Sub Regional RTEP Committee: Western
AEP Supplemental Projects

April 22, 2022

Changes for Existing Supplemental Projects

AEP Transmission Zone: Supplemental
Central South Bend Improvements

Previously Presented: 3/27/2018, 6/26/2018 SRRTEP

Problem Statement:

Equipment Material/Condition/Performance/Risk:

AEP has identified multiple rehab needs at Colfax, Drewry's and Saint Mary's stations. Colfax station is a cubicle switch gear type construction, is obsolete, and spare parts are unavailable. Mobile transformer can't be installed on site due to physical space limitations and complete station outage can only be taken during off-peak months (Sep-May). The 34.5 kV CB C and D at Colfax Station are GE FK oil-filled breakers manufactured in 1950s, have operated through 12 and 20 fault operations, exceeding the manufacturer recommendation of 10. These breakers are oil breakers. Oil breaker maintenance has become more difficult due to the oil handling required to maintain them. Oil spills are frequent with breaker failures and routine maintenance and can become an environmental hazard. The drivers for replacement of these breakers are age, number of fault operations, and a lack of repair parts. The 34.5/12 kV Transformer at Colfax was manufactured in 1974 and is also showing significant signs of deterioration. It has a load tap changer (LTC) and therefore distribution voltage regulation is difficult. Drivers for replacement of the transformer include dielectric strength breakdown (winding insulation), short circuit strength breakdown (due to the amount of through fault events), and accessory damage (bushings).

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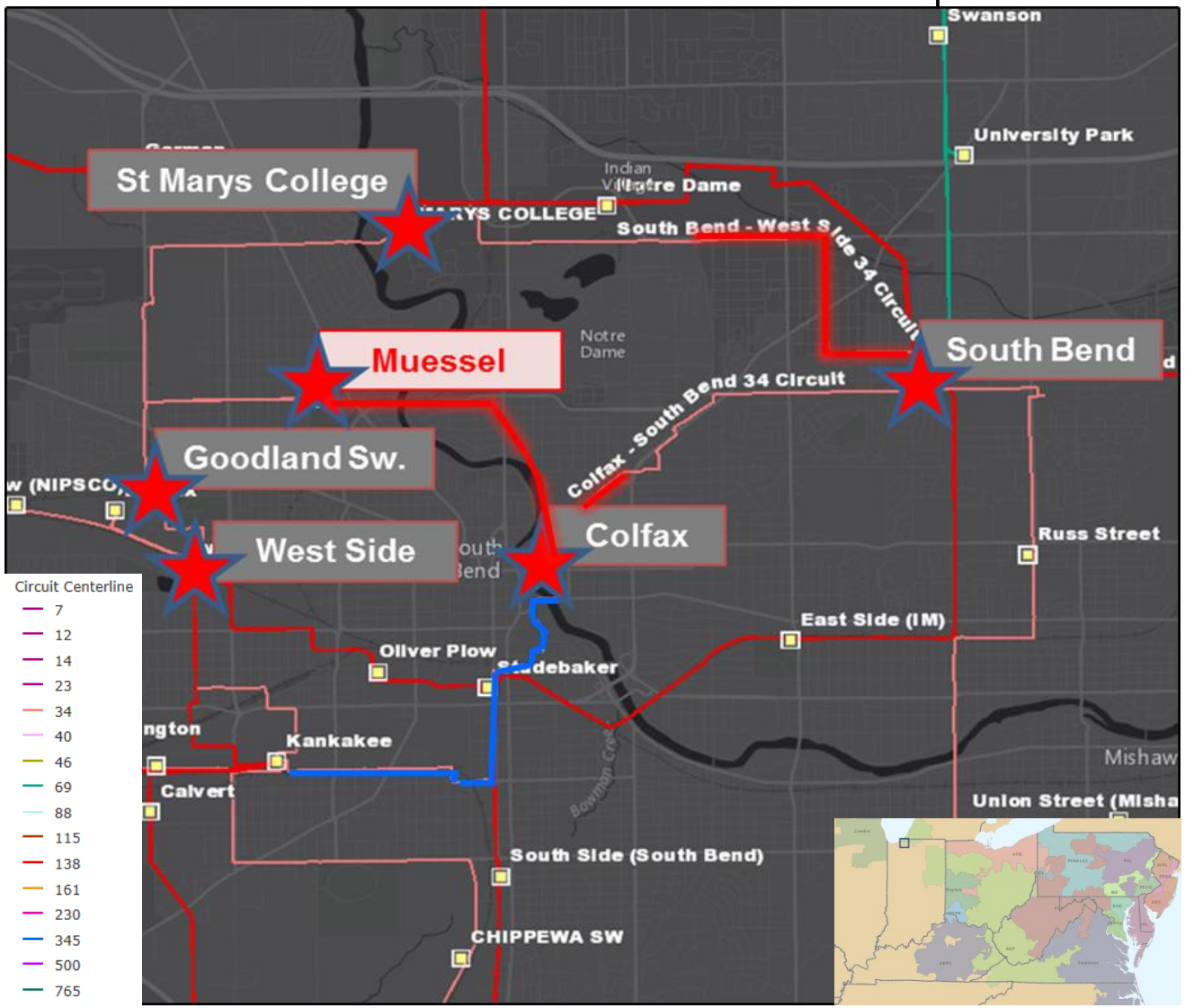

AEP Transmission Zone: Supplemental
Central South Bend Improvements

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Drewry's Station is very congested and is located adjacent to Muessel Grove public park. On site mobile transformer can't be installed due to physical space limitations. Station transformers do not meet present day electrical clearance standards. Transformer high side ground switches can't be replaced with circuit switchers and low side breakers can't be installed due to physical space limitations. There is no control house present and 14 out of 20 relays are electromechanical and are obsolete. Station drive path is not available and poses additional maintenance and safety challenges. Station foundations and steel on 12 kV structures are beginning to show signs of deterioration. 12 kV circuit breaker A,B,C & D at Drewry's are 2000 vintage but have severely exceeded the life expectancy of full fault operations. The 34.5/12kV Transformer#2 was manufactured in 1963 and the steady increase in ethylene, methane, and carbon dioxide over the years show that there has been heating of the Transformer #2 at Drewry's which has deteriorated its insulation. Additionally, the LTC is not operating properly.

The 34.5/4kV Transformer at Saint Mary's Station was manufactured in 1952 and is also showing significant signs of deterioration. Drivers for replacement of the transformer include dielectric strength breakdown (winding insulation), short circuit strength breakdown (due to the amount of through fault events), and accessory damage (bushings).

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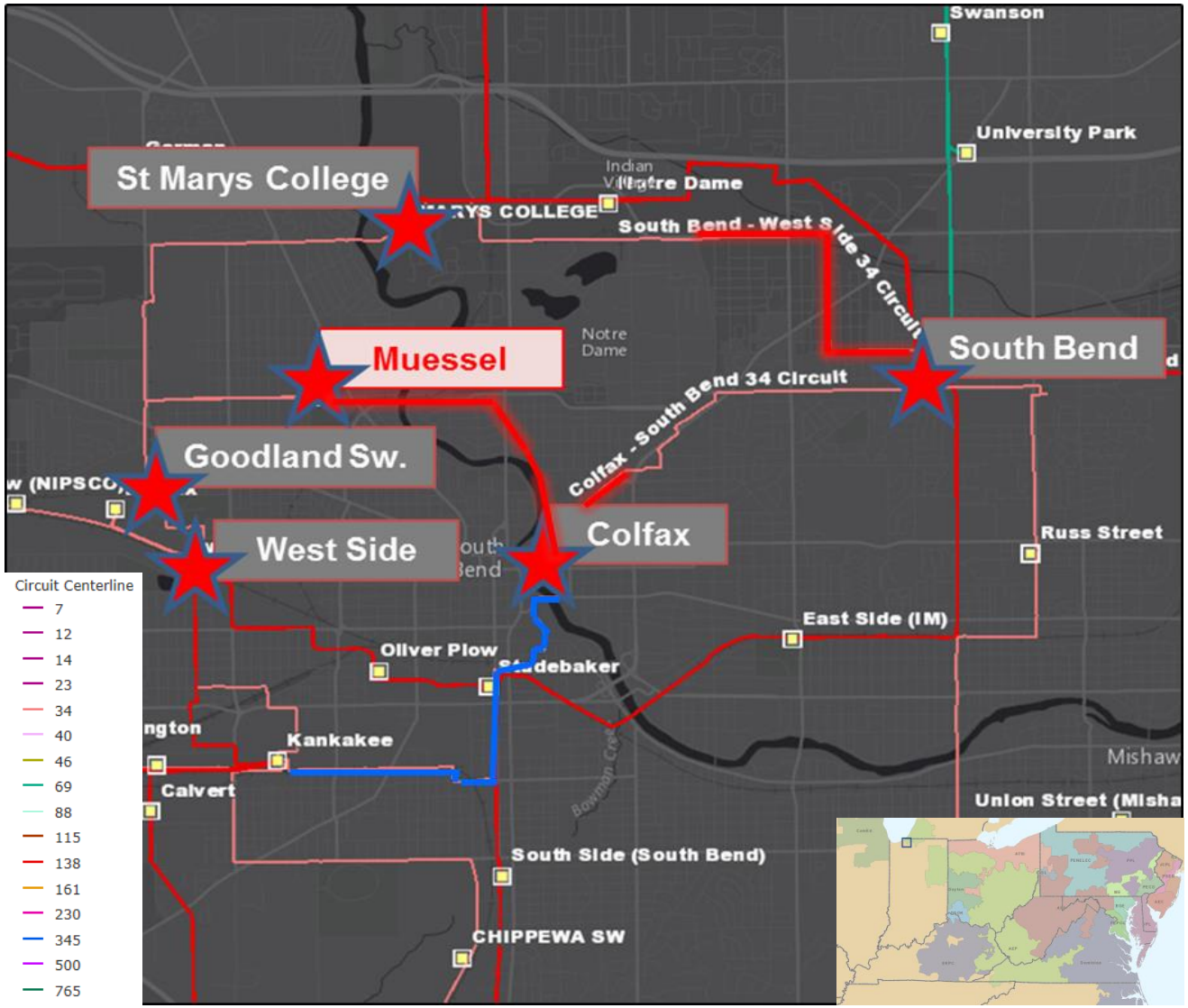

AEP Transmission Zone: Supplemental
Central South Bend Improvements

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On the Colfax-Kankakee 34.5 kV circuit, the overhead portion is ~1.5 miles while the underground section is ~1.3 miles. The overhead portion utilizes wood poles cross arm construction which is not a current AEP transmission standard. The overhead portion of this circuit is suspension insulator type construction with smaller cross-section distribution-type cross arms and braces. Historical experience with these types of wood cross arms is a higher frequency of required proactive replacement and occasional failure resulting in forced outages. The underground portion of the line occupies a manhole and conduit system that was not designed for transmission use. The underground portion occupies 33 manholes. Over half of the manholes contain transmission cable splices. An underground transmission cable system of this length should require no more than 4-7 manholes in order to minimize the number of cable splices required. Due to the number of manholes, the required number of cable splices is very excessive. Industry experience is that cable system components such as splices are a far more common failure cause than the transmission cables themselves. Almost all of the manholes are physically undersized for transmission cable system occupation, making splicing very difficult to accomplish. Many conduits are clay tile ducts installed in the 1930s. Since 2009 there have been at least seven documented failures, primarily on cable system components (splices and terminations). Cable testing performed in September 2013 and the cables passed the testing however, nine days later a cable failure occurred, causing the circuit to trip from service.

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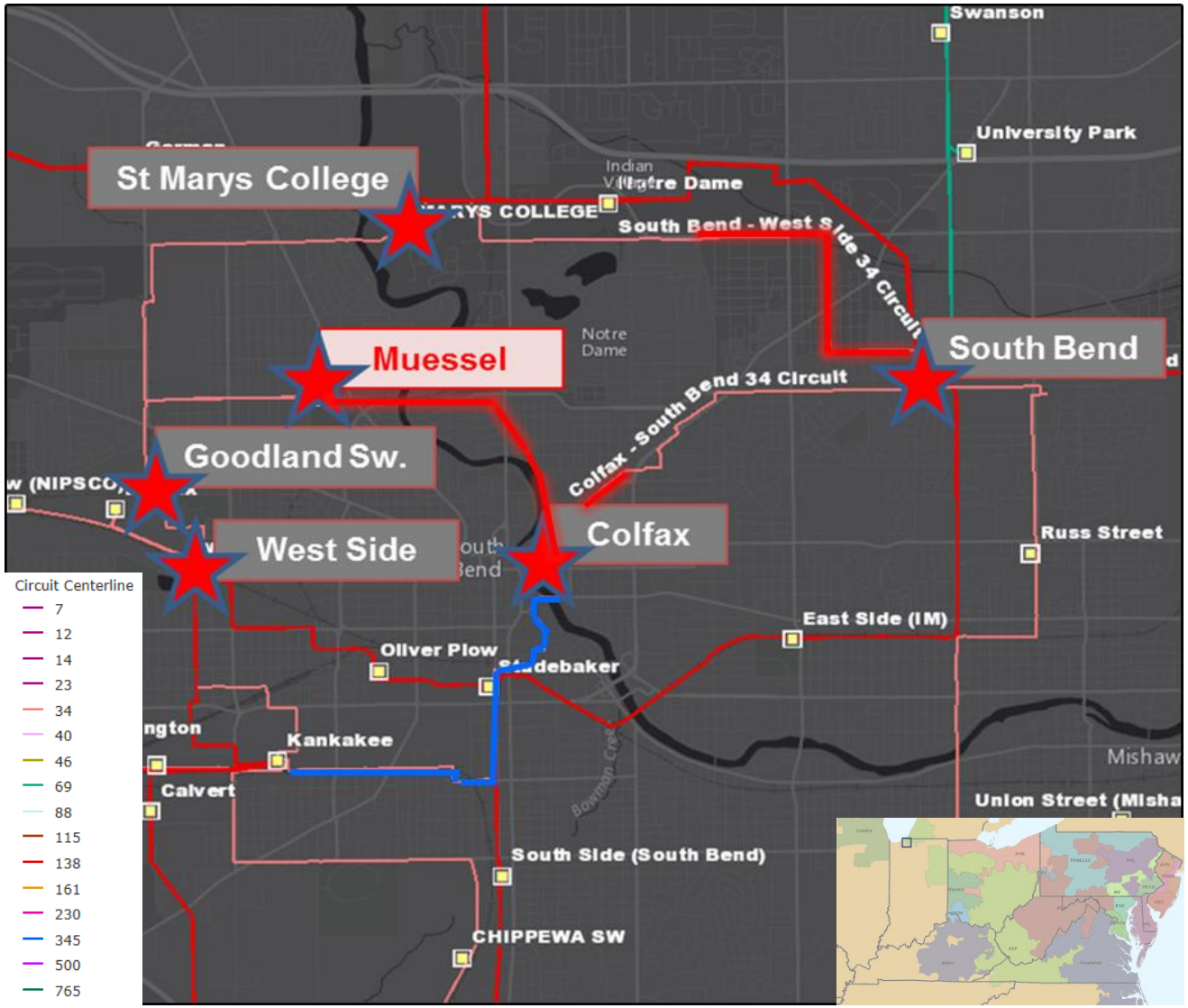

AEP Transmission Zone: Supplemental
Central South Bend Improvements

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Operational Flexibility and Efficiency:

Colfax station backs up a portion of distribution load from the South Bend station. South Bend is a 138 kV station while Colfax is 34.5 kV which results in a load drop and pick issue. On average there are between 3 to 5 drop and pick cycles per year that are experienced by Colfax and Drewry's customers. Drewry's station is served by a double circuit transmission line which traverses through residential areas and a gravel pit. An outage involving the double circuit lines results in a complete station outage and the station peak load is not recoverable from an alternate source. Colfax station serves central South Bend load and is presently served from two 34.5 kV sources, South Bend and Kankakee. Kankakee source has an underground line section which is near its useful life and has been forced out multiple times in the recent past. The new Colfax – Drewery 34.5kV Line will be an additional source to Drewry's and Colfax Station. The transformer high side protection at Drewry's and Saint Mary's station is via high side ground switch scheme which is not a standard practice in modern installations. South Bend-West Side 34.5 kV circuit is ~11 miles and serves three stations (Goodland, Drewry's, and St Mary's College). There are two series MOBs each at Drewry's and St Mary's College. Having 4 MOAB in series is an undesirable configuration as it introduces coordination challenges related to P&C.

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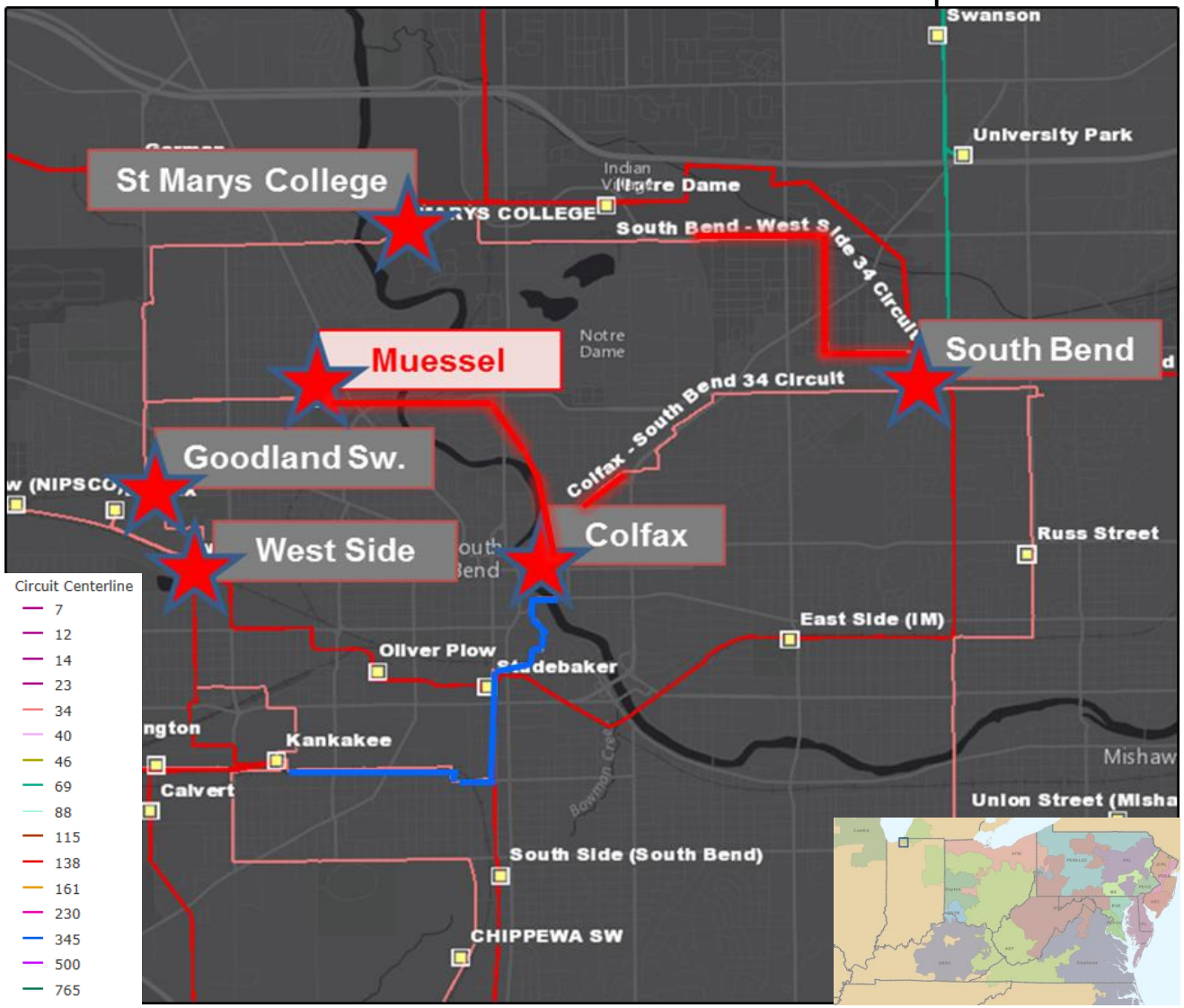

AEP Transmission Zone: Supplemental
Central South Bend Improvements

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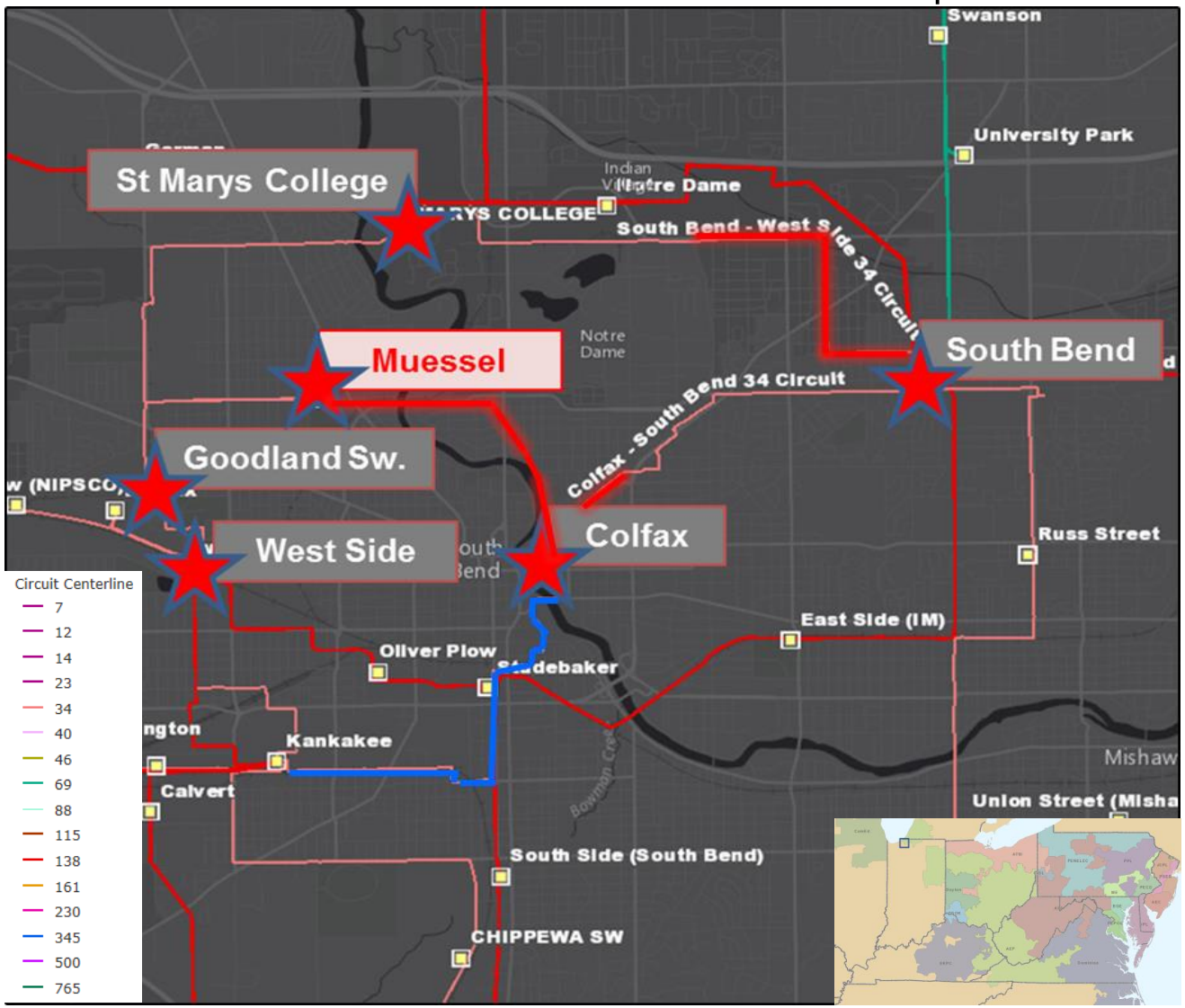
Reason for Revision:

The original project proposed to move Goodland Switch to the Bendix – Kankakee 34.5kV line. Goodland Switch has since moved to Distribution service, which eliminates the need for the line work on Bendix – Kankakee 34.5kV.



AEP Transmission Zone: Supplemental
Central South Bend Improvements

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Selected Solution:

Construction of approximately 2.5 mile 69 kV underground line between Colfax and Muessel using 1750KCMIL Copper XLPE Conductor. (**S1666.1**) **Estimated Cost: $20.1M**

Install Drewry's Extension 34.5kV. (**S1666.2**) **Estimated Cost: $0.7M**

Retire Kankakee – Colfax (UG) 34kV Line. (**S1666.3**) **Estimated Cost: $0.6M**

Rebuild .33 miles of the South Bend - Colfax UG line using 1750KCMIL Copper XLPE Conductor. (**S1666.4**) **Estimated Cost: $4.1M**

Rebuild 1.9 miles of the South Bend – West Side Line using 795 ACSR (64 MVA rating). (**S1666.5**) **Estimated Cost: $3.7M**

~~Bendix – Kankakee 34.5kV Line Work~~. Cancel (**S1666.6**) ~~**Estimated Cost: $0.2M**~~

South Bend station work to set up 69kV energization. (**S1666.7**) **Estimated Cost: $0.6M**

West Side station work to set up 69kV energization. (**S1666.8**) **Estimated Cost: $0.5M**

Completely rebuild Colfax station. Install a 69kV CB towards Muessel Station. Replace 34kV CB D with a 69kV CB towards South Bend Station. Install a 69kV SWR, 69/12kV TR#1 and (4) 12kV CB's. All 69kV CB's are 40kA breakers. (**S1666.9**) **Estimated Cost: $1.8M**

Completely rebuild Drewrys station as Muessel station in the clear. Install (3) 69kV line CB's, (1) Bus Tie CB, (2) 69kV SWR's, (2) 69/12kV TR's and (7) 12kV CB's.All 69kV CB's are 40kA breakers. (**S1666.10**) **Estimated Cost: $5.0M**

At St. Mary's College, install 69kV circuit switcher. Replace 69/12kV TR and (2) 69kV switches. (**S1666.11**) **Estimated Cost: $0.4M**

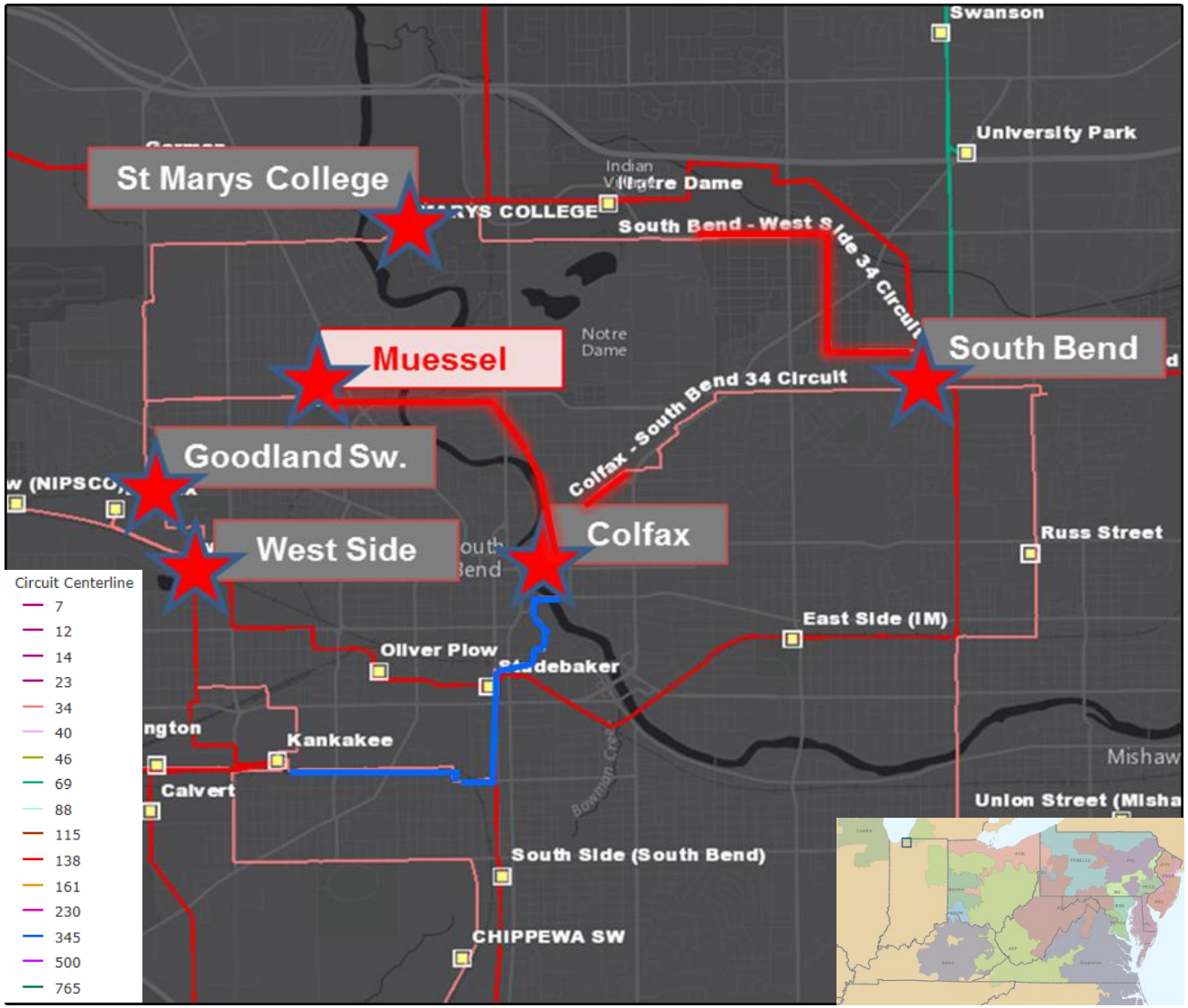
Relocate Goodland Sw to ~~West Side – Bendix 34kV Line~~ distribution service. (**S1666.12**) **Estimated Cost: $1.0M**

Kankakee: Remove 34.5kV breaker I. (**S1666.13**) **Estimated Cost: $0.1M**

Total Estimated Transmission Cost: $38.6M

Projected In-service: 5/10/2020

Project Status: Scoping



AEP Transmission Zone: Supplemental McKinley Area Improvements

Supplemental Project: S2152 (Need AEP-2019-IM018, posted to 2020 AEP local plan)

Project Description (changes are marked in red)
Slater Steel & GE Taylor 34.5kV Feeds: Retire the McKinley – General Electric Taylor West 34kV Line; McKinley – Slater Steel 34kV Line; McKinley – Taylor General Electric 34kV Line and the McKinley – General Electric Taylor East 34kV and in their place build a single ~1 mile 34.5kV feed from McKinley – Slater Steel. As a note, the customer has retired their GE Taylor station so it no longer requires a feed. (S2152.1) **Estimated Cost: $2.8M**

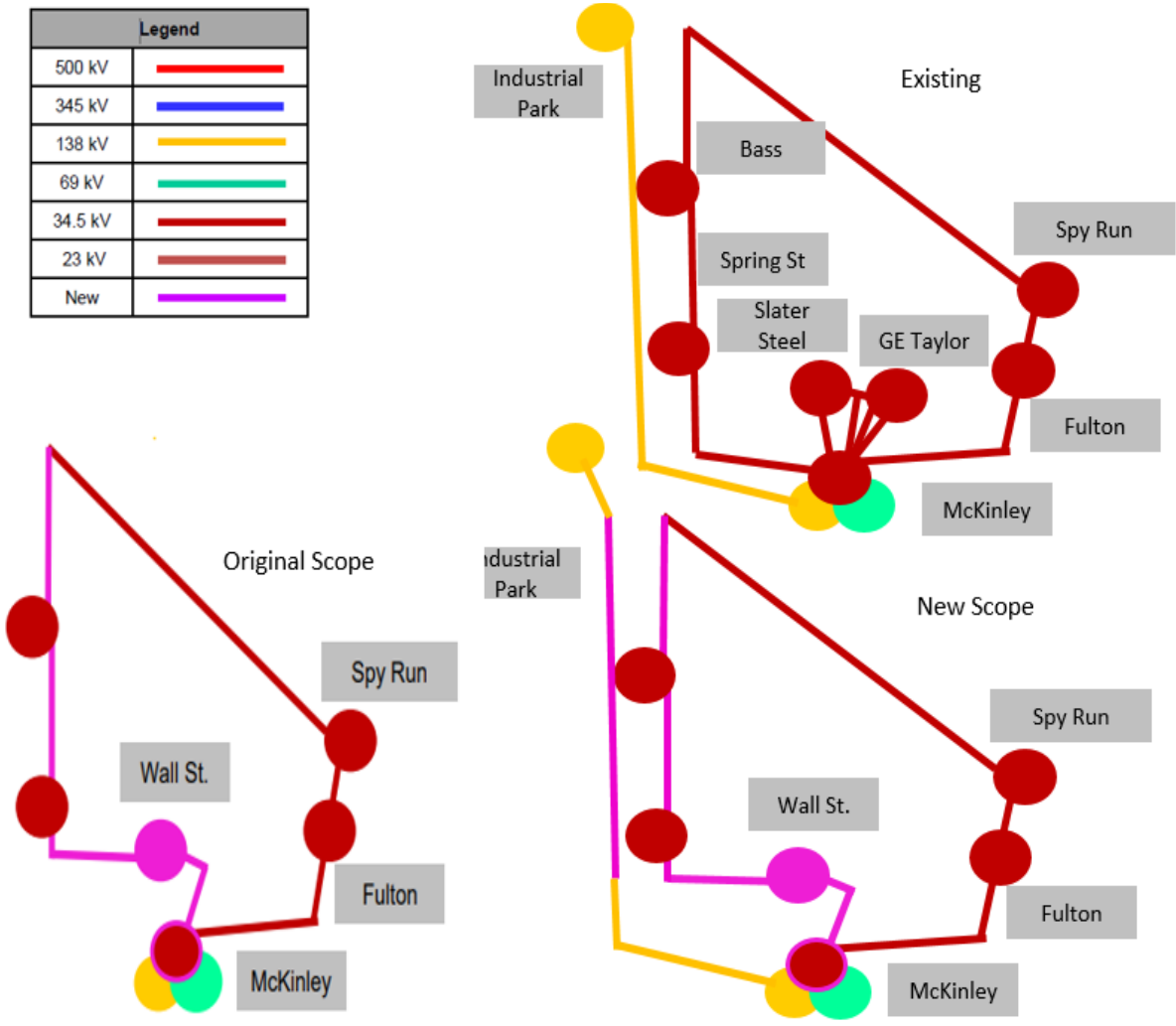
McKinley – Spy Run 34.5kV: Rebuild approximately ~~4.5~~ 2.8 miles ~~of~~ from the McKinley – ~~Spy Run~~ Spring St as single circuit 34.5kV. ~~,Including a line section approximately 2.7 miles long to feed Slater Steel Station.~~ Rebuild the remaining ~1.4 miles north of Spring Street as double circuit 138kV capable to accomidate ~1.4 miles of the Industrial Park – McKinley 138kV line outlined in the AEP-2021-IM019 need. (S2152.2) **Estimated Cost: $~~6.7M~~ 12.3M**

Wall Street 34.5kV station: Install a new PoP switch to feed Slater Steel station. (S2152.3)
Estimated Cost: $0.5M

McKinley 138/69/34.5kV station: Retire 34.5kV CB's "J", "M", "F", "K", and "DD". Consolidate the 34.5kV voltage class into a single bus and relocate the 69kV line exit into the station yard. Install a high side circuit switcher. (S2152.4) **Estimated Cost: $3.7M**

Total Estimated Cost: ~~$13.6 M~~ 19.2M

Projected In-Service: ~~5/16/2022~~ 06/09/2023
Reasons for the scope change: The segment to the north of Spring Street is what is changing, AEP originally proposed rebuilding it as single circuit, but part of AEP-2021-IM019 is along the same corridor north of the station "Spring Street". Due to the urban nature of Fort Wayne, AEP decided to consolidate both lines into a single double circuit line to save ratepayers money and to lessen our impact to the landowners.



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
McDowell County, West Virginia

Need Number: AEP-2022-AP022

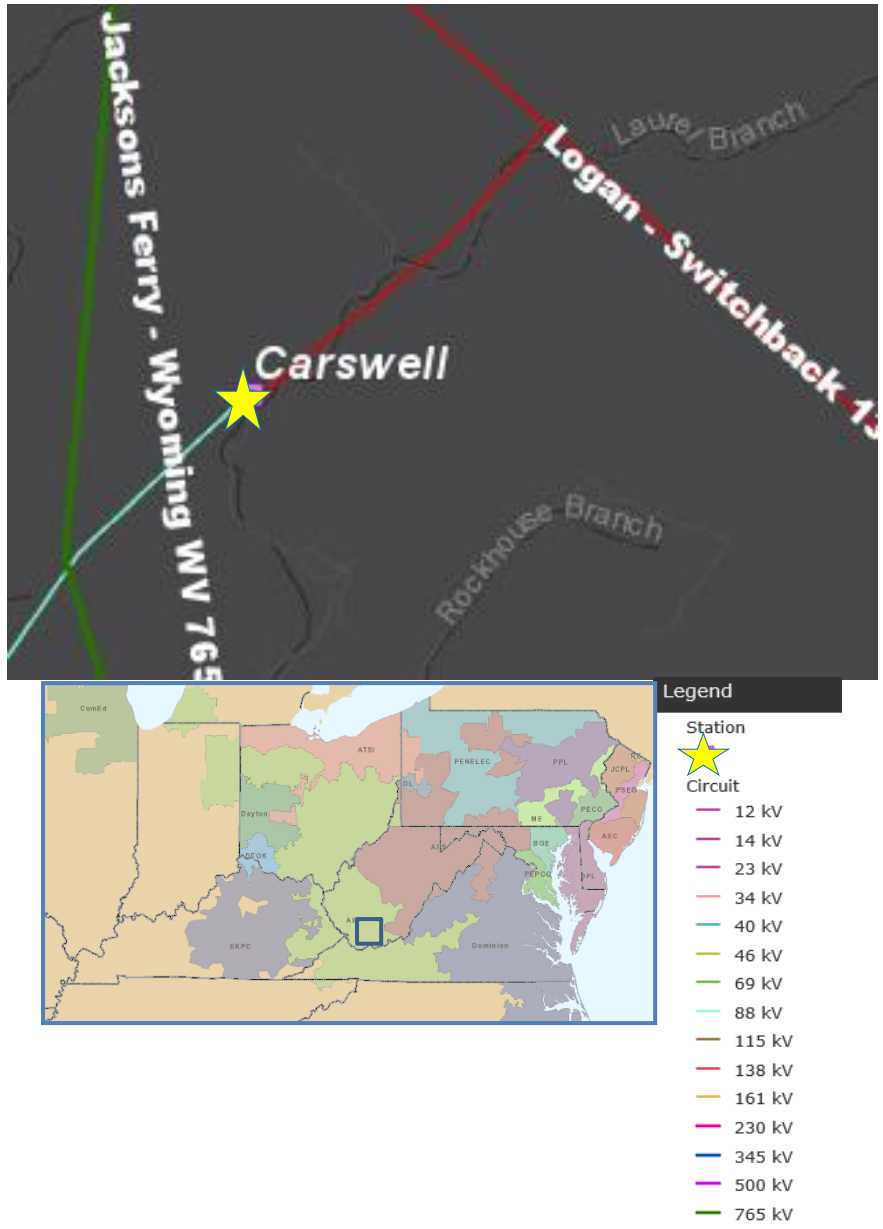
Process Stage: Need Meeting 4/22/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement Carswell Station:

- The 138/88-8kV transmission transformers Phase A, B, C and Spare are of 1949 vintage. The insulating paper material has become brittle and this puts the unit's ability to withstand future short circuit or through fault events at greater risk. There have been multiple malfunction reports regarding active oil leaks on bank Phase C. The presence of Ethane, along with the indication of overheating faults, indicates that decomposition of the non-thermally upgraded and increasingly brittle paper insulation is impairing the units' ability to withstand future short circuit or through fault events.
- The 88kV circuit breaker C is an FK-439-1500 type, oil filled breaker. This breaker is of 1949 vintage and is without oil containment. This circuit breaker has exceeded the manufacturer's designed number of full fault operations and General Electric does not provide support for this breaker.
- Currently, 21 of the 23 relays (91% of all station relays) are in need of replacement. There are 19 of the electromechanical type which have no spare part availability and fault data collection and retention. In addition, these relays lack vendor support.
- The Northwest corner of the station has had significant washouts in the past and has damaged the perimeter fence. The washouts have exposed the control cables for the 88kV circuit breaker.
- Carswell is the one of the last two stations that have an operating voltage of 88kV.



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

Need Number: AEP-2022-AP023

Process Stage: Need Meeting 4/22/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

Line Name: Carswell Loop 138kV Line

Original Install Date (Age): All the structures and conductor are from 1927

Length of Line: ~1.4 mi

Total structure count: 5

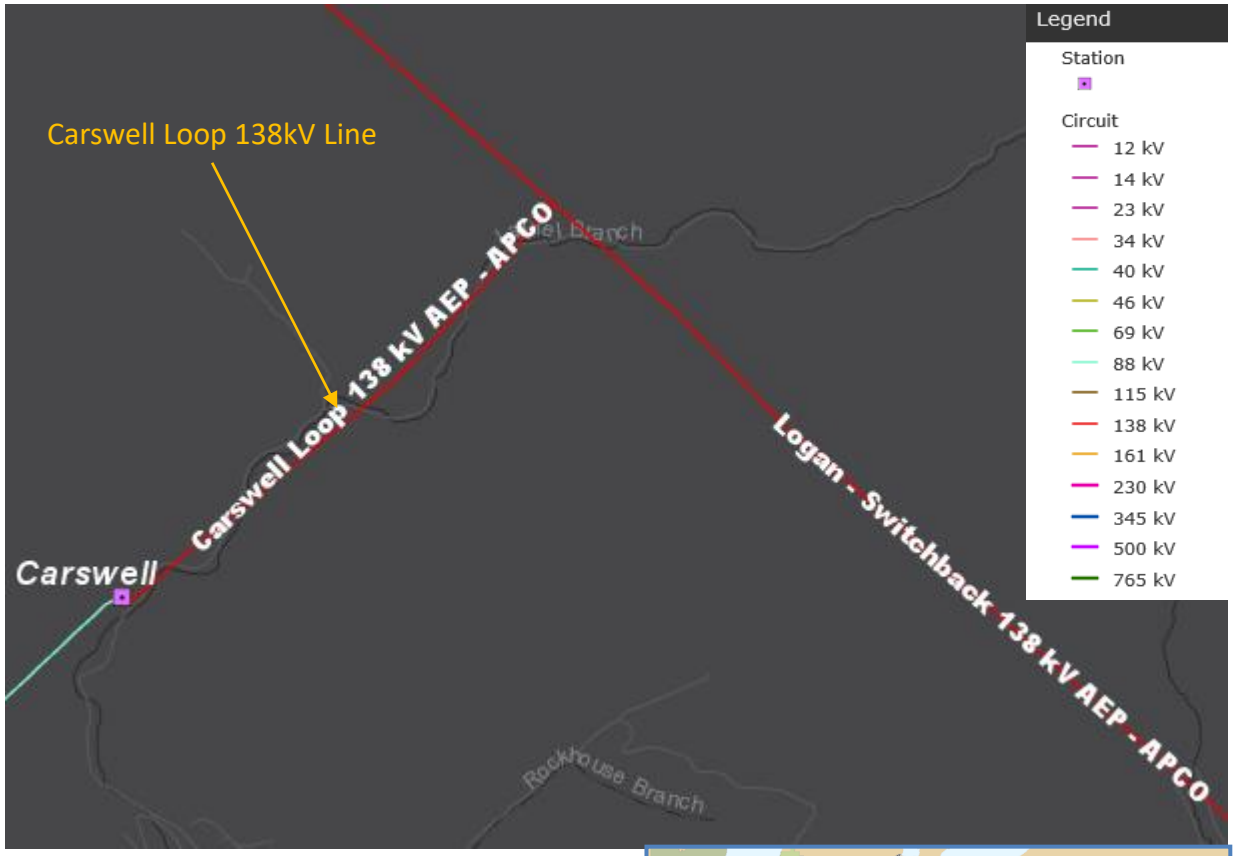
Original Line Construction Type: Lattice Steel

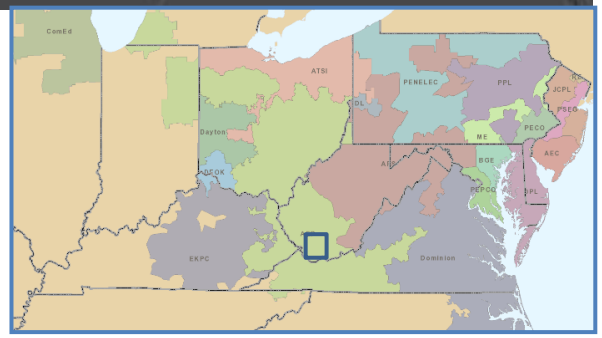
Conductor Type: 397,500 ACSR

Momentary/Permanent Outages: 25 Momentary and 3 Permanent

Line Conditions:

- The Carswell Loop line asset is hard tapped to the adjacent Logan – Switchback 138kV Line. The associated Tazewell - Trail Fork 138kV Circuit serves 13 MVA of peak load at Belcher Mountain, Carswell, & Clark Branch. Though Belcher Mountain is served at 88kV, it has a radial service from Carswell Substation that is impacted by outages on the Tazewell - Trail Fork 138kV Circuit.
- Since 2017, there have been 25 momentary and 3 permanent outages on the Tazewell – Trail Fork 138kV Circuit. The momentary outages were due to lightning (18), unknown (3), ice/snow (1), wind (1), test shot (1), and other (1) causes. The permanent outages were due to vegetation grow-in (2) and vegetation fall-in from outside of the AEP ROW (1) causes. These permanent outages caused 293k minutes of customer interruption.
- The inadequate shielding angle on this line asset leads to potential poor lightning performance.
- The porcelain insulators on the line do not meet current AEP standards for CIFO and minimum leakage distance requirements.
- Access for this line is extremely difficult due to the steep, mountainous terrain.





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

Need Number: AEP-2022-AP024

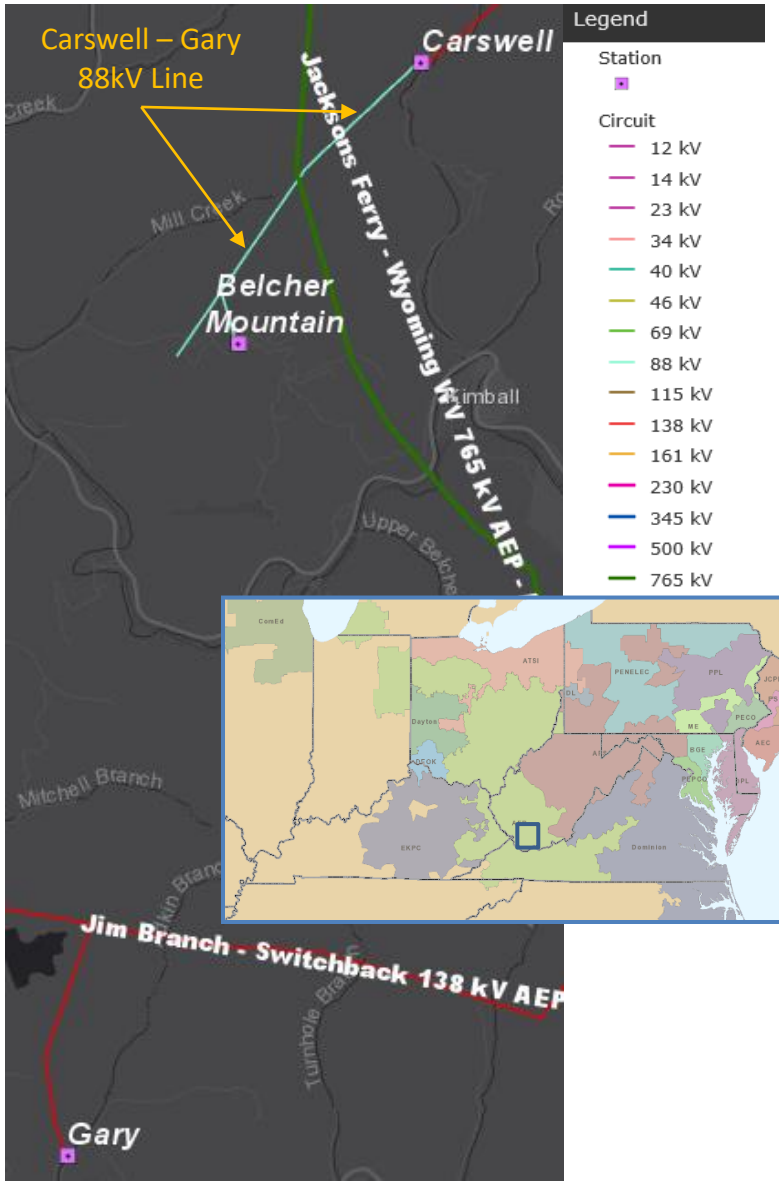
Process Stage: Need Meeting 4/22/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:
Line Name: Carswell - Gary 88kV Line
Original Install Date (Age): All the structures and conductor are from 1948
Length of Line: ~2 mi
Total structure count: 12
Original Line Construction Type: Wood
Conductor Type: 336,400 ACSR
Momentary/Permanent Outages: 8 Momentary and 5 Permanent
Line Conditions:

- The associated Carswell - Gary 88kV Circuit was retired when the segment from Belcher Mountain to Gary Substations was removed in 2018.
- From January 1, 2015, to November 11, 2018, there were 8 momentary and 4 permanent outages on the Carswell – Gary 88kV Circuit. The momentary outages were due to lightning (7) and station breaker (1) causes. The permanent outages were due to station breaker (2), lightning (1), and vegetation fall-in from outside of AEP ROW (1) causes. These outages caused 969k minutes of customer interruption.
- Since November 11, 2018, there has been 1 permanent outage on the Belcher Mountain – Carswell 88kV Circuit. This outage caused 105k minutes of customer interruption.
- Currently, there are 5 structures with at least one open structural condition, which relates to 42% of the structures on the line. There are currently 8 open structural conditions specifically affecting the crossarms and poles including rot top, insect damage, woodpecker damage, and broken conditions.
- The structures on the Carswell – Gary 88kV Line fail to meet 2017 NESC Grade B loading criteria, fail to meet current AEP structural strength requirements, and fail to meet the current ASCE structural strength requirements.
- The porcelain insulators on the line do not meet current AEP standards for CIFO and minimum leakage distance requirements.



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

Need Number: AEP-2022-AP024

Process Stage: Need Meeting 4/22/22

Supplemental Project Driver: Equipment Condition/Performance/Risk

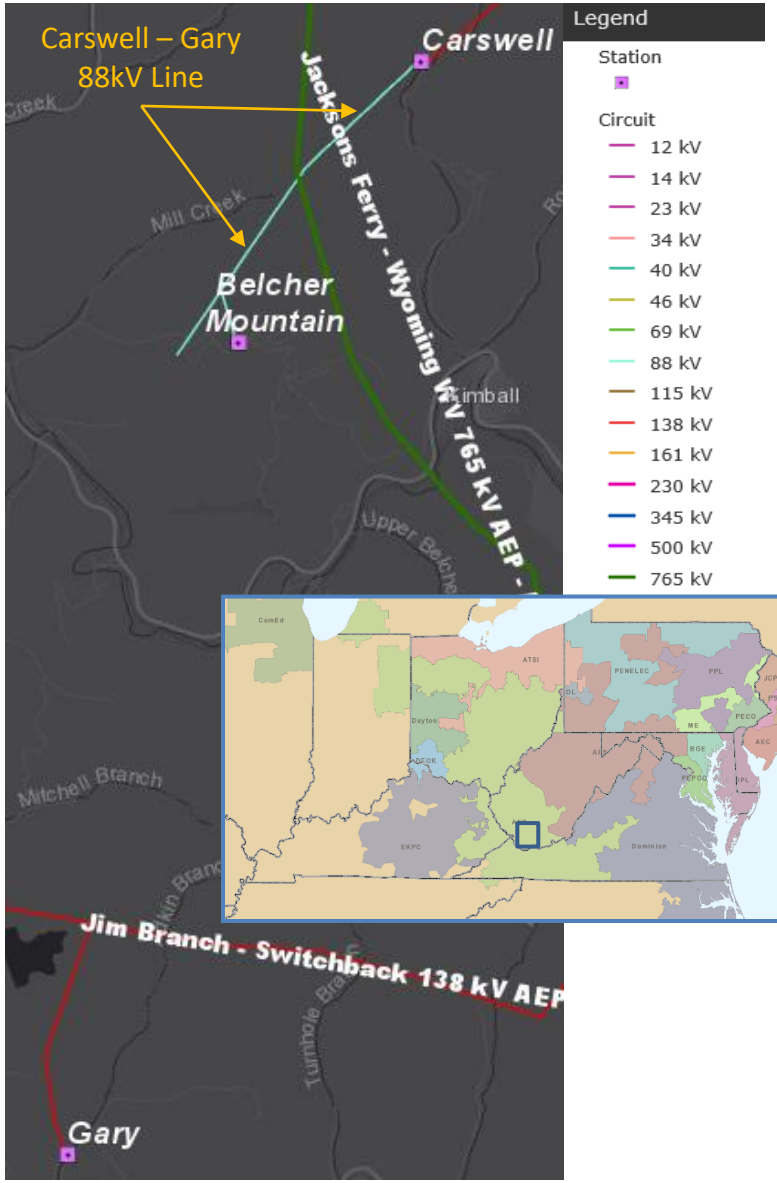
Specific Assumption Reference:

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

Problem Statement Continued:

Line Conditions Con't:

- Customers are radially served at Belcher Mountain by this line from Carswell.
- The butt wrap grounding and typical shield angle is inadequate per current AEP Standards and can cause poor lightning performance. The current grounding system, poor shielding angle, and the electrical strength of the insulators do not meet current AEP and industry accepted criteria, making the line susceptible momentary and permanent outages, affecting customer reliability.
    - The inadequate grounding limits the available path to ground during any type of line fault, increasing the intensity the conductor and related hardware have to withstand during the fault. The reduced electrical strength of the insulators could lead to electrical damage to structures and hardware during a fault if the insulator were to fail from elevated electrical stresses.
    - The line serves a peak load of 4.5 MVA at Belcher Mt. station.



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

Need Number: AEP-2022-AP025

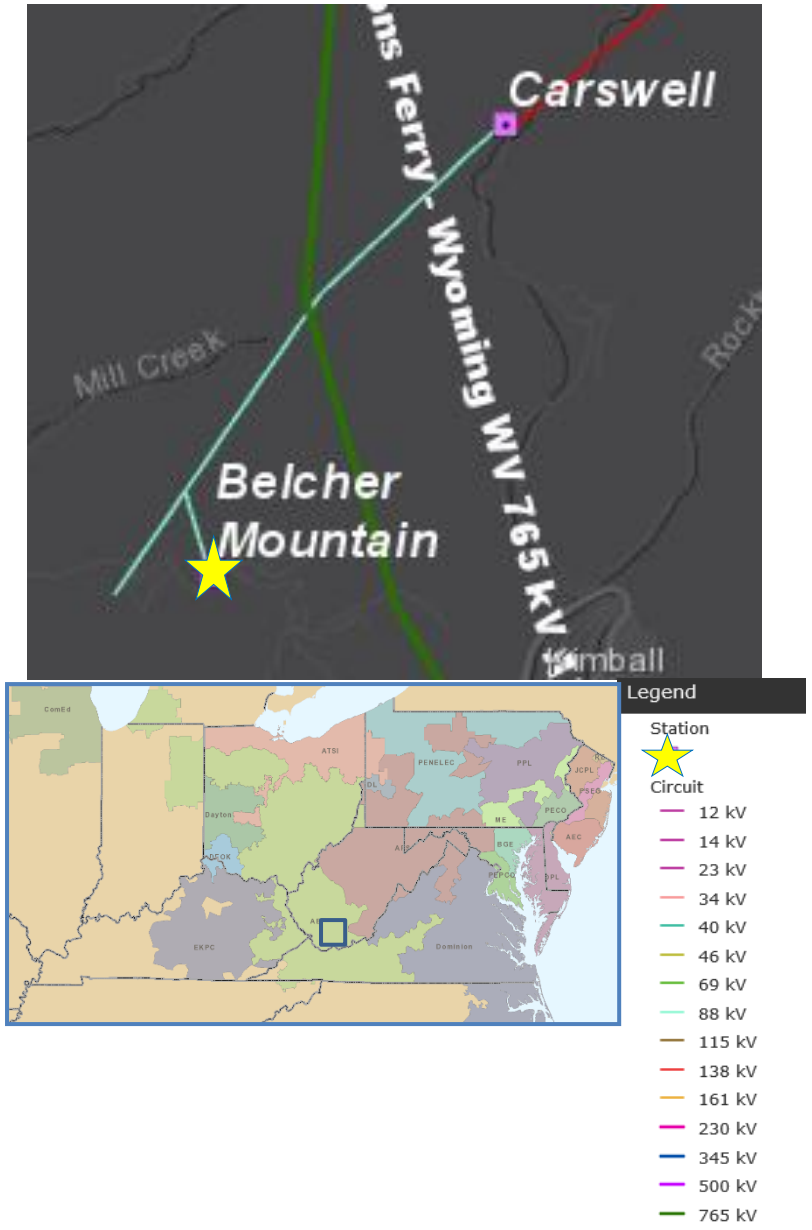
Process Stage: Need Meeting 4/22/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:
Belcher Mountain Station:

- The 88/13kV Distribution transformers are 1949 vintage and have low dielectric strength which indicates an increase in particles within the oil, decreasing the ability of the oil to withstand fault events, which can damage the paper insulation. The transformers have poor values of moisture, dielectric strength, and IFT that indicate the dielectric strengths of the insulation systems (oil and paper) are in poor condition, which impairs the units' ability to withstand electrical faults. The transformers have presence of Ethane, Carbon Dioxide, and Carbon Monoxide, along with the indication of overheating faults indicate decomposition of the increasingly brittle and non-thermally upgraded paper insulation.
- The 13kV 1969 vintage circuit breaker A is a PR type, oil filled breaker. This breaker is of 1969 vintage and is without oil containment. This circuit breaker has exceeded the manufacturer's designed number of full fault operations.
- Currently, all 10 relays (100% of all station relays) are in need of replacement. All 10 of these are of the electromechanical type which have no spare part availability and fault data collection and retention. In addition, these relays lack vendor support.
- A small sink hole is developing near the 13kV Bay.
- No remote monitoring of assets is available due to the lack of an RTU.
- Belcher Mountain is the last of two stations that have an operating voltage of 88kV.



AEP Transmission Zone M-3 Process
Raleigh County, WV

Need Number: AEP-2022-AP026

Process Stage: Need Meeting 4/22/2022

Project Driver: Equipment Condition/Performance/Risk

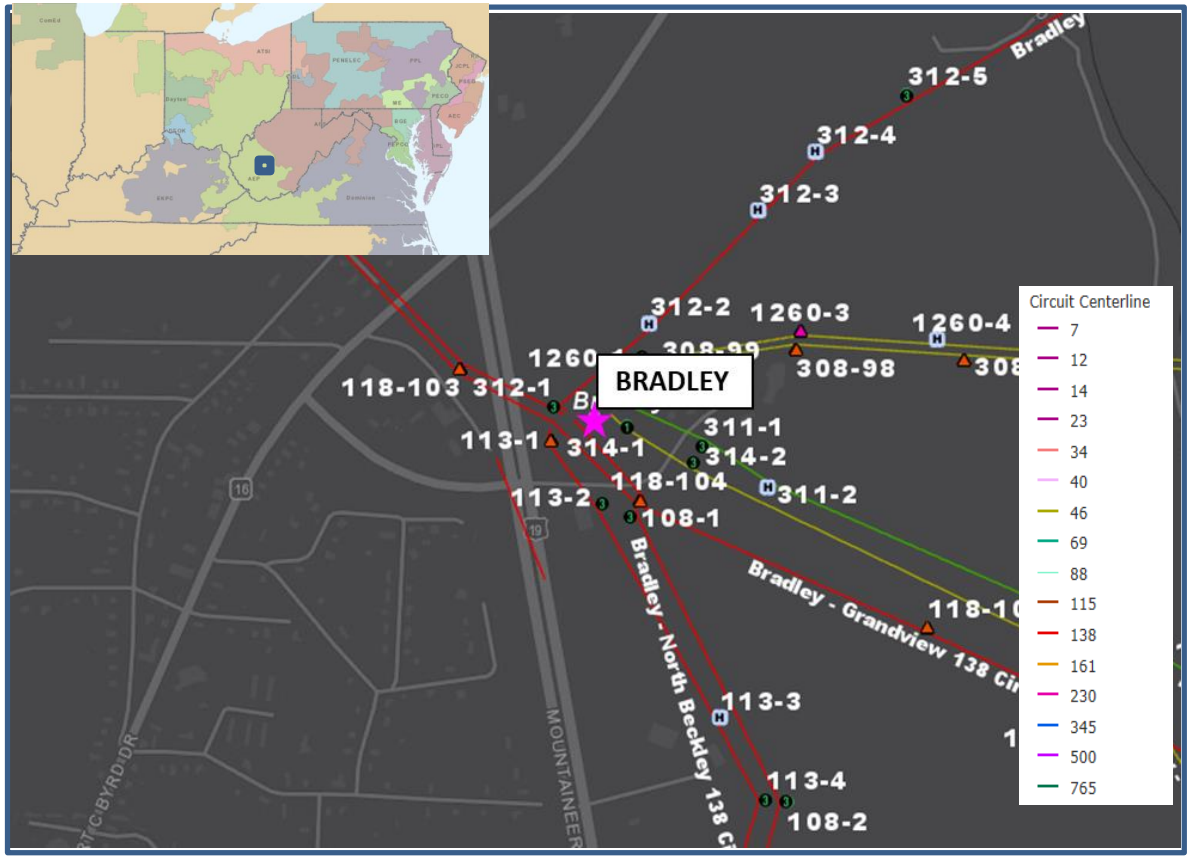
Specific Assumption Reference:

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

Problem Statement:

Bradley Station:

- Four 138kV circuit breakers, CB-A, CB-C, CB-E, and CB-N are 145-PA-40-20B type, SF6 filledbreakers.
  - These breakers are of 1989 vintage and manufactured by ASEA-Brown Boveri.
  - CB-A, CB-C, CB-E, and CB-N, have each exceeded the manufacturer's designed number of full fault operations. Each of these fault operations is likely not at the full fault current rating of the circuit breakers, but with each fault operation of any magnitude comes accelerated aging.
  - As of May 11, 2020, there have been 437 recorded malfunctions of this 145-PA model family on the AEP System, including an unsatisfactory operation of Bradley CB E. The most common issues documented are related to loss of SF6 gas and mis-operations.
  - The expected life of the bushing gaskets and door inspection port seals is 25 years; all of these units have reached this age. Seals that are no longer adequate can cause SF6 leaks to become more frequent.
  - The manufacturer provides no support for this 145-PA family of circuit breakers, and no longer manufactures spare parts for these breakers.
- Bradley Substation currently deploys 103 relays, implemented to ensure the adequate protection and operation of the substation.
  - Currently, 78 of the 103 relays (76% of all station relays) are in need of replacement.
  - There are 64 of the electromechanical type and 3 of the static type, which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack vendor support.
  - 11 microprocessor relays that are in need of remediation, either by firmware upgrade or full replacement.
- The Dameron 138kV circuit does not have any sectionalizing equipment at Bradley Station resulting in an overlap in zones of protection
  - Line faults currently trip out 138kV Bus #2 including tie breaker N and Kanawha River #1 CB A.



AEP Transmission Zone M-3 Process
Boone County, WV

Need Number: AEP-2022-AP027

Process Stage: Need Meeting 4/22/2022

Project Driver: Equipment Condition/Performance/Risk

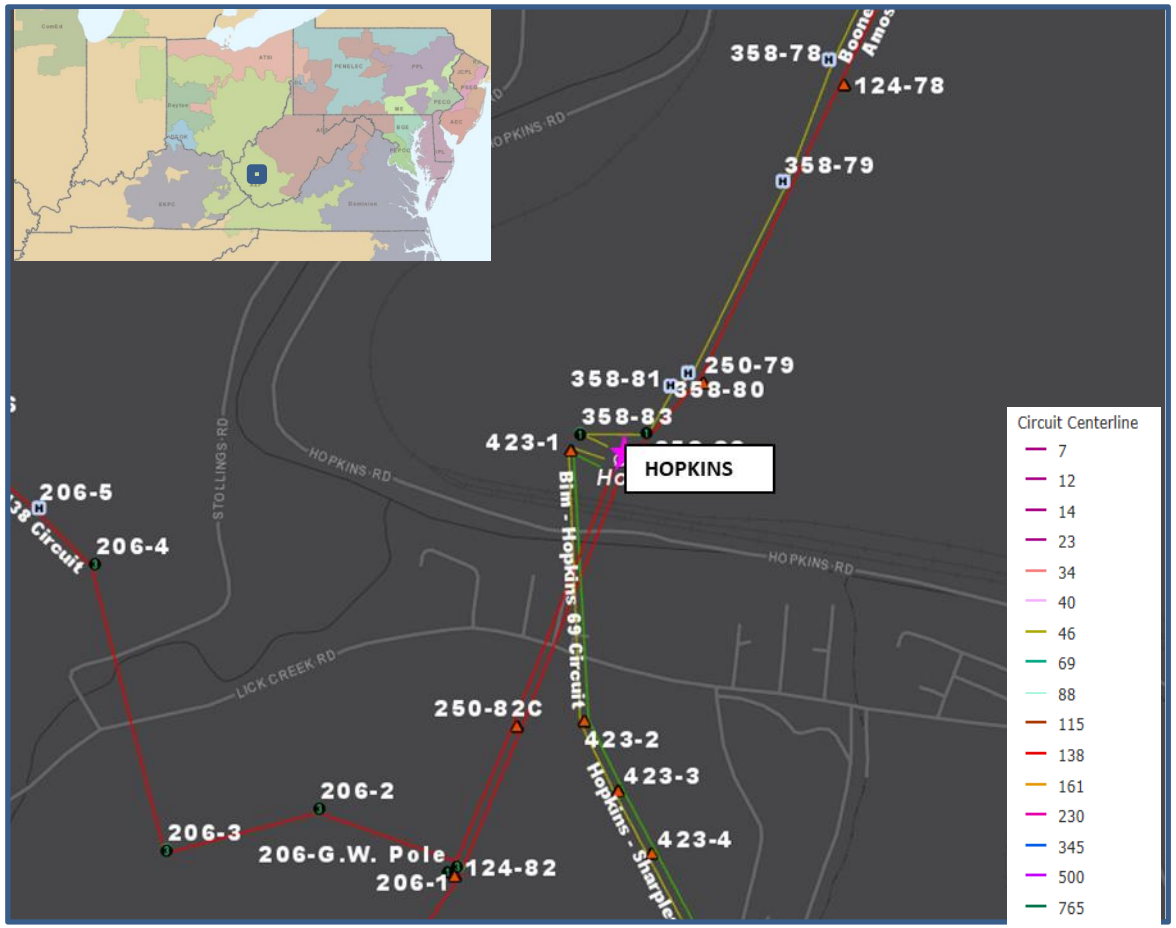
Specific Assumption Reference:

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

Problem Statement:

Hopkins Station:

- 138/69/46 kV XFR #1 has displayed low levels of Dielectric strength, which indicates an increase in particles within the oil, decreasing the dielectric strength of the oil to withstand fault events, leading to damage of the paper insulation. The values of dielectric strength and IFT indicate the dielectric strength of the insulation system (oil and paper) are in poor condition, which impairs the unit's ability to withstand electrical faults. Elevated levels of Carbon Monoxide indicate high decomposition of the paper insulating materials. As the insulating paper materials age, they become brittle. The presence of CO indicates decomposition of the paper insulation which in addition to its brittle nature that comes with aging, impairs the unit's ability to withstand future short circuit or through fault events due to the state of the paper insulation. Changes in bushing dielectric data indicate these bushings are at a greater risk of failure. Failure of a bushing may cause a failure or loss of service of the transformer.
- Currently there is no sectionalizing equipment on the high side of the existing 138/69/46 XFR, resulting in an overlap in zones of protection.
- The Hopkins series reactor on the Amos-Hopkins circuit significantly limits the rating of the line in the winter peak season for the loss of the Culloden – Wyoming and the Baker – Broadford 765 kV circuits.



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

Need Number: AEP-2022-AP028

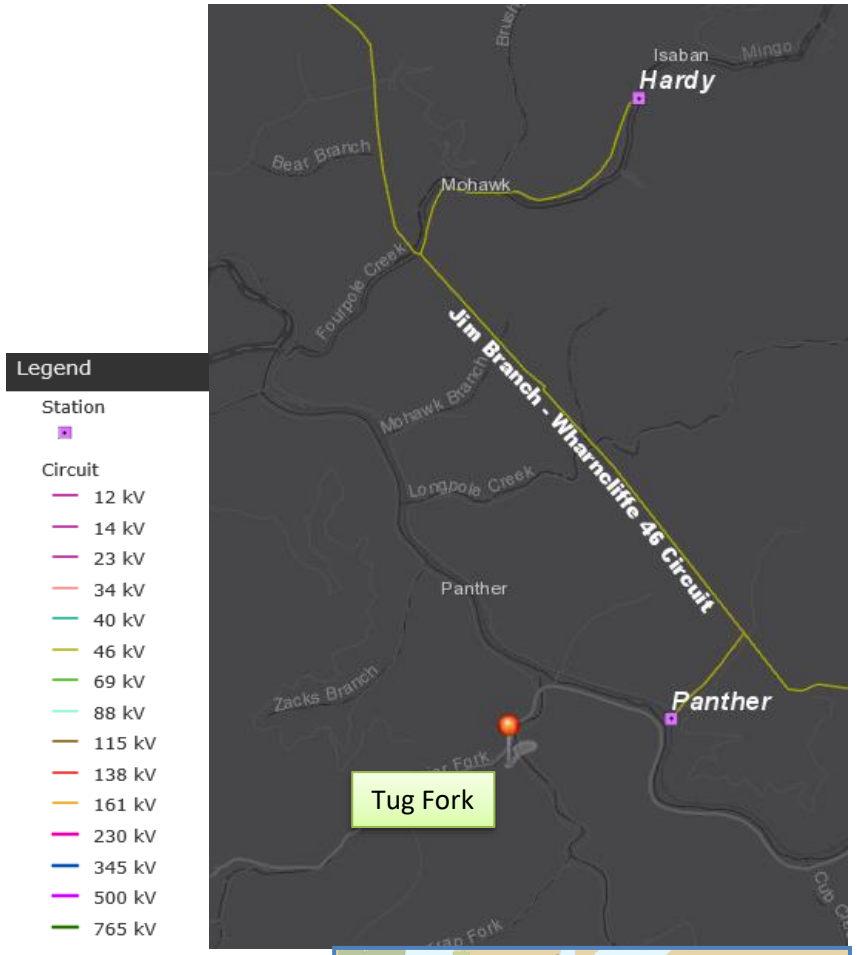
Process Stage: Need Meeting 4/22/2022

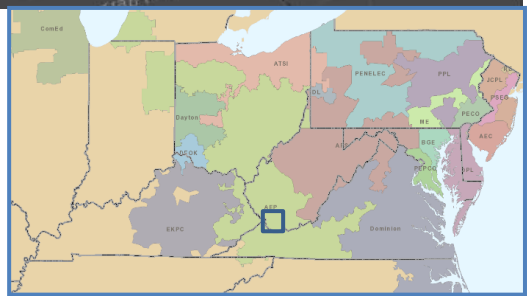
Supplemental Project Driver: Customer Service

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

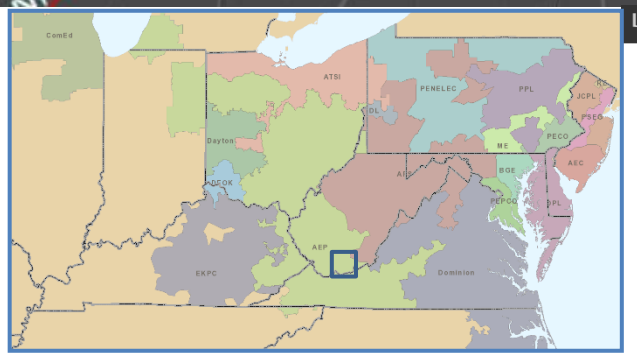
Problem Statement:

- AEP Distribution has requested a new delivery point (Tug Fork) to serve initially 5 MVA.
- Hardy station has no room for expansion. Hardy station is located directly in front of a church and the church parking making expansion difficult in any direction. Roads to the station are single lane making it challenging to bring large equipment to the station.
- The Distribution transformers at Hardy station are 1940s vintage and based on the age of the units' insulating materials, the paper insulation is becoming increasingly brittle. In addition, the units lack thermally upgraded paper insulation. PHs A and B have high levels of Ethylene which is indicative of high decomposition of the paper insulating materials and high temperature thermal faults. In addition, PH C has high levels of Carbon Dioxide and Ethane which is indicative of excessive decomposition of the paper insulating materials and overheating.
- Panther station is a compact station and is located between a main road and a hill side which doesn't allow for expansion. Wash out is a major concern with the station being built next to the hill side. Roads and bridges to the station are narrow making it difficult to bring large equipment to the station.
- The Distribution transformers at Panther station are 1940s vintage and based on the age of the units' insulating materials, the paper insulation is becoming increasingly brittle. In addition, the units lack thermally upgraded paper insulation. The units have poor dielectric strength, decreasing the ability of the oil to withstand fault events which can damage the paper insulation.
- Neither Hardy or Panther stations have mobile access to pick up the loads in case of any transformer failure or outage.





AEP Transmission Zone M-3 Process
McDowell & Mercer County, West Virginia



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-2022-AP029

Process Stage: Need Meeting 4/22/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13), AEP's Pre-1930s Era Lattice Tower and Transmission Line System Report

Problem Statement:
Line Name: Switchback - Hatcher 138kV Line
Original Install Date (Age): 1922
Length of Line: ~21.5 mi
Total structure count: 95
Original Line Construction Type: Lattice Steel structures
Conductor Type: Six-Wired Configured 397,000 ACSR, 1,272,000 ACSR
Momentary/Permanent Outages and Duration: 8 Momentary and 2 Permanent Outage on the Hatcher – South Princeton line
Momentary/Permanent Outages and Duration: 9 Momentary and 0 permanent Outage on the Switchback – South Princeton line
CMI (last 5 years only): 4M minutes for 18,968 customers with 51.5 hours of circuit outage duration
Please refer to AEP's Eastern System Pre-1930s Era Lattice Tower and Transmission Line System Report
Line conditions:

- The structures on Hatcher – Switchback 138kV line fail to meet current AEP structural strength requirements and fail to meet the current ASCE structural strength requirements.
- 94 of 95 structures are 1922 vintage
- There are currently 3 open hardware conditions related to broken insulators. There are currently 2 open shield wire conditions related to broken strands.
- 10 of 17 Momentary Outages (59%) are due to the inadequate shielding angle throughout the lines and caused by lightning. The 49° shield angle on the tangent structures is inadequate for current AEP shield angle requirements. Other Outages are due to distribution, wind, vegetation fall-in from within the AEP ROW, and vegetation fall-in from outside the ROW.
- The associated Hatcher – South Princeton 138kV line serves 63 MVA of peak load at Speedway and Halls Ridge Substations. The associated South Princeton – Switchback 138kV line serves 96 MVA of peak load at New Hope and Minnix Mountain Substations.

AEP Transmission Zone M-3 Process
New Philadelphia, Ohio

Need Number: AEP-2022-OH011

Process Stage: Need Meeting 4/22/2022

Project Driver:

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

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs; AEP Connection Requirements (AEP Assumptions Slides 12-13)

Problem Statement:

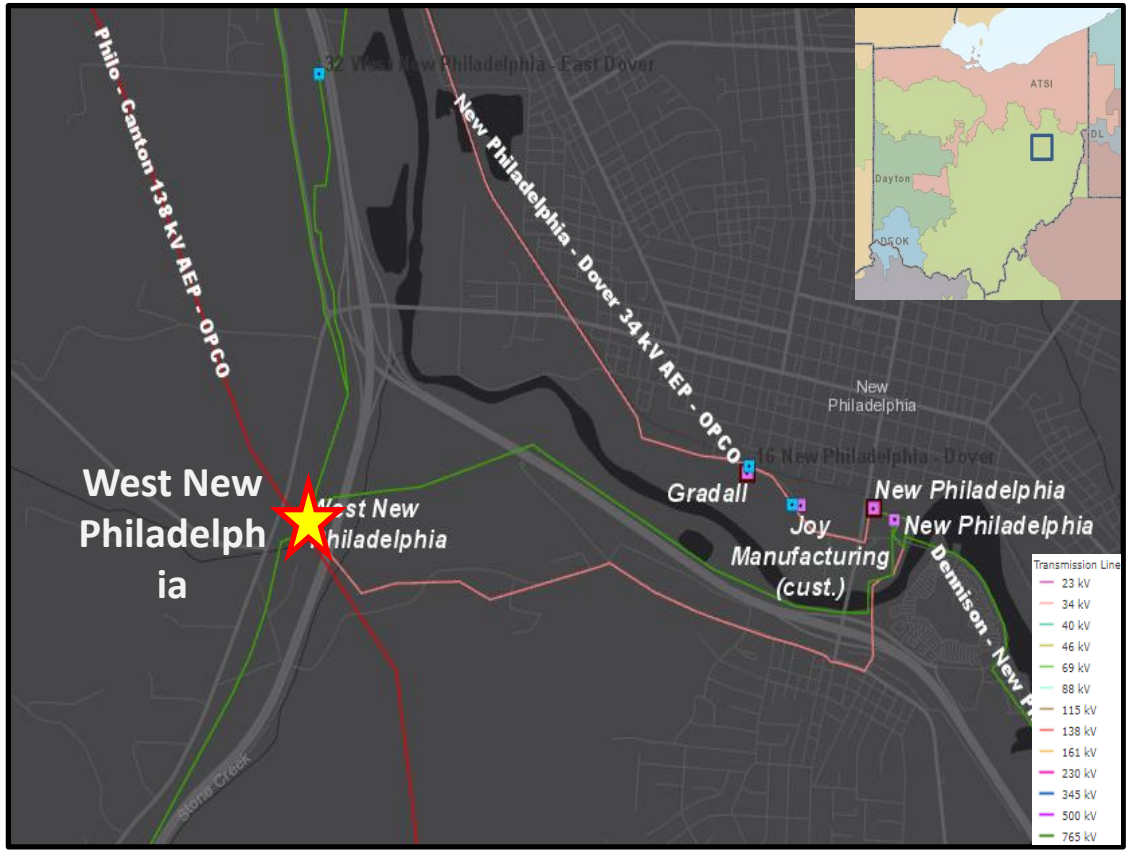
<u>West New Philadelphia 138kV Circuit Breaker A</u>

- Breaker Age: 1991
- Interruption Medium: SF6
- Fault Operations: 36 (recommended number of fault operations: 10)

Additional Information: As of May 11, 2020, there have been 437 recorded malfunctions of this model family on the AEP system (currently 109 units left on AEP's system). The most common issues documented are related to loss of SF6 gas and mis-operations. The expected life of the bushing gaskets and door inspection port seals is 25 years. Seals that are no longer adequate can cause SF6 leaks to become more frequent. The manufacturer provides no support for this family of circuit breakers and no longer produces spare parts for these breakers.

<u>138-34.5 kV Transformer TR-1 (20 MVA)</u>

- Transformer Age: 1951
- There has been an upward trend in insulation power factor, which indicates an increase in particles within the oil. The values of moisture, dielectric strength and power factor indicate the dielectric strength of the insulation system (oil and paper) are in poor condition, which impairs the unit's ability to withstand electrical faults.
- Physical condition of the tank is in poor condition
- No oil containment
- Leaks Nitrogen



AEP Transmission Zone M-3 Process
New Philadelphia, Ohio

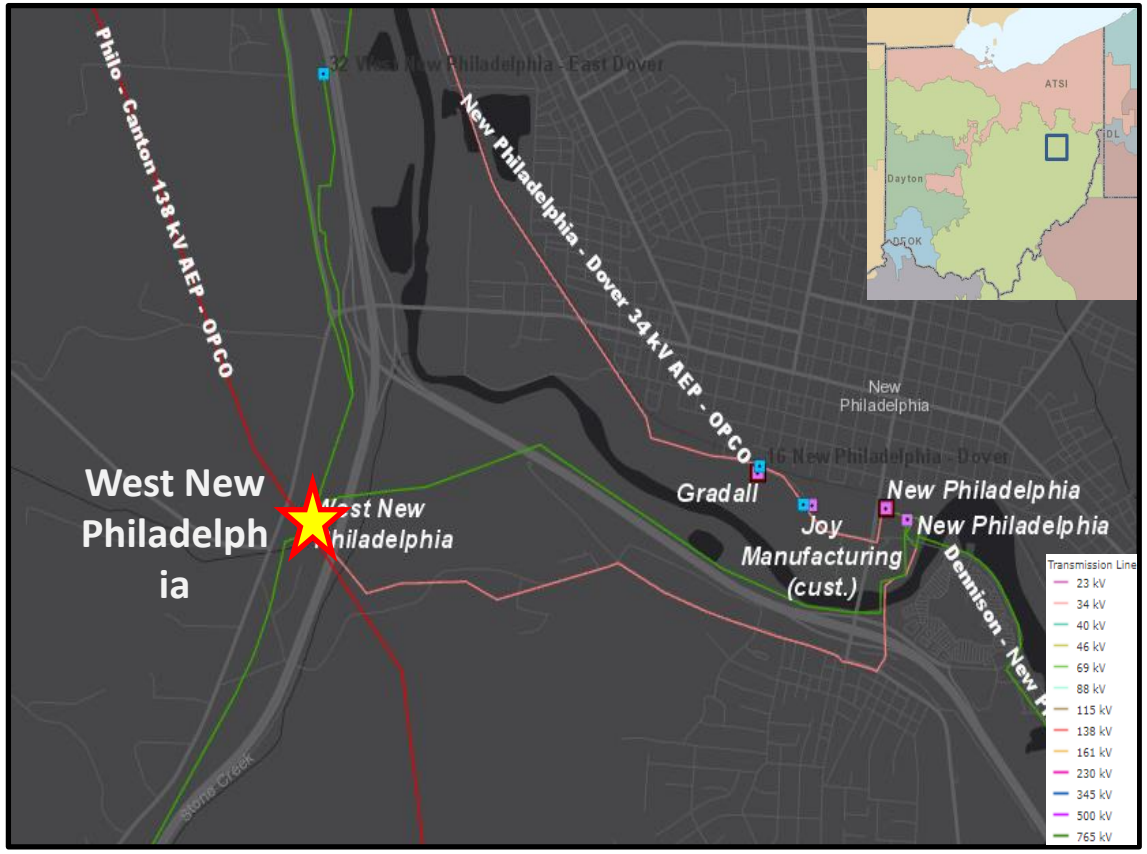
Need Number: AEP-2022-OH011

Process Stage: Need Meeting 4/22/2022

Problem Statement Continued:

Relaying

- 105 of the 110 relays (95% of all station relays) are in need of replacement. 90 of these are of the electromechanical type and 5 of these are of the static type which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack of vendor support. There are 2 microprocessor units manufactured by ABB, The 2 ABB units are a DPU type relay. Out of the 431 relays of this family in the AEP system, 129 of them have had at least one malfunction record documented. This relates to 30% of the DPU fleet. There are also 8 microprocessor based relays commissioned between 2002 and 2007 that may have firmware that is unsupported.



Operational Flexibility and Efficiency Needs:

The 138kV portion of the station consists of two 138kV buses, with a single bus-tie breaker. On Bus #1, there are overlapping zones of protection, due to the lack of breakers in the station: North Intertie 138kV circuit, 138kV Bus #1, 138-12kV transformer #3, 138-34kV transformer #1, the 34kV bus, and the #1 12kV bus. On Bus #2, there are overlapping zones of protection: Newcomerstown 138kV circuit, 138kV Bus #2, and the 138-69kV transformer. These large protection zones are very complex and prone to misoperation/over-tripping.

Three of the station transformers use obsolete 138kV MOAB/ground-switch protection systems, which require remote-breaker tripping for isolating transformer faults (138-69kV XFMR, 138-34kV transformer, 138-12kV transformer #3).

AEP Transmission Zone M-3 Process
Delphos, OH

Need Number: AEP-2022-OH019

Process Stage: Need Meeting 4/22/2022

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

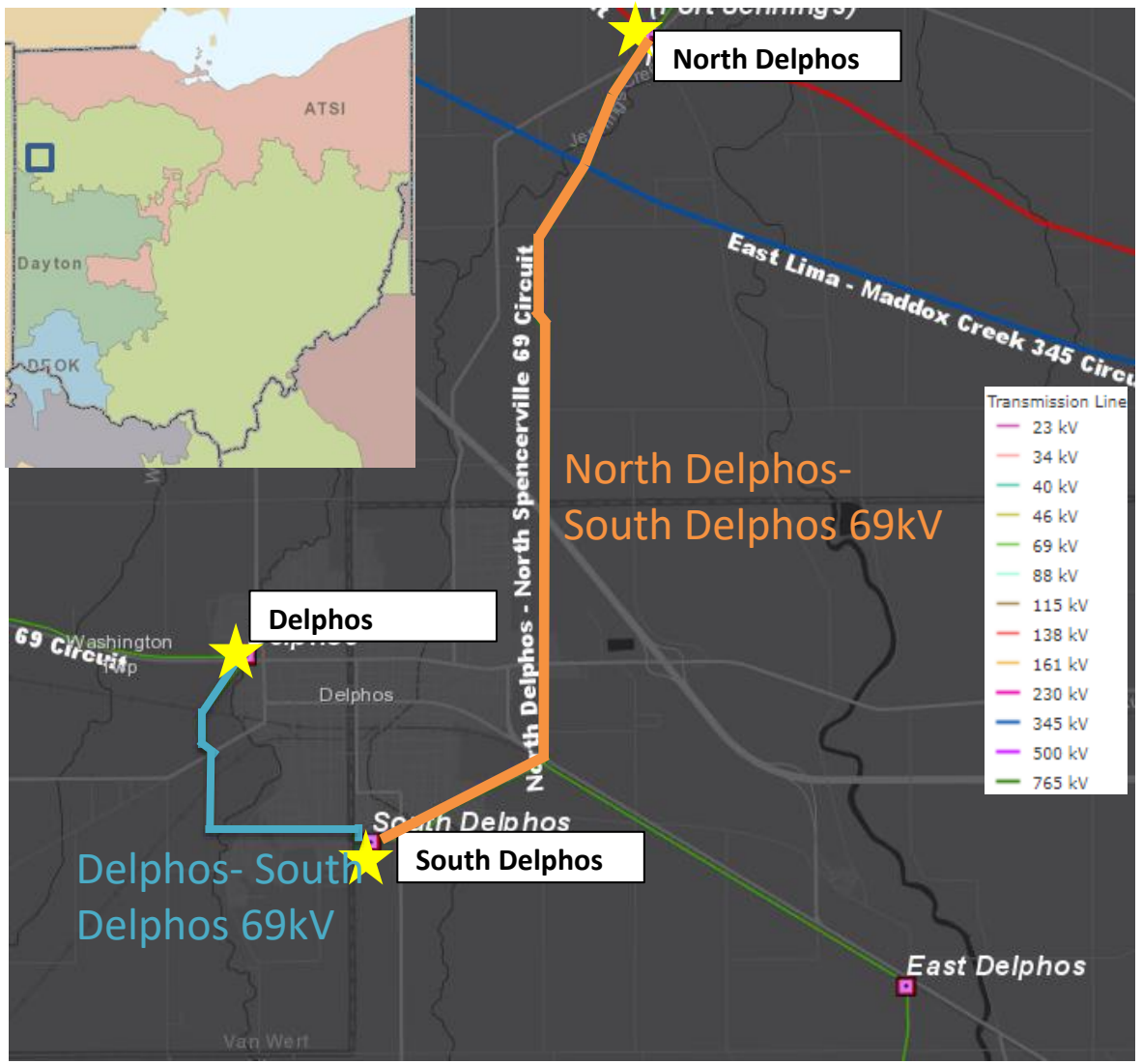
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Delphos – South Delphos 69kV Line (1961 vintage):

- Length of Line: 2.0 Miles
- Total Structure Count: 39
    - Wooden Monopole Structures
- Conductor Types: 336.4 ACSR 18/1 (Merlin), 4/0 ACSR 6/1 (Penguin)
- Outage History: 7 Momentary and 2 Permanent outages – average duration of 24.6 hours, 1.177M CMI between 2017 and 2022.
- Open Conditions: 10 open conditions on 6 unique structures, including burnt insulators, conductor splice issues, and pole rot and insect damage

The South Delphos – Delphos line does not meet 2017 NESC Grade B loading criteria or current AEP structural strength requirements. The line is insulated with horizontal post insulators which do not meet current AEP standards for CIFO and minimum leakage distance requirements.



AEP Transmission Zone M-3 Process
Delphos, OH

Problem Statement continued:

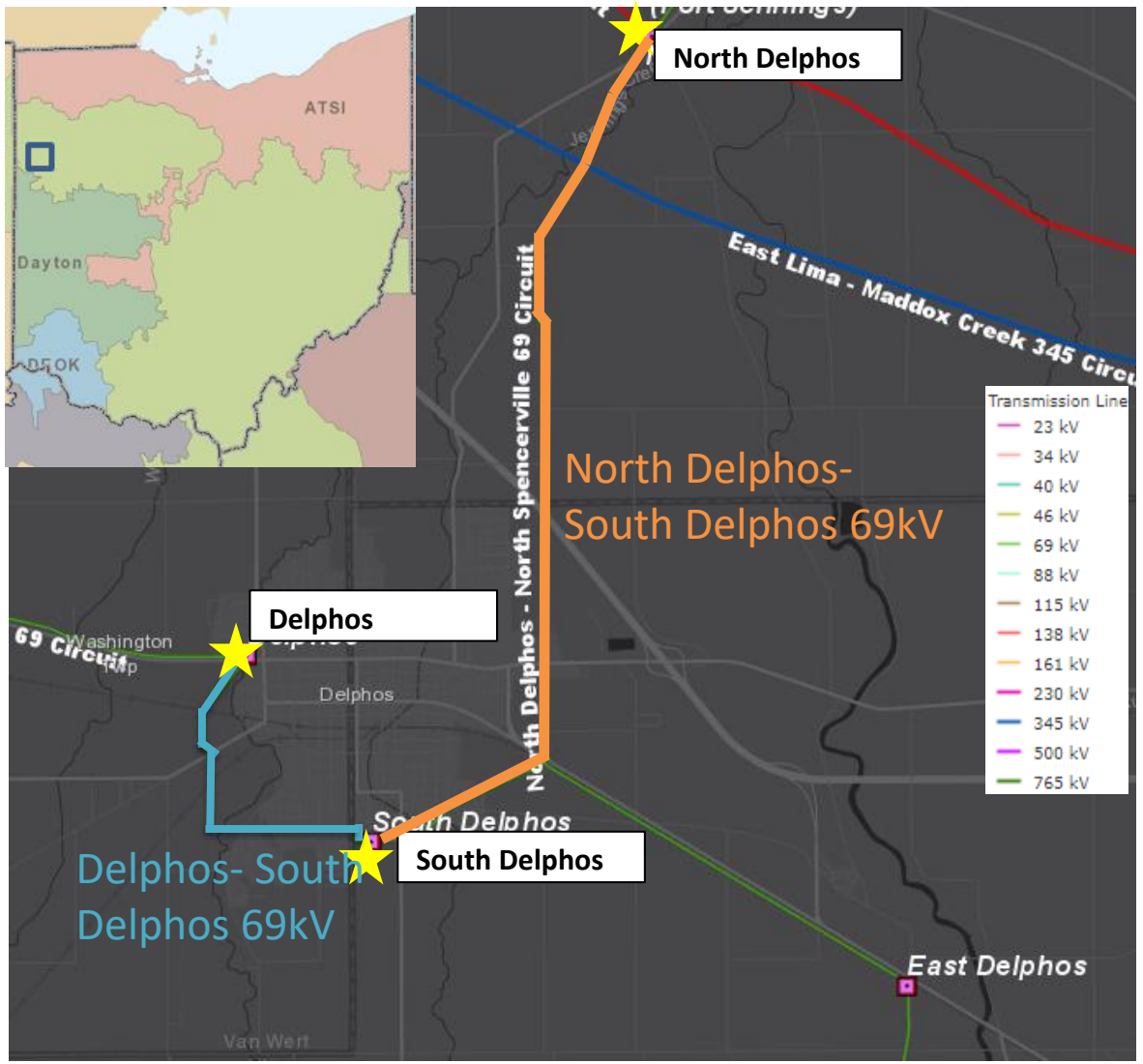
North Delphos – South Delphos 69kV Line(1943) :

- Length of Line: 5.22 Miles
- Total Structure Count: 226
    - Wooden Monopoles
    - Vertical post insulators
- Conductor Types: 336.4 ACSR 18/1 (Merlin), 4/0 COOPER, 4/0 ACSR 6/1 (Penguin) 2/0 COOPER
- Outage History: North Delphos- Van Wert: 7 Momentary and 2 Permanent outages – average duration of 24.64 hours. North Delphos – North Spencerville: 3 Momentary and 1 Permanent outages- average duration of 40 hours. Combined CMI: 2,982,794 for the 2017-2022 timeframe
- Open Conditions: 36, including broken ground lead wire and rot, split, woodpecker, and bowed poles and crossarms

The North Delphos – South Delphos fails to meet 2017 NESC Grade B loading criteria, current AEP structural strength requirements and fails to meet the current ASCE structural strength requirements. The line is insulated with vertical post insulators that do not meet current AEP standards for CIFO and minimum leakage distance requirements.

North Delphos 69kV Circuit Breakers A & C:

- Breaker Age: A 1962, C 1965
- Interrupting Medium: (oil)
- Fault Operations:
    - Number of Fault Operations: A 93, C 166
    - Manufacturer recommended Number of Operations: 10
- Additional Breaker Information: These breakers are FK-69 type oil breaker. Manufacture support and spare parts are no longer available. This type of breaker experiences common failures of the compressor, valves, and trip/reclose mechanism. These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require.



AEP Transmission Zone M-3 Process
Morgan County, Ohio

Need Number: AEP-2022-OH026

Process Stage: Need Meeting 04/22/2022

Project Driver:

Equipment Material/Condition/Performance/Risk

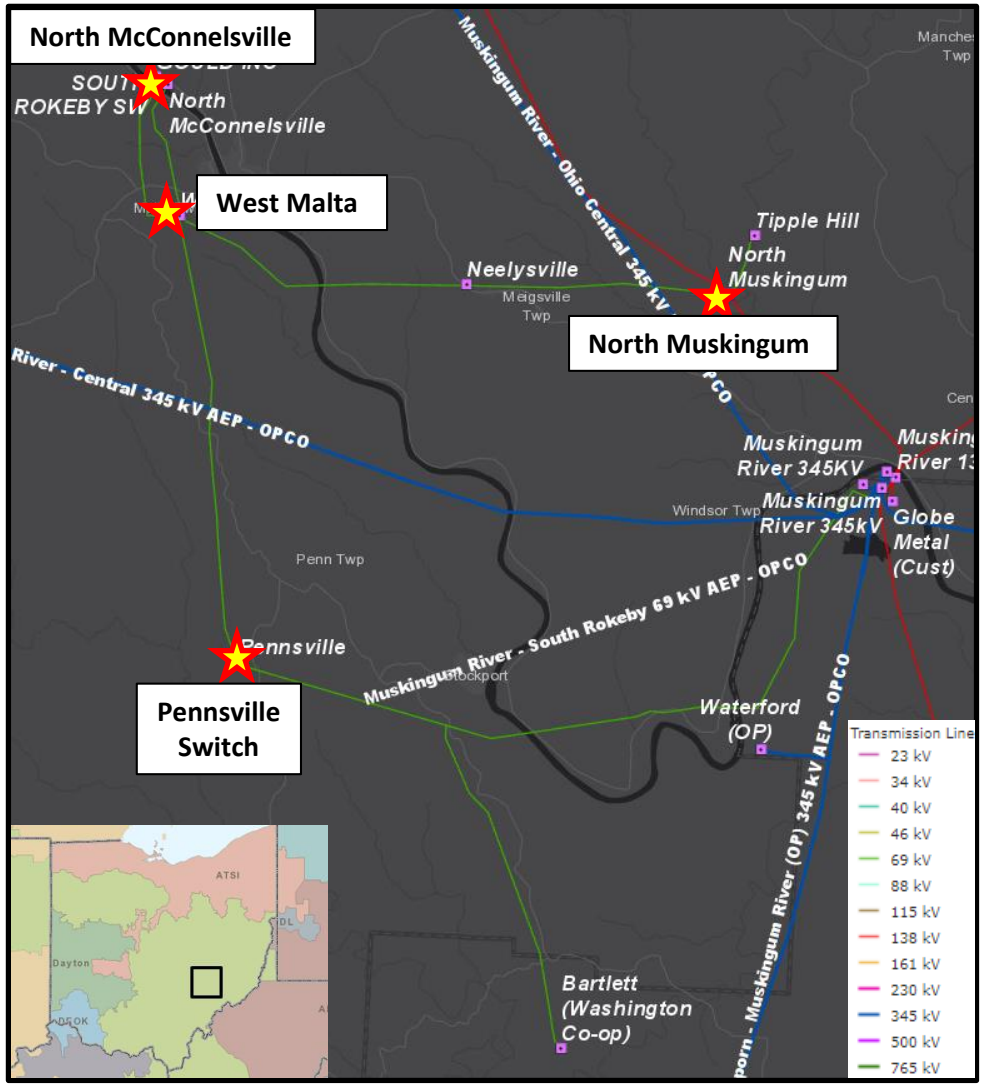
Specific Assumption Reference:

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

Problem Statement:

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

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



AEP Transmission Zone M-3 Process
Morgan County, Ohio

Need Number: AEP-2022-OH026

Process Stage: 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)

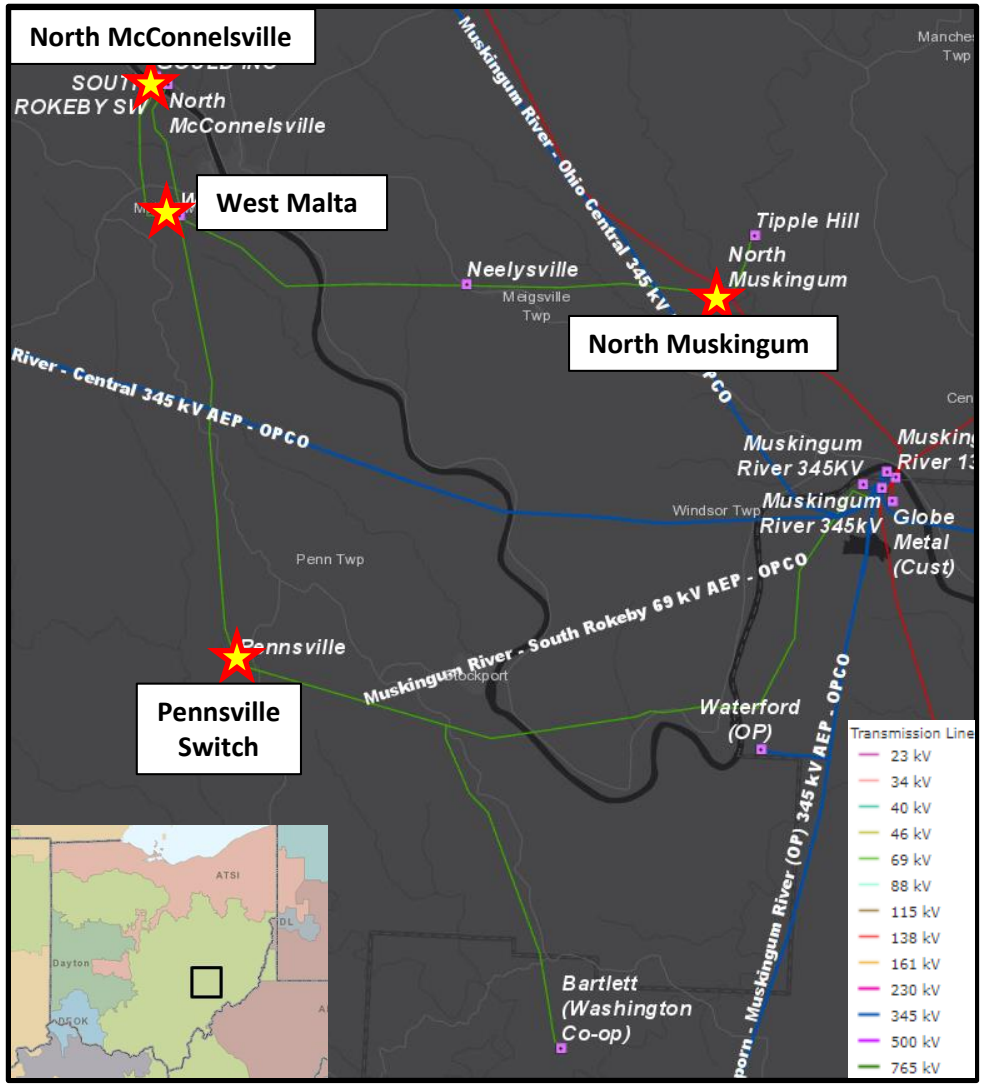
Problem Statement: Continued -

<u>West Malta – North McConnelsville 69kV (1966)</u>

- 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).

<u>North McConnelsville 69kV:</u>

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



AEP Transmission Zone M-3 Process
New Liberty – North Baltimore

Need Number: AEP-2022-OH027

Process Stage: Needs 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)

Problem Statement:

<u>New Liberty – North Baltimore 34kV Line (1940):</u>

- Length of Line: 10.28 Miles
- Total Structure Count: 274
    - Wooden Monopoles
- Conductor Types: 336.4 ACSR 18/1 (Merlin), 4/0 ACSR 6/1 (Penguin)
- Open Conditions: 45 open conditions on 42 unique structures

31 open conditions related to the ground lead wire including broken and stolen

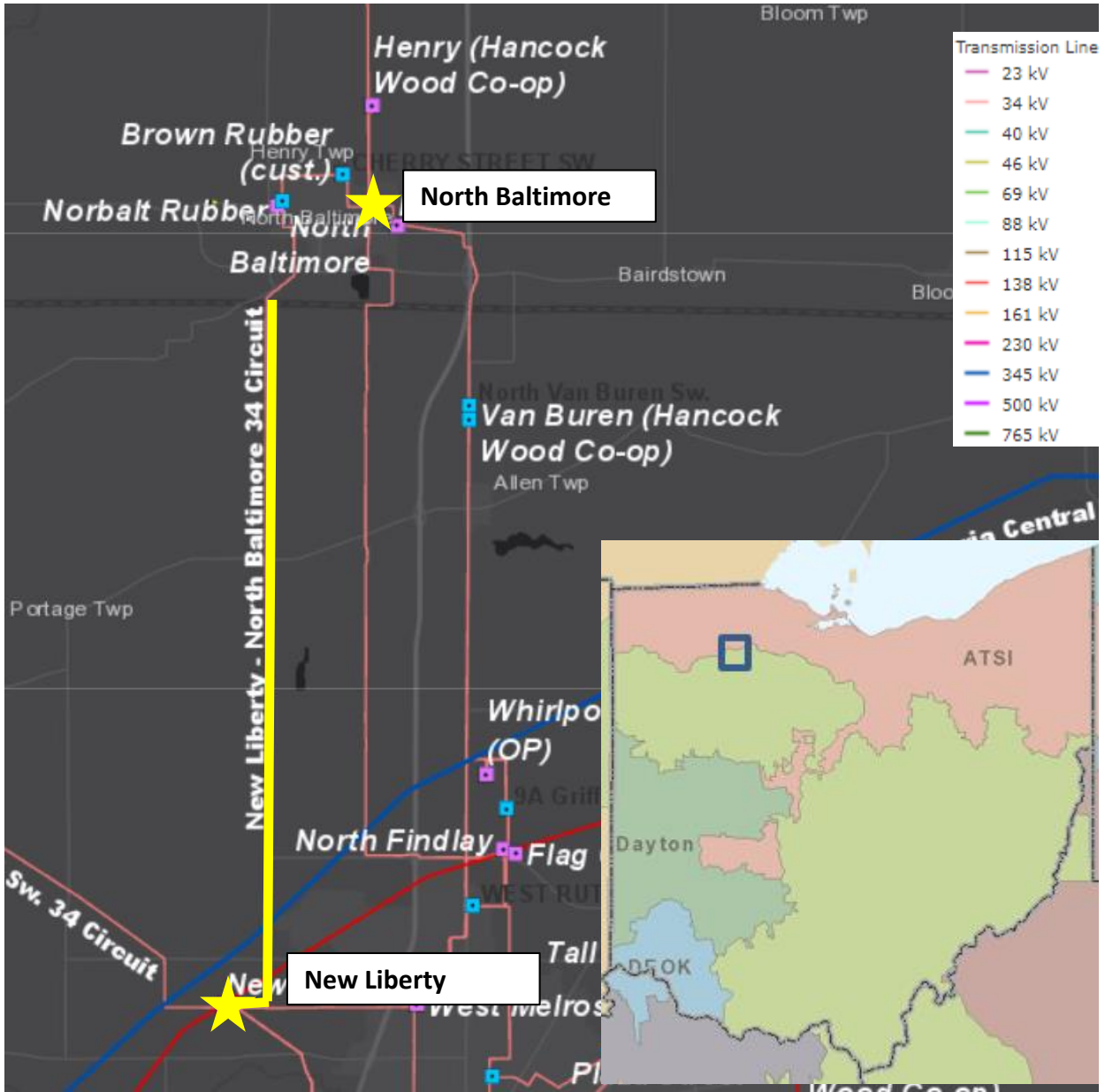
6 structure related open conditions specifically affecting the push pole, crossarm, or pole

7 open conditions related to the guys and insulator

1 conductor related open condition

The New Liberty – North Baltimore 34kV line does not meet 2017 NESC Grade B loading criteria, does not meet the current AEP structural strength requirements and does not meet the current ASCE structural strength requirements. The line is insulated with horizontal post insulators which do not meet current AEP standards for CIFO and minimum leakage distance requirements. The buttwrap grounding on the line does not meet current AEP standards.

Ten representative structures on the line were assessed by ground and drone. 40% had severe pole rot and decay requiring stub poles to be installed to support the existing structures, ground line heart and/or shell rot.



Need Number: AEP-2022-OH029

Process Stage: Need Meeting 4/22/2022

Project Driver:

Customer Service

Specific Assumption Reference:

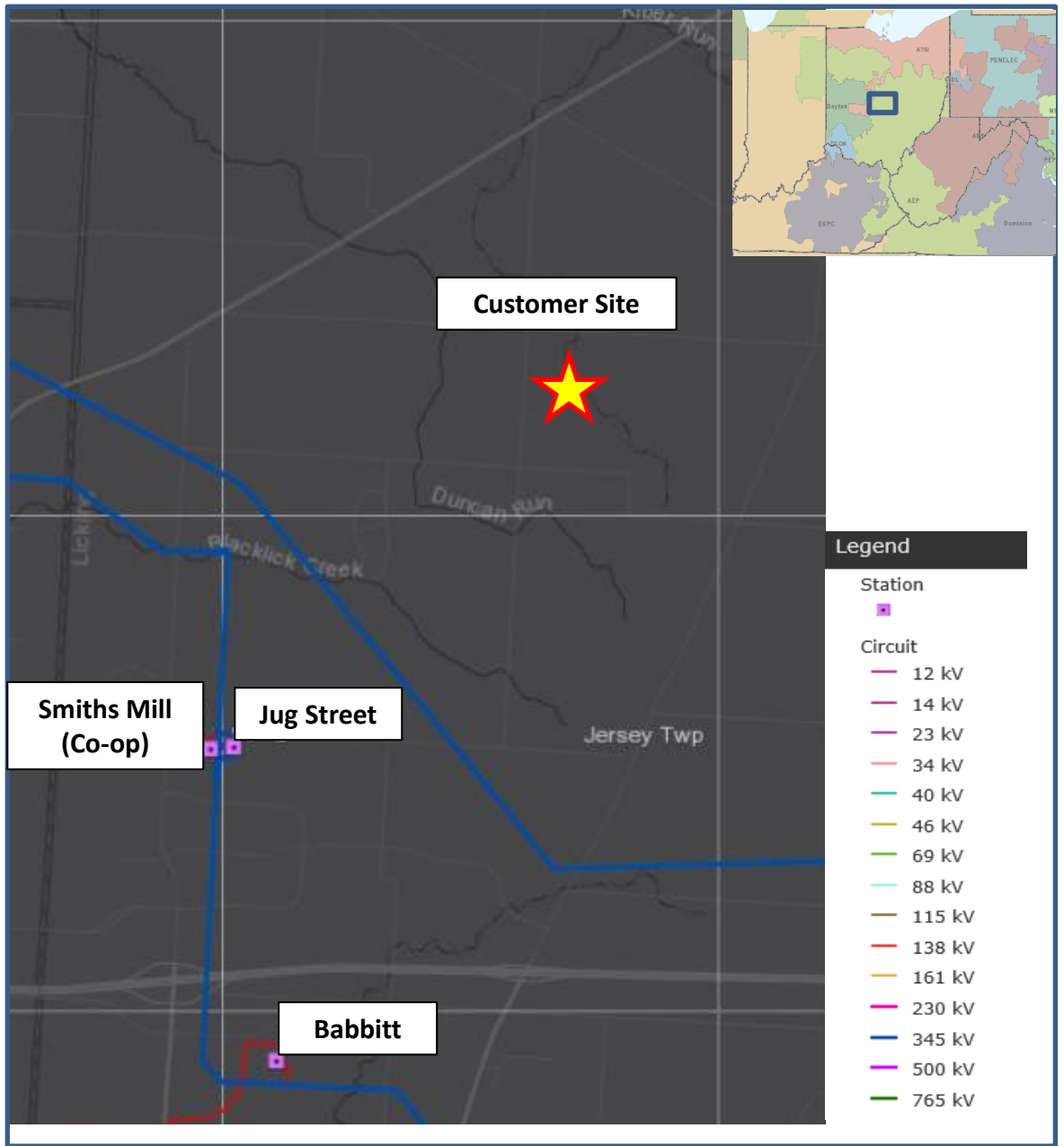
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Customer Service:

- A customer has requested distribution service at a site Northeast of AEP's existing Jug Street station in New Albany, OH.
- The customer has indicated an initial peak demand of 430 MW with an ultimate capacity of up to 1,500 MW at the site.
- The customer has a requested an in-service date of May 31st 2024.

Model: 2026 RTEP



AEP Transmission Zone M-3 Process
Canton, Ohio

Need Number: AEP-2022-OH030

Process Stage: 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)

Problem Statement:

Circuit Breakers: CC, DD, EE, NN, & OO (all 23 kV)

- Breaker Age:
  - 1941: DD
  - 1951: NN & OO
  - 1952:CC & EE
- Interrupting Medium: (Oil)
- Fault Operations:

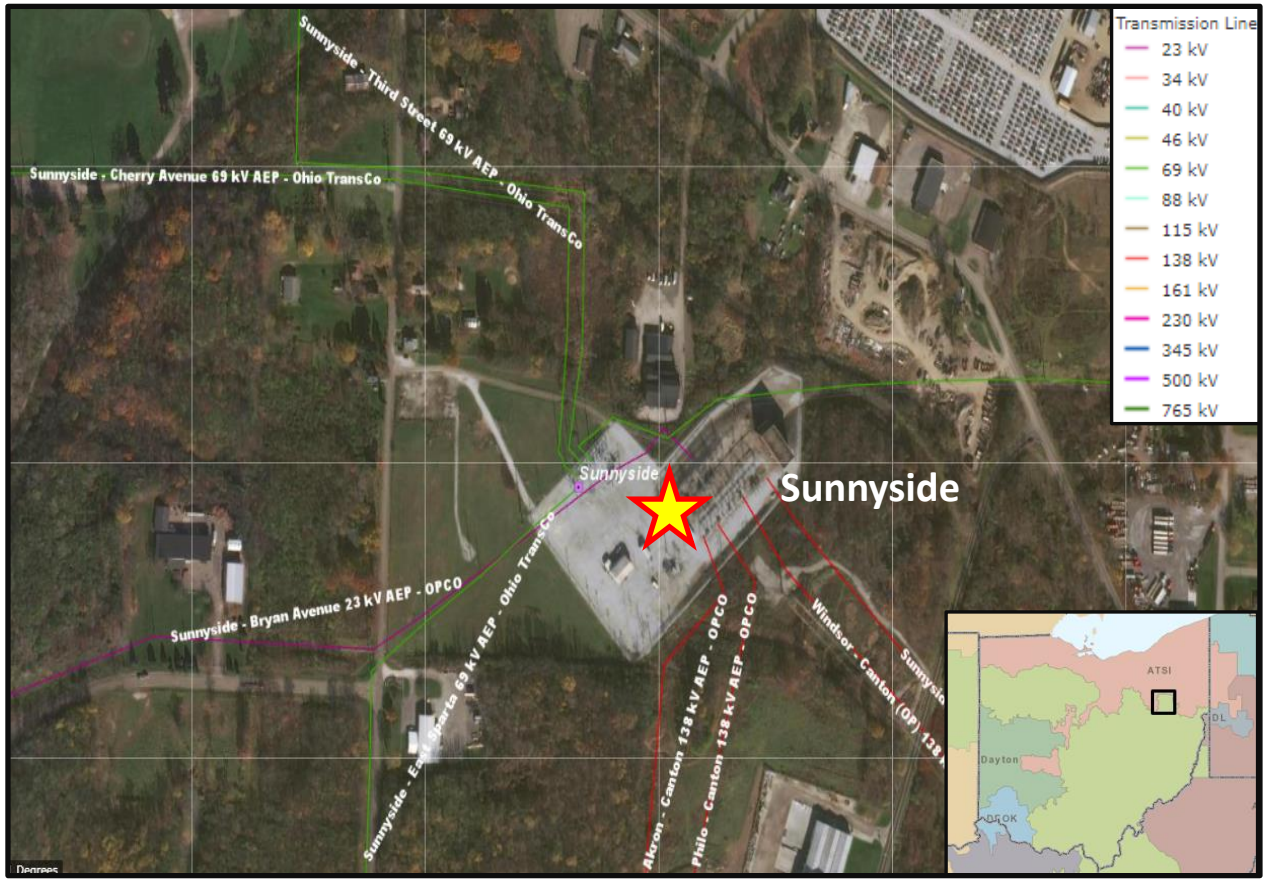
Number of Fault Operations: OO 22

  - Manufacturer recommended Number of Operations: 10

- Additional Oil Filled Breaker Information: These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern counterparts do not require.

Relays:

- Currently, 80 of the 122 relays (66% of all station relays) are in need of replacement. 68 of these are of the electromechanical type and 3 of these are of the static type which have significant limitations with regards to spare part availability and fault data collection and retention. In addition, these relays lack of vendor support. There are 9 microprocessor based relays commissioned between 1997 and 2008 that have firmware that is unsupported.



AEP Transmission Zone M-3 Process
Canton, Ohio

Need Number: AEP-2022-OH030

Process Stage: Need Meeting 04/22/2022

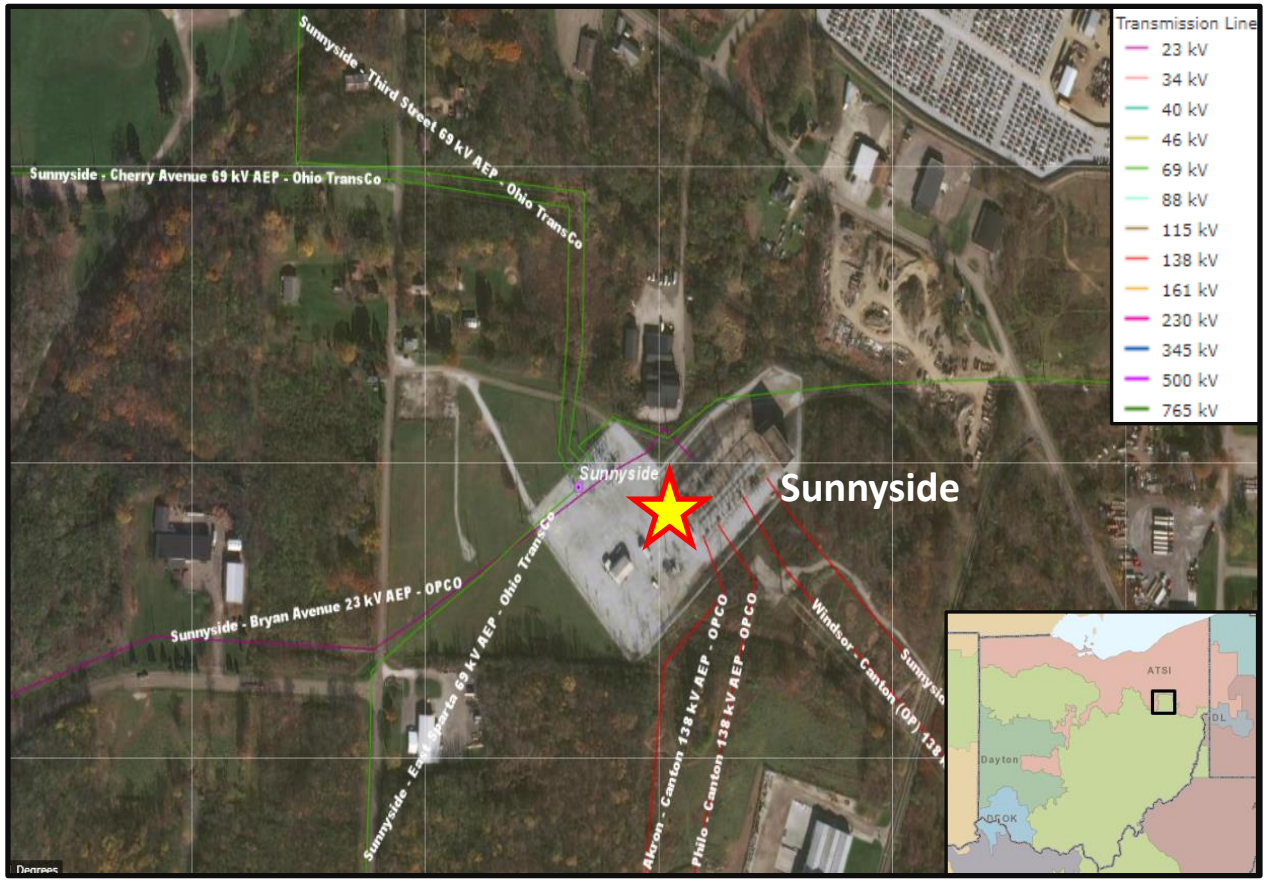
Problem Statement Continued:

138/23 kV Transformer Bank 4:

- Age: 1941
- The presence of Ethane in the DGA indicates decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault events due to the state of the paper insulation.
- An upward trend of moisture and downward trend of dielectric strength indicate the dielectric strength of the insulation system (oil and paper) are in poor condition, which impairs the unit's ability to withstand electrical faults.
- Upward trend in insulation power factor, which indicates an increase in particles within the oil. The values of IFT and power factor indicate the dielectric strength of the insulation system (oil and paper) are in poor condition, which impairs the unit's ability to withstand electrical faults.
- No oil containment

138/23 kV Transformer Bank 5:

- Age: 1954
- The presence of Ethane in the DGA indicates decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault events due to the state of the paper insulation.
- An upward trend of moisture and downward trend of dielectric strength indicate the dielectric strength of the insulation system (oil and paper) are in poor condition, which impairs the unit's ability to withstand electrical faults.
- Cooling controls are obsolete and pumps are not fully functional
- No oil containment



AEP Transmission Zone M-3 Process
Canton, Ohio

Need Number: AEP-2022-OH030

Process Stage: Need Meeting 04/22/2022

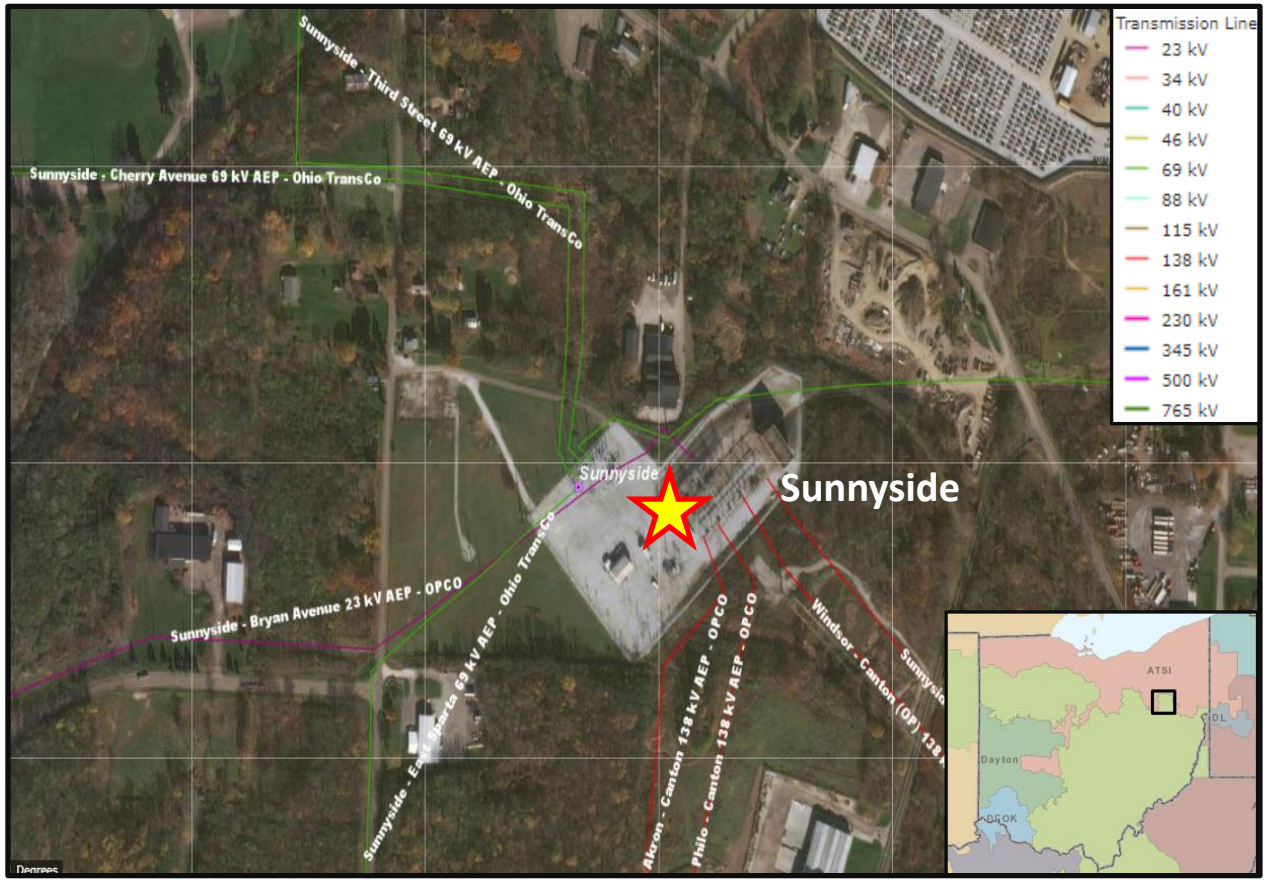
Problem Statement Continued:

The 23kV portion of the station has structures that don't meet minimum-approach safety standards and has many cap-and-pin insulators. In addition, all of the 23kV cables are direct-buried, instead of being housed in conduit/trenching.

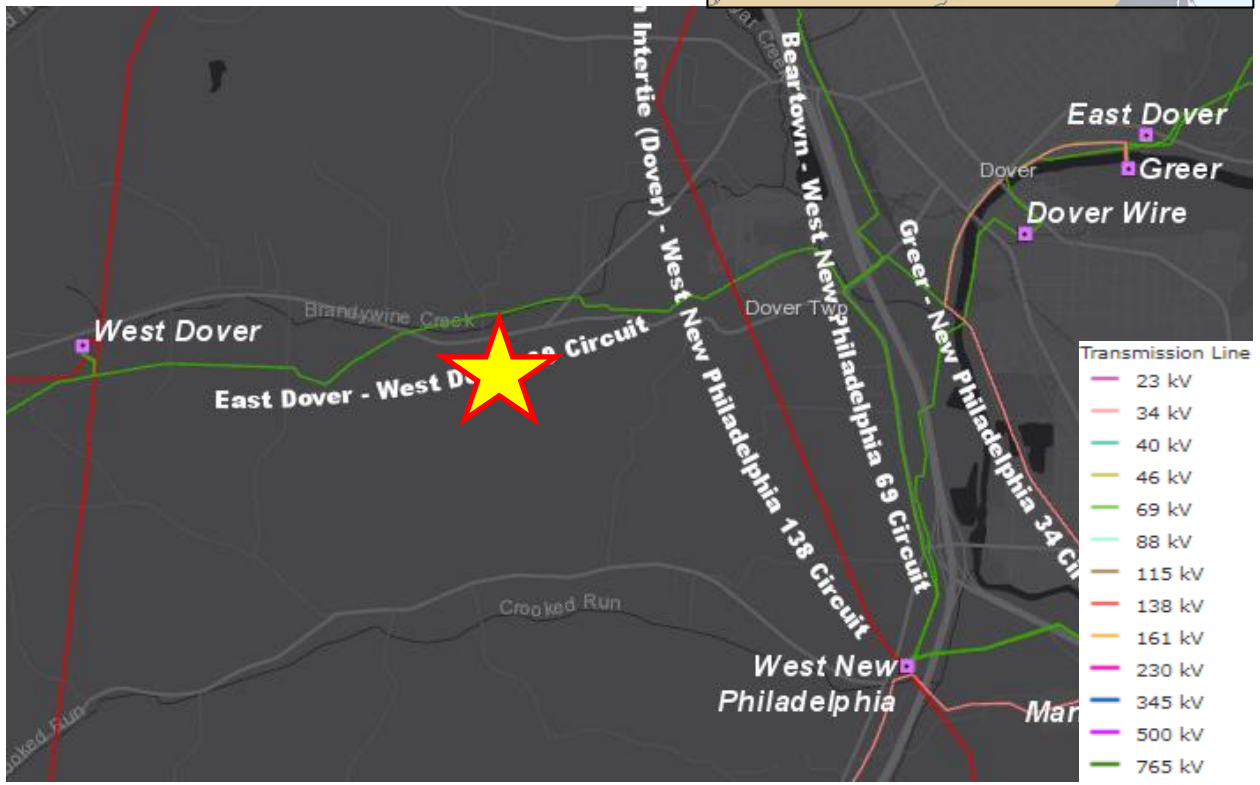
There are two large buildings on site that are no longer used; a multi-story brick building dates to 1917 when the station was first constructed.

Operational Flexibility:

The 138-12kV distribution transformer #6 only has a high-side MOAB switch for protection, which causes the entire 138kV bus #1 to be outaged for a transformer fault (4 additional facilities taken out of service). The 138-23kV subtransmission transformers #4 and #5 also do not have high-side fault-interrupting devices, but instead require clearing an entire 138kV bus for transformer faults.



AEP Transmission Zone M-3 Process
Dover, Ohio



Need Number: AEP-2022-OH031

Process Stage: Need Meeting 04/22/2022

Project Driver: Customer Service

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

Problem Statement:

An industrial customer west of Dover, Ohio has requested new transmission service. The expected peak demand is 4 MW, with a requested in-service-date of December 2022.

AEP Transmission Zone M-3 Process
Perry County, Ohio

Need Number: AEP-2022-OH032

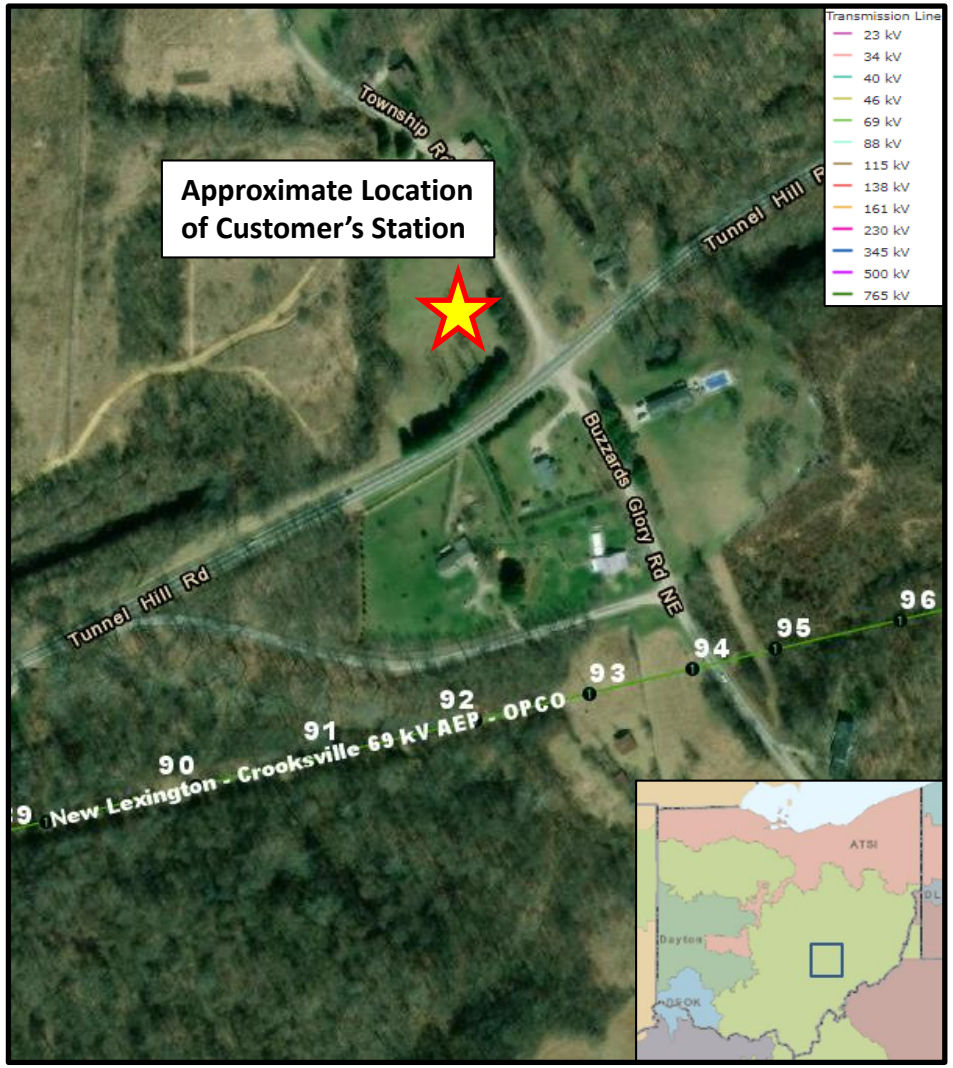
Process Stage: Need Meeting 04/22/2022

Project Driver: Customer Service

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

Problem Statement:

A retail customer has requested a new 69 kV transmission service in Perry County, OH. The peak demand at this delivery point will be approximately 6 MW. They have requested an in service date of 12/1/2022.



AEP Transmission Zone M-3 Process
Muskingum County, Ohio

Need Number: AEP-2022-OH033

Process Stage: Need Meeting 04/22/2022

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

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

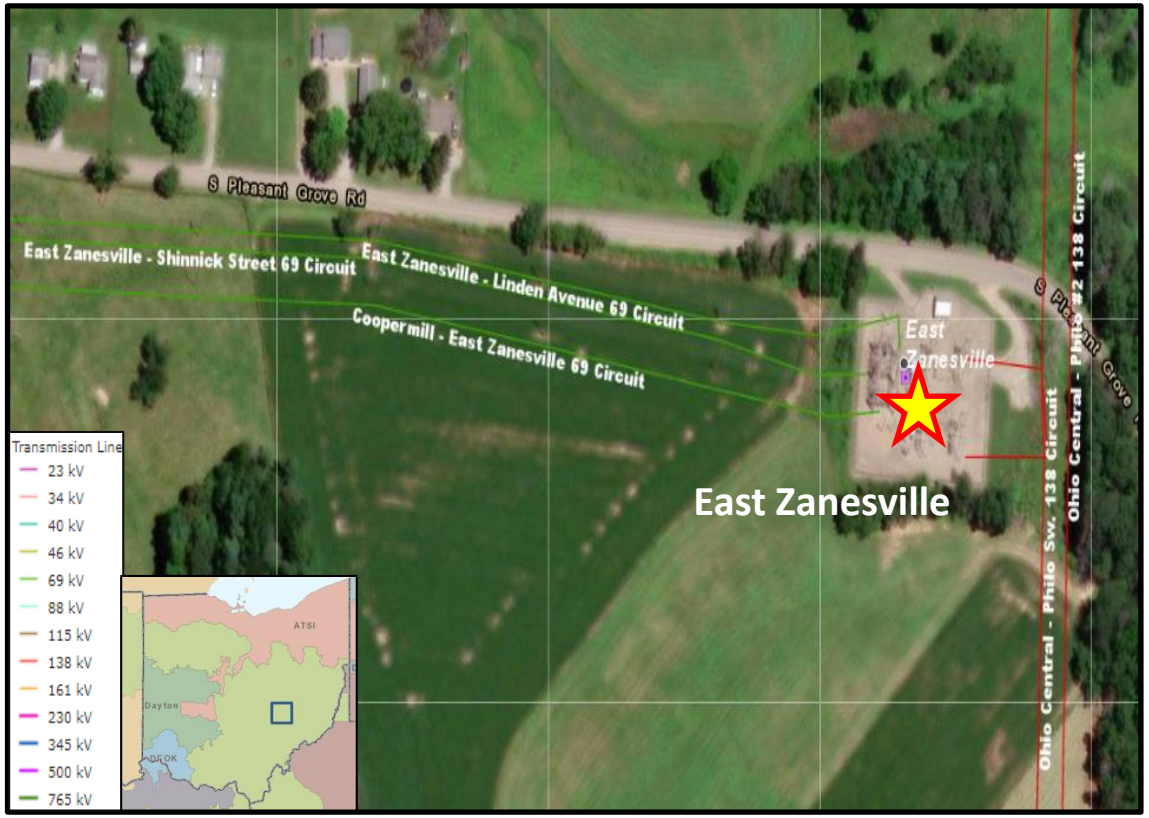
Problem Statement:

East Zanesville Circuit Breakers: J & L 69kV

- Breaker Age: 1970
- Interrupting Medium: (Oil)
- Fault Operations:
  - Number of Fault Operations: J 38 & L 52
  - Manufacturer recommended Number of Operations: 10
- Additional Oil Filled Breaker Information: These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require.

Relays:

- Currently, 54 of the 59 relays (92% of all station relays) are in need of replacement. 50 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 4 microprocessor based relays commissioned in 2006 that have firmware that is unsupported.



AEP Transmission Zone M-3 Process
Muskingum County, Ohio

Need Number: AEP-2022-OH033

Process Stage: Need Meeting 04/22/2022

Problem Statement Continued:

138/69/12 kV Transformer 1:

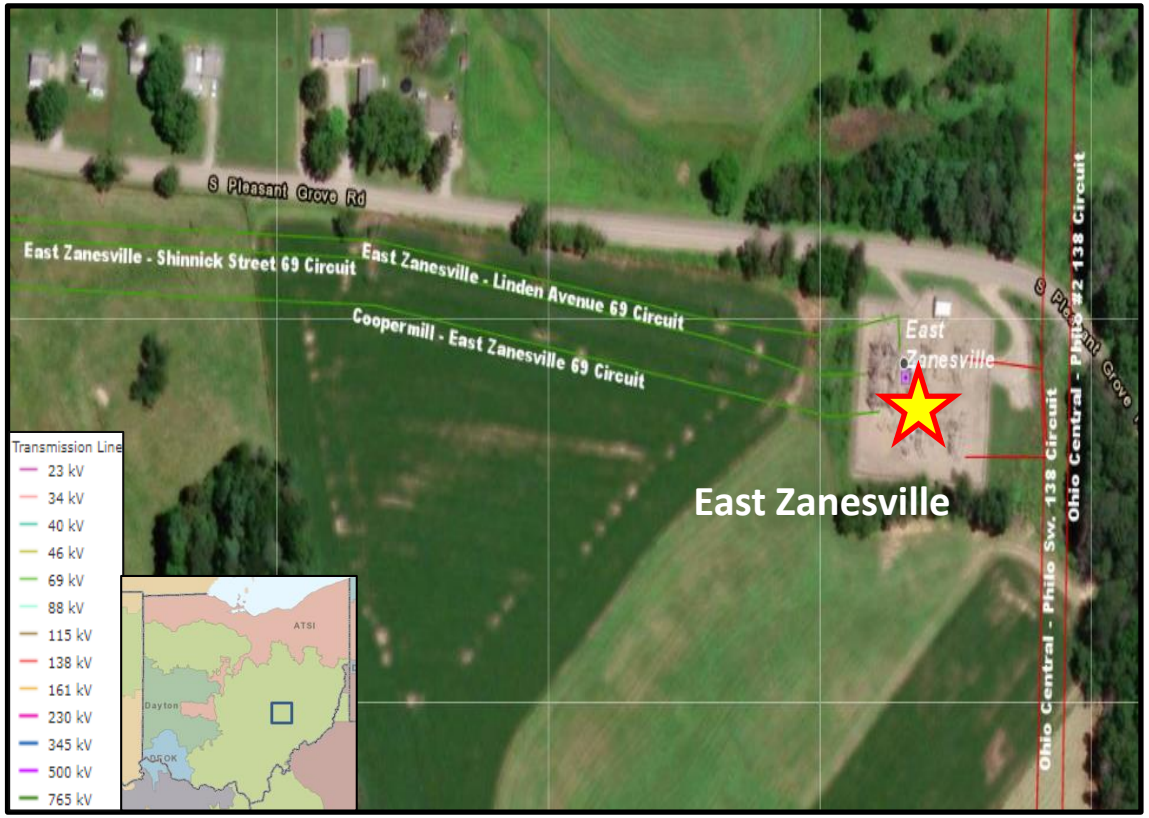
- Age: 1965
- The presence of Carbon Dioxide indicates decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault events due to the state of the paper insulation.
- The change in bushing dielectric data along with the bushing type indicates these bushings are at a greater risk of failure. Failure of a bushing may cause a failure or loss of service of the transformer.
- This unit has several oil leaks, the physical condition of the tank is in poor condition and there are thermal fault indications in the main tank.
- No oil containment

138/69/12 kV Transformer 2:

- Age: 1965
- The presence of Carbon Monoxide and Carbon Dioxide indicate decomposition of the paper insulation that impairs the unit's ability to withstand future short circuit or through fault events due to the state of the paper insulation.
- This unit has several oil leaks, the physical condition of the tank is in poor condition and there are thermal fault indications in the main tank.
- No oil containment

Operational Flexibility

- Station has no 138 kV line breakers, therefore uses ground MOAB schemes for remote tripping. Also, currently there are no sectionalizing on either side of Transformer 1 & 2 causing to have three dissimilar zones of protection (138 kV Bus, Transformers & 69 kV Bus).



AEP Transmission Zone M-3 Process
New Albany, OH

Need Number: AEP-2022-OH034

Process Stage: Need Meeting 4/22/2022

Project Driver:

Customer Service

Specific Assumption Reference:

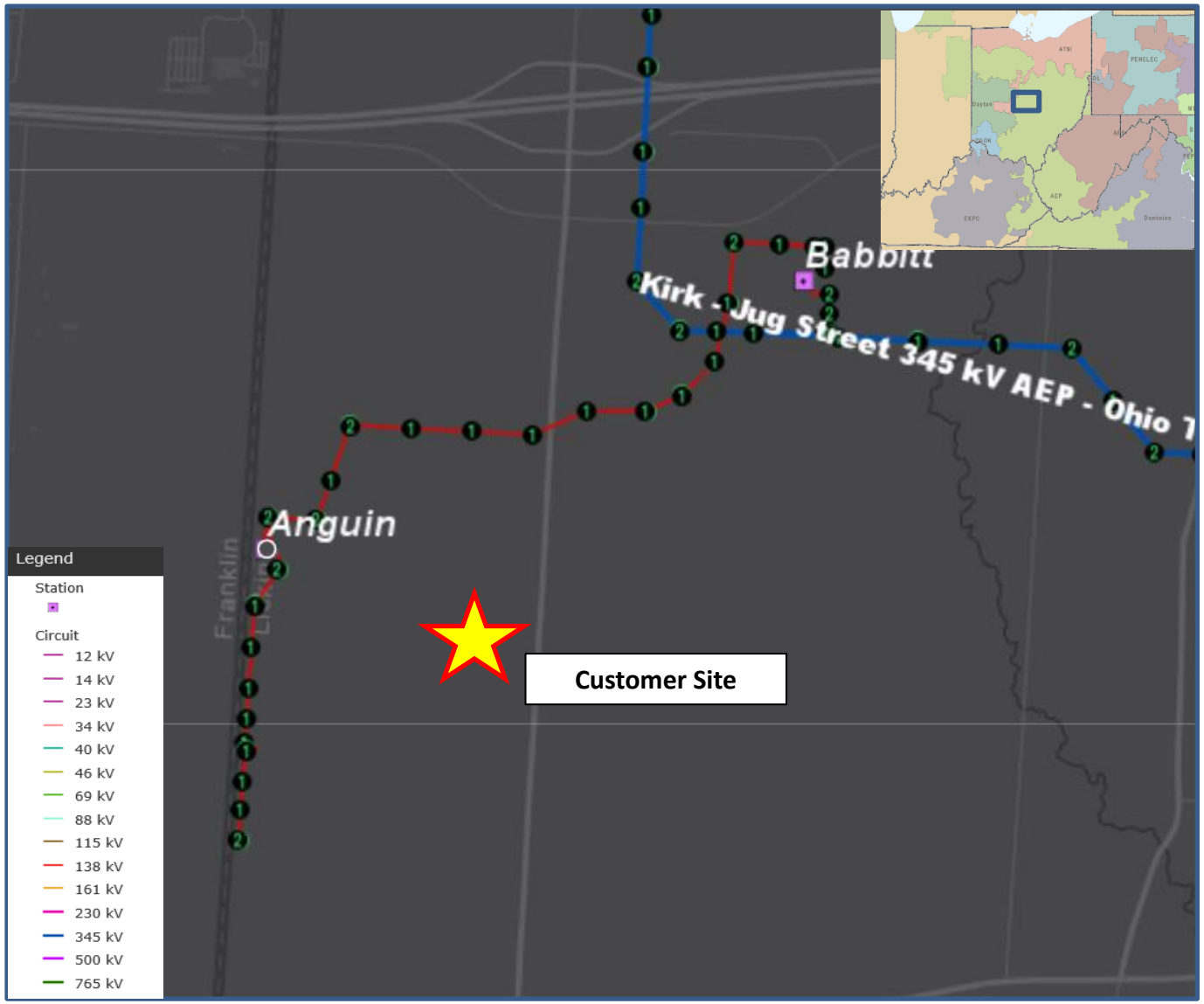
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site East of AEP's existing Anguin station in New Albany, OH.
- The customer has indicated a peak demand of 144 MW at the site.
- The customer has requested an ISD of 5/31/2023

Model: 2026 RTEP



AEP Transmission Zone M-3 Process
Hilliard, OH

Need Number: AEP-2022-OH035

Process Stage: Need Meeting 4/22/2022

Project Driver:

Customer Service

Specific Assumption Reference:

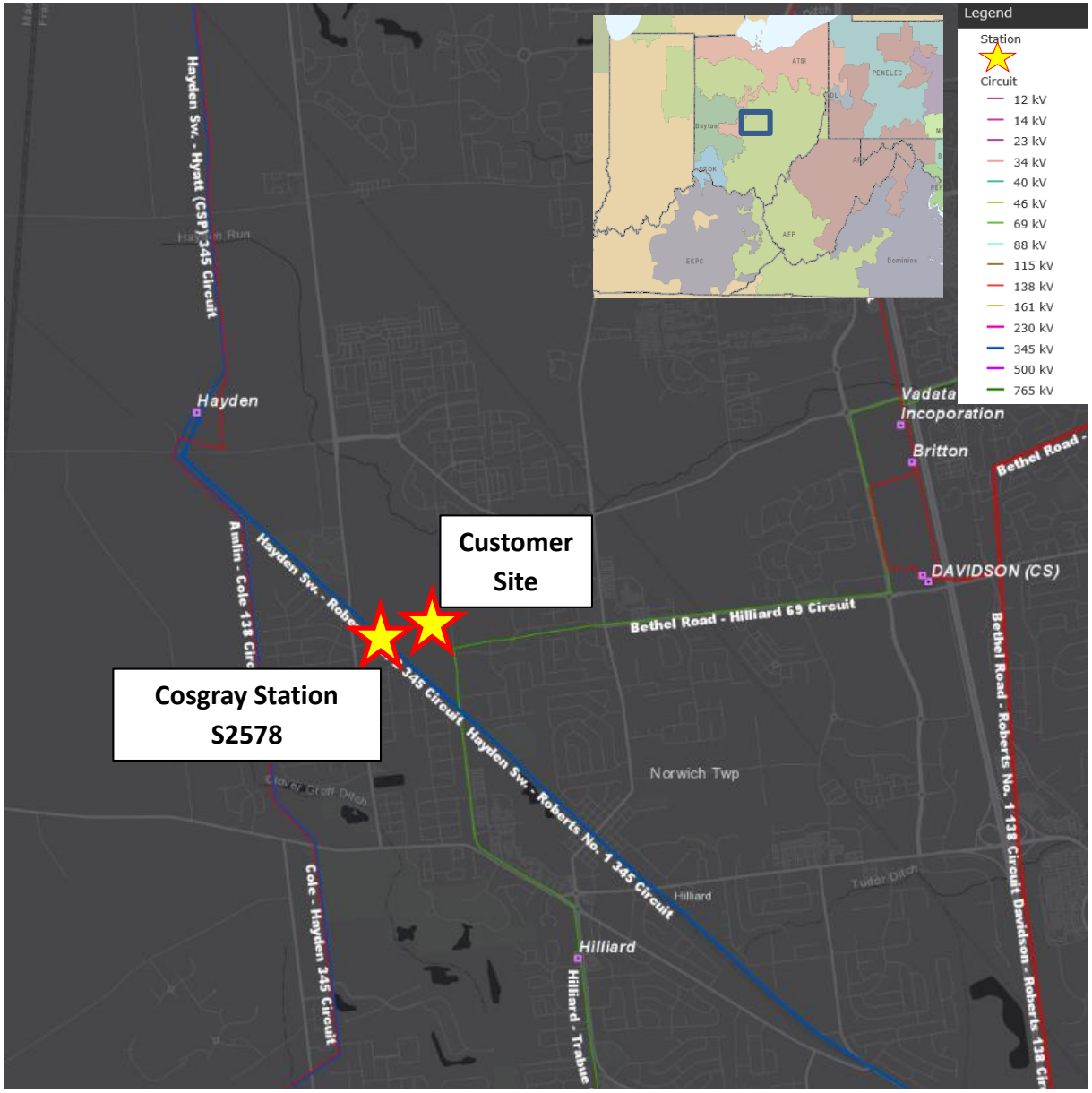
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- The customer Served out of Cosgray station (S2653) has requested additional transmission service to their existing site southeast of AEP's existing Hayden station in Hilliard, OH.
- The customer has indicated a peak demand of 250 MW at the site.
- The customer has requested an ISD of 4/1/2024

Model: 2026 RTEP



AEP Transmission Zone M-3 Process
New Albany, OH

Need Number: AEP-2022-OH036

Process Stage: Need Meeting 4/22/2022

Project Driver:

Customer Service

Specific Assumption Reference:

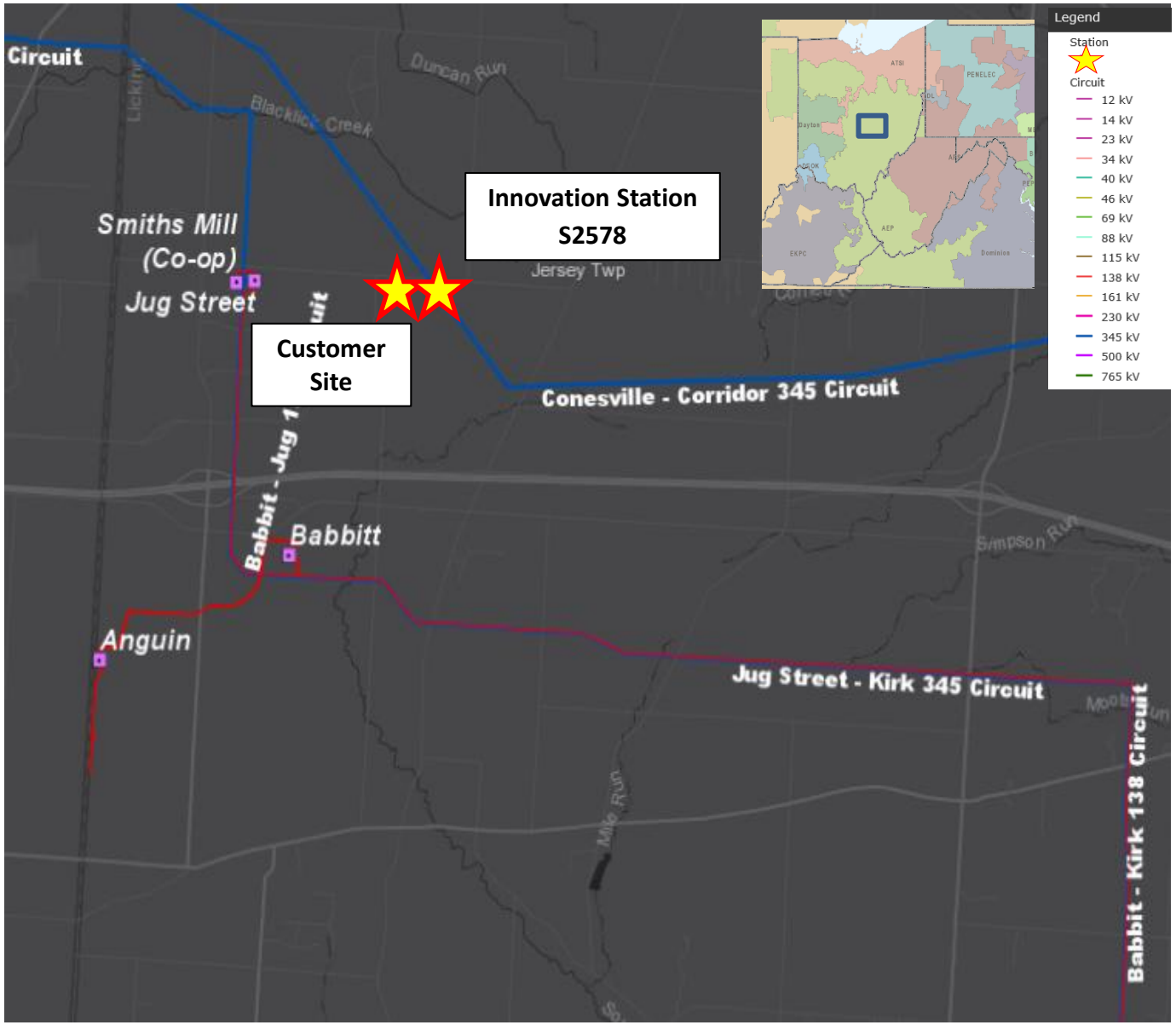
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- The customer served out of Innovation station (S2578) has requested additional transmission service at their existing site just south of the existing Conesville – Corridor 345 kV circuit in New Albany, OH.
- The customer has indicated a peak demand of 286.5 MW at the site.
- The customer has requested an ISD of 4/1/2024

Model: 2026 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
North Columbus, OH

Need Number: AEP-2021-OH038

Process Stage: Solutions Meeting 4/22/2022

Previously Presented: Need Meeting 7/16/2021

Project Driver: Equipment Material/Condition/Performance/Risk

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

Problem Statement:

Lazelle Station

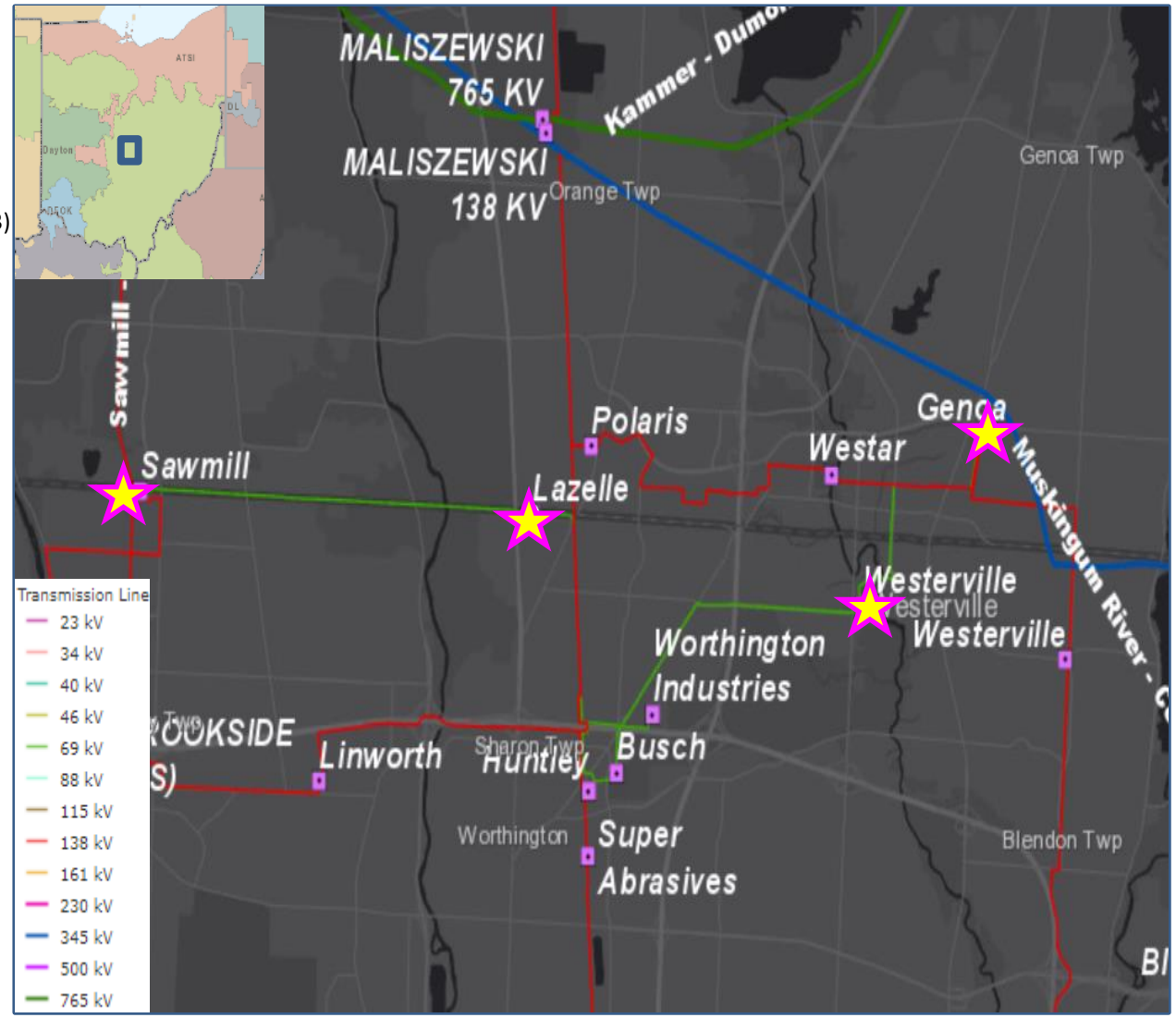
69 kV Circuit Breakers 61 & 62

- Breaker Age: 1967
- Interrupting Medium: Oil
- Fault Operations: 11 (CB-61)
- Manufacturer recommended Number of Operations: 10
- The manufacturer provides no support for these units and spare parts are increasingly more difficult to obtain. Signs of internal flashovers are present and heavy rust is showing on the breaker itself.
- Oil breaker maintenance has become more difficult due to the oil handling required to maintain them. Oil spills are frequent with breaker failures and routine maintenance and can become an environmental hazard.

Westerville Station

69 kV Circuit Breakers 62 & 63

- Breaker Age: 1967
- Interrupting Medium: Oil
- Fault Operations: 22 (CB-63)
- The manufacturer provides no support for these units and spare parts are increasingly more difficult to obtain. Signs of internal flashovers are present and heavy rust is showing on the breaker itself.
- Oil breaker maintenance has become more difficult due to the oil handling required to maintain them. Oil spills are frequent with breaker failures and routine maintenance and can become an environmental hazard.



AEP Transmission Zone M-3 Process
North Columbus, OH

Genoa Station

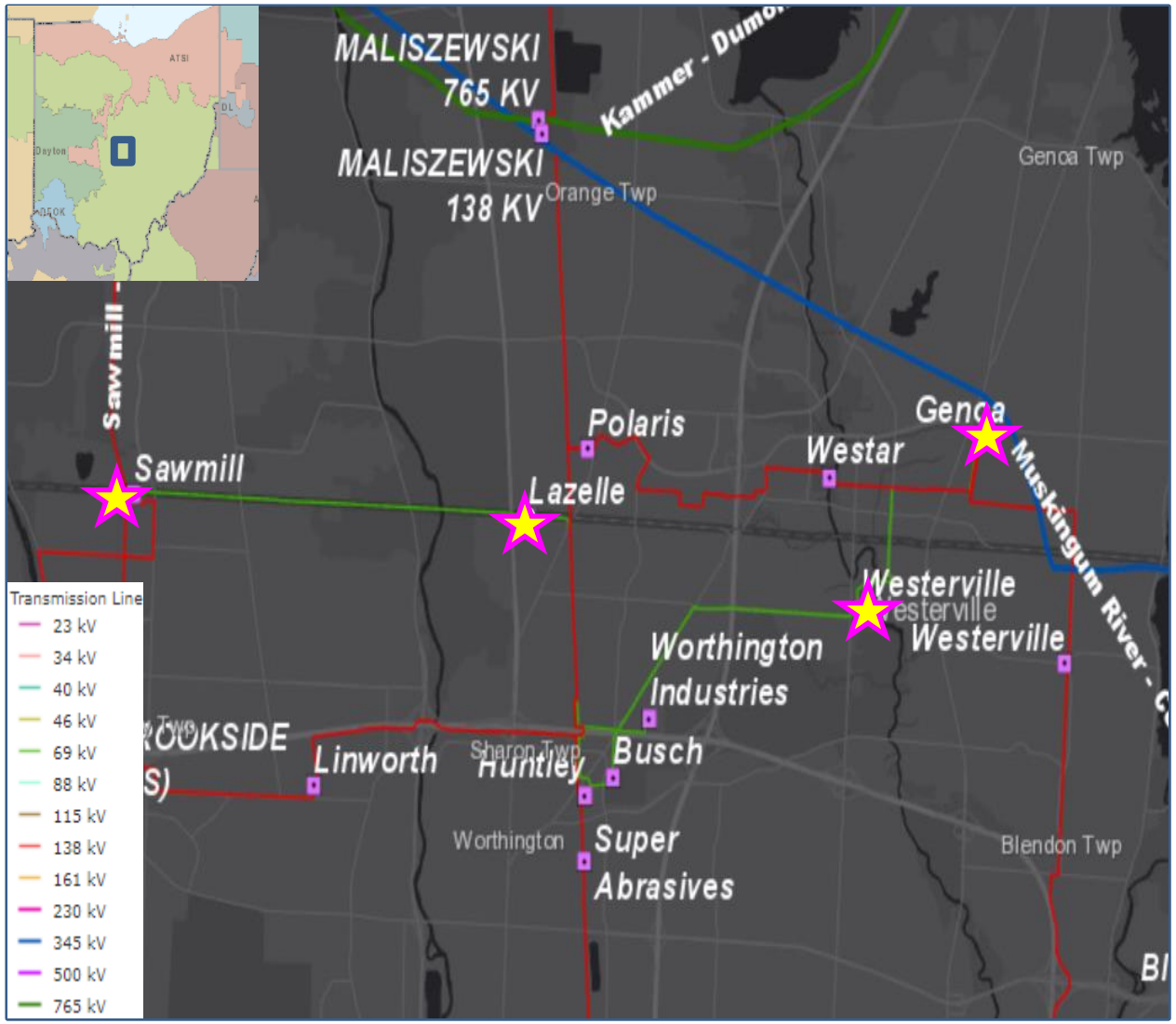
69 kV Circuit Breaker 64

- Breaker Age: 1967
- Interrupting Medium: Oil
- Fault Operations: 15 (CB-64)
- Manufacturer recommended Number of Operations: 10
- The manufacturer provides no support for these units and spare parts are increasingly more difficult to obtain.
- Oil breaker maintenance has become more difficult due to the oil handling required to maintain them. Oil spills are frequent with breaker failures and routine maintenance and can become an environmental hazard.

Sawmill Station

69 kV Circuit Breaker B

- Breaker Age: 1989
- Interrupting Medium: Oil
- Oil breaker maintenance has become more difficult due to the oil handling required to maintain them. Oil spills are frequent with breaker failures and routine maintenance and can become an environmental hazard.
- The manufacturer provides no support for the family of circuit breakers and spare parts unavailable.
- This model family has experienced major malfunctions associated with their hydraulic mechanisms, eventually leading to failure.



AEP Transmission Zone M-3 Process
North Columbus, OH

Need Number: AEP-2021-OH038

Process Stage: Solutions Meeting 4/22/2022

Proposed Solution:

- **Lazelle 69 kV Station:** Replace 69kV circuit breakers 61 and 62 with 3000A 40kA breakers and associated equipment and relaying. **Estimated Cost: $0.62M**
- **Sawmill 138kV Station:** Replace 69kV circuit breaker B with 3000A 40kA breaker and associated controls. **Estimated Cost: $0.4M**
- **Westerville 69kV Station:** Replace 69kV circuit breakers 62 and 63 with 3000A 40kA breakers and associated equipment and relaying. **Estimated Cost: $0.44M**
- **Genoa 138kV Station:** Replace 69kV circuit breaker 64 with 3000A 40kA breaker. **Estimated Cost: $0.28M**
- **Hyatt Telecom Site:** Install Telecom site with CES SFP to communicate with Lazelle station. **Estimated Cost: $0.04M**

Total Estimated Transmission Cost: $1.78M

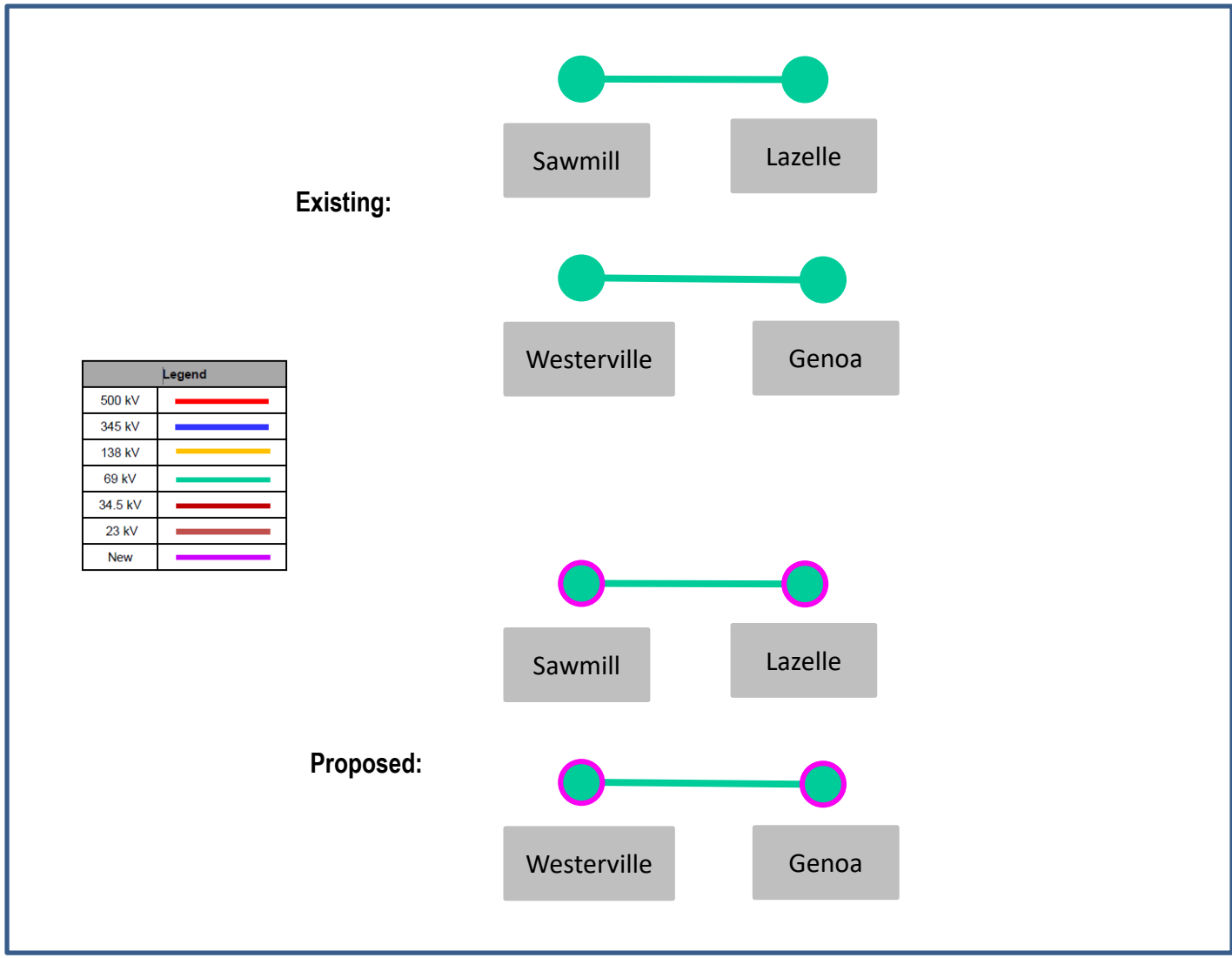
Alternatives Considered: No cost effective alternate was determined.

Additional Info: The supplemental work will be performed alongside the baseline scope of work (**B3297**) which includes rebuilding ~4.23 miles of 69 kV line between Sawmill and Lazelle station as well as replacing risers and switches. Further, partial rebuild ~1.94 miles of 69kV Line between Westerville and Genoa stations as well as replacing risers and switches.

Projected In-Service: 6/1/2025

Project Status: Scoping

Model: 2026 RTEP



AEP Transmission Zone M-3 Process
Bradley – Layland 69 kV Project

Need Number: AEP-2020-AP042

Process Stage: Solutions Meeting 4/22/2022

Previously Presented: Need Meeting 11/20/2020

Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Bradley – Layland 69 kV (14.25 miles)

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

AEP Transmission Zone M-3 Process
Bradley – Layland 69 kV Project

Need Number: AEP-2020-AP042

Process Stage: Solutions Meeting 4/22/2022

Proposed Solution:

Retire the existing Bradley – Layland 69 kV line (approx. 14.3 miles) **Total Estimated Trans. Cost: $9.7M**

Construct a new double circuit 138 kV in/out line from the existing Bradley – Grandview 138 kV line (approx. 2.6 miles) **Total Estimated Trans. Cost: $8.3M**

Prince Station: Retire existing station **Total Estimated Trans. Cost: $0.0M**

Chessie Station: Install new 138 kV station including two 138 kV switches, circuit switcher and 138/12 kV 20 MVA XFR **Total Estimated Trans. Cost: $0.3M**

Grandview Station: Install a new 138/12 kV transformer to accommodate the retirement of Prince Station **Total Estimated Trans. Cost: $2.2M**

Bradley Station: Remove existing 69 kV breaker due to line retirement **Total Estimated Trans. Cost: $0.1M**

Layland Station: Remove existing 69 kV breaker due to line retirement **Total Estimated Trans. Cost: $0.1M**

Total Estimated Trans. Cost: $20.6M

Ancillary Benefits: The majority of the existing Bradley – Layland line is located within the Park Service Territory and will be retired and removed upon completion of the proposed project, this also includes a crossing on the New River. The station will also be re-located across the river and the work related to the new station and bank at Grandview will reduce exposure to the customers in the area.

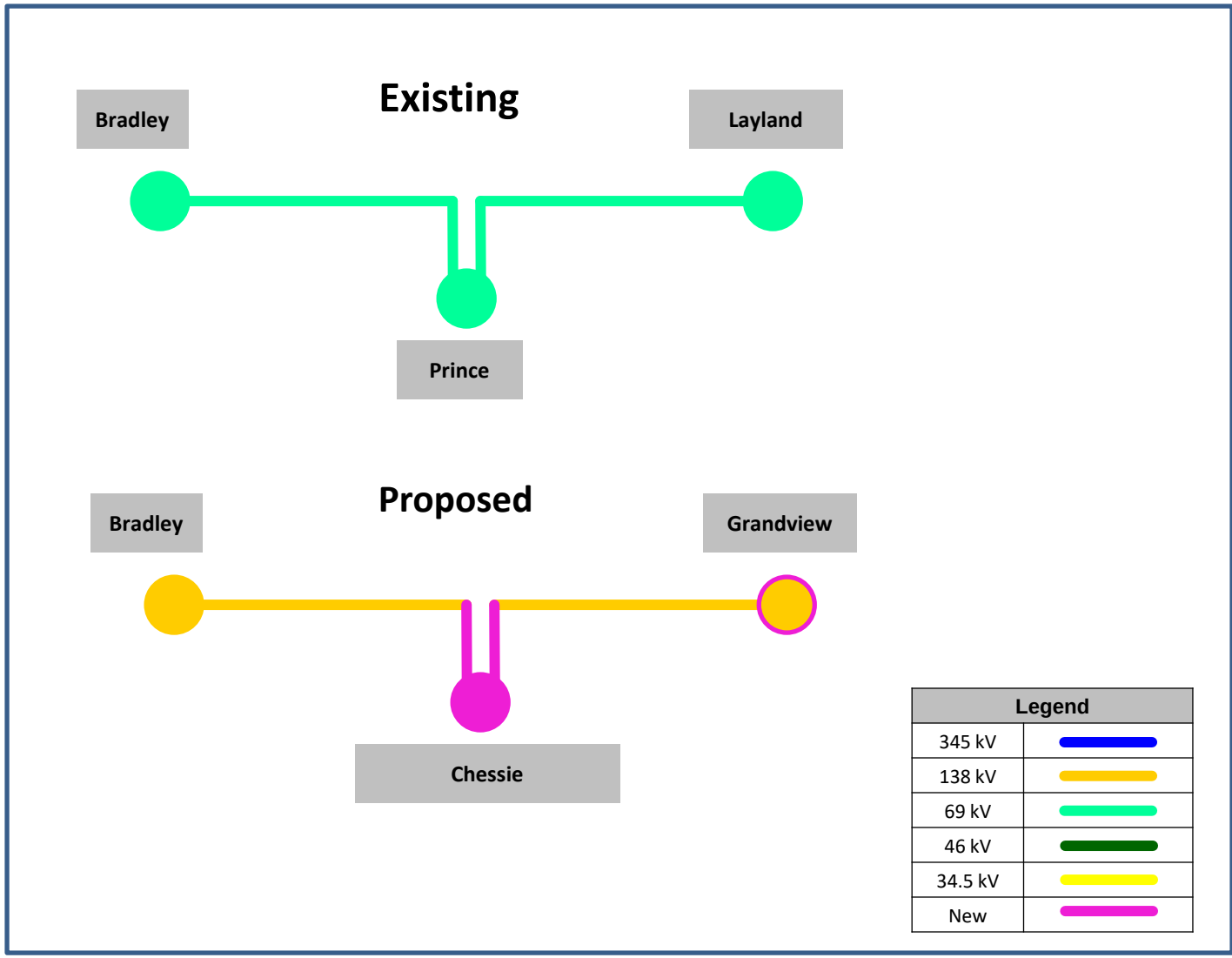
Alternatives Considered:

1. Rebuild the existing Bradley – Layland 69 kV line (approx. 14.3 miles) and replace the existing switches at Prince Station. **Total Estimated Cost: 37.3M**

Projected In-Service: 5/1/2025

Project Status: Scoping

Model: 2025 RTEP



AEP Transmission Zone: Supplemental
Pettit Ave – Melita 69kV

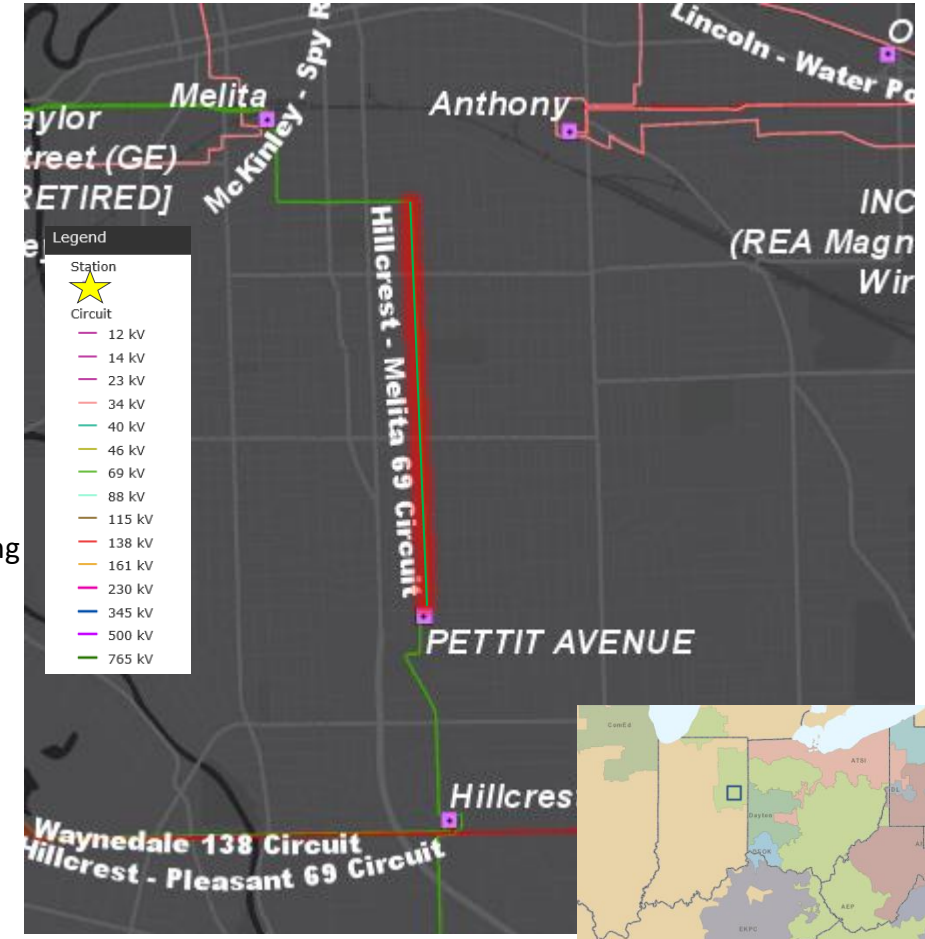
Need Number: AEP-2020-IM023
Process Stage: Solution Meeting 4/22/2022
Previously Presented: Needs Meeting 11/20/2020

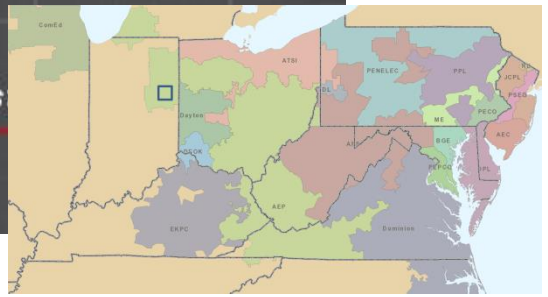
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

- **Pettit Ave – Melita 69kV ~1.84 Miles**
  - Originally constructed in 1967
  - Wood pole construction with 61/62 structures original from 1967.
  - Recent field inspection identified 48 of the 62 structures on the line have moderate to advanced decay or shell damage.
    - Additional conditions include insect damage and stolen/missing ground leads along with the rot top and/or shell decay on the structures.
  - Structures do not meet 2017 NESC Grade B loading criteria, do not meet current AEP structural strength requirements, and do not meet the current ASCE structural strength requirements.

Model: N/A





AEP Transmission Zone: Supplemental
Pettit Ave – Melita 69kV

Need Number: AEP-2020-IM023

Process Stage: Solution 4/22/2022

Proposed Solution:

Rebuild the Pettit Ave – Melita 69kV 1.84 mile section on centerline utilizing 556.5 ACSR. Construction includes a high percentage of custom self-supporting running corners and dead ends due to line angles created by route adjustments. Constrained corridors are not suitable for guy wire installation. There are also an increased number of structures per mile due to configuration of existing underbuild and existing distribution service connections to residential and commercial customers along the existing line route. The line also passes through a heavily developed urban area of Fort Wayne, requiring new easements along the route and short span construction which all lead to higher than normal costs.

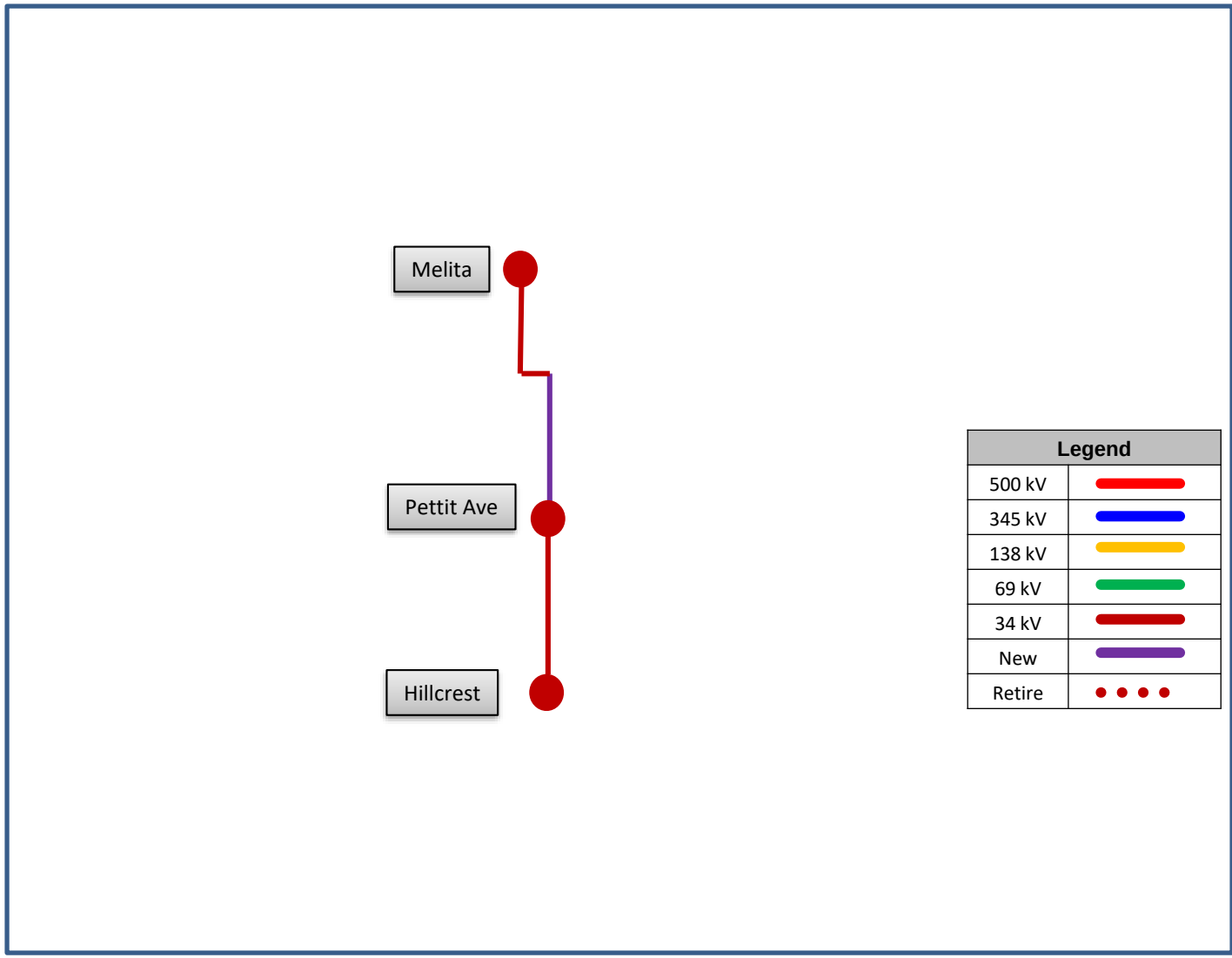
Total Estimated Transmission Cost: $7.4 to 12.0M

Alternatives Considered:

Rebuild this line as underground. This was not pursued as it would cost more and an overhead route was deemed achievable at this time.
Cost: $24.3M

Projected In-Service: 2/14/2025

Project Status: Scoping



AEP Transmission Zone M-3 Process
East Lima – Columbus Grove 69kV Line Rebuild

Need Number: AEP-2020-OH037

Process Stage: Solution Meeting 04/22/2022

Previously Presented: Need Meeting 10/16/2020

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

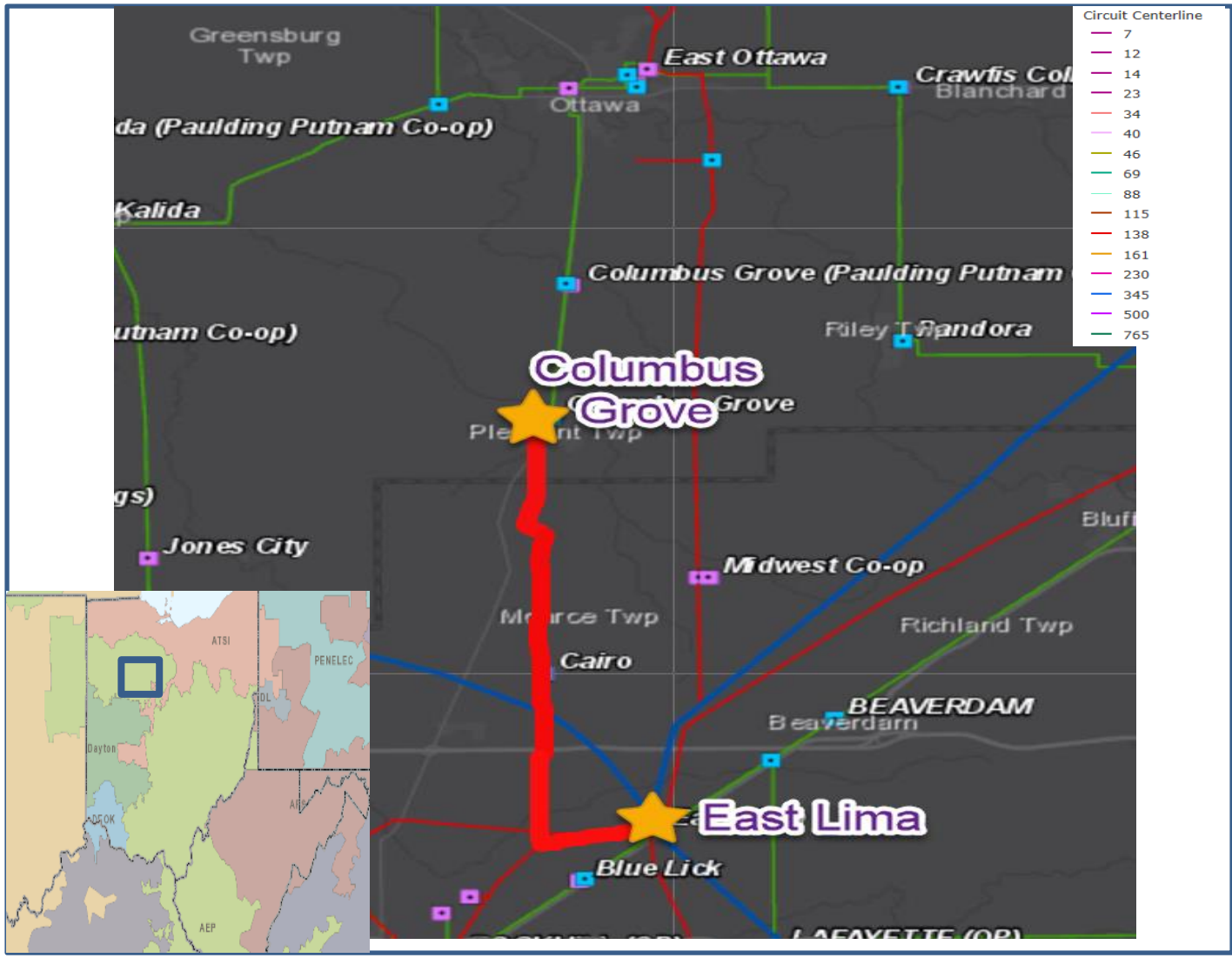
Problem Statement:

Line

East Lima – Columbus Grove 69kV (vintage 1953)

LINE CHARACTERISTICS

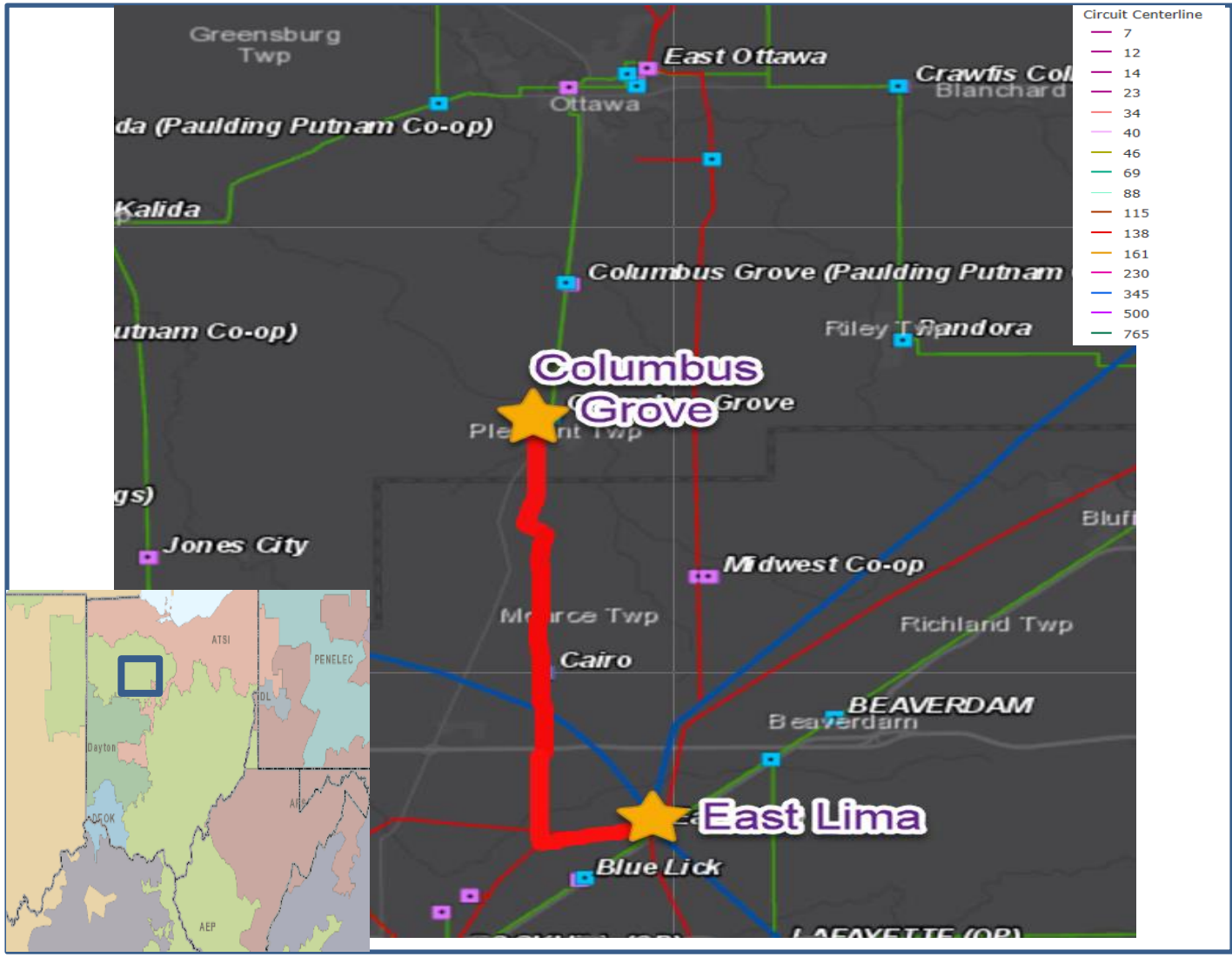
- Original install date: 1953
- Length of Line: 10.86 miles
- Total structure count: 255; 150 dating back to original installation.
- Original Line Construction Type: Wood monopoles
  - Cross Arm Material: Wood
  - The line has vertical and horizontal ceramic insulators and is butt wrap grounded
- Conductor: 4/0 ACSR 6/1 (Penguin) -72% and 556 kCM ACSR 26/7 (Dove) -28%



AEP Transmission Zone M-3 Process
East Lima – Columbus Grove 69kV Line Rebuild

CONDITION / PERFORMANCE / RISK ASSESSMENT:

- Momentary/Permanent Outages and Duration: 20 total outages: 17 (Momentary), 3 (Permanent)
- 5 Year CMI: 911,294
- Number of open conditions: 112 Open conditions on 94 unique structures
  - Open conditions include: rotten heart, woodpecker holes, insect damage, split crossarms, burnt insulators, broken ground lead wires etc.
- Risk
  - Number of Customers at Risk: 3,272
  - Load at Risk: 22.71 MVA
  - The grounding/shielding and the insulation of the line is inadequate according to the current AEP standards.



Need Number: AEP-2020-OH046

Process Stage: Solution Meeting 04/22/2022

Previously Presented: Need Meeting 12/18/2020

Project Driver:

Customer Service

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

Customer Service:

- **Station/Area Name:** Bluelick Switch
- **Load:** 3.185MW Existing/3.7MW projected by 2029
- **Customer Request:** The customer has requested to upgrade their existing delivery point from 34.5kV to 69kV.
- **Requested In-service Date:** 6/1/2024

AEP Transmission Zone M-3 Process
East Lima- Columbus Grove 69kV

Need Number: AEP-2021-OHO37, AEP-2021-OH046
Process Stage: Solutions Meeting 04/22/2022

Proposed Solution:

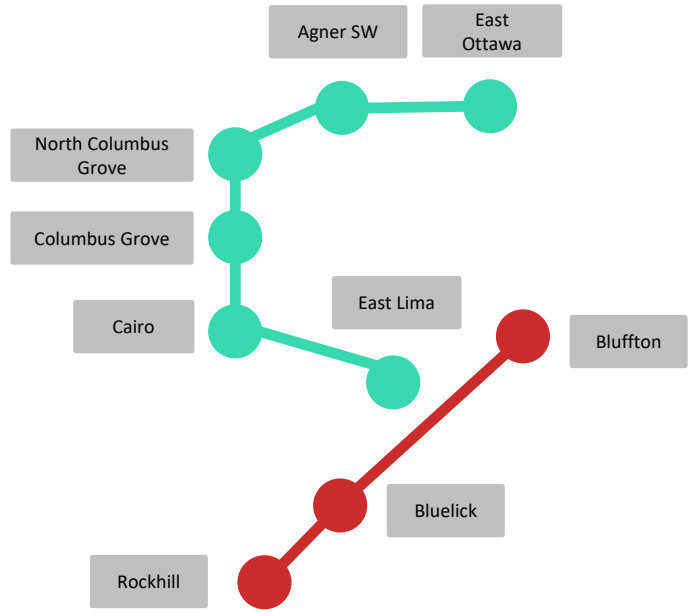
- **East Lima – Columbus Grove Line:** Rebuild 9.3 miles of the East Lima - Columbus Grove line between Columbus Grove and structure 38. Construct ~1 mile of greenfield 69 kV line between structure 38 and the existing Bluelick Sw. Rebuild 1.65 miles of the 34.5 kV line section between Bluelick and East Lima to 69 kV to provide looped service to the new 69 kV delivery at Bluelick. Retire 1.7 miles of the Columbus Grove – East Lima line from structure 38 into East Lima. **Estimated Cost $25.547M**
- **Slabtown Switch:** Install Slabtown SW with 1200A POP switches. Install Auto-sectionalizing on the through path. Upgrade Bluelick delivery point metering. **Estimated Cost $0.885M**
- **Bluelick Switch:** Retire 34.5 kV Bluelick SW **Estimated Cost $0.054M**
- **Cairo Switch:** Replace Cairo switch with 1200A POP switches. Install SCADA control on the through-path. **Estimated Cost $0.706M**
- **East Lima Station:** Upgrade telecom equipment at East Lima station. **Estimated Cost $0.021M**
- **Columbus Grove Station:** In order to accommodate the line rebuild, work will be performed on the existing Columbus Grove switch. Install a box bay with two 69 kV, 1200A line witch automated MOABs, at Columbus Gove station. **Estimated Cost $1.141M**

Total Estimated Cost: $28.354M

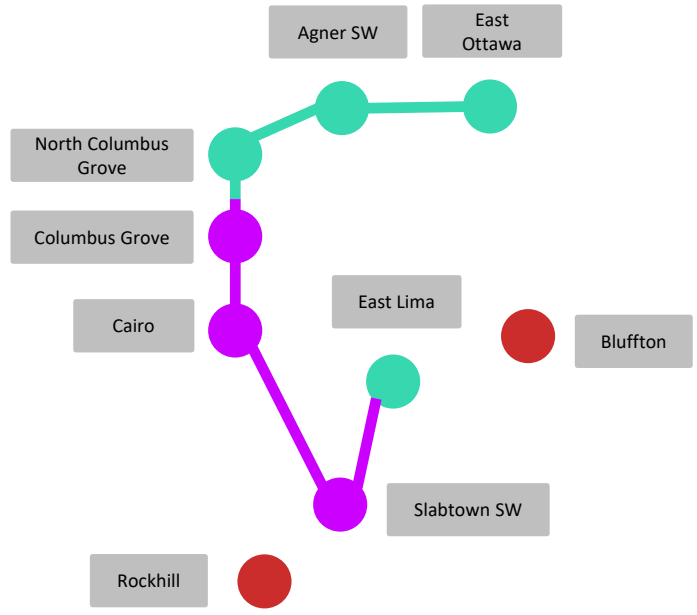
Alternatives Considered:
The East Lima – East Ottawa 69kV circuit serves multiple customers as well as provides voltage and thermal reliability during contingency conditions. Rather than providing looped service to Bluelick, a radial could have been extended from East Lima. This option would have required greater station costs at East Lima in order to accommodate the additional 69 kV line position at the station and also reduces the reliability of service to Bluelick since they have looped service today. The proposed solution also allows for retiring 4 miles of 34.5 kV line by building one new mile of greenfield 69 kV.

Projected In-Service: 05/15/2024
Project Status: Scoping
Model: 2026 PJM RTEP Load-Flow and Short Circuit Models

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



Existing

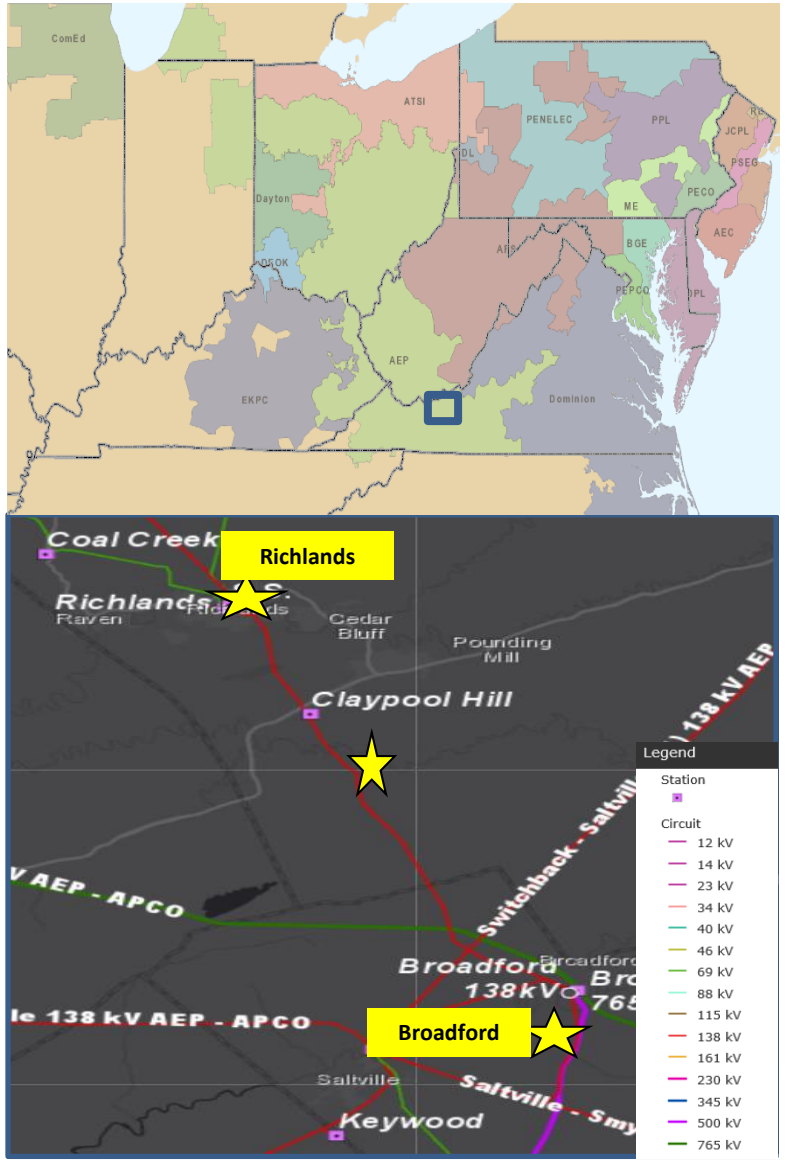


Proposed

AEP Transmission Zone M-3 Process
Tazewell County, VA

Need Number: AEP-2021-AP003
Process Stage: Solutions Meeting 4/22/2022
Previously Presented: Needs Meeting 01/15/2021
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 station to be served from the Broadford — Richlands 138 KV line. The projected peak demand is 21 MW.



Need Number(s): AEP-2021-AP003

Process Stage: Solutions Meeting 4/22/2022

Proposed Solution:

- Construct a greenfield station (Salmon) with a 138/12 kV 25 MVA transformer with high side circuit switcher. There will be two 12 kV feeders from the station. The 138 kV side will be a straight bus with two 138kV circuit breakers. **Estimated Cost: $0 (APCO Distribution Cost)**
- Tap the Broadford – Claypool Hill 138kV line and construct an in and out line to the greenfield Salmon station by building 2.3 miles of greenfield double circuit 138kV line. The higher estimated cost is due to environmental surveying and a large amount of new access roads required for this greenfield line that is in hilly terrain. **Estimated Cost: $8.5M**
- Build 4.1 miles of 96 ADSS Telecom underbuilt cable to connect Salmon station to the existing fiber network. **Estimated Cost: $0.8M**

Total Estimated Transmission Cost: $9.3M

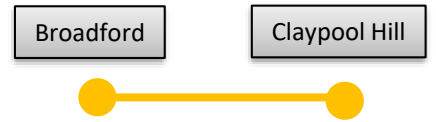
Alternatives Considered: Serve the Customer request from the existing Claypool station. There is currently not enough capacity available on the existing transformers at Claypool Hill or available room for a third transformer to be added.

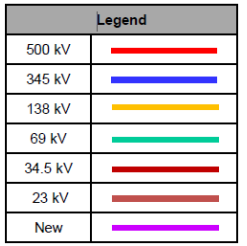
Installing switches at Salmon station is also not viable due to the sensitive nature of the load. The customer's salmon are kept in a highly controlled and regulated environments for up to two years, until they reach a harvestable size. The salmon are extremely sensitive to variations in their surroundings, which could be caused by voltage fluctuations or momentary outages. The sensitivity of the customer requires 138kV circuit breaker protection. Further, installing switches with automation capability would result in four switches in series on the line, which can result in coordination issues and potential misoperations during switching. Therefore, breakers are the recommended solution.

Projected In-Service: 9/1/2024

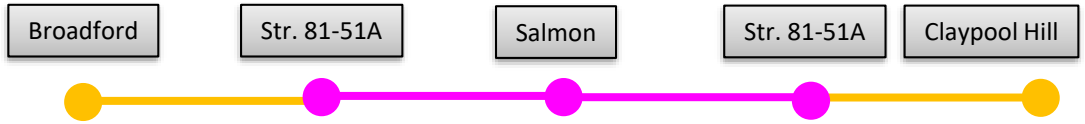
Project Status: Scoping

Existing





Proposed



AEP Transmission Zone M-3 Process
Belva – Clendenin Rebuild

Need Number: AEP-2021-AP021

Process Stage: Solutions Meeting 04/22/2022

Previously Presented: Need Meeting 06/15/2021

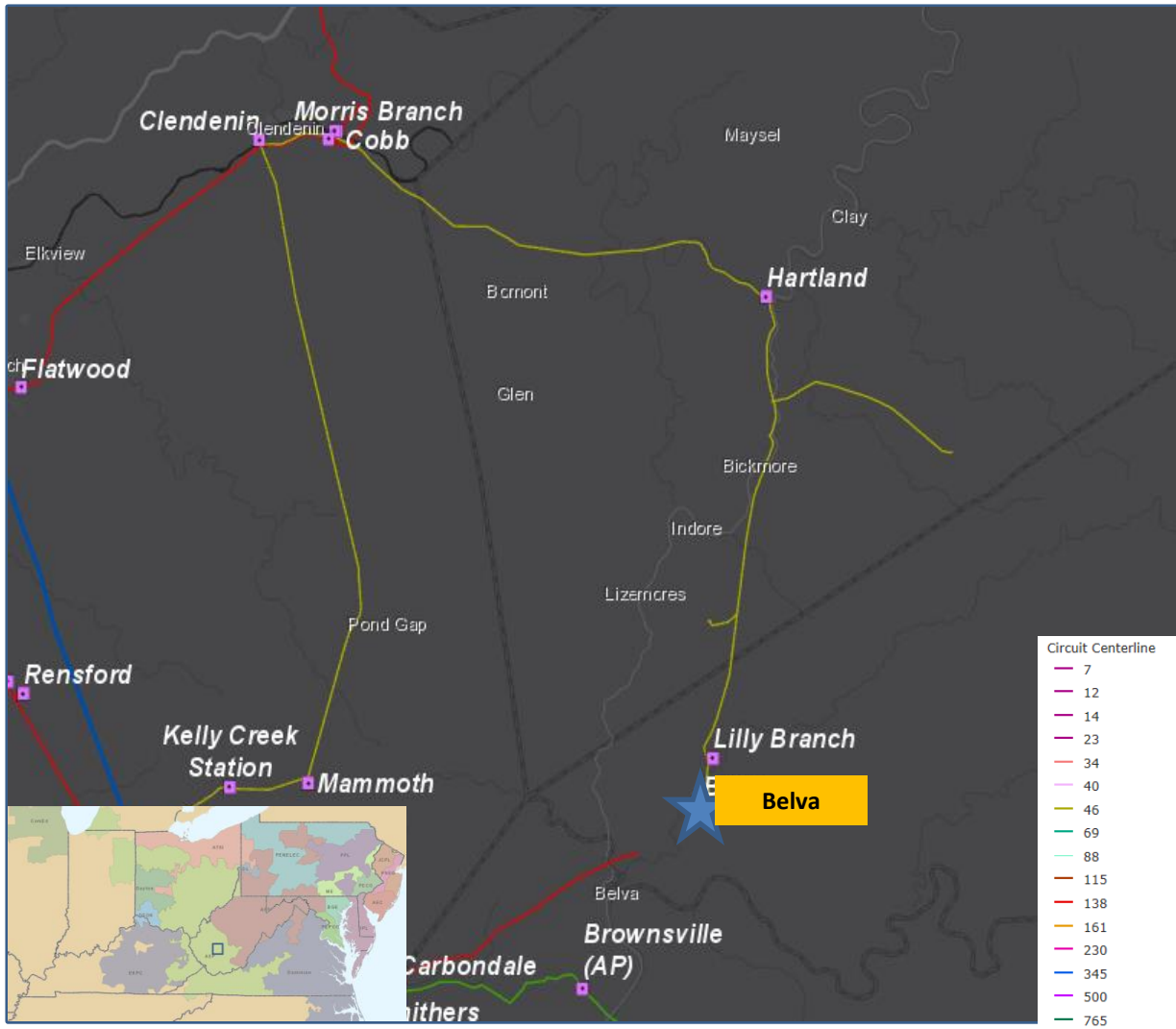
Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Belva 138/46 kV Station

- The transformer protection includes an obsolete MOAB-ground-switch system, which relies on remote station fault clearing.
- The lack of sectionalizing at the station creates dissimilar zones of protection (line, bus, and transformer) which can cause over tripping and mis-operations.
- Belva Station deploys 40 relays and currently 36 of the 40 (90%) are in need of replacement. 35 are electromechanical and 1 is static type, which have significant limitations with regards to part availability and fault data collection/retention.



AEP Transmission Zone M-3 Process
Clay County, WV

Need Number: AEP-2021-AP022

Process Stage: Solutions Meeting 04/22/2022

Previously Presented: Need Meeting 06/15/2021

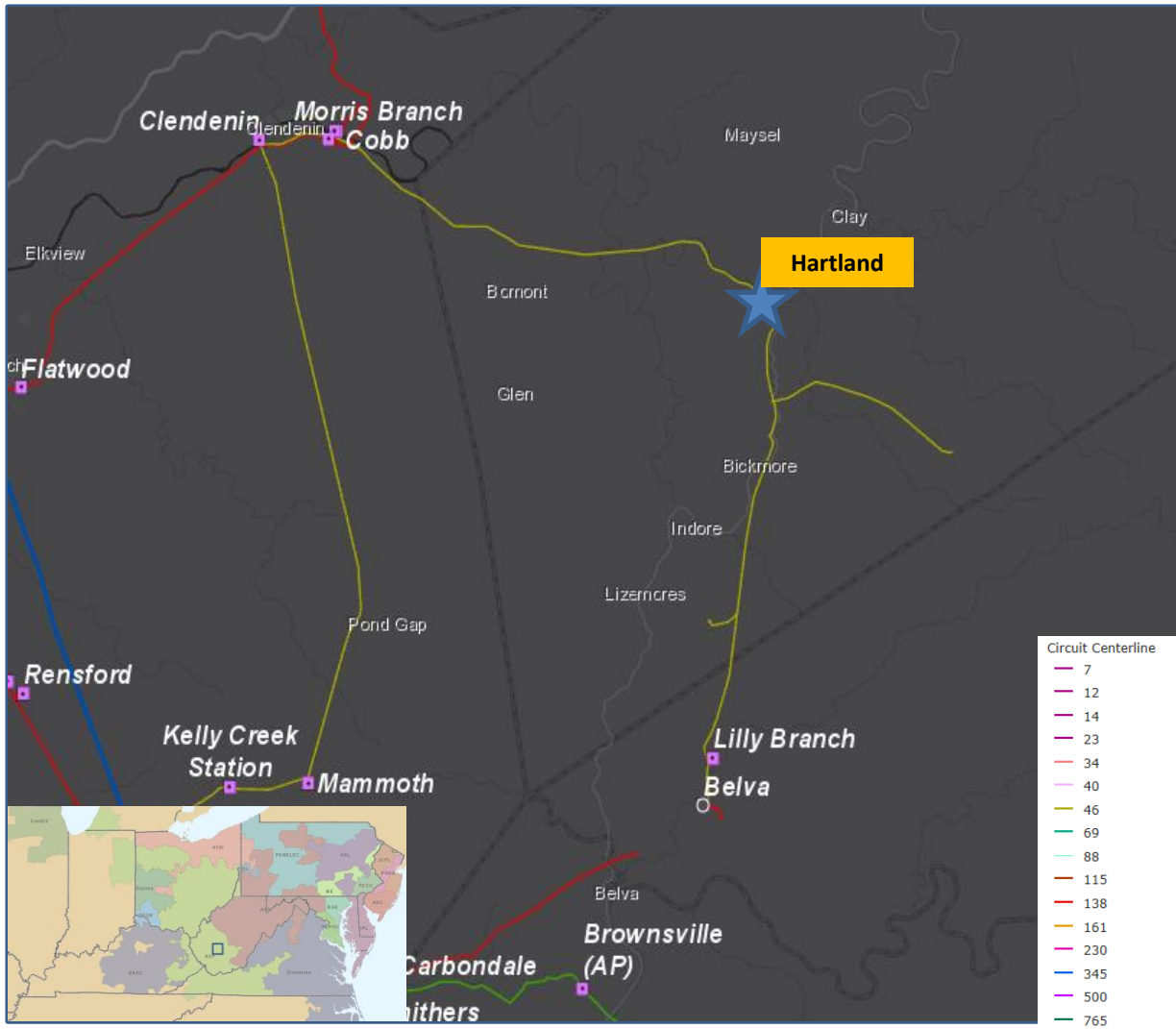
Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Hartland 46 kV Station

- Circuit switcher AA is a 2030-69 type SF6 filled switcher. The S&C 2030 family of circuit switchers have no gas monitor and currently in-service units on the AEP system have experienced 80 malfunctions from May 2002 to August 2019.
- Vacuum bottles on MOABs 'W' and 'Y' show signs of damage.



AEP Transmission Zone M-3 Process
Belva – Clendenin Rebuild

Need Number: AEP-2021-AP023

Process Stage: Solutions Meeting 04/22/2022

Previously Presented: Need Meeting 06/15/2021

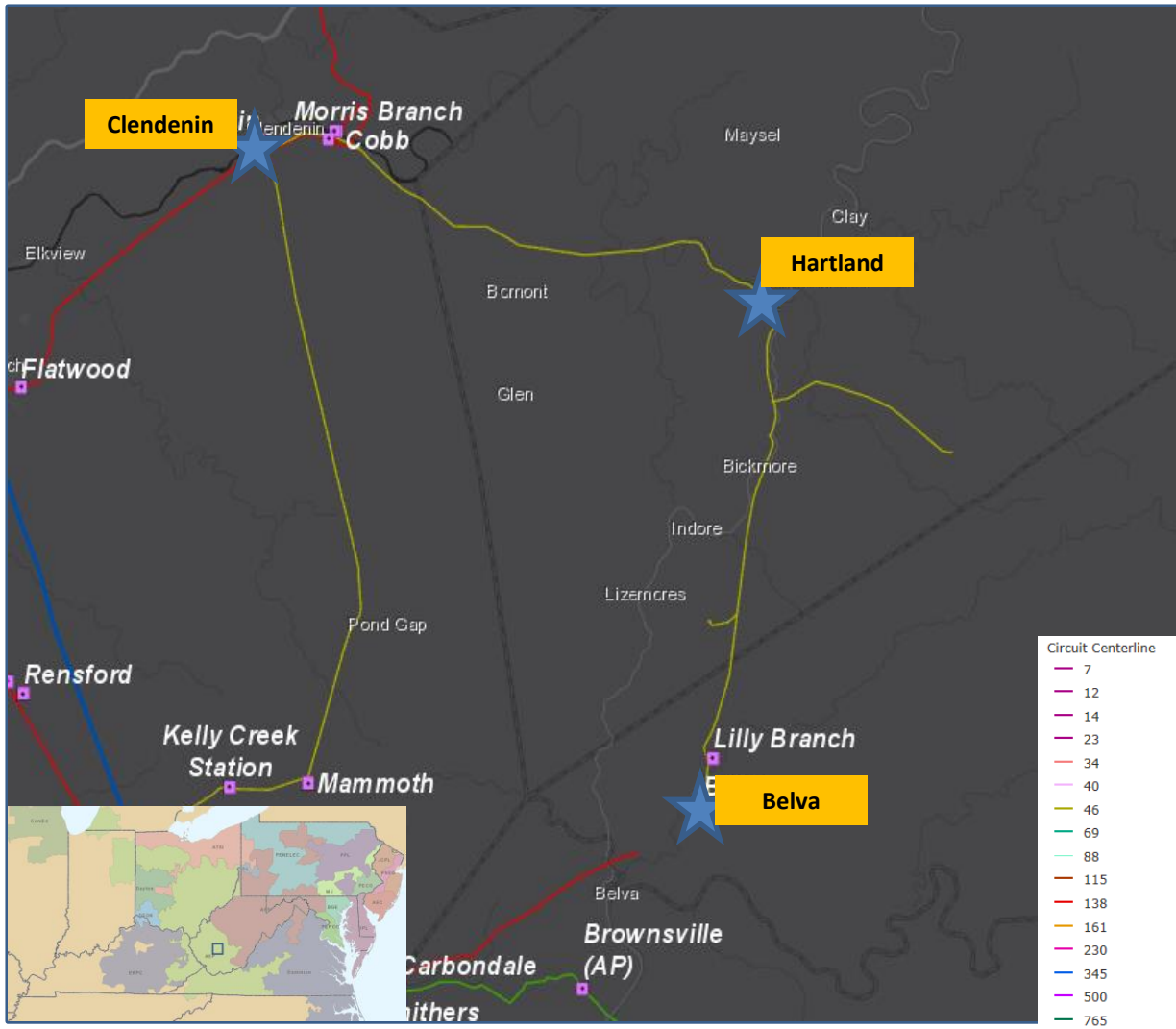
Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Belva – Clendenin 46 kV Circuit (~27 miles)

- Circuit is comprised mostly of vintage wood pole structures.
  - Original vintage wood structures from 1940
  - The Belva – Clendenin 46kV Line uses primarily original vintage conductor includeing 2/0 Copper, 4/0 ACSR and 336 ACSR.
  - The circuit fails to meet 2017 NESC Grade B loading criteria, AEP structural strength requirements, and ACSE structural strength requirements
- Since 2015, there have been 28 momentary and 30 permanent outages on the Belva – Clendenin 46kV Circuit.
  - The momentary outages were due to lightning (16), wind (3), misoperation (3), field error (1) causes.
  - The permanent outages were due to vegetation fall-in from outside of the AEP ROW (15), lightning (7), vegetation contacts from inside the AEP ROW (4), flood/slide (1), crossarm failure (1), ice/snow (1), and distribution (1) causes.
  - These outages caused 8.9M minutes of interruption for customers. The reported CMI is an estimated value due to the wholesale delivery point at Hartland Station.
- Currently, there are 114 structures with at least one open structural condition, which relates to 44% of the structures
  - 357 structural open conditions primarily related to rotten poles and crossarms. Other structural conditions include woodpecker damage, leaning in-line, or split poles, broken rusted, or corroded crossarms, and a split knee/vee brace.
  - 22 open forestry conditions related to brush clearances and dead trees
  - 21 open hardware conditions related to broken, loose, or damaged guys, broken insulators, and rusted or worn conductor hardware.
  - 1 open conductor related condition related to damaged conductor
  - 1 open grounding condition related to a broken ground lead wire



AEP Transmission Zone M-3 Process
Belva – Clendenin Rebuild

Need Number: AEP-2021-AP021, AEP-2021-AP022, AEP-2021-AP023

Process Stage: Solutions Meeting 4/22/2022

Proposed Solution:

Rebuild the existing Belva – Clendenin 46 kV line to 138 kV standards (approximately 27 miles). **Estimated Trans. Cost: $85.6M**

Belva Station: Replace existing Gr. Sw. MOAB with a new 138 kV 3000 A 40 kA CB. Install a new 138 kV 3000 A 40 kA CB on the Belva – Gilboa 138 kV line at Belva Station. Install 9.6 MVAR cap bank. **Estimated Trans Cost: $2.9M**

Hartland Station: Replace existing MOABs W and Y with two new switches. Retire/Remove existing circuit switcher AA and cap bank. **Estimated Trans Cost: $0.7M**

Total Estimated Trans. Cost: $89.2M

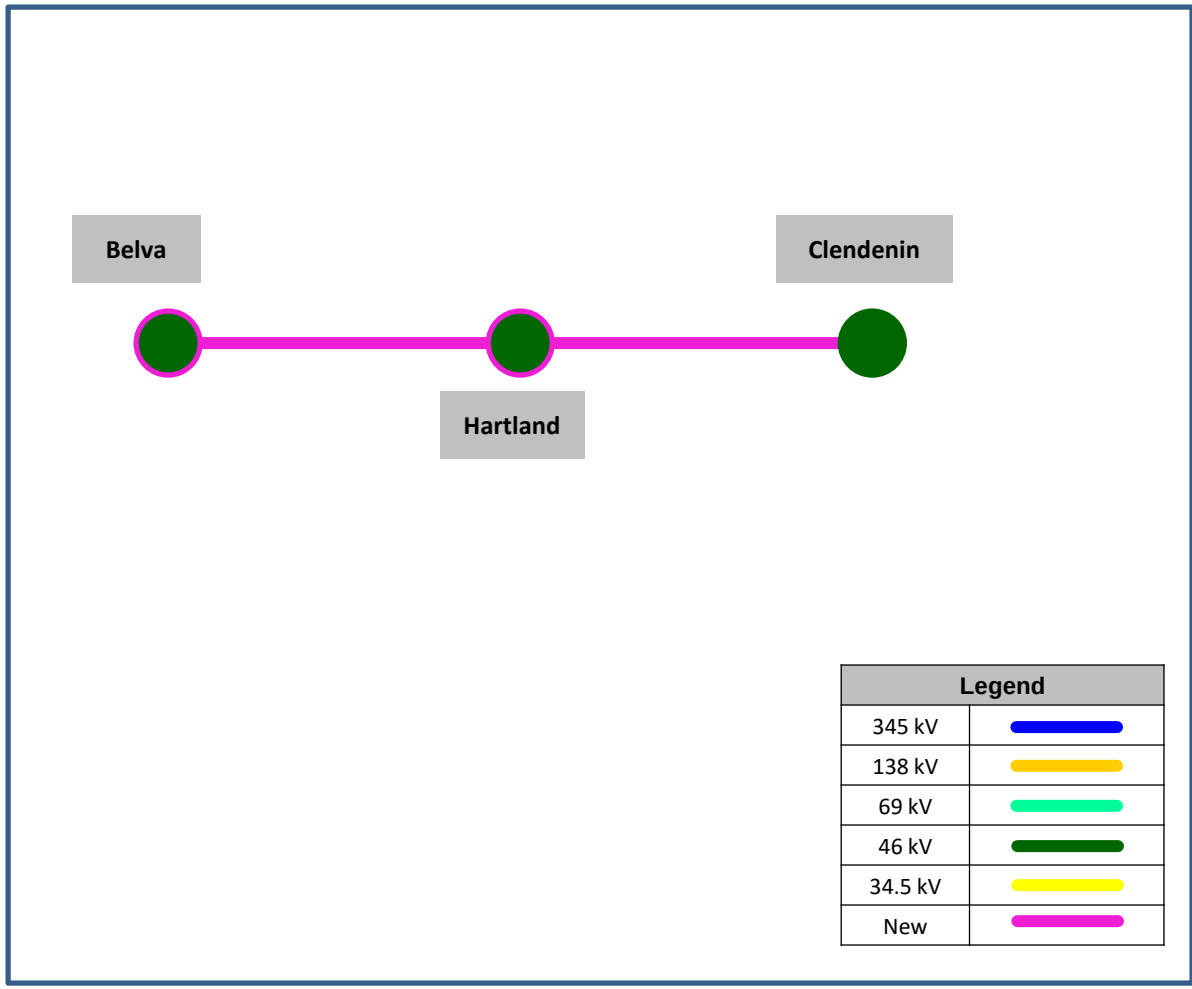
Alternatives Considered:

1. Due to the remote load that is being served at Hartland Station, retirement is not an option for this line.
2. Since there is no other 69 kV voltage in the area, rebuilding the line at 69 kV instead of 138 kV would leave this line as the only 69 kV line in the area if/when converted in the future. 138 kV construction is the prevalent voltage in the area.

Projected In-Service: 9/1/2026

Project Status: Scoping

Model: 2026 RTEP

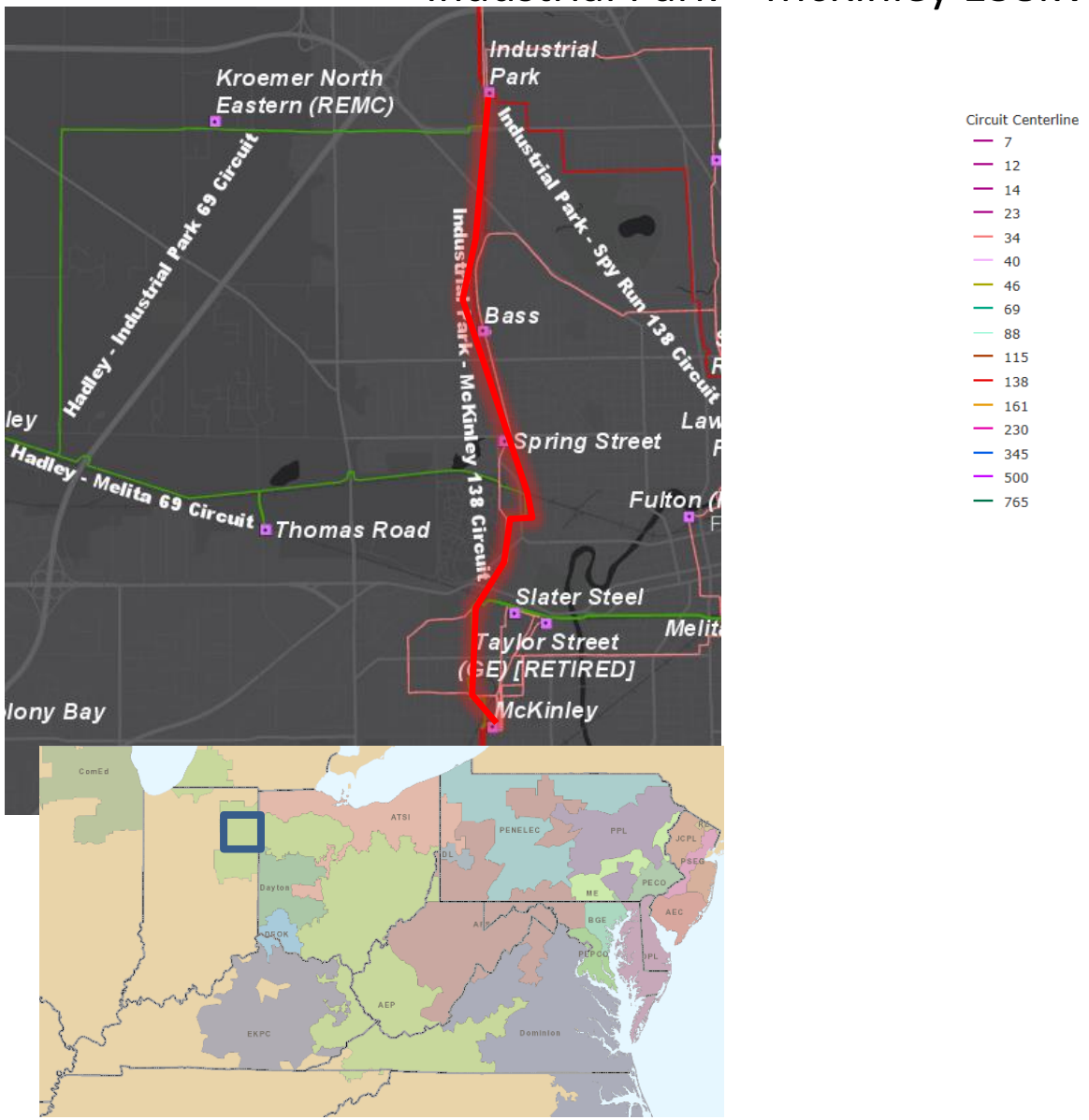


AEP Transmission Zone M-3 Process
Industrial Park – McKinley 138kV

Need Number: AEP-2021-IM019
Process Stage: Solution Meeting 4/22/2022
Previously Presented: Needs Meeting 07/16/2021
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Problem Statement:

Industrial Park – McKinley 138kV line:

- 4.59 miles of 1968 795 ACSR. ~1 miles is double circuited with McKinley – Melita 69kV and ~.9 miles is double circuit with Melita – Hadley 69kV. The remainder is single circuit.
- All sections of this line is 1968 conductor, and 85/98 structures are original wood poles. There are 11 steel structures from 1968 and 2 steel structures from 2018 that are not identified as a need at this time.
- Structures fail NESC Grade B, AEP Strength requirements, and ASCE structural strength standards
- 18 structures were inspected by drone with 11 assessed by ground crew
    - 9 structures found to have moderate-heavy checking or insect/bird damage
    - Several instances of insulators tipping away from pole
    - 81% of poles inspected by ground crew had beyond normal decay.
- 12 open conditions are on this line including woodpecker damage, damaged guy wires, damaged insulators



AEP Transmission Zone M-3 Process
Industrial Park – McKinley 138kV

Need Number: AEP-2021-IM019
Process Stage: Solution Meeting 4/22/2022

Proposed Solution:

Industrial Park – McKinley 138kV line:
Rebuild the ~1 mile section that is double circuit with McKinley – Melita 69kV and rebuild the ~0.9 mile section that is double circuit with Melita – Hadley 69kV in place. The remaining ~1.3 miles will be rebuilt as single circuit. All new line conductor will be 795 Drake ACSR. The total rebuild length is 1.9 miles double circuit and 1.3 miles single circuit for a total of 3.2 miles.

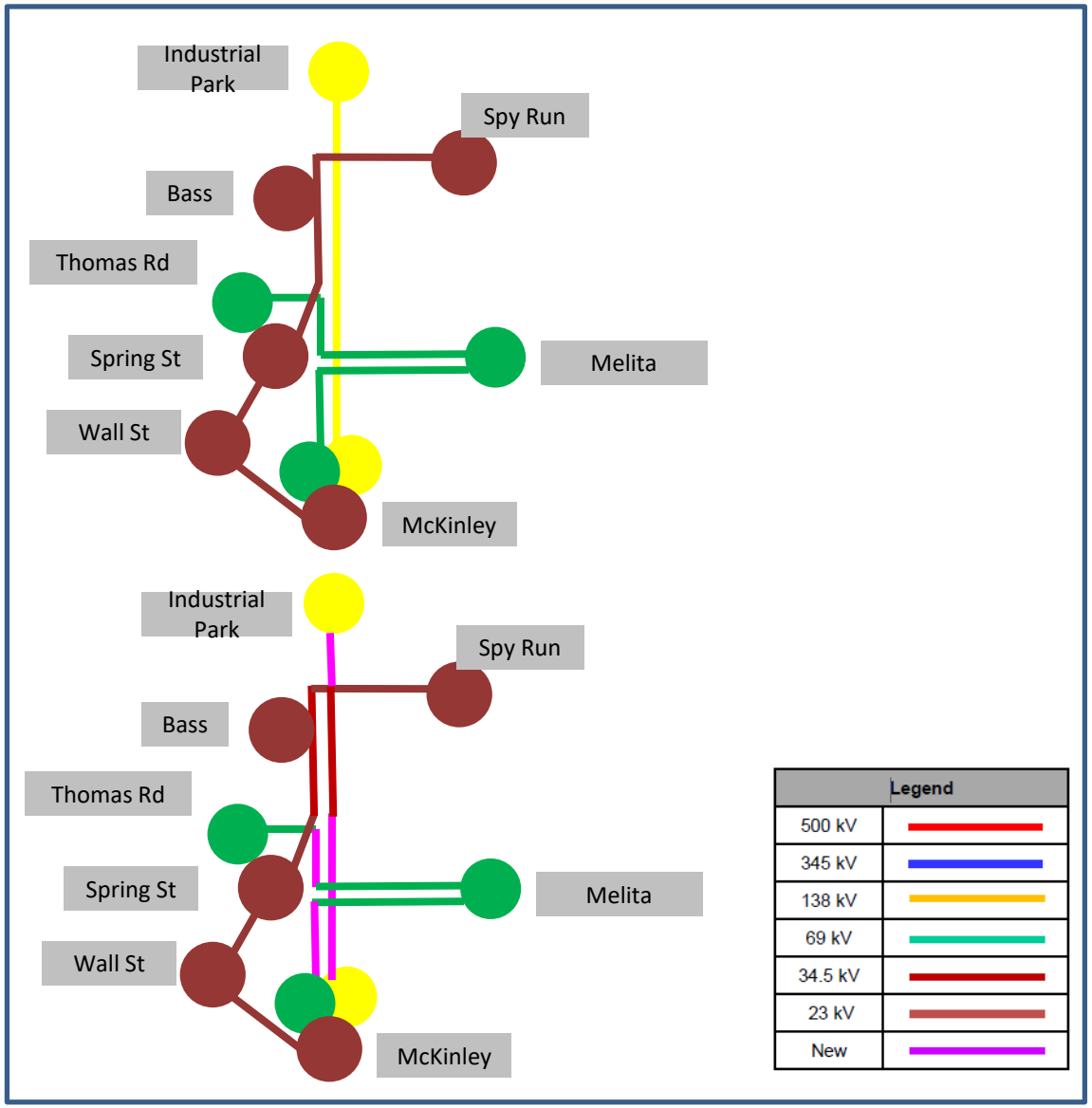
The remaining ~1.4 miles is rebuilt under S2152
Estimated Cost: $ 9.3M

Alternates:

Rebuild the line as-is instead of consolidating the Spy Run – McKinley 34 line and the Industrial Park – McKinley 138 line into a double circuit section. This would lower the cost of S2152, but would overall cost more to the ratepayers.

Alternate Cost: $13.3M

Projected In-Service: 11/01/2026
Project Status: Scoping

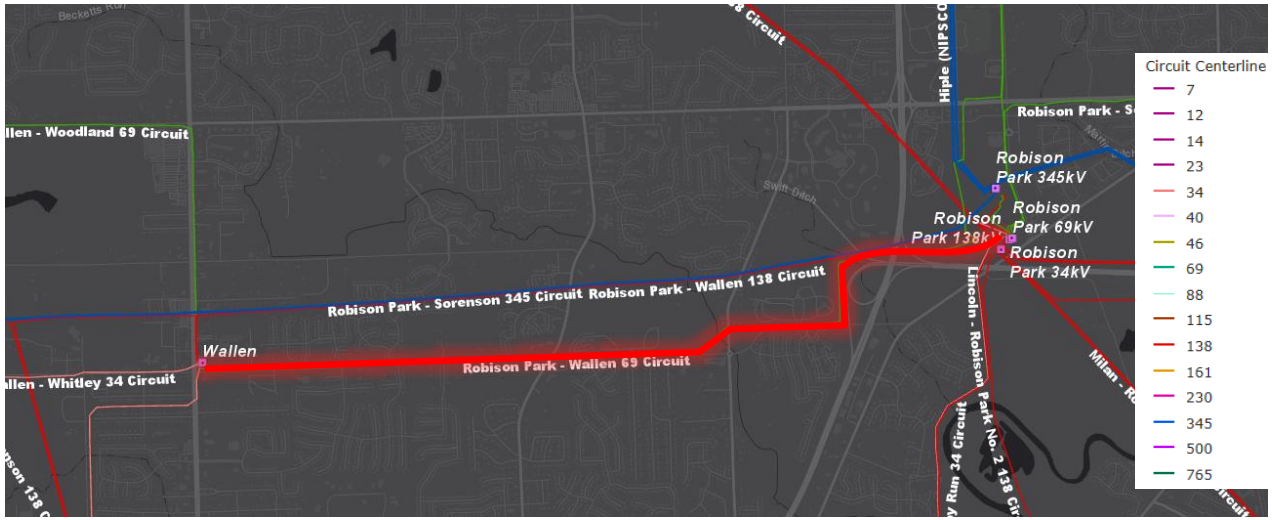


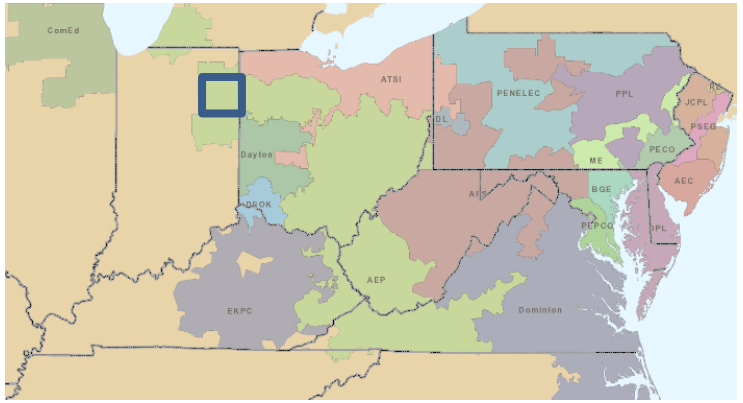
AEP Transmission Zone M-3 Process
Robison Park – Wallen 69kV

Need Number: AEP-2021-IM027
Process Stage: Solution Meeting 4/22/2022
Previously Presented: Needs Meeting 08/16/2021
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Model: N/A
Problem Statement:

Robison Park – Wallen 69kV line (3.24 miles):

- 14 of the 44 structures are original 1930 Steel Lattice
- There are 7 wood poles with significant insect and wood pecker damage, with insulators that are pulling away and flashed insulators.
- Remainder of structures are steel monopole and are in acceptable condition at this time.
- 2.96 miles of line is original 1930s vintage 300,000 CM CU conductor
- Since 2015 there have been 5 momentary and 1 permanent outages
- 7 wood structures fail NESC Grade B, AEP Strength requirements and ASCE structural strength standards





AEP Transmission Zone: Supplemental
Robison Park – Wallen 69kV

Need Number: AEP-2021-IM027
Process Stage: Solution Meeting 4/22/2022

Proposed Solution:

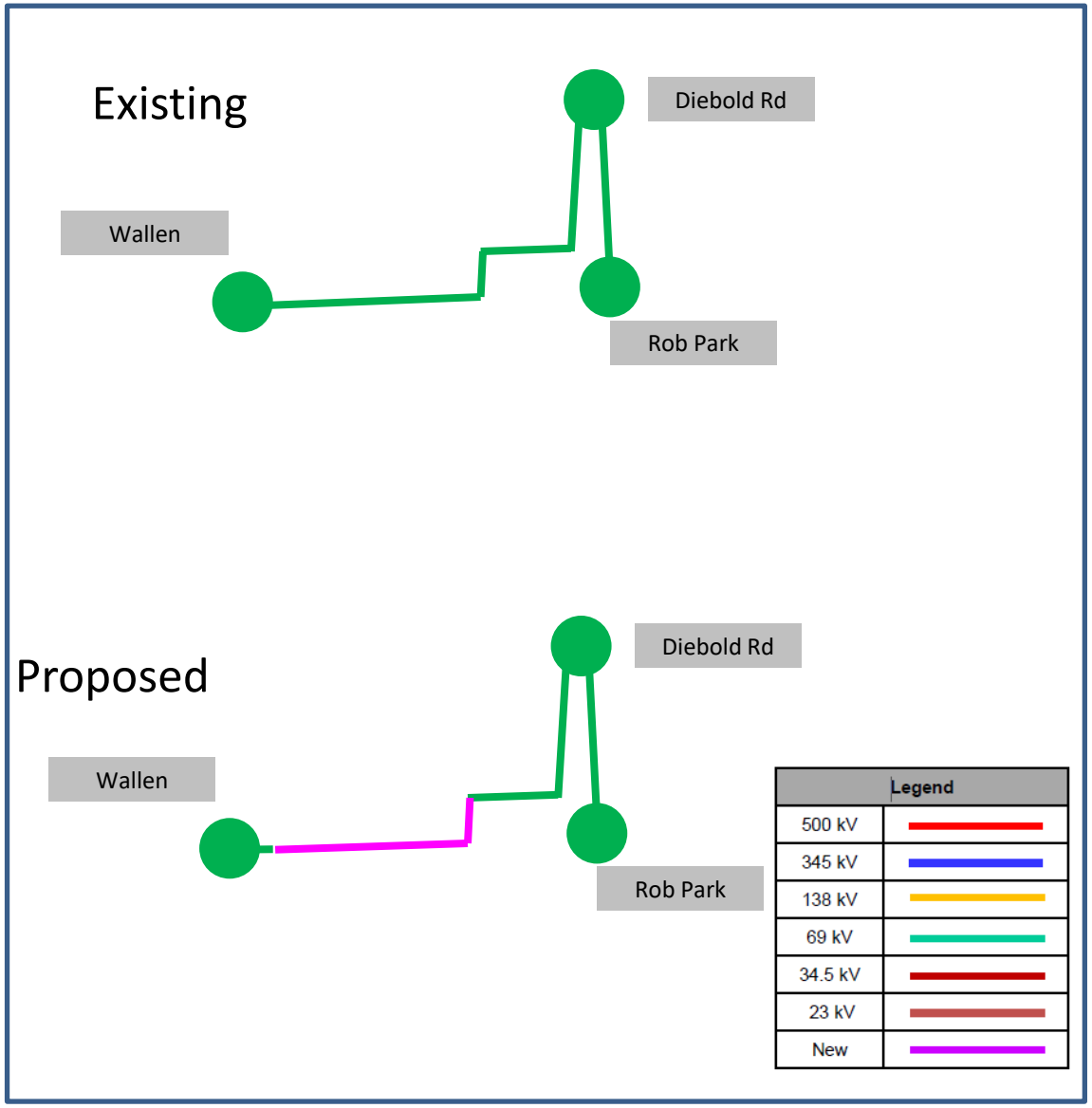
Robison Park – Wallen 69kV line:
Reconductor the ~2.96 miles of 300,000 CU with 556.5 ACSR and replace 21 structures outlined in the need with steel monopole structures.
Estimated Cost: $6.3M

Alternates:

In lieu of rebuilding the line, turn Diebold Rd into an in and out from Robison Park. Since this was just a partial rehab and not a full rebuild this solution wasn't considered. In addition, this solution would have required a second 138/69kV XFR at Robison Park to maintain two sources to the load, making it more expensive.

Cost: $8M

Projected In-Service: 11/01/2025
Project Status: Scoping



AEP Transmission Zone M-3 Process
Richland, Ohio

Need Number: AEP-2021-OH006

Process Stage: Solutions Meeting 4/22/2022

Previously Presented: Needs Meeting 2/17/2021

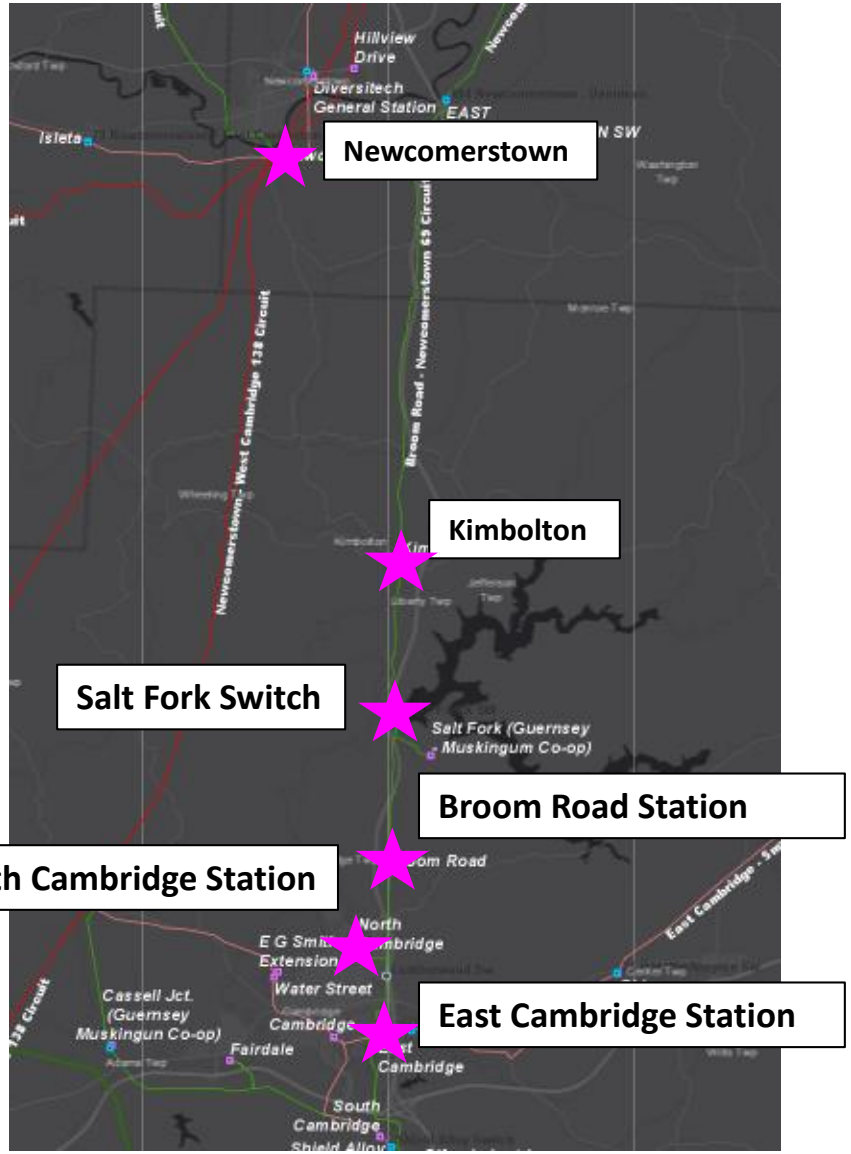
Supplemental Project Driver: Operational Flexibility, and Customer Service

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

Problem Statement:

- The Newcomerstown- Cambridge and Leatherwood- North Cambridge 69kV lines were originally constructed in 1926 with wood structures and copper conductor (3/0 CU). 79% of the lines still utilizes the original 1926 copper conductor. The remaining sections have been replaced over the years with 336 ACSR conductor.
- The circuits have had 23 forced operations in the last 5 years of which 5 have been permanent and resulted in 33.4 hours of down time and a CMI of 453,409.
- There are currently 88 open conditions along the Newcomerstown- Cambridge 69kV line and 13 open conditions along the Leatherwood- North Cambridge 69kV mile long line.
- The Leatherwood- North Cambridge 69kV line is served via a radial switch with old 1963 wood pole structures. Radial service severely restricts the ability to perform routine maintenance and restoration activities leading to longer customer outages.
- The FOI limit is surpassed for Salt Fork Switch to Newcomerstown requiring a MOAB to be added to Salt Fork. The existing structure is unable to accommodate this MOAB and a new switch pole will be required. Building this switch at Str 212 will also not require rebuilding the 0.4 mile double circuit spans thus increasing customer reliability as well

Model: PJM 2026 RTEP Series Cases



AEP Transmission Zone M-3 Process
Seneca County, Ohio

Need Number: AEP-2021-OH006

Process Stage: Solutions Meeting 4/22/2022

Proposed Solution:

- Rebuild approximately 4.6 mile of the Newcomerstown- Cambridge 69kV line that wasn't addressed under b3274 and b3345 utilizing 556 ACSR conductor **$8.97 M**
- Rebuild the 0.6 mile Leatherwood Sw- North Cambridge with double circuit 556 ACSR conductor to provide loop service to North Cambridge station. **$1.45 M**
- Add line MOABs for each of the double circuit lines coming into North Cambridge station. **$0.28 M**
- Remove the Leatherwood Switch that currently radially serves North Cambridge station. **$0.08 M**
- Replace Salt Fork Switch with a new 1200A POP Switch. **$1.13 M**

Cost estimate: $11.91 M

Alternatives Considered:

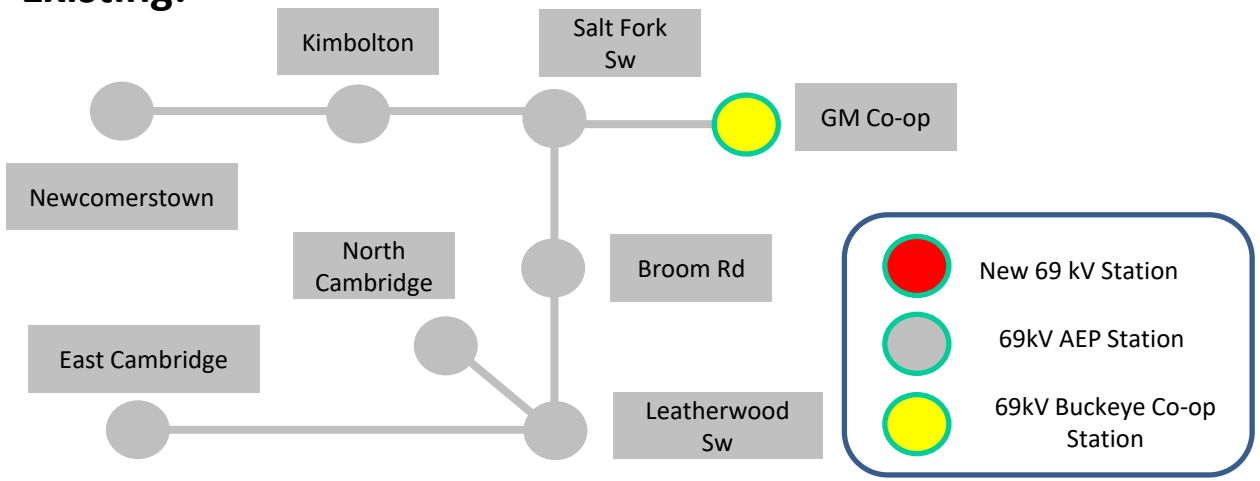
A portion of this line is already approved to be rebuilt as a baseline project. Considering the number of customers served from the line and the already approved work to rebuild, no other alternatives were identified.

Projected In-Service: 6/1/2025

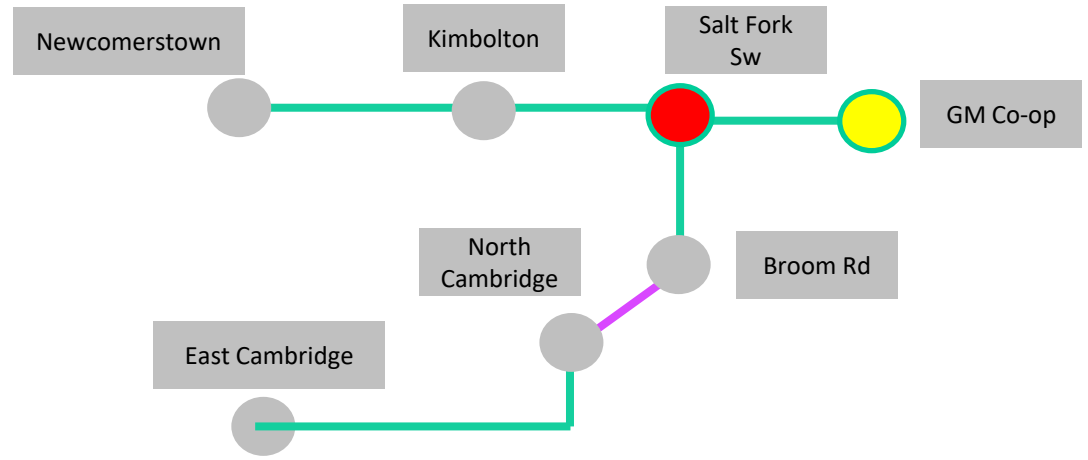
Project Status: Scoping

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

Existing:



Proposed:



AEP Transmission Zone M-3 Process
Fremont, Ohio

Need Number: AEP-2021-OH007

Process Stage: Solutions Meeting 4/22/2022

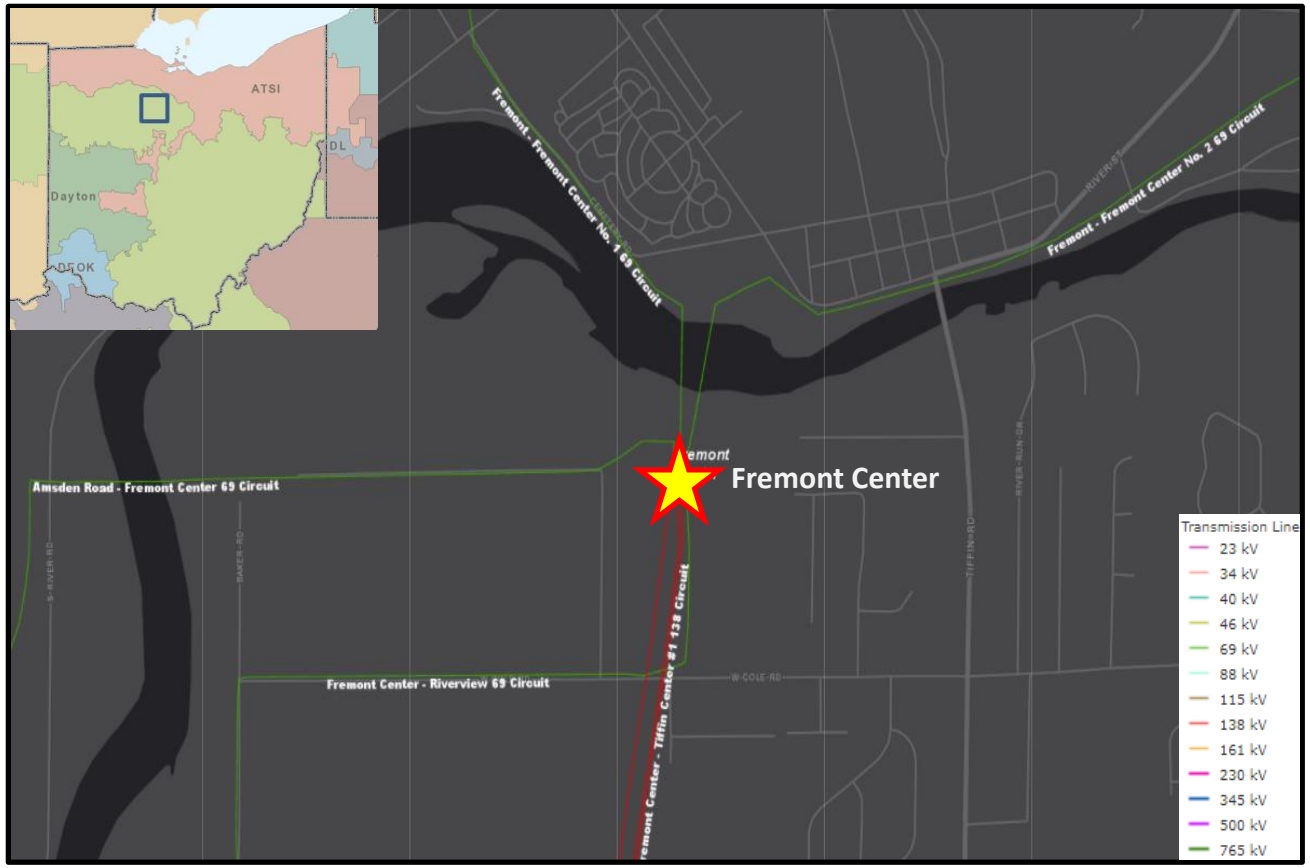
Previously Presented: Needs Meeting 2/17/2021

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

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

Problem Statement:

- Circuit Breakers F, G, H, J, K, & L
- Breaker Age: F 1971, G 1971, H 1971, J 1971, K 1971, & L 1988
- Interrupting Medium: (Oil)
- Fault Operations:
- Number of Fault Operations: F 15, G 51, H 26, J 20, K 19, & L 69
- Manufacturer recommended Number of Operations: 10
- Additional Breaker Information: These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require.
- Relays: Currently, 40 of the 76 relays (53% of all station relays) are in need of replacement or upgrades. 39 of these are of the electromechanical type and 1 of the static type which have significant limitations with regards to fault data collection and retention.
- RTU: The existing Data Concentrator – DOS type RTU installed at Fremont Center is a non-standard RTU with no vendor support, no active warranty, no available training and no Ethernet compatibility. In addition, this unit has high a malfunction rate.



Model: PJM 2025 RTEP Series Cases

AEP Transmission Zone M-3 Process
Fremont, Ohio

Need Number: AEP-2021-OH007

Process Stage: Solutions Meeting 4/22/2022

Proposed Solution:

- Rebuild the existing 69 kV yard to a breaker and a half arrangement. Install 11 new 3000A 40kA 69kV breakers and relocate one existing breaker into the new strings. **$10.35 M**

Cost estimate: $10.35 M

Ancillary Benefits:

Currently, the 69 kV bus at Fremont Center is a single bus design with five 69 kV transmission lines and three transformers served from it. In order to improve operational flexibility and address the 69 kV breakers identified at the station the 69 kV bus will be reconfigured to a breaker and a half arrangement.

Alternatives Considered:

Replace the identified breakers in place and keep the current straight bus configuration. This alternative was not advised as the breaker and a half configuration produces a superior protection scheme than the straight bus configuration that exists today. The breaker and a half configuration will now allow for a 69kV breaker fault to occur and avoid taking the entire 69kV side of the station out of service. Considering the number of transmission elements served at 69 kV, the breaker and a half arrangement provides the most reliable service to all elements for outages and maintenance considerations.

Projected In-Service: 12/15/2026

Project Status: Scoping

No bubble diagram needed. Station work only.

AEP Transmission Zone M-3 Process
Crawford County, Ohio
Seneca County, Ohio

Need Number: AEP-2021-OH023

Process Stage: Solutions Meeting 4/22/2022

Previously Presented: Needs Meeting 4/16/2021

Supplemental Project Driver: Operational Flexibility, and Customer Service

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

Problem Statement:
Line Name: Howard- Fostoria 138kV

LINE CHARACTERISTICS

- Original Install Date (Age): 1928
- Length of Line: 45.34 miles
- Total structure count: 264
- Original Line Construction Type: Steel Lattice
- Conductor Type: 397 CM ACSR 30/7

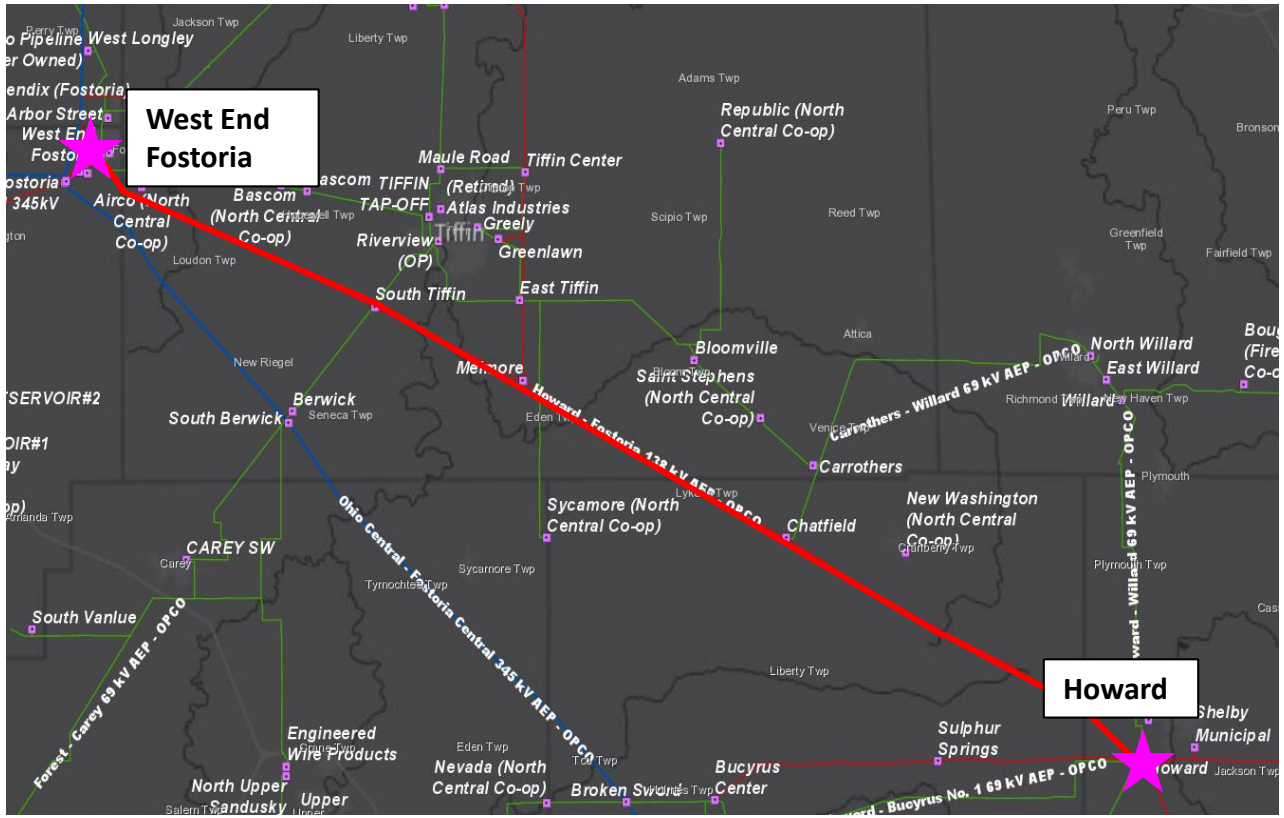
CONDITION / PERFORMANCE / RISK ASSESSMENT:

- Outage History
- 11 momentary and 2 permanent outages with an average duration of 28.53 hours
- Condition Summary
- Number of open conditions by type / defects / inspection failures: 126
- 37 structure based open conditions consisting of bent lacing, rust on the leg of a structure, vines on the leg of a structure and tower base, and tower base debris. There are currently 195 hardware based open conditions consisting of a broken/loose/missing conductors, bird droppings on insulators, broken/burnt/chipped/rusty insulators, bent/broken/burnt insulator assembly hardware and broken/loose/worn shield wire hardware.

Risk

- 410MW of planned generation on this line in the IPP queue.

Model: PJM 2026 RTEP Series Cases



AEP Transmission Zone M-3 Process
Seneca County, Ohio

Need Number: AEP-2021-OH023

Process Stage: Solutions Meeting 4/22/2022

Proposed Solution:

- Rebuild the 15.7 mile 138kV line between Howard and Chatfield stations with new 1033 ACSR conductor **$36.96 M**
- Rebuild the 6.1 mile 138kV line between Melmore and South Tiffin stations with new 1033 ACSR conductor **$14.97 M**
- Rebuild the 11.7 mile 138kV line between South Tiffin and West End Fostoria stations with new 1033 ACSR conductor **$30.19 M**

Cost estimate: $82.12 M

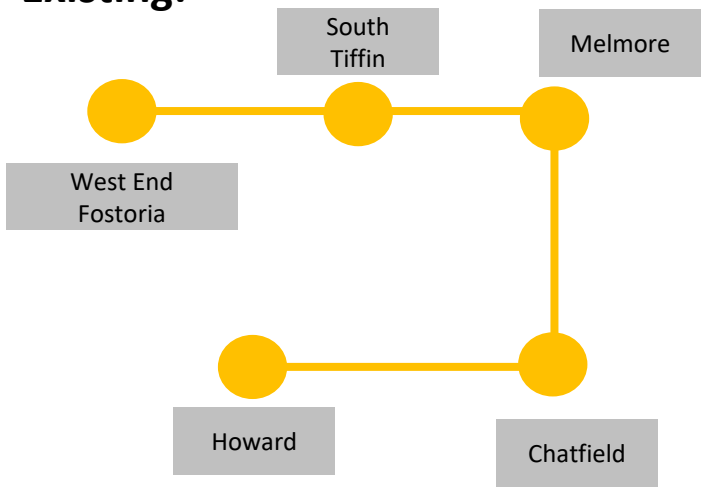
Alternatives Considered:

Considering the customers and 69 kV sources served from this line, retirement of the line is not a viable alternative. The section of line between Melmore and Chatfield has already been approved as baseline project b3249.

Projected In-Service: 5/1/2025

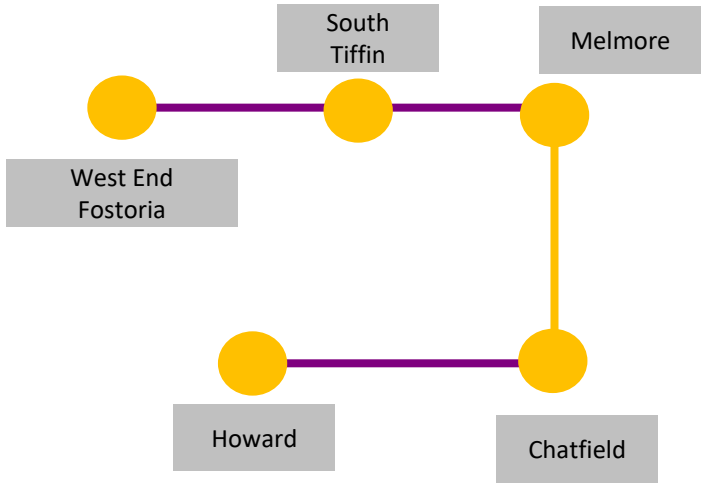
Project Status: Engineering

Existing:



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

Proposed:



Need Number: AEP-2021-OH031

Process Stage: Solutions Meeting 4/22/2022

Previously Presented: Needs Meeting 5/21/2021

Project Driver:

Customer Service

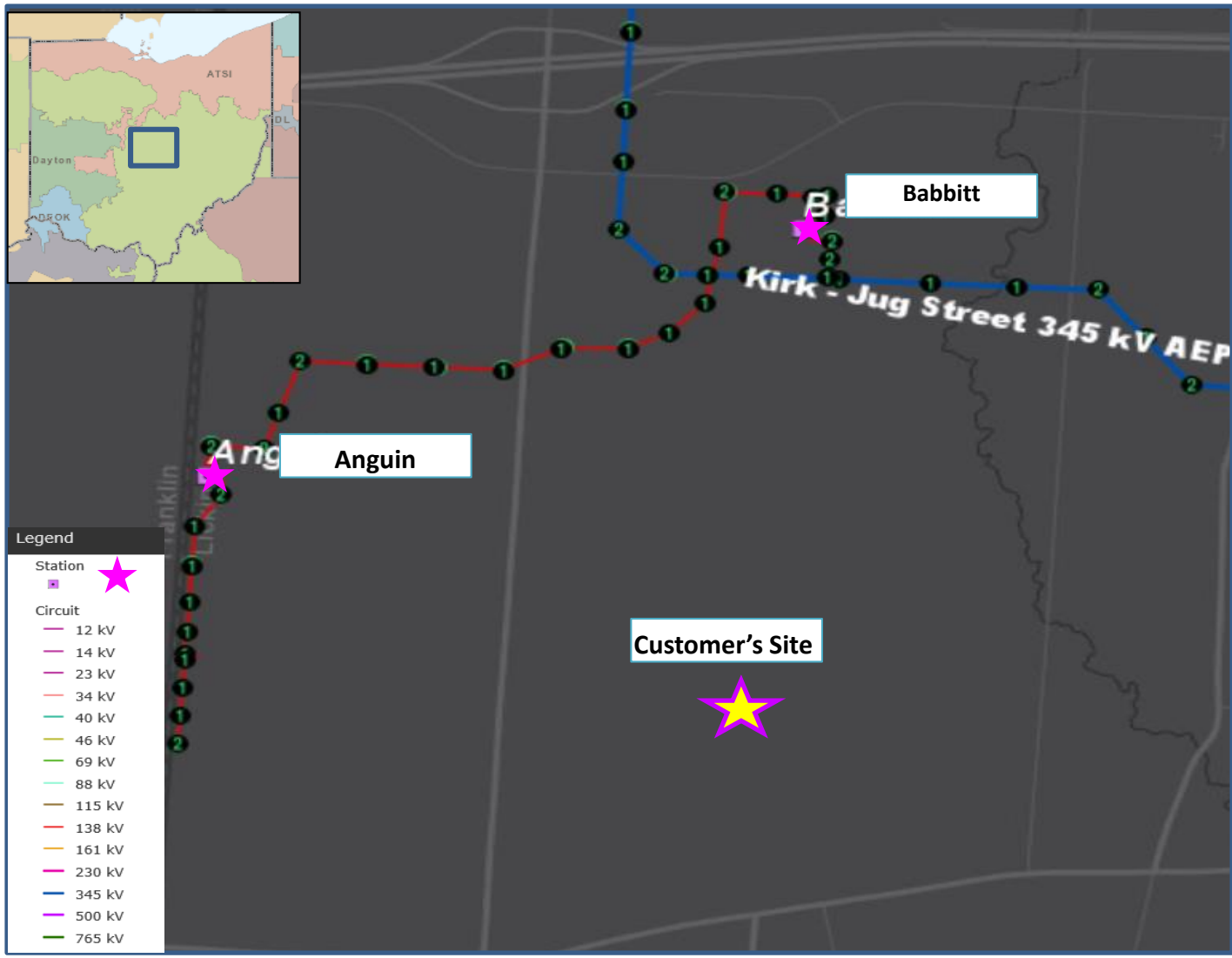
Specific Assumption Reference:

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 in New Albany, OH.
- The customer has indicated an initial peak demand of 84 MVA with an ultimate capacity of up to 240 MVA at the site.



AEP Transmission Zone M-3 Process
New Albany, Ohio

Need Number: AEP-2021-OH031

Process Stage: Solutions Meeting 4/22/2022

Proposed Solution:

- **Anguin 138 kV Station:** Relocate the Anguin extension No. 4 into strings C & D at Anguin station installing two circuit breakers in each string to complete the strings. The new double circuit line to Brie station will be installed in strings A & B. Expand DICM to accommodate additional relays. **Estimated Cost: $1.33M**
- **Anguin – Penguin DP1 138kV:** Re-terminate the existing 138 kV Anguin Extension lines into strings C & D at Anguin Station. **Estimated Cost: $0.78M**
- **Brie 138kV Station:** Establish the greenfield 138kV Brie station. Two full breaker and a half strings and 2 partial strings will be initially installed; total of ten (10) 138 kV breakers. **Estimated Cost: $11.04M**
- **Anguin – Brie 138 kV:** Build ~1.5 miles of greenfield 138kV double circuit line between Anguin and Brie station with 2 Bundle ACSS 1033.5 Curlew. Extend the telecom fiber into Brie station for relaying/communication. Short span construction and larger than normal foundations are required in this area to maintain clearances and paths for future development from the customers in the area, leading to higher than normal costs for this line. **Estimated Cost: $7.83M**
- **Brie – Customer Why 1 138kV:** Tie lines #1-4 to the customer's facility. **Estimated Cost: $0.11M**

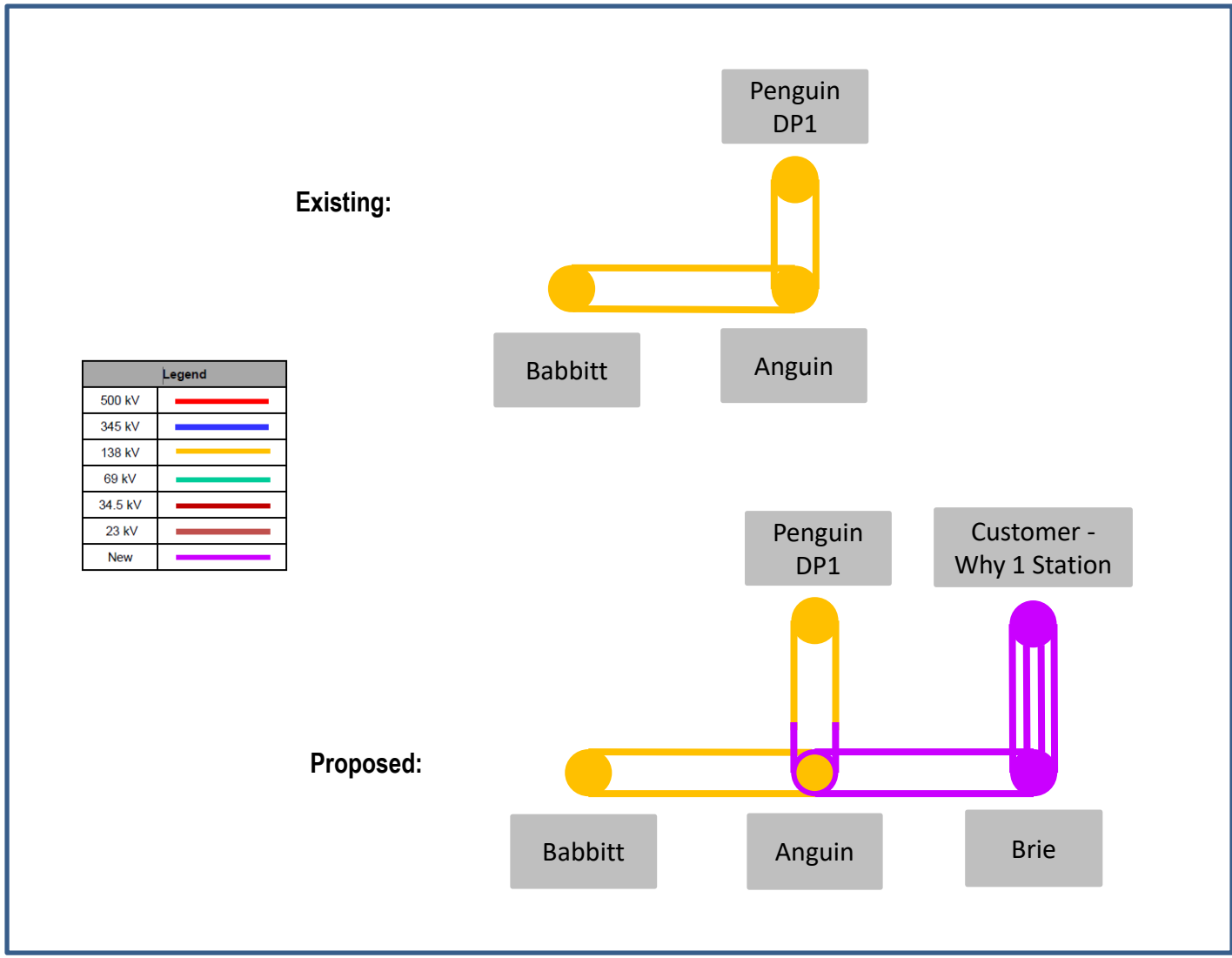
Total Estimated Transmission Cost: $21.08M

Alternatives Considered: No cost effective alternate was determined.

Projected In-Service: 6/1/2023

Project Status: Scoping

Model: 2026 RTEP



Need Number: AEP-2021-OH054

Process Stage: Solution Meeting 4/22/2022

Previously Presented: Need Meeting 10/15/2021

Supplemental Project Driver:

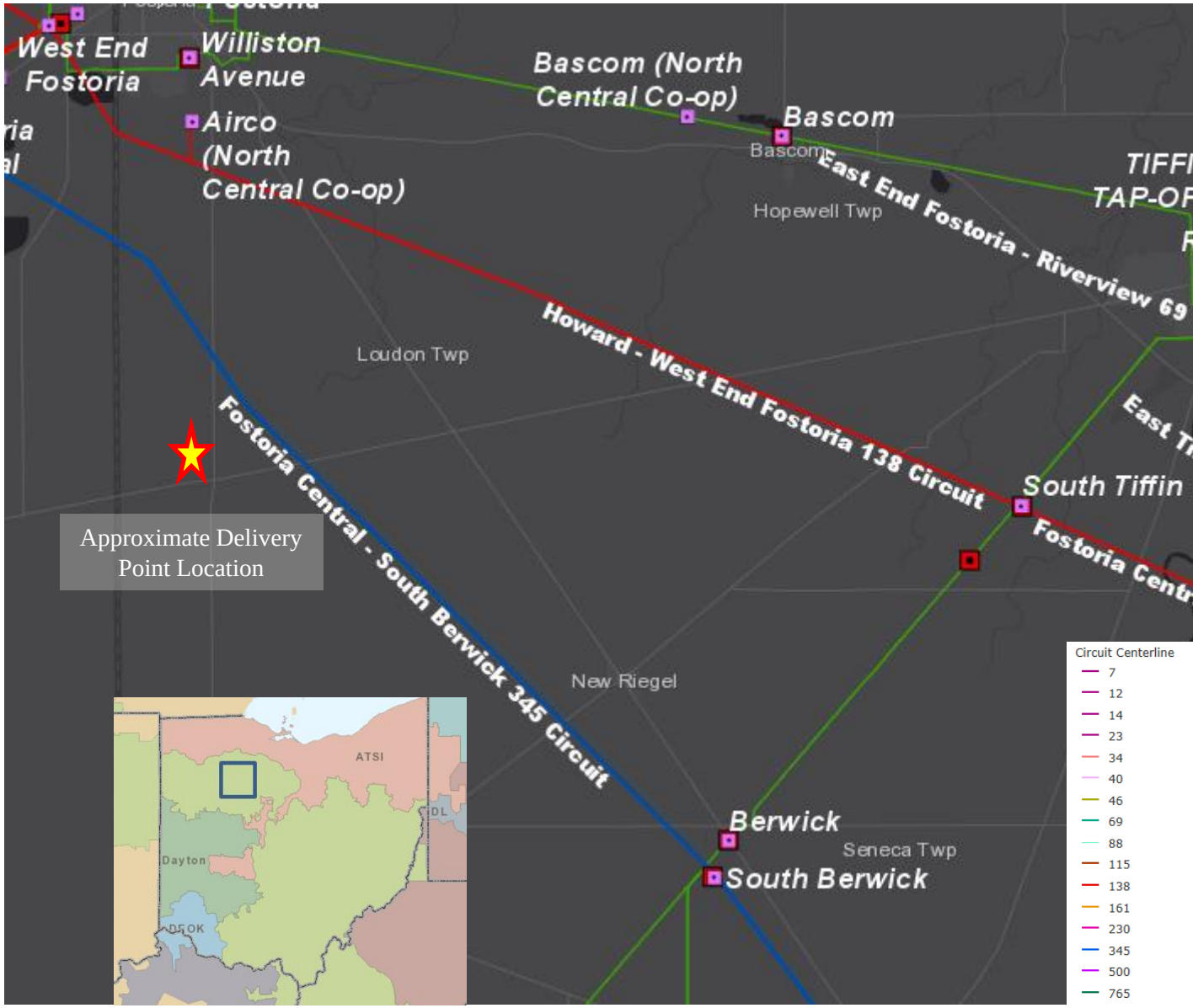
Customer Service

Specific Assumption Reference:

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

Problem Statement:

- Buckeye is requesting on behalf of North Central Electric Co-op a new 138kV delivery point tapped off of the Fostoria Central – Melmore 138kV Circuit by August 2022. Anticipated load is about 6.2 MVA.



AEP Transmission Zone M-3 Process
Iron Triangle 138kV Project

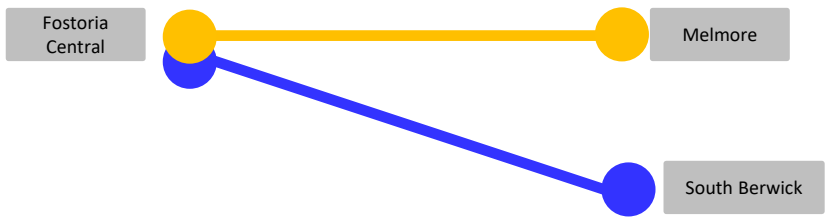
Need Number: AEP-2021-OH054
Process Stage: Solutions Meeting 04/22/2022

Proposed Solution:

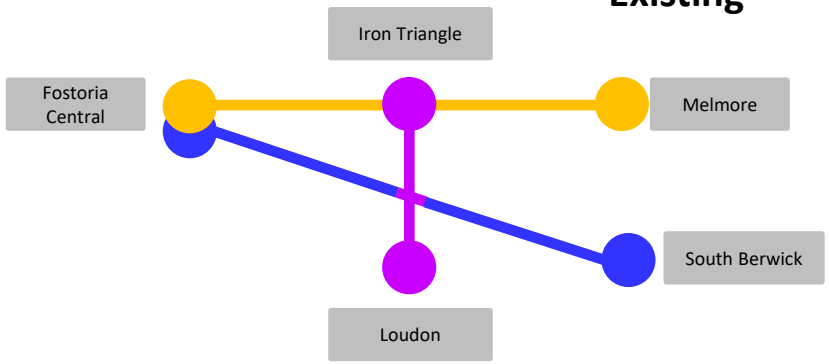
- **Iron Triangle Switch 138kV:** Establish a new three way POP switch on the Fostoria Central – Melmore circuit to serve new North Central delivery point. The through-path will include auto-sectionalizing switches. **Estimated Cost $0.866M**
- **Iron Triangle – Loudon 138kV**. Construct ~3.85 miles of single circuit 138 kV line utilizing 795 ACSR conductor between the proposed Iron Triangle Switch and the new NCEC Loudon delivery point **Estimated Cost $8.586M**
- **West End Fostoria – Melmore 138kV:** Cut in work will be required on the Fostoria – Melmore Circuit for the Iron Triangle Switch. **Estimated Cost $0.627M**
- **Ohio Central – Fostoria Central 345kV.** Modify Fostoria Central – South Berwick 345kV for the Iron Triangle – Loudon 138kV line crossing. **Estimated Cost $1.338M**

Total Estimated Cost: $11.432M

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



Existing



Proposed

Alternatives:
Considering the location and timing of the customer request, no other viable alternatives were considered.

Projected In-Service: 7/1/2023
Project Status: Scoping
Model: 2026 RTEP

Need Number: AEP-2022-OH001

Process Stage: Solutions Meeting 4/22/2022

Previously Presented: Needs Meeting 1/21/2022

Supplemental Project Driver:

Customer Service

Specific Assumption Reference:

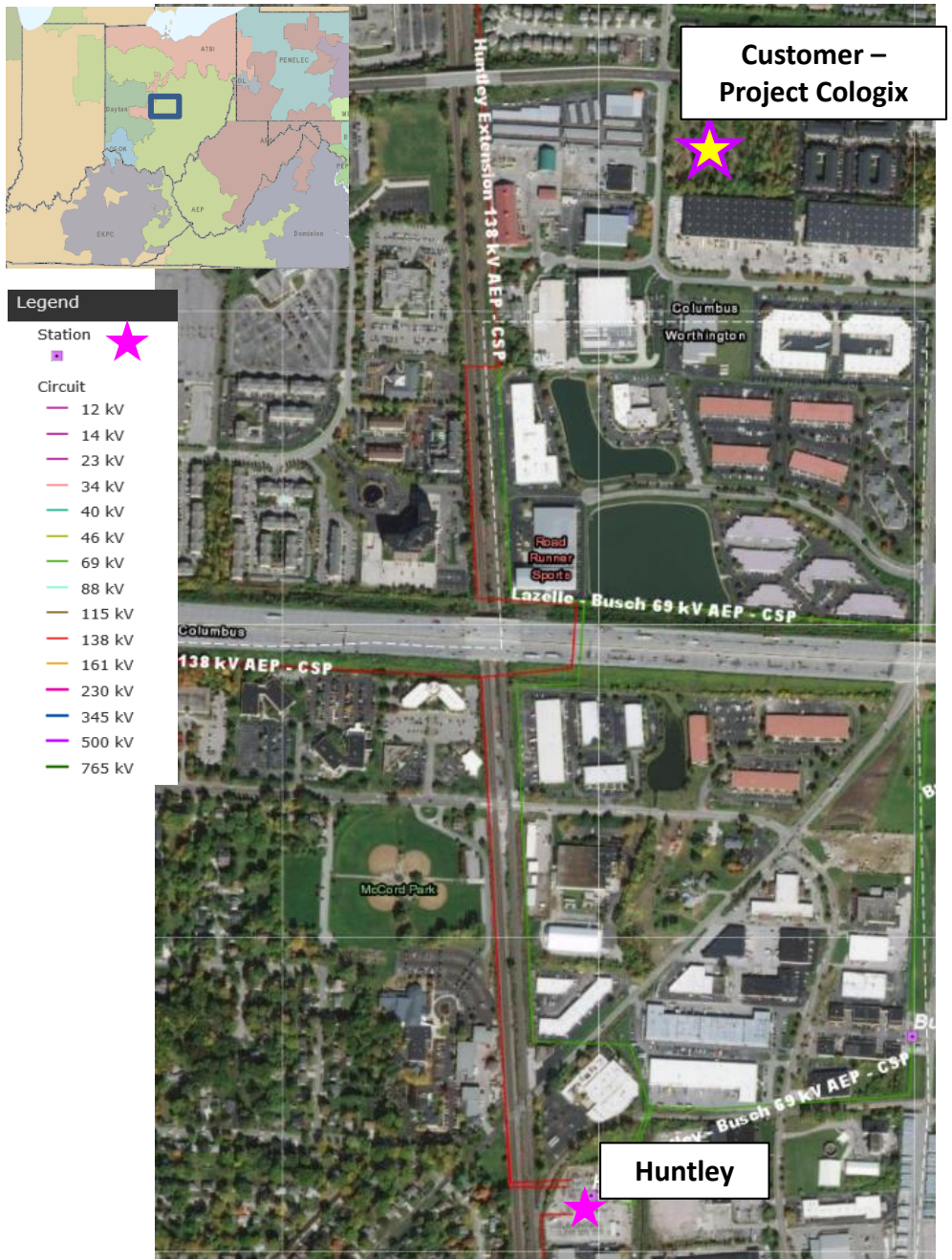
AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site North of AEP's existing Huntley station in Worthington, OH.
- The customer has indicated a demand of 40 MW at the site.

Model: 2026 RTEP



Need Number: AEP-2022-OH001

Process Stage: Solutions Meeting 4/22/2022

Proposed Solution:

- **Scherers Switch 138kV:** Install a new 2000 A three-way Phase Over Phase switch with SCADA automation on the Huntley – Greif through path and install a bypass for maintenance. **Estimated Cost: $0.800M**
- **Greif – Huntley 138kV line:** Tap the existing Greif-Huntley 138kV circuit by installing structures to carry the 69 kV underbuild Lazelle-Busch circuit and maintain separation from the new Scherers Switch as well as install dead end poles and centerline poles on each direction of the new switch. **Estimated Cost: $1.113M**
- **Cologix Extension 138kV:** Construct ~0.24 miles of single circuit 138kV radial transmission line from Scherers Switch to the new Cologix Customer Station. **Estimated Cost: $0.795M**

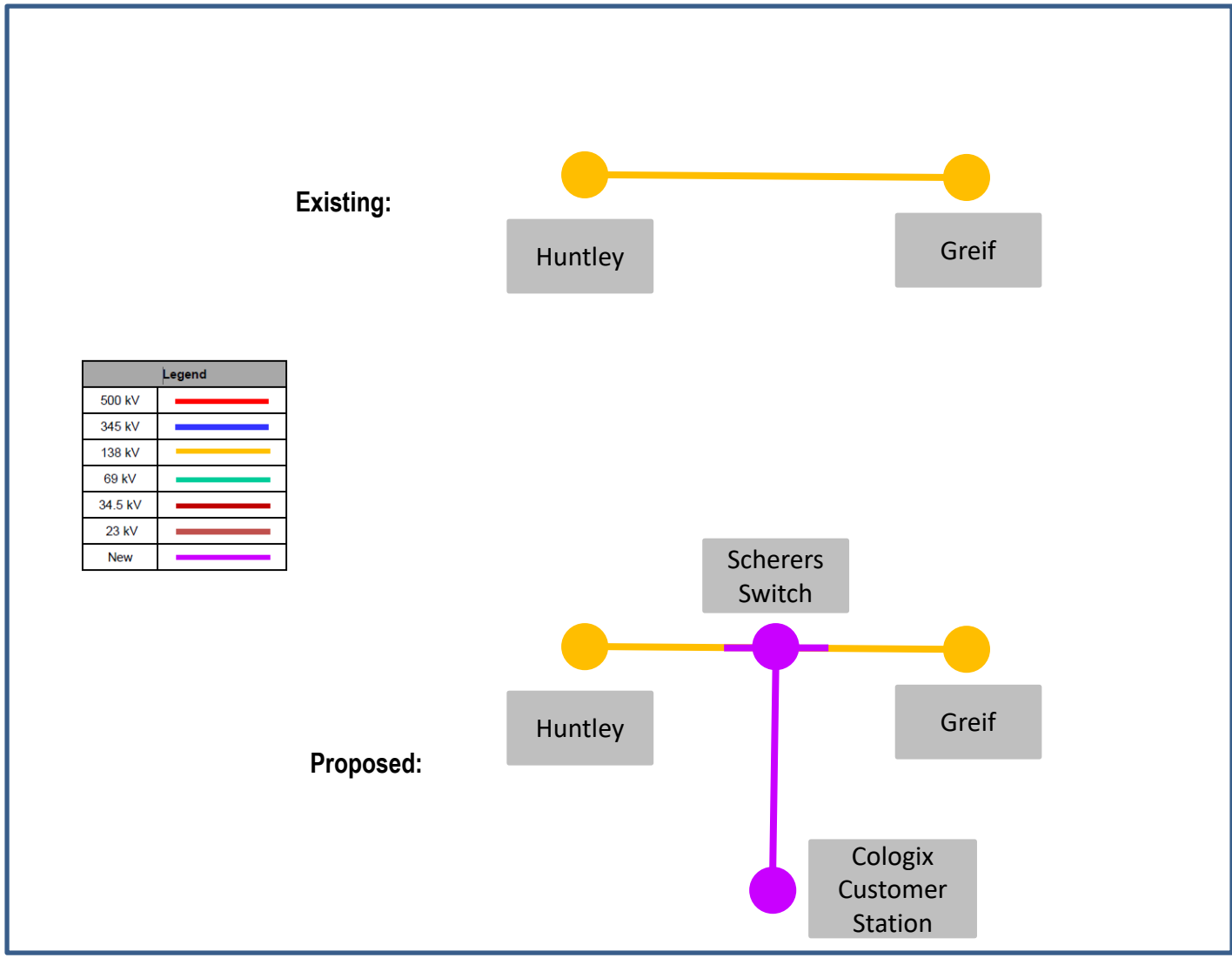
Total Estimated Transmission Cost: $2.708M

Alternatives Considered: Considering the location of the customer request and proximity of the line to serve them, no other viable alternates were identified.

Projected In-Service: 4/1/2024

Project Status: Scoping

Model: 2026 RTEP



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

4/12/2022 – V1 – Original version posted to pjm.com

4/20/2022 – V2 – Added slide #9

– Updated slide #57, move some scope to s2152

4/27/2022 – V3 – Added slide #57, corrected the rebuild lentgh