

Western Sub Regional RTEP: AEP Supplemental Projects

February 17, 2023

Changes to the Existing Supplemental Projects

AEP Transmission Zone: Supplemental Project S2098 Changes

S2098: Need number AEP-2019-IM006, Need Meeting 2/20/2019, Solution Meeting 10/25/2019, posted to 2019 AEP local plan

Reason for Changes: Hard tapped customer “Universal Tool” removed from transmission system. Basket Switch POP no longer needed

Rebuild 7.35 miles from Butler – ~~Basket Factory Switch~~ Hamilton 69kV with 556 ACSR. **(S2098.1) Estimated Cost: \$14.3M**

Install 1.6 mile long greenfield line on the Hamilton – Muskrat Sw 69kV Section to loop Hamilton and replace roughly 0.8 miles of poles with woodpecker holes on the Hamilton – Muskrat Sw 69kV Section with 556 ACSR. **(S2098.2) Estimated Cost: \$2.9M**

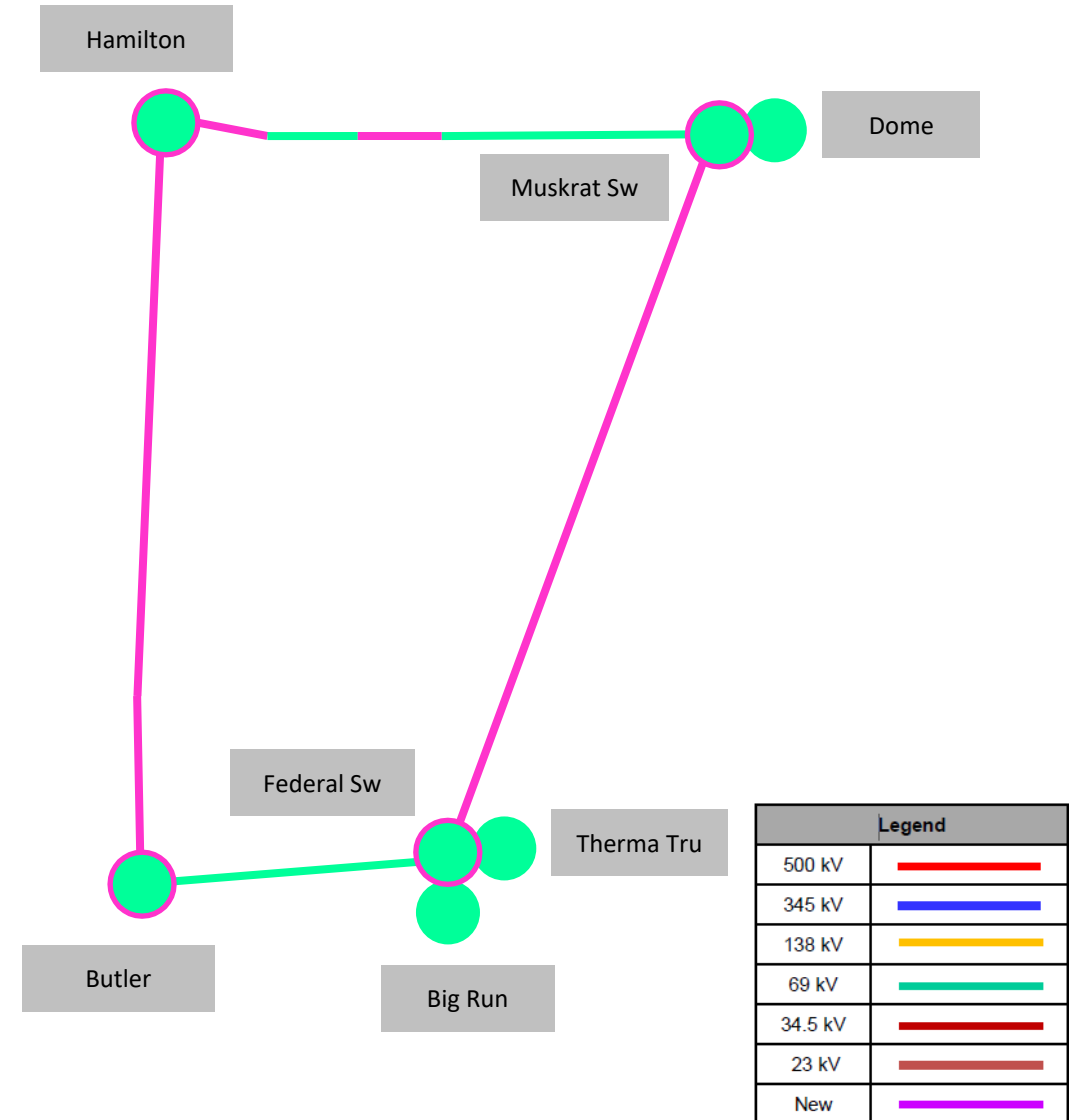
Install 8.37 mile long greenfield line with 556 ACSR from Federal Sw to Muskrat Sw to provide two way service to ~~University Tool~~, Hamilton and Dome Stations. **(S2098.3) Estimated Cost: \$13.0M**

Install a 0.04 mile long greenfield line with 556 ACSR to eliminate the hard tap on the Butler – Hicksville Junction 138kV Line. **(S2098.4) Estimated Cost: \$0.4M**

Relocate the line entrance at Butler Station. **(S2098.5) Estimated Cost: \$0.6M**

At Butler station, install (3) 69kV breakers and (2) Cap Banks to accommodate the line loops. **(S2098.6) Estimated Cost: \$5.5M**

~~Install 69kV phase over phase switch outside Universal Tool called Basket Factory Switch.~~ **(S2098.7) Estimated Cost: \$0.5M**



AEP Transmission Zone: Supplemental Project S2098 Changes

At Hamilton station, install (1) line MOAB and (1) line breaker. (**S2098.8**) **Estimated Cost: \$2.7M**

Install 69kV phase over phase switch outside Dome station called Muskrat Switch. (**S2098.9**) **Estimated Cost: \$0.3M**

Install 69kV phase over phase switch outside Therma Tru called Federal Switch (**S2098.10**) **Estimated Cost: \$0.6M**

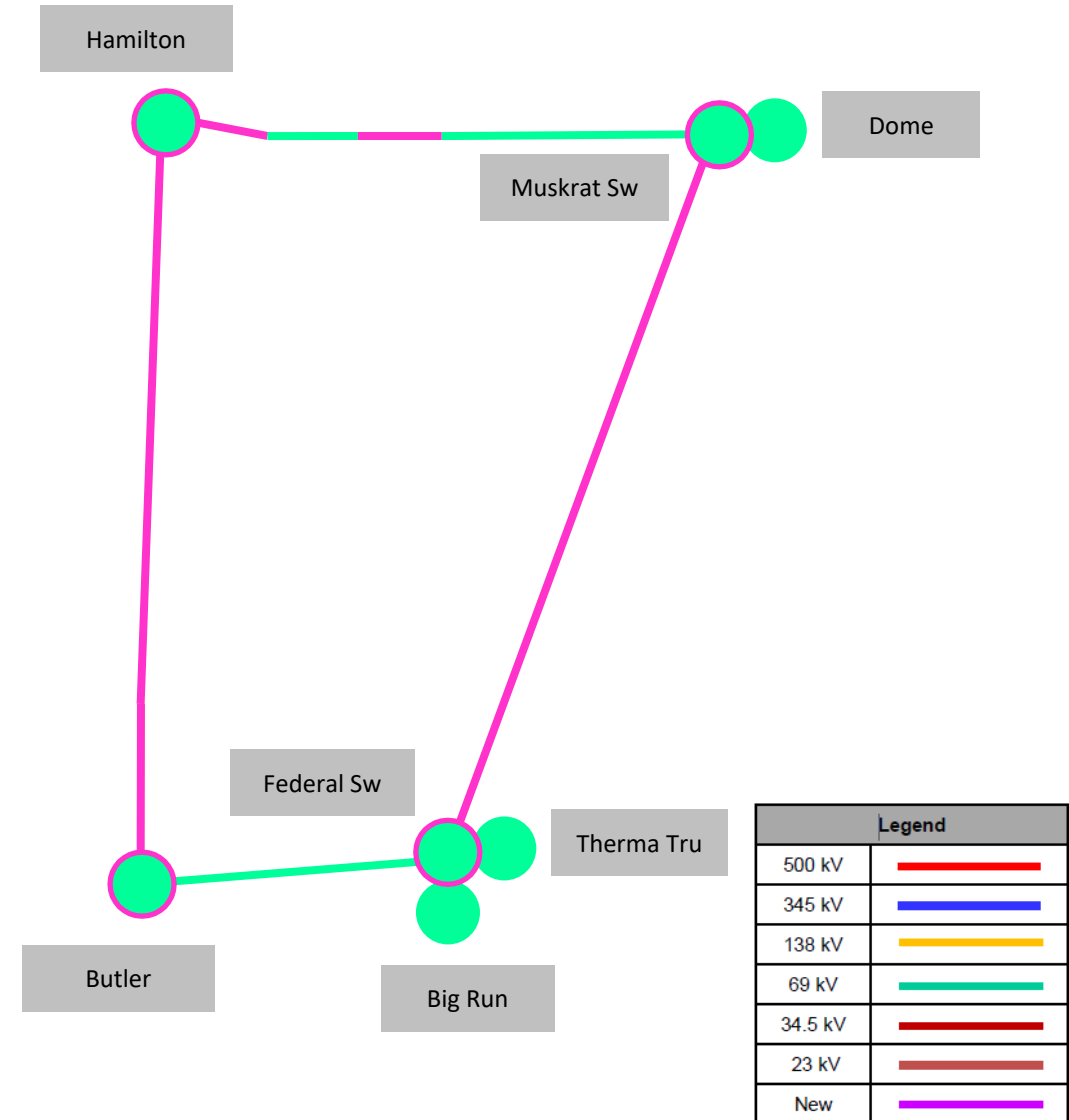
Remove Metcalf tap from the Butler-North Hicksville line and reconnect the through path. (**S2098.11**) **Estimated Cost: \$1.0M**

Remote end relay upgrades at North Hicksville. (**S2098.12**) **Estimated Cost: \$1.0M**

Total Estimated Cost: \$42.12 M ~~\$42.62M~~

Projected In-Service: 1/19/2024

Project Status: Construction



AEP Transmission Zone: Supplemental Project S2401 Changes

S2401: Need Number AEP-2020-OH006, Need Meeting 2/21/2020, Solution Meeting 9/11/2020, Posted to 2021 AEP Local Plan

Reason for Scope Change: During detailed engineering it was determined that the terrain in the area would not allow for sufficient physical space to install the proposed three breaker ring bus configuration without significant amounts of civil improvements that were not initially anticipated. Therefore, the station design has been revised to a two breaker “in and out” configuration.

Note: **s2791** be will removing the 69kV line from Grace to Muskingum 69kV station & installing Patten Mills 69kV Switch & the line to West Watertown 138/69kV Station.

S2401 Scope:

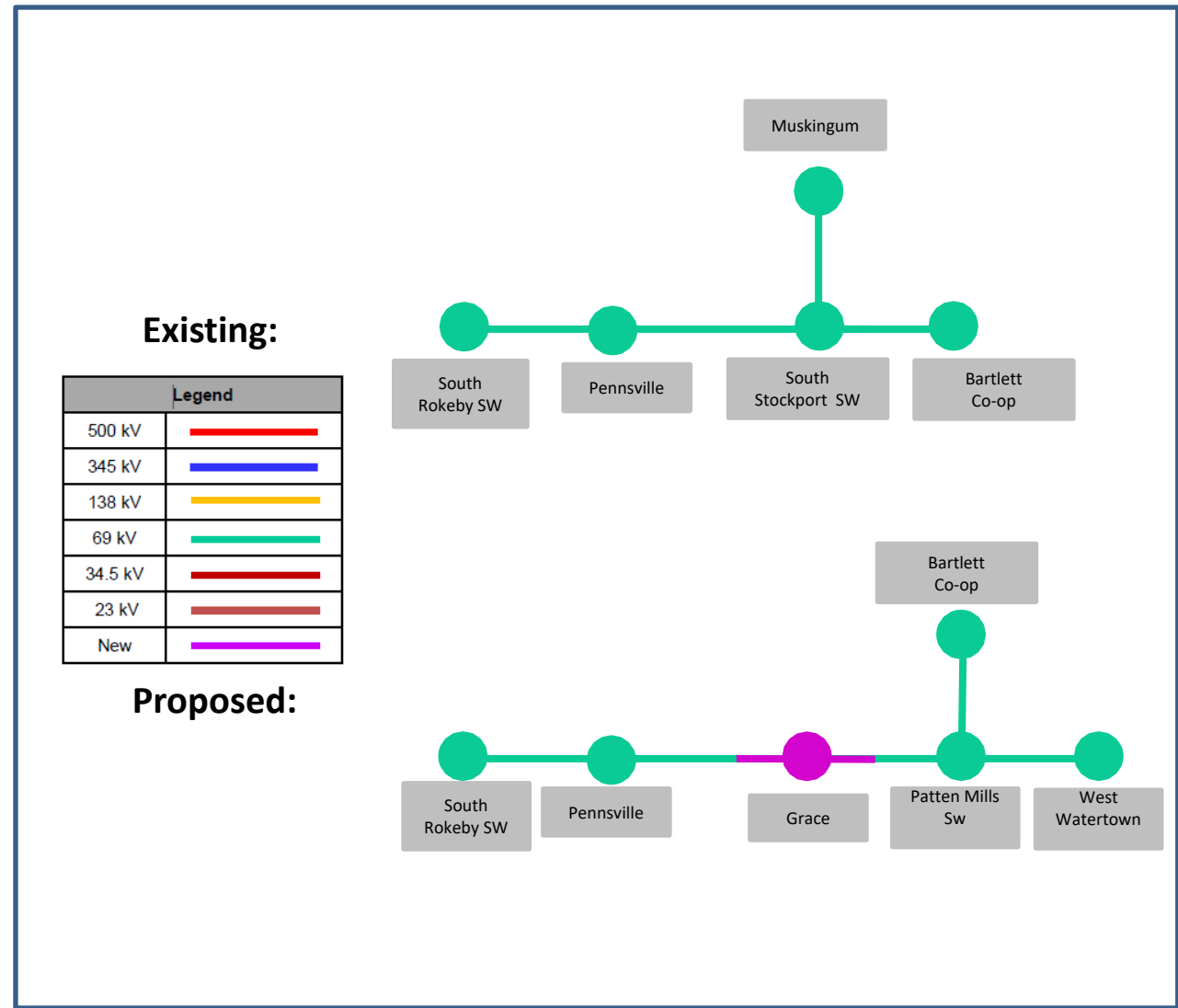
- Install a ~~3—3000A Breaker 69kV ring bus~~ a two breaker (3000A, 40 kA) 69kV straight bus station called Grace along the proposed South Rokeby – West Watertown 69 kV circuit (s2791) to serve the requested delivery point. **(S2401.1) Estimated Cost: \$2.3M \$1.8M**
- Remove the South Stockport Switch. **(S2401.5) Estimated Cost: \$0.07M**
- Install approximately 0.2 miles of 69kV line to tie the greenfield Grace station in-and-out to the Muskingum River – South Rokeby 69kV circuit. **(S2401.2) Estimated Cost: \$2.1M**
- Remove/Relocate approximately 0.05 miles of line on the Muskingum River – South Rokeby 69kV Line asset between structures 75 and 74A to accommodate the cut in to the new station. **(S2401.3) Estimated Cost: \$0.1M**
- Remote end work at South Rokeby Switch. **(S2401.4) Estimated Cost: \$0.9M**

Total Estimated Transmission Cost: \$5.4M \$4.97M

Projected In-Service: ~~5/1/2022~~ 6/12/2024

Project Status: Engineering

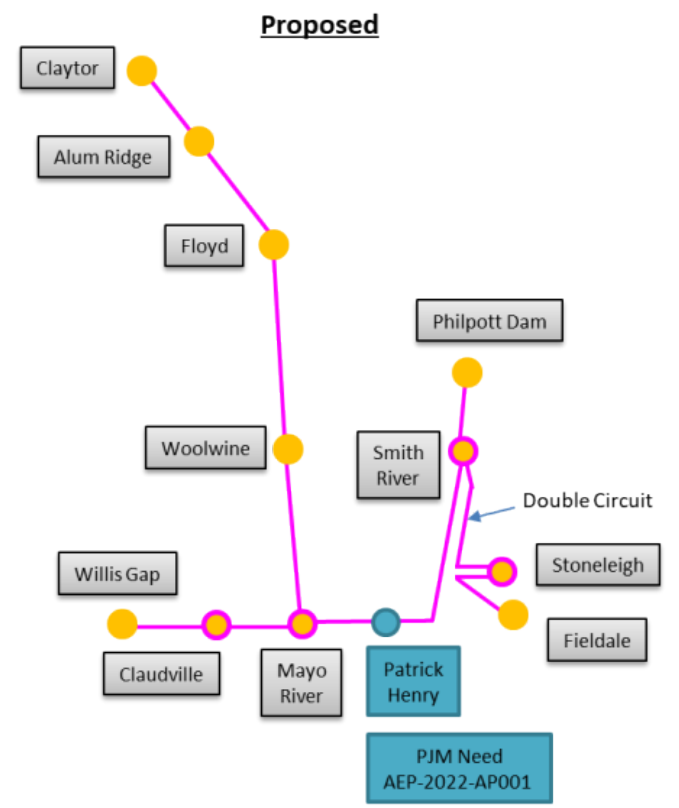
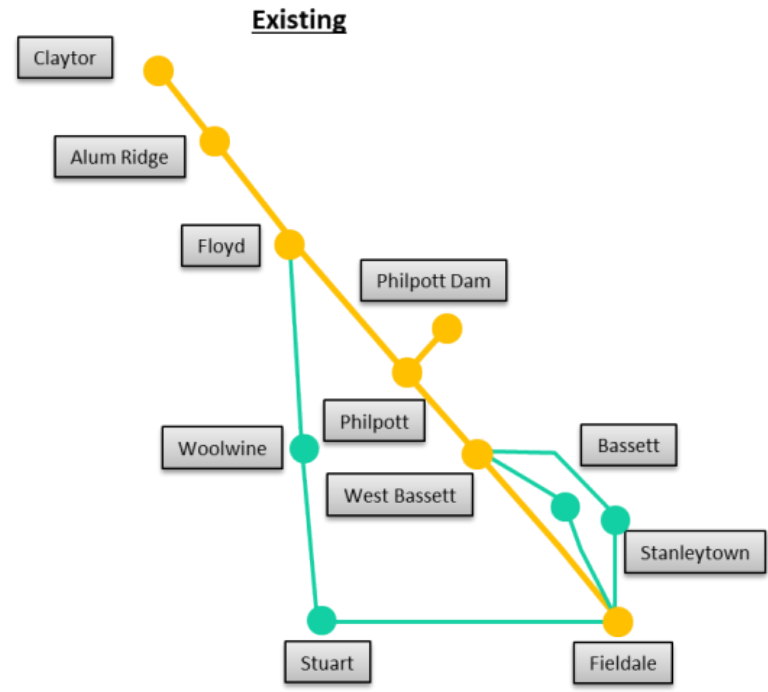
Model: 2024 RTEP



S2179: Need Number(s): AEP-2018-AP016 (Need Meeting 1/11/2019), AEP-2018-AP020 (Need Meeting 1/11/2019), AEP-2019-AP036 (Need Meeting 9/25/2019), AEP-2019-AP037 (Need Meeting 9/25/2019), AEP-2019-AP038 (Need Meeting 9/25/2019), Solutions Meeting 1/17/2020, posted to 2020 AEP Local Plan

Reason For Revision:

- As the Stuart Area Improvements Project has moved through functional and detailed scoping, updates to the scope of work have been made, although the electrical solution has remained the same. The lack of availability of new station property has impacted some of the scope of work. The replacement and conversion of the existing Stanleytown and Bassett substations has evolved into combining the substations into a new Stoneleigh station that will serve the former Stanleytown distribution load and Bassett distribution load will be served from the new Smith River substation. In addition, the former Salem Highway station has been renamed to Mayo River and the former Fairystone station has been renamed to Smith River.

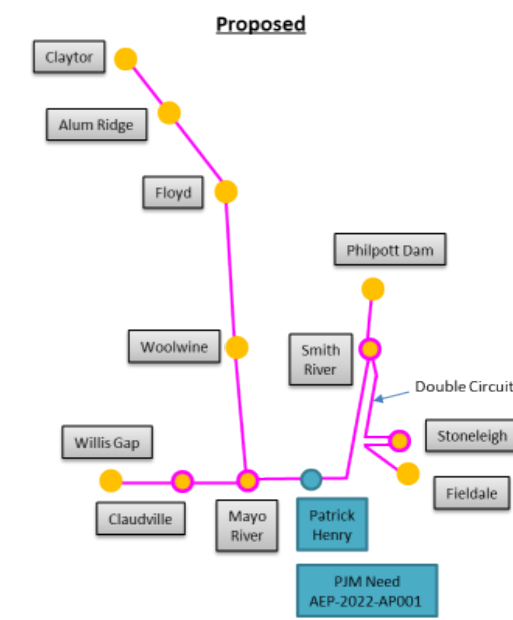
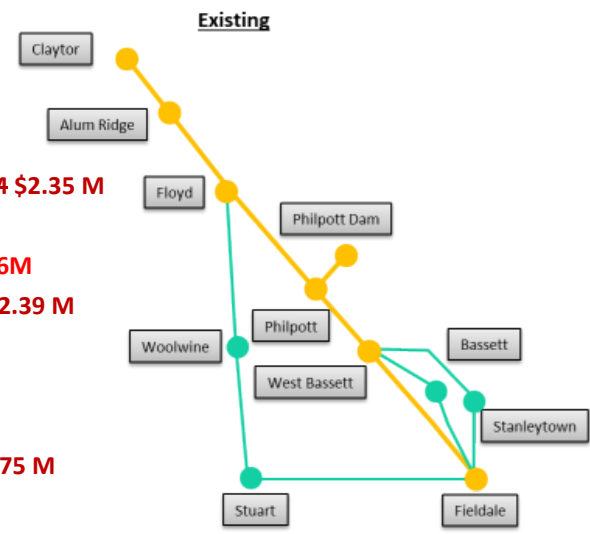


Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

AEP Transmission Zone: Supplemental Project S2179 Changes

Proposed Solution:

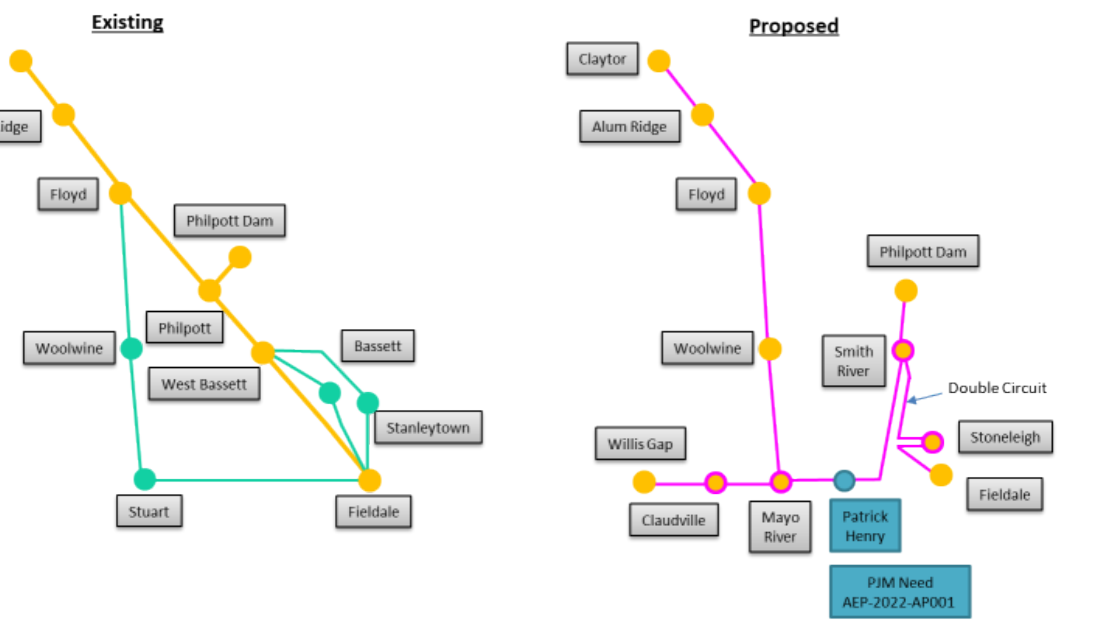
- Construct ~12.5 miles 138 kV line from Alum Ridge to Claytor. (S2179.1) Estimated Cost: ~~\$34.3M~~ \$40.78 M
- Construct ~6.5 miles 138 kV line from Alum Ridge to Floyd. (S2179.2) Estimated Cost: ~~\$20.6M~~ \$23.85
- ~~Construct ~7 miles of 138 kV line from Fieldale-Fairystone. (S2179.3) Estimated Cost: \$17.6M~~
- Construct ~~~1.25~~ 0.4 miles of double circuit 138 kV line to connect Stanleytown Stoneleigh. (S2179.4) Estimated Cost: ~~\$5.3M~~ \$2.35 M
- ~~Construct 0.07 miles of 138 kV line from Bassett Switch-Bassett. (S2179.5) Estimated Cost: \$1.5M~~
- Construct ~~~1.2~~ 1.9 miles of 138 kV line from Philpott Dam-Fairystone-Smith River. (S2179.6) Estimated Cost: ~~(\$3.6 M)~~ \$6.86M
- Construct ~~~22~~ 12.5 miles of 138 kV line from Salem Highway-Claudville to Willis Gap. (S2179.7) Estimated Cost: ~~\$65.0M~~ \$42.39 M
- Construct ~11.4 miles of 138 kV line from Claudville to Mayo River. (S2179.35) Estimated Cost: \$38.87 M
- ~~Construct ~21 miles of 138 kV line from Salem Highway-Fairystone. (S2179.8) Estimated Cost: \$60.0M~~
- Construct ~11 miles of 138 kV line from Floyd-Woolwine. (S2179.9) Estimated Cost: ~~\$29.2M~~ \$33.44 M
- Construct ~10 miles of 138 kV line from Salem Highway-Mayo River to Woolwine. (S2179.10) Estimated Cost: ~~\$29.6M~~ \$34.75 M
- Remove ~11 miles of 69 kV line from Floyd-Woolwine. (S2179.11) Estimated Cost: ~~\$1.3M~~ \$1.55 M
- Remove ~10 miles of 69 kV line from Stuart-Woolwine. (S2179.12) Estimated Cost: ~~\$4.8M~~ \$5.02 M
- Remove ~12.2 miles of 138 kV line from Alum Ridge-Claytor. (S2179.13) Estimated Cost: ~~\$1.2M~~ \$1.49 M
- Remove ~6.25 miles of 138 kV line from Alum Ridge-Floyd. (S2179.14) Estimated Cost: ~~\$0.8M~~ \$0.94 M
- Remove ~19 miles of 138 kV line from Floyd-West Bassett. (S2179.15) Estimated Cost: ~~\$12.1M~~ \$16.61 M
- Remove ~6.4 miles of 138 kV line from Fieldale-West Bassett. (S2179.16) Estimated Cost: ~~\$2.9M~~ \$3.77 M
- Remove ~0.34 miles of 138 kV line from Philpott SS-Philpott. (S2179.17) Estimated Cost: ~~\$0.1M~~ \$0.13 M
- Remove ~19 miles of 69 kV line from Fieldale to Stuart. (S2179.18) Estimated Cost: ~~\$8.3M~~ \$8.26 M
- Remove ~7.1 miles of 69 kV line from Fieldale to West Bassett #1. . (S2179.19) Estimated Cost: ~~\$10.1M~~ \$11.56 M
- Remove ~6.8 miles of 69 kV line from Fieldale to West Bassett #2. . (S2179.20) Estimated Cost: ~~\$9.5M~~ \$10.77 M
- Remove ~0.4 miles of 69 kV line from Woolwine "in and out" loop . (S2179.36) Estimated Cost: \$0.09 M
- Construct ~9.5 miles 138 kV from Stoneleigh Station Site to Proposed Patrick Henry Site . (S2179.37) Estimated Cost: \$28.87 M
- Construct ~4.1 miles of double circuit 138 kV from Stoneleigh Station Site to Smith River . (S2179.38) Estimated Cost: \$11.89 M
- Construct ~1.8 miles of 138 kV from Fieldale to Stoneleigh tap structure . (S2179.39) Estimated Cost: \$6.92 M
- Construct ~11 miles 138 kV from Mayo River to Proposed Patrick Henry Site . (S2179.40) Estimated Cost: \$34.98 M.



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

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- At Floyd station, install 2-138 kV circuit breakers (3000 A, 40 kA). Install high-side circuit switcher on T2 (3000A, 40 kA), replace 138/34.5 kV T2. Station expansion to accommodate new equipment and DICM. Install 138 kV line relaying, CCVT's, breaker controls, bus differential protection, transformer #2 protection. **(S2179.21) Estimated Cost: ~~\$6.0M~~-\$10.75 M**
- At Fieldale station, retire 69 kV CB G, D and C. Install CCVTs and arresters on 138 kV West Bassett Line. **(S2179.22) Estimated Cost: \$0.7M**
- ~~At Bassett switch, install 138 kV Switch with 2 138 kV MOABs. (S2179.23) Estimated Cost: \$0.5M~~
- At Bassett station, ~~convert station from 69 kV to 138 kV. Install 138/12 kV transformer with high side circuit switcher, transclosure and associated distribution feeders. Retire station (S2179.24) Estimated Cost: \$0M~~
- At Claytor station, install line relaying. Remove wavetrap, replace 1590 AAC risers. **(S2179.25) Estimated Cost: ~~\$0.9M~~ \$0.55 M**
- Retire Philpott 138 kV switch structure. **(S2179.26) Estimated Cost: ~~\$0.3M~~ \$0.4 M**
- At Willis Gap station, install 2-138 kV MOABs. Terminate new Salem Highway-Willis Gap 138 kV line. **(S2179.27) Estimated Cost: \$0M**
- At Woolwine station, convert station from 69 kV to 138 kV. Retire/remove 69 kV switch structure, 69 kV MOABs, 69/34.5 kV transformer. Install 138 kV 3-way switch structure with MOABs, 138/34.5 kV transformer with high-side circuit switcher. **(S2179.28) Estimated Cost: \$0M**
- At ~~Salem Highway~~-Mayo River station, establish new 138 kV station replacing Stuart Station. Install 138 kV 5-breaker ring bus, 138/34.5 kV & 138/12 kV transformers with high-side circuit switchers. Terminate Huffman, Floyd and Fairystone 138 kV circuits. **(S2179.29) Estimated Cost: \$0M**
- At Stuart station, retire and remove all existing equipment and control house. **(S2179.30) Estimated Cost: \$0M**
- At Stanleytown station, ~~convert station from 69 kV to 138 kV. Retire/remove 69 kV switch structure, 69 kV MOABs, 69/12 kV transformer. Install 138 kV 3-way switch structure with MOABs, 138/12 kV transformer with high side circuit switcher. Retire station. (S2179.31) Estimated Cost: \$0M~~
- At ~~Fairystone~~-Smith River station, establish new 138 kV station replacing West Bassett. Install 138 kV 4-breaker ring bus, 138/34.5 kV transformer with high-side circuit switcher and associated distribution feeders. Terminate Salem Highway, Fieldale and Philpott Dam 138 kV circuits. **(S2179.32) Estimated Cost: \$0M**
- At Claudville station, establish new 138/34.5 kV distribution station with 2-138 kV CBs, 138/34.5 kV transformer and 3-34.5 kV feeders. **(S2179.33) Estimated Cost: \$0M**
- Provide transition, entry and termination for OPGW connectivity at Willis Gap, Claytor, Alum Ridge, Floyd, Woolwine, Stuart, Fairystone, Philpott Dam, Bassett, Stanleytown, Fieldale, and Salem Highway to support fiber relaying. **(S2179.34) Estimated Cost: ~~\$0.7M~~ \$0.83 M**



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

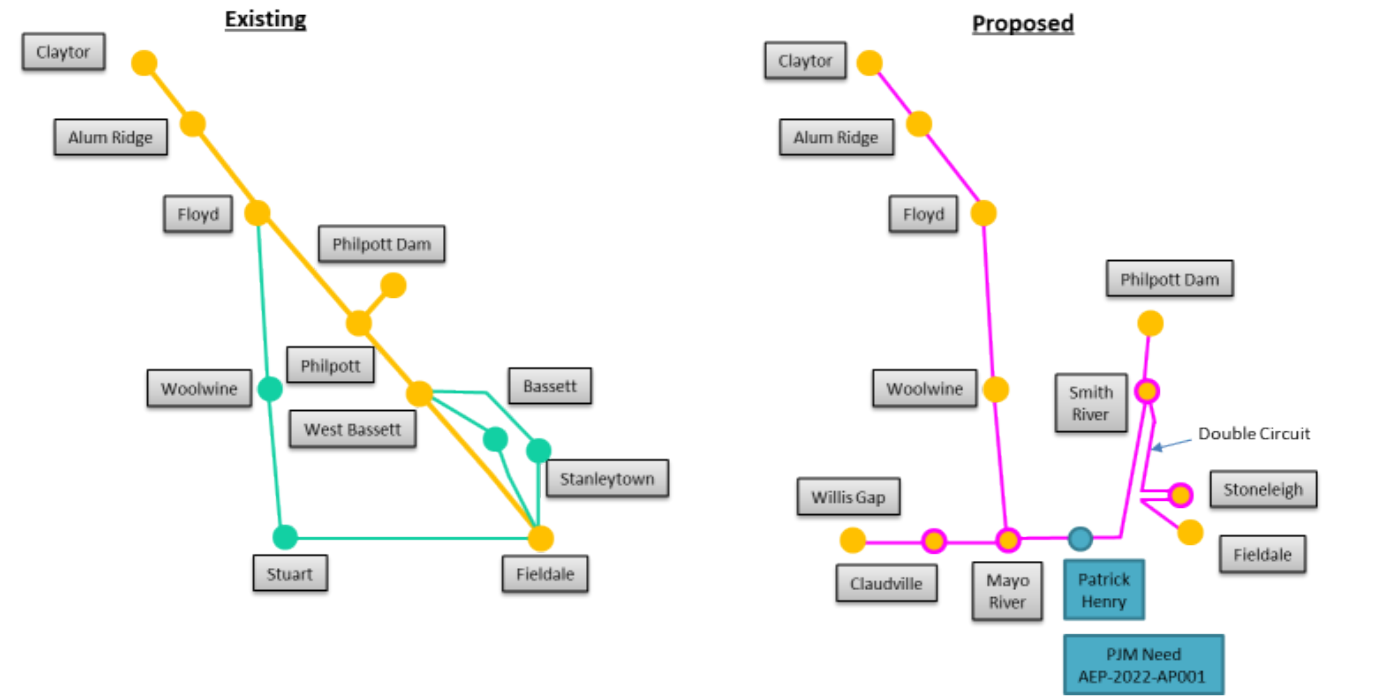
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- At Huffman station remove CB “C” bypass switch and Install CCVT with Wavetrap on Willis Gap line (**S2179.41**) **Estimated Cost: \$0M**
- Retire West Bassett station (**S2179.42**) **Estimated Cost: \$0M**
- At Stoneleigh station establish new 138 kV tap station, install 3-way MOAB switch, install 138/12 kV transformer and associated feeders (**S2179.43**) **Estimated Cost: \$0M**

Total Estimated Transmission Cost: ~~\$326.9M~~ \$379.37 M

Ancillary Benefits:

The new Salem Highway-Willis Gap 138 kV line provides an additional support to both the Galax area and the Stuart area during contingency scenarios.



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

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Alternatives Considered:

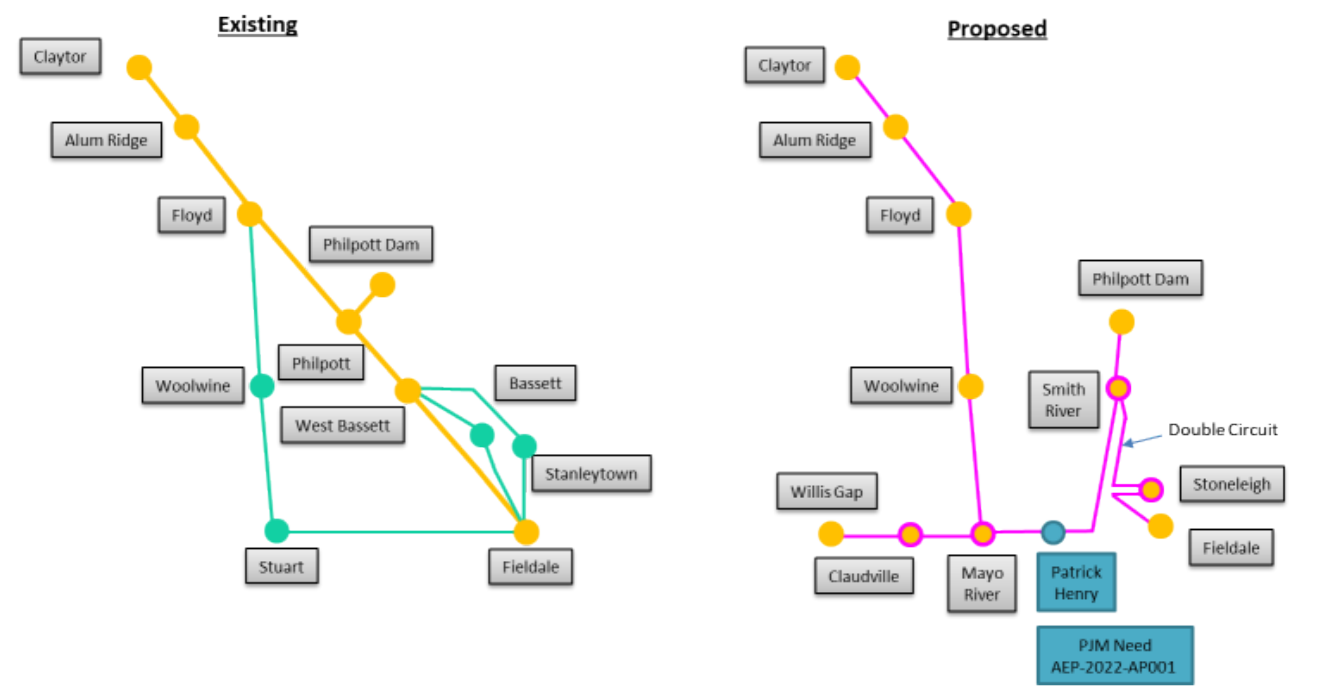
Address the asset renewal needs by rebuilding all the transmission lines of concern on existing centerline and replacing the identified station equipment in need of replacement. This would include rebuilding the following lines totaling approximately 99 miles: Claytor-Fieldale 138 kV (~45 mi.), Floyd-Stuart 69 kV (~21 mi.), Fieldale-Stuart 69 kV (~19 mi.), Fieldale-West Bassett 69 kV No. 1 (~7 mi.), Fieldale-West Bassett 69 kV No. 2 (~7 mi.). The station asset replacements include: Stuart (2-69 kV CBs, 69 kV circuit switcher and identified relays), **Floyd (2-138 kV CBs, 1-138 kV circuit switcher)**, and West Basset (1-138 kV CB, 3-69 kV CBs, 138/69/34 kV transformer #1 and identified relays). In addition, a new **22-24** mile 138 kV line would be required between Willis Gap, Claudville, and Stuart along with a 138/69 kV transformer at Stuart **with associated transformer protection and 14.4 MVar cap bank replacement**.

While this alternate plan would address the identified aging infrastructure, it would not provide the additional benefits of the preferred plan, which include: conversion of the local 69 kV system to a more robust and reliable 138 kV system, allow for the retirement of ~18 miles of 138 kV line and ~7 miles of 69 kV line, provide more reliable sectionalizing with ring bus configurations at Stuart (~~Salem Highway~~) (Mayo River) and West Bassett (~~Fairystone~~)(Smith River).

Estimated Cost: ~~\$375 M~~ 414 M

Projected In-Service: 10/31/2027 through 2030

Project Status: Scoping



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

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 Plain City, OH

Need Number: AEP-2021-OH049

Process Stage: Need Meeting 2/17/2023

Previously Presented:

Needs Meeting 7/16/2021, Need Meeting 9/17/2021

Project Driver: Customer Service

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

Problem Statement:

Jerome Delivery Point (AEP) 138 kV:

- A customer has requested new transmission service in Plain City, Ohio.
- The delivery point will be used to serve a customer with high potential for rapid load growth. The initial load will be 106 MW with a potential future peak load demand of ~~244~~ 203 MW.
- Service is requested by June 2024.
- The customer communicated a much more aggressive load ramp/build out schedule that would put their peak load at approximately 160 MW by early 2025 at the site.
- **This Need was originally presented as a Buckeye Power request; The customer has since requested service from AEP Ohio at the site. As part of this request, the customer has indicated the need for additional feeds at the delivery which will bring the load amount up to 203 MW.**

Model: 2027 RTEP



AEP Transmission Zone M-3 Process New Albany, OH

Need Number: AEP-2023-OH040

Process Stage: Need Meeting 2/17/2023

Project Driver:
Customer Service

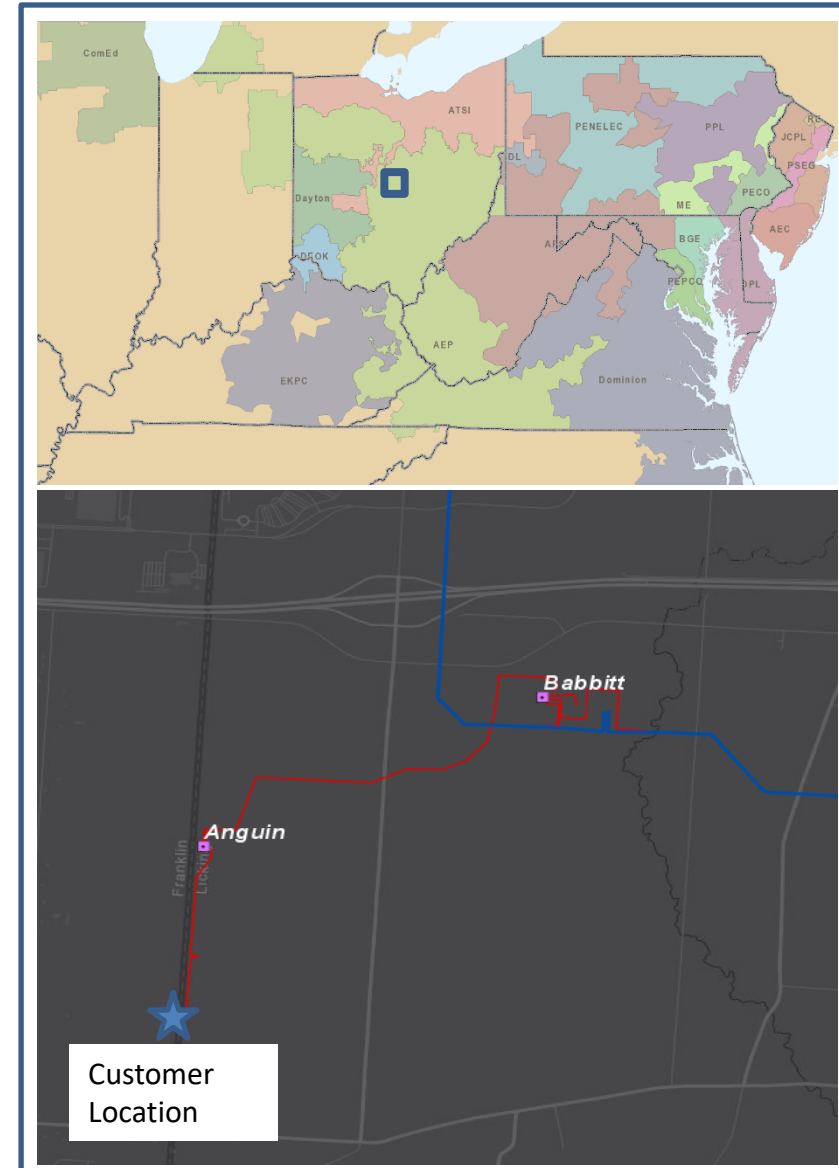
Specific Assumption Reference:

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

Problem Statement:

Customer Service:

- An existing customer served out of AEP's Anguin Station in New Albany, OH, has requested an additional service for a new bulk load addition of 100 MW. This will bring the total load for the customers site to 350 MW with an ultimate capacity of up to 720 MW.
- Customer requested in-service date of 5/31/2023.



AEP Transmission Zone M-3 Process Union County, OH

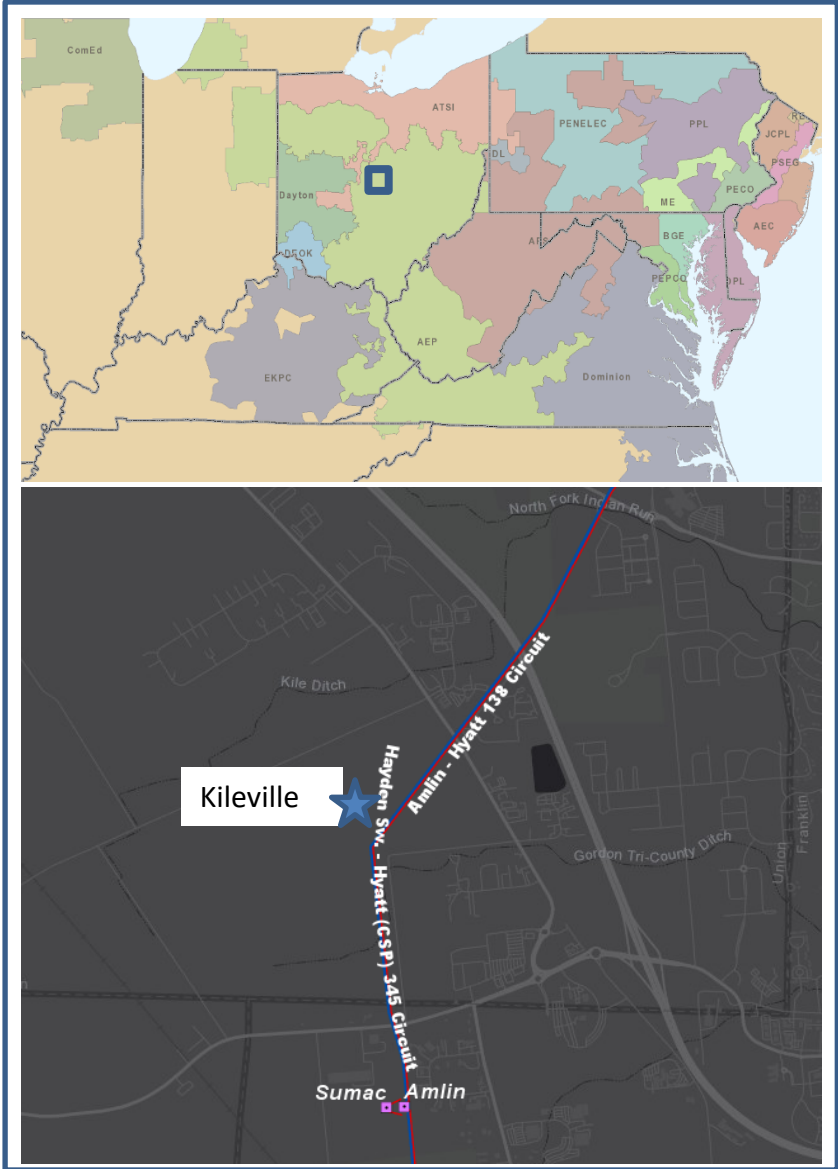
Need Number: AEP-2023-OH041

Process Stage: Need Meeting 2/17/2023

Project Driver:
Customer Service

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

- Problem Statement:**
Customer Service:
- An existing customer planned to be served out of AEP’s proposed Kileville Station in Union Count, OH, has requested service for an incremental bulk load addition of 96 MW. This will bring the total & ultimate load for the customers site to 256 MW.
 - Customer requested in-service date of 4/1/2024.



AEP Transmission Zone M-3 Process Montgomery & Roanoke County, Virginia

Need Number: AEP-2023-AP004

Process Stage: Need Meeting 2/17/2023

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13),
AEP Eastern System Pre-1930s Era Lattice Tower and Transmission Line System

Problem Statement:

Line Name: Roanoke - Claytor 138kV Double Circuit Line

Original Install Date (Age): 1926

Length of Line: ~41.4 mi

Total structure count: 175

Original Line Construction Type: Lattice Steel structures

Conductor Type: 397,500 ACSR

Momentary/Permanent Outages: 20 Momentary and 4 Permanent Outage on the Matt Funk – Tech Drive circuit

Momentary/Permanent Outages: 10 Momentary and 1 permanent Outage on the Matt Funk – Roanoke circuit

Momentary/Permanent Outages: 11 Momentary and 1 permanent Outage on the Hancock – Matt Funk No. 2 circuit

Momentary/Permanent Outages: 15 Momentary and 4 permanent Outage on the Falling Branch – Matt Funk circuit

Momentary/Permanent Outages: 1 Momentary and 0 permanent Outage on the Hancock - Roanoke circuit

Momentary/Permanent Outages: 4 Momentary and 0 permanent Outage on the Claytor – Tech Drive circuit

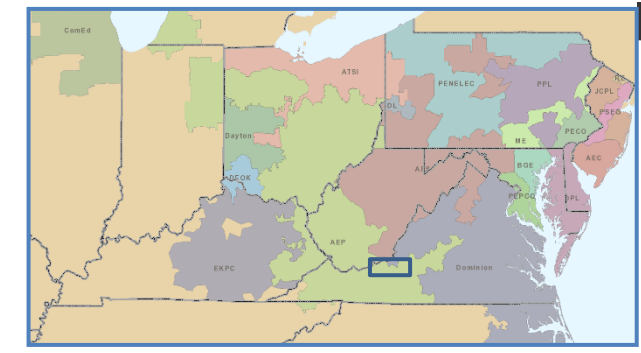
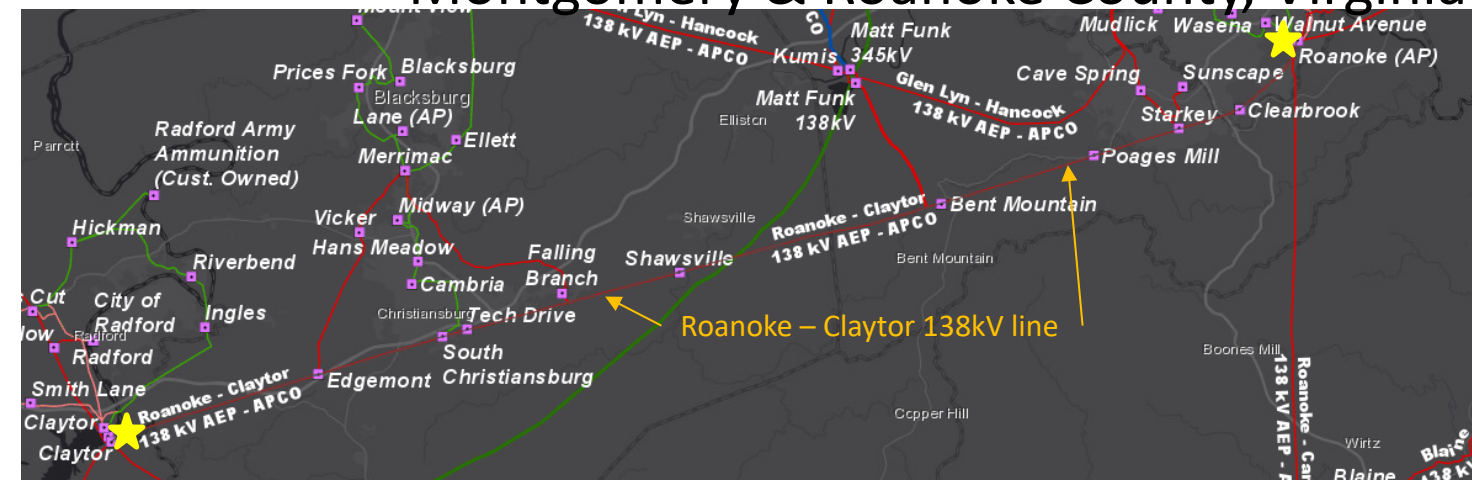
Momentary/Permanent Outages: 2 Momentary and 0 permanent Outage on the Edgemont – Falling Branch circuit

Momentary/Permanent Outages: 2 Momentary and 1 permanent Outage on the Claytor - Edgemont circuit

The line asset serves 214.5 MWs of peak load at the various Distribution stations connected to it

Line conditions:

- The structures on Roanoke - Claytor 138kV line fail to meet current AEP structural strength requirements and fail to meet the current ASCE structural strength requirements.
- 172 of 175 structures are 1926 vintage. The tower legs show significant corrosion where they enter the ground and underground. Lattice tower structures have little structural redundancy. A failure of one member of the structure will impact the integrity of the structure and may cause the entire tower to collapse.
- There are currently 4 structural open conditions affecting the legs including vines and bent conditions. 5 open conductor conditions related to broken strands. 4 open shielding conditions related to broken strands and damaged shield wire. 3 open hardware conditions related to burnt insulators.
- 26 of 65 Momentary Outages (40%) are due to the inadequate shielding angle throughout the lines and caused by lighting. The 48° shield angle on the tangent structures is inadequate for current AEP shield angle requirements. The line has a single shield wire which provides poor lightning protection.
- The hardware components and steel structures are moderately rusted. When the protective galvanized coating is gone or significantly compromised the bare steel corrodes at an accelerated rate.



Legend	
Station	■
Circuit	
12 kV	—
14 kV	—
23 kV	—
34 kV	—
40 kV	—
46 kV	—
69 kV	—
88 kV	—
115 kV	—
138 kV	—
161 kV	—
230 kV	—
345 kV	—
500 kV	—
765 kV	—

Need Number: AEP-2023-AP005

Process Stage: Needs Meeting 2/17/2023

Supplemental Project Driver: Customer Service and Operational Flexibility

Specific Assumption References: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12, 14)

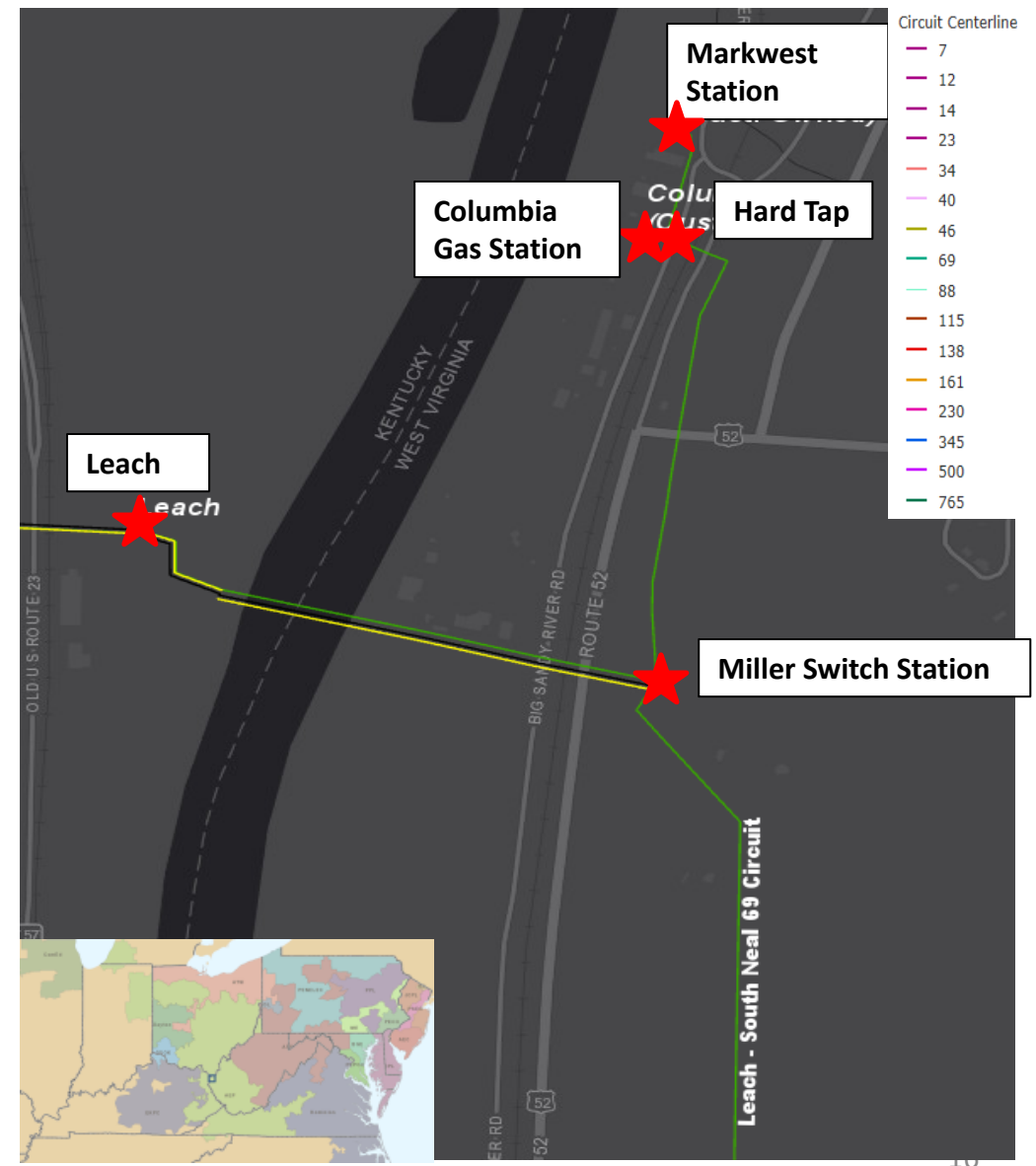
Problem Statement:

Miller Switch Station, on the existing Leach – South Neal 69 kV line currently serves two separate customers off of a 0.5 mile radial 69 kV line. Total existing load served off this line is approximately 8 MW. Radial lines complicate maintenance activities due to the customers needing to be taken out of service in order to perform any work on the line.

TC Energy – Kenova has requested a 12 MW load increase at their existing Columbia Gas Station delivery point served off the radial from Miller Switch. This load is currently served from a hard tap on the radial extension, which greatly complicates restoration activities and extend outages. This configuration also affects the customer served at the Markwest station as they are also fed from the radial line.

Summer projected load: 16 MVA

Winter projected load: 16 MVA.



Need Number: AEP-2023-AP006

Process Stage: Need Meeting 02/17/2023

Project Driver:

Customer Service

Specific Assumption Reference:

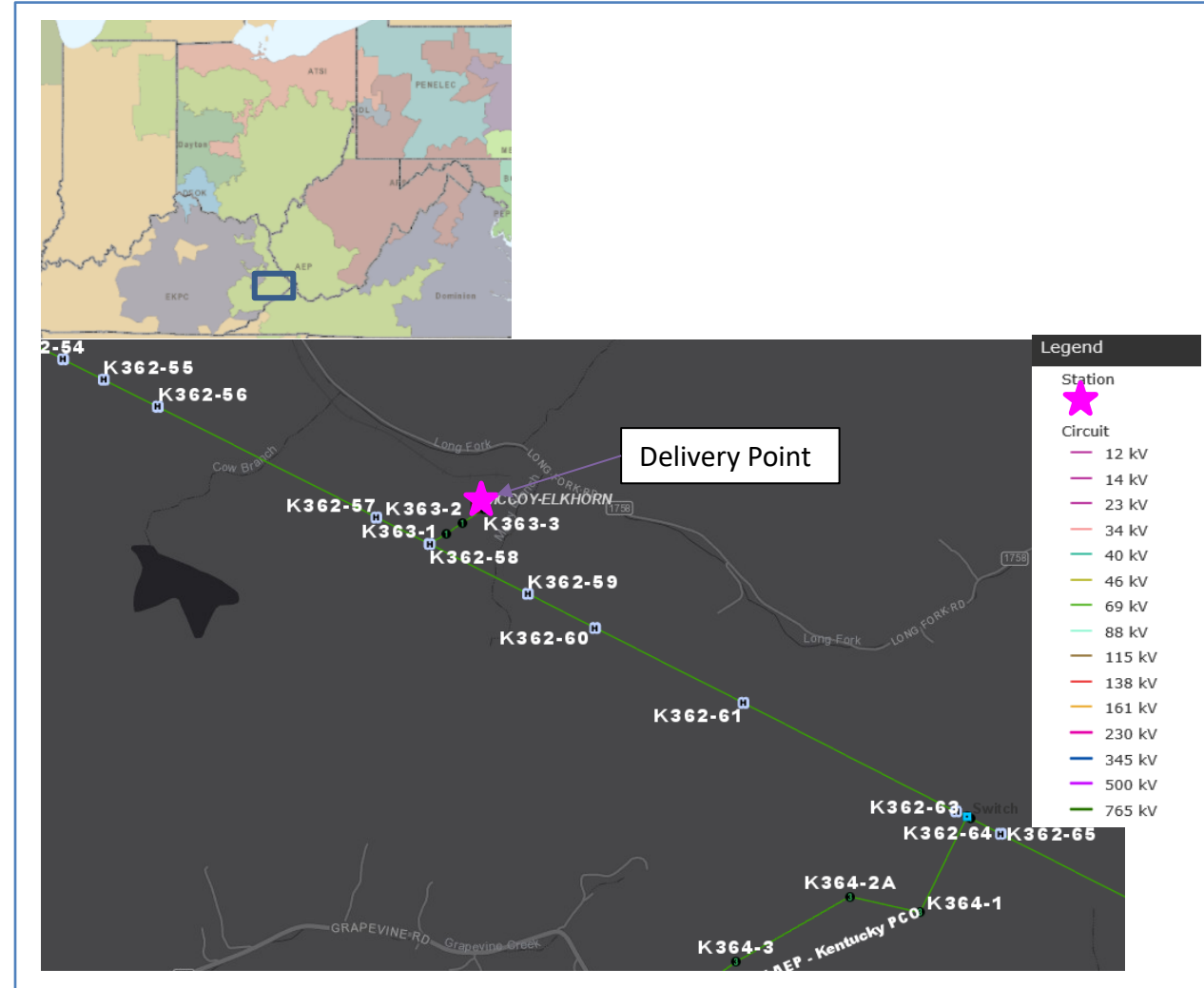
AEP Connection Requirements for the AEP Transmission System
(AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at McCoy – Elkhorn delivery point in Pike County, KY.
- This existing delivery point is served via a Hard Tap on Johns Creek - Second Fork 69kV line.
- The customer has indicated that their initial peak demand will be 15 MW at the site.
- The customer has requested an ISD of 12/15/2023

Model: 2027 RTEP



Need Number: AEP-2023-AP007

Process Stage: Need Meeting 02/17/2023

Project Driver: Equipment Condition/Performance/Risk

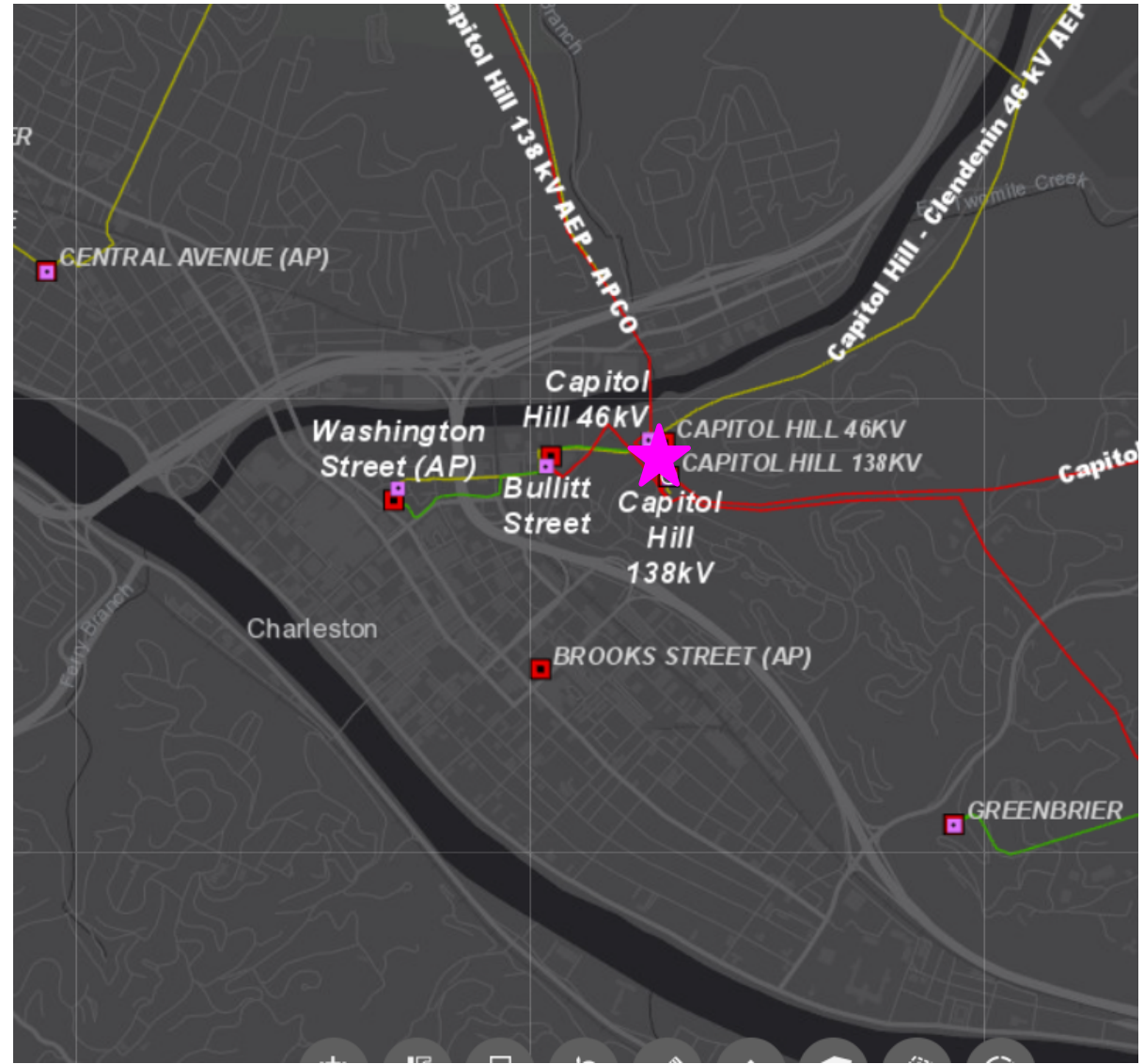
Specific Assumption Reference:

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

Problem Statement:

Capitol Hill Station:

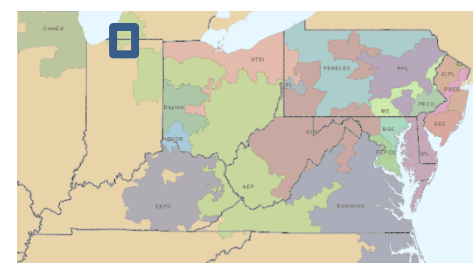
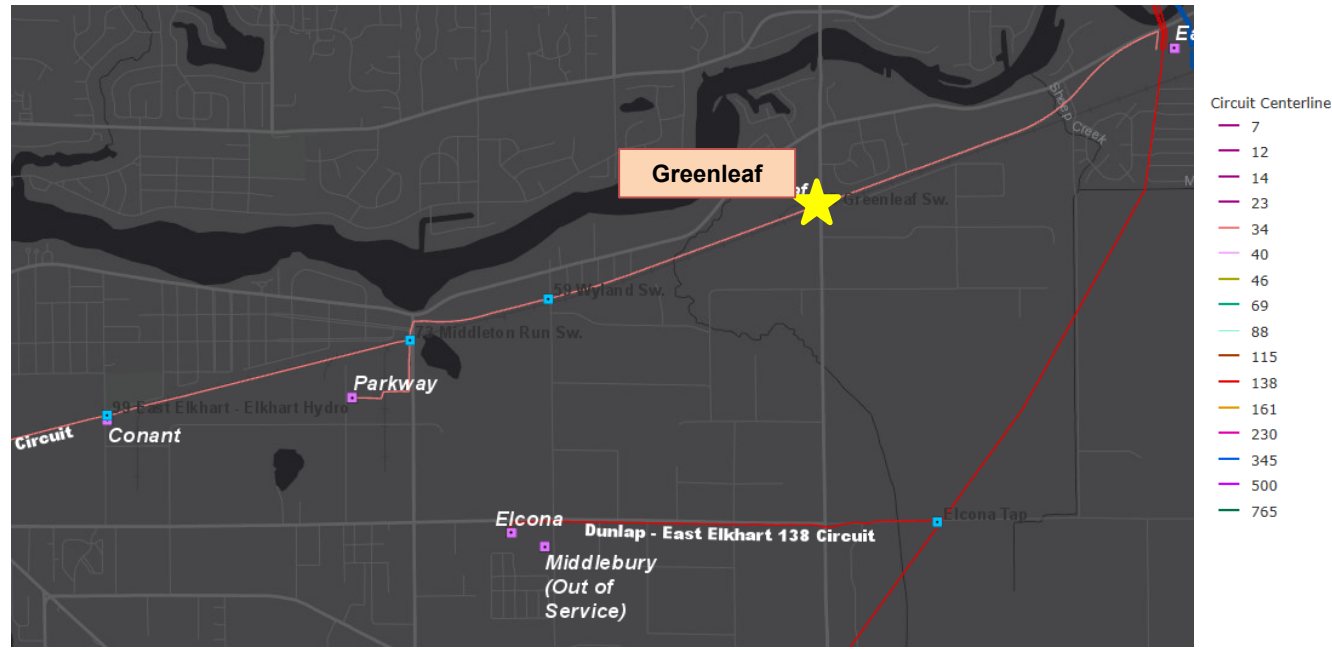
- Capitol Hill 138/69/46 kV XFR #1 (Unit Failed in June 2022)
 - Lack proper sectionalizing on the high side of the transformer resulting in an overlap of zones of protection that results in outages on the bus for an outage of the transformer.
- Capitol Hill 138/46 kV XFR #2 (Mfg. Year: 1956)
 - Lack of sectionalizing on the high side of the transformer
 - The values and trends of moisture and power factor indicate the dielectric strength of the insulation system (oil and paper) is in poor condition, which impairs the unit's ability to withstand electrical faults.
 - Lack of thermally upgraded paper insulation. Also, the age of this unit's insulation materials are of concern. As the insulating paper materials age, they become brittle.
 - Elevated levels of carbon dioxide, ethylene, and ethane. These levels indicate high decomposition of the paper insulating materials.
 - Thermal faults have occurred. The presence of carbon dioxide, ethylene, and ethane, along with the indication of overheating and thermal faults, indicates decomposition of the increasingly brittle and non-thermally upgraded paper insulation. This degradation impairs the unit's ability to withstand future short circuit or through fault events.
- 47 of the 65 relays (72%) in the Capitol Hill 138 kV yard are in need of replacement or firmware upgrades. 31 are electromechanical which have significant limitations with regards to spare part availability and fault data collection/retention.
- 22 of the 33 relays (67%) in the Capitol Hill 46 kV yard are in need of replacement or firmware upgrades. 1 electromechanical relay and 2 MP relays are in need of replacement and 19 MP relays need firmware upgrades.



Need Number: AEP-2023-IM005
Process Stage: Needs Meeting: 2/17/2023
Supplemental Project Driver: Customer Need
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Model: 2027 RTEP
Problem Statement:

Greenleaf 34.5kV Station:
 Greenleaf station is expected to achieve a loading of 22.95 MVA by summer of 2024 due to recently announced block load additions, which is 100.4% of the transformer’s capacity.

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



Need Number: AEP-2023-OH001

Process Stage: Need Meeting 2/17/2023

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

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

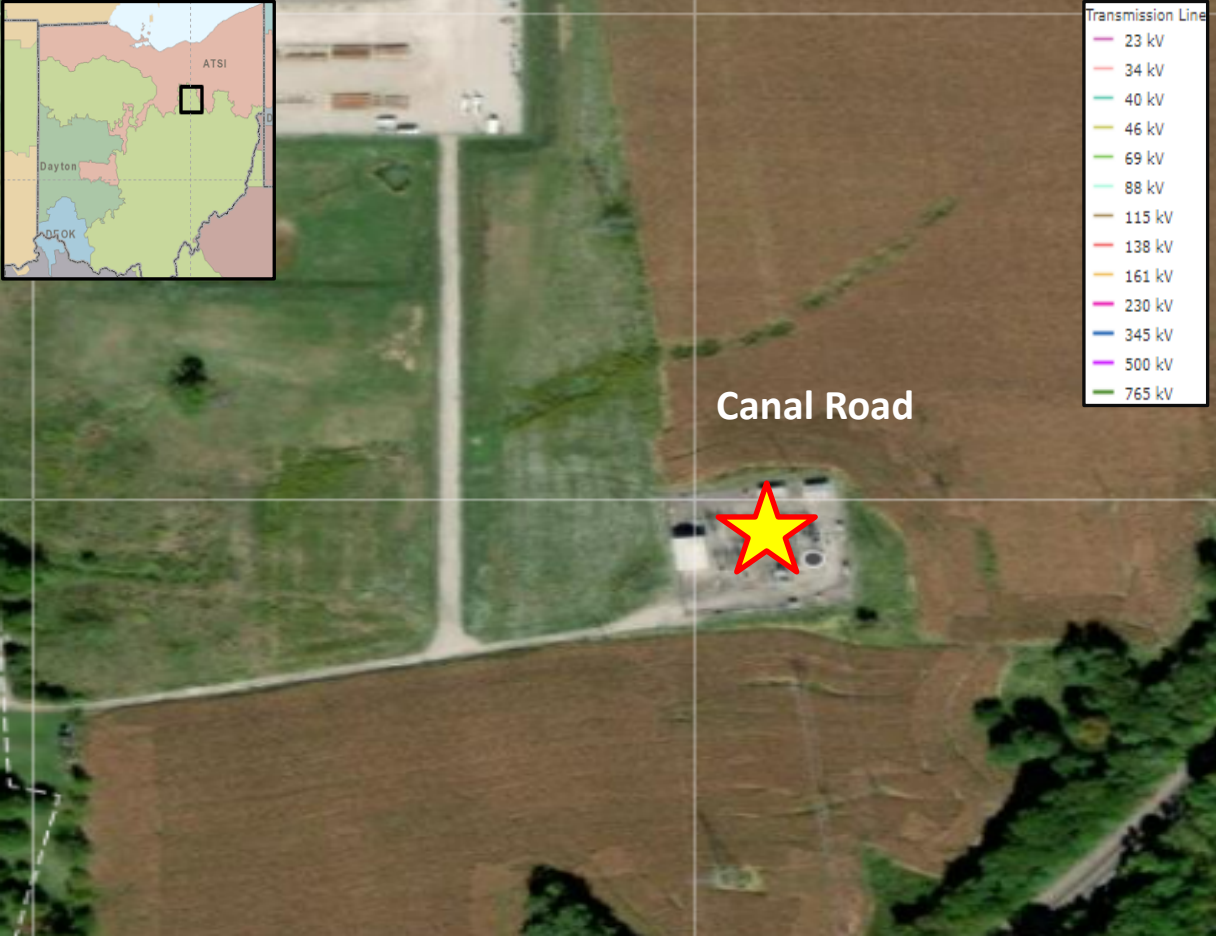
Problem Statement:

Canal Road Station, Wooster, Ohio

Equipment Material/Condition/Performance/Risk

23 kV Circuit Breaker CB - B:

- Breaker age: 1952
- Interrupting Medium: Oil
- Number of Fault Operations: 35
- Additional Information:
 - This breaker is oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require. The manufacturing provides no support for this fleet of circuit breakers and spare parts are increasingly more difficult to obtain; components are often taken from out of service units with remaining usable parts. A common failure mode documented in AEP malfunction records are compressor failures and valve defects, which cause low pressure and oil leaks. Another failure mode includes trip or reclose failures, caused primarily by spring latching and charging motor component failures. In addition, the vacuum oil and oil breakers have a lot of oil contamination from aging gaskets allowing moisture and other particle ingress.



Need Number: AEP-2023-OH001
Process Stage: Need Meeting 2/17/2023

Problem Statement, continued:

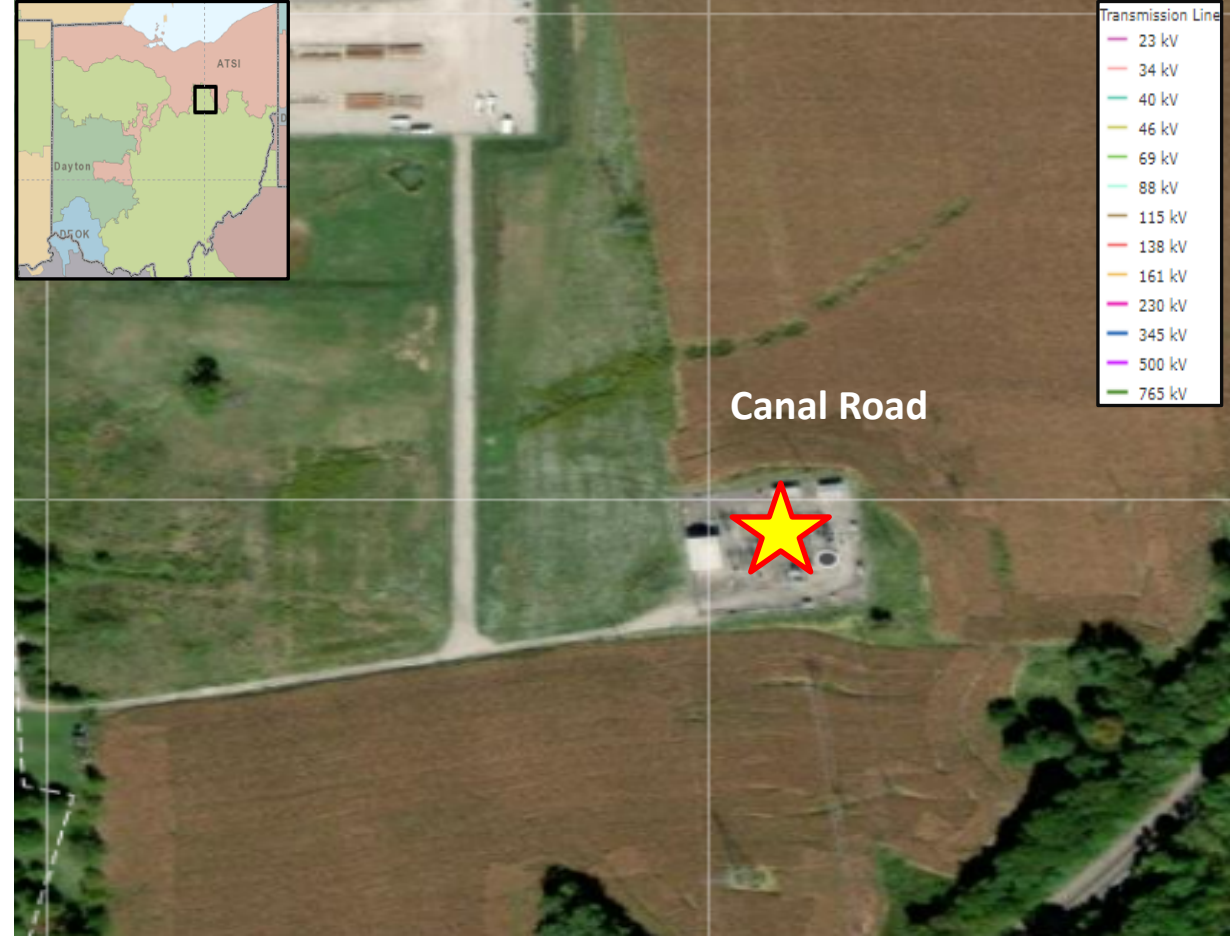
69 kV Circuit Breakers CB - C:

- Breaker age: 1993
- Interrupting Medium: SF6
- Number of Fault Operations: 4
 - The 69kV transmission owned circuit breaker CB-C is a SF6 filled breaker. It's 1993 vintage breaker kind and this type across the AEP system have had reports of moisture ingress into the breaker tank. This moisture ingress leads to increased maintenance and a higher risk of failure. These breakers have documented issues with failures to close due to burned up coils. There have been five catastrophic failures involving this model type on the AEP system. There are also 98 malfunction records related to SF6 gas leaks across the AEP fleet.

Relays:

- Currently, 6 of the 29 relays (21% of all station relays) are in need of replacement. All 6 of these are of the electromechanical type which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack of vendor support. There are also 20 microprocessor relays installed in 2009 that are nearing the end of their expected life expectancy. The RTU is a legacy model with no vendor support and recommended for replacement.

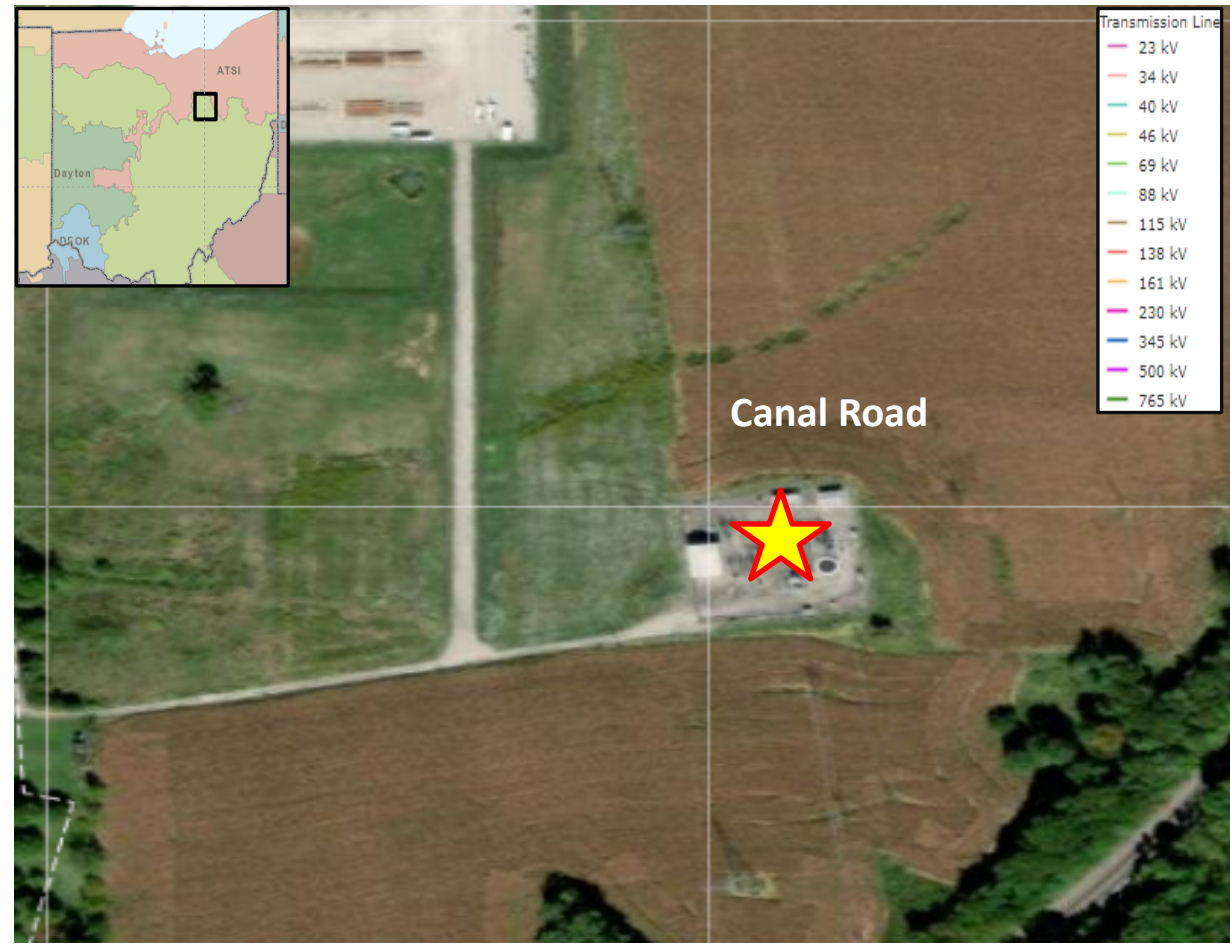
Facilities: Both the 138-69kV and 69-23kV transformers lack an oil containment system, and the 69-23kV unit sits on a wood tie foundation.



Need Number: AEP-2023-OH001
Process Stage: Need Meeting 2/17/2023
Problem Statement, continued:

Operational Flexibility and Efficiency

The station creates a 3-terminal line for the East Wooster-Canal Road-South Canton 138kV circuit, due to the 138-69kV transformer and lack of 138kV circuit breakers at Canal Road. Three-terminal lines are more difficult to reliably protect and more prone to overtripping. In addition, there are two overlapping protection zones, between the 138-69kV transformer and 69kV bus, requiring 4- 69kV breakers and 1- 138kV circuit switcher to clear a fault in this zone, which could be prone to overtripping.



Need Number: AEP-2023-OH008

Process Stage: Need Meeting 02/17/2023

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

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

Problem Statement:

69 kV Circuit Breakers A & B:

- Breaker Age: 1967
- Interrupting Medium: (Oil)
- Number of Fault Operations: A 44 & B 14

Additional Information: These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require. The manufacturer provides no support for this family of circuit breakers and spare parts are not available. This model family has experienced major malfunctions associated with their OA-3 hydraulic mechanism, which includes low-pressure readings, hydraulic leaks, pump lockouts, and failure to shut off. These mechanism malfunctions have led to several failures to close and other types of mis-operations across the AEP fleet.

Relays:

Currently, 41 of the 45 relays (91% of all station relays) are in need of replacement. 40 of these are of the electromechanical type which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack of vendor support. There is also 1 microprocessor-based relay commissioned in 2008 and may have firmware that is unsupported.



Need Number: AEP-2023-OH008

Process Stage: Need Meeting 02/17/2023

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

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

Problem Statement Continued:

Operational Flexibility and Efficiency:

The 1968-vintage 138-69-12kV transformer serves distribution load off of the tertiary winding. This requires a separate 12kV grounding transformer, which had a failure in 2020 and caused an outage to T & D.

The transformer’s high-side protection is an obsolete 138kV MOAB/ground-switch system, which requires remote 138kV breaker clearing at Tidd station.

Due to the lack of circuit breakers at the station, there are four overlapping zones of protection: 138kV line, 138-69-12kV transformer, 69kV bus, and 12kV bus. This overly complex protection setup can result in misoperations, human error, and overtripping.



AEP Transmission Zone M-3 Process New Albany, OH

Need Number: AEP-2023-OH016

Process Stage: Need Meeting 2/17/2023

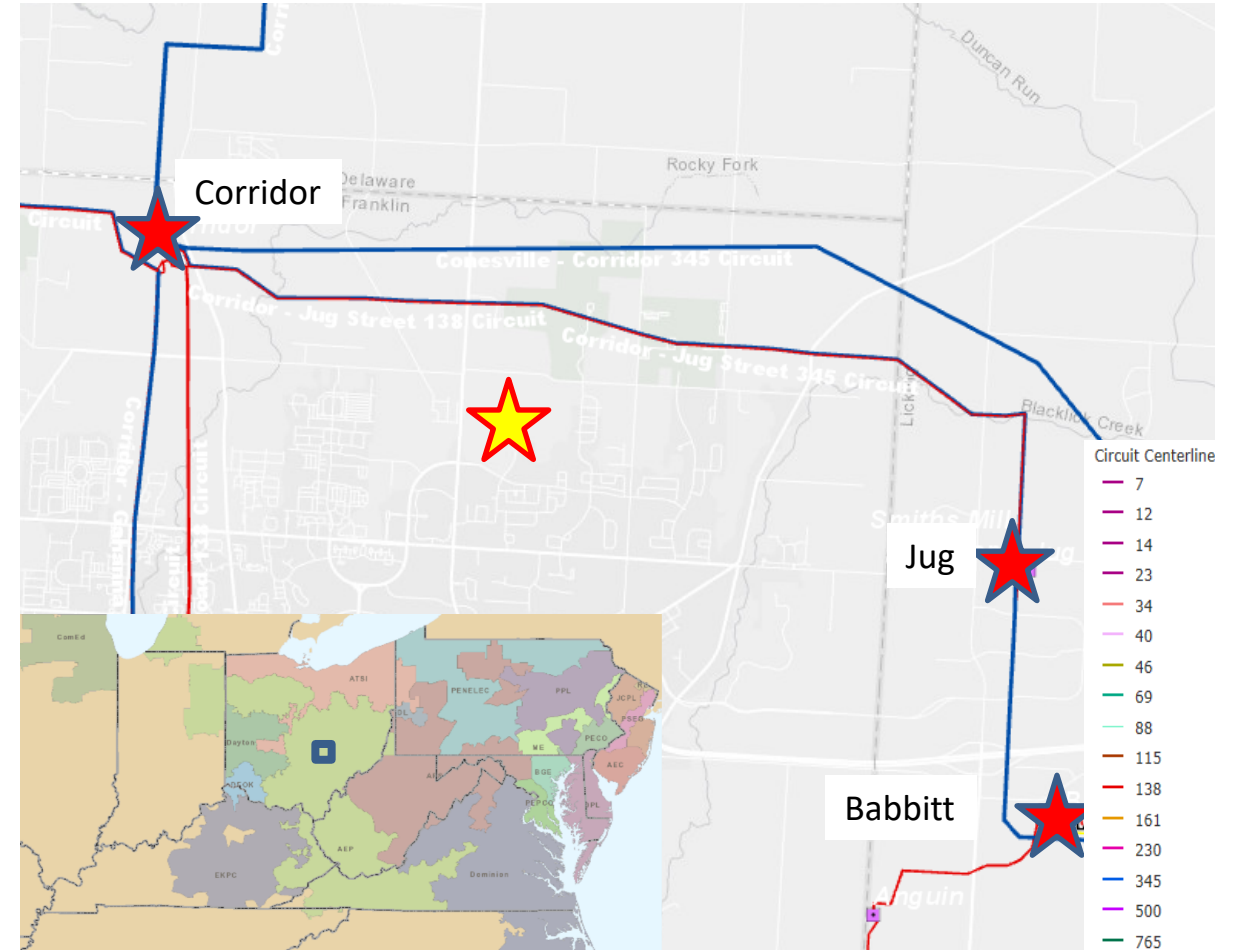
Supplemental Project Driver: Customer Service

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

Problem Statement:

AEP Ohio is requesting a new 138kV delivery point near the Corridor - Jug 138kV circuit by June 2025 to support continued growth in and around the New Albany, Ohio area. Initial load is anticipated to be approximately 24.0 MVA with a future projected load of approximately 79 MVA.

Model: 2027 RTEP



Need Number: AEP-2023-OH017

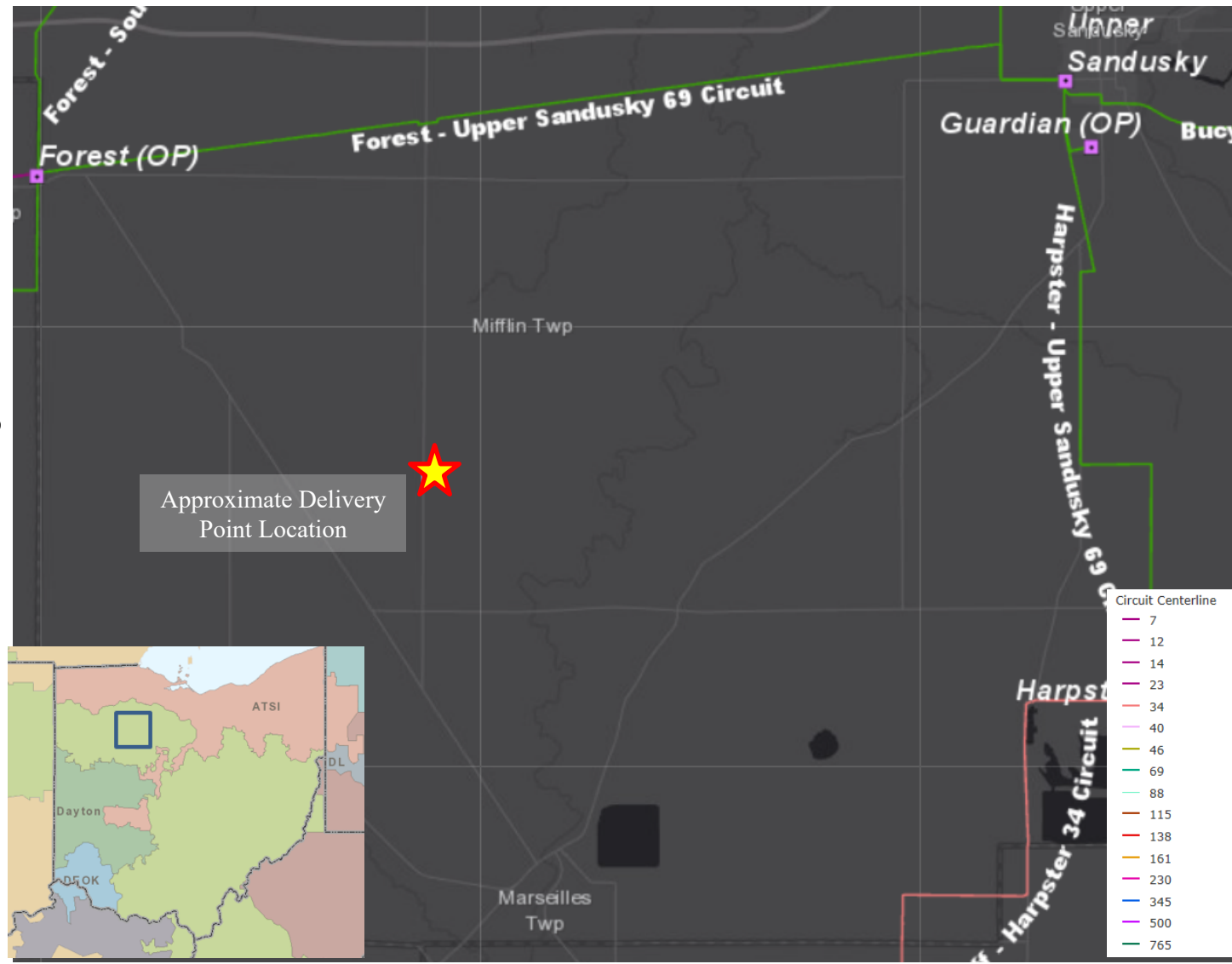
Process Stage: Need Meeting 02/17/2023

Supplemental Project Driver:
Customer Service

Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 12)

Problem Statement:

- Buckeye is requesting on behalf of Mid Ohio Electric Co-op a new 69kV delivery point tapped off of the Forest – Upper Sandusky 69kV Circuit by Summer 2026. Anticipated load is about 4.5 MVA.



AEP Transmission Zone M-3 Process Allen, Hardin, Marion Counties , OH

Need Number: AEP-2023-OH018

Process Stage: Need Meeting 2/17/2023

Project Driver:

Equipment Material/Condition/Performance/Risk

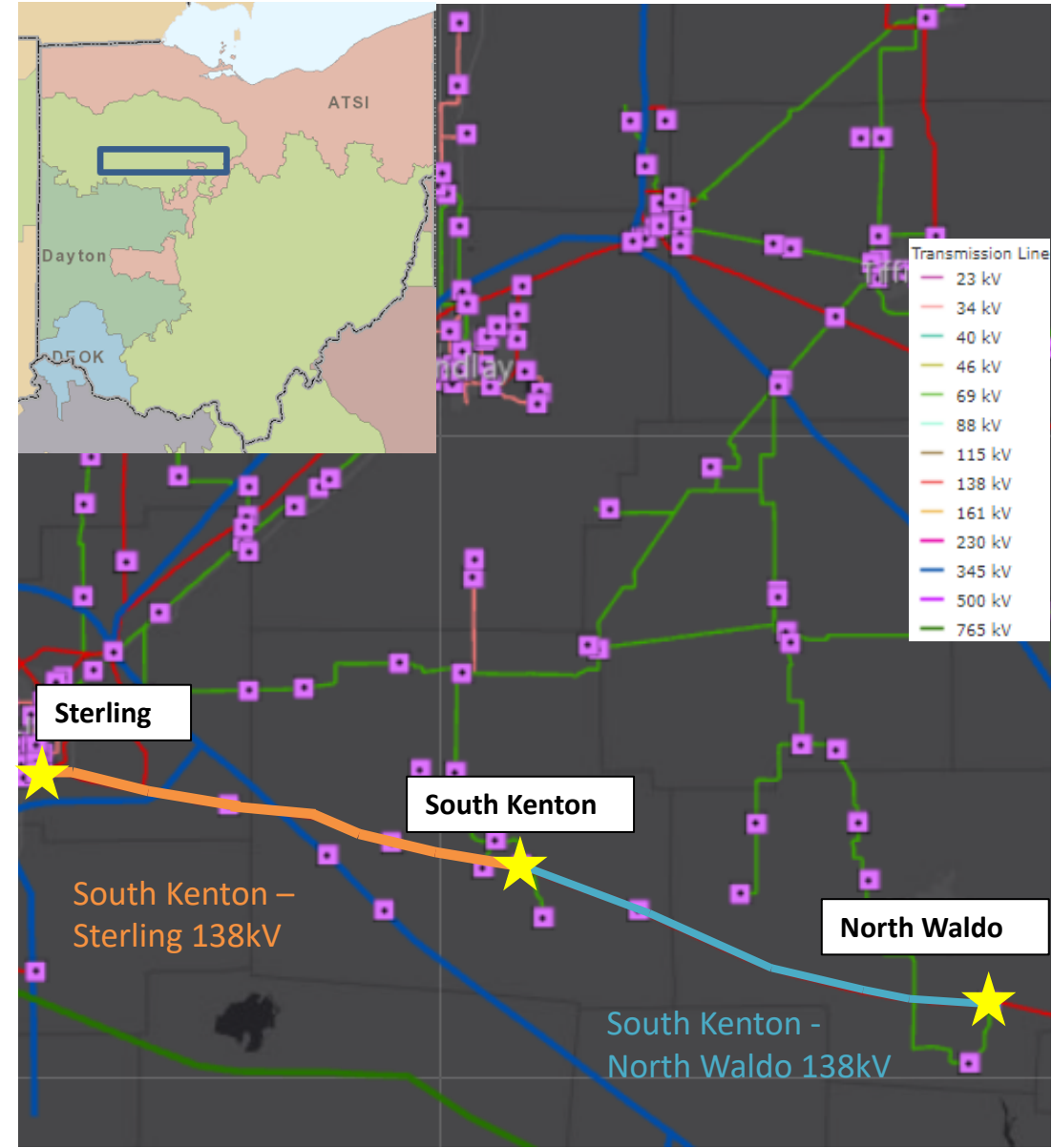
Specific Assumption Reference:

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

Problem Statement:

South Kenton - Sterling 138kV Line (1953 vintage):

- Length of Line: 28.5 Miles
- Total Structure Count: 240
 - Steel Monopole, Steel Lattice, Wooden H-frame, Concrete Structures
- Conductor Types: 336.4 ACSR 18/1 (Merlin), 4/0 ACSR 6/1 (Penguin), 477.0 ACSR 26/7 Hawk
- Outage History:
 - East Lima- South Kenton: 5 Momentary and 2 Permanent outages – average duration of 18.1 hours, 1.87M CMI over the last five years
 - East Lima – Sterling: 1 momentary and 3 Permanent outages – average duration of 3.66 hours, 1.91k CMI over the last five years
- Open Conditions: 166 open conditions on 112 unique structures related
 - 98 open condition related to broken or missing shielding/grounding wire
 - 2 related to broken/chipped insulators
 - 3 related to conductor splice and broken conductor strands
 - 63 structure related open conditions specifically affecting the poles including rot and insect damage
- The line is grounded with ground rods at non-consecutive locations which does not meet the current AEP standards.



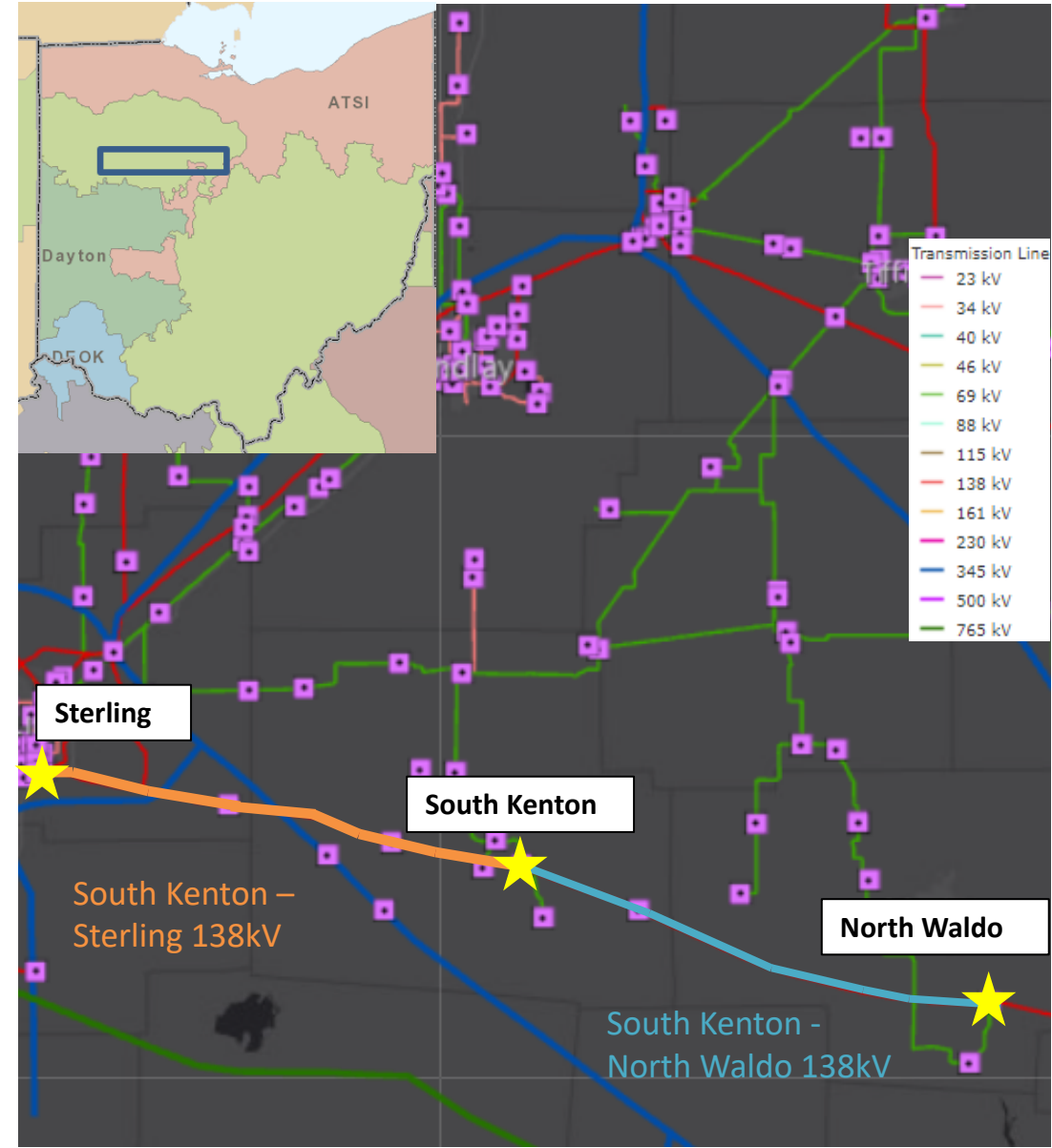
AEP Transmission Zone M-3 Process Allen, Hardin, Marion Counties , OH

Problem Statement continued:

- 13 structures were further assessed by a ground crew. 92% of those structures had reported conditions, which included the following: four structures had pole decay (heart rot), eight structures had moderate pole/crossarm/brace/fitting/wood filler block deterioration, seven structures had missing/stolen grounding downloads, two structures had significant crossarm deterioration, two structures had shield wire splices observed, two structures had conductor splices observed and the one concrete structure had deterioration of down guys/anchors and rusty ladder clips.
- Additional information: Sterling – South Kenton contains two circuits; Sterling – East Lima & East Lima – South Kenton. Lynn Mid-Ohio Co-OP is served by a hard tap on East Lima- South Kenton.

South Kenton – North Waldo 138kV Line(1954 vintage):

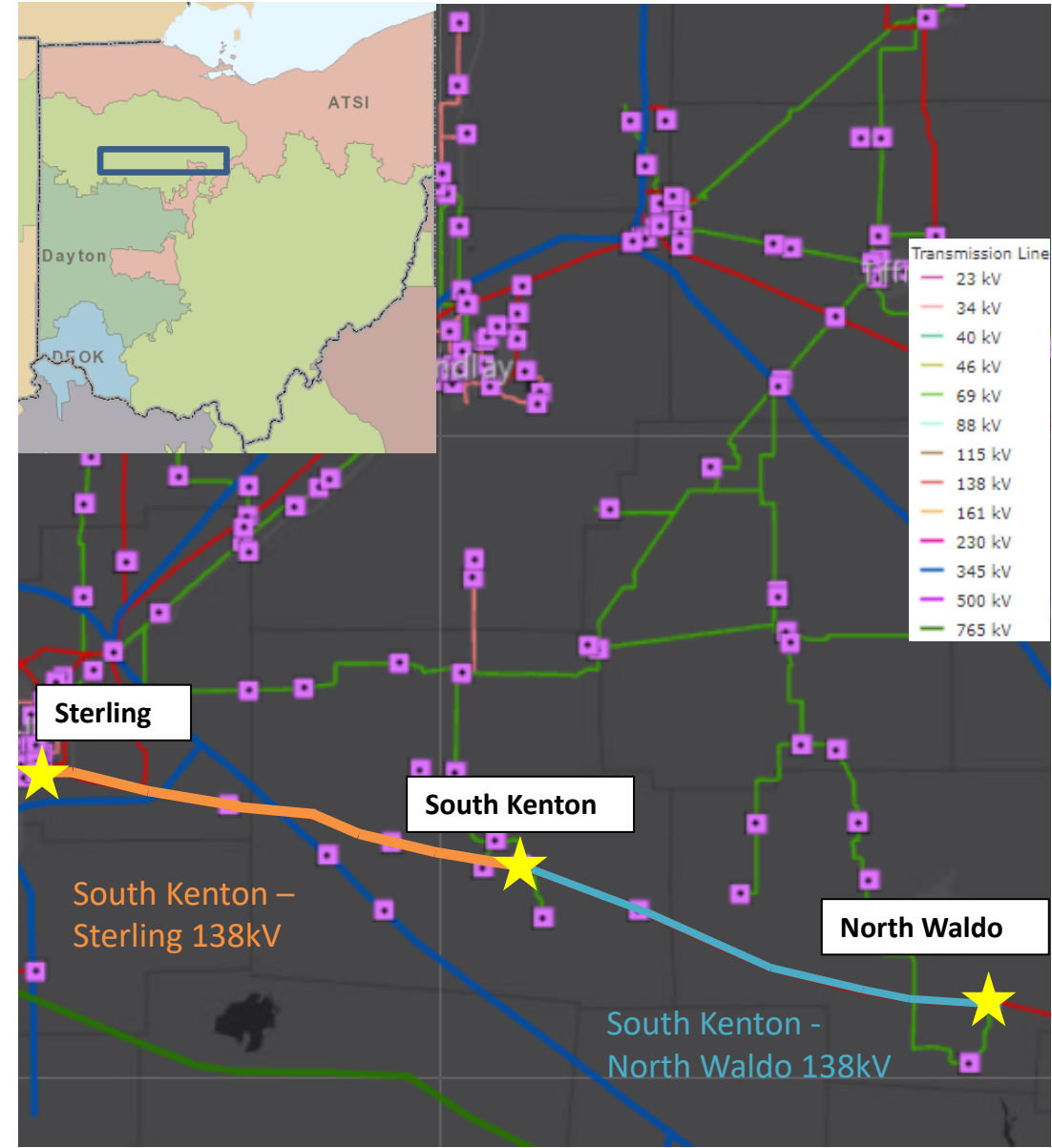
- Total Structure Count: 245
 - Wooden H-Frame Structures
 - Suspension insulators
- Conductor Types: 477 ACSR 26/7 Hawk
- Outage History: 5 momentary outages over the last five years.
- Open Conditions: 101 open conditions on 74 unique structures
 - 13 open conditions related to broken ground lead wire
 - 6 open conditions relating to burnt insulators and shield wire hardware
 - 82 structure related open conditions specifically affecting the crossarm or pole including rot, split, woodpecker, and bowed conditions
- The line is insulated with porcelain insulators which do not meet current AEP standards. The line shielding angle on the typical tangent structure is measured at 32.85° from shield wire to outside conductor and 36.3 ° from shield wire to inside conductor, which is inadequate for AEP current shielding angle requirements



AEP Transmission Zone M-3 Process Allen, Hardin, Marion Counties , OH

Problem Statement continued:

- 20 structures were further assessed by a ground crew and the entire line was assessed by an aerial drone. 90% of the structures from the ground assessment had reported conditions, which included the following: five structures had conductor and shield wire splices, eight structures had moderate/significant pole decay/heart rot, sixteen structures have moderate to significant crossarm deterioration, two structures had broken/stolen grounding, one structure had insect damage/mold on a crossarm, two structures had bowing/cracks on a crossarm, two structure had 1-2" of shell remaining on both poles and one structure had damage due to farming contact.



AEP Transmission Zone M-3 Process Seneca County, OH

Need Number: AEP-2023-OH020

Process Stage: Need Meeting: 2/17/2023

Project Driver:
Equipment Material/Condition/Performance/Risk

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

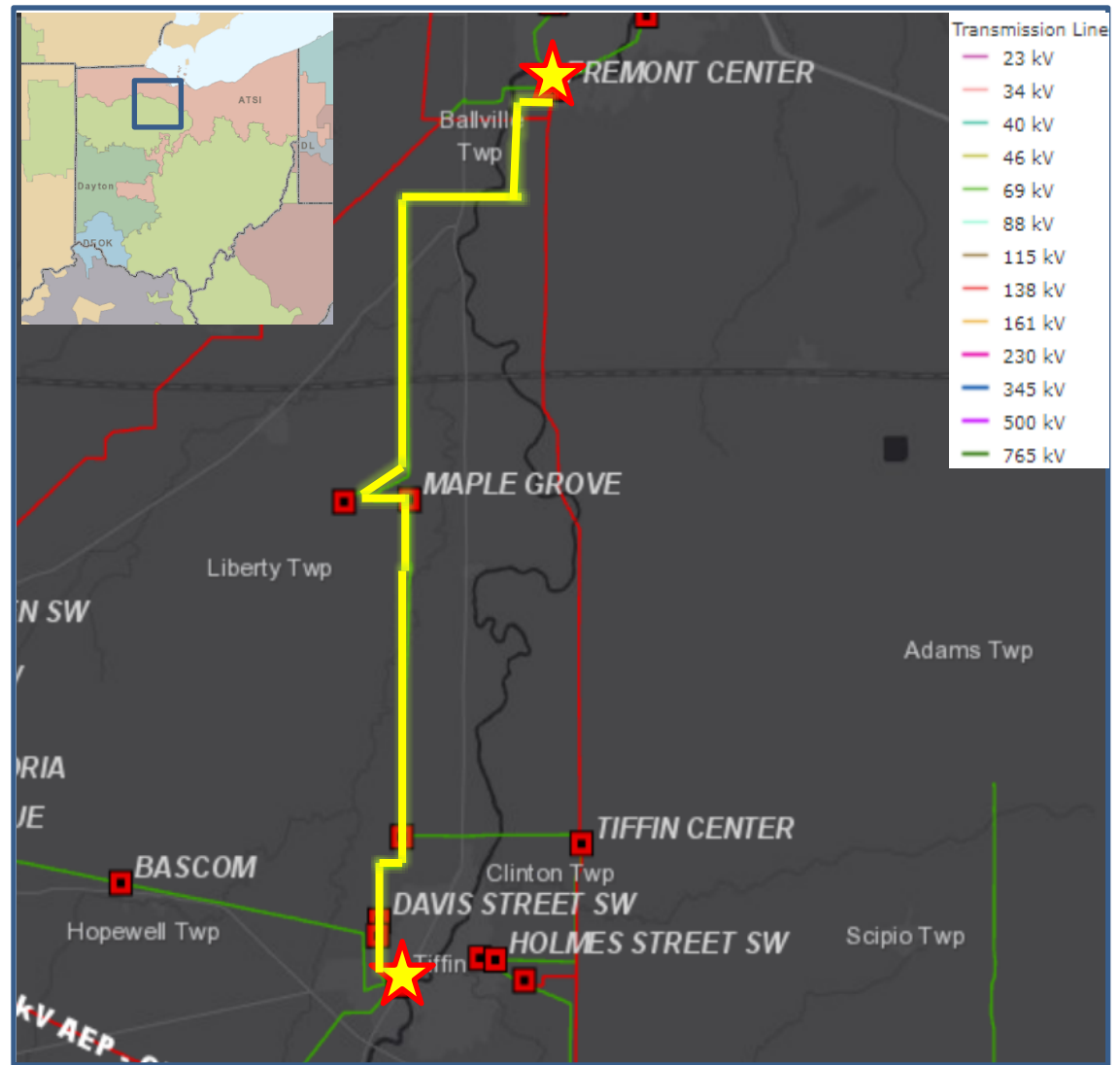
Problem Statement:
Line Name: Tiffin- Fremont Center 138kV

LINE CHARACTERISTICS

- **Original Install Date (Age):** 1916
- **Length of Line:** 20.35 miles
- **Total structure count:** 502
- **Original Line Construction Type:** Primarily wooden monopole structures with vertical and horizontal insulators
- **Conductor Type:** #1 COPPER 3 (#1COP)

CONDITION / PERFORMANCE / RISK ASSESSMENT:

- **Outage History**
 - 10 Momentary and 4 Permanent outages over five years. CMI: 1,240,284
- **Condition Summary**
 - Number of open conditions by type / defects / inspection failures: 45
 - 20 structure based open conditions consisting of rot heart, rot top, rot shell, insect damage, split knee/vee braces and a leaning transverse. 2 conductor based open conditions consisting of a disconnected bond and an improper installation of a plp splice/dead end. There are currently 15 grounding based open conditions consisting of broken/missing/stolen ground lead wires. There are currently 8 hardware based open conditions consisting of loose attachment hardware, heavy rust on hardware, loose bracket and broken/contaminated insulators.

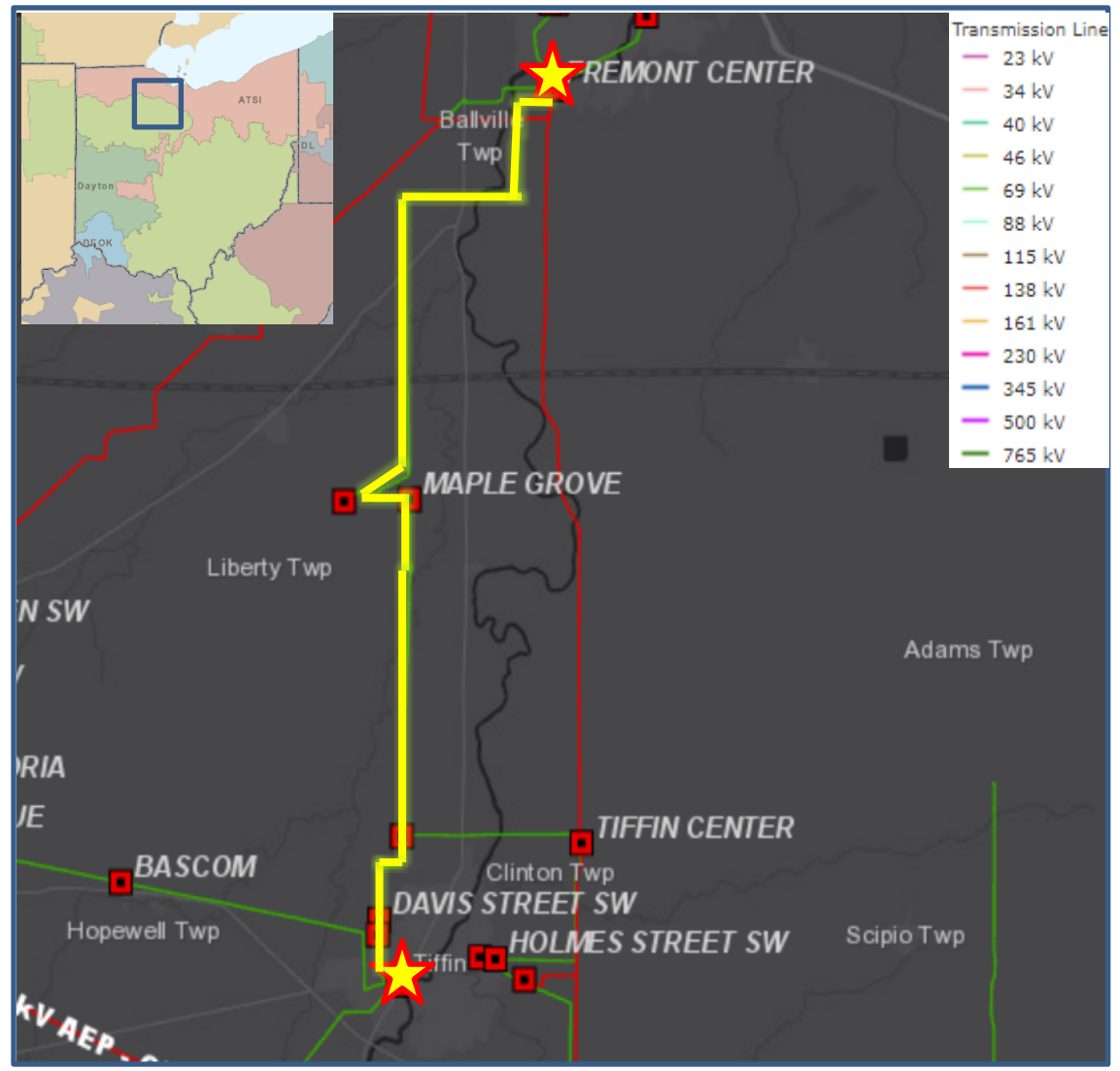


Need Number: AEP-2023-OH020

Process Stage: Need Meeting: 2/17/2023

CONDITION / PERFORMANCE / RISK ASSESSMENT (Cont):

- 25 structures were further assessed by a ground crew which reported 96% of those structures had conditions, which included the following: 15 structures have conductor splices observed, 1 structure has a PLP splice in the shield wire, 13 structures have moderate pole/crossarm/brace deterioration, 5 structures have significant pole/crossarm/brace deterioration with heart rot or rot shell present, 1 structure has surface mold reported at the ground line, 1 structure has older brown porcelain insulators, 1 structure has guying out of line, 1 structure has a small guyed angle, 1 structure has guy wire corrosion, 2 structures have insulator contamination from the nearby limestone quarry and crusher, 1 structure is leaning due to a nearby deep ditch, and 3 lattice steel structures have reported moderate to severe rust and concrete foundation deterioration.
- The transmission line structures fail to meet 2017 NESC Grade B loading criteria as well as AEP and ASCE structural strength requirements. In addition, it was noted that the line is insulated with porcelain insulators which do not meet current AEP standards for CIFO and minimum leakage distance requirements. The line is grounded with butt wraps which also does not meet current AEP standards and can lead to poor lightning performance.



Need Number: AEP-2023-OH032

Process Stage: Need Meeting 2/17/2023

Project Driver:

Customer Service

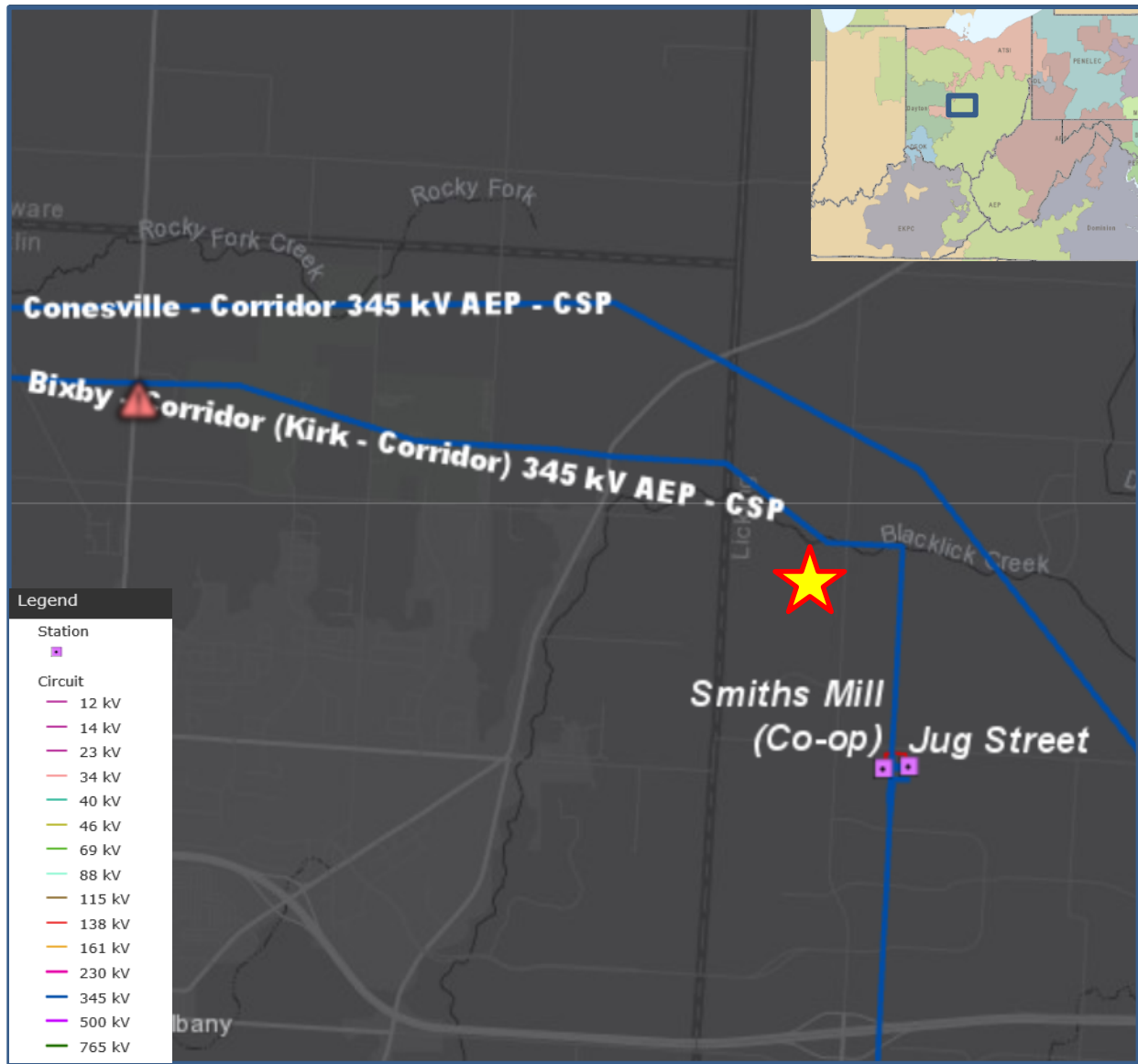
Specific Assumption Reference:

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

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site North of AEP’s existing Jug Street station in Columbus, OH.
- The customer has indicated an initial peak demand of 50 MW with an ultimate capacity of up to 300 MW at the site.
- Initial customer requested in-service date of January 1, 2026



Need Number: AEP-2023-OH033

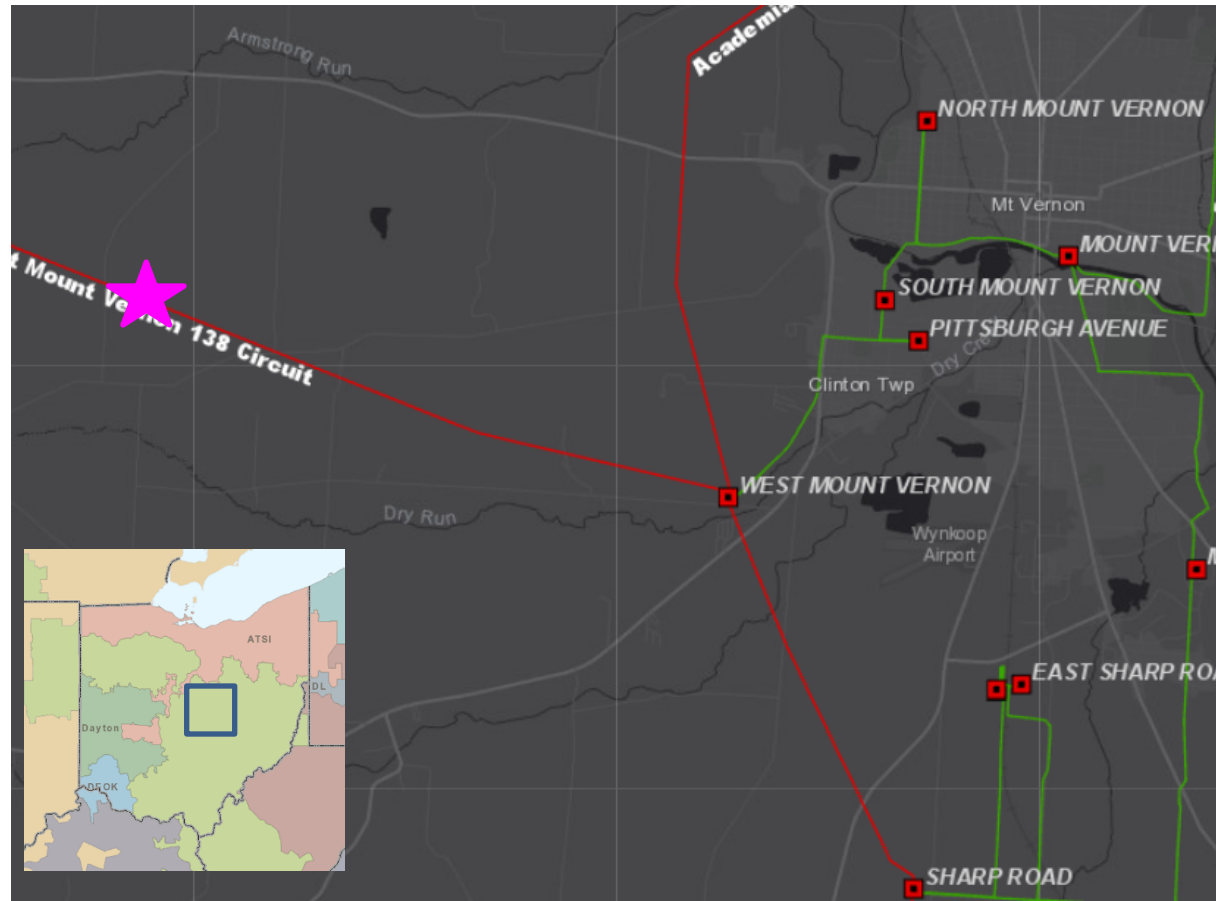
Process Stage: Need Meeting 2/17/2023

Supplemental Project Driver:
Customer Service

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

Problem Statement:

- Due to increasing load demand in the Mt. Vernon, Ohio area, AEP Ohio has exhausted capacity at North Mt. Vernon and Pittsburg Ave stations. AEP Ohio has requested a new 138kV delivery point on the South Kenton – West Mount Vernon 138kV Circuit by June 2025 in order to transfer approximately 12 MVA of load and relieve expected transformer capacity issues at those stations.



Need Number: AEP-2023-OH034

Process Stage: Need Meeting 02/17/2023

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

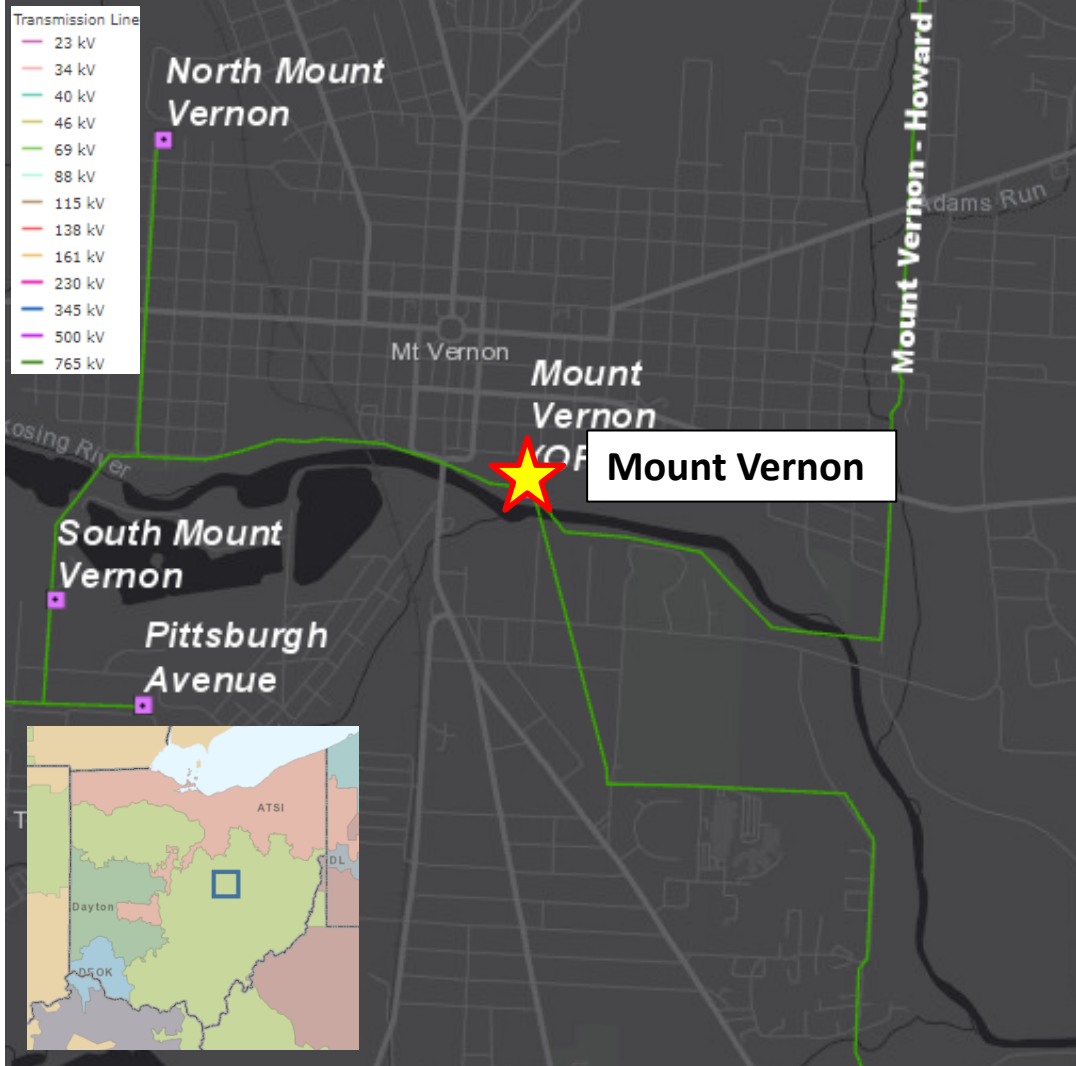
Mount Vernon Circuit Breakers: A

Breaker Age:

- 1951: A
- Interrupting Medium: (Oil)

Additional Breaker Info:

As of January 24, 2023, there are 3 remaining FK-439-69-1000 circuit breakers on the AEP system, including the 1 at this station. The manufacturer provides no support for this fleet of circuit breakers and spare parts are not available. A common failure mode documented in AEP malfunction records are compressor failures and valve defects, which cause low pressure and oil leaks. Another failure mode includes trip or reclose failures, caused primarily by spring latching and charging motor component failures. In addition, the vacuum oil and oil breakers have a lot of oil contamination from aging gaskets allowing moisture and other particle ingress.



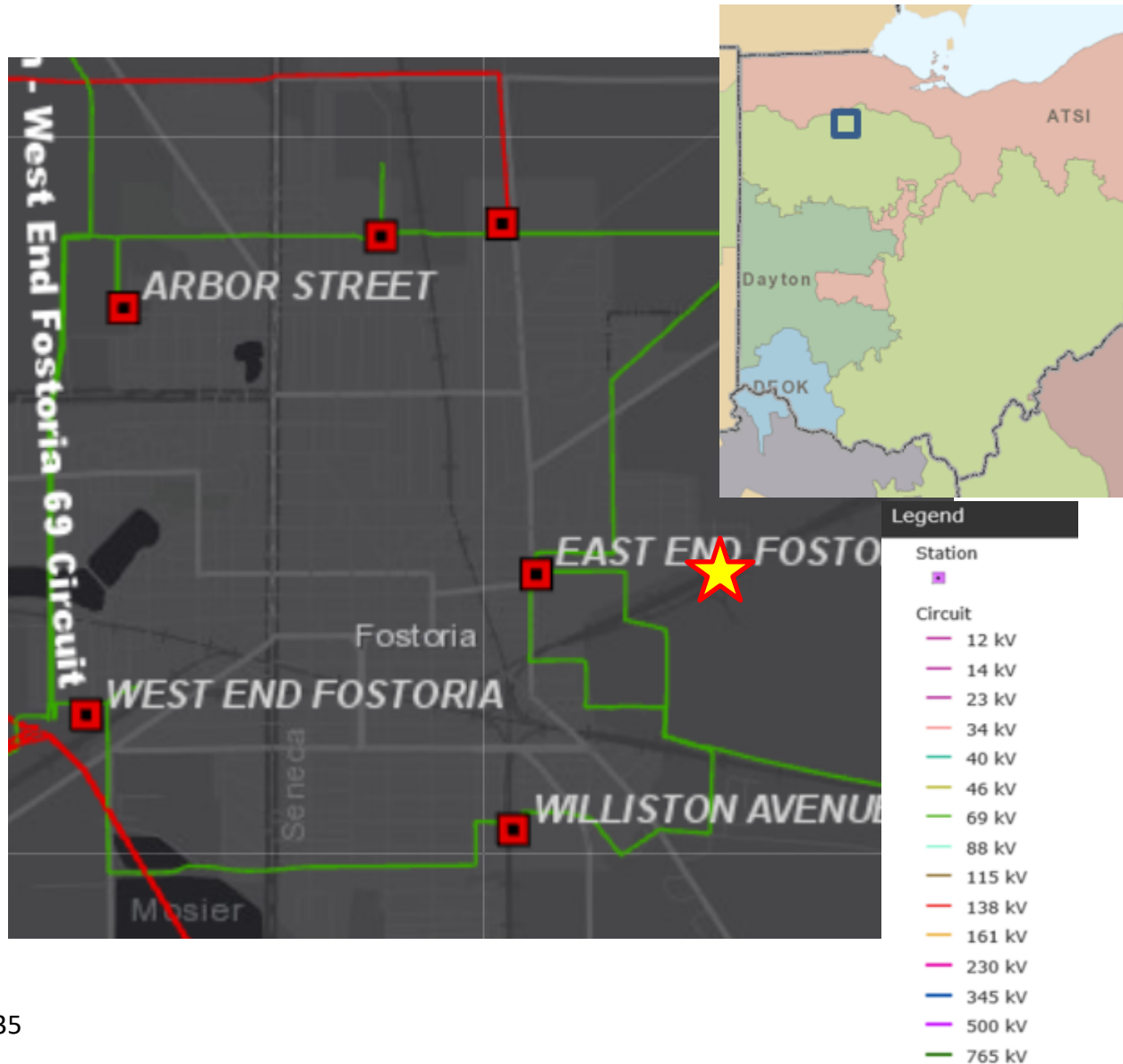
Need Number: AEP-2023-OH035

Process Stage: Need Meeting 02/17/2023

Project Driver:
Customer Service

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

- Problem Statement:**
- AEP Ohio has requested a 69kV delivery near Eastern Fostoria to replace East End Fostoria.
 - The anticipated load is 6MWA
 - AEP Ohio has requested an in-service date of 09/30/2026



Solutions

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

Need Number: AEP-2019-OH028

Process Stage: Solutions Meeting 02/17/2023

Previously Presented:

Needs Meeting 03/25/2019

Project Driver:

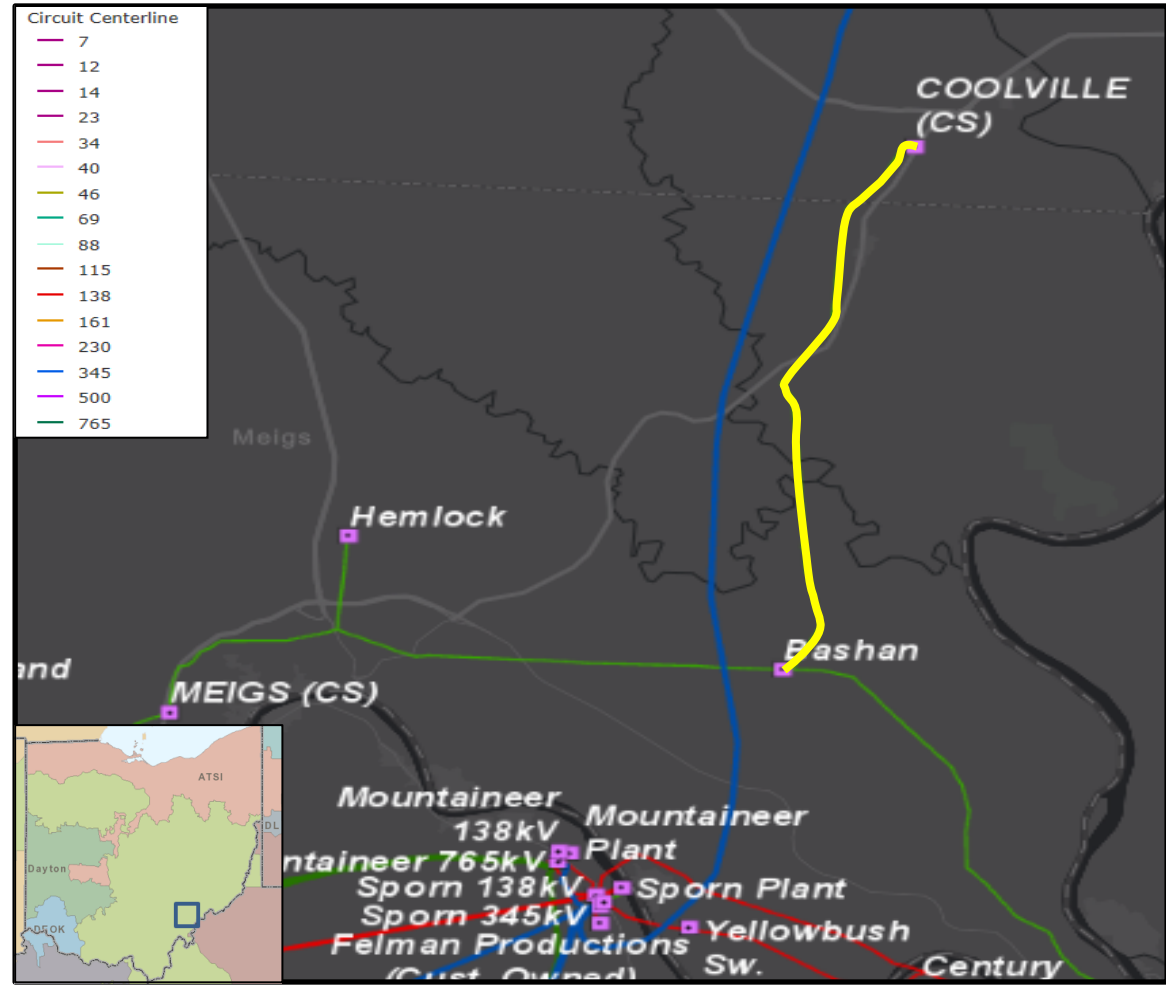
Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

Coolville 69kV station is radially served on a 1954 vintage line (~12.6 miles) utilizing 4/0 ACSR 6/1 (Penguin) conductor (50/63 MVA SN/WN). This radial line has 84 structures, 22 of which have pole related open conditions and 28 of which have ground lead wire issues/concerns. It has experienced 4.4 million CMI over the last three years. Radial lines restricts the ability to perform routine maintenance and restoration activities.



Need Number: AEP-2020-OH010

Process Stage: Solutions Meeting 02/17/2023

Previously Presented:
Needs Meeting 02/21/2020

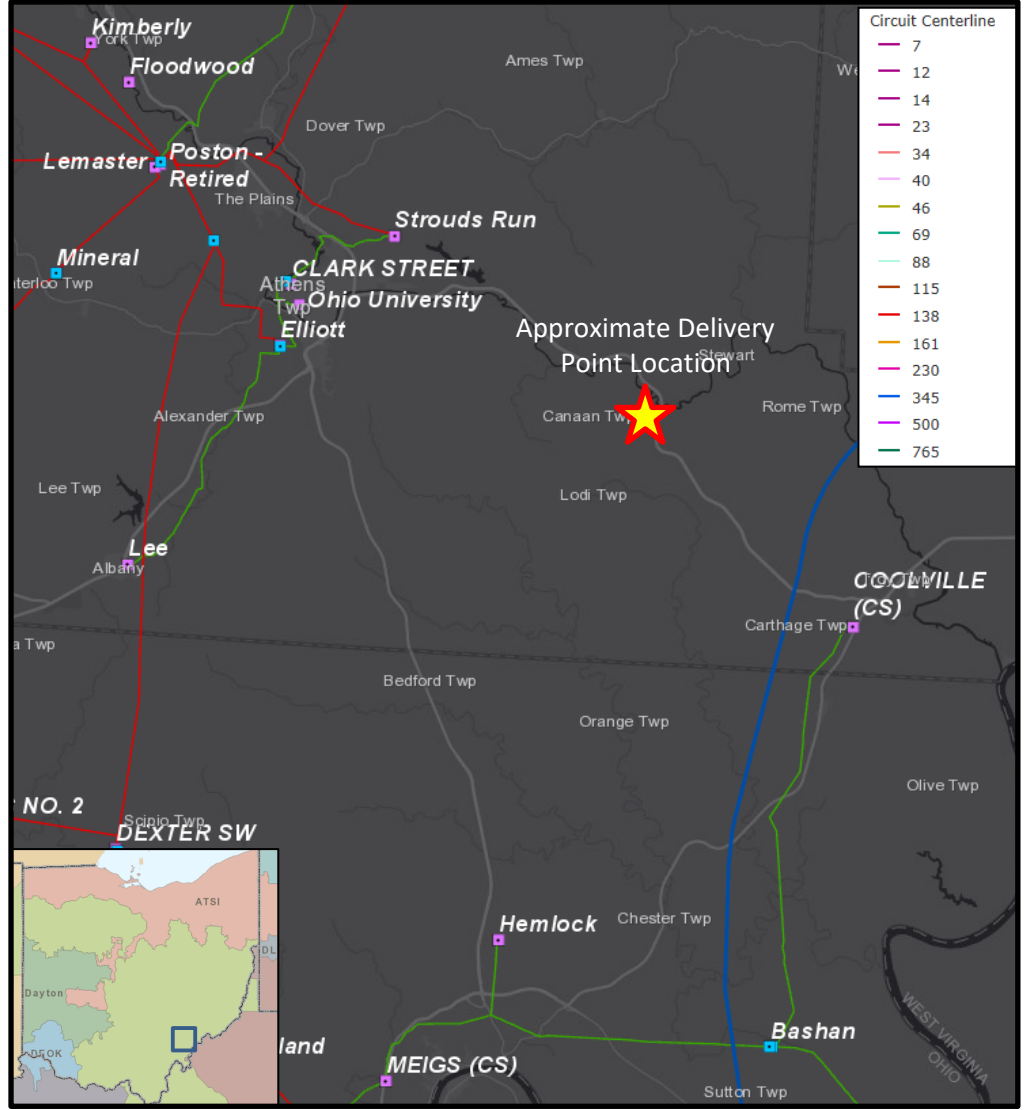
Supplemental Project Driver: Customer Service

Specific Assumption Reference:

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

Problem Statement:

AEP Ohio has requested a new delivery point between Coolville and Elliott Stations. Anticipated peak load is approximately 7.5 MVA that will be transferred from nearby stations in the area.



AEP Transmission Zone M-3 Process Coolville Loop

Need Number: AEP-2019-OH028 & AEP-2020-OH010

Process Stage: Solutions Meeting 02/17/2023

Proposed Solution:

- **Guysville 69 kV:** Install a in-out station with an 2000A auto sectionalizing MOAB switch towards Coolville and a 3000A 40kA circuit breaker towards Bryson. \$1.73M
- **Bryson - Guysville 69 kV:** Construct a greenfield ~12.5-mile single circuit line using 556.5 ACSR (Dove) conductor (SE 142 MVA). \$28.26M
- **Coolville – Guysville 69 kV:** Constructing a greenfield ~10.5-mile single circuit line using 556.5 ACSR (Dove) conductor (SE 142 MVA) \$29.22M
- **Coolville 69 kV:** Upgrade to a in-out station with two 3000A 40kA circuit breakers on the through path. Existing wood structures will be replaced with a new steel box bay to accommodate new breakers. \$3.08M
- **Coolville – East Bashan 69 kV:** Rebuild the existing single circuit ~12.6-mile line using 556.5 ACSR (Dove) conductor (SE 142 MVA). \$29.61M
- **West Bashan 69 kV:** Remove switch going to Hemlock \$0.02M
- **Hemlock – West Bashan 69kV:** Remove ~7.7 miles of single circuit line. \$2.09M
- **Hemlock 69 kV:** Remove the circuit breaker going to West Bashan (CB C). \$0.14M

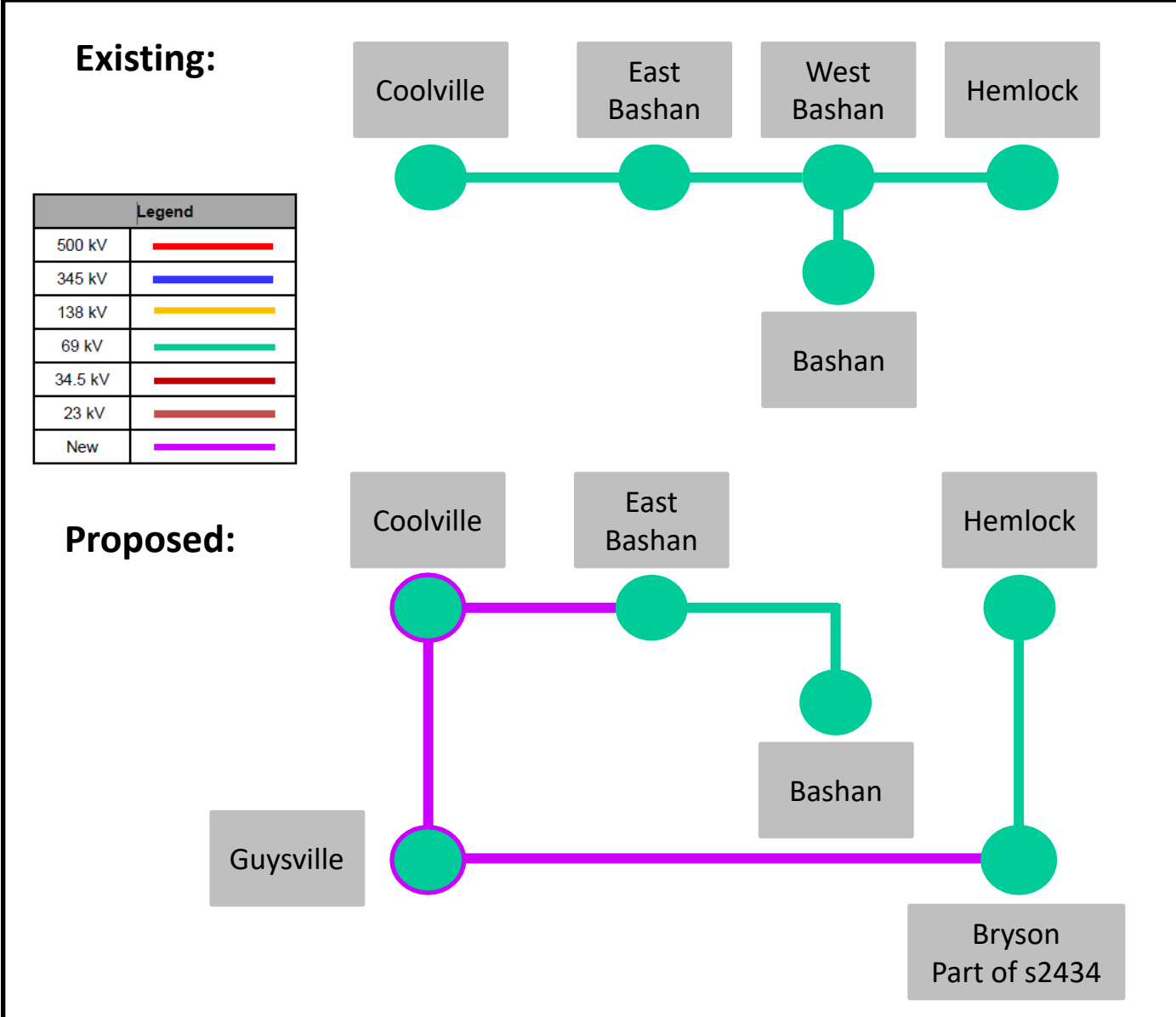
Estimated Total Cost: \$94.15M

Ancillary Benefits: This project will also eliminate the 4.3 mile radial to customers served out of the proposed Bryson switch (s2434) and allows for the retirement of 7.7 miles of wood pole line between Hemlock and West Bashan that was originally constructed in the 1920's with structures that date back to the 1950's .

Alternatives Considered: Consideration given to a new interconnection being established off a 138 kV generation feed in the area to address the radial concern at Coolville, but after the requests for Guysville and Bryson were made this alternative did not fully address the other needs in the area.

Projected In-Service: 06/01/2025

Project Status: Scoping



Need Number: AEP-2021-AP017

Process Stage: Solutions Meeting 2/17/2023

Previously Presented: Needs Meeting 4/16/2021

Supplemental Project Driver: Customer Service

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

Problem Statement:

APCO Distribution has requested a new transmission delivery point to serve a new load request. This station site also supports West Virginia Business Ready Sites Program (House Bill 144) located in Raleigh County, West Virginia.

Summer projected load: 16 MVA

Winter projected load: 16 MVA.



Need Number: AEP-2021-AP017

Process Stage: Solutions Meeting 02/17/2023

Proposed Solution:

Cut in/out of the existing Cherry Creek – Clifftop 138 kV and construct a new 4 mile double circuit 138 kV line to a new 138/12 kV station at Raleigh County Airport (RCA) **Est. Trans Cost: \$16.8M**

Install two 138 kV circuit breakers and a 138/12 kV 25 MVA transformer at the new Raleigh County Airport (RCA) Station **Est. Trans. Cost: \$0.0M**

Remote end relaying work required at Grandview Station. **Est. Trans. Cost: \$0.3M**

Estimated Total Trans. Cost: \$17.1M

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

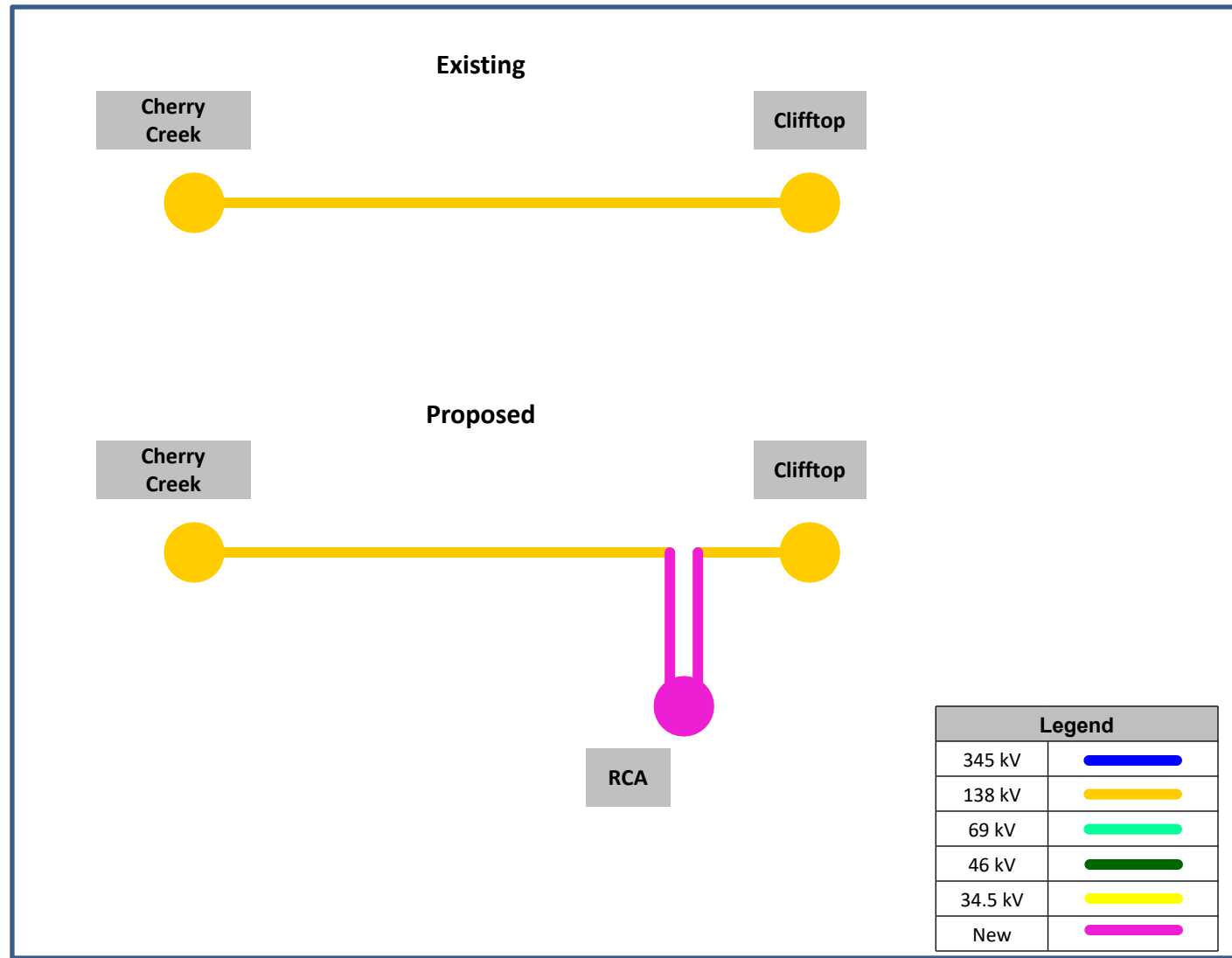
Alternatives Considered:

Multiple sites and line routes were considered; however due to line route restrictions related to the airport there were no other viable options in this area. The 46 kV network does not have the capacity to serve the request load nor any future load growth.

Projected In-Service: 3/14/2024

Project Status: Scoping

Model: 2027 RTEP



Need Number: AEP-2021-AP024

Process Stage: Solutions Meeting 02/17/2023

Previously Presented: Needs Meeting 06/15/2021

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

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

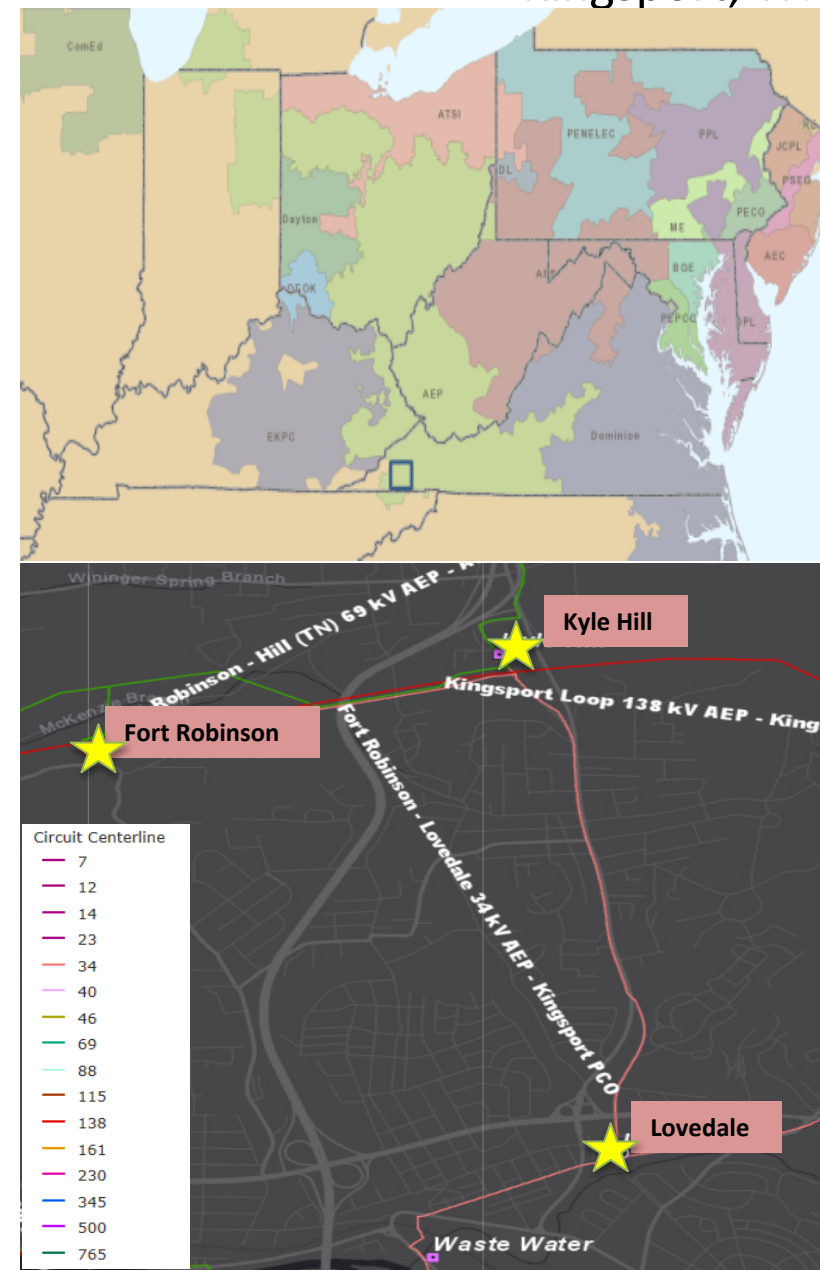
Problem Statement:

Line:

Fort Robinson — Lovedale 34.5 KV (Installed in 1969)

- Length: ~3.57 Miles
- Original Construction Type: Vintage Wood Pole
- Original Conductor Type: 556 ACSR 26/7
- Permanent Outages: 3 (5 years)
- CMI: 107,429 (2015-2020)
- Total structure count: 88
- Number of open conditions: 19
 - Open conditions include broken conductor strands, broken/burnt insulators.
- Unique structure count with open conditions: 6 (7%)
- Structures on the line failed to meet 2017 NESC Grade B loading criteria, failed to meet current AEP structural strength requirements, and failed to meet current ASCE structural strength requirements.
- Additional Info on Wood Assessment, Insulator & Conductors:
 - Wood Assessment: The structures are in poor overall condition. Conditions include rot, pole top weathering, bowing, cracking, and woodpecker holes.
 - The insulators on the line do not meet current AEP standards for Critical Impulse Flashover CIFO (an insulator rating related to what level of flashover the insulator is expected to be able to withstand) and minimum leakage distance requirements.
- **Model:** N/A

AEP Transmission Zone: Supplemental Kingsport, TN



AEP Transmission Zone: Supplemental Kingsport, TN

Need Number: AEP-2021-AP024

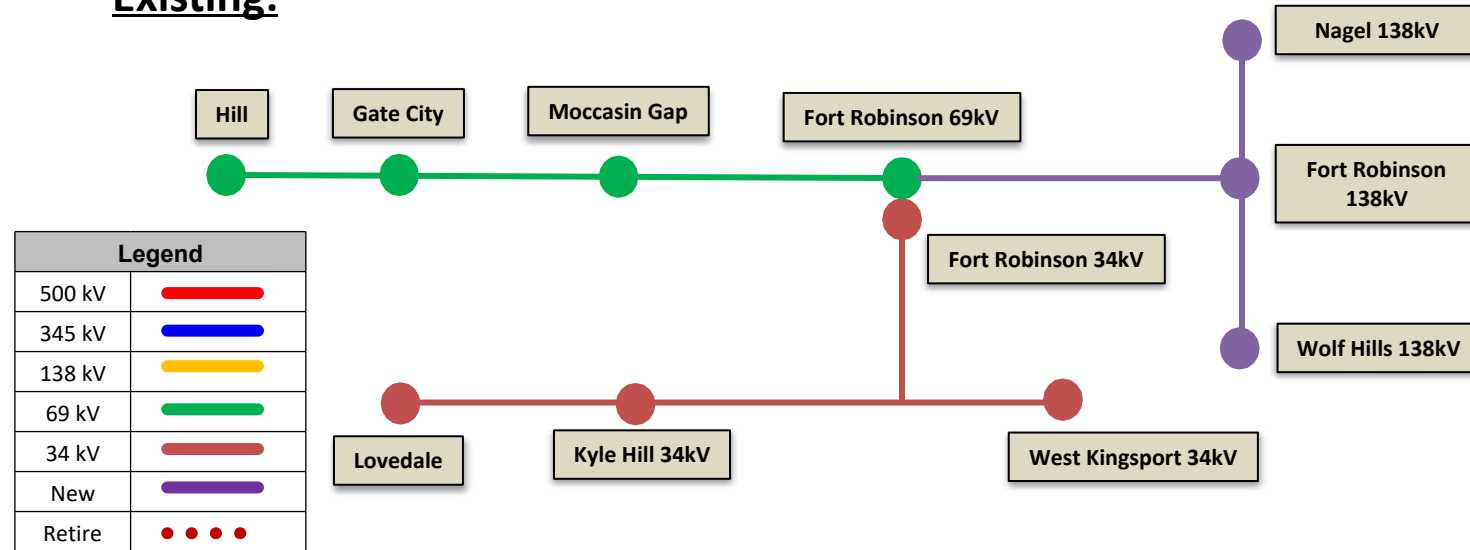
Process Stage: Solutions Meeting 02/17/2023

Proposed Solution:

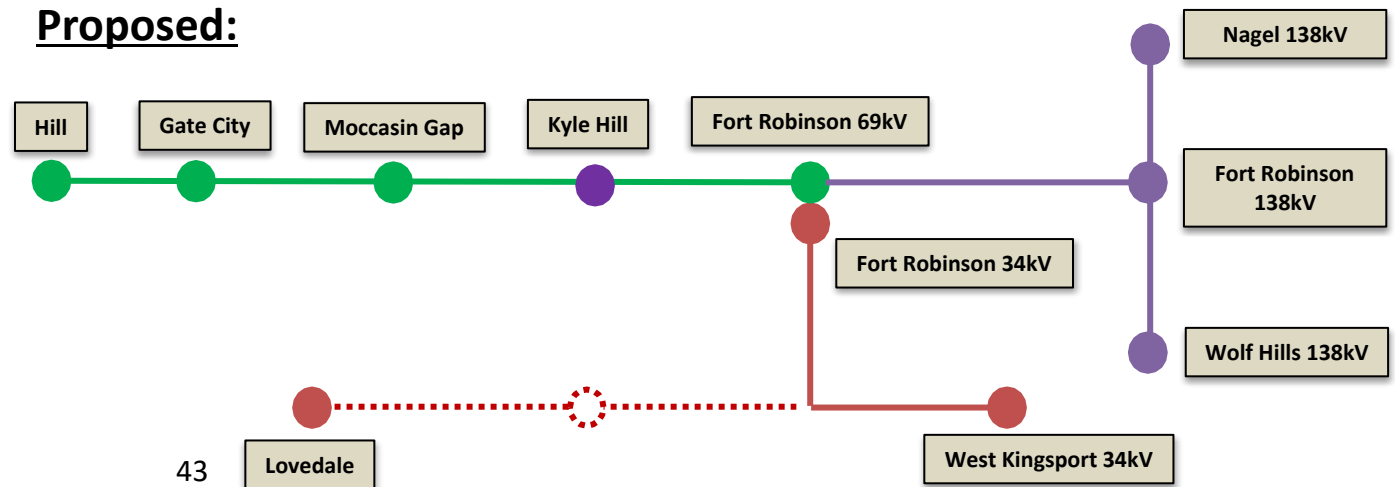
- Retire existing Kyle Hill Station. **Estimated Trans. Cost: \$0 M**
- Kyle Hill Extension : New 0.07 miles double circuit in/out line from the Fort Robinson-Hill 69kV line to the new Kyle Hill 69kV Station. **Estimated Trans. Cost: \$1.22 M**
- Build a new Kyle Hill Station behind the existing station. Establish a 69KV bus to allow a 69KV in/out from Fort Robinson – Hill 69KV line. Install one (1) 1200A 69KV rated line MOAB switches towards Hill station. Install one (1) 1200A 69KV rated line switches towards Fort Robinson station. Replace Ground MOAB with a high-side circuit switcher. Replace existing 34.5/12KV transformer #1 with 69/12KV transformer. Install new 12KV bus. Reuse existing Kyle Hill 12kv Breakers. Install 16x19 DICM. **Estimated Trans. Cost: \$0 M**
- Retire approximately 3.41 miles of the Fort Robinson-Lovedale 34.5kV line. **Estimated Trans. Cost: \$2.69 M Estimated**
- Remote end and Removal of Circuit Breaker J at Fort Robinson substation. **Estimated Trans. Cost: \$0.197 M**
- Remote end and Removal of Circuit Breaker G at Lovedale substation. **Estimated Trans. Cost: \$0 M**
- Retire 34.5 kV Echo Switch. **Estimated Trans. Cost: \$0.095 M**
- Provide Transition Fiber for Kyle Hill Station. **Estimated Trans. Cost: \$0.105 M**

Total Estimated Transmission Cost: \$4.31 M

Existing:



Proposed:



AEP Transmission Zone: Supplemental Kingsport, TN

Need Number: AEP-2021-AP024

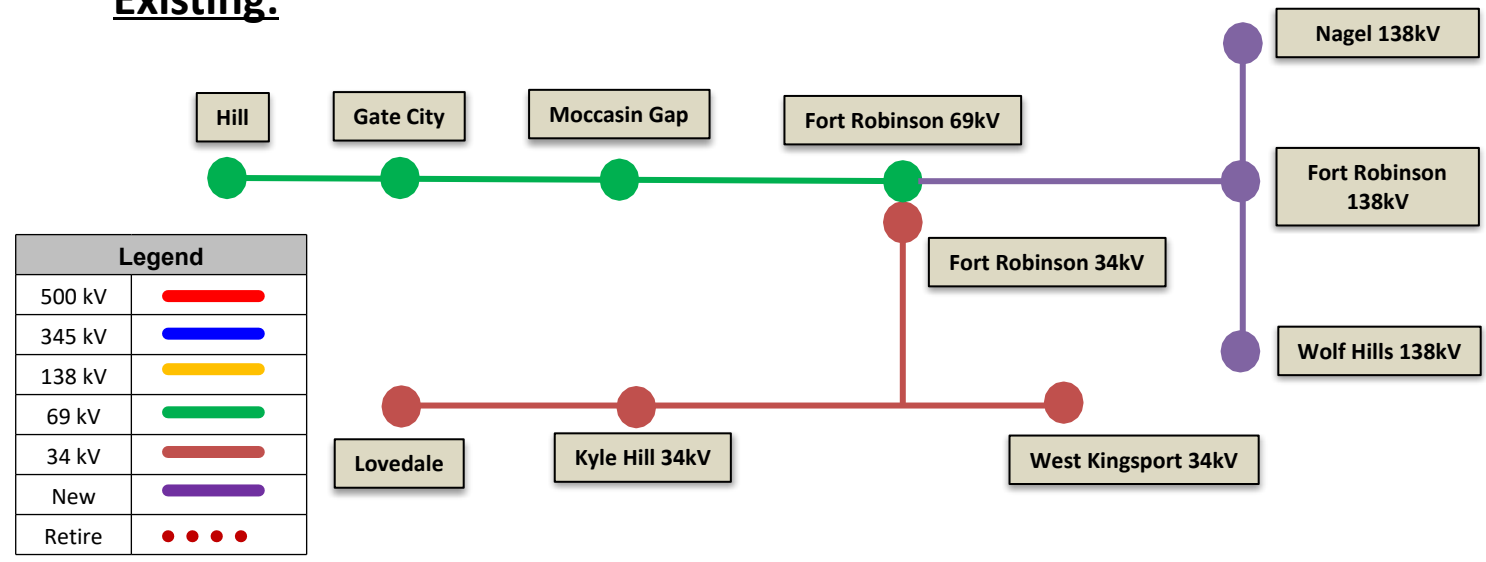
Process Stage: Solutions Meeting 02/17/2023

Alternatives Considered :

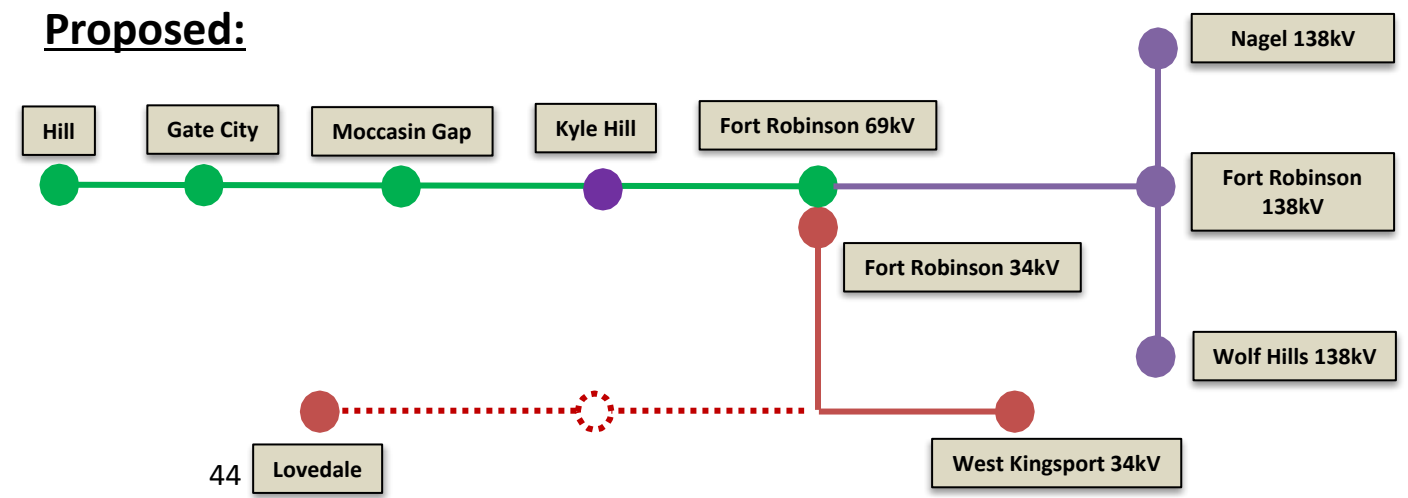
Convert Kyle Hill to 138kV substation. Construct new 138kV substation by tapping Nagel – Reedy Creek 138kV line. Install 138/12kV transformer along with 138kV circuit switcher and 12kV distribution breakers. Retire existing Kyle Hill substation and Echo switch. New substation would be a greenfield build at the bottom of the Hill. New 138kV double circuit extension. **Total Estimated Cost: \$11.6 M**

Rebuild Fort Robison – Lovedale 34.5KV line to 69 KV standard, operated at 34.5KV. Rebuild the highside for the Kyle Hill substation to accomodate IN/out t-line from Fort Robinson – Lovedale line. Retire Echo switch. **Total Estimated Cost: \$11.9 M**

Existing:



Proposed:



Projected In-Service: 07/01/2026

Project Status: Scoping

Model: 2027 RTEP

Need Number: AEP-2022-IM016

Process Stage: Solution Meeting 2/17/2023

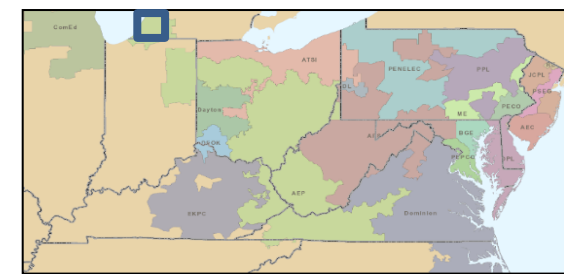
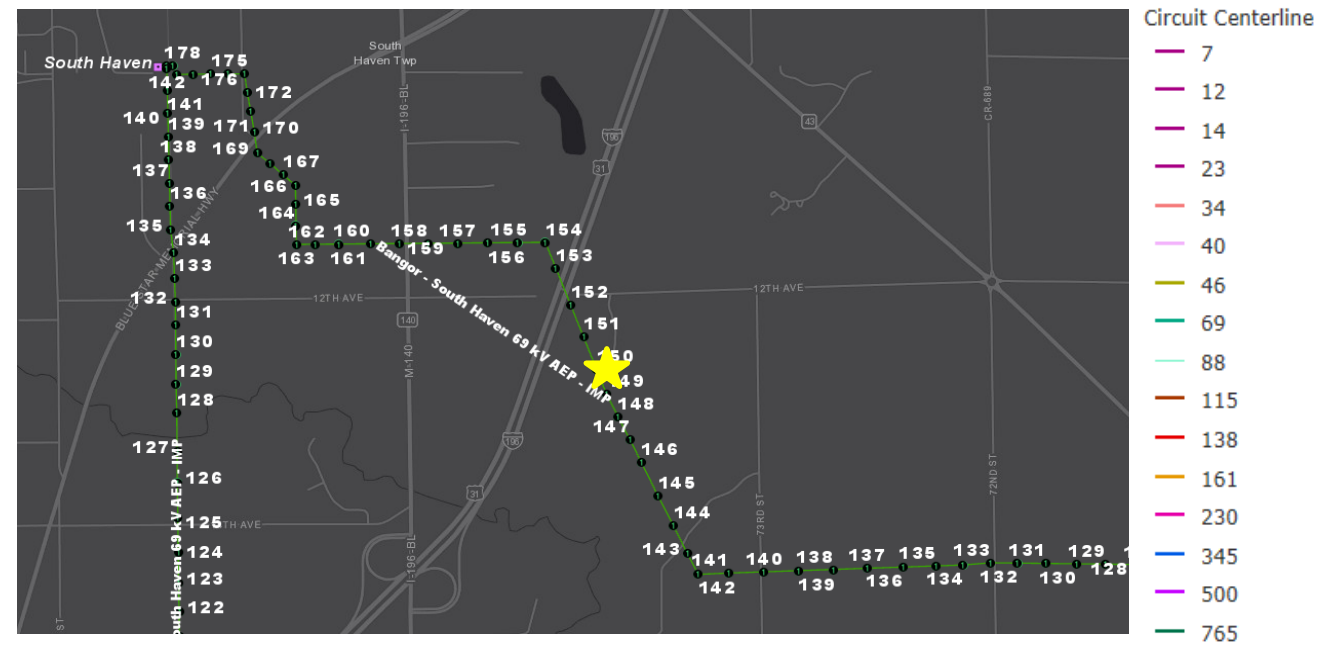
Previously Presented: Needs Meeting 9/16/2022

Project Driver: Customer Service

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

Problem Statement:

The City of South Haven has requested a new 69kV delivery point in Hartford, Michigan by the end of May 2023. Anticipated load is approximately 8.5 MVA.



AEP Transmission Zone M-3 Process

South Haven 69kV Delivery Point

Need Number: AEP-2022-IM016

Process Stage: Solution Meeting 2/17/2023

Proposed Solution:

Deerlick Creek Switch 69kV: Install a new 69kV phase over phase switch on the South Haven – Phoenix Road Tap 69kV section of the Bangor – South Haven 69kV circuit. Fiber Cable extension for the new switch. **Estimated Cost: \$1.27M**

Deerlick Creek Switch – 12th Avenue 69kV: Install ~0.06 mi of 69kV single circuit with the conductor size 795 ACSR 26/7 Drake (Cost includes ROW). **Estimated Cost: \$0.5M**

12th Avenue station: Install metering and telecom upgrades. **Estimated Cost: \$0.11M**

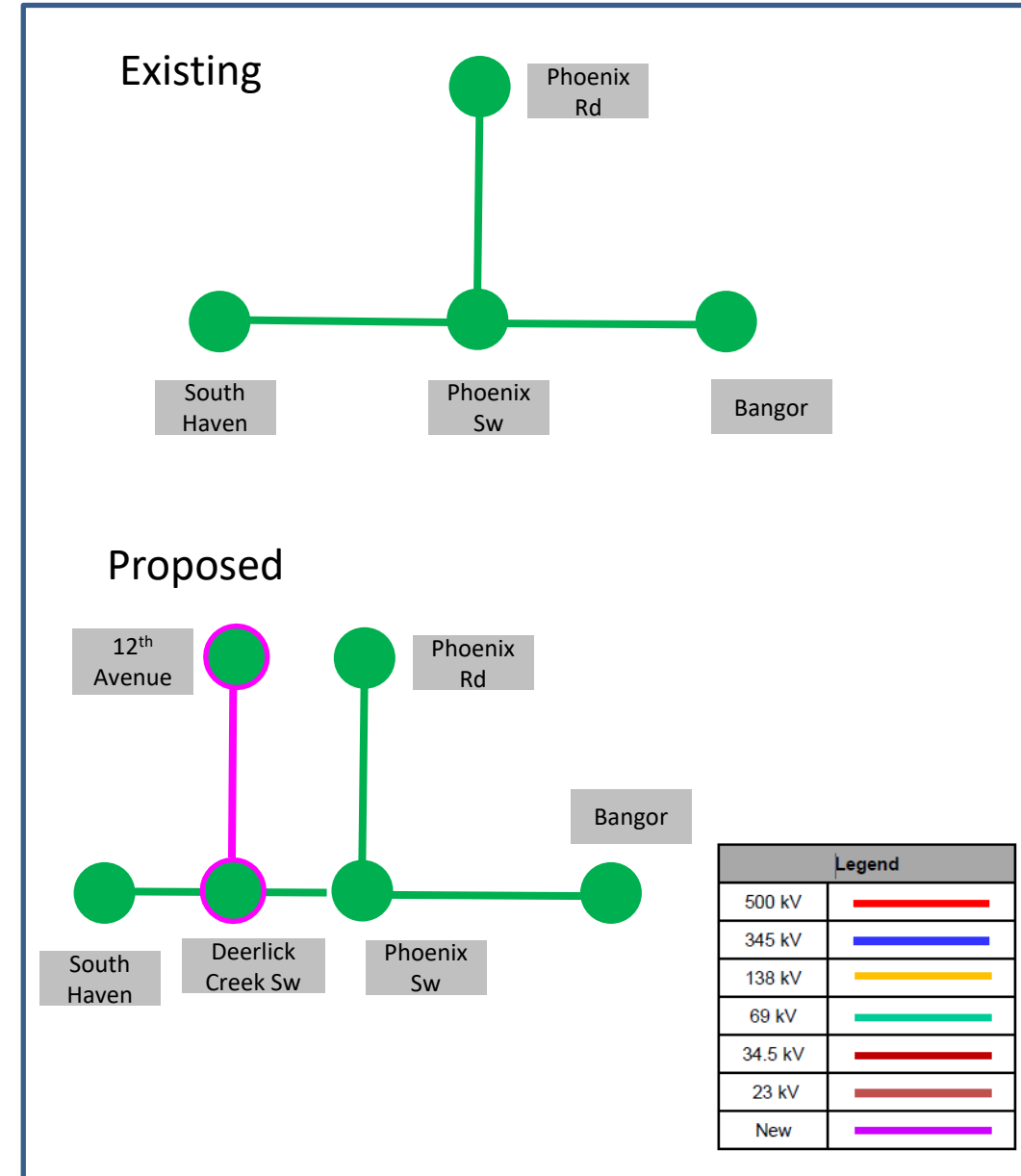
Total Estimated Transmission Cost: \$1.88M

Alternative considered:

Considering the location and timing of the customer request, no other alternatives were identified.

Projected In-Service: 5/26/2023

Project Status: Scoping



AEP Transmission Zone M-3 Process Morgan County, OH

Need Number: AEP-2022-OH026

Process Stage: Solutions Meeting 2/17/2023

Previously Presented: Need Meeting 04/22/2022

Project Driver:

Equipment Material/Condition/Performance/Risk

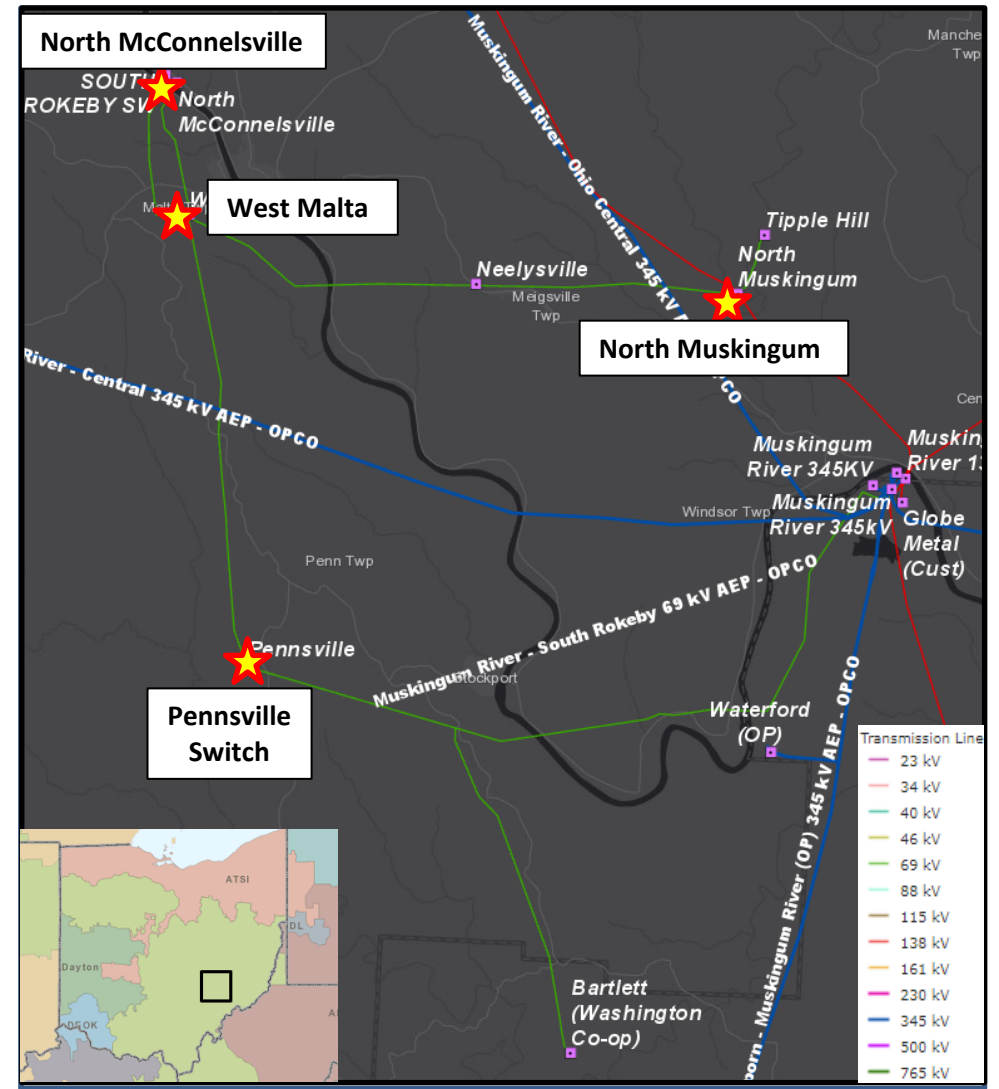
Specific Assumption Reference:

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

Problem Statement:

North Muskingum – West Malta 69kV (1952):

- Length of Line: 8.40 Miles
- Total Structure Count: 57
 - 54 Wooden H Frame & Monopole structures
 - 3 Steel Monopole structures from 2015
- Conductor Type: 4/0 ACSR 6/1 (Penguin)
- Outage History: 6 Momentary and 3 Permanent Outages, CMI 84,450 from 1/2015 – 12/2021
- Open Conditions: There are 21 structures with at least one open condition, which relates to 37% of the structures on this line. There are currently 21 structure based open condition consisting of woodpecker holes, split poles, rot top, rot heart, bowed crossarm, vines on poles, rot top of a filler block and a loose knee/vee brace. There are currently 5 grounding based open conditions consisting of stolen ground lead wires. There are currently 9 hardware based open conditions consisting of burnt/broken insulators, loose guys and loose guy wires.
- The line fails to meet 2017 NESC Grade B loading criteria, fails to meet current AEP structural strength requirements, and fails to meet the current ASCE structural strength requirements. The line is insulated with porcelain between 4 and 5 bells which does not meet the current AEP standards for the CIFO and minimum leakage distance requirements. The line shielding angle on the typical tangent structure is measured at 25.49° degrees, which is inadequate for AEP current shield angle requirements and can lead to poor lightning performance.



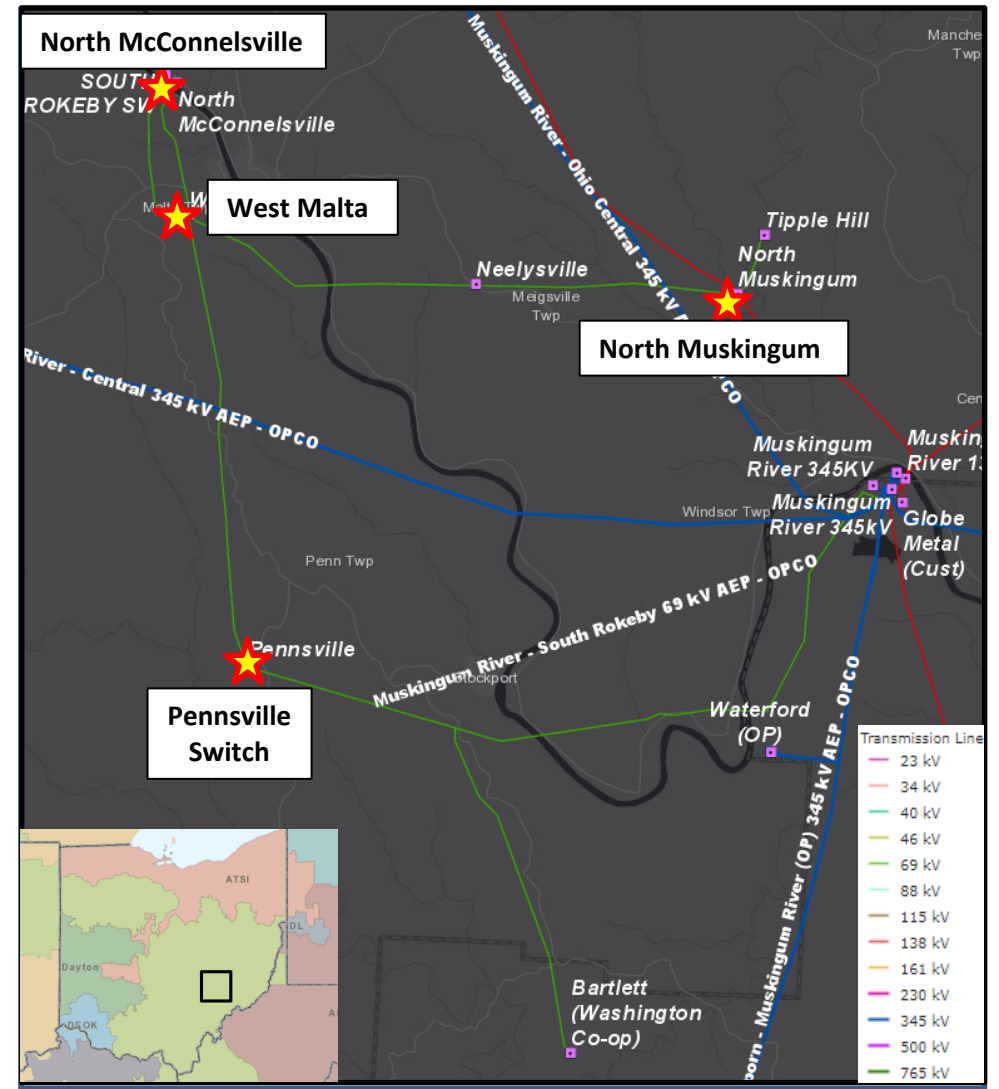
Problem Statement (continued):

West Malta – North McConnellsville 69kV (1966)

- Length of Line: 2.1 Miles
- Total Structure Count: 20 Wooden H Frame & Monopole structures
- Conductor Type: 4/0 ACSR 6/1 (Penguin)
- Outage History: 2 Momentary and 2 Permanent Outages, CMI 131,192 from 1/2015 – 12/2021
- Open Conditions: There are 11 structures with at least one open condition, which relates to 55% of this line. There are currently 7 structure based open conditions consisting of woodpecker holes, rot top and insect damage. There are currently 7 conductor based open conditions consisting of improper installation of a plp splice/dead ends and damaged conductors. There is currently 1 hardware based open condition consisting of a burnt insulator.
- The line fails to meet 2017 NESC Grade B loading criteria. The line is insulated with 4 bells ceramic and ceramic HP, which both do not meet the current AEP standards for the CIFO and minimum leakage distance requirements. The line shielding angle on the typical tangent structure is measured at 59.08° degrees, which is inadequate for AEP current shield angle requirements (due to one shield wire on H-frames).

North McConnellsville 69kV:

- North McConnellsville station is hard tapped to 69 kV line which causes customer outages during line outages where there is no flexibility for load transfer or sectionalizing.





BOUNDLESS ENERGY™

Need Number: ~~AEP-2021-OH011~~ AEP-2021-OH062

Process Stage: Solutions Meeting 2/17/2023

Previously Presented: Need Meeting 03/19/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

Line Name: Muskingum – South Rokeby 69kV

Original Install Date (Age): 1965

Length of Line: ~~~21.3~~ ~12.3 mi

Total structure count: ~~464~~ 90

Original Line Construction Type: Wood

Conductor Type: 4/0 ACSR 6/1, 336,400 CM ACSR 18/1, and 336,400 CM ACSR 30/7 Momentary/Permanent Outages and Duration: 10 Momentary and 2 Permanent Outages

CMI: 315,751 (past five years)

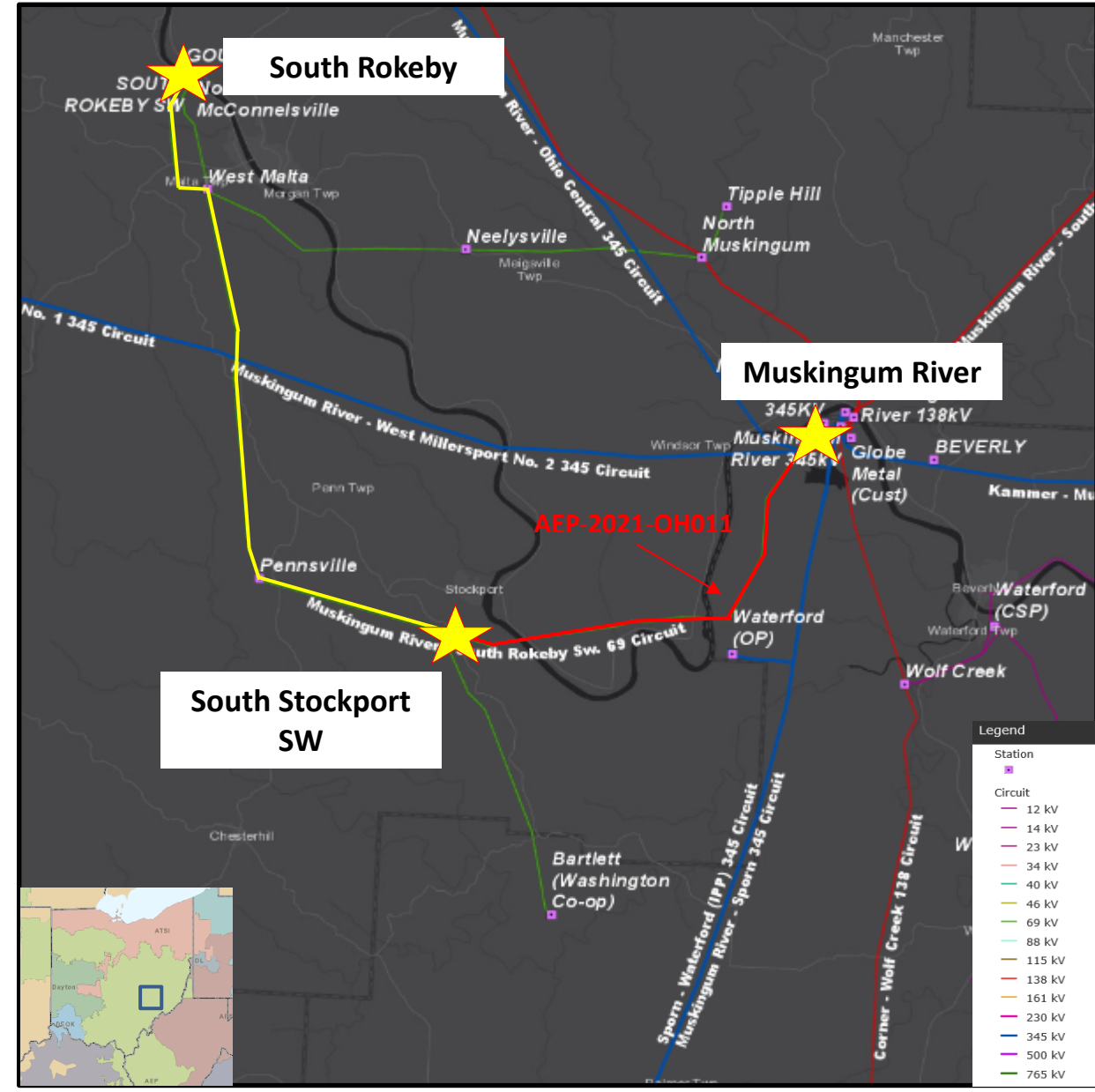
Line conditions:

- ~~48~~ 26 structures with at least one open condition, 29% of the structures on this circuit.
- ~~45~~ 20 structure related open conditions impacting wooden poles, crossarms, braces, and filler blocks including rot, bowing, woodpecker holes, insect damage, cracked, split, and rot top
- ~~12~~ 2 open conditions related to conductor issues including broken strands
- ~~12~~ 4 hardware/shielding issues including open conditions related to burnt, broken, or chipped insulators.
 - Structure Age: ~~72% 1960's, 15% 1970, 13% 1980's or newer~~ 63 structures from 1965, 25 structures from 1969, 1 structure from 1979, & 1 structure from 1983

Other:

- The line shielding angle does not meet AEP's current shielding angle requirements
- Line does not meet current NESC Grade B loading criteria or AEP's current structural strength requirements.
- ~~Washington Co-op's Bartlett Station is served radially from this line (~ 5.00 miles) with limited sectionalizing ability.~~

AEP Transmission Zone M-3 Process Washington & Morgan Counties, Ohio



AEP Transmission Zone M-3 Process Morgan County, OH

Need Number: AEP-2022-OH026 & AEP-2021-OH011

Process Stage: Solutions Meeting 2/17/2023

Proposed Solution:

Grace - South Rokeby 69 kV Line: Rebuild ~12.3 mi of line asset, the section between Grace – South Rokeby using 556 ACSR conductor & install telecom fiber. **Estimated Cost: \$29.62M**

West Malta - North Muskingum 69 kV Line: Rebuild the whole ~8.4 mi line asset using 556 ACSR conductor & install telecom fiber. **Estimated Cost : \$18.28M**

West Malta - North McConnellsville 69 kV Line: Rebuild the whole ~2.1 mi line asset using 556 ACSR conductor & install telecom fiber. **Estimated Cost : \$6.08M**

South Rokeby – Gould No.1 & No. 2 69 kV Line: Rebuild both ~0.05 mi (each) line assets using 556 ACSR conductor & install telecom fiber. **Estimated Cost : \$0.78M**

South Rokeby - North McConnellsville 69kV Line: ~0.25 miles rebuild on the South Rokeby – West Malta 69 kV Circuit & install telecom fiber. **Estimated Cost : \$0.92M**

Buttermilk Hill Switch 69 kV: Install a new 69 kV, 1200A, 3-way POP switch outside the fence of North McConnellsville station and install auto-sectionalizing. **Estimated Cost : \$0.73M**

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

Total Estimated Cost: \$57.15M

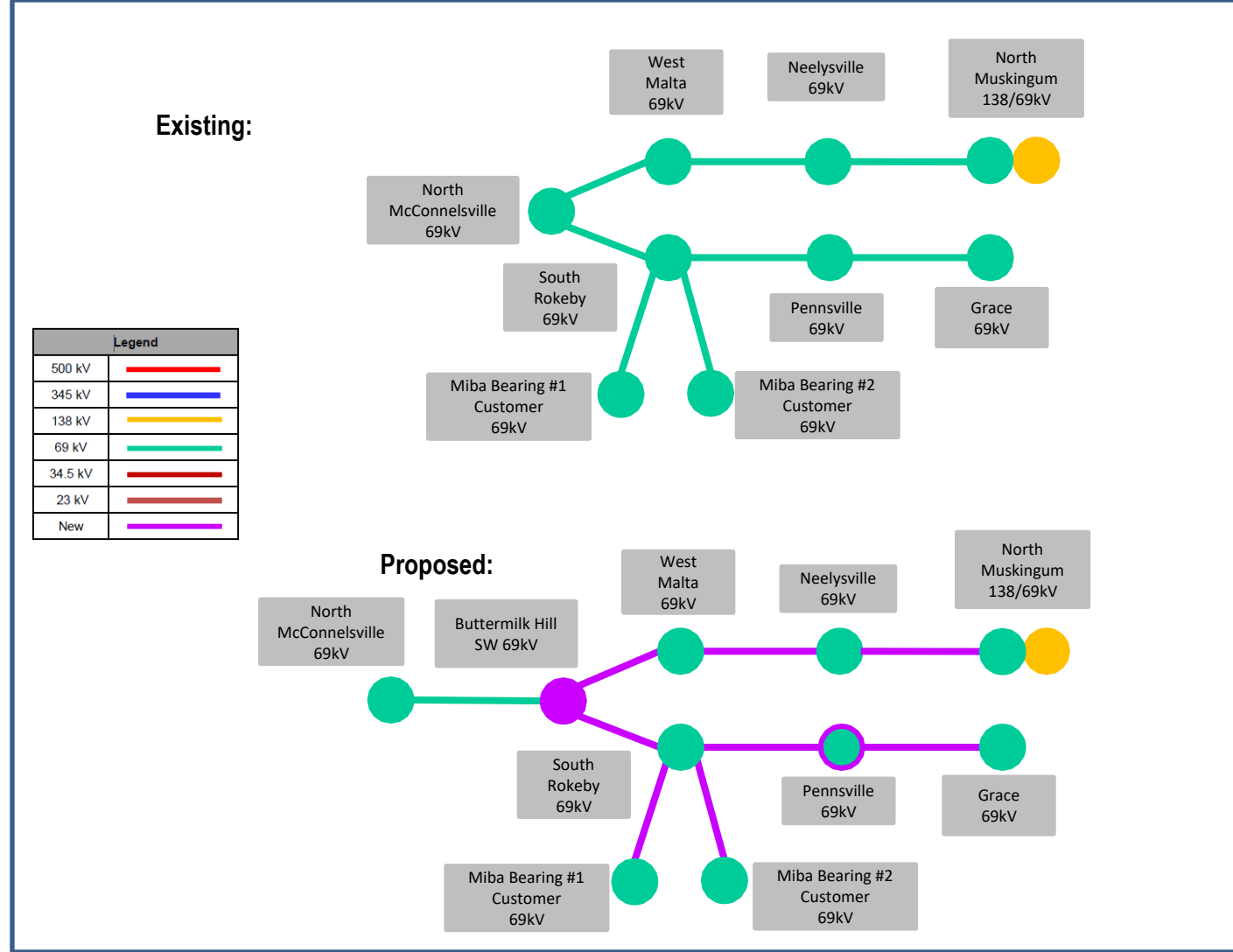
Alternatives Considered:

Considering the number of customers served and locations of existing stations on the line, retirement of this line is not possible. There are no other sources from which to serve the load in this area.

Projected In-Service: 10/1/2026

Project Status: Engineering

Model: 2027 RTEP



Need Number: AEP-2022-OH061

Process Stage: Solution Meeting 2/17/2023

Previously Presented: Need Meeting 7/22/2022

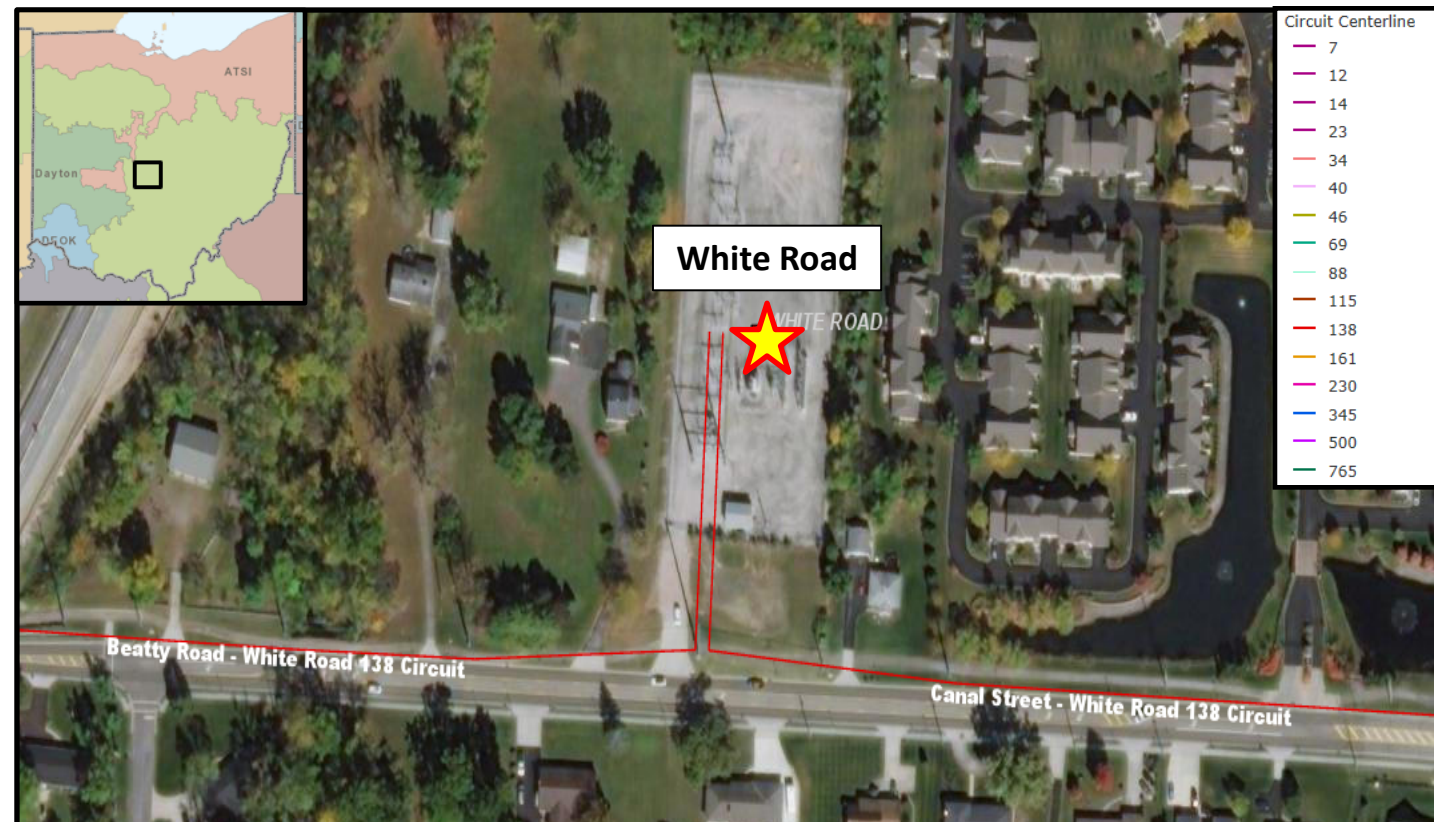
Project Driver: Customer Service

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

Problem Statement:

AEP Ohio has requested to add capacity at White Road station, due to continuous load growth in the area. The anticipated peak load is approximately 40-50 MVA. The requested in-service date is August 2023.

Model: 2027 RTEP



Need Number: AEP-2022-OH061

Process Stage: Solutions Meeting 2/17/2023

Proposed Solution:

White Road 138kV: Close in the station ring bus with a vertical ring bus, install 3-138kV circuit breakers and associated relaying to accommodate new distribution source at the station. **Estimated Cost: \$1.71M**

Re-terminate T-line 138kV: Install new 138kV structure just west of existing Str. 29. Re-terminate lines into new ring bus positions. **Estimated Cost: \$0.36M**

Total Estimated Cost: \$2.07M

Alternatives Considered:

Considering the location and available space at the station location, no other alternatives were identified.

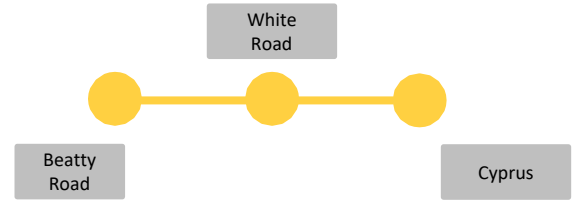
Projected In-Service: 08/08/2023

Project Status: Engineering

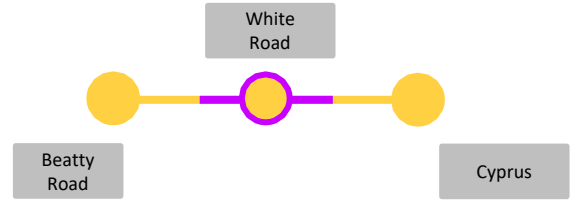
Model: 2027 RTEP

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

Existing:



Proposed:



Need Number: AEP-2023-OH014

Process Stage: Solutions Meeting 2/17/2023

Previously Presented: Needs Meeting 1/20/2023

Supplemental Project Driver:

Customer Service

Specific Assumption Reference:

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

Problem Statement:

Guernsey – Muskingum Electrical Co-op customers served out of Cassel Junction switch have experienced 8 momentary and 6 permanent outages from 2018-2022. This has resulted in 3,079,440 minutes of customer interruption.



Need Number: AEP-2023-OH014

Process Stage: Solutions Meeting 2/17/2023

Proposed Solution:

- Reconfigure the existing East Cambridge- West Cambridge 69kV circuit to add in a replacement switch pole for Cassell Junction Sw that is capable of adding MOAB operation on the throughpath. This replacement structure will be one span down from the existing switch in order to comply with current ROW standards. **\$0.89 M**
- Install a new 138kV three- way phase over phase switch named Cassell Junction Switch to serve the Cassell Junction Co-op station. **\$0.68 M**
- Construct ~ 0.12 miles of new 69 kV line between the new Cassell Junction Switch and the Cassell Junction Co-op station using 556 ACSR conductor. **\$0.66 M**
- Install new customer metering at Cassell Junction for Guernsey Muskingum Electric Cooperative. **\$0.004 M**

Cost estimate: \$2.234 M

Ancillary Benefits:

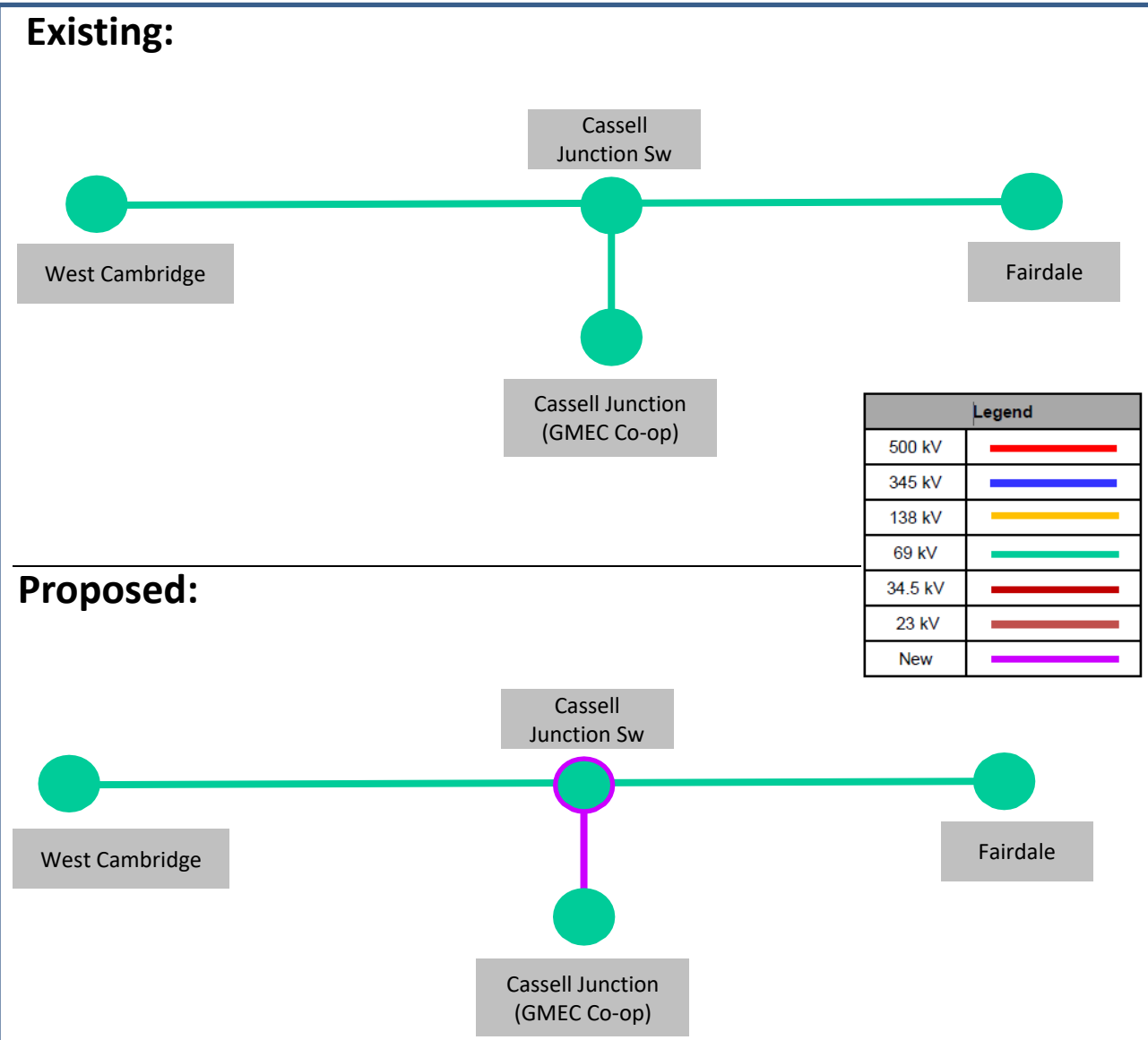
Provides Guernsey Muskingum Electric Cooperative the ability to have MOAB operation for additional protection in the case of momentary outages on the East Cambridge- West Cambridge 69kV circuit.

Alternatives Considered:

- Upgrade the existing structure to utilize MOABs and continue to use the same line toward Cassell Junction. This option was not feasible as the current switch structure is not capable of adding motor operators or automatic operation capability.

Projected In-Service: 12/31/2025

Project Status: Engineering



Appendix

High Level M-3 Meeting Schedule

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

Revision History

2/6/2023– V1 – Original version posted to pjm.com

2/7/2023– V2 – Added slides #6-10

2/10/2023– V3 – Added slides #9, Corrected the project sub ID

2/16/2023– V4 – Slides #6-10, Updated the bubble diagram. Updated the project description on Slide #7 and total project cost on Slide #9

3/28/2023– V5 – Slides #35, Corrected Need # AEP-2022-035 to AEP-2023-OH035

6/20/2023– V6 – Slides #49, Corrected Need # AEP-2021-OH011 to AEP-2021-OH062