

Sub Regional RTEP Committee: Western AEP Supplemental Projects

September 17, 2021

Needs

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

AEP Transmission Zone: Supplemental Boyd County, KY

Need Number: AEP-2021-AP029

Process Stage: Needs Meeting 09/17/2021

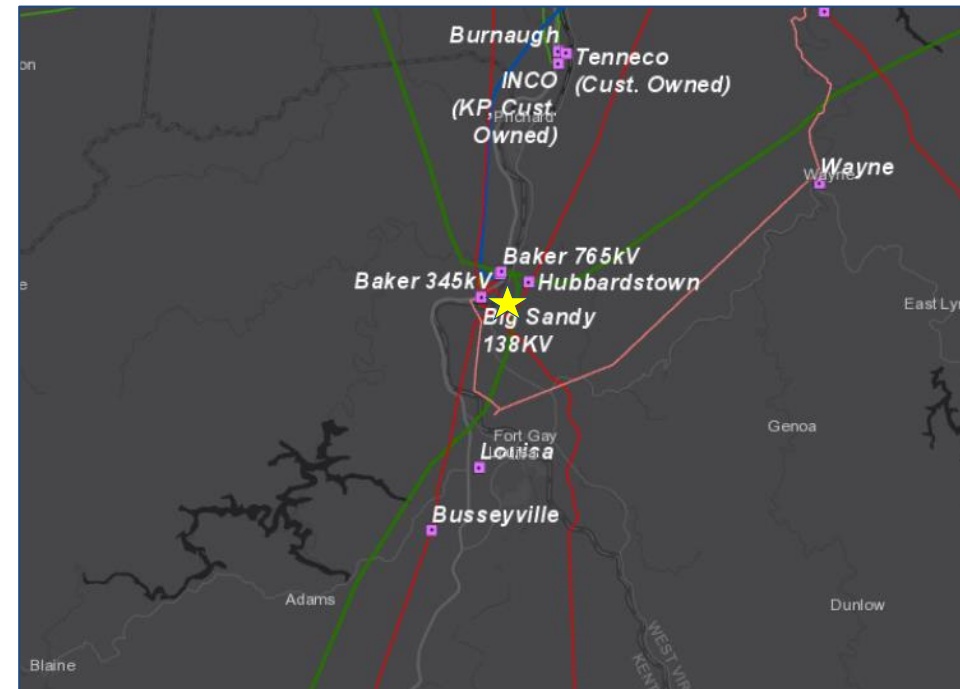
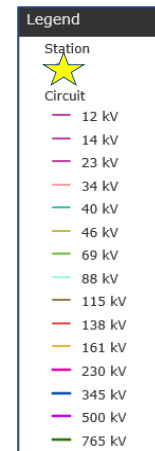
Supplemental Project Driver: Customer Service

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

Problem Statement:

- A customer service request to serve up to 250 MW of load near the Big Sandy substation in Kentucky. Initial load request is for 100 MW. Requested in service date is January 2022.

Model: N/A



AEP Transmission Zone: Supplemental Lynchburg, VA Area

Need Number: AEP-2021-AP030

Process Stage: Needs Meeting 09/17/2021

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

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

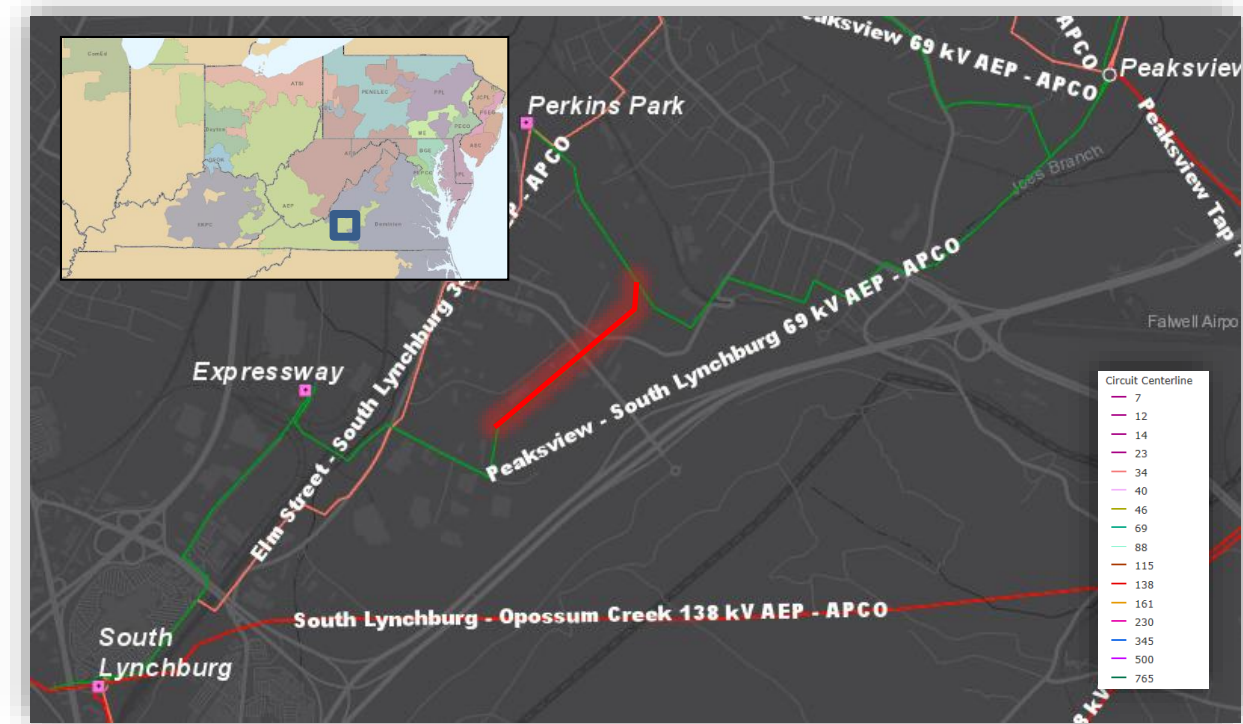
Problem Statement:

- **Peaksview-South Lynchburg 69 kV Line Asset**

- 0.63 miles of 4/0 COPPER 7 conductor is 1938 vintage
- Structures 443-43 to 443-49 are all wood poles
 - Structure 48 is 2004 vintage
 - 1 of the 3 poles of Structure 443-49 is 2001 Vintage
- 2 Open Structural Conditions on this section (woodpecker damage and corroded cross-arms)

- **Performance**

- 4 Permanent Outages for 37.5 Total Hours
 - 180,000 Customer Minutes of Interruption (CMI)
- 16 Momentary Outages - Lightning (7), Distribution (3), Unknown (2), Station Insulator (1), Other Station Equipment (1), Animal (1) & Other (1)
- Operational studies identified thermal overloads of this line section during upcoming scheduled construction outages in the area. Addressing the 4/0 COPPER section will allow for upcoming outages to continue without risk to load served in the area.



AEP Transmission Zone M-3 Process Indiana

Need Number: AEP-2021-IM028

Process Stage: Needs Meeting: 9/17/2021

Supplemental Project Driver: Equipment Condition/Performance/Risk

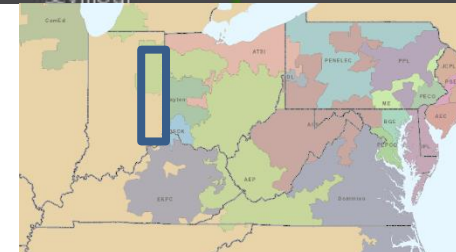
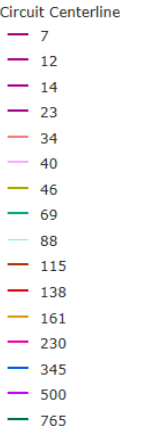
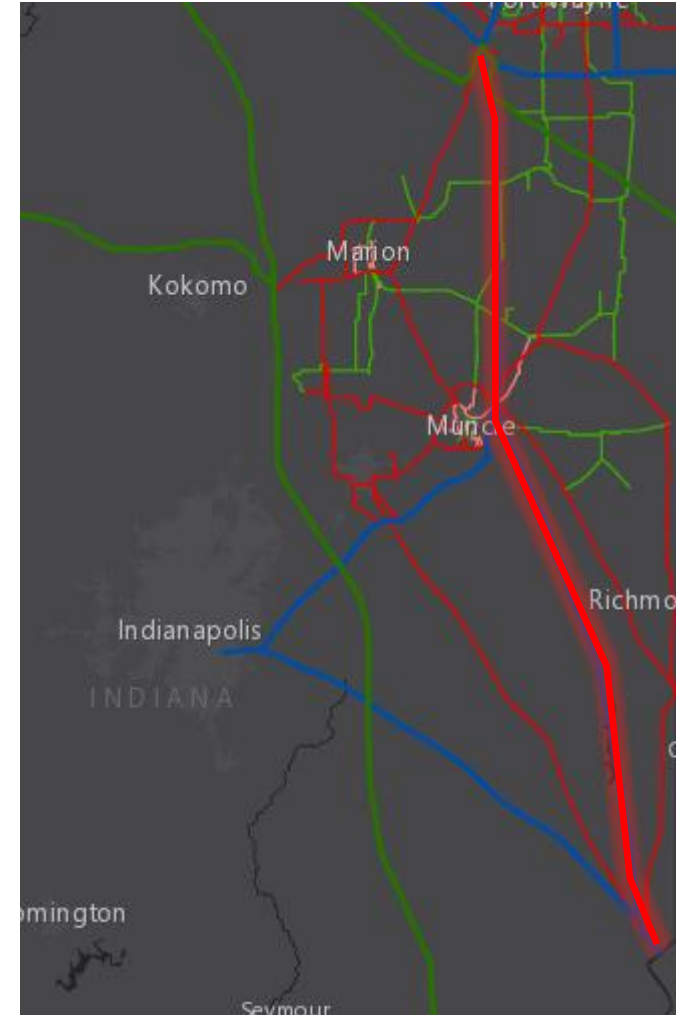
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Model: N/A

Problem Statement:

Tanners Creek—Desoto – Sorenson 345kV line (138-84.4 miles):

- Majority (561/575 357/359) structures are original 1952 Steel Lattice
- Majority (137 84.4 miles) of Conductor is 1952 vintage paper expanded conductor on the ~~Sorenson—Desoto, Sorenson—Keystone, Keystone—Desoto and~~Desoto – Tanners Creek circuits.
- Since 2014 there have been **29 7 momentary and 14-2** permanent outages across this line asset.
- The Paper Expanded conductor is difficult to splice during repairs due to the unavailability of like for like replacement conductor.
- Line is prone to galloping, and causes issues for sensitive customers in the Marion and Ft Wayne area.
- 19 structures **on the full Tanners Creek – Desoto – Sorenson asset** were investigated at the ground and 38 structures were assessed by drone.
 - 20 of these structures had rust or galvanizing
 - 11 had broken/flushes or rusted insulators
 - 6 had sliding/bent or damaged dampers
 - 1 had broken spacers
- With **393-186** open conditions total, **249-125** of the **575 359** structures have at least one open condition. These open conditions include but are not limited to the following.
 - Loose braces; damaged, loose, or rust heavy lacing; rusty legs; broken, damaged, or gunshot conductor; broken or corroded shield wire; and significant hardware issues.



AEP Transmission Zone M-3 Process

Tanners Creek – Desoto 345kV

Need Number: AEP-2021-IM039

Process Stage: Needs Meeting: 9/17/2022

Supplemental Project Driver: Equipment Condition/Performance/Risk

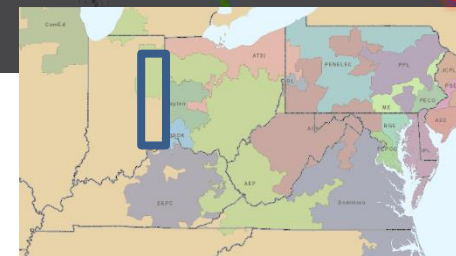
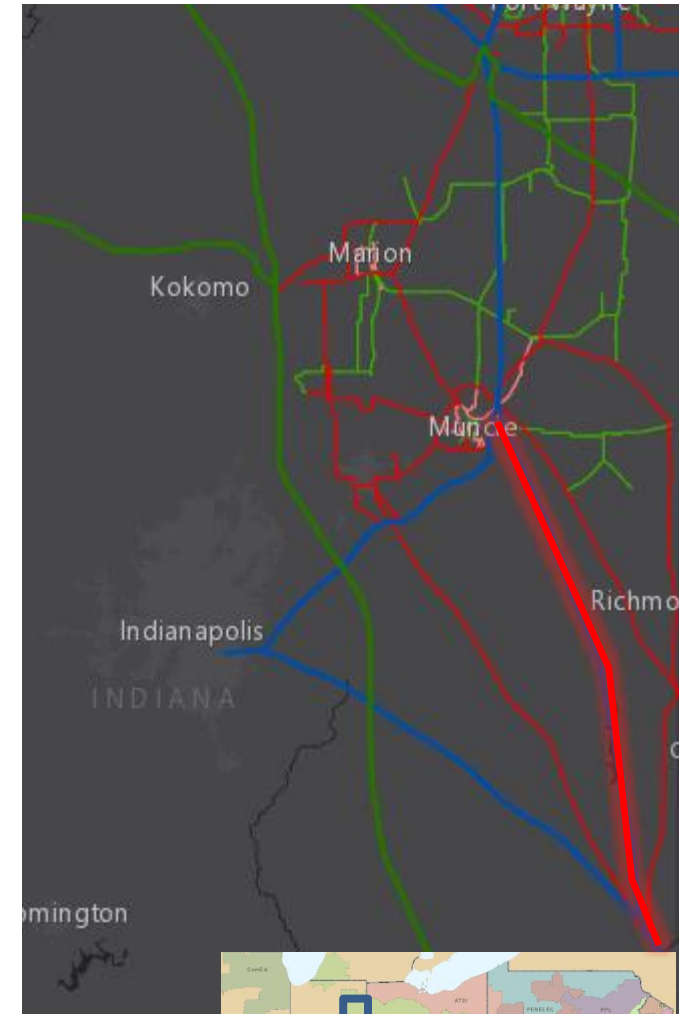
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Model: N/A

Problem Statement:

Tanners Creek – Desoto 345kV line (84.4 miles):

- Majority (357/359) structures are original 1952 Steel Lattice
- Majority (84.4 miles) of Conductor is 1952 vintage paper expanded conductor on the Desoto – Tanners Creek circuit.
- Since 2014 there have been 7 momentary and 2 permanent outages across this line asset.
- The Paper Expanded conductor is difficult to splice during repairs due to the unavailability of like for like replacement conductor.
- Line is prone to galloping and causes issues for sensitive customers in the Marion and Ft Wayne area.
- 19 structures on the full Tanners Creek – Desoto – Sorenson asset were investigated at the ground and 38 structures were assessed by drone.
 - 20 of these structures had rust or galvanizing
 - 11 had broken/ashes or rusted insulators
 - 6 had sliding/bent or damaged dampers
 - 1 had broken spacers
- With 186 open conditions total, 125 of the 359 structures have at least one open condition. These open conditions include but are not limited to the following.
 - Loose braces; damaged, loose, or rust heavy lacing; rusty legs; broken, damaged, or gunshot conductor; broken or corroded shield wire; and significant hardware issues.



Need Number: AEP-2021-IM030

Process Stage: Needs Meeting 09/17/2021

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

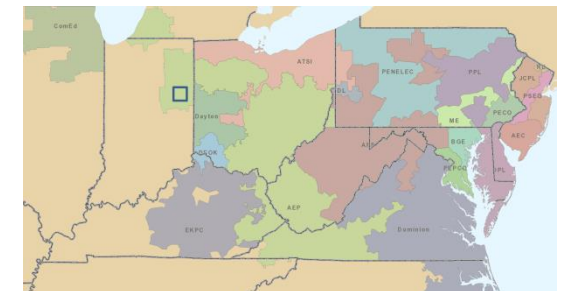
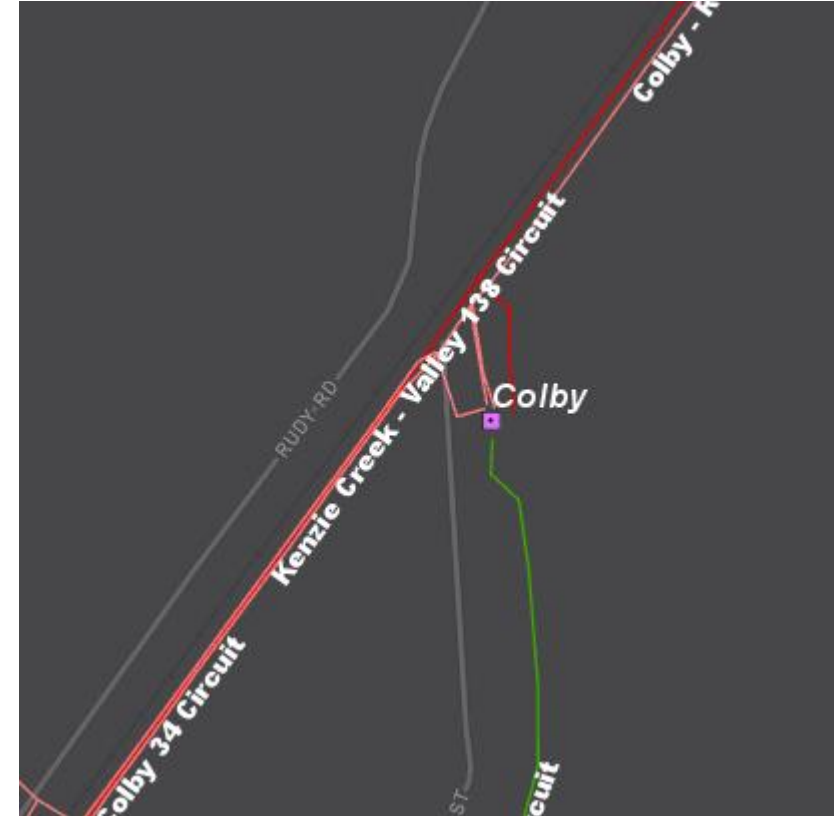
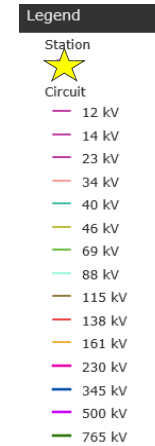
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Problem Statement:

- **Colby 138/69/34.5kV**
 - 69/34.5kV XFR 1
 - 1965 Vintage unit
 - DGA indicates elevated levels of CO2 gas concentration
 - Decomposition in paper insulating materials
 - Wood tie foundations
 - No oil containment
 - 138/12kV XFR 2
 - 1970 Vintage LTC unit
 - DGA shows Ethylene levels exceeding Acetylene which indicates deteriorating internal components
 - Dielectric data indicates this LTC is at greater risk of failure.
 - Increase of Power factor indicates an increase of particles in the oil.
 - Wood tie foundation
 - 138kV Bus structures are corroding.
 - 34.5kV bus structures are corroding

Model: N/A

AEP Transmission Zone: Supplemental Dowagiac, MI Area



Need Number: AEP-2021-OH046

Process Stage: Need Meeting 9/17/2021

Supplemental Project Driver:

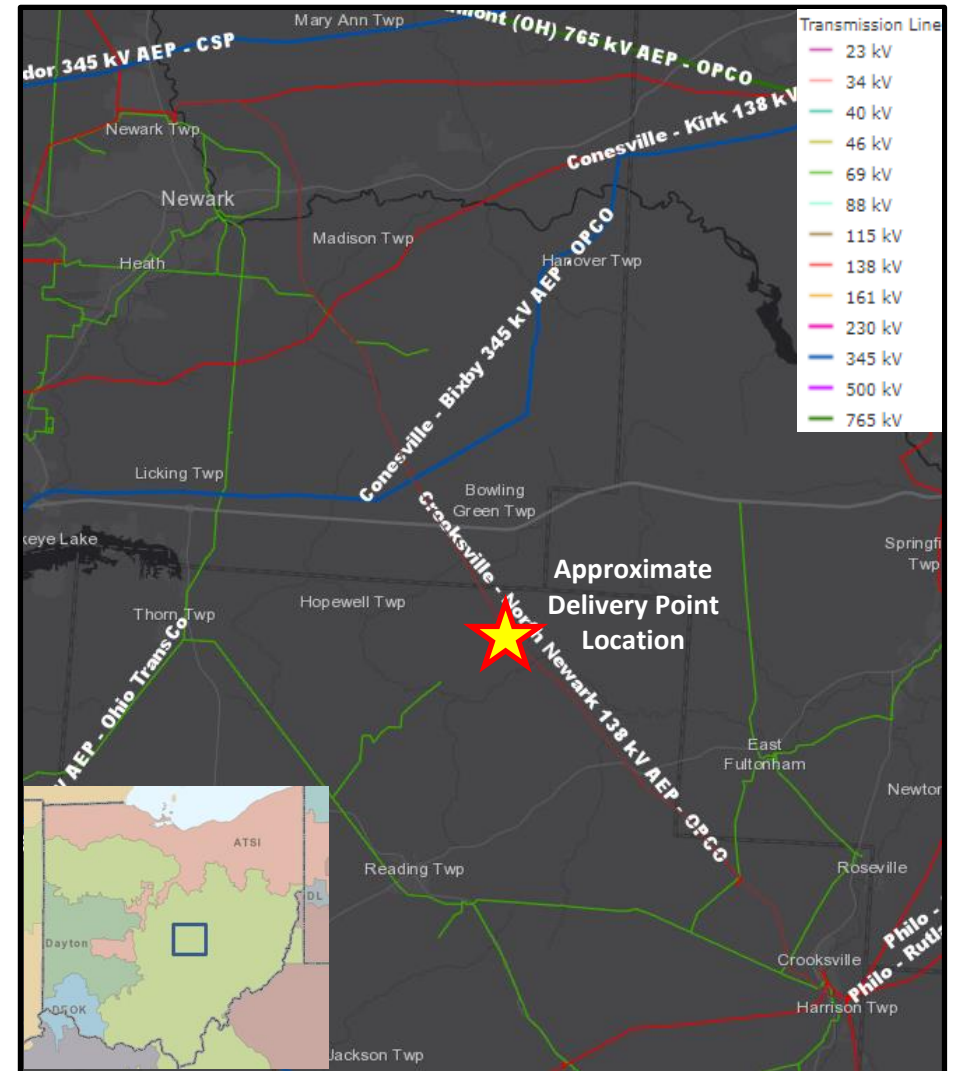
Customer Service

Specific Assumption Reference:

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

Problem Statement:

- Buckeye is requesting, on behalf of South Central Power (SCP), a new 138kV delivery point on the Crooksville – North Newark 138kV circuit by April 2024. The anticipated peak demand at this delivery point will be approximately 4.3 MW.



AEP Transmission Zone M-3 Process East Liverpool, Ohio

Need Number: AEP-2021-OH047

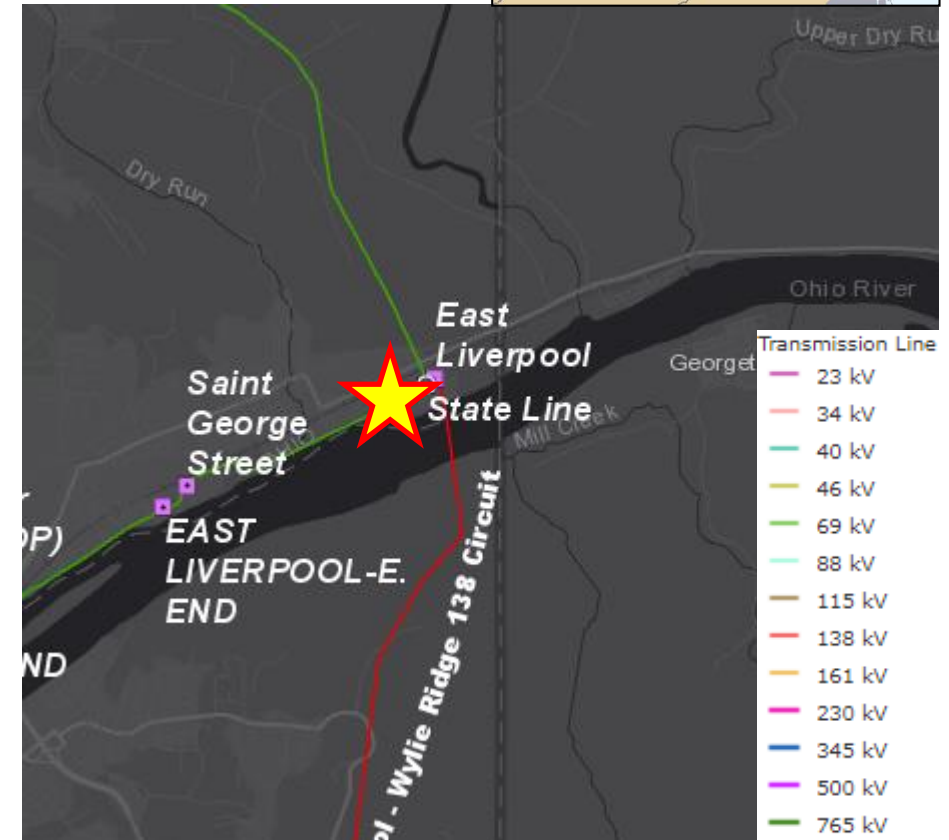
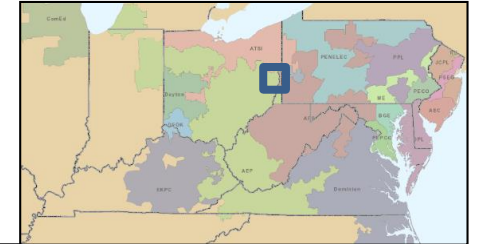
Process Stage: Need Meeting 09/17/2021

Project Driver: Customer Service

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

Problem Statement:

A new customer in East Liverpool, Ohio has requested new transmission service. The expected peak demand is 3 MW, with a forecasted in-service-date of December 2022.



Need Number: AEP-2021-OH048

Process Stage: Need Meeting 9/17/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

West Coshocton Station:

138 kV Circuit Switcher "CS-1A"

- Breaker Age: 1975
- Interrupting Medium: SF6
- Fault Operations: 40 (manufacturer recommended limit is 10)
- Additional: The 138 kV Mark III circuit switcher CS – 1A have limited spare part availability and are no longer vendor supported. These models have experienced 47 recorded malfunctions from July 2001 to August 2019. Failed operational components including high contact resistance, gas loss, and interrupter failure represent the majority of these malfunctions. The expected life span of bushing gaskets and door inspection ports on these units based on AEP experience is only 25 years. The current age of this remaining fleet indicates that the existing gaskets and door inspection ports are at risk for increasing gas loss over time.

Transformer # 3 (138/69 kV, 50 MVA)

- Transformer Age: 1966
- Additional: The tertiary bushing needs replaced. The cooling fans are open cage, which is not OSHA rated. Pumps are leaking and rusted. There is no oil containment. Asbestos has been found in the internal wiring. The oil needs drained, gaskets on the radiators and pumps need replaced, and flange valves need repacked as they are leaking

Relaying

- Currently, 26 of the 27 relays (96% of all station relays) are in need of replacement. All 26 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.



Need Number: AEP-2021-OH049

Process Stage: Need Meeting 9/17/2021

Project Driver: Customer Service

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

Problem Statement:

Jerome Delivery Point (UREC) 138 kV:

- Buckeye Power Inc., on behalf of Union Rural Electric Cooperative Inc., has requested new transmission service in Plain City, Ohio.
- The delivery point will be used to serve a customer with high potential for rapid load growth. The initial load will be 62.5 MW with a potential future peak load demand of 250 MW.
- Service is requested by January 2025.

Model: 2026 RTEP



Need Number: AEP-2021-OH050

Process Stage: Need Meeting 9/17/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

Marion Road 138 kV

138 kV CB-2, CB-3, CB-4, & CB-5

- Breaker Age: 1972
- Interrupting Medium: Oil
- Fault Operations: 10 (CB-2), 16 (CB-3)
- Additional: CB-2, 3, 4, 5, are 138 kV BZO oil filled type breakers without oil containment; oil filled breakers have much more maintenance required due to oil handling. CB-2 & CB-3 has exceeded the manufacturer's recommended (10) number of full fault operations.

40 kV CB-10

- Breaker Age: 1964
- Interrupting Medium: Oil
- Additional: CB-10, is a 40kV FKA oil filled type breaker without oil containment; oil filled breakers have much more maintenance required due to oil handling. The manufacturer provides no support for this circuit breaker and spare parts are increasingly more difficult to obtain.



Problem Statement (continued):

138 kV CS-AA

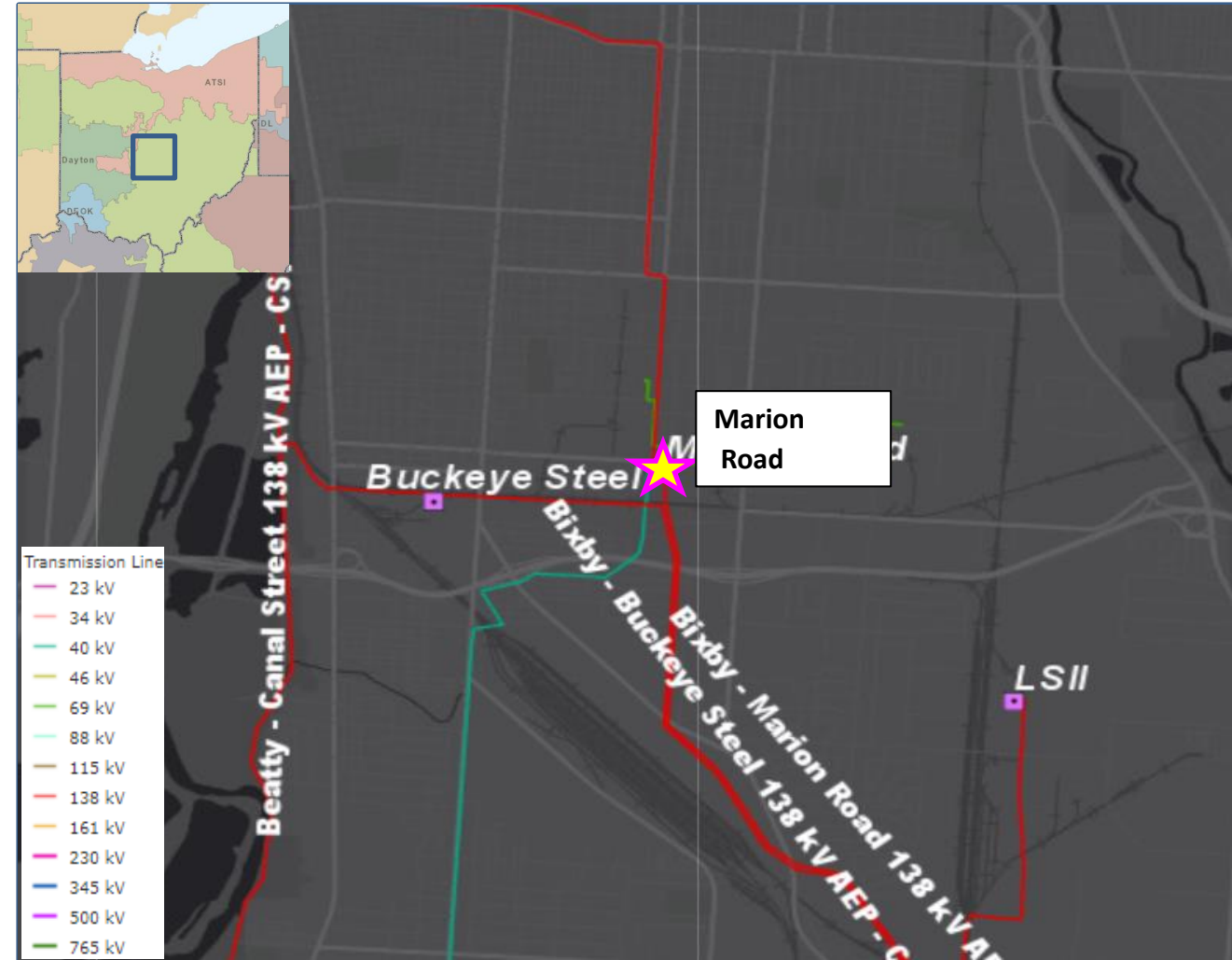
- Breaker Age: 1990
- Interrupting Medium: SF6
- Additional: CS-AA, is a 138kV Mark V-138 SF6 type switcher that have no gas monitor and currently in-service units on the AEP system have experienced 110 malfunctions from May 2000 to August 2019. Failed operational components including high contact resistance, gas loss, and interrupter failure represent half of these malfunctions. Two malfunctions of note were catastrophic equipment failure events. Parts are expensive because they can only be replaced, not repaired.

138/40/13 kV Transformers 5 & 6

- Transformer age: 1961
- Additional: Insulation breakdown is indicated by elevated levels of Carbon Dioxide. The high levels of CO2 and deteriorated insulation reduce the transformer’s ability to withstand through-fault events. Additionally, elevated Ethylene levels in the LTC indicated deteriorating interior components which leads to a greater risk of failure due to eroded contacts.

Relaying:

- Marion Road Substation currently deploys 293 relays. Currently, 277 of the 293 relays (95% of all station relays) are in need of replacement. All 277 of these are of the electromechanical and 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.



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: Supplemental Huguenard Area Improvements

Need Number: AEP-2019-IM048

Previously Presented: Needs Meeting 4/23/2019

Process Stage: Solution Meeting 09/17/2021

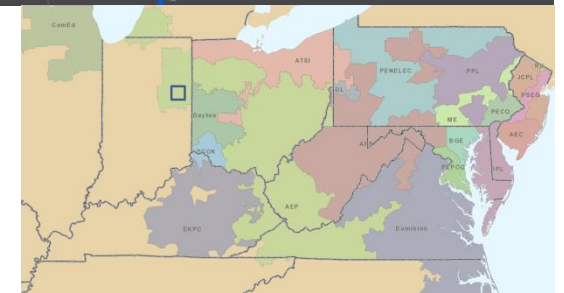
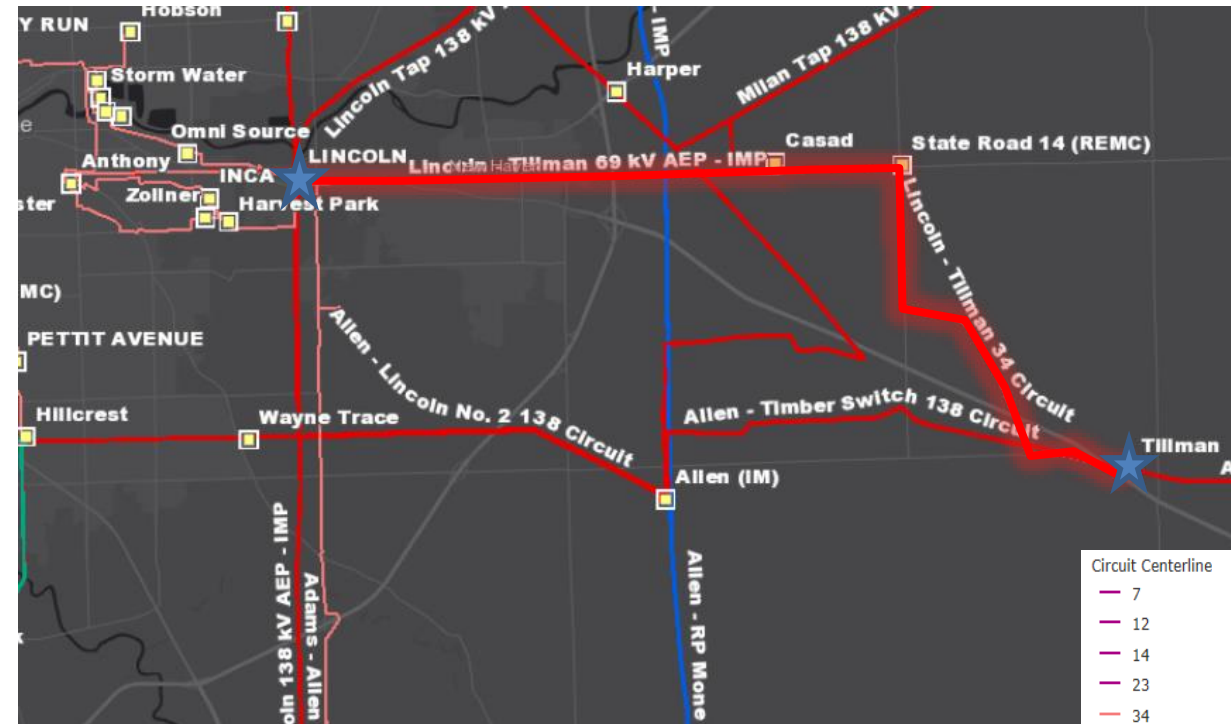
Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Lincoln – Tillman 69kV Line (~13 Miles)

- 1968 vintage wood crossarm construction with 4/0 ACSR
- Currently 102 of the 306 structures have at least one open condition on this line including broken, corroded, cracked, rotting, leaning, split or damaged crossarms and poles;
- Currently fails to meet NESC Grade B, AEP Structural Strength requirements, AEP CIFO standards nor minimum leakage distance requirements
- ~2.9 miles are legacy crossarm cap and pin style construction



AEP Transmission Zone: Supplemental Huguenard Area Improvements

Need Number: AEP-2019-IM048

Process Stage: Solution Meeting 9/17/2021

Proposed Solution:

Lincoln – Tillman 34.5kV line:

Retire approximately ~11 miles of the Lincoln – Tillman 34.5kV line.

Estimated Cost: \$2.8M

Lincoln 138/69/34.5kV substation :

Remove Lincoln CB “P”.

Estimated Cost: \$0.1M

Tillman 138/34.5kV substation:

Remove CB “A” and “B” as well as the 138/34.5kV transformer and all 34.5kV equipment

Estimated Cost: \$0.4M

St Rd 14 Sw:

Remove St Rd 14 34.5kV Sw

Estimated Cost: \$0.1M

Huguenard 138kV extension:

Rebuild a portion of the Lincoln-Tillman line as a new ~2.5 mile 138kV double circuit extension from the Allen – Milan 138kV line to Huguenard 138/34.5kV substation

Estimated Cost: \$7.9M

Huguenard 138/34.5kV station:

Build the new 138/34.5kV substation to feed the St Rd 14 load. This station will have 2 138kV CB’s, 1 138kV Circuit switcher, 1 34.5kV CB and a 138/34.5kV 30MVA XFR. The XFR, 34.5kV CB and high side switcher will be reused from Tillman substation.

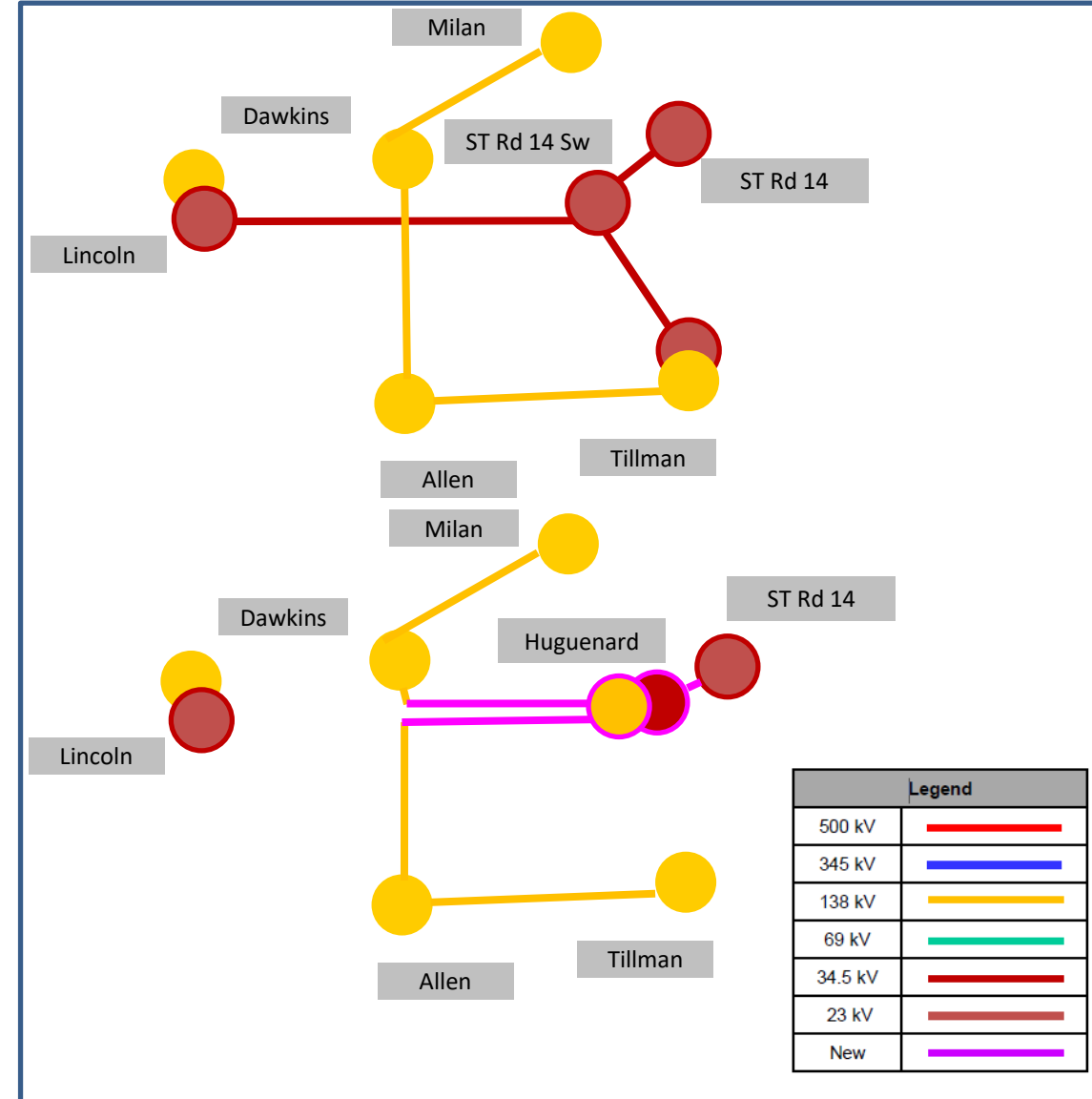
Estimated Cost: \$5.1M

Huguenard – ST Rd 14 34.5kV:

Rebuild the radial 34.5kV line to connect to the new Huguenard substation.

Estimated Cost: \$0.9M

Total Estimated Cost: \$ 17.3Million



AEP Transmission Zone: Supplemental Huguenard Area Improvements

Need Number: AEP-2019-IM048

Process Stage: Solution Meeting 9/17/2021

Ancillary Benefits: By constructing 2.5 miles of new 138 kV line, AEP will retire an additional 11 miles of deteriorated 34.5 kV line in this area while reusing a portion of the existing ROW as the path for the new line.

Alternatives:

Alternate 1

Connect Huguenard to the Dawkins – Milan branch instead of the Allen – Dawkins branch. This would be ~1 mile shorter but would be greenfield line instead of the brownfield route currently picked. In addition to this, the Dawkins – Milan double circuit section is difficult to get outages on due to the large industrial customer at Milan substation. Due to the ROW and outage concerns, it was decided to connect to the Dawkins – Allen branch.

Total Estimated Cost: \$ 17.3Million

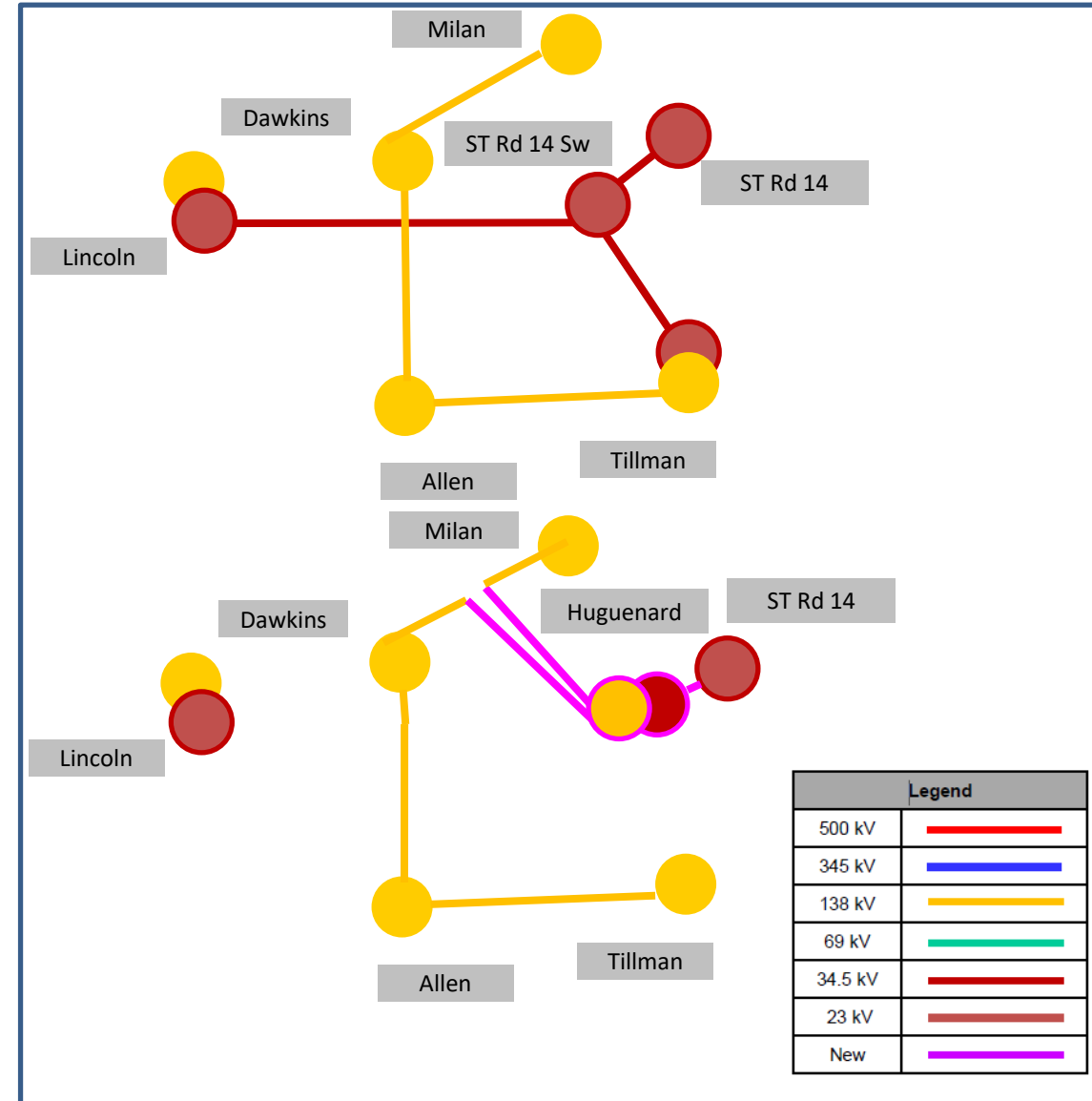
Alternate 2

Rebuild the ~13 mile Lincoln – Tillman 34.5kV line as is.

Total Estimated Cost: \$ 31 Million

Projected In-Service: 10/31/2024

Project Status: Scoping



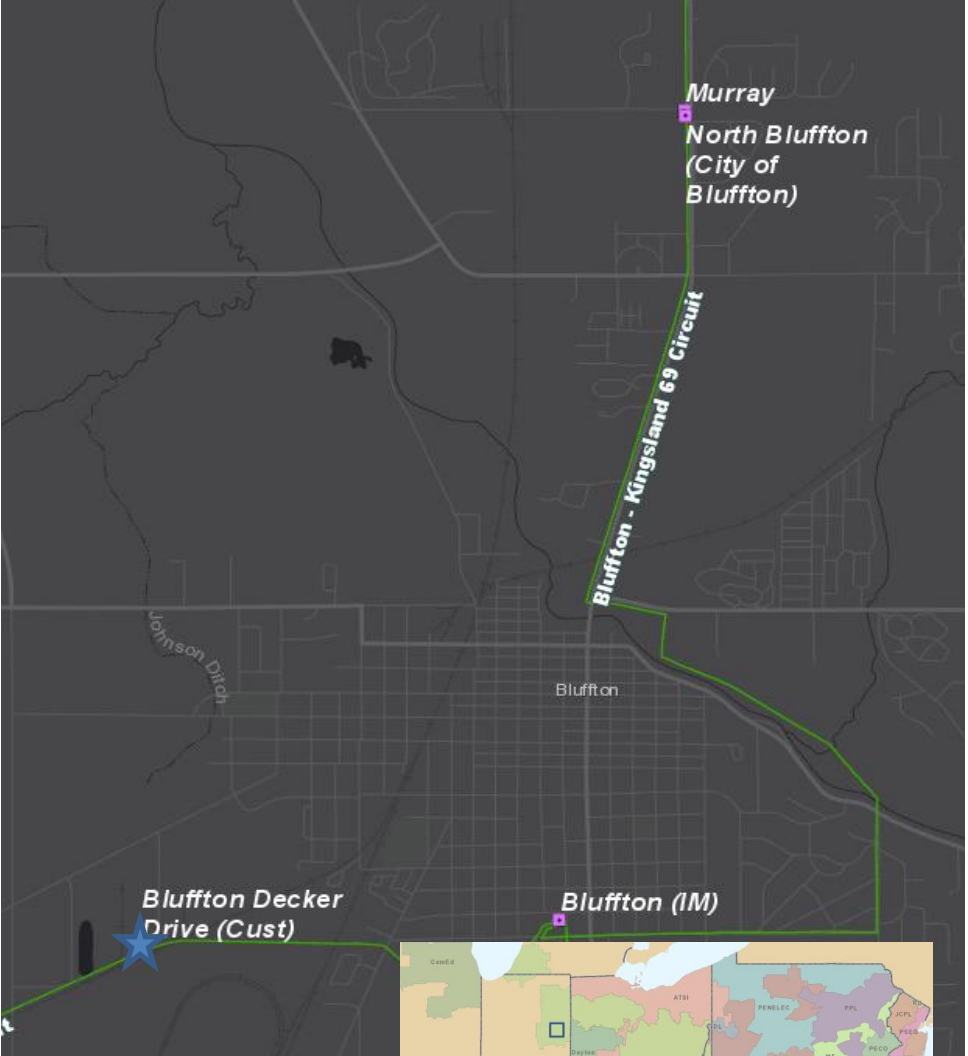
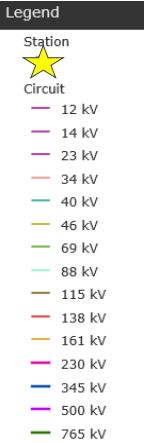
AEP Transmission Zone: Supplemental Decker 69kV Load Addition

Need Number: AEP-2021-IM012
Process Stage: Solutions Meeting 09/17/2021
Previously Presented: Needs Meeting 02/17/2021
Supplemental Project Driver: Customer Service
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 12)

Problem Statement:

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

Model: N/A



AEP Transmission Zone: Supplemental Decker 69kV Load Addition

Need Number: AEP-2021-IM012

Process Stage: Solution Meeting 9/17/2021

Proposed Solution:

Install a new switch pole to feed the new Decker 69kV XFR. Install a motor on the switch toward Liberty Center. **Estimated Cost: \$0.4M**

Cut the new pole at Decker Switch into the Liberty Center – Bluffton 69kV line. **Estimated Cost: \$0.1M**

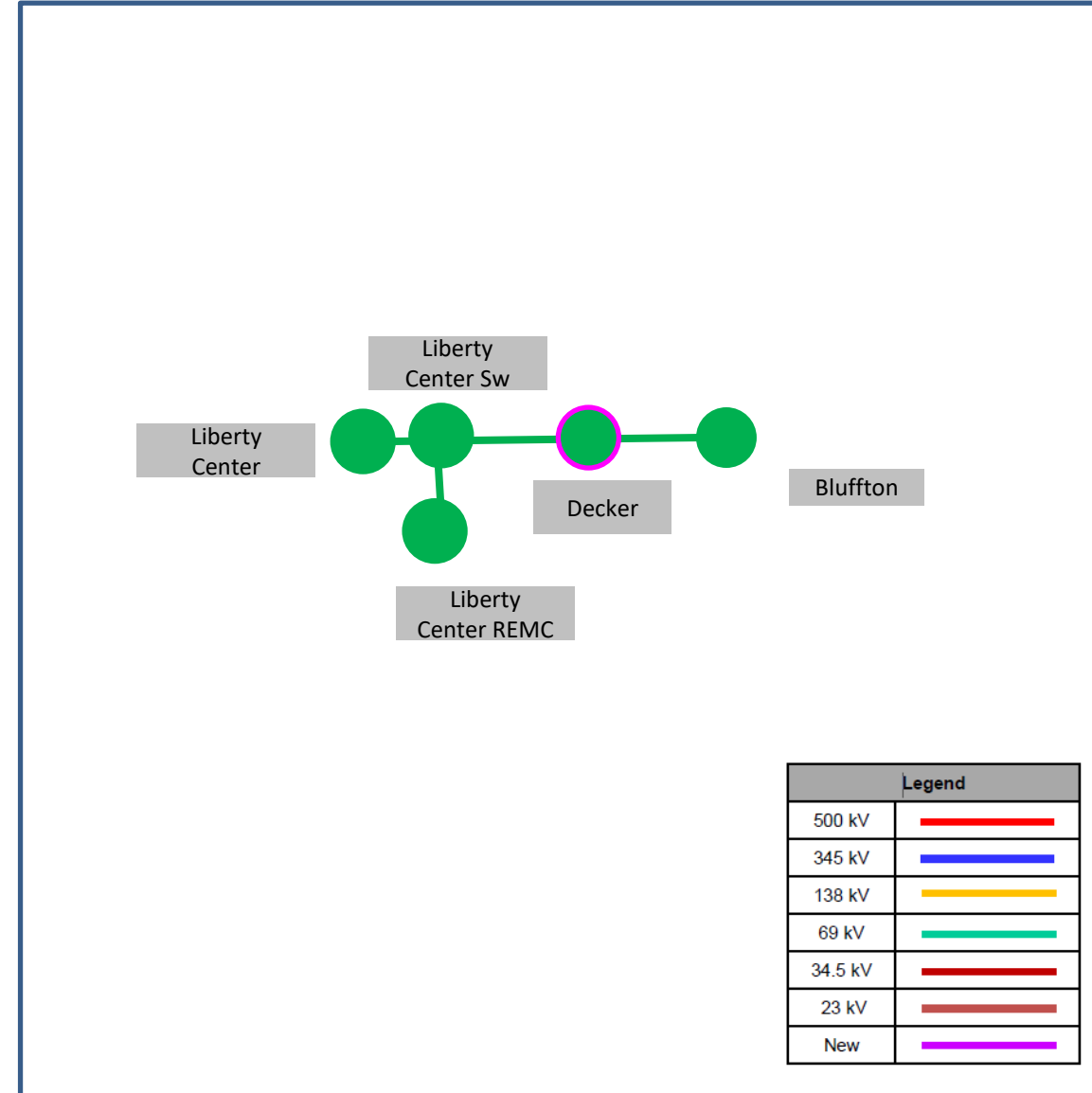
Total Estimated Cost: \$0.5 Million

Alternatives:

Considering the location and timing of the request, no viable alternates were identified.

Projected In-Service: 03/31/2022

Project Status: Scoping



AEP Transmission Zone M-3 Process Kincaid – Pax Branch

Need Number: AEP-2020-AP001

Process Stage: Solutions Meeting 9/17/2021

Previously Presented: Needs Meeting 1/17/2020

Supplemental Project Driver:

Equipment Condition/Performance/Risk, Operational Flexibility and Efficiency

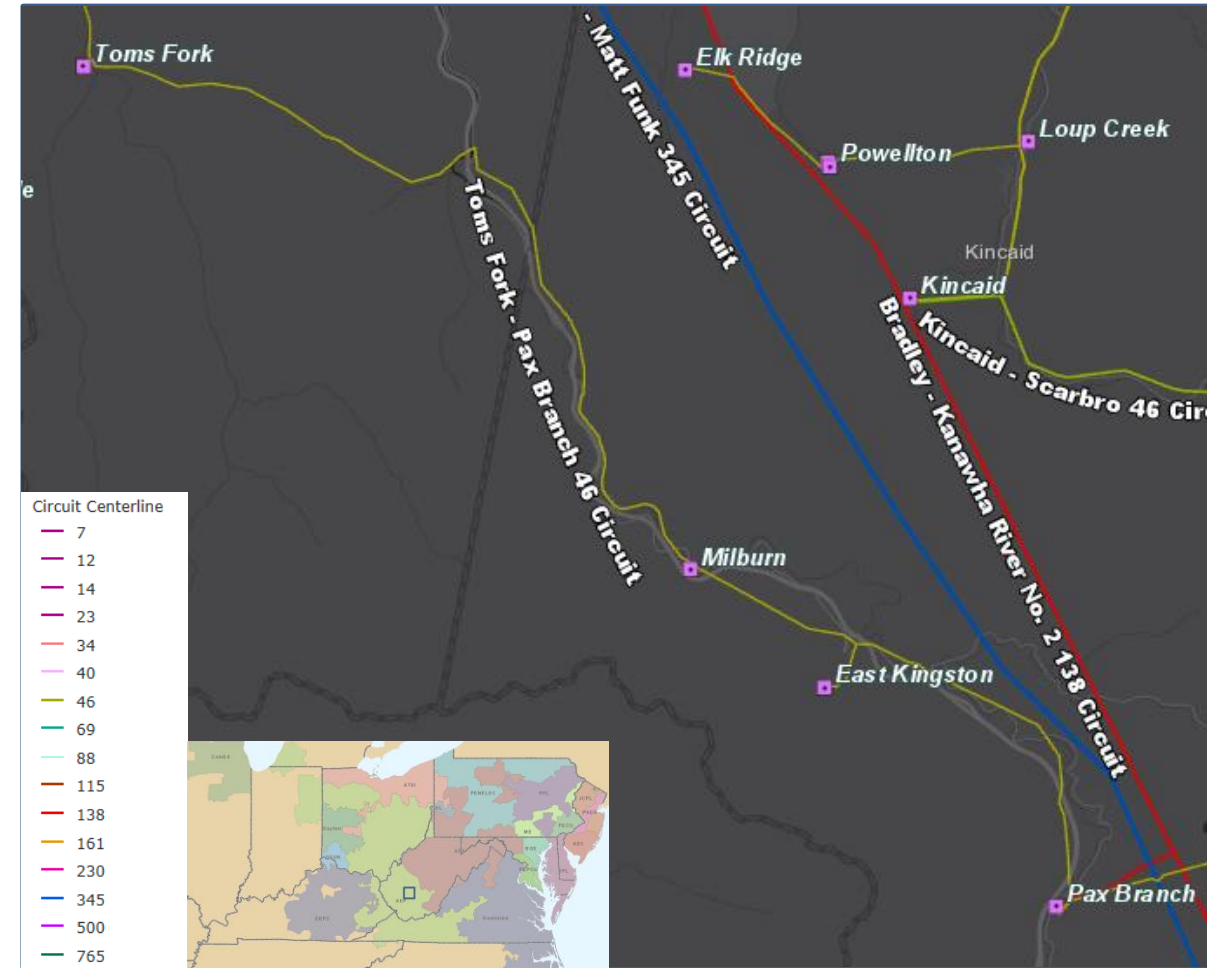
Specific Assumption Reference:

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

Problem Statement:

Pax Branch – Toms Fork 46 kV line (~17.4 miles)

- Majority of the circuit is constructed with wood structures varying in age from 49-106 years old. The circuit also contains some lattice structures that are 50 years old. 85% of the line is constructed with 1950s wood.
 - 55% of the structures on the line have conditions
 - Steel structures show evidence of corrosion on arms and braces as well as hardware rusting
 - Wood structures show evidence of rot, split, and woodpecker damage.
- The line is insulated with 4-bell porcelain insulators originally installed in 1915 and do not meet current AEP standards for CIFO and minimum leakage distance requirements
- Approximately 70% of the line conductor is from 1915.
- Static wire is 104 years old and does not comply with the current material standards.
- Since 2014, the circuit experienced 8 momentary and 27 permanent outages.



AEP Transmission Zone M-3 Process Kincaid – Pax Branch

Need Number: AEP-2020-AP001

Process Stage: Solutions Meeting 9/17/2021

Proposed Solution:

Construct approximately 3 miles of new 46 kV line from Kincaid to Westerly. Rebuild 5.4 miles of the existing Westerly – Pax Branch 46 kV line. New line to be constructed at 69 kV, operated at 46 kV. Install fiber on the new line construction for upgraded relaying communication. **Estimated Trans. Cost: \$23.1M**

Retire Toms Fork – Westerly 46 kV and Toms Fork – Str. 364-13 46 kV (approximately 24 miles total) **Estimated Trans. Cost \$8.9M**

6 wire the existing double circuit 46 kV line from Cabin Creek to Str. 364-13 to maintain the feed to Rhoda station. **Estimated Trans. Cost: \$0.2M**

Construct a new 138 kV double circuit in/out (approx. 2 miles) from Kanawha – Sundial #1 138 kV circuit to Toms Fork Station. Because of the very rugged terrain in the area, large angles and long span construction is required. These heavy angles and long spans mean minimal tangent structures could be utilized and required dead end towers for nearly every structure instead. These dead end towers are very heavy, resulting in larger equipment and steel costs, and require large foundations resulting in higher costs. **Estimated Trans. Cost: \$9.1M**

Convert Toms Fork Station to 138 kV by installing a new 138/12 kV XFR, circuit switcher and two 138 kV line switches. **Estimated Trans. Cost: \$1.5M** (Note: this estimate does not include Distribution costs for the transformer)

Replace existing switches at Westerly Station with two new 1200 A switches. **Estimated Trans. Cost: \$0.5M**

Replace existing switches at Fork Ridge/Mossy Creek with two new 1200 A switches, renamed Haystack Station. **Estimated Trans. Cost: \$0.7M**

Kincaid remote end work. **Estimated Trans. Cost: \$0.4M**

Pax Branch remote end work. **Estimated Trans. Cost: \$0.4M**

Total Estimated Transmission Cost: \$44.8M

Ancillary Benefits: This proposal allows for the retirement of an additional 7 miles of 46 kV line from Toms Fork – Cabin Creek 46 kV

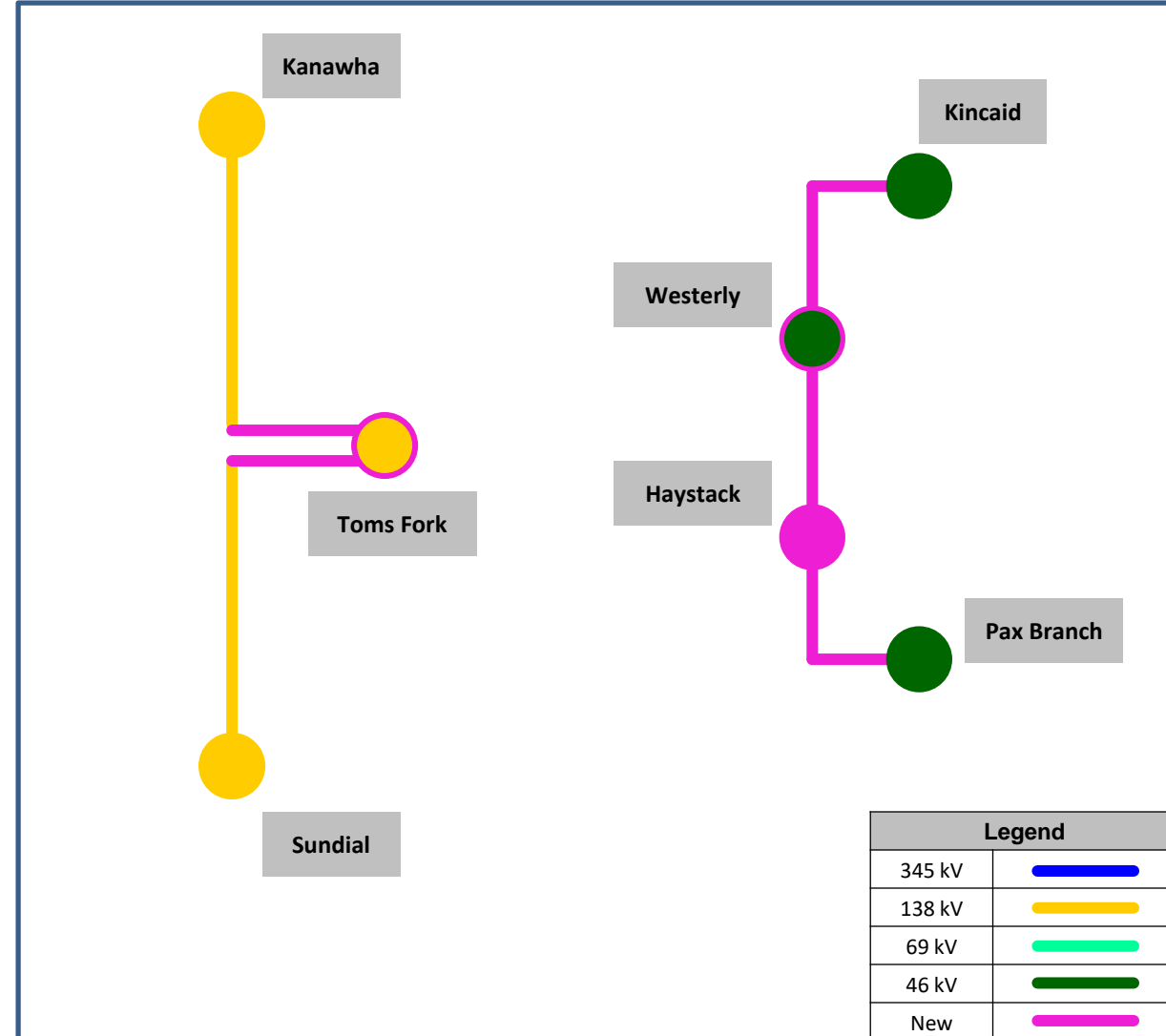
Alternatives Considered:

Rebuild the existing Toms Fork – Pax Branch 46 kV line (~17.4 miles). Replace existing switches at Westerly Station with two new 1200 A switches. Replace existing switches at Fork Ridge/Mossy Creek with new 1200 A switches. Pax Branch Remote End work required. **Estimated Trans Cost: \$55.5M**

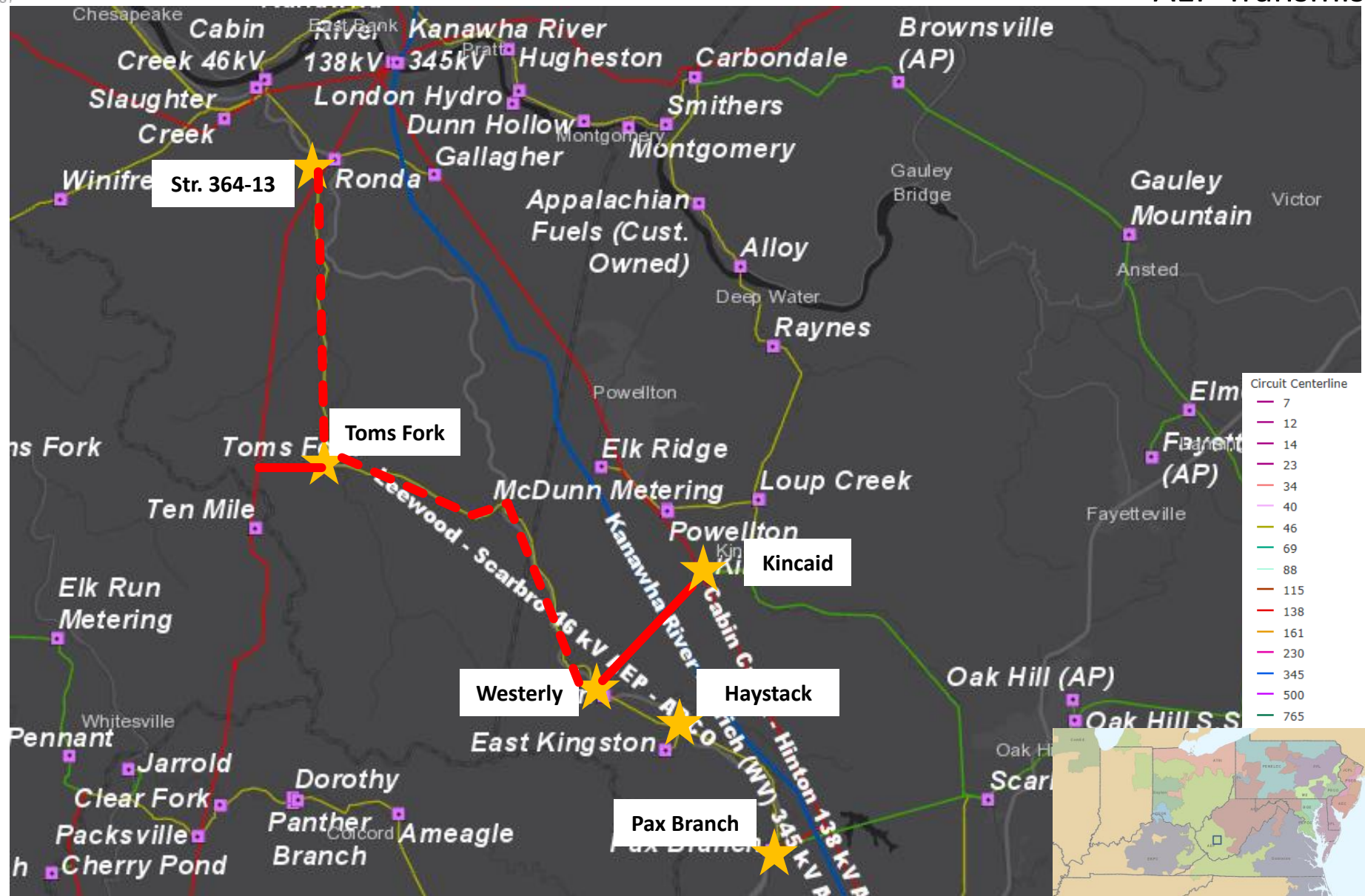
Projected In-Service: 10/7/2024

Project Status: Scoping

Model: 2026 RTEP



AEP Transmission Zone M-3 Process
Kincaid – Pax Branch



AEP Transmission Zone M-3 Process Chemical – Ward Hollow Hard Taps

Need Number: AEP-2021-AP007

Process Stage: Solutions Meeting 9/17/2021

Previously Presented: Need Meeting 3/19/2021

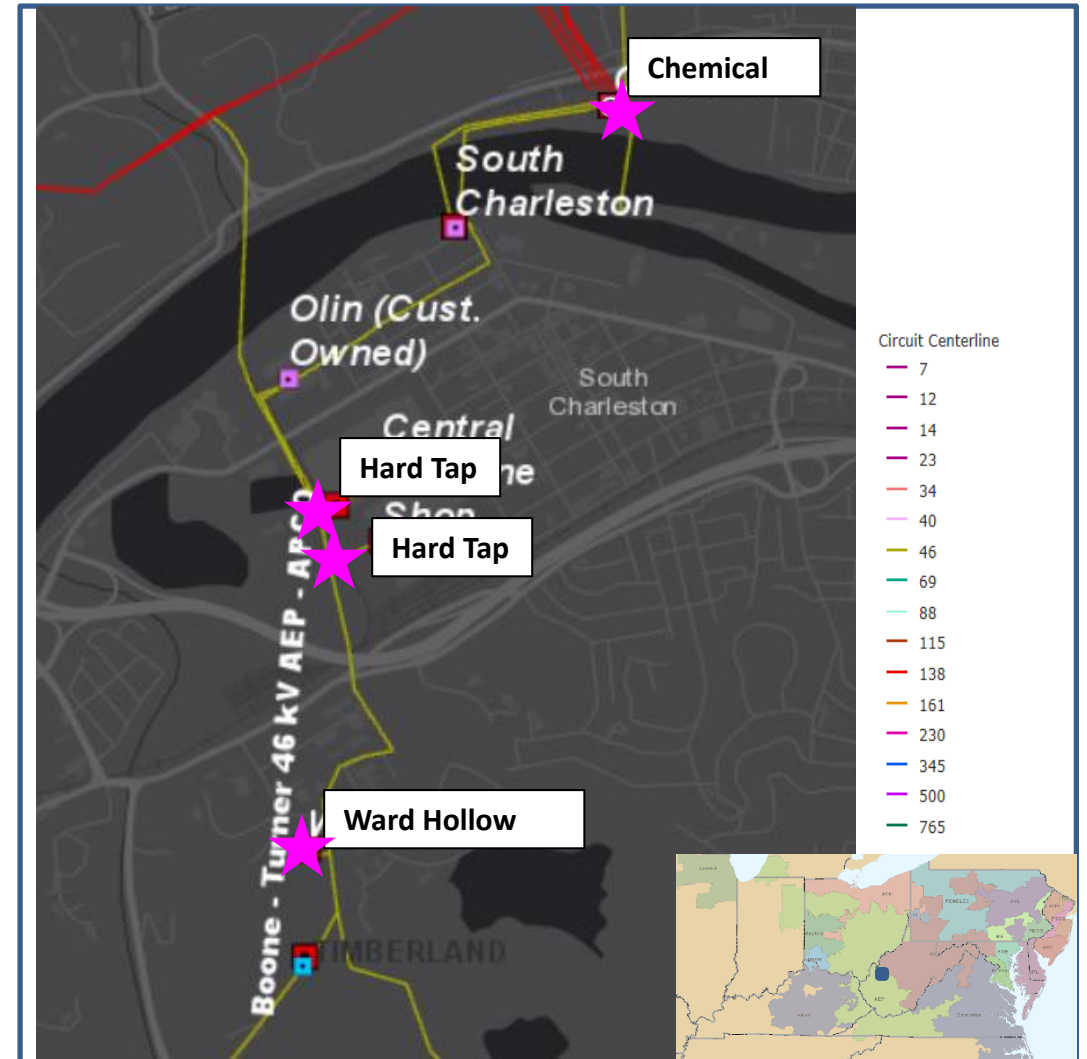
Project Driver: Operational Flexibility, Customer Service (AEP Assumptions slides 12, 14)

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

- The 3 mile Chemical – Ward Hollow 46 kV line has two delivery points that are connected via hard taps. The hard taps complicate restoration activities and extend outages.
- Customers served at the hard taps have communicated concerns regarding continuation of service due to upcoming outages scheduled for ongoing projects at Chemical (B3100, S2348), South Charleston (S2348) and Turner (S2165)



AEP Transmission Zone M-3 Process Chemical – Ward Hollow Hard Taps

Need Number: AEP-2021-AP007

Process Stage: Solutions Meeting 9/17/2021

Proposed Solution:

Replace existing hard tap at SCSM with a new 1200 A three way SCADA controlled MOAB switch **Estimated Trans Cost: \$0.7M**

Replace existing hard tap at CMS with a new 1200 A three way switch **Estimated Trans Cost: \$0.4M**

Reconfigure 0.13 mile of the Chemical – Ward Hollow line to accommodate the new switches being installed **Estimated Trans. Cost: \$1.8M**

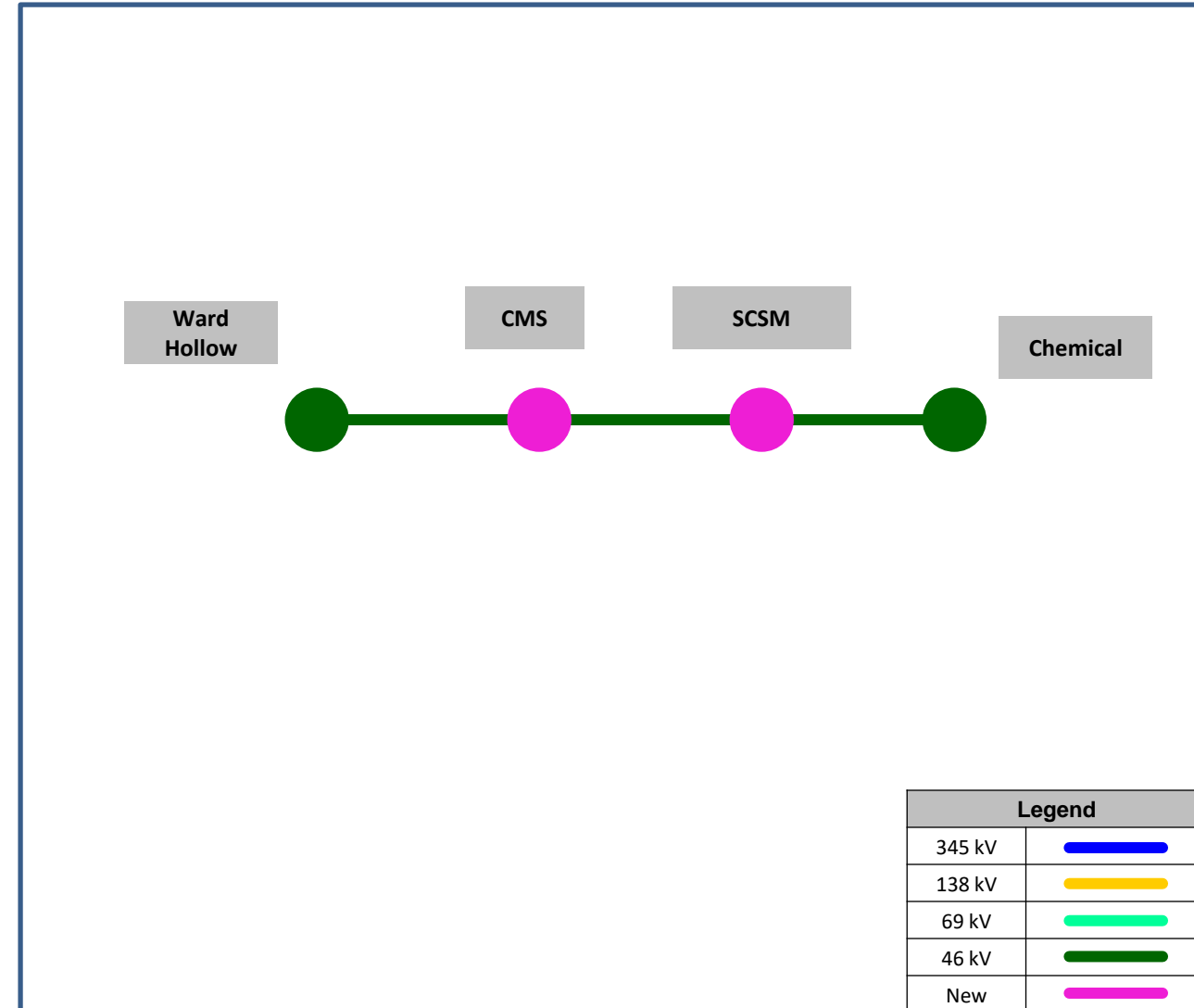
Total Estimated Trans. Cost: \$2.9M

Alternatives Considered:

1. No viable Transmission alternative. Considering the location of the line and customers served from it, retirement or relocation is not an option.

Projected In-Service: 10/7/2022

Project Status: Scoping



AEP Transmission Zone M-3 Process Christiansburg, VA

Need Number: AEP-2021-AP008

Process Stage: Solution Meeting 9/17/2021

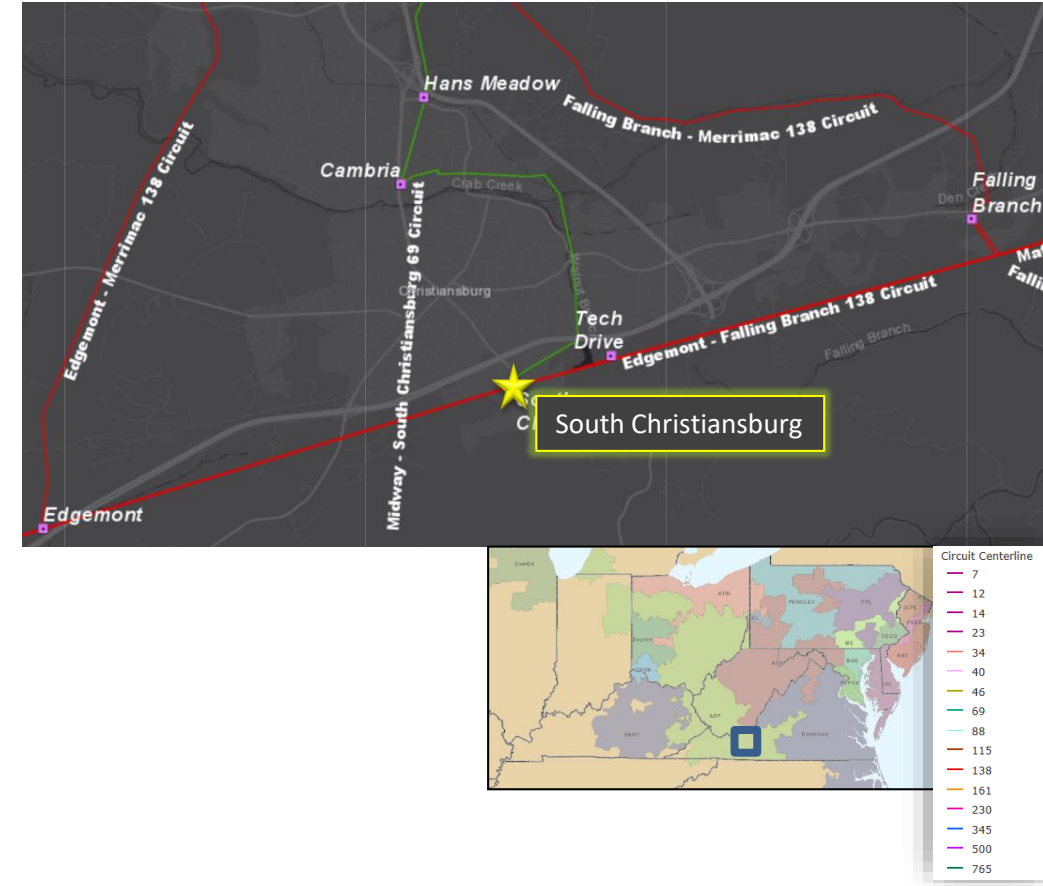
Previously Presented: Need Meeting 3/19/2021

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

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

Problem Statement:

- The 13.2 Mvar 69 kV capacitor bank at South Christiansburg station has failed.



AEP Transmission Zone: Supplemental Christiansburg, VA

Need Number: AEP-2021-AP008

Process Stage: Solutions Meeting 09/17/2021

Proposed Solution: The 13.2 Mvar 69 kV capacitor bank and circuit switcher at South Christiansburg station will be replaced with a circuit switcher and a 17.2 Mvar 69 kV capacitor bank at Hans Meadow Station. The placement of the capacitor bank at Hans Meadow will provide better support to the 69 kV network and place the capacitor bank closer to the load centers on the 69 kV circuit.

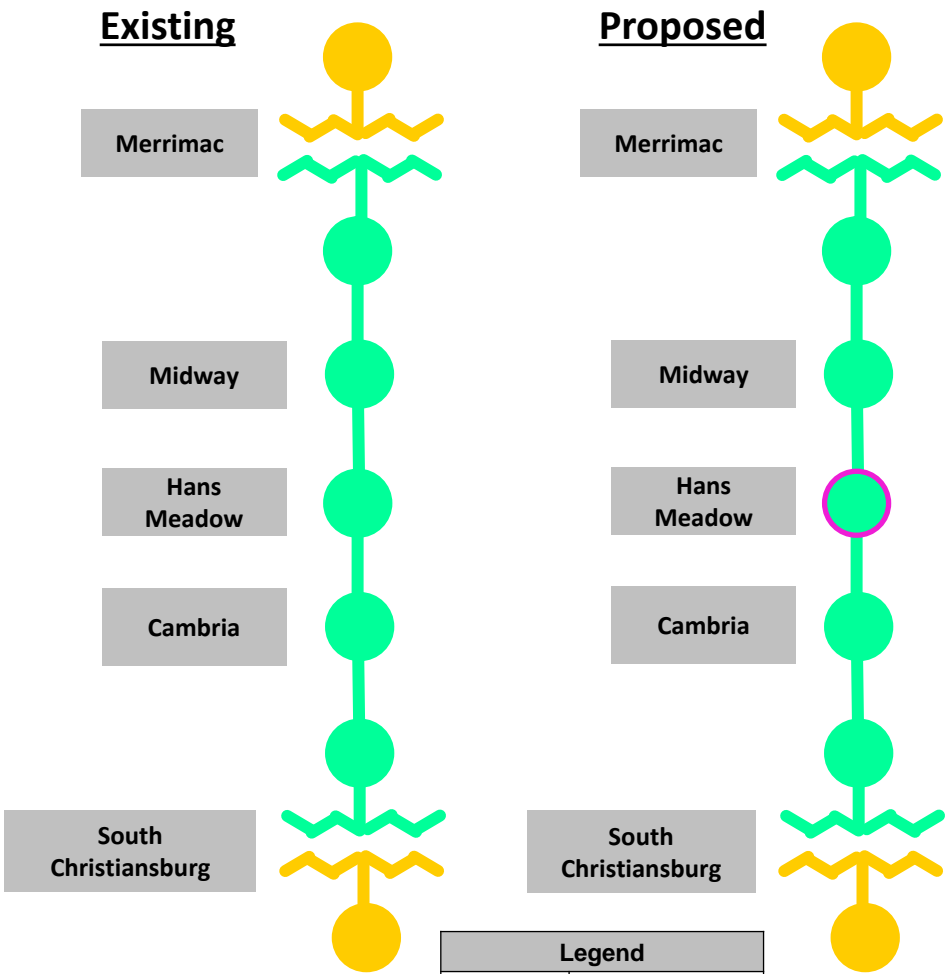
Total Estimated Transmission Cost: \$1.097M

Ancillary Benefits: N/A

Alternatives Considered: Replacing the failed capacitor bank at South Christiansburg Station, comparable cost.

Projected IS Date: 11/19/2021

Project Status: Engineering



Legend	
345 kV	
138 kV	
69 kV	
46 kV	
New	

AEP Transmission Zone M-3 Process Seneca County, Ohio

Need Number: AEP-2019-OH031

Process Stage: Solutions Meeting 9/17/2021

Previously Presented: Needs Meeting 6/17/2019

Supplemental Project Driver: Operational Flexibility, and Customer Service

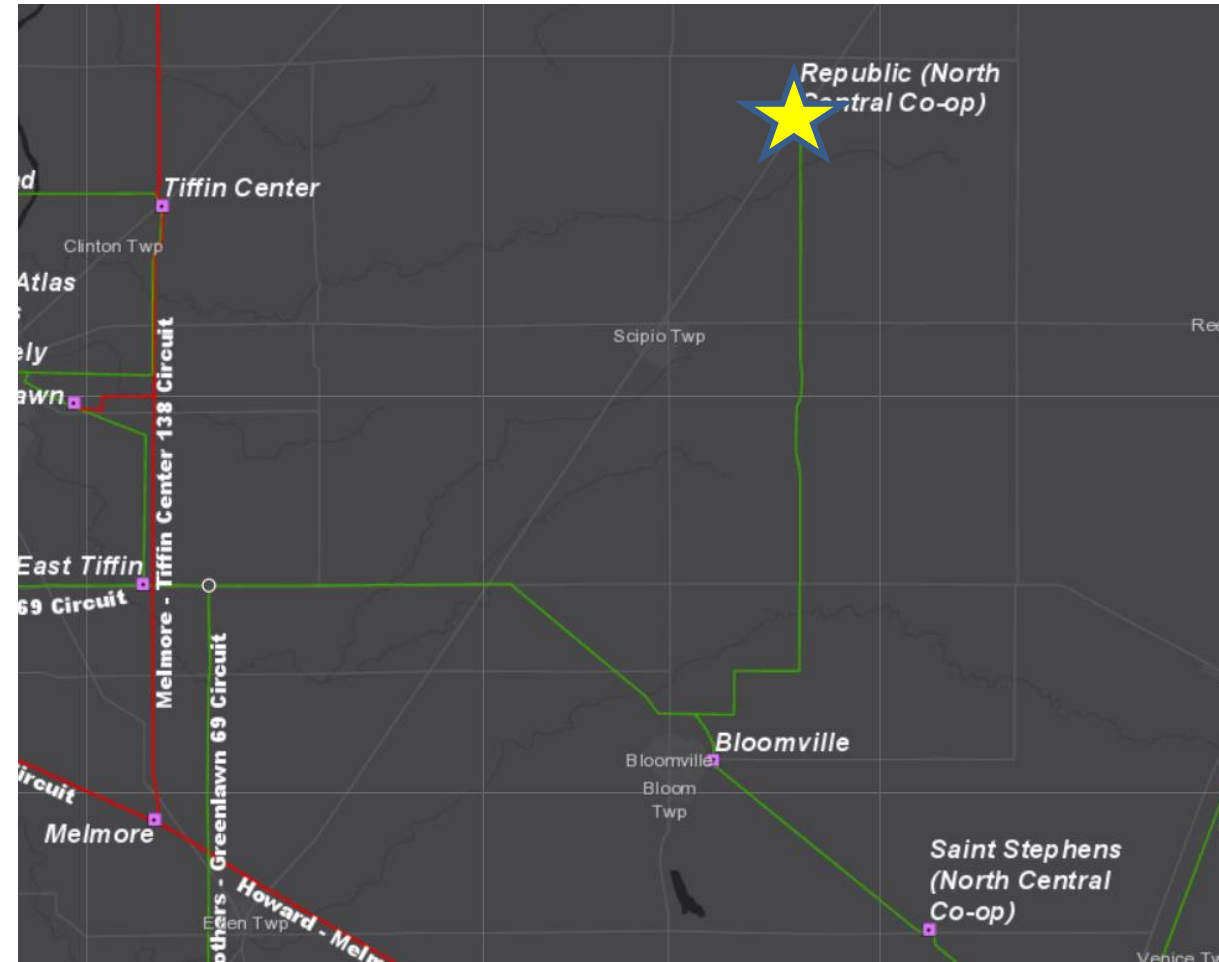
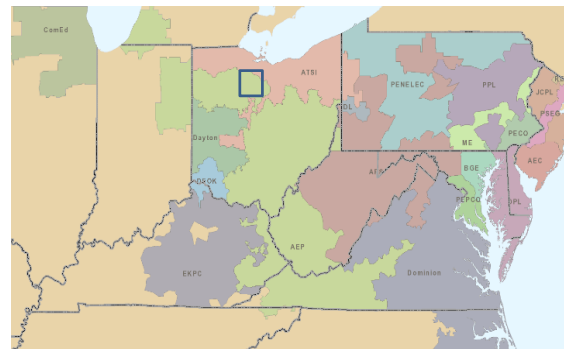
Specific Assumption Reference:

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

Problem Statement:

- North Central Cooperative has experienced below average reliability due to the radial nature of the Carrothers- Greenlawn 69kV circuit.
- **There have been 14 momentary and 8 permanent outages from 2014-2019 (CMI: 4,881,447; 9.278 MW). The radial line is 8.1 miles long.**

Model: PJM 2019 RTEP Series Cases



AEP Transmission Zone M-3 Process Seneca County, Ohio

Need Number: AEP-2019-OH031

Process Stage: Solutions Meeting 9/17/2021

Proposed Solution:

- Install a new 69 kV 3-way POP Switch (Kilbourne Sw) and 69 kV metering to serve North Central's Republic Station. **Estimated Cost: \$0.64 M**
- Construct a new 3- breaker 69kV Station in a ring configuration named Founders. **Estimated Cost: \$5.1M**
- Construct ~ 8 miles of new 69 kV line between Tiffin Center and the new Kilbourne Switch delivery point using 556 ACSR conductor. **Estimated Cost: \$11.99 M**
- Install a new 69 kV 3000A 40kA breaker and associated terminal equipment at Tiffin Center on the line towards Kilbourne switch. **Estimated Cost: \$0.7 M**
- Remove the existing Honey Creek 69 kV switch currently used to radially serve the Republic delivery point. **Estimated Cost: \$0.1 M**
- Construct ~ 0.83 miles of new 69 kV double circuit line between structure 103 on the Carrothers-Greenlawn circuit to the new Founders delivery point using 556 ACSR conductor. **Estimated Cost: \$2.4M**

Total Estimated Transmission Cost: \$20.93 M

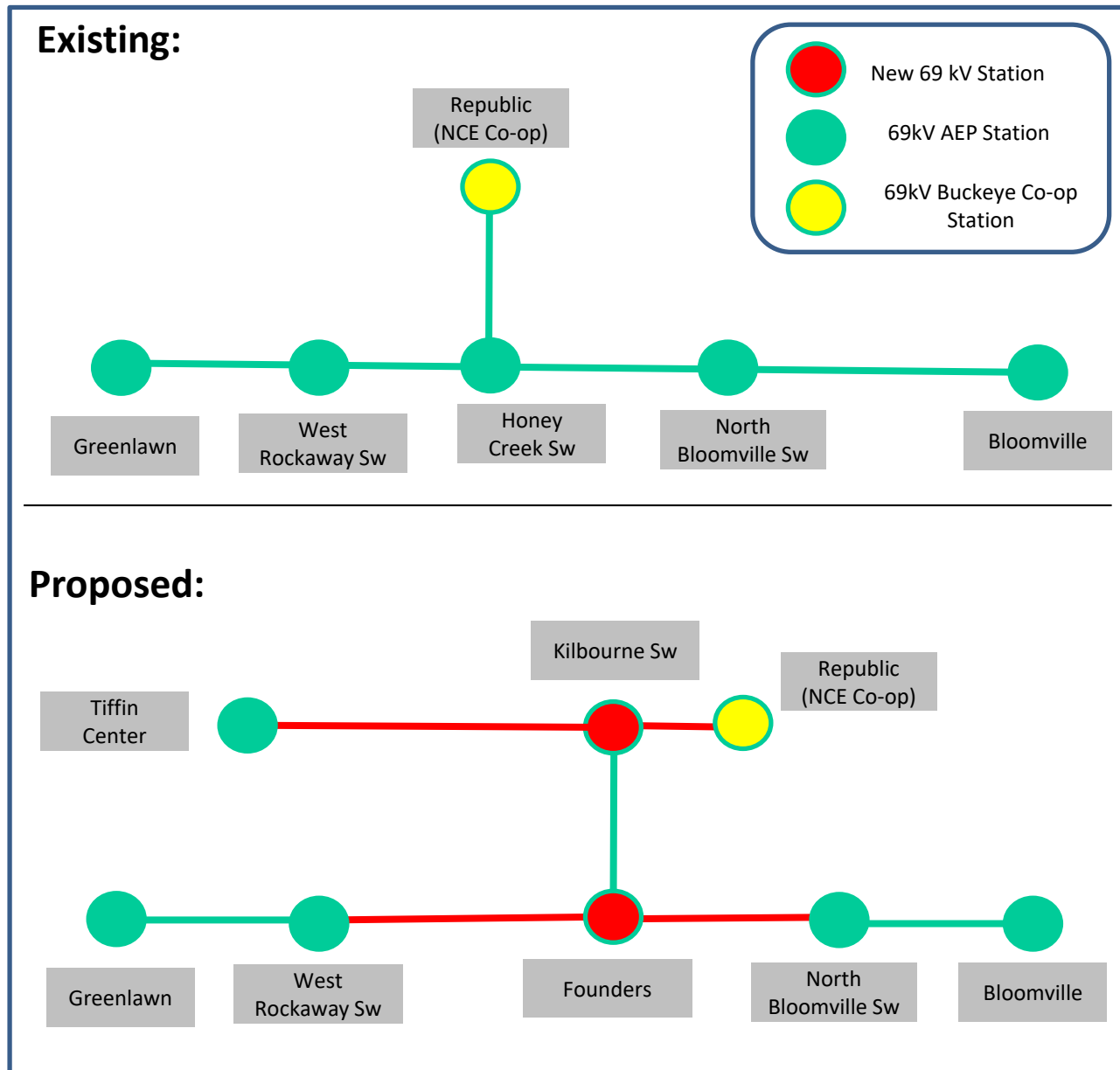
Ancillary Benefits:

Provides the Republic radial line looped transmission service to reduce the number of outages. **Alternatives Considered:**

Construct a new 6.5 mile greenfield line from Republic to a new delivery point on the Carrothers-Greenlawn 69kV circuit. This alternative would then allow for looped service to the Republic radial with a shorter greenfield build. However, this alternative was not chosen due to outage concerns with both ends of the feed to Republic residing on the same Carrothers- Greenlawn circuit which could result in more frequent outages to the customer rather than being fed from two independent lines.

Projected In-Service: 9/1/2024

Project Status: Engineering



AEP Transmission Zone M-3 Process Robyville Station Upgrade

Need Number: AEP-2020-OH007

Process Stage: Solutions Meeting 9/17/2021

Previously Presented: Needs Meeting 2/21/2020

Supplemental Project Driver:

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

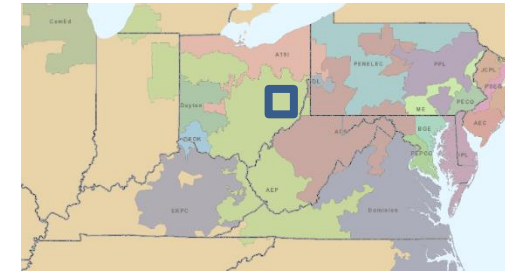
Specific Assumption Reference:

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

Problem Statement:

Equipment Material Condition, Performance and Risk:

- The Robyville 69-12kV substation is in poor condition. The 69kV breaker ‘C’ is an oil-filled unit from 1965, has experienced 143 fault operations (manufacturer recommends 10), and has mechanical problems on the breaker’s open/close mechanism.
- The station consists of deteriorating wooden 69kV & 12kV station structures. Foundations for the 2- transformers and voltage regulator are of wooden rail road tie construction. The station fence and retaining wall are in very poor condition. The two distribution transformers date to 1941 & 1947; both are showing signs of thermal degradation (due to past electrical faults), high carbon-monoxide levels (due to excessive heating), contaminated oil, and hot spots.
- The small control house dates to the 1940’s. Of the 16 relays, 12 are original electromechanical models, which lack modern fault recording, no SCADA functionality, and have limited spare part availability.



AEP Transmission Zone M-3 Process Robyville Station Upgrade

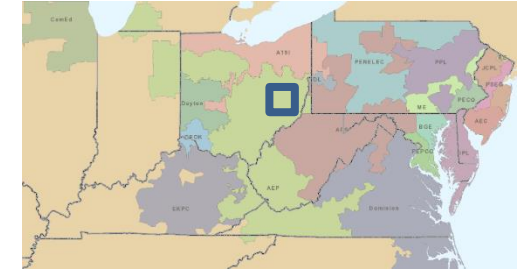
Need Number: AEP-2020-OH007

Process Stage: Solutions Meeting 9/17/2021

Previously Presented: Needs Meeting 2/21/2020

Operational Flexibility & Efficiency:

- Robyville Station contains dissimilar zones (2-lines, bus, and transformer) of protection that cause misoperations and over tripping.
- The distribution transformers at Robyville are in parallel (1.5 MVA each) and lack a high-side protective device. A fault on either transformer or the low-side 12kV bus will take out both 69-12kV transformers and an outage 1,000+ customers served from this station.
- In the past 5 years, the Dillonvale-Robyville-South Cadiz 69kV circuit has experienced 10 momentary outages and 2 sustained outages. Distribution customers served from Robyville have experienced a CMI (customer-minutes-of-interruption) total of 610,598.
- South Cadiz 69 kV breaker D is an oil-filled unit from 1965, with 34 fault operations; it exhibits signs of mechanical degradation.
- Dillonvale 69 kV breaker B is an oil-filled unit from 1952, with 35 fault operations.



AEP Transmission Zone M-3 Process Robyville Station Upgrade

Need Number: AEP-2020-OH007

Process Stage: Solutions Meeting 9/17/2021

Proposed Solution:

Construct a new 69-12kV station (“Ruby”) 0.2-mile to the east of Robyville, on new property. The station will have a 4-breaker 69kV ring bus, with 3- 69kV circuit connections and serving one AEP Ohio distribution transformer. **Estimated Cost: \$6.2M**

At the 69kV remote-end of South Cadiz: Replace 69kV circuit breaker D, line relays to Ruby, and 69kV bus protection; expand control building. **Estimated Cost: \$1.3M**

At the 69kV remote-end of Dillonvale: Replace 69kV circuit breaker B, line relays to Ruby, and 69kV bus protection. **Estimated Cost: \$0.8M**

Re-route the three 69kV transmission lines near Robyville to extend to the new Ruby station: **Estimated Cost: \$1.8M**

Remove the former DTE Coal 69kV switch just south of South Cadiz station. **Estimated Cost: \$0.04M**

Retire the existing Robyville station and remove all equipment. **Estimated Cost: \$0.4M**

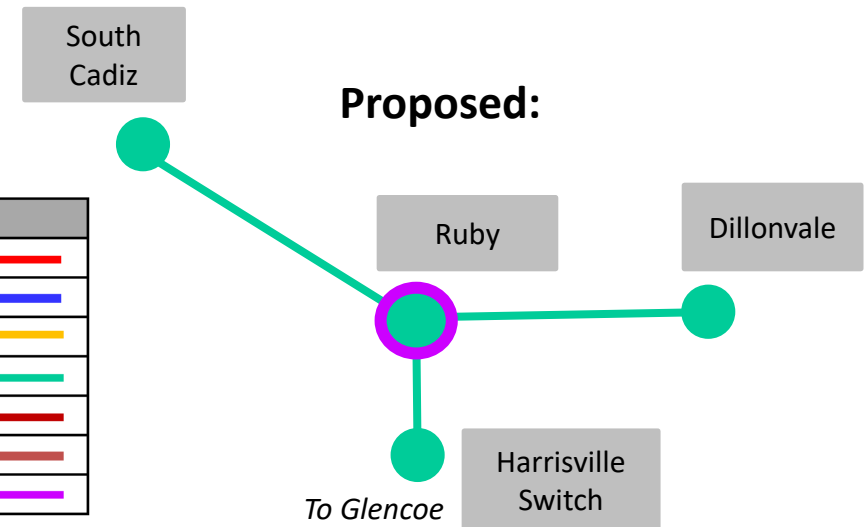
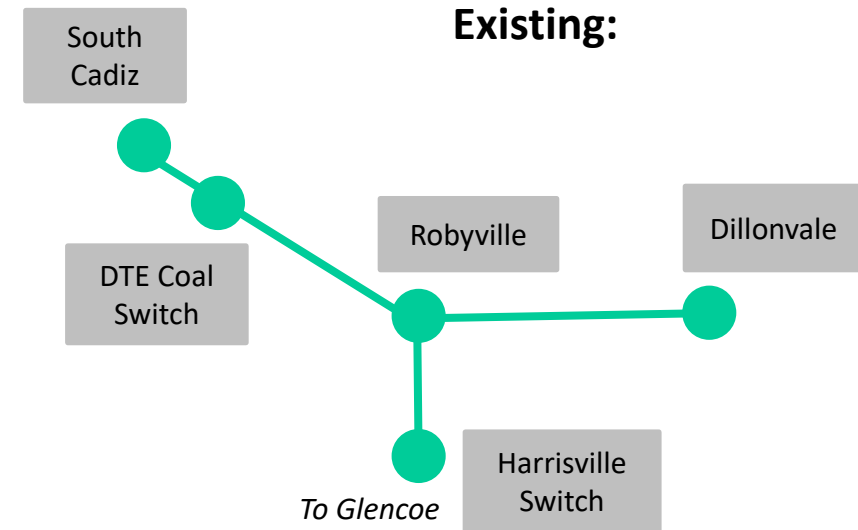
Total Estimated Transmission Cost: \$10.54 Million

Alternatives Considered:

No viable alternative identified due to severe limitations in the existing station. The station retaining wall is deteriorating and the control building is in poor shape. The wooden station bay structures and railroad tie transformer foundations are in poor condition. Installing 2-additional 69kV breakers, replacing 1- 69kV breaker, replacing the distribution transformer, and adding a new control house is not possible at the existing station. The station can’t be eliminated due to being a hub on the local 69kV system, along with serving distribution customers.

Projected In-Service Date: 11/1/2023

Project Status: Scoping



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

AEP Transmission Zone M-3 Process Whitehall, OH

Need Number: AEP-2020-OH016

Process Stage: Solutions Meeting 09/17/2021

Previously Presented: Need Meeting 03/19/2020

Supplemental Project Driver: Customer Service

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

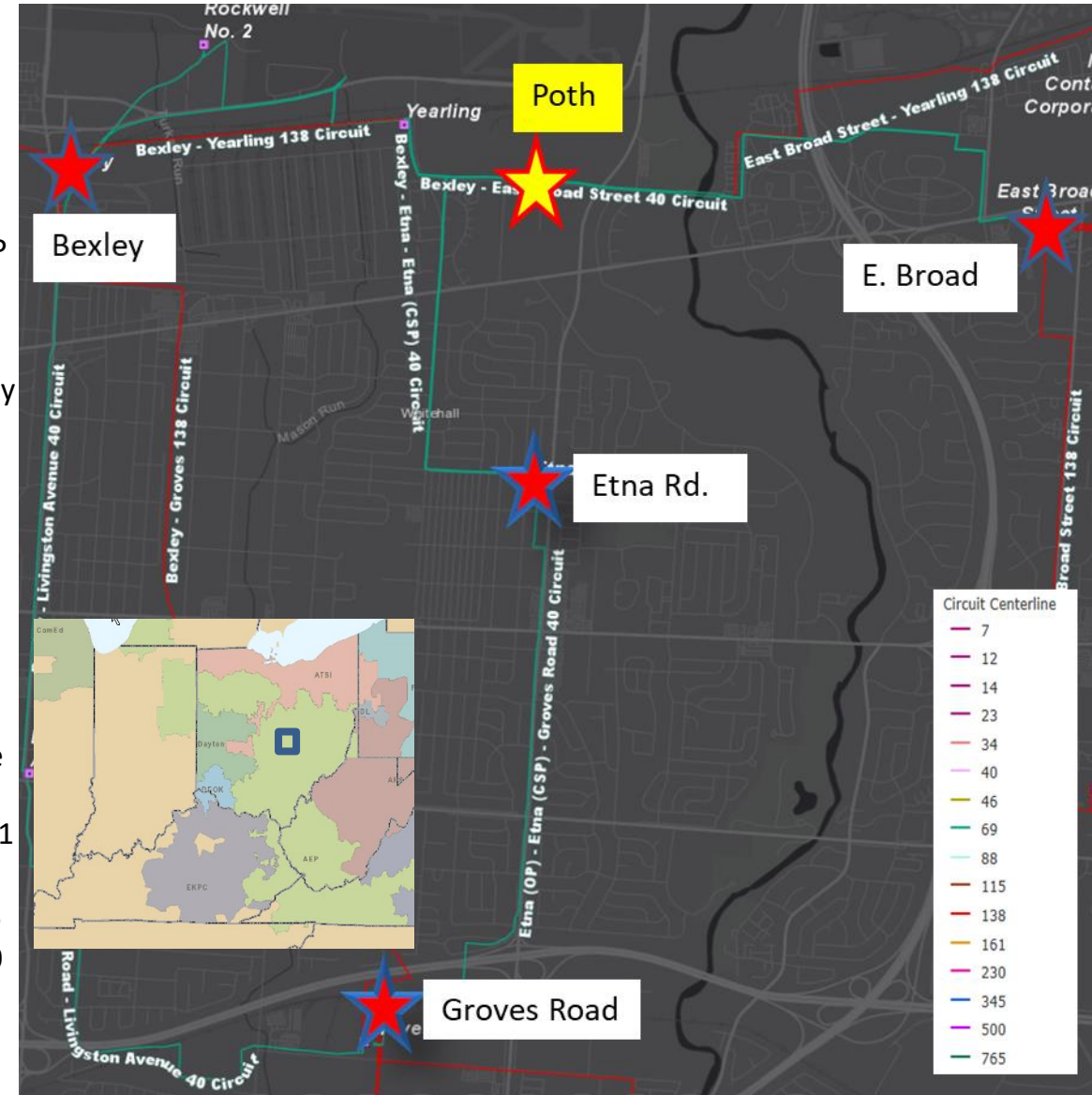
Problem Statement:

AEP Ohio has requested a new 138kV delivery point (Poth) off the East Broad Street - Bexley 138kV circuit by December 2022.

At Etna Road station, 101/102 of the relays are electro-mechanical that are no longer supported by the manufacturer, lack SCADA ability, and lack fault collection. 46 kV CB's 30, 31, 32, 33, 34, and 36 (vintage 1955) are oil type breakers, with some have a high number of fault operations, and are an obsolete kV. Over the last 5 years we have had 402,323 CMI and three outages.

Etna-Groves Road 40 kV line is a majority 1960's vintage (70%) wood pole line with the remainder being built since 1990. The conductor is the original 636 ACSR from 1965. There are a total of 56 open conditions on this line with 51% (42/82) of the poles having at least one condition. These conditions include rot top poles and cross arms, woodpecker damage, broken/missing ground leads, and damaged guy wires. Over the last 5 years there have been 1 momentary and 3 permanent outages on this line.

Etna Tap 40 kV extension (part of the Etna – Bexley circuit) is a vintage 1957 (57%) with the remainder between 1970 (8%), 1980 (5%), 1990 (5%), and 2010 (22%). There are currently 30 open conditions with 28% (22/80) of poles having at least one condition. These conditions include rot top poles and cross arms, woodpecker damage, broken/missing ground leads, and damaged guy wires. Over the last 5 years there have been 4 momentary and 2 permanent outages.



Need Number: AEP-2020-OH016

Process Stage: Solutions Meeting 09/17/2021

Proposed Solution:

- **Poth 138 kV Station:** Construct a greenfield station 138kV ring bus with (4) 3000A 63kA 138kV breakers and two 138/13 kV transformers to replace the existing 40 kV station. **Estimated Cost: \$4.19M**
- **East Broad 138 kV Station:** Replace CB 3 & CB 7 and 4 disconnect switches with 3000A 63kA 138kV breakers and 4-3000A disconnect switches and install new relaying to coordinate with the new relays at Poth station. **Estimated Cost: \$0.793M**
- **Yearling 138 kV Station:** Remote end relay settings. **Estimated Cost: \$0.064M**
- **Poth Extension 138 kV:** Tap the existing East Broad-Bexley 138kV line into Poth station by constructing approximately 0.5 miles of greenfield lines from the line taps. Extend telecom ADSS for relaying and communication from Bexley to Poth & East Broad to Poth. **Estimated Cost: \$3.06M**

Total Estimated Cost: \$8.107M

Ancillary Benefits: The existing CB-3 at East Broad Station is an oil filled breaker has experienced 13 Fault Ops & the CB-7 is also an oil filled breaker with 15 Fault Ops. Furthermore, the oil filled breakers have more maintenance required due to oil handling. Therefore, along with replacing the remote end relays required for relay coordination, the circuit breakers will be replaced with this project to best align outages in the area. The remaining East Broad needs are presented as AEP-2021-OH045.

Alternatives Considered: Complete rebuild of Etna Rd 40/13.2kV Station and purchase a new spare transformer. Rebuild the East Broad – Etna Rd – Groves Rd 40kV line and the East Broad – Etna Rd – Bexley 40kV line. This option would be more expensive overall. Transfer options would remain a constraint, and loading of the 138/40/13.2kV transformers at East Broad, Bexley, and Groves Station will be limited.

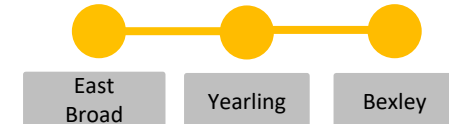
Projected In-Service: 12/18/2023

Project Status: Scoping

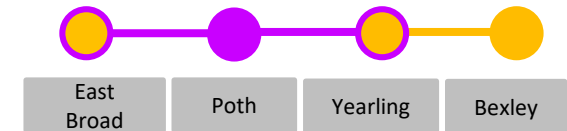
Bubble Diagram

Existing:

Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
40kV	
New	



Proposed:



Need Number: AEP-2020-OH051

Process Stage: Solution Meeting 9/17/2021

Previously Presented: Need Meeting 3/19/2020

Supplemental Project Driver:

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

Specific Assumption Reference:

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

Problem Statement:

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



Need Number: AEP-2020-OH051

Process Stage: Solution Meeting 9/17/2021

Proposed Solution:

At West Dover station, install 4- 138kV breakers in a ring bus arrangement. Install 1- 69kV breaker on the low-side of the 138-69kV transformer. Remove the existing control building and install a new prefabricated drop-in-control-module (DICM). Upgrade the 69kV circuit protection to Sugarcreek, replacing electromechanical relays with new fiber-based protection. Various improvements to the station site, including new fencing, grading, and station service. **Estimated Cost: \$7.03M**

Re-terminate the 3- 138kV transmission lines at West Dover to connect to the new ring bus layout. The Sugarcreek 138kV tap will be re-routed slightly. **Estimated Cost: \$0.77M**

Remote-end 69kV protection upgrades at Sugarcreek station, to coordinate with the West Dover upgrades. **Estimated Cost: \$0.51M**








Total Estimated Transmission Cost: \$8.31M

Alternatives Considered:

Complete the proposed West Dover station upgrade, but on the 138kV side, install a 138kV straight bus with 4- 138kV breakers. This is not preferred compared to a ring bus design, since any breaker maintenance would interrupt the 138kV through-path; plus it would require dropping the radial Sugarcreek 138kV station and installing a mobile to pick up the distribution load there. In addition, this option would be more challenging from a construction and outage-scheduling standpoint. Alternative cost: \$7.8 Million

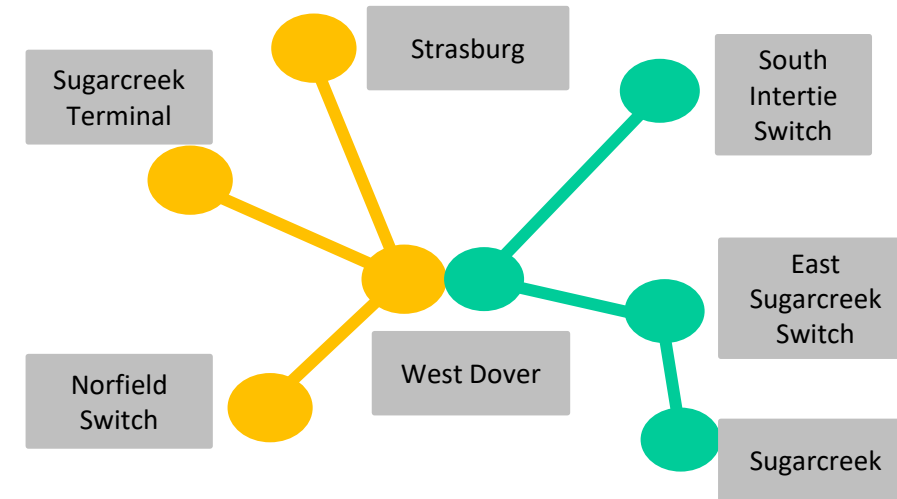
Projected In-Service: 12/1/2023

Project Status: Scoping

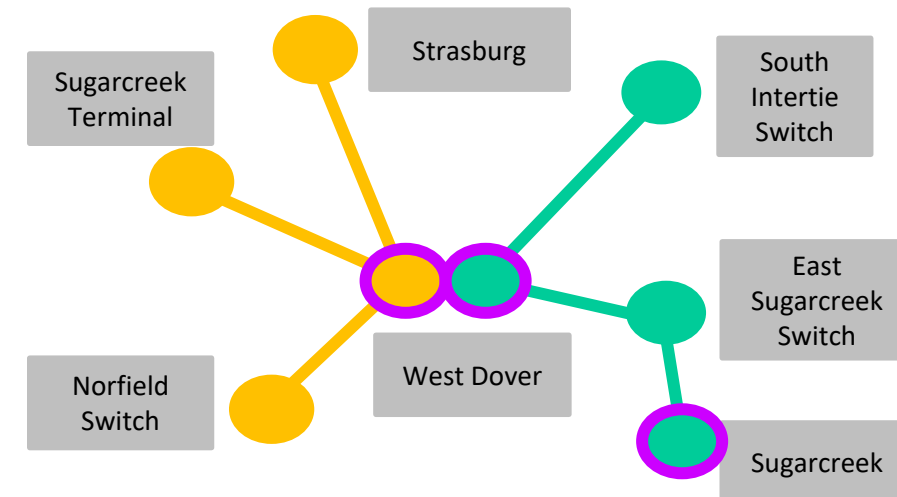
Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

AEP Transmission Zone M-3 Process West Dover Station Upgrade

Existing:



Proposed:



AEP Transmission Zone M-3 Process Holmesville, Ohio

Need Number: AEP-2021-OH012

Process Stage: Solutions Meeting 9/17/2021

Previously Presented: Needs Meeting 3/19/2021

Supplemental Project Driver: Customer Service

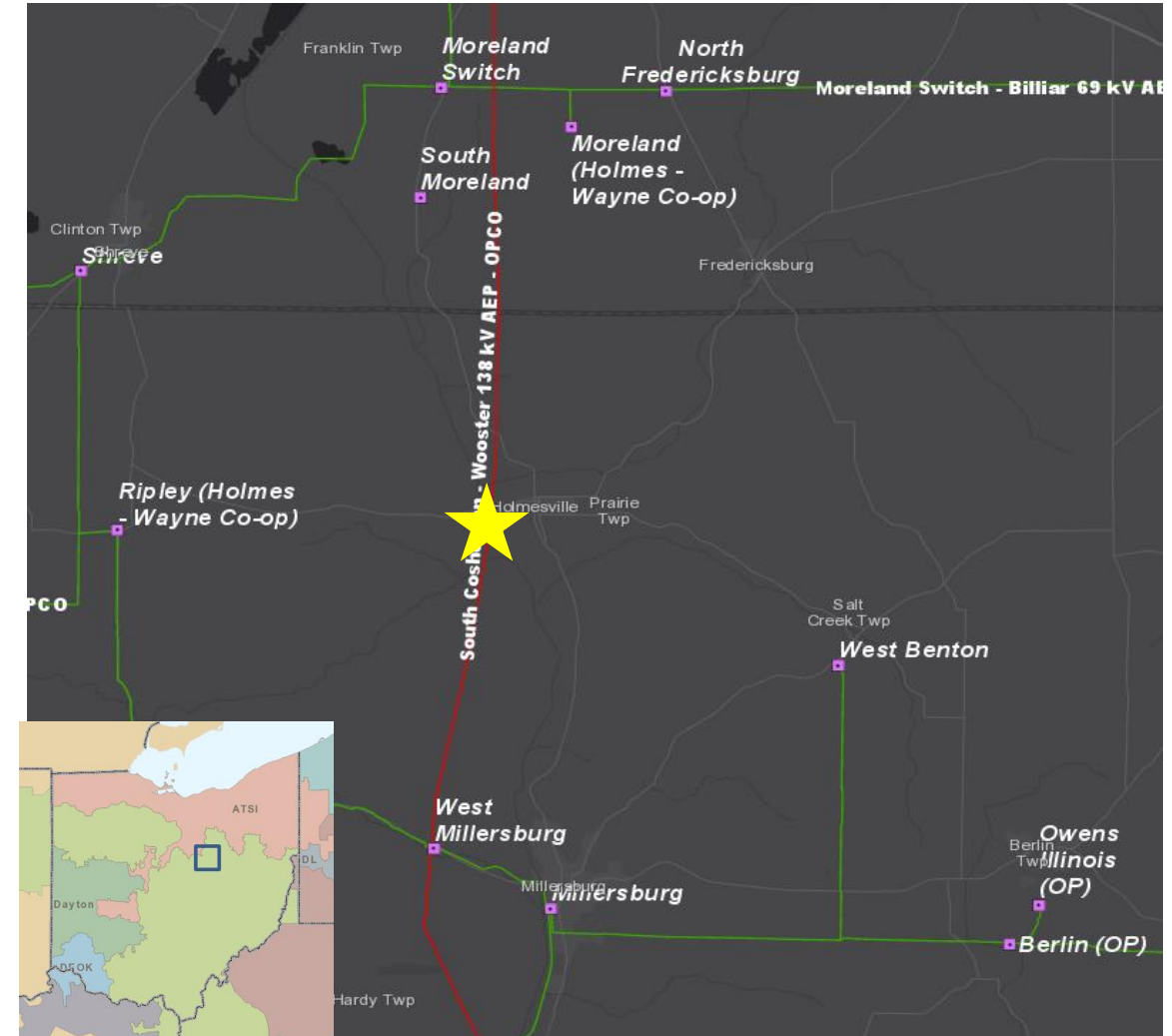
Specific Assumption Reference:

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

Problem Statement:

- Buckeye Power is requesting on behalf of Holmes- Wayne Electric co-op for a new 138kV delivery point on the West Millersburg- Wooster 138kV Circuit by August 2023. Anticipated load is 4.4 MW.

Model: PJM 2025 RTEP Series Cases



Need Number: AEP-2021-OH012 snap

Process Stage: Solutions Meeting 9/17/2021

Proposed Solution:

- Reconfiguring the existing West Millersburg – Wooster 138kV circuit to add in Salt Creek Switch. **\$0.2 M**
- Install a new 138kV three- way phase over phase switch named Salt Creek Switch. **\$0.87 M**
- Construct ~ 0.75 miles of new 138 kV line between Salt Creek Switch and Holmesville delivery point using 556 ACSR conductor. **\$1.4 M**
- Install new customer metering at Holmesville for Holmes Wayne Cooperative. **\$0.009 M**

Cost estimate: \$2.48 M

Ancillary Benefits:

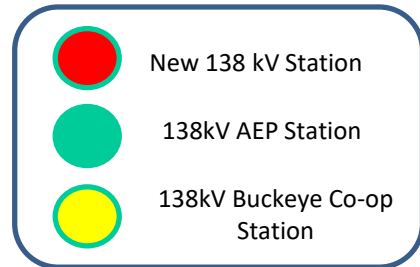
Provides Holmes- Wayne Electric Cooperative the ability to have supplementary service to the growing community and load demands as well as help to aid the loads currently served out of the Moreland delivery point.

Alternatives Considered:

N/A

Projected In-Service: 7/31/2023

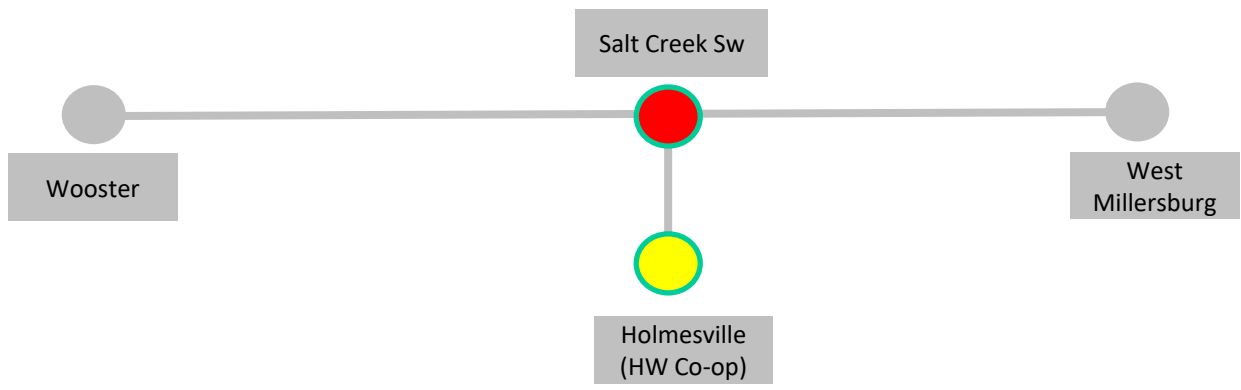
Project Status: Engineering



Existing:



Proposed:



Appendix

High Level M-3 Meeting Schedule

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

Revision History

9/8/2021 – V1 – Original version posted to pjm.com

9/17/2021 – V2 – Slide #36, Corrected the typo “Salt Fork” to “Salt Creek”

12/2/2021 – V3 – Slide #27, Corrected the total estimated cost from “\$21.7M” to “\$20.93M”

11/4/2022 – V4 – Slide #5 and 6, Split the need AEP–2021–IM028 into AEP–2021–IM028 and AEP–2021–IM039,

Changes are highlighted in the slides

11/10/2022 – V5 – Slide #6, Corrected typos in the need date