated Cost: $0.37 M (s2814.5)**
- Provide 0.2 miles of fiber from Distribution structures outside the station to the new DICMs. **Estimated Cost: $0.49 M (s2814.6)**

**Total Estimated Transmission Cost: $17.58 M**

**Supplemental Project ID:** s2814.1-.6



# AEP Transmission Zone M-3 Process
# Pike County, KY

**Need Number:** AEP-2021-AP031

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previously Presented:**

Solutions Meeting 08/19/2022

Needs Meeting 10/15/2021

**Project Driver:**

Equipment Material/Condition/Performance/Risk

**Specific Assumption Reference:**

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

**Problem Statement:**

Hatfield Substation:

**Transformer #2 (46/7.2kV 111 MVA):**

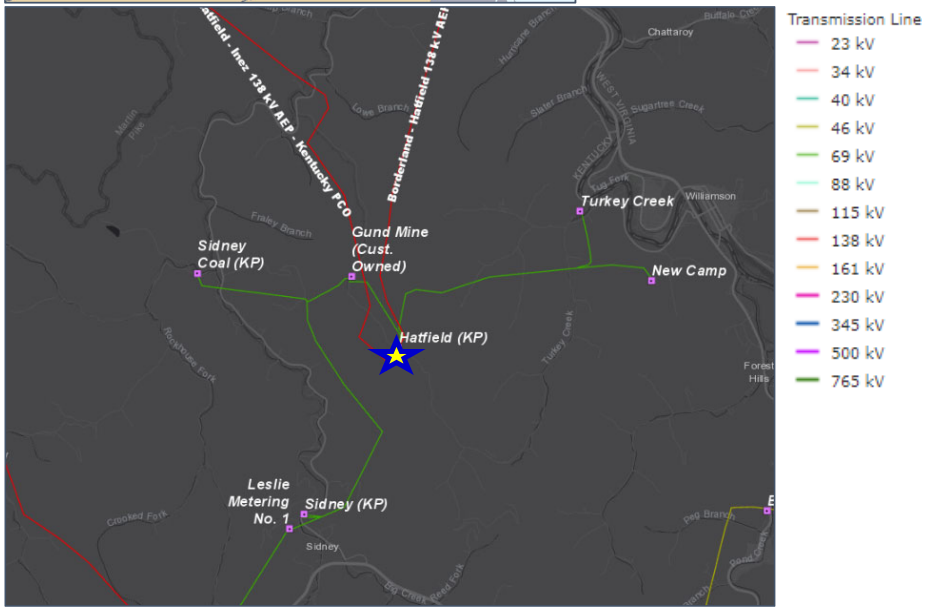
- Grounding Transformer for station service
- 1990 Vintage unit
- DGA indicates elevated levels of CO2 gas concentration
- Bushings are at a greater risk of failure due to capacitive layer deterioration and change in bushing power factor.
- High decomposition of the paper insulating materials.
- Wood tie foundations
- Worn down Oil containment

**Transformer # (138/69/46kV):**

- The high side MOAB/Ground Switch scheme on TR1 protection. Legacy electromechanical overcurrent protection is associated with TR-1 since this bank is tapped off the 138kV Bus without 138kV line breakers.

**Additional information on Transformers:**

- GND TR-2 is an artifact from the previous station setup that has been preserved as a source of station service. The grounding bank and associated bus work increases the exposure for failure in order to provide station service.



# AEP Transmission Zone M-3 Process
# Pike County, KY

**Need Number:** AEP-2021-AP031

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Problem Statement Continued:**

**Circuit Breakers B:**

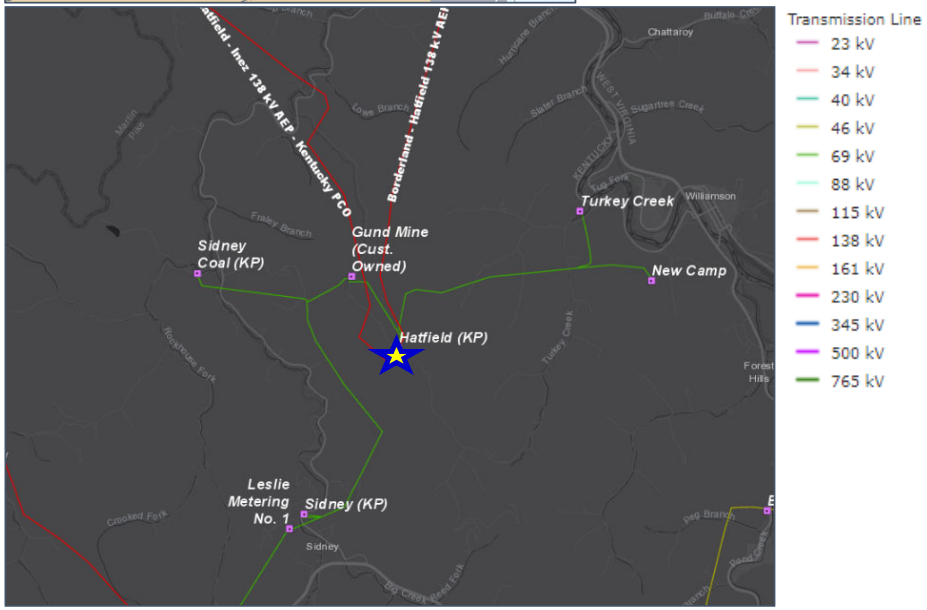
- Breaker Age: B 1990,
- Interrupting Medium: (SF6)
- Fault Operations:
  - Number of Fault Operations: B 65
- **Additional information on this breaker:** This particular breaker has had 35 reported malfunctions related to gas leaks. In addition, its CTs have previously been removed and dried.

**Relays:**

- Currently, 41 of the 45 relays (91% of all station relays) are in need of replacement. There are 38 of the electromechanical type and 3 of the static 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.

**Station Physical considerations:**

- The driveway is unsafe due to its short length and close proximity to the road. The 69kV Bus from TR-1 goes underground to circuit breaker B. Because of this configuration, the TR-1 low side breaker CB B is not in a “normal” position. This introduces opportunities for HP errors.
- the station service “transfer” cabinet is in poor condition the requires manual wiring or fuse changes to transfer to the alternate distribution source. The sources are out of phase and break-before-make action is entirely manually performed with normally open fuses. Arc flash hazards and HP error prone design complicate transferring between sources and making emergency settings.



# AEP Transmission Zone M-3 Process
# Pike County, KY

**Need Number:** AEP-2021-AP031

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution:**

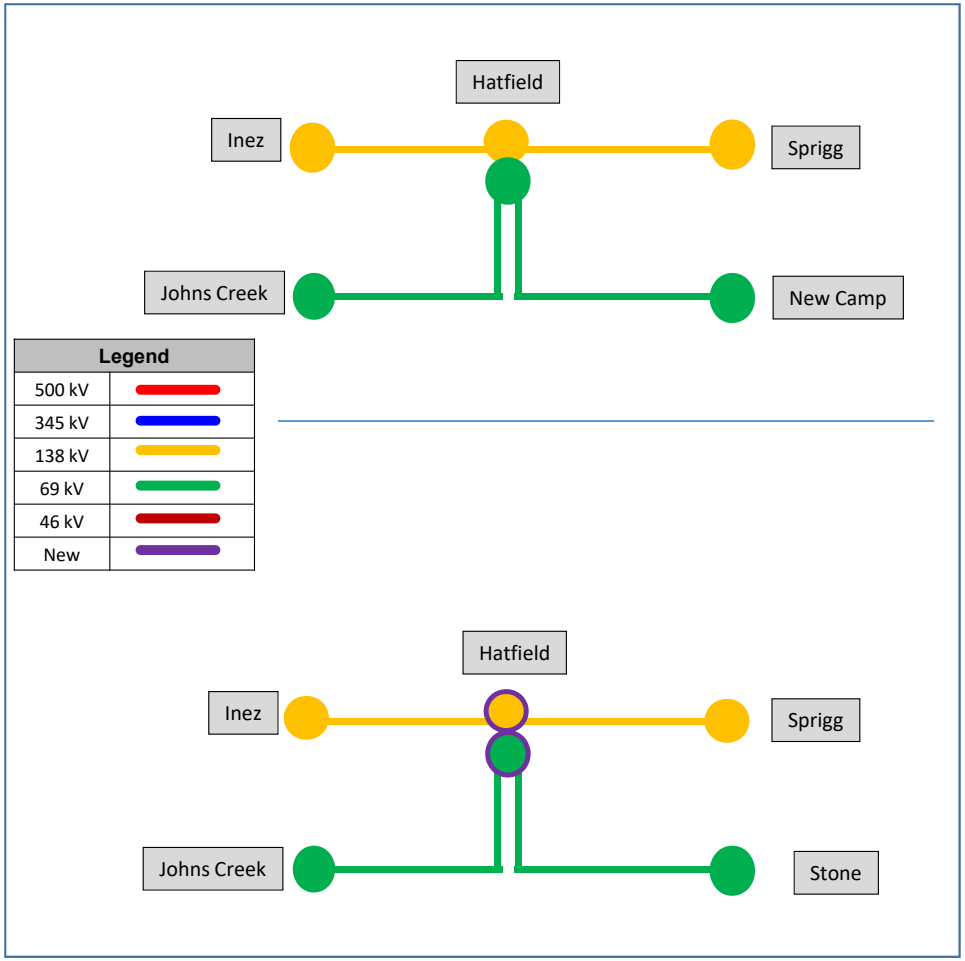
- At Hatfield Substation, expand the substation yard. Relocate 138/69/46kV XF#1. Replace 138/69/46kV XF#1 Bushings, 138kV 3 phase Bus CCVTs, MOAB X1 and GND Switch Z1 with a new 138kV Circuit Switcher. Replace 138KV Sprigg Line metering, Line Switch "11" with a 138kV Circuit Breaker. Replace and relocate 69kV CB-B to standard Bay position. Replace 69KV CB-A and add 3 phase CCVTs to John's Creek 69kV line. Add 138kV Backup and 69kV Primary Station Service transformers and Station Service. Expand yard and install a 16' X 27' base DICM. Remove 111MVA 46/7.2KV Transformer #2 and associated equipment and 7.2KV 3 phase station service. Remove the control building. **Estimated Cost: $4.95 M (s2815.1)**
- On the Leslie No.1 – Hatfield 69kV circuit, remove existing guyed dead-end structure K357-29 and install a new single pole, single circuit, custom dead-end to remove the guy wires conflicting with station footprint plans. The existing guy anchors would conflict with station expansion plans, and it is not feasible to span guy over top of proposed control house as the anchors would land in the proposed station drive path. The proposed custom dead-end structure will be placed 20' downhill from existing structure K357-29. **Estimated Cost: $0.5 M (s2815.2)**

**Total Estimated Transmission Cost: $5.45 M**

**Projected In-Service:** 08/01/2024

**Supplemental Project ID:** s2815.1-.2

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Logan and Mingo County, West Virginia

**Need Number:** AEP-2021-AP033

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previously Presented:**

Solutions Meeting 08/19/2022

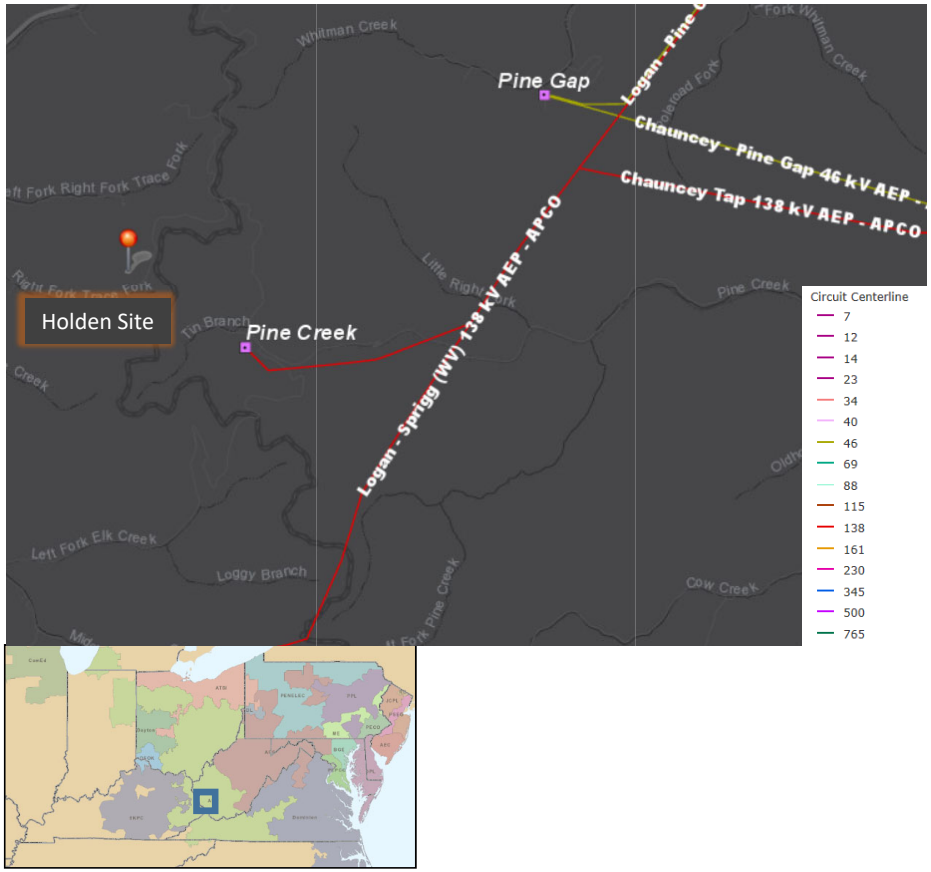
Needs Meeting 11/19/2021

**Supplemental Project Driver:** Customer Service

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

**Problem Statement:**

- AEP Distribution has requested new transmission service to a new distribution station, Holden, supporting the Buck Harless Industrial Park site in Whitman, WV.
- This station is the result of West Virginia House Bill 144. The intent of the program is to support the development of Business Ready Sites in WV.
- Initial load at the Holden Site will transfer from the existing Pine Creek station site. Pine Creek Station is constructed using wood poles in an arrangement that is not expandable. There are also site constraints at Pine Creek preventing station expansion onto adjacent property. The site constraints prevent the industrial park site from being served by the existing Pine Creek station location. Adding new circuits for the industrial park would require replacement of the distribution structures and expansion of the station which is not feasible in the current location.
- At Pine Creek, 138 kV Circuit Breaker XT1 is an oil breaker that are difficult to maintain due to the required oil handling. There is an increased potential for oil spills during routine maintenance and failures with these types of breakers. There are 7 remaining AHE-54-138-5000 circuit breakers on the AEP system, including the 1 at this station. Spare parts are increasingly more difficult to obtain because the manufacturer no longer supports this model type.



# AEP Transmission Zone M-3 Process
# Logan and Mingo County, West Virginia

**Need Number(s):** AEP-2021-AP033

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution:**

- Construct a new greenfield station (Holden) with a 138/12 kV 25 MVA transformer and high side circuit switcher. There will be two 12 kV feeders from the station. The 138 kV side will be a straight bus with one 138kV circuit breaker facing Ragland and one 138kV MOAB switch facing Tin Branch. The intent of the greenfield station is to support the business ready site and the 138kV circuit breaker will provide added protection for sensitive industrial customers. The existing Pine Creek station will be retired. **Estimated Cost: $0 (Distribution cost) (s2816.1)**
- Tap the Logan – Sprigg #2 138kV line and build 3.5 miles of greenfield double circuit 138kV line to serve Holden station. The higher estimated cost is due to a large amount of new access roads and environmental studies that are required for this greenfield line that will be built through mountainous terrain. **Estimated Cost: $12.18M (s2816.2)**
- Build 0.6 miles of 96 ADSS Telecom underbuilt cable to connect Holden station to the existing fiber network. **Estimated Cost: $0.18M (s2816.3)**
- Remove 1.85 mile long Pine Creek 138kV Tap. **Estimated Cost: $1.74M (s2816.4)**

**Total Estimated Transmission Cost: $14.1 M**

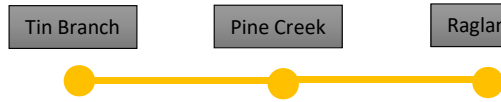
**Ancillary Benefits:** The existing Pine Creek Distribution customers will be served from the new Holden station improving their reliability due to receiving service from a Holden station that has looped Transmission service and a high side circuit breaker. This proposal also eliminates a hard tap on the existing 138 kV line currently serving Pine Creek station.

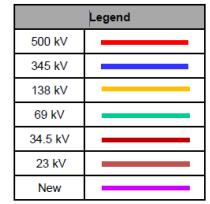
**Projected In-Service:** 6/1/2024

**Supplemental Project ID:** s2816.1-.4

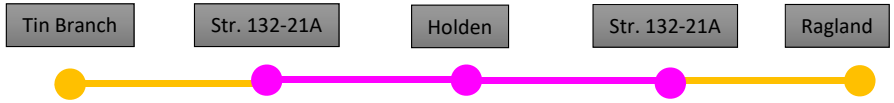
**Project Status:** Scoping

**Existing**




**Proposed**



# AEP Transmission Zone M-3 Process
# Montgomery County, VA

**Need Number:** AEP-2022-AP002

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previously Presented:**

Solutions Meeting 08/19/2022

Needs Meeting 1/21/2022

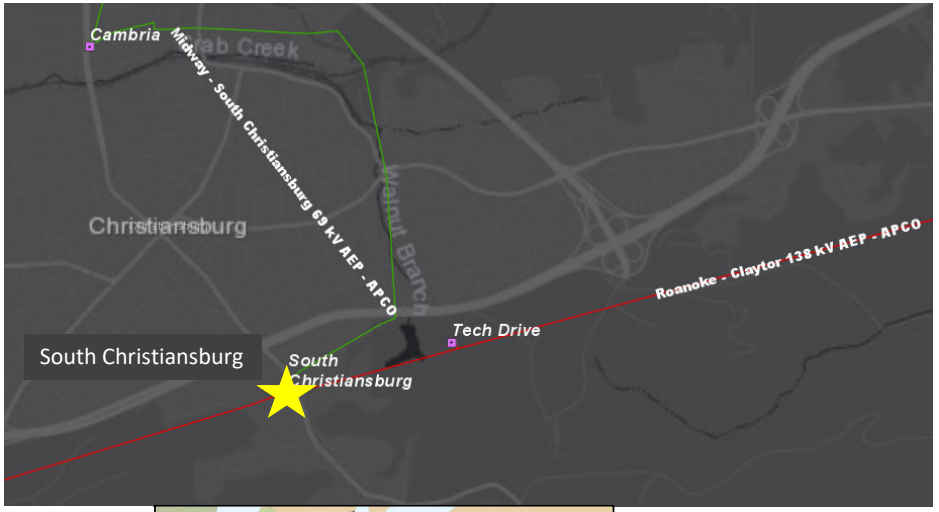
**Supplemental Project Driver:** Equipment Material/Condition/Performance/Risk

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

**Problem Statement:**

South Christiansburg Station:

- 138/69-12 kV Transformer #1
  - 1972 Vintage Transformer
  - Elevated levels of carbon dioxide in the DGA indicates decomposition of the increasingly brittle paper insulation that impairs the unit's ability to withstand future short circuit or through fault events.
  - Rising power factor and decreasing dielectric strength are both indications of an increase in particles within the oil. This decreases the ability of the oil to withstand fault events, which can further damage the paper insulation. The values of dielectric strength and power factor indicate the dielectric strength of the insulation system (oil and paper) is in declining condition, which impairs the unit's ability to withstand electrical faults.
  - The advanced age of this unit's insulation materials (49 years old) is of concern. As the insulating paper materials age, they become brittle.
  - This unit regularly leaks nitrogen. Loss of nitrogen is typically related to small leaks that are difficult to locate and repair.
  - There are oil leaks around the temperature wells.
- The 69kV circuit breaker at South Christiansburg station is 1965 vintage and is oil filled without oil containment. This circuit breaker has exceeded the manufacturer's designed number of full fault operations. The manufacturer provides no support for this type of breaker and spare parts are not available. As of March 24, 2021, there are 54 remaining FK-69-2500-5 circuit breakers on the AEP system, including the 1 at this station.
- The transformers use obsolete 138kV MOAB/ground-switch protection systems, which require remote-breaker tripping for isolating transformer faults



# AEP Transmission Zone M-3 Process
# Montgomery County, Virginia

**Need Number:** AEP-2022-AP003

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previously Presented:**
Solutions Meeting 08/19/2022
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)

**Problem Statement:**

Line Name: Midway – South Christiansburg 69kV Line

Original Install Date (Age): 1967

Length of Line: ~5.7 mi

Total structure count: 111

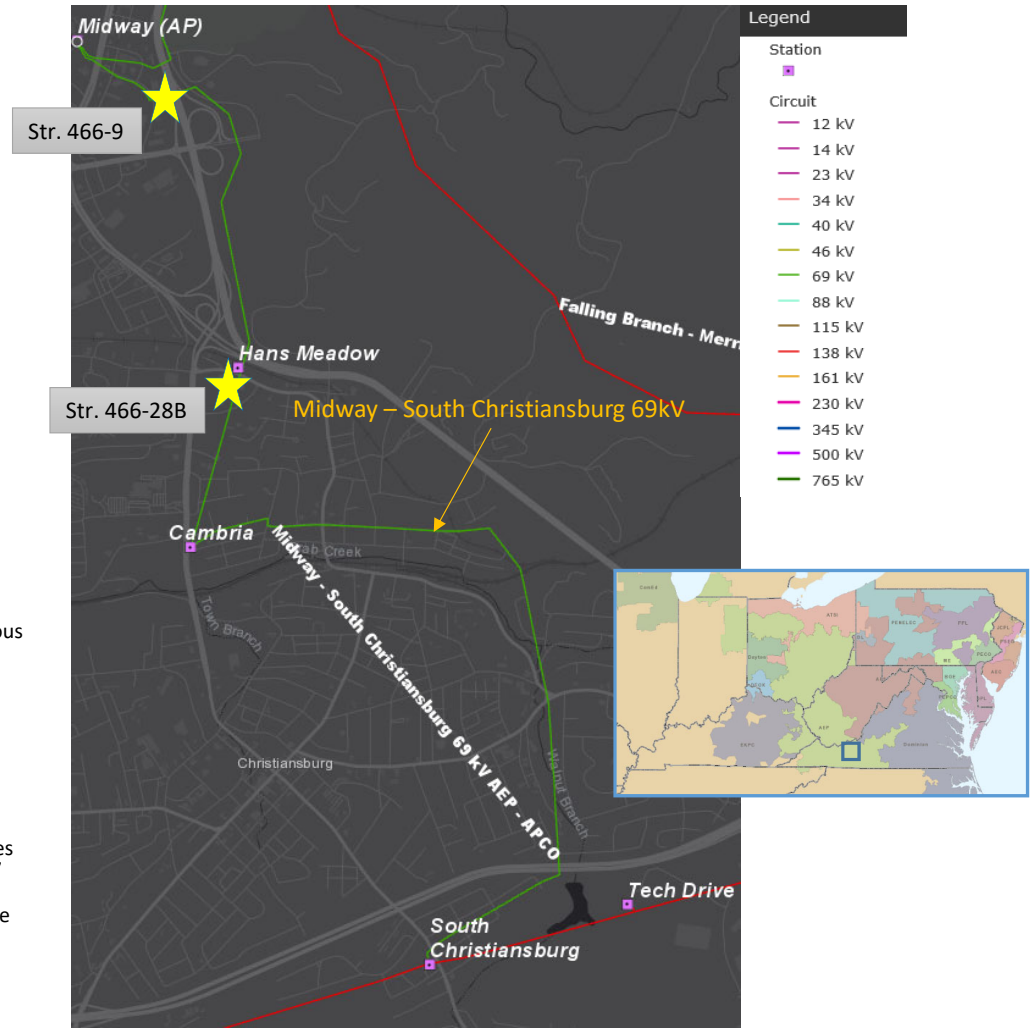
Original Line Construction Type: Wood

Conductor Type: 3/0 ACSR, 4/0 ACSR, 336,400 ACSR, 556,500 ACSR

Momentary/Permanent Outages: 4 Momentary and 0 Permanent

Line Conditions:

- The line structures fail to meet 2017 NESC Grade B loading criteria, current AEP structural strength requirements, and the current ASCE structural strength requirements.
- The vertical post insulators on the line do not meet current AEP standards for CIFO and minimum leakage distance requirements.
- Additional assessments were taken on a representative sample of the 1960s era structures, indicating numerous conditions that are expected to be present on the remainder of the line. The results showed:
    - Pole top weathering on multiple structures
    - Weathered/splitting/cracking crossarms
    - Woodpecker damage
    - Corroded hardware and insulator end fittings
- 19 structure related open conditions affecting the crossarm, knee/ vee brace, or pole including rot, damaged, and insect damage conditions.
- 80 of 111 structures are 1960s vintage. There is a 1.3 mile segment from Structure 466-9 to 466-28B of more recent construction associated with the previous widening of U.S. Route 460. This section utilizes 14 steel poles installed in 2007 and 7 wood poles installed in 1999 or 2007. In addition, the conductor on this section is 2007 vintage 556,500 CM ACSR 26/7 (Dove) and is not a need at this time.
- 16 independent structures with at least one open condition, 18% of the structures on this circuit, excluding the 21 structure segment from Structure 466-9 to 466-28B.



# AEP Transmission Zone M-3 Process
# Montgomery County, Virginia

**Need Number:** AEP-2022-AP003

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Supplemental Project Driver:** Equipment Condition/Performance/Risk

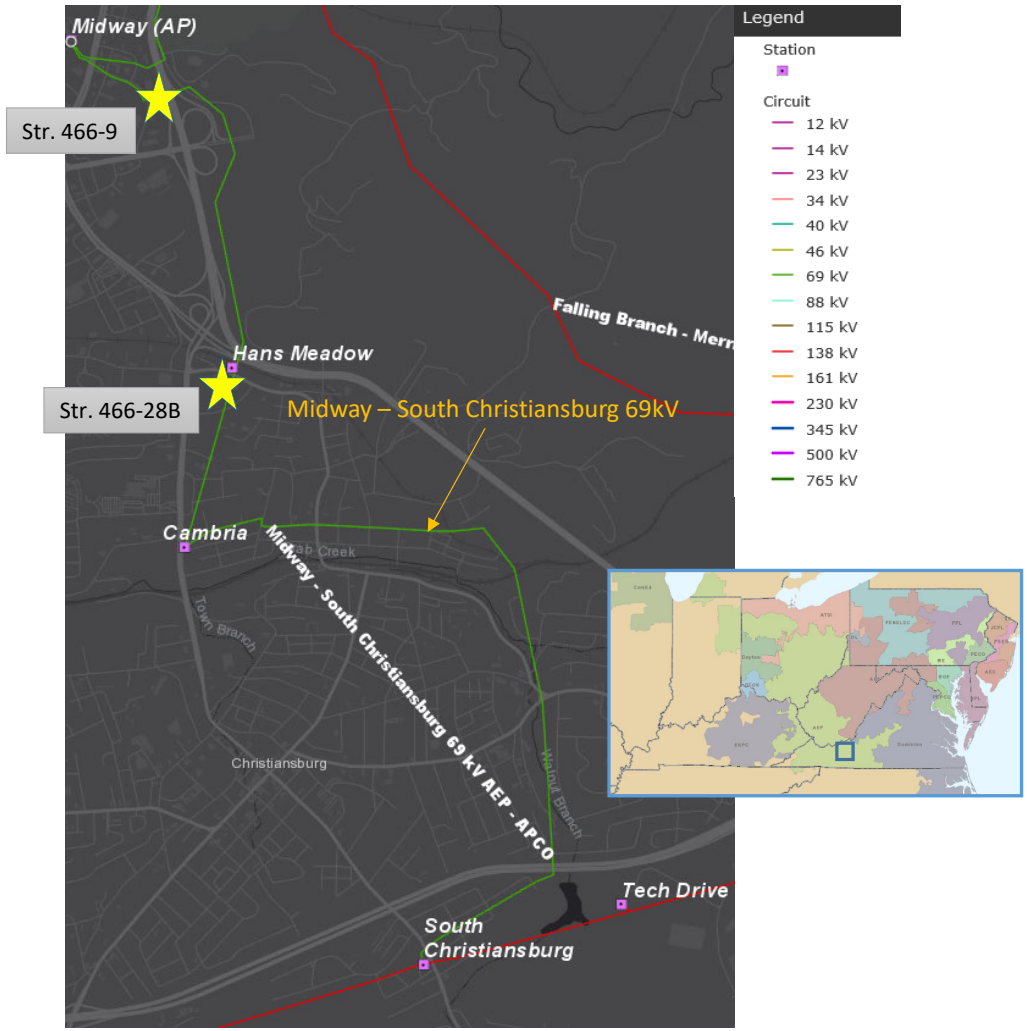
**Specific Assumption Reference:**

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

**Problem Statement Continued:**

Line Conditions Con't:

- 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 43 MVA at Cambria and Hans Meadow Substations.



# AEP Transmission Zone M-3 Process
# Montgomery County, VA

**Need Number(s):** AEP-2022-AP002, AEP-2022-AP003

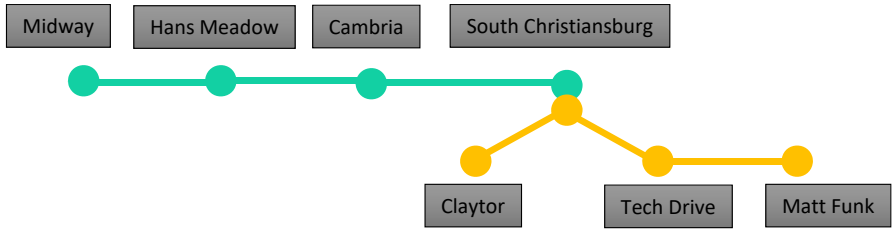
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution:**

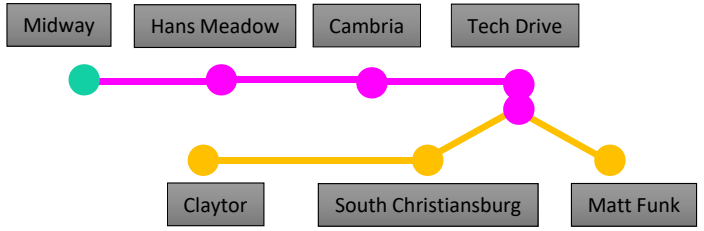
- Rebuild the Midway – South Christiansburg 69kV line from Midway station to Str. 466-9 (0.45 miles). Rebuild the Midway – South Christiansburg 69kV line from Str. 466-28B to Str. 466-98 (3.8 miles). At Str. 466-98 build new 69kV line to the existing Tech Drive station (0.35 miles). The cost per mile is due to the need for matted access roads to minimize property damage in the urban environment. 50 permanent encroachments have been identified within the existing ROW and require a greater number of line structures than normal to reroute the line. Also, due to numerous encroachments on the existing centerline, the rebuild will consist of 1.8 miles rebuilt on existing centerline and 2.8 miles near centerline or greenfield. **Estimated Cost: $21.33M (s2817.1)**
- Remove the Midway – South Christiansburg 69kV circuit from Midway station to Str. 466-9 (0.45 miles). Remove the Midway – South Christiansburg 69kV circuit from Str. 466-28B to Str. 466-98 (3.4 miles). Retire the Midway – South Christiansburg 69kV circuit from South Christiansburg station to Str. 466-98 (0.7 miles). **Estimated Cost: $2.7M (s2817.2)**
- At South Christiansburg station, remove the existing 138/69kV transformer and 69kV circuit breaker. **Estimated Cost: $1.29M (s2817.3)**
- Build 4 fiber station transitions using OPGW at Midway, Hans Meadow, Tech Drive and South Christiansburg. Retire 4.3 miles of ADSS fiber currently on the Midway – South Christiansburg 69kV circuit. Build 4.6 miles of OPGW on the new Midway - Tech Drive 69kV Line. **Estimated Cost: $1.03M (s2817.4)**
- At Hans Meadow station, replace the MOAB switch facing Cambria station with a 69kV circuit breaker. **Estimated Cost: $0 (Distribution cost) (s2817.5)**
- At Cambria station, replace existing 69kV line CCVTs, bus conductors, and pass-through riser connectors on both line exits to match the 69kV line capacity. **Estimated Cost: $0 (Distribution cost) (s2817.6)**
- At Midway station, replace existing risers to support the 69kV line rebuild. **Estimated Cost: $0 (Distribution cost) (s2817.7)**
- At Tech Drive station, replace the manual switch facing South Christiansburg station with a 138kV circuit breaker and remove the 138kV bus tie switch. Install a 138kV circuit switcher and a 90 MVA 138/69 kV transformer. Add a 69kV circuit breaker to the 69kV side of the transformer. **Estimated Cost: $0 (Distribution cost) (s2817.8)**

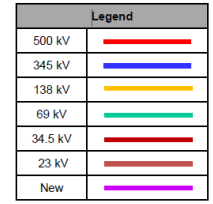
**Total Estimated Transmission Cost: $26.35 M**

**Existing**




**Proposed**



# AEP Transmission Zone M-3 Process
# Montgomery County, VA

**Need Number(s):** AEP-2022-AP002, AEP-2022-AP003

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution Continued:**

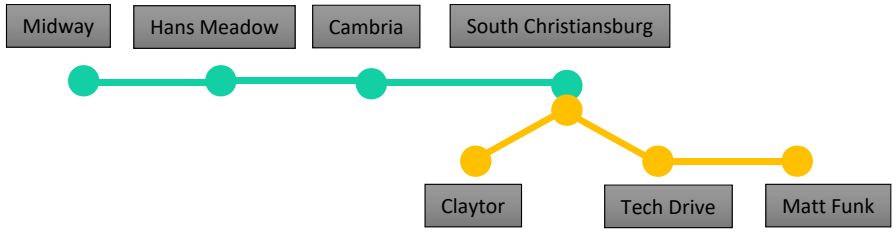
**Ancillary Benefits:** The new 69kV breaker at Hans Meadow will break up the current system configuration of 5 MOABs in series, providing greater protection for Distribution customers served from Hans Meadow and Cambria stations. Tech Drive station is newer and in an industrial park instead of South Christiansburg station that is older and in a residential neighborhood, reducing the need to expand the station footprint. Building the 69kV line to Tech drive instead of South Christiansburg will remove 0.7 miles of Transmission lines in a residential neighborhood and free up room at the already congested South Christiansburg station.

**Projected In-Service:** 6/1/2027

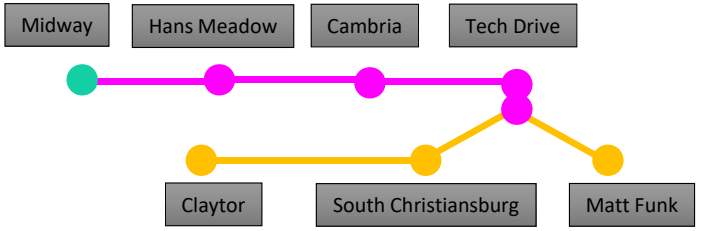
**Supplemental Project ID:** s2817.1-.8

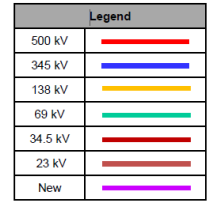
**Project Status:** Scoping

**Existing**




**Proposed**



# AEP Transmission Zone M-3 Process
# Logan County, West Virginia

**Need Number:** AEP-2022-AP033

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Previously Presented:**

Solutions Meeting 8/19/2022

Need Meeting 06/15/2022

**Supplemental Project Driver:** Operational Flexibility and Efficiency

**Specific Assumption Reference:**

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

**Problem Statement:**

Line Name: Chauncey Tap 138kV Line

Original Install Date (Age): 1949

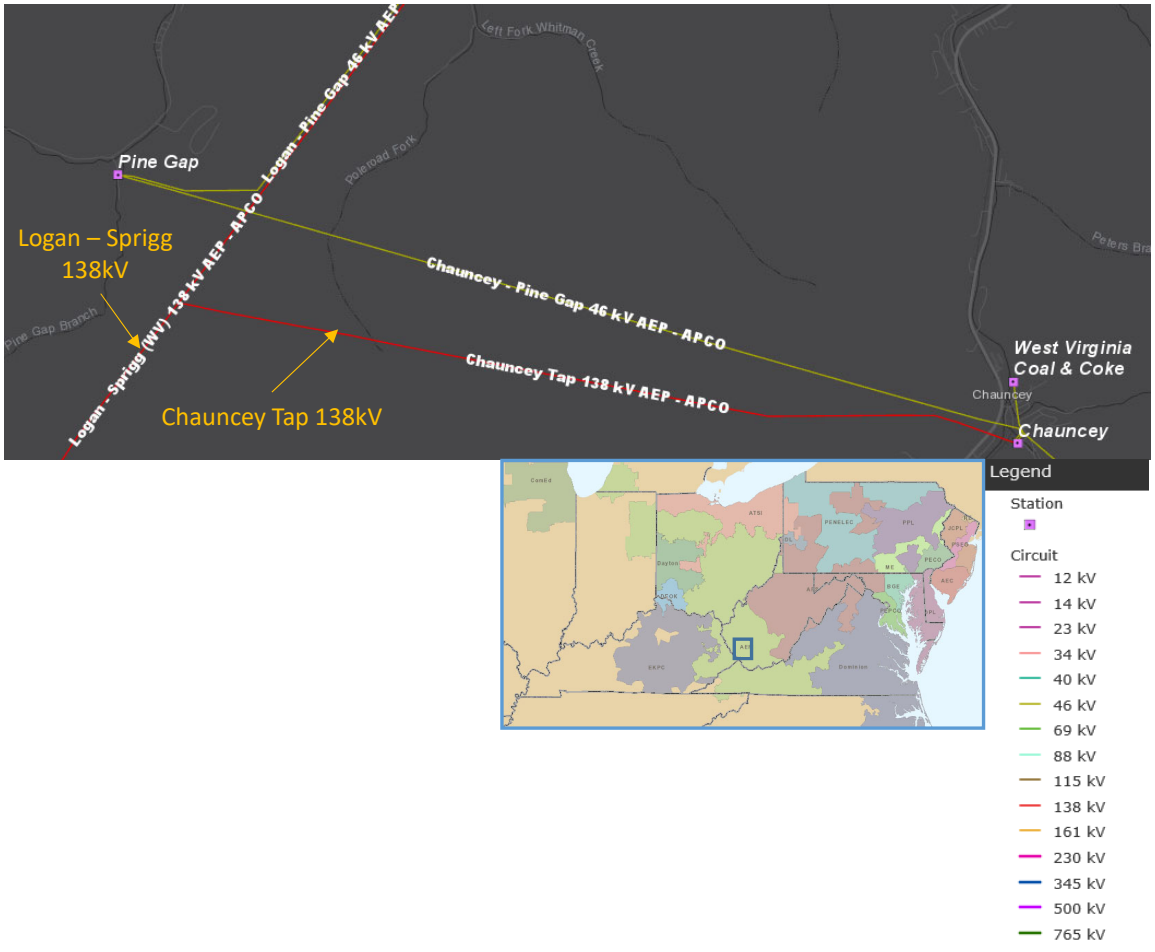
Length of Line: ~3.7 mi

Total structure count: 15

Conductor Type: 397,500 ACSR

Momentary/Permanent Outages: 11 Momentary and 1 Permanent (2017 – 2021)

- The outages include the Logan – Sprigg 138kV line because the Chauncey Tap is hard tapped to the Logan – Sprigg line and the outages travel onto the Chauncey Hard Tap and vice versa.
- Hard tapped lines are difficult when there is a line fault, the fault will take out the through line and leave no way for Transmission Operations to restore the tapped station. Requiring a Transmission Line crew to "open loops" means (1) finding a dead–end structure that is accessible with a bucket truck, (2) having an available and usable access road and (3) having a Transmission Line crew available.
- This consideration also extends to the tap line, where a fault on this section will outage the through–path with no readily available restoration procedure. While the primary consideration is forced outages, these considerations also apply to planned outages such that much more effort and planning is required to perform the above steps than if switches are available to be used to separate the line sections.



# AEP Transmission Zone M-3 Process
# Logan County, WV

**Need Number(s):** AEP-2022-AP033

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/10/2023

**Solution:**

- Add two additional 138kV circuit breakers to the already proposed and approved Tin Branch station (b3348), transforming the designed station from a 138kV two-breaker straight station to a four-breaker ring bus station. **Estimated Cost: $1.9M (s2818.1)**
- Disconnect the Chauncey hard tap from the Logan – Sprigg circuit and build 1.5 miles of greenfield 138kV line to connect the Chauncey 138kV Tap into the new Tin Branch station. The higher estimated cost is due to the difficult mountainous terrain, expensive access roads and required environmental studies. **Estimated Cost: $5.6M (s2818.2)**

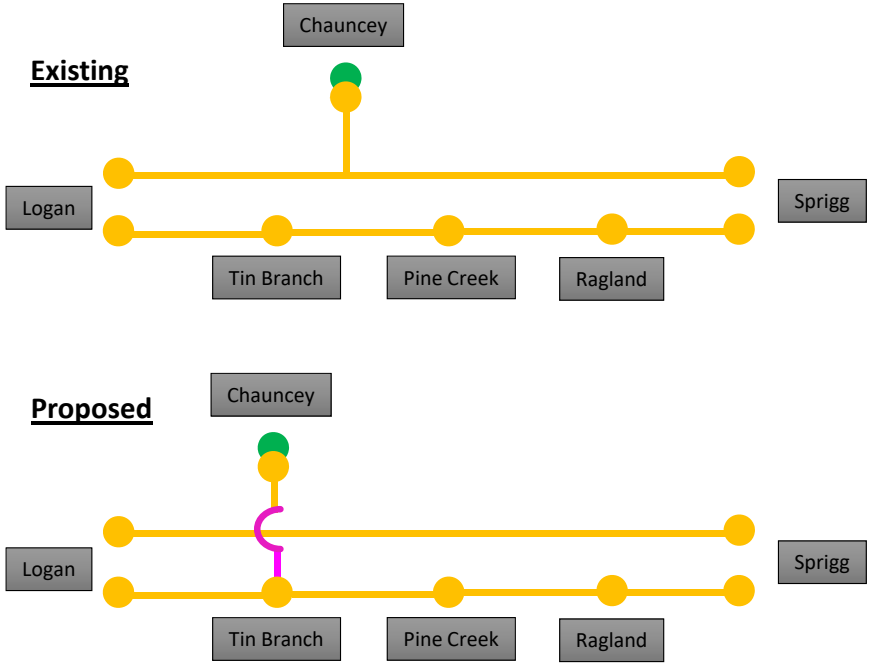
**Estimated Total Transmission Cost: $7.5 M**

**Ancillary Benefits:** Addressing the hard taps improves the overall system reliability and operational flexibility. There are also outage and cost efficiencies with completing this scope of work with the baseline work at Tin Branch (B3348).

**Projected In-Service:** 3/1/2027

**Supplemental Project ID:** s2818.1-.2

**Project Status:** Scoping




| Legend | |
|---|---|
| 345 kV | |
| 138 kV | |
| 69 kV | |
| 46 kV | |
| 34.5 kV | |
| New | |

# AEP Transmission Zone M-3 Process
# Apple Grove Area Project

**Need Number:** AEP-2020-AP018

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Previously Presented:**
Solution Meeting 9/16/2022
Need Meeting 2/21/2020

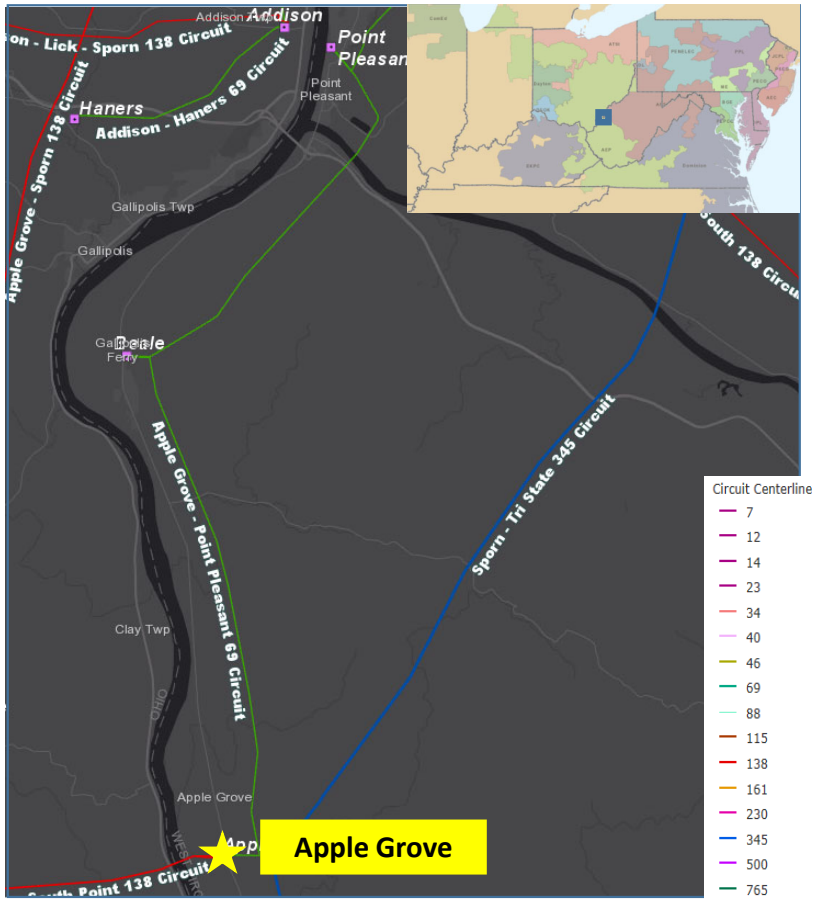
**Supplemental Project Driver:** Equipment Condition/Performance/Risk

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

**Problem Statement:**

Apple Grove Station

- 69 kV circuit breaker L is an FK type oil filled breaker, without oil containment.
  - 1960s vintage
  - Oil filled breakers need more maintenance due to the oil handling required and oil spills can result in significant cost associated with environmental mitigations
  - The manufacturer does not provide support for this type of breaker and spare parts are increasingly more difficult to obtain.
- 138/69 kV transformer bank #1 was manufactured in 1965
  - Elevated moisture levels
  - Elevated Carbon Monoxide and Carbon Dioxide levels
    - Indicates abnormal paper insulation deterioration
  - In 2004 one fan was destroyed by a failed fan blade
  - Oil containment inspection indicates deficiencies in the existing containment
  - The bank is connected directly to the 138 kV bus with a high side MOAB switch.
    - This can cause a fault in the station to signal the remote end breakers to open which is a known safety hazard in legacy station designs.
- 54 of the 66 relays (82% of all station relays) have needs associated with them
  - 51 are electromechanical type and 3 are static type which have significant limitations with regards to spare part availability and fault data collection/retention
- Overlapping zones of protection in existing station configuration
  - Apple Grove – Point Pleasant 69 kV line terminates directly into the 69 kV bus



# AEP Transmission Zone M-3 Process
# Apple Grove Area Project

**Need Number:** AEP-2020-AP016, AEP-2020-AP018

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Solution:**

Rebuild existing Apple Grove – Point Pleasant 69 kV line to 138 kV standards. (approx. 17.3 miles) **Estimated Trans. Cost $50.3M (s2819.1)**

Apple Grove Station: Replace existing 69 kV CB-L with a new 69 kV 3000 A 40 kA CB. Replace existing 138/69 kV XFR #1 with a new 138/69 kV 90 MVA XFR and install new high side circuit switcher. Add 138 kV CB on 138 kV bus increasing sectionalizing, by separating existing customer facilities from AEP facilities. Upgrade metering at station. Install new DICM. Replace existing 69/12 kV XFR #2 with a new 138/12 kV XFR. **Estimated Trans. Cost $6.7M (s2819.2)**

**Estimated Total Trans. Cost: $57.0M**

**Ancillary Benefits:** Baseline project B3279 at Apple Grove will be combined and executed with this supplemental work.

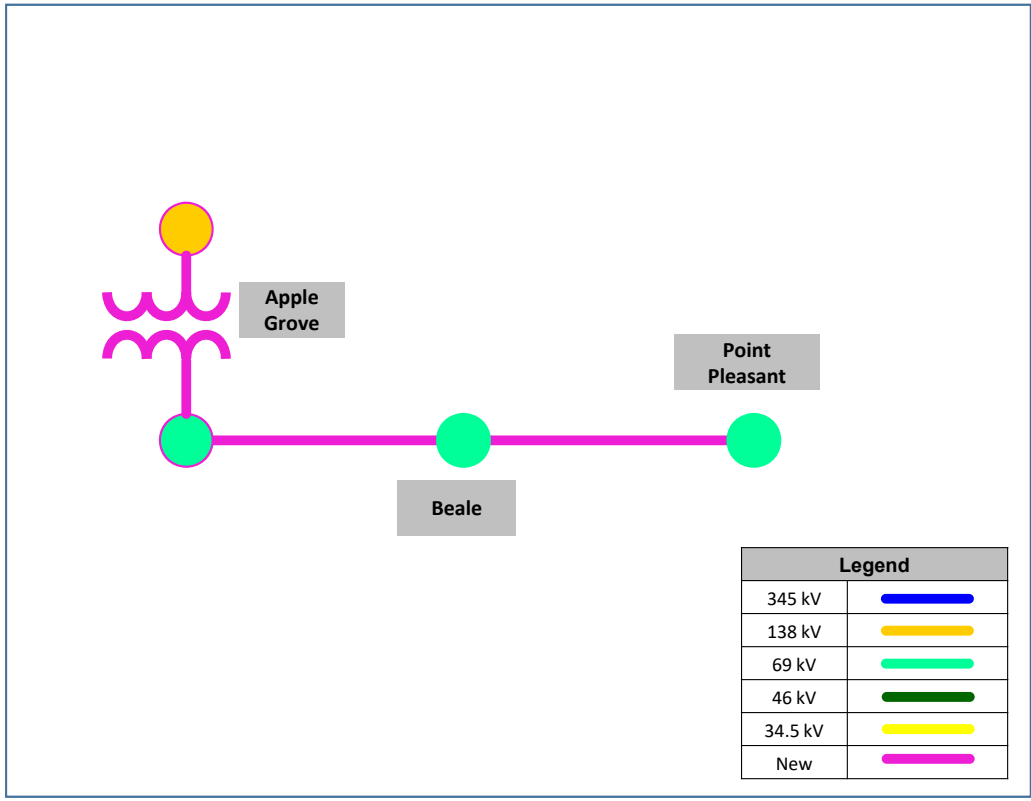
There have been numerous inquiries for new load customers in the area; building to 138 kV standards allows for increased capacity in the future with minimal cost today.

**Projected In-Service:** 4/1/2025

**Project Status:** Scoping

**Supplemental Project ID:** s2819.1-.2

**Model:** 2027 RTEP



# AEP Transmission Zone M-3 Process
# Stark & Tuscarawas Counties, Ohio

**Need Number:** AEP-2020-OH053 (split from AEP-2020-OH050)

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Previously Presented:**

Solution Meeting 9/16/2022

Need Meeting 3/19/2020

**Supplemental Project Driver:**

Equipment Material Condition, Performance and Risk; Operational

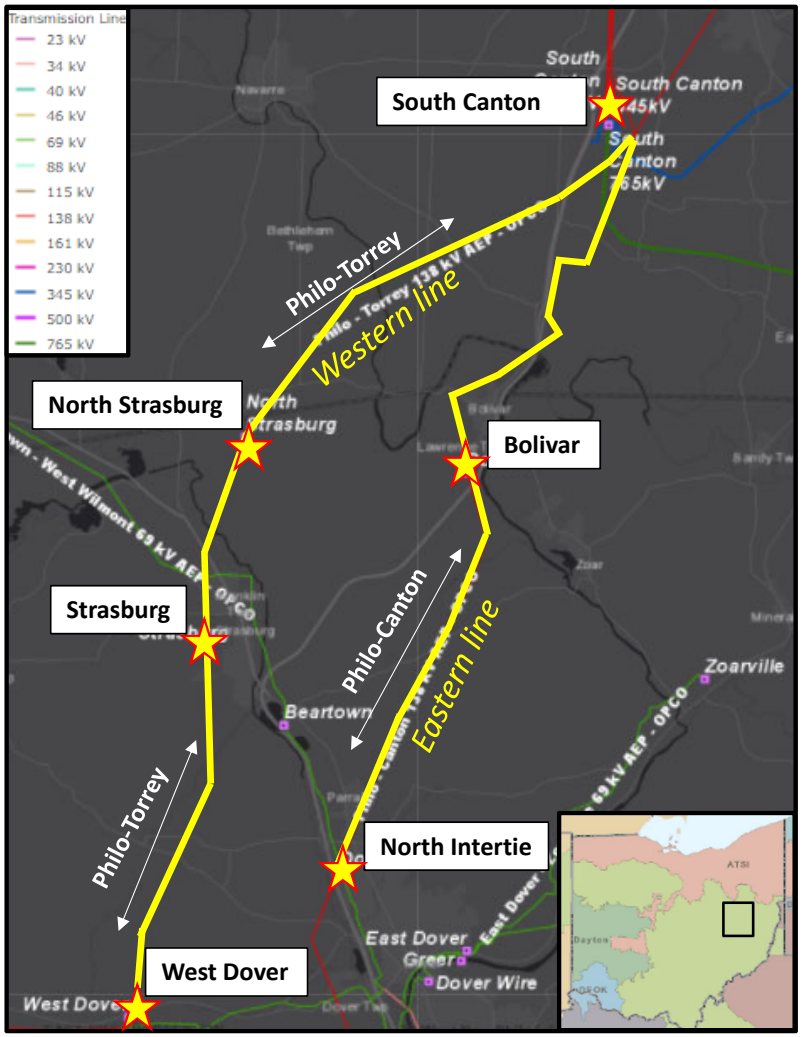
Flexibility & Efficiency

**Specific Assumption Reference:**

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8), AEP Presentation on Pre-1930s Lines

**Problem Statement:**

- The South Canton – North Intertie eastern 138kV transmission line is 14.6 miles long, originally constructed in 1923. The vast majority of the structures are still original, as well as the six-wired 336 ACSR conductor, insulators, and hardware. This line is made up of several circuits connected between South Canton and Sunnyside stations.
- Insulator assemblies are showing corrosion and deterioration, which could lead to additional failures and safety concerns.
- This line has experienced 12 momentary outages and 2 sustained outages over the past 10 years (2008/2018).



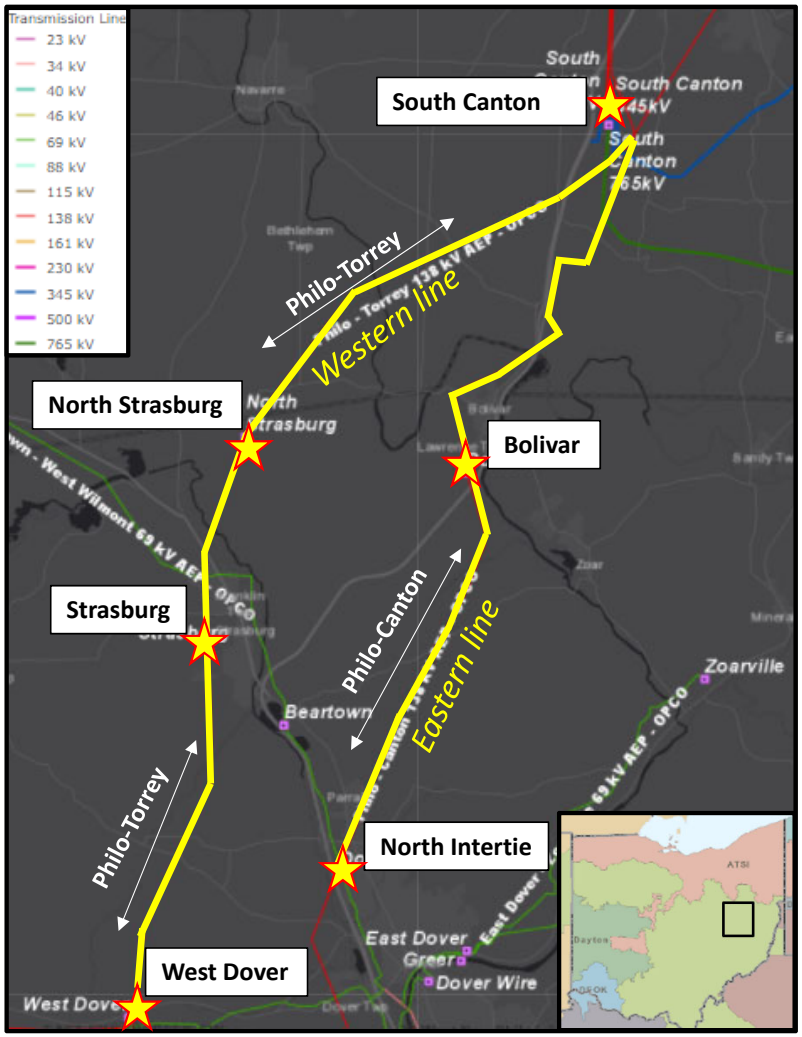
# AEP Transmission Zone M-3 Process
# Stark & Tuscarawas Counties, Ohio

**Need Number:** AEP-2020-OH053 (split from AEP-2020-OH050)

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Problem Statement continued:**

- The South Canton-West Dover western 138kV transmission line is 18.0 miles long and is part of the 75.2-mile-long circuit Philo-South Canton. The line was originally built in 1942 with steel lattice towers. The conductor is 6-wired single-circuit, with one side installed in 1942 (397 ACSR) and the other side installed in 1954 (477 ACSR). The line does not meet current grounding and shielding requirements, due to the condition of the obsolete shield wire size (159 ACSR), and the line shielding angle being inadequate. This T-line exhibits similar conditions as the examples listed in AEP's 1930's steel lattice tower line presentation.
- The Philo-South Canton 138kV circuit has experienced 18 momentary outages over the past 5 years and 4 sustained outages, resulting in 437,567 minutes of CMI. There are currently 18 open conditions on the circuit. Examples of the conditions include: burnt insulators, worn hardware, rusting towers, damaged shield wire, and severe rusting of the tower steel.



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

**Need Number:** AEP-2020-OH053

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Solution:**

Rebuild the "Philo-Torrey" 138kV transmission line between West Dover and South Canton stations (18.0 miles). The circuit affected is South Canton-West Dover 138kV. Remove the existing lattice towers and supplement the right-of-way as needed. **Estimated Cost: $46.74 Million (s2820.1)**

Rebuild the "Philo-Canton" 138kV transmission line between North Intertie and South Canton (14.6 miles). The circuit affected is North Intertie-South Canton 138kV. Remove the existing lattice towers and supplement the right-of-way as needed. **Estimated Cost: $42.84 Million (s2820.2)**

**Total Estimated Transmission Cost: $89.58 Million**

**Existing Summer Normal/Emergency Circuit Ratings:**

West Dover-Strasburg = 287/337 MVA; Strasburg-North Strasburg = 287/337 MVA; North Strasburg-South Canton = 296/296 MVA; North Intertie-Bolivar = 293/296 MVA; Bolivar-South Canton = 296/296 MVA

**Future Summer Normal/Emergency Circuit Ratings:**

West Dover-Strasburg = 257/337 MVA; Strasburg-North Strasburg = 257/337 MVA; North Strasburg-South Canton = 257/296 MVA; North Intertie-Bolivar = 257/341 MVA; Bolivar-South Canton = 257/296 MVA

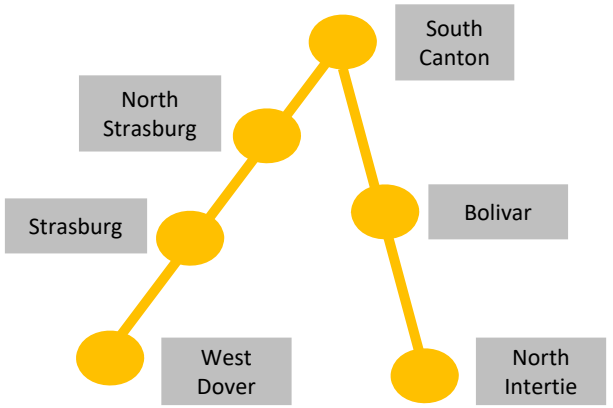
**Projected In-Service:** 12/1/2026

**Project Status:** Scoping

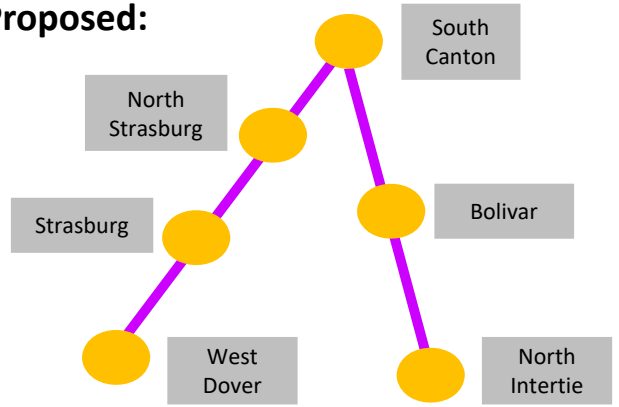
**Supplemental Project ID:** s2820.1-.2

# AEP Transmission Zone M-3 Process Dover to South Canton Line Rebuilds

**Existing:**




**Proposed:**



# AEP Transmission Zone M-3 Process
# Kalamazoo – Vicksburg 69kV Rebuild

**Need Number:** AEP-2021-IM023

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Previously Presented:**

Solution Meeting 9/16/2022

Needs Meeting 5/21/2021

**Supplemental Project Driver:** Equipment Condition/Performance/Risk

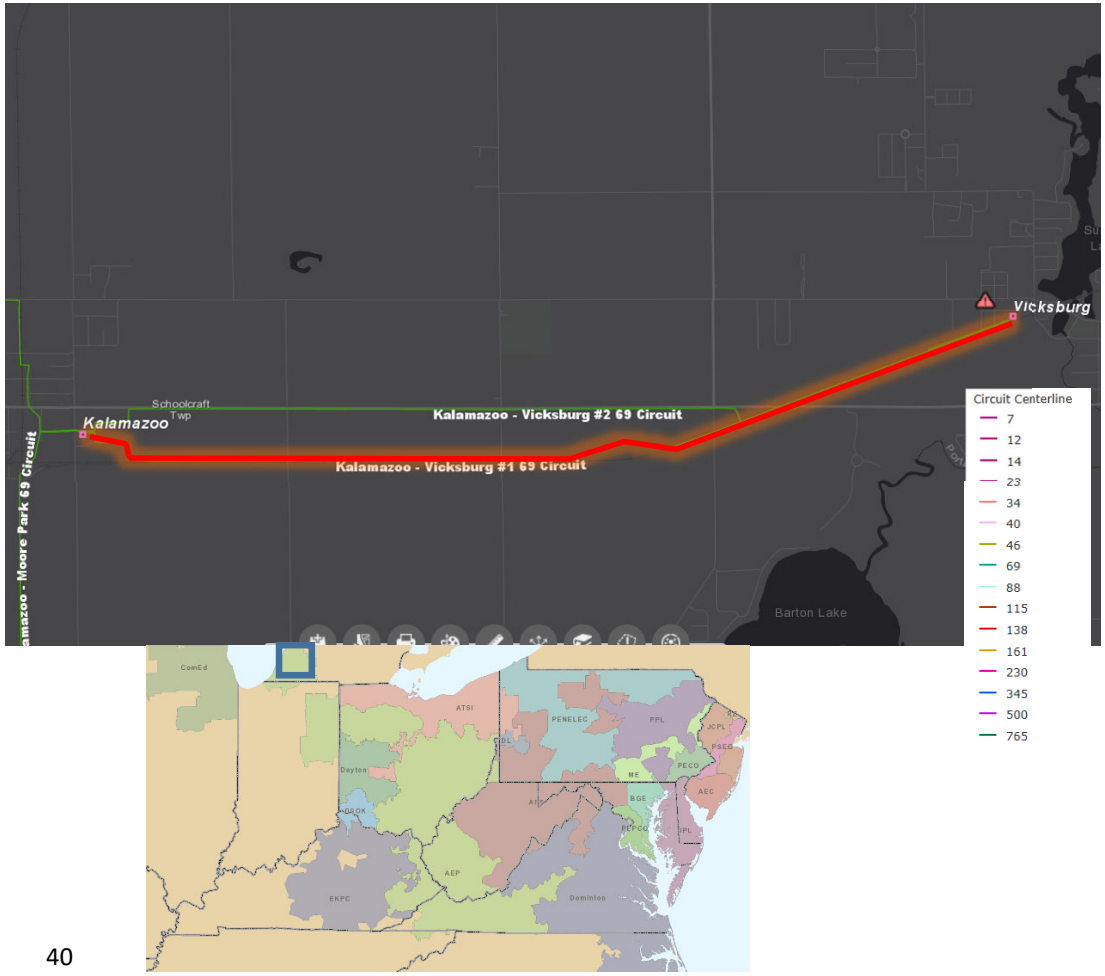
**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**Model:** N/A

**Problem Statement:**

Kalamazoo - Vicksburg 69kV line:

- 4.72 miles of mostly 1972 wood pole
- Conductor is 3/0 ACSR
- Since 2015 there have been 7 momentary and 1 permanent outages
- Structures fail NESC Grade B, AEP Strength requirements and ASCE structural strength standards
- There are 26 structures with open conditions (41% of line). 17 of these are structure related including pole rot, split and woodpecker damage



# AEP Transmission Zone M-3 Process
# Kalamazoo – Vicksburg 69kV Rebuild

**Need Number:** AEP-2021-IM023

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Solution:**

Kalamazoo – Vicksburg 69kV line:

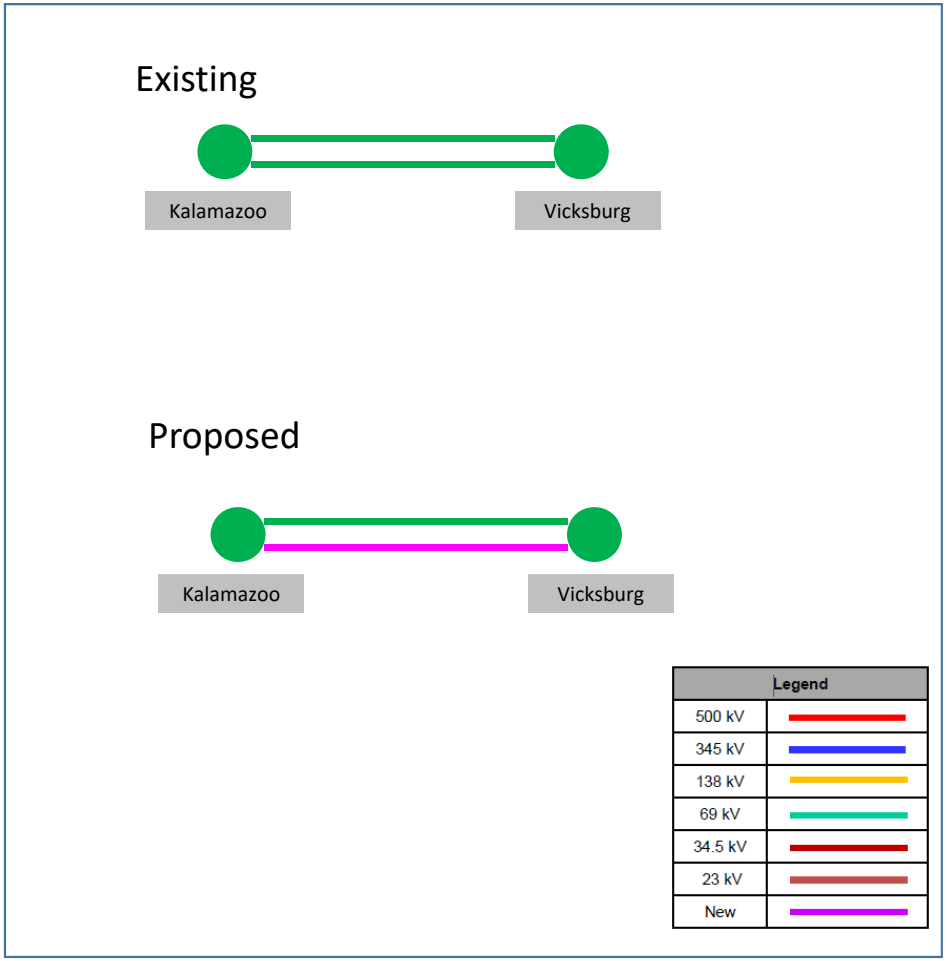
Rebuild the 4.72 Kalamazoo – Vicksburg #1 69kV line with 336 30/7 ACSR Oriole and eliminate line crossings with Kalamazoo – Vicksburg #2 69kV.

**Estimated Cost: $8.45M**

**Projected In-Service:** 11/2/2026

**Project Status:** Scoping

**Supplemental Project ID:** s2821



# AEP Transmission Zone M-3 Process
# Canton, Ohio

**Need Number:** AEP-2021-OH041

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Previously Presented:**

Solution Meeting 09/16/2022

Need Meeting 08/16/2021

**Project Driver:** Equipment Material/Condition/Performance/Risk; Customer Service

**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs; AEP Connection Requirements (AEP Assumptions Slides 12-13)

**Problem Statement:**

Gambrinus Road Station 69kV:

Equipment Material/Condition/Performance/Risk:

Circuit Breaker: T (69 kV)

- Breaker Age: 1978
- This breaker is 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.

Relays: 42 of the 44 relays (95% of all station relays) are in need of replacement. All 42 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
# Canton, Ohio

**Need Number:** AEP-2021-OH041

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

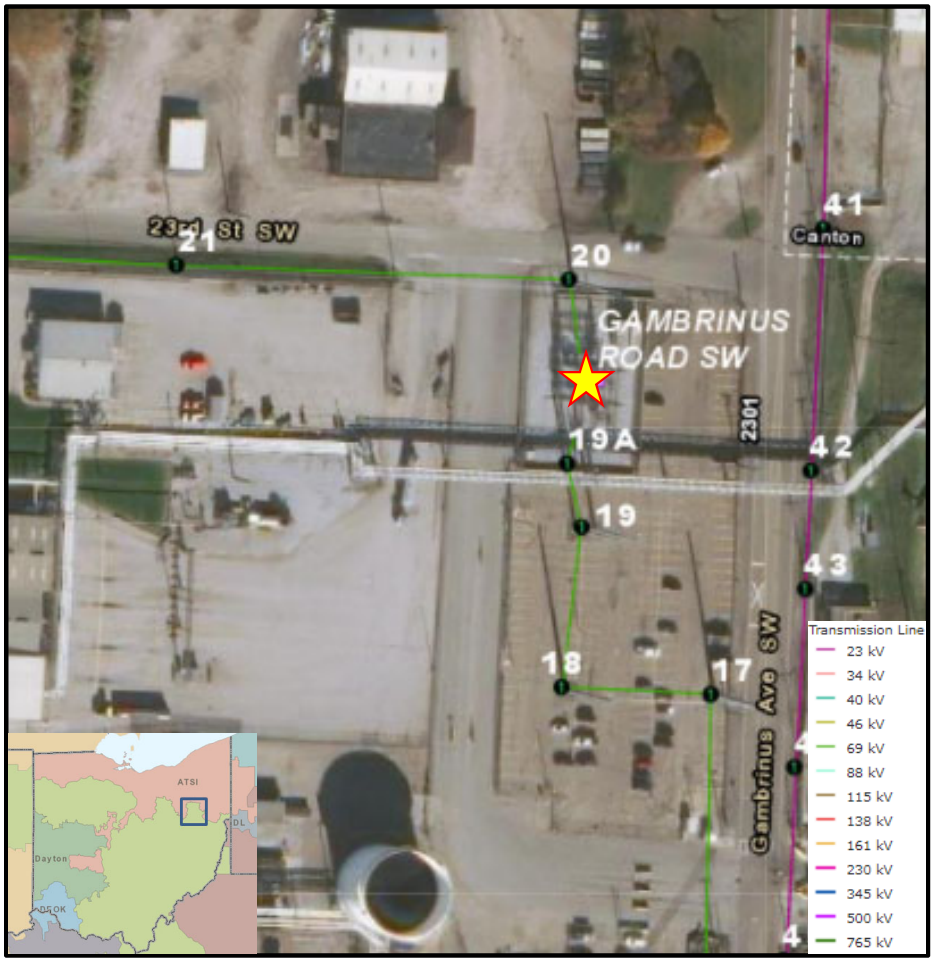
**Problem Statement Continued:**

The control house has asbestos and various maintenance issues. The station entry is in a congested industrial area, along with minimal drive-path width, resulting in labor constraints and safety issues for field personnel. The station fence is not built to current AEP standards. Station cables are direct-buried in the ground, leaving them more vulnerable to failure over time.

The 69kV revenue metering is a legacy 2-element style, not the current 3-element metering. All of the 69kV connections use a legacy pilot wire communications channel.

Customer Service:

The Gambrinus Road station serves an oil refinery customer with a peak demand of 44 MW. The station is served by only two remote 69kV sources, leaving it vulnerable to outages when maintenance must be performed on either of the two sources.



# AEP Transmission Zone M-3 Process
# Canton, Ohio

**Need Number:** AEP-2021-OH052

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Previously Presented:**

Solution Meeting 09/16/2022

Need Meeting 10/15/2021

**Project Driver:** Equipment Material/Condition/Performance/Risk; Operational Flexibility & Efficiency

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

**Problem Statement:**

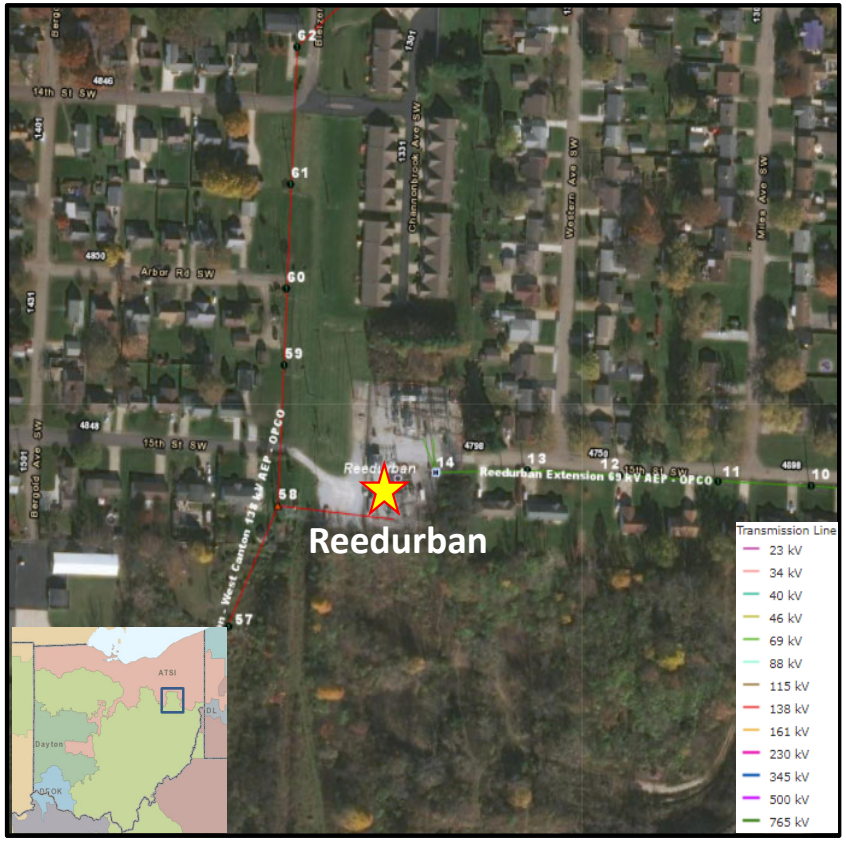
Reedurban Station:

Circuit Breaker: R (69 kV)

- Breaker Age: 1979
- Fault Operations: 10
- This breaker is 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.
- 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 misoperations across the AEP fleet.
- The manufacturer provides no support for this family of circuit breakers and spare parts are not available.

Relays: 8 of the 25 relays (21% of all station relays) are in need of replacement. All 8 of these are of the electromechanical type which have significant limitations with regards to spare part availability and fault data collection and retention. The 69kV circuit to Gambrinus used an obsolete pilot wire communications channel.

The control house has a number of concerns: poor ventilation, rusting roof, lead-based paint, and physical security issues. Portions of the perimeter are not built to current standards. All station cables are direct-buried without a cable trench, leading to increased probability of failure. The station service is an obsolete design (delta configuration, with corner ground, which is a safety concern).



# AEP Transmission Zone M-3 Process
# Canton, Ohio

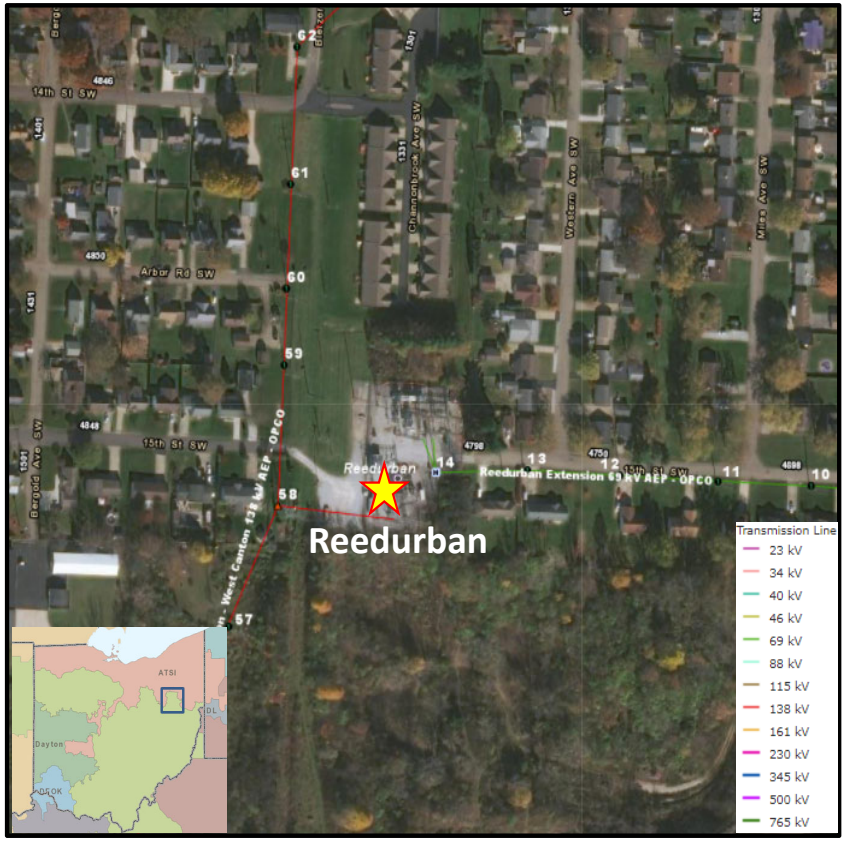
**Need Number:** AEP-2021-OH052

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Problem Statement continued:**

Operational Flexibility & Efficiency

The Miles Avenue-Reedurban-South Canton 138kV circuit is a 3-terminal line, due to the 138-69kV transformer source at Reedurban, and the lack of 138kV line breakers at Reedurban (contains motor-operated switches today, requiring remote-end breaker operation). Three-terminal lines are more difficult to reliably protect and are a risk for overtripping and misoperations.



# AEP Transmission Zone M-3 Process
# Gambrinus & Reedurban Station Upgrades

**Need Number:** AEP-2021-OH041 and AEP-2021-OH052

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 1/11/2023

**Solution:**

Rebuild Gambrinus station as Nolan station approximately 0.2 miles away as a 4-breaker 69kV ring bus. **Estimated Cost: $7.07 million (s2822.1)**

Retire Gambrinus station and remove all equipment. **Estimated Cost: $1.04 million (s2822.2)**

Extend the Gambrinus-Reedurban and Gambrinus-Torrey 69kV transmission lines 0.2 mile northward, to connect to Nolan station. **Estimated Cost: $1.36 million (s2822.3)**

From Nolan station, construct a span of 69kV transmission line and a structure, for each of the two feeds to the customer. This will connect to the customer's 69kV loop. **Estimated Cost: $0.67 million (s2822.4)**

At the 69kV remote-end of Torrey, upgrade line relays to coordinate with Nolan station. **Estimated Cost: $0.47 million (s2822.5)**

At the 69kV remote-end of Reedurban, upgrade line relays to coordinate with Nolan and also replace the 69kV oil-filled breaker "R". Convert the 69kV pilot wire system to fiber. Eliminate the 138kV 3-terminal configuration by installing 2- 138kV breakers on the incoming 138kV circuits. **Estimated Cost: $3.61 million (s2822.6)**

At Reedurban station, reconfigure the South Canton-Reedurban-Miles Avenue 138kV transmission line going into the station, to connect to the new breakers and bus. **Estimated Cost: $0.66 million (s2822.7)**

At Reedurban station, replace and relocate a structure on the Nolan 69kV transmission line, to accommodate the station improvements and distribution scope. **Estimated Cost: $0.33 million (s2822.8)**

**Total Estimated Transmission Cost: $15.21 million**

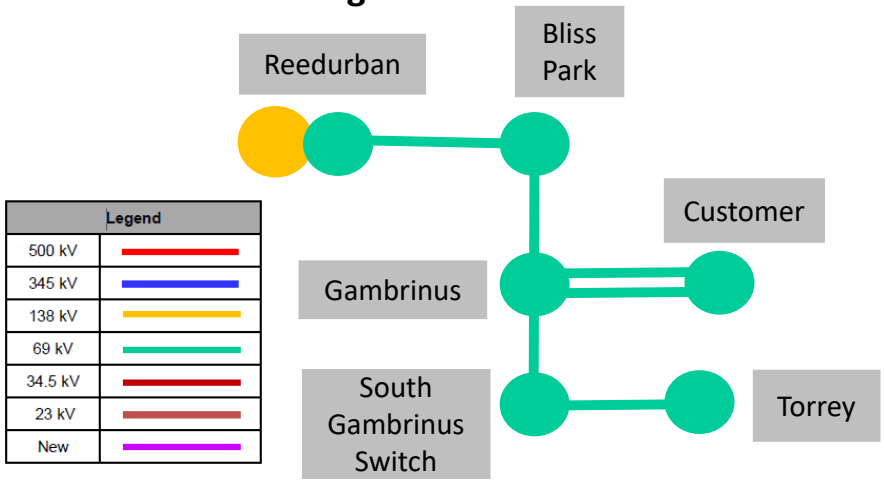
**Projected In-Service:** 12/1/2025

**Project Status**: Scoping

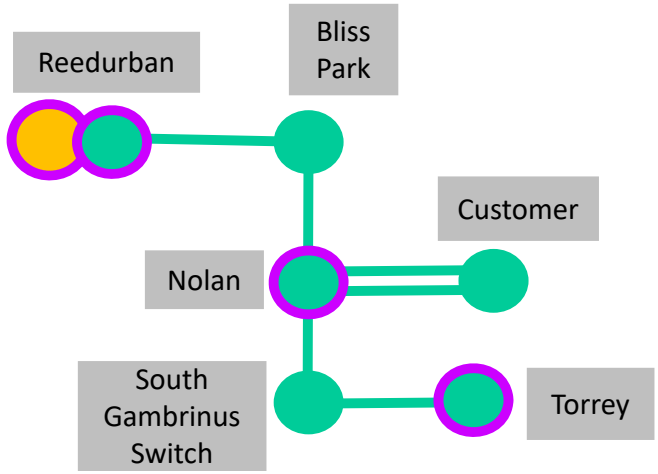
**Supplemental Project ID:** s2822.1-.8

**Model:** 2026 PJM RTEP

**Existing:**




**Proposed:**



# AMPT Projects in AEP Transmission Zone M3 Process
# Deshler, OH

**Need Number:** AMPT-2021-004

**Process Stage:** Submission of Supplemental Project for Inclusion in the Local Plan

**Previously Presented:** Solution Meeting – 9/16/2022, Need Meeting – 11/19/2021

**Supplemental Project Driver(s):** Customer Service

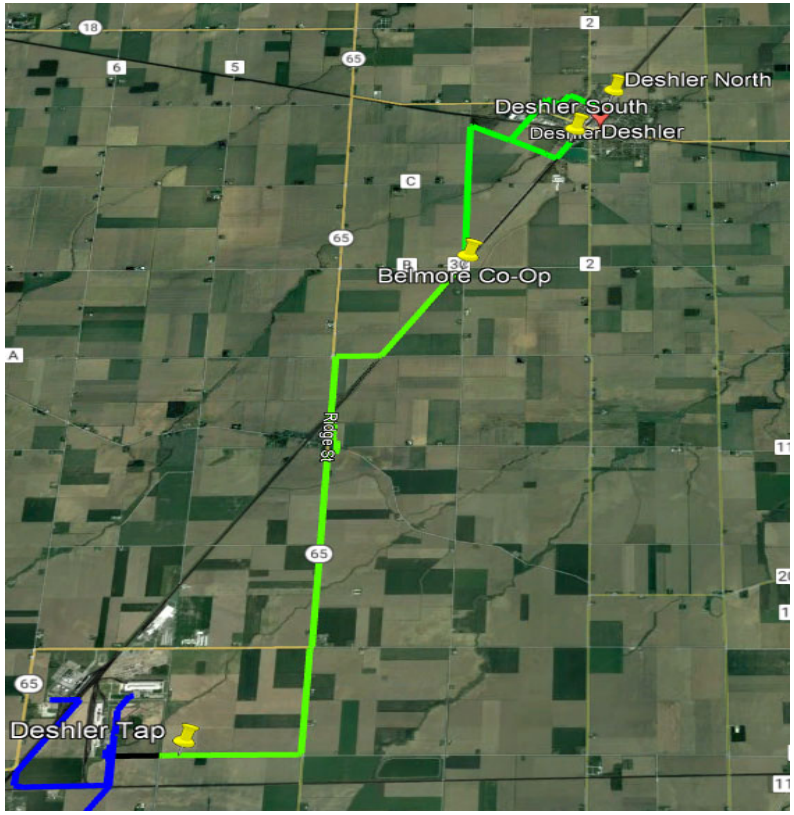
**Specific Assumption Reference(s):** AMPT Transmission Facilities Interconnection Requirements Document

**Problem Statement:**

AMPT's Deshler Tap is an approximately 10.7 mile radial 69 kV tap supplied from AEP's East Leipsic-East Ottawa 69 kV line. Three stations are served off the Tap – Belmore Co-op, Deshler South, and Deshler North.

The village of Deshler has requested a 2nd supply to support the load (approximately 4.2 MVA). The radial supply presents a single point of failure that could jeopardize reliability for the village.

AMPT's Transmission Facilities Interconnection Requirements specify looped facilities for loads exceeding 5 MVA or 35 MW-mile thresholds.



# AMPT Projects in AEP Transmission Zone M3 Process
# Deshler, OH

**Need Number:** AMPT-2021-004

**Process Stage:** Submission of Supplemental Project for Inclusion in the Local Plan

**Previously Presented:** Solution Meeting – 9/16/2022

**Supplemental Project Driver(s):** Customer Service

**Proposed Solution:**

*AMPT Identified Scope S2827.1* ***(Estimated Transmission Cost: $27.5 M)***

- Construct a greenfield 69 kV single circuit transmission line for approximately 11.8 miles using 795 26/7 ACSR conductor from AMPT's Bremer 69 kV substation to a structure outside of ATSI's Weston 69 kV ring bus station. Install four (4) 69 kV load break air switches in total on the existing Bremer Tap. Install the switches on either side of the Keyser and Belmore Co-op stations for sectionalizing. Install one (1) load break air switch outside of ATSI's Weston 69 kV station on the new line between Bremer and Weston. **($23.7 M)**
- Expand the existing Bremer 69 kV station to a new 3-CB ring bus configuration to accommodate a second 69 kV circuit. Install a total of four (4) new CBs - including one (1) 69 kV CB for the 69/12 kV transformer high side protection. **($3.8 M)**

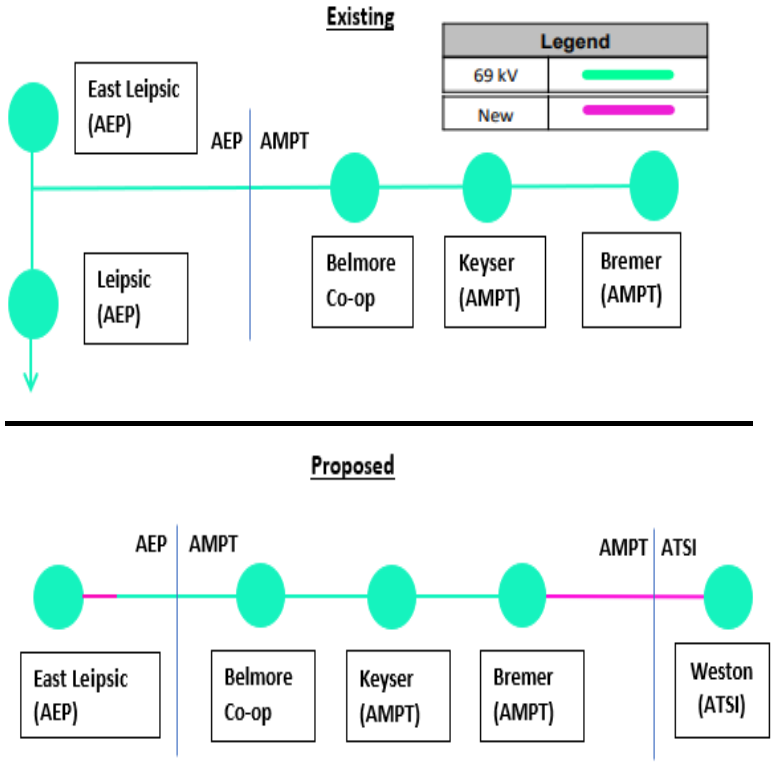
*AEP Identified Scope S2827.2* ***(Estimated Transmission Cost: $8.01 M)***

- At AEP's East Leipsic station extend the 69kV bus and install a new 69kV breaker. Install 69kV To/To Metering. The station will need expanded to accommodate the work. **($1.5 M)**
- Construct a new greenfield 0.55 miles long 69kV single circuit line using 556 ACSR Dove from the new East Leipsic 69kV breaker to the AEP / AMPT POI. **($3.15 M)**
- Modify the East Leipsic Extension line (**$1.68 M)**
- Modify the Yellow Creek - East Leipsic 69kV line. **($1.68 M)**

*FE Identified Scope S2827.3* ***(Estimated Transmission Cost: $1.9 M)***

- Install one 69 kV circuit breaker and associated equipment at FE's Weston 69 kV substation.
- Install one span of conductor to a structure outside the FE Weston 69 kV substation.
- Install tie line interchange revenue metering at FE's Weston 69 kV substation.

**Total Estimated Transmission Cost: $37.41 M**



# AMPT Projects in AEP Transmission Zone M3 Process Deshler, OH

**Projected In-Service:** 8/1/2025

**Supplemental Project ID:** s2827.1 (AMPT); s2827.2 (AEP); s2827.3 (ATSI)

**Project Status:**

- Scoping (AMPT), Conceptual (FE), Conceptual (AEP)

**Alternative Considered:**

- Build a greenfield 69 kV 3-CB ring bus station between ATSI's Maroe and Malinta stations to accommodate three 69 kV circuits. Expand the existing Bremer 69 kV station to a new 3-CB ring bus station. Construct a greenfield 69 kV single circuit transmission line for approximately 11 miles using 795 26/7 ACSR conductor from AMPT's Bremer 69 kV substation to the new ring bus station. Reterminate the Deshler Tap into a new 69 kV bay position at AEP's East Leipsic substation.

Similar in scope to the preferred reinforcement option however is less cost effective than the selected option with the installation of a new ring bus station.

- Build a greenfield 69 kV 3-CB ring bus yard at AEP and AMPT's Deshler Tap demarcation point to break the existing East Leipsic-East Ottawa 69 kV line and Deshler Tap into three (3) 69 kV circuits. Expand the existing Bremer 69 kV station to a new 3-CB ring bus station. Construct a greenfield 69 kV single circuit transmission line for approximately 12 miles using 795 26/7 ACSR conductor from AMPT's Bremer 69 kV substation to ATSI's Weston 69 kV ring bus station.

Similar in scope to the preferred reinforcement option however is less cost effective than the selected option with the installation of a new ring bus station.

# AEP Transmission Zone M-3 Process
# Wagenhals Station Upgrade

**Need Number:** AEP-2021-OH001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Previously Presented**:

Solution Meeting 10/14/2022

Need Meeting 1/15/2021

**Project Driver:**

Equipment Material/Condition/Performance/Risk; Operational Flexibility and Efficiency

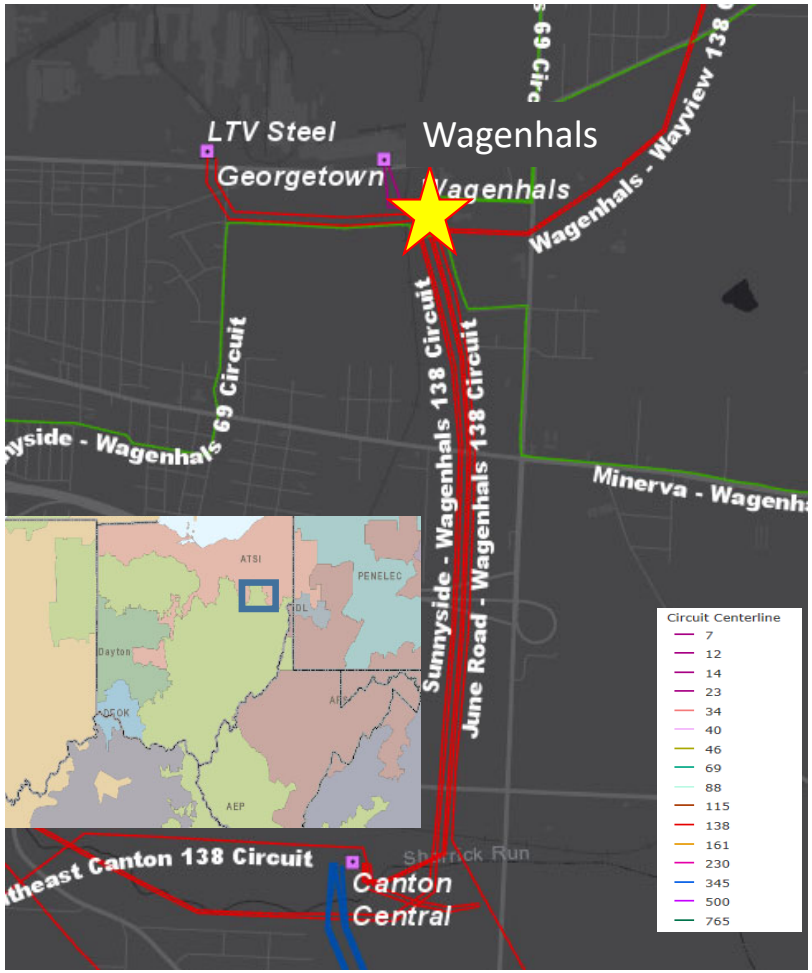
**Specific Assumption Reference:**

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

**Problem Statement:**

Equipment Material/Condition/Performance/Risk:

- The Wagenhals 138-69-23kV station was originally constructed in 1943.
- The station directly serves approximately 140 MW of industrial load (130 MW steel mill at 138kV; 10 MW casting plant at 23kV).
- The 138-23kV transformer #1 (vintage 1957) has the following asset concerns: insulation breakdown, elevated levels of CO2, high moisture readings, leaks, and wood-tie foundations in poor condition.
- The 138-69-23kV transformer #2 (vintage 1967) has the following asset concerns: insulation breakdown, elevated ethane and ethylene levels, high moisture readings, and low dielectric strength, and wood-tie foundations in poor condition.
- The control house has various issues: water intrusion, animal-related damage, lead paint, leaking roof, and asbestos.
- The 23kV yard has corroded steel and crumbling foundations, along with cap-and-pin insulators. In addition, energized equipment does not meet current clearance requirements.
- There are environmental concerns: positive tests for PCB's; lead paint and asbestos, which are a safety risk to field personnel.
- The ground grid is inadequate and the AC station service and DC cabinets are in very poor condition.
- All 3 station transformers lack an oil containment system.



# AEP Transmission Zone M-3 Process
# Wagenhals Station Upgrade

**Need Number:** AEP-2021-OH001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Project Driver:**

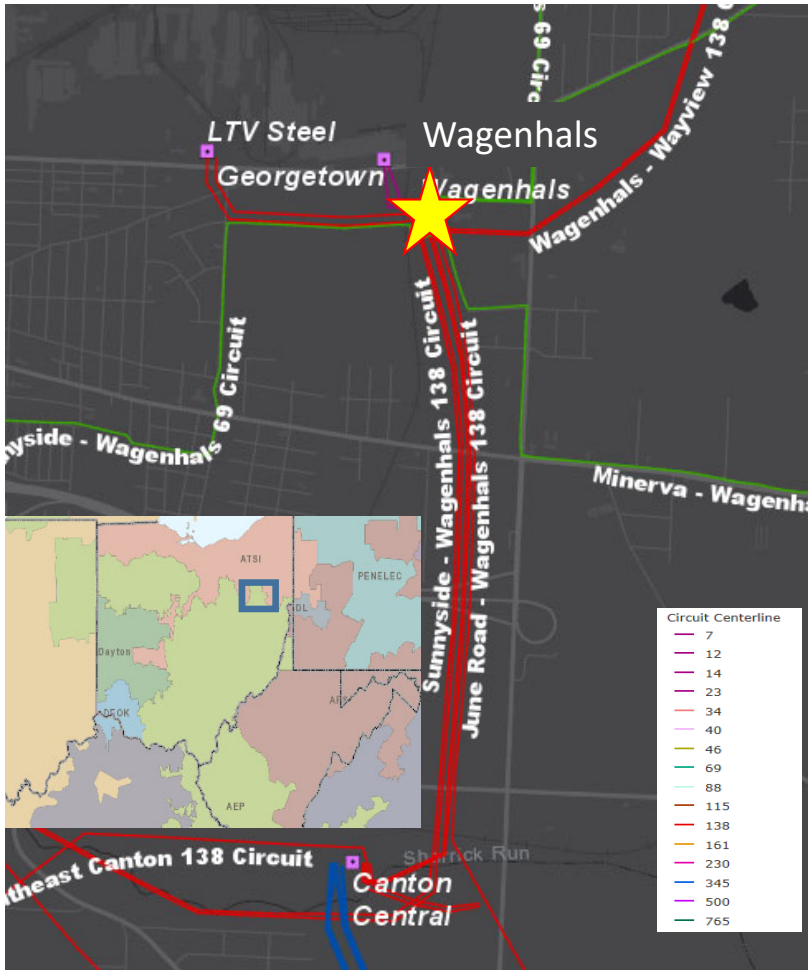
Equipment Material/Condition/Performance/Risk; Operational Flexibility and Efficiency

**Specific Assumption Reference:**

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

**Problem Statement:**

- 138kV breaker 'H' has routine SF6 leaks and 138kV breaker 'A' has an oil leak.
- There are 3- 69kV oil-filled breakers (P, Q, S), installed between 1962-1970, that are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling requirements. In addition, spare parts or technical support for these breakers are not available. This model of breakers has been prone to hydraulic mechanism malfunctions.
- The 2- 23kV breakers are oil-filled and were installed in 1977. 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. In addition, spare parts or technical support for these breakers are not available. This model of breakers has been prone to hydraulic mechanism malfunctions.
- There are a large number of 69kV and 23kV transmission hook-stick switches identified in need of replacement with Gang Operated Air-Breaker Switches (GOAB)
- The 138kV & 23kV PT's are original to the station (1943) and have significant rusting and are at risk of oil spills.
- The station contains 103 electromechanical relays and 1 static relay. 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. The relays of concern are involved with 138kV, 69kV, & 23kV circuit protection, 69kV & 23kV bus protection, and transformer protection.



# AEP Transmission Zone M-3 Process
# Wagenhals Station Upgrade

**Need Number:** AEP-2021-OH001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Project Driver:**

Equipment Material/Condition/Performance/Risk; Operational Flexibility and Efficiency

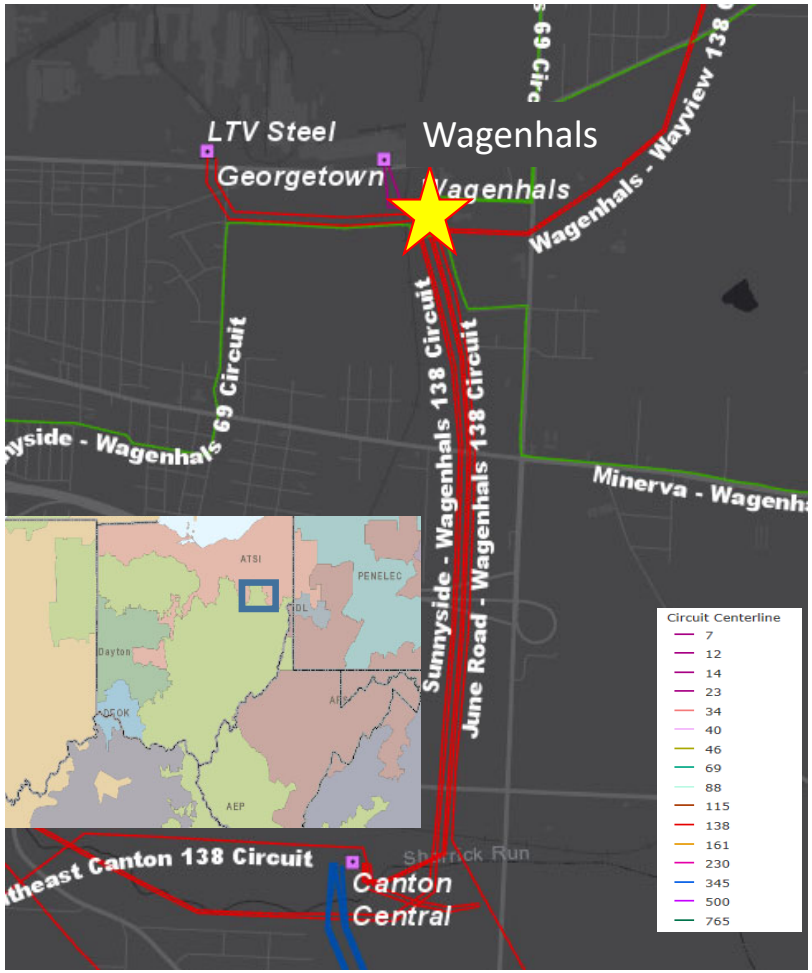
**Specific Assumption Reference:**

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

**Problem Statement:**

Operational Flexibility and Efficiency:

- The 3- transformers lack a high-side fault interrupting devices and require tripping an entire 138kV bus to clear a fault. These dissimilar zones of protection can cause over tripping and mis-operations.
- The 138kV design consists of 2- straight buses with a single bus-tie breaker, this configuration causes extended outages for maintenance, especially for a station serving a major steel customer. A stuck-breaker contingency on the 138kV bus-tie breaker requires tripping 9- 138kV breakers, 4- 69kV breakers, and 2- 23kV breakers (15 total breakers), taking the entire station out of service. This contingency would result in load loss of approximately 140 MW, loss of a 138kV cap bank, plus the loss of 2 sources to the local 69kV system.



# AEP Transmission Zone M-3 Process
# Wagenhals Station Upgrade

**Need Number:** AEP-2021-OH001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Solution:**

**Wagenhals Station:** Construct a new Wagenhals 138-69kV station on greenfield property owned by AEP to the south of the existing station. The 138kV portion will be a breaker-and-a-half design, with a total of 17 breakers. The 69kV will be a 5-breaker ring bus. The existing 138-69kV transformer #3 and 138kV cap bank will be transferred, while the 138-69-23kV transformer #2 will be retired. **Estimated Cost: $27.45 Million (s2829.1)**

Retire the existing 138-69-23kV station, including structures and control house. **Estimated Cost: $3.71 Million (s2829.2)**

Relocate 8- 138kV transmission lines and 4- 69kV transmission lines to connect to the new station location. **Estimated Cost: $10.48 Million (s2829.3)**

Required environmental remediation at the existing station property. Dispose of PCB-contaminated soils, drainage tile, legacy oil piping and storage tanks, and synchronous condenser system. Final abatement plan to be determined with EPA. **Estimated Cost: $1.17 - $23.51 Million (s2829.4)**

**Wayview:** Remote-end 138kV relay upgrades. **Estimated Cost: $0.36 Million (s2829.5)**

**Sunnyside:** Remote-end 69kV relay upgrades. **Estimated Cost: $1.02 Million (s2829.6)**

**Stanley Court:** Remote-end 69kV relay upgrades. **Estimated Cost: $0.49 Million (s2829.7)**

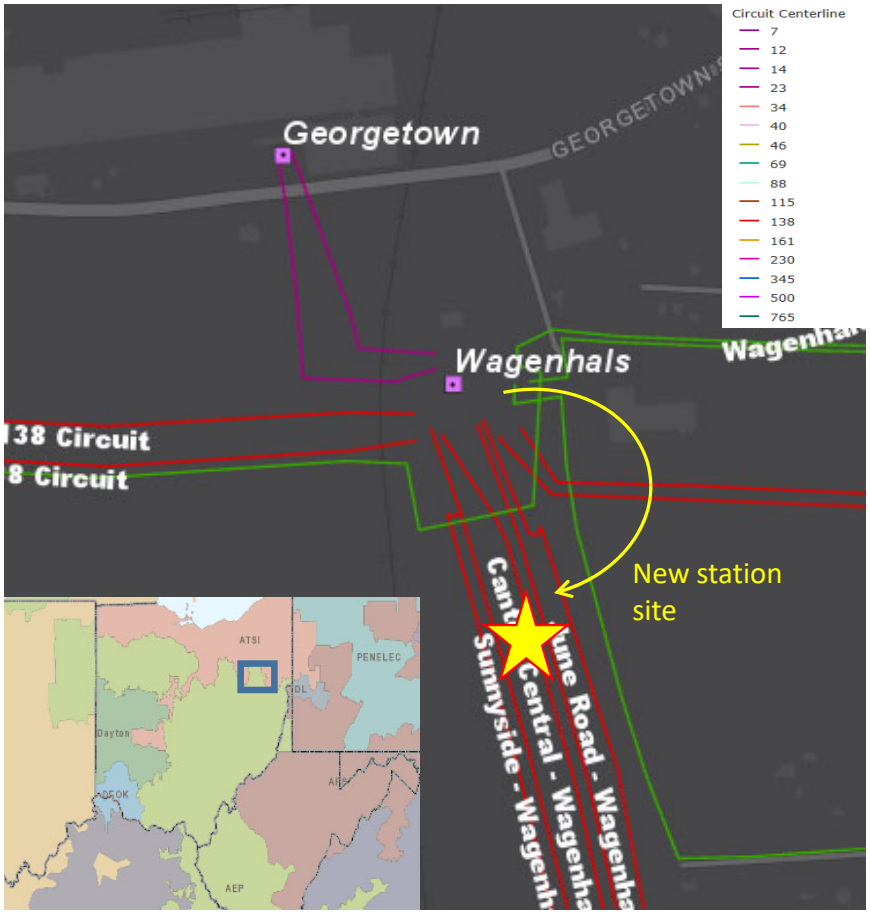
**Total Estimated Transmission Cost: $44.68 - 67.02 Million (s2829)**

**Ancillary Benefits:** The build-in-the-clear approach allows for the future environmental clean up and remediation of the existing station and also permits continuous service to the two industrial customer facilities served directly from Wagenhals.

**Project In-Service:** 6/1/2025

**Project Status:** Scoping

**Supplemental Project ID:** s2829.1-.7



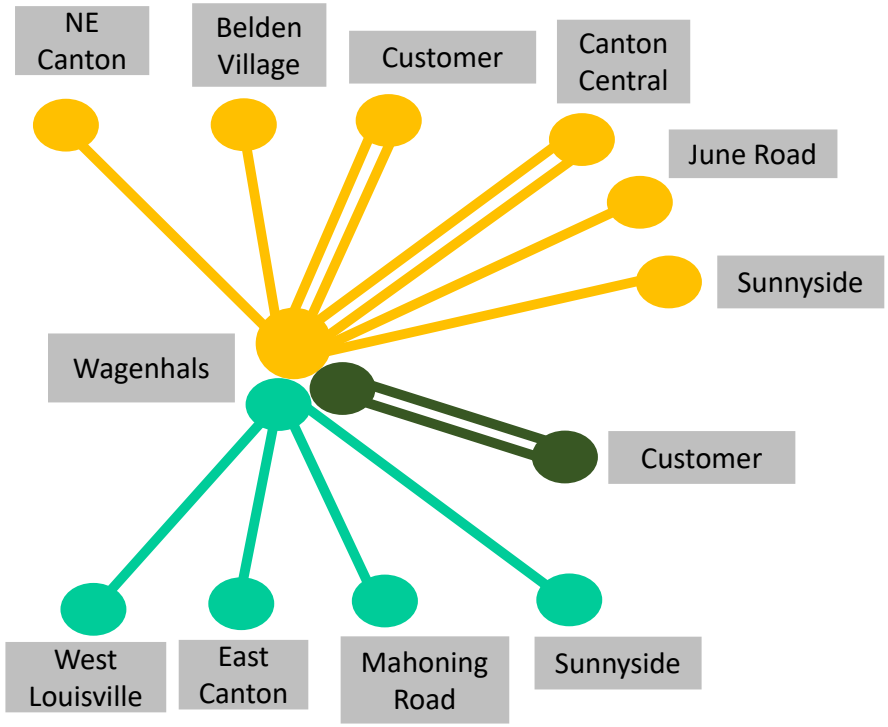
# AEP Transmission Zone M-3 Process
# Wagenhals Station Upgrade

**Need Number:** AEP-2021-OH001

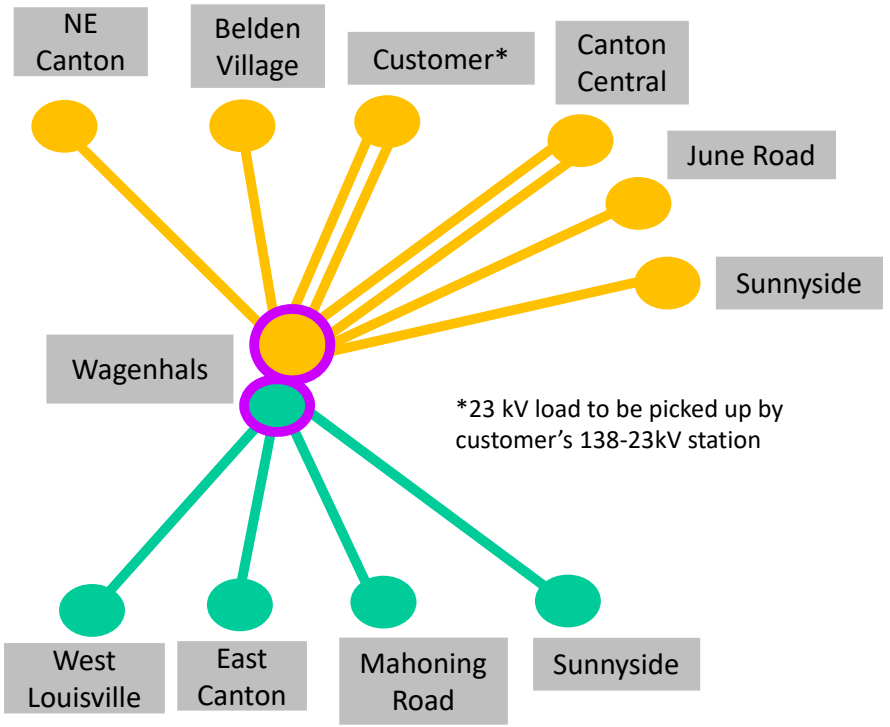
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

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

## Existing:




## Proposed:



# AEP Transmission Zone: Supplemental
## Albion Area Improvements

**Need Number:** AEP-2021-IM007

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Previously Presented:**

Solution Meeting 10/14/2022

Needs Meeting 5/21/2021

**Supplemental Project Driver:** Equipment Material/Condition/Performance/Risk

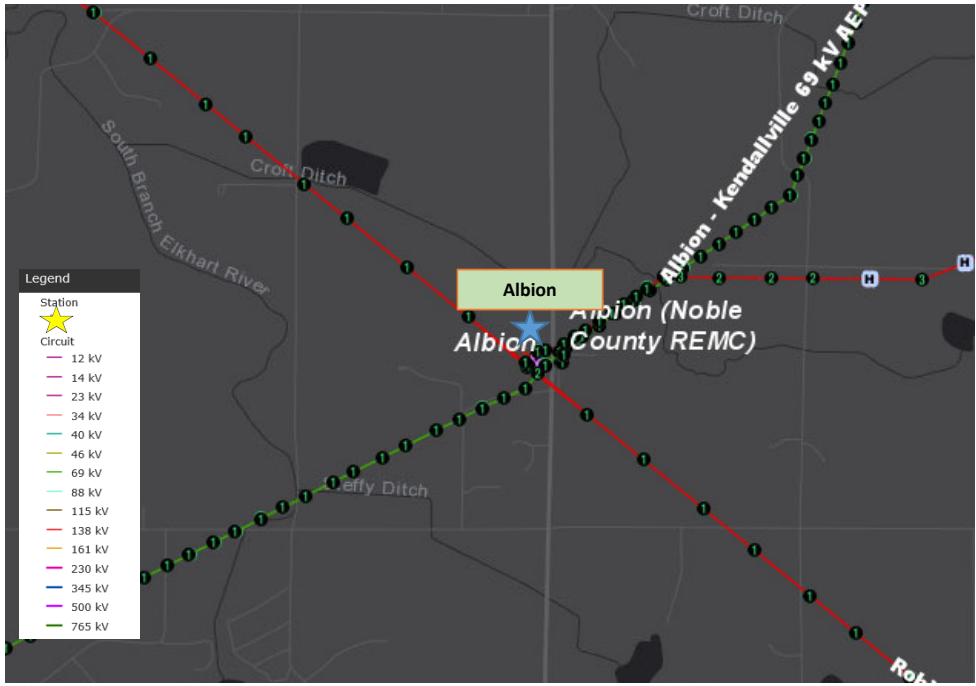
**Specific Assumptions Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**Problem Statement:**

**Albion 138/69kV**

- Circuit Breaker "F" is a 1994 138kV 145-PA type Breaker.
  - The 145-PA Type Breakers are experiencing marked increases in malfunctions. There have been 437 recorded malfunctions on 132 total units of this model type on the AEP System. The most common issues are related to loss of SF6 gas and mis-operations. The expected life of the bushing gaskets and door inspection port seals is 25 years. Seals that are no longer adequate can cause SF6 leaks to become more frequent. Low SF6 pressure in the breaker reduces the ability of the breaker to correctly interrupt a fault. Additionally, low pressure alarms and SF6 leaks lead to increased maintenance costs. The manufacturer provides no support or parts for this model of circuit breakers. Finally, SF6 leaks impact the environment.
  - This breaker has experienced 17 faults, over the manufacturer recommended 10.
- Cap Switcher "BB" is a 1980's vintage 138kV Mark V Cap Switcher.
  - Due to numerous malfunctions, cost of repair and lack of monitoring, AEP is replacing these units where viable.

**Model:** N/A




# AEP Transmission Zone: Supplemental
## Albion Area Improvements

**Need Number:** AEP-2020-IM026

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Previously Presented:**

Solution Meeting 10/14/2022

Needs Meeting 11/20/2020

**Supplemental Project Driver:** Equipment Material/Condition/Performance/Risk

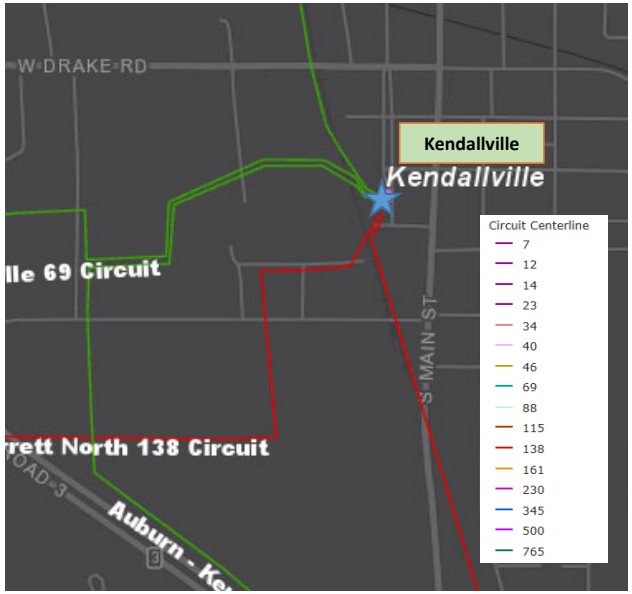
**Specific Assumptions Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

**Problem Statement:**

**Kendallville 138/69kV Station:**

138/69kV Transformer 1

- Manufactured in 1971
- Transformer has increased levels of Ethane and CO2 indicated in the dissolved gas analysis
- Increased levels of CO2 and Ethane indicates decomposition of the paper insulating materials, which impairs the units ability to withstand faults.
- The downward Interfacial Tension trend paired with upward power factor trend and increased moisture content indicate that there are increased particles within the oil, decreasing the dielectric strength of the transformer.




# AEP Transmission Zone: Supplemental
## Albion Area Improvements

**Need Number:** AEP-2021-IM006

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Previously Presented:**

Solution Meeting 10/14/2022

Needs Meeting 02/17/2021

**Supplemental Project Driver:** Equipment Material/Condition/Performance/Risk

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

**Problem Statement:**

- **Wolf Lake Tap 69kV ~5.44 Miles**
  - **Original Construction Date:** 1958
  - **Original Construction Type:** Wood pole with 4/0 ACSR conductor (57/68 structures original from 1958)
  - **Outage History (2015-2020)**
    - 697,305 CMI with 8 momentary and 1 permanent outages
    - Radial service to Wolf Lake. Radial service severely restricts the ability to perform routine maintenance and restoration activities, which can degrade the reliability of the associated lines/equipment in comparison to other non-radial facilities.
  - **Additional Info:**
    - 12 of 30 structures assessed by ground crew/UAV showed some level of wood pole decay
    - Structures do not meet 2017 NESC Grade B loading criteria, do not meet current AEP structural strength requirements, and do not meet the current ASCE structural strength requirements.

**Model:** N/A


# AEP Transmission Zone: Supplemental
## Albion Area Improvements

**Need Number:** AEP-2021-IM031

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Previously Presented:**

Solution Meeting 10/14/2022

Needs Meeting: 11/19/2021

**Supplemental Project Driver:** Equipment Condition/Performance/Risk

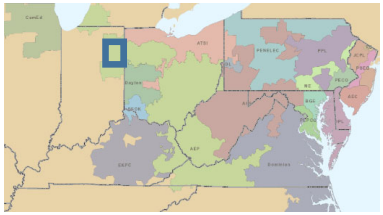
**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**Model:** N/A

**Problem Statement:**

**Albion – Kendallville 138kV line (9.75 miles):**

- 1972 wood H frame construction
- Since 2015 there have been 2 momentary outages to this line
- The structures on this line fail to meet NESC Grade B, AEP structural strength standards, grounding standards and shield angle requirements.
- 10 structures were investigated at the ground and 44 structures were assessed by drone. The following conditions were noted.
    - Nearly all structures had moderate to heavy insect or woodpecker damage, and light to moderate shell decay. A few also had decay pockets at ground line.
    - All H Frames have light to moderate decay
    - ~14% had flashed insulators
    - Light to moderate corrosion on hardware
- Currently 23 (25% of line) structures have at least one open condition
    - 28 total conditions include rotting, cracked, burnt, leaning or woodpecker affected structures; broken conductor, shield wire and ground lead wire

# AEP Transmission Zone: Supplemental Albion Area Improvements

**Need Number:** AEP-2022-IM002

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Previously Presented:**

Solution Meeting 10/14/2022

Needs Meeting: 1/21/22

**Supplemental Project Driver:** Equipment Condition/Performance/Risk

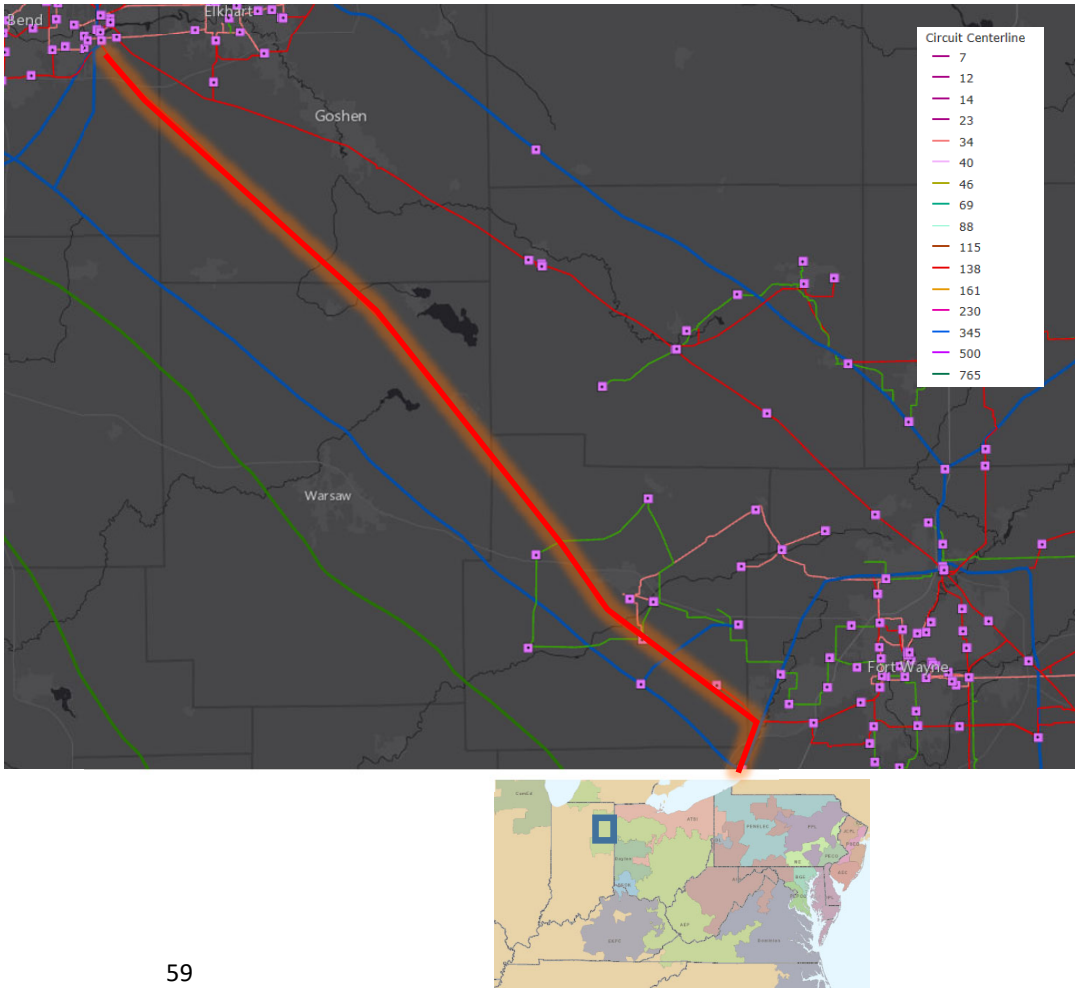
**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**Model:** N/A

**Problem Statement:**

**Twin Branch - Sorenson 138kV line (65.1 miles):**

- Line is 1949 Steel lattice construction
- Since 2014 there have been 6 momentary outages to this line
- Currently there are 172 (47%) structures with at least one open condition.
- Currently there are 222 open conditions including damaged legs, broken strands, damaged conductor, broken shield wire strand, broken/burnt insulators, broken/burnt insulators, or broken and missing shield wire hardware.
- The Shielding Angle is inadequate for AEP standards which can lead to poor performance of the line for lightening strikes.



# Albion Area Improvements

**Need Number:** AEP-2022-IM003

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Previously Presented:**

Solution Meeting 10/14/2022

Needs Meeting: 1/21/2022

**Supplemental Project Driver:** Equipment Condition/Performance/Risk

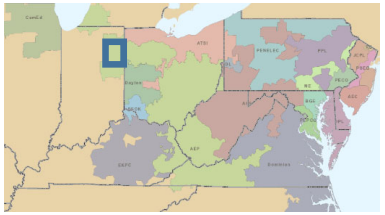
**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**Model:** N/A

**Problem Statement:**
Line Name: Richland – Tri Lakes 69kV

Original Install Date (Age): 1965

- Length of Line: 8.66 Miles
- Total structure count: 122
- Original Line Construction Type: 1960s Wood Pole
- Conductor Type: 4/0 ACSR
- Outage History since 2015
  - Momentary/Permanent Outages and Duration:
    - 20 Momentary and 6 Permanent
    - CMI: 125,904
- Condition Summary
  - 71 structures (58%) have at least one open condition including cracked, rotten, woodpecker damaged and leaning poles; Chipped, Loose, Contaminated and rusted Insulators.
  - 40 representative structures were assessed by drone with 12 assessed by a ground crew. Of these the following was observed
    - Wood decay was moderate to advanced on structures at ground line and poles have rot top.

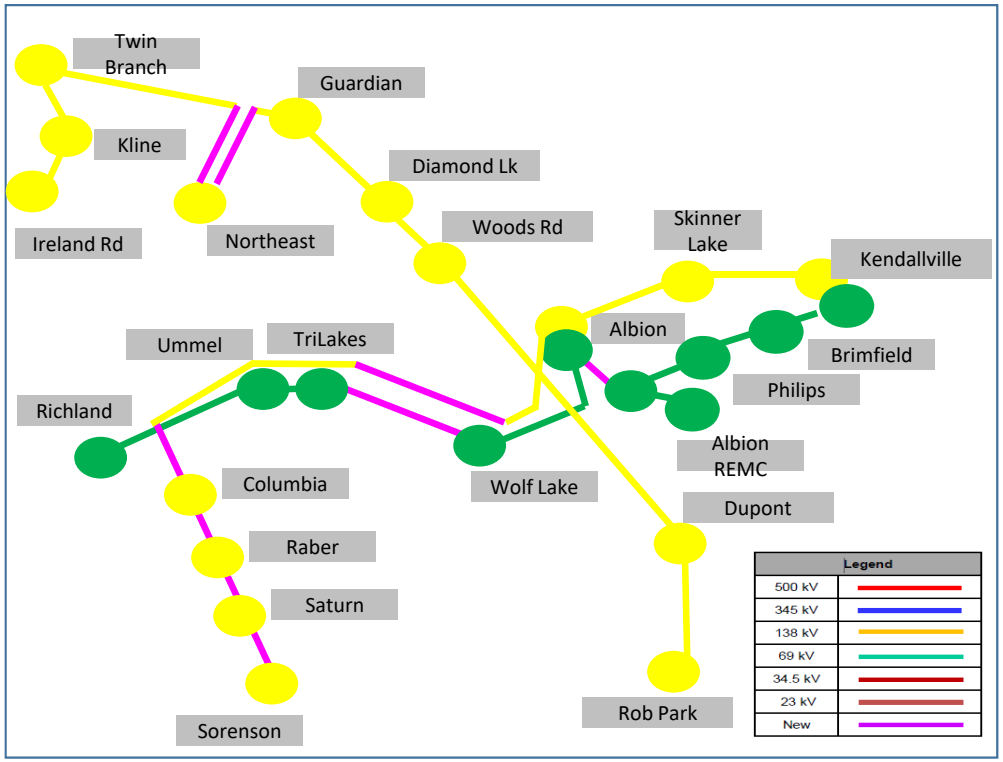
# AEP Transmission Zone: Supplemental
## Albion Area Improvements

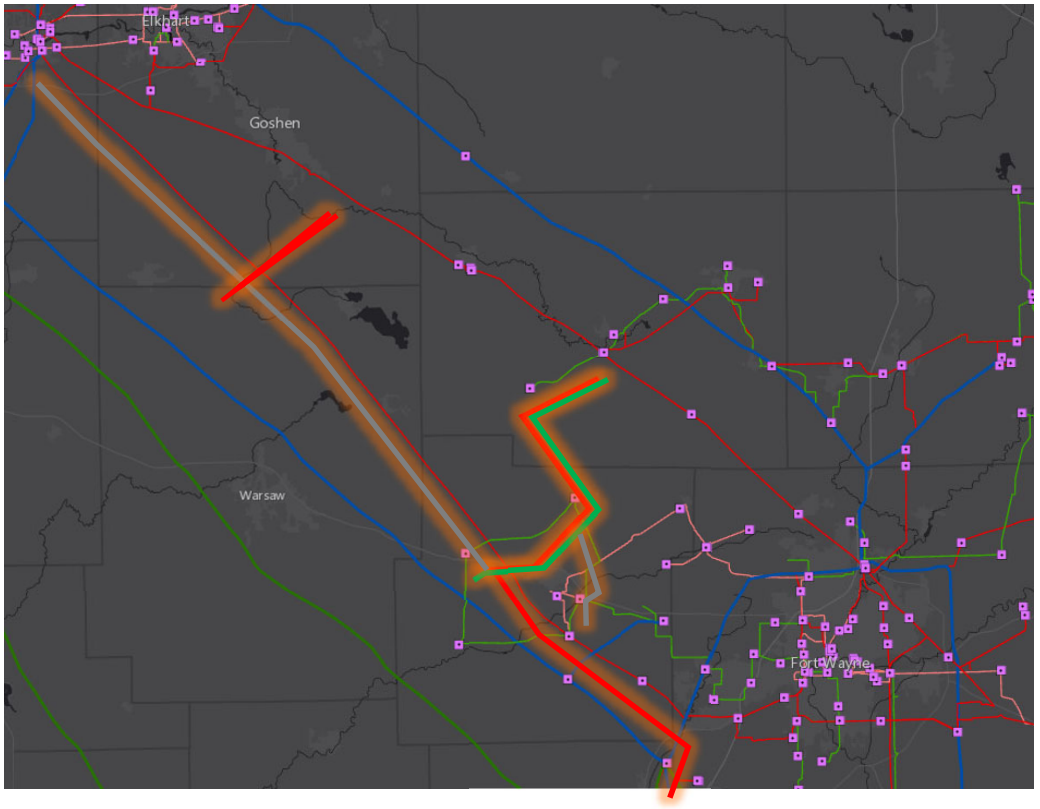
**Need Number:** AEP-2022-IM003, AEP-2021-IM031, AEP-2021-IM007, AEP-2021-IM006, AEP-2020-IM026 & AEP-2022-IM002

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**138kV Plan summary**

Twin Branch – Sorenson is a 65.1 mile 1940's line that AEP can retire due to other improvements made in the area and multiple paths on both 138 kV and 345 kV lines. By building Richland – Tri Lakes and Wolf Lake tap to 138kV double circuit standards in phase 1, the network is set up so that in phase 2, AEP will not need to rebuild the full 65.1 miles that exist currently and can instead retire a good portion of it.



# AEP Transmission Zone: Supplemental
## Albion Area Improvements Phase 1

**Need Number:** AEP-2022-IM003, AEP-2021-IM031, AEP-2021-IM007, AEP-2021-IM006, AEP-2020-IM026 & AEP-2022-IM002

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Phase 1 Solution:**

Richland – Ummel/Tri Lakes 69kV line:
Rebuild the ~8.7 mile line using double circuit 138kV construction and 795 ACSR Drake construction but energize only one side at 69kV
**Estimated Cost: $17.1M (s2830.1)**

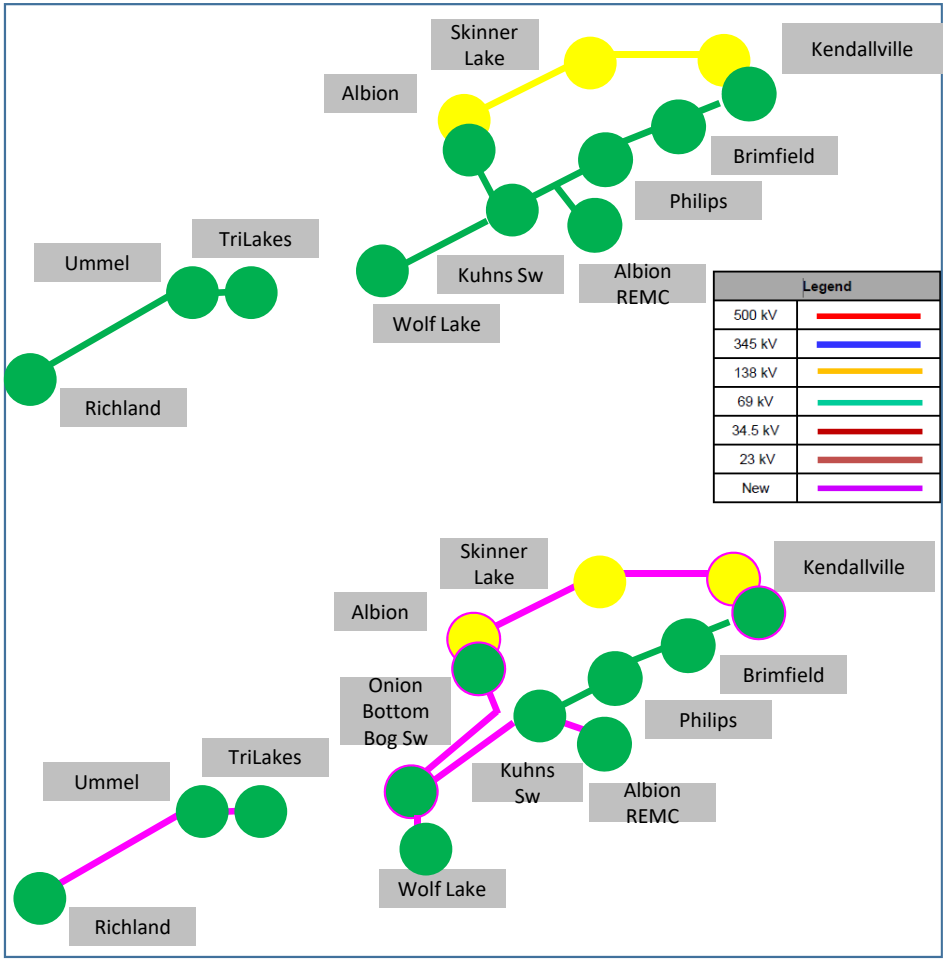
Rebuild the Albion – Kendallville 138kV
Rebuild the ~8.5 mile Albion – Kendallville 138kV circuit using 795 ACSR Drake
**Estimated Cost: $15.8M (s2830.2)**

Wolf Lake 69kV Tap
Rebuild the ~5.5 mile Wolf Lake tap as double circuit 138kV using 795 ACSR Drake. This line will be energized at 69kV.
**Estimated Cost: $13.6M (s2830.3)**

Albion 138/69kV:
Replace 138kV CB "F" and cap switcher "BB". In addition to this, this station had significant ancillary work needed including foundation repairs, new control cable runs and DICM installation. Construction at this station will be aligned with B3248
**Estimated Cost: $ 4.6M (s2830.4)**

Kuhns / Albion REMC 69kV:
Reconnect Kuhns Sw to serve the currently hard tapped Albion REMC load

**Estimated Cost: $0.6M (s2830.5)**



# AEP Transmission Zone M-3 Process
# Albion Area Improvements Phase 1

**Need Number:** AEP-2022-IM003, AEP-2021-IM031, AEP-2021-IM007, AEP-2021-IM006, AEP-2020-IM026 & AEP-2022-IM002

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Phase 1 Solution:**

Albion REMC 69kV Radial Tap:
Reterminate the line into Kuhns Sw 69kV.
**Estimated Cost: $0.2M (s2830.6)**

Albion – Kendallville 69kV Line:
Reterminate the Albion – Kendallville 69kV line into Kuhns Sw 69kV.
**Estimated Cost: $0.8M (s2830.7)**

Kendallville 138/69kV:
Replace the 138/69kV transformer with a 90MVA unit. This work will be aligned with S2431.
**Estimated Cost: $2.2M (s2830.8)**

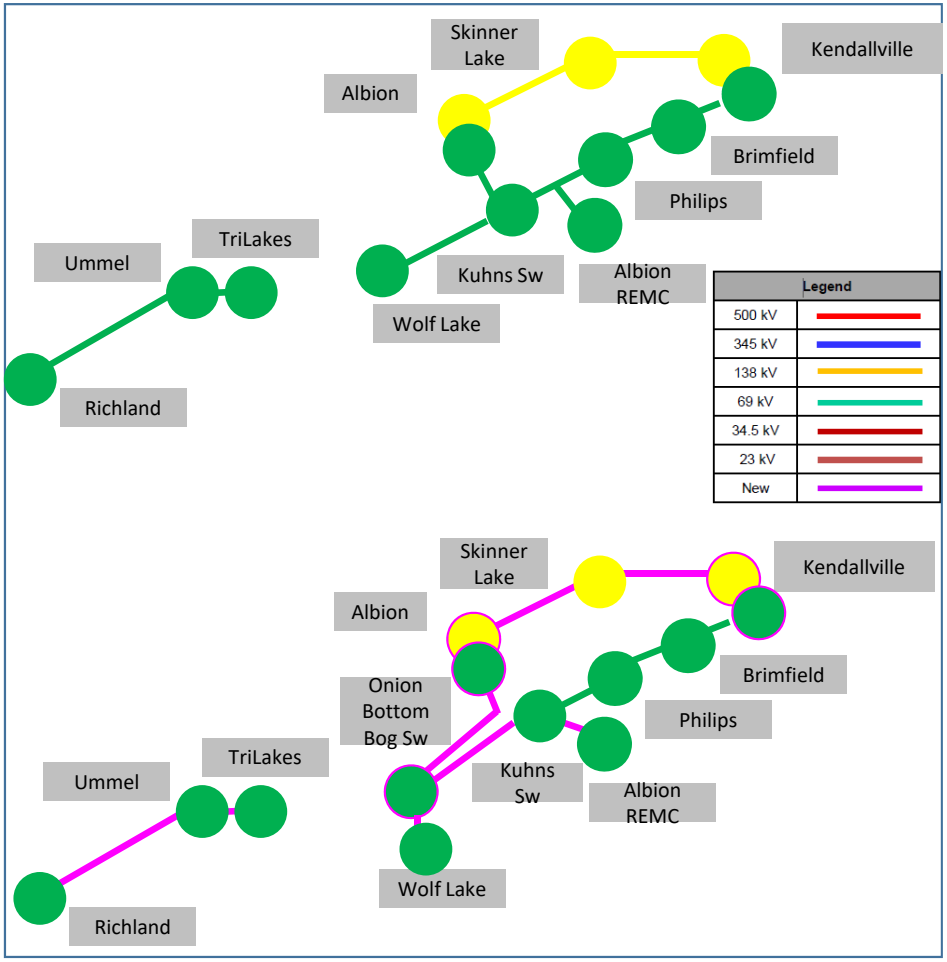
Onion Bottom Bog Sw/Wolf Lake 69kV
Install a 69kV POP "Onion Bottom Bog" Switch to serve Wolf Lake station. This switch will be re-used from the "Whitford Sw" that was removed with S2431

**Estimated Cost: $ 0.4M (s2830.9)**

**Total Estimated Transmission Cost (Phase 1): $55.3M**

**Projected In-Service:** 11/3/2025

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Albion Area Improvements Phase 2

**Need Number:** AEP-2022-IM003, AEP-2021-IM031, AEP-2021-IM007, AEP-2021-IM006, AEP-2020-IM026 & AEP-2022-IM002

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Phase 2 Solution:**

Rebuild ~21 miles of the circuit from Sorenson to north of Columbia. Retire the remaining 44.1 miles of the line. **Estimated Cost: $65.7M (s2830.10)**

Build a new ~7.5 mile double circuit extension from the Twin Branch – Guardian line to connect the existing Northeast station. **Estimated Cost: $21M (s2830.11)**

Build a new ~11.7 mile double circuit 138/69kV line from Tri Lakes – Onion Bottom Bog Sw and re-energize the 138kV circuit from Columbia – Albion. **Estimated Cost: $32.8M (s2830.12)**

Retire the ~7.8 mile Tri Lakes – Gateway 69kV line. **Estimated Cost: $2.3M (s2830.13)**

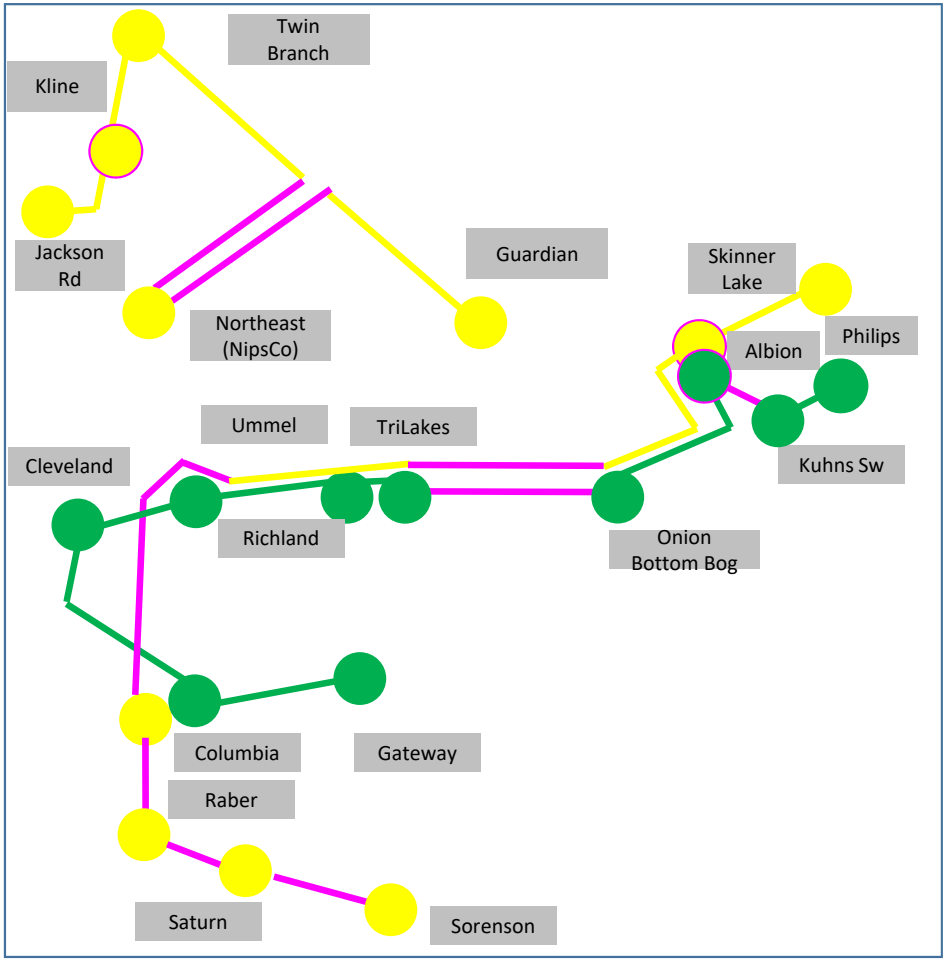
Install a new 138kV CB and a new 69kV CB to connect the new lines at Albion station. **Estimated Cost: $2M (s2830.14)**

Reconnect Kline station to the Twin Branch – Jackson Rd 138kV line and install a new 138kV breaker. **Estimated Cost: $1M (s2830.15)**

**Total Estimated Transmission Cost (Phase 2): $124.8M**

**Projected In-Service:** 12/1/2032

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Albion Area Improvements

**Need Number:** AEP-2022-IM003, AEP-2021-IM031, AEP-2021-IM007, AEP-2021-IM006, AEP-2020-IM026 & AEP-2022-IM002

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Ancillary Benefits**

By looping Wolf Lake, the customers at this station will have increased reliability.

By removing the hard tap feeding Albion REMC, the customers at this station will have improved reliability and the line will not be subject to extended outages due to customer equipment failures.

Looping Tri-Lakes into Onion Bottom Bog allows retirement of Tri-Lakes – Gateway 69kV which is a 1978 wood line.

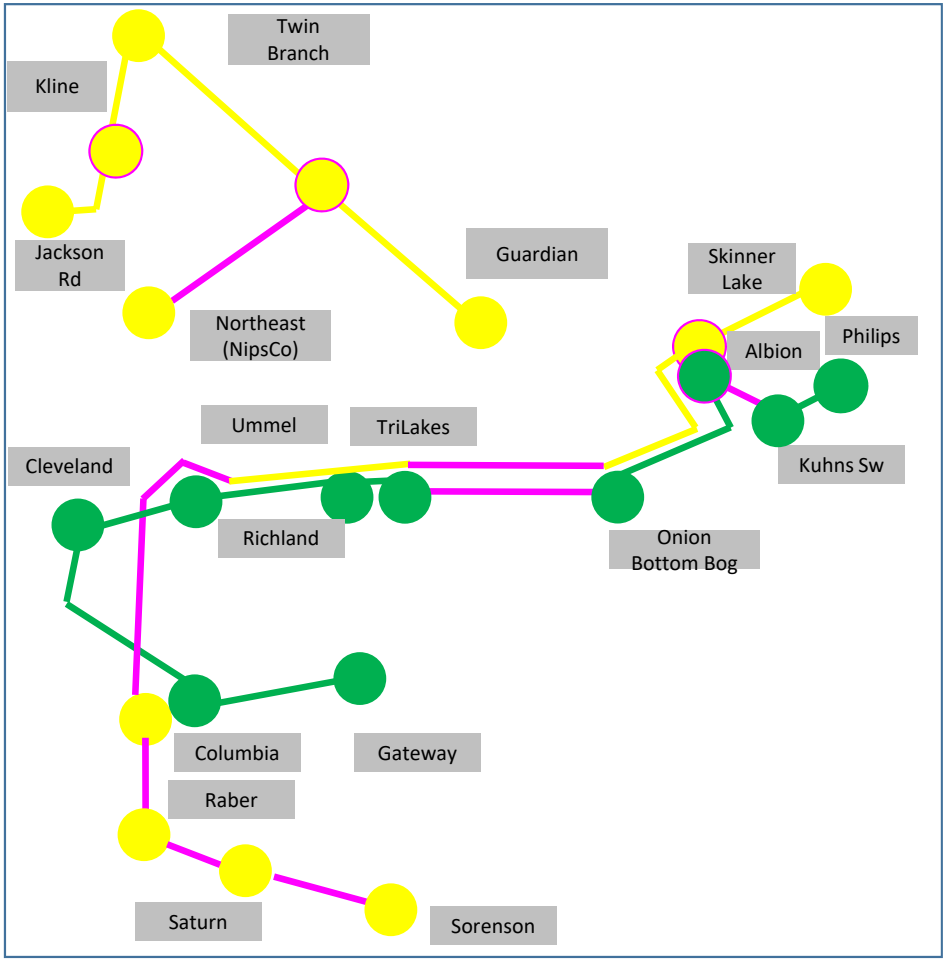
This connection will also provide more voltage support to the Albion 69kV network

**Total Estimated Transmission Cost: $180M**

**Projected In-Service:** 11/3/2025

**Project Status:** Scoping

**Supplemental Project ID:** s2830.1-.15



# AEP Transmission Zone M-3 Process
# Noble Station rebuild

**Need Number:** AEP-2022-IM011

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Previously Presented:**

Solution Meeting: 10/14/2022

Needs Meeting: 6/15/2022

**Supplemental Project Driver:** Customer Need

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

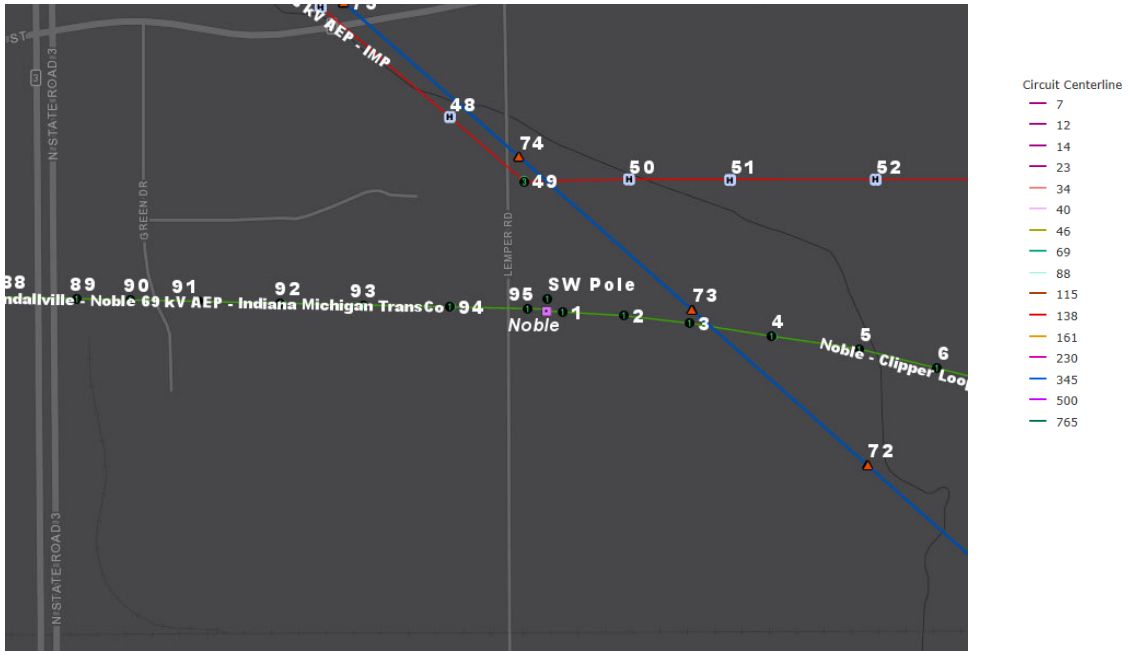
**Model:** N/A

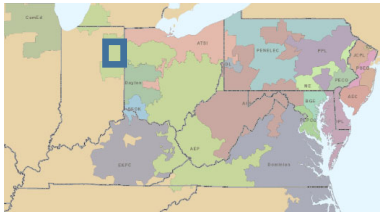
**Problem Statement:**

**Noble 69kV Station:**

Noble Station is a vintage 1950's wood pole station that is currently loaded beyond its capacity. The peak 2021 loading reached 12.04MVA which is 103% over the transformer's capacity.

Because of this, I&M Distribution has requested a new delivery point in this area.



# AEP Transmission Zone M-3 Process
# Noble Station rebuild

**Need Number:** AEP-2022-IM011

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Solution:**

Noble 69kV Station:

Rebuild Noble 69/12kV distribution station on neighboring property with a bus tie breaker and line Moab.

**Cost: $1.5M (s2831.1)**

Reconnect the Auburn – Kendallville 69kV line to the new station

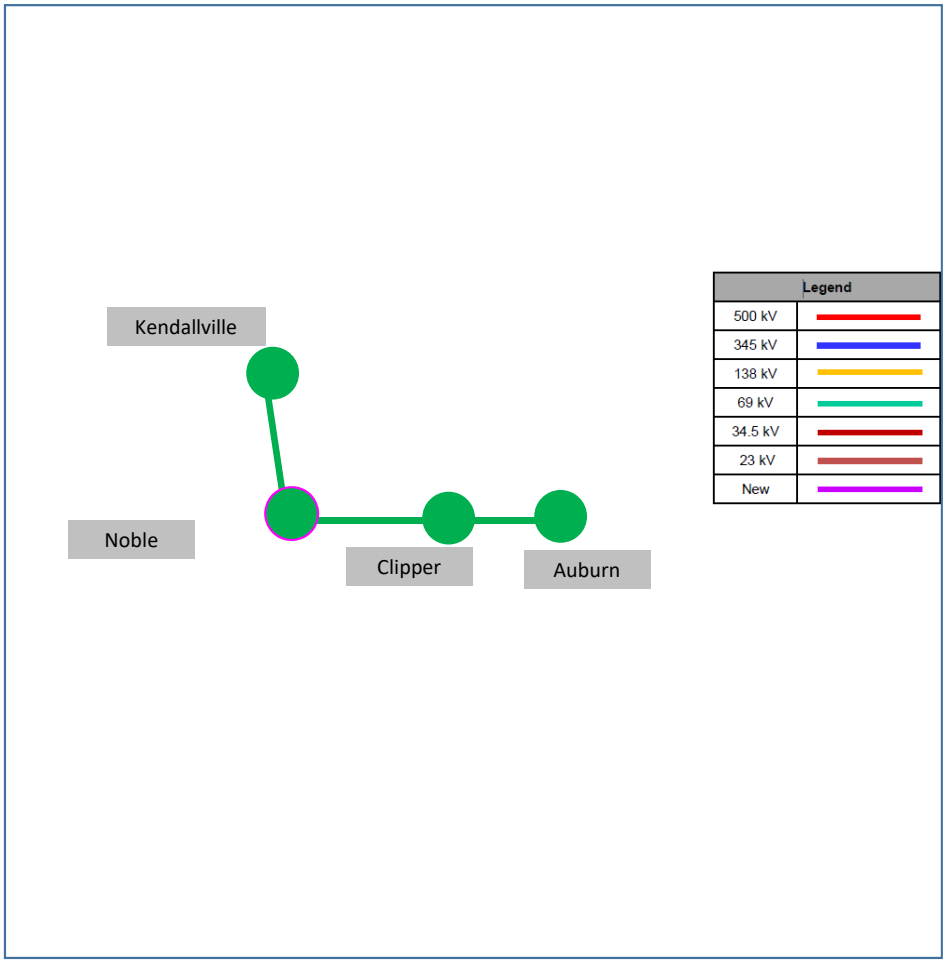
**Cost: $0.5M (s2831.2)**

**Total Transmission Cost: $2M**

**Projected In-Service:** 12/31/2024

**Project Status:** Scoping

**Supplemental Project ID:** s2831.1-.2



# AEP Transmission Zone M-3 Process Multiplier Remediation Projects

**Need Number:** AEP-2020-AEP001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Previously Presented:**

Solutions Meeting 10/4/2022

Needs Meeting 12/1/2020, 11/30/2021

**Supplemental Project Driver:** Operational Flexibility and Efficiency

**Specific Assumption Reference:**
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 8)

**Problem Statement:**

- AEP is proposing to implement a ratings methodology change whereby single element open ratings would be applied to all facilities as part of their overall rating. This is to avoid any compliance violations of FAC-008 and TOP standards in case a breaker is opened.
- AEP's historic practice was to apply a 2x multiplier to any facilities that connected in a configuration where flow could split between two paths in a station.
- This practice has been eliminated for any new facilities being constructed.
- AEP has maintained a list of facilities that continue to operate with a 2x multiplier on them pending future analysis and/or projects to address them
- For the 2025 RTEP analysis, AEP worked with PJM to apply single multiplier ratings to all facilities on the system
- There were four lines that were flagged in the 2025 analysis that show potential violations
    - ~~Muskingum-Waterford 345 kV line~~ Addressed through the 2021 RTEP Window 1. First read solution presented 10/5/2021.
    - Jefferson-Clifty Creek 345 kV line
    - East Lima 345/138 kV transformer
    - Olive-New Carlisle 138 kV line (flagged in market efficiency analysis)
    - Marysville 765/345 kV Transformer #2 (flagged in market efficiency analysis)
- AEP is proposing to address these needs in order to eliminate the exceptions and apply all single element open ratings in our future cases and in real time operations to comply with the request from PJM Operations and Planning

**Model:** PJM 2020 RTEP Series Cases

# AEP Transmission Zone M-3 Process
# Clifty Creek Circuit Breakers Replacement

**Need Number:** AEP-2020-AEP001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Solution:**

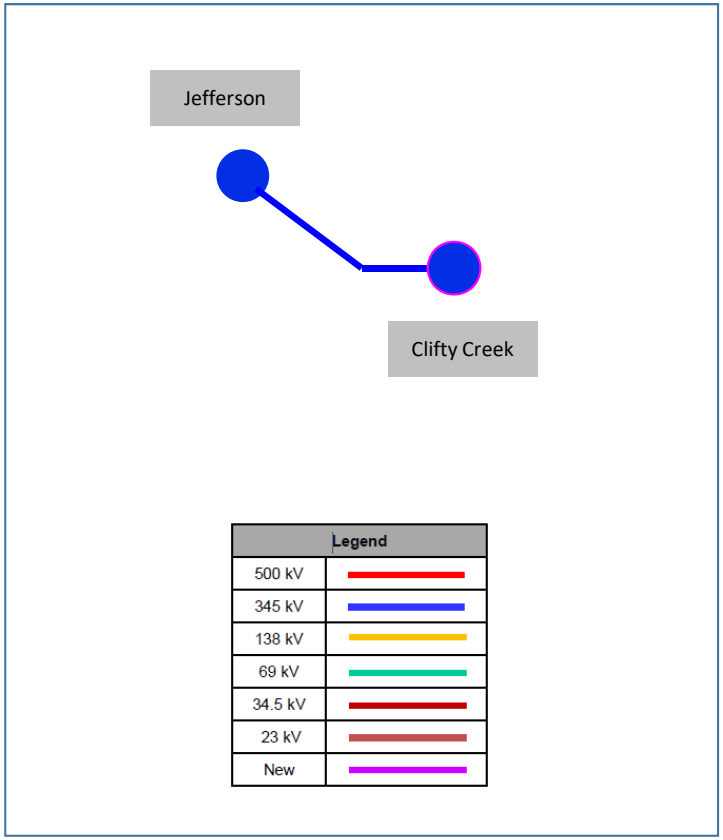
Clifty Creek 345 kV: Replace 345 kV circuit breakers “R” and “S” with 5000 A, 63 kA circuit breakers. (**S2832.1**)

**Total Estimated Transmission Cost: $1.89M**

**Projected In-Service:** 5/2024

**Project Status:** Scoping

**Supplemental Project ID:** s2832.1



# AEP Transmission Zone M-3 Process
# East Lima Bus Conductor Replacement

**Need Number:** AEP-2020-AEP001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Solution:**

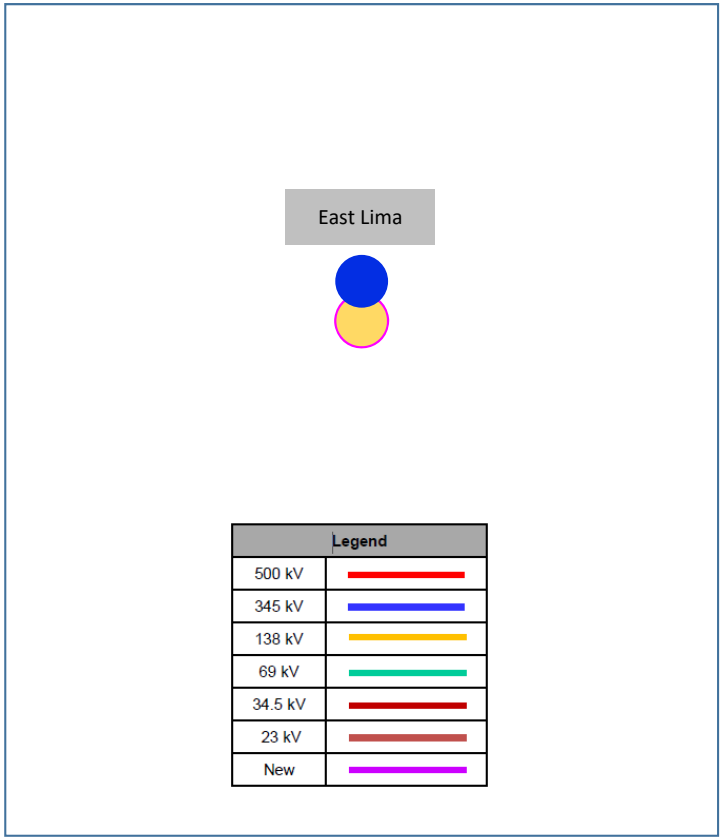
East Lima 138kV: Replace 1000MCM, 1590 AAC bus and riser conductors on the 'B' string and Bus 2 with 2-2000 MCM AAC. (**s2832.2**)

**Total Estimated Transmission Cost: $0.3M**

**Projected In-Service:** 2/2025

**Project Status:** Scoping

**Supplemental Project ID:** s2832.2



# AEP Transmission Zone M-3 Process Rating Methodology Changes

**Need Number:** AEP-2020-AEP001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

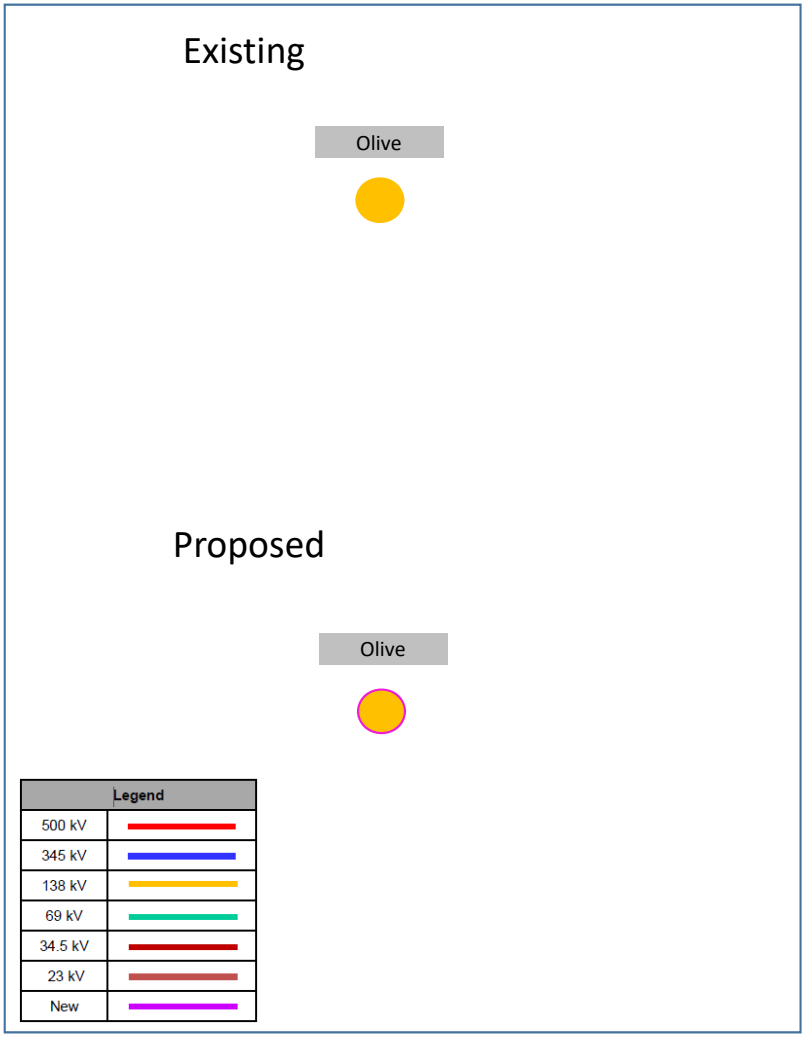
**Solution:**

Replace the 1590 station conductor at Olive 138kV station on the Olive – New Carlisle 138kV line and increase the CT Thermal Limit above 606 MVA WE. (**s2832.3**)

**Total Estimated Transmission Cost: $0.1M**

**Projected In-Service: 12/31/2022**

**Supplemental Project ID:** s2832.3



# AEP Transmission Zone M-3 Process
# Marysville XFMR #2 Ratings

**Need Number:** AEP-2020-AEP001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 2/27/2023

**Solution:**

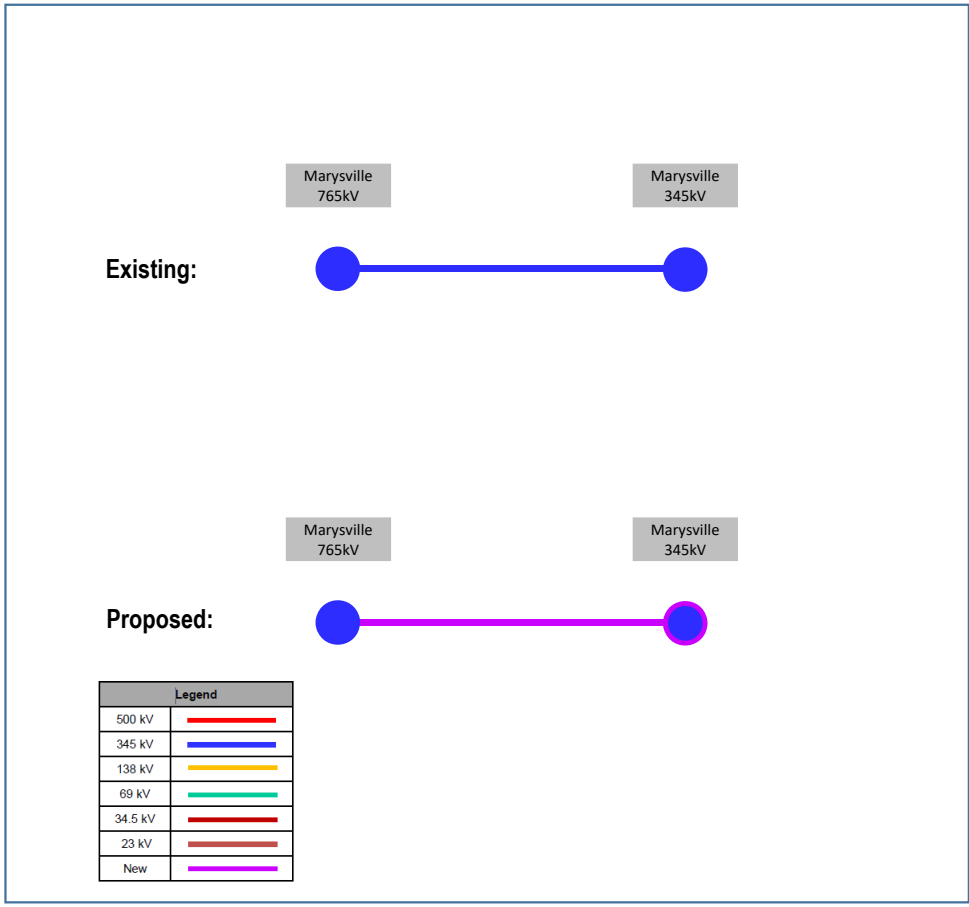
Marysville 345kV station: Replace (2) 345 kV 5000A 63kA circuit breakers and associated sub conductor and switches on the H string to eliminate the lower-rated equipment. (**s2832.4**)

**Total Estimated Transmission Cost: $3.01M**

**Projected In-Service:** 3/31/2023

**Project Status:** Scoping

**Supplemental Project ID:** s2832.4



# AEP Transmission Zone: Supplemental Fieldale, VA Area

**Need Number:** AEP-2022-AP001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**

Solutions Meeting 11/18/2022

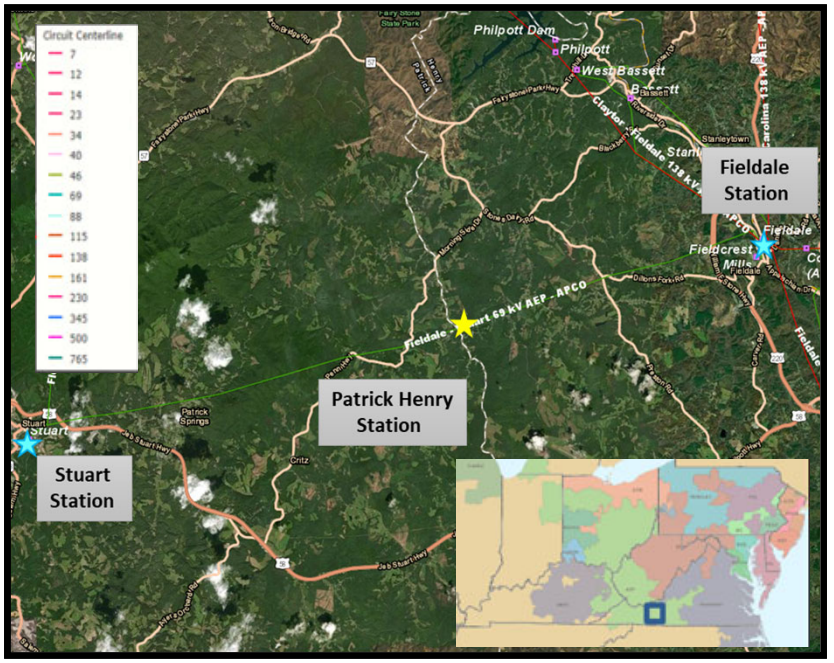
Needs Meeting 1/21/2022

**Supplemental Project Driver:** Customer Service

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

**Problem Statement:**

- Distribution requested a new station (Patrick Henry)
- Future capacity and contingency overload anticipated on the Stuart #2 69/34.5 kV (30 MVA) transformer, which is projected to be loaded to 44.2 MVA or 101% of its 44.1 MVA winter capability by winter 2025/26
- Poor reliability observed on the Stuart/Critz 34.5 kV circuit. The Stuart/Critz 34.5 kV circuit averages 945,000 customer minutes of interruption (CMI) per year during the last nine years (considering permanent outages only). There are over 2800 customers served from the Critz circuit over 263 line miles, making it one of the largest 34.5kV circuits in VA. The projected winter peak is 19.1 MVA.
- This project will reduce load and exposure on the West Bassett/Blackberry (111 miles), Stuart/Critz (263 miles), and Fieldale/Rangeley (118 miles) 34.5 KV circuits and create a much needed tie to the Fieldale/Carver (75 miles) 34.5kV circuit to improve area transfer capability.



# AEP Transmission Zone: Supplemental
# Danville, VA

**Need Number(s):** AEP-2022-AP001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Solution:**

- Patrick Henry Station
  - Establish new Distribution station which will be designed at 138 kV and operated at 69 kV until the area conversion project converts the high-side to 138 kV as part of s2179 (Stuart Area Improvements). The new station will consist of two 138 kV Motor Operated Air-Break Switches (MOABs), high-side circuit switcher, 138 (69) kV/34.5 kV 30 MVA transformer, 34.5 kV low-side circuit breaker and 2-34.5 kV distribution feeder circuit breakers. (s2848)
  - **Estimated Transmission Cost: $0 (Distribution Station)**

**Total Estimated Transmission Cost: $0**

**Ancillary Benefits:**
Establishing a new delivery point for Distribution will provide additional automatic sectionalizing on the existing Fieldale-Stuart 69 kV Circuit, decreasing the amount of exposure to permanent faults while establishing additional capacity for future distribution load growth in the area.

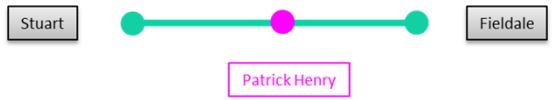
**Projected In-Service:** 12/02/2025

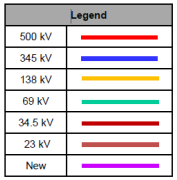
**Supplemental Project ID:** s2848

**Project Status:** Scoping

**Existing**


**Proposed**



# AEP Transmission Zone M-3 Process
# Conesville, Ohio

**Need Number:** AEP-2022-OH055

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**

Solutions Meeting 11/18/2022

Need Meeting 07/22/2022

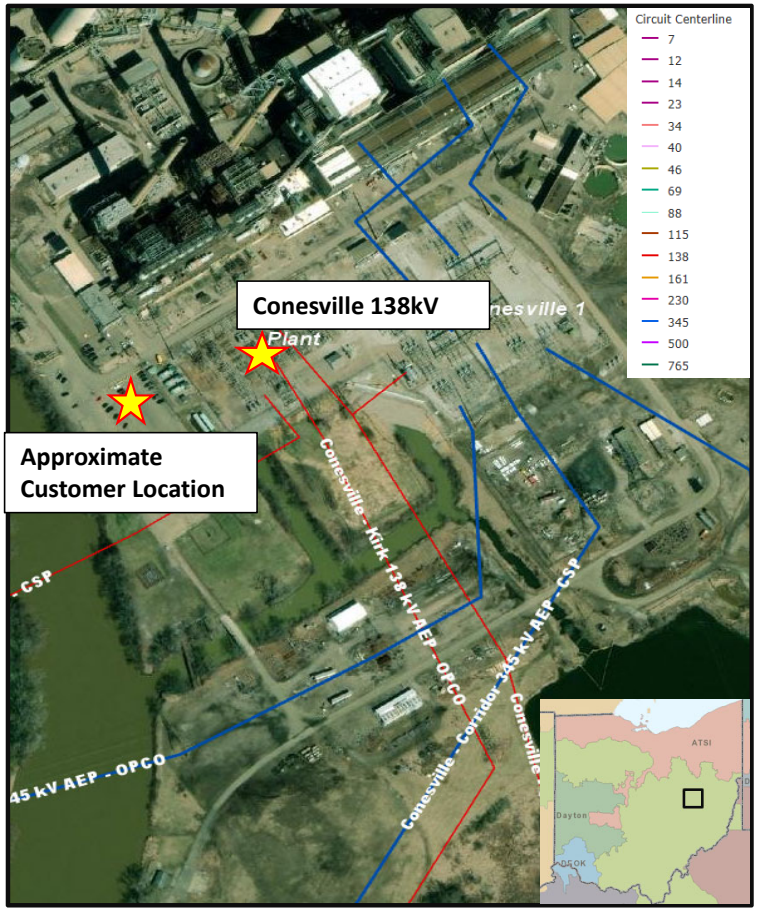
**Project Driver:** Customer Service

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

**Problem Statement:**

A customer has requested a new 138 kV service for their facility next to the existing 138 kV Conesville station. The initial peak demand will be 50 MW with an ultimate capacity of up to 300 MW.

**Requested In-Service:** 12/1/2022



# AEP Transmission Zone M-3 Process
# Conesville, Ohio

**Need Number:** AEP-2022-OH055

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Solution:**

Conesville – Slate (Customer) #1 138kV Line: Construct 138kV line approximately 200 feet from Conesville 138kV yard to the Slate Customer's new station. Cost: $ 0.045M (**s2849.1**)

Conesville – Slate (Customer) #2 138kV Line: Construct 138kV line approximately 200 feet from Conesville 138kV yard to the Slate Customer's new station. Cost: $ 0.045M (**s2849.2**)

Conesville - Centerburg 138 kV Line : Relocate the existing 138kV line to the 3rd string in Conesville station. Cost: $ 0.075M (**s2849.3**)

Conesville 138kV Station: Relocate the existing Centerburg circuit to the 3rd string in the breaker and half, installing 2-138kV circuit breakers in the string to terminate the circuit. Replace the existing Horizontal takeoff structures in the 2nd string with Vertical takeoff structures. Install associated protection equipment. Replace the existing 138 kV Cap Bank-BB with a 69.1 MVAR bank. Cost: $ 4.32M (**s2849.4**)

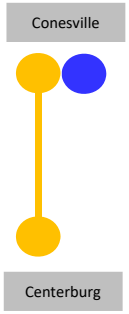
**Total Estimated Transmission Cost: $ 4.485M**

**Projected In-Service:** 5/31/2023

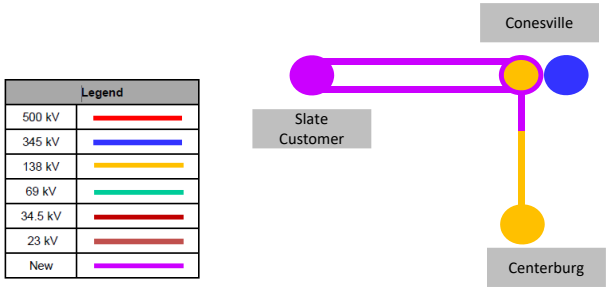
**Supplemental Project ID:** s2849.1-.4

**Project Status:** Scoping

**Existing:**




**Proposed:**



# AEP Transmission Zone M-3 Process
# Columbus, OH

**Need Number:** AEP-2022-OH070

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**

Solutions Meeting 11/18/2022

Needs Meeting 9/16/2022

**Project Driver:**

Customer Service

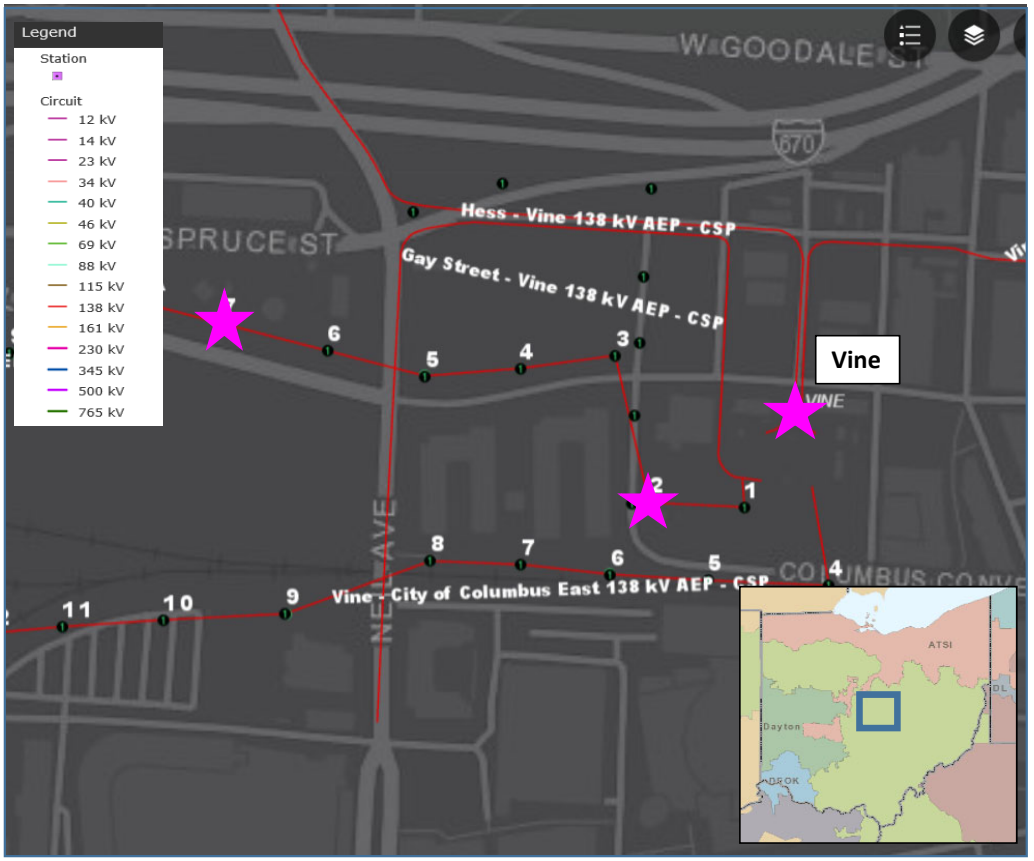
**Specific Assumption Reference:**

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

**Problem Statement:**

<u>Vine- City of Columbus West 138kV Line:</u>

- A customer has requested that AEP relocate the section from structures 2 to 7 of the Vine - City of Columbus West 138kV line from overhead to underground in a duct bank to accommodate development in the area.
- Service is requested by June 2023.



# AEP Transmission Zone M-3 Process
# Columbus, OH

**Need Number:** AEP-2022-OH070

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Solution:**

Vine- City of Columbus West 138kV Line: Rebuild the 0.3 mile section between structures 2-7 from above ground to underground.

Estimated Cost: $0 (Fully Reimbursable)

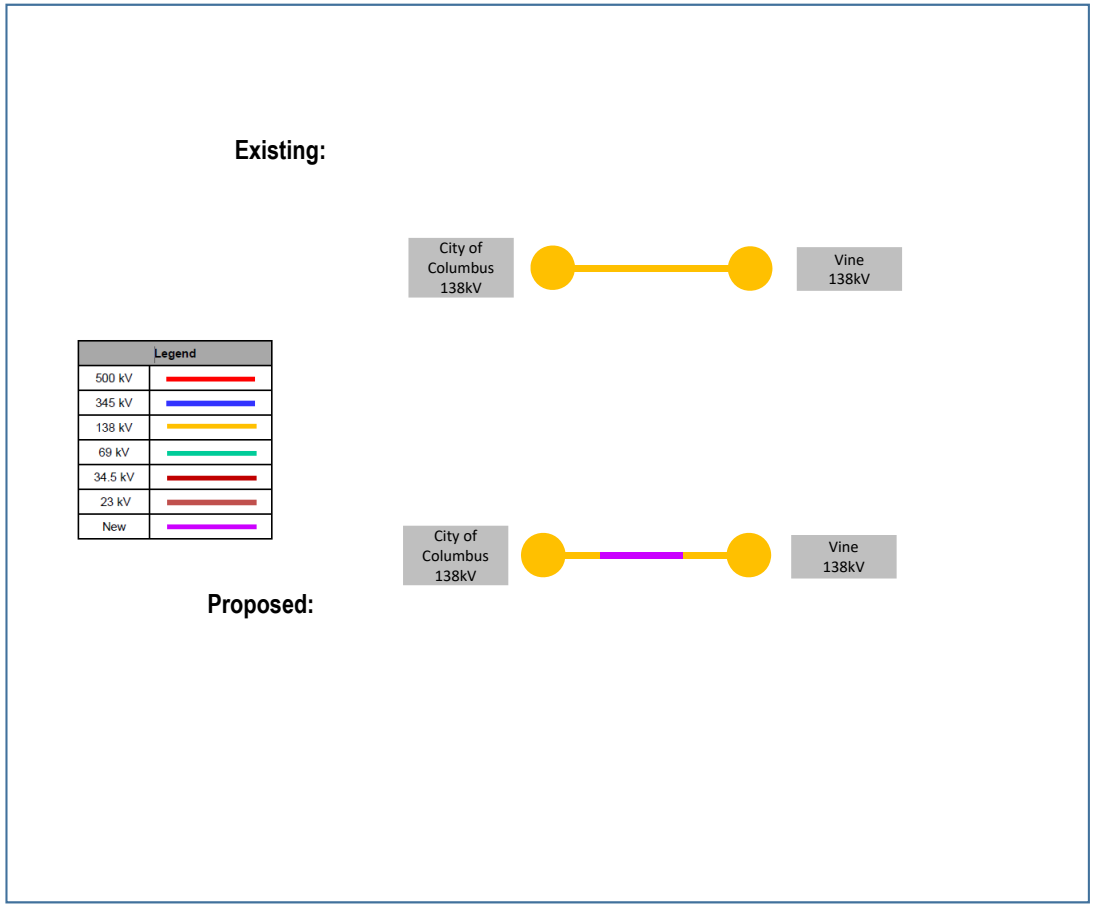
**Total Estimated Transmission Cost:** $0 (Reimbursable)

**Projected In-Service:** 6/1/2023

**Supplemental Project ID:** s2850

**Project Status:** Engineering

**Model:** 2027 RTEP



# AEP Transmission Zone M-3 Process
# New Carlisle Breaker A

**Need Number:** AEP-2022-IM018

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**

Solution Meeting 11/18/2022

Needs Meeting 10/14/2022

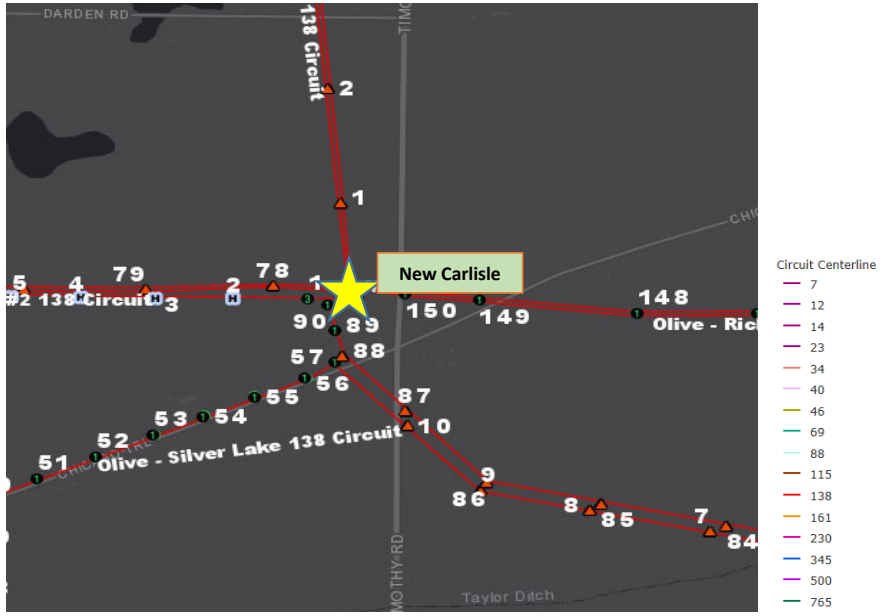
**Supplemental Project Driver:** Equipment Material/Condition/Performance/Risk

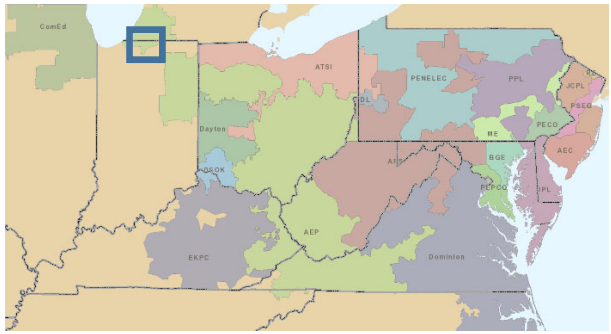
**Specific Assumptions Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**Problem Statement:**

**New Carlisle 138kV Circuit Breaker A:**

- Only air trip breaker remaining at the station and is not preferred due to potential large air leaks which will cause the breaker to not trip before a lockout situation occurs. The air system is not designed to produce dry air, which in turn means that rusting and damaging components are common. Field services have been called out numerous times in a lockout position due to frozen airlines.
- Only remaining 2000A 40kA breaker left at the station
- Trip timing results are beginning to increase and major maintenance will soon be required. Trip timing results are roughly 9ms higher than what the manual recommends (less than 33 milliseconds).



# AEP Transmission Zone M-3 Process
## New Carlisle Breaker A

**Need Number:** AEP-2022-IM018

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Solution:**

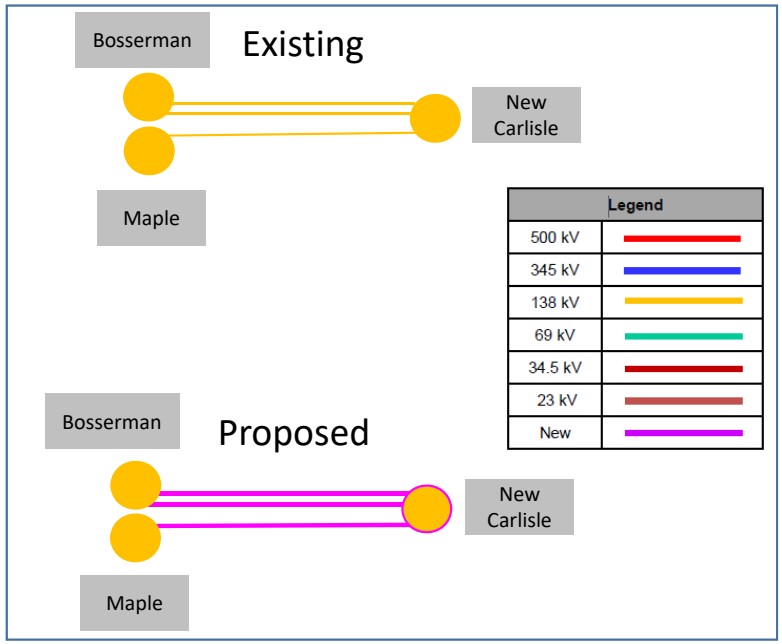
New Carlisle 138 kV station: Replace 138kV circuit breaker A with a new 3000A 63kA circuit breaker. **Estimated Cost: $0.35M**

**Total Estimated Transmission Cost: $0.35M**

**Proposed In Service Date:** 10/28/2024

**Supplemental Project ID:** s2851

**Status:** Scoping



**Need Number:** AEP-2021-IM034

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**

Solution Meeting 12/16/2022

Needs Meeting 11/19/2021

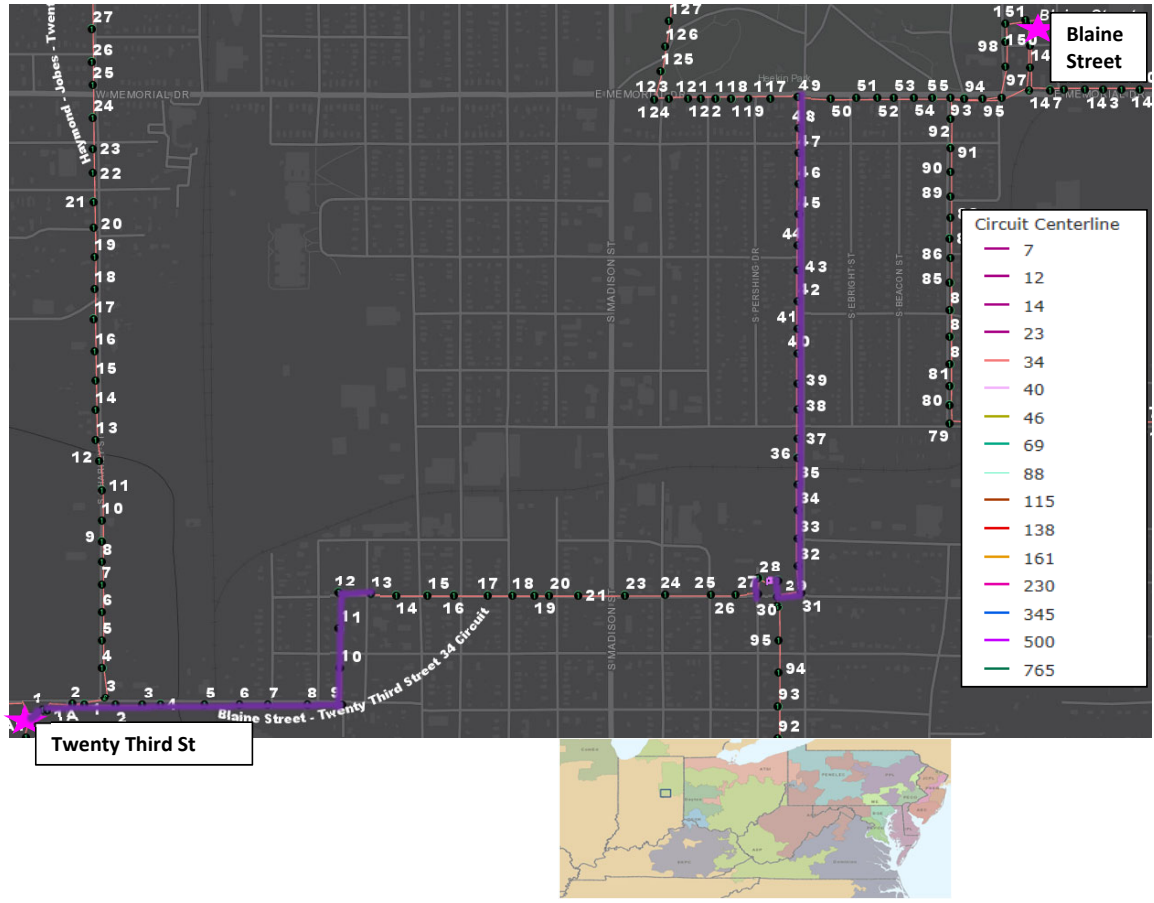
**Project Driver:** Equipment Material Condition, Performance and Risk

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

**Problem Statement:**

**Twenty Third Street – 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:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**

Solution Meeting 12/16/2022

Needs Meeting 11/19/2021

**Project Driver:** Equipment Material Condition, Performance and Risk

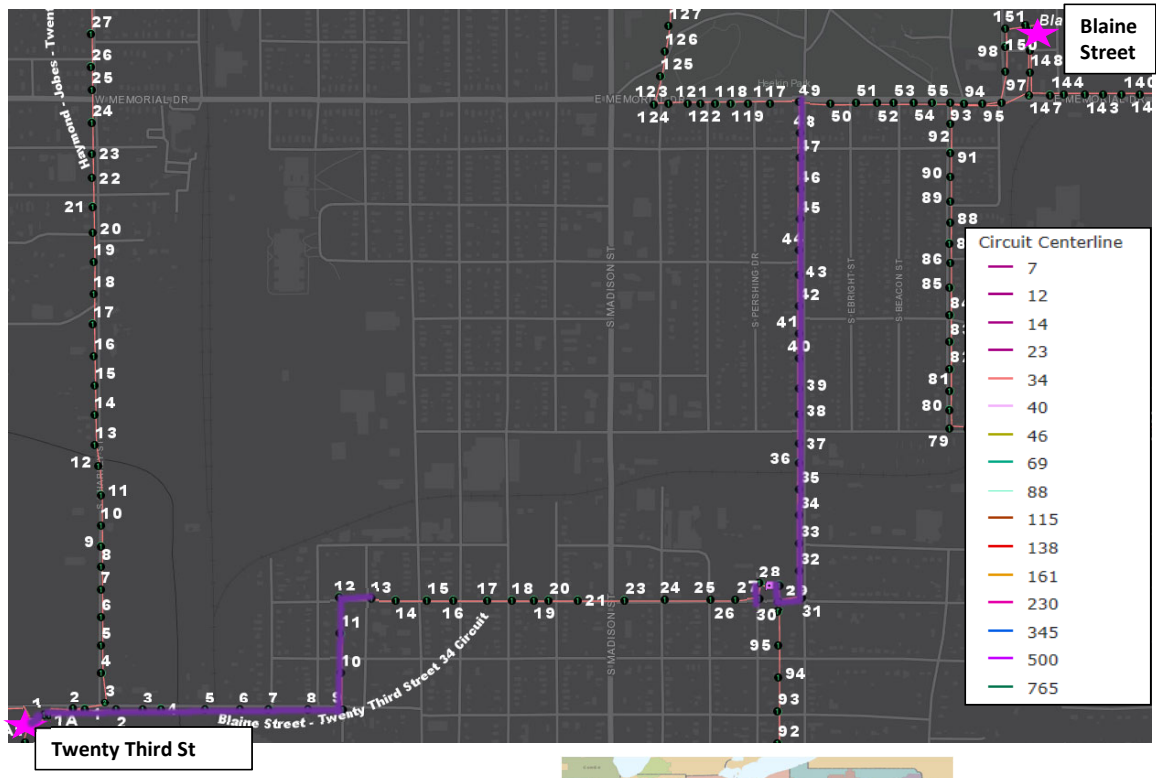
**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

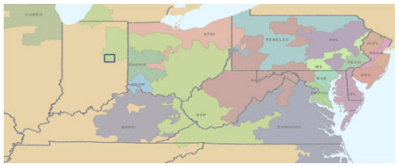
**Problem Statement: Twenty Third Street 138/34.5 kV transformer #1:**

- 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 faiure or loss of service of the transformer.



**Need Number:** AEP-2021-IM034

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**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 (s2854.1)**

Twenty Third Street station:

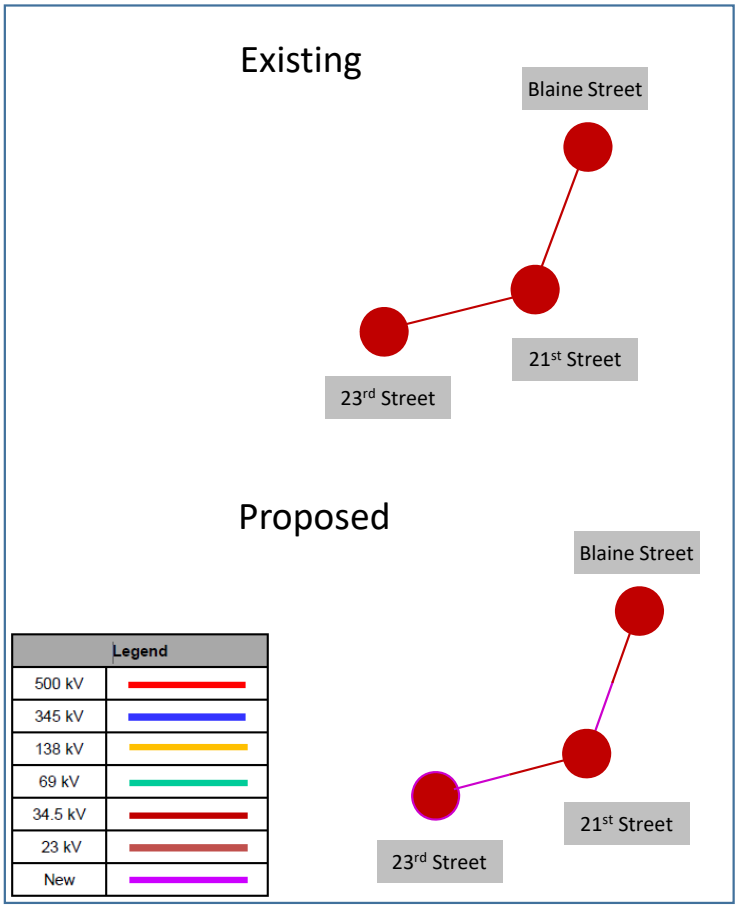
Replace the Twenty Third Street 138/34.5 kV transformer #1 and transformer #2 with two 138/69/34.5 kV 90 MVA transformers. The following cost includes install and removal.
**Cost: $5.36M (s2854.2)**

**Total Cost: $12.36M**

**Projected In-Service:** 10/15/2026

**Supplemental Project ID:** s2854.1-.2

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Union County, Ohio

**Need Number:** AEP-2021-OH040

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**

Solutions Meeting 12/16/2022

Updated Needs Meeting 1/21/2022

Needs Meeting 7/16/2021

**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:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**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 (s2855.1)**
- **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 (s2855.2)**
- **Kileville-Shire (Customer) 138 kV:** Two tie lines to the customer's facility. **Estimated Cost: $0.05 M (s2855.3)**
- **Amlin & Hyatt 138 kV Stations:** Remote end relay settings work. **Estimated Cost: $0.677 M (s2855.4)**
- **Temporary Kileville Skid Station:** Temporary customer power required. **Estimated Cost: $0.00 M (s2855.5)**

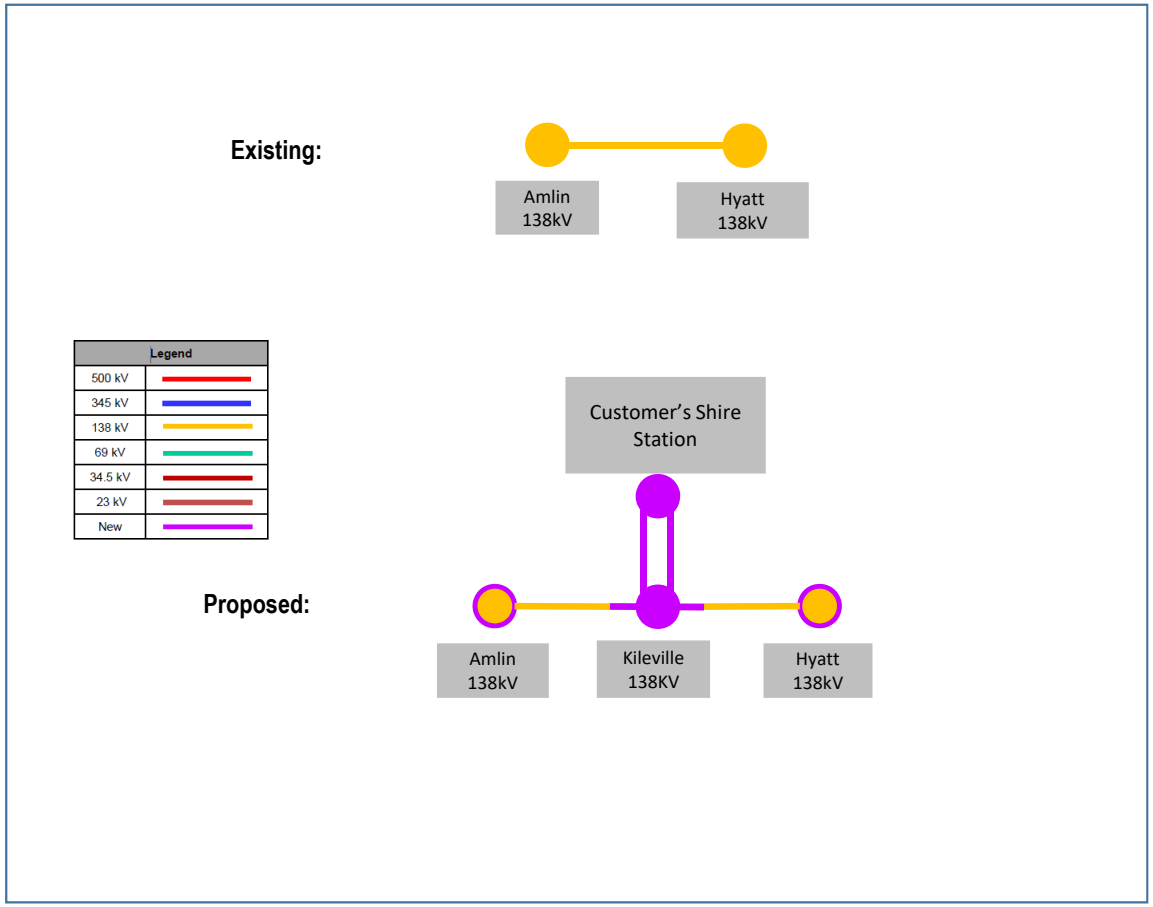
**Total Estimated Transmission Cost: $15.85 M**

**Projected In-Service:** 7/31/2023

**Supplemental Project ID:** s2855.1-.5

**Project Status:** Scoping/Engineering

**Model:** RTEP 2027



# AEP Transmission Zone M-3 Process
# West Coshocton Station Upgrade

**Need Number:** AEP-2021-OH048

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**
Solution Meeting 12/16/2022
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:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**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**

**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.

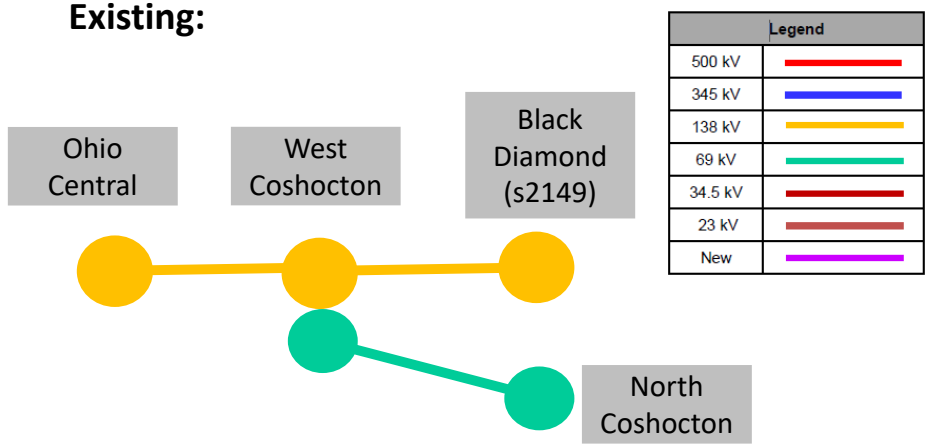
**Projected In-Service:** 12/1/2025

**Supplemental Project ID:** s2856

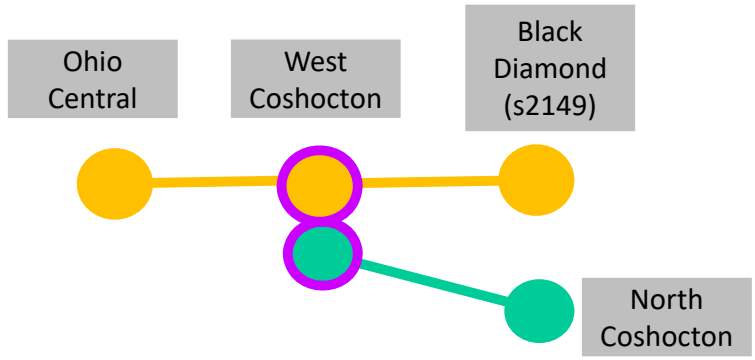
**Project Status**: Scoping

**Model:** 2027 PJM RTEP

**Existing:**




**Proposed:**



# AEP Transmission Zone M-3 Process
# Green Chapel

**Need Number:** AEP-2022-OH029

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**

Solutions Meeting 12/16/2022
Need Meeting 04/22/2022

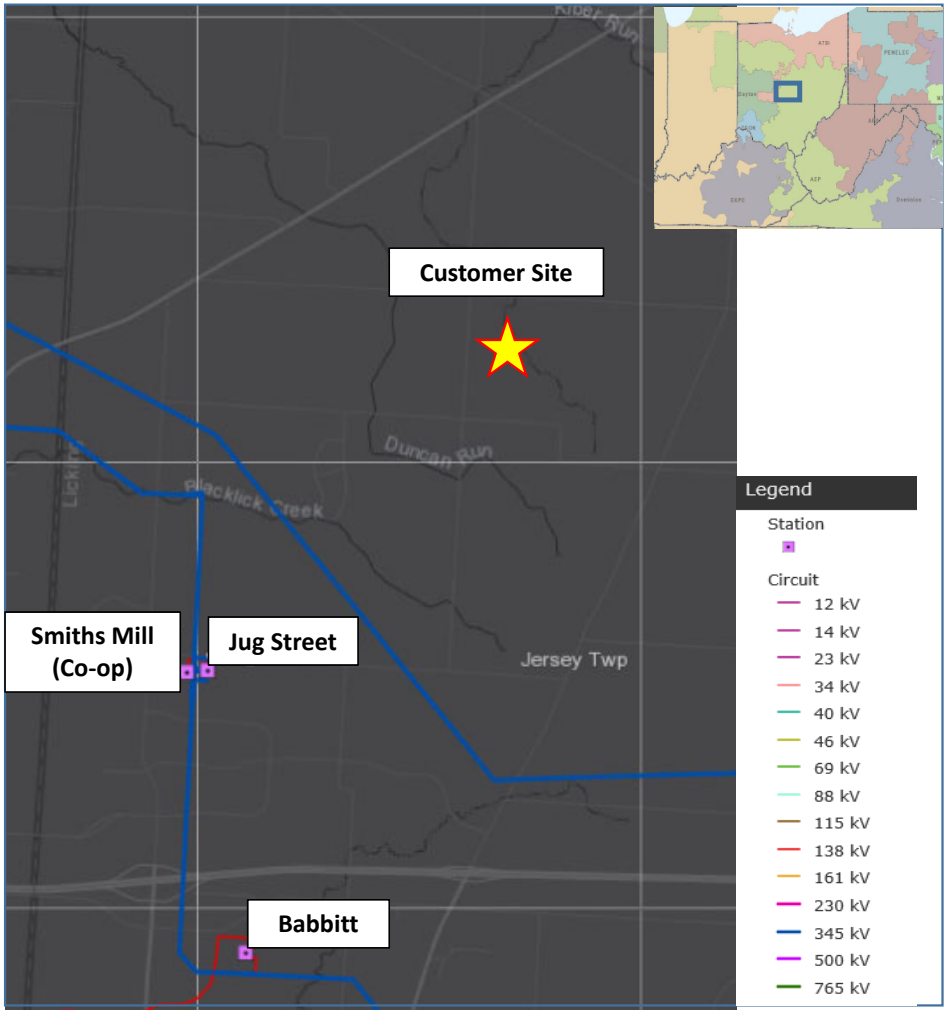
**Project Driver:**
Customer Service

**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.



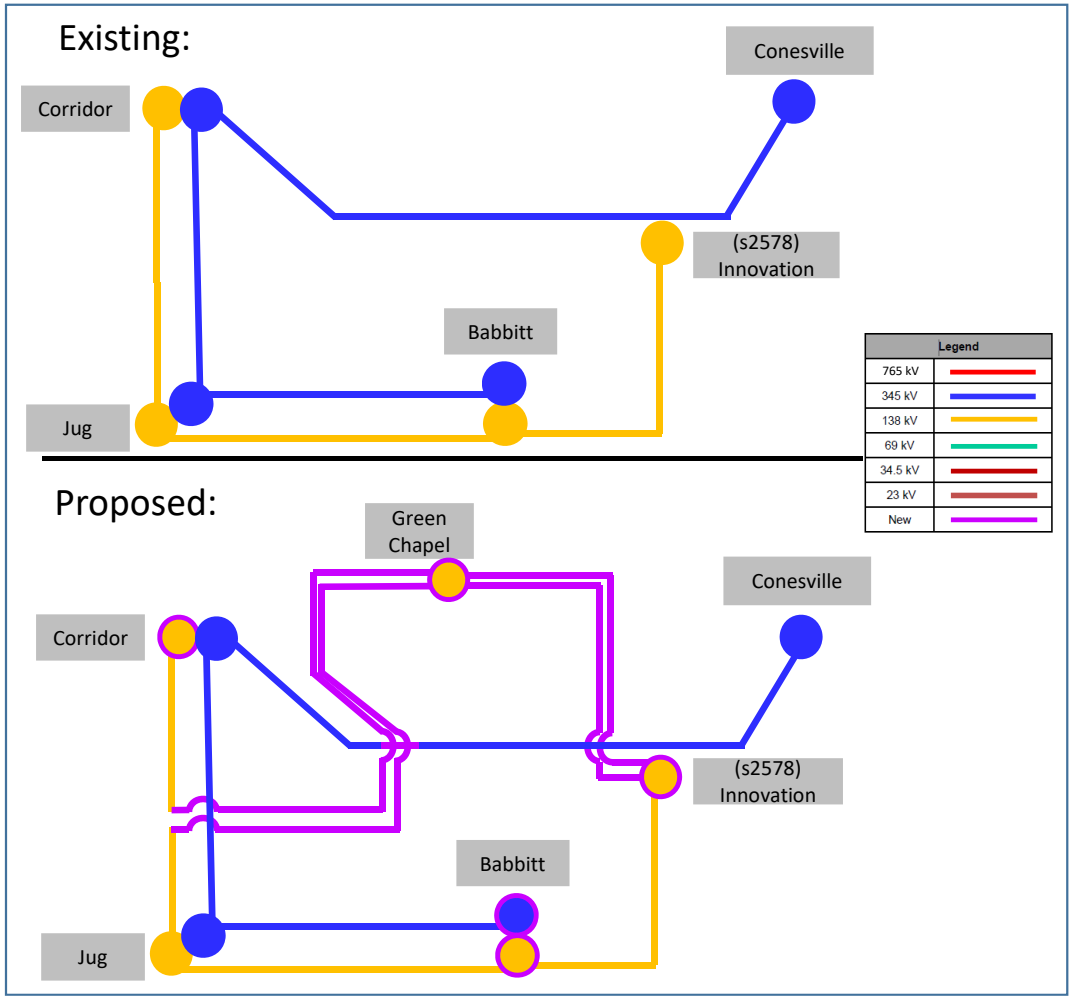
# AEP Transmission Zone M-3 Process
# Green Chapel

**Need Number:** AEP-2022-OH029

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**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 (s2857.1)**
- **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 (s2857.2)**
- **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 (s2857.3)**
- **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 (s2857.4)**
- **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 (s2857.5)**
- **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 (s2857.6)**



# AEP Transmission Zone M-3 Process
# Green Chapel

**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 (s2857.7)**
- **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 (s2857.8)**
- **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 (s2857.9)**

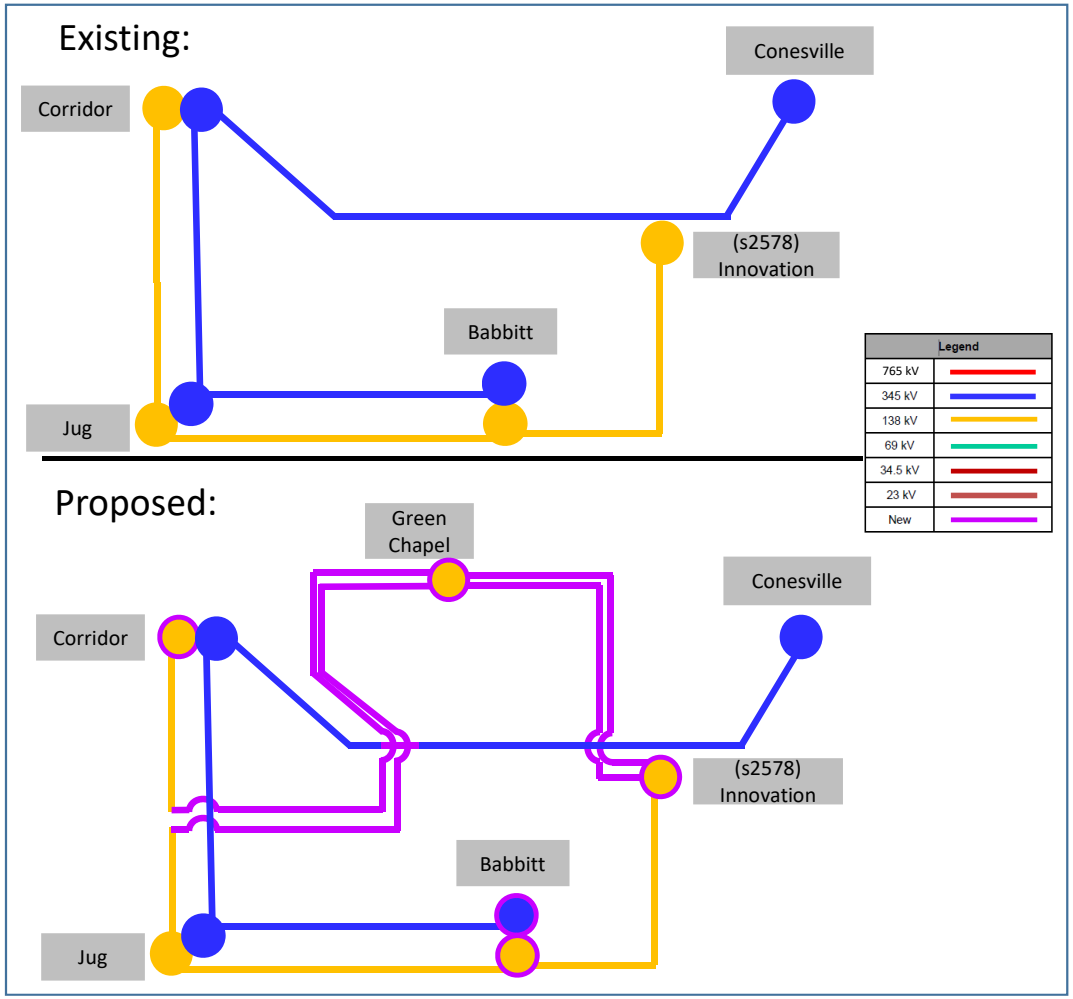
**Total Estimated Transmission Cost: $86.75M**

**Projected In-Service:** 5/31/2024

**Supplemental Project ID:** s2857.1-.9

**Project Status:** Scoping/Engineering

**Model:** 2027 RTEP



# AEP Transmission Zone M-3 Process
# Jug Station Capacity Expansion

**Need Number:** AEP-2022-OH062

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously Presented:**

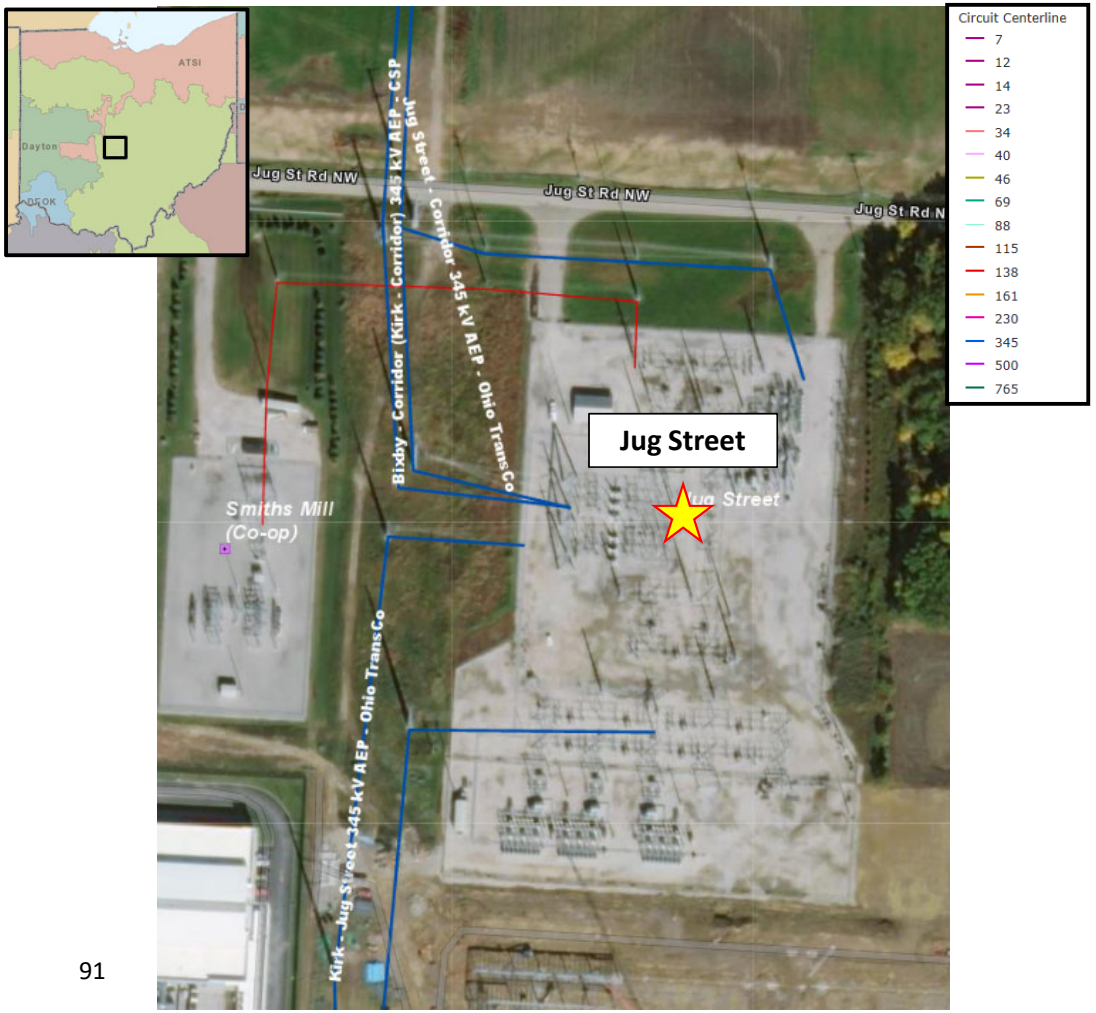
Solutions Meeting 12/16/2022
Need Meeting 08/19/2022

**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:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**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**

**Projected In-Service:** 06/01/2024

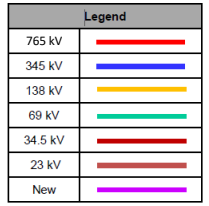
**Supplemental Project ID:** s2858

**Project Status:** Scoping/Engineering

**Model:** 2027 RTEP

Existing:


Proposed:

# AEP Transmission Zone M-3 Process
# Findlay, Ohio

**Need Number:** AEP-2022-OH065

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**Previously presented:**

Solutions Meeting 12/16/2022

Need Meeting 9/16/2022

**Supplemental Project Driver:**

Customer Service

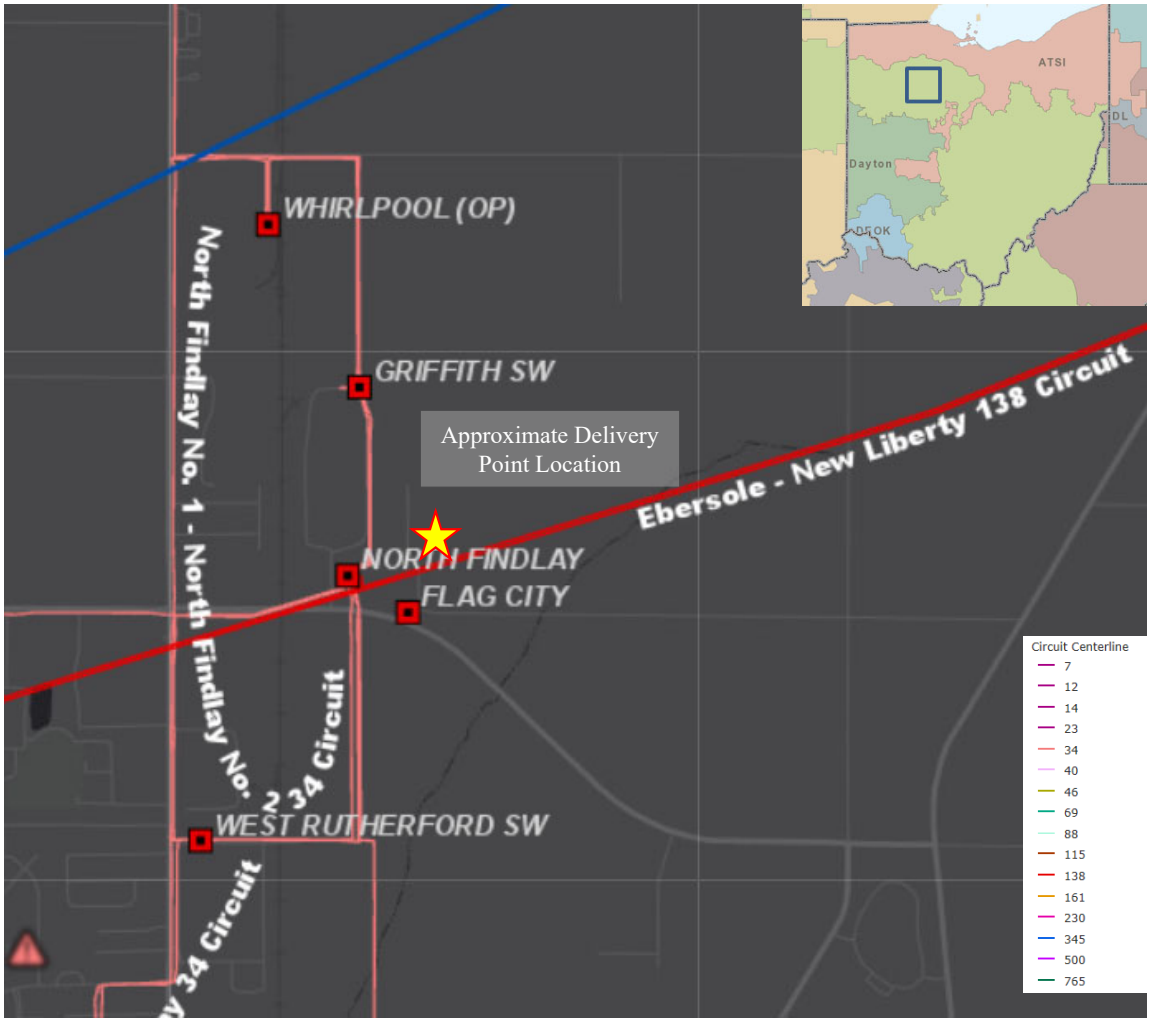
**Specific Assumption Reference:**

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:** Submission of Supplemental Project for inclusion in the Local Plan 3/28/2023

**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)**

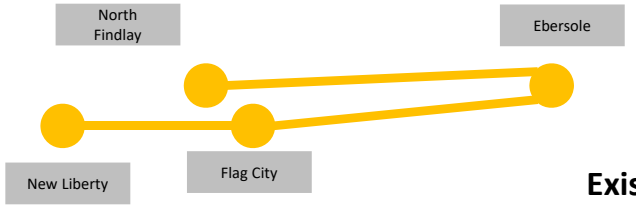
**Model:** PJM 2027 RTEP case

**Projected In-Service**: 03/17/2023

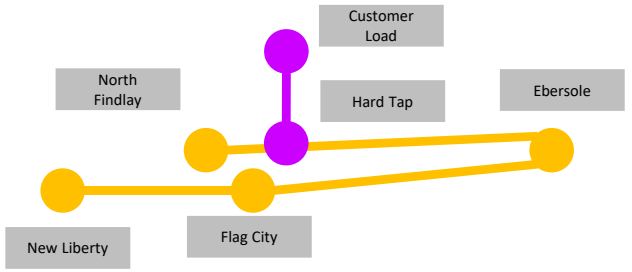
**Supplemental Project ID:** s2852

**Project Status:** Scoping

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




**Existing**




**Proposed**

# AEP Transmission Zone M-3 Process
# Columbus, Ohio

**Need Number:** AEP-2019-OH020

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Previously Presented:**

Solutions Meeting 1/20/2023

Needs Meeting 4/23/2019

**Supplemental Project Driver:**

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

**Specific Assumption References:**

AEP Guidelines for Transmission Owner Identified Needs

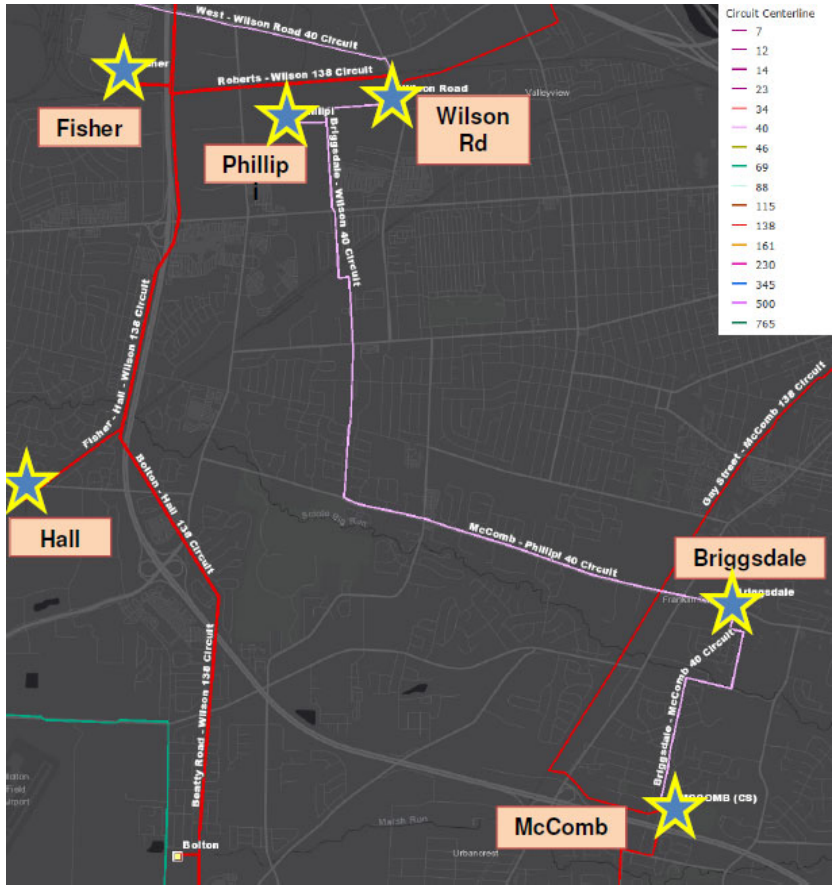
**Problem Statement:**

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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Problem Statement Continued:**

McComb Station

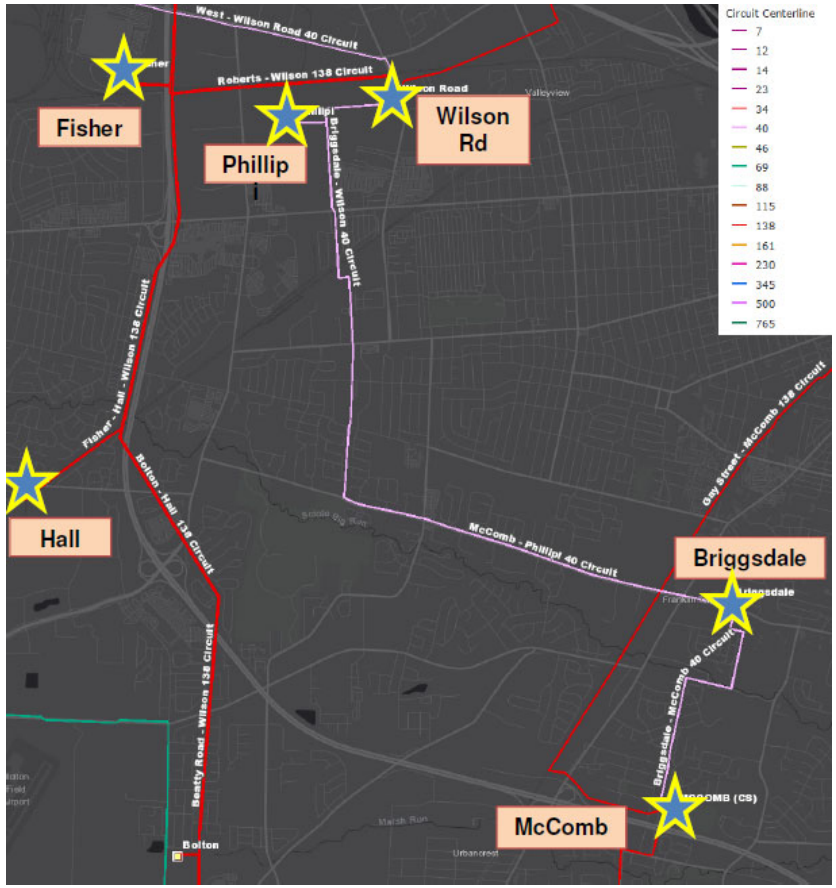
- 5 – 46kV: (CBs 41-45) oil type breakers
  - Fault Operations: (CB-42 = 15 & CB-43 = 26)
- 1 – 138kV CS-CC (Mark V): This model of switcher has been identified for replacement due to lack of spare part availability, historical reliability, and lack of vendor support. It also has 16 fault operations.
- 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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Solution:**

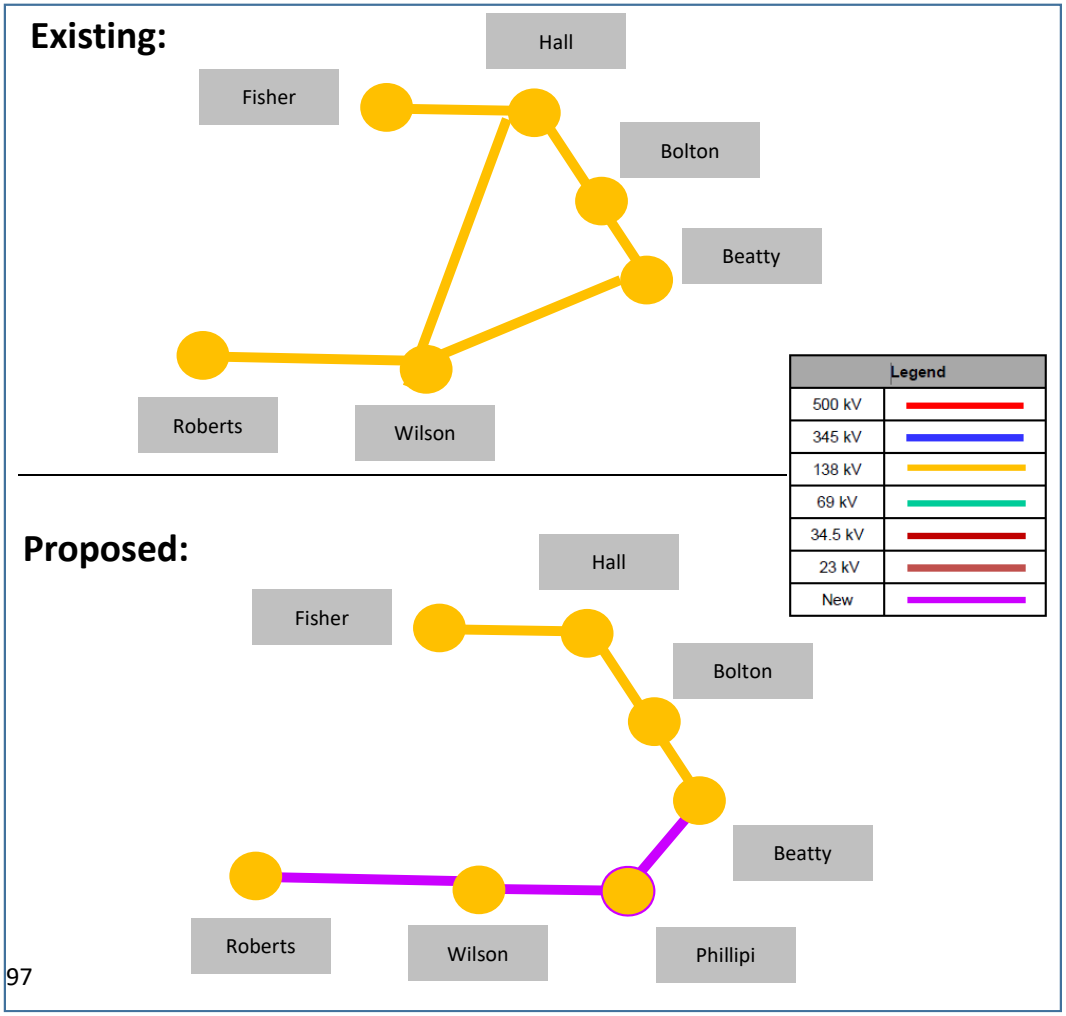
- Install a new seven breaker 138 kV ring bus utilizing 3000A 63kA breakers to replace the existing Wilson Rd ring bus. Retire the 40kV equipment at Wilson Rd. **Estimated Cost: $8 M (s2882.1)**
- Rebuild the existing 0.7 miles triple circuit line between structure 47 and Wilson Rd as double circuit 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 (s2882.2)**
- 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 (s2882.3)**
- 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 (s2882.4)**
- Retire the 5.45 mile 40kV circuit between Wilson and McComb. **Estimated Cost: $1.1 M (s2882.5)**
- 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 (s2882.6)**

**Total Estimated Transmission Cost: $13.7 M**

**Projected In-Service:** 6/30/2025

**Supplemental Project ID:** s2882.1-.6

**Project Status:** Engineering



# AEP Transmission Zone M-3 Process
# Natrium, West Virginia

**Need Number:** AEP-2021-OH016

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Previously Presented:**

Solution Meeting 01/20/2023

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

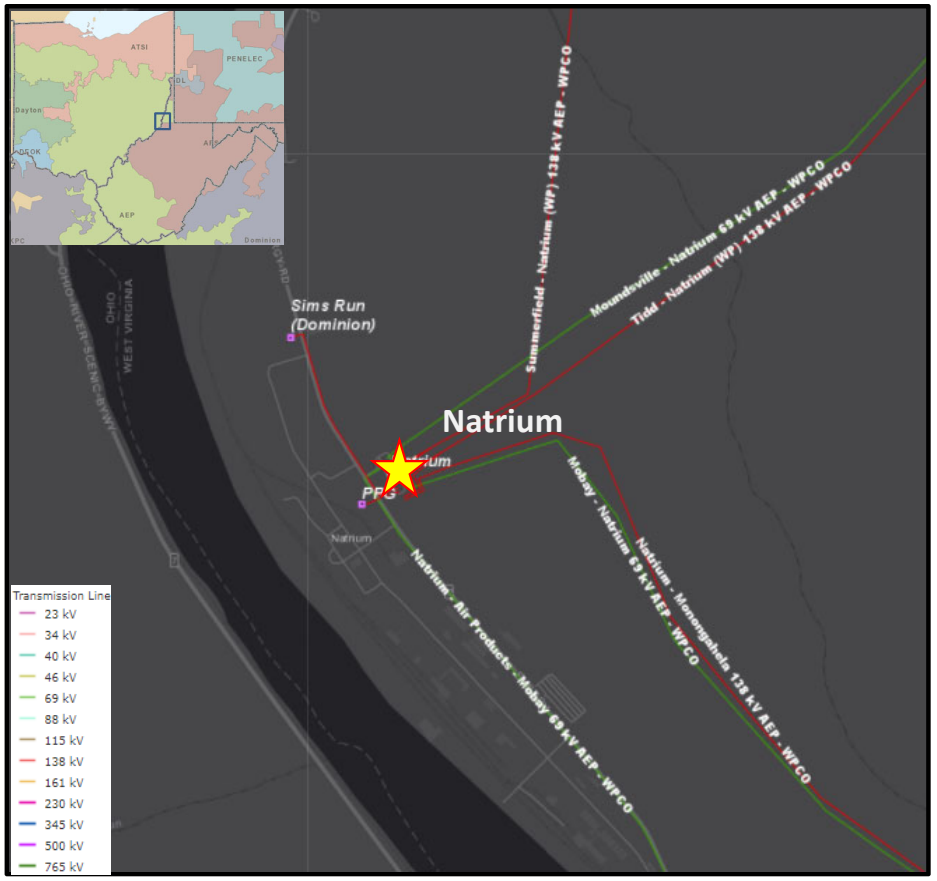
- Breaker Age:
  - 1960'-70's vintage
  - Interrupting Medium: (Oil)
- Fault Operations:
  - Number of Fault Operations: C: 2, E: 28, L: 8, P: 67
- These breakers are oil filled without oil containment; oil filled breakers have much more maintenance requirements due to oil handling that their modern, 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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Previously Presented:**

Solution Meeting 01/20/2023

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:

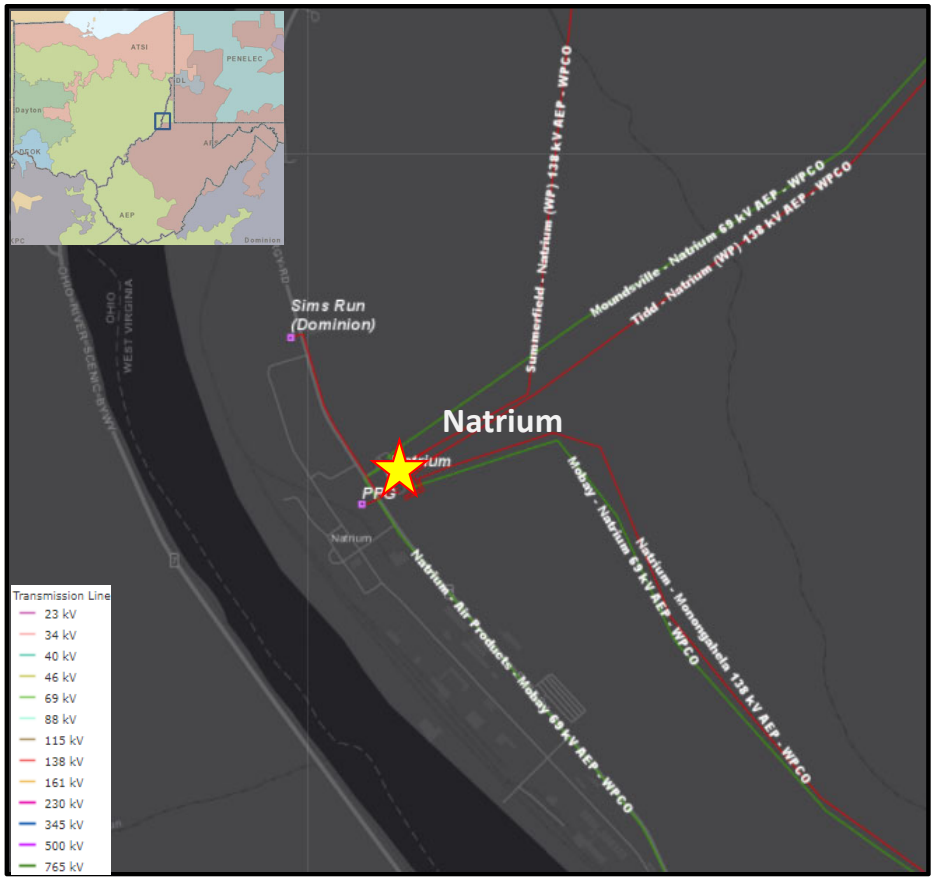
- The station contains two control houses. The older building (1947 vintage) has various issues: leaking roof, asbestos, access issues, broken HVAC, and completely full cable trenches.
- The station service for the 69kV & 12kV yard is from a corner-ground source, which is a safety concern.
- Yard cabinets 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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Previously Presented:**

Solution Meeting 01/20/2023

Need Meeting 7/16/2021

**Project Driver:**

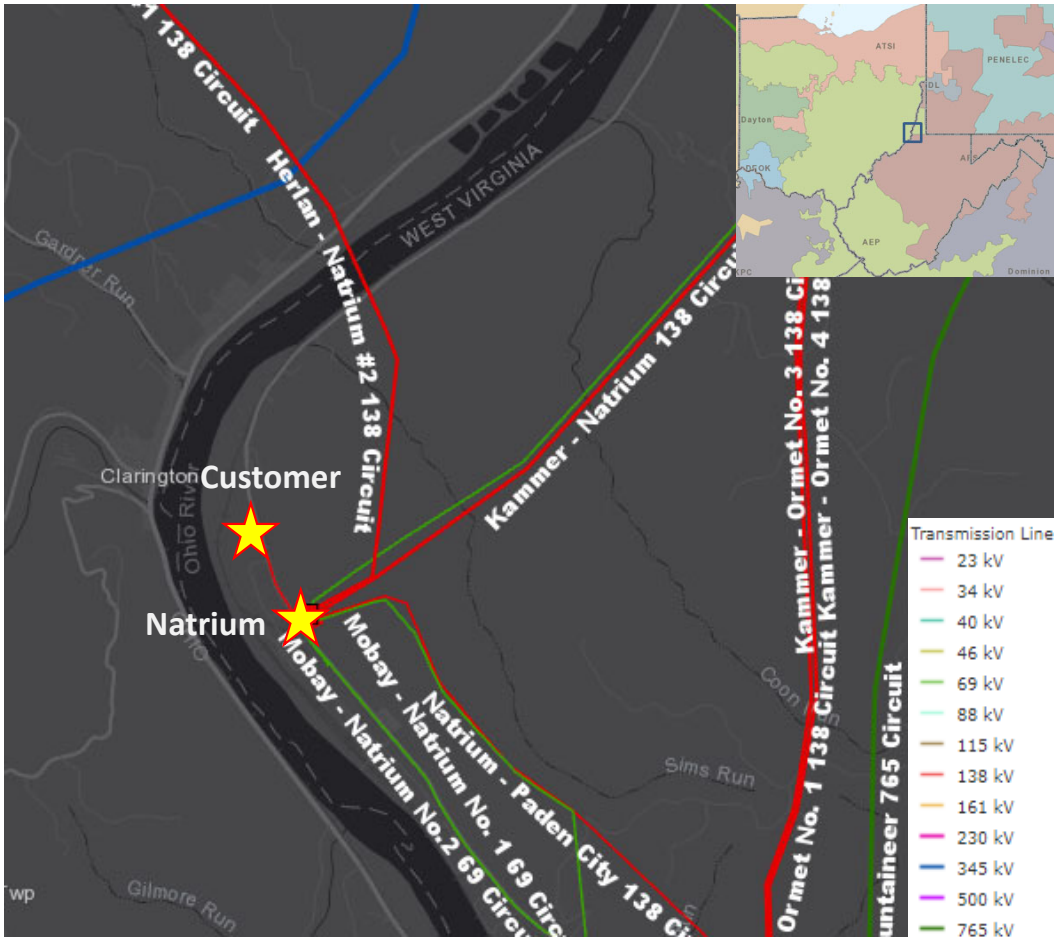
Operational Flexibility and Efficiency

**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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**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 **(s2883.1)**
- 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 **(s2883.2)**
- 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 **(s2883.3)**

**Total Transmission Cost: $22.07 Million**

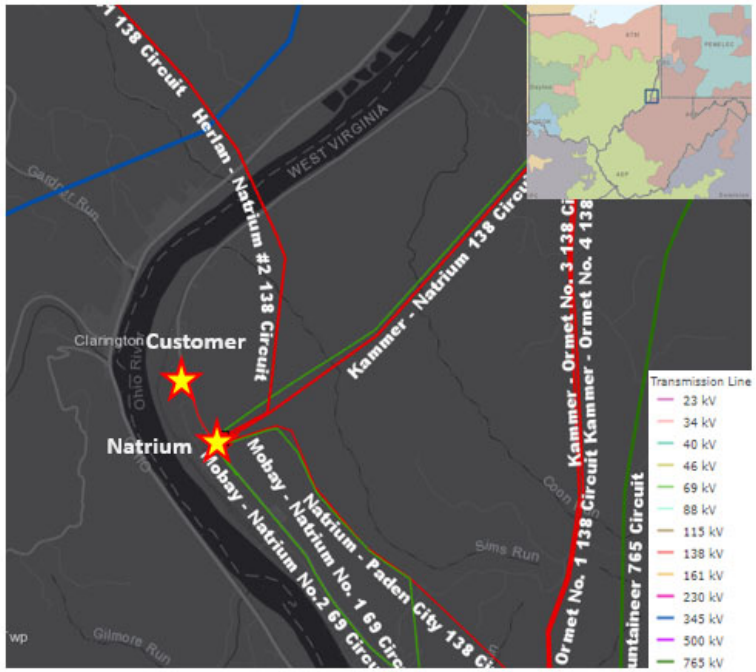
**Ancillary Benefits:** Greatly improves the operational and protection design of the station, by converting the 2- 138kV straight buses and 2- 69kV straight buses to a breaker-and-a-half design. This will improve the long-term reliability of the 138 & 69kV facilities served from Natrium, including several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

**Projected In-Service:** 12/1/2024

**Supplemental Project ID:** s2883.1-.3

**Project Status**: Scoping

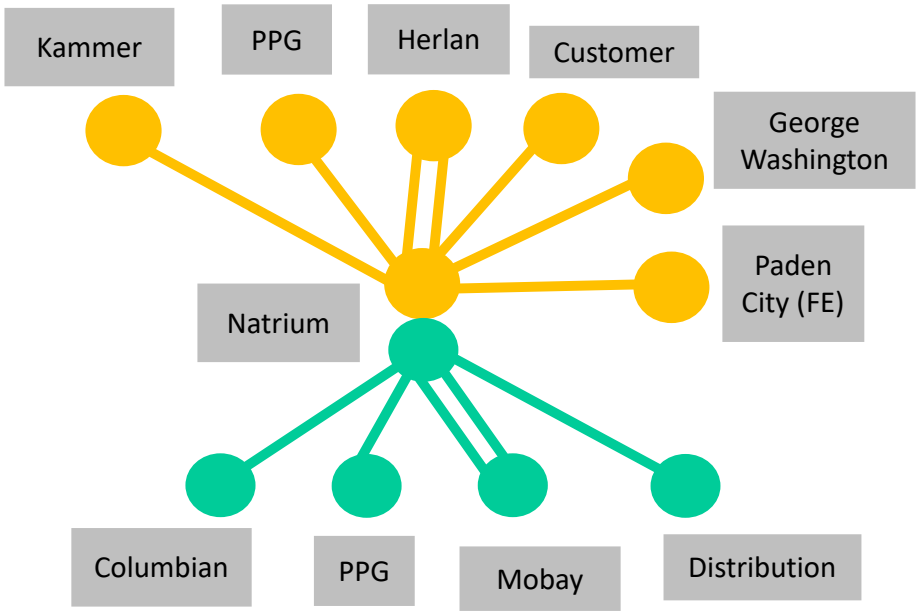
**Model:** 2027 PJM RTEP



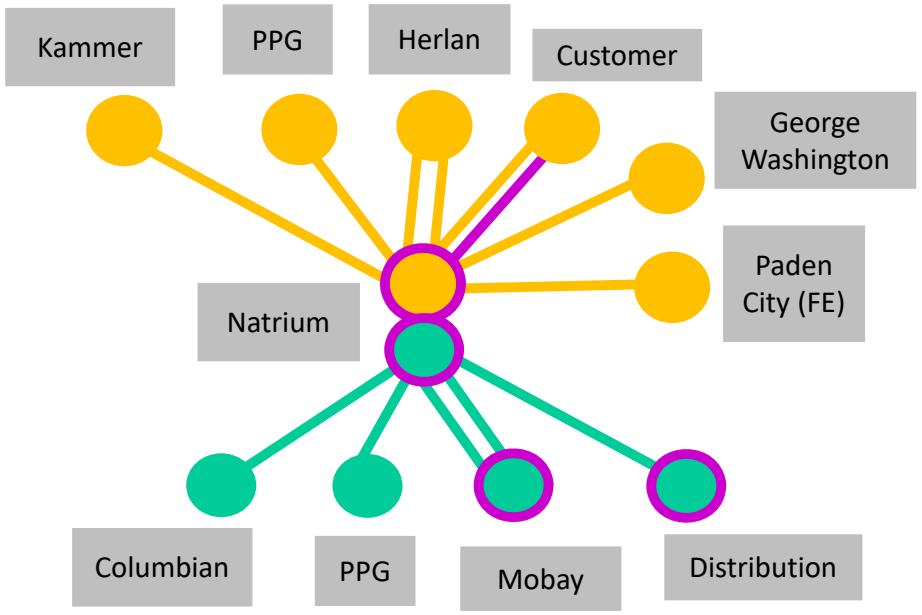
# AEP Transmission Zone M-3 Process
# Natrium Station Upgrade

| 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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Previously Presented**:

Solution Meeting 1/20/2023

Need Meeting 11/19/2021

**Project Driver:**

Equipment Material/Condition/Performance/Risk

**Specific Assumption Reference:**

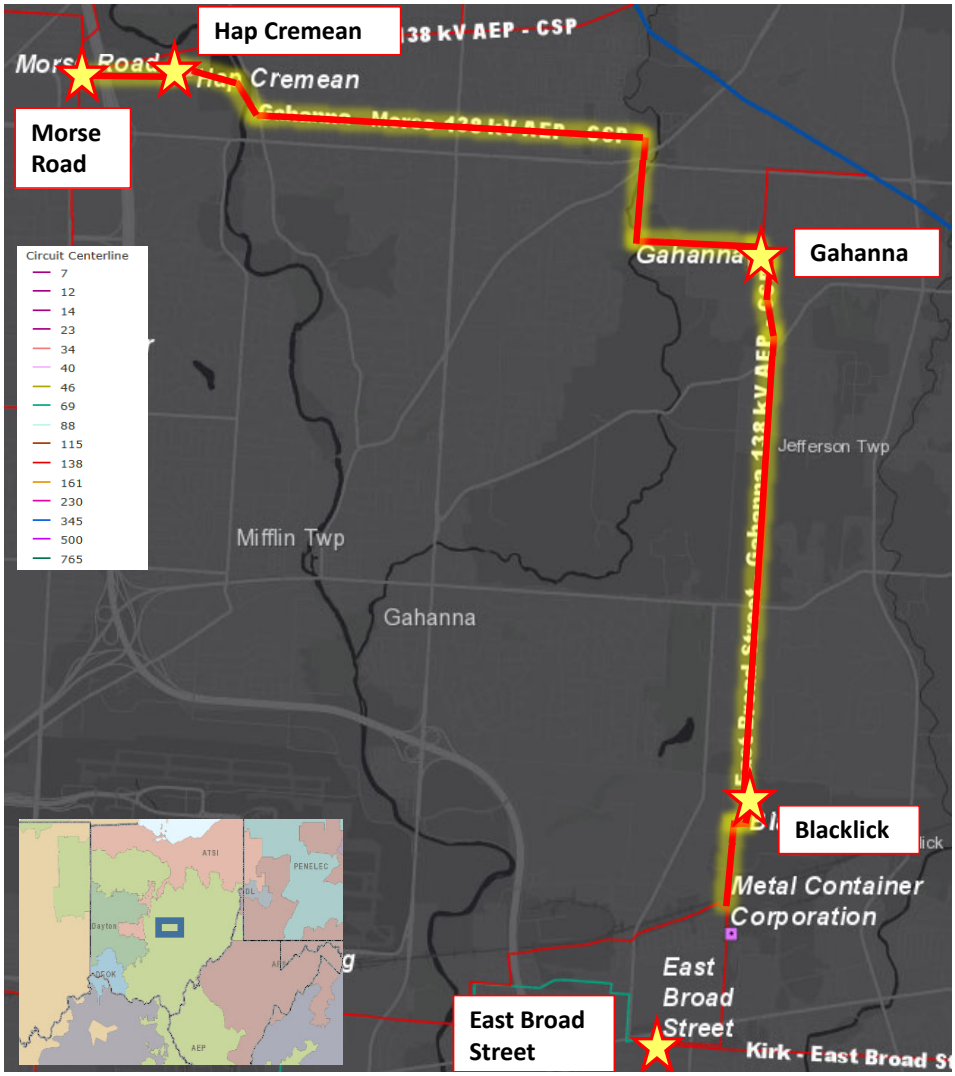
AEP Guidelines for Transmission Owner Identified Needs (slide 13)

**Problem Statement:**

Equipment Material/Condition/Performance/Risk:

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

- 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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Project Driver (continued):**

Equipment Material/Condition/Performance/Risk

**Specific Assumption Reference:**

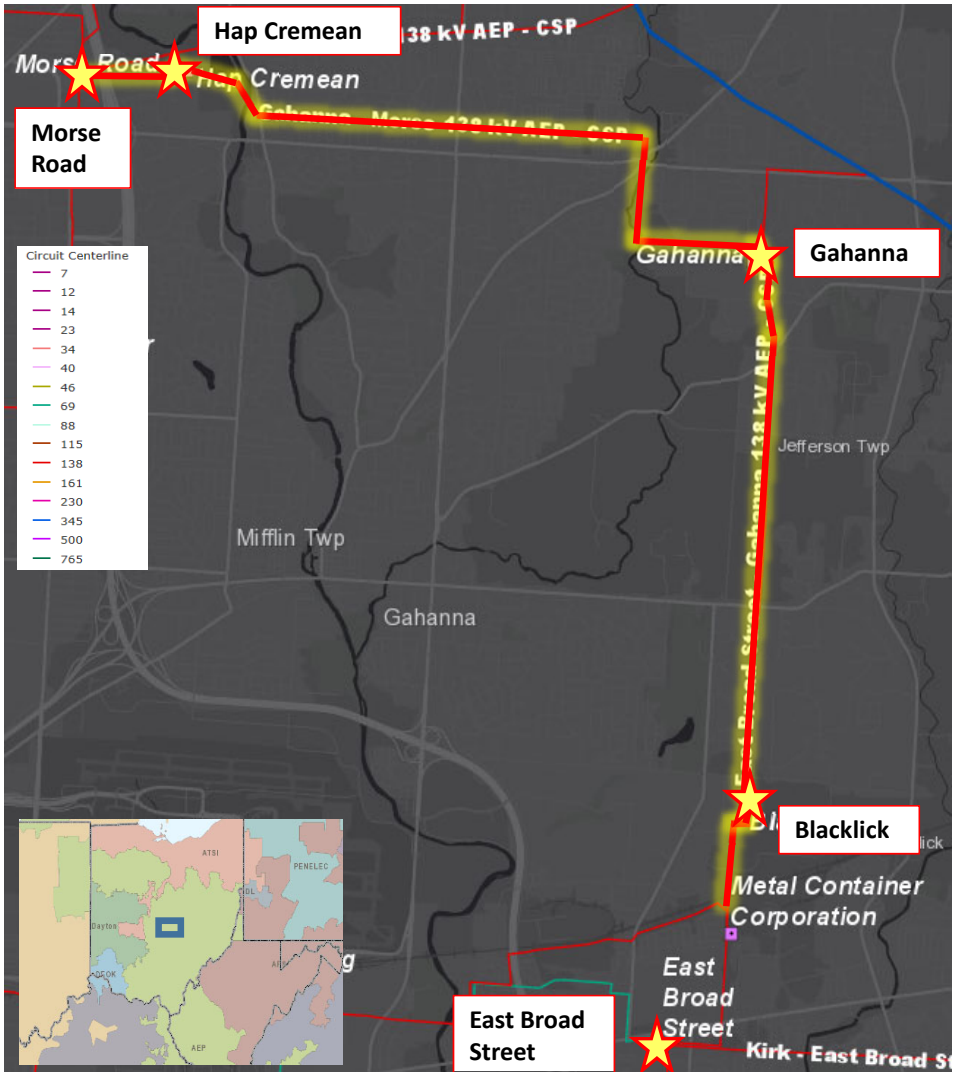
AEP Guidelines for Transmission Owner Identified Needs (slide 13)

**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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**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 (s2884.1)**
- 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 (s2884.2)**
- 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 (s2884.3)**
- Morse Road 138kV station: Telecom upgrades. **Estimated Cost: $ 0.025M (s2884.4)**
- Hap Cremean 138kV station: Install remote end relay upgrades, CCVTs, telecom multiplexer, & remove wave trap. **Estimated Cost: $ 0.508M (s2884.5)**
- Gahanna 138kV station: Install remote end relay upgrades, telecom multiplexer, & remove wave trap. **Estimated Cost: $ 0.497M (s2884.6)**
- Blacklick 138kV station: Install remote end relay upgrades, CCVTs, Telecom Multiplexer, & remove wave trap. **Estimated Cost: $ 0.681M (s2884.7)**
- East Broad Street 138kV station: Install remote end relay upgrades, telecom upgrades, CCVTs, & remove wave trap. **Estimated Cost: $ 0.482M (s2884.8)**

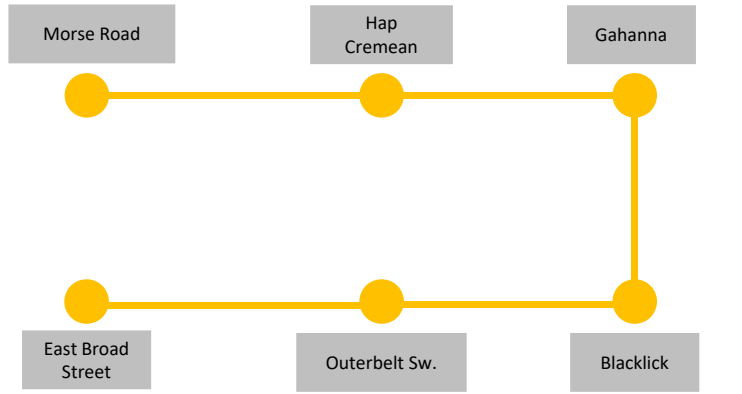
**Total Estimated Transmission Cost: $ 29.68M**

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

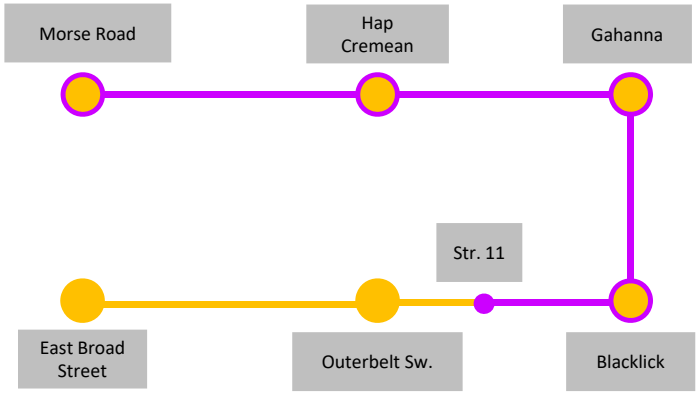
**Supplemental Project ID:** s2884.1-.8

**Project Status:** Scoping

**Existing:**




**Proposed:**



# AEP Transmission Zone M-3 Process
# Dover, Ohio

**Need Number:** AEP-2022-OH031

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Previously Presented:**

Solution Meeting 01/20/2023

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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**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 **(s2885.1)**
- Extend a 0.4-mile radial 69kV transmission line to reach the customer's substation. $1.06 million **(s2885.2)**
- Modify the East Dover-West Dover 69kV transmission line, to connect to the new 3-way switch. $0.81 Million **(s2885.3)**

**Total Estimated Transmission Cost: $2.87 Million**

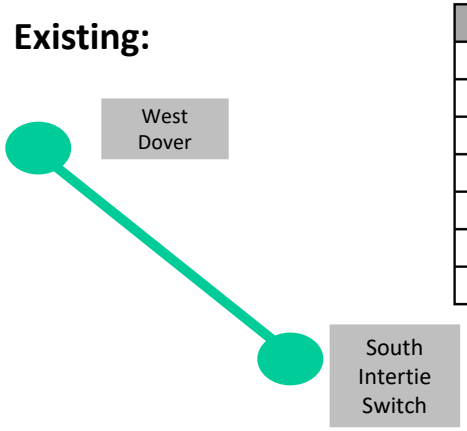
**Projected In-Service:** 06/01/2023

**Supplemental Project ID:** s2885.1-.3

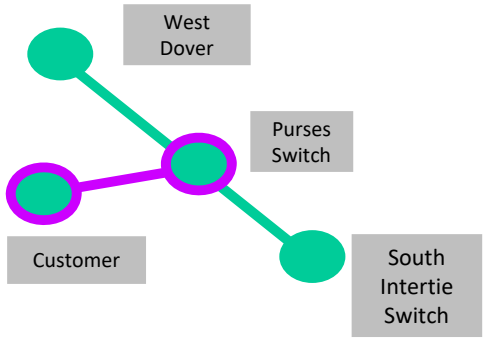
**Project Status:** Engineering

**Model:** 2027 PJM RTEP

**Existing:**




**Proposed:**



# AEP Transmission Zone M-3 Process
# Perry County, Ohio

**Need Number:** AEP-2022-OH032

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Previously Presented:**

Solution Meeting 1/20/2023

Need Meeting 04/22/2022

**Project Driver:**

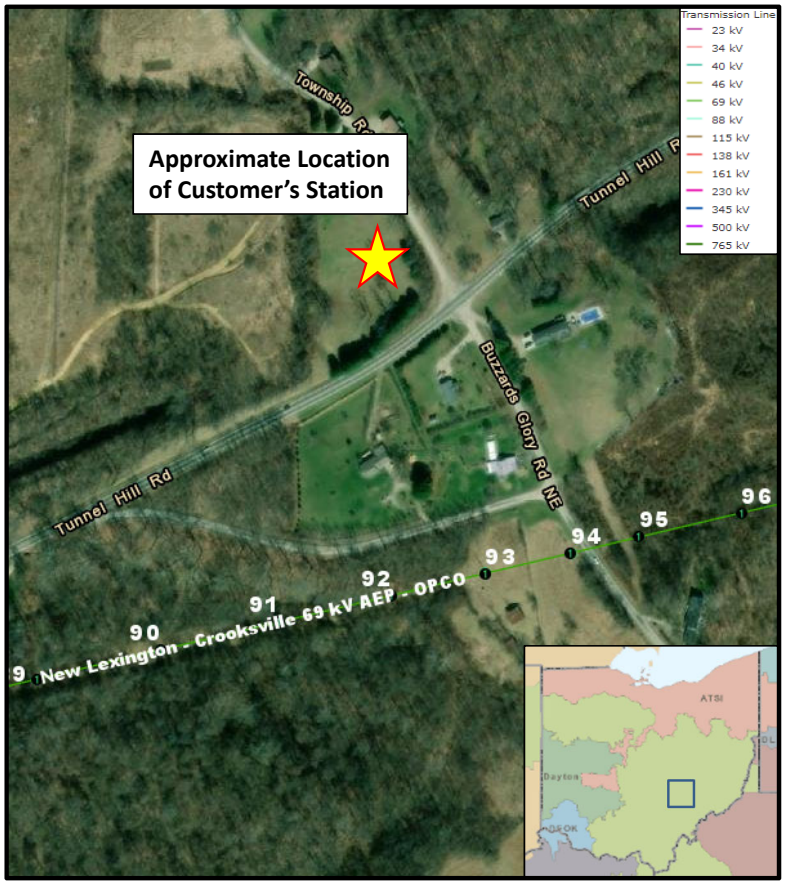
Customer Service

**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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Solution:**

- Install Buzzard Glory 3-way PoP MOAB switch off Crooksville – New Lexington 69 kV line **Estimated Cost: $ 0.95M (s2886.1)**
- Cut-in to the Crooksville – New Lexington 69kV line and connect to the new phase over phase switch. **Estimated Cost: $ 0.66M (s2886.2)**
- 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 (s2886.3)**

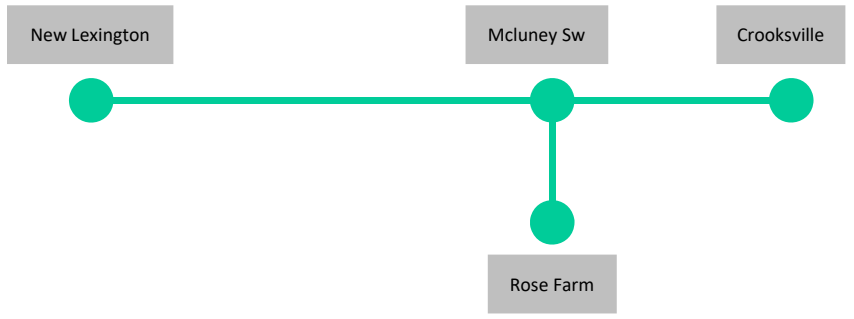
**Total Estimated Transmission Cost: $ 2.13M**

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

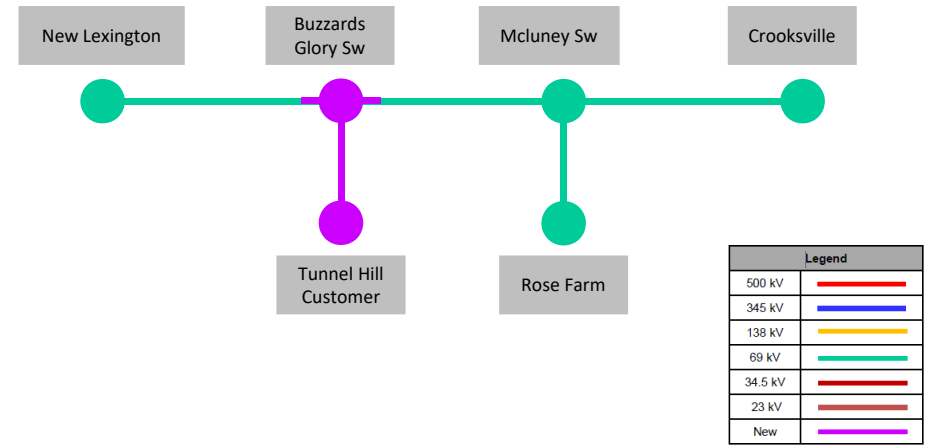
**Supplemental Project ID:** s2886.1-.3

**Project Status:** Scoping

**Existing:**




**Proposed:**



# AEP Transmission Zone: Supplemental
# Giles County, Virginia

**Need Number:** AEP-2020-AP003
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023
**Previously Presented:**
Solutions Meeting 01/20/2023
Needs Meeting 01/17/2020

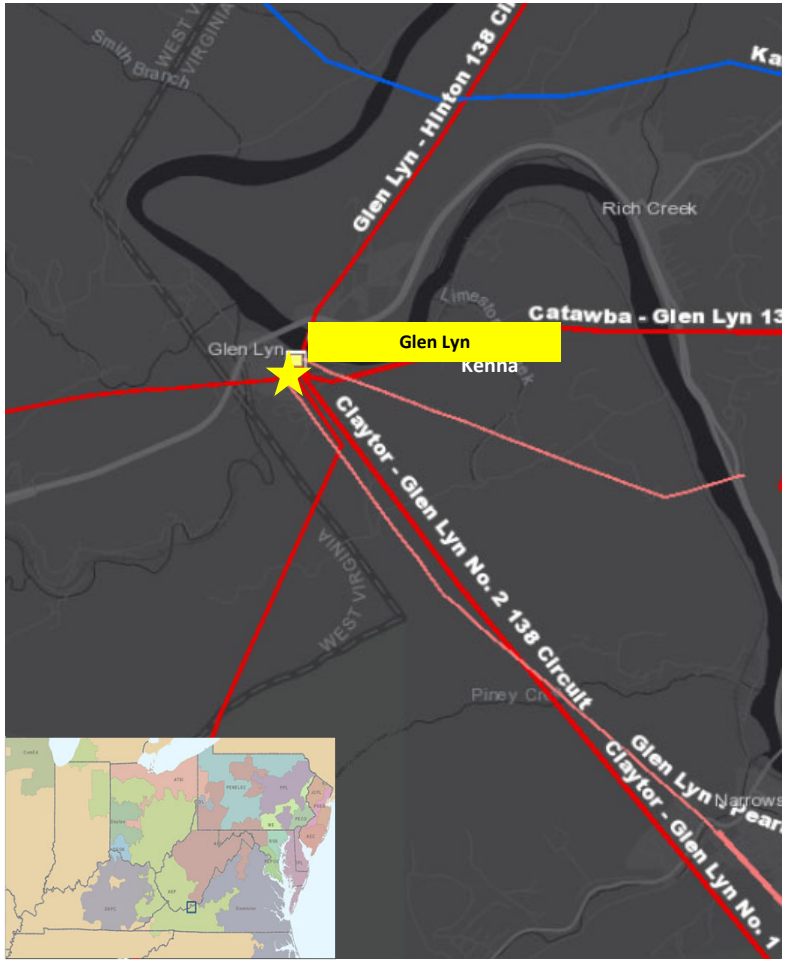
**Supplemental Project Driver:** Equipment Material/ Condition/Performance/Risk, Operational Flexibility and Efficiency

**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.



**Need Number:** AEP-2020-AP003
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023
**Station (continued)**

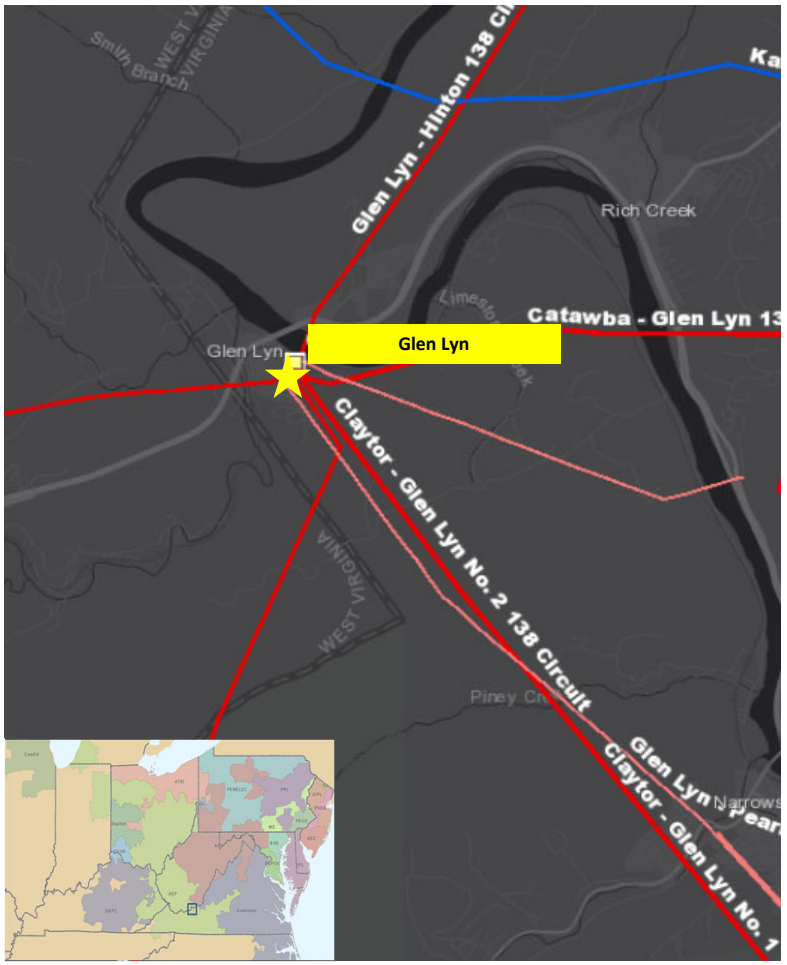
Circuit Breakers AA, AC, AF (34 KV) Concerns:

- 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



**Need Number:** AEP-2020-AP003
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023
**Station (continued)**

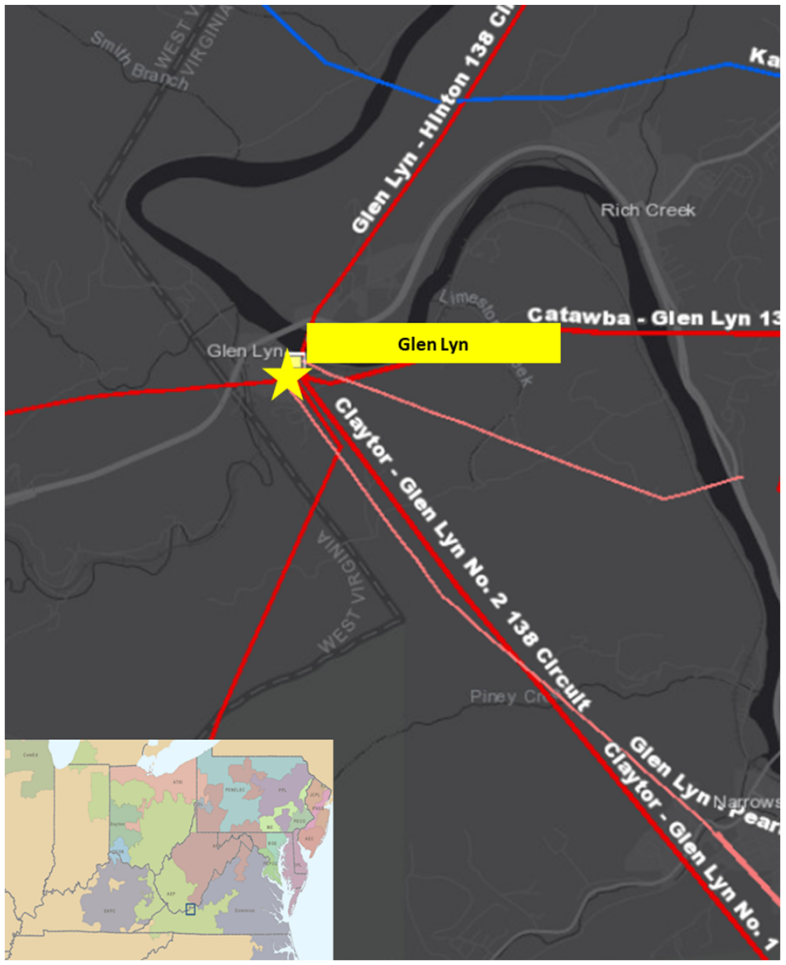
Other station Specific equipment concerns:

- 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: Supplemental
## Giles County, Virginia



**Need Number(s):** AEP-2020-AP003

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**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 **(s2887.1)**
- 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 **(s2887.2)**
- 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 **(s2887.3)**
- 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 **(s2887.4)**
- 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 **(s2887.5)**
- Extend the Glen Lyn – Hinton circuit ~0.1 miles to reconnect the line to the new Glen Lyn station. Estimated cost: $1.8M **(s2887.6)**
- Required work to connect the New Glen Lyn station to the existing fiber network. Estimated cost: $0.71M **(s2887.7)**

**Estimated Total Transmission Cost: $48.18 M**

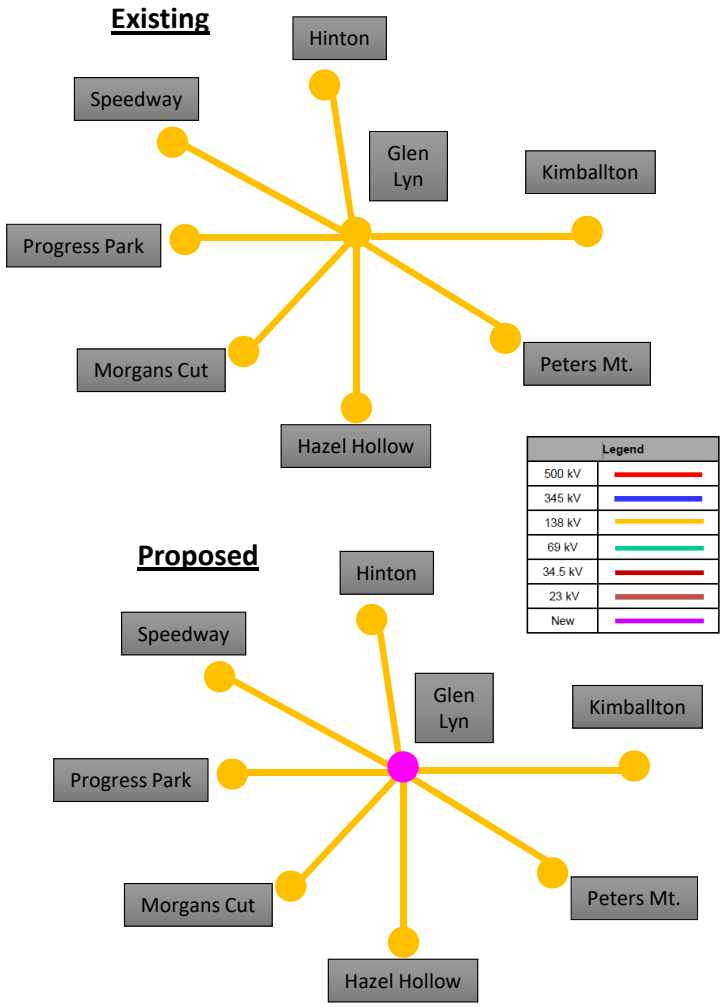
**Ancillary Benefits:** The current Glen Lyn station is configured as two straight buses with a third tie bus. This configuration is problematic when a bus outage is taken because all the 138kV lines connected to the bus are electrically disconnected.
This project will completely rebuild Glen Lyn as 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.

**Projected In-Service:** 6/1/2026

**Supplemental Project ID:** s2887.1-.7

**Project Status:** Scoping

AEP Transmission Zone M-3 Process
Giles County, Virginia



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

**Need Number:** AEP-2022-IM008

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Previously Presented:**

Solution Meeting 01/20/2023

Needs Meeting 2/18/2022

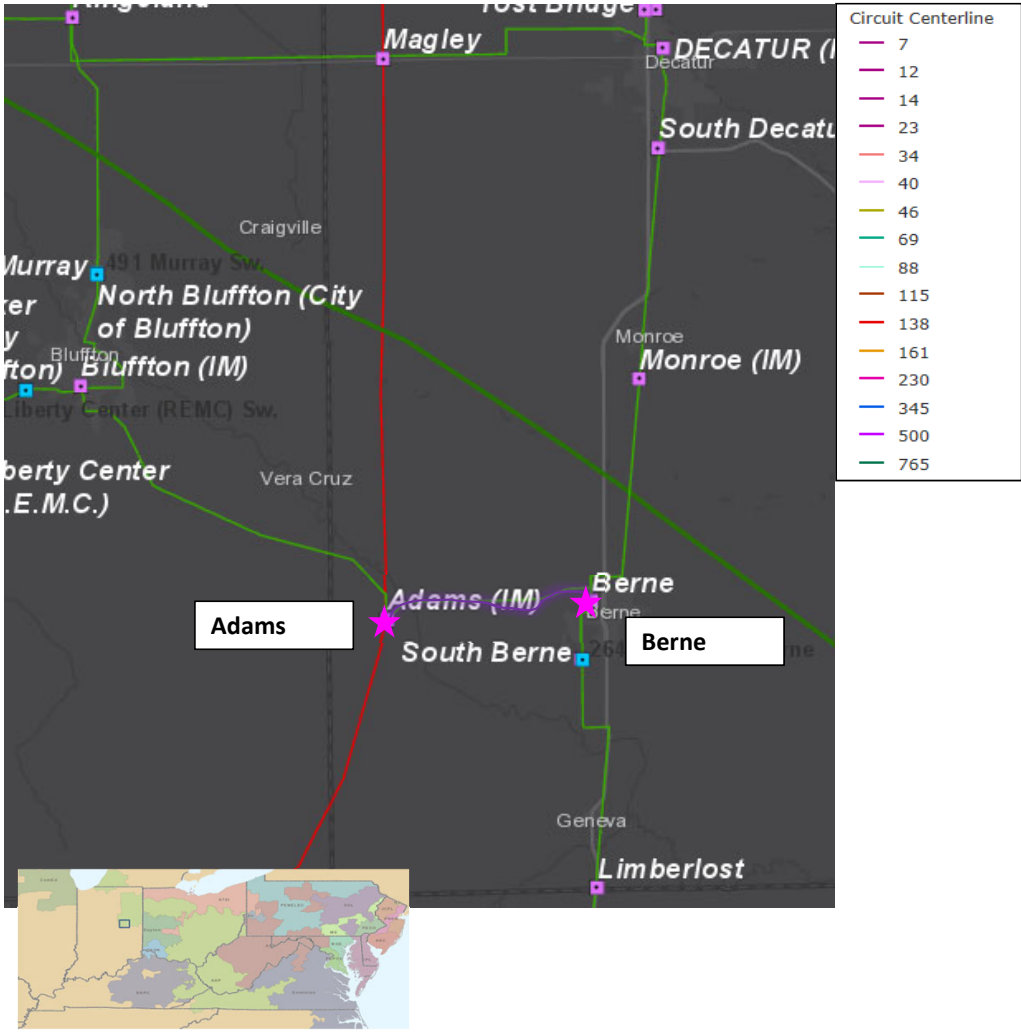
**Project Driver:** Equipment Material Condition, Performance and Risk

**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:** Submission of Supplemental Project for inclusion in the Local Plan 6/2/2023

**Solution:**

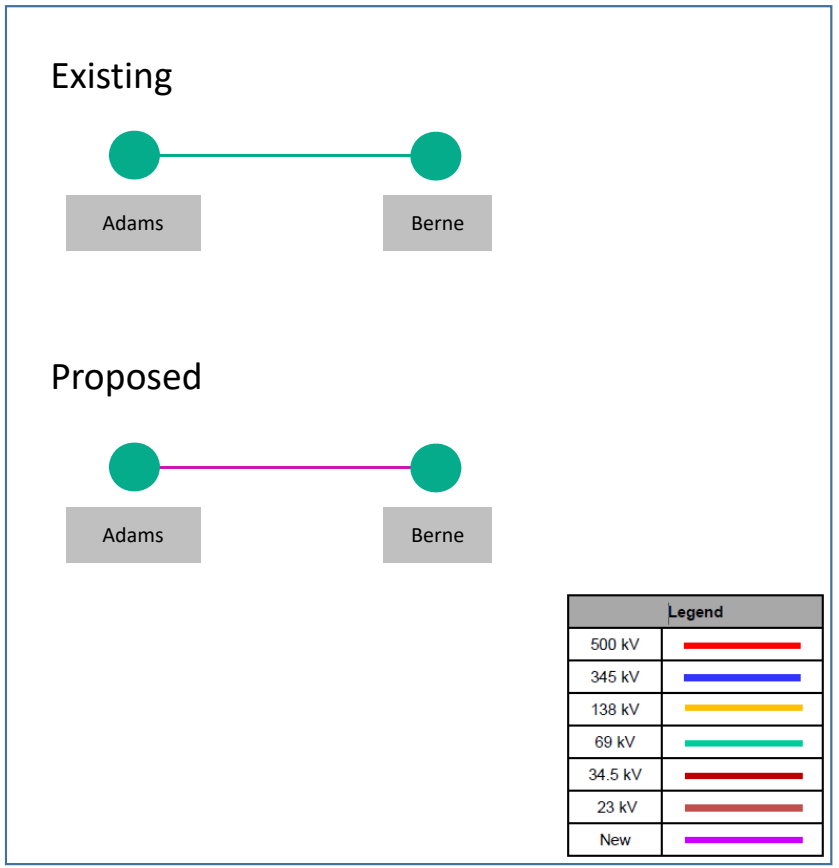
Adams – Berne 69 kV: Replace ~4.9 miles of 69 kV line structures. The following cost includes the structure replacements, structure removals, ROW acquisitions, and station connections. (**s2888**)

**Total Estimated Transmission Cost: $12.8 M**

**Projected In-Service:** 11/01/2026

**Supplemental Project ID:** s2888

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# East Lima

**Need Number:** AEP-2022-OH006

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solution Meeting 3/17/2023

Need Meeting 1-21-2022

**Project Driver:**

Equipment Material/Condition/Performance/Risk

**Specific Assumption Reference:**

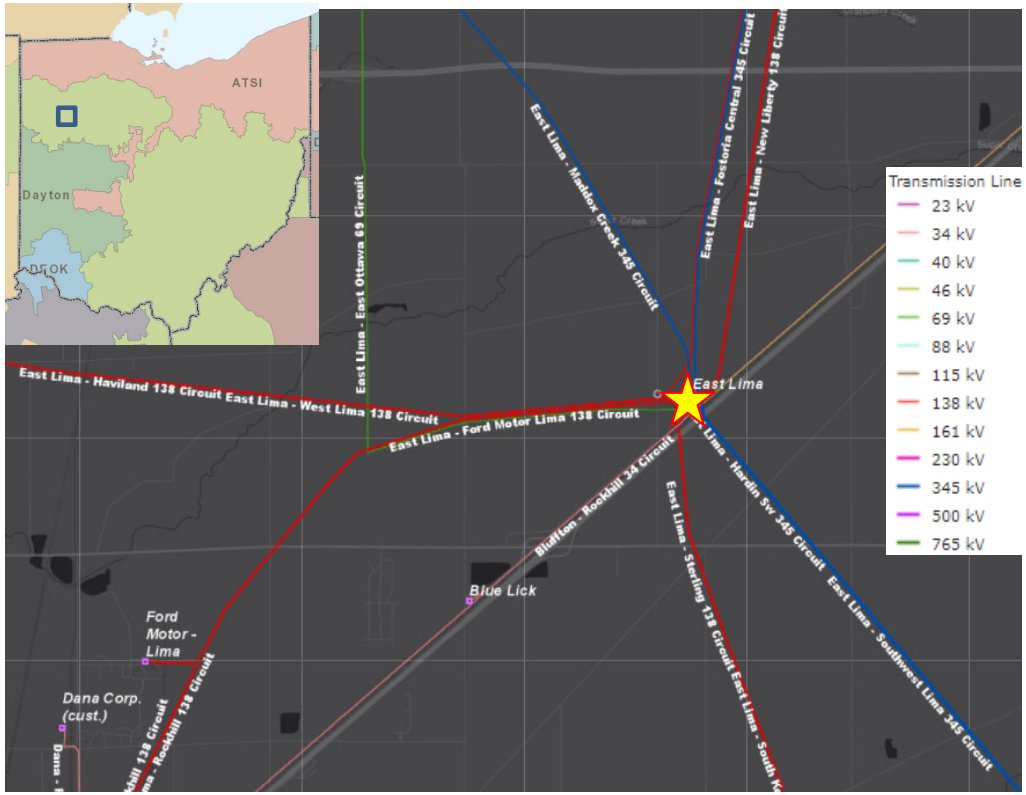
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**Problem Statement:**

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-OH006

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**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 (s2920.1)**
- 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 (s2920.2)**

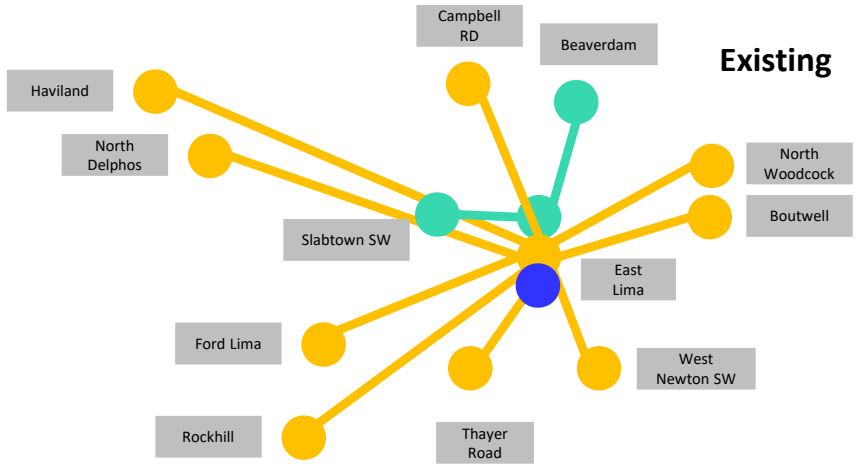
**Total Estimated Transmission Cost: $12.1M**

**Projected In-Service:** 12/01/2024

**Supplemental Project ID:** s2920

**Project Status:** Scoping

**Existing**




**Proposed**

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

**No Change**

# AEP Transmission Zone M-3 Process
# Coolville Loop

**Need Number:** AEP-2019-OH028

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solutions Meeting 02/17/2023

Needs Meeting 03/25/2019

**Project Driver:**

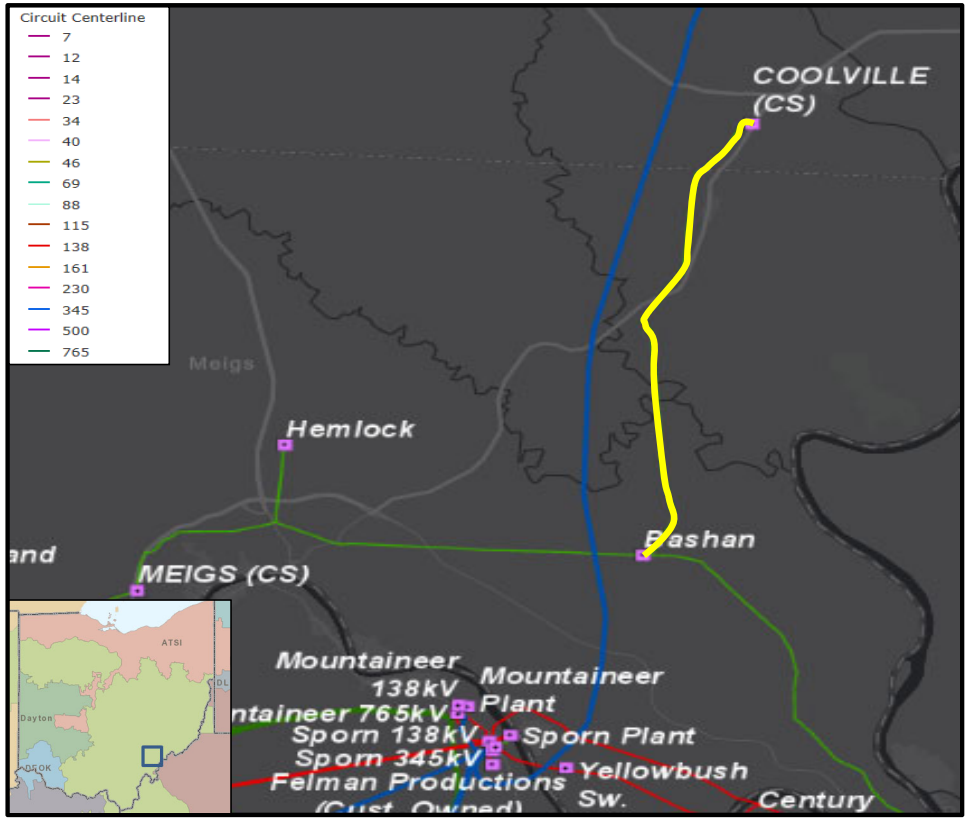
Equipment Material/Condition/Performance/Risk

**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:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solutions Meeting 02/17/2023

Needs Meeting 02/21/2020

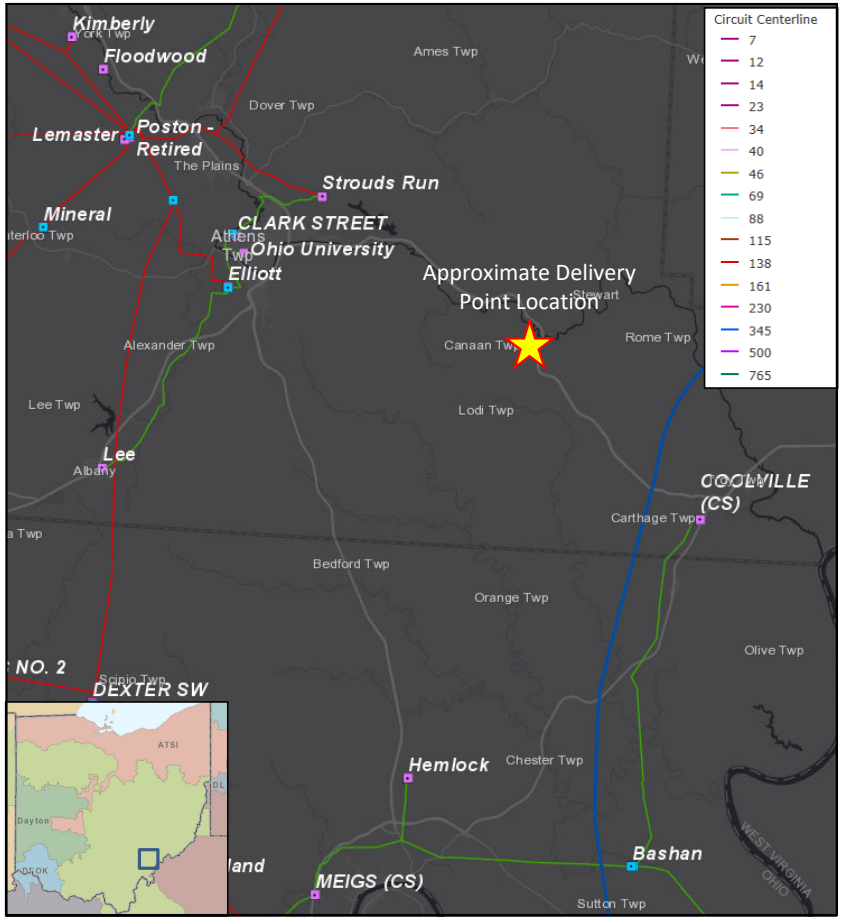
**Supplemental Project Driver:** Customer Service

**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:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**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 **(s2911.1)**
- Bryson - Guysville 69 kV: Construct a greenfield ~12.5-mile single circuit line using 556.5 ACSR (Dove) conductor (SE 142 MVA). $28.26M **(s2911.2)**
- Coolville – Guysville 69 kV: Constructing a greenfield ~10.5-mile single circuit line using 556.5 ACSR (Dove) conductor (SE 142 MVA) $29.22M **(s2911.3)**
- 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 **(s2911.4)**
- 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 **(s2911.5)**
- West Bashan 69 kV: Remove switch going to Hemlock $0.02M **(s2911.6)**
- Hemlock – West Bashan 69kV: Remove ~7.7 miles of single circuit line. $2.09M **(s2911.7)**
- Hemlock 69 kV: Remove the circuit breaker going to West Bashan (CB C). $0.14M **(s2911.8)**

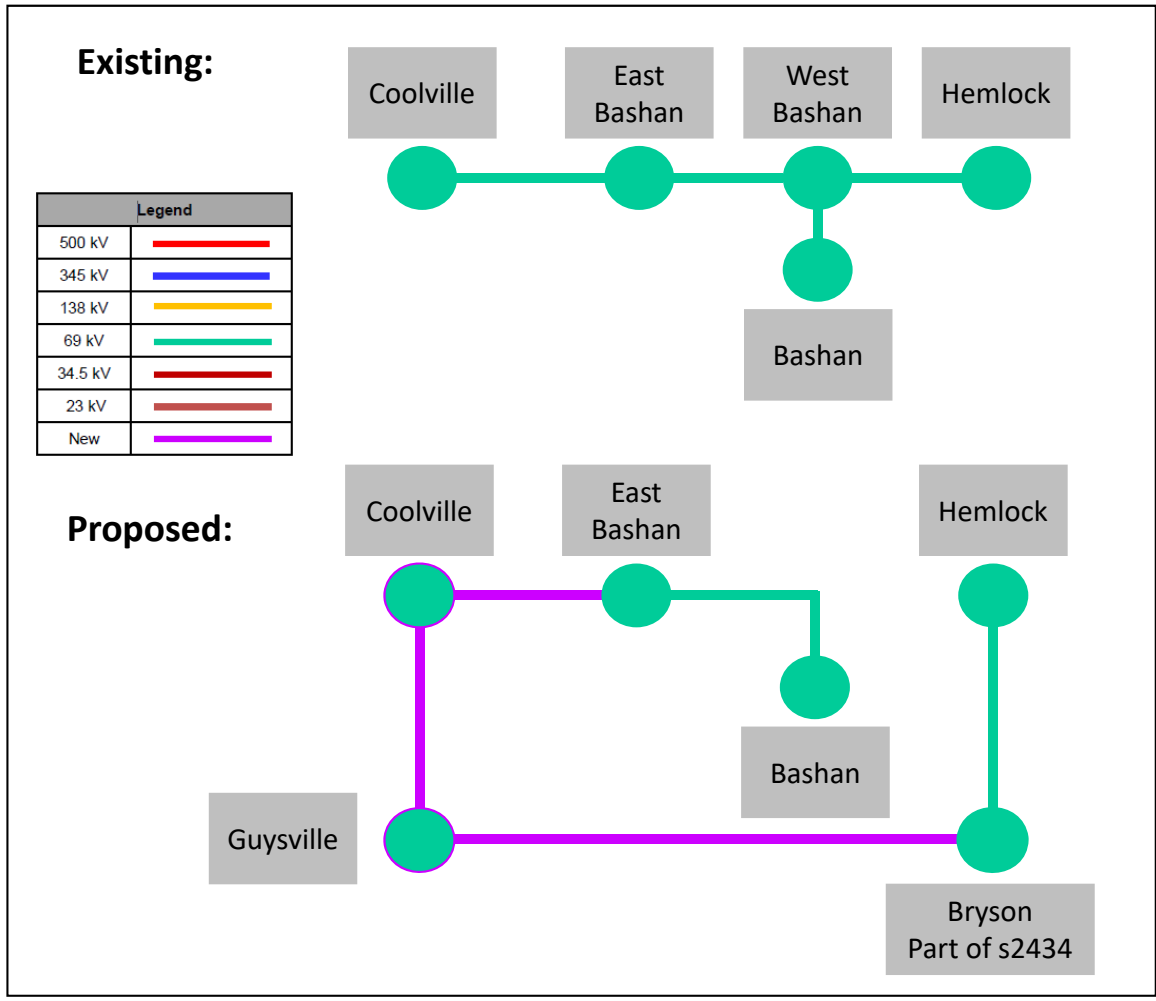
**Estimated Total Cost: $94.15M**

**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 .

**Projected In-Service:** 06/01/2025

**Supplemental Project ID:** s2911.1-.8

**Project Status:** Scoping



**Need Number:** AEP-2021-AP017

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solutions Meeting 2/17/2023

Needs Meeting 4/16/2021

**Supplemental Project Driver:** Customer Service

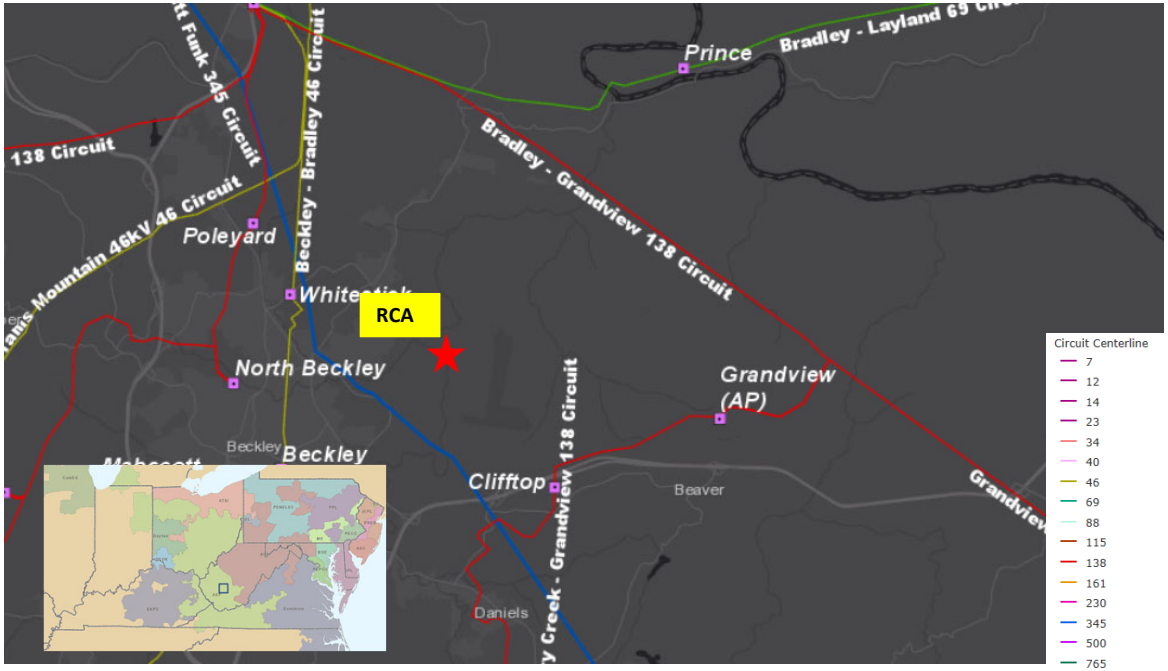
**Specific Assumption References:** AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

**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:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**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 (s2912.1)**

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 (s2912.2)**

Remote end relaying work required at Grandview Station. **Est. Trans. Cost: $0.3M (s2912.3)**

**Estimated Total Trans. Cost: $17.1M**

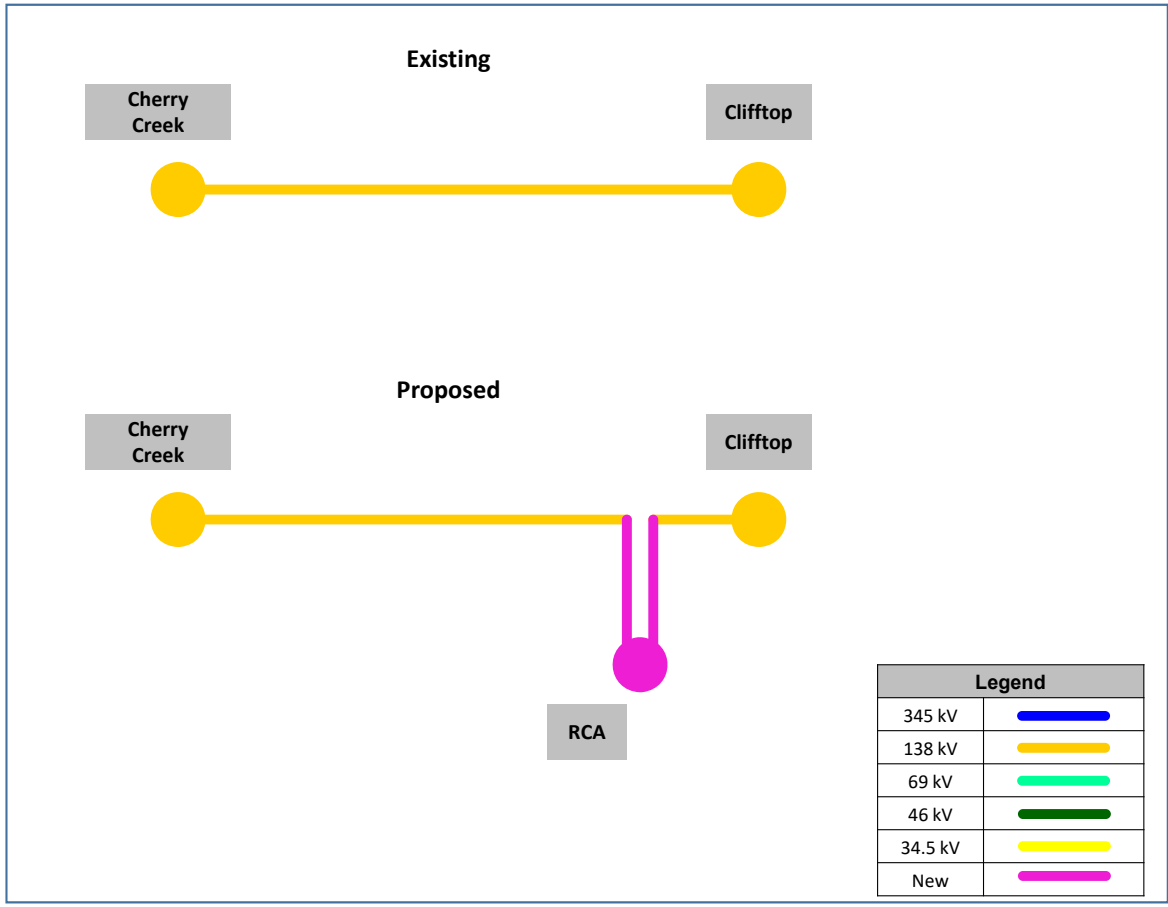
**Ancillary Benefits:** New station will offload the existing Clifftop Station transformer which is nearing it's max capability. Supports WV House Bill 144 to support Economic Development activities.

**Projected In-Service:** 3/14/2024

**Supplemental Project ID:** s2912.1-.3

**Project Status:** Scoping

**Model:** 2027 RTEP



# AEP Transmission Zone: Supplemental Kingsport, TN

**Need Number:** AEP-2021-AP024

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solutions Meeting 02/17/2023
Needs Meeting 06/15/2021

**Supplemental Project Driver:** Equipment Condition/Performance/Risk

**Specific Assumption Reference:**

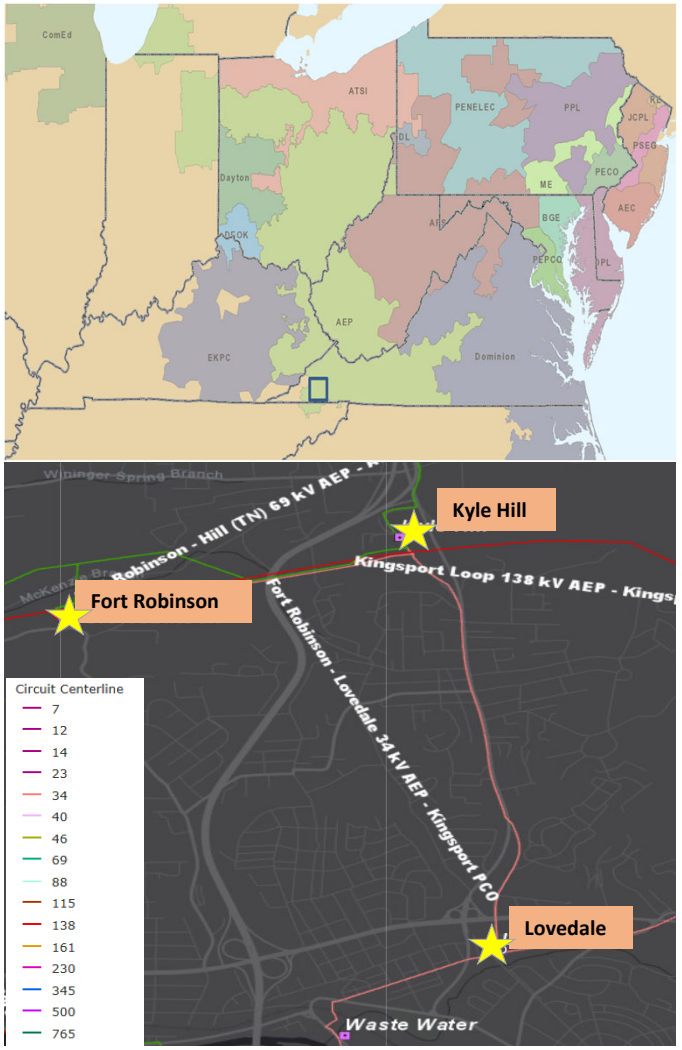
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13,14,15)

**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

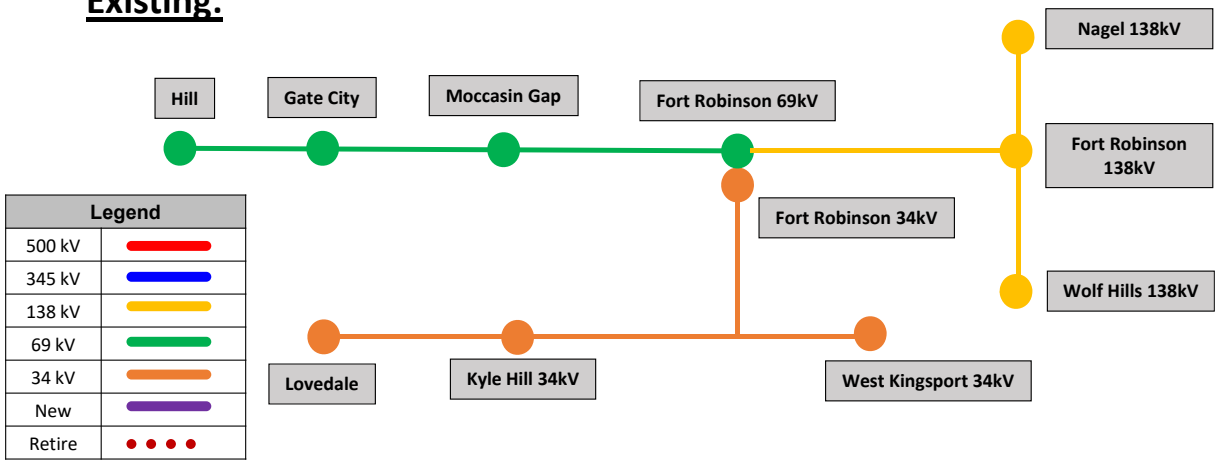
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Solution:**

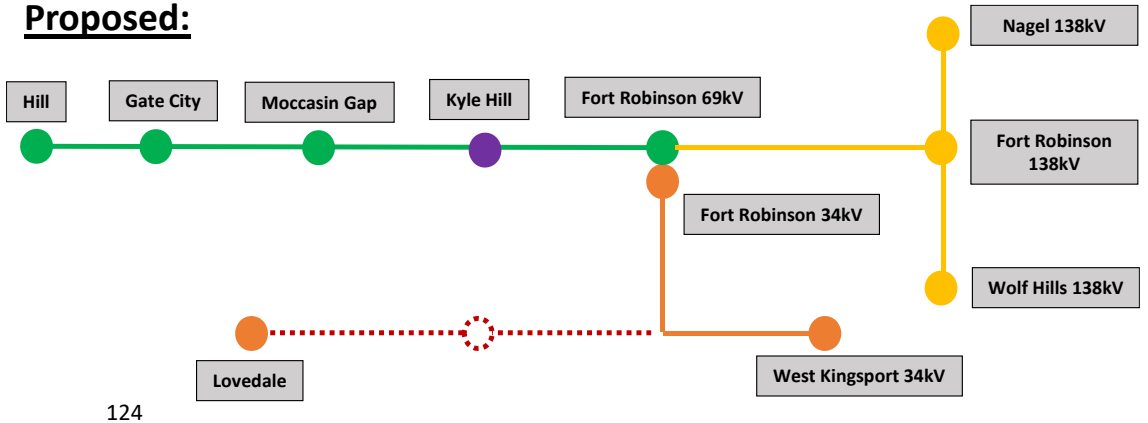
- Retire existing Kyle Hill Station. **Estimated Trans. Cost: $0 M (s2913.1)**
- Kyle Hill Extension : New 0.07 miles double circuit in/out line from the Fort Robinson-Hill 69kV line to the new Kyle Hill 69kV Station. **Estimated Trans. Cost: $1.22 M (s2913.2)**
- Build a new Kyle Hill Station behind 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 (s2913.3)**
- Retire approximately 3.41 miles of the Fort Robinson-Lovedale 34.5kV line. **Estimated Trans. Cost: $2.69 M Estimated (s2913.4)**
- Remote end and Removal of Circuit Breaker J at Fort Robinson substation. **Estimated Trans. Cost: $0.197 M (s2913.5)**
- Remote end and Removal of Circuit Breaker G at Lovedale substation. **Estimated Trans. Cost: $0 M (s2913.6)**
- Retire 34.5 kV Echo Switch. **Estimated Trans. Cost: $0.095 M (s2913.7)**
- Provide Transition Fiber for Kyle Hill Station. **Estimated Trans. Cost: $0.105 M (s2913.8)**

**Total Estimated Transmission Cost: $4.31 M**

**Existing:**




**Proposed:**



# AEP Transmission Zone: Supplemental Kingsport, TN

**Need Number:** AEP-2021-AP024

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

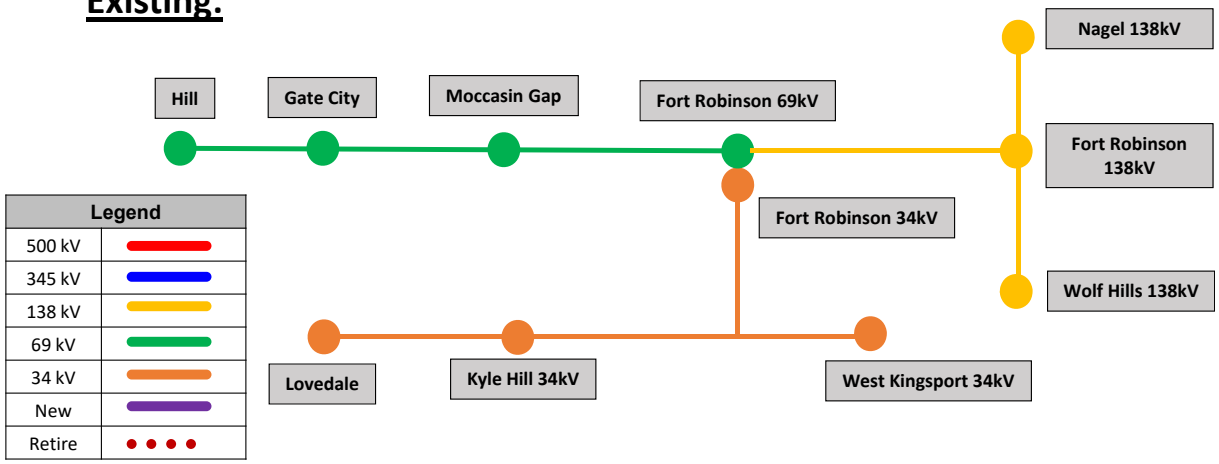
**Projected In-Service:** 07/01/2026

**Supplemental Project ID:** s2913.1-.8

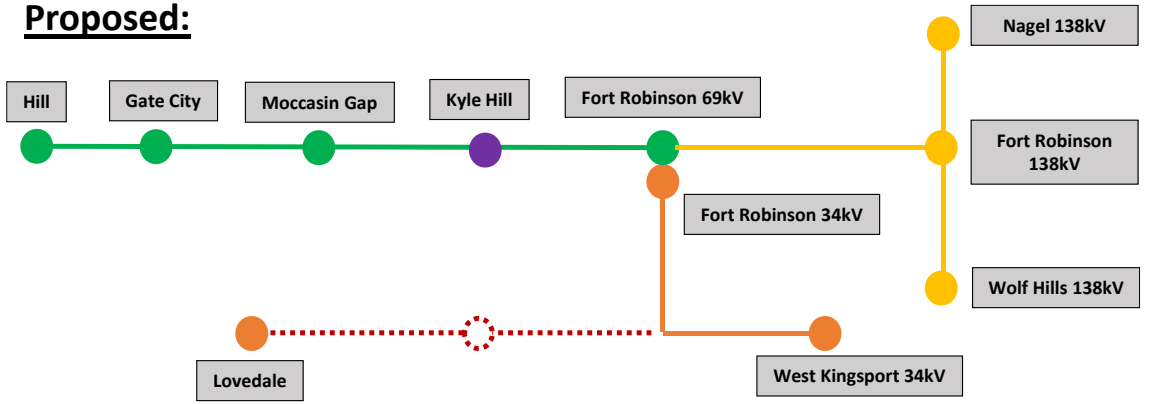
**Project Status:** Scoping

**Model:** 2027 RTEP

**Existing:**




**Proposed:**



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

**Need Number:** AEP-2022-IM016

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solution Meeting 2/17/2023

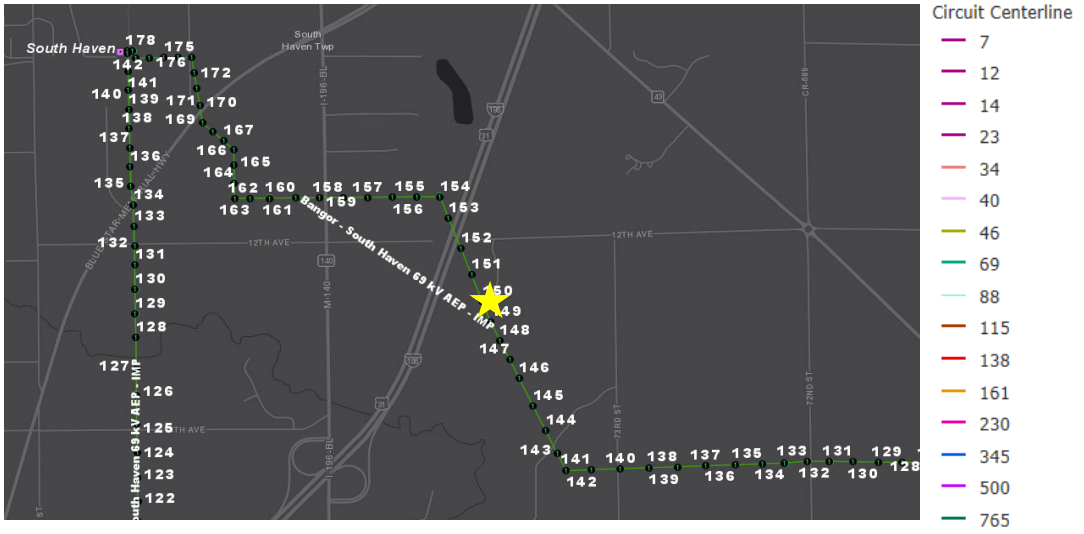
Needs Meeting 9/16/2022

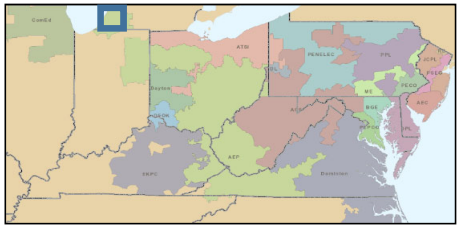
**Project Driver:** Customer Service

**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:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**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 (s2914.1)**

**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 (s2914.2)**

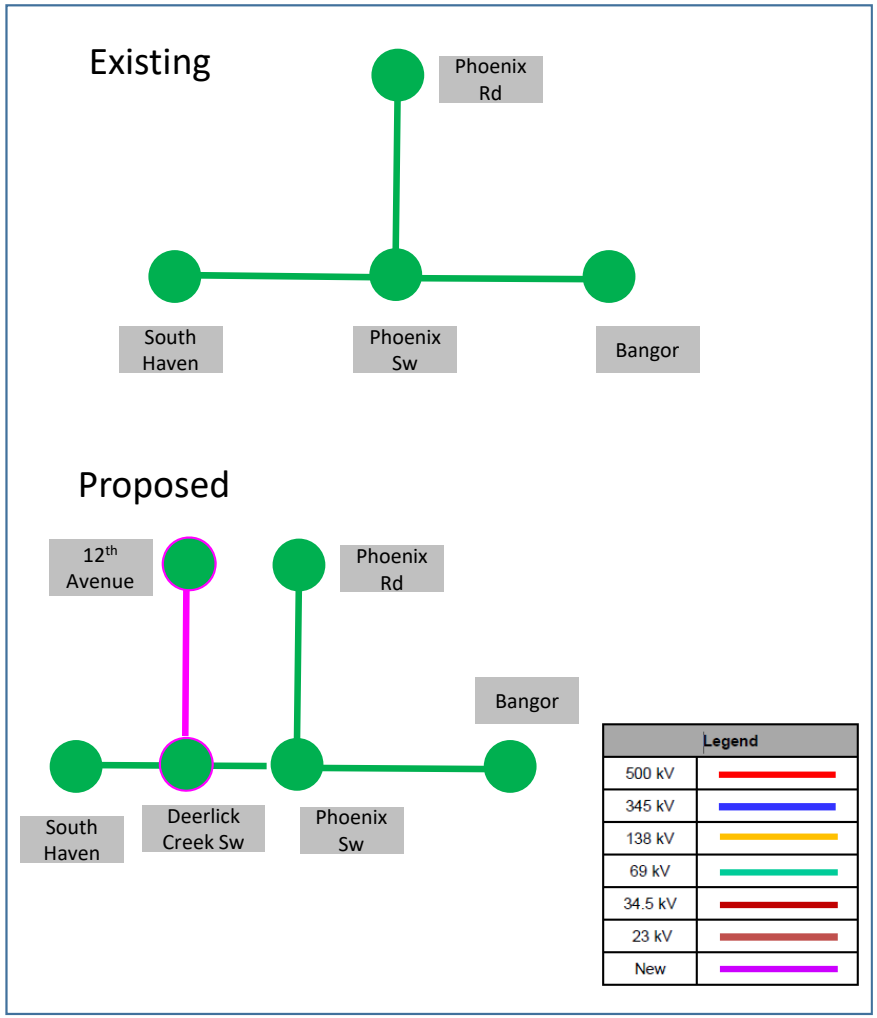
**12th Avenue station:** Install metering and telecom upgrades. **Estimated Cost: $0.11M (s2914.3)**

**Total Estimated Transmission Cost: $1.88M**

**Projected In-Service:** 5/26/2023

**Supplemental Project ID:** s2914.1-.3

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Morgan County, OH

**Need Number:** AEP-2022-OH026

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solutions Meeting 2/17/2023

Need Meeting 04/22/2022

**Project Driver:**

Equipment Material/Condition/Performance/Risk

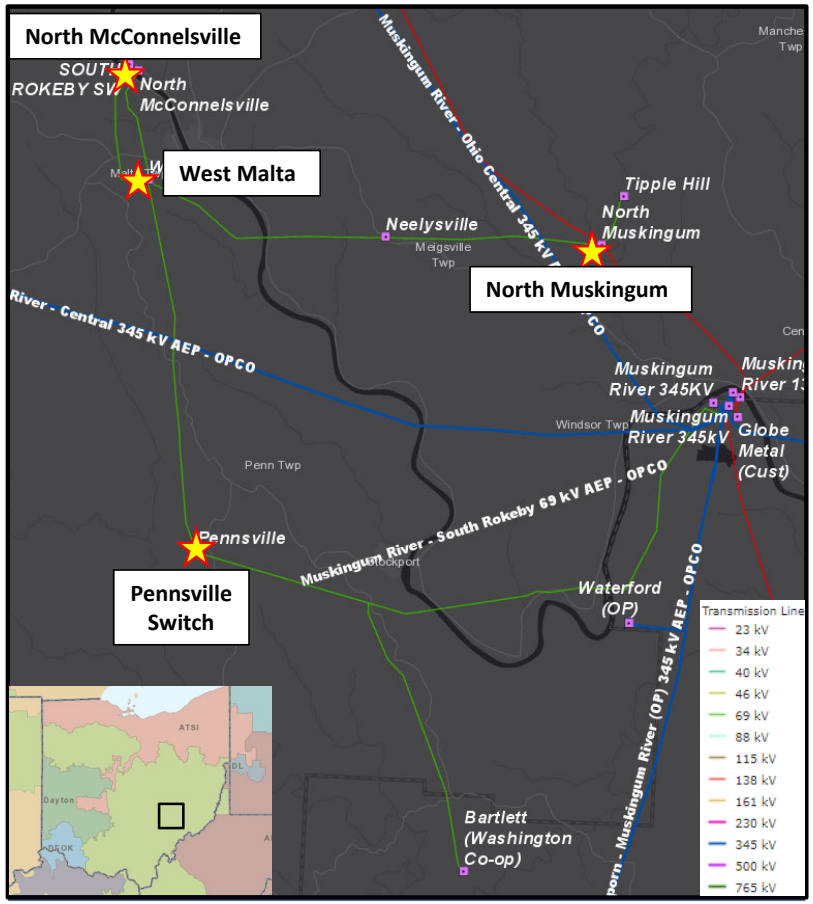
**Specific Assumption Reference:**

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

**Problem Statement:**

<u>North Muskingum – West Malta 69kV (1952):</u>

- 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

**Need Number:** AEP-2022-OH026

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

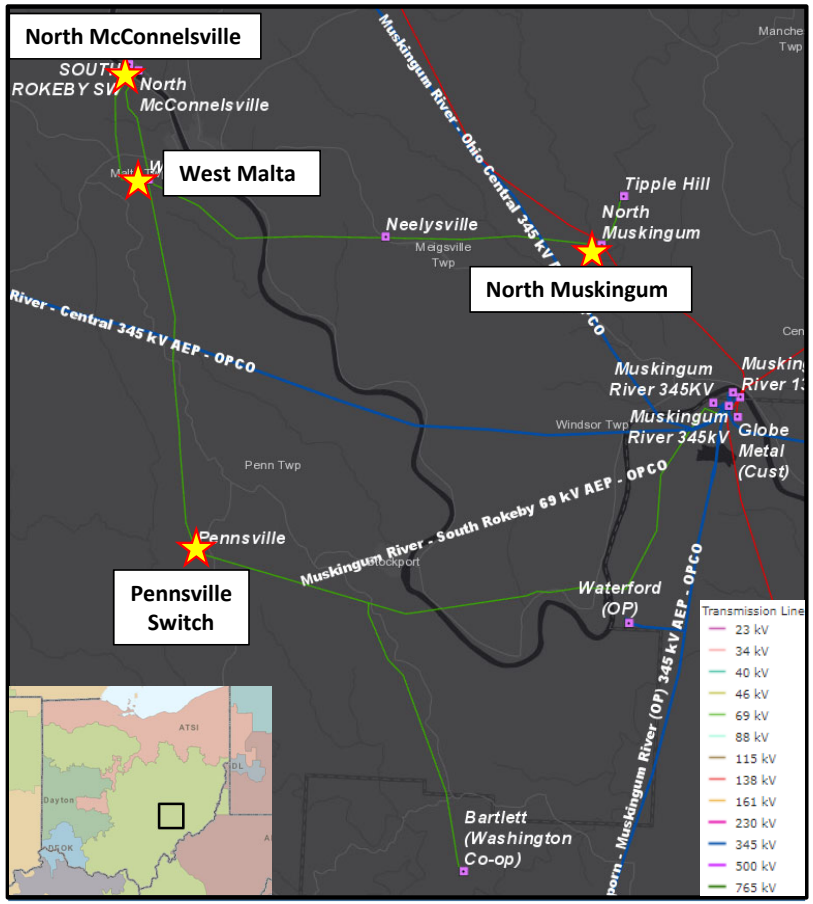
**Problem Statement (continued):**

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:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solutions Meeting 2/17/2023
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)

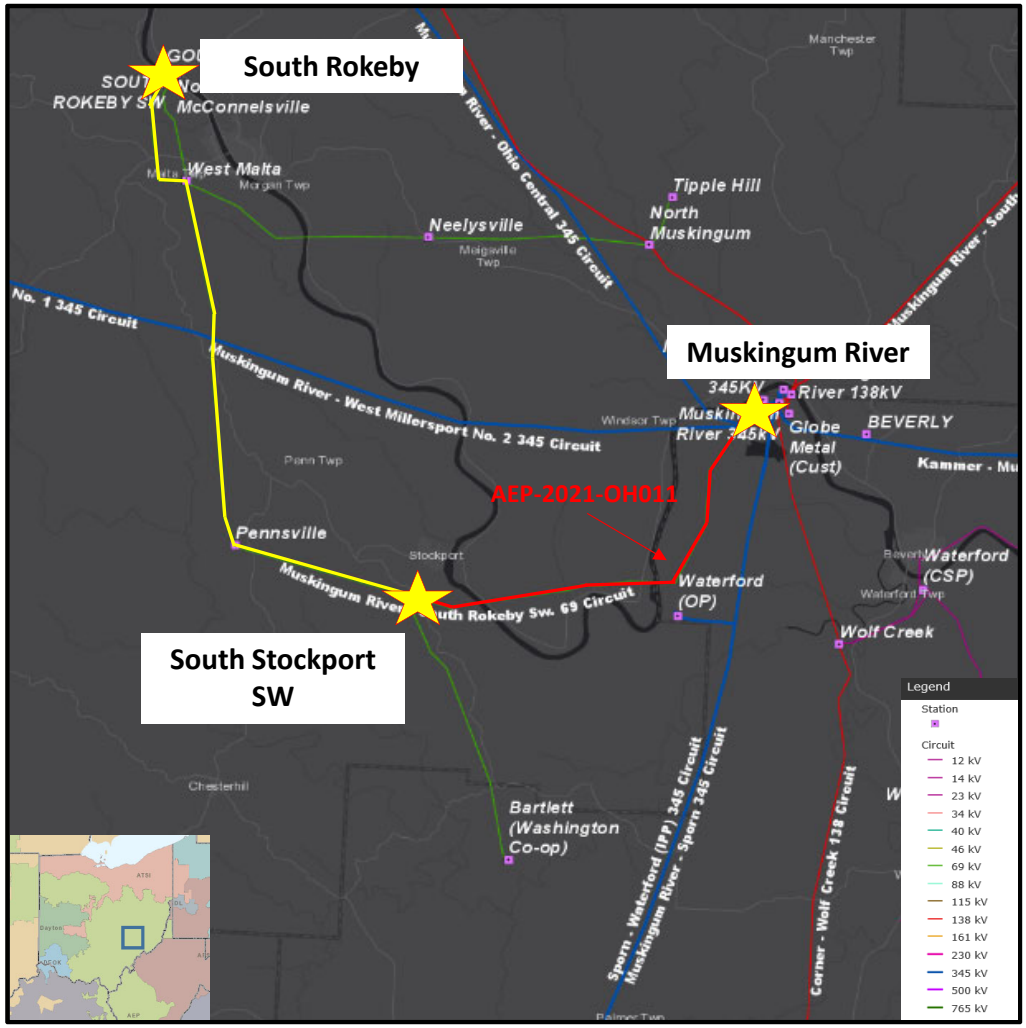
**Problem Statement:**

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-OH062

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**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 (s2915.1)**

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 (s2915.2)**

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 (s2915.3)**

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 (s2915.4)**

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 (s2915.5)**

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 (s2915.6)**

Pennsville 69 kV POP Switch: Replace existing switch with 1200A, 3-way switch & install auto-sectionalizing. **Estimated Cost : $0.73M (s2915.7)**

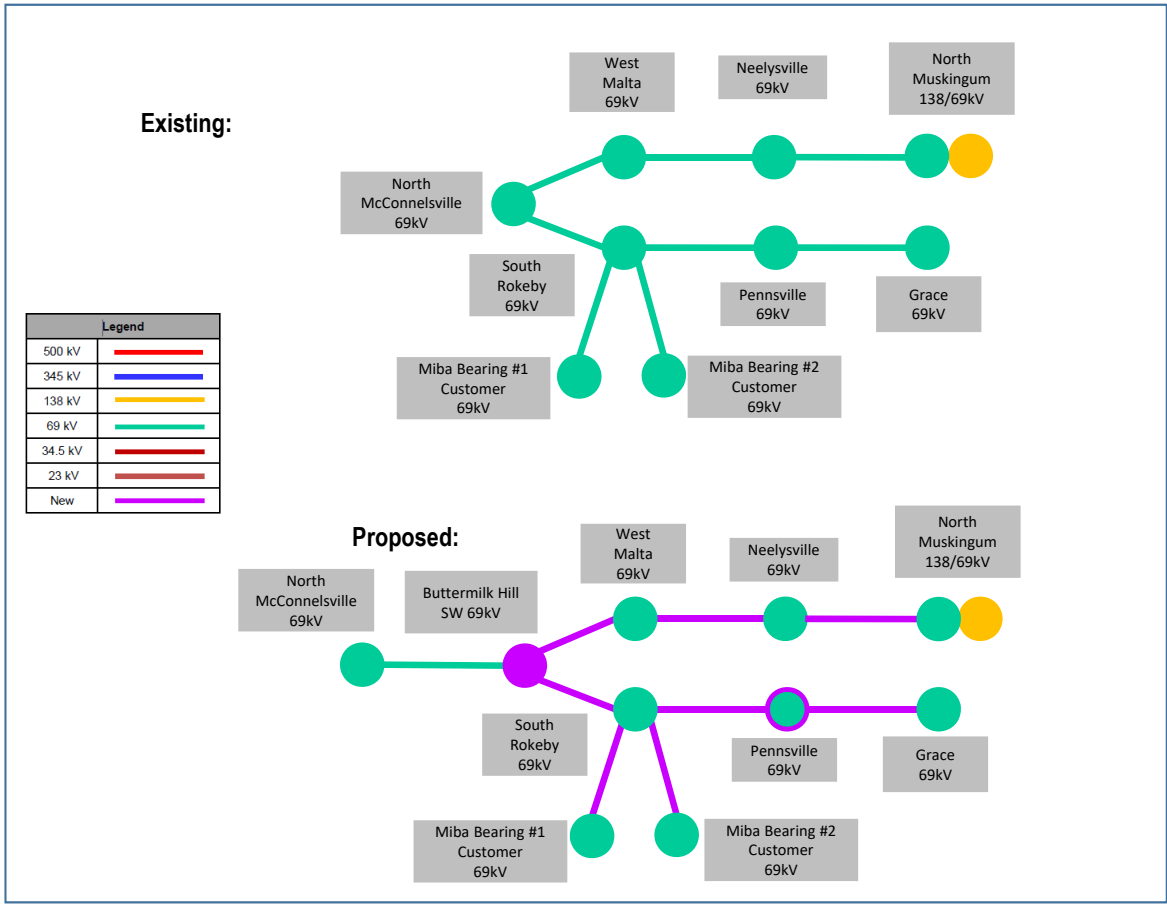
**Total Estimated Cost: $57.15M**

**Projected In-Service:** 10/1/2026

**Supplemental Project ID:** s2915.1-.7

**Project Status:** Engineering

**Model:** 2027 **RTEP**



# AEP Transmission Zone M-3 Process
# Grove City, Ohio

**Need Number:** AEP-2022-OH061

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solution Meeting 2/17/2023

Need Meeting 7/22/2022

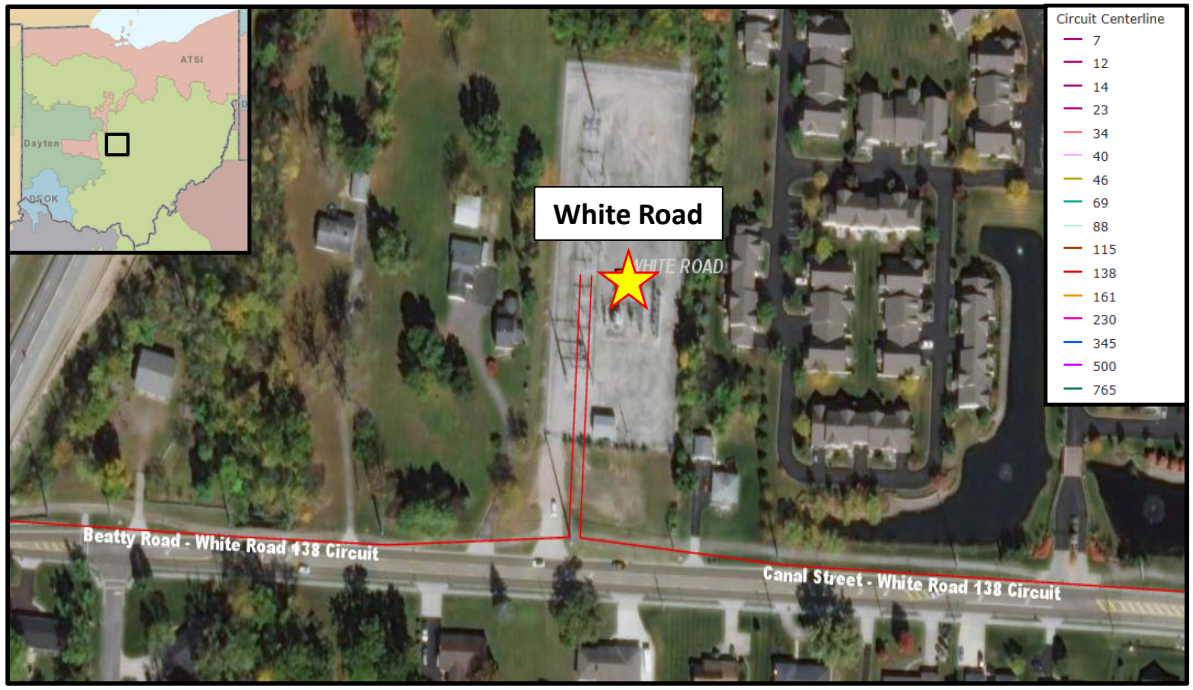
**Project Driver:** Customer Service

**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:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**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 (s2916.1)**

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 (s2916.2)**

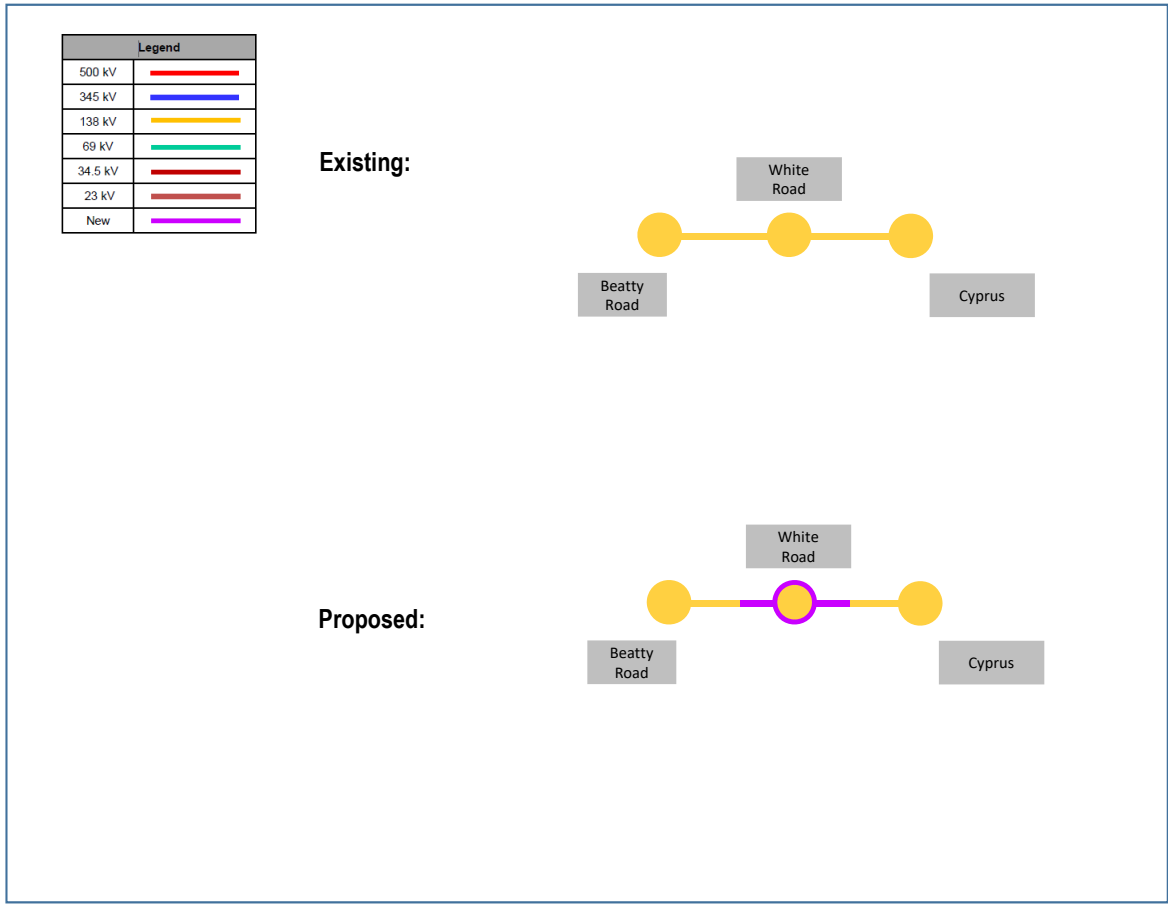
**Total Estimated Cost: $2.07M**

**Projected In-Service:** 08/08/2023

**Supplemental Project ID:** s2916.1-.2

**Project Status:** Engineering

**Model:** 2027 RTEP



# AEP Transmission Zone M-3 Process
# Cambridge, Ohio

**Need Number:** AEP-2023-OH014

**Process Stage:**

**Previously Presented:**

Solutions Meeting 2/17/2023

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:**

**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 (s2917.1)**
- 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 (s2917.2)**
- 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 (s2917.3)**
- Install new customer metering at Cassell Junction for Guernsey Muskingum Electric Cooperative. **$0.004 M (s2917.4)**

**Cost estimate: $2.234 M**

**Ancillary Benefits:**

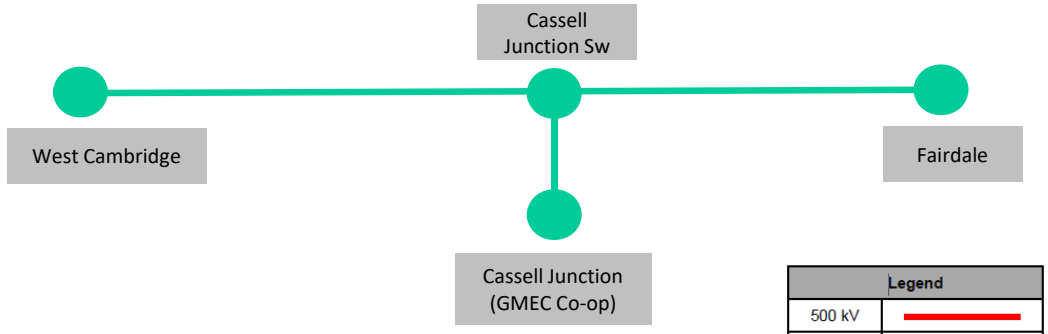
Provides Guernsey Muskingum Electric Cooperative the ability to have MOAB operation for additional protection in the case of momentary outages on the East Cambridge- West Cambridge 69kV circuit.

**Projected In-Service:** 12/31/2025

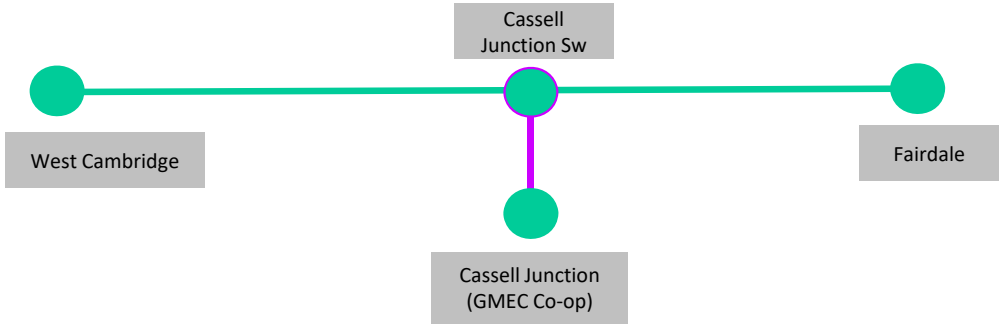
**Supplemental Project ID:** s2917.1-.4

**Project Status:** Engineering

**Existing:**




**Proposed:**



# AEP Transmission Zone M-3 Process
# Conesville – Bixby 345 kV

**Need Number:** AEP-2022-OH039

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 6/21/2023

**Previously Presented:**

Solution Meeting 02/07/2023

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:**

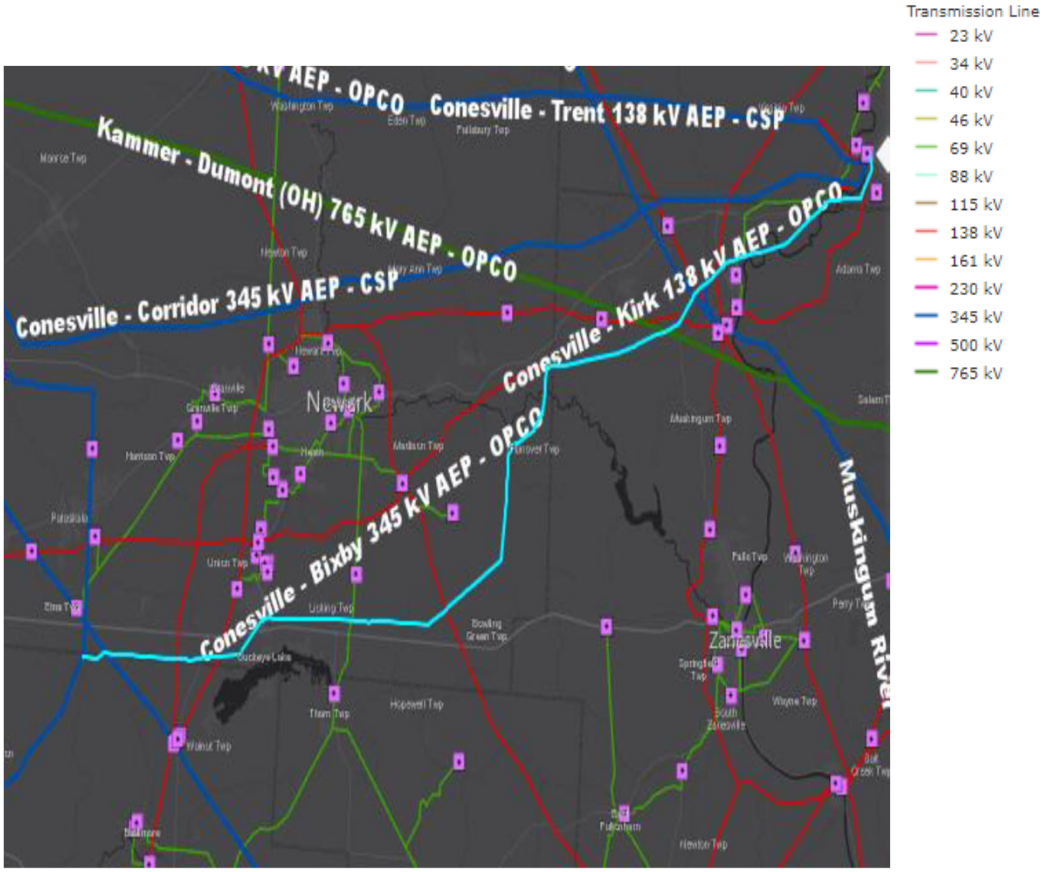
**Conesville – Bixby**

- 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:**

**Previously Presented:**

Solution Meeting 02/07/2023

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:**

**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 (s2921)**

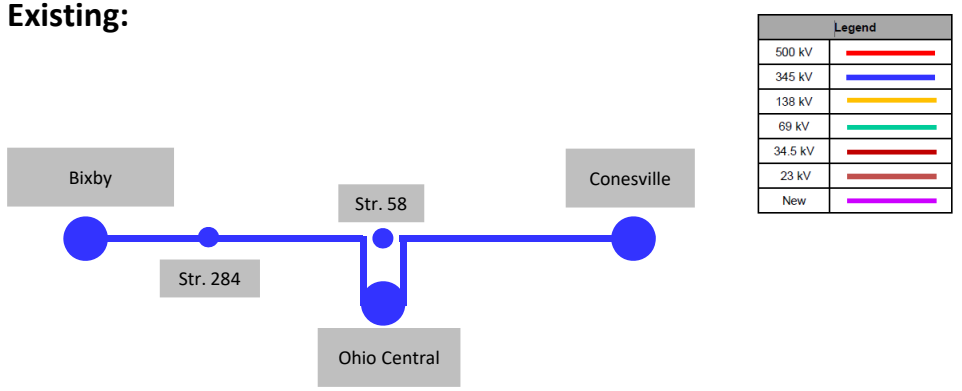
**Total Estimated Transmission Cost: $ 154.53M**

**Projected In-Service:** 9/1/2026 targeted ISD

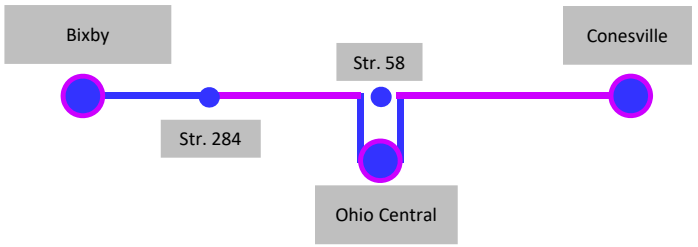
**Supplemental Project ID:** s2921

**Project Status:** Scoping

**Existing:**




**Proposed:**



# AEP Transmission Zone M-3 Process
# Coco Station Project

**Need Number:** AEP-2022-AP037

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 9/7/2023

**Previously Presented:**

Solutions Meeting 4/21/2023

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:** Submission of Supplemental Project for inclusion in the Local Plan 9/7/2023

**Solution:**

Install one new 138/12 kV XFR and one new 138 kV CB at the existing Coco Station.
Estimated Trans Cost: $0.9M (s2941)

**Total Estimated Transmission Cost: $0.9M**

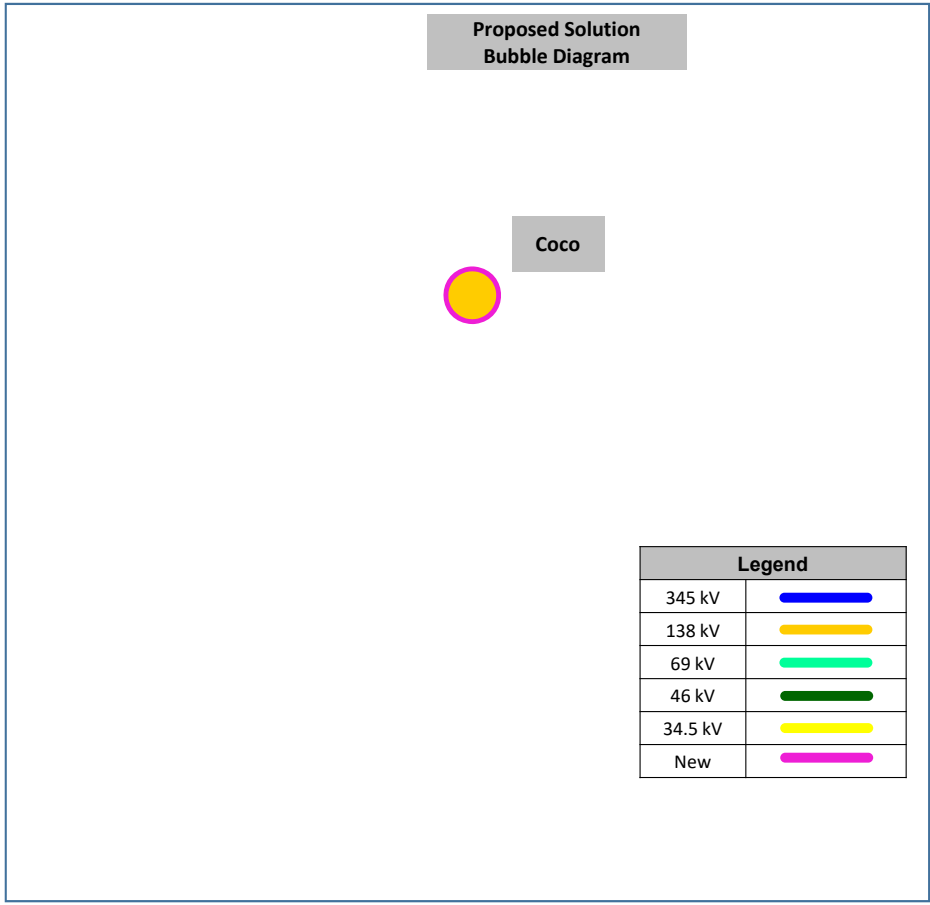
**Projected In-Service:** 11/22/2023

**Supplemental Project ID:** s2941

**Project Status:** Scoping

**Model:** 2027 RTEP

**Proposed Solution Bubble Diagram**



# AEP Transmission Zone M-3 Process
# Benton Harbor Area Improvements

**Need Number:** AEP-2022-IM004

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 9/7/2023

**Previously Presented:**

Solution Meeting 4/21/2023
Needs Meeting 1/21/2022

**Supplemental Project Driver:** Equipment Condition/Performance/Risk

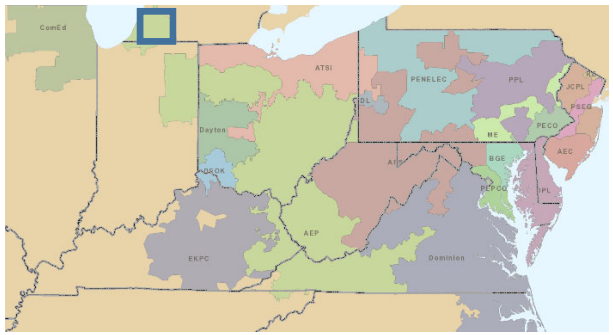
**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**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.

# AEP Transmission Zone M-3 Process
# Benton Harbor Area Improvements

**Need Number:** AEP-2022-IM004

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 9/7/2023

**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.

**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 (s2942.1)**

Main Street – Hickory Creek 34.5kV (via Pearl Street): Energize at 69kV.

**Estimated Cost: $0M (s2942.2)**

Main Street: Energize circuit breakers J, K, and L to 69kV.

**Estimated Cost: $0.91M (s2942.3)**

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 (s2942.4)**

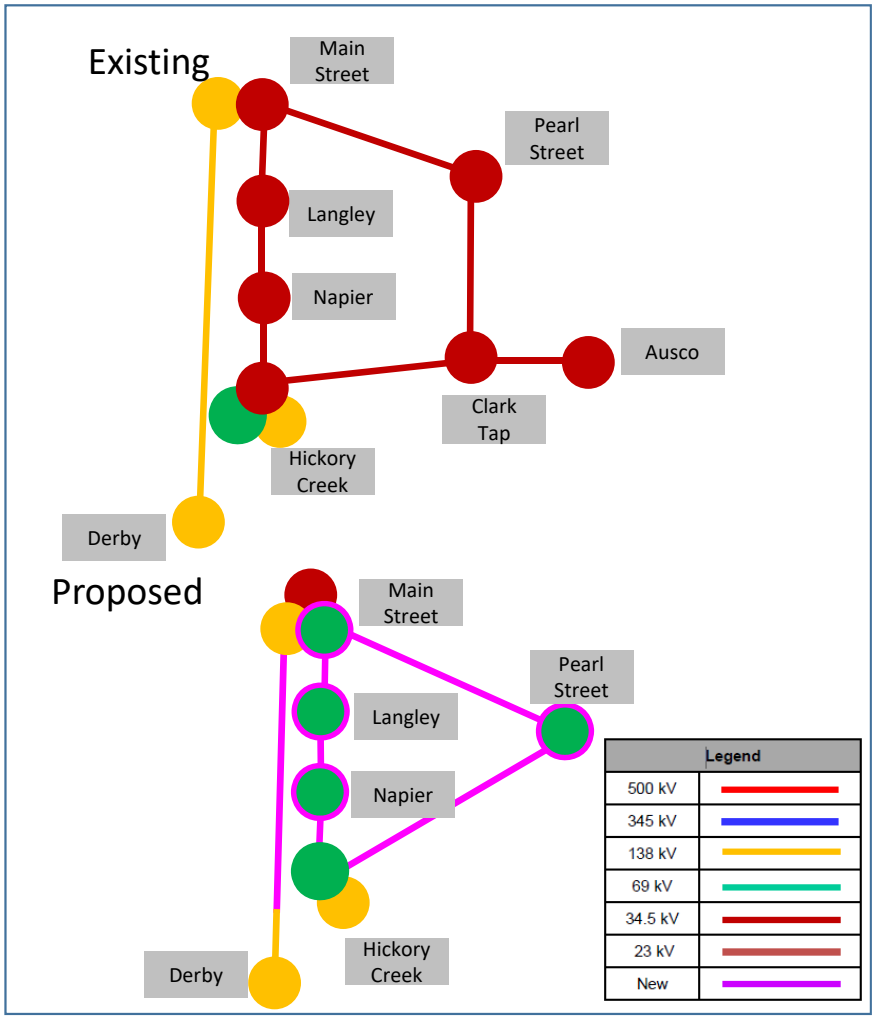
Pearl Street, Langley, and Napier: Energize to 69kV.

**Estimated Cost: $0.41M (s2942.5)**

Ausco Radial 34.5kV: Retire the 34.5kV Ausco radial

**Estimated Cost: $0.6M (s2942.6)**

**Total Estimated Transmission Cost: $19.3M**



# AEP Transmission Zone M-3 Process
# Benton Harbor Area Improvements

**Need Number:** AEP-2022-IM004

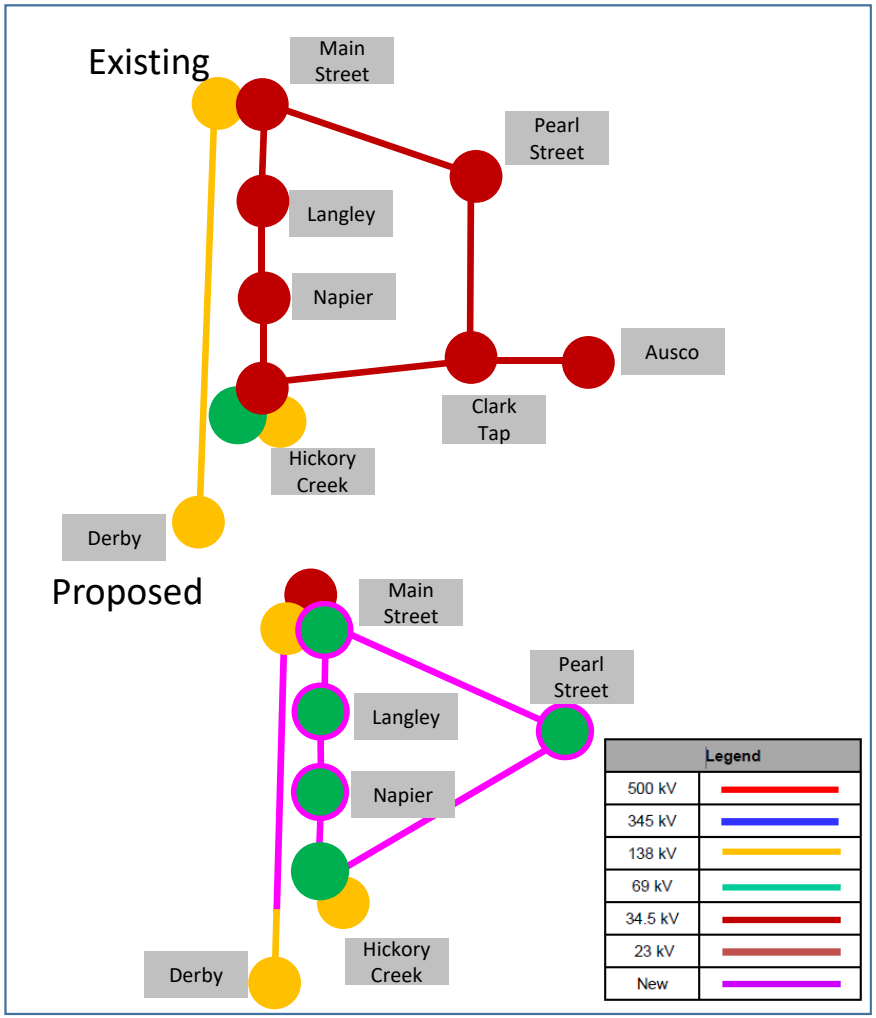
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 9/7/2023

**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.

**Projected In-Service:** 5/7/2027

**Supplemental Project ID:** s2942.1-.6

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Magley-Decatur 69kV line rebuild

**Need Number:** AEP-2022-IM015

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 9/7/2023

**Previously Presented:**

Solutions Meeting 4/21/2023
Needs Meeting 9/16/2022

**Project Driver:** Equipment Material Condition, Performance and Risk

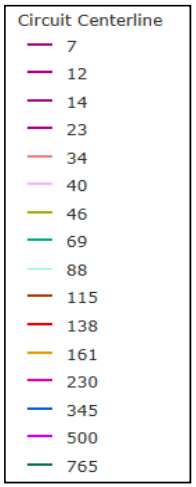
**Specific Assumption Reference:**

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:** Submission of Supplemental Project for inclusion in the Local Plan 9/7/2023

**Solution:**

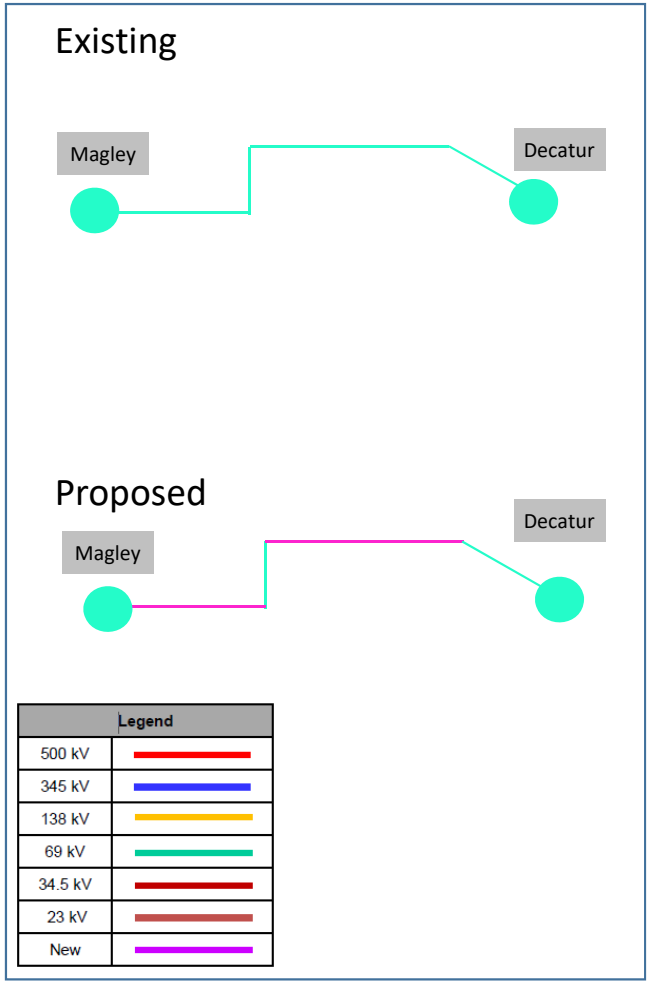
Rebuild 5.88 miles of the 6.36 mile circuit from Magley-Decatur with 795 ACSR. The rebuild will consist of all 1957 and 1966 vintage poles, towers with failed strength requirements, as well as the 4/0 and 336 ACSR conductor. (s2943)
**Total Estimated Transmission Cost: $12.48 M**

**Total Cost: $3.11M**

**Projected In-Service:** 08/01/2028

**Supplemental Project ID:** s2943

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Wheeling, West Virginia

**Need Number:** AEP-2022-OH060
**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 9/7/2023
**Previously Presented:**
Solution Meeting 04/21/2023
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:** Submission of Supplemental Project for inclusion in the Local Plan 9/7/2023

**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. (s2944)

**Total Estimated Transmission Cost: $1.49M**

**Ancillary Benefits:**

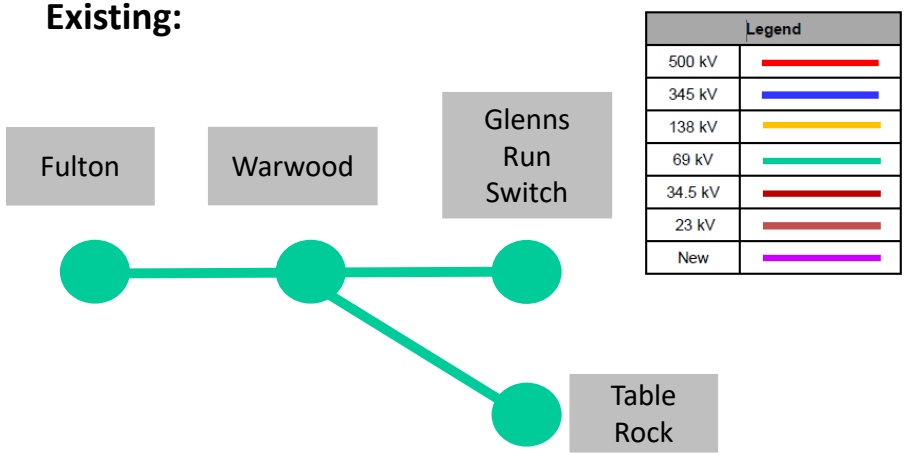
This project will greatly expand the SCADA capabilities at Warwood, which serves as a transmission hub on the local 69kV system. This will provide enhanced switching capabilities and situational awareness for AEP System Operations personnel.

**Projected In-Service:** 10/1/2024

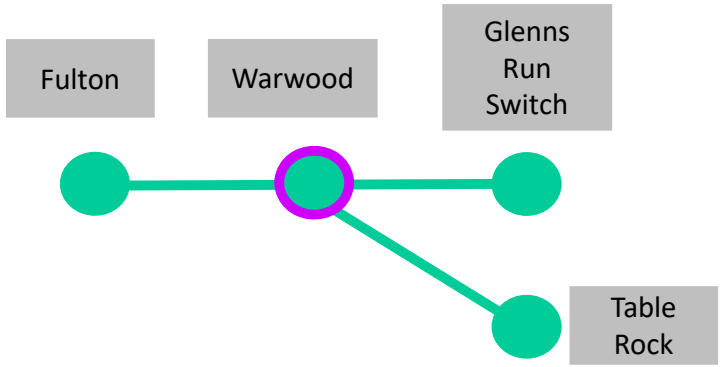
**Supplemental Project ID:** s2944

**Project Status**: Scoping

**Existing:**




**Proposed:**



# AEP Transmission Zone M-3 Process
# Scio, Ohio

**Need Number:** AEP-2023-OH064

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 9/20/2023

**Previously Presented:**

Solution Meeting 06/16/2023

Need Meeting 04/21/2023

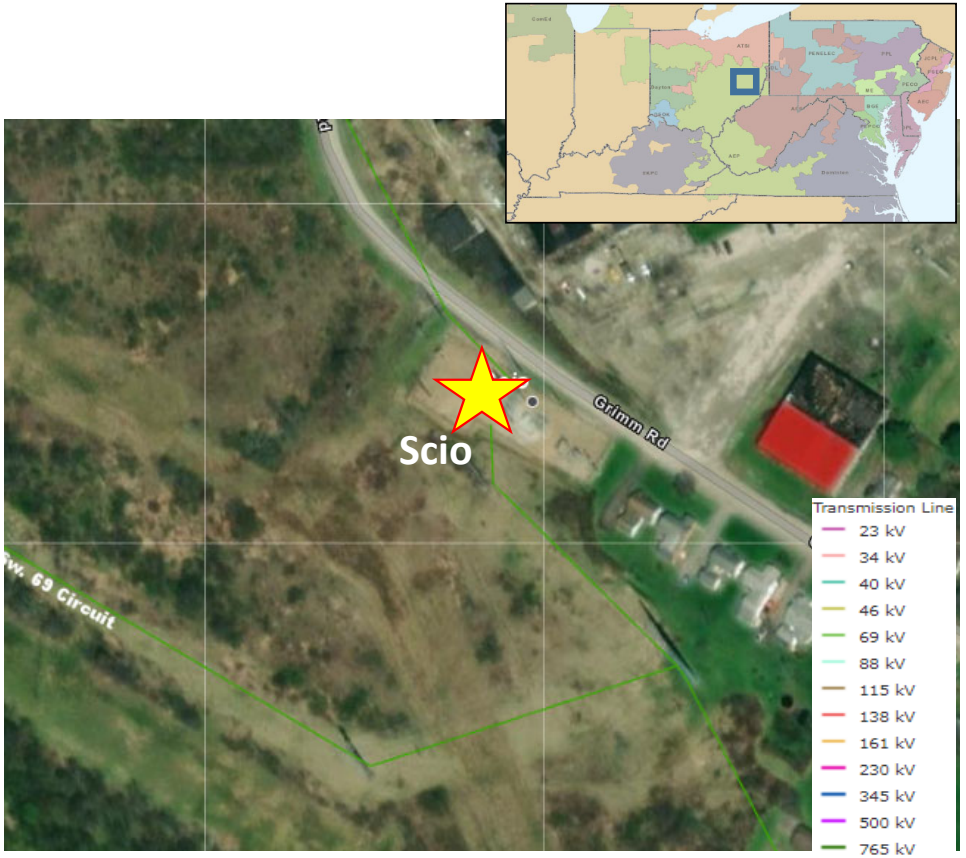
**Project Driver:** Customer Service; Equipment Material/Condition/ Performance/Risk

**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:** Submission of Supplemental Project for inclusion in the Local Plan 9/20/2023

**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 (s2970)**

**Projected In-Service:** 12/01/2024

**Supplemental Project ID:** s2970

**Project Status:** Scoping

**Model:** 2027 PJM RTEP Load-Flow Model

69kV capacitor bank removal only. Bubble diagram not applicable.

# AEP Transmission Zone M-3 Process
# East Elkhart – Menges Ditch 138kV

**Need Number:** AEP-2019-IM045

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Previously Presented:**

Solution Meeting 5/19/2023

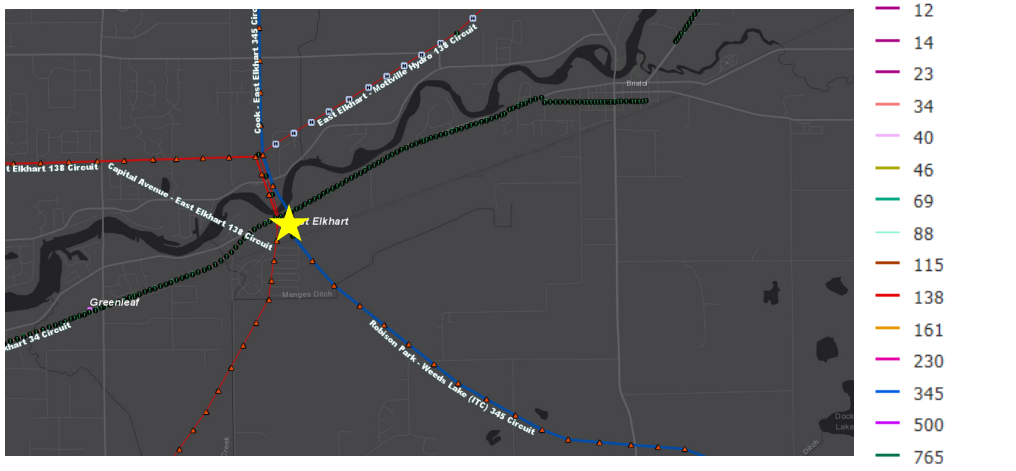
Needs Meeting 11/22/2019

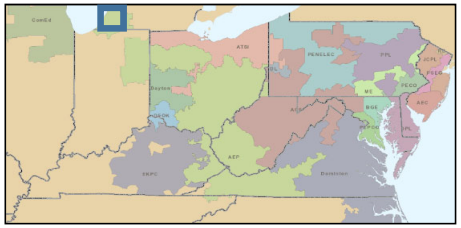
**Project Driver:** Customer Service

**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:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**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 (s2986.1)**

**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 (s2986.2)**

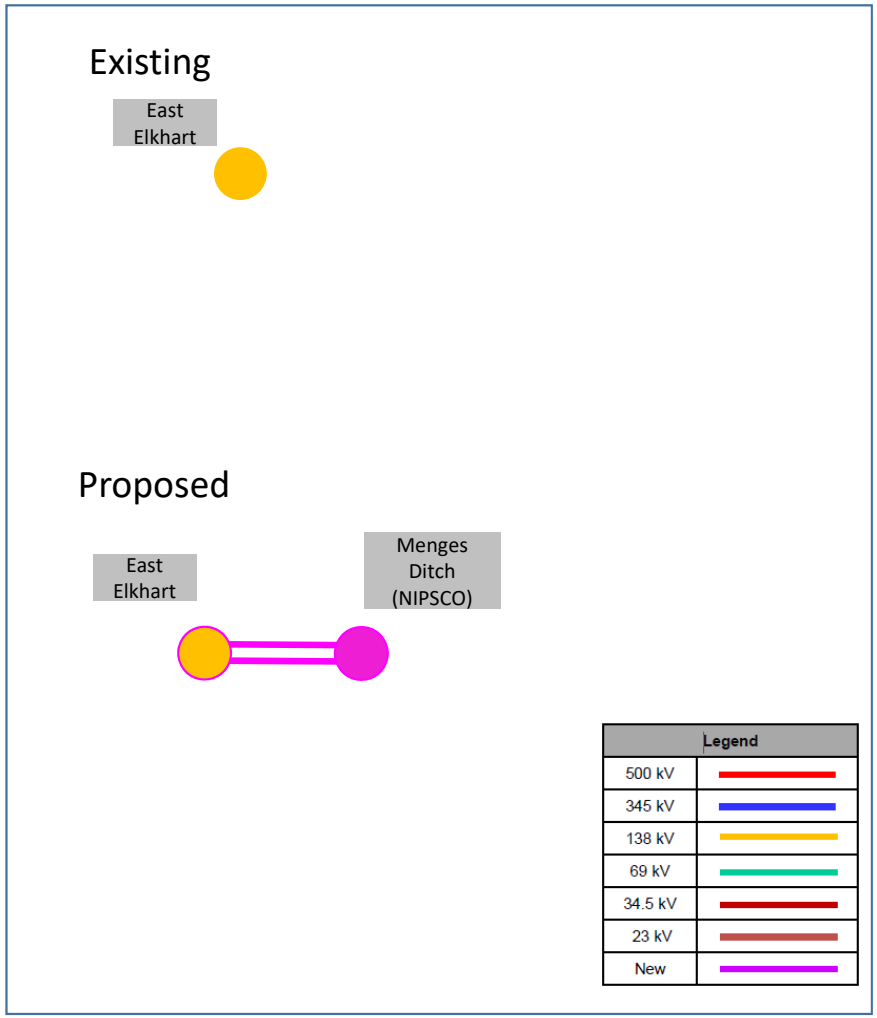
**Total Estimated Transmission Cost: $0.00M**

**Projected In-Service:** 12/1/2025

**Supplemental Project ID:** s2986.1-.2

**Project Status:** Scoping

**This project is fully funded by NIPSCO in MISO.**



# AEP Transmission Zone M-3 Process
# Mason County Industrial Park

**Need Number:** AEP-2021-AP019

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Previously Presented:**

Solutions Meeting 6/16/2023

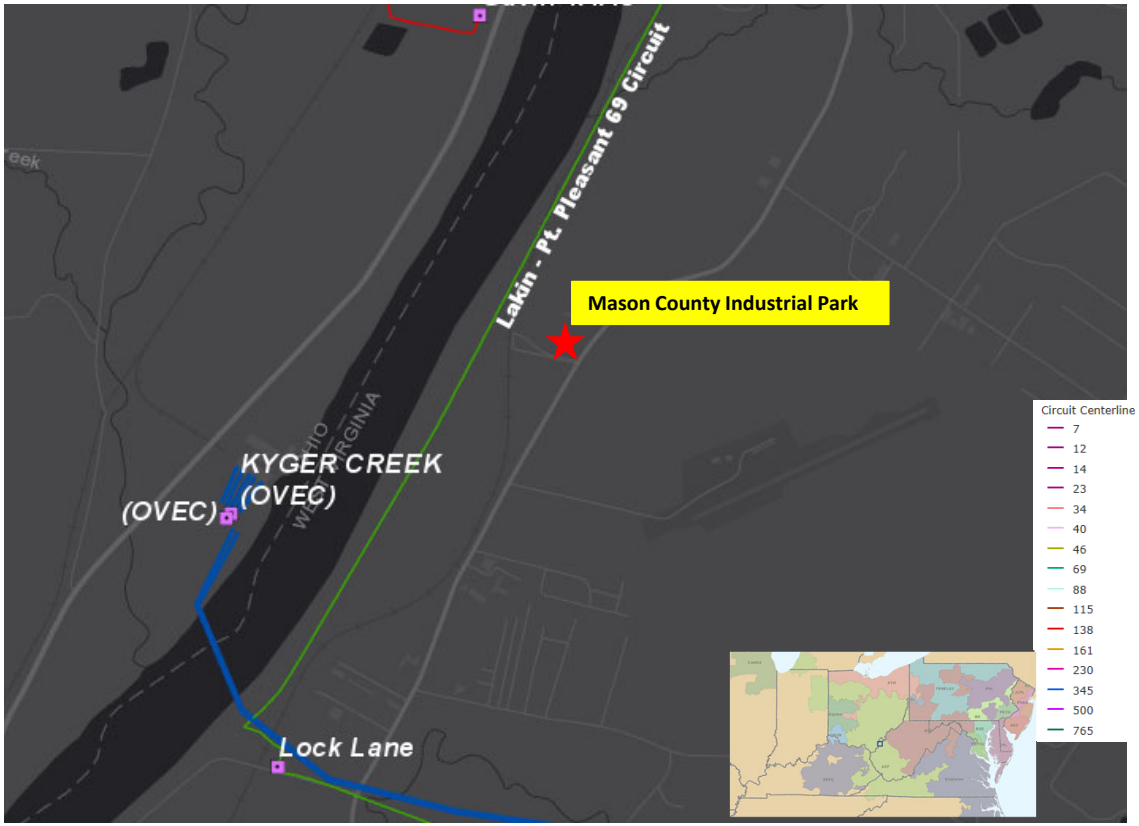
Needs Meeting 5/21/2021

**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:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**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 (s2981.1)**

Install two 69 kV circuit breakers and a 69/12 kV 25 MVA transformer at the new Mason County Industrial Park Station **Est. Trans. Cost: $0.0M (s2981.2)**

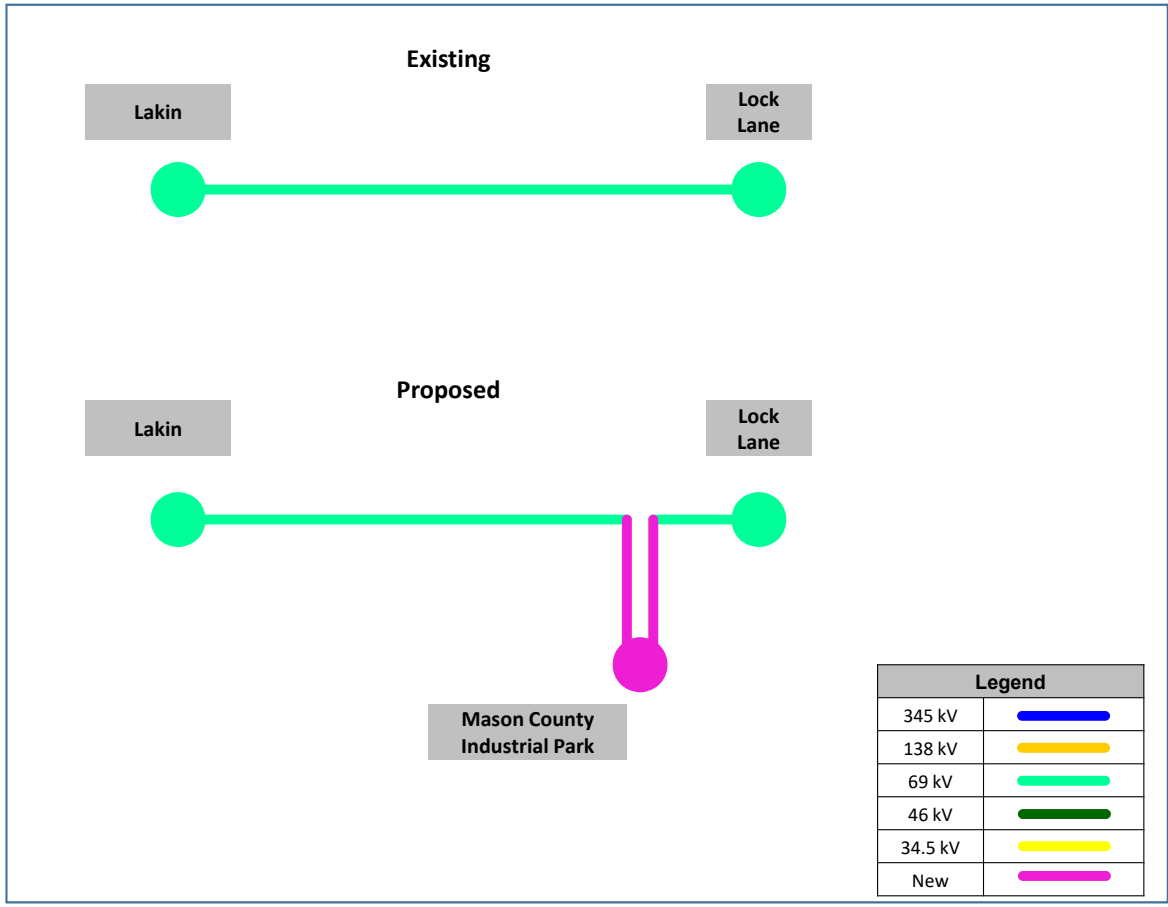
**Estimated Total Trans. Cost: $2.1M**

**Projected In-Service:** 5/1/2024

**Supplemental Project ID:** s2981.1-.2

**Project Status:** Engineering

**Model:** 2027 RTEP



# AEP Transmission Zone M-3 Process
# Kenton, OH

**Need Number:** AEP-2022-OH007

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Previously Presented:**

Solutions Meeting 7/21/2023
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 :**

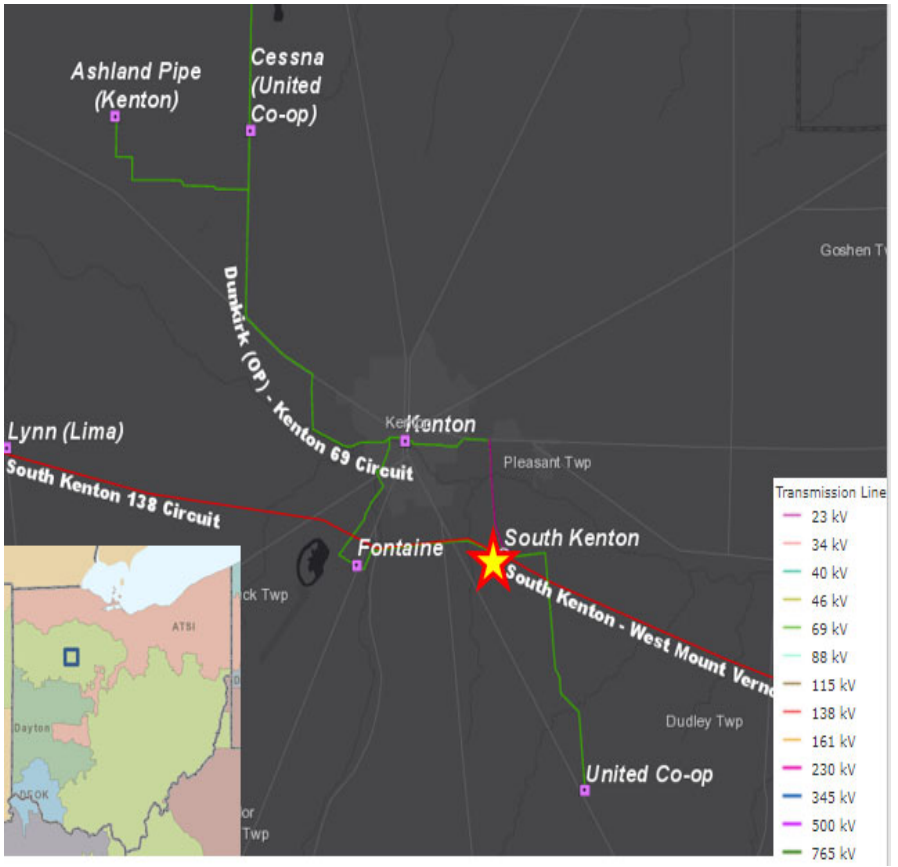
- Breaker Age: A 1953 (138 kV), B 1952 (138 kV), E 1954 (69 kV)
- Interrupting Medium: (Oil)
- Fault Operations:
  - Number of Fault Operations: A 42, B 49,E 26
  - Manufacturer recommended Number of Operations: 10
- Additional Breaker Information: These breakers are FK-439. These breakers are oil filled 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:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Solution:**

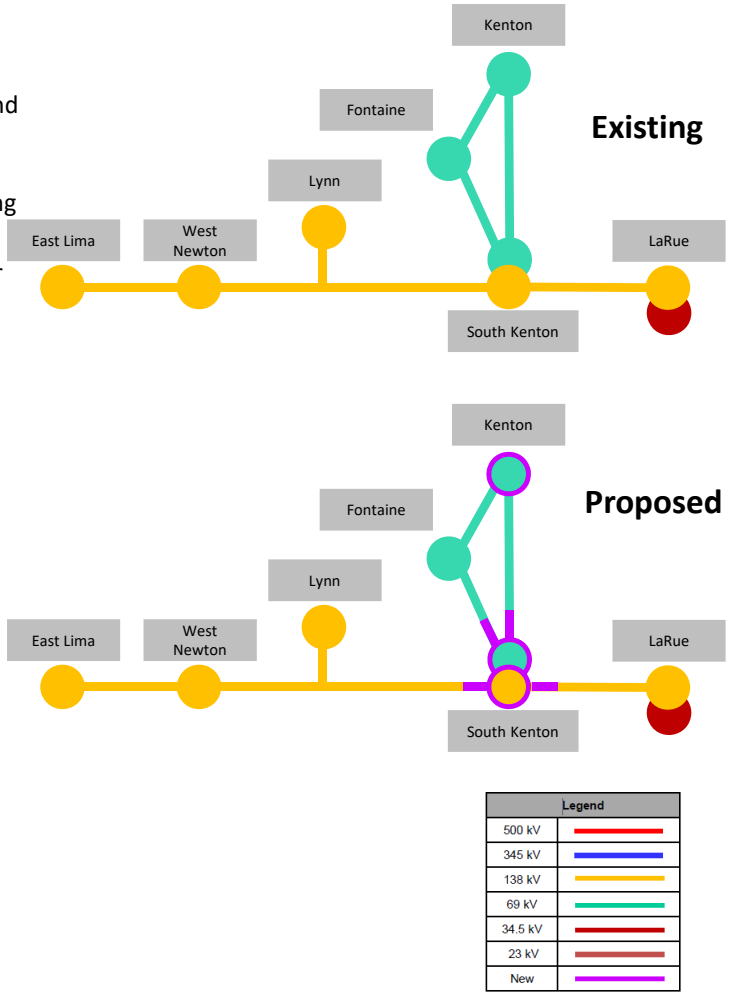
- **South Kenton**. Rebuild the 138kV bay as a four breaker ring bus using 3000A 40kA breakers. Replace transformers two and three with a single 90MVA unit. Install a DICM and replace the EM relays. Replace the 69kV bus and breakers C and E. **Estimated Cost $12.7M (s2982.1)**
- Re-terminate the East Lima - South Kenton 138 kV and South Kenton - Larue 138kV circuits into the new South Kenton ring bus. **Estimated Cost $3.64M (s2982.2)**
- 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 (s2982.3)**
- At Kenton station, replace MOABS X,Z with 69kV 3000A 40kA breakers. Install a DICM **Estimated Cost $3.80M (s2982.4)**
- Upgrade telecom equipment at Rangeline and Gunn Road stations **Estimated cost $94.4K (s2982.5)**

**Total Estimated Transmission Cost: $21.70M**

**Projected In-Service:** 06/01/2025

**Supplemental Project ID:** s2982.1-.5

**Project Status:** Scoping



# AEP Transmission Zone M-3 Process
# Delphos, OH

**Need Number:** AEP-2022-OH019

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Previously Presented:**

Solutions Meeting 7/21/2023

Need Meeting 4/22/2022

**Project Driver:**

Equipment Material/Condition/Performance/Risk

**Specific Assumption Reference:**

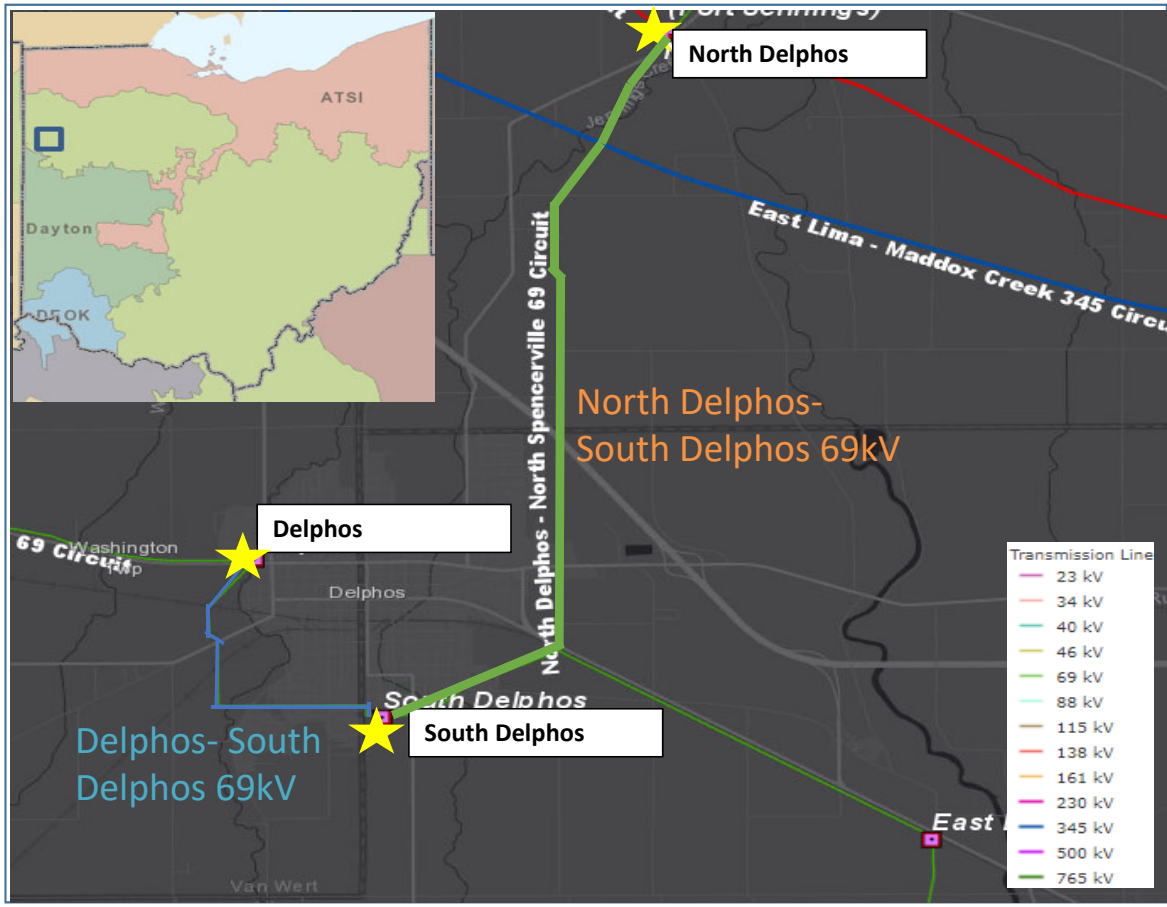
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**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):**

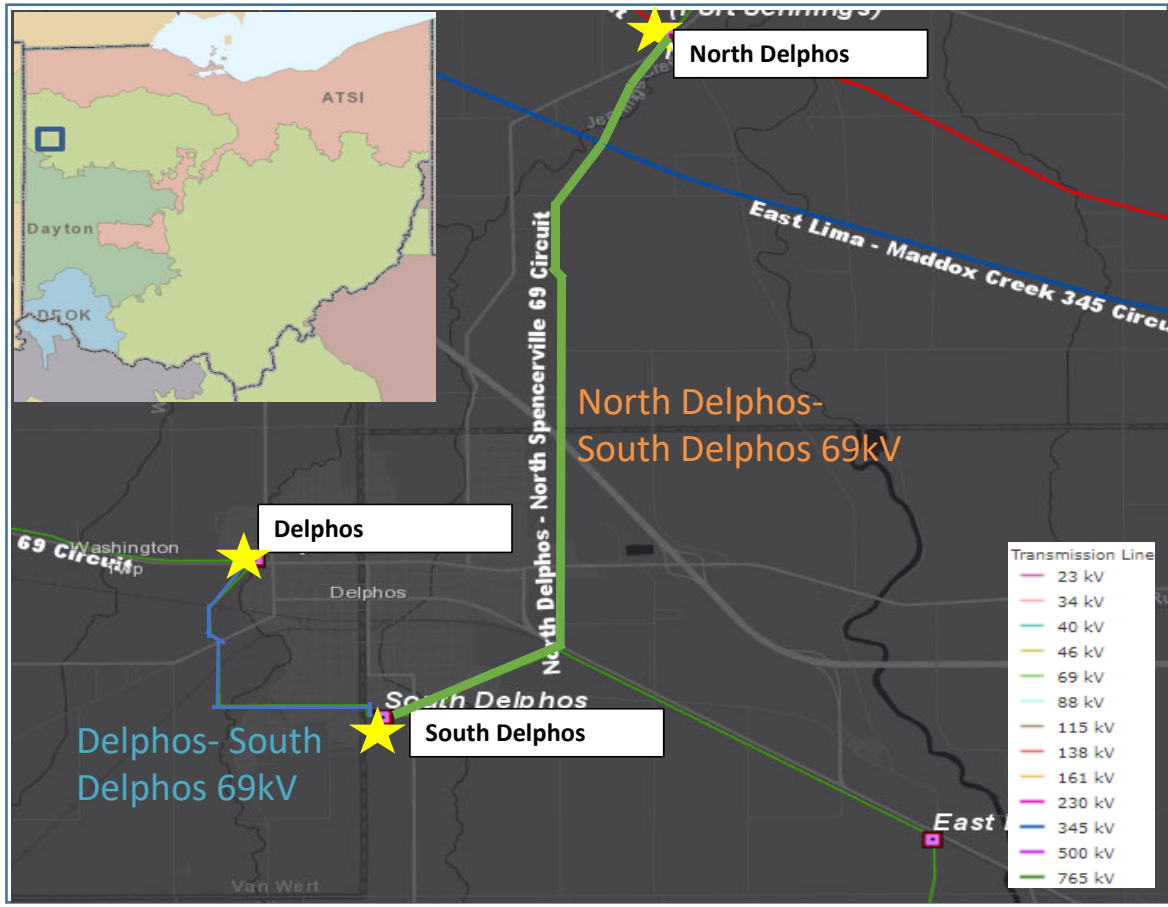
**North Delphos – South Delphos 69kV Line(1943) :**

- 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:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Solution:**

North Delphos: Replace 69kV circuit breakers A & C and Install DICM. **Cost: $3.3M (s2983.1)**

Van Wert: Upgrade line relays. **Cost: $0.7M (s2983.2)**

South Delphos – Delphos: Rebuild 2.7 miles of 69kV with 556 ACSR conductor. **Cost: $7.8M (s2983.3)**

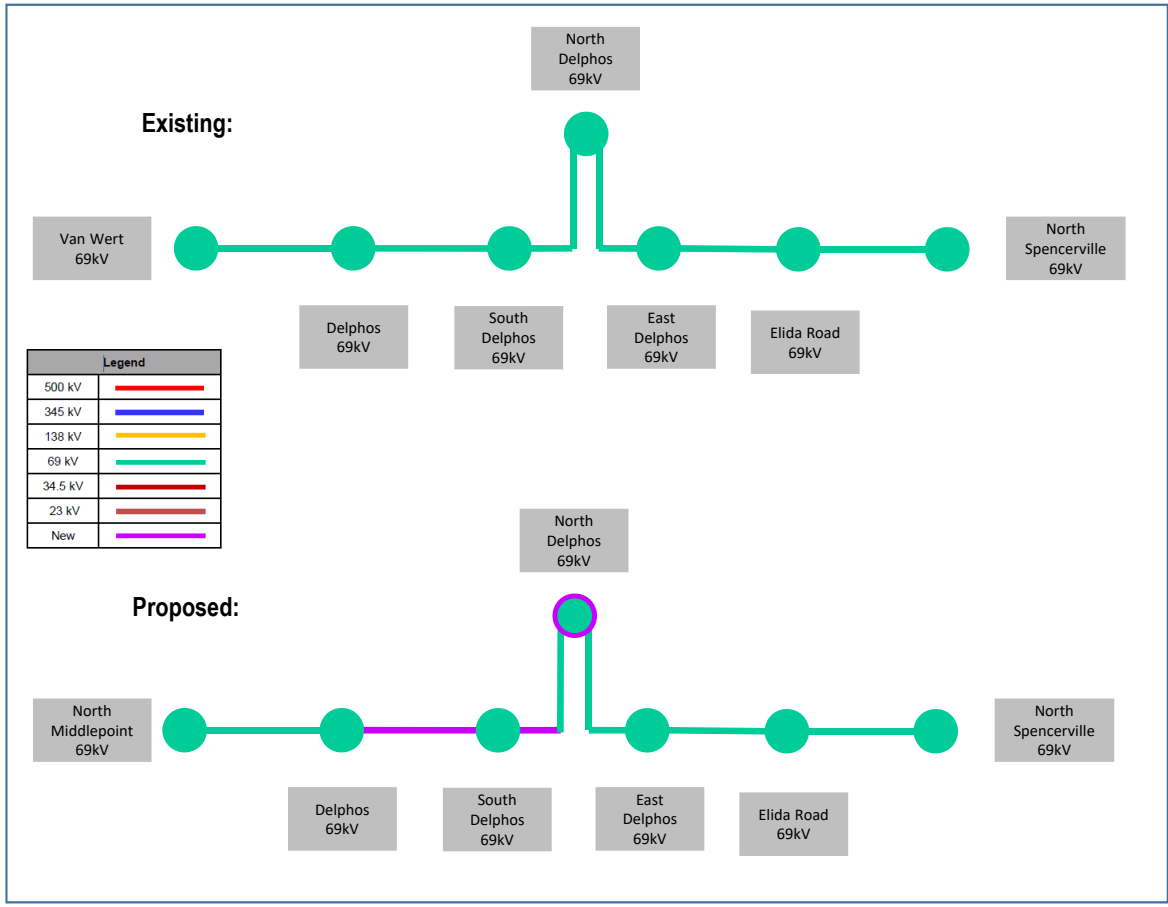
North Delphos - South Delphos: Rebuild 4.33 miles of 69kV with dove 556 ACSR. 1.1 miles will be double circuit (part of the in and out to North Delphos not covered under b3346) and 3.2 miles will be single circuit. **Cost: $ 11.7M (s2983.4)**

**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.

**Supplemental Project ID:** s2983.1-.4

**Project Status:** Conceptual



# AEP Transmission Zone M-3 Process
# Paulding Co., OH

**Need Number:** AEP-2022-OH042

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Previously Presented:**

Solution Meeting 7/21/2023

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:**

**Haviland - Paulding 69kV Line (1951 vintage):**

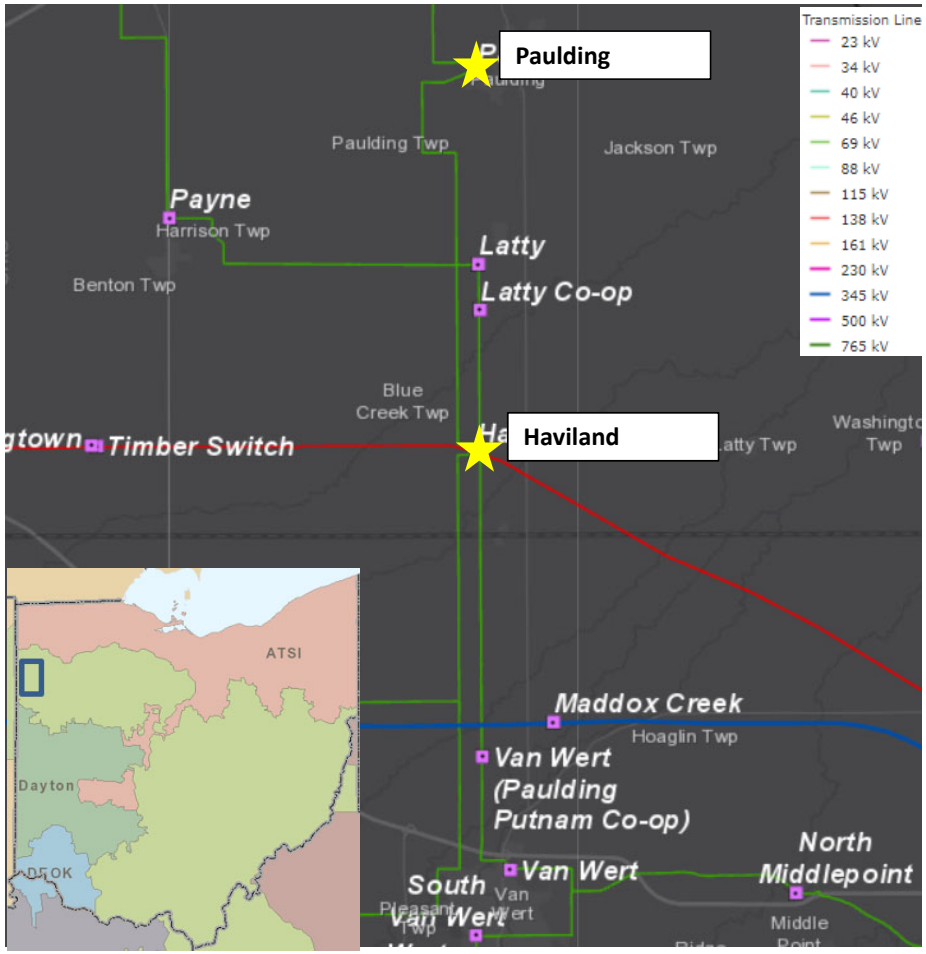
- Length of Line: 10.73 Miles
- Total Structure Count: 175
    - Wooden, Steel Monopole Structures
- Conductor Types: 4/0 ACSR 6/1 (Penguin), 336.4 ACSR 18/1 (Merlin),
- Outage History: 7 Momentary and 3 Permanent outages – average duration of 24.6 hours, 1.185M CMI between 2015 and 2020.
- Open Conditions: 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:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Solution:**

Haviland - Paulding 69kV: Rebuild the existing 10.73 mile-long line using 795 ACSR Drake conductor. **Estimated Cost $18.74M (s2984.1)**

Paulding: Perform remote end work **Estimated Cost $1.40M (s2984.2)**

Haviland: Perform remote end work **Estimated Cost $1.03M (s2984.3)**

**Total Estimated Transmission Cost: $21.189M**

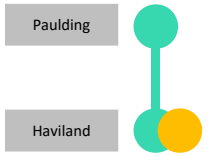
**Model:** PJM 2027 RTEP

**Projected In-Service:** 1/1/2026

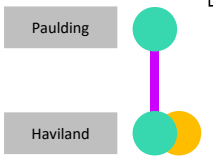
**Supplemental Project ID:** s2984.1-.3

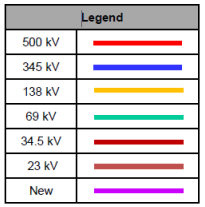
**Project Status:** Scoping

**Existing**




**Proposed**



# AEP Transmission Zone M-3 Process
# Van Wert County, Ohio

**Need Number:** AEP-2022-OH004

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Previously Presented:**

Solutions Meeting 7/21/2023

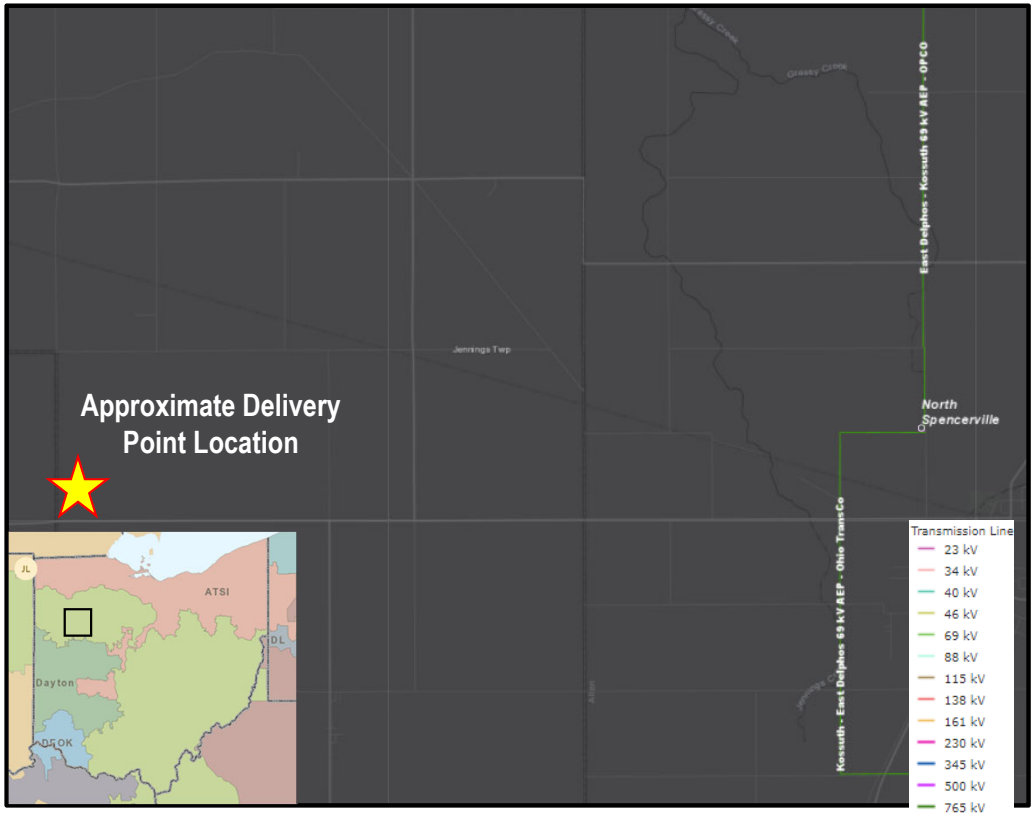
Need Meeting 5/21/2021

**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:** Submission of Supplemental Project for inclusion in the Local Plan 10/13/2023

**Solution:**

Elgin – North Spencerville: Construct approximately 5 miles of 69kv single circuit. Install ADSS. Cost: $12.13M **(s2985.1)**

North Spencerville: Install a DCIM expansion and new 69kv circuit breaker. Install bypass switch called West Spencerville Cost: $0.5M **(s2985.2)**

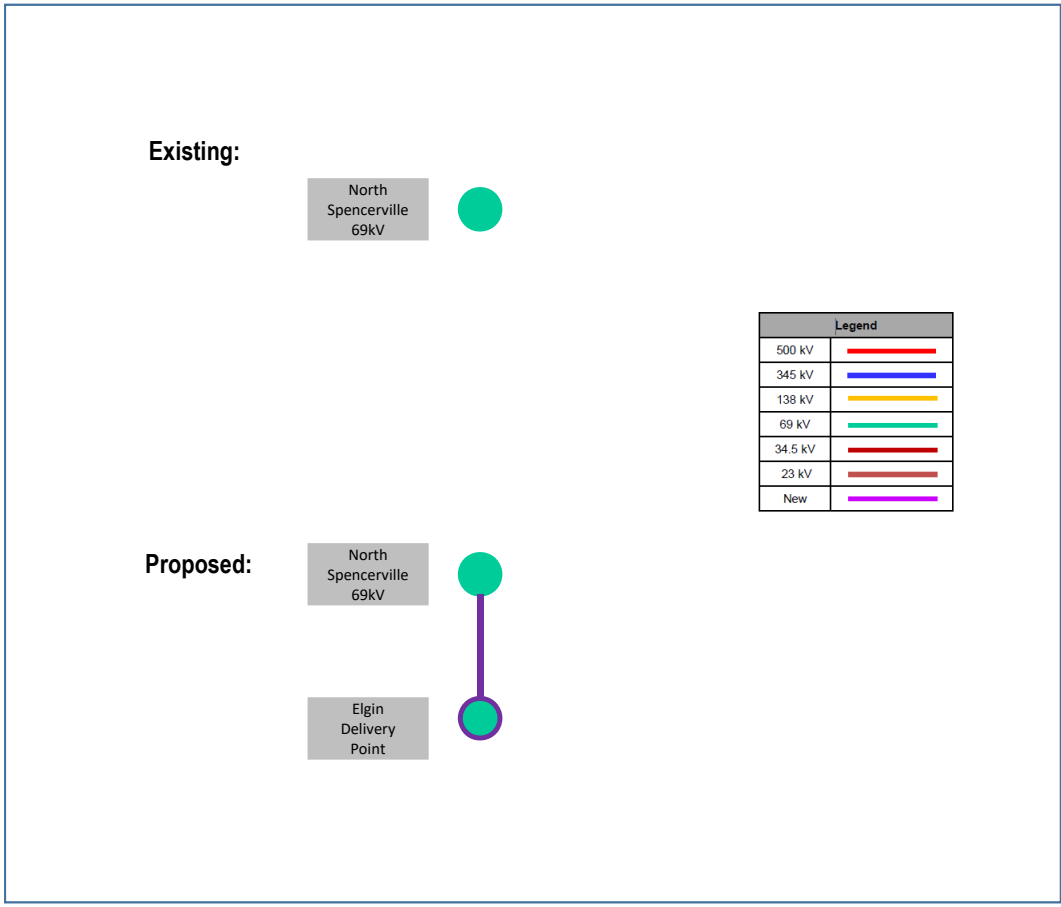
Kossuth-E Delphos: Install ~0.05 miles of 69kv single circuit. $0.31M **(s2985.3)**

**Projected In-Service:** 12/01/2024

**Supplemental Project ID:** s2985.1-.3

**Project Status:** Functional

**Model:** RTEP 2024



# 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**

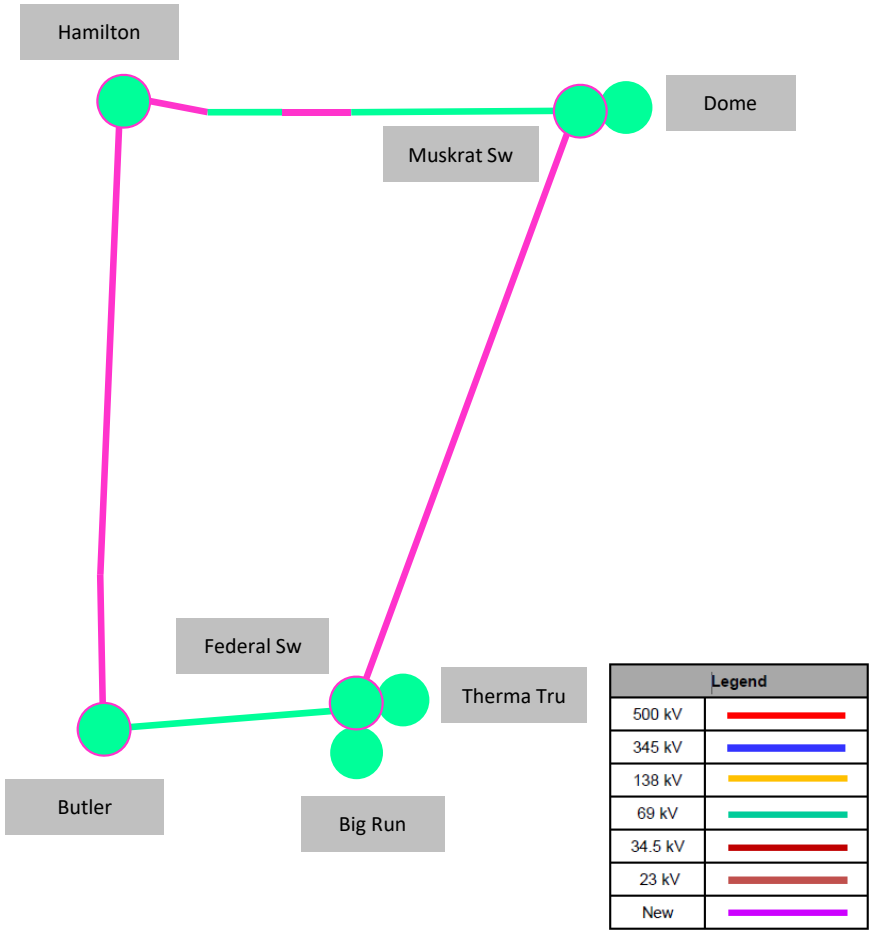
Install 8.37 mile long greenfield line with 556 ACSR from Federal Sw to Muskrat Sw to provide two way service to ~~University Tool,~~ Hamilton and Dome Stations. (**S2098.3**) **Estimated Cost: $13.0M**

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**

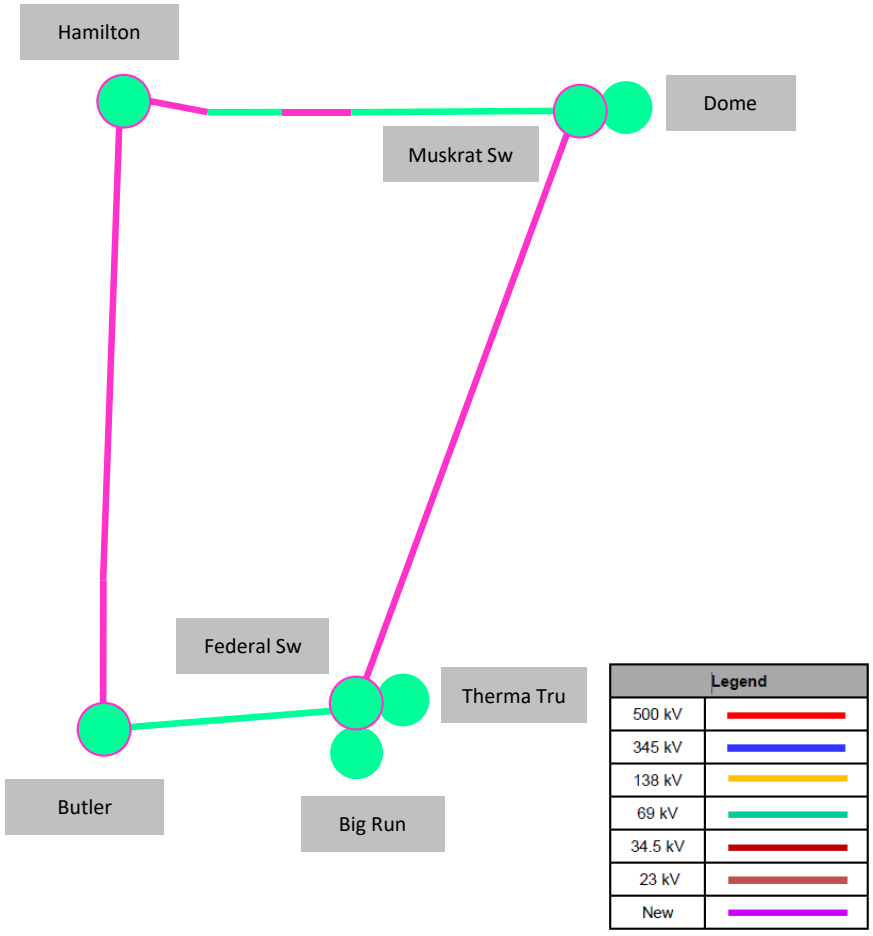
Remove Metcalf tap from the Butler-North Hicksville line and reconnect the through path. (**S2098.11**) **Estimated Cost: $1.0M**

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:**

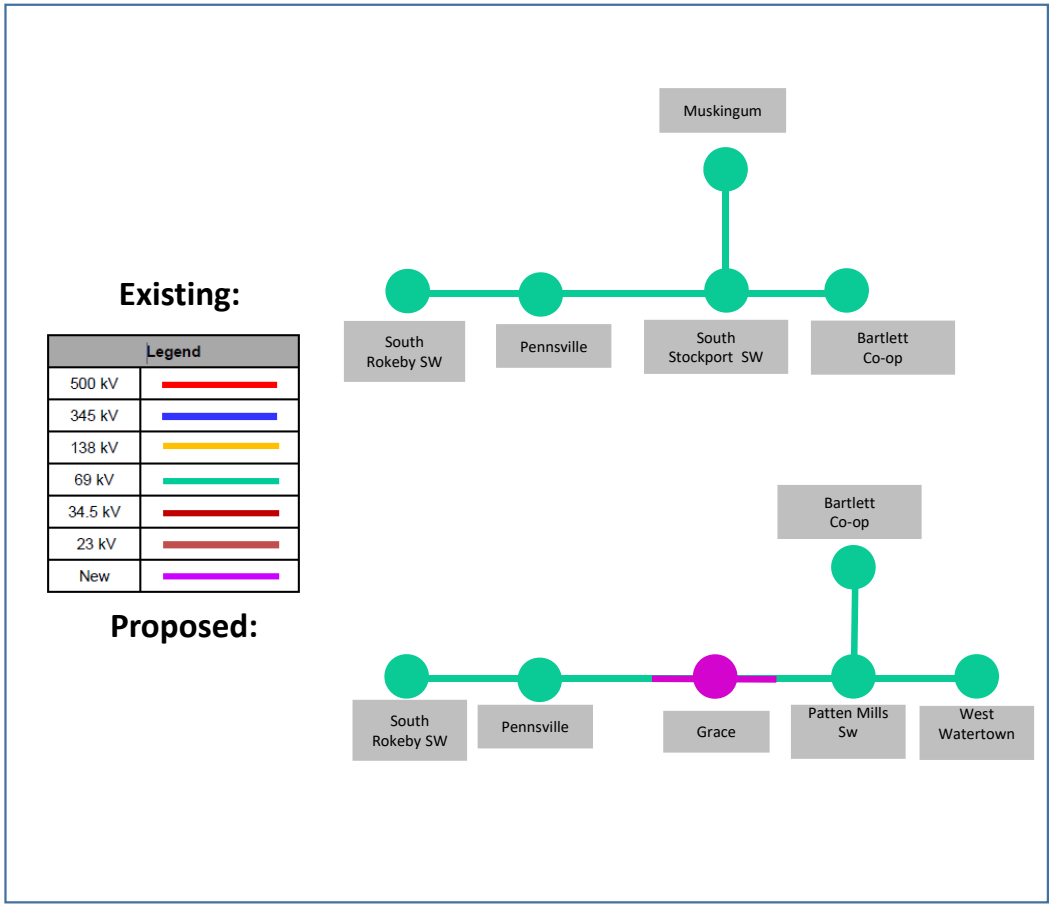
- Install a ~~3 - 3000A Breaker 69kV ring bus~~ a two breaker (3000A, 40 kA) 69kV straight bus station called Grace along the proposed South Rokeby – West Watertown 69 kV circuit (s2791) to serve the requested delivery point. (**S2401.1**) **Estimated Cost: ~~$2.3M~~ $1.8M**
- Remove the South Stockport 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

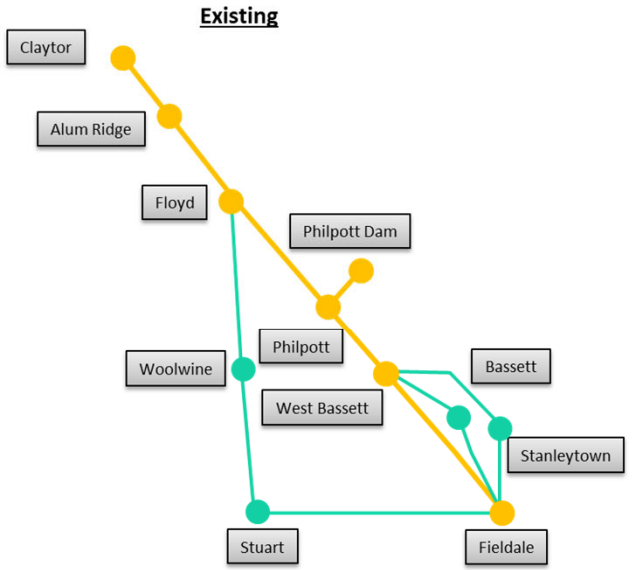
**Model:** 2024 RTEP

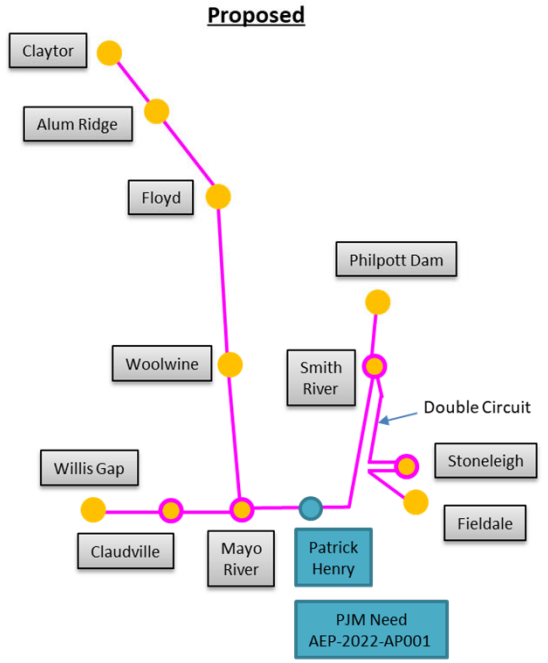


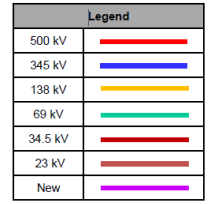
**S2179:** Need Number(s): AEP-2018-AP016 (Need Meeting 1/11/2019), AEP-2018-AP020 (Need Meeting 1/11/2019), AEP-2019-AP036 (Need Meeting 9/25/2019), AEP-2019-AP037 (Need Meeting 9/25/2019), AEP-2019-AP038 (Need Meeting 9/25/2019), Solutions Meeting 1/17/2020, posted to 2020 AEP Local Plan

**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.



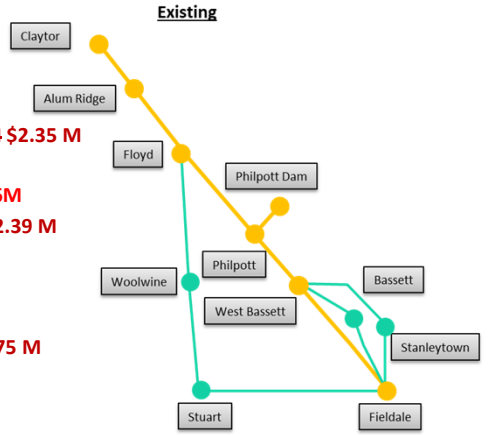



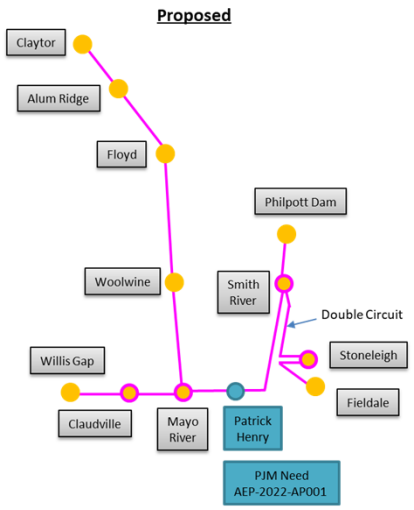



# AEP Transmission Zone: Supplemental Project S2179 Changes

**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 | |
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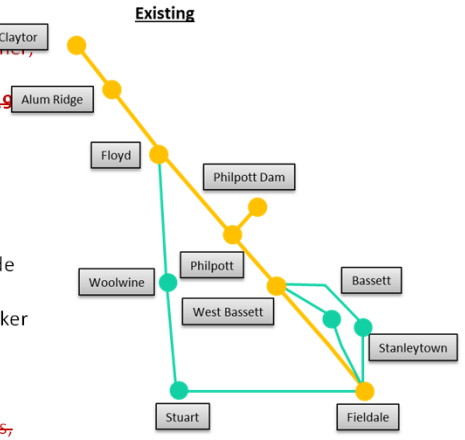
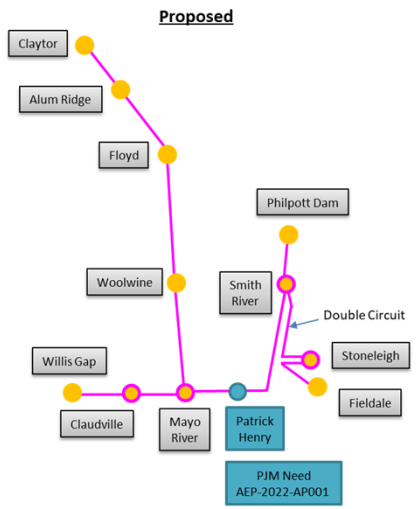
| 500 kV | |
| 345 kV | |
| 138 kV | |
| 69 kV | |
| 34.5 kV | |
| 23 kV | |
| New | |

# 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: ~~$0.9~~ $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 | |
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| 500 kV | |
| 345 kV | |
| 138 kV | |
| 69 kV | |
| 34.5 kV | |
| 23 kV | |
| New | |

# AEP Transmission Zone: Supplemental Project S2179 Changes

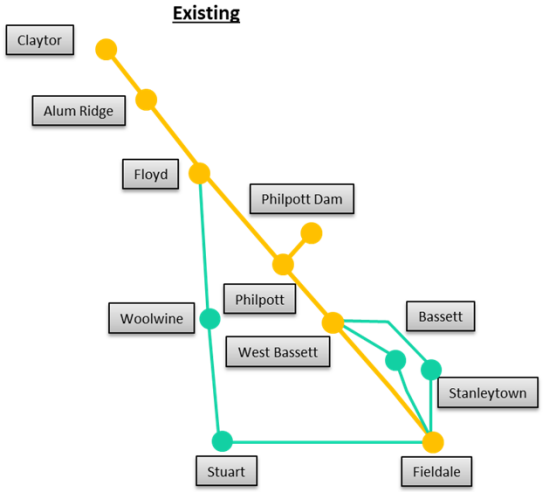
*Continued from previous slide …*

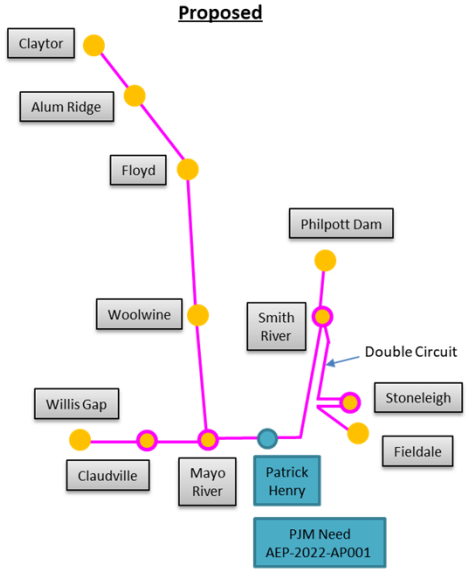
- At Huffman station remove CB "C" bypass switch and Install CCVT with Wavetrap on Willis Gap line **(S2179.41) Estimated Cost: $0M**
- Retire West Bassett station **(S2179.42) Estimated Cost: $0M**
- At Stoneleigh station establish new 138 kV tap station, install 3-way MOAB switch, install 138/12 kV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

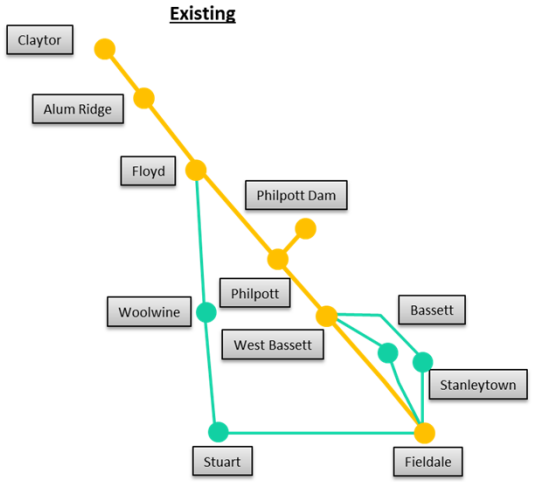
**Alternatives Considered:**
Address the asset renewal needs by rebuilding all the transmission lines of concern on existing centerline and replacing the identified station equipment in need of replacement. This would include rebuilding the following lines totaling approximately 99 miles: Claytor-Fieldale 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.

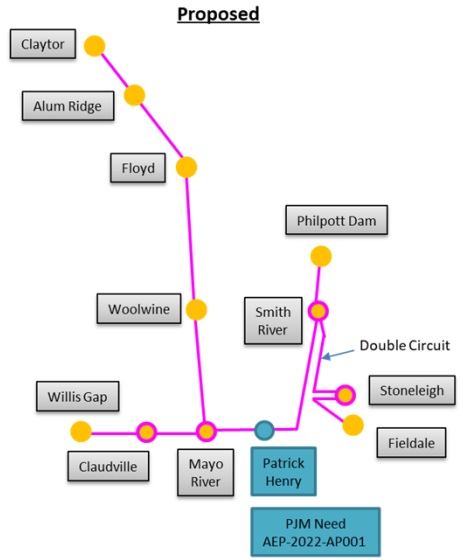
While this alternate plan would address the identified aging infrastructure, it would not provide the additional benefits of the preferred plan, which include: conversion of the local 69 kV system to a more robust and reliable 138 kV system, allow for the retirement of ~18 miles of 138 kV line and ~7 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 | |

# AEP Transmission Zone
# S2270 Scope Change

**S2270.1 -.7 (2020 AEP local plan)**

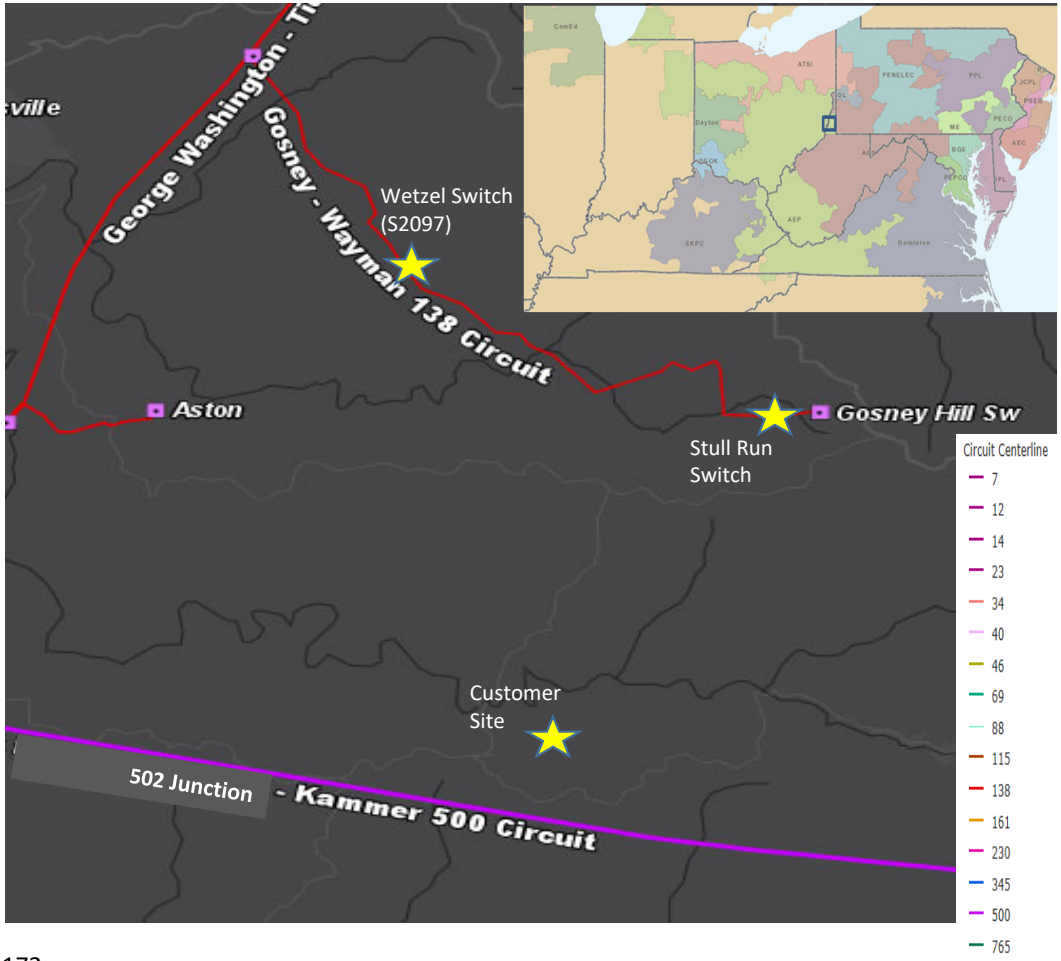
**Supplemental Project Driver:**

Customer Service: A customer has requested new service west of Cameron, West Virginia. The forecasted peak demand is 30 MW initially, with long-term prospects of 90 MW.

With the addition of this customer load, the Wayman-Gosney-Nauvoo Ridge 138kV radial line has an MVA-mile demand of 896, far exceeding AEP's guideline of 75 MVA-miles. The MVA-mile demand that exists today on the Wayman-Gosney Hill 138kV circuit is 313 without any new load additions

**Scope change was presented in** 3/8/2022 TEAC

<u>The reason for the scope change:</u> After further site exploration and preliminary engineering for the Panhandle 500-138kV station, the cost estimates increased significantly, due to the large amount of civil grading scope required, in this very hilly area of West Virginia. The total station cost estimate rose to $105.5 million for a traditional, open-air design. AEP also evaluated a hybrid GIS station design, which used GIS for the 500kV portion of the station; this cost estimate was $95.0 million. In addition, the cost estimate to modify the 500kV transmission line increased to over $4 million. Overall, Panhandle was no longer a cost-effective system upgrade, so alternatives were studied.



# AEP Transmission Zone S2270 Scope Change

**New Scope presented in** 3/8/2022 TEAC**:**

~~Construct a new 500-138kV station (Panhandle), connecting to the Kammer-502 Junction 500kV circuit (~10.3 miles from Kammer, 31.7 miles from 502 Junction). Install a 3-breaker 500kV ring bus; 450 MVA 500-138kV transformer; 3-breaker 138kV ring bus.~~ ~~**Estimated Cost: $25.0 M (s2270.1)**~~

Construct a new 138kV switching station (Nauvoo Ridge) with 8- 138kV breakers in a breaker-and-a-half design. The station will have 1 circuit to Gosney Hill, 2 circuits to the customer's facility, ~~2 circuits to Panhandle~~ 1 circuit to George Washington, 1 circuit to Natrium, and a 23 MVAR 138kV cap bank. **Estimated Cost: ~~$16.4 M~~ $15.5 M (s2270.2)**

At Gosney Hill, install a new 138kV breaker toward Nauvoo Ridge. Update station protection. ~~Replace the 795 kcmil AAC risers and strain bus with 2000 kcmil AAC risers~~. **Estimated Cost: ~~$1.3 M~~ $1.0 M (s2270.3)**

Construct a new 4.7-mile 138kV line south of Gosney Hill station to Nauvoo Ridge. Utilize 1033 ACSR conductor. Acquire new right-of-way. **Estimated Cost: $14.7 M (s2270.4)**

Construct a new 1.3 mile double-circuit 138kV line from Nauvoo Ridge to the customer's substation. Acquire new right-of-way. **Estimated Cost: $4.8 M (s2270.5)**

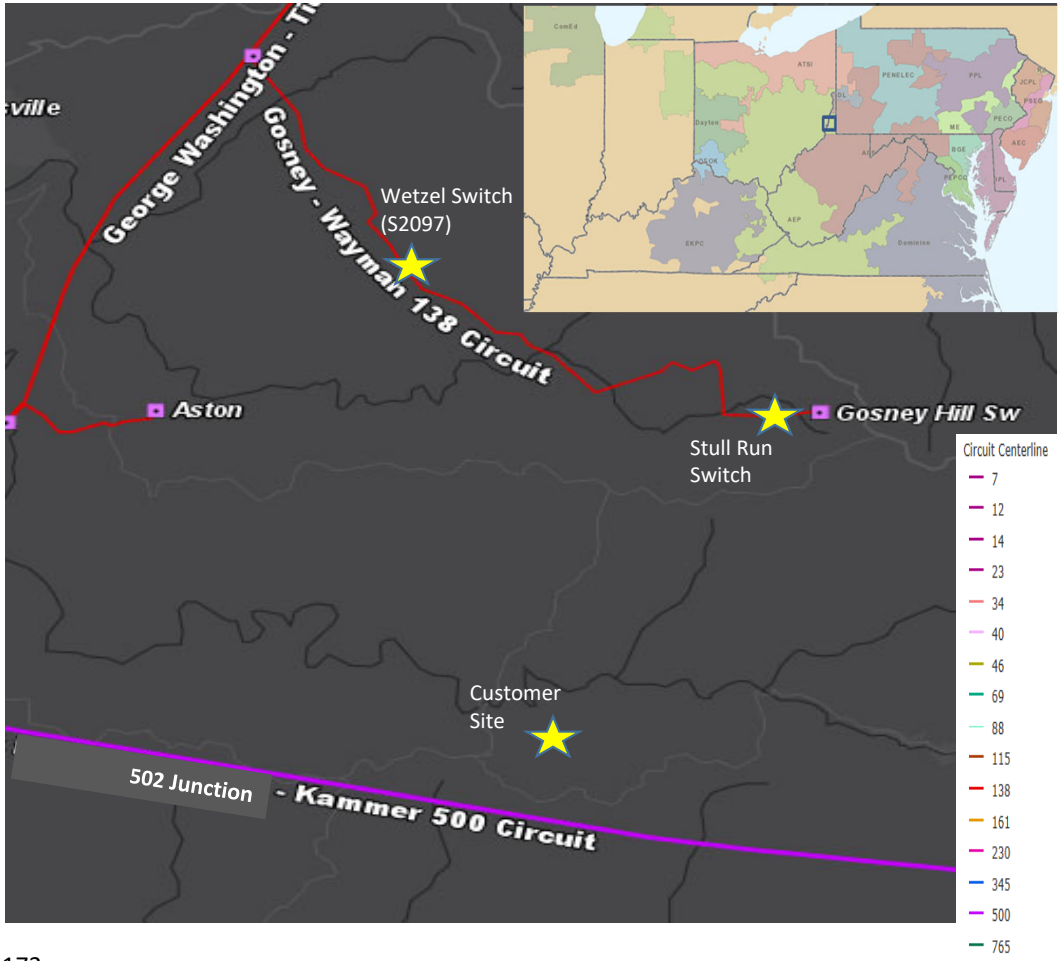
~~Construct a new 1.5 mile double-circuit 138kV line from Panhandle to Nauvoo Ridge. Utilize 1033 ACSR conductor for each circuit. Acquire new right-of-way.~~ ~~**Estimated Cost: $5.0 M (s2270.6)**~~

~~Extend the Kammer-502 Junction 500kV transmission line 0.1 mile into Panhandle station (0.2 mile total).~~ ~~**Estimated Cost: $1.5 M (s2270.7)**~~

Cut into the George Washington-Natrium 138kV circuit and extend an 8.6-mile double-circuit 138kV loop east to Nauvoo Ridge. (**S2270.8**) $23.13 M

Modify the George Washington-Natrium 138kV line, which is part of a double-circuit lattice tower line. (**S2270.9**) $0.65 M

**After additional DNH study by PJM, an overload on Kammer-Natrium 138kV has been identified, due to a slight loading increase attributed to the new scope of s2270.**



# AEP Transmission Zone
# S2270 Scope Change

**Additional Project Scope:**

Rebuild the Kammer-Natrium 138kV double-circuit line (9.3 miles). The circuit's limiting ratings are currently set by the T-Line conductor (556 ACSR). The rebuilt circuit will utilize 795 ACSS high-temperature conductor, to optimize the new structure sizing and cost. (**S2270.10**) $22.86 Million

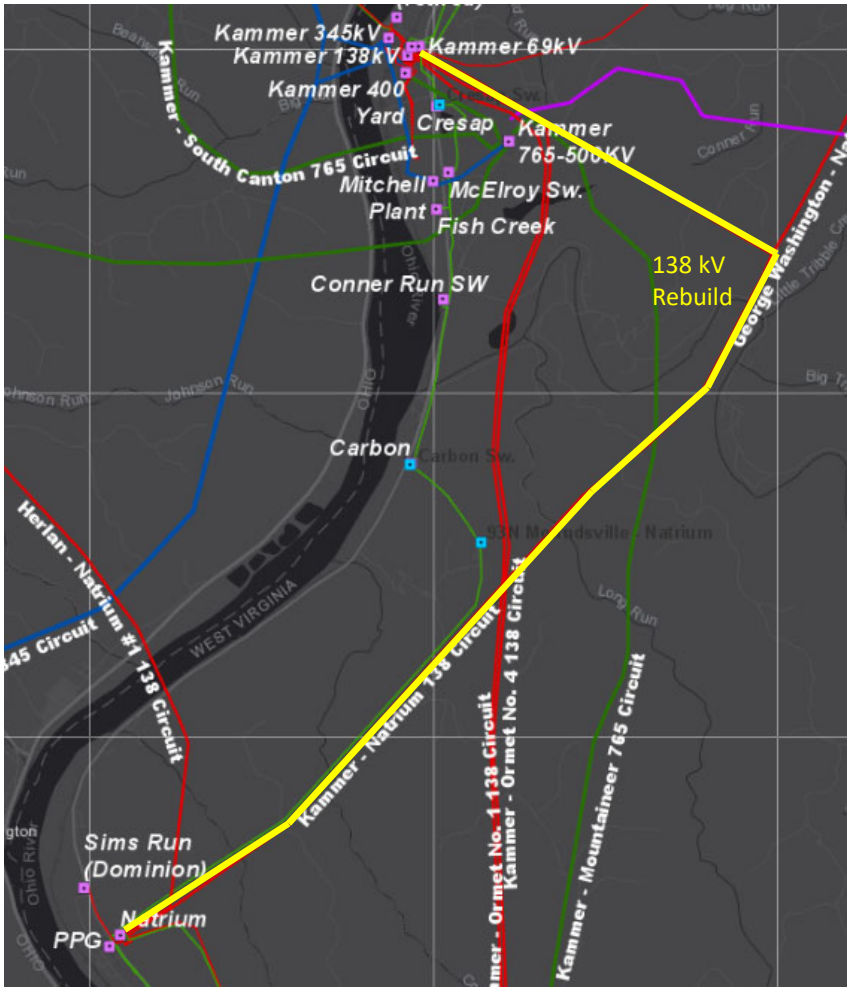
**Total Project Cost**: $82.64 million *(compared to a total of approximately $137.9 M, if the Panhandle 500-138kV option had proceeded)*

**Ancillary Benefits:** The rebuild of Kammer-Natrium 138kV addresses end-of-life concerns on this transmission facility. The circuit consists of 6.5 miles of lattice tower line built in 1945 and 2.8 miles of lattice tower line built in 1956. The line has various open conditions including conductor damage, insulator corrosion, and shield wire problems. The line is not built to current AEP engineering design standards.

**Alternatives Considered:** Instead of a full line rebuild, a reconductor project was also considered. However, given the age and condition of the line asset, it is not prudent to install new conductor on the structures.

**Project Status**: Scoping (new double-circuit 138kV loop to Nauvoo Ridge and Kammer-Natrium 138kV line rebuild). In-service (Gosney Hill to Nauvoo Ridge to the customer)

**Projected In-Service Date**: 12/1/2025



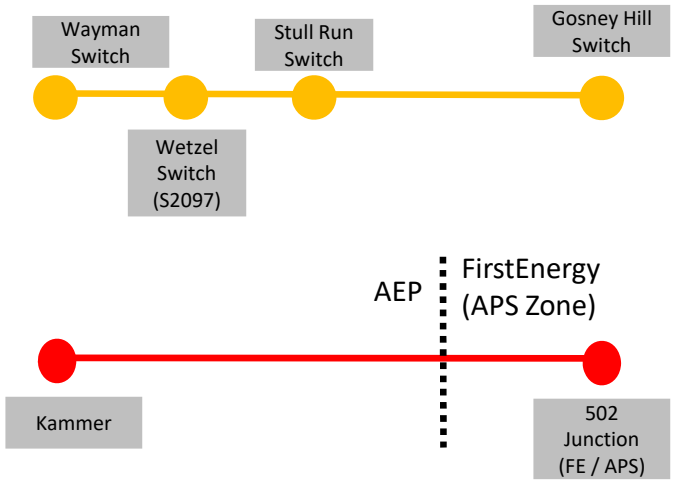
**Need Number:** AEP-2018-OH032

**Process Stage:** Solutions Meeting 9/16/2022

**Proposed Solution:**

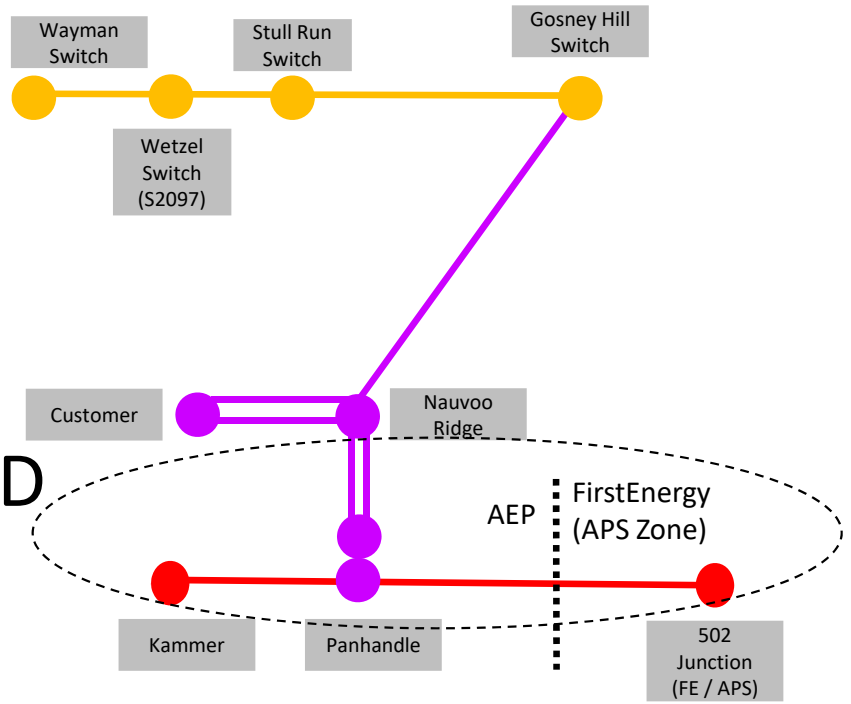
| Legend | |
|---|---|
| 500 kV | |
| 345 kV | |
| 138 kV | |
| 69 kV | |
| 34.5 kV | |
| 23 kV | |
| New | |

**Existing:**




CANCELLED 3/2022

**Proposed:**



AEP Transmission Zone
S2270 Scope change

**Need Number:** AEP-2018-OH032

**Process Stage:** Solutions Meeting 9/16/2022

**Proposed Solution:**

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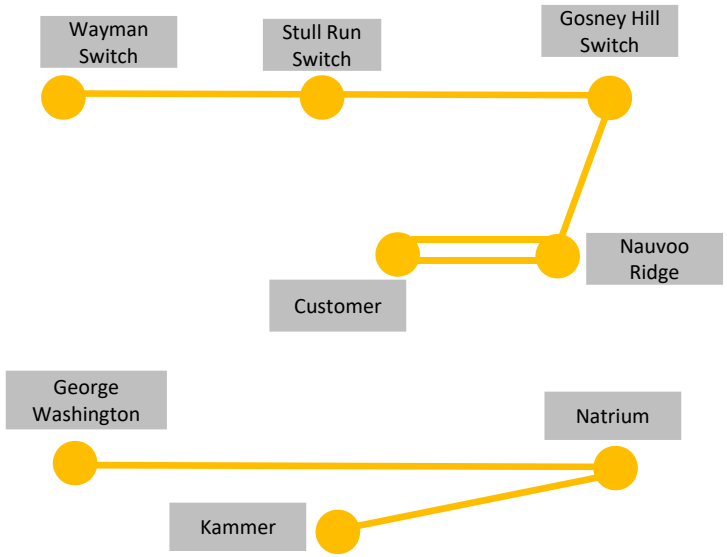
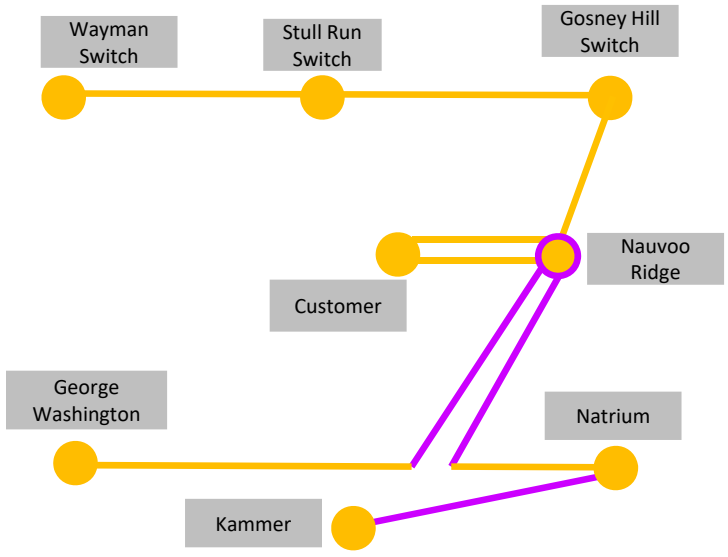
| 500 kV | |
| 345 kV | |
| 138 kV | |
| 69 kV | |
| 34.5 kV | |
| 23 kV | |
| New | |

**Existing:**




**Proposed (After 2nd Scope Update):**



# AEP Transmission Zone M-3 Process
# Central Ohio

**Need Number:** AEP-2023-OH072

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 11/28/2023

**Previously Presented:**

Solutions Meeting 10/31/2023

Need Meeting 05/09/2023

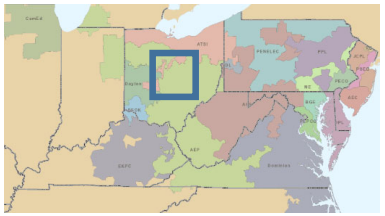
**Supplemental Project Driver:** Equipment Material/Condition/Performance/Risk

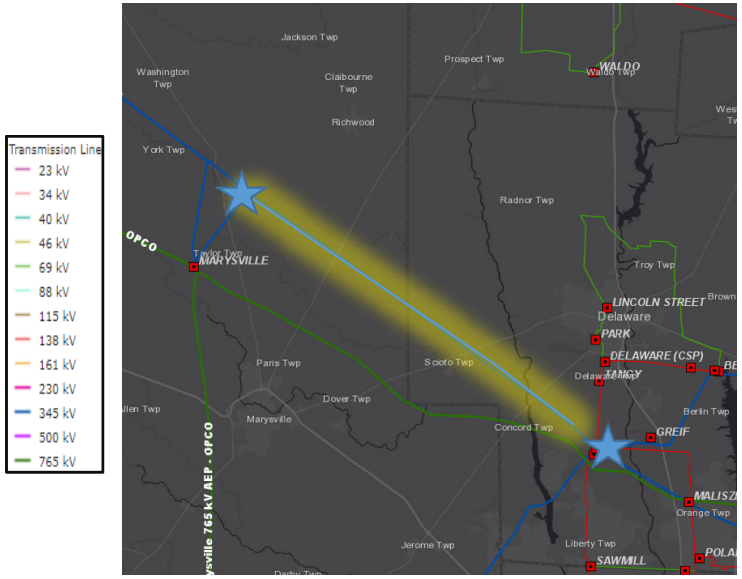
**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**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:** Submission of Supplemental Project for inclusion in the Local Plan 11/28/2023

**Previously Presented:**

Solutions Meeting 10/31/2023

Need Meeting 05/09/2023

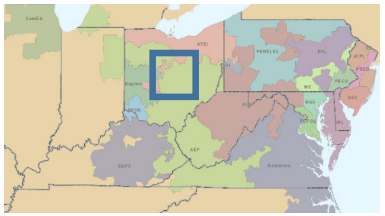
**Supplemental Project Driver:** Equipment Material/Condition/Performance/Risk

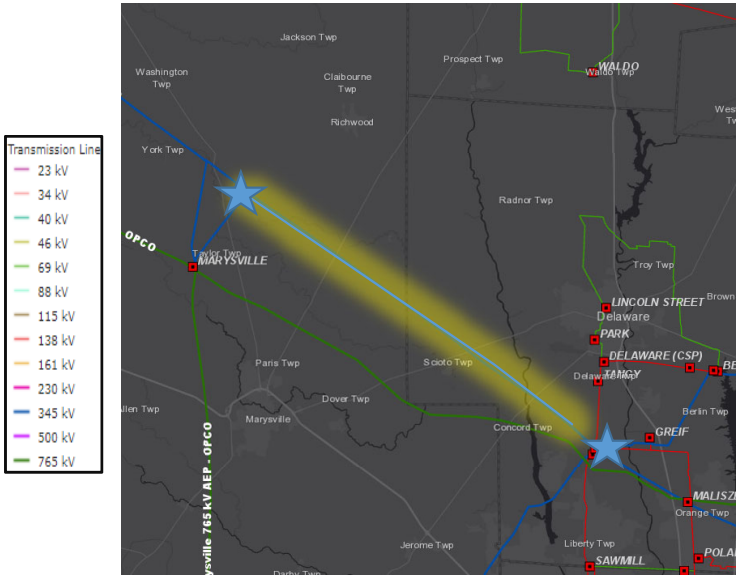
**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**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:** Submission of Supplemental Project for inclusion in the Local Plan 11/28/2023

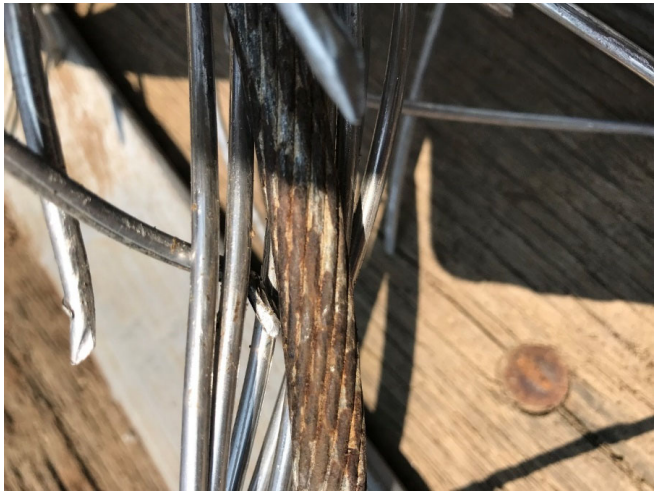
**Previously Presented:**

Solutions Meeting 10/31/2023

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

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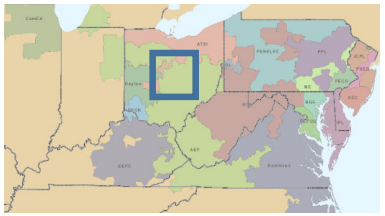
**Supplemental Project Driver:** Equipment Material/Condition/Performance/Risk

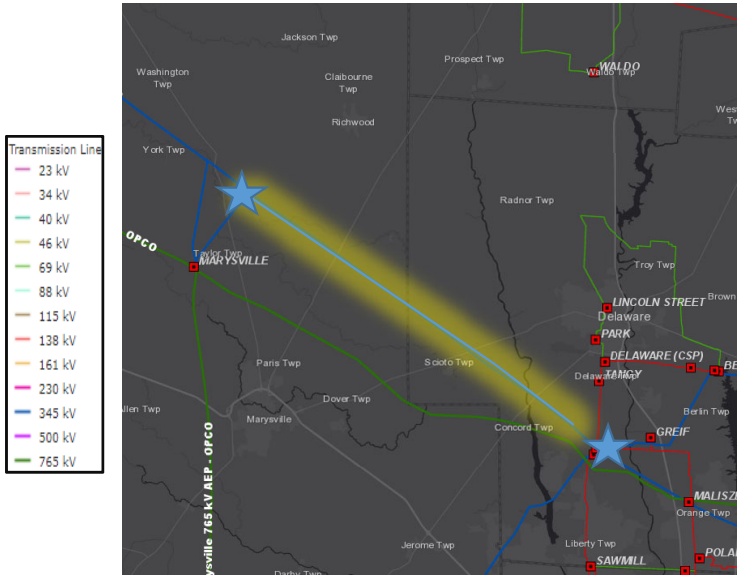
**Specific Assumption Reference:** AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

**Problem Statement: Paper Expanded/Air Expanded (PE/AE) Lines in AEP**

<u>Marysville- Hyatt 345kV Line PE Conductor Need</u>

- 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:** Submission of Supplemental Project for inclusion in the Local Plan 11/28/2023

**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

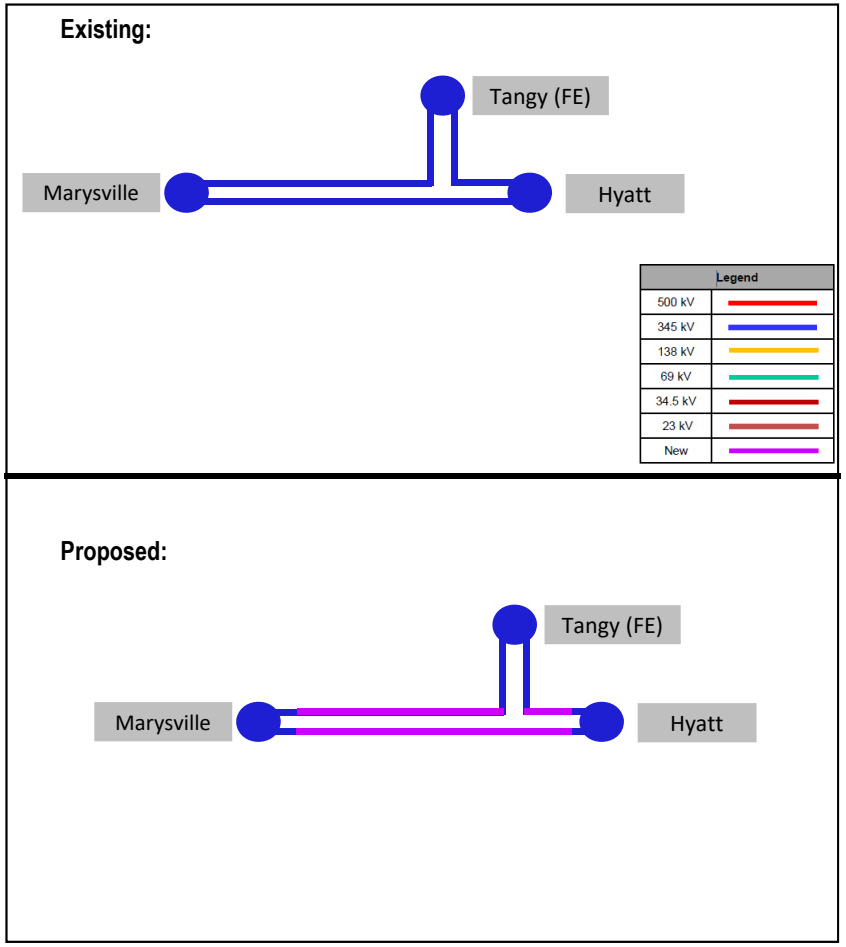
**Total Estimated Transmission Cost: $116.7M**

**Projected In-Service:** 6/1/2027

**Supplemental Project ID:** s3006

**Project Status:** Scoping

**Model:** 2027 RTEP



# Revision History

1/5/2023 – V1 – Added Slides #1-4, S2807.2

1/10/2023 – V2 – Added Slides #5-34, S2810 through S2818.1-.2

1/12/2023 – V3 – Added Slides #35-46, S2819.1-.2 through S2822.1-.8

2/6/2023 – V4 – Added Slides #47-49, S2827.1-.3

2/28/2023 – V5 – Added Slides #50-72, S2829.1- .7through S2832.1-.4.1-.3

3/29/2023 – V6 – Added Slides #73-94, S2848 through S2852 and S2854.1- .2 through S2858

6/2/2023 – V7 – Added Slides #95-115, S2882.1- .6 through S2888

6/22/2023 – V8 – Added Slides #116-139, S2911.1- .9 through S2917.1-.4, S2920 and S2921

9/8/2023 – V9 – Added Slides #140-148, S2911.1- .9 through S2941 –S2944

9/21/2023 – V10 – Added Slides #149-150, S2970

10/17/2023 – V11 – Added Slides #151-176, S2981.1-.2 through S2986.1-.2, S2098 scope change, S2179 scope change, S2401 scope change, and S2270 scope change

11/29/2023 – V12 – Added Slides #177 - 181, S3006