SRRTEP - Western Committee
AEP Supplemental Projects

February 17, 2021

Needs

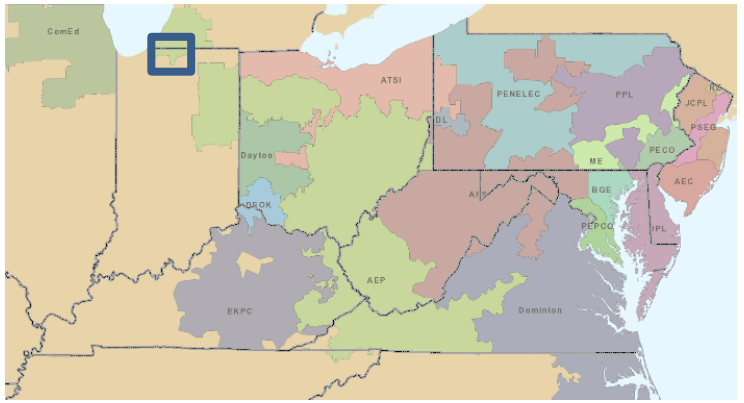
Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

AEP Transmission Zone M-3 Process
South Bend – New Carlisle 138kV

Need Number: AEP-2021-IM001
Process Stage: Needs Meeting 02/17/2021
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13), AEP presentation on pre-1930s lines (https://pjm.com/-/media/committees-groups/committees/srrtep-w/20191218/20191218-aep-system-pre-1930s-tower-lines.ashx)
Model: N/A
Problem Statement:

South Bend – New Carlisle 138kV line:

- 0.88 miles of double circuit 1930 steel lattice line
- Original 397 MCM ACSR and steel structures are still on the line
- There is one structure with open conditions (20% of line) relating to worn shield wire hardware
- Circuit 1 has had 3 momentary outages and 3 permanent outages since 2015.
- Circuit 2 had 1 permanent outage since 2015
- Circuit is a tie with NIPSCO

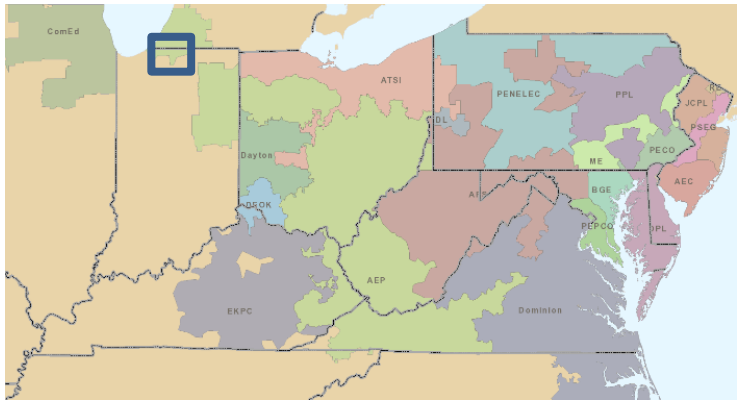


AEP Transmission Zone M-3 Process
New Carlisle – Maple 138kV

Need Number: AEP-2021-IM002
Process Stage: Needs Meeting 02/17/2021
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Model: N/A
Problem Statement:

New Carlisle - Maple 138kV line:

- 0.86 miles of 1952 wood pole H frame line
- Utilizes original structures and 397 ACSR from 1952
- 5 structures have open conditions (63% of line) relating to pole rot, split or rot crossarms, broken ground lead wire, rusty guy wires, and cracked static bracket
- 2 momentary outages over the past 5 years
- Circuit is an interconnection with NIPSCO and MISO



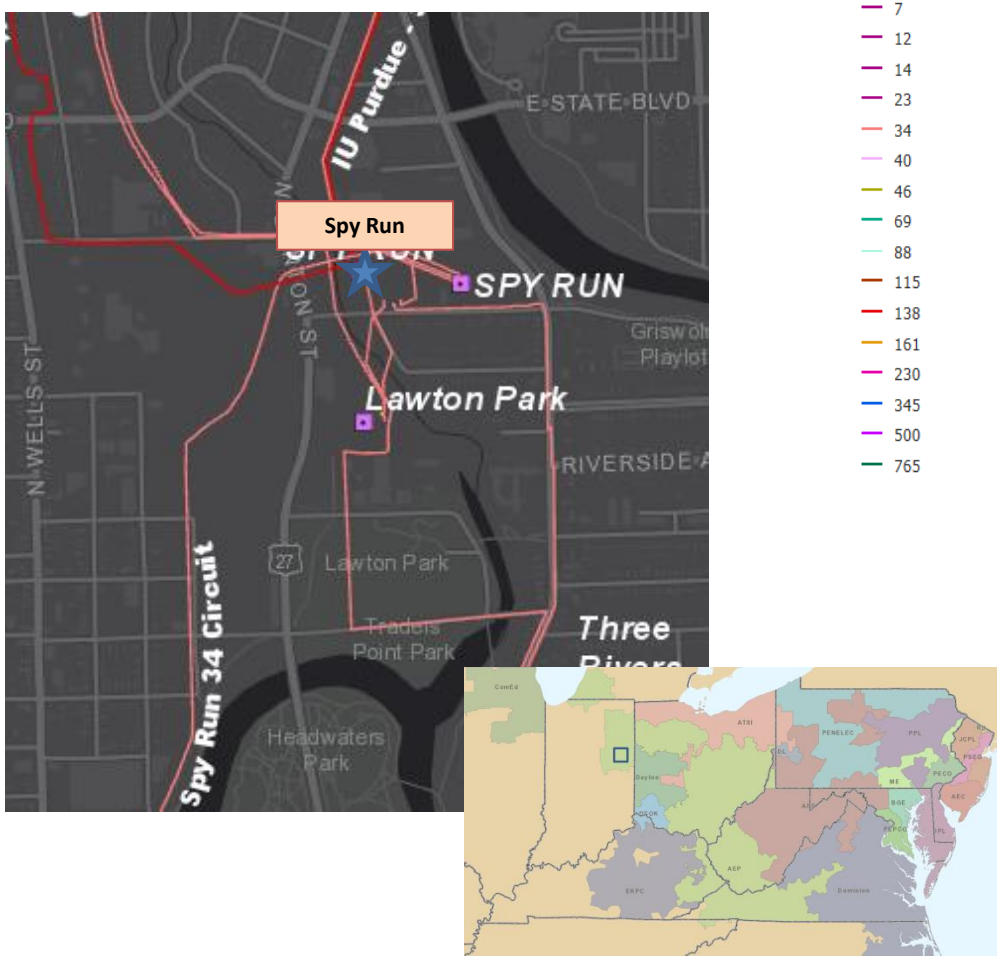
AEP Transmission Zone: Supplemental
Spy Run Transformer

Need Number: AEP-2021-IM004
Process Stage: 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 8)
Problem Statement:

Spy Run 138/34.5kV Station

138/34.5kV Transformer 3

- Manufactured in 1975
- Per DGA analysis, this transformer has increased levels of gassing of Ethylene, Ethane, and CO2
- The low level of dielectric strength indicates acid coating insulation with sludge ready to deposit in the transformer, increasing the risk of failure.
- The levels of moisture and dielectric strength indicate the insulation system is in poor condition, reducing the ability of the unit to withstand through faults.



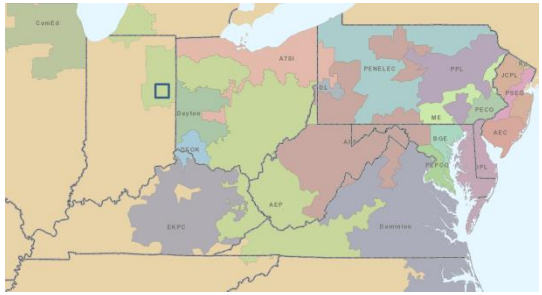
AEP Transmission Zone: Supplemental
Wolf Lake 69kV Tap

Need Number: AEP-2021-IM006
Process Stage: 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



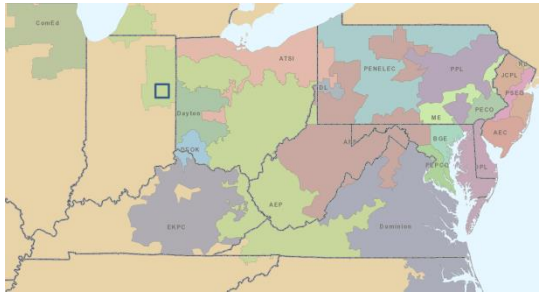
AEP Transmission Zone: Supplemental
Lincoln 138/69/34.5kV

Need Number: AEP-2021-IM011
Process Stage: 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:

- **Lincoln 138/69/34.5kV**
- CB "B", "C" and "I" are 1995, 1988 and 1987 vintage 145-PA type breakers
  - 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; all three of these units have reached this age. 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.
  - CB "B" has experienced 37 fault operations

Model: N/A



AEP Transmission Zone: Supplemental Decker 69kV Load Addition

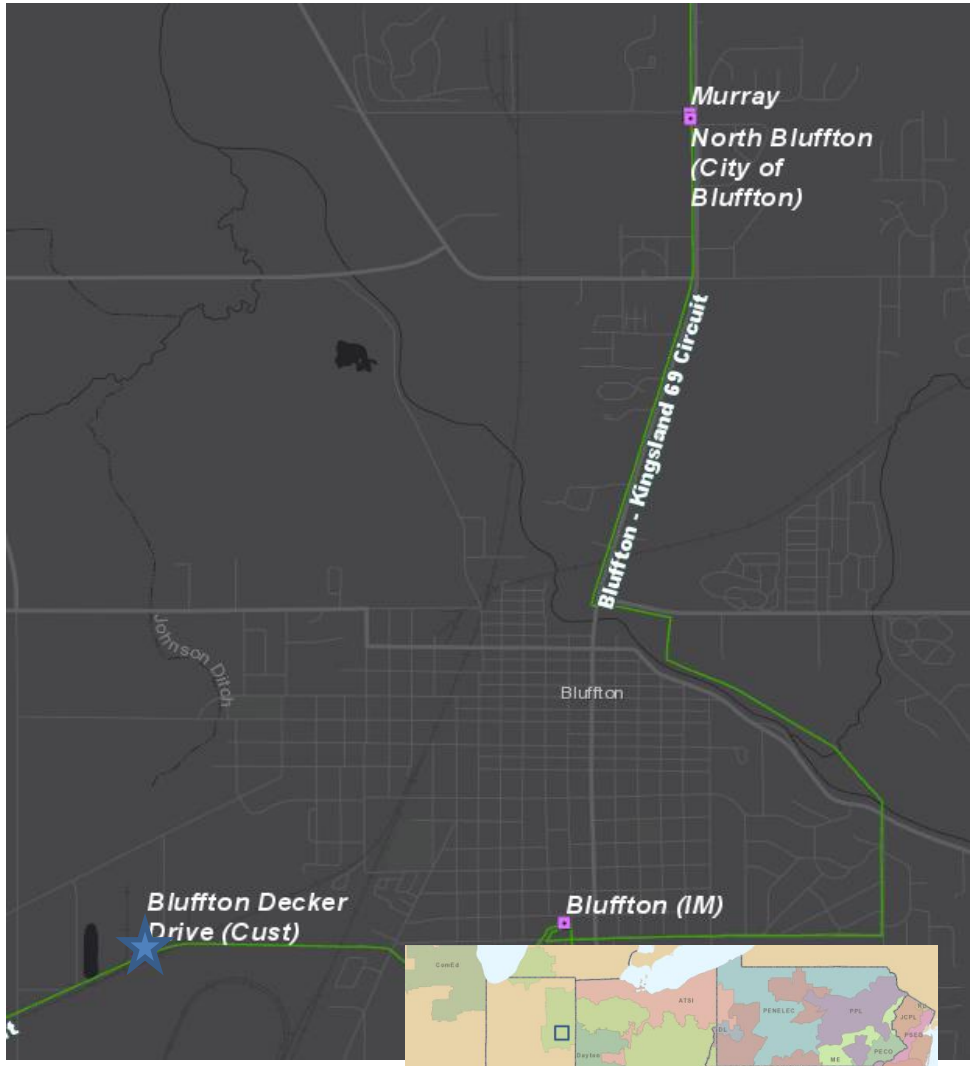
Need Number: AEP-2021-IM012
Process Stage: Needs Meeting 02/17/2021
Supplemental Project Driver: Customer Service
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 12)

Problem Statement:

Decker 69kV

- City of Bluffton has requested an expansion to their delivery point at Decker 69 kV station to serve a new 15.8MW load by November 1 2021.

Model: N/A



AEP Transmission Zone M-3 Process
Hancock, Ohio

Need Number: AEP-2021-OH003

Process Stage: Need Meeting 2/17/2021

Supplemental Project Driver:

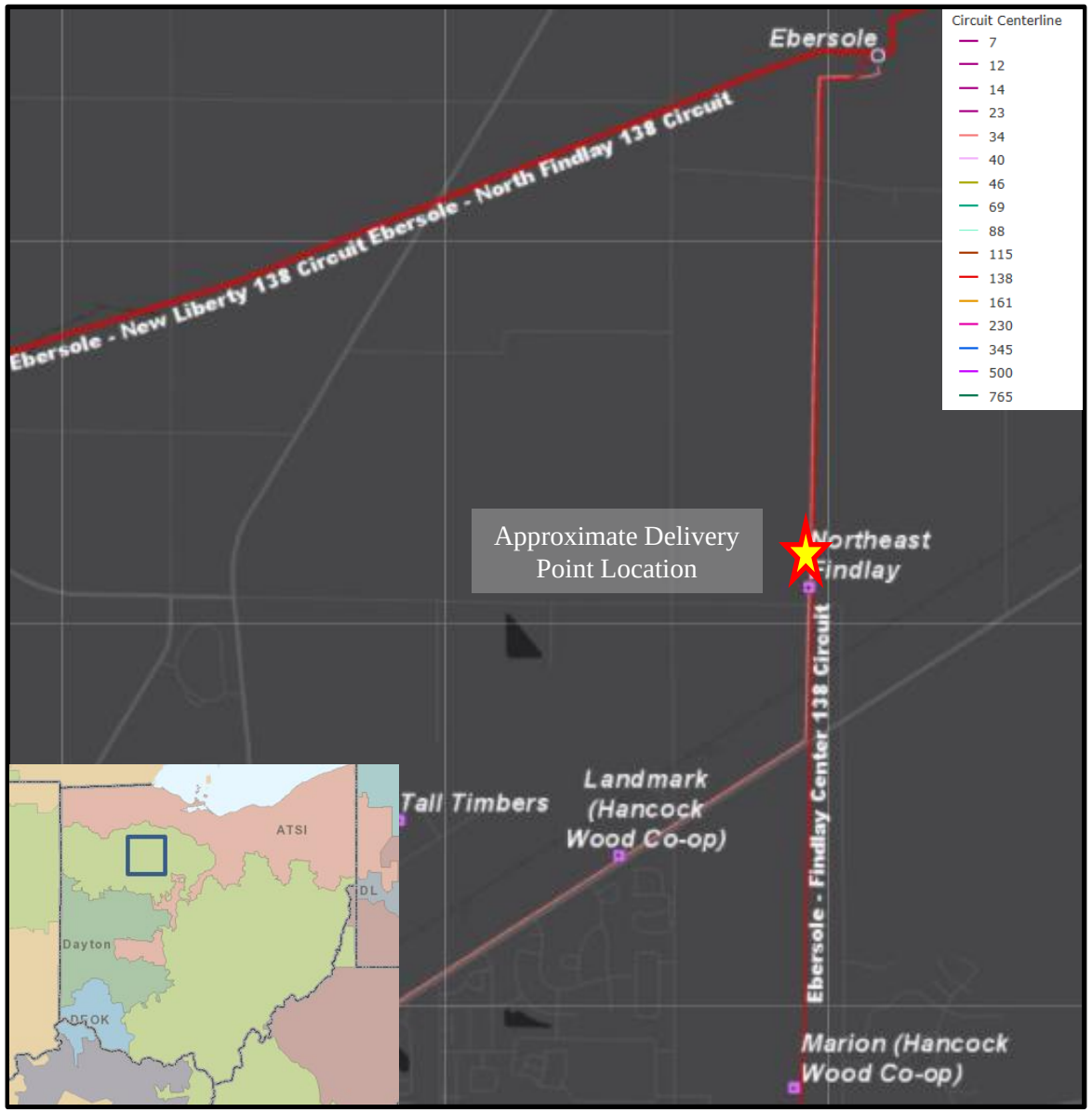
Customer Service

Specific Assumption Reference:

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

Problem Statement:

- Buckeye is requesting on behalf of Hancock-Wood Electric Co-op a new 138kV delivery point on the Ebersole – Findlay Center 138kV Circuit by August 2023. Anticipated load is about 3 MVA.



AEP Transmission Zone M-3 Process
Mark Center SW

Need Number: AEP-2021-OH004

Process Stage: Need Meeting 2/17/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

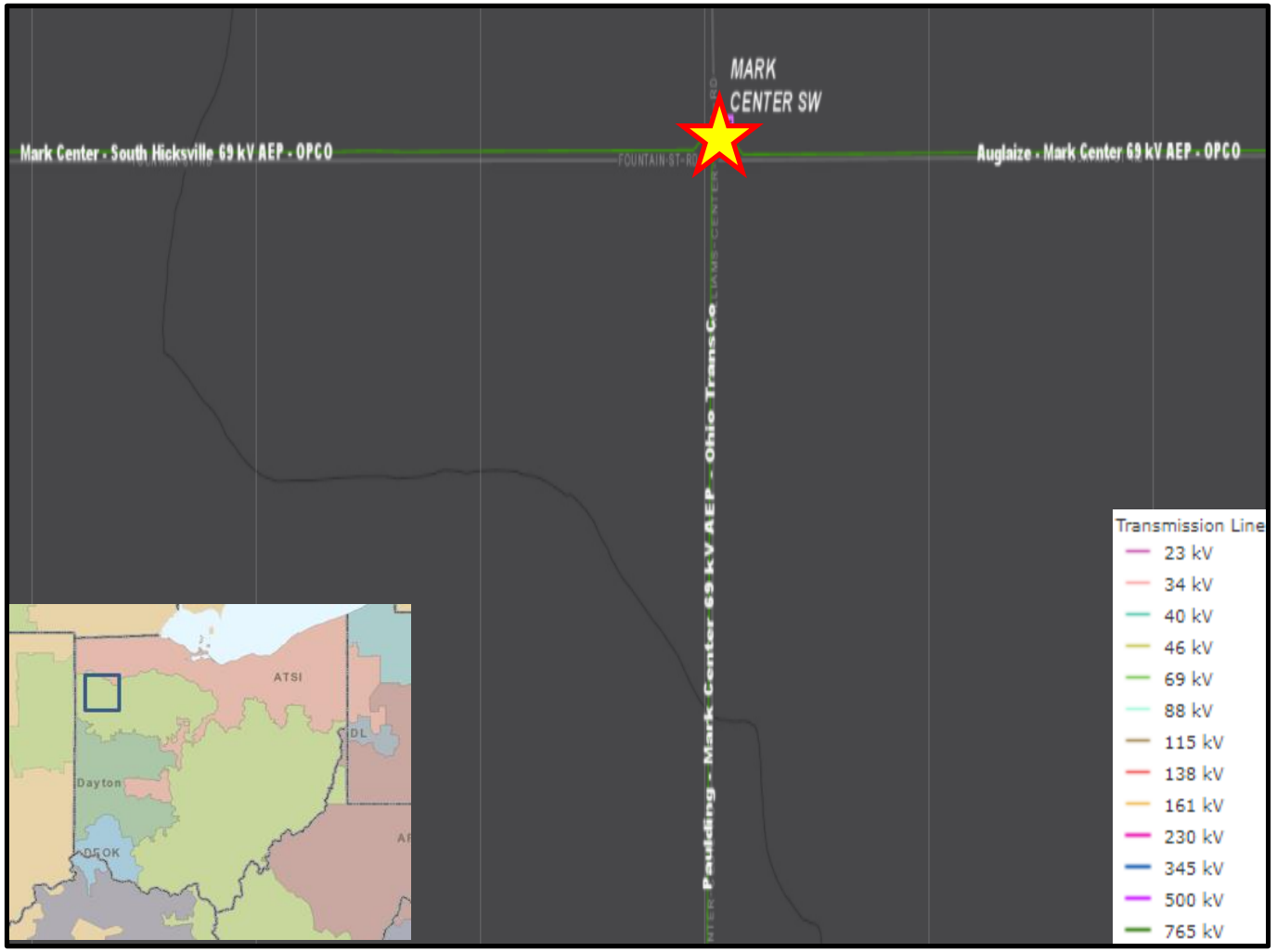
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

Mark Center Switch 69kV:

Circuit Breakers B, C, & D:

- Breaker Age: B 1956, C 1967, & D 1975
- Interrupting Medium: (Oil)
- Fault Operations:
  - Number of Fault Operations: B 26 , C 140, & D 40
  - **Additional Breaker Information**: The breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling. Oil spills are common and can result in significant environmental mitigation costs.
- **Relays:** Currently, 41 of the 47 relays (87% of all station relays) are in need of replacement. 39 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, SCADA functionality, and fault data collection and retention.



AEP Transmission Zone M-3 Process
Fairfield County, OH

Need Number: AEP-2021-OH005

Process Stage: Needs Meeting 2/17/2021

Supplemental Project Driver:

Customer Service

Specific Assumption Reference:

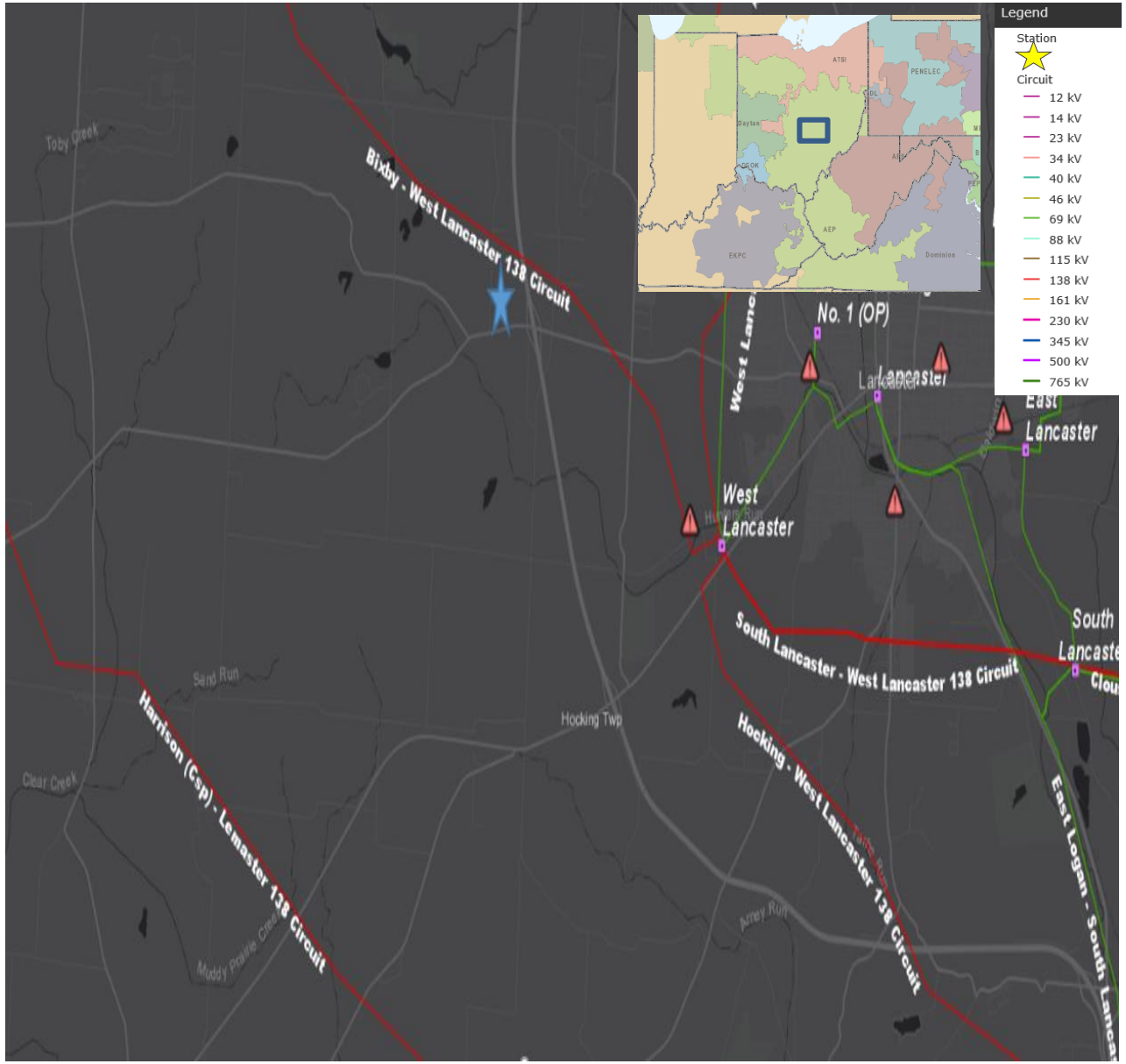
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service near AEP's existing Bixby – West Lancaster 138 kV circuit in Lancaster, OH.
- The customer has indicated an initial peak demand of 100 MW with the potential for an ultimate capacity of up to 300 MW at the site.

Model: 2026 RTEP



AEP Transmission Zone M-3 Process
Guernesy County, Ohio

Need Number: AEP-2021-OH006

Process Stage: Need Meeting 2-17-2021

Project Driver:

Equipment Material/Condition/Performance/Risk

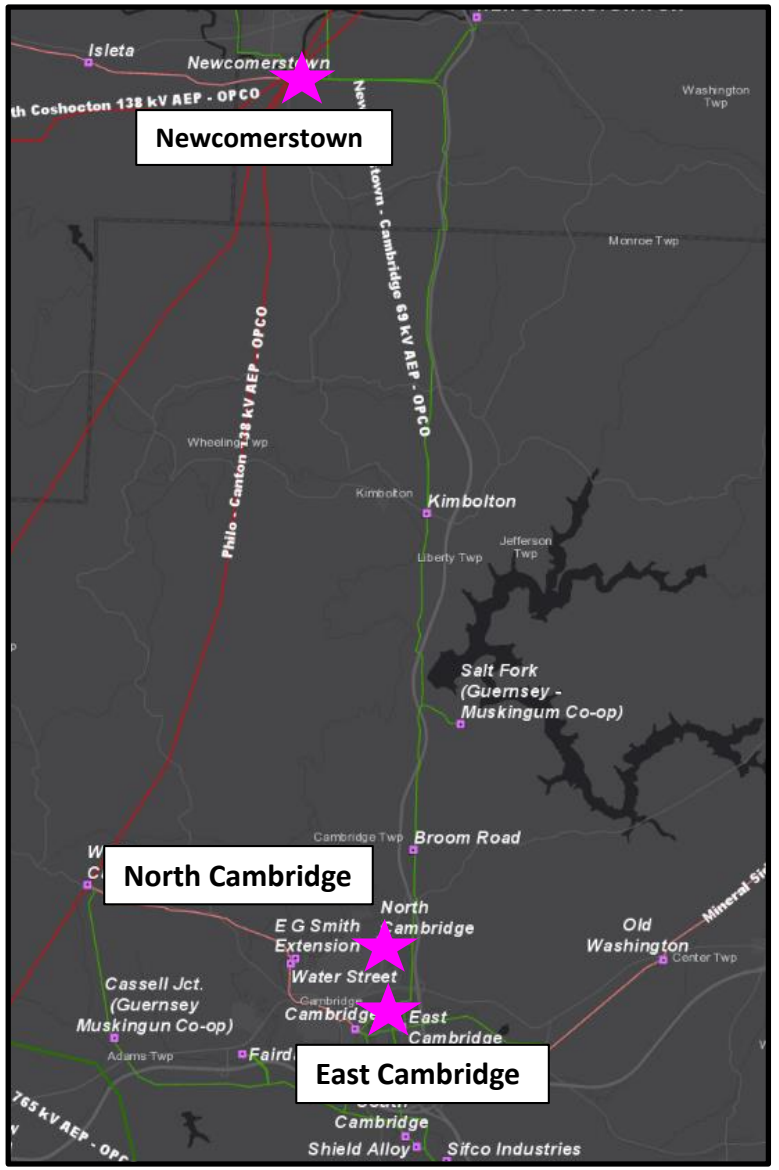
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13), Assumption slides on pre-1930s tower lines (https://pjm.com/-/media/committees-groups/committees/srrtep-w/20191218/20191218-aep-system-pre-1930s-tower-lines.ashx)

Problem Statement:

Line Name: Newcomerstown- Cambridge 69kV, Leatherwood- North Cambridge 69kV
Original Install Date (Age): 1926

- **Length of Line:** 21.94 miles
- **Total structure count:** 317
- **Original Line Construction Type:** Steel lattice and Wood
    - 3% of structures recently replaced
- **Conductor Type:** 3/0 Copper 7 and 336 ACSR 18/1 conductor
- **Outage History**
    - 18 momentary and 5 permanent outages with an average duration of 33.41 hours
    - CMI: 453,409 from 1/1/2014 – 3/20/2019
    - Load at Risk: 16.829 MVA
- **Condition Summary**
    - Number of open conditions by type / defects / inspection failures: Newcomerstown- Cambridge 88, Leatherwood- North Cambridge 13
    - Ground lead wire missing, stolen or broken, structure related conditions affecting the cross arm or pole including rot, split or woodpecker holes, contaminated or broken insulator hardware
- **Additional Info**
    - Leatherwood – North Cambridge is served via a radial switch with old 1963 wood pole structures. 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.
    - A portion of this line is covered under Proposal #2020_1-182 in the 2020 RTEP Window #1. The baseline submittal includes rebuilding the 8.9 mile line between Newcomerstown and Salt Fork Switch with 556 ACSR conductor.



AEP Transmission Zone M-3 Process
Fremont, Ohio

Need Number: AEP-2021-OH007

Process Stage: Need Meeting 2-17-2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

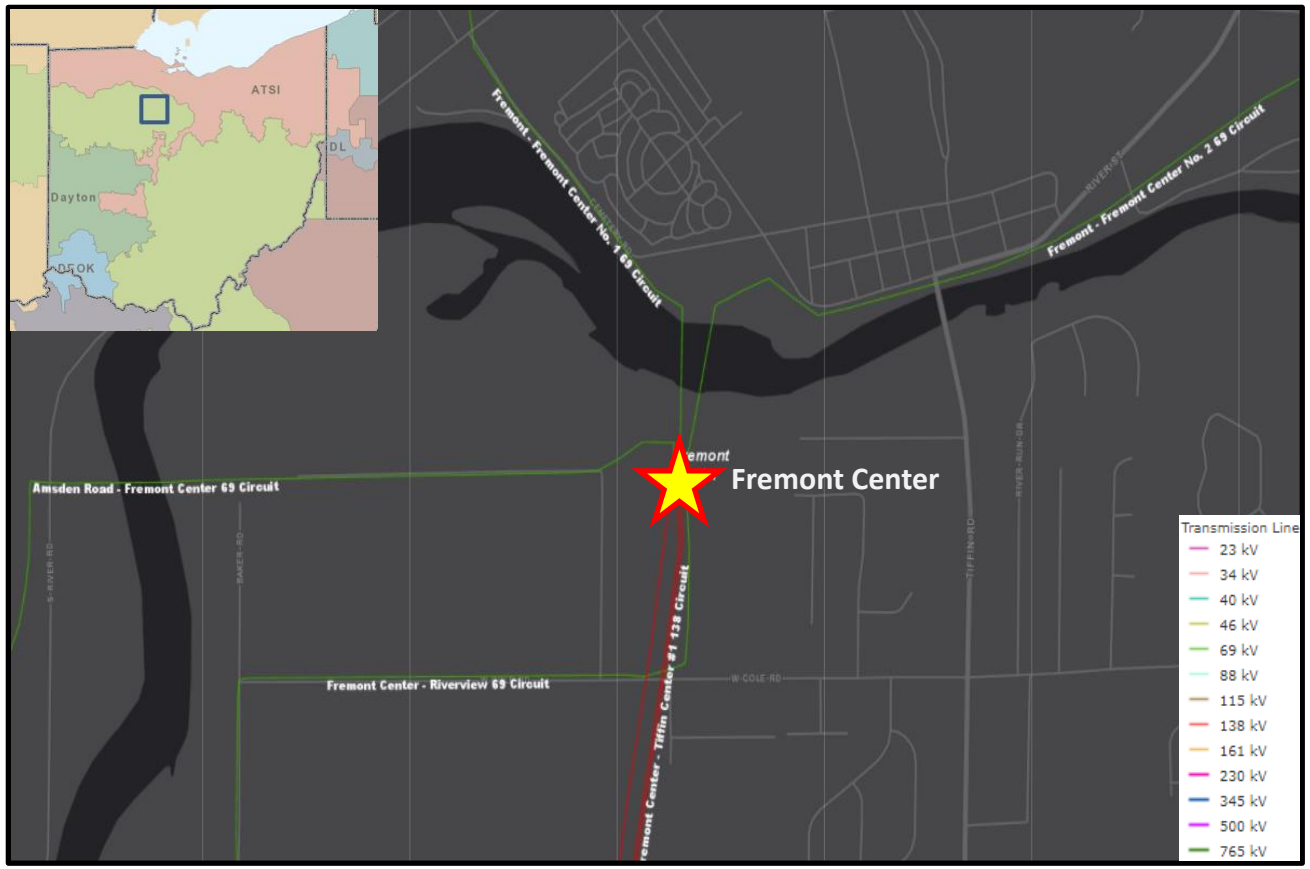
Fremont Center Station:

69 kV Circuit Breakers F, G, H, J, K, & L

- Breaker Age: F-1971, G-1971, H-1971, J-1971, K-1971, & L-1988
- Interrupting Medium: (Oil)
- Fault Operations:
  - Number of Fault Operations: F-15, G-51, H-26, J-20, K-19, & L-69
  - 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 counterparts do not require.

Relays: Currently, 40 of the 76 relays (53% of all station relays) are in need of replacement or upgrades. 39 of these are of the electromechanical type and 1 of the static type which have significant limitations with regards to fault data collection, SCADA functionality, spare parts, and data retention.

RTU: The existing Data Concentrator – DOS type RTU installed at Fremont Center is a non-standard RTU with no vendor support, no active warranty, and no Ethernet compatibility. In addition, this unit has high a malfunction rate.



AEP Transmission Zone M-3 Process
Lima, Ohio

Need Number: AEP-2021-OH008

Process Stage: Need Meeting 2-17-2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

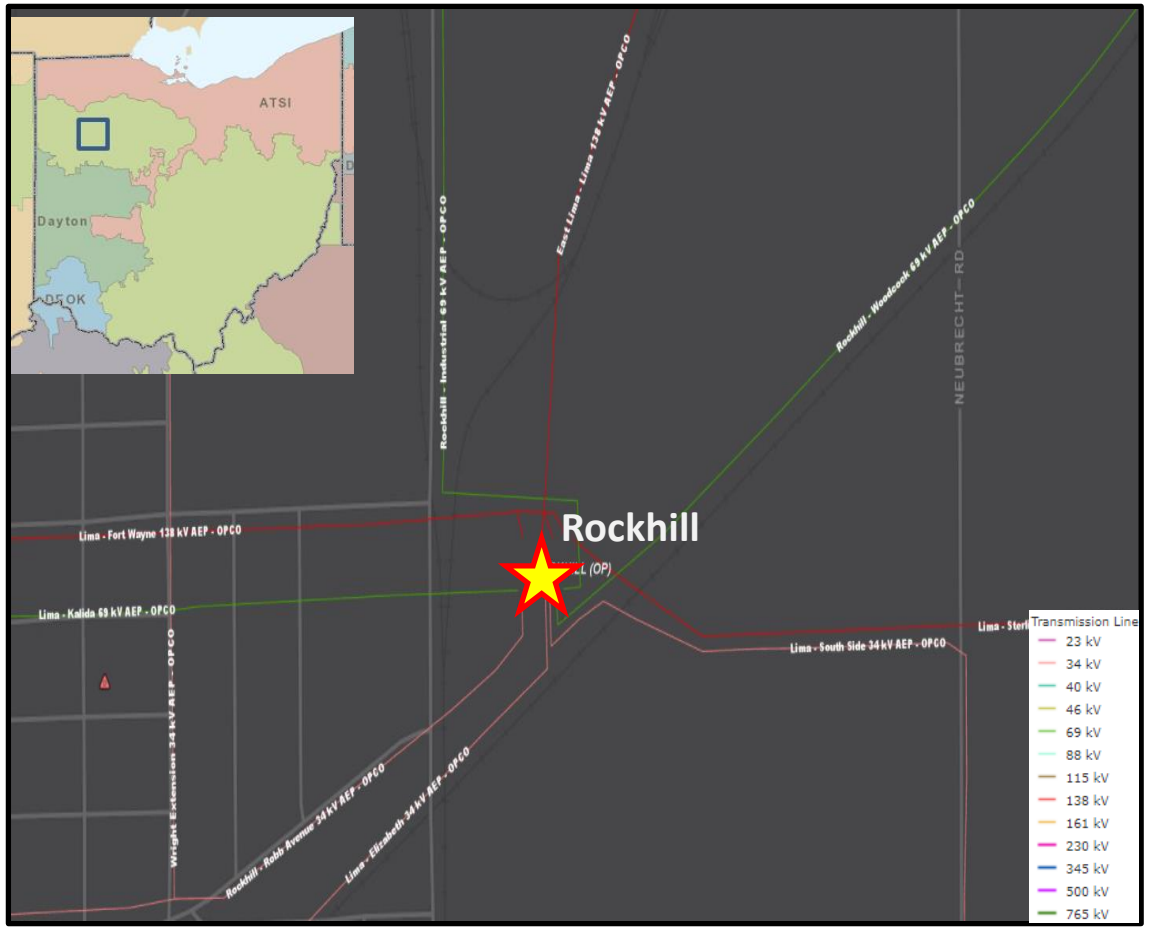
Circuit Breakers (34.5 kV): F, G, H, I, J, L, M, N, U, V, & W

- Breaker Age:
  - F, G, H, I, J, L, N, U, & V (1952); M (1955); W (1951)
- Interrupting Medium: (Oil)
- Fault Operations:
  - Number of Fault Operations: F 48, G 1, H 1, I 4, J 2, L 2, M 3, N 21, U 10, V 50, & W 13
- 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 (138 kV): Circuit Breakers: A, D, E, & C

Breaker Age:

- A, D, E, & C (1986)
- Interrupting Medium: (SF6)
- Fault Operations:
  - Number of Fault Operations: A 17, D 2, E 2, & C 1
- Additional Information: Breaker models for these are 145-PA. 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; all four of these units have reached this age. 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.



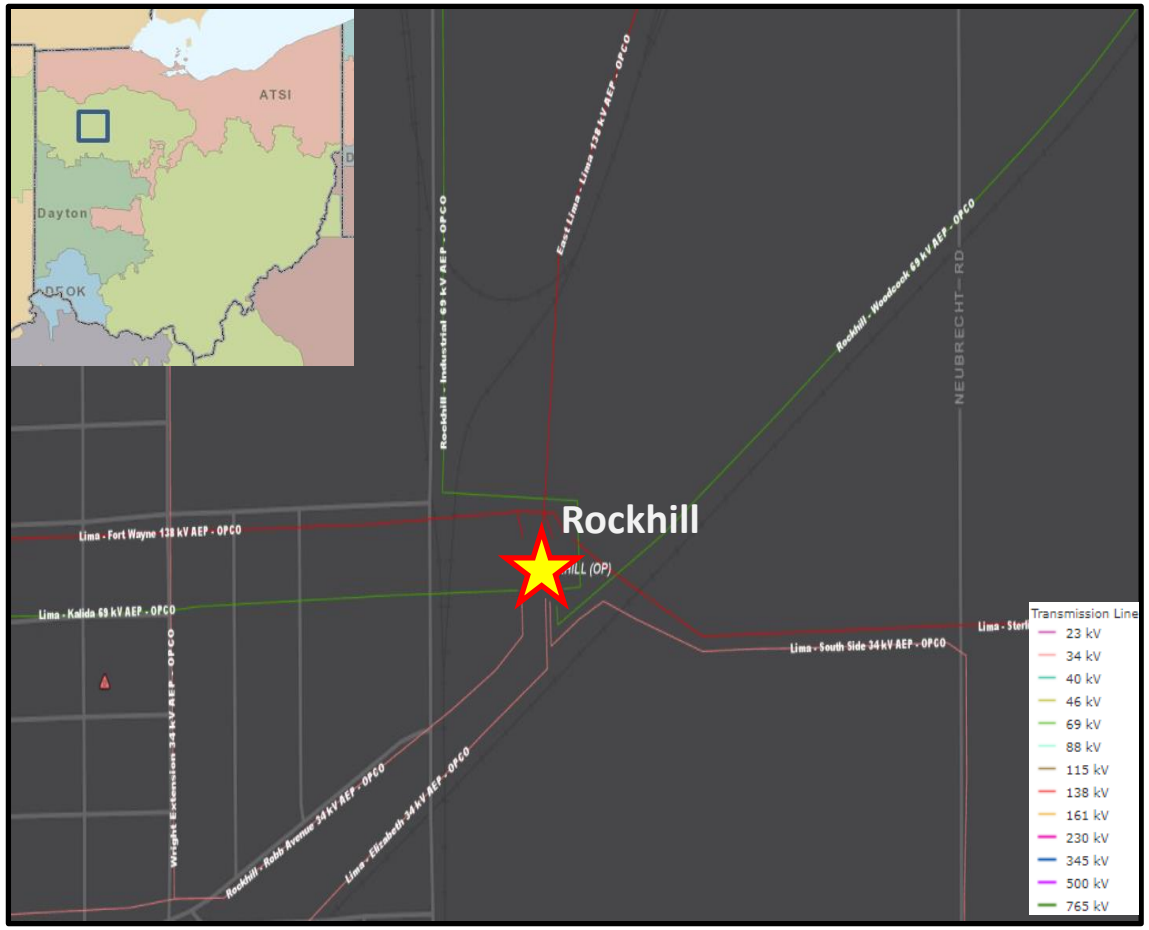
AEP Transmission Zone M-3 Process
Lima, Ohio

Problem Statement Continued:

Transformers:

- 138/34.5/12 kV Transformer Bank 1 (three single phase units)
  - Age: 1941 (all units)
  - The single phase units of this transformer are showing signs of decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault events.
  - The units are also showing signs of increased particle contamination and degraded dielectric strength of the insulation system (oil and paper)
  - No oil containment
- 138/34.5/12 kV Transformer Bank 2 (three single phase units)
  - Age: 1941 (unit 1); 1949 (units 2&3)
  - The single phase units of this transformer are showing signs of increased particle contamination and degraded dielectric strength of the insulation system (oil and paper)
  - No oil containment
- 138/34.5/12 kV Transformer Bank 3
  - Age: 1955
  - This 3-phase unit is showing signs of decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault events.
  - This unit is also showing signs of degradation of dielectric strength of the insulation system (oil and paper).
  - No Oil Containment

- Relays:
  - Currently, 156 of the 174 relays (90% of all station relays) are in need of replacement. 152 of these are of the electromechanical type and 3 are of the static type which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays have no vendor support.

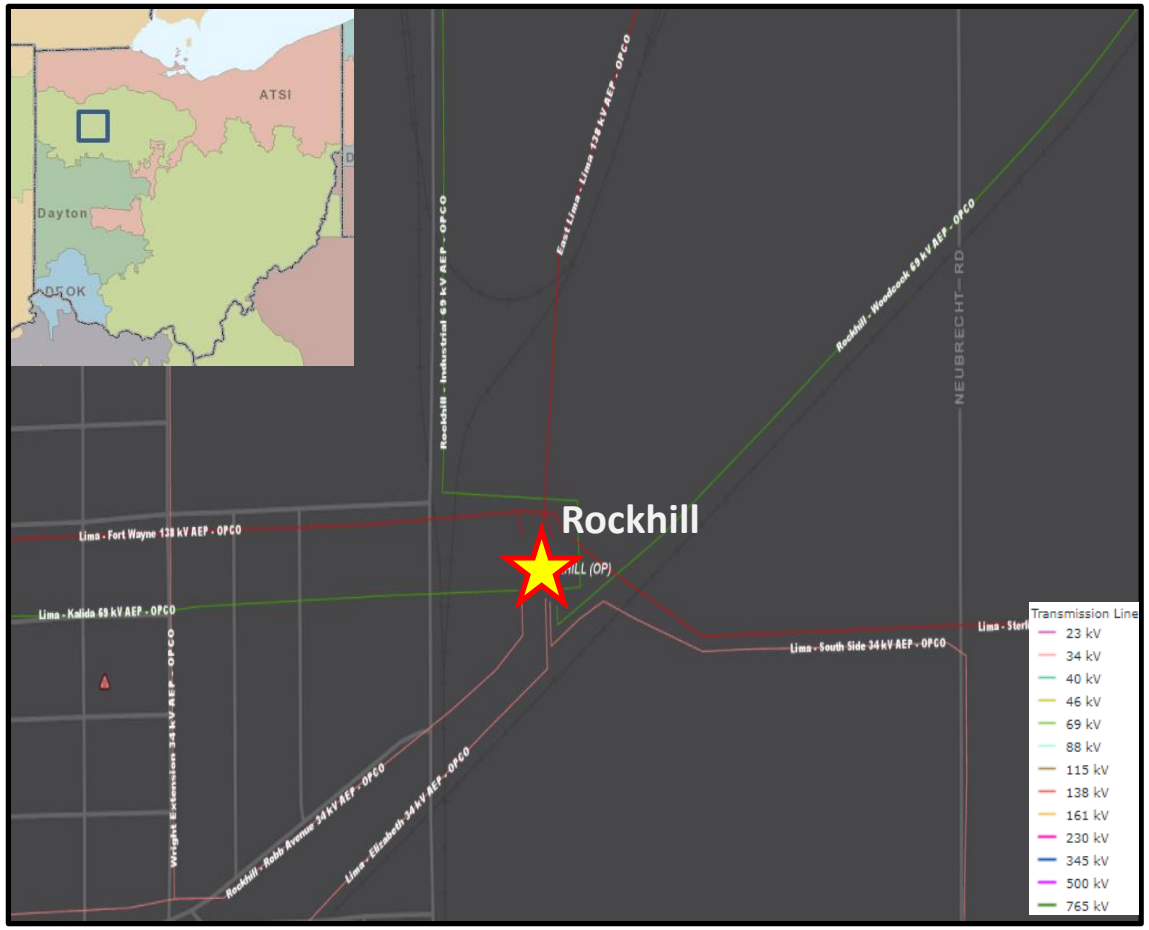


AEP Transmission Zone M-3 Process
Lima, Ohio

Problem Statement Continued:

Additional Issues:

- Ground grid concerns: 1 ground per structure
- 138kV and 34.5kV bays have cap-and-pin insulators
- All four Transformers have high-side Motor Operated Air Brake switches (MOABs) that are obsolete.
- There is insufficient road access to get into the station. Need to cross highly utilized railroad crossing to enter the station. There are no crossing signs or barricades which causes safety concerns. An alternative route into the station is needed.
- Washout risks on the north side of the station.
- Environmental concerns with the old oil house and underground pipes that were used to pump oil to the 138kV CBs. There are also leftover oil storage tanks and drums on the site.
- 34.5kV bus is within reaching distance, which causes safety concerns.
- 34.5kV line PTs are leaking oil and obsolete.
- Station configuration: Bus tie switches on 138kV Bus 1 & 2.
- Station Service: Transformers are obsolete, rusting and cable insulation is cracking and contains PCBs.



Solutions

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

AEP Transmission Zone M-3 Process
Millbrook Park – Franklin Furnace

Need Number: AEP-2018-OH030

Process Stage: Solutions Meeting 02/17/2021

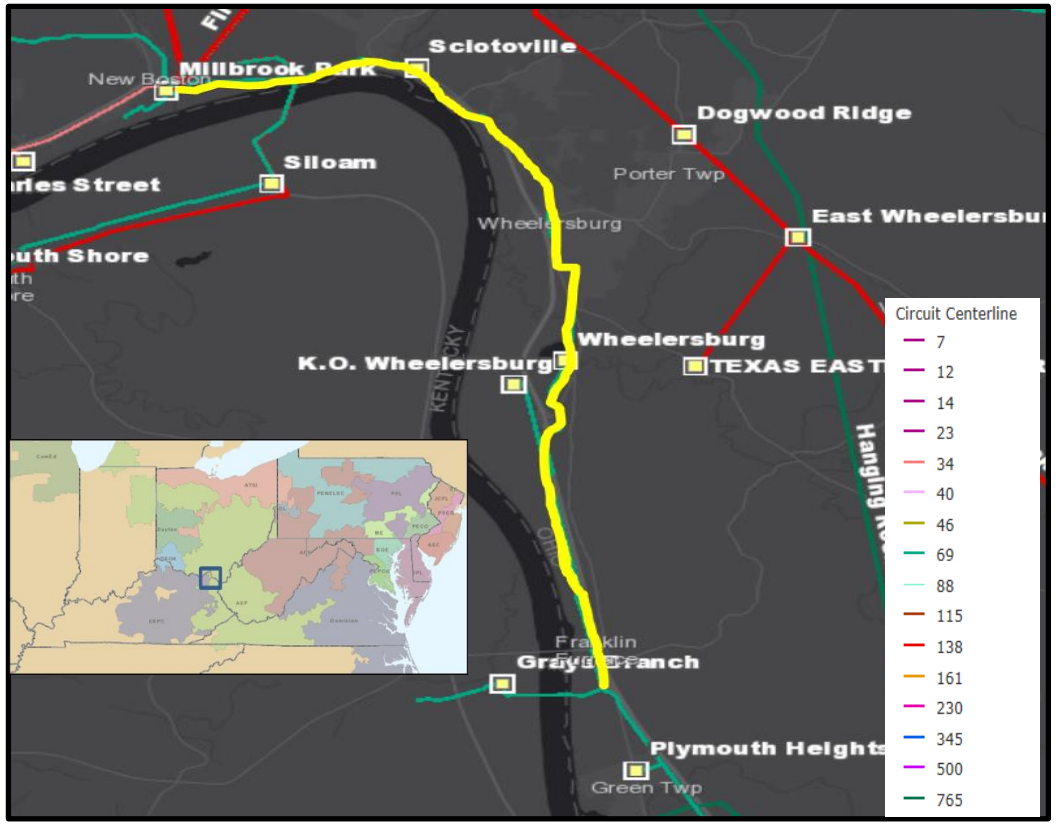
Previously Presented:
Needs Meeting 01/11/19

Supplemental Project Driver: Equipment Condition, Performance Risk, Customer Service, Operational Flexibility

Specific Assumption References:
AEP Guidelines for Transmission Owner Identified Needs.

Problem Statement:

- The 27-mile 69kV Portsmouth-Ironton line (vintage 1915) uses wood pole structures with variety of conductors, mostly 2/0 Cu (40 MVA rating). A 11.9 mile section between Millbrook Park and Franklin Furnace has 73 open A conditions, including rotten cross-arms, burnt/broken insulators, and loose/broken conductor hardware.
- The Millbrook Park-Franklin Furnace-Argentum line is a 3-terminal line. Three-terminal lines cannot be adequately protected due to the complexity of coordination, which, causes misoperations including over-tripping. The Millbrook Park-North Haverhill-Argentum circuit is protected by an impedance based Directional Comparison Blocking (DCB) pilot system, which cannot adequately protect a three terminal lines.
- Over the past several years, the Millbrook Park-Argentum-North Haverhill circuit has experienced reliability issues including 5 sustained outages and 21 momentary outages.
- The Texas Eastern Substation serves a peak load of 26 MW via a 2.1-mile radial line from East Wheelersburg. Also, K.O. Wheelersburg is a 1.2 MVA 69 kV retail load served off a 1.3-mile radial line. These radial loads are at risk of extended outages for line maintenance or repair.
- At Sciotoville, CBs A and B are both oil type breakers with 16 and 10 fault operations respectively. This particular model has no spare parts and a history of poor reliability. Sciotoville has a ground switch MOAB on the transformer. Ground switch MOAB's cause intentional high side faults to clear the transformer faults which cause damage to and reduction in life of nearby equipment.
- Sciotoville and Wheelersburg currently have 8 (of 10) and 10 (of 10) electro-mechanical relays respectively. EM relays have no spare part availability, a lack vendor support, no SCADA functionality, and no fault data collection ability.



AEP Transmission Zone M-3 Process
Millbrook Park – Franklin Furnace

Need Number: AEP-2018-OH030

Process Stage: Solutions Meeting 02/17/2021

Proposed Solution:

Rebuild ~2 miles of 138kV line between East Wheelersburg and Texas Eastern using 795 ACSR 26/7 Drake (SE 359 MVA).

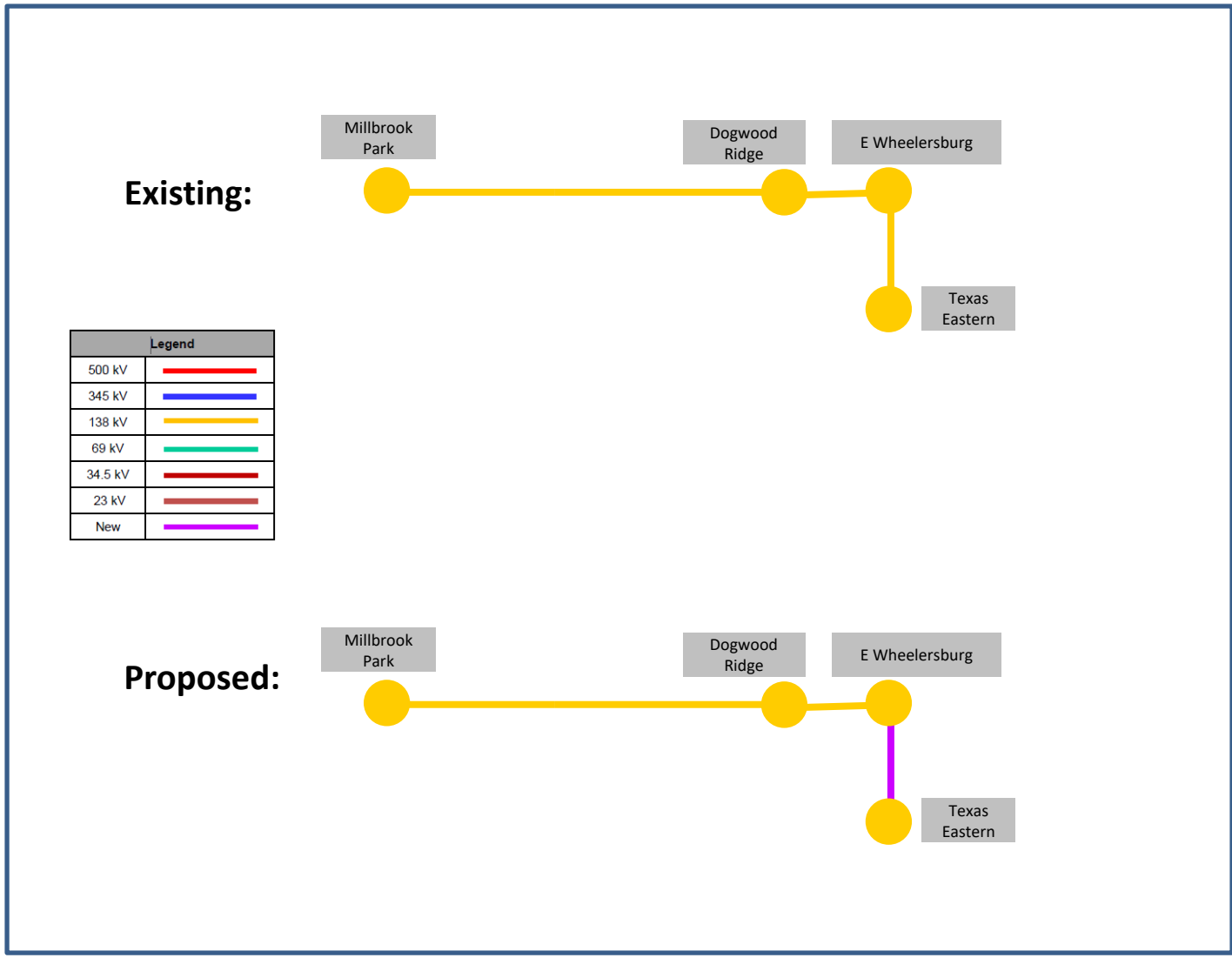
Estimated Cost: $3.41M

NOTE: The remaining needs identified with AEP-2018-OH030 are addressed with the proposed scope change associated with b2604. This rebuild will be done in conjunction with that project.

Total Estimated Transmission Cost: $3.41M

Projected In-Service: 4/15/2025

Project Status: Scoping



AEP Transmission Zone M-3 Process

Muskingum to Tuscarawas ~~Stark~~ Counties, Ohio

Need Number: AEP-2019-OH018 (revised)

Process Stage: Solution Meeting 2/17/2021

Previously Presented: Need Meeting 4/23/2019

Supplemental Project Driver:

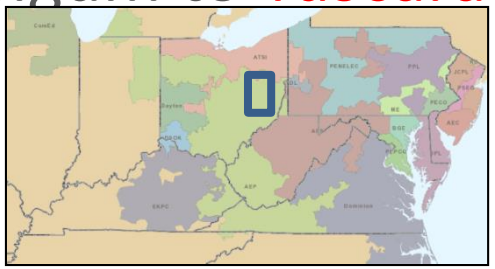
Equipment Material/ Condition/Performance/Risk and Operational Flexibility

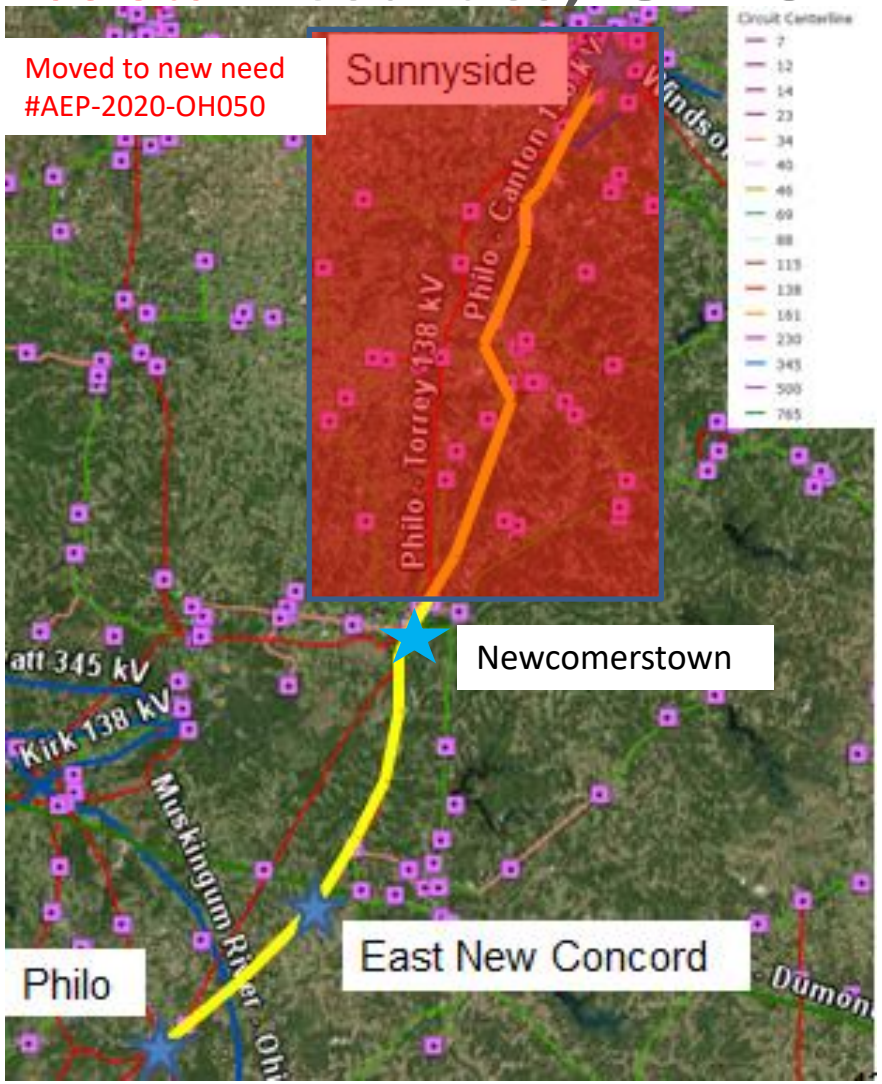
Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

- The Philo-Newcomerstown ~~Sunnyside~~ 138kV transmission line section is 33 ~~75~~ 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 Muskingum River and Newcomerstown ~~Sunnyside~~ stations.
- Insulator assemblies are showing corrosion and deterioration, which could lead to additional failures and safety concerns.
- There have been 1.4 ~~2.1~~ million customer-minutes-of-interruption (CMI) over the 2008-2018 time period.
- This line has experienced 8 ~~44~~ momentary outages and 3 ~~8~~ sustained outages over the past 10 years.
- The East New Concord Station is connected via a hard tap (no sectionalizing switches present). Lack of sectionalizing requires a substation outage whenever maintenance or emergency repairs are performed on either side of the 138kV tap.





AEP Transmission Zone M-3 Process
Muskingum, Guernsey, Tuscarawas ~~& Stark~~ Counties, Ohio

Need Number: AEP-2020-OH001 (revised)

Process Stage: Solution Meeting 2/17/2021

Previously Presented: Need Meeting 3/19/2020

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk; Operational Flexibility & Efficiency

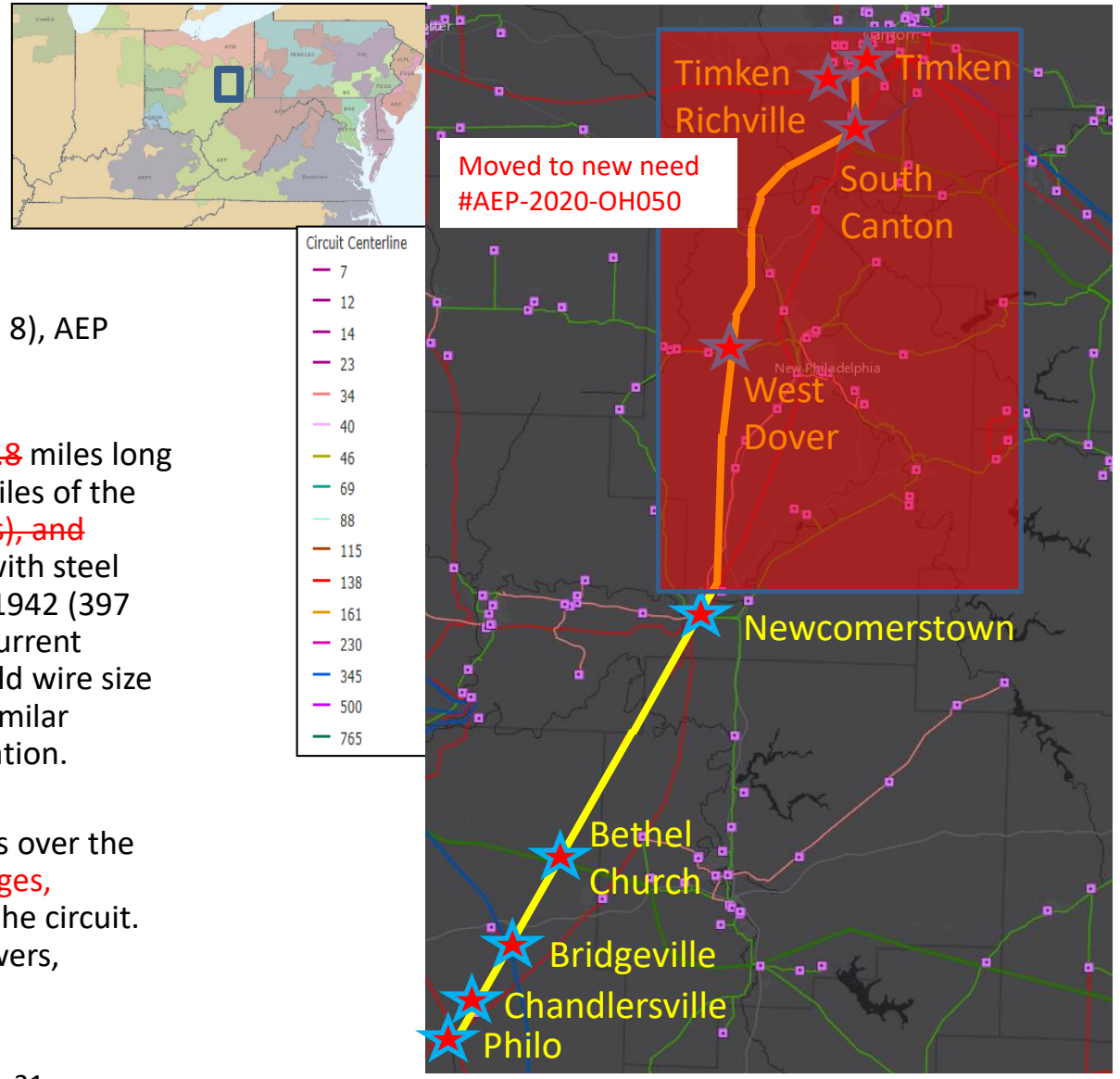
Specific Assumption Reference:

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

Problem Statement:

The Philo-Newcomerstown ~~Torrey~~ 138kV transmission line section ~~asset~~ is 32 ~~70.8~~ miles long and consists of portions of the following circuits: Philo-South Canton (32 ~~68.2~~ miles of the total circuit length of 75.2 miles), ~~South Canton-Timken Richville (2.0 of 3.5 miles), and Timken Richville-Timken (0.6 of 3.4 miles)~~. 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 ~~15~~ momentary outages over the past 5 years ~~(zero sustained outages, resulting in zero CMI)~~ 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.



AEP Transmission Zone M-3 Process
Muskingum, Guernsey, Tuscarawas ~~& Stark~~ Counties, Ohio

Need Number: AEP-2020-OH001 (revised)

Process Stage: Solution Meeting 2/17/2021

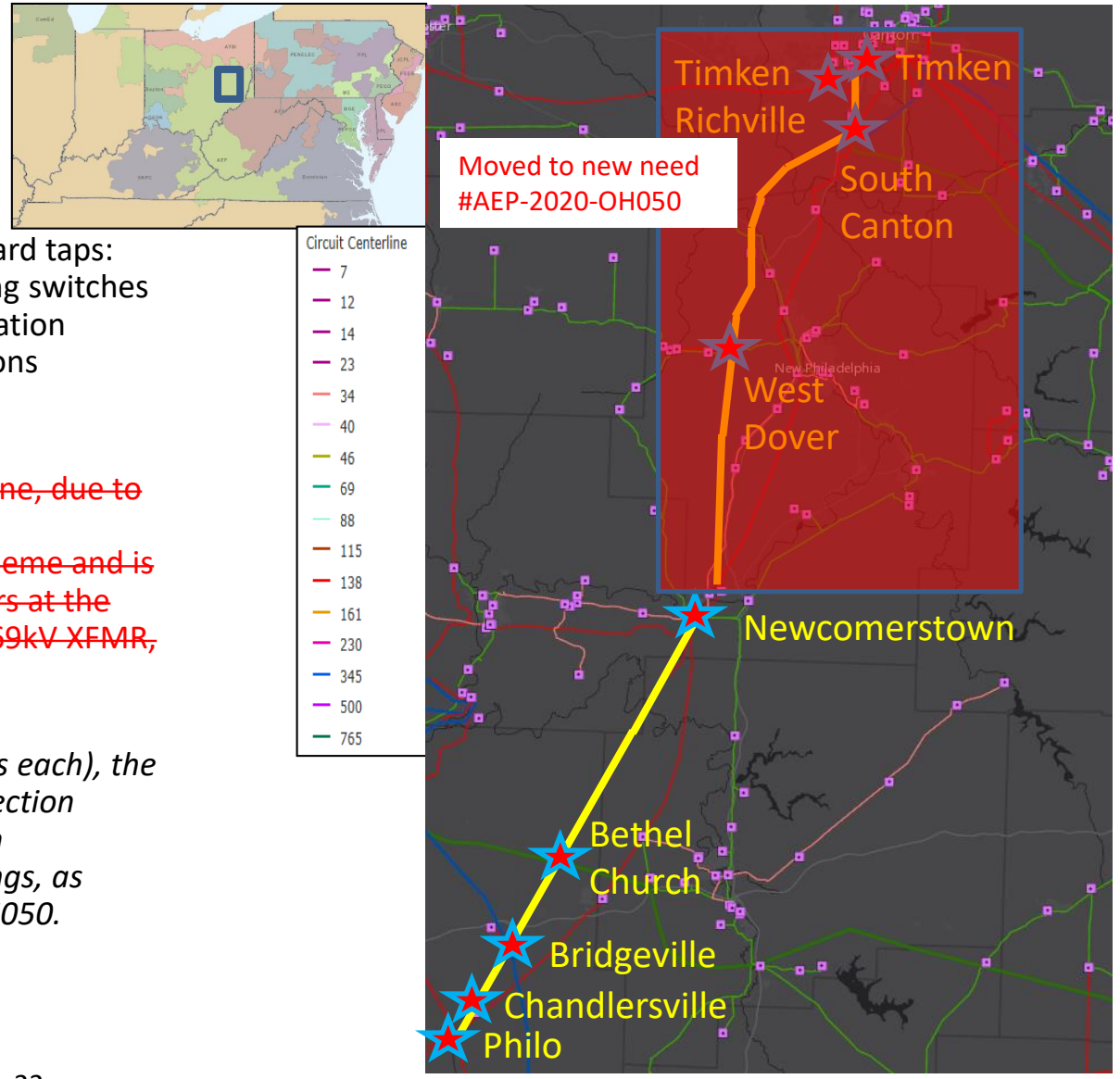
Previously Presented: Need Meeting 3/19/2020

The Philo-Newcomerstown ~~South Canton~~ 138kV circuit contains 3 consecutive hard taps: Chandlersville Co-op, Bridgeville, Bethel Church Co-op. Without line sectionalizing switches at these taps, it makes it very difficult to perform T-Line maintenance and restoration activities. Outages must be scheduled with the customers at each of these stations whenever the 138kV circuit needs taken out of service.

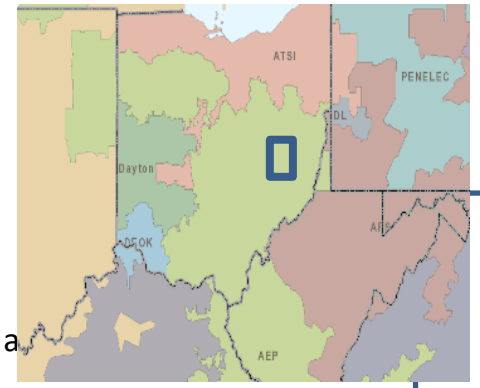
~~In addition, the West Dover 138-69kV station creates a 3-terminal point on the line, due to the lack of 138kV line breakers or a 138kV transformer protection device (just a MOAB/ground- switch system today). This complicates the circuit protection scheme and is a risk for misoperations and over-tripping. In addition, due to the lack of breakers at the station, there are 3 dissimilar zones of protection combined: 138kV circuit, 138-69kV XFMR, 69kV bus.~~

**Note that due to the long mileage of both transmission line needs (over 70 miles each), the previous two AEP Needs have been reduced, to include only the southern-most section between Philo and Newcomerstown stations. The solutions to the needs between Newcomerstown north to the Canton area will be presented in future PJM meetings, as solutions are studied and developed; these are placed in new Need AEP-2020-OH050.*

Model: N/A



AEP Transmission Zone M-3 Process
Philo-Newcomerstown 138kV Line Rebuild

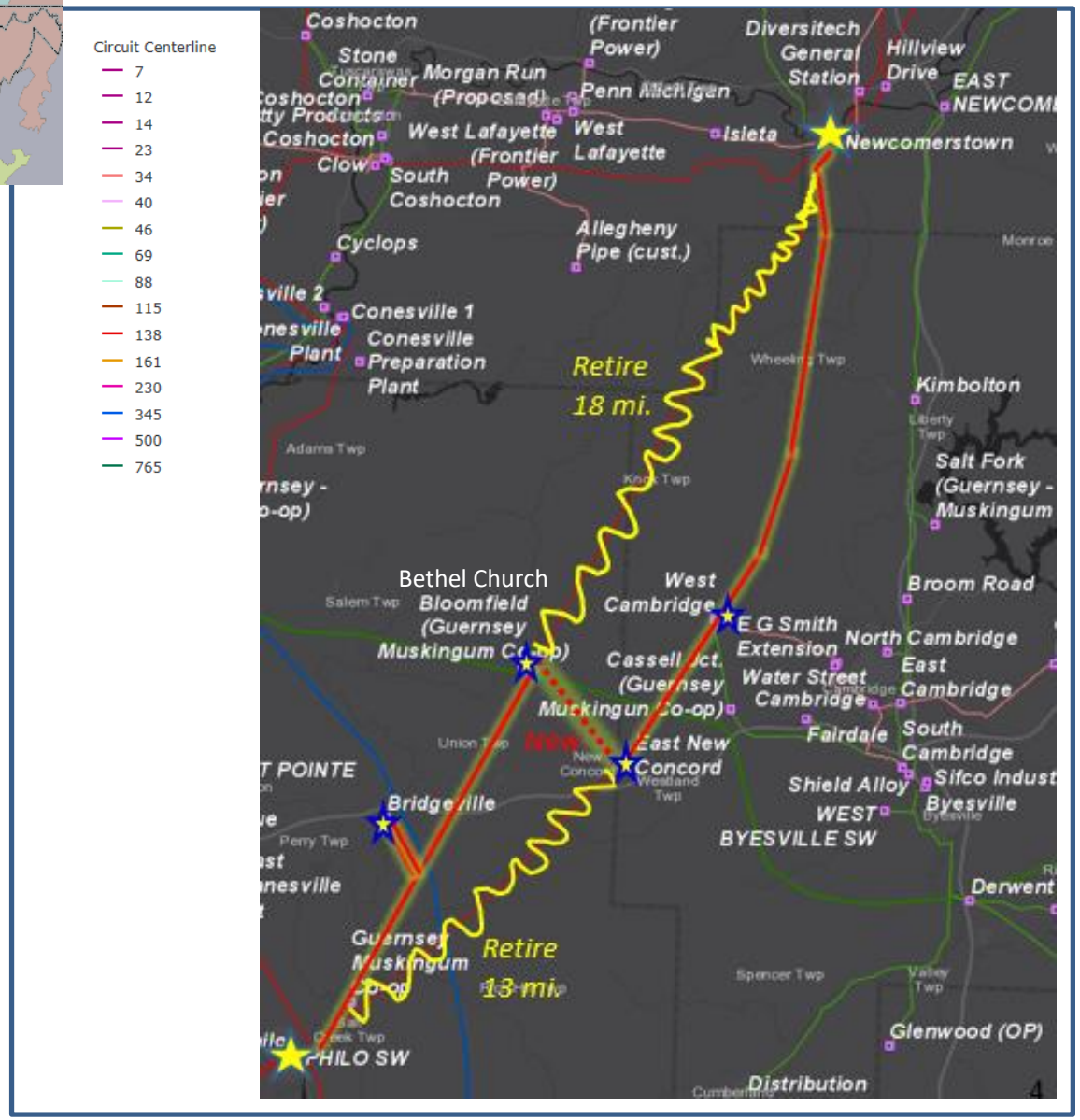


Need Number: AEP-2019-OH018 & AEP-2020-OH001

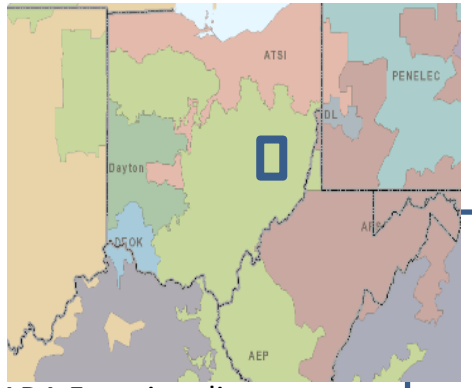
Process Stage: Solution Meeting 2/17/2021

Proposed Solution:

- Retire ~3 miles of the Philo- Canton 138kV line, between Philo a... Concord. Estimated Cost: $6.18M
- Retire ~18 miles of the Philo-Torrey 138kV line, north of Bethel Church/Bloomfield and stopping at Newcomerstown Estimated Cost: $6.01M
- Rebuild from Philo to Str 62 a ~13.07 mile section of the Philo – Torrey 138kV line as double circuit, using 795 KCMIL 26/7 ACSR "Drake" conductor. Estimated Cost: $32.65M
- Build a greenfield ~4.76 mile double circuit line between Str. 62 on the Philo – Torrey line to the greenfield East New Concord Switch, using 795 KCMIL 26/7 ACSR "Drake" conductor. Estimated Cost: $13.27M
- Rebuild from the greenfield East New Concord Switch to Newcomerstown station a ~19.72 mile section of the Philo – Canton 138kV line as double circuit, using 795 KCMIL 26/7 ACSR "Drake" conductor. Estimated Cost: $49.26M
- Install a 3 Way Phase Over Phase Switch, 1200A, 138 KV Full SCADA Functionality (Rustic Switch) to replace the hard tap to Bridgeville. Estimated Cost: $0.63M
- Rebuild the 1.9-mile radial T-line tap to Bridgeville as a double-circuit in-and-out loop up to the new 3-way switch, Rustic Switch. The new line will use 556.5 KCMIL ACSR 26/7 "Dove". Estimated Cost: $4.62M
- Install a 3 Way Phase Over Phase Switch, 1200A, 138 KV Full SCADA Functionality (Chandlersville Switch) to replace the hard tap to Chandlersville. Estimated Cost: $0.63M
- A new 0.12-mile double circuit 138kV loop line is to be constructed to replace the existing tap to GM Co-op Chandlerville station, to supply a loop line circuit to a new switch structure The new line will use 556.5 KCMIL ACSR 26/7 "Dove". Estimated Cost:$1.3M



AEP Transmission Zone M-3 Process
Philo-Newcomerstown 138kV Line Rebuild



Need Number: AEP-2019-OH018 & AEP-2020-OH001

Process Stage: Solution Meeting 2/17/2021

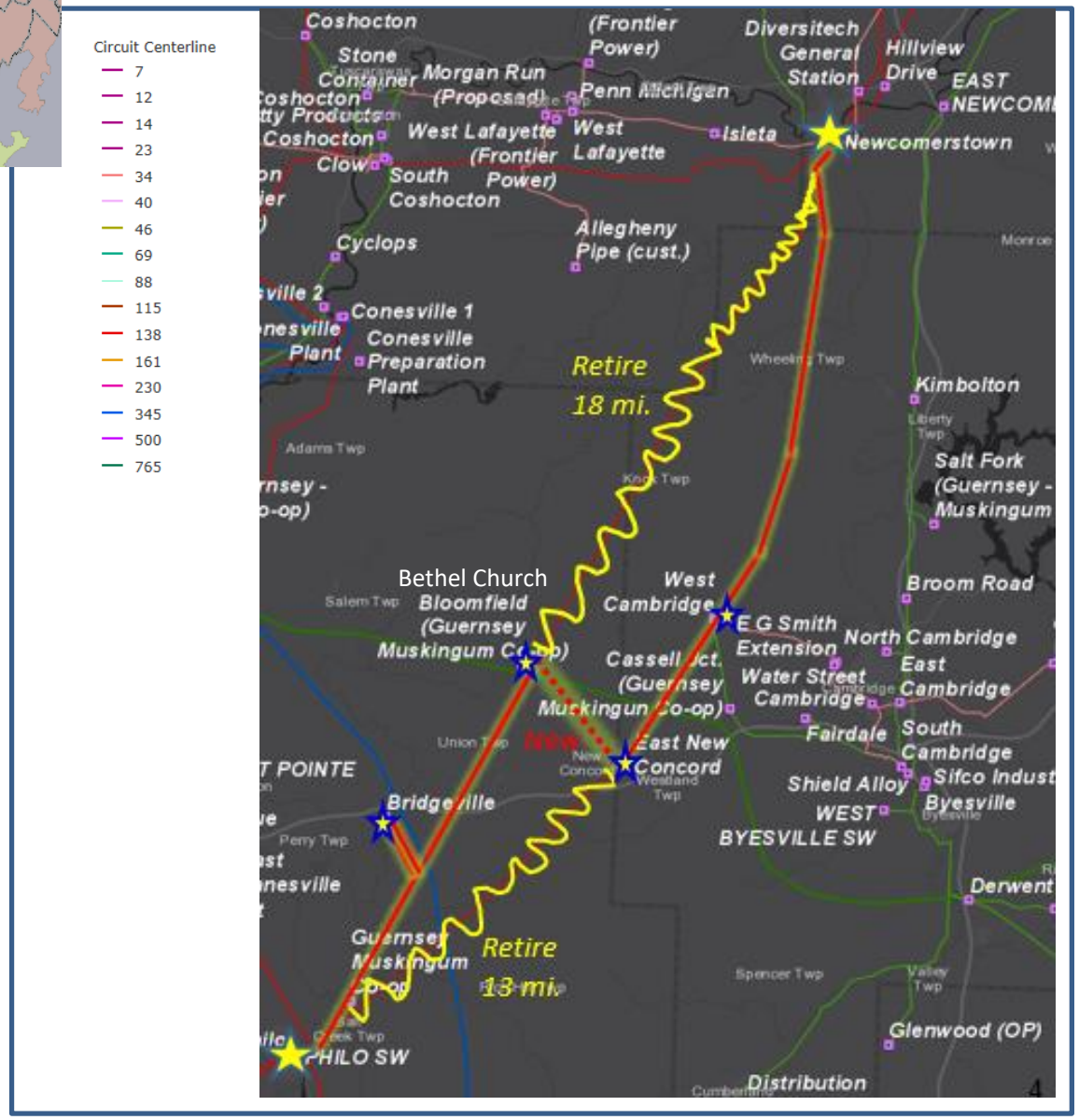
Proposed Solution (Cont'd):

- Install a 3 Way Phase Over Phase Switch, 1200A, 138 KV Full SCADA Functionality (Norfield Switch) to replace the hard tap to Bethel Church. Remove the existing Bloomfield 1-way switch. Estimated Cost : $0.65M
- A new 0.5-mile double circuit 138kV line is to be constructed to replace a portion of the Philo- Torrey 138kV line, to supply a loop line circuit to a new two pole dead-end with one of the poles of the two pole dead-end supporting a new switch structure. From the switch structure, it will connect to an existing structure of the existing tap line to supply the Bloomfield – GM Co-op tap. The new line will use 556.5 KCMIL ACSR 26/7 "Dove." Estimated Cost:$0.96M
- Install a 3 Way Phase Over Phase Switch, 1200A, 138 KV Full SCADA Functionality (East New Concord Switch) to replace the hard tap to East New Concord. Estimated Cost: $0.63M
- Upgrade the line protection relays at Philo, replacing the electromechanical relays with modern microprocessor-based relays. Estimated Cost : $0.16M
- Connect OPGW fiber to stations and switches along the route, for telecom network connectivity. Estimated Cost:$0.47M

Total Estimated Transmission Cost: $117.42 Million

Ancillary Benefits:

The consolidation of two transmission lines into one line reduces long-term maintenance costs and reduces public impacts. The elimination of 4- 138kV hard taps will improve reliability for customers and better permit maintenance of transmission facilities. The new switch locations were selected to ensure the safety of field personnel.



AEP Transmission Zone M-3 Process
Philo-Newcomerstown 138kV Line Rebuild

Need Number: AEP-2019-OH018 & AEP-2020-OH001

Process Stage: Solution Meeting 2/17/2021

Alternatives Considered:

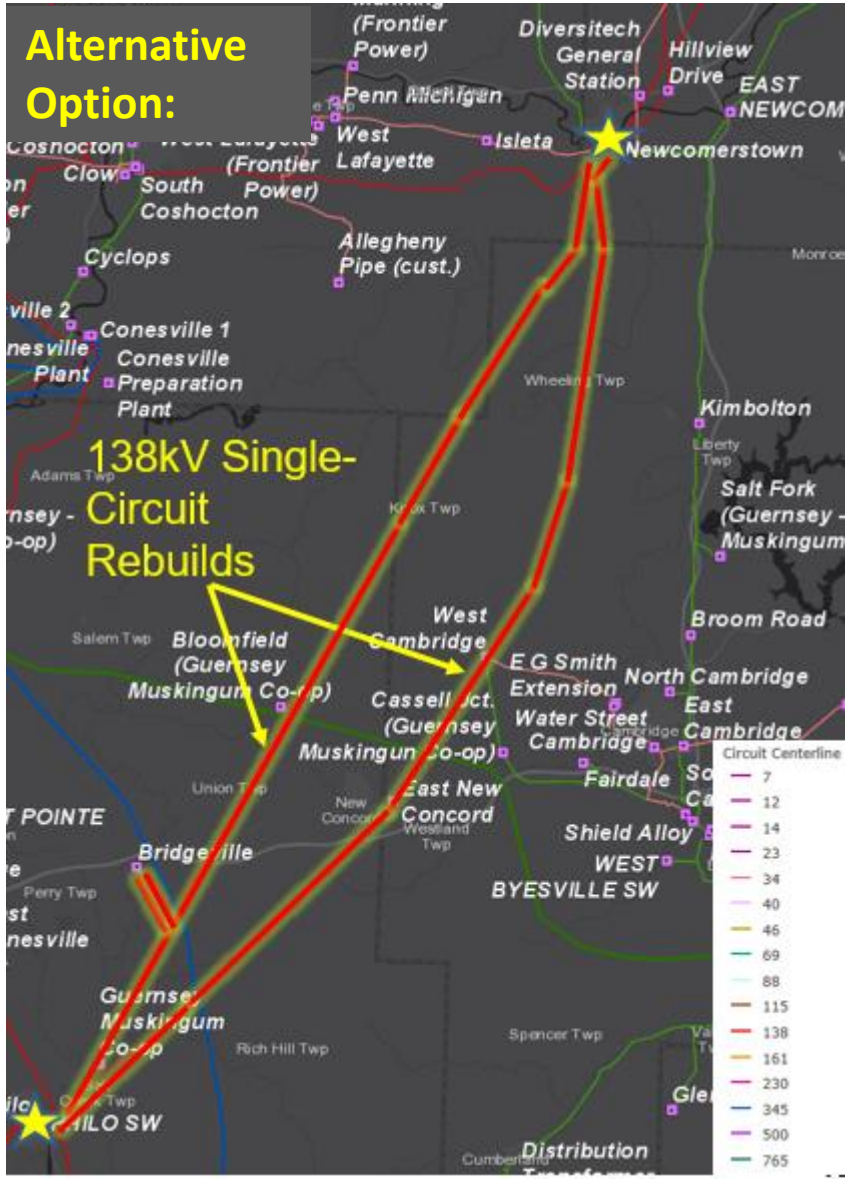
Rebuild the two separate 138kV transmission lines as single-circuit, on their existing routes between Philo and Newcomerstown. This would equate to 32 miles single-circuit between Philo and Newcomerstown on the western route (Philo-South Canton circuit), and 33 miles single-circuit between Philo and Newcomerstown on the eastern route (circuits connecting to West Cambridge & Newcomerstown). Replace the 4- 138kV hard taps with 3-way switch structures at Chandlersville, Bridgeville (Rustic Switch), Bethel Church (Norfield Switch), and East New Concord. Upgrade the Philo relays.

Alternative Cost Estimate: $174 Million

Considering this is the only 138 kV path in this area and the number of stations served from the circuits, retirement of one circuit and rebuilding only one circuit was not a viable alternate.

Projected In-Service: 12/1/2024

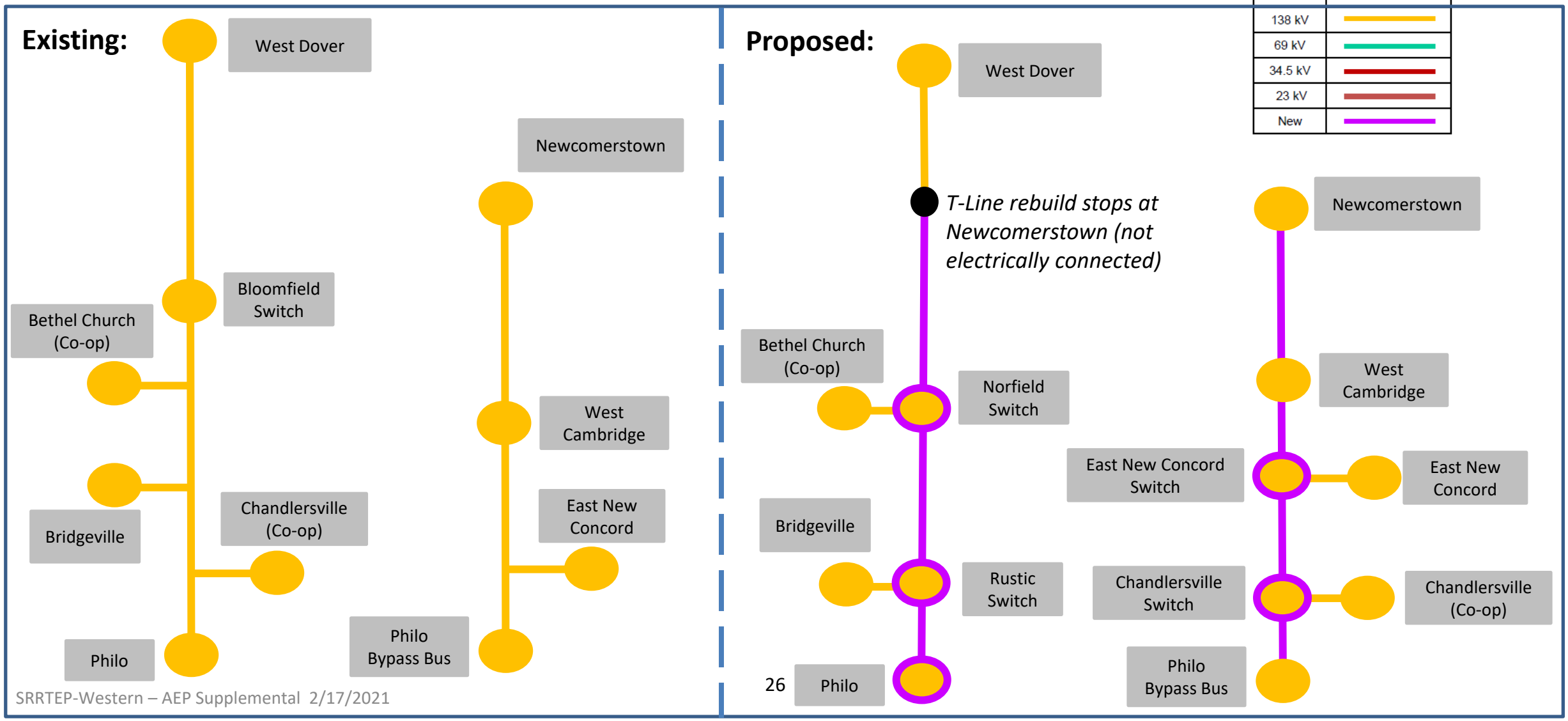
Project Status: Scoping



AEP Transmission Zone M-3 Process
Philo-Newcomerstown 138kV Line Rebuild

Need Number: AEP-2019-OH018 & AEP-2020-OH001

Process Stage: Solution Meeting 2/17/2021



AEP Transmission Zone M-3 Process
Wes Del Transmission upgrades

Need Number: AEP-2020-IM019

Process Stage: Solutions Meeting 2/17/2021

Previously Presented: Need Meeting 9/11/2020

Project Driver:

Equipment Condition/Performance/Risk

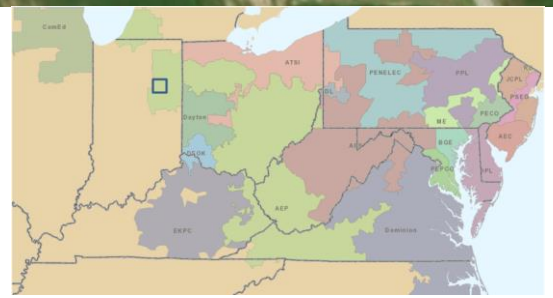
Specific Assumption Reference:

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

Problem Statement:

Wes Del 138/12kv station

- 138/69/12 kV Transformer #1
  - Unit failed in February 2020, station currently served by mobile unit
  - 1968 vintage
- Line MOABs X & Y
  - Configuration of switches on non-standard structure makes them impossible to maintain without a transformer outage.
  - Due to switch operating condition and length of operating pipe, motor operators cannot be properly adjusted to attain full open/close position.
  - Switches were manufactured in 1969
  - Neither switch will fully close after operation without assistance.



AEP Transmission Zone M-3 Process
Wes Del Transmission upgrades

Need Number: AEP-2020-IM019

Process Stage: Solutions Meeting 2/17/2021

Proposed Solution:

Wes Del will now be connected to the Deer Creek – Desoto 138 kV circuit due to its location. It is easier access to it and avoids line crossings.

Install a 138 kV box bay with 138 kV 3000 A Moab switches towards Desoto and Deer Creek via Gaston.

Cost Estimate: $0.88 Million

Reterminate the existing Desoto – Deer Creek – Delaware 138 kV line into the new station bays at Wes Del station with 0.2 miles of 636 ACSR 26/7. Remove 0.1 miles of the Desoto – Deer Creek – Delaware 138 kV line to accommodate the new connection of Wes Del to the Deer Creek – Desoto 138 kV circuit.

Cost Estimate: $0.51 Million

Total Transmission Cost: $1.39 Million

Ancillary Benefits:

Connecting Wes Del to the Deer Creek – Desoto 138 kV circuit will make it safer and easier to maintain given the proximity to the circuit. It is difficult for construction and design to bring a circuit under another circuit(south to north in this case). The station is north of the line so it is easiest and safer to energize and maintain the station from the northern circuit.

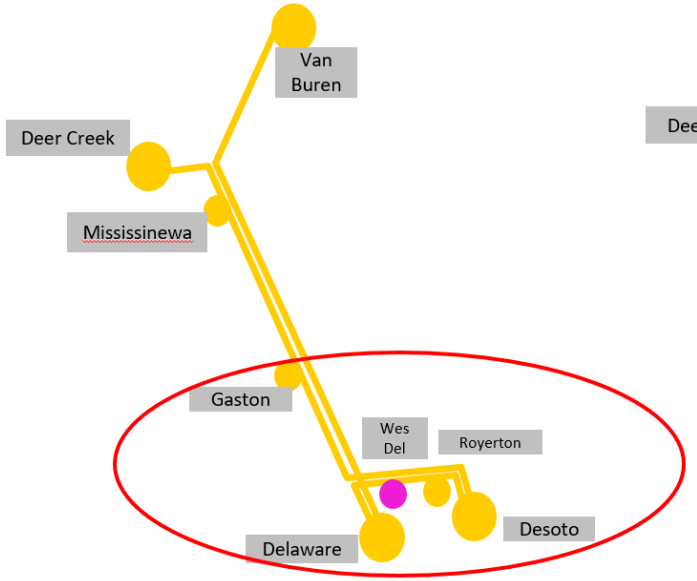
Alternatives Considered:

1. Upgrade the Wes Del 138 kV Moab switches towards Delaware and Desoto and leave it connected to the Delaware – Desoto 138 kV circuit. With the current configuration it is difficult for construction and maintenance due to the line crossing. The station is north of the line so it is easiest and safest to energize the station and maintain from the northern circuit.

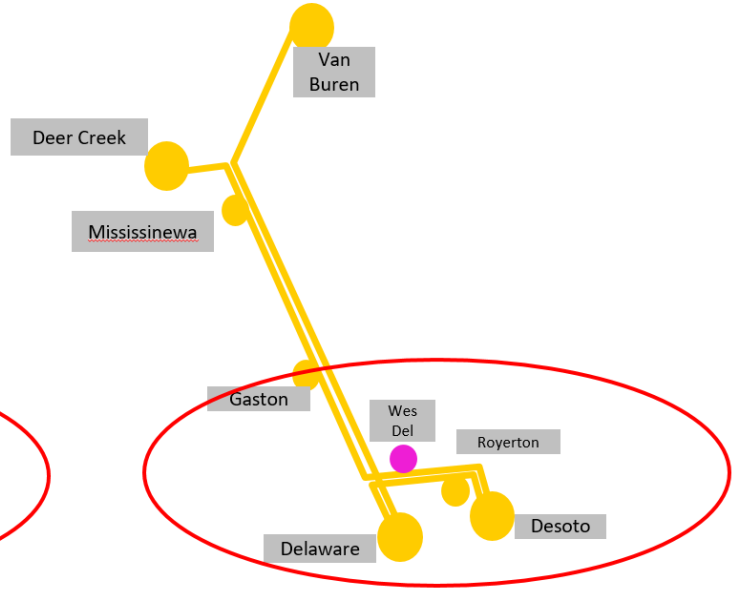
Alternative Cost estimate: $1.48 Million

Projected In-Service: 1/2022
Project Status: Engineering

Existing:



Proposed:



AEP Transmission Zone M-3 Process
Payne 69kV

Need Number: AEP-2020-OH040

Process Stage: Solutions Meeting 02/17/2021

Previously Presented: Need Meeting 09/11/2020

Project Driver:

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

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (slide 11).

Problem Statement:

Station

Payne 69kV

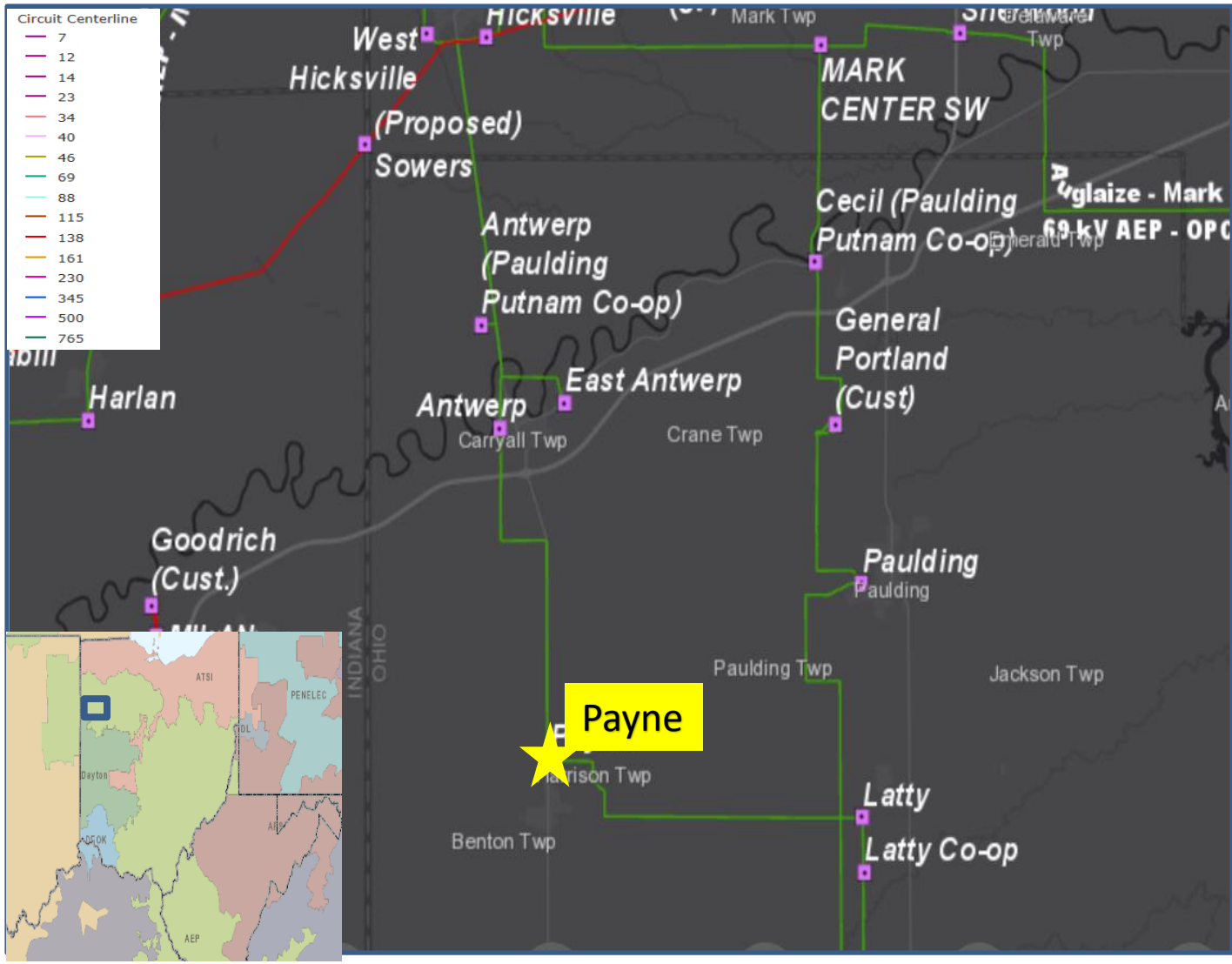
CONDITION / PERFORMANCE / RISK ASSESSMENT:

- Two (2) 69 kV circuit breakers are oil filled breakers of 1960s vintage without oil containment and have exceeded the recommended fault operations of 10. These breakers have 66 and 46 fault operations respectively.
- 21 out 23 relays are electromechanical and 2 are static relays without vendor support
- The existing RTU is a legacy IBOX unit

Operational Flexibility and Efficiency

- The 69/12 kV transformer is a fused back with no sectionalizing capability.

  Breakers need to be opened to be able to safely work on the fuse.



AEP Transmission Zone M-3 Process
Payne 69kV

Need Number: AEP-2020-OH040

Process Stage: Solutions Meeting 02/17/2021

Proposed Solution:

Payne: Replace circuit breakers B and C with 69kV 3000A 40kA breakers. Replace the EM relays with new relays and install a new control house.
Estimated Cost: $1.41M

Install a high side switch on the 69/12 kV transformer.

Estimated Cost: $0 (Distribution cost)

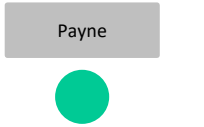
Alternatives Considered:

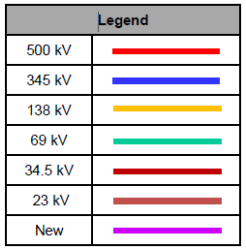
No viable cost-effective transmission alternative has been identified.

Projected In-Service: 07/31/2022

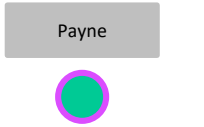
Project Status: Scoping

Existing:





Proposed:



AEP Transmission Zone M-3 Process
North Strasburg, Ohio

Need Number: AEP-2020-OH047

Process Stage: Solution Meeting 2/17/2021

Previously Presented: Need Meeting 11/20/2020

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (slide 13)

Problem Statement:

Station

North Strasburg 138kV

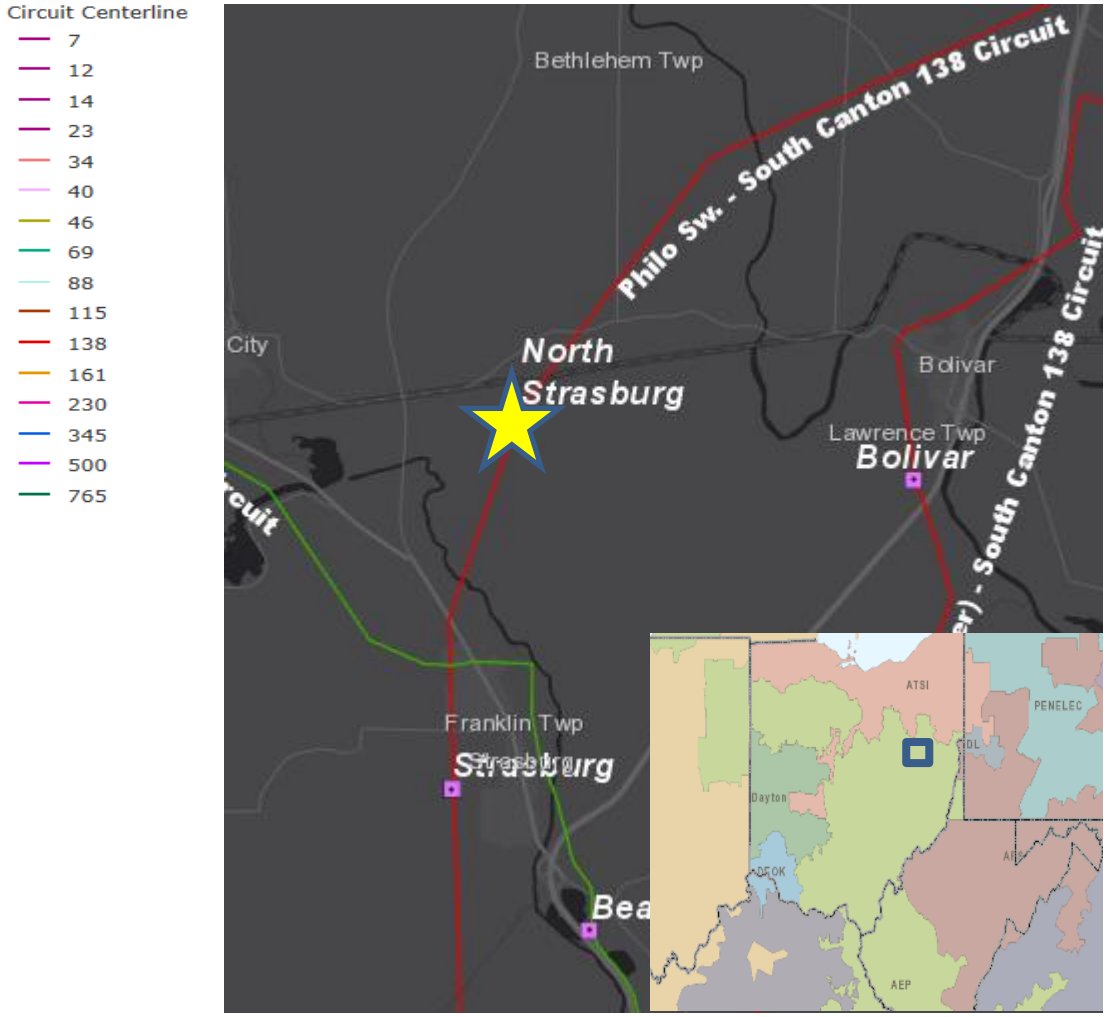
CONDITION / PERFORMANCE / RISK ASSESSMENT:

Equipment Concerns:

- The station utilizes two circuit switchers for 138kV sectionalizing devices on the through-path. The circuit switchers have failed and are no longer operable. They have been disabled to avoid a system misoperation.
    - 1966 vintage, S&C Electric type 'G' model (both switchers)
    - The motor mechanisms and relays no longer function properly.

Other Station Concerns:

- The circuit switchers are installed on deteriorating wood structures.



AEP Transmission Zone M-3 Process
North Strasburg, Ohio

Need Number: AEP-2020-OH047

Process Stage: Solution Meeting 2/17/2021

Proposed Solution:

Replace the failed 138kV circuit switchers with new station line switches. Replace the wood support structures with new steel structures. Add a high side fuse on the 138/4 kV (2.5 MVA) transformer.

Existing ratings (SN/SE/WN/WE):

North Strasburg-South Canton = 296/296/370/370 MVA

North Strasburg-Strasburg = 287/299/363/370 MVA

Future ratings (SN/SE/WN/WE):

North Strasburg-South Canton = 296/296/375/375 MVA

North Strasburg-Strasburg = 287/335/363/400 MVA

Cost estimate: $0.23 Million

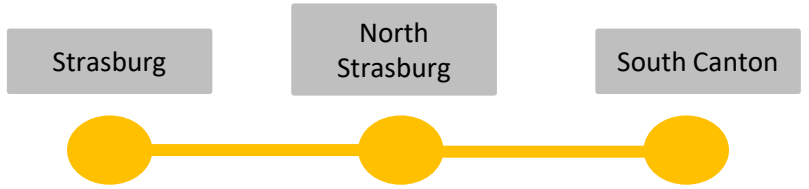
Alternatives Considered:

Auto-sectionalizing MOAB switches or circuit breakers were also considered for this station. However, due to the limited amount of load served, manual switches were deemed to be adequate. This is the quickest upgrade that will permit the long 138kV circuit to be properly sectionalized when needed, such as for transmission line maintenance or remote-end station work.

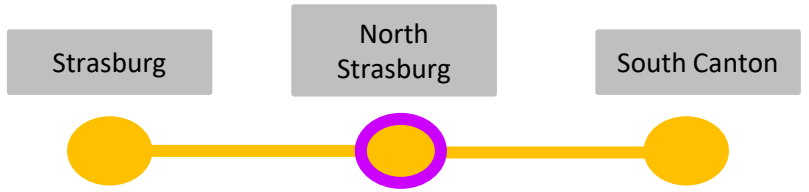
Projected In-Service: 7/1/2021

Project Status: Engineering

Existing:



Proposed:



Appendix

High Level M-3 Meeting Schedule

Assumptions

Activity	Timing
Posting of TO Assumptions Meeting information	20 days before Assumptions Meeting
Stakeholder comments	10 days after Assumptions Meeting

Needs

Activity	Timing
TOs and Stakeholders Post Needs Meeting slides	10 days before Needs Meeting
Stakeholder comments	10 days after Needs Meeting

Solutions

Activity	Timing
TOs and Stakeholders Post Solutions Meeting slides	10 days before Solutions Meeting
Stakeholder comments	10 days after Solutions Meeting

Submission of Supplemental Projects & Local Plan

Activity	Timing
Do No Harm (DNH) analysis for selected solution	Prior to posting selected solution
Post selected solution(s)	Following completion of DNH analysis
Stakeholder comments	10 days prior to Local Plan Submission for integration into RTEP
Local Plan submitted to PJM for integration into RTEP	Following review and consideration of comments received after posting of selected solutions

Revision History

2/5/2021 – V1 – Original version posted to pjm.com

2/10/2021 – V2 – Slide #22, Changed the Need number in the notes from AEP-2021-OH009 to AEP-2020-OH050

5/11/2021 – V3 – Slide #23 &#24, Provide split costs for each split scope for AEP-2019-OH018 & AEP-2020-OH001 solution

10/19/2021 – V4 – Slide #5, Corrected Need # AEP-2020-IM004 to AEP-2021-IM004