

SRRTEP Committee: Western AEP Supplemental Projects

May22, 2020

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 Clifford, VA Area

Need Number: AEP-2020-AP031

Process Stage: Needs Meeting 05/22/2020

Supplemental Project Driver: Equipment Condition/Performance/Risk

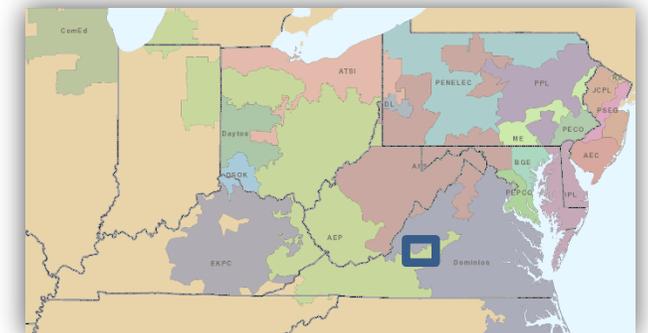
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

Clifford Station:

- 138/69/46 kV Transformer #1
 - 1963 Vintage Transformer
 - Elevated levels of Acetylene have been documented indicating increased decomposition of the paper insulating materials. The presence of acetylene indicates electrical discharge faults of high energy have occurred within the main tank causing electrical breakdown of the unit.
 - Due to deteriorated gaskets at the radiator headers, this unit is leaking oil.

- 138/46 kV Transformer #3
 - 1950 Vintage Transformer
 - An upward trend in insulation power factor indicates an increase in particles within the oil and the dielectric strength of the insulation system (oil and paper) are in poor condition, impairing the unit's ability to withstand electrical faults.



AEP Transmission Zone M-3 Process Roanoke, VA Area

Need Number: AEP-2020-AP033

Process Stage: Needs Meeting 05/22/2020

Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

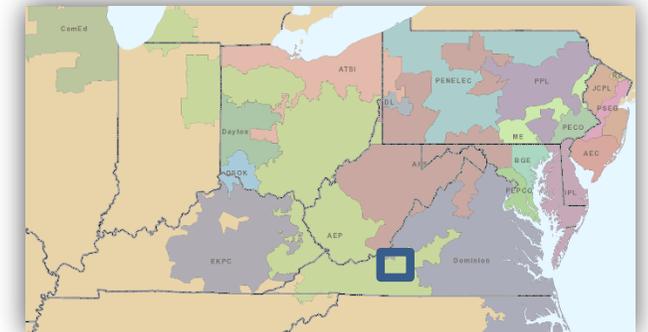
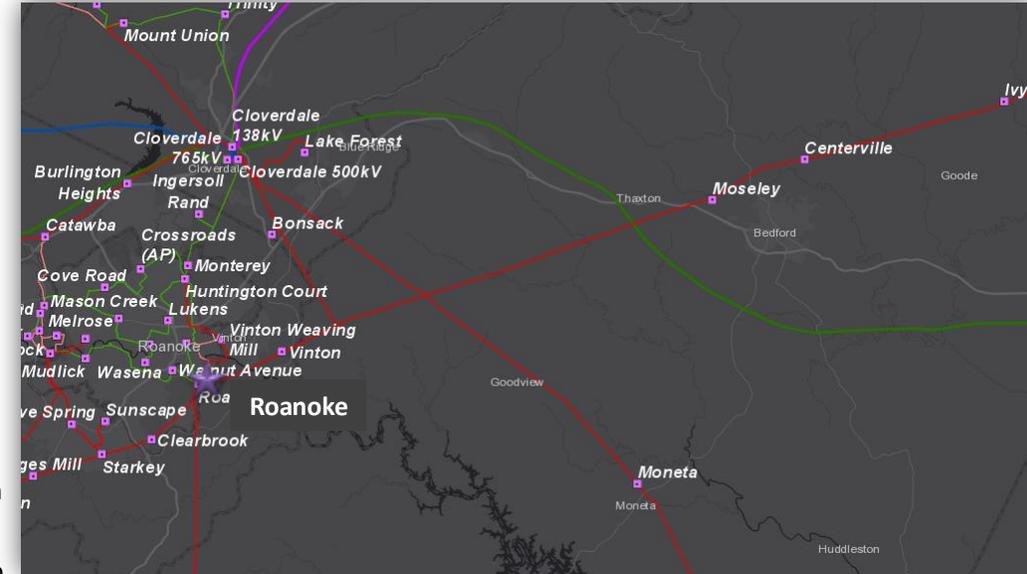
Roanoke Station:

- 138/69/12 kV Transformer #5
 - 1981 Vintage Transformer
 - Elevated levels of carbon monoxide, carbon dioxide and hydrogen indicate excessive levels of decomposition of the paper insulating materials.

- 138 kV Circuit Switchers BB and CC
 - Both are 1990's vintage
 - The Mark V family of circuit switchers have no gas monitor and currently in-service units on the AEP system have experienced 110 malfunctions from May 2000 to August 2019. Failed operational components including high contact resistance, gas loss, and interrupter failure represent half of these malfunctions. Two malfunctions of note were catastrophic equipment failures involving failures to trip.

- 138 kV Capacitor Bank CC and 34.5 kV Capacitor Bank AA
 - Leaking around bushings on both banks
 - 6 cans are failed on bank CC

- 69 kV Circuit Breakers U and V
 - 1970's Vintage Circuit Breakers
 - 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 breaker U has each exceeded the manufacturer's designed number of full fault operations (12)

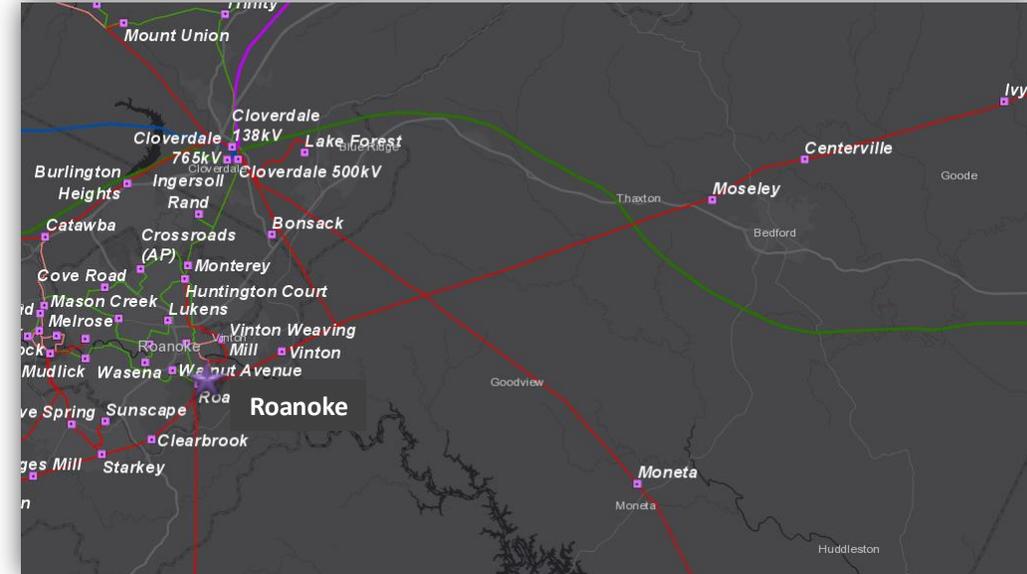


AEP Transmission Zone M-3 Process Roanoke, VA Area

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Roanoke Station:

- Relaying
 - Roanoke Substation currently deploys 103 relays, implemented to ensure the adequate protection and operation of the substation. Currently, 79 of the 103 relays (77% of all station relays) are in need of replacement.
 - There are 50 electromechanical and 8 static which have significant limitations with regards to fault data collection and retention. These relays lack vendor support and have little to no access to spare parts.
 - There are 3 DPU microprocessor type relays on the three distribution breakers. The DPU relays pose a potential safety risk to persons performing breaker operation because the DPUs are mounted directly on the circuit breaker without a delay for opening and closing the breaker.
 - There are 18 microprocessor relays that utilize legacy firmware.
- Pilot Wire
 - Pilot wire relaying exists on the Campbell Ave. 69 kV, Roanoke 69 kV and Campbell Ave 34.5 kV circuits
 - TFS lacks adequate crew training and experience on handling pilot wire; only a small number of crews are available with necessary experience to perform corrective maintenance
 - High corrective maintenance costs are incurred (P&C, line, forestry, build roads, etc.)
- High-Side Transformer Protection
 - No automatic high-side protection exists on transformer #5 or #2
 - Both are directly connected to 138 kV bus #2, which would operate five 138 kV circuit breakers for a transformer fault



AEP Transmission Zone M-3 Process Centerville, VA Area

Need Number: AEP-2020-AP034

Process Stage: Needs Meeting 05/22/2020

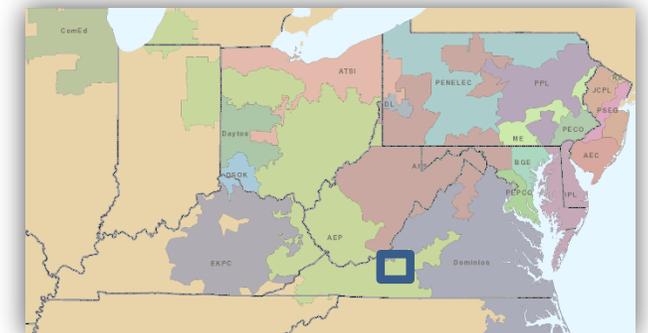
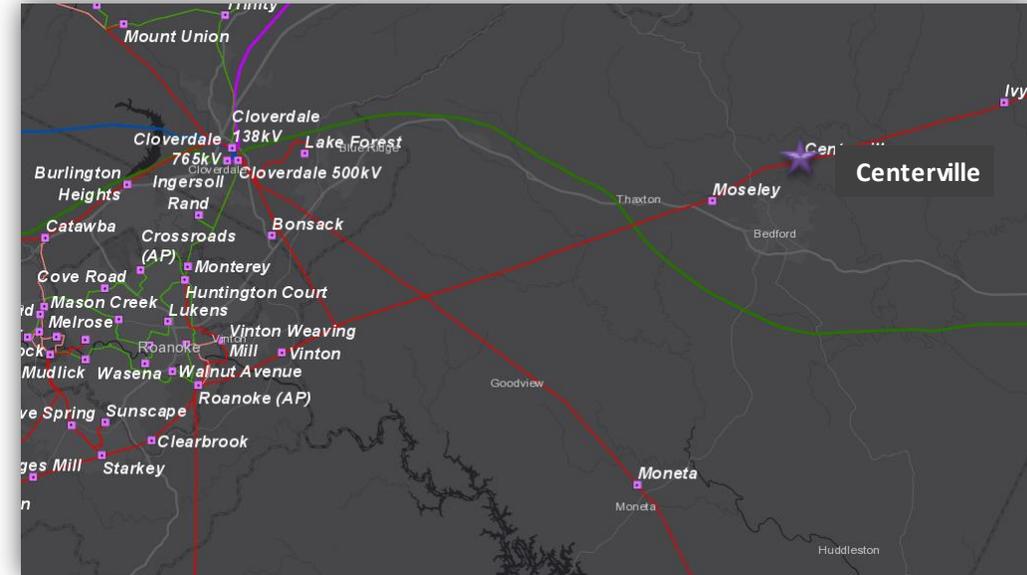
Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Centerville Station:

- 69 kV Circuit Breaker B
 - 1970’s Vintage Circuit Breaker
 - Oil filled breaker without oil containment. Oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require.
 - This circuit breaker, has exceeded the manufacturer’s designed number of full fault operations (108)
- High-side Transformer MOAB Ground Switch (138/69/12 kV T1) is used for high-side transformer protection
- There is a three terminal line configuration through the Town of Bedford 69 kV loop.
- The flip-flop configuration connection to the double circuit 138 kV line that runs adjacent to the station is a source of operational and protection challenges when faults occur.
- Relaying
 - Centerville Substation currently deploys 26 relays, implemented to ensure the adequate protection and operation of the substation. Currently, all 26 of the relays (100% of all station relays) are in need of replacement. There are 21 of the electromechanical which have significant limitations with regards to fault data collection and retention. These relays lack vendor support and have little to no access to spare parts. Also, the remaining 5 relays that are microprocessor based from utilize legacy firmware.



Need Number: AEP-2020-IM014

Process Stage: 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 Station

- 34.5/12kV Transformer #4 is a 1954 unit
 - Increased CO and CO2 gassing with decreasing interfacial tension and oil deterioration
- 138/34.5kV Transformer #5 currently has a high side MOAB switch protection scheme

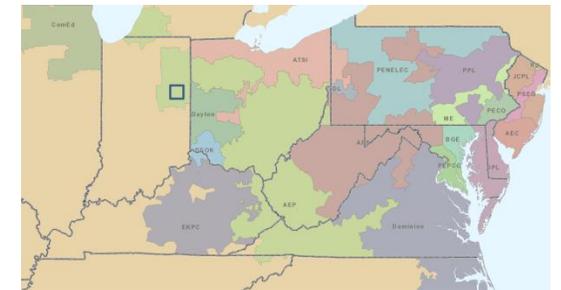
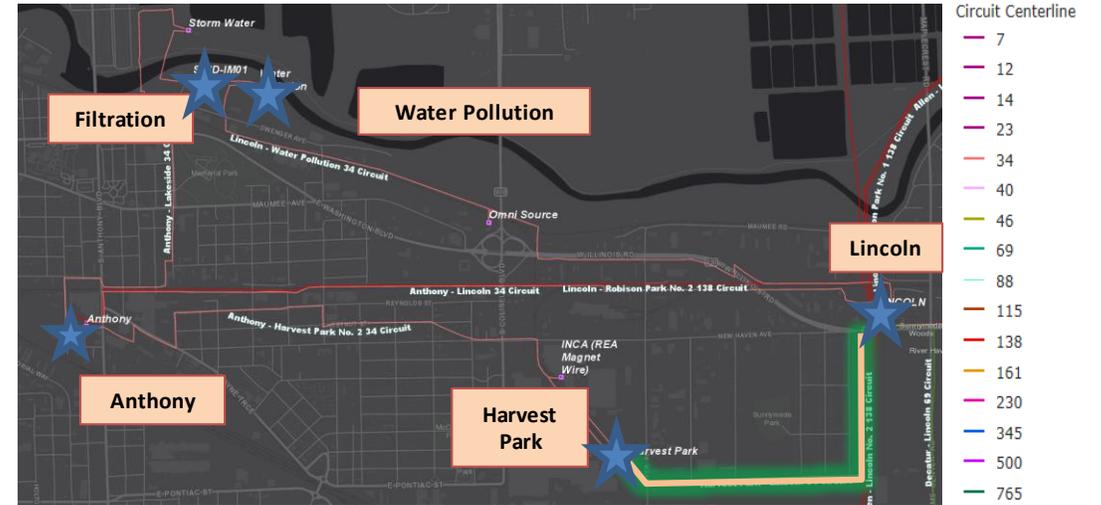
Filtration 34.5/12kV Switch Station

- I&M has an obligation to remove this station upon completion of the City of Fort 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 and 3#8 copperweld shield-wire
- Field inspection found the 10 1920's towers had significant rusting
- Older copper wires like the 300,000 CM copper conductor and the 3#8 copperweld shield wire have a higher rate of failure and become brittle and difficult to splice with age.
- 3 structures had flashover damage and 4 structures had severe rust and corrosion on the insulation.

AEP Transmission Zone: Supplemental Ft Wayne Area, Indiana



Need Number: AEP-2020-IM014

Process Stage: 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:

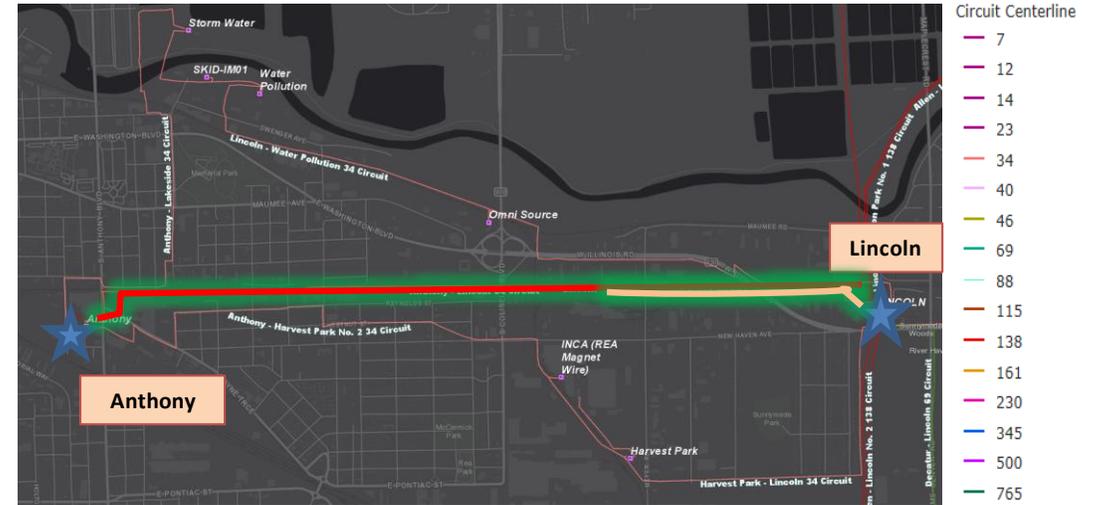
Lincoln – Anthony 34.5kV line (~1.1 miles)

- 1.1 miles of 1971 wood pole line with 300,000 CM copper conductor
- This line segment fails to meet NESC loading criteria.
- This line segment fails to meet AEP loading and leakage distance requirements
- This line segment fails to meet ASCE strength requirements.
- 4 poles have crossarm decay, 2 poles have splitting or decay, 1 broken static lead and 1 knee brace with decay across 21 poles on the line.

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

- 3.07 miles of 1971 wood pole line
- 20 unique structures with open conditions (31% of the line).
 - These conditions include insect damaged poles, twisted crossarms, broken strands and missing grounds.
- This line segment fails to meet AEP strength and leakage distance requirements.
- The line segment fails to meet NESC loading criteria
- The line segment fails to meet ASCE strength requirements
- 4 poles have flashover indication, 1 broken static lead and 1 pole vertically splitting

AEP Transmission Zone: Supplemental Fort Wayne, Indiana



AEP Transmission Zone: Supplemental Van Buren, Indiana

Need Number: AEP-2020-IM018

Meeting Date: Needs Meeting 05/22/2020

Supplemental Project Driver: Equipment

Material/Condition/Performance/Risk/Operational

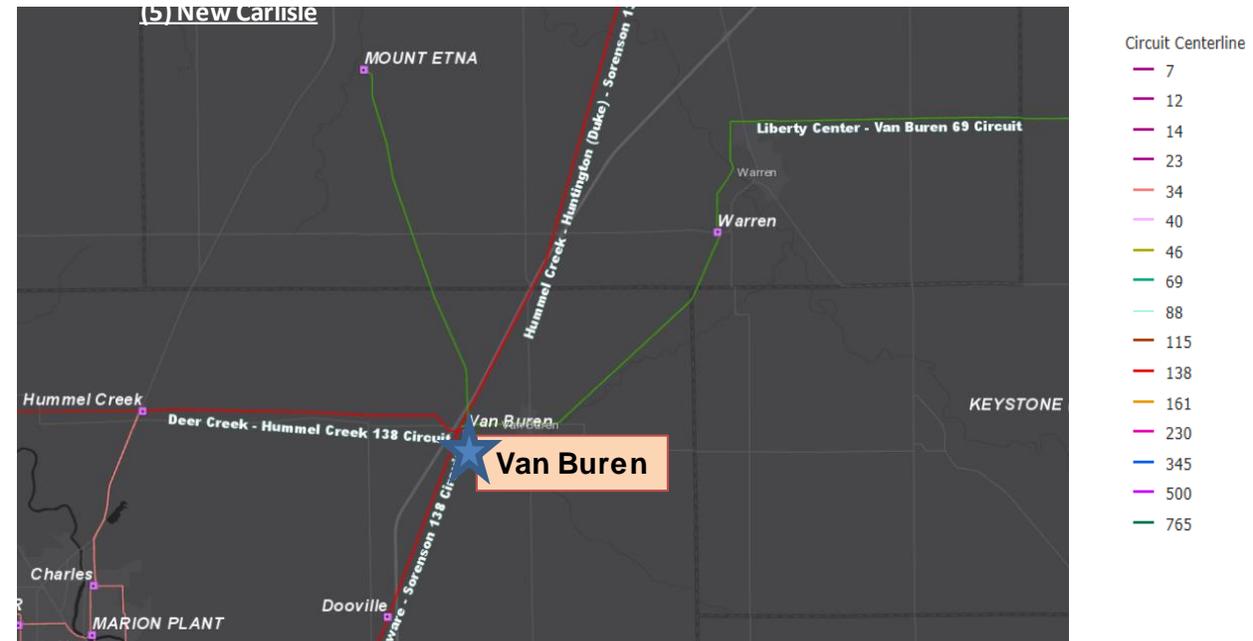
Specific Assumptions Reference: AEP Guidelines for

Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

Van Buren 138/69/12kv station

- 138/69/12 kV Transformer #1
 - 1967 vintage
 - Elevated moisture levels
 - Increased cost of maintenance due to leaking
 - Increased levels of decomposition of the paper insulating materials, leading to increased risk of failure
- Breaker B 69kV
 - 1964 vintage oil filled, CF-type breaker.
 - This type is oil filled without oil containment. Oil filled breakers have much more maintenance required due to oil handling that their modern, vacuum counterparts do not require.
 - Finding spare parts for these units is not possible due to these models no longer being vendor supported
- Van Buren is part of a three-terminal line configuration with the Delaware – Sorenson 138kV circuit.



AEP Transmission Zone M-3 Process Canton, Ohio

Need Number: AEP-2020-OH019

Process Stage: Need Meeting 05/22/2020

Supplemental Project Driver:

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

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slides 7, 8)

Problem Statement:

Customer Service:

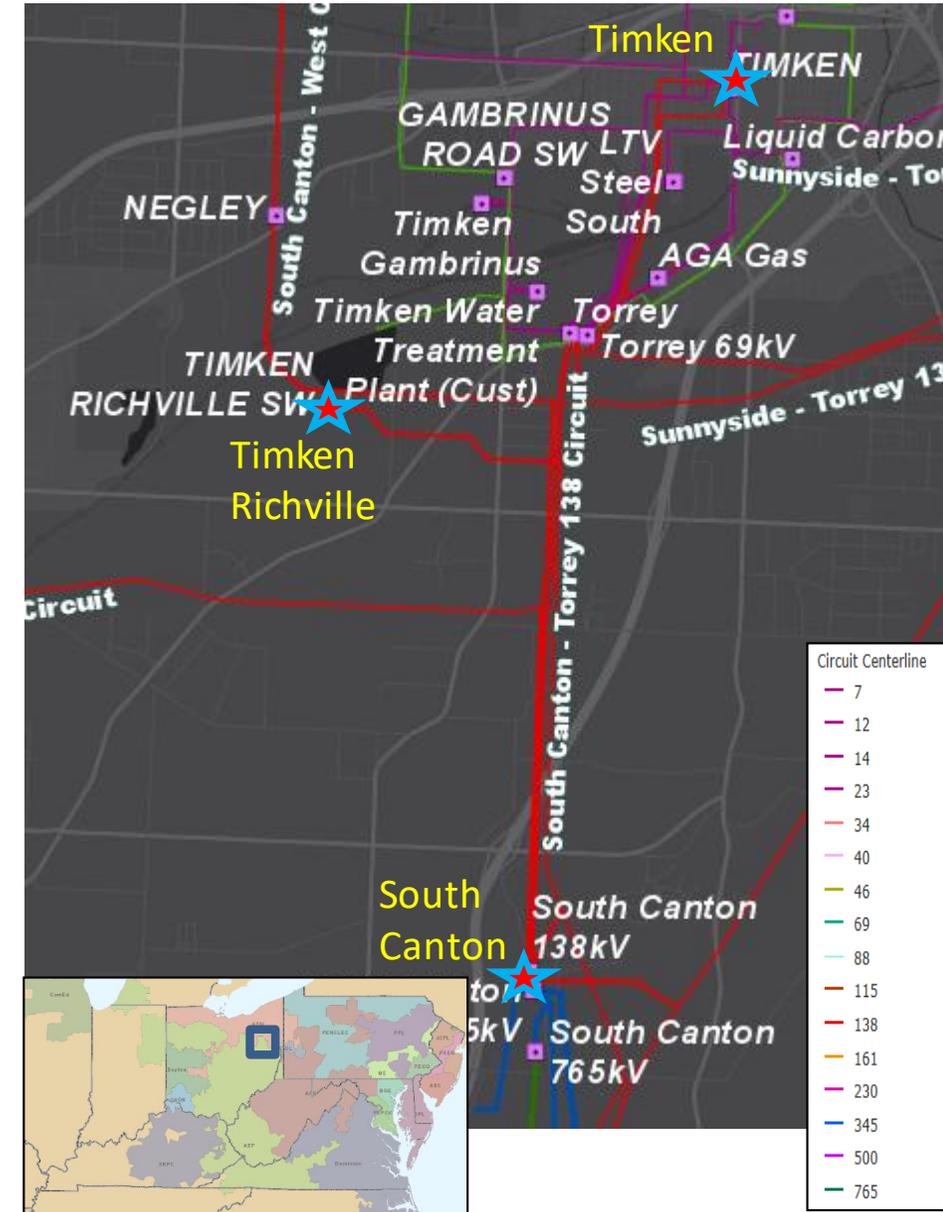
- **Timken Richville 138kV Station**

- Peak customer load is 150 MW; steel mill with an arc furnace.
- Outage history: the customer has experienced 2 prolonged outages over the past 5 years. Any interruption to service is disruptive and costly for this facility.
- The customer's sensitive equipment includes a continuous caster, electric arc furnace, and refining furnaces. If there is a loss of power it could lead to the customer having to dump the molten steel and risks the steel solidifying in the equipment. These events would be very detrimental to the company's long-term business operations.

Operational Flexibility & Efficiency:

- **Timken Richville 138kV Station**

- The station contains 2- 138kV lines and 2- 138kV customer feeds with only a single 138kV bus-tie breaker. A fault on either of the 138kV lines or bus will take out up to 75 MW of load for a single event (1/2 of peak load).
- A fault on either 138kV circuit requires tripping one of the customer's 138kV breakers to clear the fault. If the customer's equipment were to fail to clear a line fault, a single 138kV circuit fault would expand to take out both 138kV circuits connected to Timken Richville, dropping the customer entirely and requiring additional remote-end clearing (at South Canton or Timken station).



AEP Transmission Zone M-3 Process Canton, Ohio

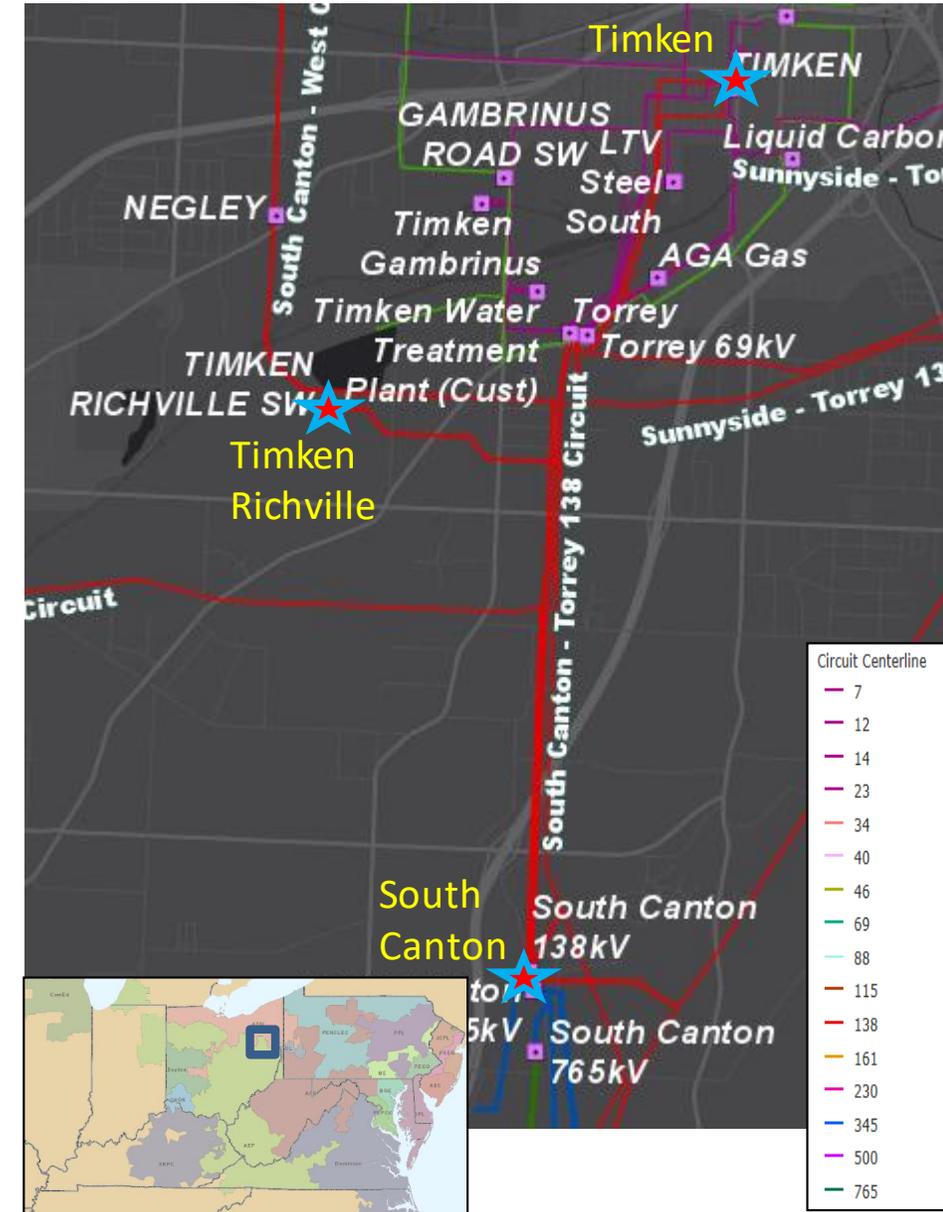
Need Number: AEP-2020-OH019

Process Stage: Need Meeting 05/22/2020

Equipment Material Condition, Performance and Risk:

- **Timken Richville 138kV Station**

- The station was constructed in 1985 and 32 of the 34 protective relays in the station are electromechanical (with 2 static relays). Electromechanical relays lack vendor support, don't have SCADA, and lack fault data collection.
- The line protection to Timken and to South Canton consists of an outdated pilot wire scheme that is increasingly prone to failure.
- The RTU is a legacy model that is no longer supported by the manufacturer.
- AC station service comes from the customer's substation, which is a reliability concern.
- The control house ceiling is made of an asbestos-cement product (transite).
- There is no fence separating AEP's substation from the customer's substation, which is a physical security risk.
- The metering PT's and CT's show signs of heavy rusting.



Need Number: AEP-2020-OH030

Process Stage: Need Meeting 05/22/2020

Supplemental Project Driver:

Customer Service and Operational Flexibility

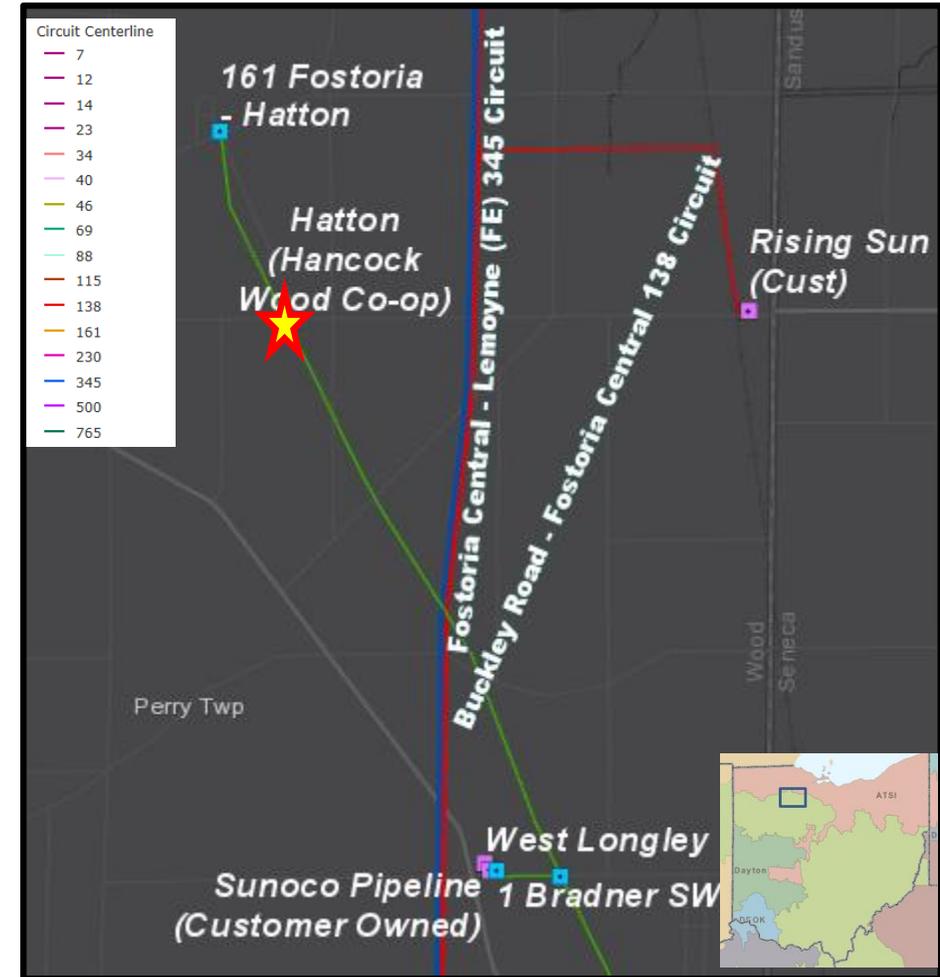
Specific Assumption Reference:

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

Problem Statement:

- Hancock-Wood Co-op has requested a new service to replace their existing Hatton Delivery Point. Hatton delivery point is currently served via a hard tap from the Pemberville (FE) – West End Fostoria (AEP) 69kV circuit. The new customer station is being built to adjacent to their existing substation. The hard tap limits operational capabilities for this circuit. It is difficult to coordinate maintenance efforts because any work on the section from Longley Switch to Pemberville (FE) involves outage to the Hatton Delivery Point.
- Load is approximately 2.26 MVA
- CMI: There were no unplanned outages, but there were six scheduled and one monetary outages that affected the customer, in the last 5 years.

Model: 2024 RTEP



Need Number: AEP-2020-OH032

Process Stage: Need Meeting 5/22/2020

Project Driver:

Equipment/Material/Condition/Performance/Risk

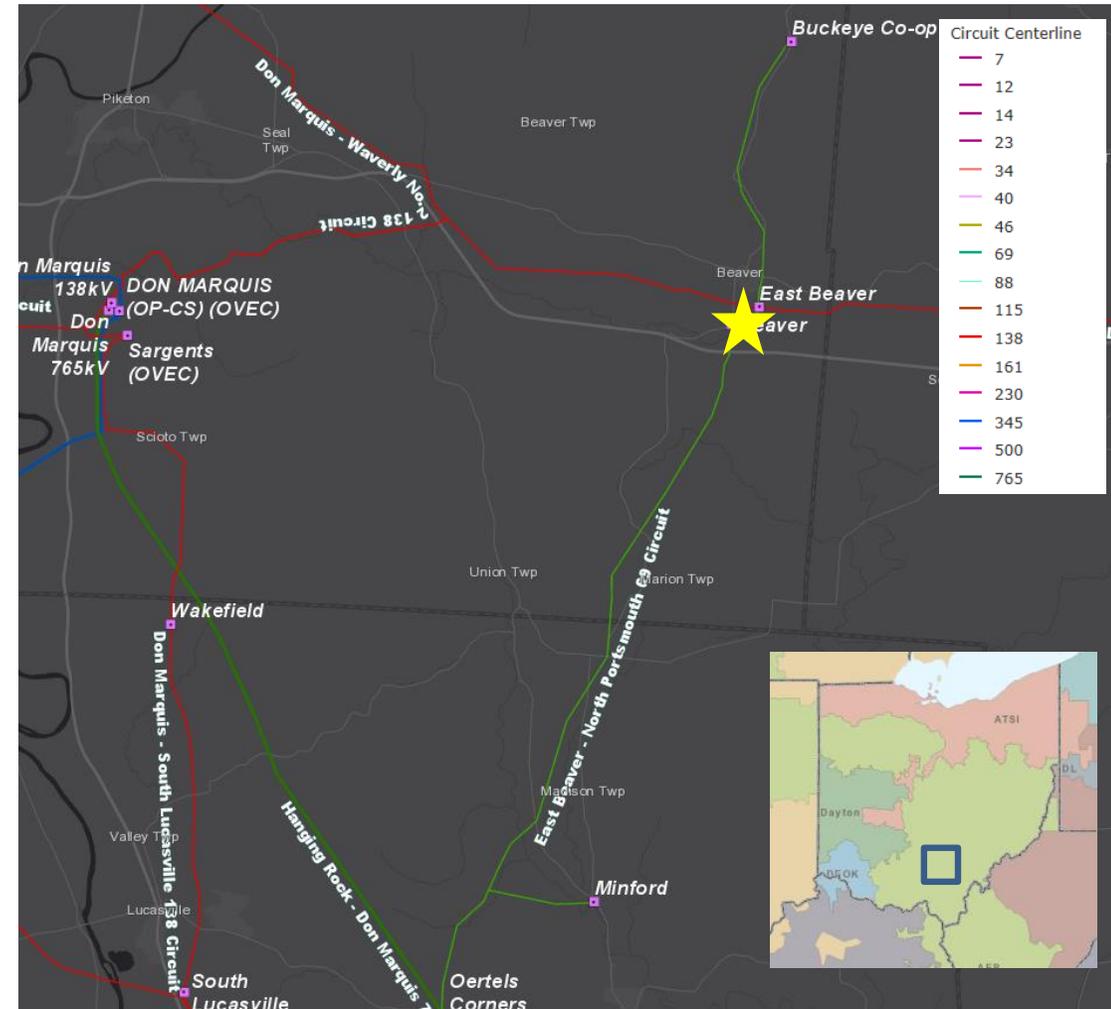
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

East Beaver 138/69 kV Transformer #1:

- The 138/69 kV 56/72 MVA (vintage 1962) at East Beaver has failed. There is no spare on site to utilize as a replacement.



AEP Transmission Zone M-3 Process Columbus, OH

Need Number: AEP-2020-OH033

Process Stage: Need Meeting 5/22/2020

Project Driver:

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

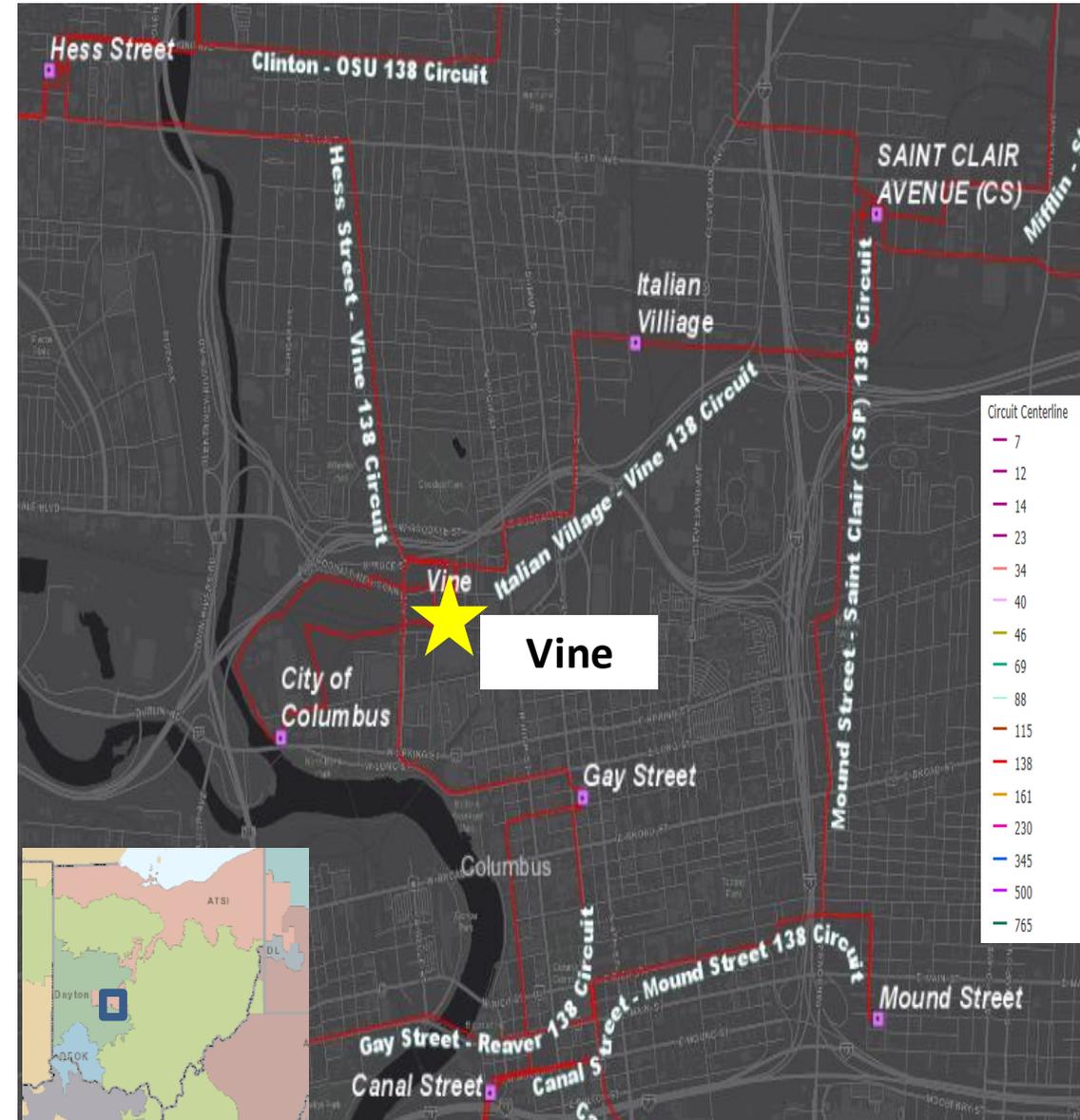
Specific Assumption Reference:

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

Problem Statement:

Vine Station

- Vine station is located in the heart of the downtown Columbus Arena District. The downtown area of Columbus has experienced a significant level of growth and development over the last decade. Projects such as the recently announced MLS Crew stadium indicates continued growth for the foreseeable future. The footprint of the existing station is extremely small, which creates issues when performing routine maintenance, severely limits the ability to replace major equipment, and often results in extended outages due to clearance issues. These space constraints also limit the ability to expand the station to accommodate future load growth. A mobile cannot fit inside the station; any mobile installs require placing it in the street and constructing temporary facilities to connect it.
- Circuit Breakers 101, 102, 103, 104, 106, 107
 - 138 kV 2000A 40kA* oil type breakers (*CB 107 is a 50kA)
 - Install date ranging from 1974 -1977 (43-46 years old)
 - Oil breakers that are difficult to maintain due to the required oil handling requirements. There is an increased potential for oil spills during routine maintenance and failures with these types of breakers.
 - Other needs include damage to bushings, lack of spare part availability, and lack of vendor support of the breakers.
- Capacitor Switcher EE
 - 138 kV Mark V type switcher
 - MARK V models have a history of malfunctioning and has presented AEP with a large # of failures and mis-operations including catastrophic equipment failures involving failure to trip.



AEP Transmission Zone M-3 Process Columbus, OH

Need Number: AEP-2020-OH033

Process Stage: Need Meeting 5/22/2020

Project Driver:

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

Specific Assumption Reference:

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

Problem Statement:

Gay – Vine 138 kV Underground Circuit*

- The existing Gay – Vine 138 kV underground circuit is approximately 1.4 miles long and was originally installed in the 1960's.

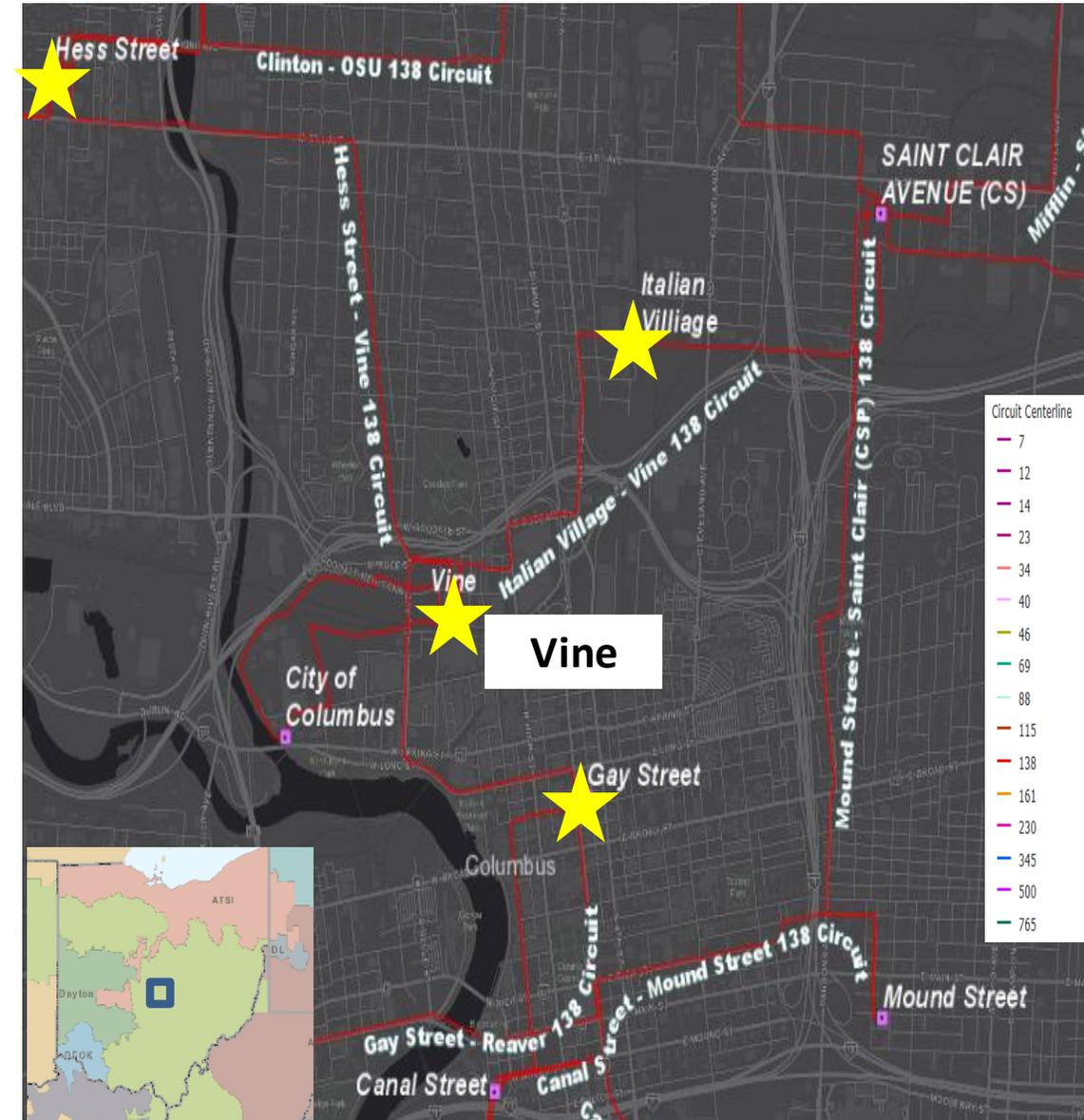
Hess – Vine 138 kV Underground Circuit*

- The existing Hess – Vine 138 kV underground circuit is approximately 2.5 miles long and was originally installed in the 1980's.

Italian Village – Vine 138 kV Underground Circuit*

- The existing Italian Village – Vine 138 kV underground circuit is approximately 1.3 miles long and was originally installed in the 1990's.

*All of these circuits utilize an underground oil-filled pipe type cable design. Oil-filled pipe type underground cables come with several challenges/risks in densely populated urban areas. There is a single manufacturer of oil-filled cables which has informed AEP of its desire to discontinue this product due to lack of demand and cheaper available alternates such as XLPE. A failure of any section may result in weeks of outage to customers in downtown Columbus.



AEP Transmission Zone M-3 Process Wood County, Ohio

Need Number: AEP-2020-OH031

Process Stage: Need Meeting 05/22/2020

Supplemental Project Driver:

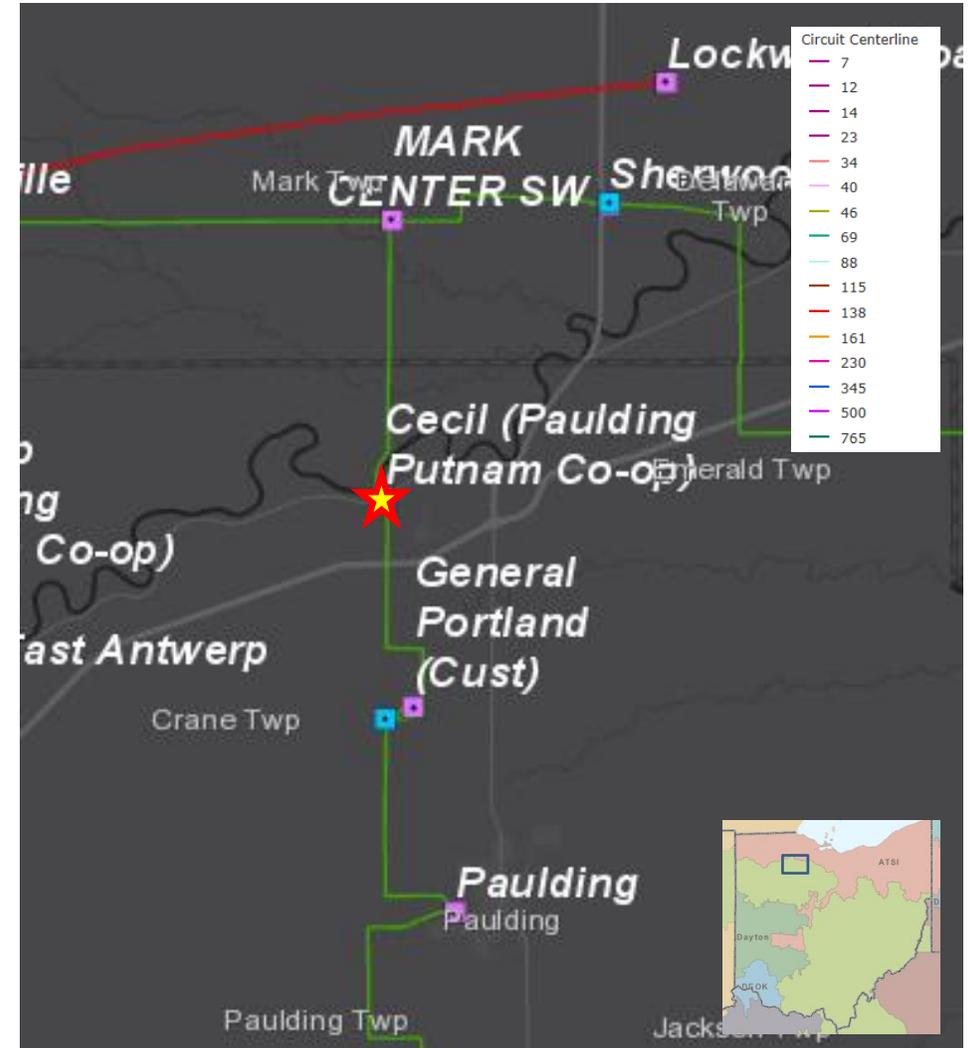
Customer Service and Operational Flexibility

Specific Assumption Reference:

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

Problem Statement:

- Paulding – Putnam Electric Co-op is replacing their 3.75 MVA transformer with a 12/16/20 MVA transformer, which requires some changes to their delivery point. This delivery point is served by the North Cecil switch on the Mark Center – Paulding 69 kV circuit. North Cecil has no auto-sectionalizing capability.
- Load: The Co-op delivery point serves approximately 4.9 MW
- CMI: In the last 5 years, there were 6 unscheduled outages affecting the customer, 3 of which were momentary and 3 were permanent outages. The 5-year CMI experienced by this customer is 170,520.
- **Model:** 2024 RTEP



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 Walhonding

Need Number: AEP-2018-OH035

Process Stage: Solutions Meeting 05/22/2020

Previously Presented:

Need Meeting 10/26/2018

Project Driver:

Customer Service

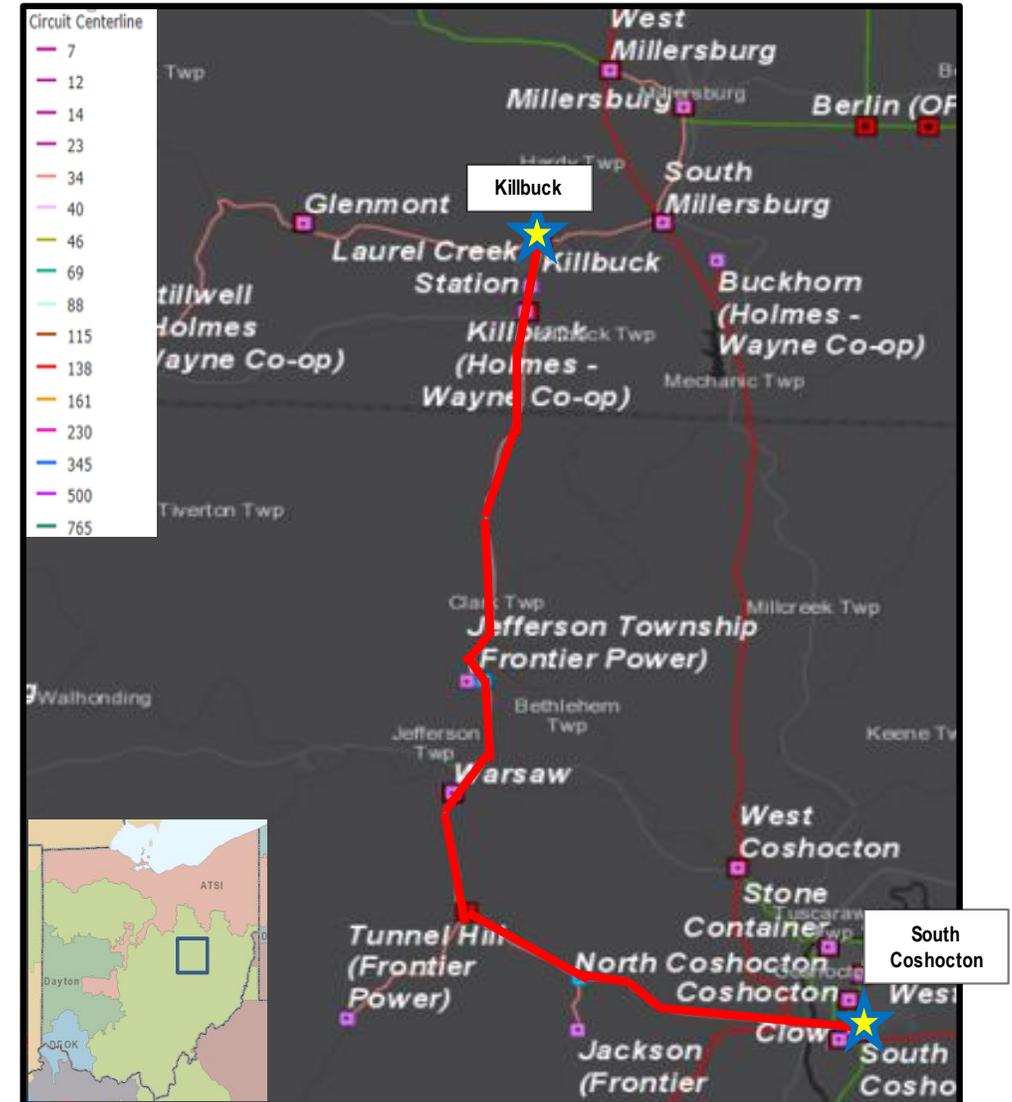
Specific Assumption Reference:

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

Problem Statement:

A recent customer service request of 2.5 MW has been made
on the Killbuck – South Coshocton 34.5 kV circuit.

Model: 2024 RTEP



Need Number: AEP-2018-OH035

Process Stage: Solutions Meeting 05/22/2020

Proposed Solution:

Walhonding Switch and the Walhonding Extension will be built at 69 kV design but will operate at 34.5 kV until project S2149 is in service, at which time it will operate at 69 kV.

- Install approximately 1 mile of double circuit line to tie the greenfield Walhonding Switch to the Killbuck – South Coshocton 34.5kV circuit. **Estimated Cost: \$3.2M**
- Install approximately 0.01 mile radial line extension, connecting Marathon’s station to Walhonding switch. **Estimated Cost: \$0.1M**
- Install a new 3-way 69 kV 1200A switch with Auto-Sectionalizing, MOABs, and SCADA to serve the new customer. **Estimated Cost: \$1.0M**

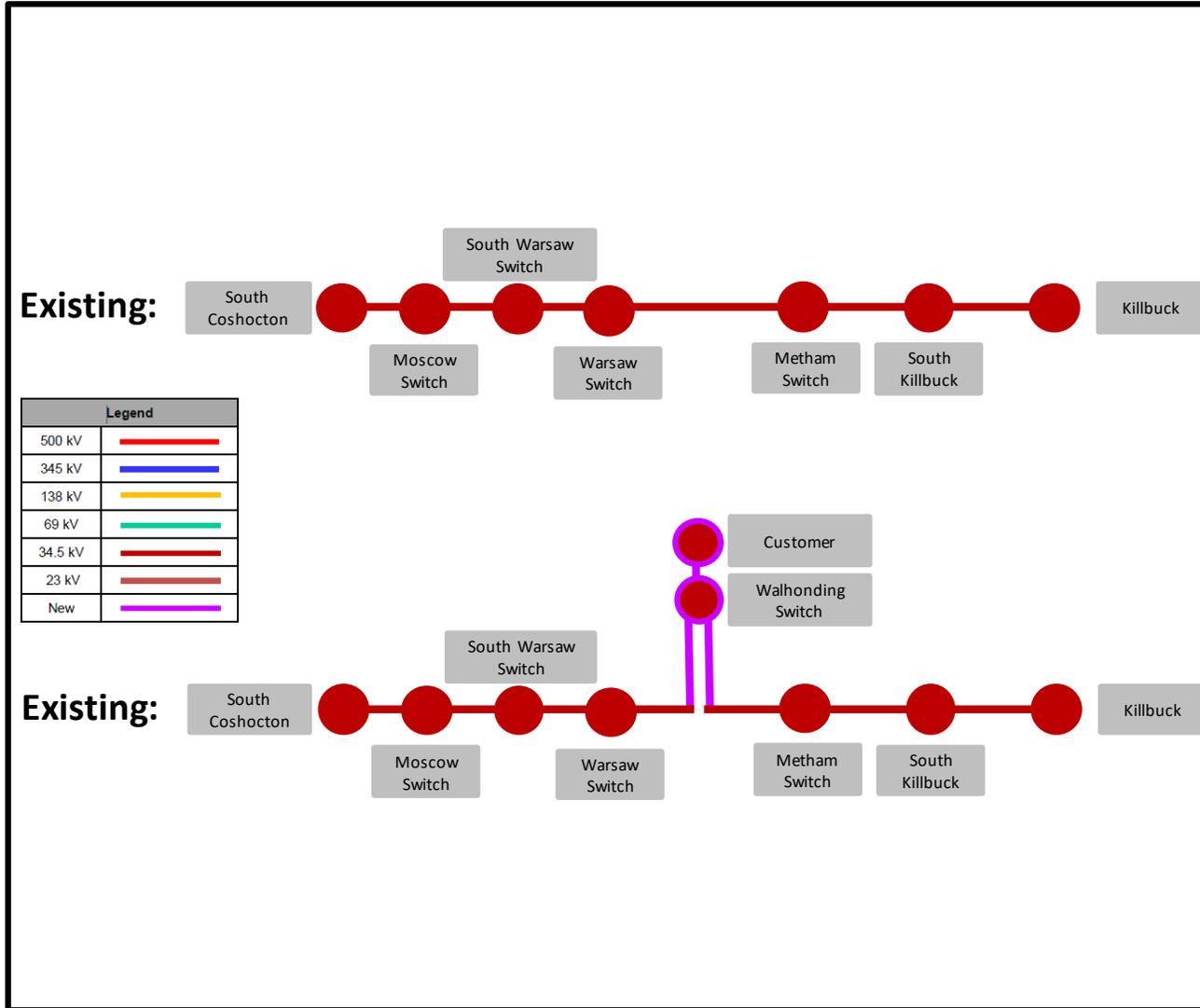
Total Estimated Transmission Cost: \$4.3M

Alternatives Considered:

- Consideration was also given to installing the Walhonding switch closer to the existing Killbuck – South Coshocton 34.5 kV circuit. The alternative would still require constructing a mile of single circuit line to tie Walhonding Switch to the Marathon station. In addition, we would be required to maintain a mile access road to the switch resulting in no significant cost savings over the proposed solution.

Projected In-Service: 04/01/2021

Project Status: Engineering



AEP Transmission Zone M-3 Process Millbrook Park-South Point Rebuild

Need Number: AEP-2019-OH025

Process Stage: Solutions Meeting 05/22/2020

Previously Presented: Needs Meeting 05/20/2019

Supplemental Project Driver: Equipment/Material/Performance/Risk

Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8), Presentation on pre-1930s lines

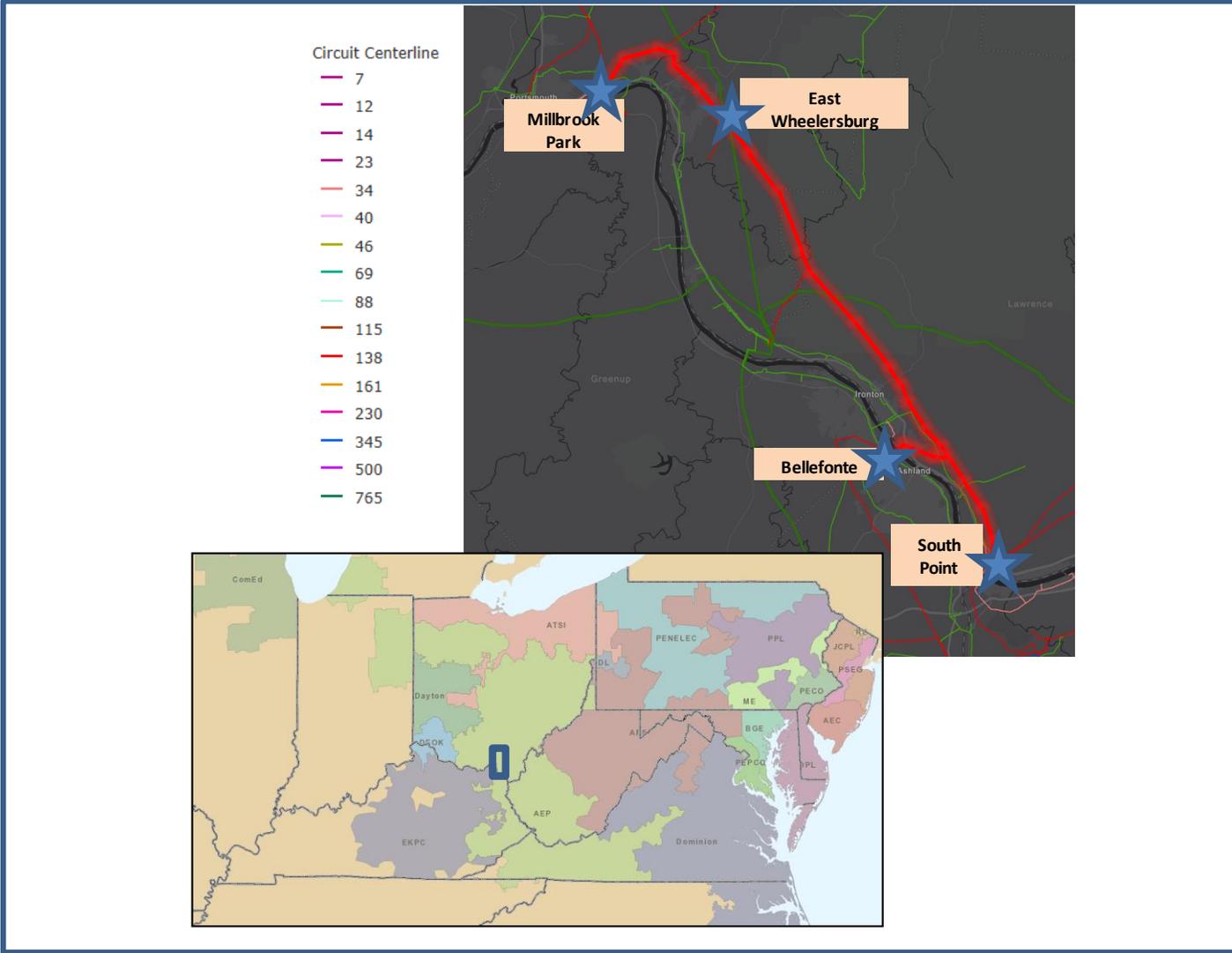
Problem Statement:

- The South Point – Portsmouth 138 kV double circuit is 34.7 miles and the Bellefonte 138 kV Extension is 4 miles in length.
- The conductor is primarily 397.5 ACSR (167 MVA).
- The South Point-Portsmouth line was originally constructed in 1929, with the majority of the structures and conductor being original.
- There are 45 open conditions on the line, including conductor issues, burnt/broken insulators, and loose/broken conductor hardware.
- Insulators of this vintage have shown heightened failure rates.

In general, several issues impact 1920 lattice tower lines:

- The steel conductor attachment plates have significant wear resulting in a loss of 50% of its strength.
- The cross arm hanger tension members are single mode of failure elements that are deteriorated and undersized due to the original design criteria.
- Lattice towers of this vintage do not meet current design requirements for wind and ice loading.
- Foundations are undersized for modern wind loading.
- Towers are beginning to show corrosion.

Model: N/A



AEP Transmission Zone M-3 Process Millbrook Park-South Point Rebuild

Need Number: AEP-2019-OH025

Process Stage: Solutions Meeting 05/22/2020

Proposed Solution:

Rebuild the 35-miles of the South Point- Portsmouth double circuit 138 kV line between Millbrook Park – South Point; with 795 ACSR (257MVA) or equivalent conductor. **Estimated Cost: \$128.0M**

Rebuild the 3.8-miles of the Bellefonte Extension Line from the South Point – Portsmouth line to Bellefonte; with 795 ACSR (257MVA) or equivalent conductor. **Estimated Cost: \$20.1M**

Remote end work at South Point station. **Estimated Cost: \$0.6M**

Total Estimated Transmission Cost: \$148.7M

Alternatives Considered:

Rebuild the Millbrook Park – South Point 138 kV corridor as single circuit by retiring the existing Millbrook Park – South Point 138 kV circuit and rebuilding the Millbrook Park – Bellefonte – North Proctorville 138 kV circuits.

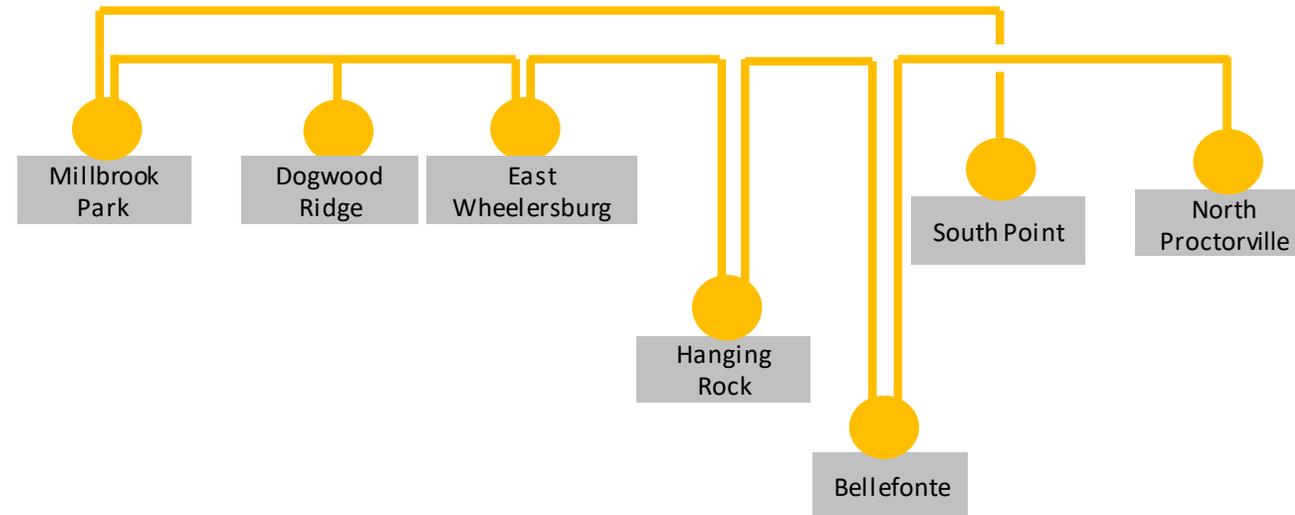
The area that the line traverses consistently receives a significant amount of large load inquiries due to its proximity to the Ohio River and railways. Reducing the corridor to a single circuit would greatly diminish the ability to support new load in the area due to the existing connections to the area’s 69 kV system. Flexibility in how to address the area’s existing 69 kV system in the future would also be greatly limited.

Estimated Alternative Transmission Cost: \$138.7M

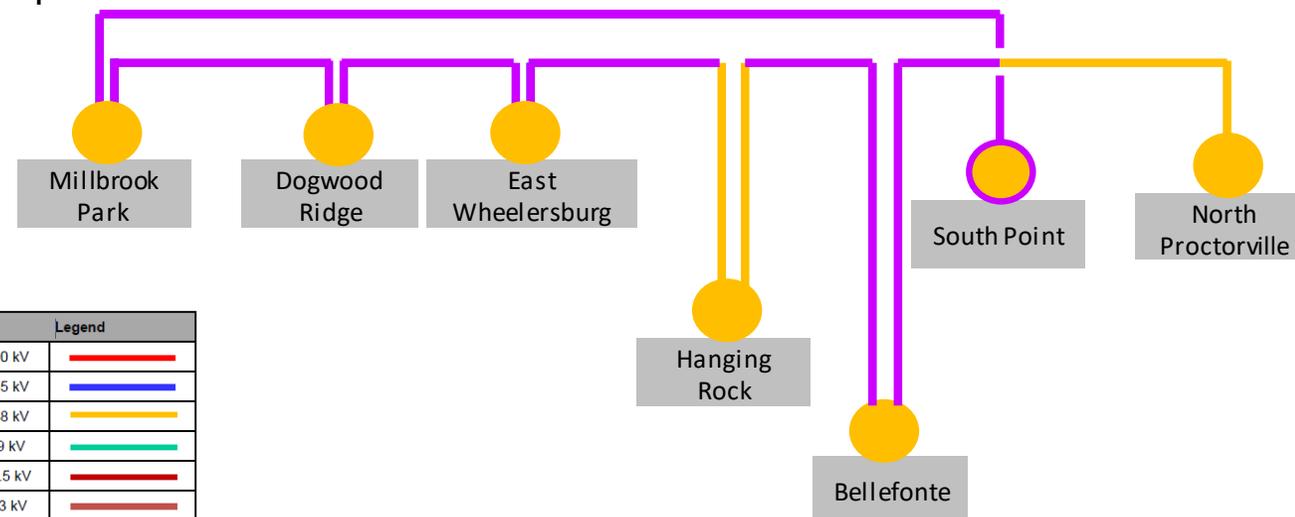
Projected In-Service: 12/15/2025

Project Status: Scoping

Existing:



Proposed:



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

AEP Transmission Zone M-3 Process Winchester Area Improvements Supplemental

Need Number: AEP-2020-IM004

Process Stage: Solutions Meeting 05/22/2020

Previously Presented: Needs Meeting 02/21/2020

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

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

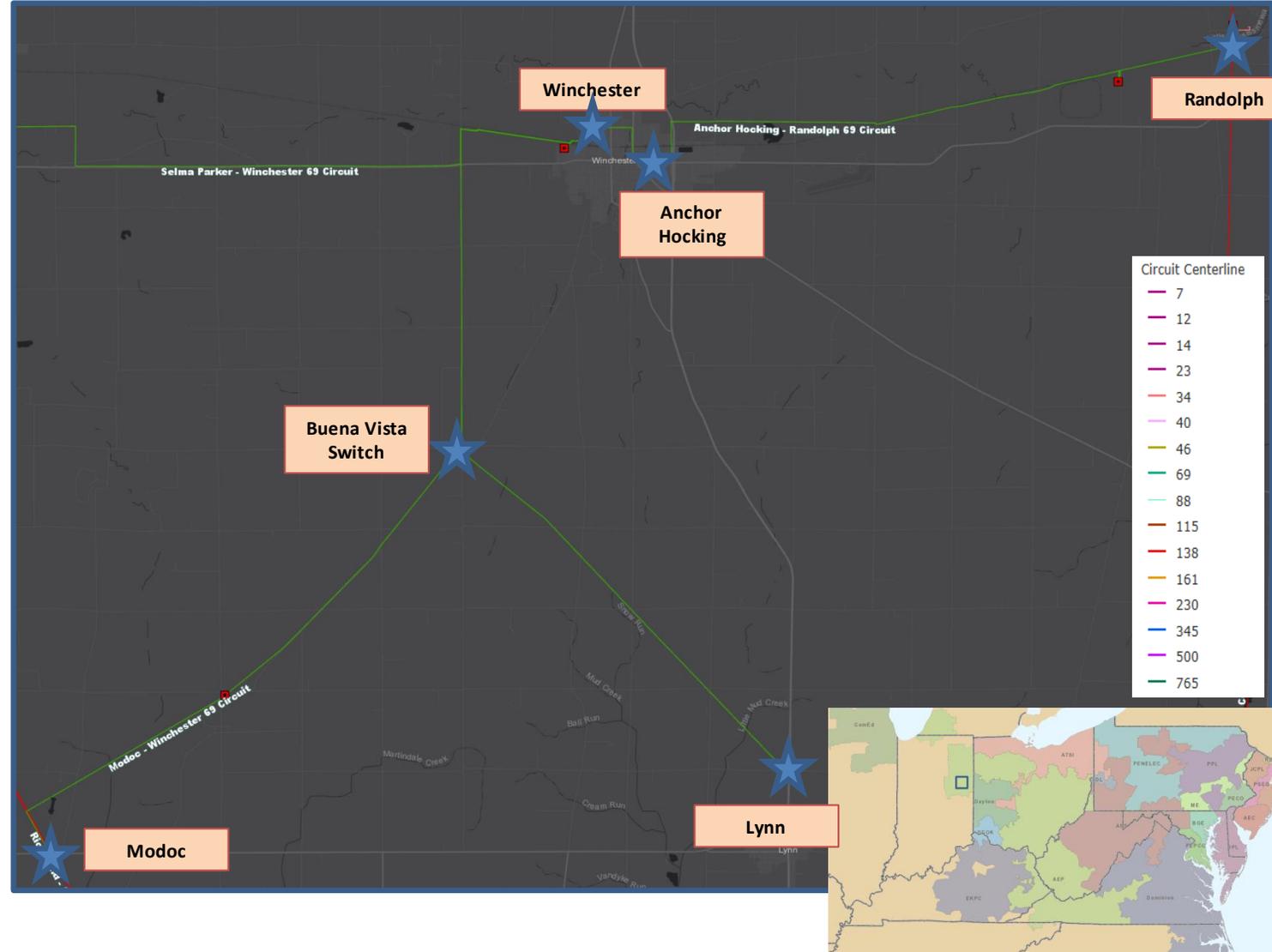
Problem Statement:

Anchor Hocking – Winchester 69kV Line (~1.25 Miles)

- 1968 vintage wood pole, crossarm construction
- There are currently 12 open conditions on this line (11 structures with at least one open condition or 25% of the line).
- Open conditions include: Damaged pole, worn shield wires, stolen ground lead wires, and damaged jumpers.

Anchor Hocking 69kV station

- Breaker B 69kV
 - 1972 vintage oil filled, CF-type breaker. This type is oil filled without oil containment. Oil filled breakers have much more maintenance required due to oil handling that their modern, vacuum counterparts do not require. Finding spare parts for these units not possible as these models are no longer vendor supported



AEP Transmission Zone M-3 Process Winchester Area Improvements Supplemental

Need Number: AEP-2020-IM004

Process Stage: Solutions Meeting 05/22/2020

Previously Presented: Needs Meeting 02/21/2020

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

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

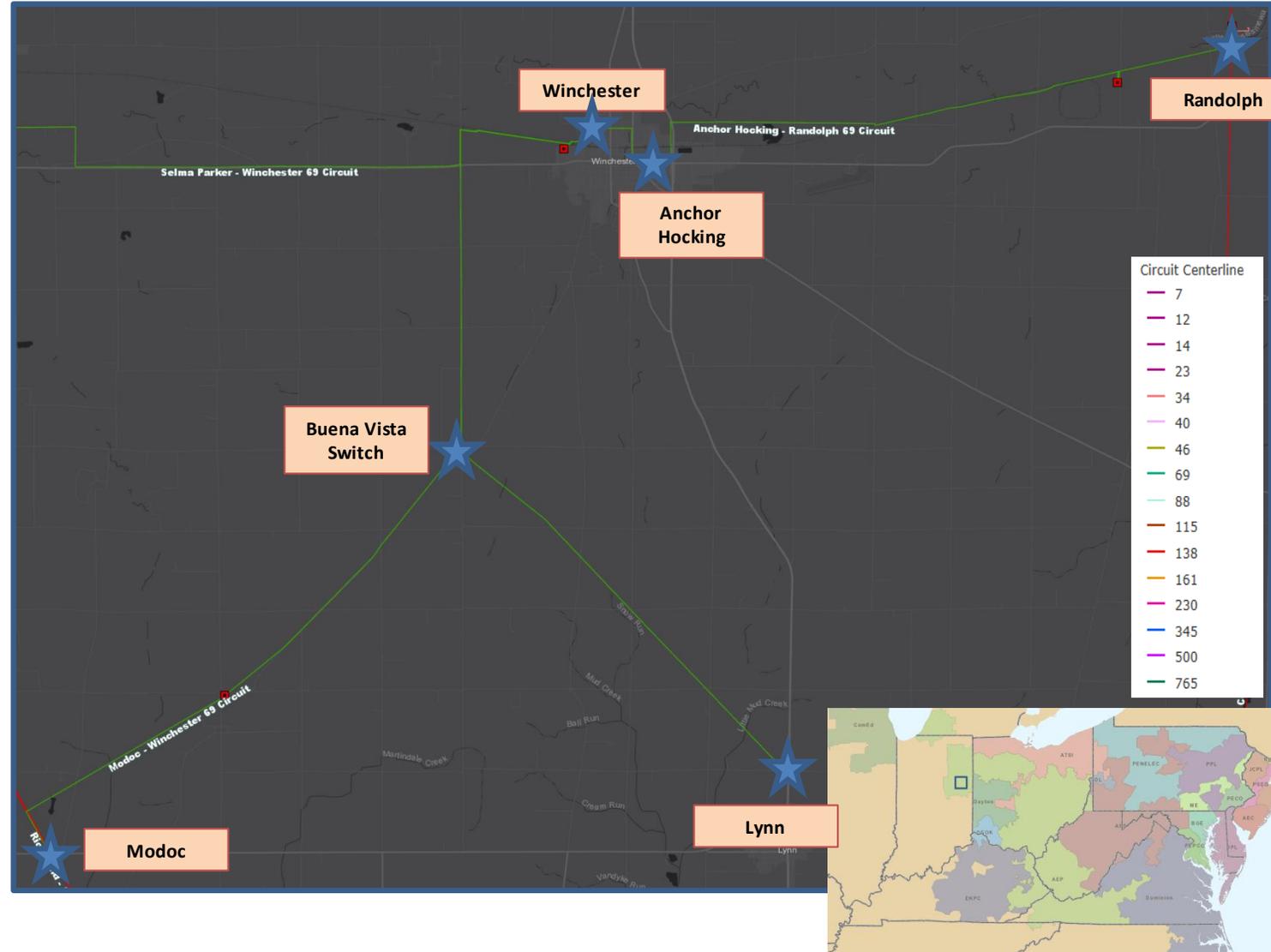
Problem Statement:

Winchester 69kV station

- Breakers A and B 69kV
 - 1971 vintage oil filled, CF-type breaker. This type is oil filled without oil containment. Oil filled breakers have much more maintenance required due to oil handling that modern, vacuum counterparts do not require. Finding spare parts for these units not possible as these models are no longer vendor supported. Also, oil spills can result in significant cost to mitigate

Modoc 138/69/12kV station

- 138/69kV Transformer #1
 - 1965 vintage
 - Elevated moisture levels
 - Decrease in interfacial tension of the oil, reducing its insulating capabilities
 - Unit is showing signs of leaking



AEP Transmission Zone M-3 Process Winchester Area Improvements Supplemental

Need Number: AEP-2020-IM004

Process Stage: Solutions Meeting 05/22/2020

Previously Presented: Needs Meeting 02/21/2020

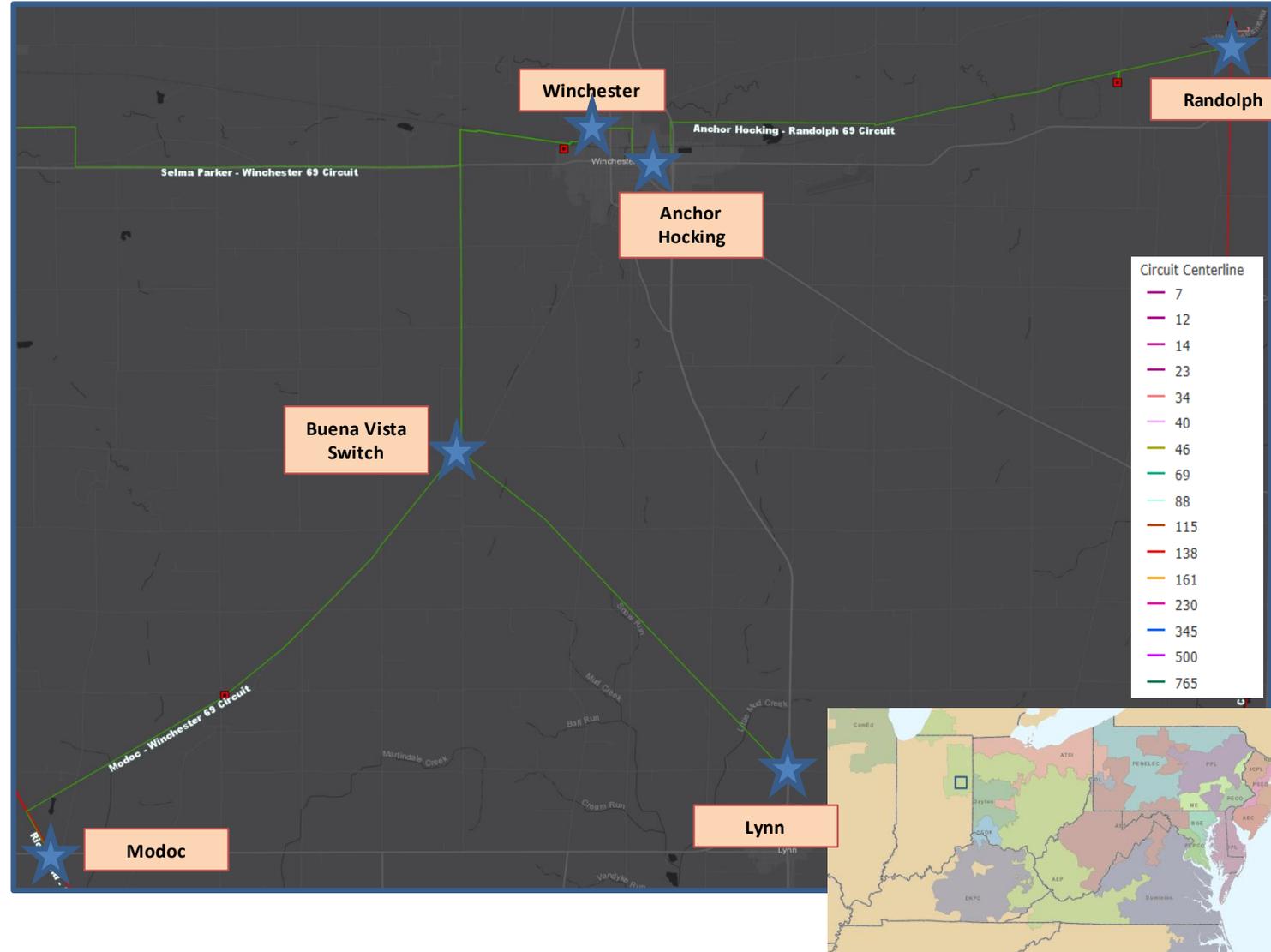
Supplemental Project Driver: Equipment
Material/Condition/Performance/Risk

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

Problem Statement:

Randolph 138/69kV station

- 138/69/12 kV Transformer #1
 - 1970 vintage
 - Elevated carbon dioxide levels
 - Increased levels of decomposition of the paper insulating materials, leading to increased risk of failure
- Switcher V 138kV
 - Mark V S&C Electric type switcher
 - Failed operational components including high contact resistance, gas loss, and interrupter failure represent half of these malfunctions.
 - This model has no gas monitor and a history of malfunction
- Cap Switcher AA
 - 2030-69 S&C Electric type switcher.
 - This model has no gas monitor and a history of malfunction.
 - This particular switcher has exceeded the recommended number of switched operations with 5497 (5000 recommended)



AEP Transmission Zone M-3 Process Winchester Area Improvements Supplemental

Need Number: AEP-2020-IM004

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Previously Presented: Needs Meeting 02/21/2020

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

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

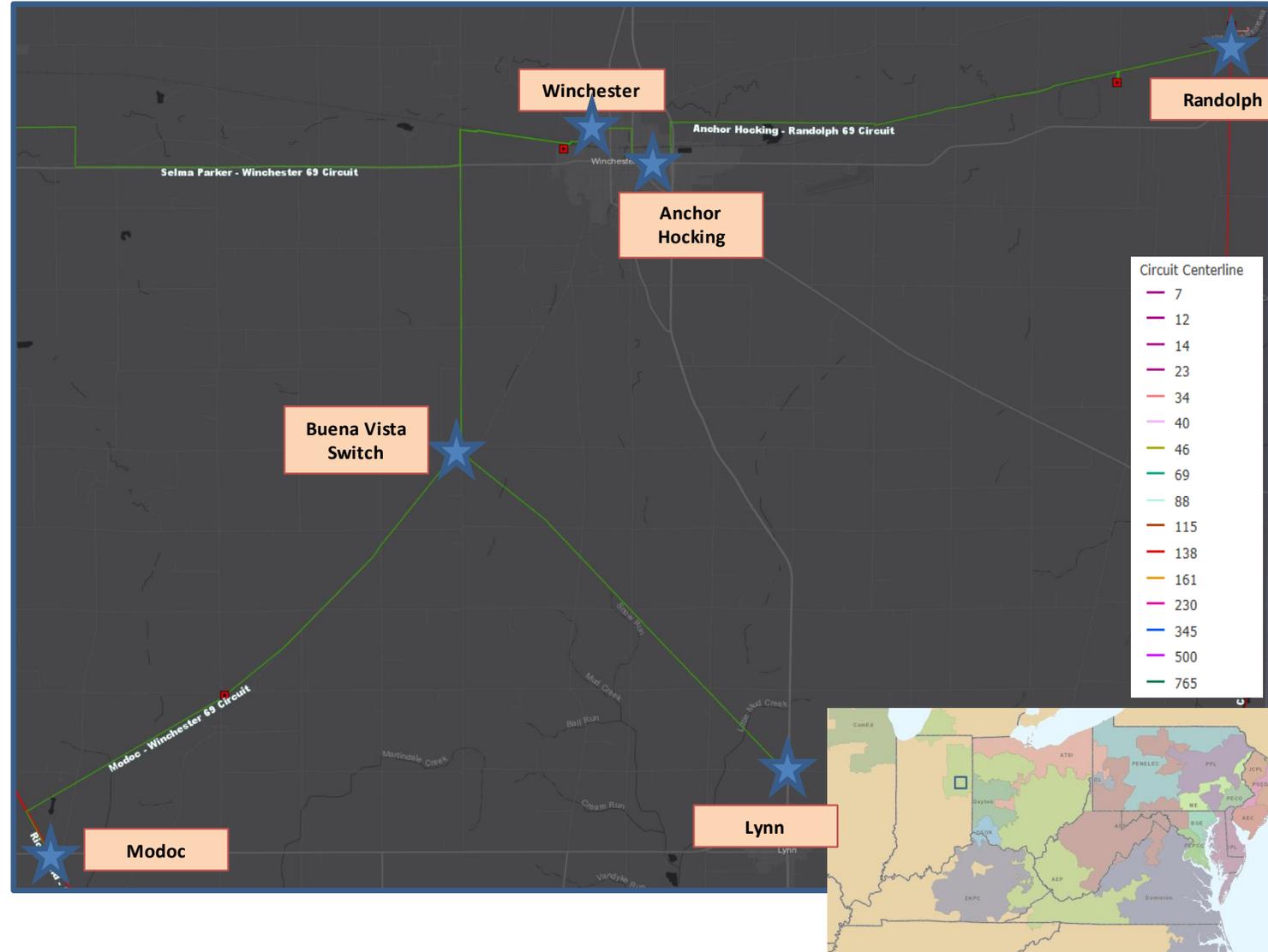
Problem Statement:

Modoc – Winchester 69kV Line (~13.4 Miles)

- 1967 vintage wood pole, horizontal insulator line
- There are currently 69 open conditions on this line (63 structures with at least one open condition or 26% of the line).
- Open conditions include: Damaged poles, damaged braces, broken guy wires, and damaged insulators.

Buena Vista – Lynn 69kV Line (~5.7 Miles)

- 1967 vintage wood pole, horizontal insulator line
- There are currently 31 open conditions on this line (28 structures with at least one open condition or 38% of the line).
- Open conditions include: Damaged poles, damaged shield wires, broken ground lead wires, and damaged insulators.



AEP Transmission Zone M-3 Process Winchester Area Improvements Supplemental

Need Number: AEP-2020-IM004

Process Stage: Solutions Meeting 05/22/2020

Previously Presented: Needs Meeting 02/21/2020

Supplemental Project Driver: Operational Flexibility

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

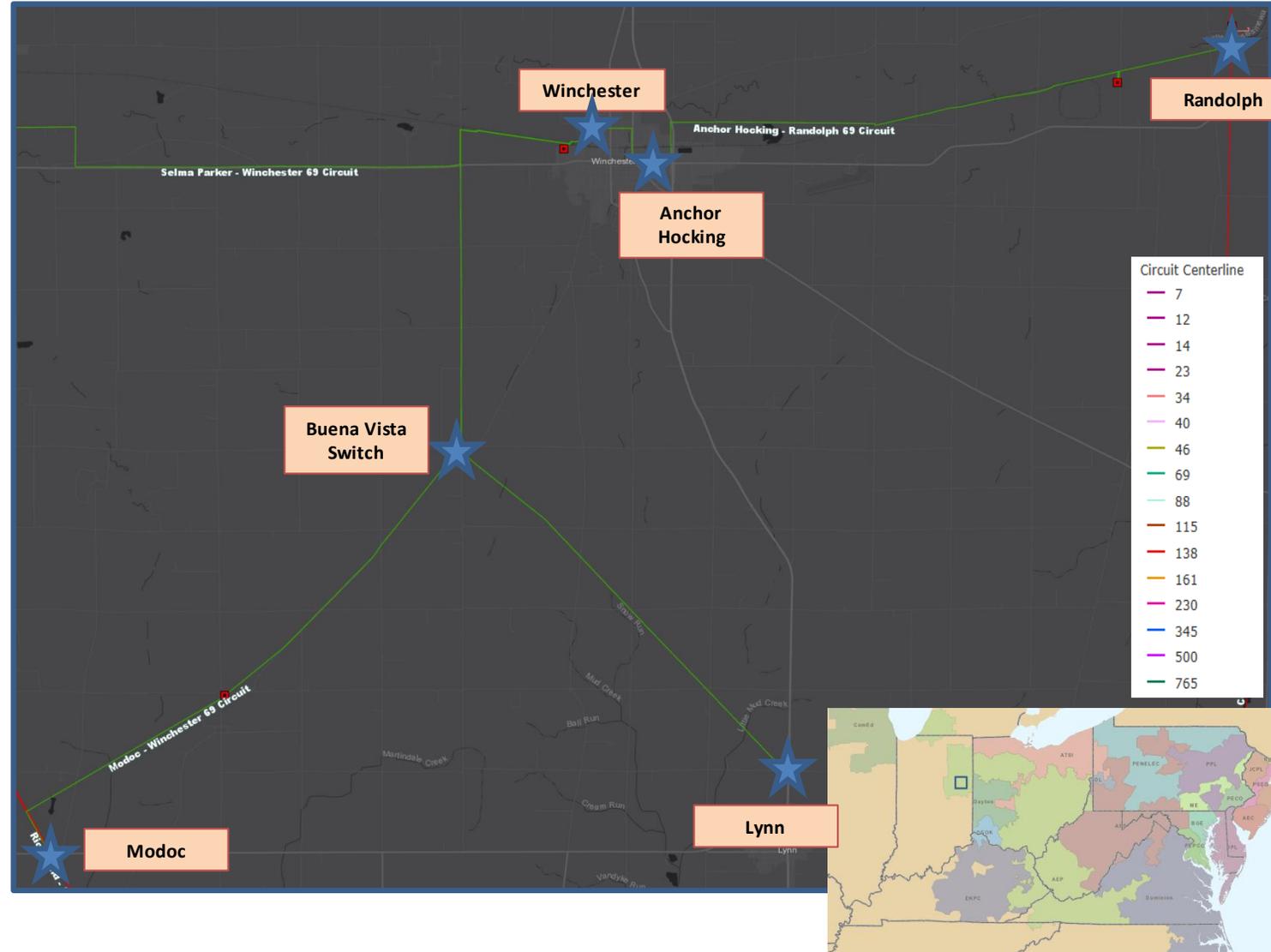
Problem Statement:

Lynn 69/12kV station

- Radial circuit serving 7MW peak load to REMC and the distribution network for the city of Lynn.

Modoc 138/69/12kV station

- Modoc is a 3 terminal line off of the Desoto – College Corner 138kV circuit with high speed ground switch protection on the transformer



AEP Transmission Zone M-3 Process Winchester Area Improvements Supplemental

Need Number: AEP-2020-IM004
Process Stage: Solutions Meeting 05/22/2020

Proposed Solution:

Rebuild the 1.25 mile long Anchor Hocking-Winchester 69 kV circuit. **Estimated Cost: \$5.9M**

Expand and upgrade Anchor Hocking station to a 5 breaker ring bus to accommodate 5 elements (2 transmission lines and 3 distribution transformers). **Estimated Cost: \$6.7M**

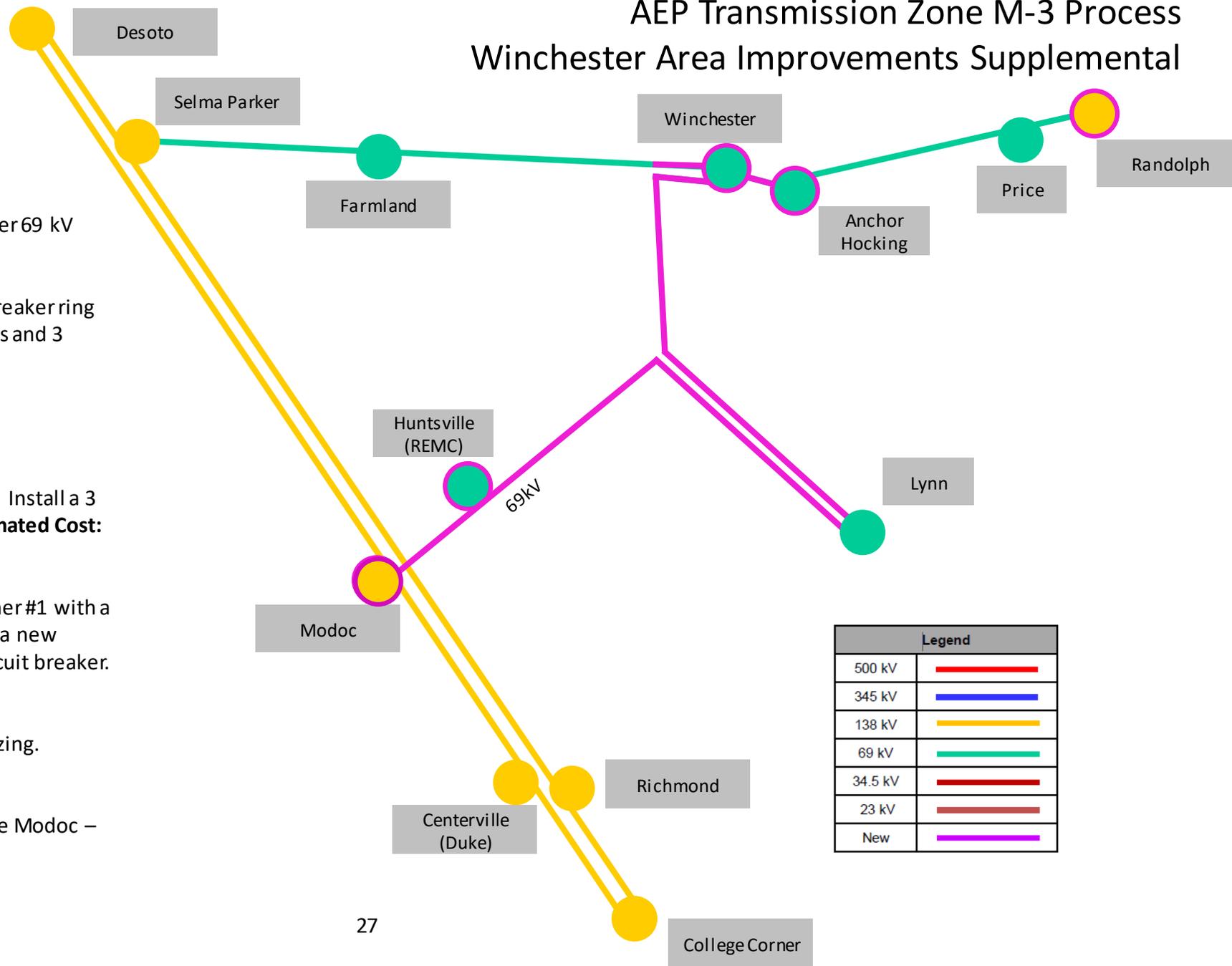
Replace circuit breakers A & B at Winchester station. **Estimated Cost: \$3.0M**

At Modoc station, replace 138/69kV Transformer #1. Install a 3 breaker ring bus eliminating the 3 terminal line. **Estimated Cost: \$11.8M**

At Randolph station, replace 138/69/12 kV Transformer #1 with a 138/69kV 90MVA unit, move the distribution load to a new 138/12kV transformer, and install a 138kV bus tie circuit breaker. Replace cap switcher AA. **Estimated Cost: \$6.8M**

At Lynn station, install 2 69kV switches for sectionalizing. **Estimated Cost: \$0.8M**

Replace the Huntsville (REMC) switch structure on the Modoc – Winchester 69kv line. **Estimated Cost: \$0.6M**



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

AEP Transmission Zone M-3 Process Winchester Area Improvements Supplemental

Need Number: AEP-2020-IM004
Process Stage: Solutions Meeting 05/22/2020

Proposed Solution (con't):

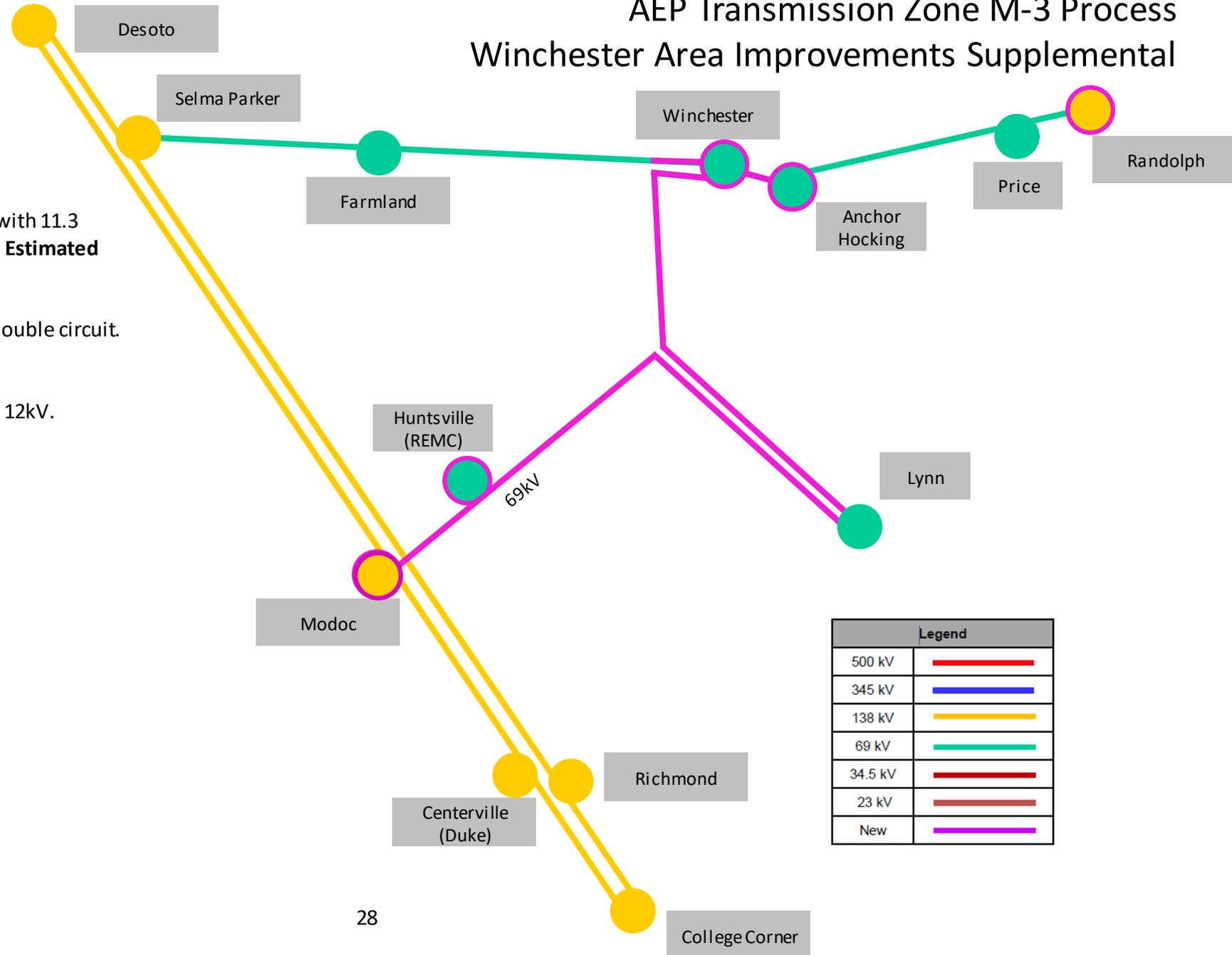
Rebuild the 13.4 mile Modoc-Winchester 69 kV line with 11.3 miles as single circuit and 2.1 miles as double circuit. **Estimated Cost: \$22.8M**

Rebuild the 5.7 mile Buena Vista-Lynn 69 kV line as double circuit. **Estimated Cost: \$9.9M**

Retire Lobdell station. Moved the load from 69kV to 12kV. **Estimated Cost: \$0.0M**

Retire Buena Vista Switch. **Estimated Cost: \$0.2M**

Total Estimated Transmission Cost: \$68.5M



Need Number: AEP-2020-IM005

Process Stage: Solutions Meeting 05/22/2020

Proposed Solution:

Rebuild a 4.17 mile portion of the Madison – Pendleton 138kV single circuit line with DRAKE 795 ACSR 26/7. **Estimated Cost: \$7.7M**

At Meadowbrook station, install 2 138kV circuit breakers to eliminate the 3 terminal line. **Estimated Cost: \$2.8M**

Total Estimated Transmission Cost: \$10.5M

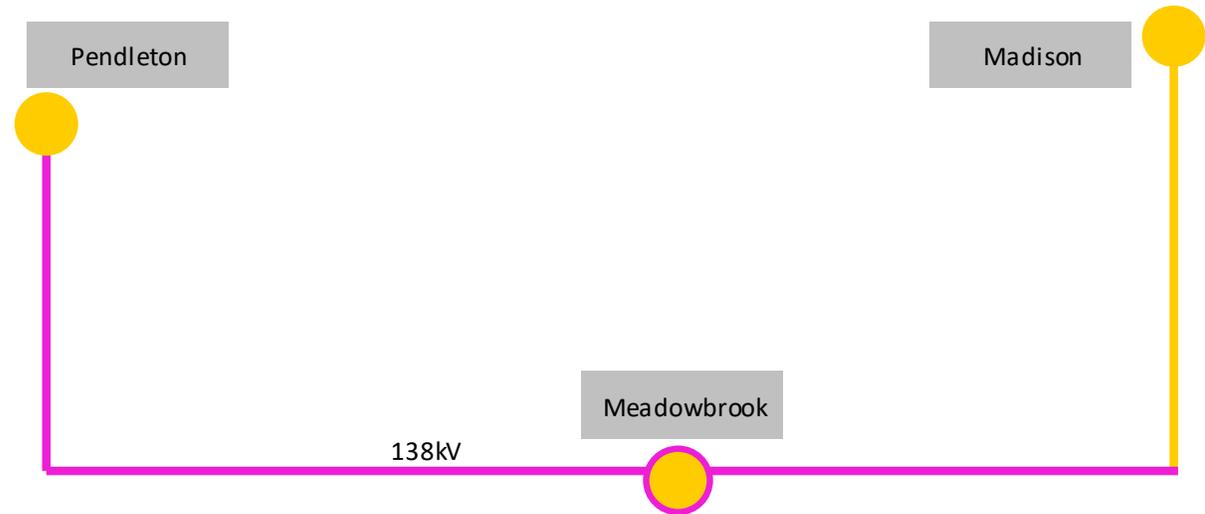
Alternatives Considered:

Due to the location of Meadowbrook Station, a new line route wouldn't be prudent, nor is retirement an option. Madison, Pendleton, and Meadowbrook serve as three delivery points feeding the IMPA system.

Projected In-Service: 05/01/2023

Project Status: Scoping

AEP Transmission Zone M-3 Process Madison-Pendleton 138kV Line Rebuild



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

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

5/12/2020 – V1 – Original version posted to pjm.com

5/15/2020 – V2 – Slide #16, update problem statement