Sub Regional RTEP Committee: Western
AEP Supplemental Projects

November 20, 2020

AEP WV Project Updates

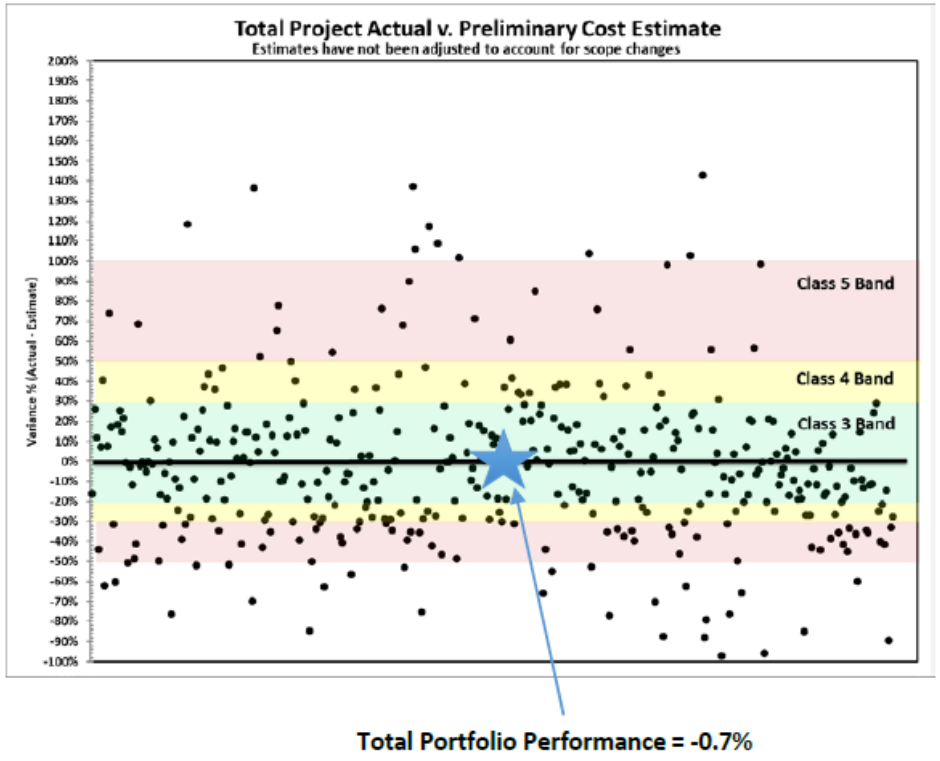
SRRTEP Western Meeting

11/20/2020

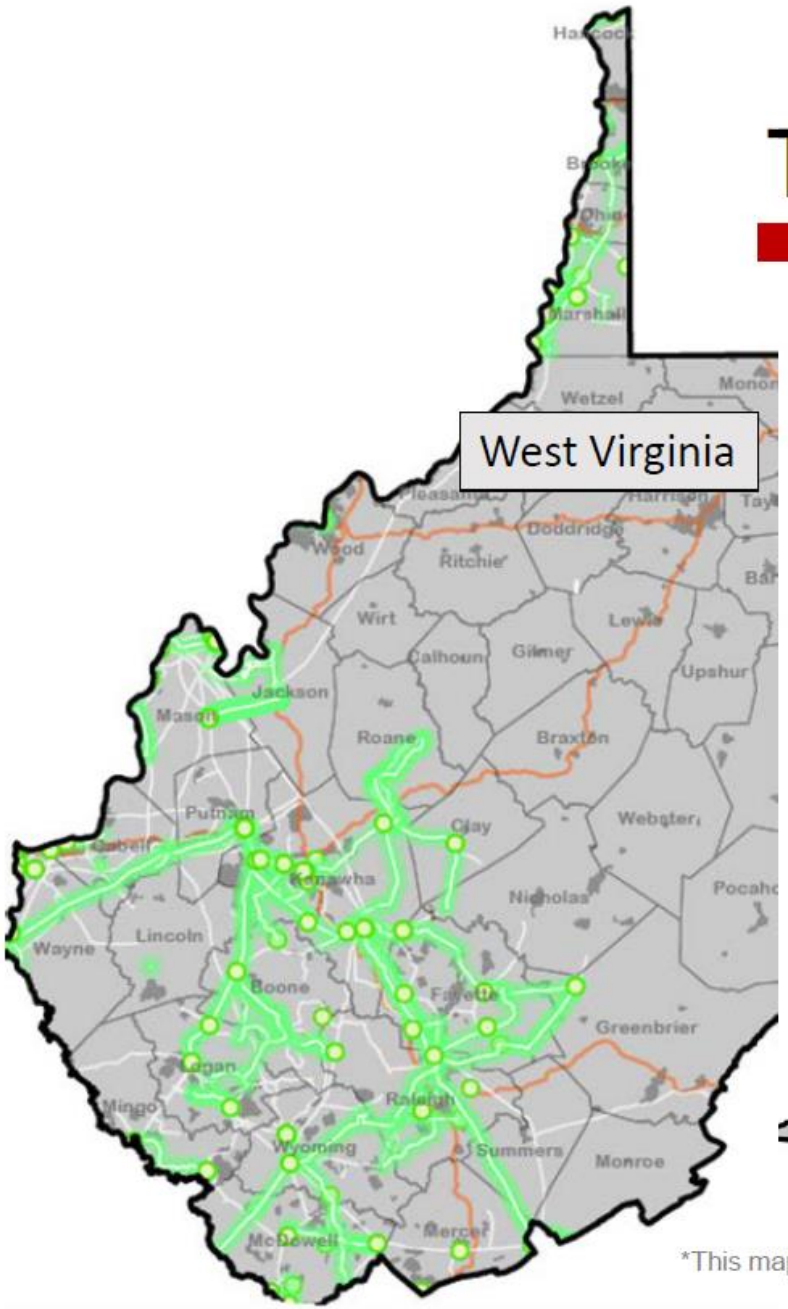
Cost Competitive Solutions

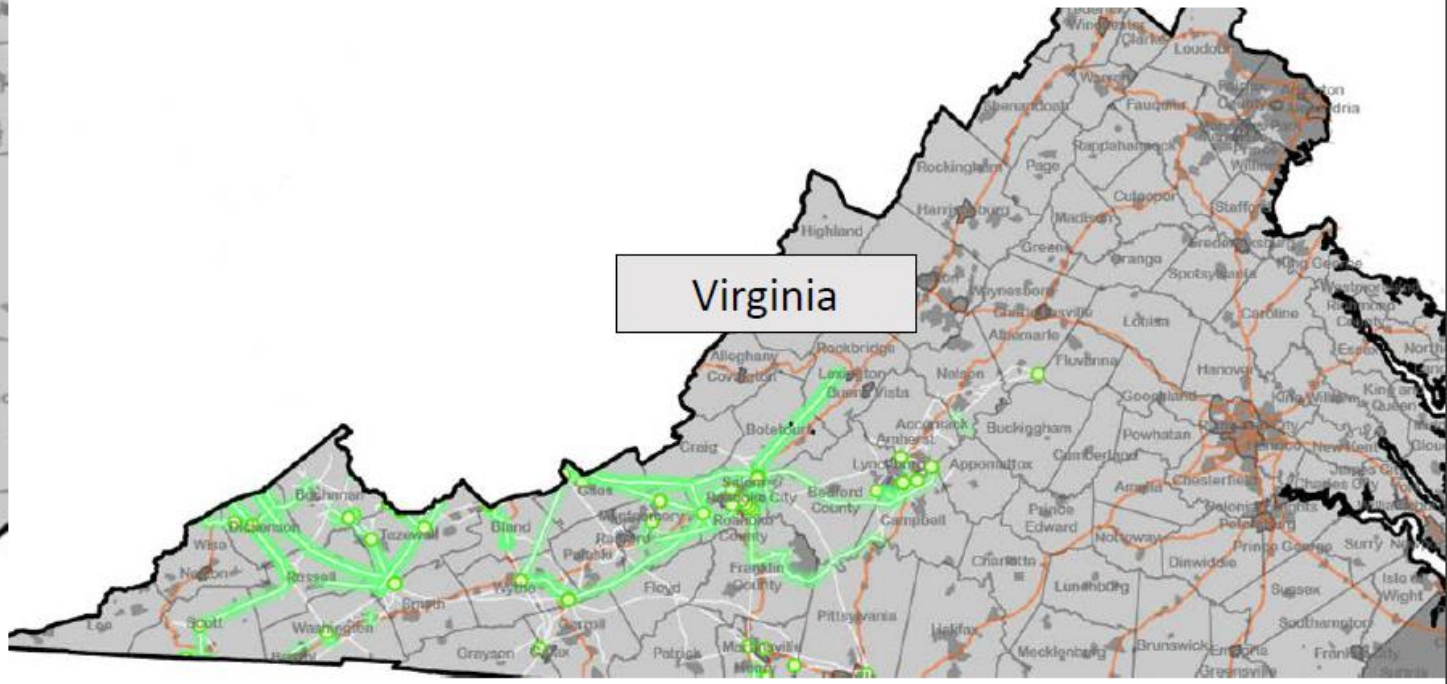
Rigorous Industry Best Practices to Manage Risk and Cost

- Design to industry and AEP standards
- Competitive bidding from a broad base of suppliers
  - Engineering
  - Materials and Supplies
  - Construction Labor
- Market value assessment-driven ROW acquisition
- Construction Management staff to monitor field construction and safety
- Industry project and risk management practices
- Project financial cost controls



Appalachian Power
Transmission Projects 2012-2019





Station Project > $1 Million Investment
Line Project > $1 Million Investment
AEP Transmission Line
USA Freeway System

*This map reflects transmission line and substation projects placed in-service between 2012 and 2019

AEP Transmission Zone M-3 Process
Carbondale – Tower 117 Rebuild

Previously presented on 3/9/2018 SRRTEP

Problem Statement:

Equipment Material/Condition/Performance/Risk:

From 2013 – 2016 the Carbondale – Tower 117 69 kV (vintage 1938) circuit has experienced 23 permanent and 8 momentary outages resulting in over 3.4M customer minutes of interruption. 5.6 miles of this line has no shielding, which leaves it susceptible to outages due to lightening. AEP's Transmission Line Engineering group has determined shielding cannot be added to the existing structures In addition, the 9.8 miles we are rebuilding (out of a total of 21.1 miles) have 23 current open A conditions on 79 structures of single circuit wood pole construction. These conditions consist of rotted/broken poles, rotted/broken crossarms, damaged shield wires, burnt poles, and woodpecker/insect damage. The conductor on the sections being rebuilt varies in size from 3/0 ACSR, 4/0 ACSR, and 556 ACSR (44 MVA rating). The original conductor over the course of its 79 year life has endured multiple contacts and severe weather conditions. The existing 600 A phase over phase (P.O.P.) switch will be replaced with a 1200 A P.O.P. due to the line rebuild at Gauley Mountain.

Selected Solution:

Rebuild ~4 miles of the Carbondale – Brownsville 69 kV line utilizing 795 ACSR conductor (125 MVA rating) at 69 kV standards with steel equivalent H frame structures. Rebuild ~5.6 miles of the Brownsville – Gauley Mountain 69 kV line utilizing 795 ACSR conductor at 69 kV standards with steel equivalent H frame structures. Rebuild 0.1 miles of the Elmo – Tower 117 69 kV line over route 19 with 795 ACSR conductor at 69 kV standards. (S1509.1)

Estimated Cost: ~~$25.5M~~ $46.1M

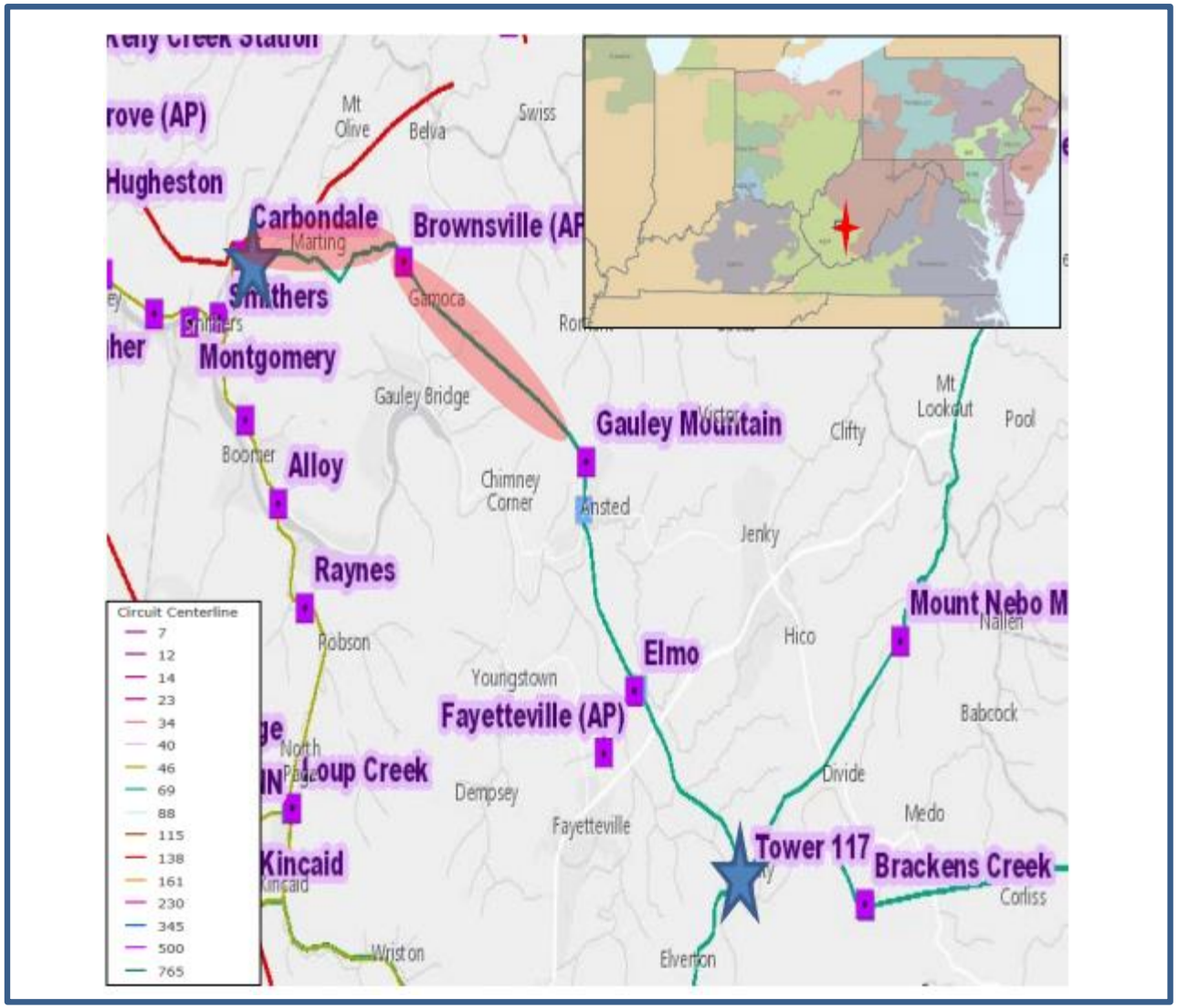
Replace Gauley Mountain switches with a new 3 way motorized Phase Over Phase structure. (S1509.2)

Estimated Cost: ~~$0.5M~~ $0.6M

Total Estimated Transmission Cost: ~~**$26.0M**~~ **$46.7M**

In-service: ~~12/01/2019~~ 3/23/2021

Project Status: Engineering



Major Reasons for Cost Increase:

Line reroute and extended line extension to pick up Brownsville ($2.9M)
A change in the line route increased the total line length from 11.2 miles to 12.41 miles including a 0.5 mile double circuit in and out loop to serve Brownsville.
Relocation of original route was requested for two reasons:
A) To avoid passing over or near homes located in Brownsville near the Gauley River crossing
B) To avoid building the new line on side slopes
The reroute increased the length of the line by 1.21 miles
Additional tree and brush clearing for pull pads and blowout ($1.9M)
The original estimate included 102 acres of ROW clearing on the Carbondale to Gauley Mountain line. 23.71 additional ROW clearing acreage was required after final surveying has been completed.
Unaccounted for rock at drilling and grillage sites ($2.9M)
Encountering excessive access road rock & excessive rock drilling costs above anticipated amounts based on available soil borings.
Access road cut and fill, matting requirements ($4.0M)
Due to no initial access rights and heavily wooded terrain, original estimated did not include any cut or fill along the access roads, which are dependent upon field conditions. All new access roads installed and existing roads upgraded shall be left as is for maintenance after project completion. Cost includes additional stone placement and matting.
Additional costs due to slow progress resulting from land owner negotiations and missed bat window ($3.5M)
Property owners negotiations took longer than anticipated and the bat window was missed delaying the project for a year. Remobilization costs, extended laydown yard rental and upkeep costs, and extended SWPPP maintenance costs.
Landslide remediation due to safety on access roads ($1.25M)
Terrain and excessive rain caused landslides, and in some cases construction of access roads and clearing of trees for Transmission line clearances.
Storm Water Pollution Prevention Plan – 2019 Revision ($4.1M)
WVDEP requirement on enhanced SWPPP including increased inspection intervals and enhanced environmental barriers. Recent change to state regulations.

Terrain Challenges – Landslides & Pollution control

Access Road Challenges

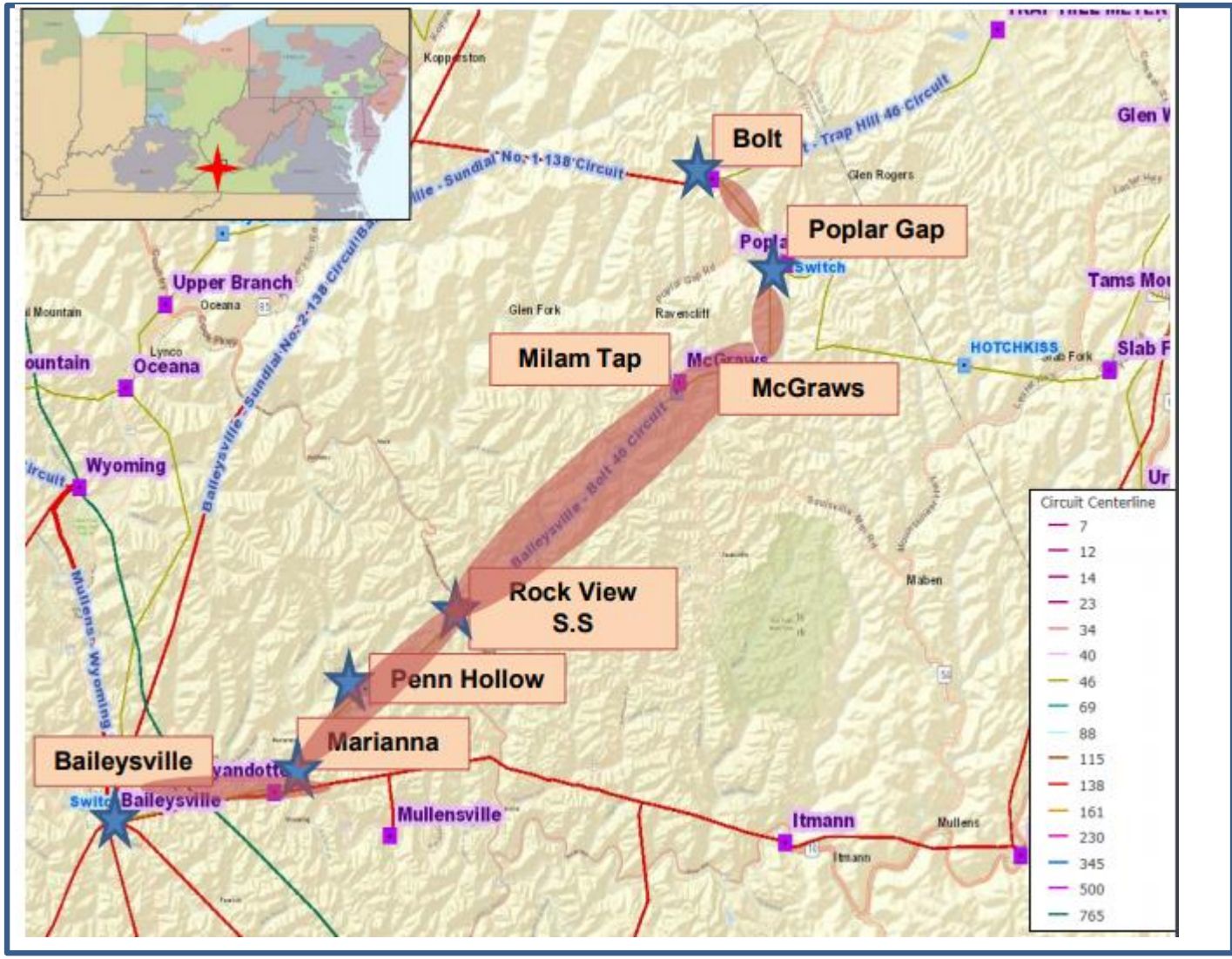
Structure location and ROW Clearing Challenges

Previously presented on 2/14/2018 SRRTEP

Problem Statement:

Equipment Material/Condition/Performance/Risk:

The Baileysville – Bolt 46 kV circuit has experienced 4.5 million customer minutes of interruption from 2013 to 2016. Approximately 16 miles of the 19 mile long circuit utilizes wood pole structures from the 1940s with 3/0 and 4/0 ACSR conductor (29 MVA rating). In addition, this line has a shield wire along only 13% of the structures and lightening strikes are a frequent occurrence. There are currently 39 category A open conditions along the circuit. These open conditions include damaged/rotted poles and cross arms. Our circuit breaker guideline justifies installing a breaker at McGraws Station towards Baileysvile Station with a Momentary/Permanent Outage Index (MPOI) calculation of 273, above the 200 threshold.



AEP Transmission Zone M-3 Process
Baileysville – Bolt Rebuild

Selected Solution:

Rebuild ~16.6 miles of the Baileysville-Bolt line with 795 ACSR conductor to 138 kV standards (energized at 46 kV, 86 MVA rating). Existing ROW will be used when possible but supplemental ROW may be needed in order to build to 138kV standards. ADSS will be installed on the new line. **(S1497.1)** Estimated Cost: ~~$25.8M~~ $69.3M

At Baileysville Station, replace 46kV bus/risers and switches on circuit breaker E. **(S1497.2)** Estimated Cost: ~~$0.6M~~ $0.7M

~~At Marianna Station, replace the existing switches with a 1200A phase-overphase switch and replace the bus/risers.~~ Retire Marianna Station. **(S1497.3)** Estimated Cost: $0.0M

At Rock View Station, replace the existing switches with a 1200A phaseover-phase switch. **(S1497.4)** Estimated Cost: ~~$0.4M~~ $0.9M

At Poplar Gap Station, replace the existing switches with a 1200A phaseover-phase switch. **(S1497.5)** Estimated Cost: ~~$0.6M~~ $1.2M

Retire Milam Tap Station. **(S1497.6)** Estimated Cost: $0.0M

Retire Penn Hollow Tap Station. **(S1497.7)** Estimated Cost: $0.0M

Install a 3000A circuit breaker at McGraws Station towards Baileysville. **(S1497.8)** Estimated Cost: ~~$1.2M~~ $1.3M

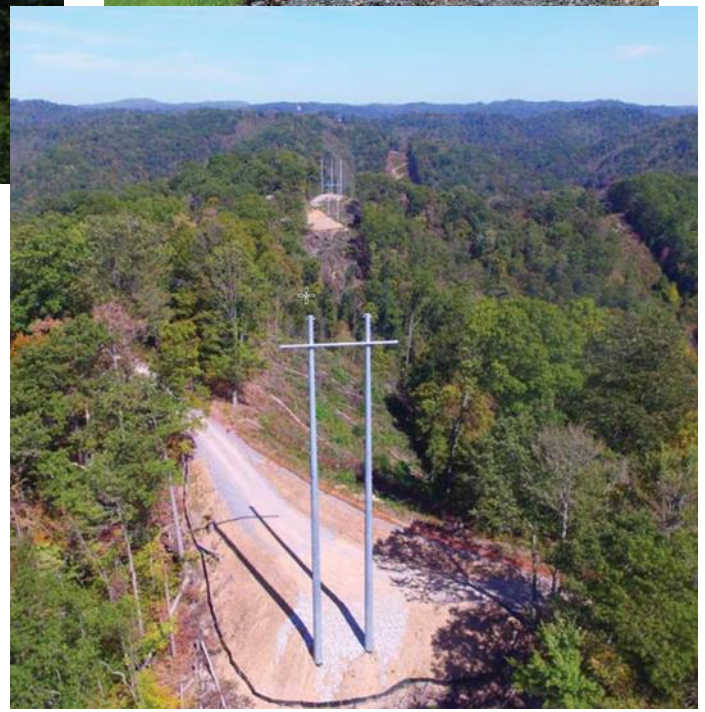
Expand Guyandotte 138 kV Station, install new 138 kV switch, circuit switcher and 138/12 kV transformer to allow for retirement of Marianna Station. **Due to a line route change driven by ROW acquisition, Marianna station was retired and consolidated at Guyandotte station which had to be expanded** Estimated Cost: $5.1M

Total Estimated Transmission Cost: ~~$28.6M~~ $78.5M

Functional Estimated Transmission Cost= $33.0M

In-service: ~~**12/01/2019**~~ **6/1/2021**

Project Status: Engineering



AEP Transmission Zone M-3 Process
Baileysville – Bolt Rebuild

Major Reasons for Cost Increase:

ROW acquisition delays associated land owner negotiations and condemnation proceedings. This delay has been exacerbated by the closure of some WV Court Systems due to the on-going COVID pandemic. At this time two (2) parcels of 53 total parcels are awaiting condemnation proceedings.

Standby Costs include ($4M)

- Laydown yard related costs
- Access Road and SWPPP maintenance costs
- Court delays could add $400K per month

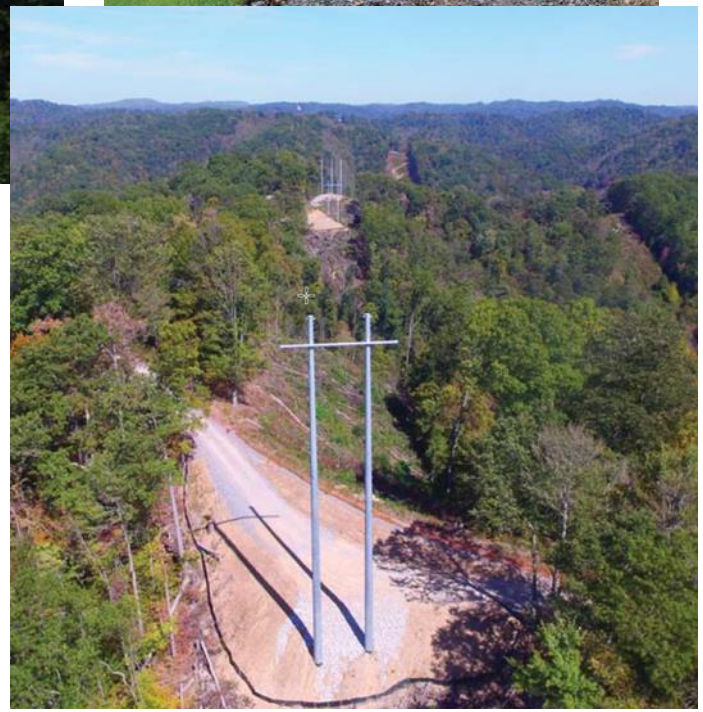
Construction Costs and Delay Costs ($6M)

- Out of sequence construction impacts
- Labor rate increases
- Rental rate increase
- Additional Mobilizations

Due to the complexity of the project and difficult terrain, construction bids came in higher than original estimates ($20.4M)

Storm Water Pollution Prevention Plan – 2019 Revision ($6.0M)

WVDEP requirement on enhanced SWPPP including increased inspection intervals and enhanced environmental barriers. Recent change to state regulations.



AEP Transmission Zone M-3 Process
Boone – Ward Hollow Rebuild

Previously presented on 2/14/2018 SRRTEP

Problem Statement:

Equipment Material/Condition/Performance/Risk:

From 2013 – 2016, the Boone – Ward Hollow 46 kV circuit has experienced 8 Permanent and 5 Momentary outages resulting in 393,000 customer minutes of interruption. Over 90% of the structures that make up the approximately 17.5 mile circuit were installed in 1920 with 2/0 Copper conductor (27 MVA rating) and only 21% of the circuit is shielded for lightning protection. These service interruptions are due to a lack of shielding. Additionally, there are 35 current open A conditions consisting of pole, conductor and hardware damage.

Selected Solution:

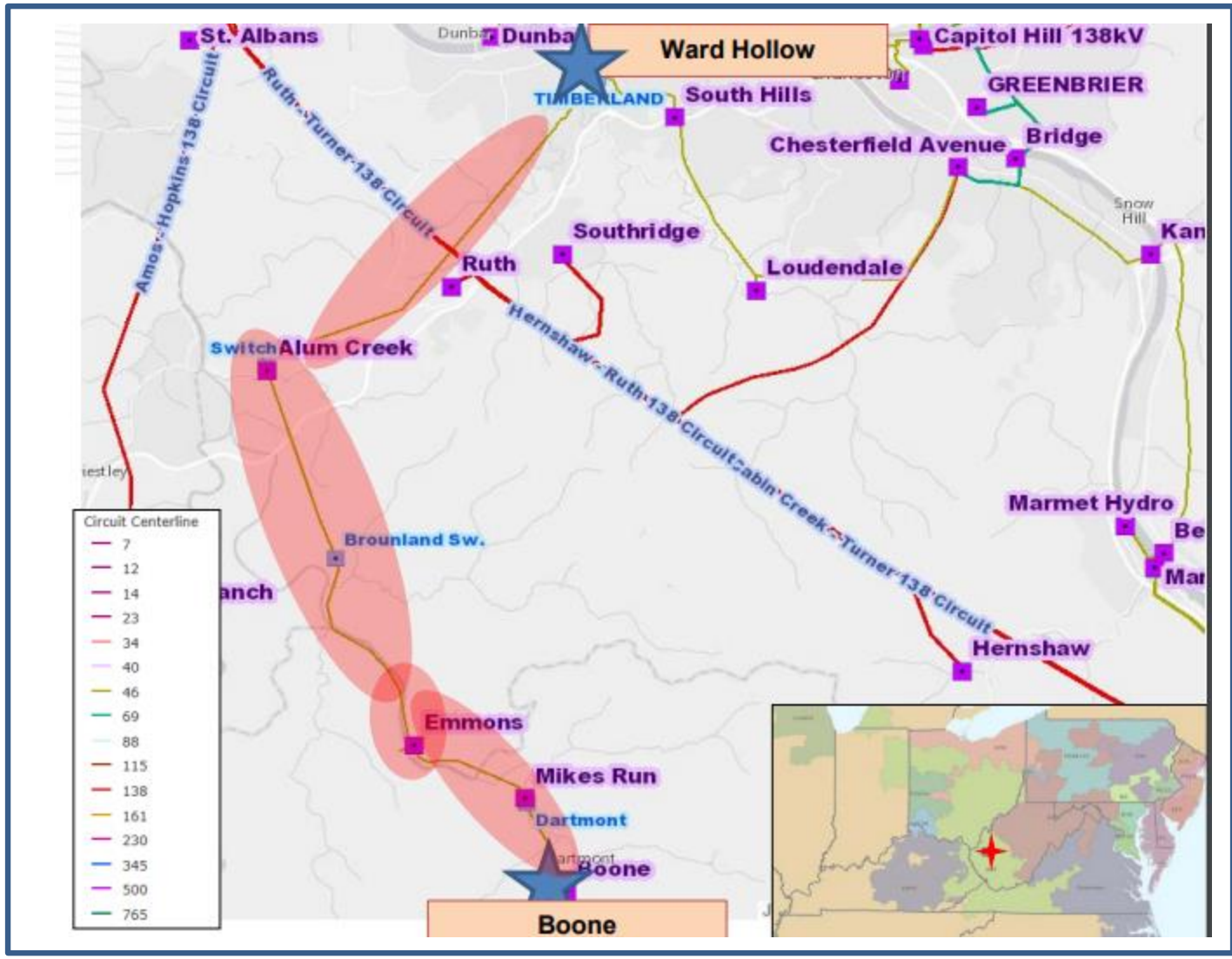
Rebuild ~17.5 miles of the Boone – Ward Hollow circuit utilizing 795 26/7 ACSR (86 MVA rating) at 69 kV standards (operated at 46 kV). Switching structures at Mikes Run, Emmons, and Alum Creek will be replaced with a standard 3-way Phase Over Phase Switch. Retire Timberland Switching Station. (S1501)

Total Estimated Transmission Cost: ~~$32.7M Projected~~ $76.5M

Functional Estimated Transmission Cost=$41.1M

In-service: ~~12/01/2020~~ 12/22/2021

Project Status: Engineering



AEP Transmission Zone M-3 Process
Boone – Ward Hollow Rebuild

Major Reasons for Cost Increase:

Land Acquisition delays Additional surveying ($9.6M)

Delays due to land owner condemnations as part of ROW acquisition plan. Numerous parcels entered into the legal condemnation process which included land owned by mining companies. Two parcels went through actual condemnation and were further delayed by court closures due to COVID. The total delay attributed to this process was 12 months. Increase in costs include having to maintain equipment, laydown yards, environmental SWPPP, mobilization and remobilization, personnel to maintain sites while work is shutdown, and loss of efficiencies

Multiple re-routes totaling 1.6 miles (slight increase in net mileage) ($7.5M)

Re-routes due to external drivers (newly opened mining area to route around & avoidance of Lexington Coal's slurry containment) that was not present during project planning. The bulk of the costs for these re-routes are found in the need for new access roads and upgrading existing access.

Unaccounted for rock at drilling sites and access roads ($6M)

Encountering excessive access road rock & excessive rock drilling costs above anticipated amounts based on available soil borings.

ROW width revision to meet landowners requirements to gain access ($1.0M)

Adjustment of ROW width required the use of an additional structure and establishment of a new access road.

Jefferson Road deadend addition for City of South Charleston land clearing accommodation ($782K)

Majority of cost increase is due to additional transmission structures and required additional transmission wire and the labor to install it.

Landslide remediation due to safety on access roads ($4.5M)

Terrain and excessive rain caused landslides, and in some cases construction of access roads and clearing of trees for Transmission line clearances. Also includes mitigation of unstable soils due to hillside springs.

Storm Water Pollution Prevention Plan – 2019 Revision ($6.0M)

WVDEP requirement on enhanced SWPPP including increased inspection intervals and enhanced environmental barriers. Recent change to state regulations.

Previously presented on 1/8/2018 SRRTEP

Problem Statement:

Equipment Material/Condition/Performance/Risk:

Hopkins – Sharples 46 kV circuit has had 8 permanent and 9 momentary forced outages resulting in over 1 million customer minutes of interruption from 2013 - 2015. There are currently 101 open A conditions along the 11-mile length of the circuit. The conditions include damaged poles/crossarms/shield wire/conductor and rotted poles/crossarms The majority of the line is constructed with 1960s wood structures with 4/0 ACSR and 1/0 copper conductor (23 MVA rating).

Selected Solution:

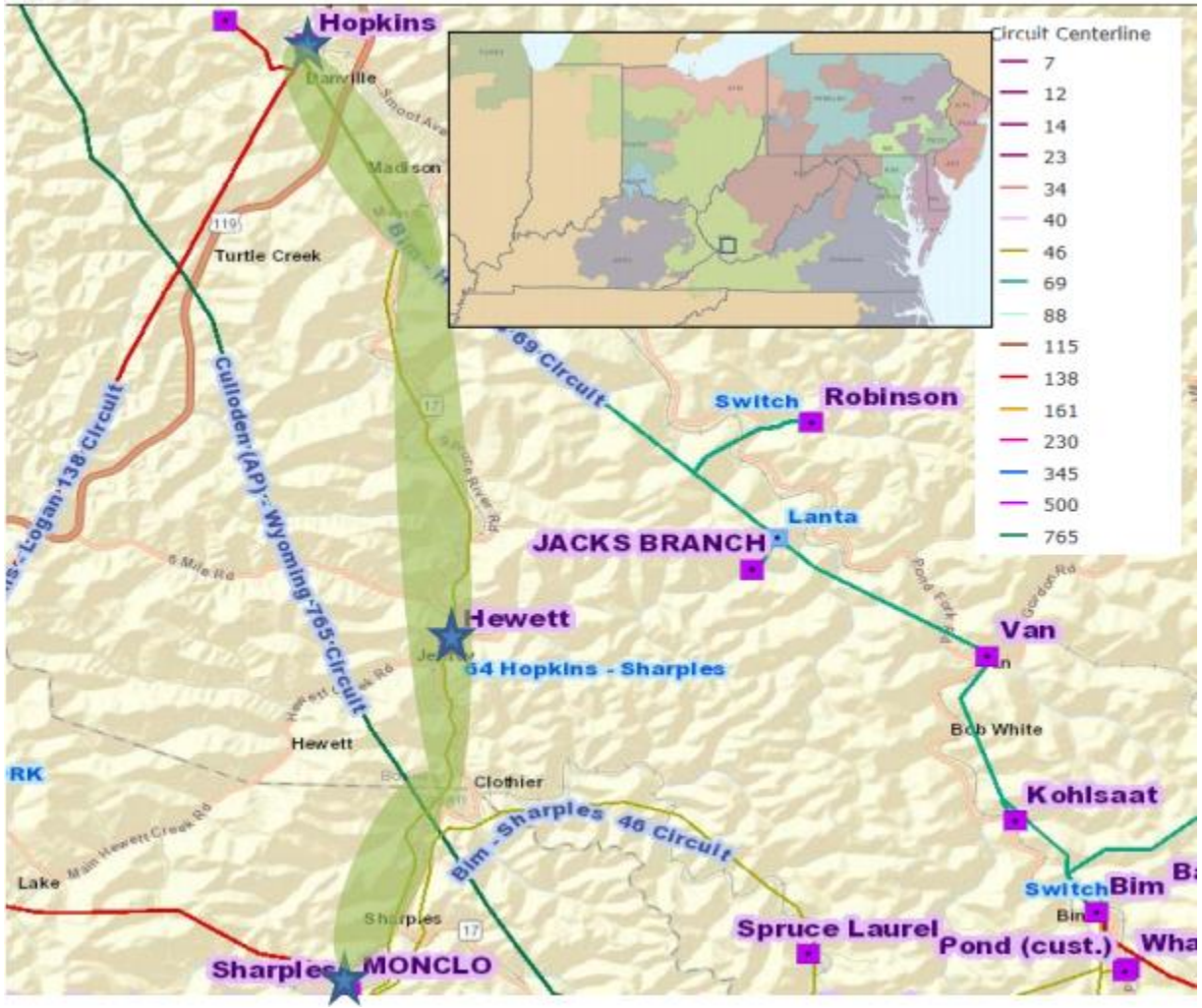
Rebuild ~11 miles of the Hopkins – Sharples circuit (designed to 69 kV standards, operated at 46 kV) with single circuit 795 26/7 ACSR (62 MVA rating, non-conductor limited) including ~2.6 miles of the Hopkins – Bim line that is double circuited with Hopkins – Sharples. Replace switches at Hewett station with 1200A 3-way Phase Over Phase (POP) switch. On all lines, install OPGW. **(s1431)**

Total Estimated Transmission Cost: ~~$23.7M~~ $61.73M

Functional Estimated Transmission Cost=$35.7M

In-service: ~~12/01/2019~~ 4/7/2022

Project Status: Engineering



AEP Transmission Zone M-3 Process
Hopkins – Sharples Rebuild

Major Reasons for Cost Increase:

Unaccounted for rock at drilling sites and excavation ($3.05M)
Encountering excessive access road rock & excessive rock drilling costs above anticipated amounts based on available soil borings.

Access road cut and fill, matting requirements ($9.27M)
Due to no initial access rights and heavily wooded terrain, original estimated did not include any cut or fill along the access roads, which are dependent upon field conditions. All new access roads installed and existing roads upgraded shall be left as is for maintenance after project completion. Cost includes additional stone placement and matting.

Land acquisition delays ($1.45M)
Additional cost for project schedule extended for 11 months due to easements not being secured on some properties and others that went into condemnation.

Re-route of approx. 6.8 mi. to reduce impact of residential areas (no net mileage increase) ($1.85M)
New siting study conducted to reduce residential impact resulted in additional design time and changes, additional negotiations for access roads, new ROW acquisition, and bat surveys.

Station design changes ($1.35M)
Revised standards for equipment procurement caused changes to engineering deliverables and revised vendor quotes.

Structure material true up ($1.56M)
Steel cost escalations due to new tariffs and transmission line re-routes.

Storm Water Pollution Prevention Plan – 2019 Revision ($7.5M)
WVDEP requirement on enhanced SWPPP including increased inspection intervals and enhanced environmental barriers. Recent change to state regulations.

AEP Transmission Zone M-3 Process
Carbondale – London Rebuild

Previously presented on 5/31/2017 SRRTEP

Problem Statement:

The Dunnhollow – London 69 kV line (3/0 Copper, 31 MVA rating, 103%) overloads for loss of Kanawha River 138 kV Bus #1 or multiple breaker failure contingencies at Kanawha River in the 2021 RTEP case. In addition to the planning criteria violation, the Carbondale – London 46kV line is a poor performing circuit in the APCo region. From 2013-2016, this circuit has experienced 9 permanent outages and 1,721,181 customer minutes of interruption. Approximately 2.4 miles of this circuit utilizes structures from 1915. There are currently 65 category A open conditions along the 5.9 mile long line. These open conditions include damaged/rotted poles and damaged guy wires, shield wire, conductor, insulator and cross arms.

Selected Solution:

Rebuild ~1.7 miles of the Dunn Hollow – London 46kV line section utilizing 795 26/7 ACSR conductor (58 MVA rating, non-conductor limited, 55%). (B2881)

Estimated Baseline Cost: ~~$4.5M~~ $11.3M

Rebuild ~3.5 miles of the Carbondale – Dunn Hollow 46kV line section with 795 ACSR conductor. This section of line is currently comprised of a mix of 2/0, 3/0, and 4/0 Copper conductor. The line portion to Montgomery station is of newer construction with larger conductor.(S1290.1)

Retire the Smithers Switch structure. Smithers load will be served out of Carbondale station via a new transformer. Replace existing Dunn Hollow Switching Structure with new 3-way phase over phase Structure. (S1290.2)

Estimated Supplemental Project Cost: ~~$9.4M~~ $23.5M

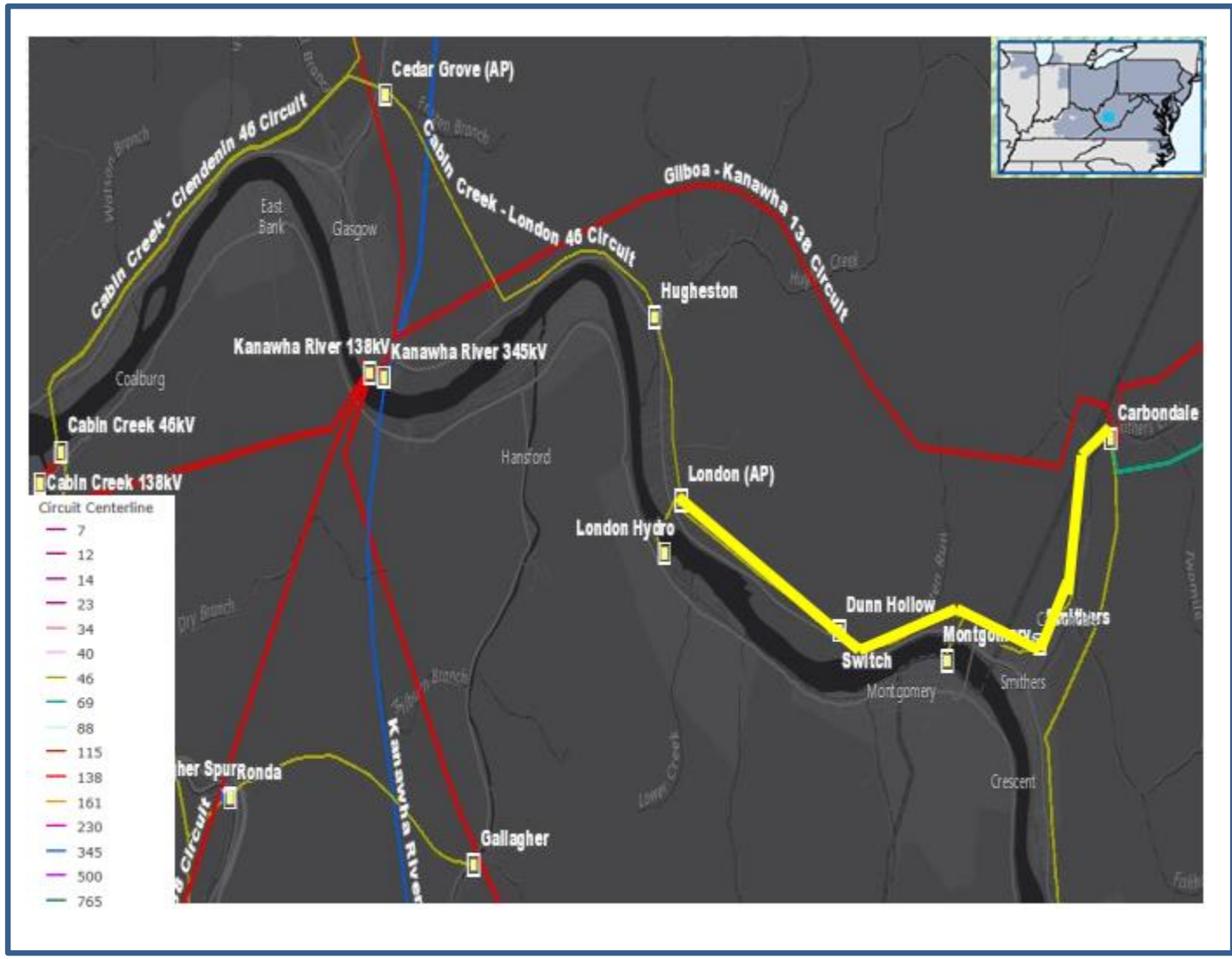
Total Estimated Cost: ~~$13.9M~~ $34.8M

Functional Estimated Transmission Cost=$21.0M

Required IS Date: 6/1/2021

Projected IS Date: ~~12/1/2018~~ 5/31/2021

Project Status: ~~Engineering~~ In Construction



AEP Transmission Zone M-3 Process
Carbondale – London Rebuild

Major Reasons for Cost Increase:

- **Unaccounted for rock at drilling and grillage sites ($2.95M)**

Encountering excessive access road rock & excessive rock drilling costs above anticipated amounts based on available soil borings.

- **Access road cut and fill, matting requirements ($1.86M)**

Due to no initial access rights and heavily wooded terrain, original estimated did not include any cut or fill along the access roads, which are dependent upon field conditions. All new access roads installed and existing roads upgraded shall be left as is for maintenance after project completion. Cost includes additional stone placement and matting.

- **Additional tree and brush clearing ($2.71M)**

On completion of ROW negotiations, expediting tree clear was necessary to catch the bat window.

- **Landslide remediation due to safety on access roads ($1.74M)**

Terrain and excessive rain caused landslides, and in some cases construction of access roads and clearing of trees for Transmission line clearances.

- **Station design changes ($0.72M)**

Station service requirements during outage, oil removal, and obsolete equipment upgrades

- **Structure material true up ($0.72M)**

Steel cost escalations and design changes

- **Storm Water Pollution Prevention Plant – 2019 Revision ($3.48M)**

WVDEP requirement on enhanced SWPPP including increased inspection intervals and enhanced environmental barriers. Recent change to state regulations.

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
Fayette/Raleigh County, WV

Need Number: AEP-2020-AP042

Process Stage: Need Meeting 11/20/2020

Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Bradley – Layland 69 kV (14.25 miles)

- Circuit is comprised mostly of wood pole structures
  - 1930s vintage structures (81%)
  - Circuit fails to meet 2017 NESC Grade B loading criteria, AEP structural strength requirements, and fails to meet current ASCE structural strength requirements
  - 4-bell porcelain insulators do not meet current AEP Standards
- 39 structures with at least one open condition (38% of the structures)
  - Structure conditions include rot top, insect damage, woodpecker holes
- Since 2014, there have been 30 momentary and 23 permanent outages on the Bradley - Layland 69 kV circuit
  - Majority of the momentary outages were due to weather including lightning/wind
  - Outages resulted in approximately 984k customer minutes of interruption

AEP Transmission Zone M-3 Process
Kanawha County, WV

Need Number: AEP-2020-AP043

Process Stage: Need Meeting 11/20/2020

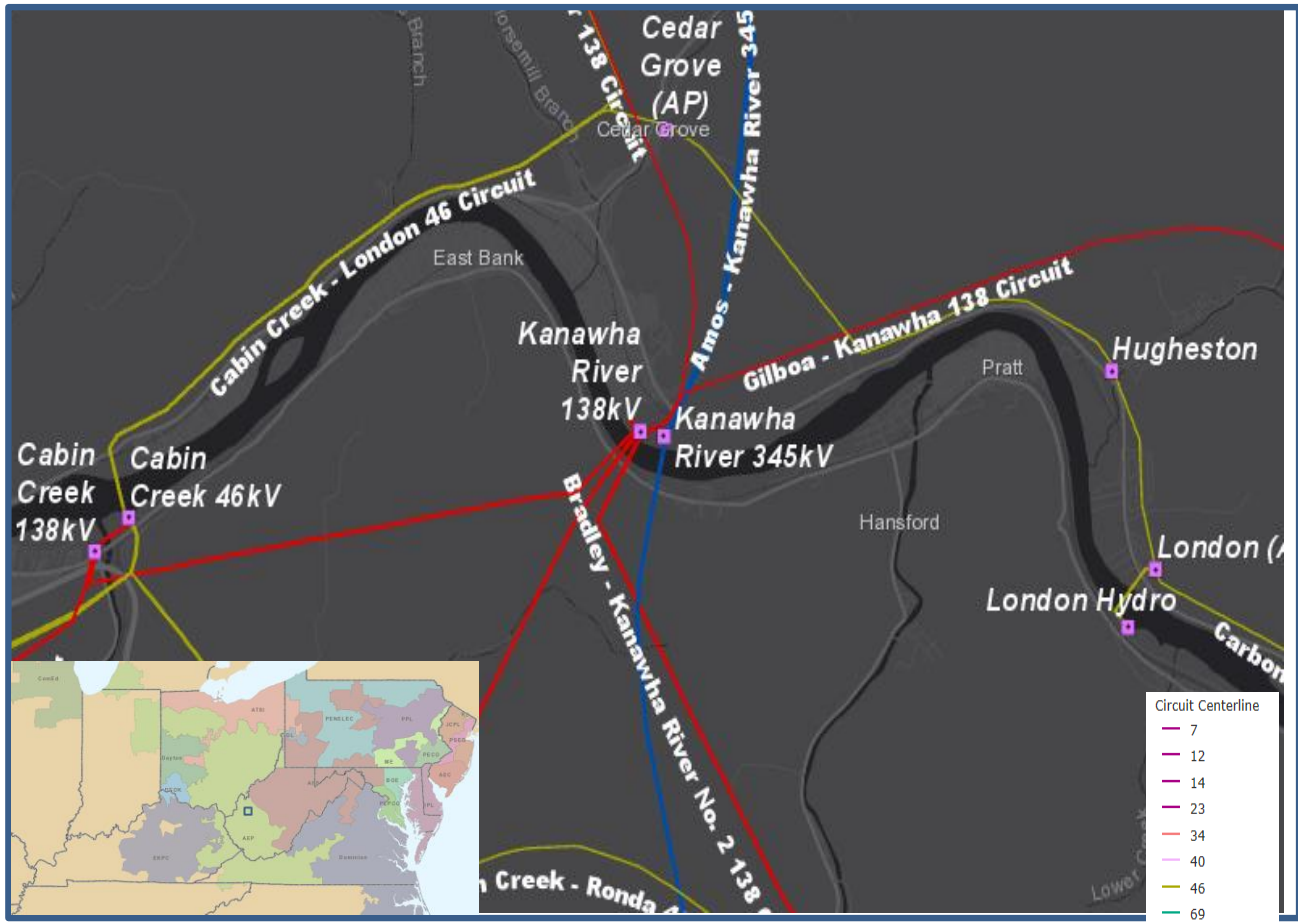
Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Cabin Creek – London 46 kV (8.35 miles)

- Circuit is comprised primarily of 1913 vintage lattice steel (38%), 1999 vintage wood (27%) and 2011 vintage steel (29%)
  - Line was originally constructed in 1913
  - Circuit fails to meet 2017 NESC Grade B loading criteria, AEP structural strength requirements, and fails to meet current ASCE structural strength requirements
  - 4-bell porcelain insulators do not meet current AEP Standards
  - Conductor on the line is primarily 3/0 and 4/0 Copper
  - The circuit is located along the Kanawha River and has a history of landslides
- 9 Structures with at least one open condition (7% of the line)
  - 13 structural conditions include rot top, insect damage, woodpecker holes, bent/damaged steel lacing
- 58 hardware conditions related to rusted/corroded shielding and conductor hardware, broken insulators and guys, worn/cracked conductor hardware
- Since 2014, there have been 9 momentary and 1 permanent outages on the Cabin Creek – London 46 kV circuit
  - Majority of the momentary outages were due to weather including lightning/wind
  - Permanent outages were caused by vegetation fall-in from outside the ROW, flood/slides, lightning/ice/snow
  - Outages resulted in approximately 10k customer minutes of interruption
- There are a significant number of landslides along the length of this line. Known slides have occurred in the last 10 years. The terrain along the line is very rough and mountainous.



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

Need Number: AEP-2020-AP044

Process Stage: Need Meeting 11/20/2020

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

Line Name: Becco – Pine Gap 46kV

Original Install Date (Age): 1930

Length of Line: ~20.79 mi

Total structure count: 160

Original Line Construction Type: Wood

Conductor Type: 3/0 ACSR, 176,900 ACSR, 1/0 COPPER, 336,400 ACSR

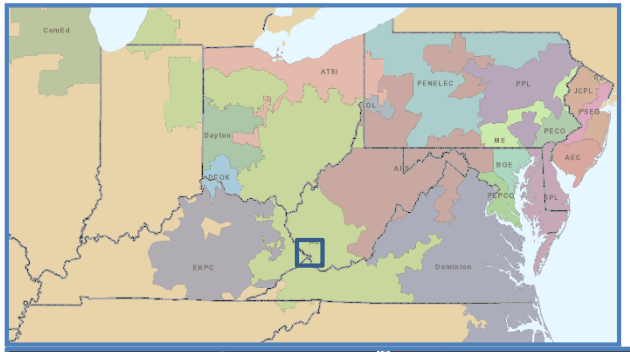
Momentary/Permanent Outages and Duration: 19 Momentary and 8 permanent Outage

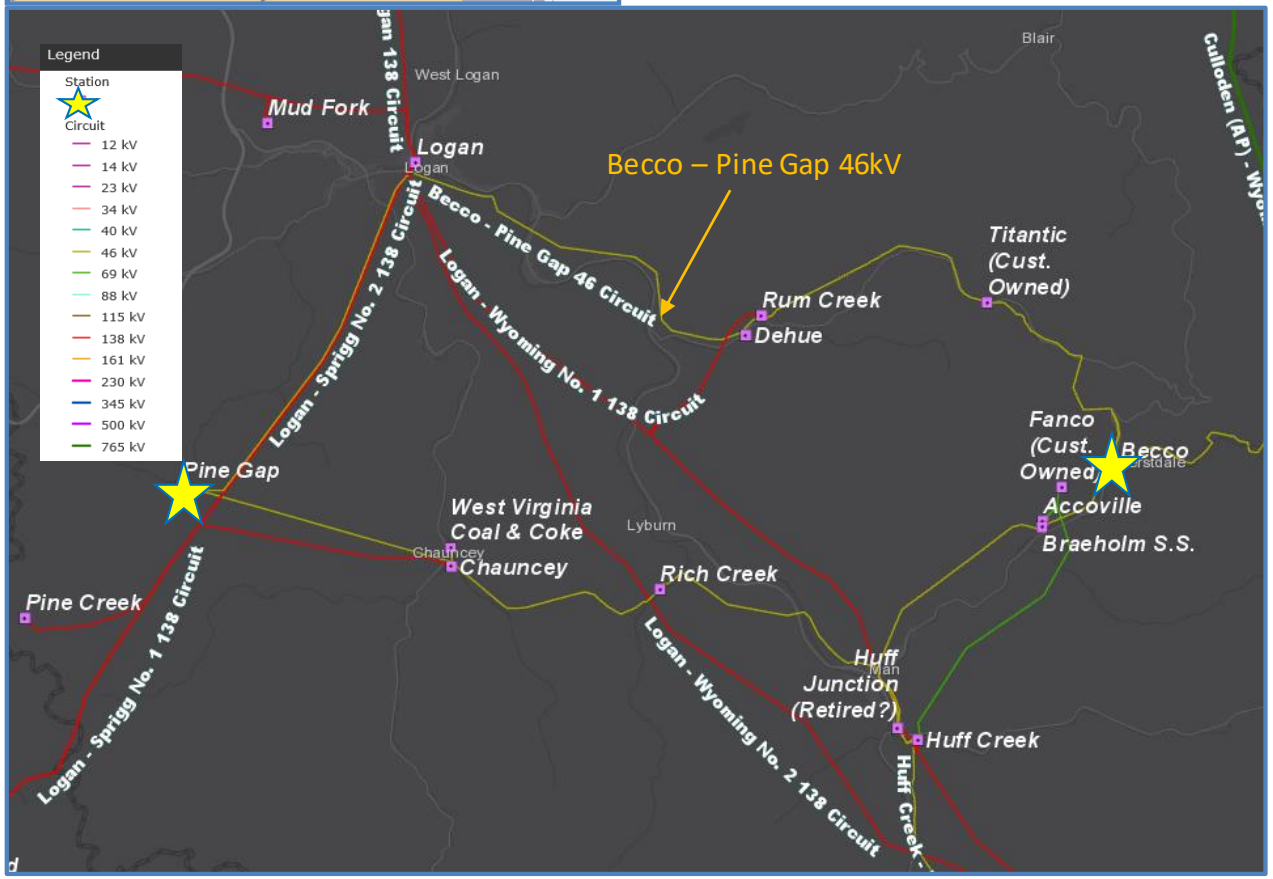
CMI (last 5 years only): 1,790,749 minutes

Line conditions:

Becco – Pine Gap 46kV:

- 35 structures with at least one open condition, 21% of the structures on this circuit.
- 32 structure related open conditions : affecting the crossarm, knee/ vee brace, or pole including rot, damaged, and insect damage conditions.
- 3 guy wire related open conditions including: Loose, Broken, damaged.
- 117 of 160 structures are 1930s wood vintage
- 148 of 160 structures are wood construction





AEP Transmission Zone M-3 Process
Kanawha County, WV

Need Number: AEP-2020-AP045

Process Stage: Need Meeting 11/20/2020

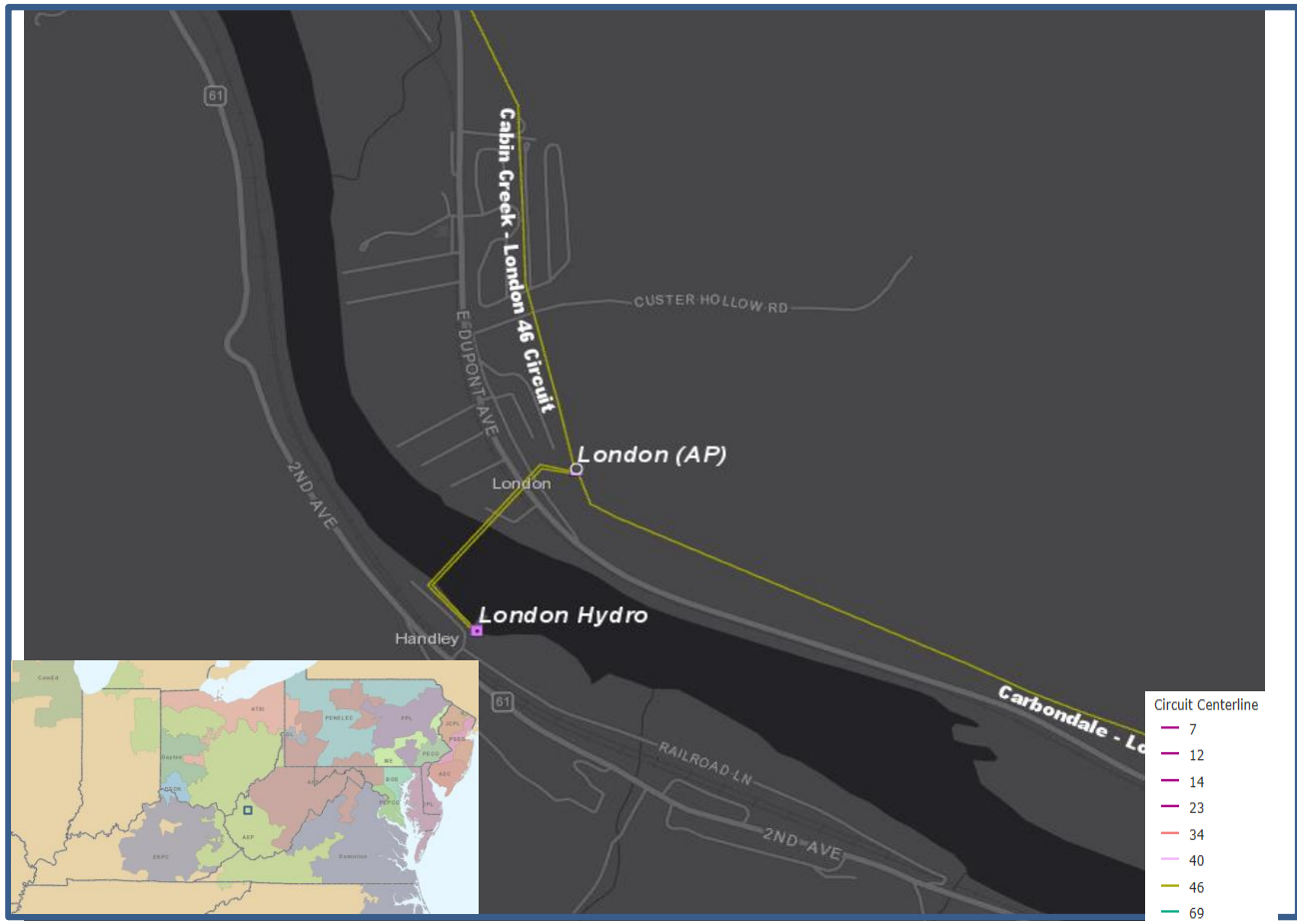
Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

London Station

- 46 kV CB-B
  - 1988 vintage
  - The breaker is 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.
  - 53 total fault operations
- 46 kV CB-F
  - 1968 vintage
  - The breaker is 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.
  - 15 total fault operations
- London station currently deploys 35 relays
  - 33 out of 35 relays are in need of replacement (94%)
  - 28 are electromechanical relays which have significant limitations with regards to fault data collection
  - 5 of the microprocessor relays utilize legacy firmware
- Control House
  - Asbestos/lead paint is present in the control house
- Access road to the station severely limits the ability to deliver large equipment to the station
- 46 kV bus shows significant signs of rust on lattice members and on bolts



AEP Transmission Zone M-3 Process
Scottsville, VA Area

Need Number: AEP-2020-AP046

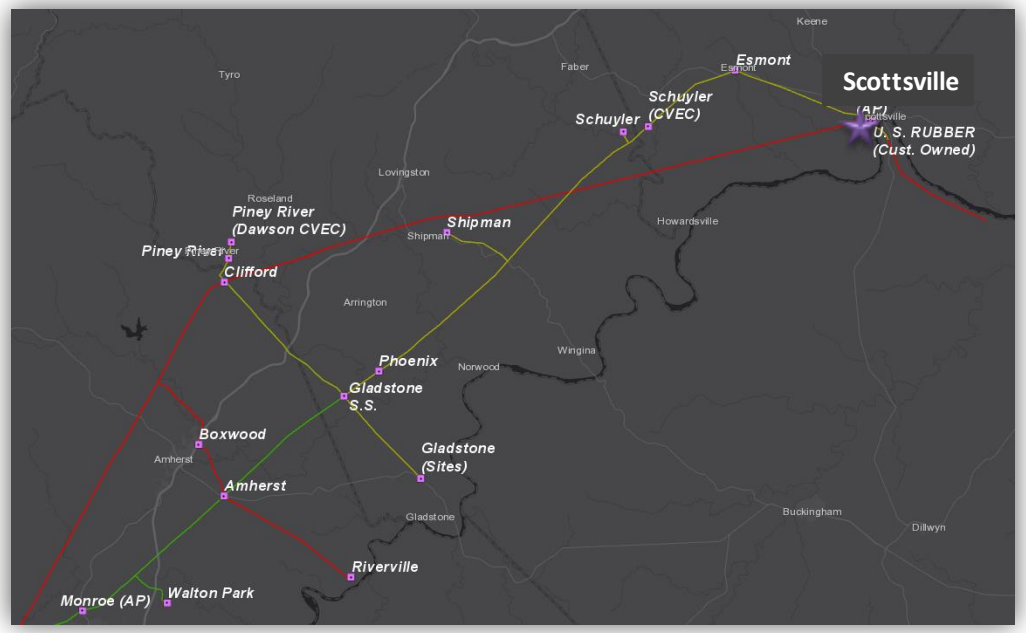
Process Stage: Needs Meeting 11/20/2020

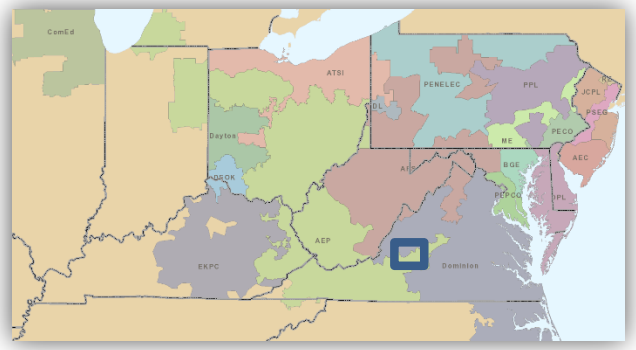
Supplemental Project Driver: Customer Service/Equipment Condition/Performance/Risk

Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7), AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

- **Scottsville Station**
  - AEP APCo Distribution is requesting additional load serving capability at Scottsville Station, including a new feeder exit and larger transformer, to serve as a backup source for the load served out of Esmont station.
  - Esmont station will be radially fed after the completion of b3208 due to the retirement of the 46 kV line towards Clifford. This request is to provide additional flexibility for the customers served from Esmont.
  - 46 kV Circuit Breaker E:
    - 72EPB-31.5-20 Type, SF-6 filled breaker manufactured in 1992
    - This circuit breaker has experienced 116 fault operations, exceeding the manufacturer's designed number of 15 full fault operations. Each of these fault operations is likely not at the full fault current rating of the circuit breaker, but with each fault operation of any magnitude comes accelerated aging.
    - Since 2003, there have been 24 gas leak malfunction records associated with CB E at Scottsville
    - These model types have historically exhibited bad gas leaks, bushing failures, and CT cores getting wet.





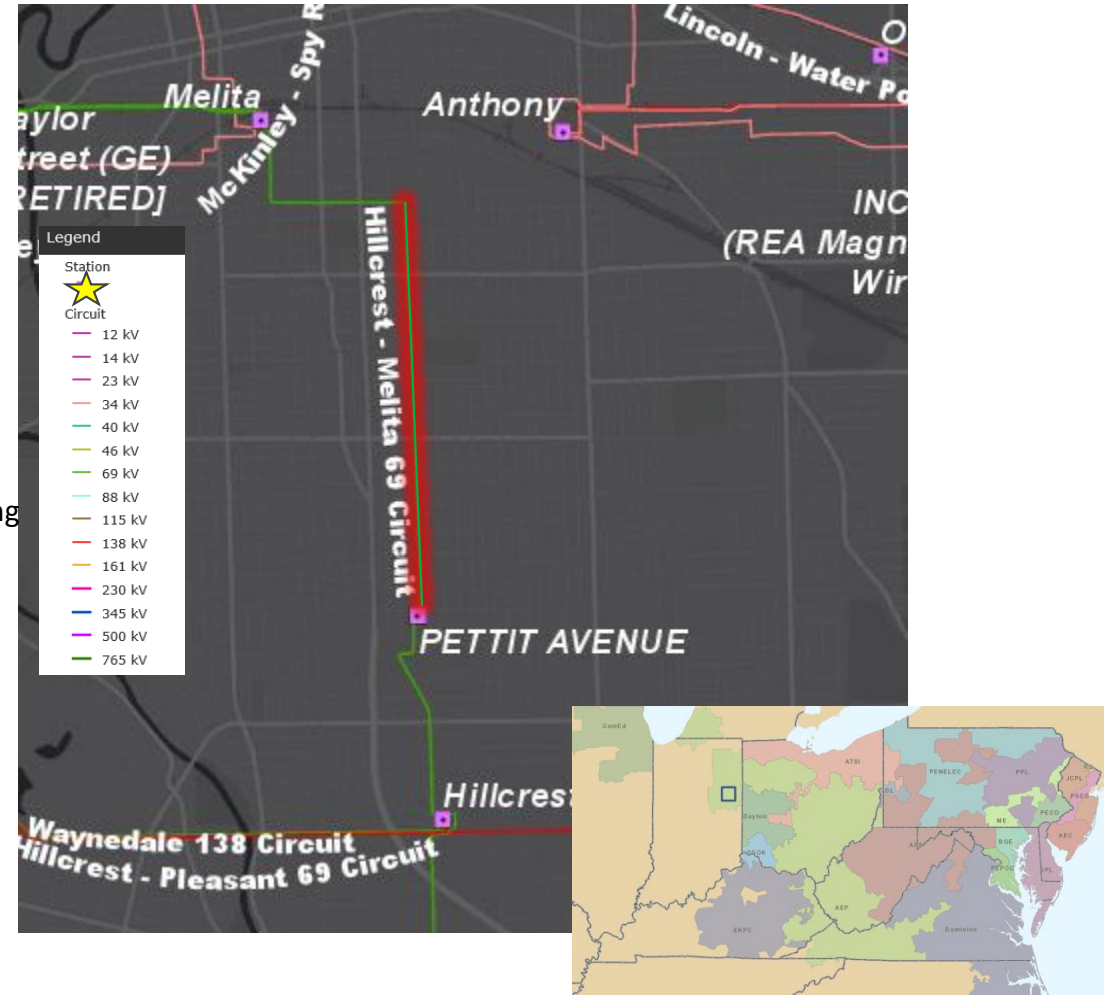
Need Number: AEP-2020-IM023
Process Stage: Needs Meeting 11/20/2020

Supplemental Project Driver: Equipment Material/Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

- **Pettit Ave – Melita 69kV ~1.84 Miles**
  - Originally constructed in 1967
  - Wood pole construction with 61/62 structures original from 1967.
  - Recent field inspection identified 48 of the 62 structures on the line have moderate to advanced decay or shell damage.
    - Additional conditions include insect damage and stolen/missing ground leads along with the rot top and/or shell decay on the structures.
  - 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



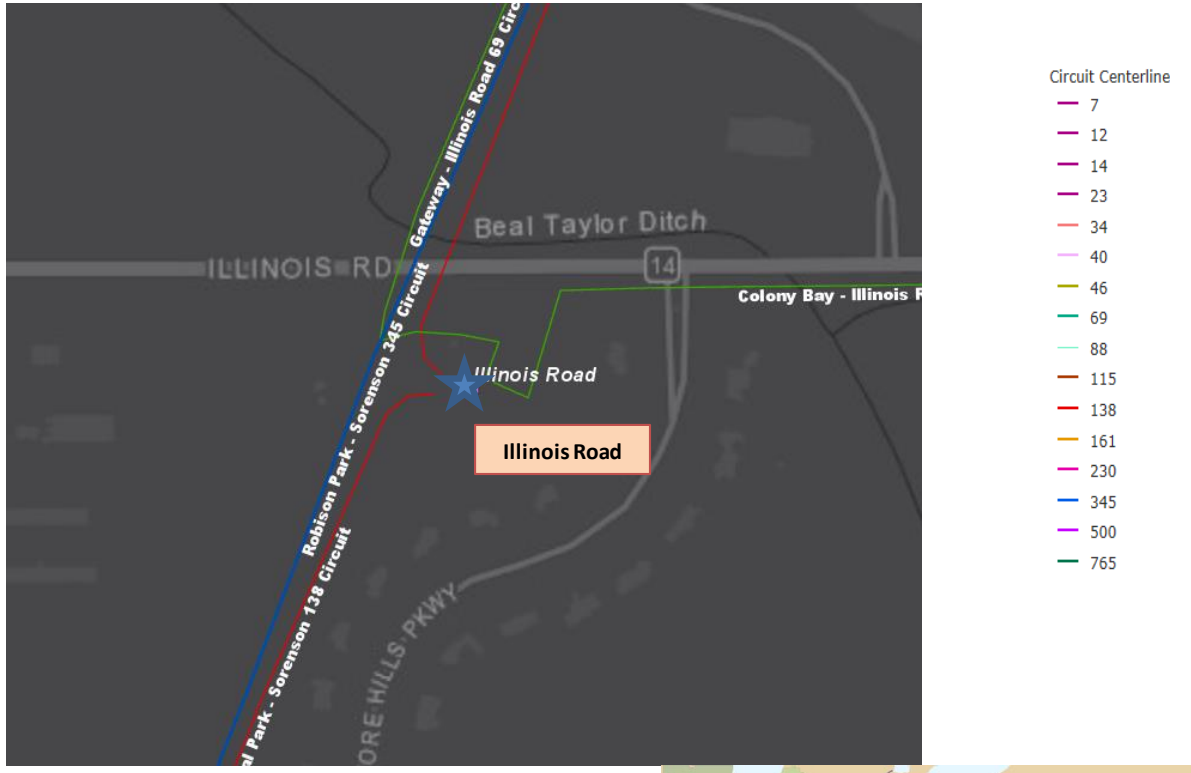
AEP Transmission Zone: Supplemental
Illinois Road Transformer

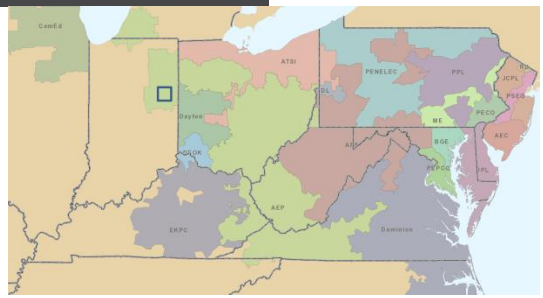
Need Number: AEP-2020-IM024
Process Stage: Needs Meeting 11/20/2020
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

Illinois Road 138/69kV Station:

138/69/12kV Transformer 1

- Manufactured in 1980
- Transformer is showing elevated moisture levels, low levels of Interfacial Tension and an increasing trend in Power Factor.
- This level of moisture is an indication of gasket leaks and breakdown in oil or paper insulation.
- The low level of Interfacial Tension is an indication acid has coated the insulation and sludge is ready to deposit within the main tank.
- The upward trend in PF indicates that there is an increase in particles in the oil.





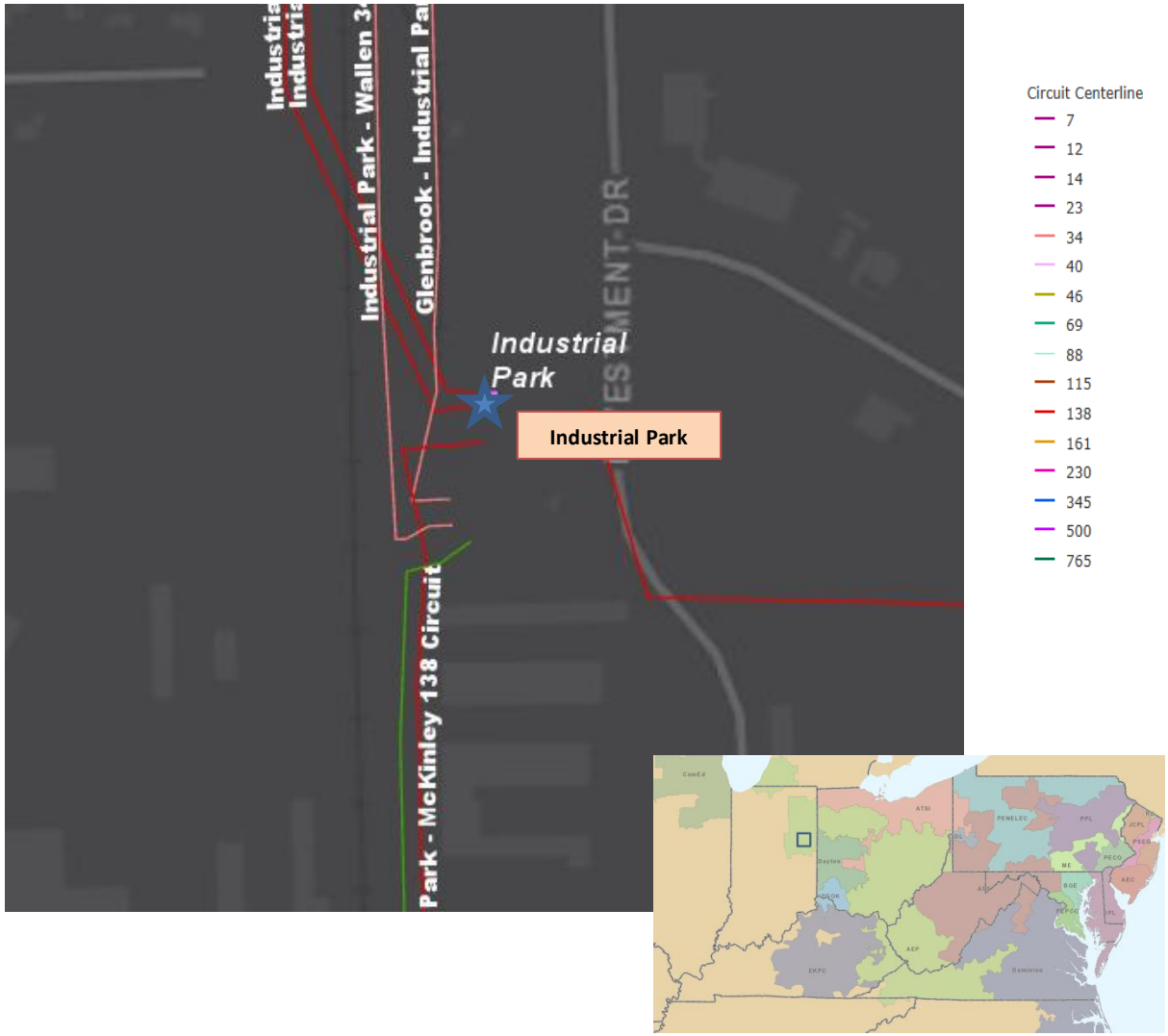
AEP Transmission Zone: Supplemental Industrial Park Transformer

Need Number: AEP-2020-IM025
Process Stage: 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:

Industrial Park 138/69/34.5kV Station:

138/69/34.5kV Transformer 1

- Manufactured in 1967
- Transformer has increased levels of CO2 indicated in the dissolved gas analysis.
- Level of CO2 indicates decomposition of the paper insulating materials which impairs units ability to withstand faults.
- The downward Interfacial Tension trend paired with upward power factor trend indicate that there are increased particles within the oil, which decreases the dielectric strength of the transformer.
- Doble tests on the bushings indicate changes in the bushing power factor and capacitance. This change indicates these bushings are at a greater risk of failure.



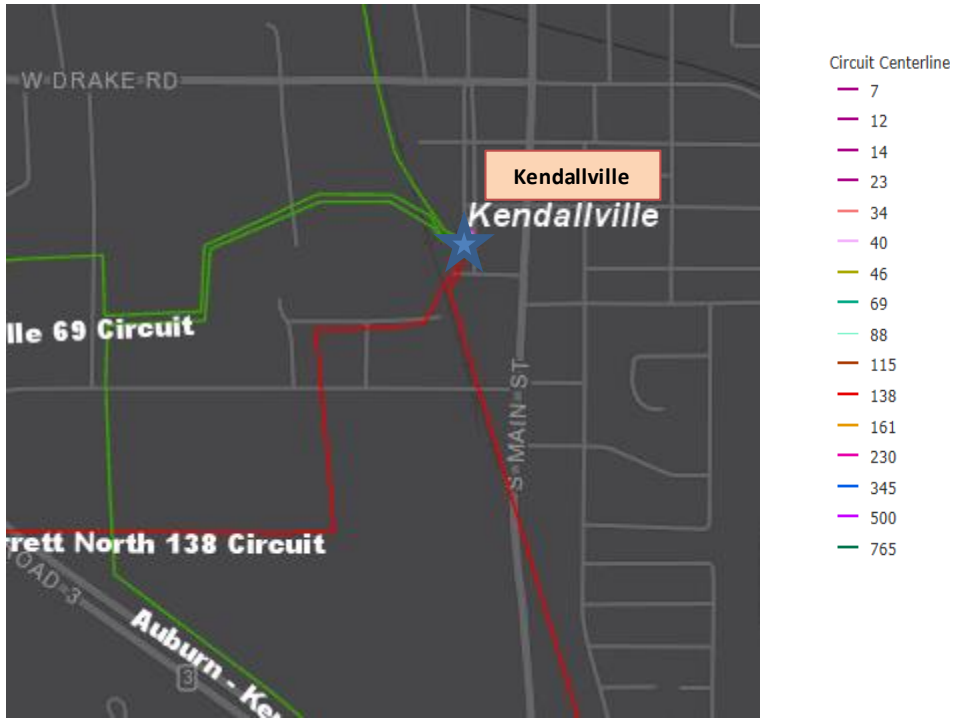
AEP Transmission Zone: Supplemental Kendallville Transformer

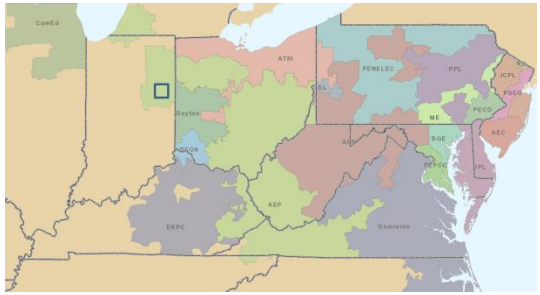
Need Number: AEP-2020-IM026
Process Stage: Needs Meeting 11/20/2020
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

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.





Need Number: AEP-2020-OH045

Process Stage: Need Meeting 11/20/2020

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 installation of a second 138/13.8 kV transformer at Fifth Ave Station to address increased loading on the existing distribution feeders at the station due to load growth in the area. Fifth Avenue station has limited transferability and serves approximately 7,000 customers via a single transformer in an urban environment.
- AEP Ohio has also expressed concerns over the amount of exposure that existing feeders out of Hess station are subject to in the area.

Model: 2025 RTEP

AEP Transmission Zone M-3 Process
North Strasburg, Ohio

Need Number: AEP-2020-OH047

Process Stage: Need Meeting 11/20/2020

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (slide 8)

Problem Statement:

Station

North Strasburg 138kV

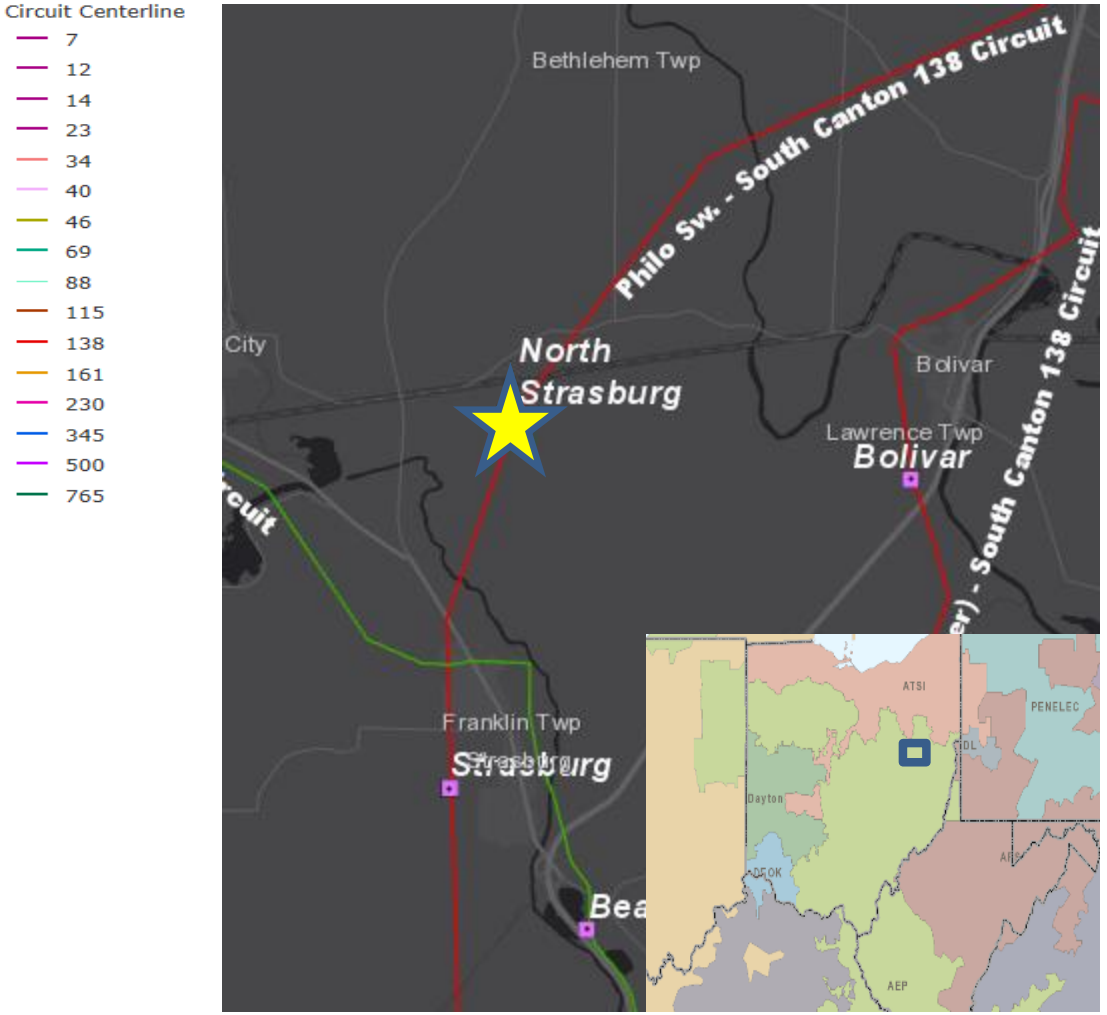
CONDITION / PERFORMANCE / RISK ASSESSMENT:

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.



Solutions

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

Need Number: AEP-2018-OH015

Process Stage: Solutions Meeting 11/20/2020

Previously Presented: Needs Meeting 10/28/18

Project Driver:

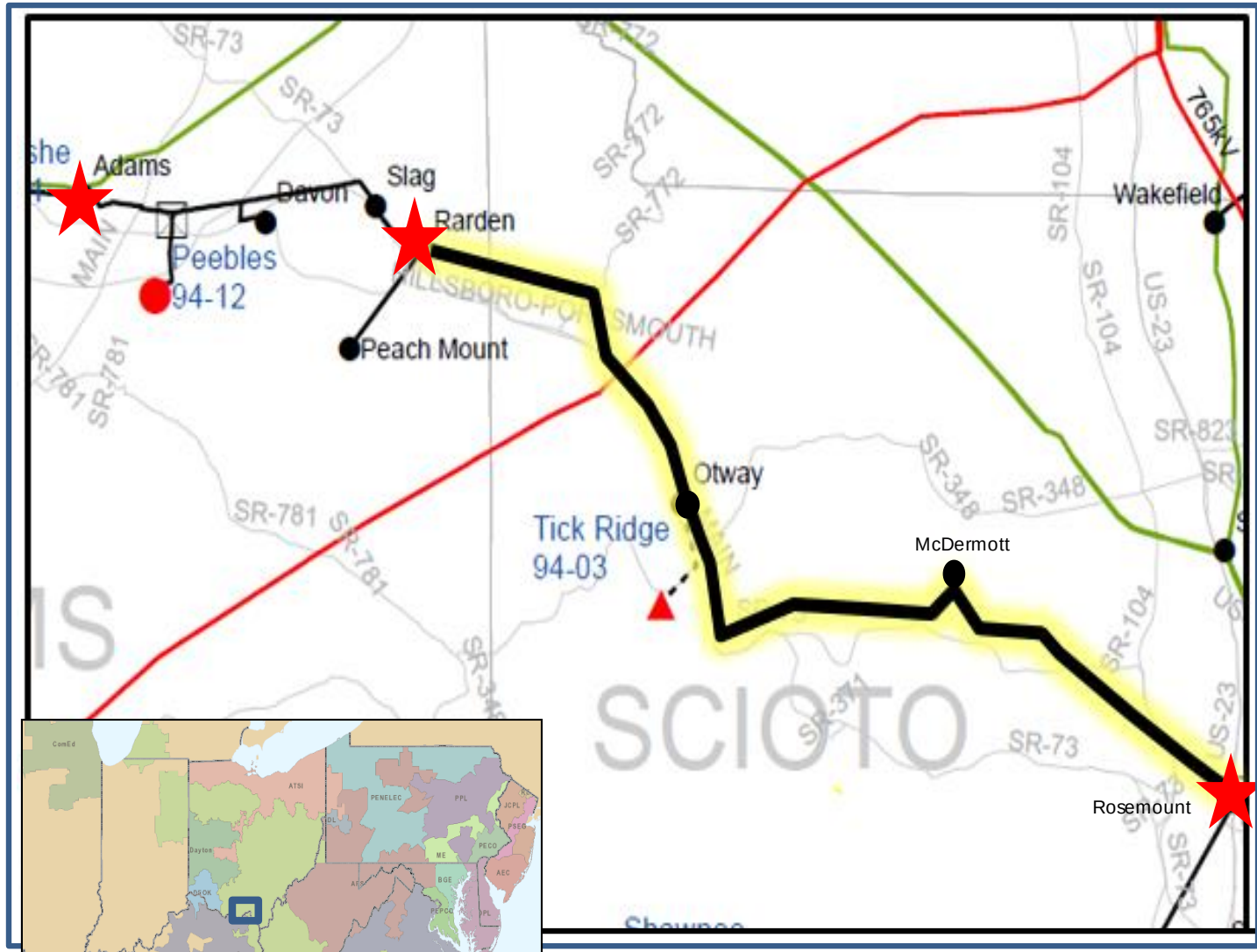
Operational Flexibility and Efficiency, Customer Service.

Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System

Problem Statement:

- Rarden and Rosemount Stations are connected by a 34.5 kV line with four 34.5/12 kV substations and several distribution customers served directly from the line. The total load served along this 24 mile line is 26/30 MVA (summer/winter).
- There is a normal-open point near Otway.
- The area suffers from reliability issues due to the rugged terrain and remote access. Customers have experienced over four million customer minutes of interruption over the past three years.
- The area's peak load can exceed the source transformers (Rarden and Rosemount). The 336 AAC conductor has already been overloaded (115% on 2014). Because the line is categorized as distribution these are not considered TO criteria violations.
- The two 69-34.5 kV transformers at Rarden are protected with high-speed ground switches which can cause through-faults on the transmission system.



AEP Transmission Zone: Supplemental
Portsmouth, Ohio

Need Number: AEP-2018-OH015

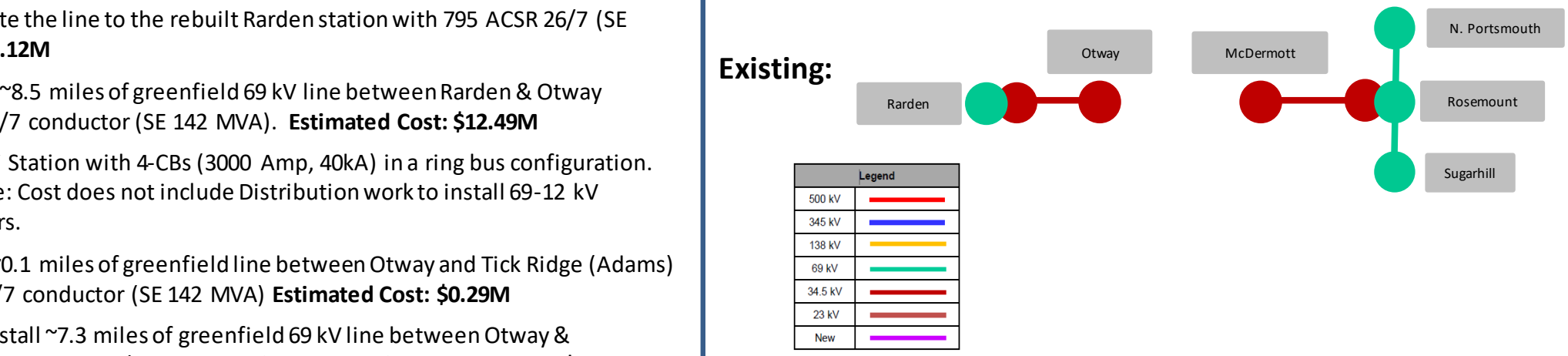
Process Stage: Solutions Meeting 11/20/2020

Proposed Solution:

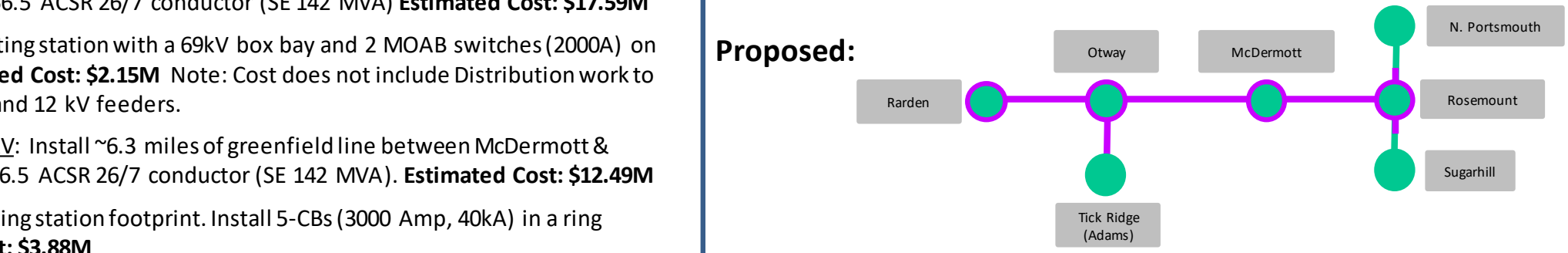
- Rarden: The existing station will be rebuilt to 69 kV with a new 69kV breaker (3000A, 40kA) facing Adams and a MOAB switch (2000A) facing Otway. **Estimated Cost: $2.24M**
- Adams – Rarden 69kV: Reroute the line to the rebuilt Rarden station with 795 ACSR 26/7 (SE 179MVA). **Estimated Cost: $0.12M**
- Rarden – Otway 69kV: Install ~8.5 miles of greenfield 69 kV line between Rarden & Otway stations; using 556.5 ACSR 26/7 conductor (SE 142 MVA). **Estimated Cost: $12.49M**
- Otway: Construct a new 69kV Station with 4-CBs (3000 Amp, 40kA) in a ring bus configuration. **Estimated Cost: $5.23M** Note: Cost does not include Distribution work to install 69-12 kV transformer and 12 kV feeders.
- Tick Ridge Extension: Install ~0.1 miles of greenfield line between Otway and Tick Ridge (Adams) stations using 556.5 ACSR 26/7 conductor (SE 142 MVA) **Estimated Cost: $0.29M**
- Otway – McDermott 69kV: Install ~7.3 miles of greenfield 69 kV line between Otway & McDermott stations; using 556.5 ACSR 26/7 conductor (SE 142 MVA) **Estimated Cost: $17.59M**
- McDermott: Rebuild the existing station with a 69kV box bay and 2 MOAB switches (2000A) on the line connections. **Estimated Cost: $2.15M** Note: Cost does not include Distribution work to install 69-12 kV transformer and 12 kV feeders.
- McDermott – Rosemount 69kV: Install ~6.3 miles of greenfield line between McDermott & Rosemount stations; using 556.5 ACSR 26/7 conductor (SE 142 MVA). **Estimated Cost: $12.49M**
- Rosemount: Expand the existing station footprint. Install 5-CBs (3000 Amp, 40kA) in a ring configuration. **Estimated Cost: $3.88M**
- Rosemount Extension: Reroute the line into the Rosemount 69kV ring bus with 795 ACSR 26/7 (SE 179MVA). **Estimated Cost: $0.95M**

Total Estimated Transmission Cost: $57.43M

Existing:



Proposed:



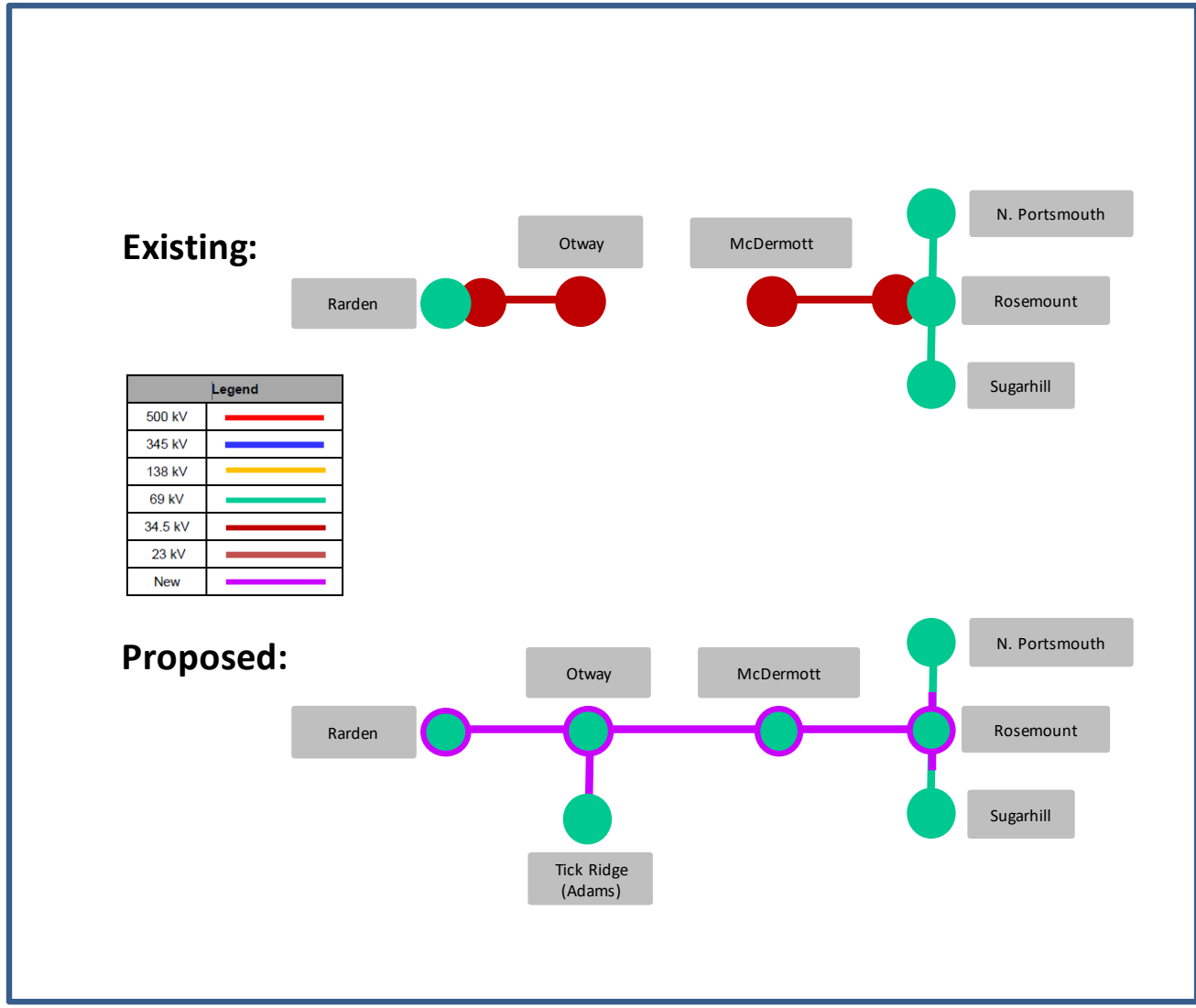
AEP Transmission Zone: Supplemental
Portsmouth, Ohio

Alternatives Considered:

1. Rebuild and convert the Rarden-Rosemount distribution line from 34kV to 69kV. Three problems were discovered with this solution. First was the 34kV network was extensive with 700-1,000 customers served directly at 34kV. The second issue is that the existing line route is not as direct as the chosen option; therefore, conversion would require an additional 7-10 miles of additional line to be built than the greenfield option. Third was that obtaining adequate right of way would be a challenge due to the numerous encroachments. Total cost of alternate: $82M

Projected In-Service: 10/15/2023

Project Status: Engineering



AEP Transmission Zone M-3 Process
Holmes County, Ohio

Need Number: AEP-2019-OH035

Process Stage: Solutions Meeting 11/20/2020

Previously Presented: Needs Meeting 6/17/2019

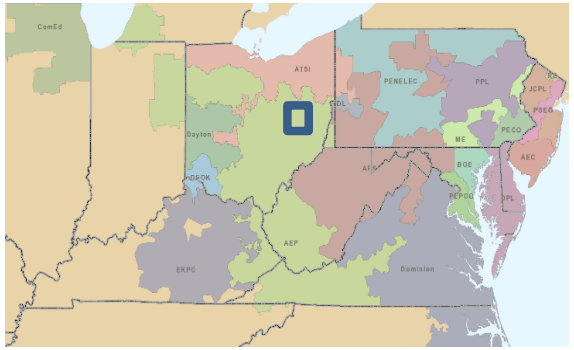
Supplemental Project Driver: Equipment Condition, Operational Flexibility, and Customer Service

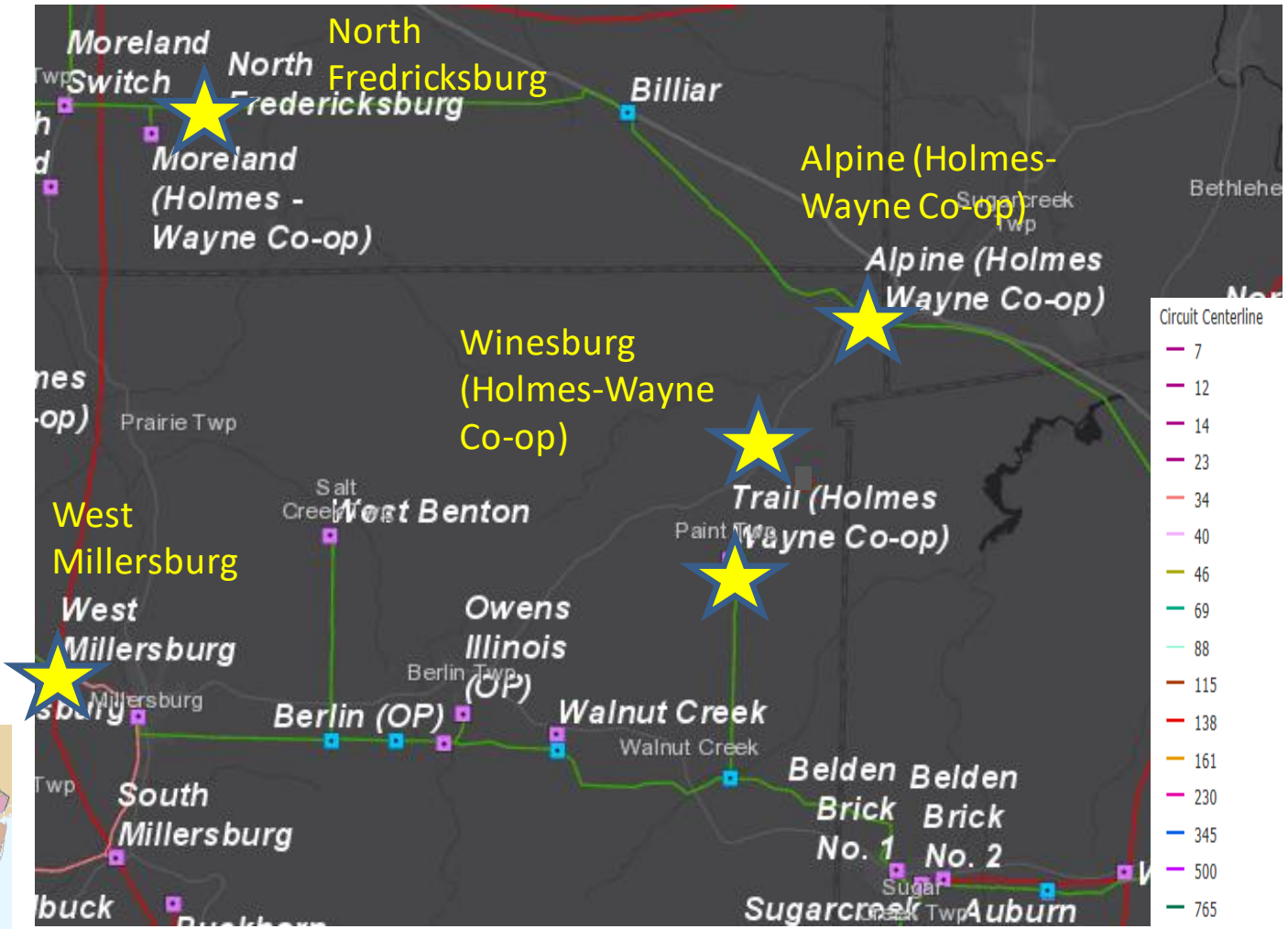
Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 8)

Problem Statement:

- Holmes-Wayne Electric Cooperative is requesting a new delivery point between Trail and Alpine stations at Winesburg.
- The anticipated new load is 13 MW. The load will be phased in starting in December 2021.

Model: PJM 2019 RTEP Series Cases





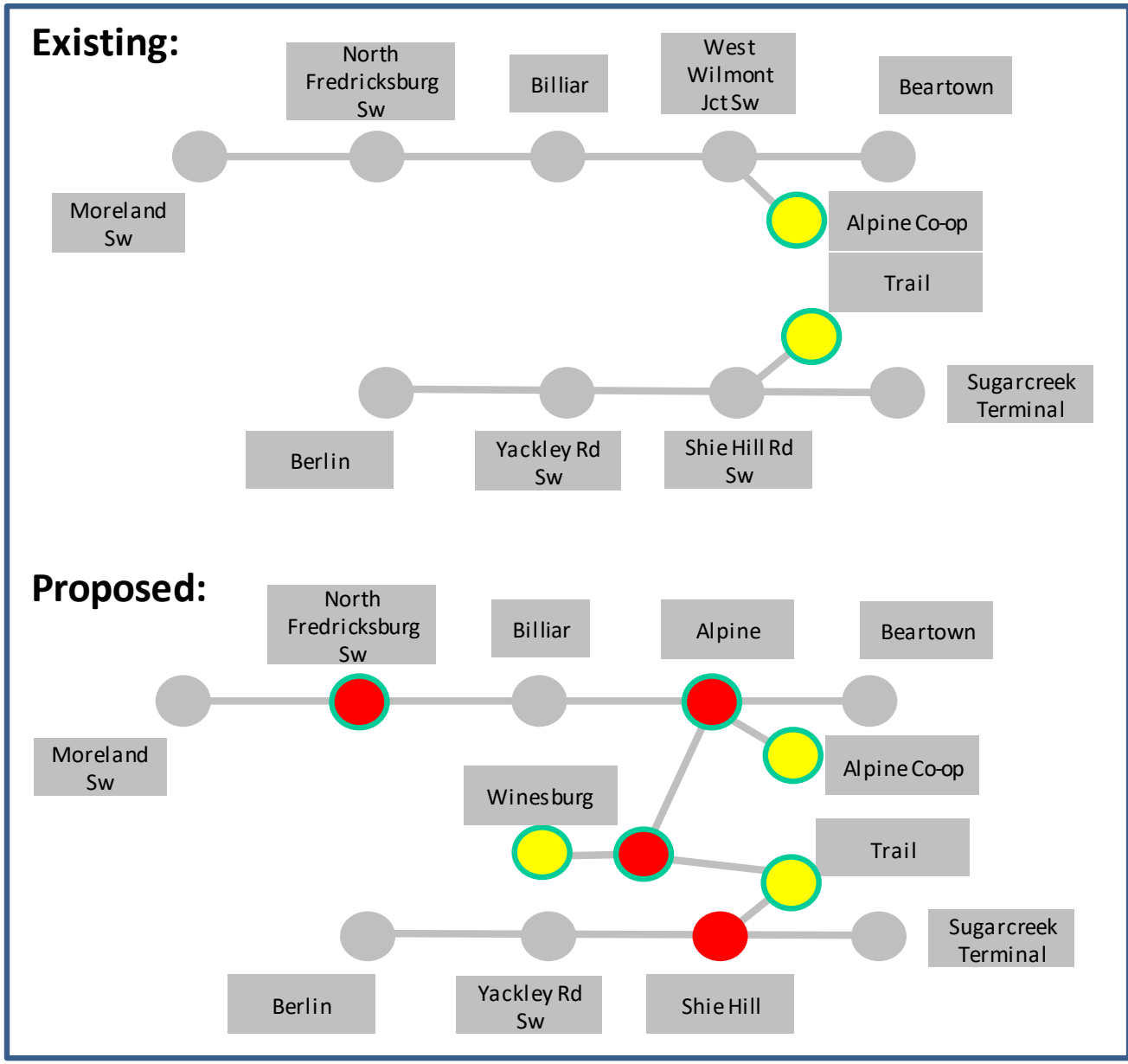
AEP Transmission Zone M-3 Process
Holmes County, Ohio

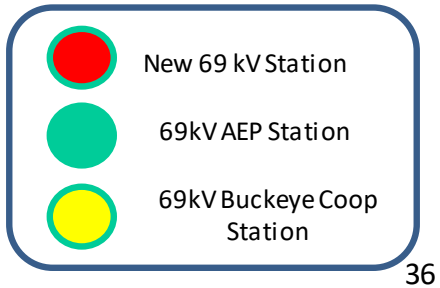
Need Number: AEP-2019-OH035

Process Stage: Solutions Meeting 11/20/2020

Proposed Solution:

- Construct ~ 5.1 miles of new 69 kV line between the existing Trail and Alpine delivery points using 556 ACSR conductor. **$18.5 M**
- Establish a new delivery point at Winesburg Switch by installing a new 1200A 69 kV Phase over Phase Switch with MOAB's and metering. **$0.7 M**
- Build a new 3-way POP Switch to serve the Holmes- Wayne owned Trail station. **$0.6 M**
- Retire West Wilmont Jct Sw. **$0.04 M**
- West Wilmont- Holmes Wayne Co-op line work for Alpine station. **$0.1 M**
- Biliar – West Wilmont 69kV line work for Alpine station. **$1.2 M**
- Beartown – West Wilmont 69kV line work for Alpine station. **$0.5 M**
- Build a new station (called Alpine), replacing West Wilmont Junction Switch. This station will be a 4 breaker 69kV ring bus utilizing 3000A 40kA breakers. **$6.8 M**
- Remote end relay work at Beartown station. **$0.03 M**
- Remote end relay work at Moreland Sw. **$0.03 M**





AEP Transmission Zone M-3 Process
Holmes County, Ohio

Need Number: AEP-2019-OH035

Process Stage: Solutions Meeting 11/20/2020

Proposed Solution:

- Retire Shie Hill Sw. **$0.04 M**
- Build a new station replacing Shie Hill Sw named Shie Hill. This station will be a 3 breaker 69kV ring bus utilizing 3000A 40kA breakers. **$6.4 M**
- Sugar Creek – Millersburg 34.5kV line work for Shie Hill station. **$1.6 M**
- Shie Hill- Holmes Wayne Co-op line work for Shie Hill station. **$0.1 M**
- Remote end relay work at Sugarcreek Terminal station. **$0.4 M**
- Remote end relay work at Berlin station. **$0.3 M**
- Install a new 138 kV 3000A 40kA breaker at West Millersburg Station on the line towards Wooster to reduce contingency impacts and potential low voltage concerns resulting from the new load. **$0.8 M**
- Replace the 2-way POP Switch at North Fredericksburg with a new 1200A 69 kV POP with new MOAB's. The switch currently in place is not capable of supporting the necessary new equipment. **$1 M**
- Moreland Sw- Biliar line work for North Fredricksburg Switch. **$0.9 M**

Total Estimated Transmission Cost: $40.04 M

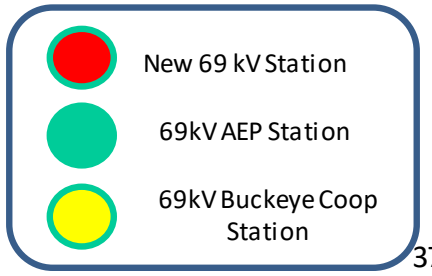
Ancillary Benefits: Gives the existing Trail radial looped transmission service to reduce the number of sustained outages. The new load addition at Winesburg plus the existing load at Trail meets the 75-MW/mile threshold to loop the load.

Alternatives Considered:

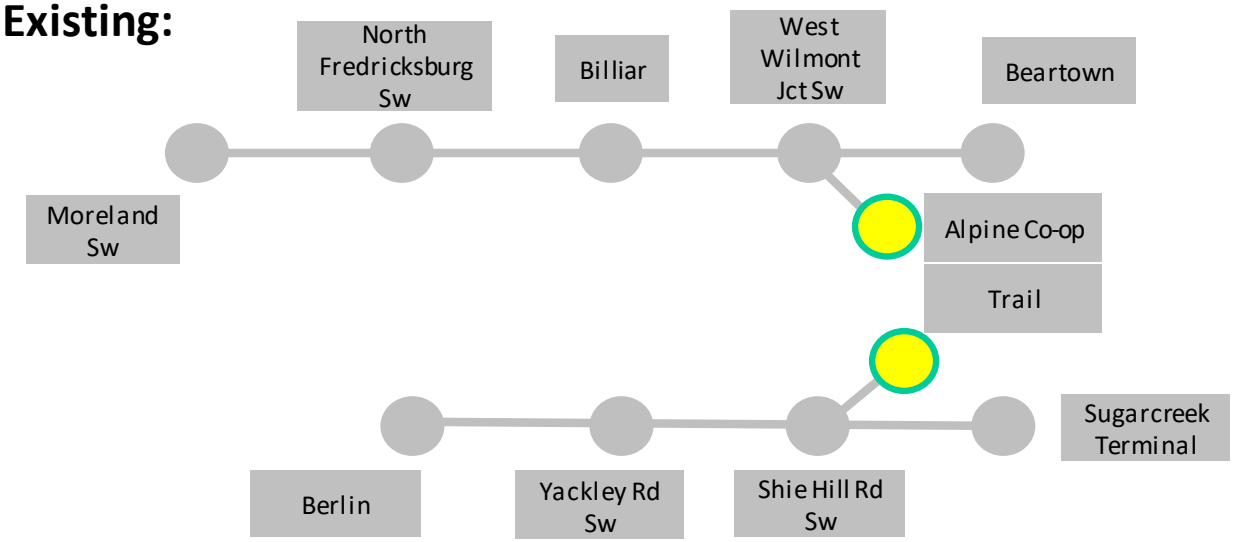
N/A

Projected In-Service: 2/10/2023

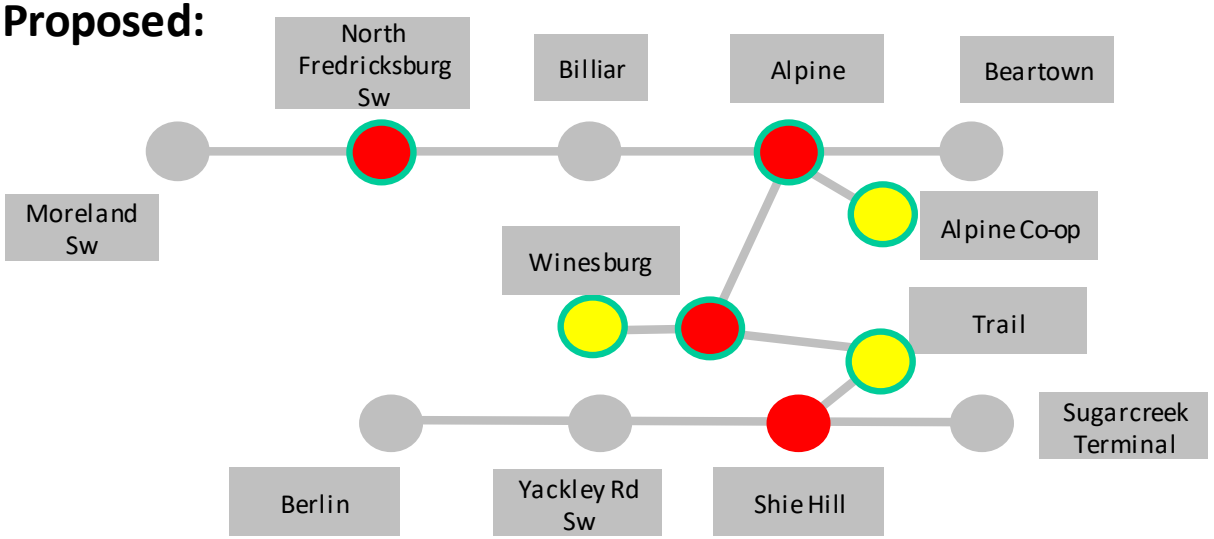
Project Status: Engineering



Existing:



Proposed:



Need Number: AEP-2020-OH035

Process Stage: Solutions Meeting 11/20/2020

Previously Presented: Needs Meeting 07/17/2020

Project Driver:

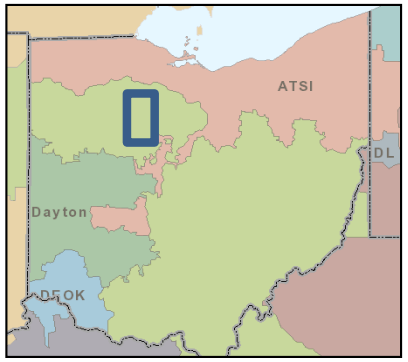
Customer Service

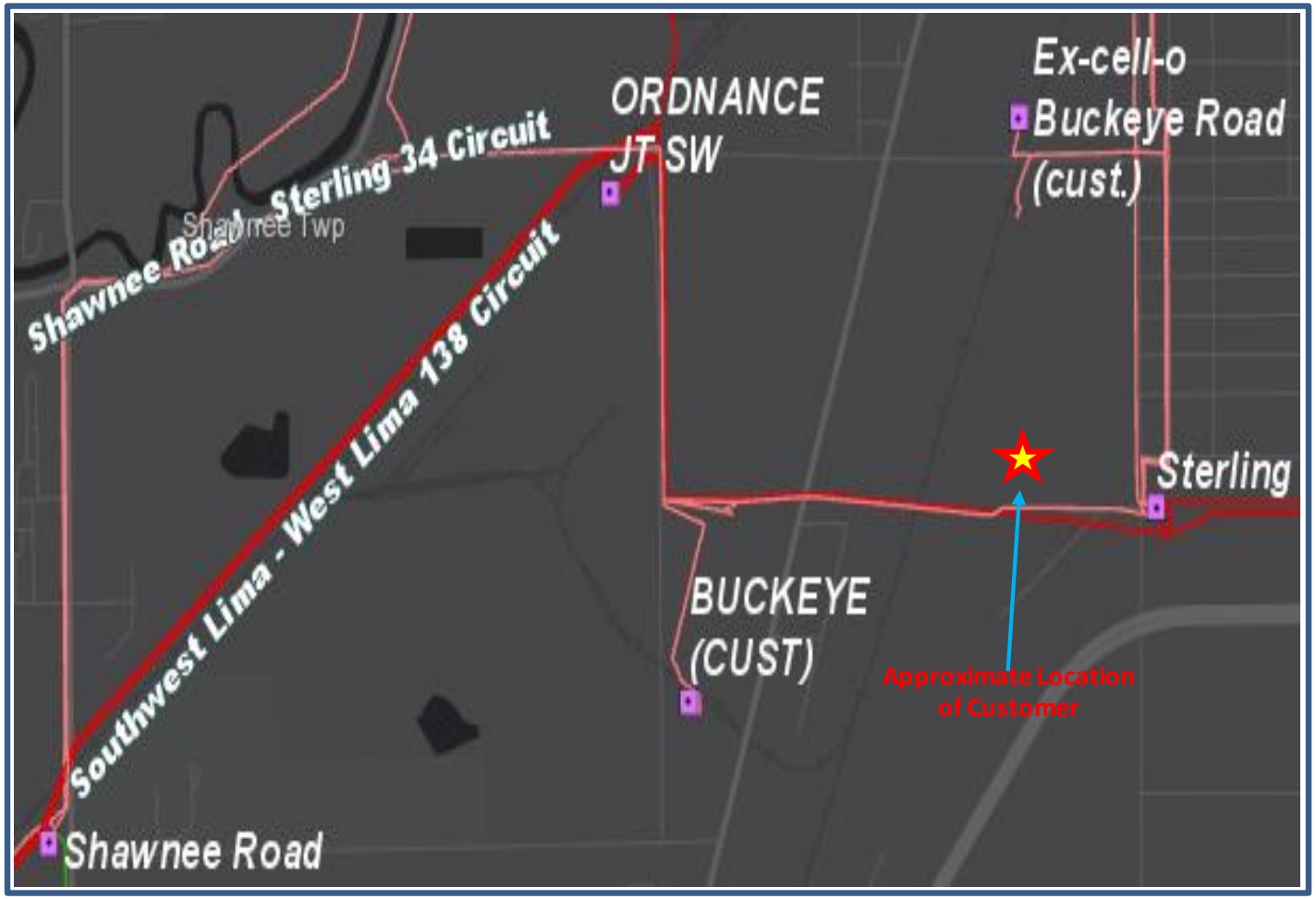
Specific Assumption Reference:

AEP Connection Requirements for the AEP Transmission System

Problem Statement:

A request has been made by a customer to provide service for a 1.7 MW load to be connected to the Shawnee Road – Sterling 34.5kV circuit.





Need Number: AEP-2020-OH035

Process Stage: Solutions Meeting 11/20/2020

Proposed Solution:

- Cut-in the Sterling Extension line asset at Str. 8 to install the new Lima Petrol Switch. **Estimated Cost: $0.5M**
- Build 0.07 mile line extension from Lima Petrol Switch to customer station. **Estimated Cost: $0.2M**
- Install a new manually operated 1200A 3-way Phase over Phase switch named Lima Petrol Switch. **Estimated Cost: $0.2M**

Total Estimated Transmission Cost: $0.9M

Alternatives Considered:

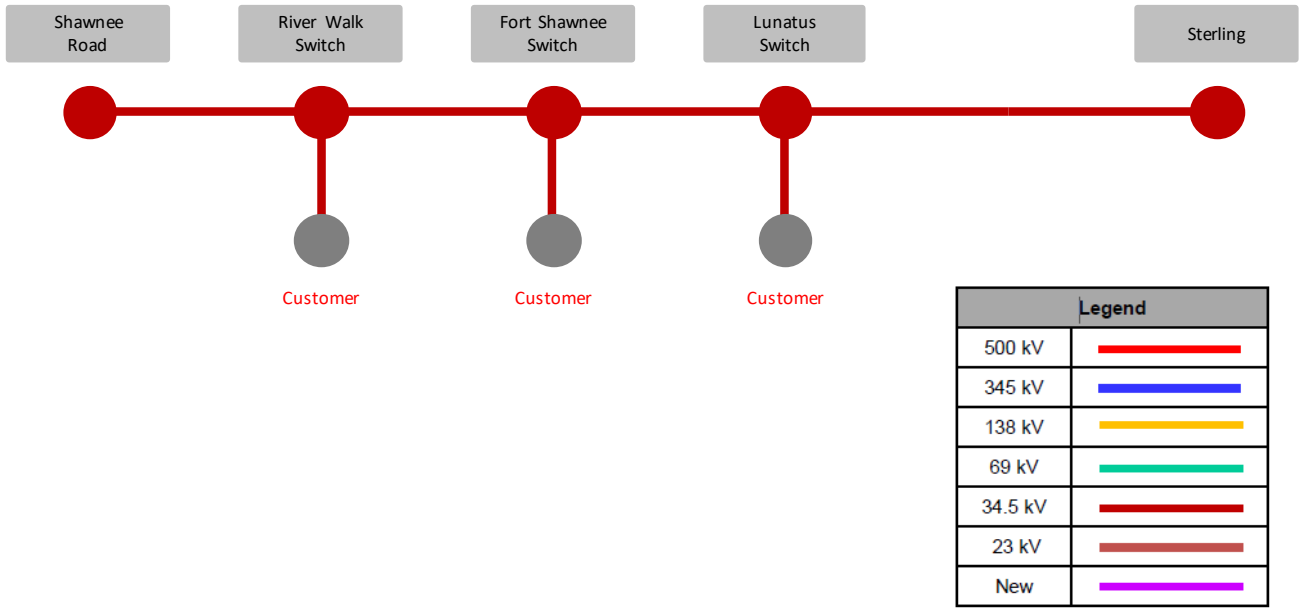
No viable cost-effective Transmission alternative could be identified.

Projected In-Service: 9/15/2021

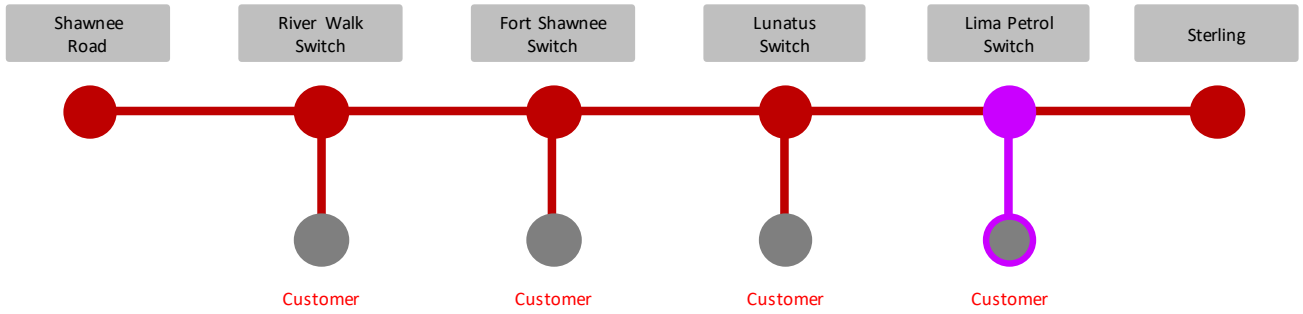
Project Status: Engineering

Model: 2025 RTEP

Existing Configuration:



Future Configuration:



AEP Transmission Zone M-3 Process
Leslie County, Kentucky

Need Number: AEP-2020-AP026

Process Stage: Solutions Meeting 11/20/2020

Previously Presented: Need Meeting 03/19/2020

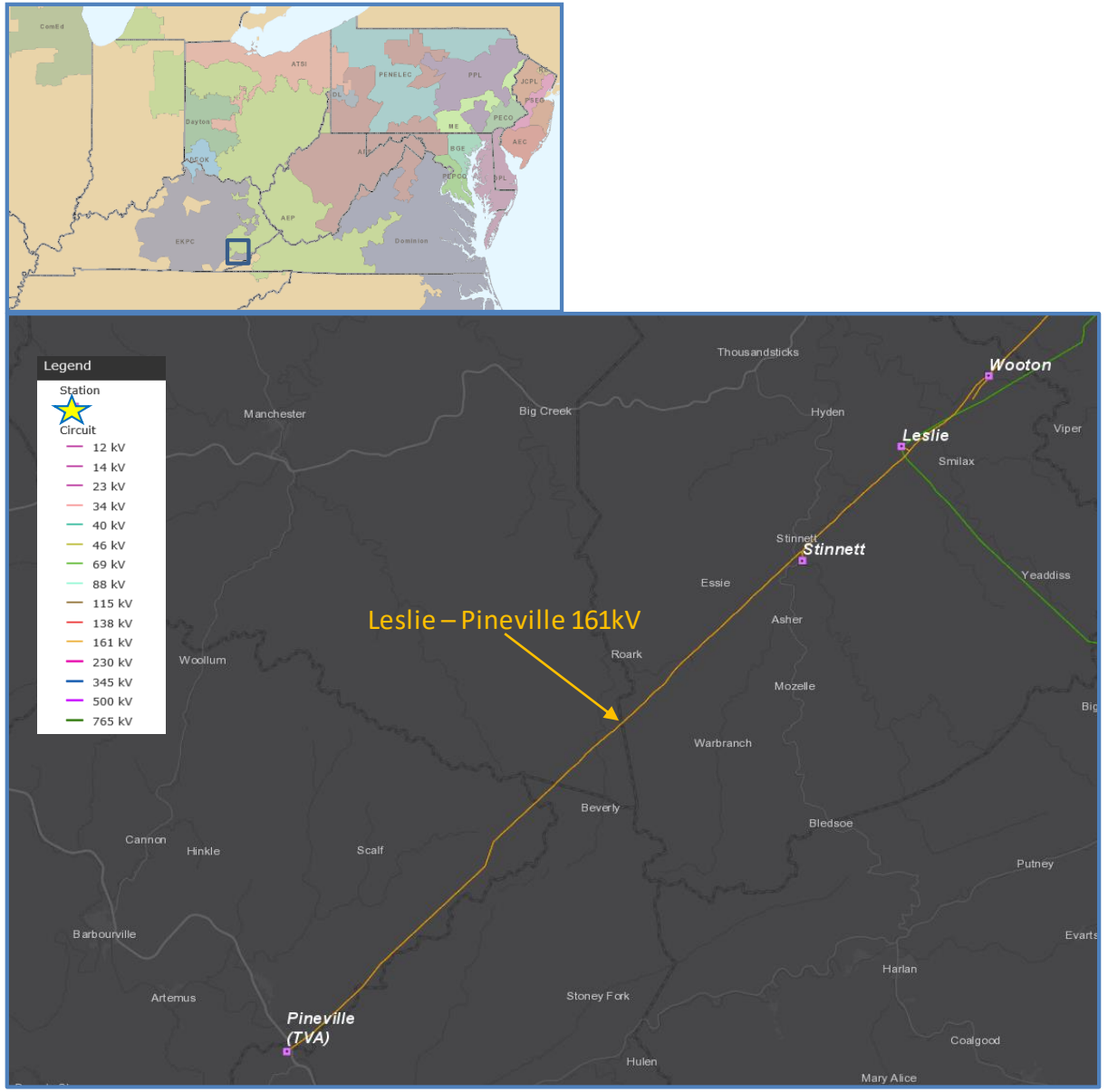
Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:
Line Name: Wooton – Pineville 161kV
Line Section: Leslie – Pineville 161kV
Original Install Date (Age): 1942
Length of Line: ~34.24 mi
Total structure count: 189
Original Line Construction Type: Wood
Conductor Type: 500 KCM COPPER
Momentary/Permanent Outages and Duration: 12 Momentary and 5 permanent Outage
CMI (last 5 years only): 26,096 minutes
Line conditions:

Leslie – Pineville line section:

- 130 structures with at least one open condition, 69% of the structures on this circuit.
- 221 structure related open conditions : affecting the crossarm, knee/ vee brace, or pole including rot, split, woodpecker, damaged, loose, and bowed conditions
- 2 open conditions related to the shielding wire, including broken strands
- 3 hardware related open conditions related to insulator, conductor hardware, or shield wire hardware, including broken, missing bolt, and worn



AEP Transmission Zone M-3 Process
Leslie County, Kentucky

Line Section: Wooton – Leslie 161kV

Original Install Date (Age): 1942

Length of Line: ~4.68 mi

Total structure count: 23

Original Line Construction Type: Wood

Conductor Type: 500 KCM COPPER

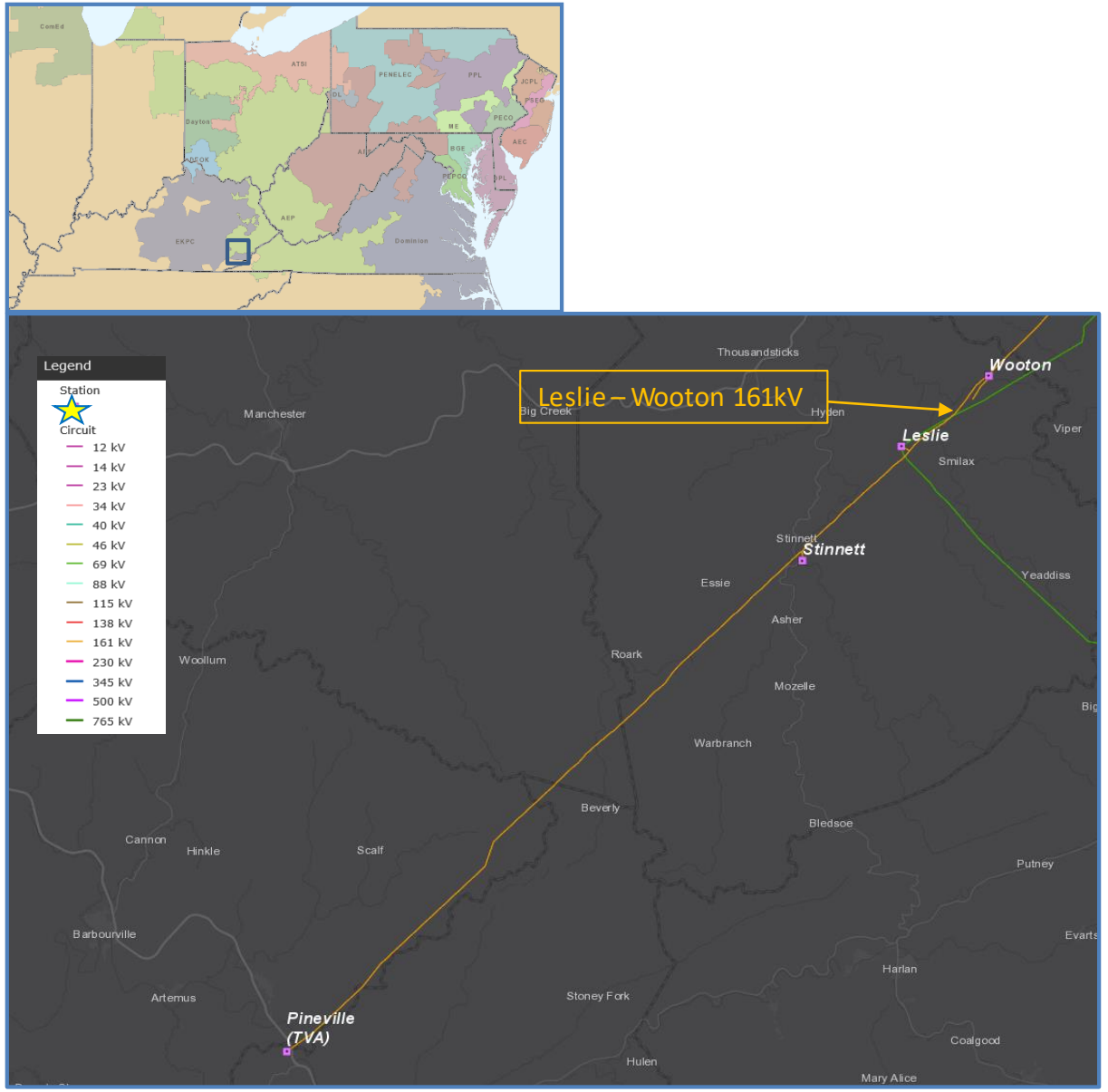
Momentary/Permanent Outages and Duration: none in last five years

CMI (last 5 years only): none in last five years

Line conditions:

Leslie – Wooton line section:

- 17 structures with at least one open condition, 74% of the structures on this section.
- 32 structure related open conditions including: crossarm or pole including rot, insect damage and woodpecker damage



AEP Transmission Zone M-3 Process
Leslie, Clay, Bell and Knox Counties, Kentucky

Need Number(s): AEP-2020-AP026
Process Stage: Solutions Meeting 11/20/2020
Proposed Solution:

At Wooton station, upgrade relaying to accommodate new OPGW fiber protection.
Estimated Cost: $1.1 M

At Leslie station, reconductor the 161kV Bus, Relaying upgrades towards Wooton and Pineville, Replace 161kV MOAB W, Replace 161kV XF#1 high side switch. Install DICM.
Estimated Cost: $1.2 M

Remote end work at Hazard substation **Estimated Cost: $0.03 M**

Rebuild approximately ~40 miles of Wooton – Pineville 161kV line to address the identified asset condition needs. This work also includes line removal work as well as access road construction. Majority of proposed line rebuild is to be constructed on existing center line. **Estimated Cost: $115.0M**

Expand existing ROW for the Wooton – Pineville 161kV line. **Estimated Cost: $8.5 M**

Relocate ~0.32 mi 69kV Leslie – Clover Fork which includes of one structure and reconfiguration of the existing line to cross underneath the proposed Wooton-Stinnett 161kV Line. **Estimated Cost: $0.7 M**

AEP Transmission Zone M-3 Process
Leslie, Clay, Bell and Knox Counties, Kentucky

Proposed Solution (Cont.):

At Stinnett station, upgrade relaying to accommodate new OPGW fiber protection. Provide transition, entry and termination for OPGW connectivity to the Hazard-Pineville fiber route.
Estimated Cost: $0.7M

Provide transition, entry and termination for OPGW connectivity at Leslie substation.
Estimated Cost: $0.1 M

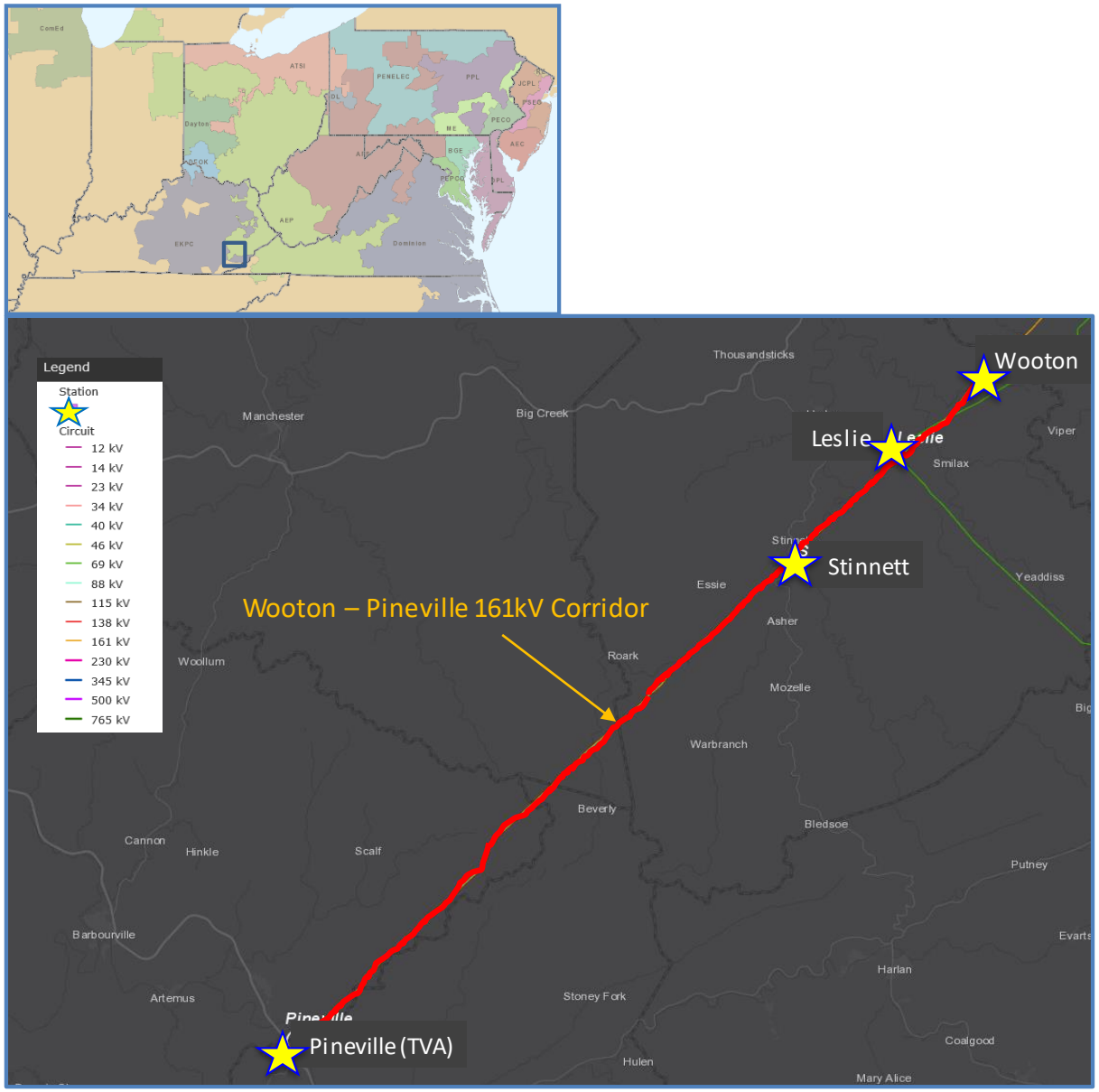
Total Estimated Transmission Cost: $127.33 M

Alternative considered:

Given the remote nature of the line and the customers served from the line, no cost effective alternative exists. This line also serves as a tie into TVA.

Projected In-Service: 11/31/2027

Project Status: Scoping



AEP Transmission Zone: Supplemental Rocky Mount, VA Area

Need Number: AEP-2020-AP038

Process Stage: Solutions Meeting 11/20/2020

Previously Presented: Needs Meeting 07/17/2020

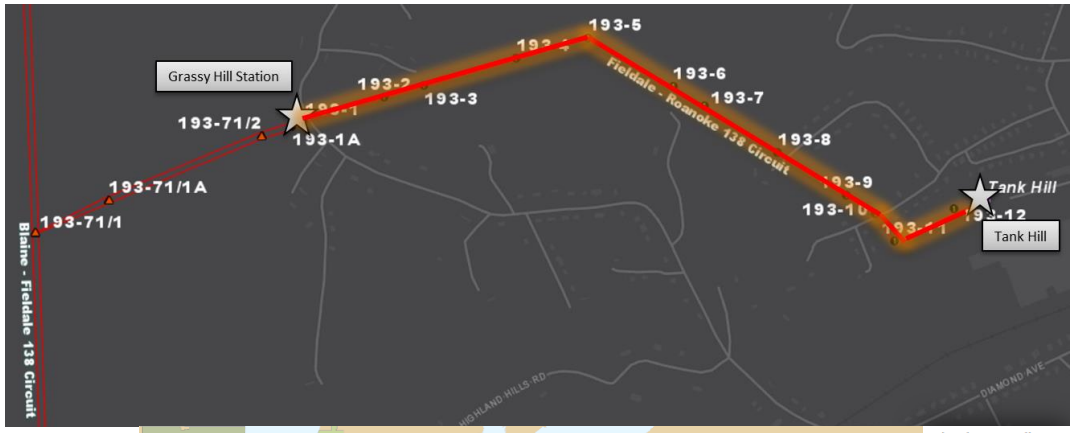
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk

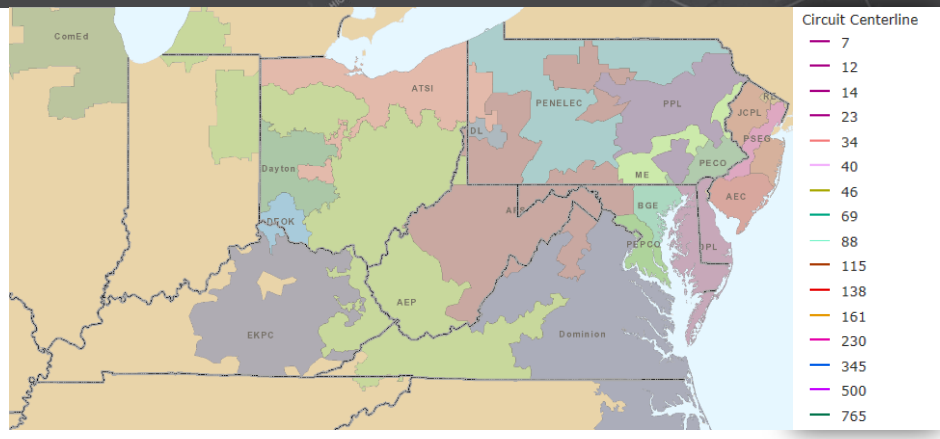
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

- **Grassy Hill Loop and Tank Hill Tap 138 kV Line Asset (1.3 mi.)**
  - The single circuit wood pole structures that make up 0.95 miles of the 1.3 mile long Grassy Hill Loop and Tank Hill Tap 138 kV Line Asset are the focus of the concern.
  - Recent field assessments have identified severe Woodpecker holes and cracking damage, accounting for 67% of the 12 single pole structures on the radial line.
    - Weather cracks range in size from 2 to 7 feet in length, with many poles having multiple.
    - Woodpecker holes range in size from 1 to 5 inches in diameter and the poles have 10 to 30 of them.
    - A pole appears to be hollow on the inside.
    - A pole has mold on the upper portion, that is 10 feet in length.
  - The radial line feeds sensitive industrial customers in the Rocky Mount, VA area. These customers operate 24 hours a day and do not take outages. The Tank Hill station that is fed from the Fieldale – Roanoke line is the only station that can handle the industrial load.
  - From 2015, there have been 6 momentary and 2 permanent outages on the associated Fieldale - Roanoke circuit.

Model: N/A





AEP Transmission Zone: Supplemental
Rocky Mount, VA Area

Need Number(s): AEP-2020-AP038

Process Stage: Solutions Meeting 11/20/2020

Proposed Solution:

- Replacement of all the structures that make up the Grassy Hill Loop & Tank Hill Tap 138 kV line asset from the Grassy Hill switch to the Tank Hill Tap, consisting of approximately 0.95 miles of single circuit 138 kV wood poles.

Estimated Cost: $1.97M

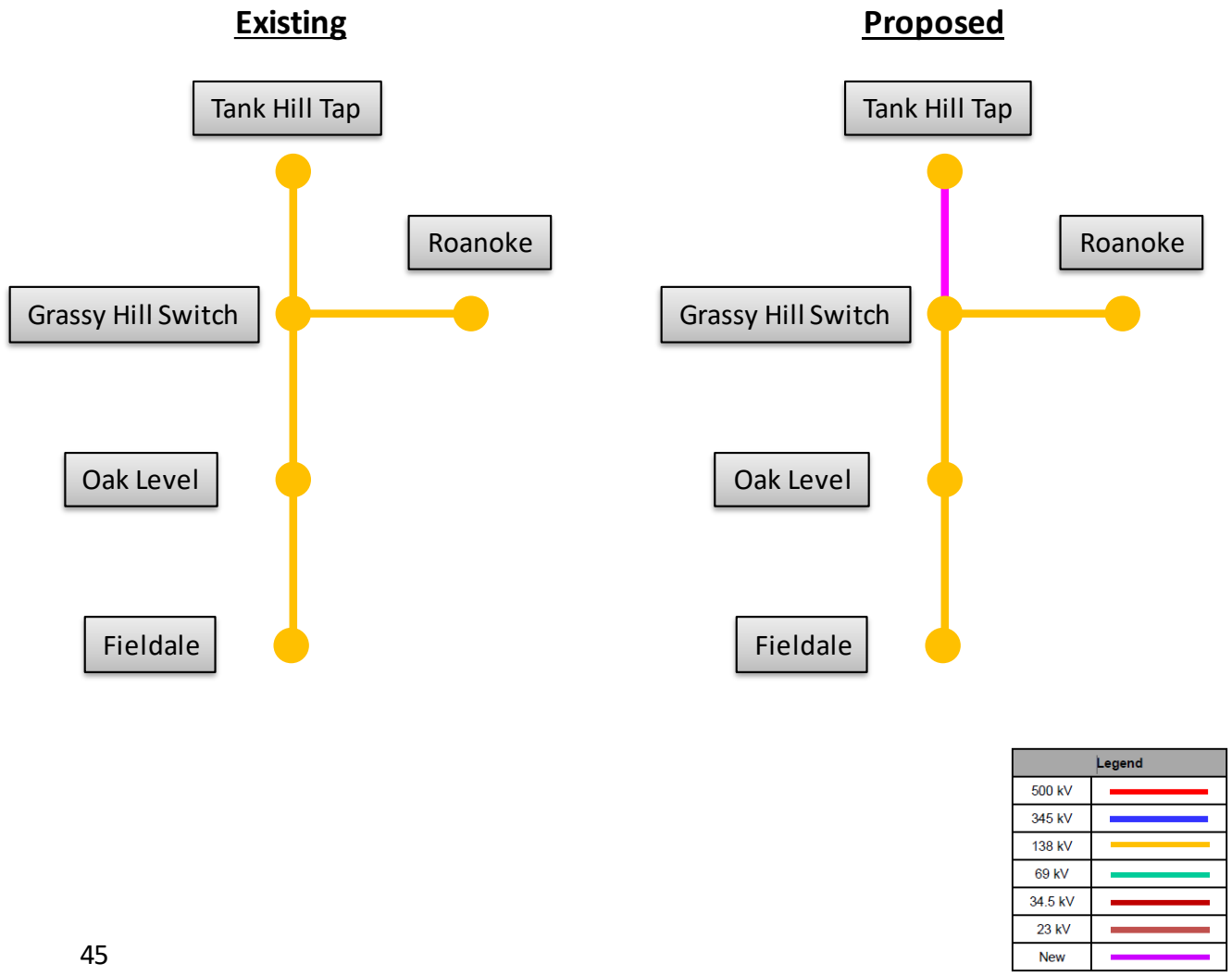
Total Estimated Transmission Cost: $1.97M

Alternatives Considered:

Replacement of the single circuit Grassy Hill Loop & Tank Hill Tap 138 kV line asset with double circuit 138 kV to eliminate the radial was evaluated. This was not a feasible option due to space constraints at the Tank Hill Tap station. The conductor on the line serving Tank Hill was installed in the 1980s and was determined to be in good condition. The existing conductor will be transferred to the new poles as part of the structure replacements in the proposed solution.

Projected In-Service: 10/31/2021

Project Status: Scoping



AEP Transmission Zone M-3 Process
Kincaid Area Project

Need Number: AEP-2019-AP042

Process Stage: Solutions Meeting 11/20/2020

Previously Presented: Needs Meeting 11/22/2019

Supplemental Project Driver: Equipment Condition/Performance/Risk

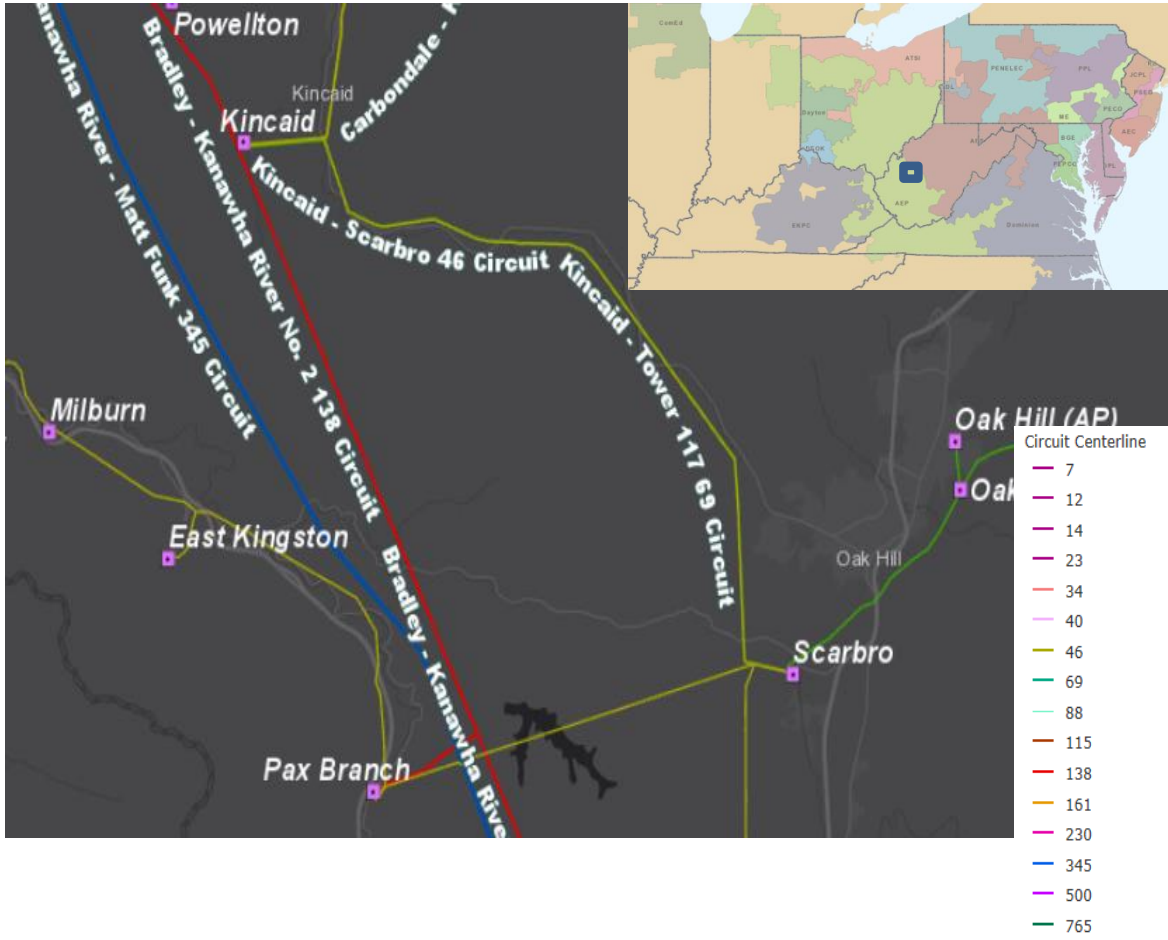
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

Kincaid – Tower 117 69 kV (22.42 mile), includes Kincaid – Scarbro 46 kV line (10.1 miles)

- The double circuit segment from Kincaid to Scarbro is comprised of a combination of lattice steel and wood poles.
  - Lattice structures utilize direct embed grillage foundation
  - Line originally installed in 1913, primarily with 3/0 Copper conductor
  - The structures failed to meet 2017 NESC 250B and 250D loading criteria
  - The lattice towers show flaking of the galvanized coating with significant section loss and corrosion above and below grade on the tower legs.
  - 4-bell insulators have noticeable wear and tear including rusting
  - The original conductor has visible signs of wear, such as burns and rust.
- Since 2014 there have been 86 momentary and 27 permanent outages on the Kincaid – Tower 117 69 kV and Kincaid – Scarbro 46 kV circuits.
  - Majority of the momentary outages were due to weather including wind/lightning
    - This is indicative of insufficient shielding, and/or insufficient grounding
  - Permanent outages were caused by a vegetation fall-ins due to insufficient ROW and line equipment failures
    - These permanent outages attributed to 1.1M customer minutes of interruption
- There are currently 33 structures with at least one open structural condition, which relates to 29% of the structures on the double circuit segment (10.1 miles).
- There are currently 68 open structural conditions mainly related to heavy rust on lattice steel lacing and rot on poles/crossarms.

Model: N/A



AEP Transmission Zone M-3 Process
Kincaid Area Project

Need Number: AEP-2020-AP002

Process Stage: Solutions Meeting 11/20/2020

Previously Presented: Needs Meeting 1/17/2020

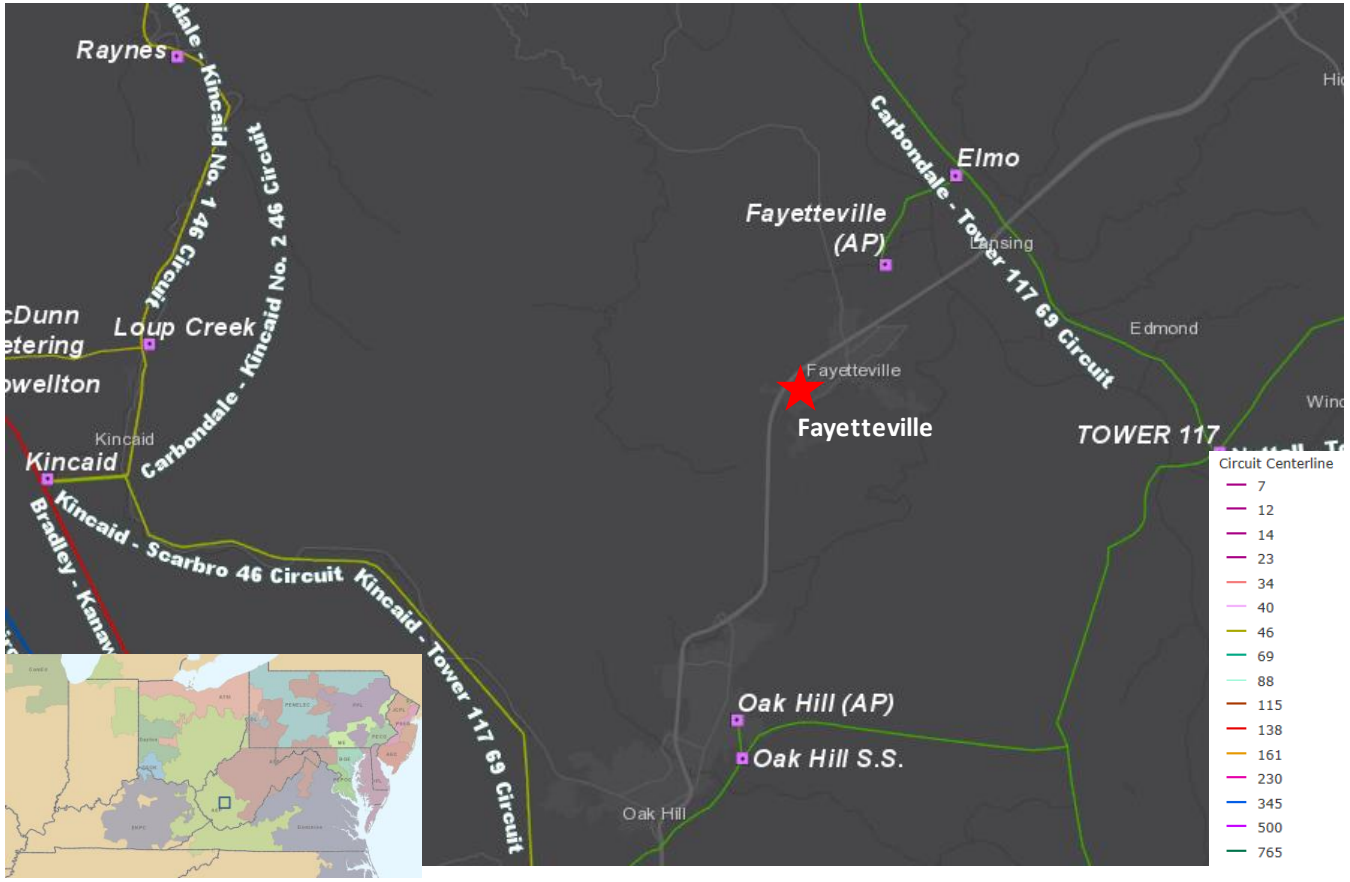
Supplemental Project Driver: Customer Service

Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)

Problem Statement:

APCO Distribution has requested a new distribution station located in Fayetteville, West Virginia. Summer projected load 11 MVA Winter projected load 13 MVA.

Model: 2024 RTEP



Need Number: AEP-2020-AP039

Process Stage: Solutions Meeting 11/20/2020

Previously Presented: Needs Meeting 9/11/2020

Supplemental Project Driver: Customer Service

Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)

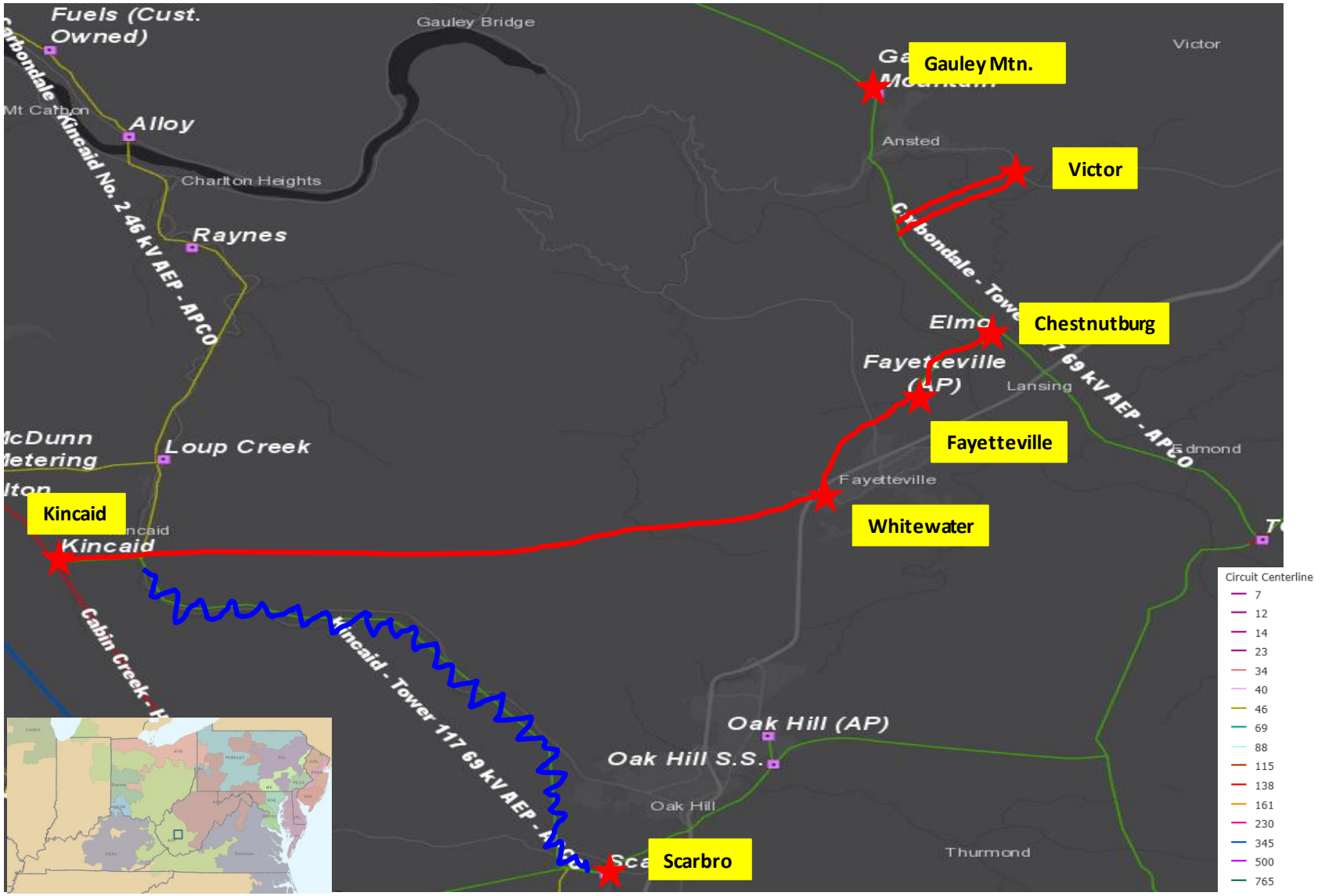
Problem Statement:

APCO Distribution has requested a new distribution station located in Fayette County, West Virginia.

Summer projected load: 9 MVA

Winter projected load: 14 MVA.

AEP Transmission Zone: Supplemental
Fayetteville, WV



AEP Transmission Zone M-3 Process
Kincaid Area Project

Need Number: AEP-2019-AP042, AEP-2020-AP002, AEP-2020-AP039

Process Stage: Solutions Meeting 11/20/2020

Proposed Solution:

Construct ~9.6 miles of new 69kV line from Kincaid station to the new Whitewater distribution station. **Estimated Cost: $27.0M**

Construct ~3.9 miles of new 69kV line from Whitewater station to Fayetteville 69 kV station. Rebuild the line section between Fayetteville and Elmo SS 69kV (~1.7 miles). **Estimated Cost: $16.5M**

Construct ~1.5 miles of new 69 kV double circuit line from the Carbondale – Tower 117 69 kV circuit to serve the new Victor Station in/out. **Estimated Cost: $5.8M**

Retire the Kincaid – Scarbro 46kV/Kincaid – Oak Hill 69kV double circuit line to a point just outside Scarbro station. Reconfigure and terminate the line towards Oak Hill into Scarbro station. **Estimated Cost: $8.8M**

Reconfigure a line section between Tower 117 – Carbondale to connect in the new Chestnutburg Station. **Estimated Cost: $0.6M**

Whitewater Station: Establish 69 kV bus and install two new 69kV 3000A 40 kA circuit breakers to serve requested Distribution delivery point. **Estimated Cost: $3.3M**

Victor Station: Retire/remove Gauley Mountain 69 kV Station. Establish a 69 kV bus and install two new 69 kV 3000 A 40 kA circuit breakers at the new site to be called Victor Station to serve requested Distribution delivery point. **Estimated Cost: $2.3M**

Fayetteville Station: Install a new 69kV 3-way PoP switch outside of the station. **Estimated Cost: $0.4M**

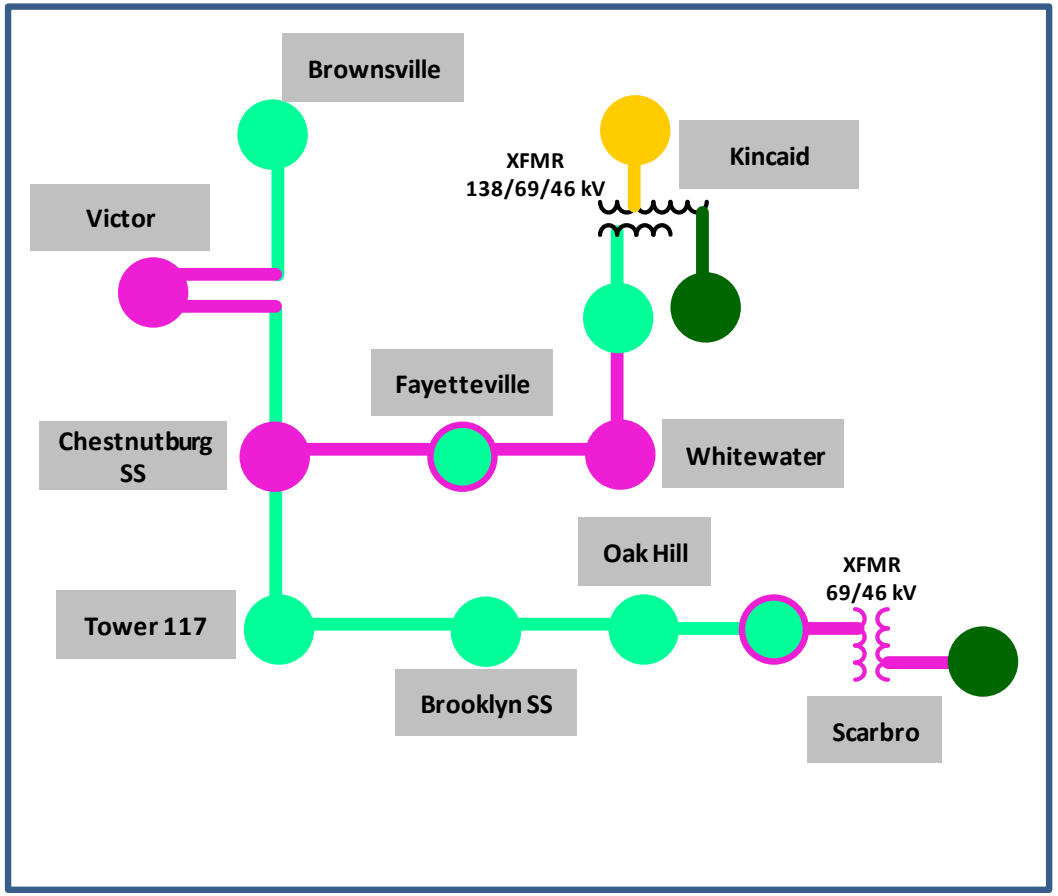
Chestnutburg SS: Construct a new three breaker ring utilizing three new 69kV 3000A 40kA circuit breakers to eliminate a three terminal line connection. **Estimated Cost: $3.2M**

Scarbro Station: Establish a 69kV bus and install a new 69/46kV 50 MVA transformer and a new 69kV 3000A 40kA circuit breaker to tie in Tower 117 69 kV line exit. **Estimated Cost: $3.5M**

Tower 117 Station: Remote end work **Estimated Cost: $0.3M**

Carbondale Station: Remote end work **Estimated Cost: $0.3M**

Total Estimated Transmission Cost: $72.0M



Legend	
345 kV	
138 kV	
69 kV	
46 kV	
New	

AEP Transmission Zone M-3 Process
Kincaid Area Project

Alternatives Considered:

Alternate #1

Rebuild the existing Kincaid – Scarbro (~10 miles) double circuit segment of the Kincaid – Tower 117 circuit. Construct a new 69 kV line from Oak Hill – Whitewater – Fayetteville (~9 miles) in order to serve the new delivery point. Rebuild the Fayetteville radial tap (~1.7 miles). Construct a new three circuit breaker ring station near Elmo S.S. This option to serve Whitewater Station is not feasible due to complications with building an additional line out of the existing Oak Hill Station as well as acquiring Right-of-Way between Oak Hill and the new Whitewater site. There are significant right-of-way concerns with building a new line out of Oak Hill to the North to Whitewater due to populated residential areas nearby. Construct ~1.5 miles of new 69 kV double circuit line along the Carbondale – Tower 117 circuit, to serve the new Victor Station in/out. Establish a 69 kV bus and install two new 69 kV breakers at Victor Station.

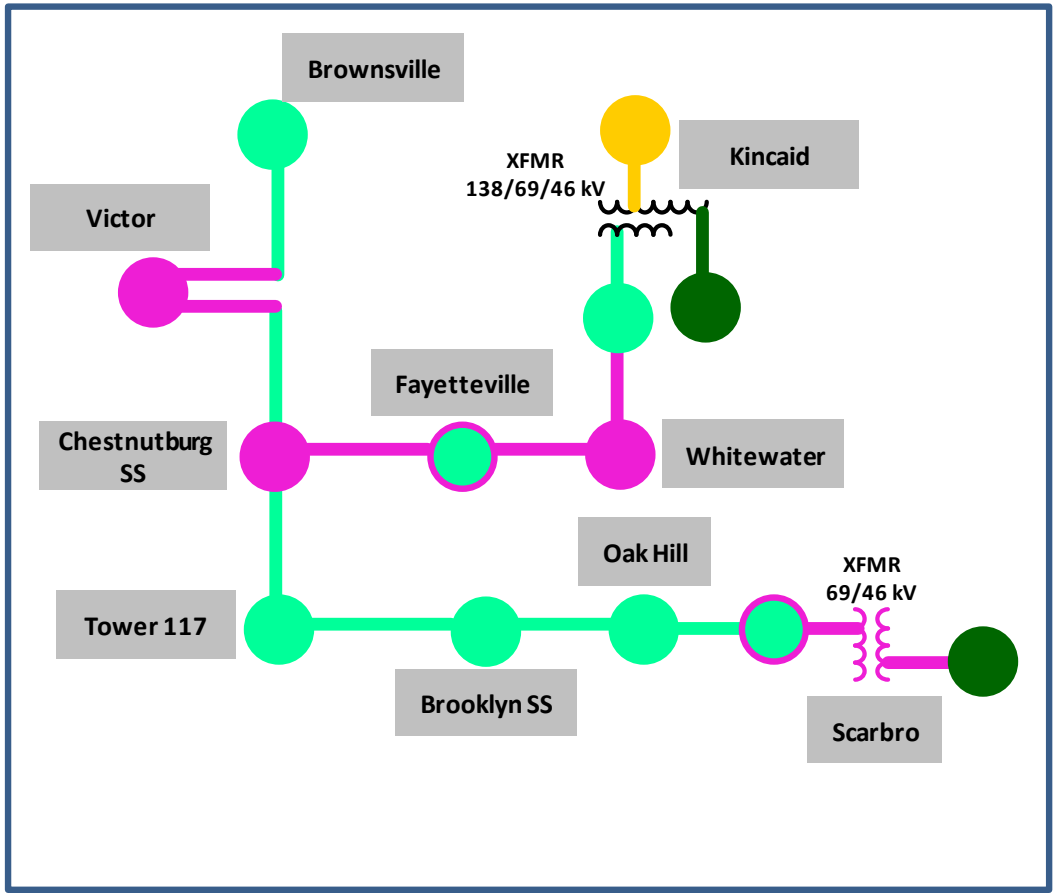
Conceptual Estimated Cost: $96.3M

Alternate #2

Rebuild the existing Kincaid – Scarbro double circuit segment of the Kincaid – Tower 117 circuit. Construct a new double circuit 69 kV line (~6 miles) cut in/out of the existing Kincaid – Tower 117, on the Oak Hill – Tower 117 line segment. Construct a new 3 mile 69 kV line (~3 miles) to Fayetteville. Rebuild the Fayetteville radial tap (~1.7 miles). Construct a new three circuit breaker ring station near Elmo S.S. This option to serve Whitewater Station is not feasible due to complications with building an additional line out of the existing Oak Hill Station. Construct ~1.5 miles of new 69 kV double circuit line along the Carbondale – Tower 117 circuit, to serve the new Victor Station in/out. Establish a 69 kV bus and install two new 69 kV breakers at Victor Station.

Conceptual Direct Estimated Cost: $97.4M

Projected In-Service: 9/1/2023
Project Status: Scoping



Legend	
345 kV	
138 kV	
69 kV	
46 kV	
New	

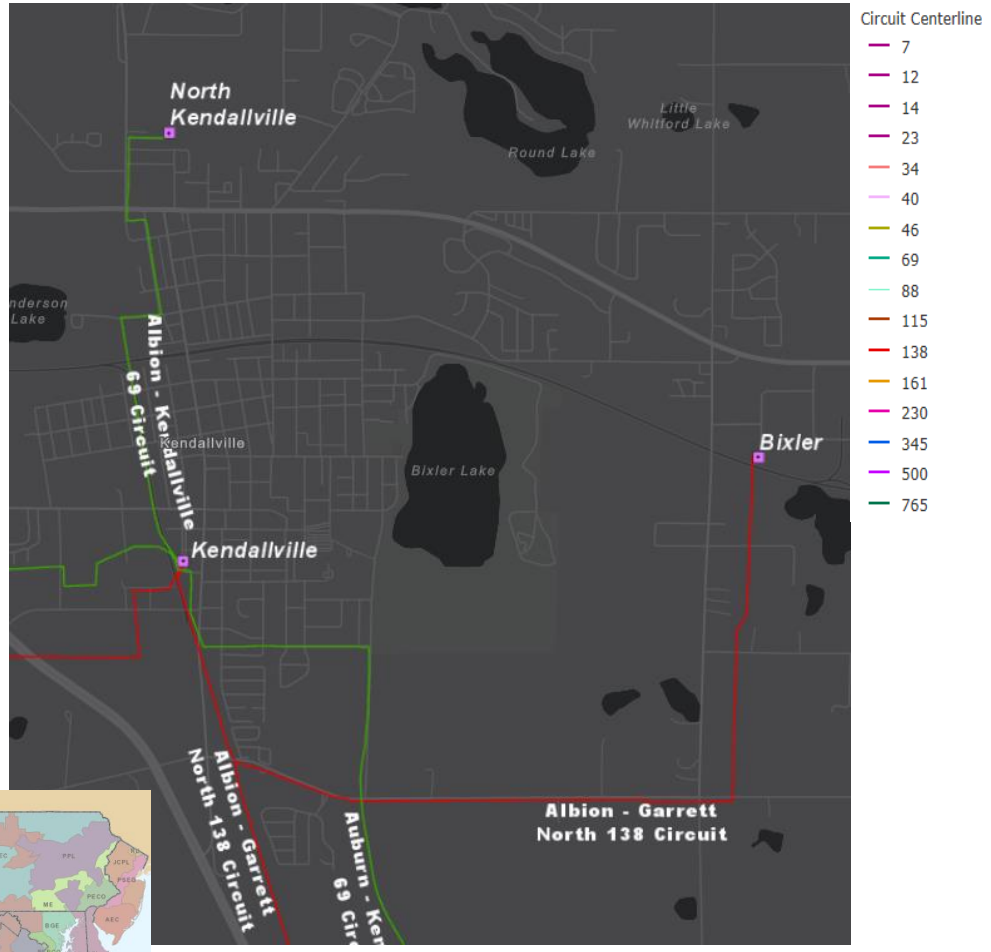
AEP Transmission Zone: Supplemental
Ft. Wayne, Indiana

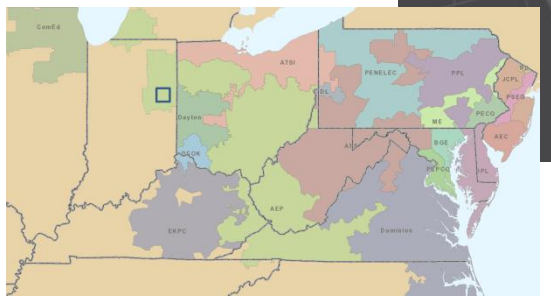
Need Number: AEP-2019-IM015
Process Stage: Solution Meeting 11/20/2019
Previously Presented: Needs Meeting 04/23/2019
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

The loads at Bixler and North Kendallville are 20.58 MW and 17.13 MW respectively. Bixler is radially served from a 2.89 mile long 138kV line. North Kendallville is radially served from a 1.79 mile long 69kV line.

Kendallville – North Kendallville 69kV Line (~1.7 Miles)

- 1960's vintage wood pole construction
- There are currently 5 open conditions on this line with majority being structure issues.
- CMI: 1,541,297
- Forced Momentary Outages: 1
- Forced Permanent Outages: 9

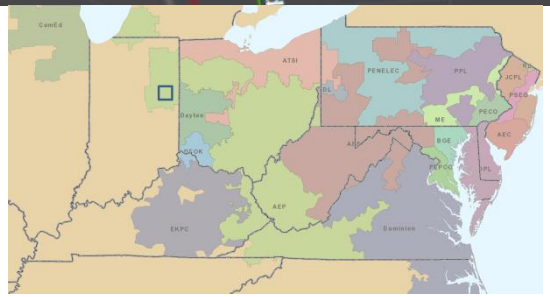




AEP Transmission Zone: Supplemental
Kendallville, IN

Need Number: AEP-2020-IM008
Process Stage: Solution Meeting 11/20/2020
Previously Presented: Needs Meeting 2/21/2020
Supplemental Project Driver: Customer Service
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 7)
Model: 2024 RTEP
Problem Statement:

I&M Distribution has requested a expansion of their Bixler station and a rebuild of their North Kendallville stations in order to help address the loading and recoverability of the area. These stations serve sensitive customers, including industrial plants and the local hospital, and the load is not recoverable for an outage due to the radial nature of the transmission feeds as presented in need AEP-2019-IM015.



AEP Transmission Zone: Supplemental Bixler Area Improvements

Need Number: AEP-2020-IM008 & AEP-2019-IM015
Process Stage: Solutions Meeting 11/20/2020
Proposed Solution:

Proposed Solution:
Rebuild North Kendallville 69/12kV station as Henderson 138/12kV station.
Estimated Cost: $0.7M

Expand Bixler 138/12kV station with a second transformer. Rebuild the through path to accommodate the expansion with a bus tie breaker and line MOAB's.
Estimated Cost: $2.5M

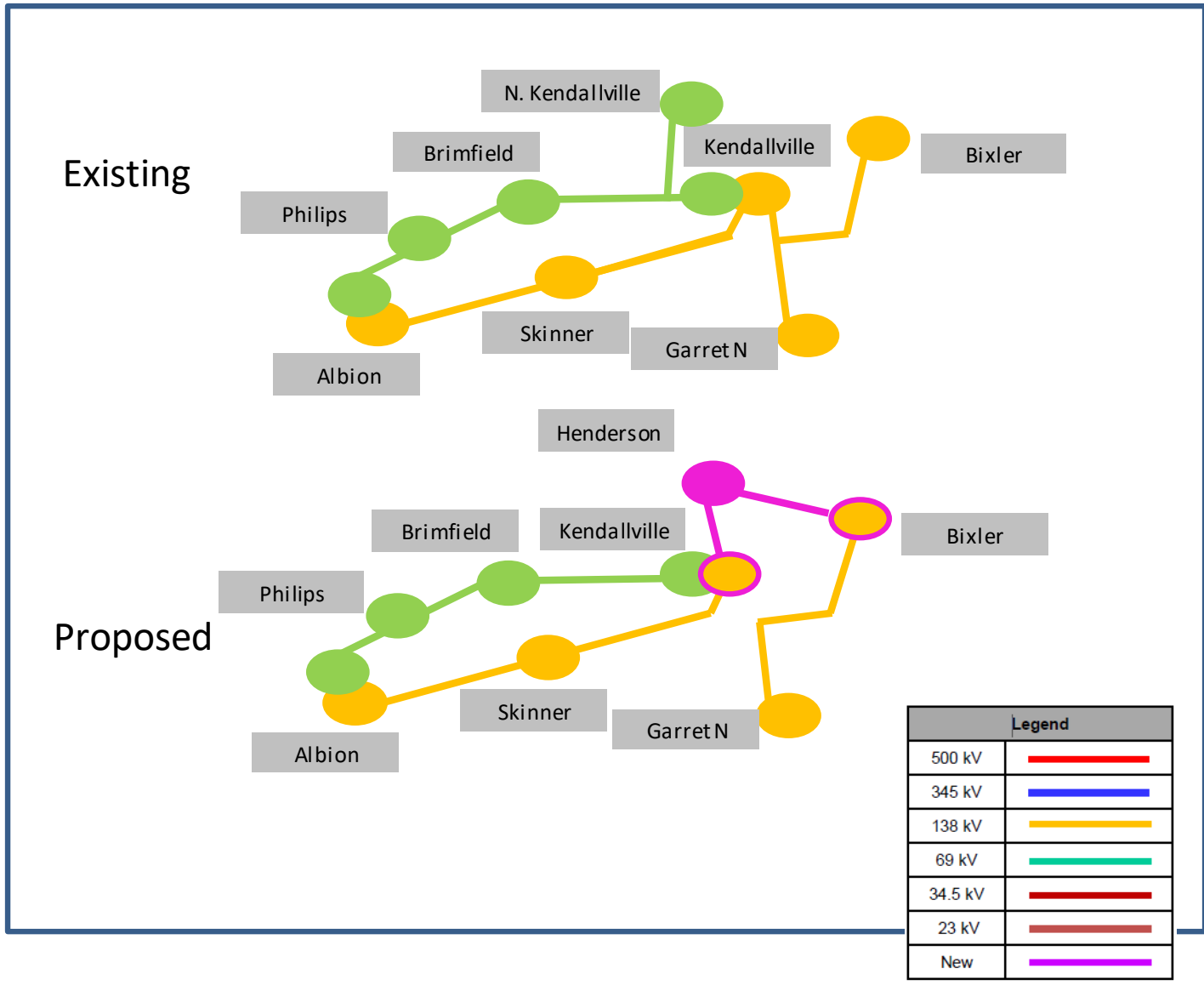
Add a 138kV CB to Kendallville station on the line exit to Henderson. **Estimated Cost: $1.5M**

Rebuild the ~1.8 mile North Kendallville 69kV tap as the 138kV Henderson – Kendallville line. **Estimated Cost: $5.5M**

Build the new ~2.6 mile Henderson – Bixler 138kV line. **Estimated Cost: $6.9M**

Retire the 138kV Bixler Sw, and the ~.6 mile between Bixler SW and Kendallville station. **Estimated Cost: $0.7M**

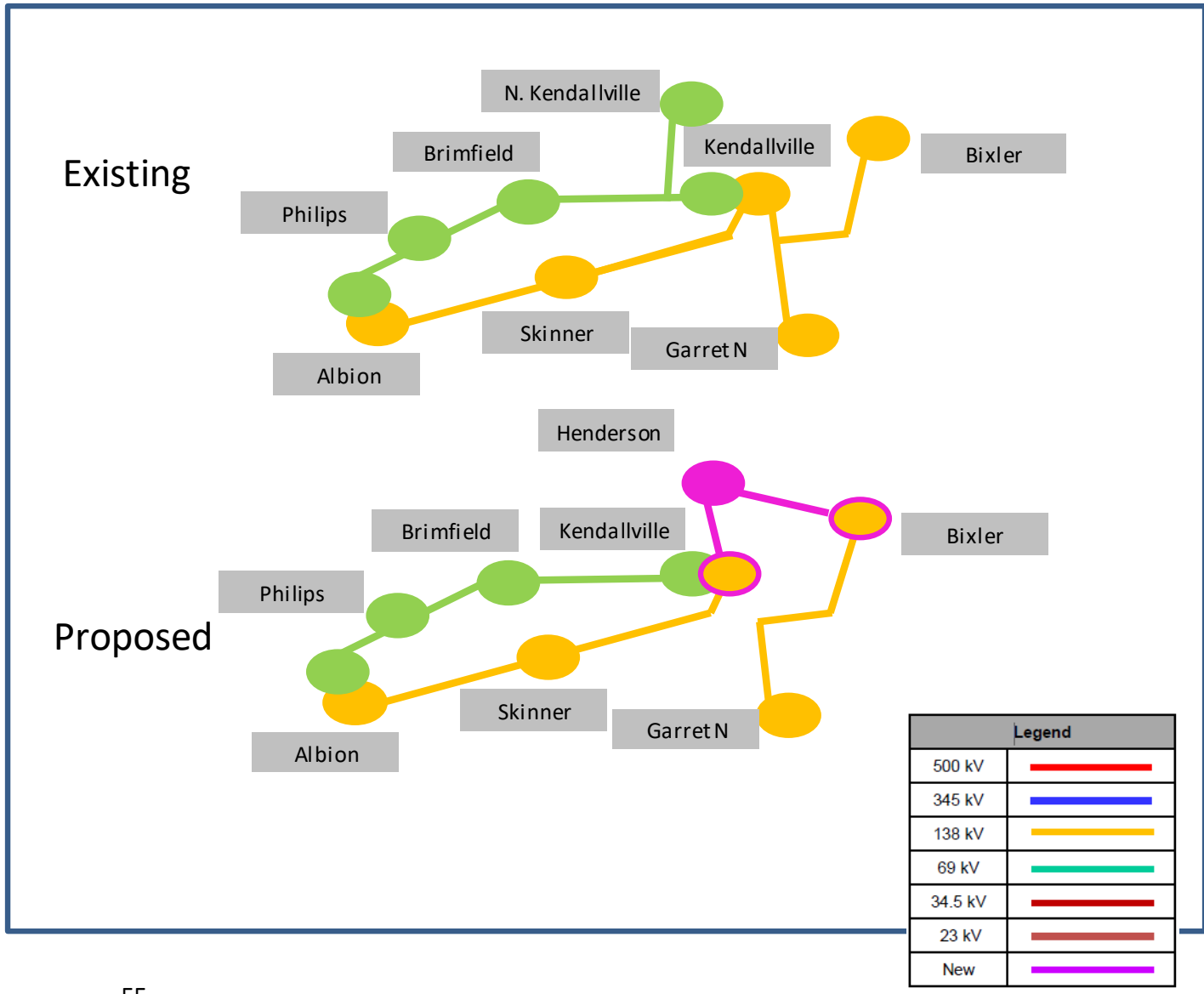
Total Estimated Transmission Cost: $17.8M



AEP Transmission Zone: Supplemental
Bixler Area Improvements

Alternatives:
Rebuild the North Kendallville tap fully greenfield as 138kV double circuit and rebuild North Kendallville station as 138/12kV. This would leave Bixler on a radial line. As this station is self-recoverable and mainly serves industrial load, it would mean AEP would not be able to take the line out for maintenance. Due to this reason, this alternate was not chosen.

Proposed IS Date: 06/01/2024
Project Status: Scoping



AEP Transmission Zone: Supplemental
Eastern Melita Area Improvements

Need Number: AEP-2019-IM016
Process Stage: Solutions Meeting 11/20/2020
Previously Presented: Needs Meeting 4/23/2019
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

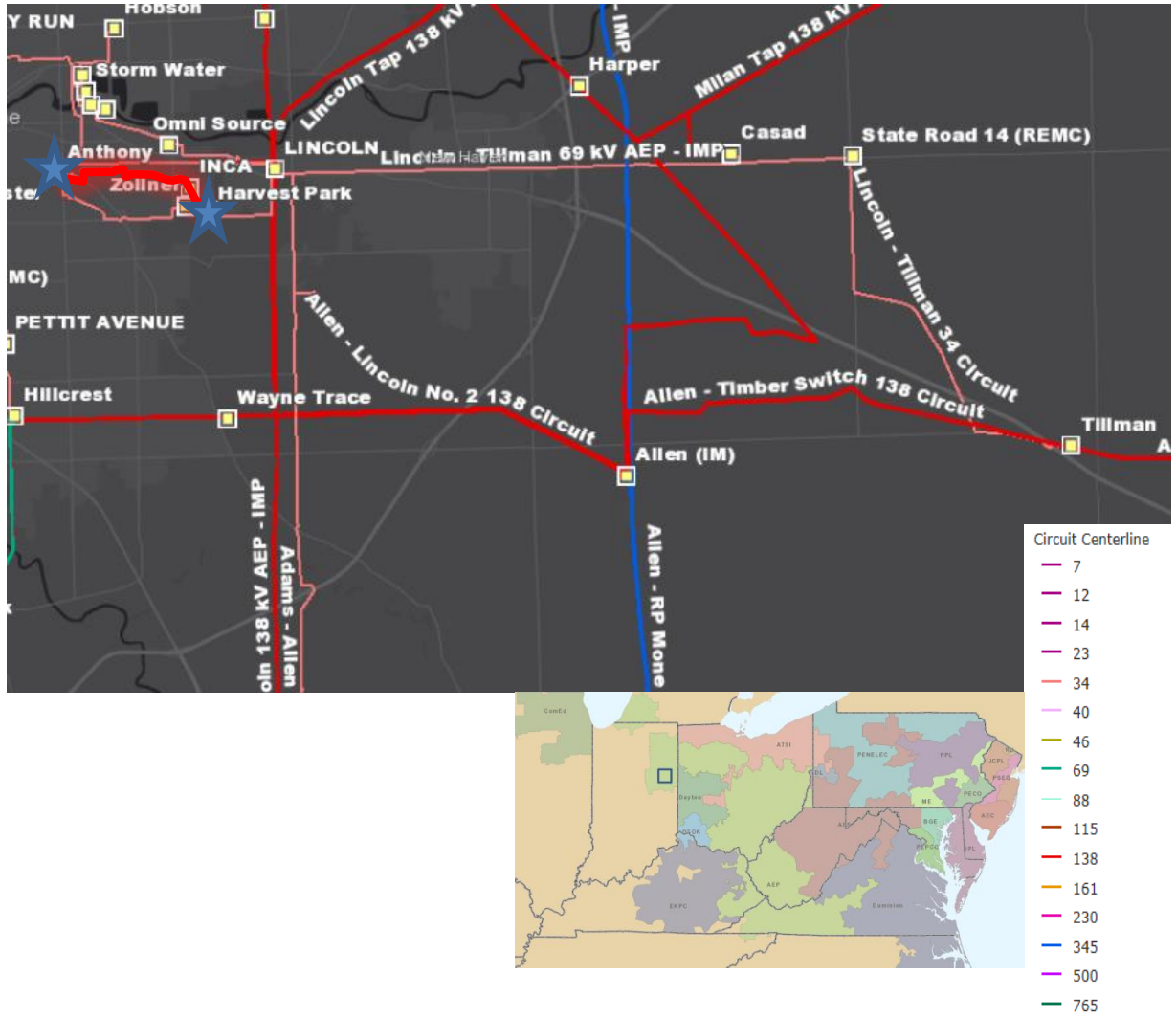
Anthony – Harvest Park No.2 34kV Line (~2.5 Miles)

- 1930's vintage wood crossarm construction
- There are currently 14 open conditions on this line with majority being structure issues. The O&M cost of the line is expected to increase as the age of the line increases.

This need was moved to a new need number (AEP-2019-IM048) and will be addressed separately.

~~Lincoln – Tillman 69kV Line (~13 Miles)~~

- ~~1968 vintage wood crossarm construction~~
- ~~There are currently 24 open conditions on this line with majority being structure issues. The O&M cost of the line is expected to increase as the age of the line increases.~~

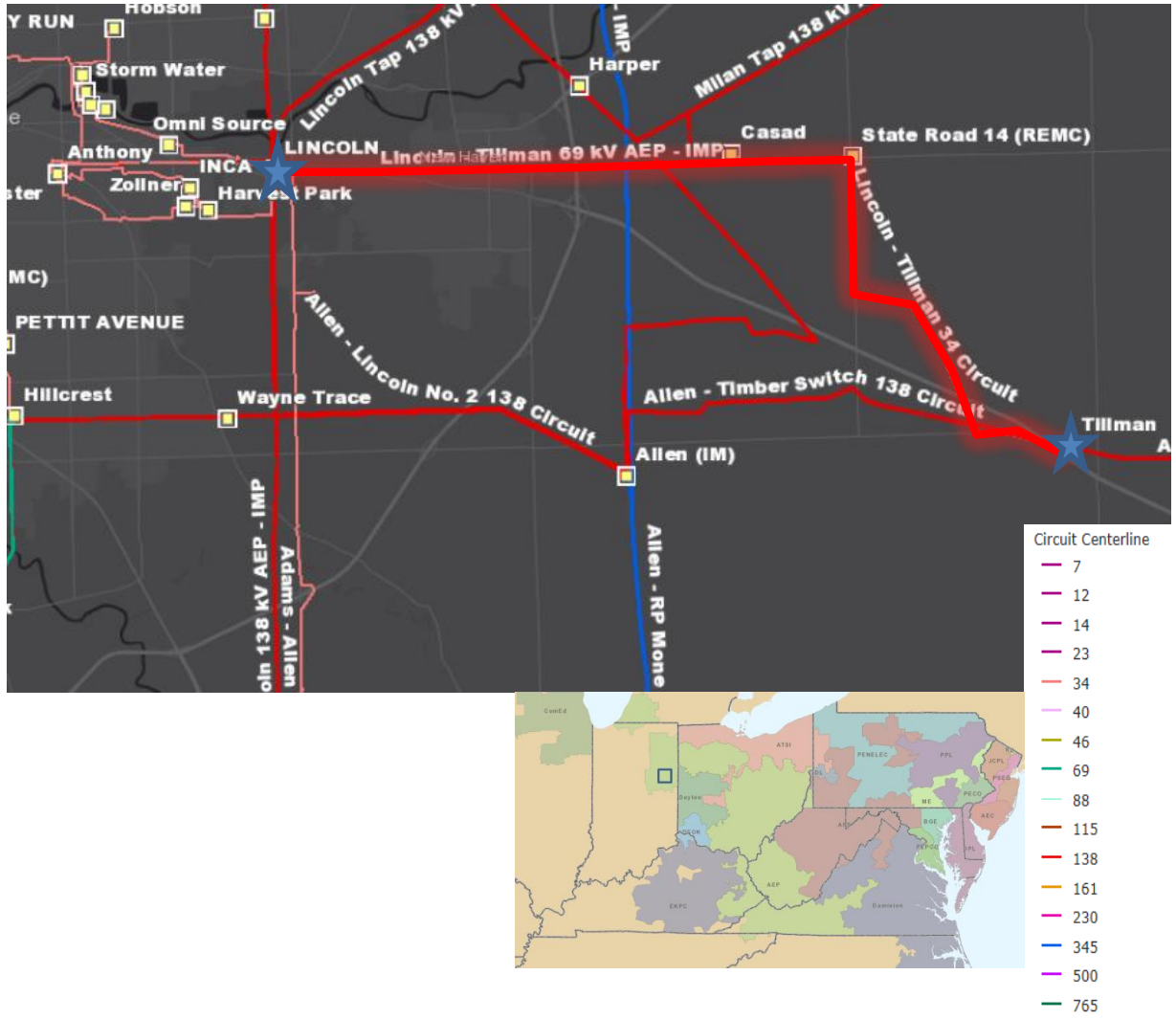


AEP Transmission Zone: Supplemental Eastern Melita Area Improvements

Need Number: AEP-2019-IM048
Previously Presented: Needs Meeting 4/23/2019
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

Lincoln – Tillman 69kV Line (~13 Miles)

- 1968 vintage wood crossarm construction
- There are currently 24 open conditions on this line with majority being structure issues. The O&M cost of the line is expected to increase as the age of the line increases.



AEP Transmission Zone: Supplemental Eastern Melita Area Improvements

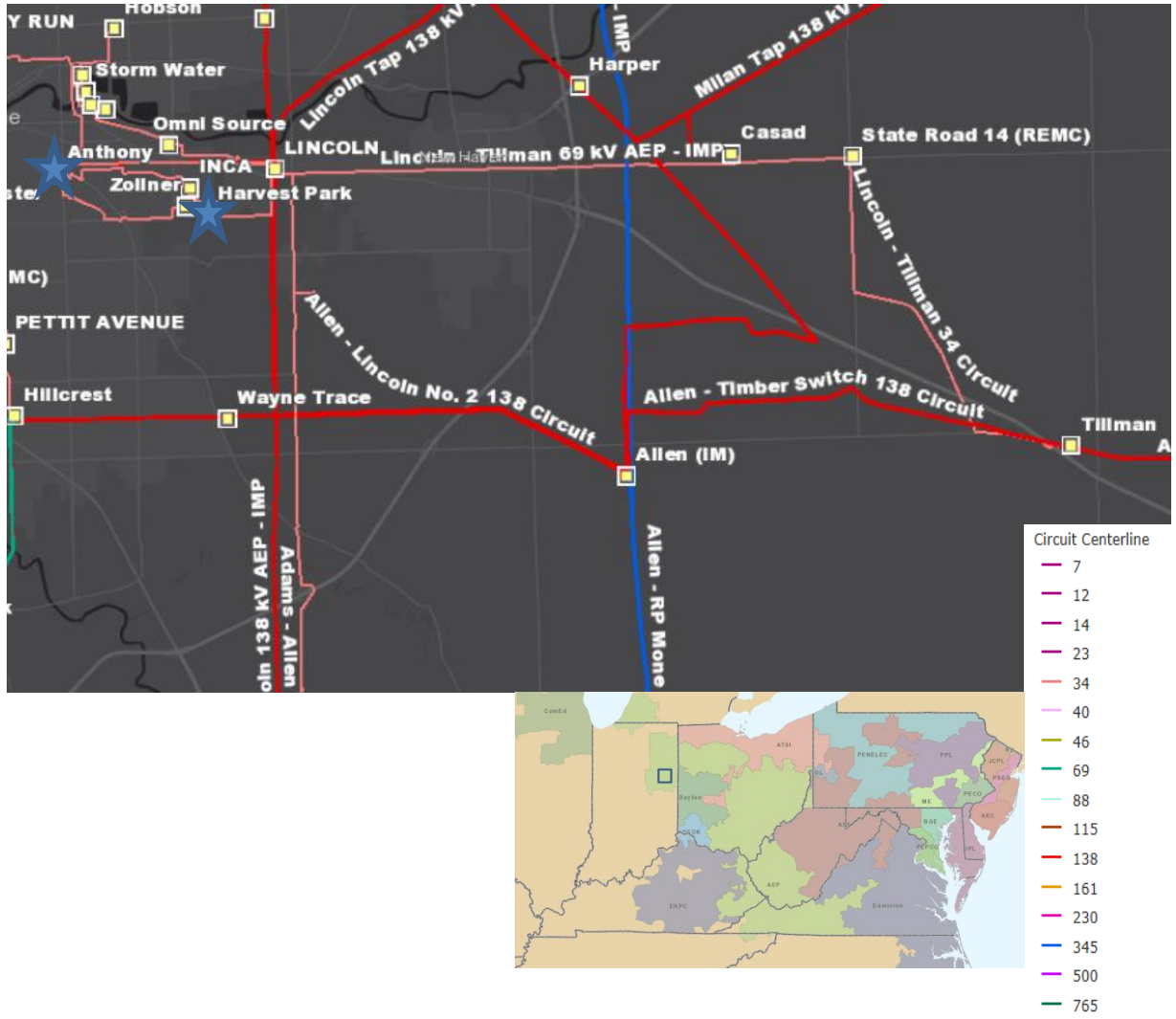
Need Number: AEP-2019-IM016
Process Stage: Solutions Meeting 11/20/2020
Previously Presented: Needs Meeting 4/23/2019
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

Anthony 34kV station

- Breakers H, Q, D, C & A 34kV
  - 1970 vintage FK Oil breakers
  - Fault Operations: H(21), A(12) – Recommended(10)
  - Oil filled breakers have much more maintenance required due to oil handling that their modern, vacuum counterparts do not require. Finding spare parts for these units is difficult or impossible, and these models are no longer vendor supported

Harvest Park 34kV station

- Breakers S, N, A & B 34kV
  - 1962 vintage FK Oil breakers S, N & B
  - 1956 vintage FK Oil breakers B
  - Fault Operations: A(49) – Recommended(10)
  - Oil filled breakers have much more maintenance required due to oil handling that their modern, vacuum counterparts do not require. Finding spare parts for these units is difficult or impossible, and these models are no longer vendor supported

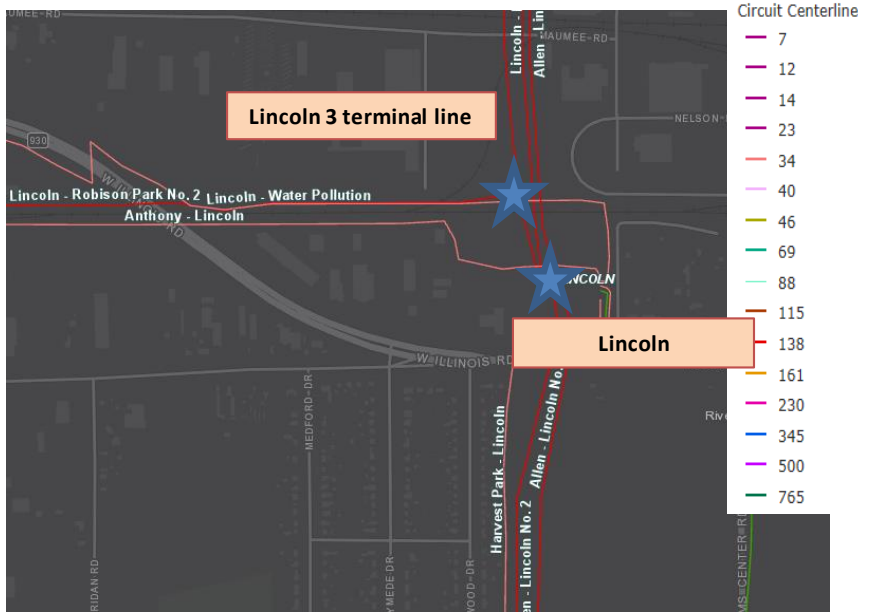


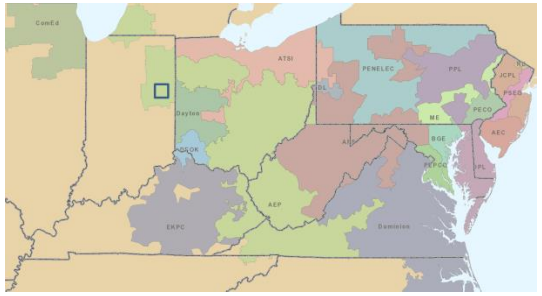
AEP Transmission Zone: Supplemental Eastern Melita Area Improvements

Need Number: AEP-2019-IM038
Process Stage: Solutions Meeting 11/20/2020
Previously Presented: Needs Meeting 10/25/2019
Supplemental Project Driver: Customer Request/Operational
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

Lincoln 138/69/34.5kV Station

- I&M Distribution has requested a new delivery point at Lincoln station.
- There is currently a three terminal line outside Lincoln station that connects Anthony, Lincoln and Robison Park. AEP has been addressing these three terminal lines when feasible.





AEP Transmission Zone: Supplemental Eastern Melita Area Improvements

Need Number: AEP-2020-IM014
Process Stage: Solutions Meeting 11/20/2020
Previously Presented: Needs Meeting 5/22/2020
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

Anthony 138/34.5/12kV

- 34.5/12kV XFR 4 is a 1954 unit with IEEE level 2 CO and level 3 CO2 gassing with decreasing interfacial tension and oil deterioration.
- Transformer #5 currently has a high side moab switch protection scheme.

Water Pollution 34.5/4kV

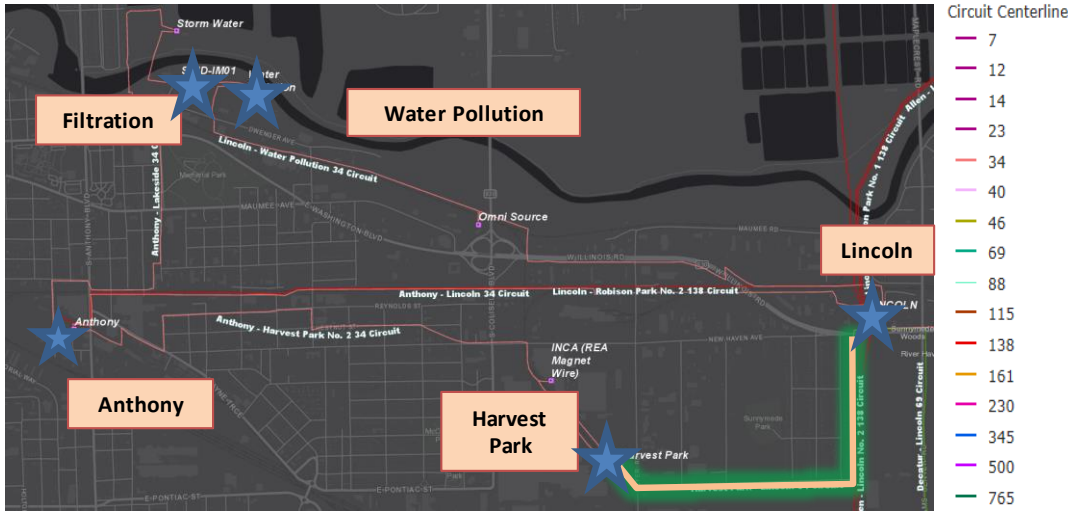
- 34.5/4kV XFR 1 is a 1974 unit with IEEE level 4 Ethane and level 3 CO2 gassing.

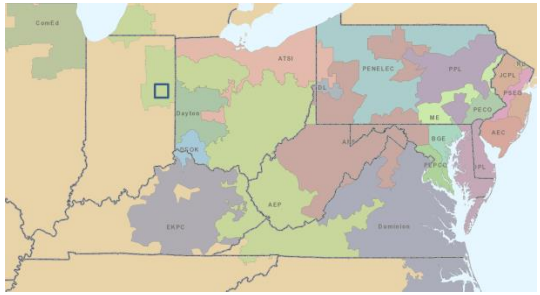
Filtration 34.5/12kV Switch Station

I&M has an obligation to remove this station upon completion of the FT Wayne tunneling project.

Lincoln – Harvest Park 34.5kV line (~1.5 miles)

- 1.5 miles of 1920-1930's steel structures with 300,000 CM copper conductor. There are currently 4 structures with open conditions (20% of the line)





AEP Transmission Zone: Supplemental
Eastern Melita Area Improvements

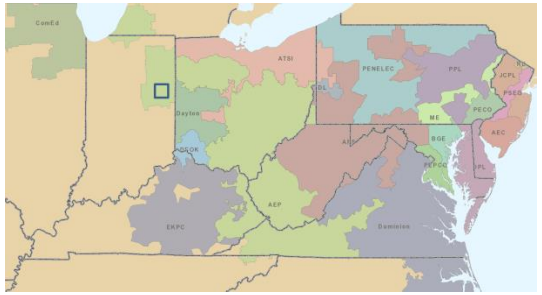
Need Number: AEP-2020-IM014
Process Stage: Solutions Meeting 11/20/2020
Previously Presented: Needs Meeting 5/22/2020
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)
Problem Statement:

Lincoln – Anthony 34.5kV line (~1.1 miles)

- 1.1 miles of 1971 wood pole line with 300,000 CM copper conductor. 9 unique structures with open conditions (36% of the line)
- This line segment fails to meet several loading and leakage distance requirements.

Lincoln – Anthony 138/34.5kV line (~3.07 miles)

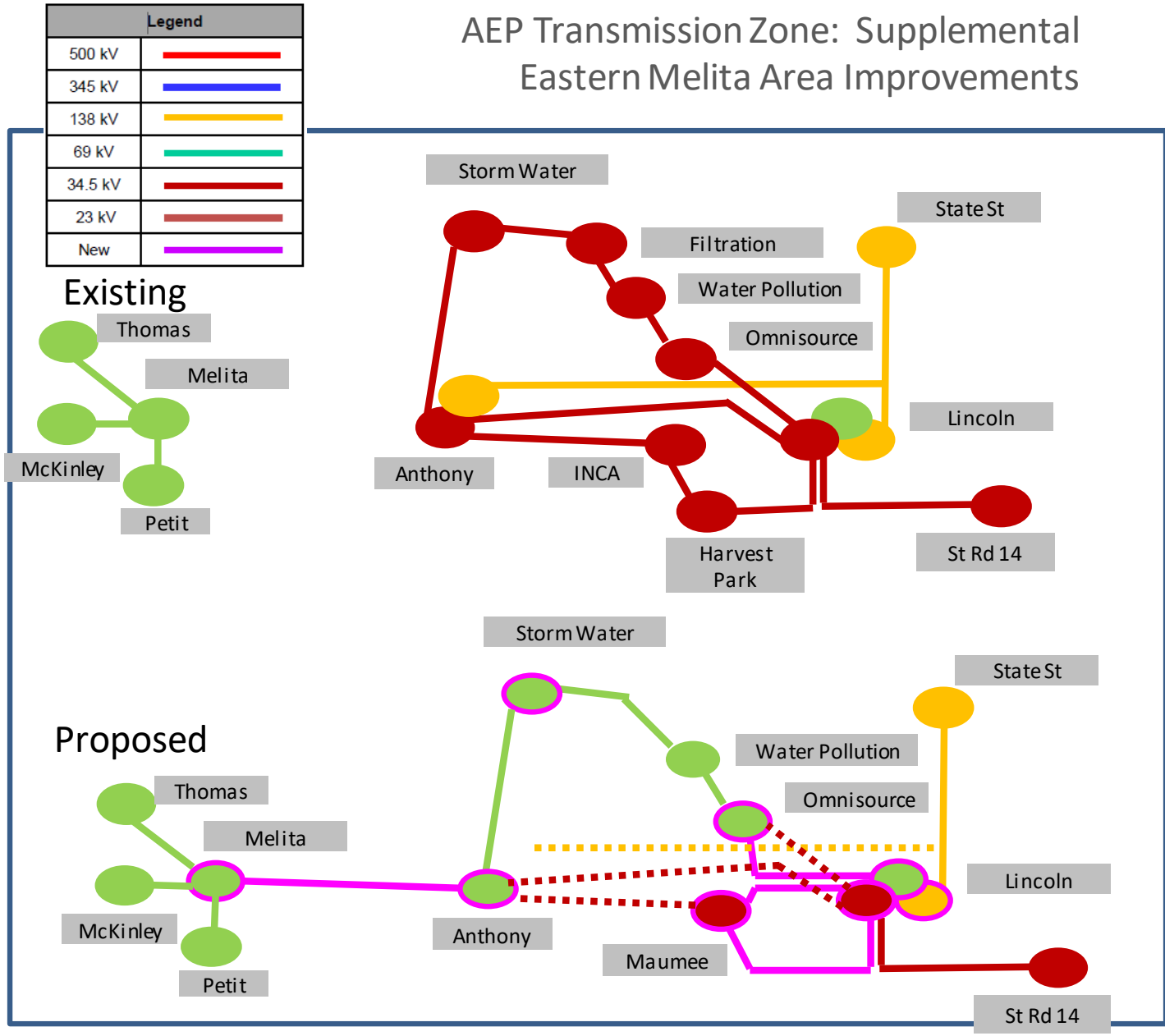
- 3.07 miles of 1971 wood pole line with 23 unique structures with open conditions (37% of the line). These conditions include insect damaged poles, twisted crossarms, broken strands and missing grounds.
- This line segment fails to meet several loading and leakage distance requirements.



AEP Transmission Zone: Supplemental Eastern Melita Area Improvements

Need Number: AEP-2019-IM038 & AEP-2019-IM016&AEP-2020-IM014
Process Stage: Solutions Meeting 11/20/2020
Proposed Solution:

Overall Project Summary:
The Lincoln – Anthony 138/34.5kV network is subject to significant amounts of needs. This solution would rebuild ~2.6 miles, install ~2.6 miles and retire ~7.1 miles of transmission line. This solution would also retire Harvest Park, Filtration and a good potion of Anthony station. With some station work at Melita, Anthony and Storm Water, the area needs are fully addressed and this area is re-energized to 69kV.



Need Number: AEP-2019-IM038 & AEP-2019-IM016&AEP-2020-IM014
Process Stage: Solutions Meeting 11/20/2020
Proposed Solution:

Retire Harvest Park 34.5kV station and move distribution load source to Lincoln station. **Estimated Cost: $0M**

Retire ~.6 miles of the Storm Water - Lincoln line. **Estimated Cost: $0.1M**

Retire the ~2.5 mile Anthony – Harvest Park line. **Estimated Cost: $0.5M**

Retire Filtration Switch. **Estimated Cost: $0.1M**

Retire the ~1.1 mile Anthony – Lincoln 34.5kV line. **Estimated Cost: $0.2M**

Retire the ~2.9 mile Anthony – Lincoln 138kV line. **Estimated Cost: $0.6M**

At Lincoln station, move the Storm Water CB to the 69kV bus. Install 138/12kV transformer with new 12kV distribution bay to replace Harvest Park. **Estimated Cost: $5.7M**

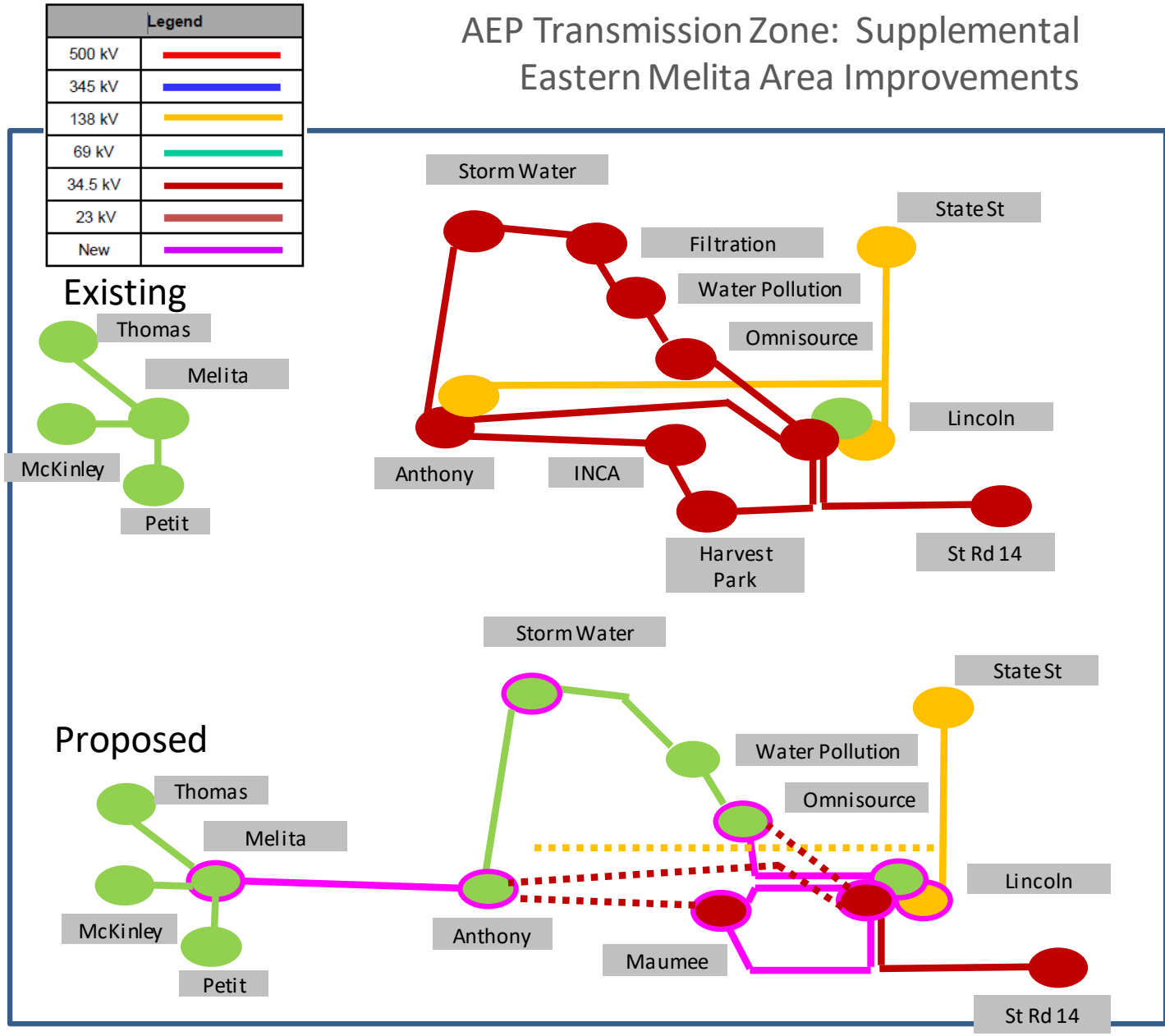
Rebuild the Lincoln – Inca line. Line will connect to the new Lincoln 69/34.5kV extension at Maumee switch. **Estimated Cost: $6.3M**

Build a ~0.9 mile 69/34.5kV double circuit line out of Lincoln station to connect to the Lincoln – Maumee 34.5kV line and the Lincoln – Stormwater 69kV line. **Estimated Cost: $3.4M**

Install a 34.5kV POP Switch to feed Inca station called Maumee switch. **Estimated Cost: $0.6M**

Build a greenfield ~1.7 mile Anthony – Melita 69kV line. **Estimated Cost: $6.2M**

AEP Transmission Zone: Supplemental Eastern Melita Area Improvements



AEP Transmission Zone: Supplemental Eastern Melita Area Improvements

Need Number: AEP-2019-IM038 & AEP-2019-IM016&AEP-2020-IM014
Process Stage: Solutions Meeting 11/20/2020
Proposed Solution:

At Storm Water station, replace Transformer 1 with a 69/12kV unit and re-energize station at 69kV. **Estimated Cost: $0M**

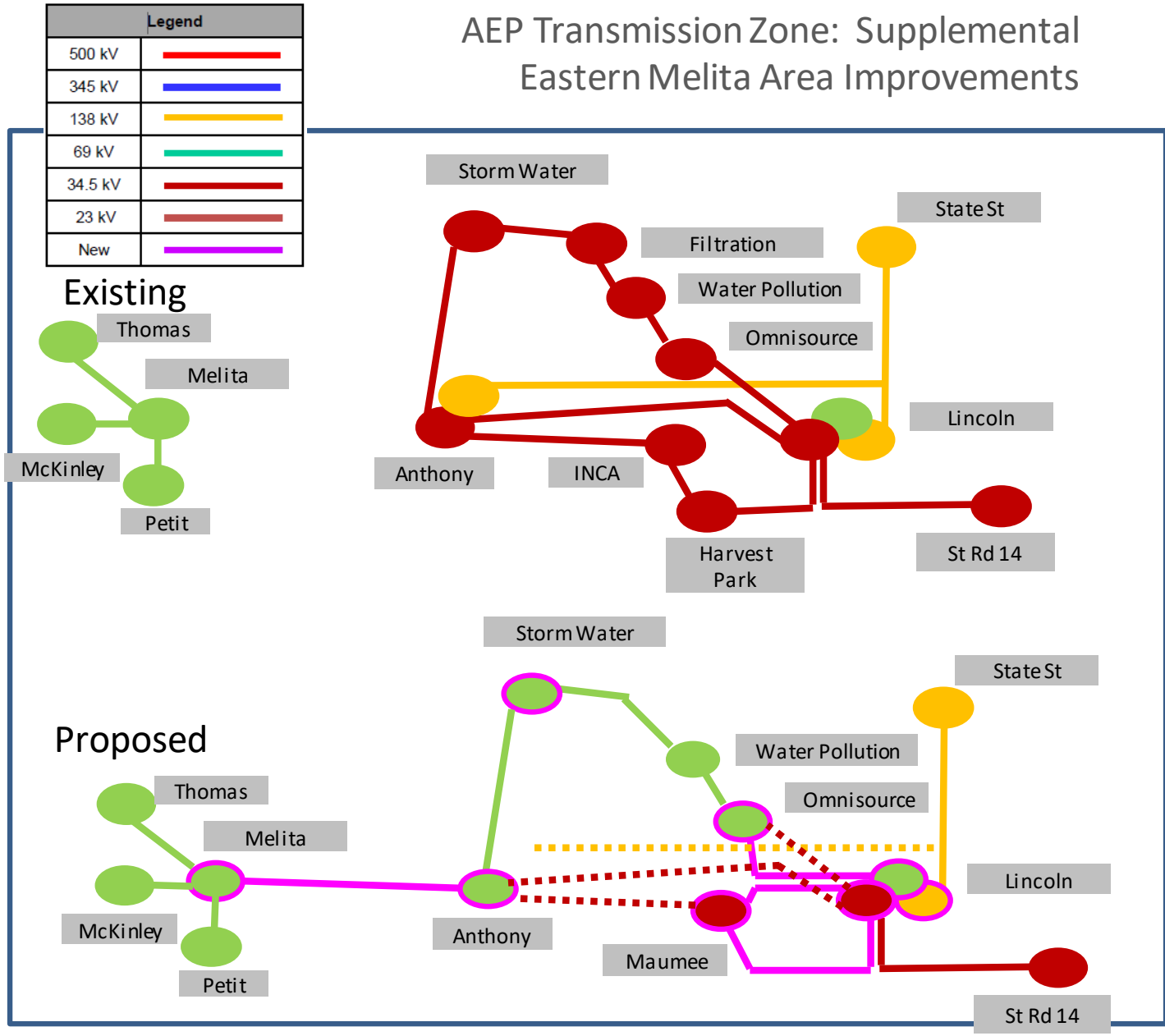
At Water Pollution station, re-energize station at 69kV. Station was previously built to take either 34.5 or 69 kV service. **Estimated Cost: $0M**

At Omnisource station, replace Transformer 1 with a 69/4kV unit and re-energize station at 69kV. **Estimated Cost: $1.2M**

At Melita station, install a 3000A 40kA 69kV CB for the Anthony line entrance. **Estimated Cost: $0.9M**

At Anthony station, replace both 34.5/12kV transformers with 69/12kV 25MVA units. Replace 2 CB's with 3000A 40kA 69kV CB's for the Water Pollution line exit and bus tie positions. Re-use the existing Water Pollution breaker for the new Melita line entrance. Install a 21.6Mvar Cap bank. Retire the 138/34.5kV transformer, the 34.5kV CB's Q and A, and the existing buswork. **Estimated Cost: $8.7M**

Total Estimated Transmission Cost: $34.5M



AEP Transmission Zone: Supplemental Eastern Melita Area Improvements

Need Number: AEP-2019-IM038 & AEP-2019-IM016&AEP-2020-IM014

Process Stage: Solutions Meeting 11/20/2020

Alternatives Considered:

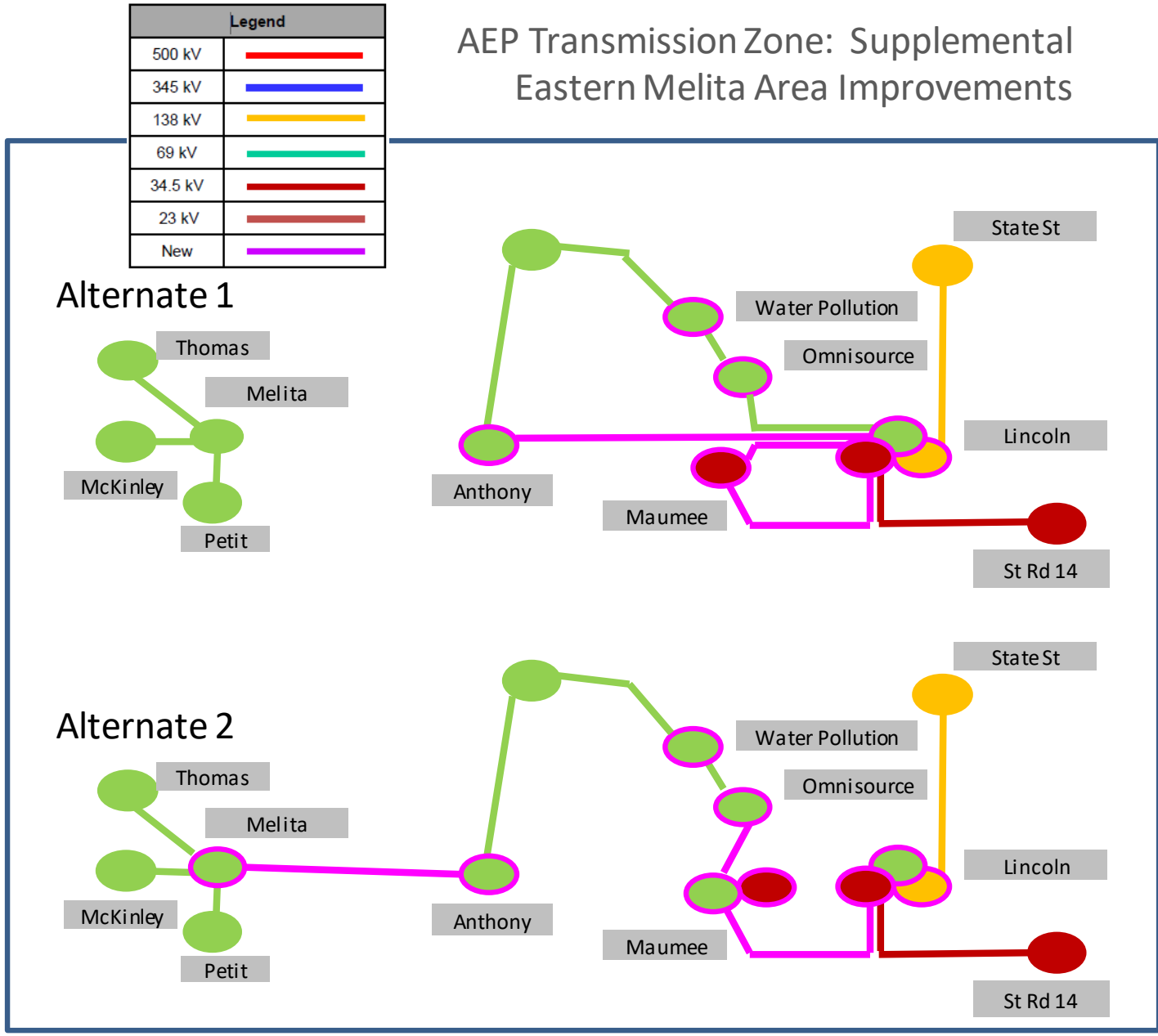
1. In lieu of the Melita – Anthony 69kV line, rebuild the Anthony – Lincoln 138kV line and energize it at 69kV. Replace XFR 2 at Lincoln with a 138/69/34.5kV unit and add another 69kV CB. The 2nd transformer would be needed due to a loss of XFR 1 and Magley – Decatur 69kV causing significant voltage violations across the southern Ft Wayne 69kV network. This option would cost slightly more but would cause the whole loop to be subject to a single N-1 loss at Lincoln station. In addition, this option would not establish a new 69kV feed into the downtown Ft Wayne network, which would support future growth in the downtown district and provide a needed source to the southern Ft. Wayne 69kV network.
   Estimated Cost: $36M

2. Install a 69/34.5kV step down substation at Maumee to feed the 34.5kV Inca delivery point and convert the entire line to 69 kV instead of keeping a separate 34.5 kV loop to Inca. Outage constraints around INCA would be prohibitive to their operation. There is also no space in the area for a greenfield 69/34.5 kV station. So this option was not pursued.
   Estimated Cost: $34.0M

Projected In-Service: 04/03/2023

Project Status: Scoping

Model: N/A



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

11/10/2020 – V1 – Original version posted to pjm.com

11/16/2020 – V2 – Added Slides #2 - #18, “AEP WV Project Updates”

11/20/2020 – V3 – Added Slides #57,

Updated Slide #56, changes are marked in the slide

11/30/2020 – V4 – Slides #60 and 61, Corrected the Need number and Need Date

Slides #62 -#64, Added the Need number AEP-2020-IM014

Slide #5, Corrected the Total Estimated Cost

4/7/2021 – V5 – Slides #33, Corrected the typo in the Need number

– Slides #37, Corrected the total cost to match the sum of the split costs

– Slides #43, Corrected the total cost to match the sum of the split costs