Sub Regional RTEP Committee: Western
AEP Supplemental Projects

July 16, 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
Danville, VA

Need Number: AEP-2021-AP027

Process Stage: Needs Meeting 7/16/2021

Supplemental Project Driver: Customer Service

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

Problem Statement:

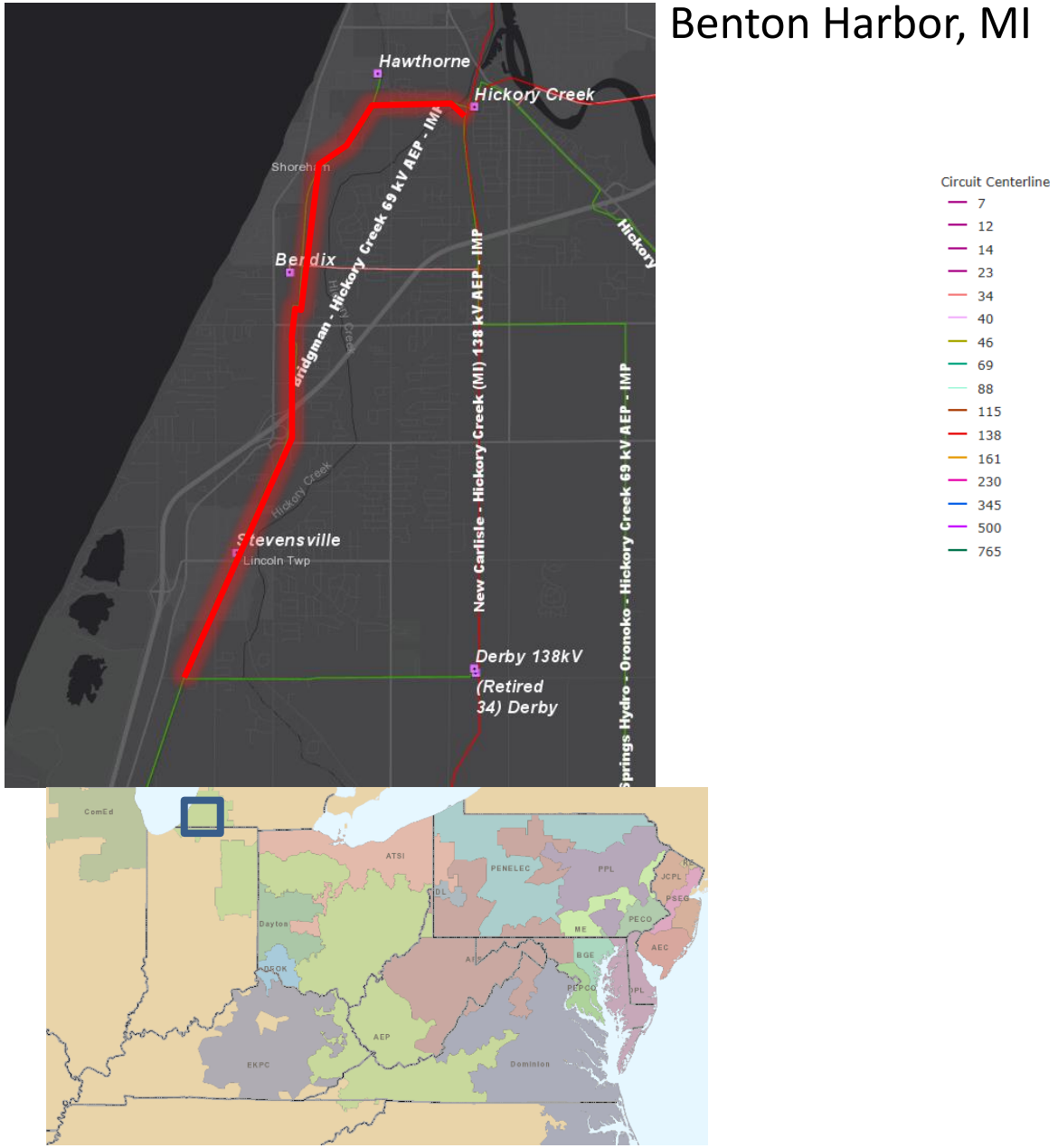
- The City of Danville has requested a new delivery point to feed their West Fork station. The new delivery point will support the City's networked 69 kV system.

AEP Transmission Zone M-3 Process
Benton Harbor, MI

Need Number: AEP-2021-IM017
Process Stage: 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)
Model: N/A
Problem Statement:

Derby – Hickory Creek 69kV line:

- ~6.2 miles of 1965 336.4 ACSR wood line exist on this line.
- Structures fail NESC Grade B, AEP Strength requirements, and ASCE structural strength standards
- Since 2015 there have been 13 momentary outages and 1 permanent outage on this circuit
- 13 structures were inspected by drone with 10 assessed by ground crew
    - 8 have flashed insulators
    - 7 had wood decay
    - 54% of poles inspected by ground crew had beyond normal decay.
- 24 structures have open conditions on this line including burnt insulators, broken/rust guys and corroded shield wires



AEP Transmission Zone M-3 Process
Benton Harbor, Mi

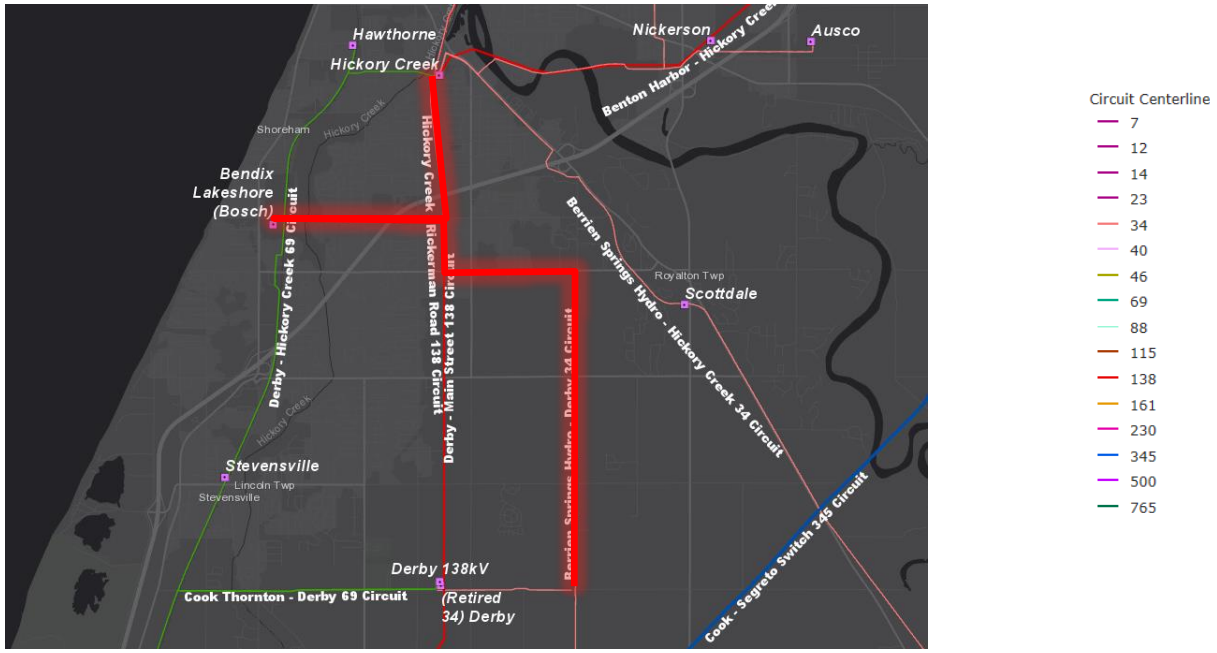
Need Number: AEP-2021-IM018
Process Stage: Needs Meeting 7/16/2021
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Model: N/A
Problem Statement:

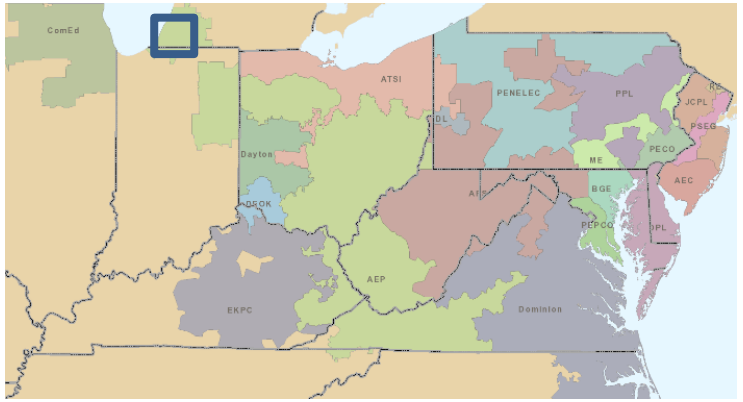
Derby – Hickory Creek 34.5kV line (6.16 miles):

- Majority structures are 1957 wood pole crossarm style.
- Conductor is original 1957 4/0 Copper conductor
- Insulation is legacy cap and pin style insulation
- Structures fail NESC Grade B, AEP Strength requirements, ASCE structural strength standards, Insulation standards minimum leakage distance and shielding angle.
- 24 were assessed by drone with 18 assessed by ground crew.
    - 50% of crossarms had ground or shell decay
    - 15/24 drone inspected poles had moderate decay or splitting arms
    - Most insulators and attachment hardware was corroded
- Currently there are 82 structures with open conditions on this segment including rot, corrosion, splitting, twisting and bowing on the poles and corssarms.

Bendix Lakeshore 34.5kV Tap (1.73 miles):

- Majority structures are 1952 wood pole crossarm style.
- Conductor is original 1952 4/0 ACSR
- Structures fail NESC Grade B, AEP Strength requirements, ASCE structural strength standards, Insulation standards minimum leakage distance and shielding angle.
- All structures were assessed by drone with 10 assessed by ground crew.
    - 25% of crossarms had decay
    - All structures had moderate levels of decay
    - Several crossarms had insect damage
- Currently there are 11 structures with open conditions on this segment including rot, cracked wood, and woodpecker damage.
- Line is a radial line which is difficult to maintain due to outage constraints.



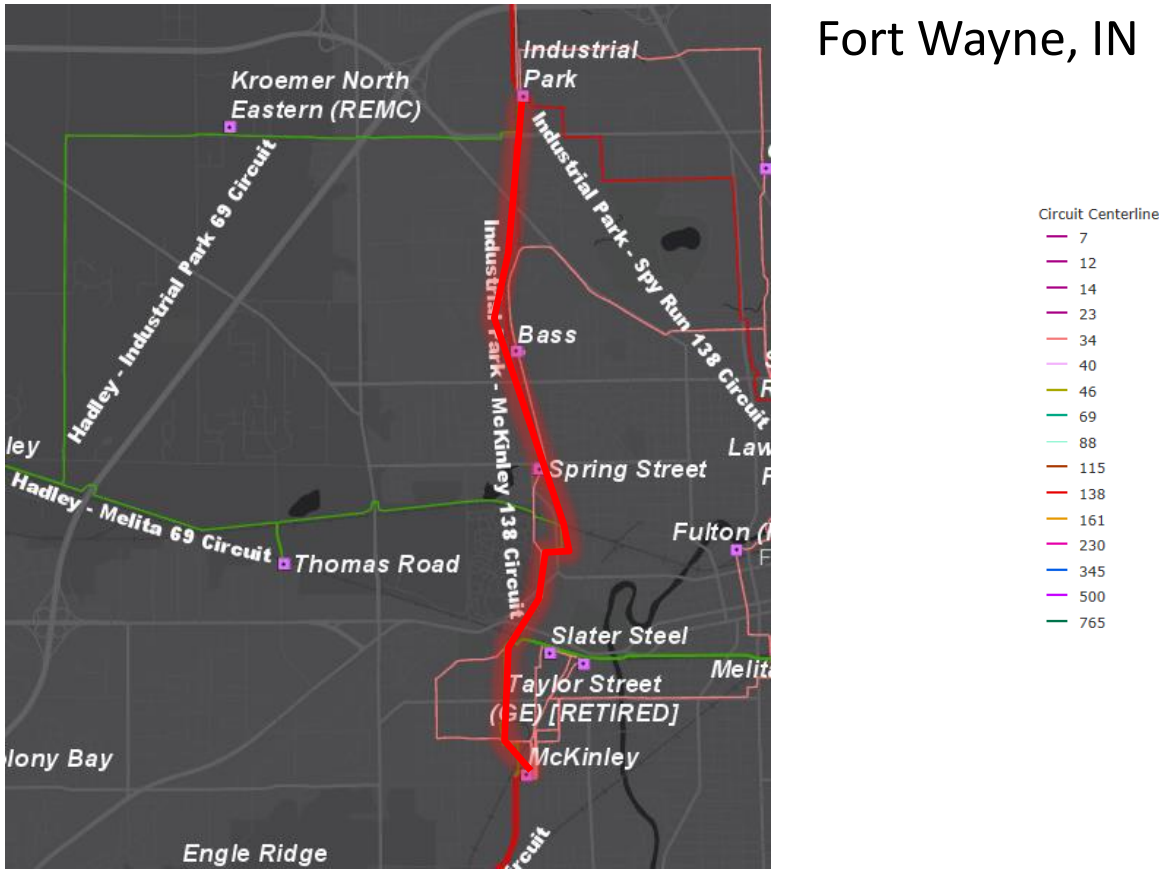


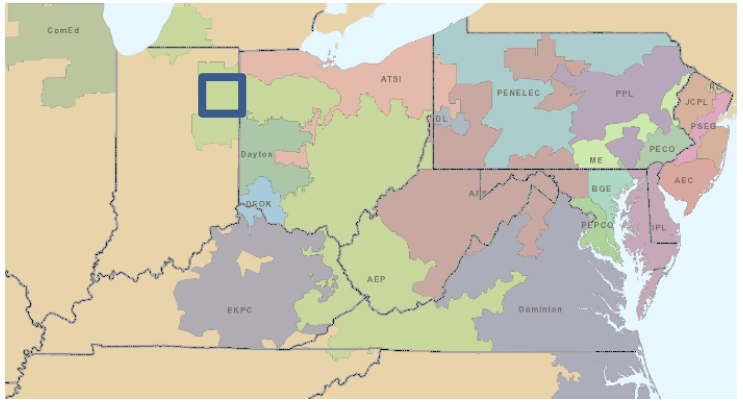
AEP Transmission Zone M-3 Process
Fort Wayne, IN

Need Number: AEP-2021-IM019
Process Stage: 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



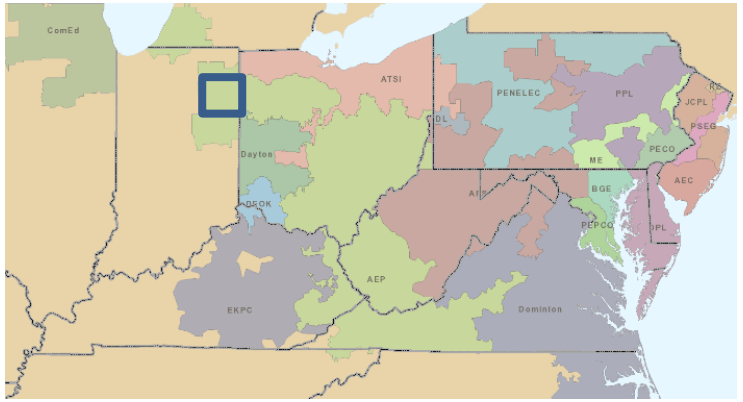


AEP Transmission Zone M-3 Process
Fort Wayne, IN

Need Number: AEP-2021-IM020
Process Stage: 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)
Model: N/A
Problem Statement:

Colony Bay – Illinois Rd 69kV line (6.92 miles):

- 71 of the 189 poles are original 1969 wood poles.
- 6.33 miles of line is original 1969 556.5 AL conductor
- Since 2015 there have been 6 momentary outages
- Structures fail NESC Grade B, AEP Strength requirements and ASCE structural strength standards
- 14 of 36 structures assessed had issues such as ground line decay, insect/bird, shell damage
- 30% of structures on this line were identified as having beyond normal levels of decay.

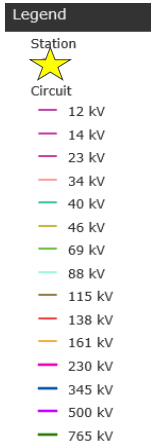


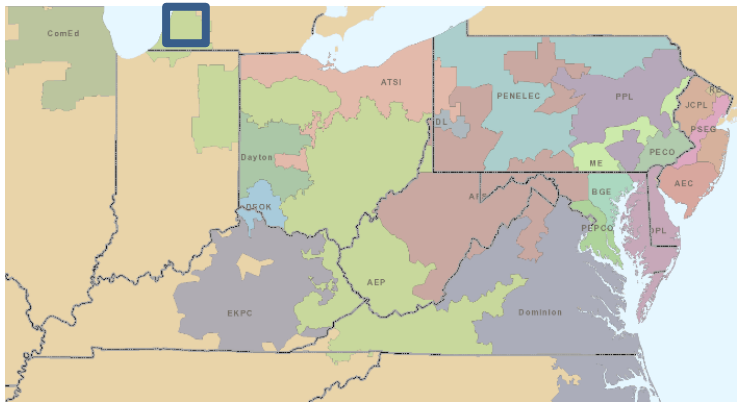
Need Number: AEP-2021-IM021
Process Stage: Needs Meeting 07/16/2021
Supplemental Project Driver: Equipment Material/Condition/Performance/Risk
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

- **Kenzie Creek 345/138/69kV**
- CB "F", "F1", "F2", "G" and "G1" are 1990's vintage 145-PA type breakers
  - The 145-PA Type Breakers are experiencing marked increases in malfunctions. There have been 437 recorded malfunctions on 132 total units of this model type on the AEP System. The most common issues 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. Low SF6 pressure in the breaker reduces the ability of the breaker to correctly interrupt a fault. Additionally, low pressure alarms and SF6 leaks lead to increased maintenance costs. The manufacturer provides no support or parts for this model of circuit breakers. Finally, SF6 leaks impact the environment.
  - The CB's have experience the following faults and are above the manufacturers recommended rating of 10
    - Breaker G: 39
    - Breaker G1: 24
    - Breaker F1: 12
    - Breaker F: 29
    - Breaker F2: 34

Model: N/A



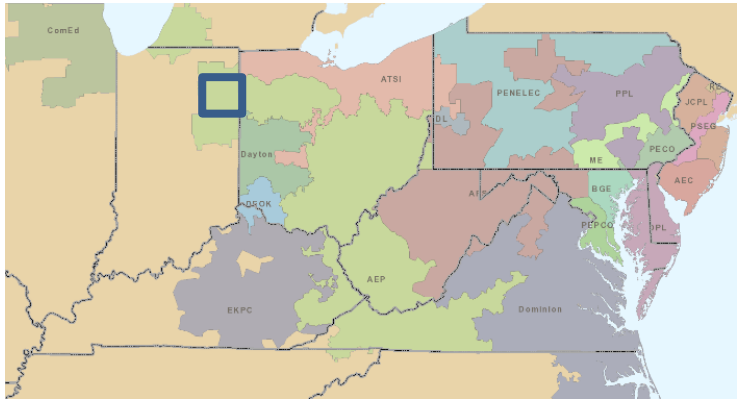


AEP Transmission Zone M-3 Process
Fort Wayne, IN

Need Number: AEP-2021-IM022
Process Stage: Needs Meeting 7/16/2021
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Problem Statement:

Robison Park – Sowers 138kV line:

- 13.6 miles of this 18 mile line is 1966 wood H Frame construction
- 4.3 miles of this 18 mile line is 1966 Steel lattice and isn't identified as a need at this time.
- 17.9 miles of this 18 mile line is 1966 636 Grosbeak ACSR conductor
- Structures fail AEP Strength requirements and ASCE structural strength standards and AEP Shielding requirements
- The 2015-2020 time period has seen 4 momentary and 3 permanent outages
- Line has been subject to 464,404 CMI to customers served out of Grabill station.
- 15 structures were inspected by drone with 16 assessed by ground crew
    - Moderate shell decay on most wood poles
    - Most Cross Arms have moderate decay on top side of arms
    - 40% of structures had broken/missing grounds.
- 11 structures with open conditions are on this line currently including disconnected X Braces/Crossarms, Rot Top and broken ground leads.



AEP Transmission Zone M-3 Process
Marion, IN

Need Number: AEP-2021-IM025

Process Stage: Need Meeting 07/16/2021

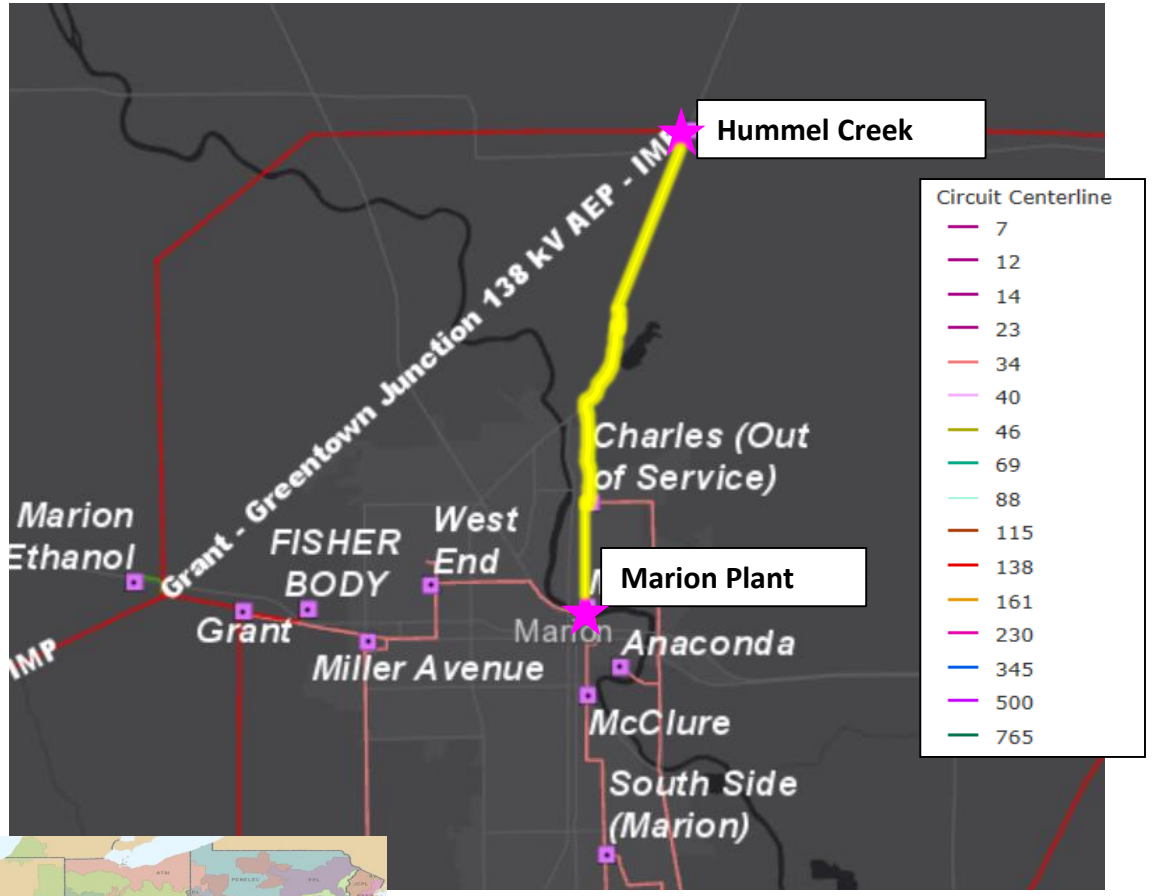
Project Driver: Equipment Material Condition, Performance and Risk

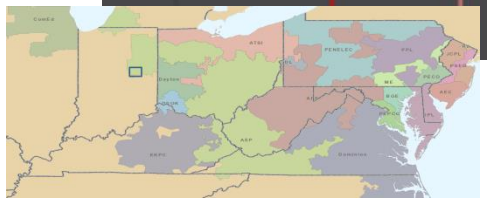
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 13)

Problem Statement:

Hummel Creek – Marion Plant 34.5 kV (Vintage 1967)

- Length of Line: 4.47 miles
- Total structure count: 136 with 119 dating back to original installation.
- Original Line Construction Type: Wood monopole and two pole structures with cross arm construction.
    - Porcelain insulators
- Conductor Type: 556,500 CM ALUM/1350 19 Dahlia
- Condition Summary
    - Number of open conditions: 19 structure open conditions
        - Open conditions include knee/vee brace, shielding/grounding open conditions related to the ground lead wire with missing or stolen, hardware, broken insulators.
        - Based on the ground crew assessment most poles and arms assessed are in poor condition with a overall condition of the line moving towards increased maintenance cycles and less reliability.
    - Structures fail NESC Grade B, AEP Strength requirements, and ASCE structural strength standards
    - The grounding method utilizes butt wraps on every other structure, providing reduced lightening protection for the line.





AEP Transmission Zone M-3 Process
Dover, Ohio

Need Number: AEP-2021-OH032

Process Stage: Need Meeting 07/16/2021

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

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

Problem Statement:

Equipment Material/Condition/Performance/Risk:

Greer Station

34.5kV Circuit Breaker: D

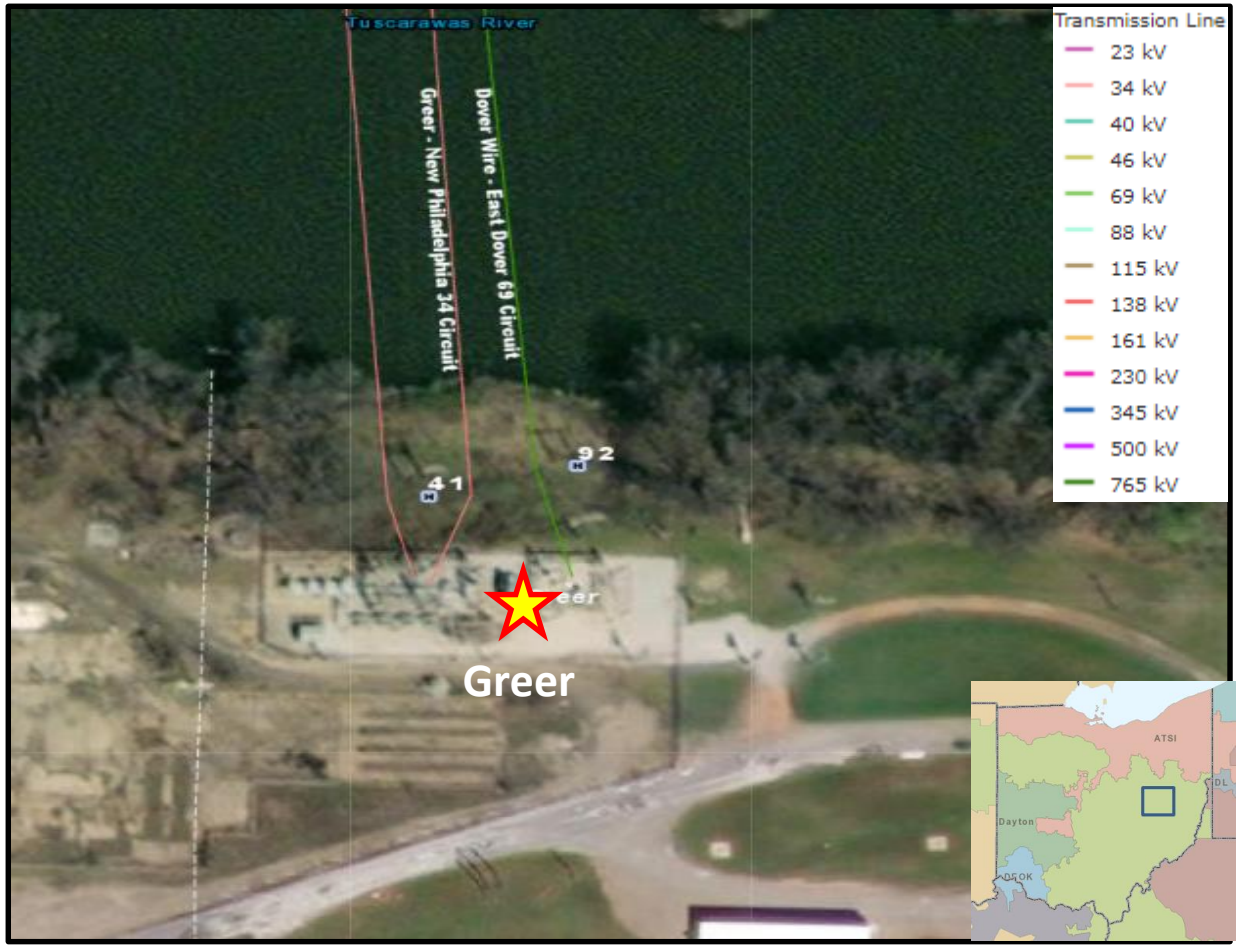
- Breaker Age: 1962
- Interrupting Medium: (Oil)
- Fault Operations: 22
- Additional Oil Filled Breaker Information: These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require.

Transformer 3 - 69-34.5 kV:

- Transformer Age: 1958
- This unit had oil processing done in 2009 but there have been subsequent increases in combustibles in the DGA that indicate continued breakdown of insulating and internal components. The CO/CO2 ratio is above the warning threshold and this unit has experienced overheating which has deteriorated the insulation.

Relays: Currently, 28 of the 31 relays are of the electromechanical type, which have significant limitations with regards to fault data collection and retention. There is minimal room in the existing control house for replacement

Other: The station yard and control building are overall in very poor condition, with peeling paint, heavy rusting, possible asbestos and PCB's, and obsolete cap-and-pin insulators. The transformer foundations are crumbling, with signs of past oil leaks.



AEP Transmission Zone M-3 Process
Dover, Ohio

Need Number: AEP-2021-OH032

Process Stage: Need Meeting 07/16/2021

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

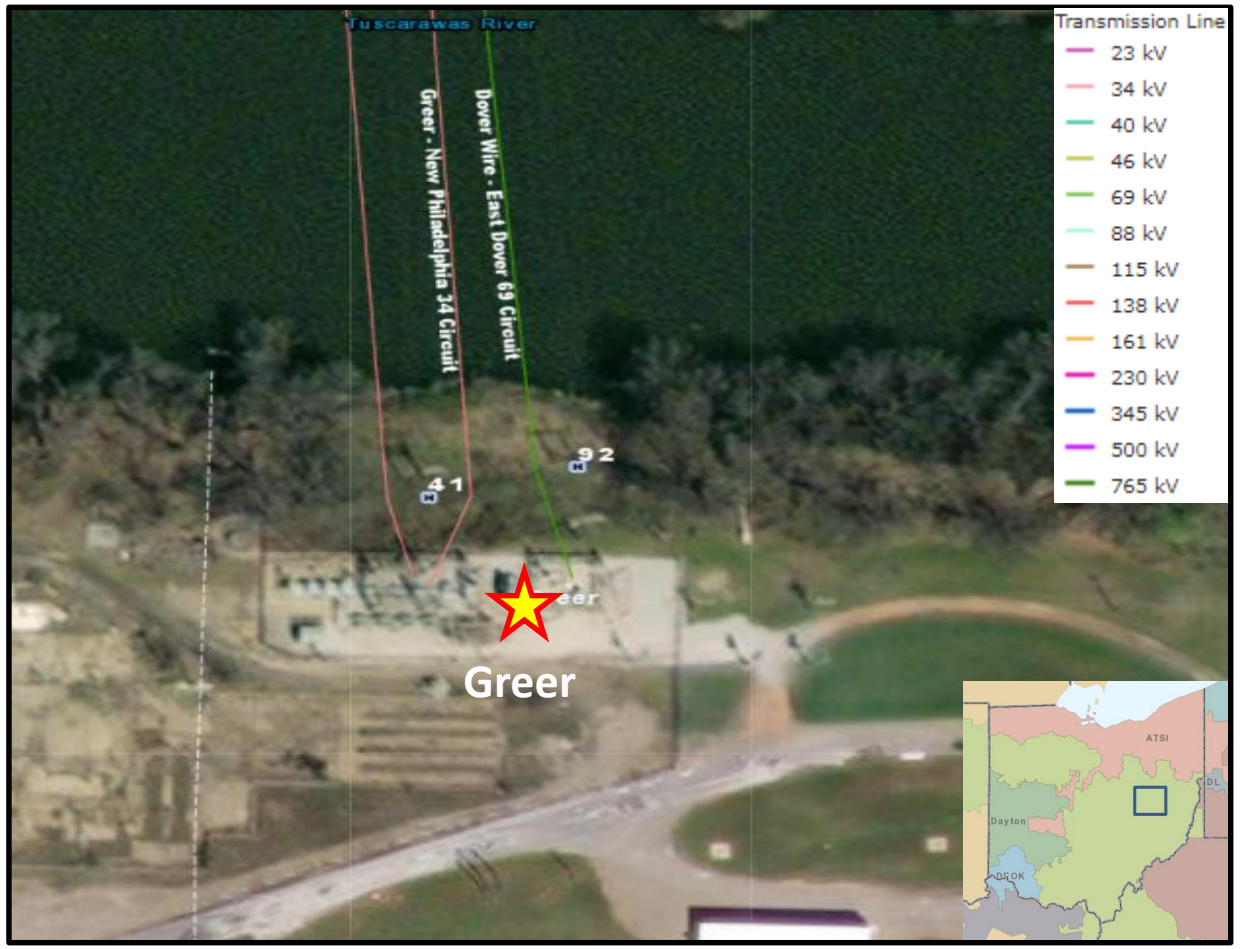
Specific Assumption Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Operational Flexibility & Efficiency:

Greer station is a 69-34.5kV-7.2kV delta station serving an industrial customer, along with providing a source to the local 34.5kV sub-transmission system. The station is connected via a hard tap to the Dover Wire-East Dover-Greer 69kV circuit, which is a 3-terminal line. Three-terminal lines are more difficult to reliably protect and more prone to overtripping. The hard tap connection makes it more difficult to perform 69kV maintenance in the area, due to the lack of line sectionalizing switches at the tap point.

The 69-34.5kV transformer lacks a high-side fault-interrupting device, and only has a motor-operated switch & ground-switch system, which requires remote-end 69kV fault clearing.



AEP Transmission Zone M-3 Process
Wooster, OH

Need Number: AEP-2021-OH033

Process Stage: Need Meeting 07/16/2021

Project Driver: Equipment Material/Condition/Performance/Risk

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

Problem Statement:

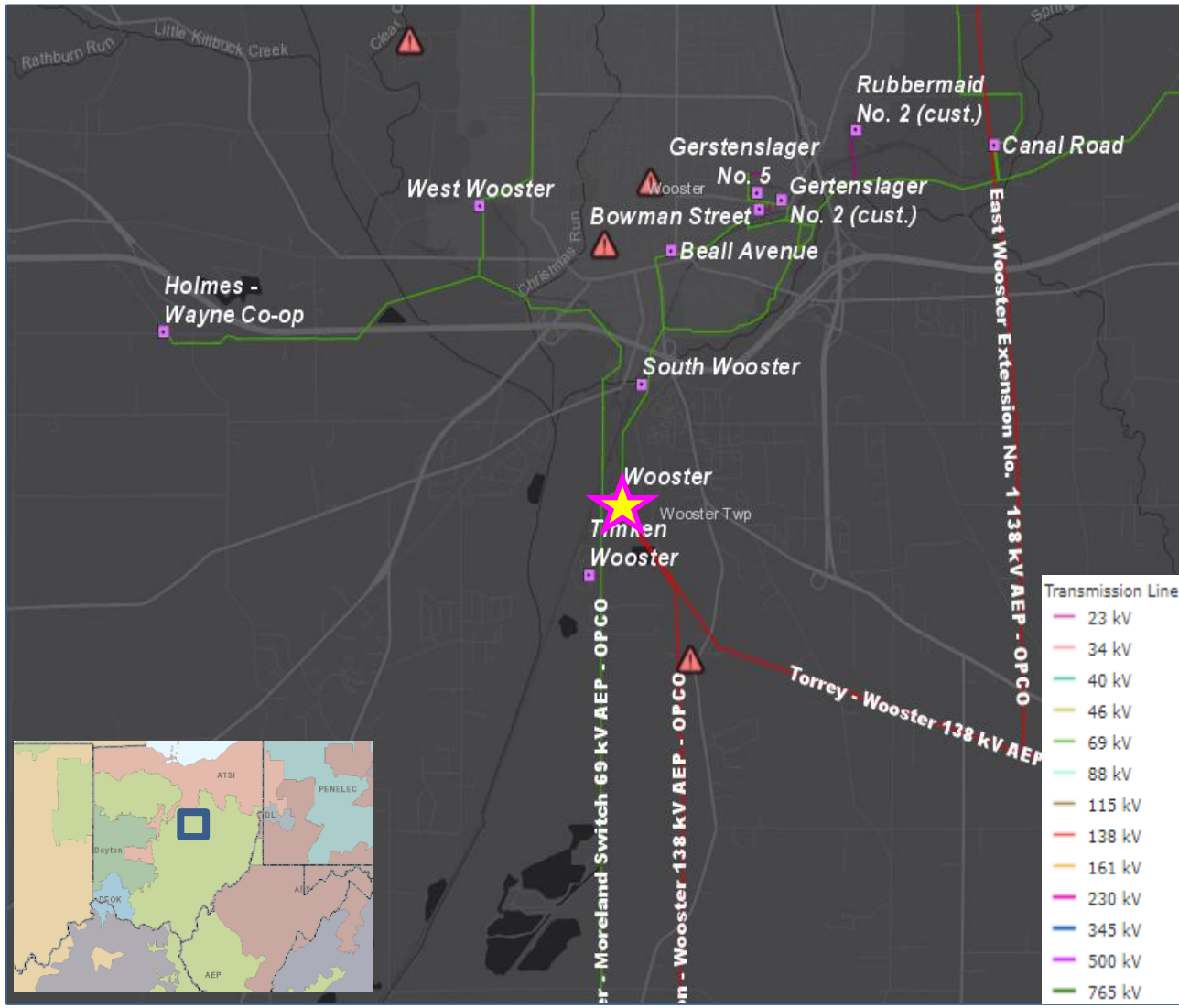
Wooster Station:

Circuit Breaker: CS-BB

- Manufacture Date : 1986
- Interrupting Medium: SF6 Mark-V
- Additional: Mark V family of circuit switchers have no gas monitoring and these have experienced numerous malfunctions (110 over a 10 year period) across the AEP system. Failed components, gas loss, and interrupter failure represent half of these malfunctions. Two malfunctions of note were catastrophic equipment failures. Parts are expensive, especially because interrupters can only be replaced, not repaired, as they are hermetically sealed.

Circuit Breaker: CB-G

- Manufacture Date : 1968
- Interrupting Medium: Oil
- Fault Operations: 16
- Additional: 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
Wooster, OH

Problem Statement Continued:

Circuit Breaker: CB-A, D & F

- Manufacture Date : 1952 (A & D), 1962 (F)
- Interrupting Medium: Oil
- Fault Operations: 51
- Additional: These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling requirements than their modern, SF6 counterparts. The manufacturer provides no support for these units and spare parts are increasingly more difficult to obtain.

138/23 kV Transformer 1:

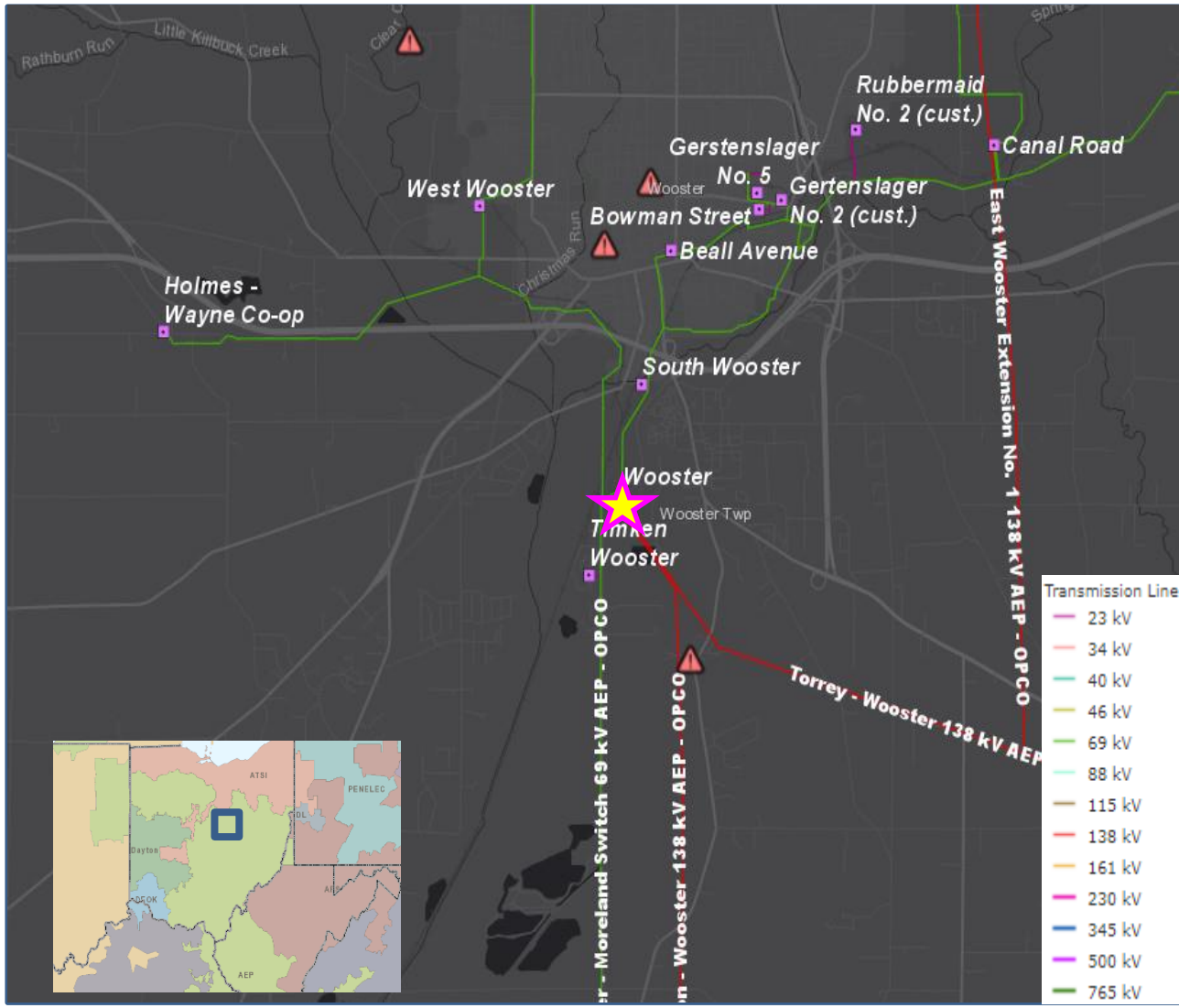
- Manufacture Date: 1953
- Additional: No arrestors are on this unit. Bushings and cooling fans are obsolete with no spare parts available. One oil pump is not functional. No oil containment. Dielectric and short circuit breakdown and moisture content has been detected in the oil.

138/69/12 kV Transformer 2:

- Manufacture Date : 1962
- Additional: Cooling fans are obsolete with no spare parts available. No oil containment. Dielectric and short circuit breakdown are indicated in the DGA.

Transformer: Ground Bank-1

- Manufacture Date : 1953
- Additional: Cooling fans are obsolete with no spare parts available. No oil containment. Dielectric and short circuit breakdown are indicated in the DGA.



AEP Transmission Zone M-3 Process
Wooster, OH

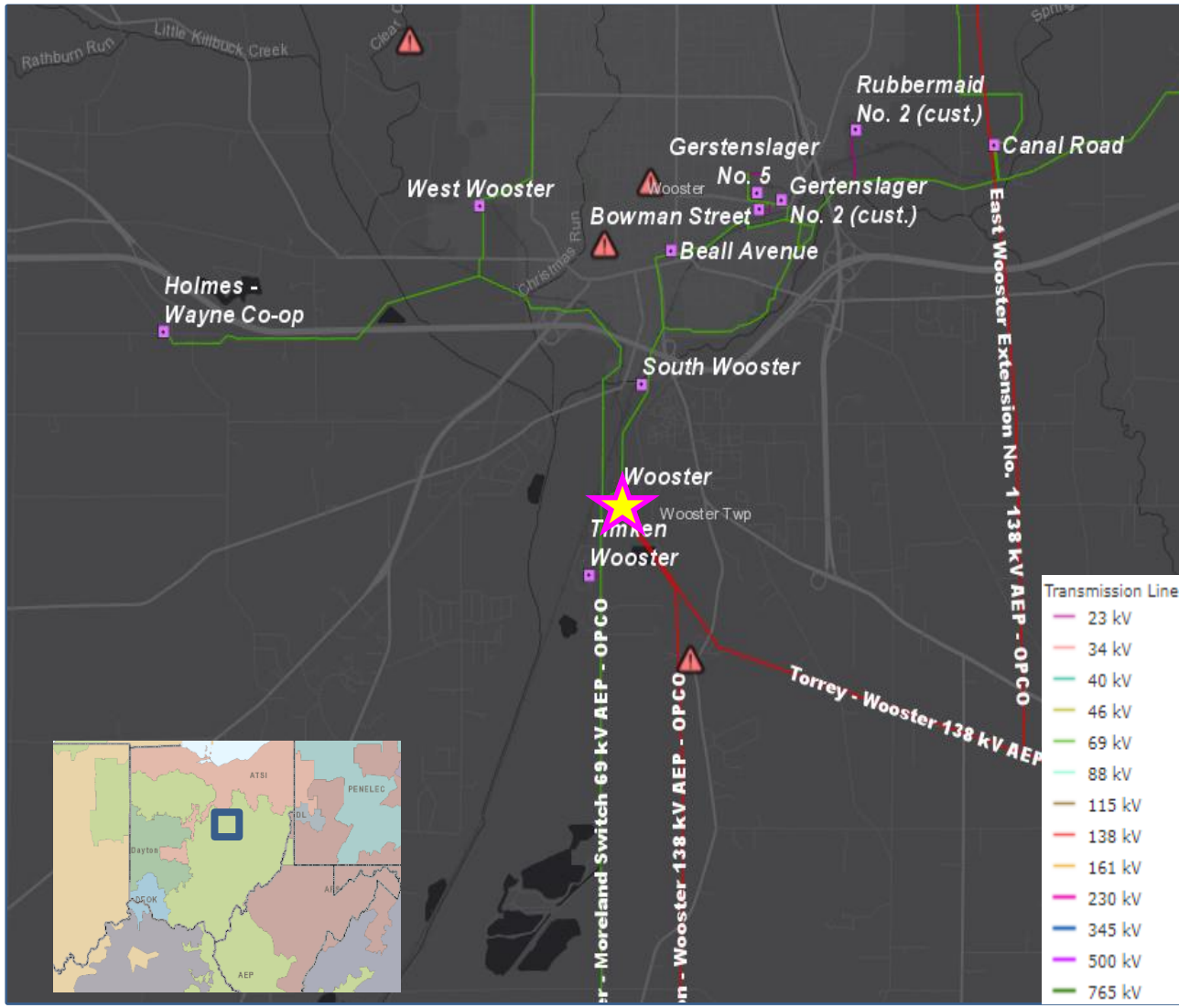
Problem Statement Continued:

Transformer: Ground Bank-2

- Manufacture Date : 1953
- Additional: Bushings are obsolete with no spare parts available. No cooling fans on this unit. No oil containment. Cap-and-pin insulator disconnect switches need replaced due to deterioration.

Relays:

- 75 of the 77 relays (97% of all station relays) are in need of replacement. 49 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 26 microprocessor based relays commissioned between 2006-2011 unsupported firmware.



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

Need Number: AEP-2021-OH036

Process Stage: Need Meeting 7/16/2021

Project Driver:

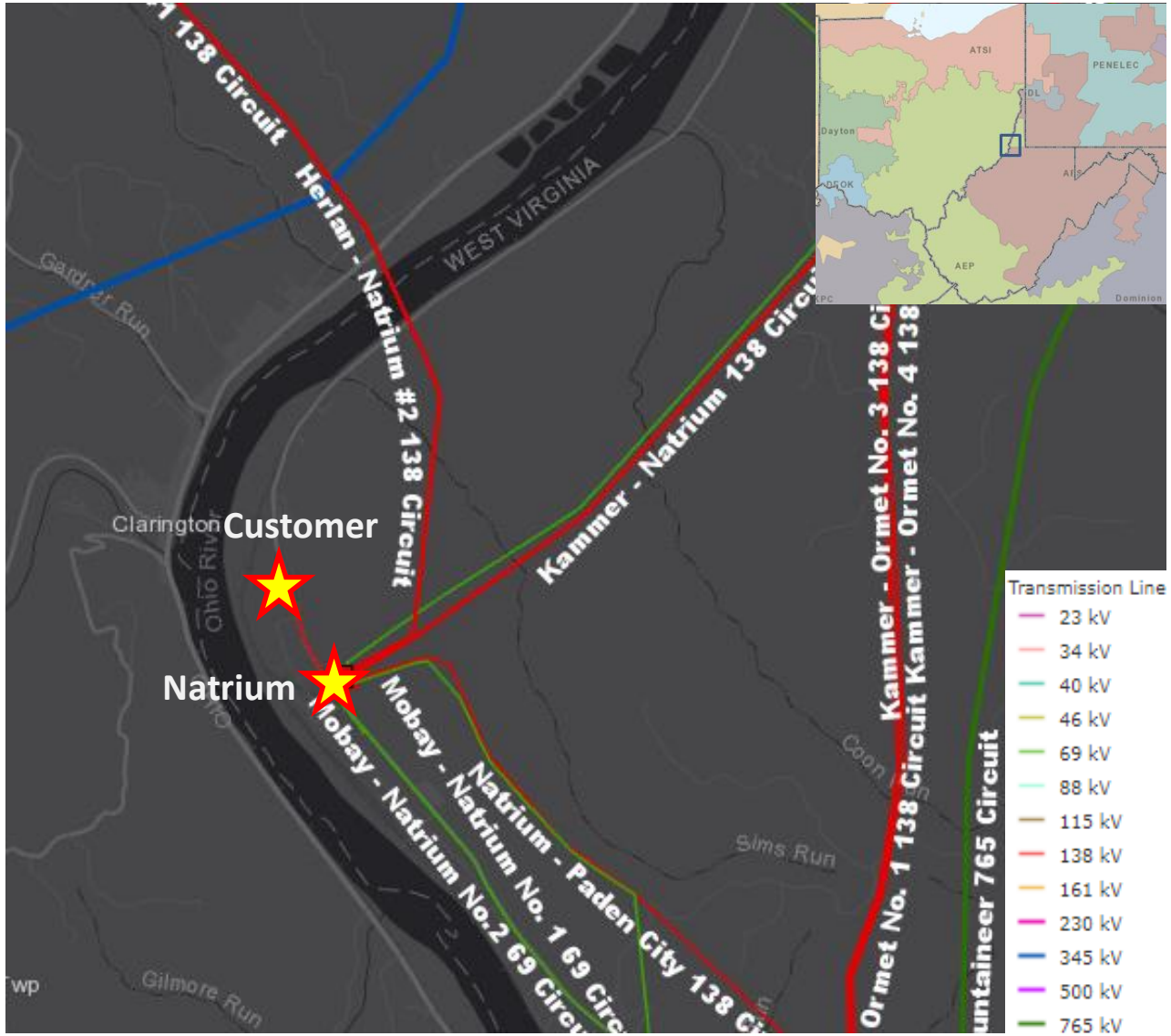
Operational Flexibility and Efficiency

Specific Assumption Reference:

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

Problem Statement:

A 138kV transmission customer north of Natrium station is served via a 0.5-mile radial 138kV transmission circuit. The customer's operational peak demand is 132 MW (contract peak is 109 MW). This amount of radial load exceeds AEP's radial guideline of 35 MW for a single customer, for looping transmission customers. The radial service presents single points of failure that could jeopardize reliability for the customer, which is one of the largest in West Virginia.



AEP Transmission Zone M-3 Process
North Columbus, OH

Need Number: AEP-2021-OH038

Process Stage: 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

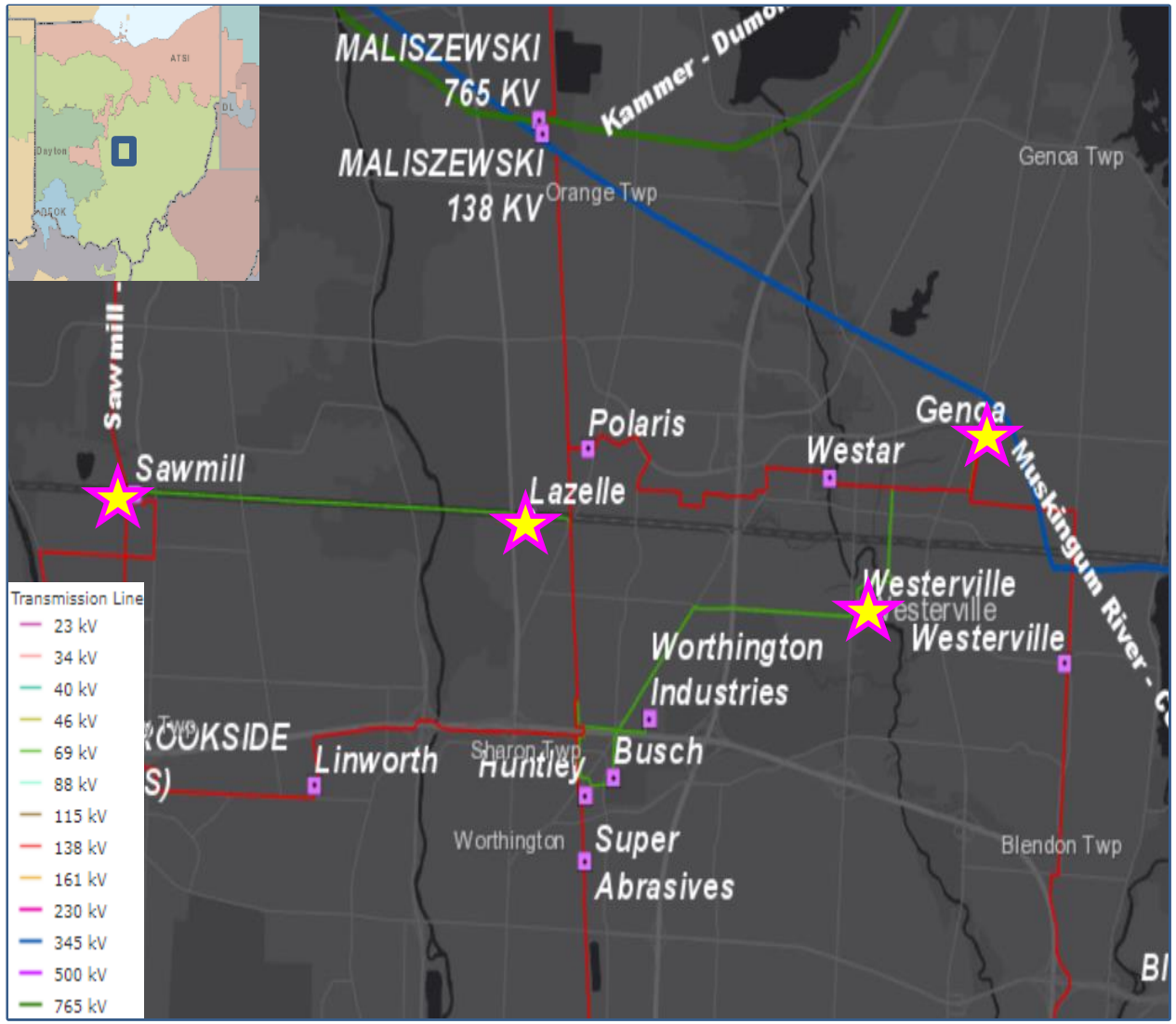
69 kV Circuit Breakers 61 & 62

- 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

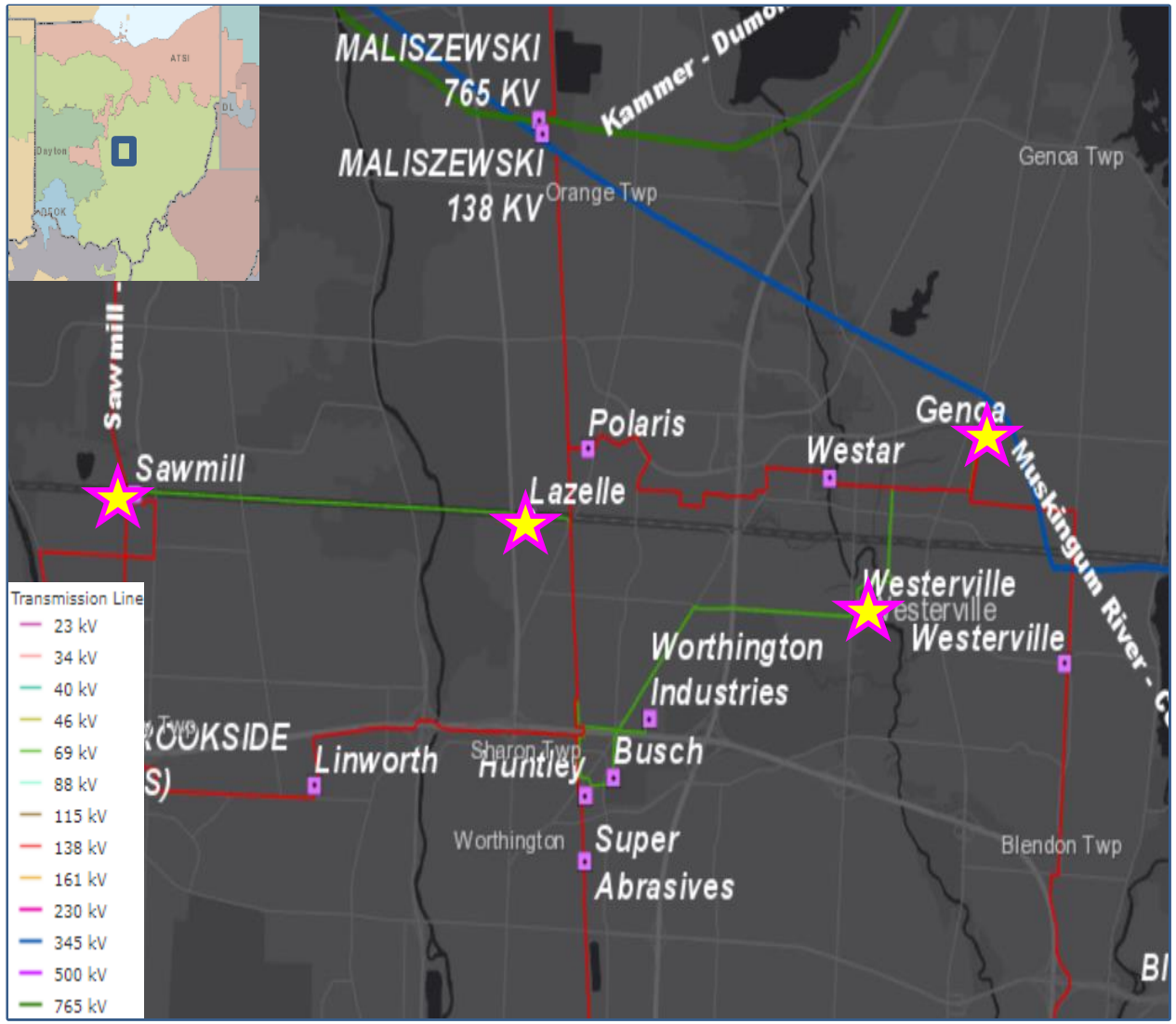
69 kV Circuit Breaker 64

- 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
Newark, Ohio

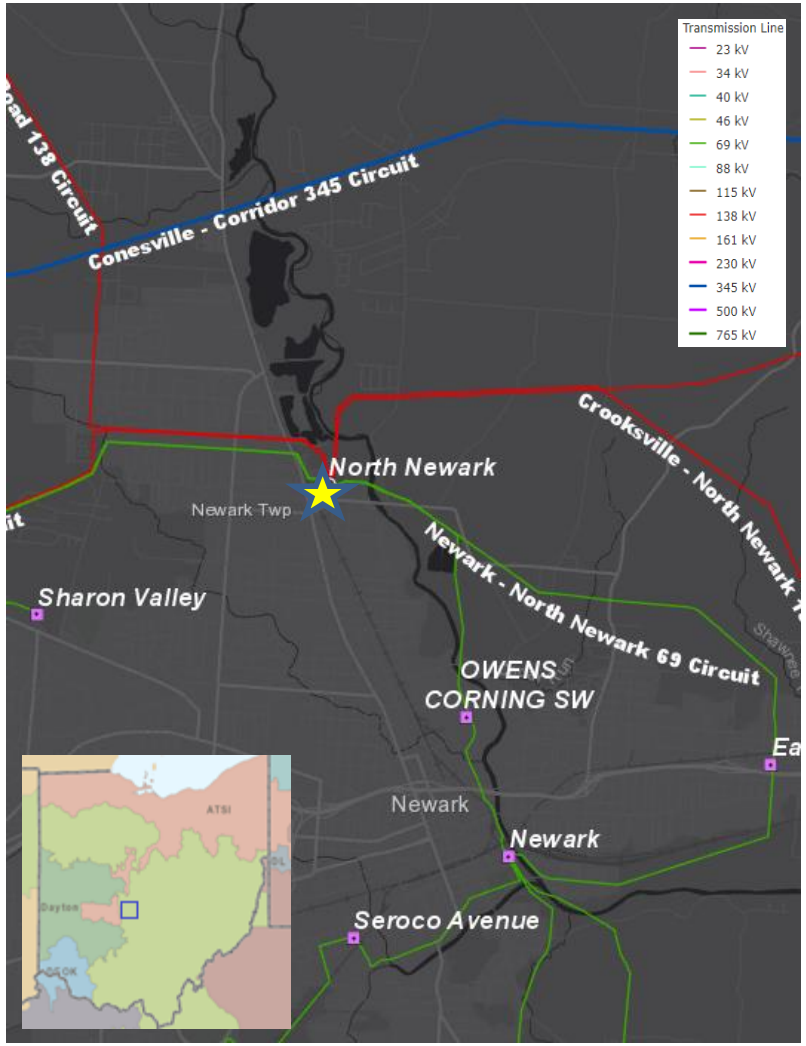
Need Number: AEP-2021-OH039

Process Stage: Need Meeting 07/16/2021

Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:



North Newark Station

Circuit Breakers: H & P (138 kV)

- Breaker Age: 1952: H & 1947: P
- Interrupting Medium: (Oil)
- Fault Ops: H: 46 & P: 38 (Manufactured recommended number of fault ops is 10)
- Additional Info: These breakers are FK type oil filled breakers without oil containment; Oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require.
- CB-H recently failed to stay closed after being tripped, and is currently being operated normally open. As a result of being N.O., we are leaving customers on the 138 kV circuit to Crooksville served radially.
- Recent testing of CB-P revealed poor bushing health along with alignment issues, bad contacts, bad closing resistors, and the connections make and break multiple times during an operation. These issues are causing excessive arcing and burning on the contacts.
- Field personnel are treating these breakers as a failure situation and are looking to replace them as soon as possible.

Circuit Switcher: BB (138 kV)

- Switcher Age: 1989
- Interrupting Medium: (SF6)
- Additional Info: This switcher is a S&C Electric, Mark V type that has no gas monitor and currently in-service units on the AEP system have experienced 110 malfunctions from May 2000 to August 2019. Failed operational components including high contact resistance, gas loss, and interrupter failure represent half of these malfunctions. Two malfunctions of note were catastrophic equipment failures involving failures to trip.

Problem Statement Continued:

North Newark Station - continued

Circuit Switcher: AA (69 kV)

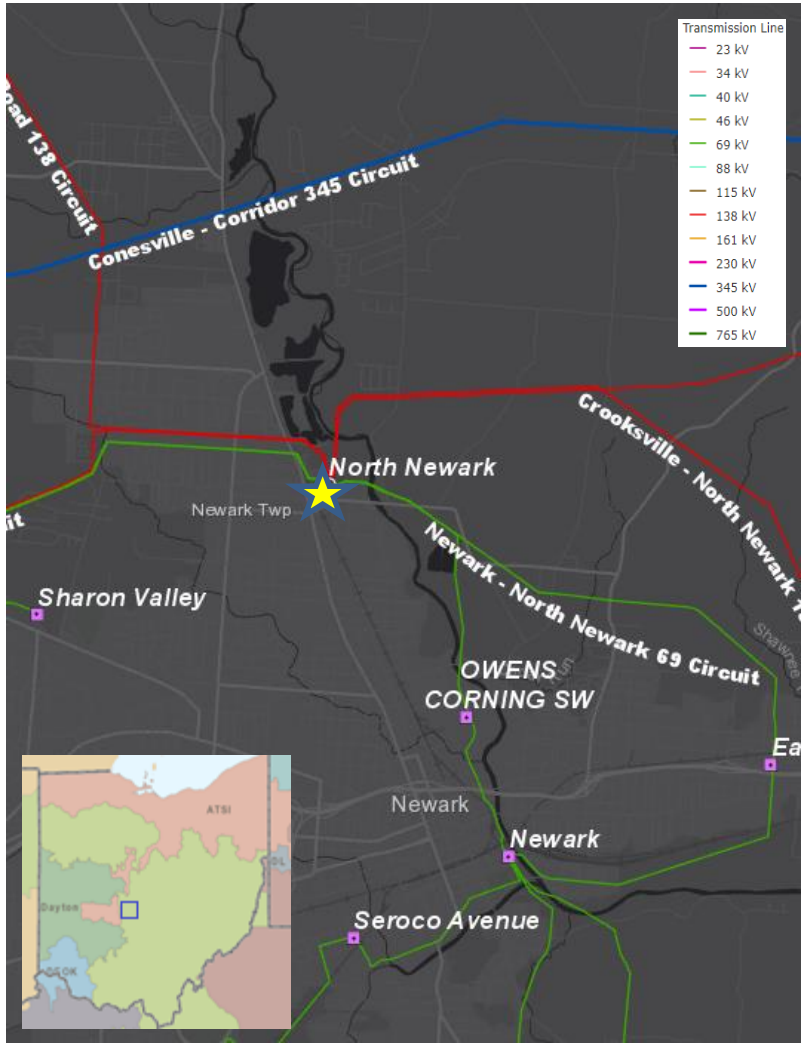
- Switcher Age: 1993
- Interrupting Medium: (SF6)
- Additional Info: This switcher is a S&C Electric, 2030-69 type that has no gas monitor and currently in-service units on the AEP system have experienced 80 malfunctions from May 2002 to August 2019. The major malfunction events, which account for 80% of recorded malfunctions, include gas loss, interrupter failures, operating mechanism failures, and trip or reclose failures.

138/69/4kV Transformer 1 & 2 (40 MVA)

- Age: 1951: T1 & 1956: T2
- Historical data shows elevated volume of acetylene and methane that indicates arcing inside the transformer tank.
- Transformer tanks are leaking and have no oil containment.
- Additional Info.: Currently no sectionalizing on high side of Transformer 1 & 2, there are two dissimilar zones of protection (138 kV Bus, Transformer) .

Relaying:

Currently, 84 of the 115 relays (73% of all station relays) are in need of replacement. 73 of these are of the electromechanical type and 6 of these is 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 also 5 microprocessor based relays commissioned between 2006-2007 that may have firmware that is unsupported.



AEP Transmission Zone M-3 Process
Plain City, OH

Need Number: AEP-2021-OH040

Process Stage: Need Meeting 7/16/2021

Project Driver: Customer Service

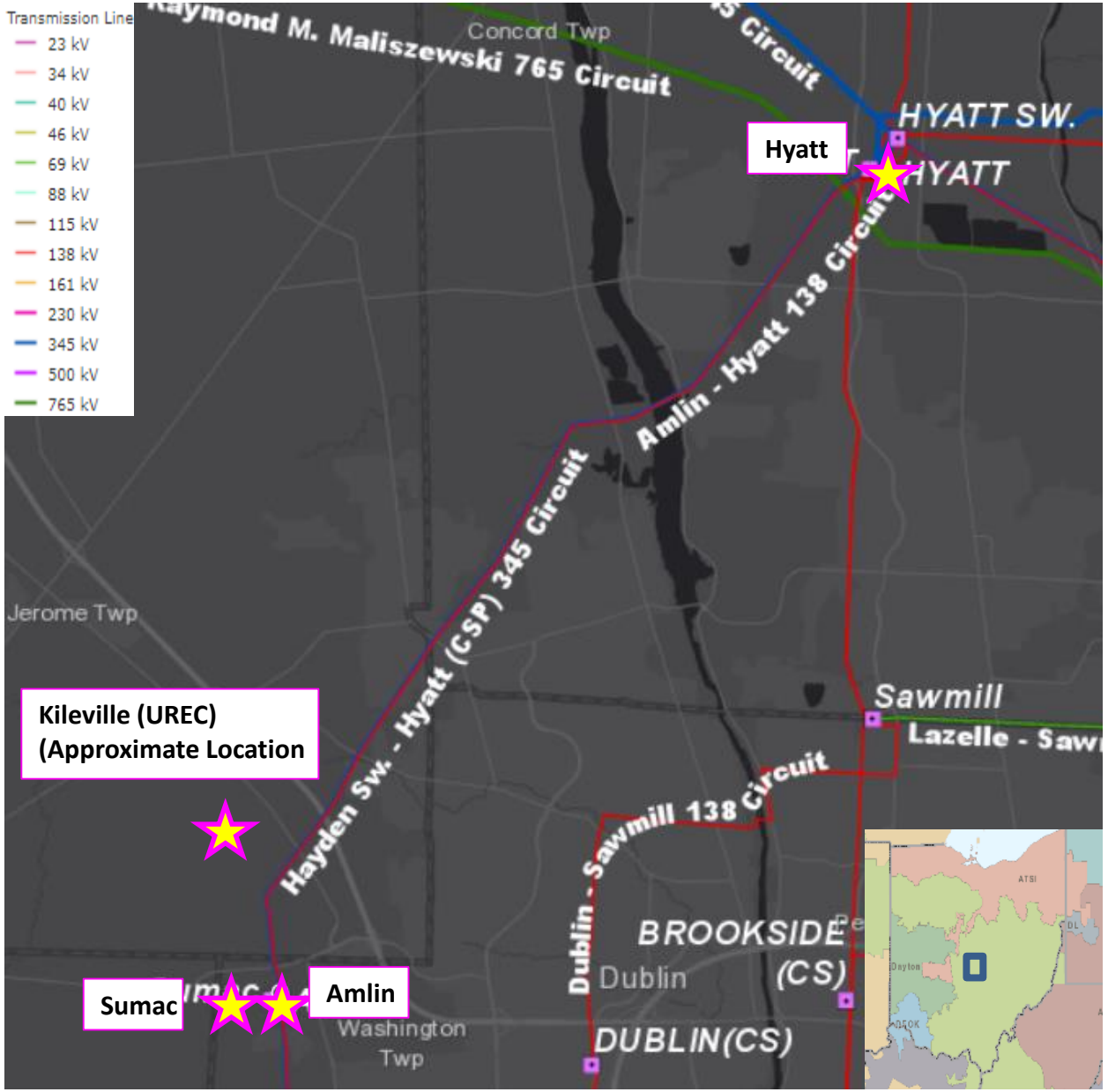
Specific Assumption Reference: AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 12)

Problem Statement:

Kileville 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 primarily be used to serve a large data center customer with high potential for rapid load growth. The Initial load with be 40 MW with a potential future peak load demand of 240 MW.
- Service is requested by June 2023.

Model: 2025 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
Eastern Marion Improvements

Need Number: AEP-2018-IM017

Process Stage: Solution Meeting 07/16/2021

Previously Presented: Needs Meeting 1/10/2019

Project Driver: Equipment Material Condition, Performance and Risk

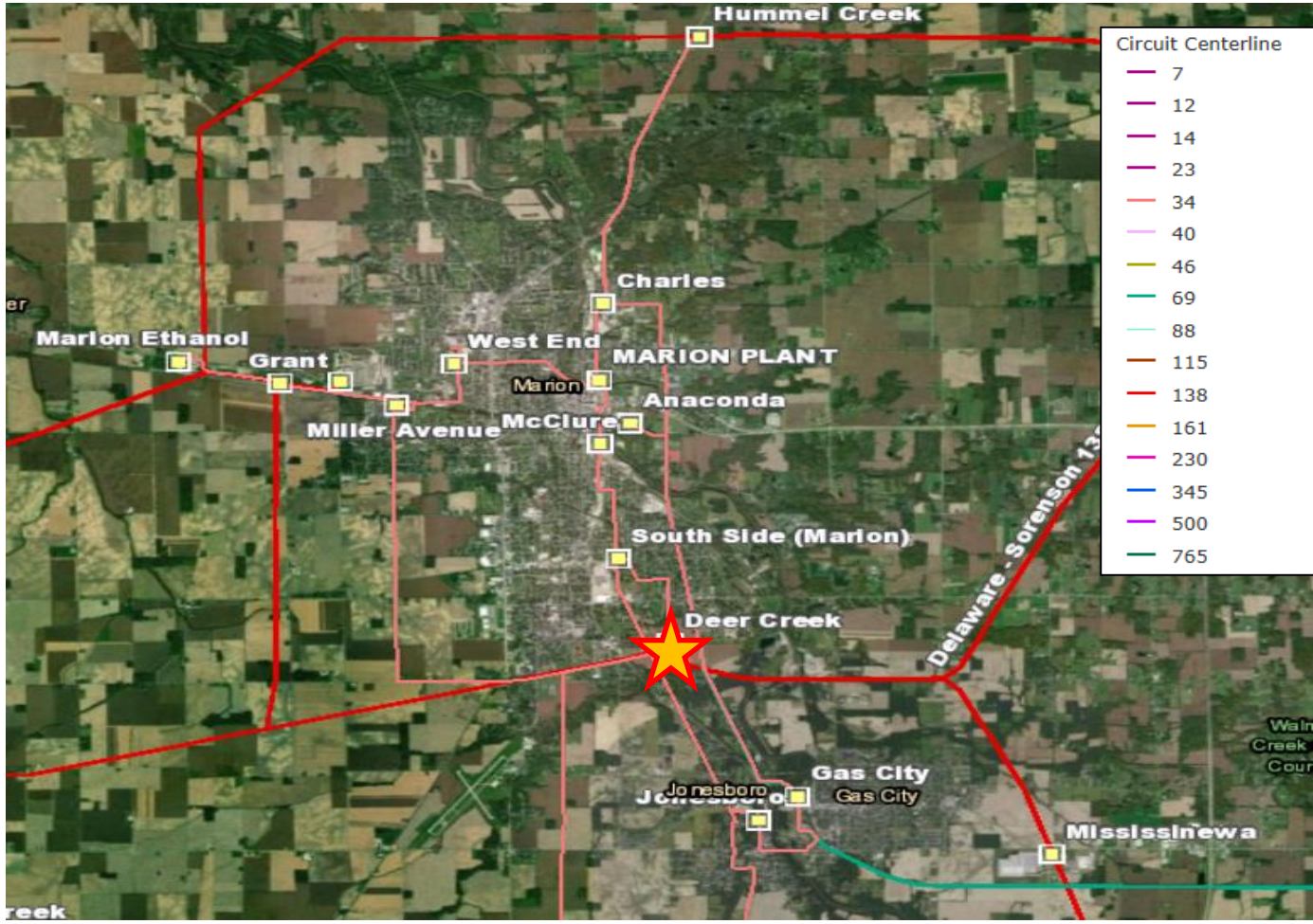
Specific Assumption Reference:

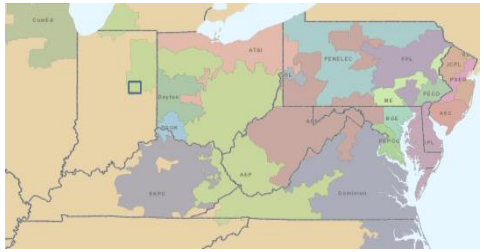
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8);

Problem Statement:

Deer Creek 34.5kV

- Breakers “K”, “F”, “M”, “H”, “V”, “W”
  - 1949-62 vintage FK oil breakers without containment
  - Fault Operations: CB K(9) CB F(1) CB M(17) CB H(16) CB V(5) CB W(1) - Recommended(10)
  - CB W is over the recommended amount of switching operations.





AEP Transmission Zone M-3 Process
Eastern Marion Improvements

Need Number: AEP-2018-IM022

Process Stage: Solution Meeting 07/16/2021

Previously Presented: Needs Meeting 12/21/2018

Project Driver: Equipment Material Condition, Performance and Risk

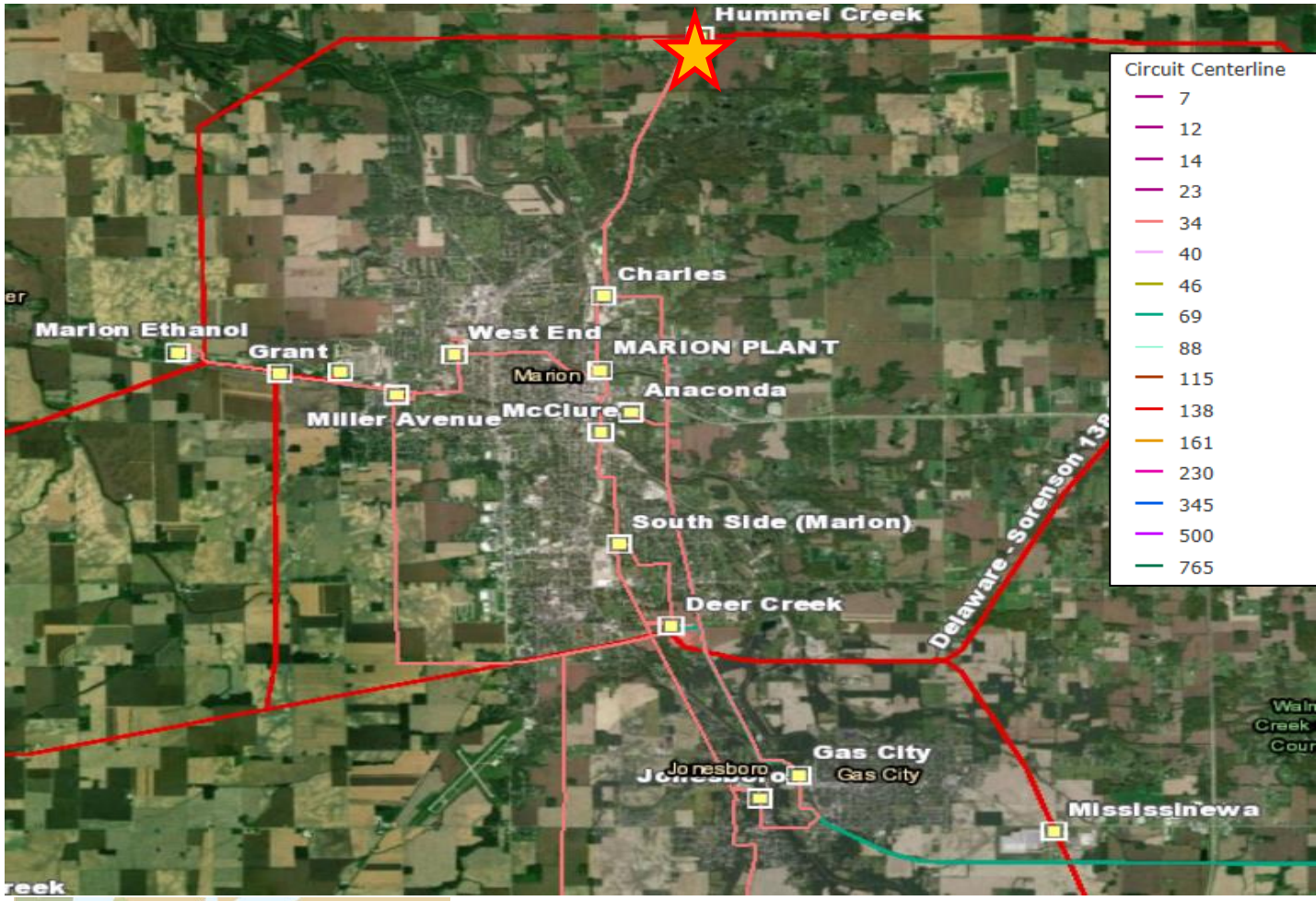
Specific Assumption Reference:

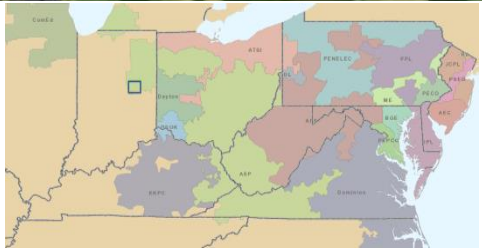
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8);

Problem Statement:

Hummel Creek 34.5kV

- Breakers “L” and “M”
  - 1949-1950 vintage FK oil breaker without containment
  - Fault Operations: CB M(33)– Recommended(10)





AEP Transmission Zone M-3 Process
Eastern Marion Improvements

Need Number: AEP-2018-IM023

Process Stage: Solution Meeting 07/16/2021

Previously Presented: Needs Meeting 1/11/2019

Project Driver: Equipment Material Condition, Performance and Risk

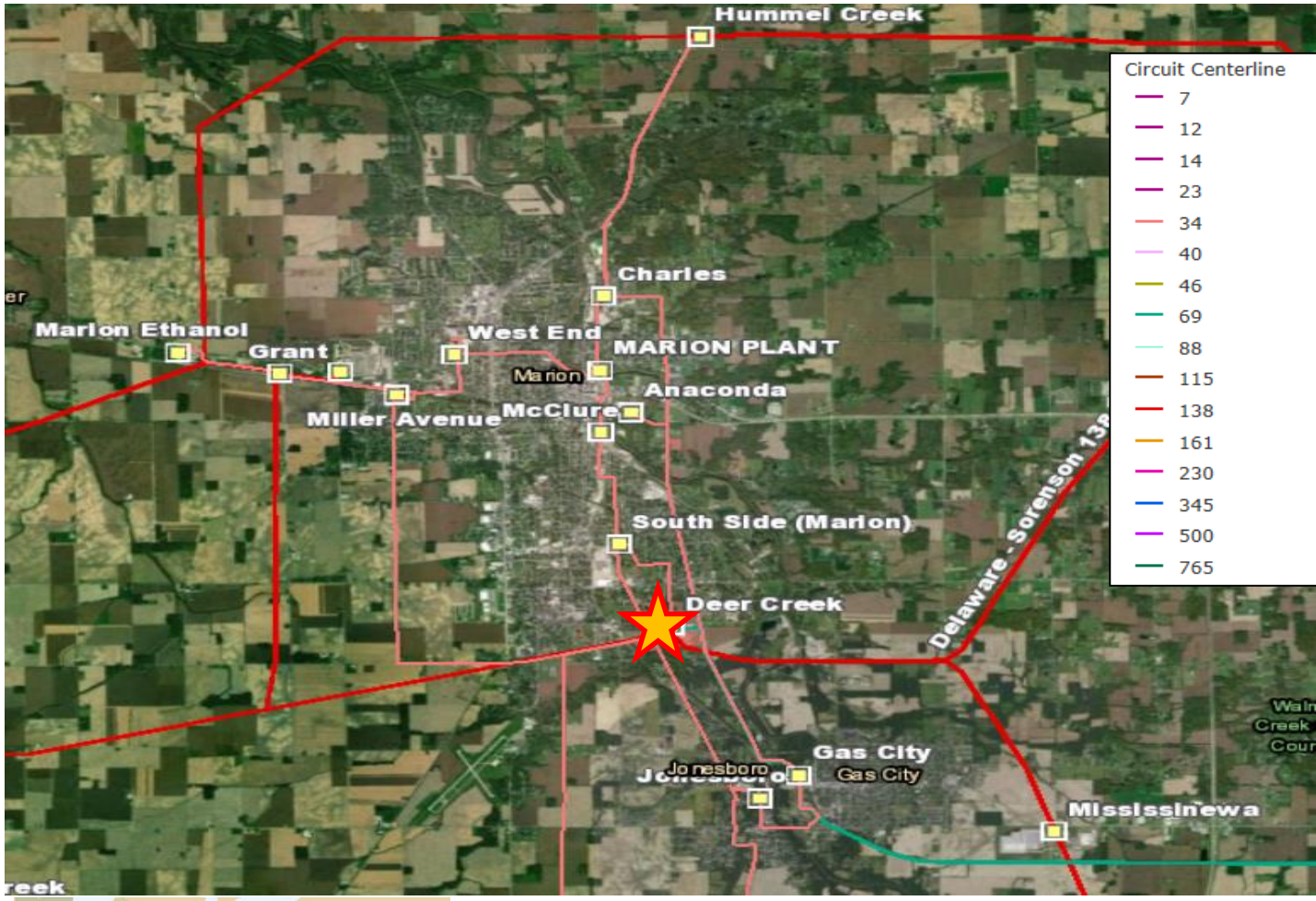
Specific Assumption Reference:

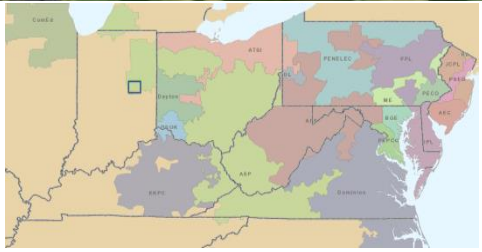
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8);

Problem Statement:

Deer Creek – Hummel Creek 34.5 kV (11 miles)

- 1940 wood crossarm construction (age based on age of station)
- Subject to 16 open A conditions
- Subject to 17 open B conditions
- In the past 10 years, 16 structures have had active maintenance performed. This is expected to increase as line ages.





AEP Transmission Zone M-3 Process
Eastern Marion Improvements

Need Number: AEP-2021-IM014

Process Stage: Solution Meeting 07/16/2021

Previously Presented: Needs Meeting 04/16/2021

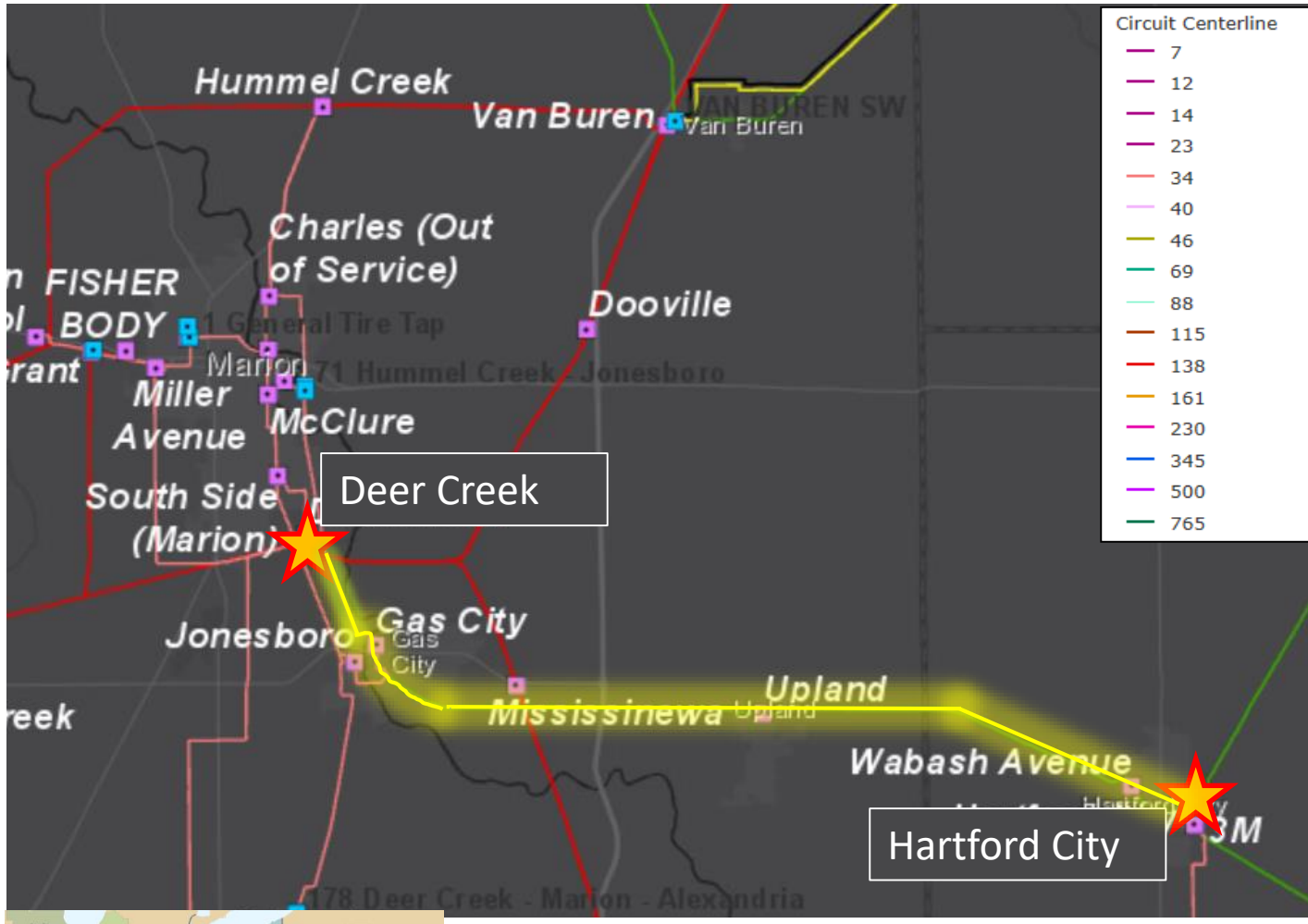
Project Driver: Equipment Material Condition, Performance and Risk

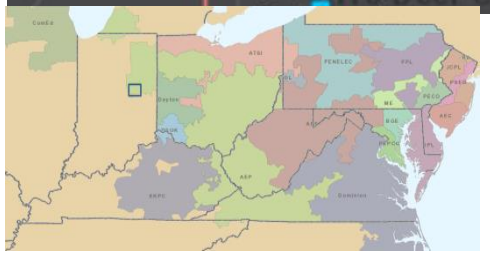
Specific Assumption Reference:
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13);

Problem Statement:

Deer Creek – Hartford City 69 kV (vintage 1967):

- Length: 17.67 Miles
- Original Construction Type: Wood pole structures with cross arm construction and vertical post insulators.
- Original Conductor Type:
  - 336.4 kCM ACSR 18/1 Merlin (18.17 mi, vintage 1967)
  - 3/0 Copper 7 (30COP) (2.24 mi, vintage 1967)
- Momentary/Permanent Outages: 21 total outages: 10 (Momentary), 11 (Permanent).
- 5 Year CMI: 67,818
- Number of open conditions: 4
  - Open conditions include: Cross arm or pole with split and woodpecker conditions and broken or missing ground lead wire.
- Based on the ground crew assessment roughly 28% of the structures had advanced levels of decay on the poles
- Total structure count: 378 with 366 dating back to original installation.





AEP Transmission Zone M-3 Process
Eastern Marion Improvements

Need Number: AEP-2021-IM014

Process Stage: Solution Meeting 07/16/2021

Previously Presented: Needs Meeting 04/16/2021

Project Driver:

Equipment Material Condition, Performance and Risk

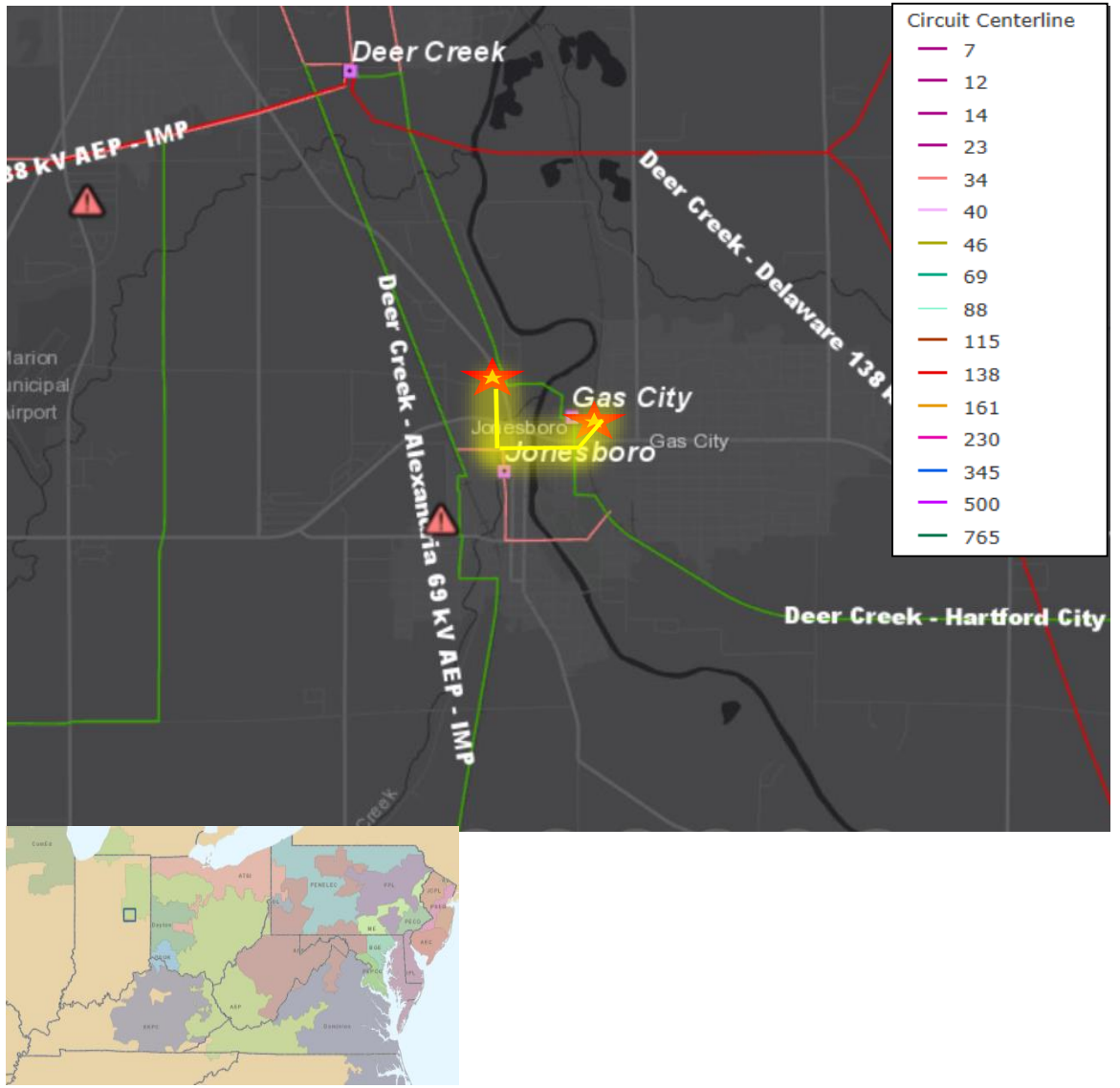
Specific Assumption Reference:

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

Problem Statement:

Jonesboro – Gas City 34.5 kV (vintage 1969):

- Length: 1.01 Miles
- Original Construction Type: Wood pole structures
- Original Conductor Type:
  - 336.4 ACSR 18/1 Merlin (0.65 mi, vintage 1969)
  - 3/0 Copper 7 (0.36 mi, vintage 1969)
- Number of open conditions: 12
  - Open conditions include: Cross arm or pole with split rot conditions, knee/vee brace with loose conditions, broken guy strain insulator and right of way encroaching buildings.
- Total structure count: 34 (original vintage)



AEP Transmission Zone M-3 Process
Eastern Marion Improvements

Need Number: AEP-2021-IM014

Process Stage: Solution Meeting 07/16/2021

Previously Presented: Needs Meeting 04/16/2021

Project Driver:

Equipment Material Condition, Performance and Risk

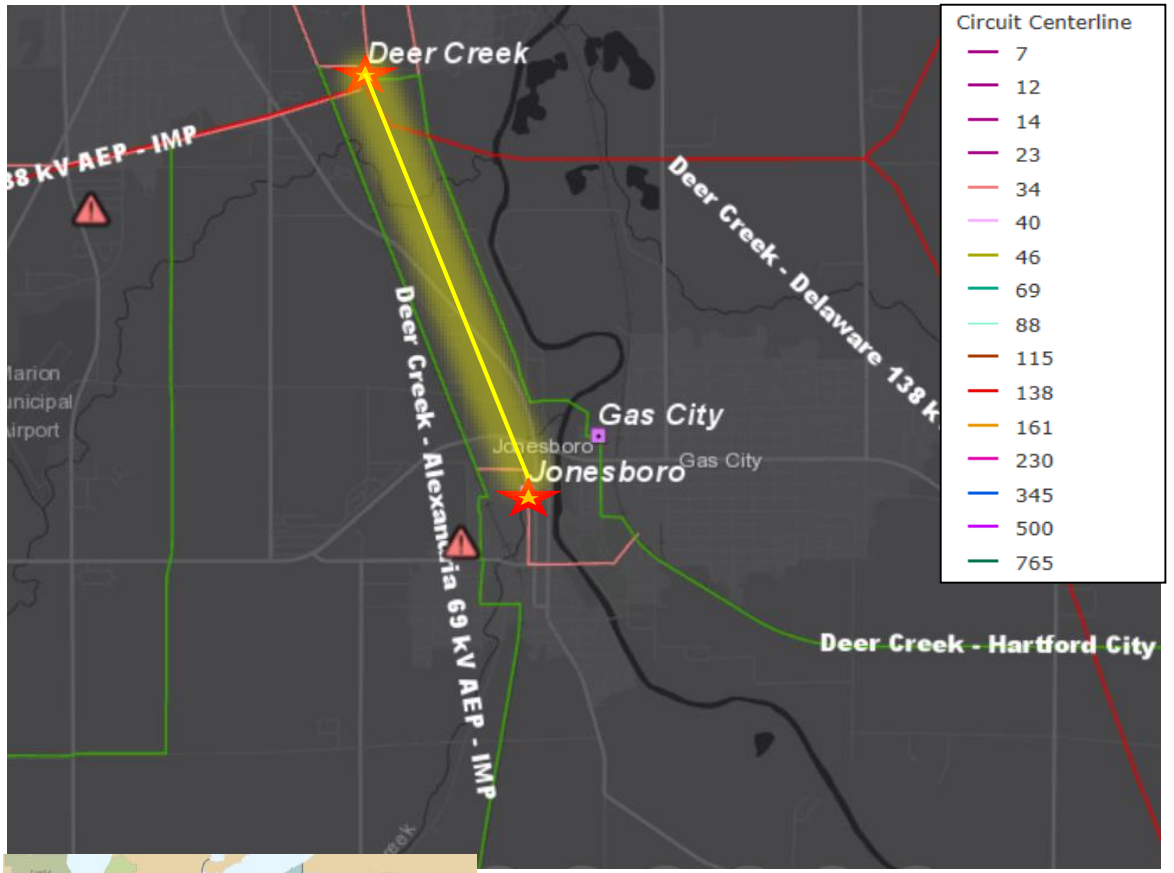
Specific Assumption Reference:

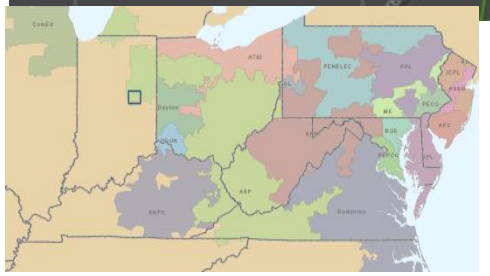
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13);

Problem Statement:

Deer Creek – Alexandria 34.5 kV (vintage 1968):

- Length: 2.19 Miles
- Original Construction Type: Wood pole structures
- Original Conductor Type:
    - 556.5 kCM ALUM/1250 19 Dahlia
- Number of open conditions: 7
    - Open conditions include: Cross arm or pole with rot top conditions, stolen ground lead wires and improperly installed shield wire.
- Total structure count: 61, with 60 dating back to original installation.





AEP Transmission Zone M-3 Process
Eastern Marion Improvements

Need Number: AEP-2018-IM017, AEP-2018-IM022, AEP-2018-IM023, AEP-2021-IM014

Process Stage: Solution Meeting 7/16/2021

Proposed Solution:

Deer Creek – Hartford City 69 kV: Rebuild ~17.67 miles of 69 kV line with the conductor size 556.5 ACSR 26/7 Dove. The following cost includes the line rebuild, line removal and right of way.
Cost: $40.69 M

Hummel Creek – Deer Creek 34.5 kV: Retire ~4.6 miles of 34.5 kV 1940s wood line.
Cost: $1.01 M

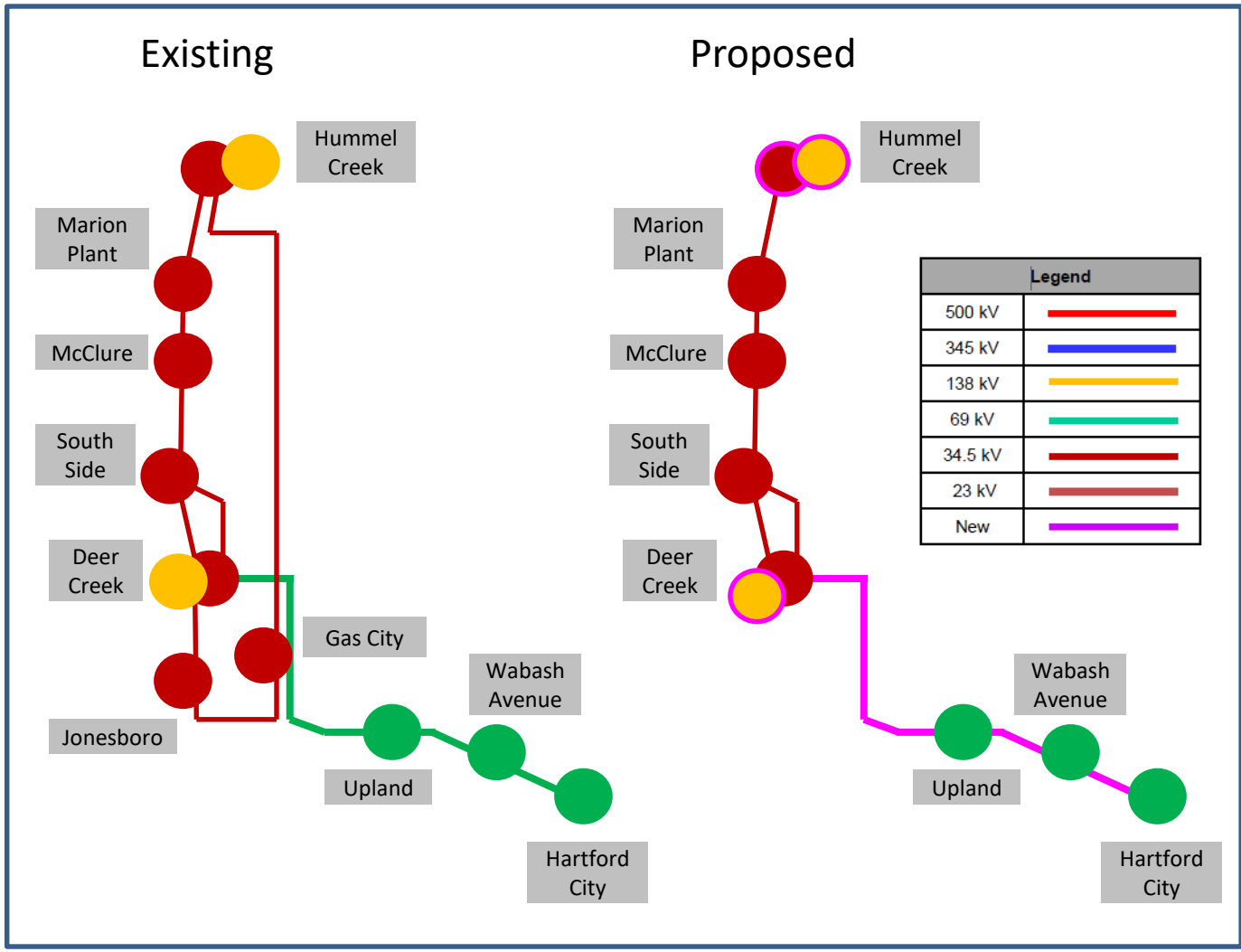
Jonesboro – Gas City 34.5 kV : Retire ~0.99 miles of 34.5 kV 1969 wood line.
Cost: $0.42 M

Deer Creek – Alexandria 34.5 kV : Retire ~2.2 miles of 34.5 kV 1968 wood line.
Cost: $1.23 M

Hummel Creek 34.5 kV Station: Remove the 34.5 kV circuit breaker "M". Replace 34.5 kV circuit breaker "L" with a system spare circuit breaker. Rebuild the 34.5 kV bus to a 69 kV standards. Install a 138 kV high side circuit switcher on the 138/34.5 kV transformer.
Cost: $1.74 M

Deer Creek substation: Remove the 34.5 kV circuit breaker "M". Install a 138/12 kV 20 MVA transformer with a high side 138 kV circuit switcher. Also install a low side 12 kV 2000 A circuit breaker a 12 kV 2000 A bus tie circuit breaker and three 12 kV 2000 A feeder circuit breakers. Install a new high side 138 kV circuit switcher 138/12 kV transformer #4.
Cost: $4.14M

Total Cost: $49.2 M



AEP Transmission Zone M-3 Process
Eastern Marion Improvements

Need Number: AEP-2018-IM017, AEP-2018-IM022, AEP-2018-IM023, AEP-2021-IM014

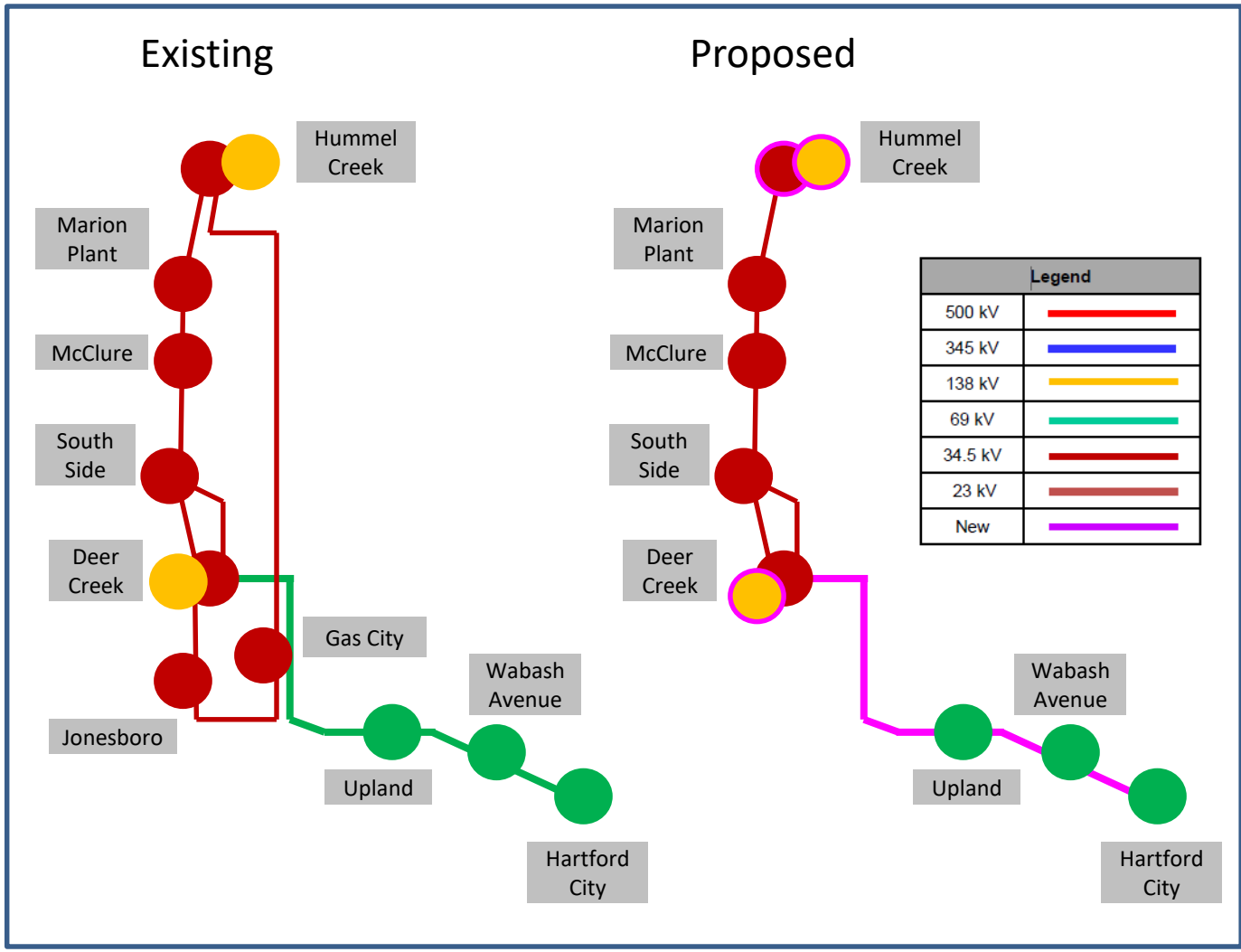
Process Stage: Solution Meeting 7/16/2021

Alternative: Remove the 69 kV line between Deer Creek and Wabash Avenue. Relocate Upland station and connect with a 138 kV loop to the Desoto – Sorenson 138 kV circuit. Loop Wabash Avenue to Hartford City station and install a 69 kV tie circuit breaker at Hartford City. This alternative would also retire the Hummel Creek – Deer Creek 34.5 kV, Deer Creek 34.5 kV extension, Jonesboro – Gas City 34.5 kV and Deer Creek – Alexandria 34.5 kV lines. This alternative was not selected as building an additional line between Wabash Avenue and Hartford City would be difficult and costly due to urban construction.

Cost $53 M

Projected In-Service: 10/25/2024

Project Status: Scoping

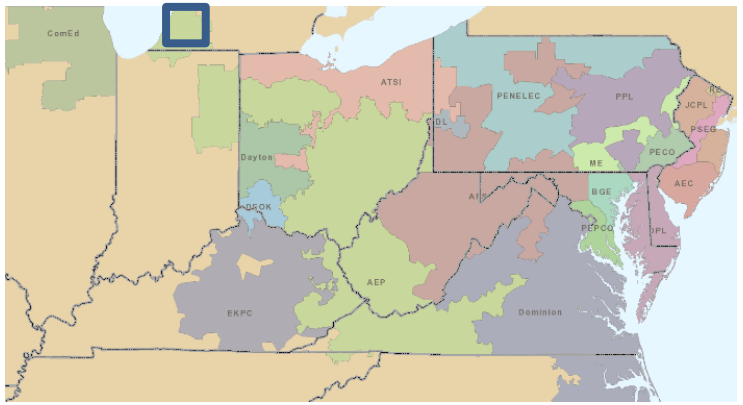


AEP Transmission Zone M-3 Process
Hartford Area Improvements

Need Number: AEP-2021-IM003
Process Stage: Solution Meeting 7/16/2021
Previously Presented: Needs Meeting 4/16/2021
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:

Riverside – Hartford 138kV line:

- 16.85 miles of mostly 1957 wood H-Frame construction
- Conductor is 397 MCM ACSR
- There are 48 structures with open conditions (36% of line). 40 of these are structure related affecting the crossarm, pole, or X-brace including rot, corrosion, cracked, woodpecker, and disconnected conditions.
- Additional assessment identified the following:
    - 15 structures were subject to some level of decay above normal weathering
    - 10 had crossarm decay
    - 9 had ground line decay
    - 4 had broken/flashed insulators
    - 64% of structures assessed had some level of decay

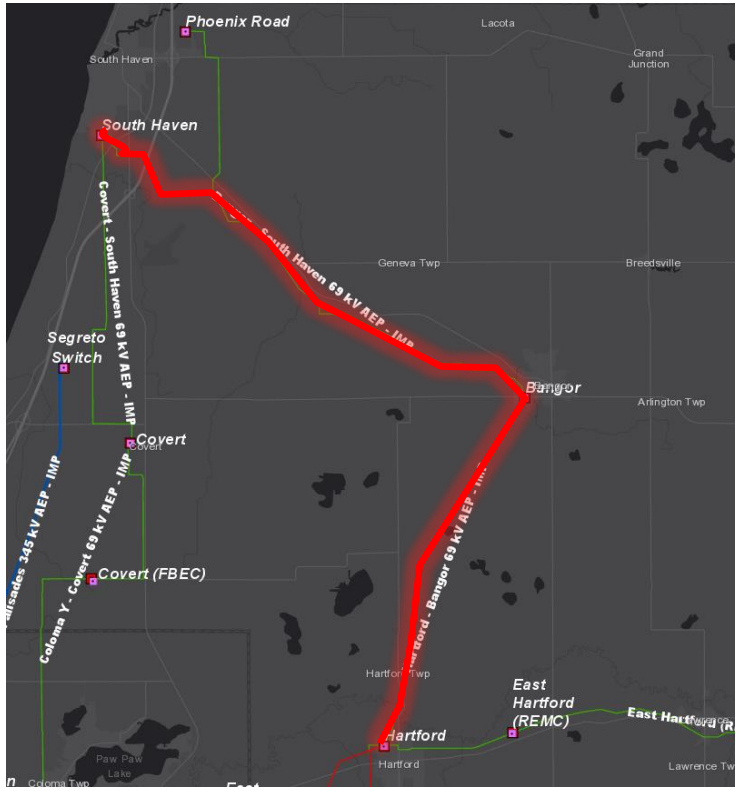


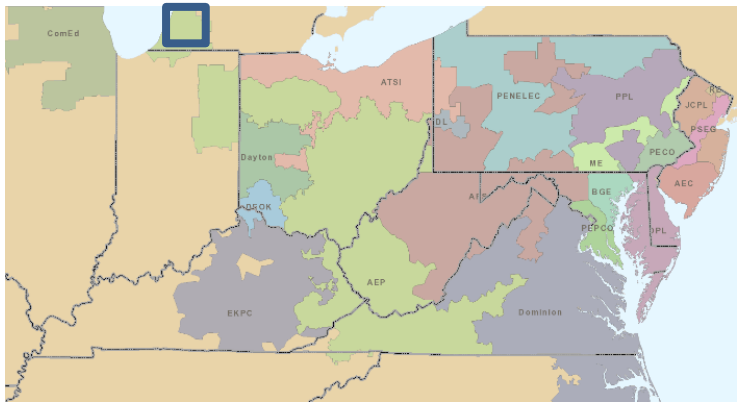
AEP Transmission Zone M-3 Process
Hartford Area Improvements

Need Number: AEP-2021-IM015
Process Stage: Solution Meeting 7/16/2021
Previously Presented: Needs Meeting 4/16/2021
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:

Hartford – South Haven 69kV line:

- 18.68 miles of mostly 1966 wood pole
- Conductor is 336.4 ACSR
- Since 2015 there have been 20 momentary and 4 permanent outages.
- 4,984,780 CMI from 2015-2020
- Structures fail NESC Grade B, AEP Strength requirements and ASCE strength requirements
- There are 90 structures with open conditions (29% of line). 52 of these are structure related including pole rot, split and woodpecker damage





AEP Transmission Zone: Supplemental
Hartford Area Improvements

Need Number: AEP-2021-IM003 & AEP-2021-IM015

Process Stage: Solution Meeting 7/16/2021

Proposed Solution:

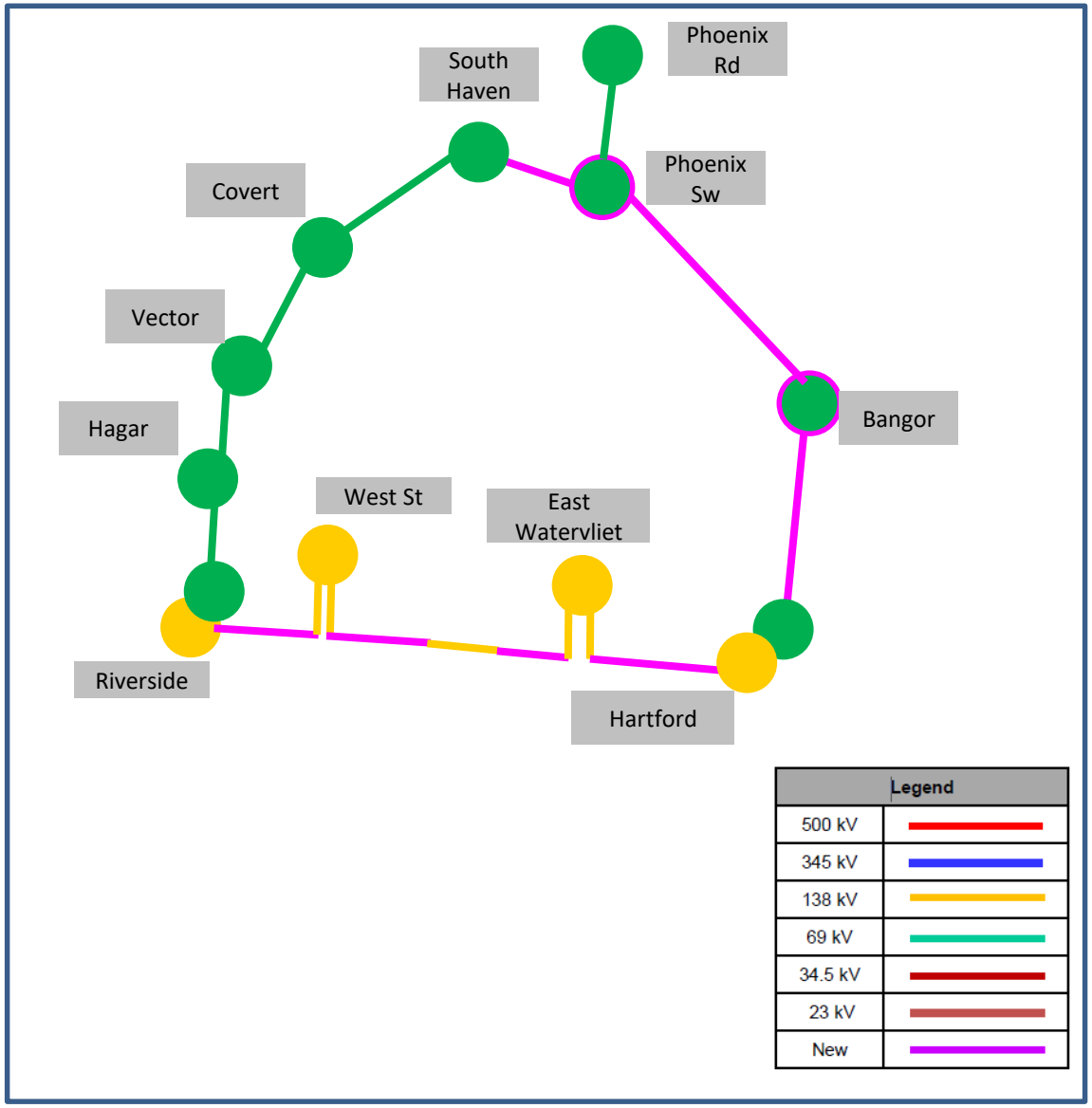
Riverside – Hartford 138kV:
Rebuild the ~14.7 miles of 1950's wood H Frame line with 795 Drake ACSR.
Estimated Cost: $26.9M

South Haven – Hartford 69kV:
Rebuild the ~18.7 miles of 1960's wood pole line with 795 Drake ACSR.
Estimated Cost: $37.1M

Phoenix Switch 69kV:
Replace the switch with a new POP Switch with line MOAB's
Estimated Cost: $0.6M

Bangor 69kV:
Install a bus tie breaker at Bangor 69kV station
Estimated Cost: $0.8M

Total Estimated Cost: $ 65.4 Million



AEP Transmission Zone: Supplemental
Hartford Area Improvements

Need Number: AEP-2021-IM003 & AEP-2021-IM015

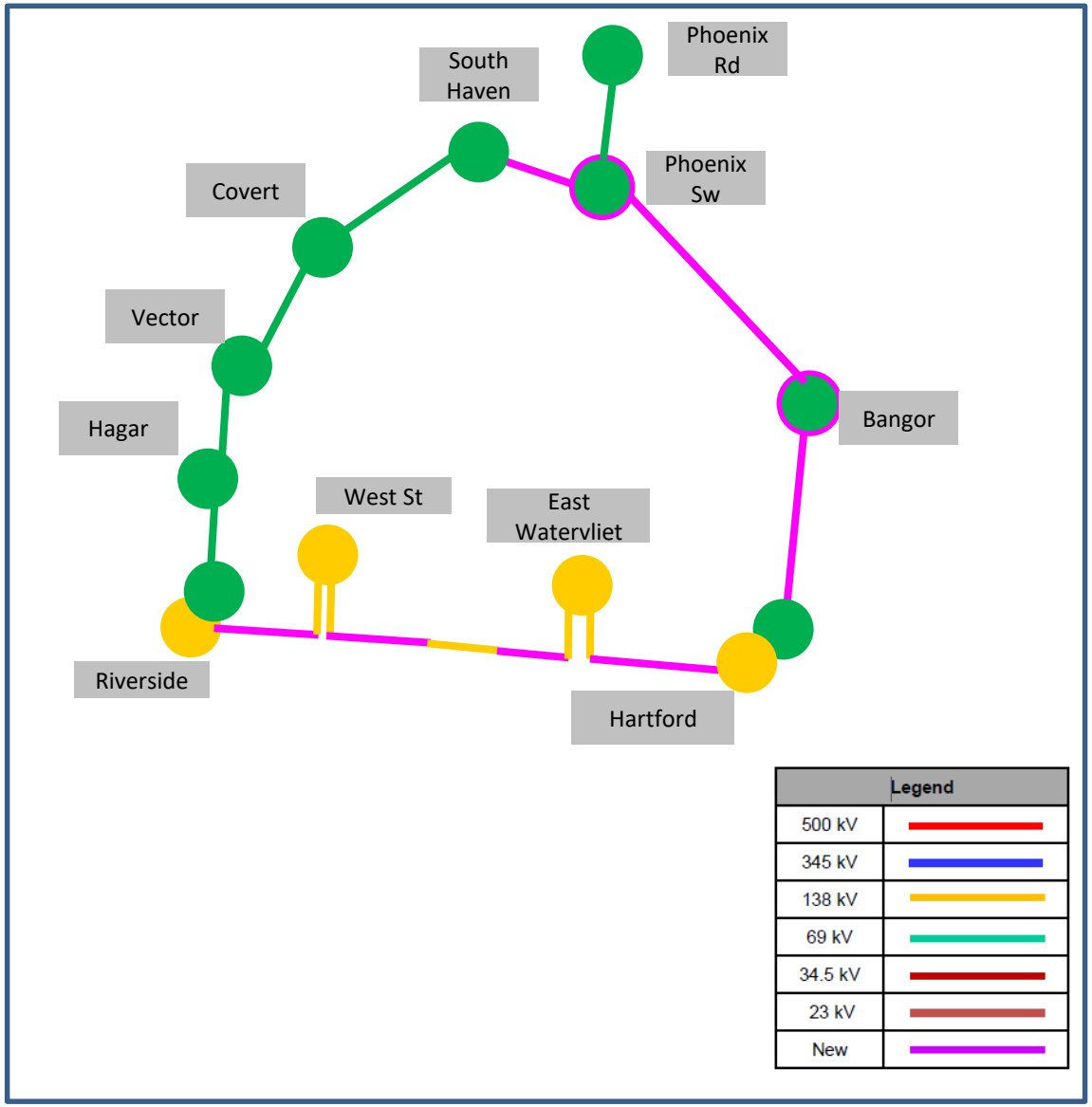
Process Stage: Solution Meeting 7/16/2021

Alternatives:

Considering the location and number of stations served from these lines, no other viable solutions were considered. Consideration was given to looping Phoenix Road station to eliminate the radial feed; however, the area around South Haven and Phoenix Road is urban and well developed, resulting in increased costs. Estimated Cost: $67.4

Projected In-Service: 10/28/2024

Project Status: Scoping



AEP Transmission Zone M-3 Process
Smyth County, VA

Need Number: AEP-2020-AP037

Process Stage: Solutions Meeting 07/16/2021

Previously Presented: Need Meeting 7/17/2020

Supplemental Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

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

Problem Statement:

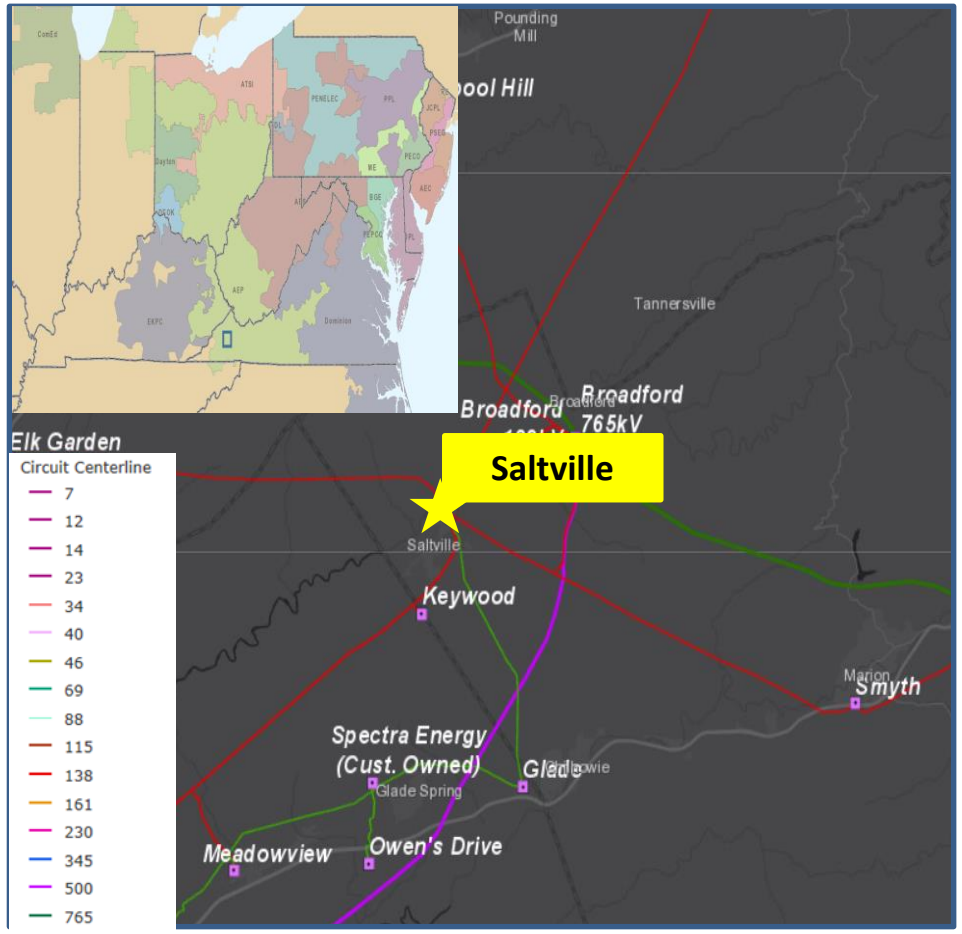
Station Name: Saltville

Circuit Breakers A, B, C, L & V (138 KV) Concerns:

- All of these breakers are HVB145-40000. These breakers are of either 1996 (A & B) or 2001 (C, L, & V) vintage.
- These CBs require maintenance beyond the typical SF6 model type because of air trip mechanisms. The entire air system must be rebuilt whenever maintenance is performed resulting in significant costs.
- All of these breakers have exceeded the manufacturer's designed number of full fault operations – Breakers A, B, C, L, V have experienced 51, 75, 12, 22, 70 fault operations, respectively —exceeding manufacturer's recommended number of 10.

Circuit Breakers J (69 KV) Concerns:

- Circuit breaker J is 53 years old, CF-48-69-2500 type, oil filled breaker – which requires frequent maintenance. Oil spills are common and can result in significant environmental mitigation costs.
- This breaker has experienced 34 fault operations — exceeding manufacturer's recommended number of 10.
- There is no support for the CF family of circuit breakers and spare parts are obsolete, impossible to obtain.



Saltville Station (continued)

Transformer Bank 1 (138/ 69-34.5 KV) Concerns:

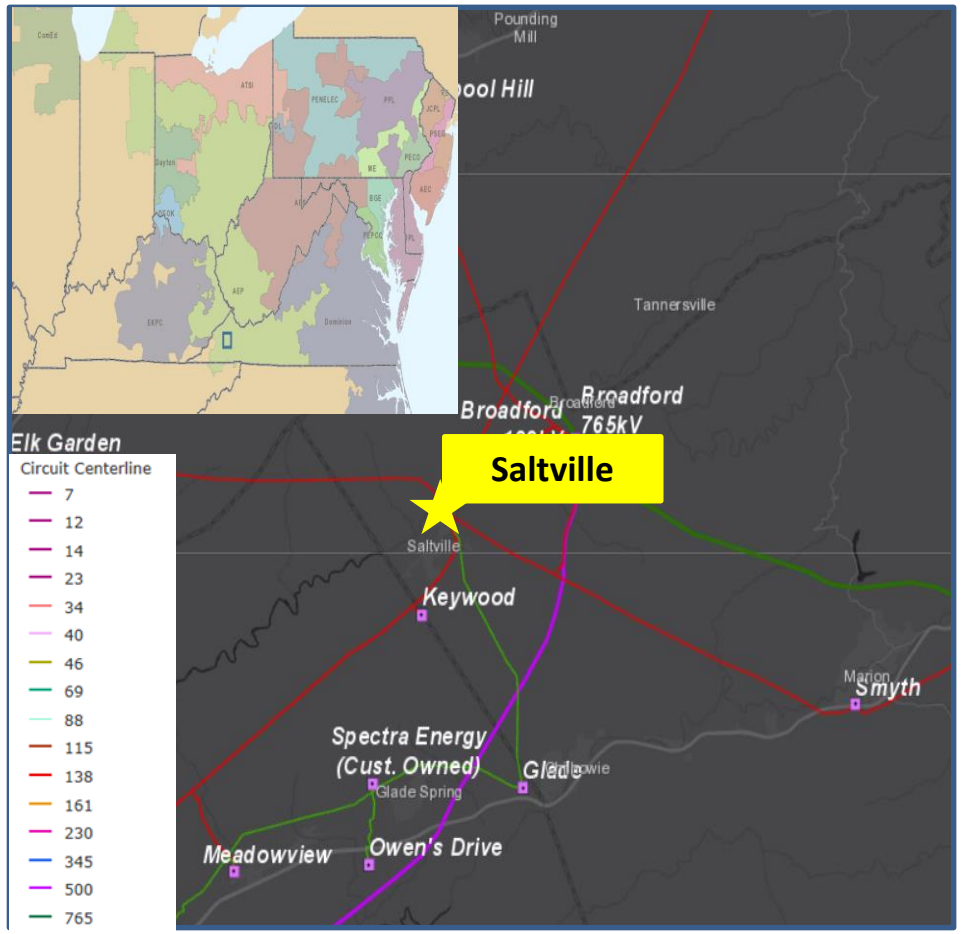
- The 138/ 69-34.5 KV Transformer Bank is 53 yeas old with no oil containment
- This unit shows elevated levels of Carbon Dioxide and Ethane, which are currently at IEEE Level 3 and 4, respectively. These levels indicate excessive decomposition of the paper insulating materials.
- The presence of Carbon Dioxide and Ethane indicates decomposition of the paper insulation that impairs the unit to withstand future short circuit or through fault events due to the state of the paper insulation.
- The low side surge arresters (on 69KV) are obsolete and in need of replacement.

Other station concerns:

- The station yard is tiered with stairs to access the different levels which creates a washout risk.
- Power transformers XF#1, XF#2, and XF#5 are connected directly to 138kV bus through MOABs — which renders Saltville bus#1 and bus#2 to a transformer fault. Moreover, malfunction record indicated that the MOAB X1 would not open during trip testing due to the plunger sticking on the contactor. Also, MOAB X2 is on cap and pin insulators.
- Perimeter fence is not standard height and damaged.
- Concrete cable trench along retaining wall is damaged.
- Several foundations throughout station are degraded.
- Lower elevation levels in the station yard are in the 100-year flood plain of the nearby New River.
- Asbestos and lead paint in both of the control buildings.

Relay concerns:

- Currently, 79 of the 95 relays are in need of replacement.
- There are 68 of the electromechanical, 6 static type and 5 legacy microprocessor relays — which have significant limitations with regards to fault data collection and retention.



AEP Transmission Zone: Supplemental Smyth/Tazewell County, VA

Need Number: AEP-2021-AP004

Process Stage: Solutions Meeting 07/16/2021

Previously Presented: Need Meeting 01/15/2021

Supplemental Project Driver: Equipment Condition/Performance/Risk

Specific Assumption Reference:

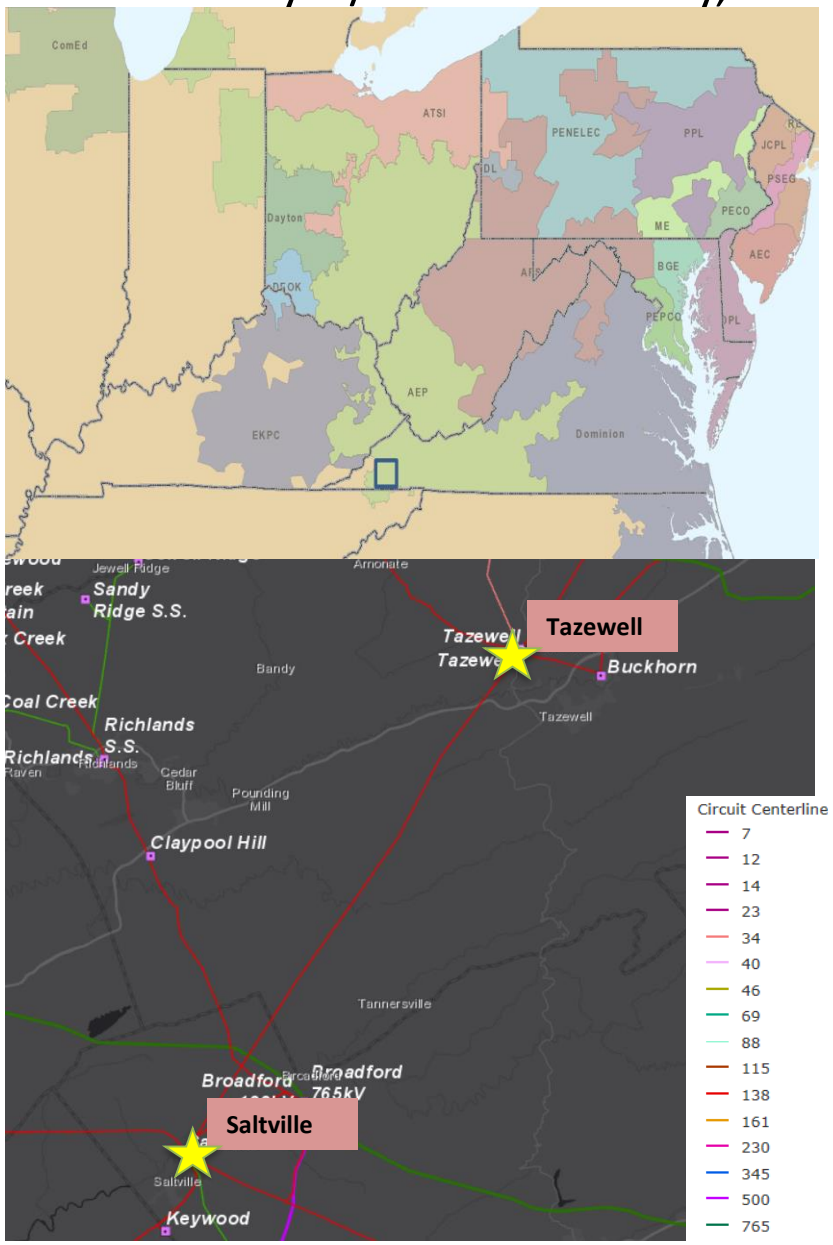
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13), AEP Presentation on Pre-1930s Lines

Problem Statement:

Line:

Saltville — Tazewell 138 KV (installed in 1927)

- Length: ~21 Miles
- Original Construction Type: Lattice Steel
- Original Conductor Type: 97.3% 397.5 ACSR, 1 % 795 ACSR, 1.5% 1033.5 ACSR
- Momentary/Permanent Outages: 15/2 (5 years)
- Total structure count: 98
- Number of open conditions: 26
  - Open conditions include: broken conductor strands, broken/burnt insulators.
- Unique structure count with open conditions: 12 (12%)
- Additional Info on Insulator & Hardware Corrosion:
  - Section Loss: The connecting elements including the tower attachment hole and the insulator hook have experienced serious cross-section loss due to corrosion and wear. This loss of metal cross-section significantly reduces the capacity of the connection
  - Corrosion: The insulator caps and connecting hardware have experienced heavy to complete loss of galvanizing. When the protective galvanized coating is gone or significantly compromised, the bare steel corrodes at an accelerated rate
  - Tower members with corrosion and damage. Lattice tower structures have little structural redundancy. A failure of one member of the structure will impact the integrity of the structure and may cause the entire tower to collapse.
- **Model:** N/A



AEP Transmission Zone: Supplemental
Smyth/Tazewell County, VA

Need Number: AEP-2020-AP037, AEP-2021-AP004
Process Stage: Solutions Meeting 07/16/2021

Proposed Solution:

Rebuild and reconfigure the Saltville 138 KV station in a 3 string breaker-and-a-half bus arrangement to allow replacement of 138 KV CBs A, B, C, V, L, and U with new 3000A 40 KA circuit breakers. Replace existing 69 KV circuit breaker J with a new 3000A 40 KA circuit breaker. Replace existing Transformer #1 with a new 138/69-34.5 KV 50 MVA transformer. Replace existing high side MOAB switches with high side circuit switchers on T2&T5.

- Estimated Install Cost: ~$12.54M; Estimated Removal Cost: ~$1M

Line work and ROW required to relocate the Broadford – Saltville #1 138KV, Broadford – Saltville #2 138KV, Clinch River – Saltville 138KV lines to terminate into Saltville Station's new configuration. This work includes installing 2 structures (steel tower structures) and total of ~0.24 new wire and old wire replacement. - **Estimated Cost: ~$1.87 M**

Rebuild ~21 miles of the 138KV line between Saltville and Tazewell stations (SN/SE/WN/WE: 296/413/375/464 MVA) .

- Estimated Cost: ~$53.8M; Estimated Removal Cost: ~$5.7M

Remote End Work Costs Tazewell, Meadowview, Broadford and Clinch River Stations:

- Estimated Transmission Costs: ~$0.7M

Total Estimated Transmission Cost: ~$75.61M

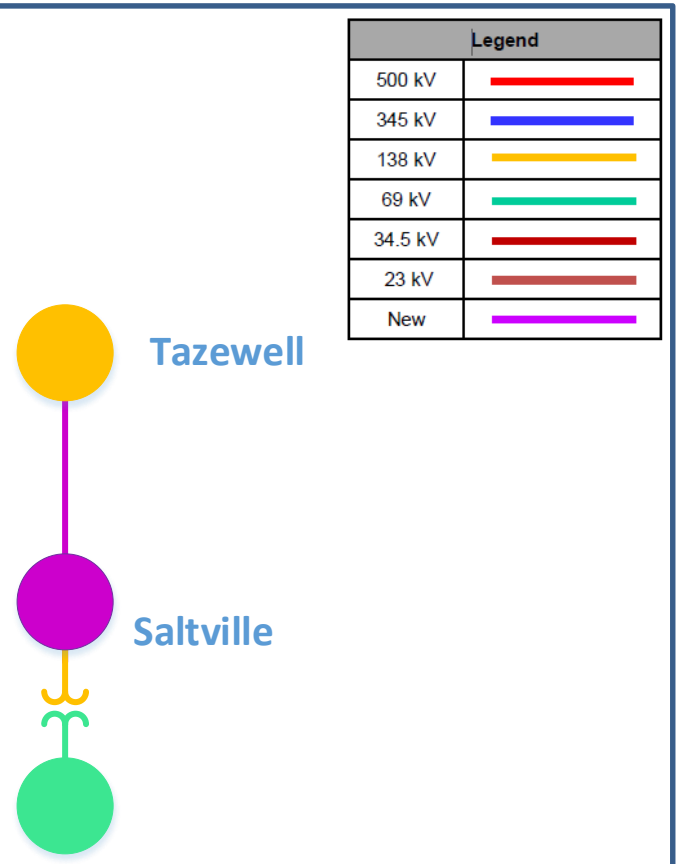
Alternatives Considered:

A ring bus arrangement was considered at Saltville instead of the breaker and a half proposal. The existing station site cannot fit a ring bus on and limits any potential future expansion considering an additional 138 kV line physically passes through the station but does not electrically connect.

Projected IS Date: 7/01/2025

Project Status: Scoping

Proposed



AEP Transmission Zone M-3 Process
Boone County, WV

Need Number: AEP-2021-AP010

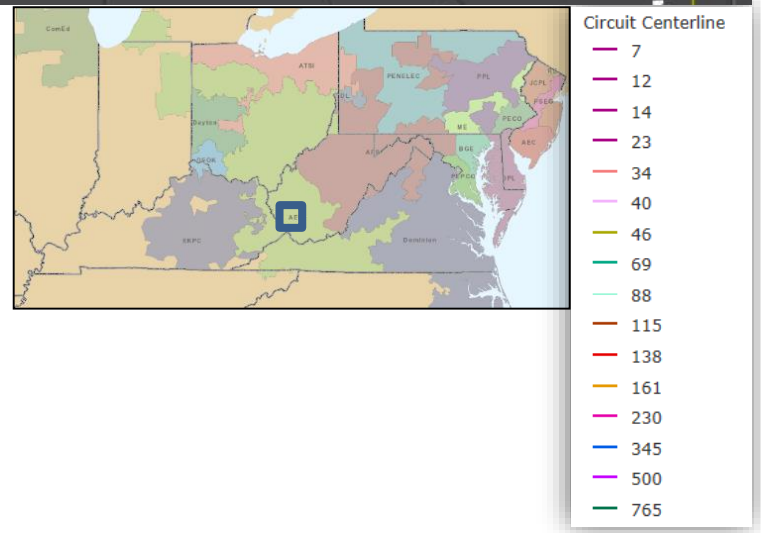
Process Stage: Solutions Meeting 07/16/2021
Previously Presented: Needs Meeting 03/19/2021

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

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

Problem Statement:

- Both Spruce Laurel and Hampton stations are no longer feeding customers but have equipment connected to the transmission through path.



Need Number: AEP-2021-AP010

Process Stage: Solutions Meeting 07/16/2021

Proposed Solution:
- Remove the equipment at Spruce Laurel station.
- **Estimated Transmission Cost: $0.224M**

- Remove the equipment at Hampton station.
- **Estimated Transmission Cost: $0 (station is Distribution)**

- One Transmission line structure at Hampton station will be removed and new guy wires will be added to an existing structure.
- **Estimated Transmission Cost: $0.222M**

Total Estimated Transmission Cost: $0.446M

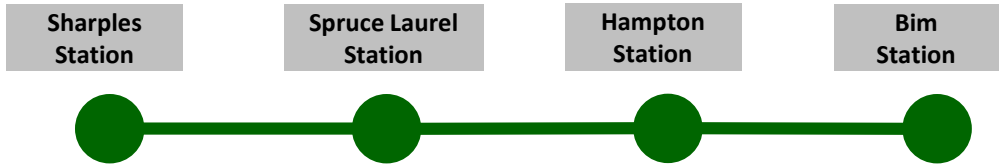
Ancillary Benefits: No longer need to maintain two stations, reducing future O&M costs.

Alternatives Considered:
- The alternative to this project is to leave the stations as they are. This would be a risk if there is an equipment failure at either station because they are within abandoned customer facilities and access to the stations is difficult. Both stations have poor access roads due to the roads being controlled by the customers.

Projected IS Date: 5/1/2022

Project Status: Scoping

Existing



Proposed

Legend	
345 kV	
138 kV	
69 kV	
46 kV	
New	

Need Number: AEP-2021-AP020
Process Stage: Solutions Meeting 07/16/2021
Previously Presented: Needs Meeting 5/21/2021
Supplemental Project Driver: Equipment Condition/Performance/Risk
Specific Assumption References: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)
Problem Statement:
The Fries – Independence 69 kV line has 35 open conditions associated with the structures that make up 41% of the line. Conditions include woodpecker damage and rot top. Majority of the circuit utilizes 1950s wood structures.

Since 2013, there has been 5 momentary and 6 permanent outages on the Fries - Independence 69kV Circuit. The 5 momentary outages were due to lightning (3), ice/snow (1), and wind (1) causes. The 6 permanent outages were due to wind (2), lightning (1), vegetation fall-in from outside AEP ROW (2), and relay (1) causes.

The structures on the Fries – Independence 69kV Circuit 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 line is grounded using the butt wrap method which does not meet current AEP standards. The line shielding angle on the typical tangent structure is measured at 33°, which is inadequate for current AEP shielding angle requirements.

S1851 was updated to present a scope change at Independence station due to space constraints and a cost update. The remaining need on the condition of the existing line is presented here.

42

Need Number: AEP-2021-AP020

Process Stage: Solutions Meeting 7/16/2021

Proposed Solution:
- Once the Jubal Early to Point Lookout line is built, rebuild the existing ~11.4 mile 69kV Fries – Point Lookout line on the current center line. **Estimated Transmission Cost: $33.0M**

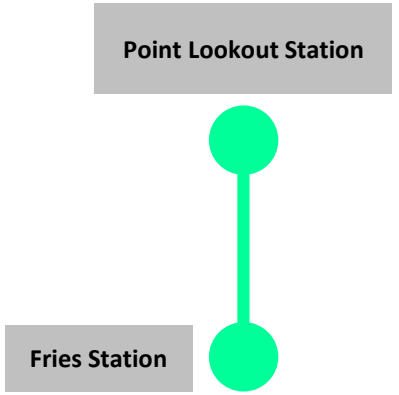
Ancillary Benefits: N/A

Alternatives Considered:
- Construct a second 69 kV line (approximately 12 miles) from Fries Station to Point Lookout Station in the clear and retire the original Fries to Point Lookout line. This option was not considered because it will be more costly to rebuild the line on new ROW and with the new line from Jubal Early to Point Lookout, Point Lookout will still have service during the Fries to Point Lookout line construction. Further, the load at Point Lookout meets the 75 MW-mile guideline to loop radial customers. This alternative would keep the Pont Lookout load on a long radial.

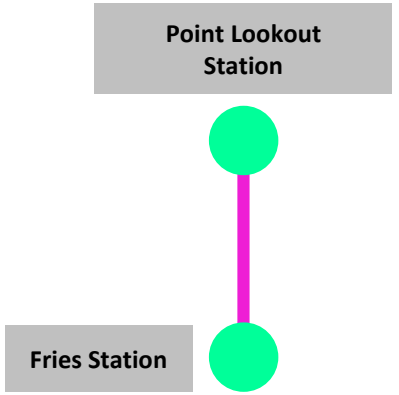
Projected IS Date: 5/1/2025

Project Status: Scoping

Existing



Proposed



Legend	
345 kV	
138 kV	
69 kV	
46 kV	
New	

AEP Transmission Zone M-3 Process
Seneca County, Ohio

Need Number: AEP-2019-OH032

Process Stage: Solutions Meeting 07/16/2021

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)

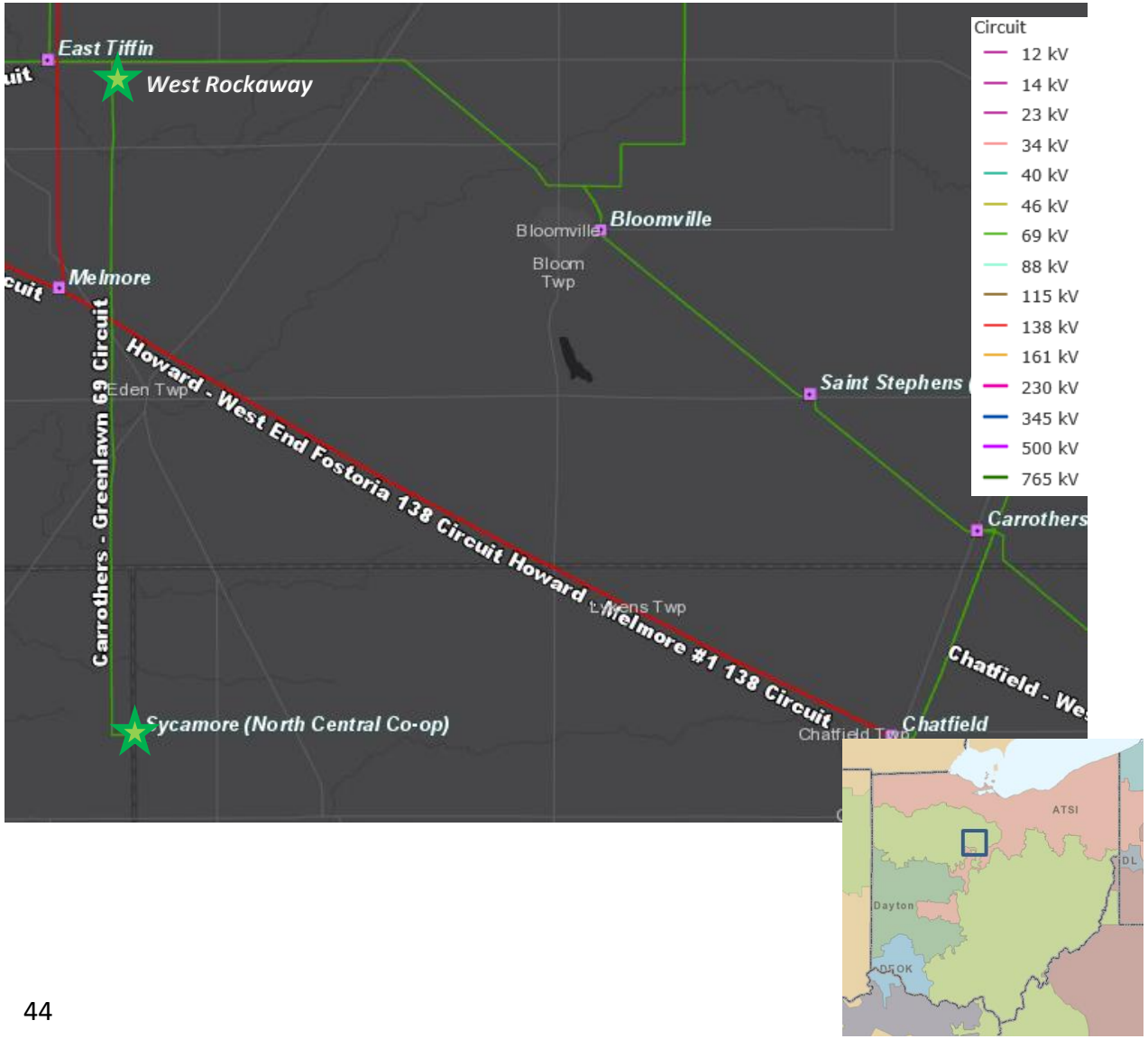
Problem Statement:

West Rockaway – North Central Co-op Line (vintage 1960)

- Length: 8.32 Miles
- Original Construction Type: Wood
- Original Conductor Type: 1/0 ACSR 6/1 (Raven)
- Momentary/Permanent Outages: 13 in the past 5 years
- CMI: 2,505,168

Additional Info: Radial service severely restricts the ability to perform routine maintenance and restoration activities. The maintenance of radial transmission lines often requires costly temporary facilities or other labor-intensive measures involving energized work because a maintenance outage to such radial loads is generally not feasible.

Model: PJM 2019 RTEP Series Cases



AEP Transmission Zone M-3 Process
Crawford County, Ohio

Need Number: AEP-2021-OH024

Process Stage: Solutions Meeting 07/16/2021

Previously Presented: Needs Meeting 4/16/2021

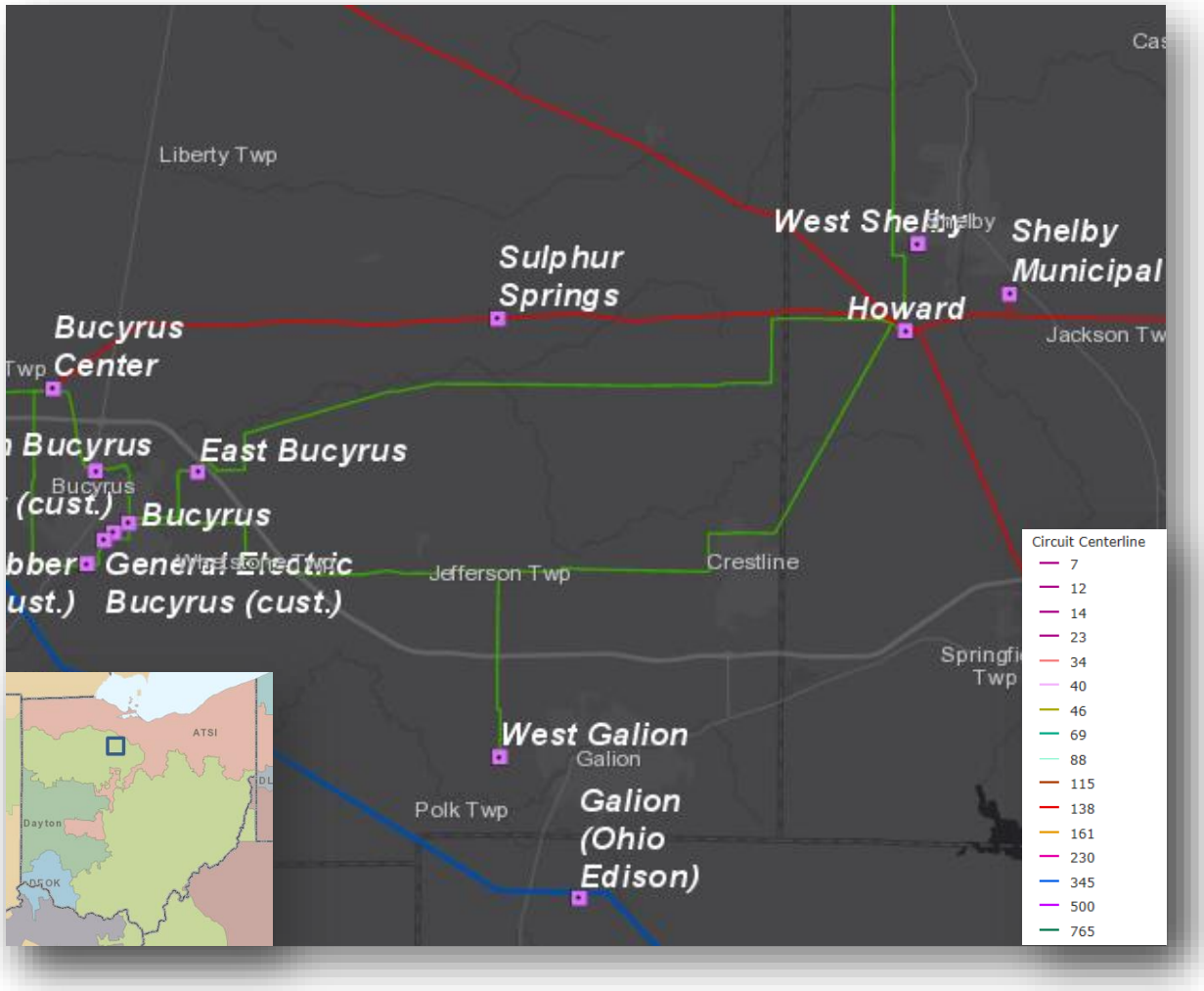
Project Driver: Equipment Material/Condition/Performance/Risk

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

Problem Statement:

Line Name: Bucyrus – Howard No.1 69kV

- **Original Install Date (Age):** 1948
- **Length of Line:** 18.05 miles
- **Total structure count:** 413
- **Original Line Construction Type:** Wood
    - 14 % of structures rehabbed since installation
    - Wood Cross Arms
- **Conductor Type:** 3/0 Copper 7 conductor
- **Outage History (past 5 years)**
    - 7 momentary and 2 permanent outages with an average duration of 5.37 hours
    - CMI: 60,120
- **Condition Summary**
    - Number of open conditions by type / defects / inspection failures: 78
    - Ground lead wire missing, stolen or broken, structure related conditions affecting the cross arm or pole including rot, split or woodpecker holes, contaminated or broken insulator hardware
- Number of Customers at Risk: 331, 11.527 MVA



AEP Transmission Zone M-3 Process
Seneca County, Ohio

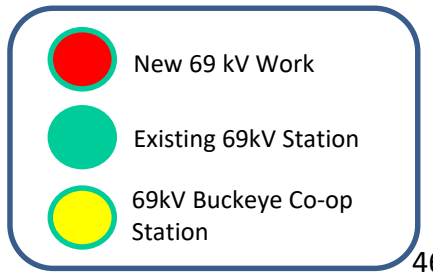
Need Numbers: AEP-2019-OH032, AEP-2021-OH024

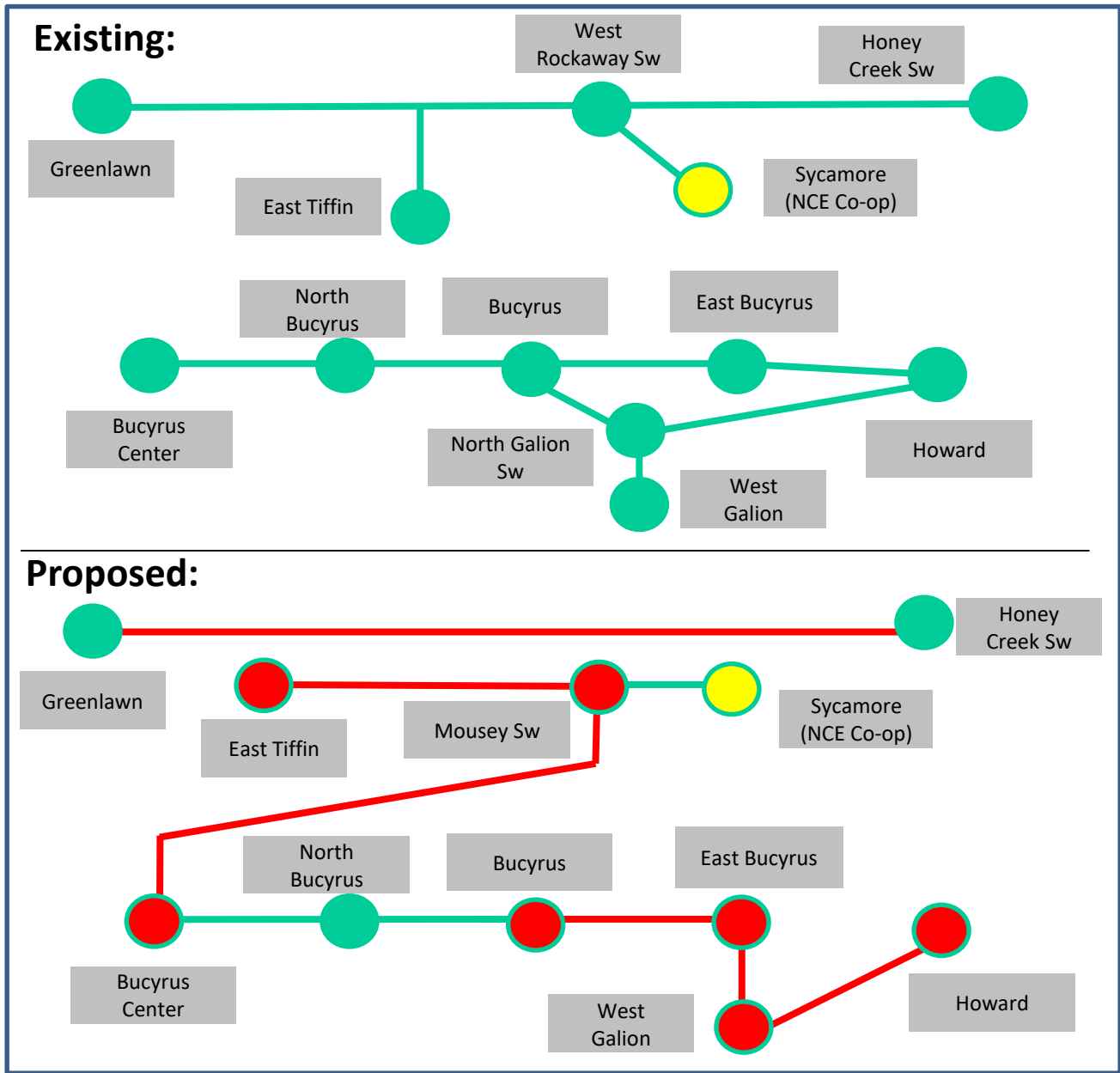
Process Stage: Solutions Meeting 07/16/2021

Proposed Solution:

- Install a new 3-way POP Switch (Mousey Sw) and 69 kV metering to serve North Central's Sycamore station. **Estimated Cost: $0.68 M**
- Construct ~ 13 miles of new 69 kV line between Bucyrus Center and the new Mousey Switch delivery point using 556 ACSR conductor. **Estimated Cost: $29.3 M**
- Install a new 69 kV 3000A 40kA breaker and associated terminal equipment at Bucyrus Center on the line towards Mousey switch. **Estimated Cost: $1.02 M**
- Remove the existing West Rockaway 69 kV switch currently used to radially serve the Sycamore delivery point. **Estimated Cost: $0.075 M**
- Construct ~ 0.8 miles of new 69 kV line between the existing Sycamore radial line and East Tiffin delivery points using 556 ACSR conductor. **Estimated Cost: $2.54 M**
- Reconfigure East Tiffin station to add in a box bay, a breaker, and terminal equipment towards Mousey switch and a new line MOAB toward South Tiffin. **Estimated Cost: $2.5 M**
- Rebuild ~ 2.3 miles of new 69 kV line between the existing Bucyrus and East Bucyrus delivery points using 556 ACSR conductor. **Estimated Cost: $5.9M**
- Remove ~ 16 miles of existing 69 kV line between the existing East Bucyrus and Howard delivery points. **Estimated Cost: $5.94 M**
- Retire the existing ~1.4 miles of the Howard- Bucyrus #2 line between Bucyrus station and structure 366. **Estimated Cost: $0.32 M**
- Construct ~ 1.3 miles of new 69 kV line between the existing East Bucyrus delivery point and structure 336 on the Howard- East Bucyrus #2 line. This construction will be coordinated with rebuild project S2156. **Estimated Cost: $3.3 M**

Total Estimated Transmission Cost: $51.6M





AEP Transmission Zone M-3 Process
Seneca County, Ohio

Ancillary Benefits:

Provides both Sycamore and East Tiffin radial lines looped transmission service to reduce exposure of both stations to outages. Allows for 18 miles of line retirement instead of new construction.

Alternatives Considered:

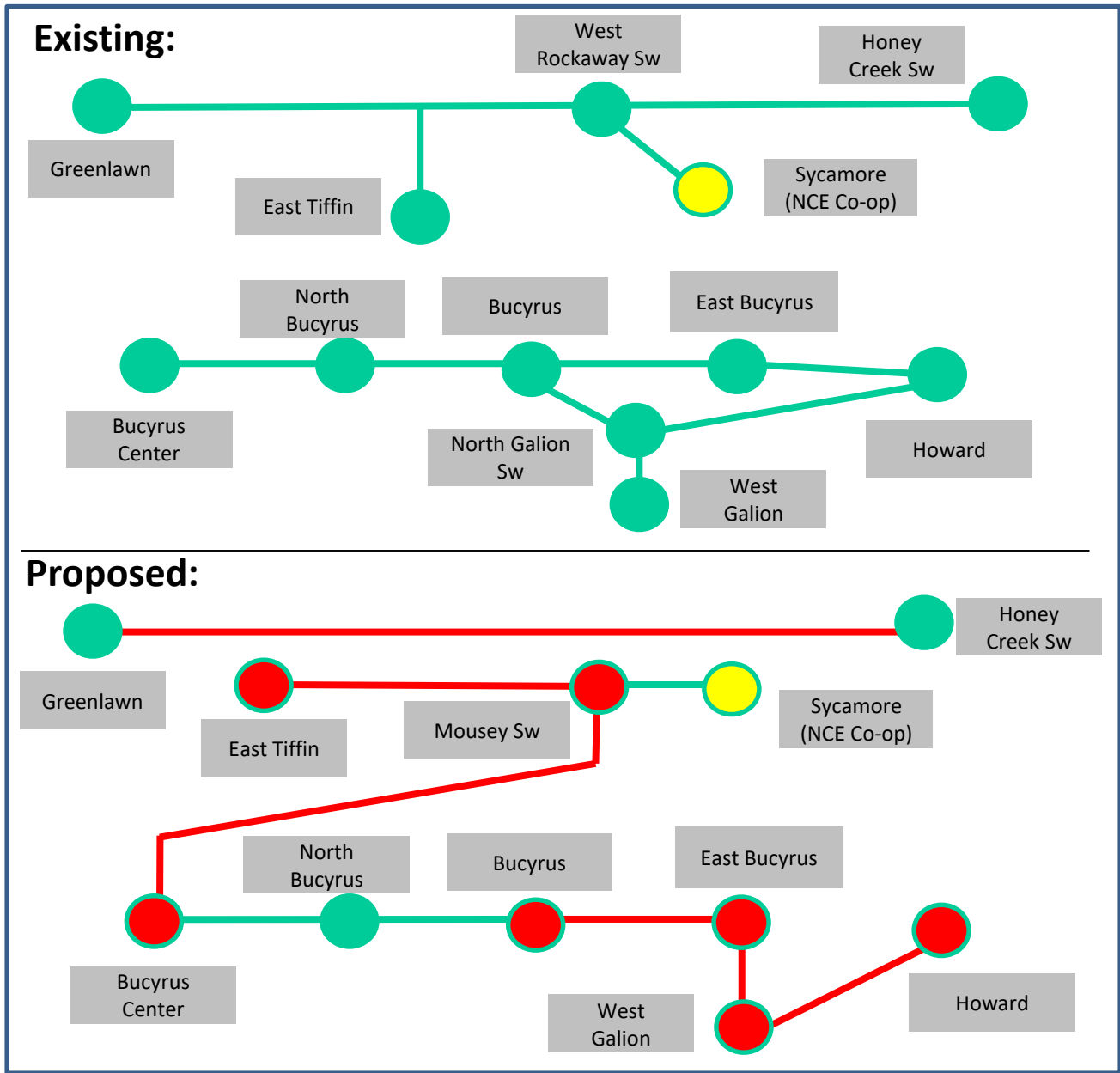
1. Construct a new greenfield line from Sycamore to Melmore station and remove the South Tiffin to East Tiffin line and closing in the East Tiffin normally open switch. Due to limited space at Melmore (active IPP projects) makes this option more difficult and costly. To accommodate this new line, the station would need to be expanded or rebuilt.

2. Construct a new greenfield line from Sycamore to Chatfield station and replace West Rockaway switch with a new 3 breaker ring bus station. Currently Chatfield station does not have available space to accommodate a new line and additional land would need to be purchased in order to expand the station and was therefore not considered.

3. Rebuild 16 miles the Bucyrus-Howard #1 line in place. This option keeps the line in the area. S2156 is rebuilding the Bucyrus-Howard #2 line and this project will coordinate with that one to eliminate one of the 69 kV paths in the area while maintaining service to customers. Estimated cost: $40M

Projected In-Service: 11/1/2024

Project Status: Engineering

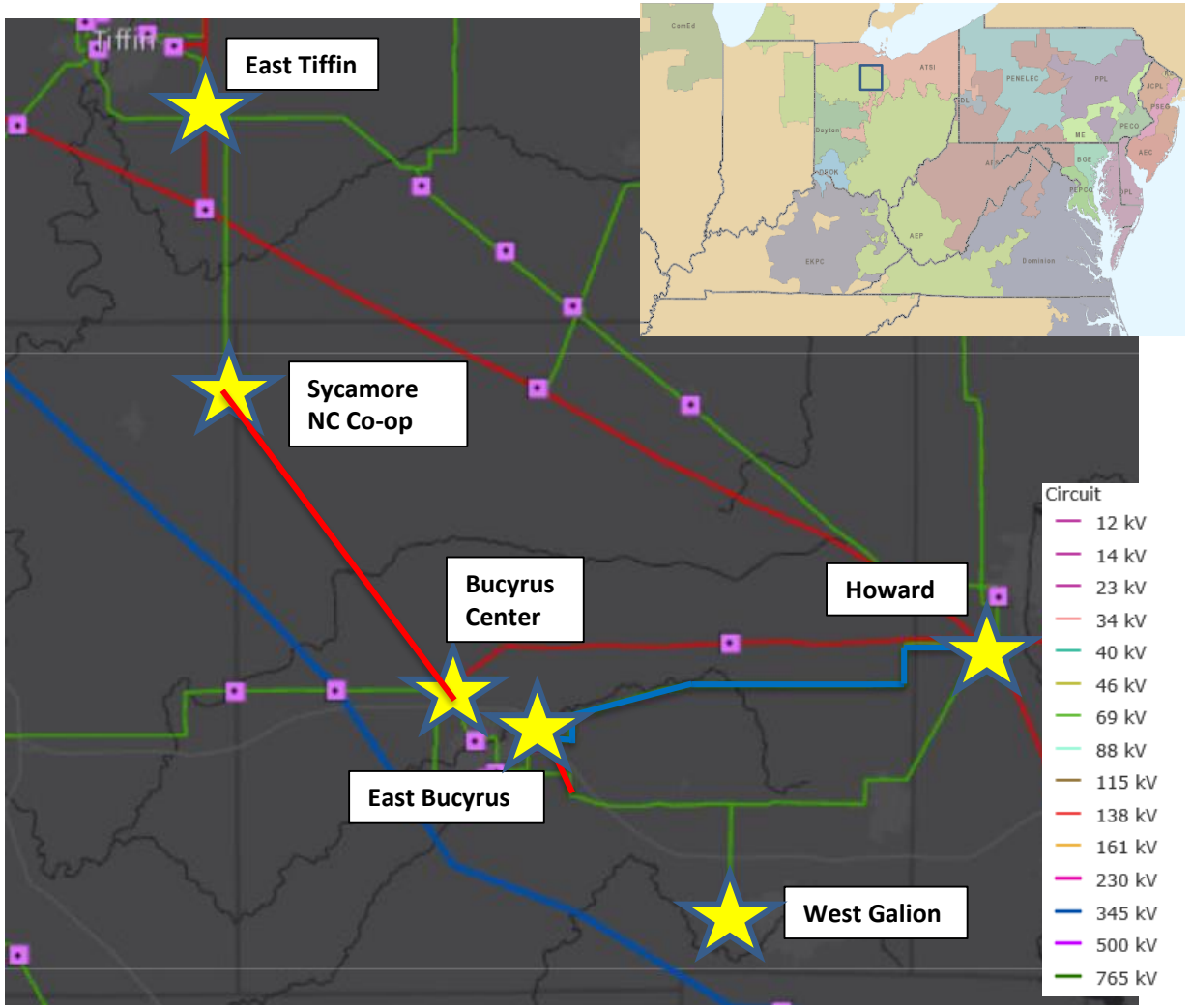


New 69 kV Work

Existing 69kV Station

69kV Buckeye Co-op Station

AEP Transmission Zone M-3 Process
Seneca County, Ohio



AEP Transmission Zone M-3 Process
Lick – Pedro 69kV Line Rebuild

Need Number: AEP-2020-OH012

Process Stage: Solutions Meeting 07/16/2021

Previously Presented:

Needs Meeting 02/21/2020

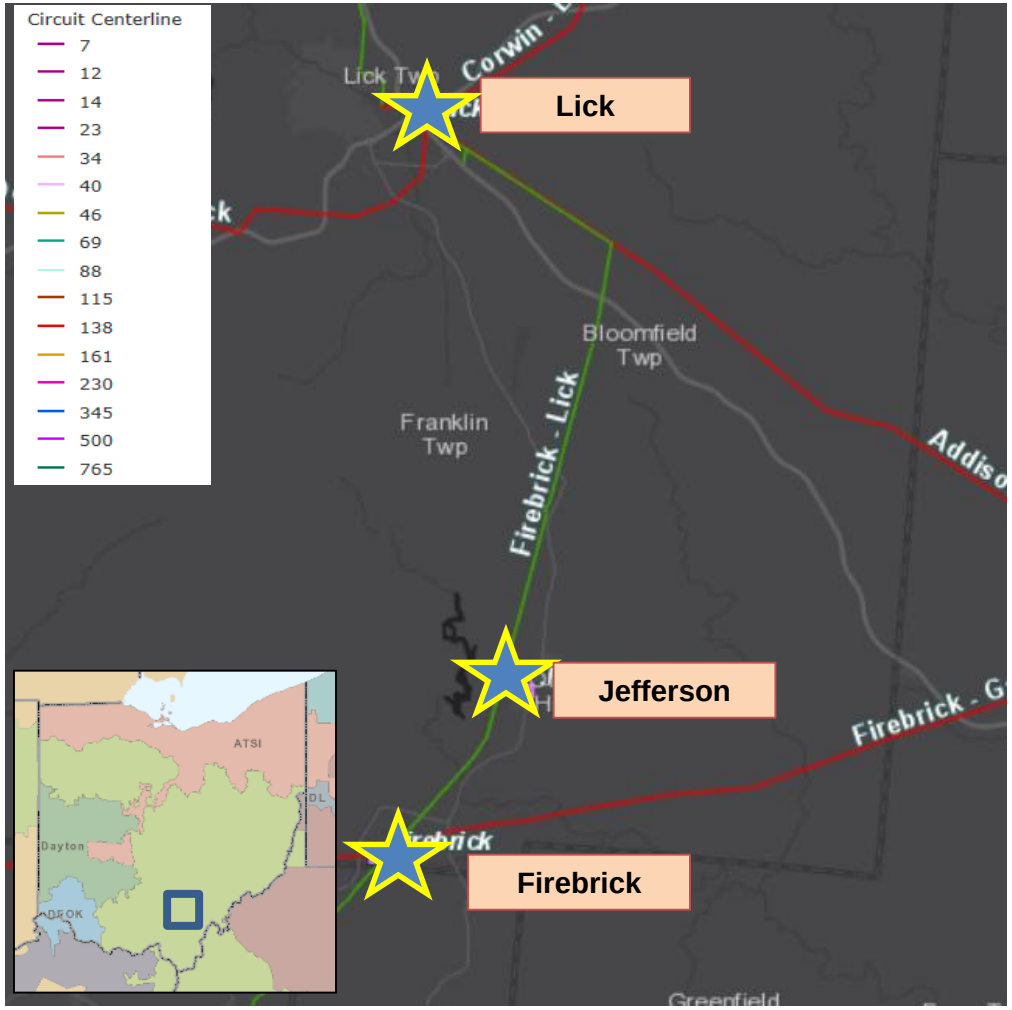
Supplemental Project Driver: Equipment Material/Condition/ Performance/Risk

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

Problem Statement:

Jefferson-Lick 69 kV line

- Original Construction Date: 1927
- Length: 12.5 miles
- Original Construction Type: Wood (1927, 1953, and 1980s)
- Conductor Type: 8.5 miles of 4/0 ACSR conductor (1927 and 1967) with 4.0 miles of 336 ACSR conductor (1980s)
- Outages: 4 Permanent and 17 Momentary (5 years)
- 3.96 million customer minutes of interruption (CMI) associated with the Firebrick – Lick 69 kV circuit over the last 5 years.
- Conditions: 27 of 93 structures have at least one open condition including rot top pole, crossarm damage, and insulator issues.



AEP Transmission Zone M-3 Process
Lick – Pedro 69kV Line Rebuild

Need Number: AEP-2020-OH012

Process Stage: Solutions Meeting 07/16/2021

Proposed Solution:

Lick-Jefferson 69kV: Rebuild ~8.3 miles of the 69kV line from Structure 29 to Jefferson switch station with 556.5 ACSR. Install shield wire from Structure 29 to Lick Station, approximately 4 miles. This work requires tree clearing and access road construction in order to add the shield wire to existing structures. Total access road construction is 5.5 miles. **Estimated Cost: $25.0M**

Echo Valley: Replace existing switch with a 3-way phase over phase 69kV 1200A Switch with SCADA. There will be auto-sectionalizing enabled toward Firebrick. **Estimated Cost: $1.39M**

Remote end work associate with the line rebuild at Lick & Firebrick. **Estimated Cost: $0.31M**

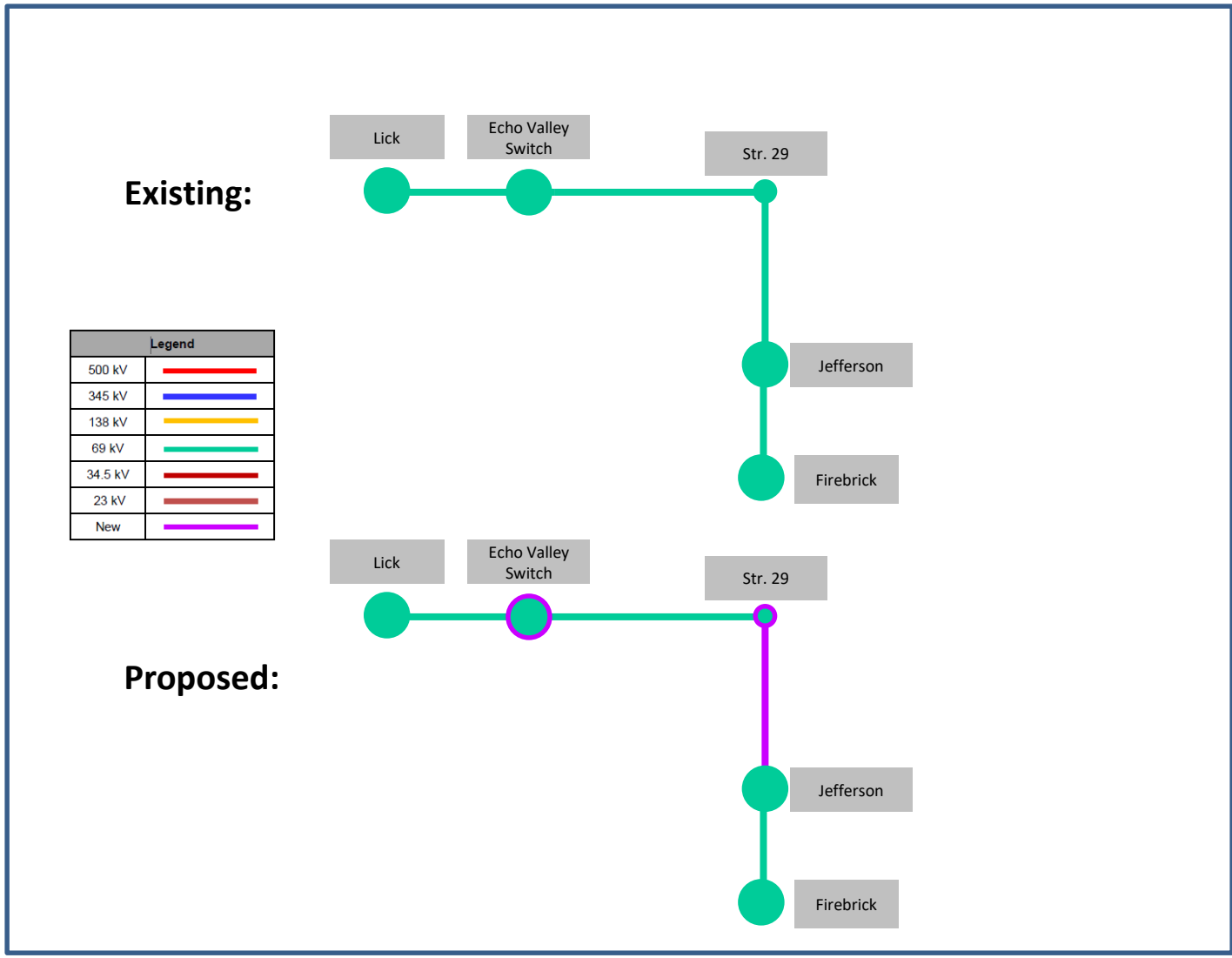
Total Estimated Transmission Cost: $26.7M

Alternatives Considered:

An alternative project was considered to convert the 69kV Firebrick-Lick circuit to 138kV. This alternative would require additional cost of converting two distribution substations to 138 kV. Additionally, the 4-mile long section of line between structure 29 and Lick station and the 4-mile long section between Jefferson and Firebrick stations would also need rebuilt to 138 kV standards to complete the conversion; since the first section is newer (1980s), it is not being rebuilt at this time. The cost of the alternate project is $70M

Projected In-Service: 04/20/2023

Project Status: Scoping



AEP Transmission Zone M-3 Process
East Logan – South Lancaster 69kV

Need Number: AEP-2019-OH042

Process Stage: Solutions Meeting 07/16/2021

Previously Presented: Need Meeting 7/24/2019

Project Driver:

Equipment Material/Condition/Performance/Risk

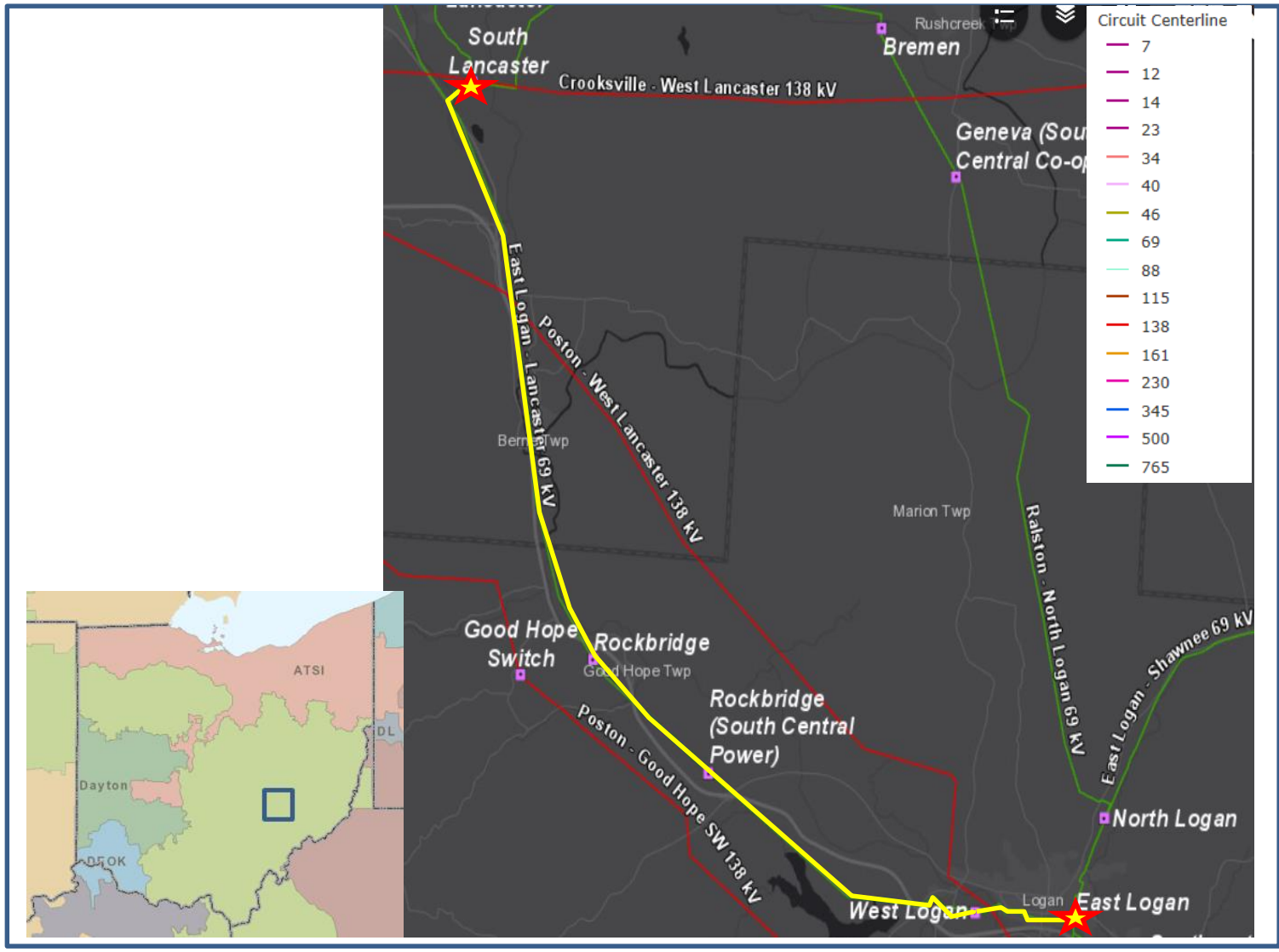
Specific Assumption Reference:

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

Problem Statement:

East Logan – South Lancaster 69kV (vintage 1923)

- Length: 16.43 Miles
- Original Construction Type: Steel Lattice/Wood
- Original Conductor Type: 2/0 Copper
- Momentary/Permanent Outages: 43 total outages
- CMI: 872,607 in the last 3 years
- Number of open conditions: 40
  - Open conditions include: Burnt/broken insulators, pole rot, insect damage, damaged conductor



AEP Transmission Zone M-3 Process
East Logan – South Lancaster 69kV

Need Number: AEP-2019-OH042

Process Stage: Solutions Meeting 07/16/2021

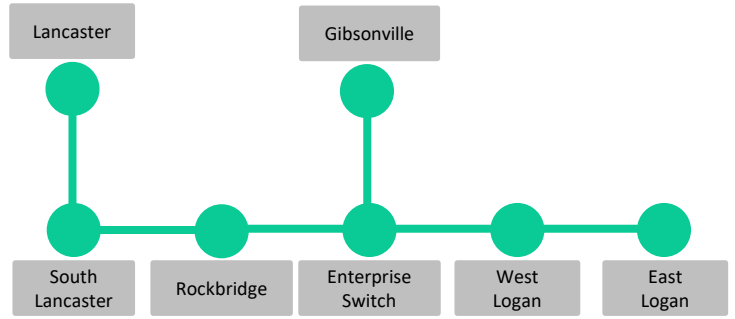
Proposed Solution:

- Rebuild the South Lancaster – East Logan 69 KV circuit, approximately 16.6 miles in length, with 556.5 ACSR Dove conductor. **Estimated Cost: $40.0M to $52M**
- Rebuild the Enterprise Switch - Enterprise Metering Structure, approximately 200’ in length; with 556.5 ACSR Dove conductor. **Estimated Cost: $0.51M**
- Enterprise Switch: Replace the two way phase over phase switch with a new 1200A three way phase over phase switch with auto sectionalizing and SCADA functionality. Replace the CTs, PTs, and metering. **Estimated Cost: $0.93M**
- West Logan: Replace the three way phase over phase switch with a new 1200A three way phase over phase switch. **Estimated Cost: $0.77M**
- South Lancaster: Remote end work **Estimated Cost: $0.1M**

Total Estimated Cost: $42.31M to $54.31M

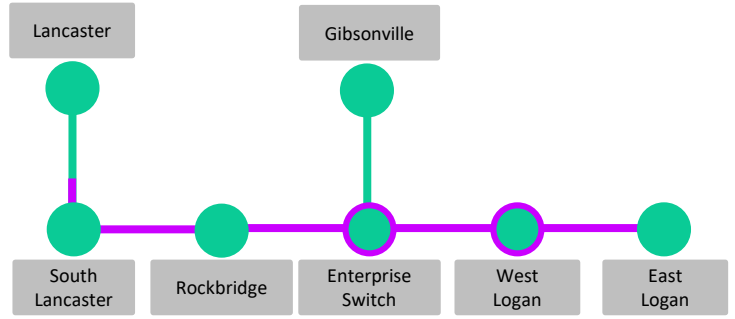
Existing:

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



Bubble Diagram

Proposed:



AEP Transmission Zone M-3 Process
East Logan – South Lancaster 69kV

Need Number: AEP-2019-OH042

Process Stage: Solutions Meeting 07/16/2021

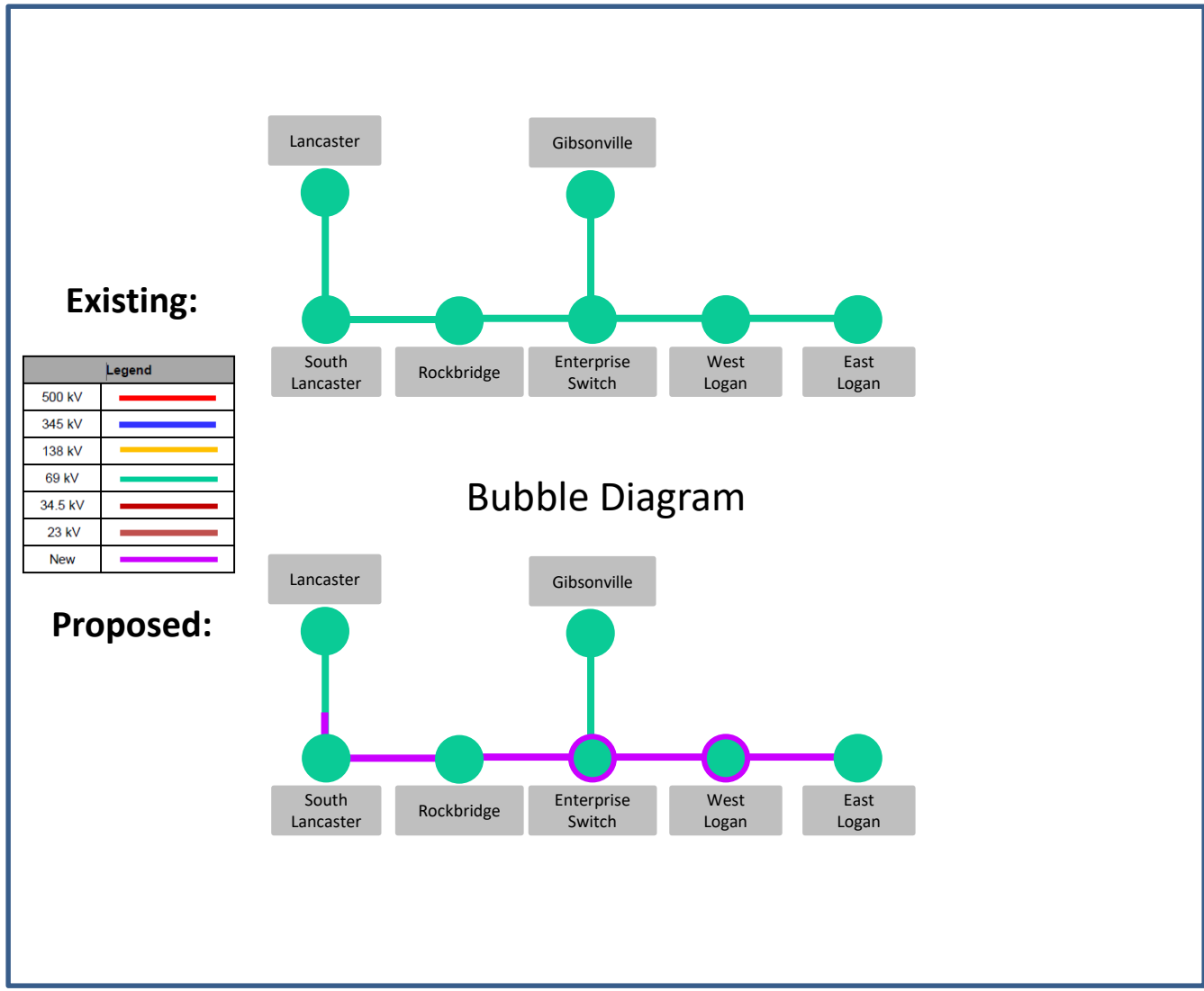
Alternatives Considered:

Instead of rebuilding the 8 miles of existing 69 kV line between South Lancaster and Rockbridge, establish a 138/69 kV station at Good Hope Switch and construct ~2.5 miles of greenfield 69 kV line between Good Hope and Rockbridge. ROW and siting challenges between Good Hope and Rockbridge presented large challenges to constructing a greenfield line in the area. There were also significant civil challenges and risk associated with converting the Good Hope Switching structure to a conventional station due to elevation changes surrounding the switch. The conceptual cost of this alternative came out to be similar to the section of 69 kV rebuild, but given the increased risks associated, this alternative was eliminated.

Projected In-Service: 5/02/2024

Project Status: Scoping

Model: N/A



AEP Transmission Zone M-3 Process
Licking County, OH

Need Number: AEP-2020-OH048

Process Stage: Solutions Meeting 07/16/2021

Previously Presented: Needs Meeting 12/18/2020

Supplemental Project Driver:

Customer Service

Specific Assumption Reference:

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

Problem Statement:

Customer Service:

- A customer has requested transmission service at a site just south of the existing Conesville – Corridor 345 kV circuit in New Albany, OH.
- The customer has indicated an initial peak demand of 64 MW with a potential capacity of up to 256 MW at the site.

Model: 2025 RTEP

AEP Transmission Zone M-3 Process
Innovation Station 138 kV

Need Number: AEP-2020-OH048

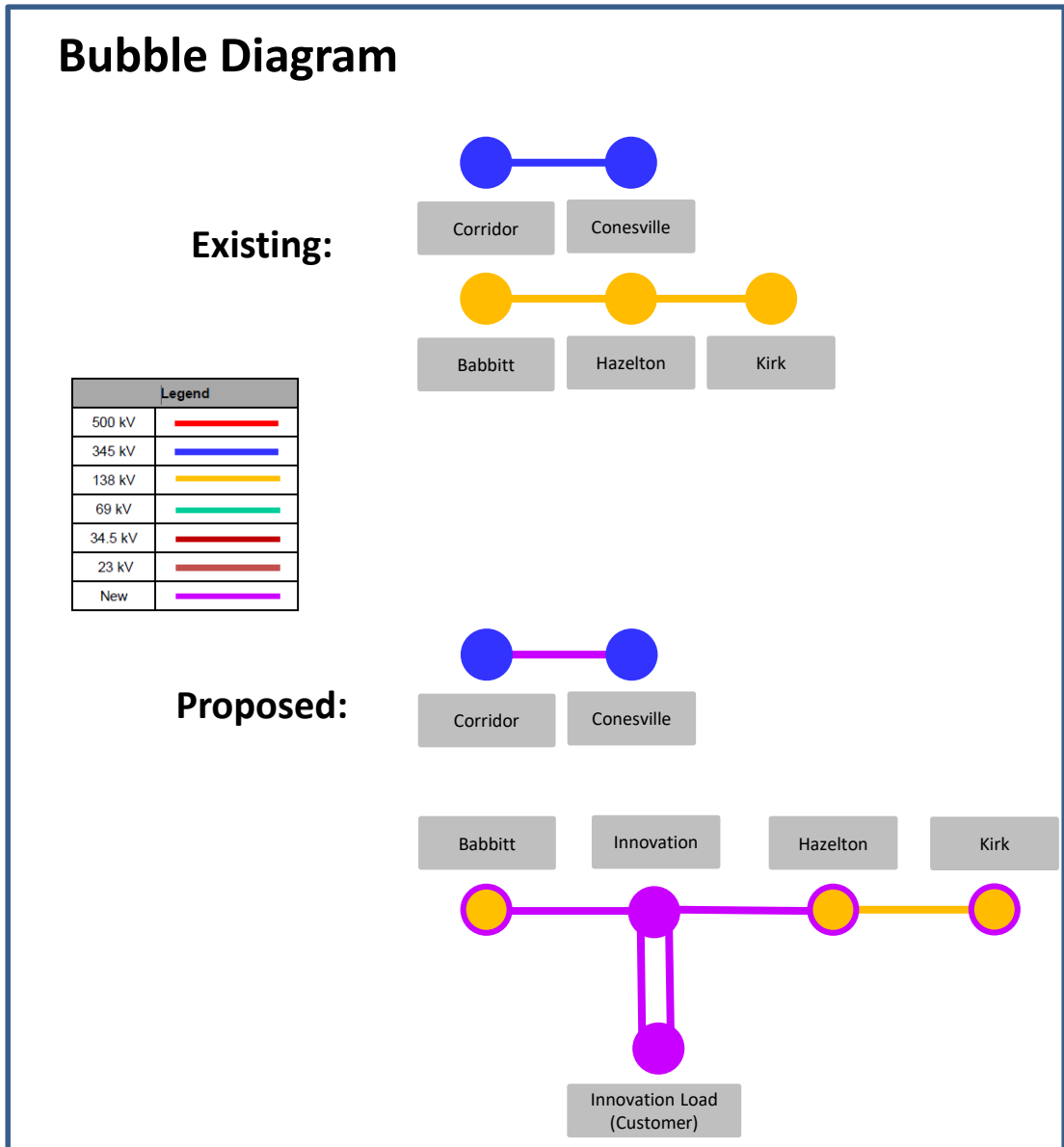
Process Stage: Solutions Meeting 07/16/2021

Proposed Solution:

- **Innovation 138 kV Station:** Construct a greenfield 138kV breaker and half station that includes seven 138kV 3000A 63kA circuit breakers and four total line exits to serve the requested load. **Estimated Cost: $11.611M**
- **Innovation Extension 138kV**: Tap the existing Babbitt-Kirk 138kV circuit creating the Babbitt-Innovation and Kirk-Innovation 138kV circuits and construct approximately 2.2 miles of double circuit line to serve the new station. Extend the telecom fiber into Innovation station for relaying/communication. **Estimated Cost: $ 13.334M**
- **Conesville-Corridor 345kV**: Relocate a portion of the existing Conesville-Corridor 345kV single circuit line to accommodate the install of Innovation Station. Approximately 0.40 miles of line to be rerouted around station site. **Estimated Cost: $2.478M**
- **Babbitt 138 kV Station:** Update remote end relay settings and telecom electronics. **Estimated Cost: $ 0.074M**
- **Kirk 138 kV Station:** Update remote end relay settings and telecom electronics. **Estimated Cost: $0.062M**

Total Estimated Cost: $ 27.6M

Bubble Diagram



Alternatives Considered:

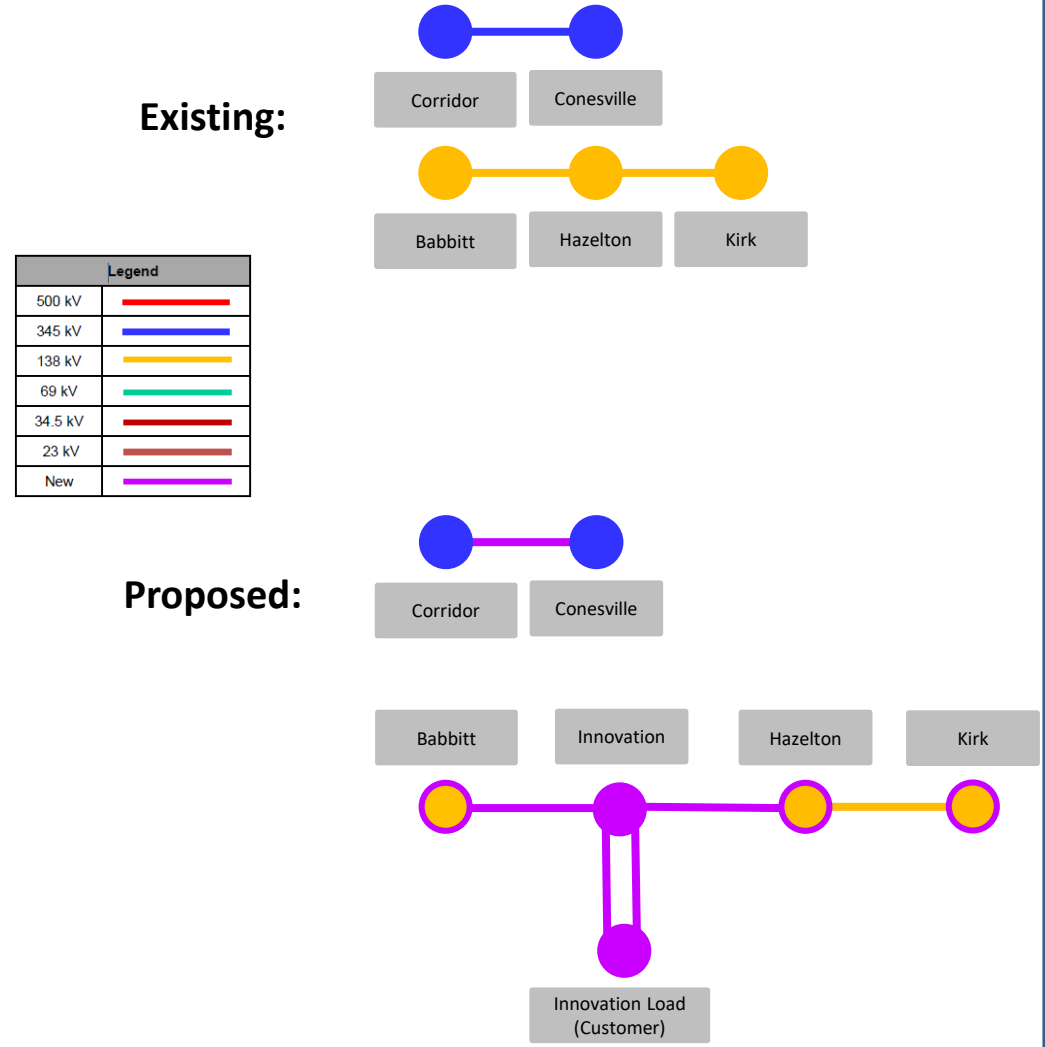
Construct approximately 2 miles of new 138 kV line from Babbitt station to the site. This option was not chosen because it would require additional station work at Babbitt to connect the new line exits. Constructing and operating Innovation station initially as a ring laid out as a breaker and a half configuration was considered, but not chosen after taking into account the customer's anticipated future load requirements. There would have been approximately $1M in incremental costs to convert the station from ring to breaker and a half as part of the second build out.

Projected In-Service: 3/31/2023

Project Status: Scoping

Model: RTEP 2025

Bubble Diagram



AEP Transmission Zone M-3 Process
Westfall Delivery Point

Need Number: AEP-2020-OH049

Process Stage: Solutions Meeting 07/16/2021

Previously Presented: Needs Meeting 12/18/2020

Project Driver:

Equipment Material/Condition/Performance/Risk

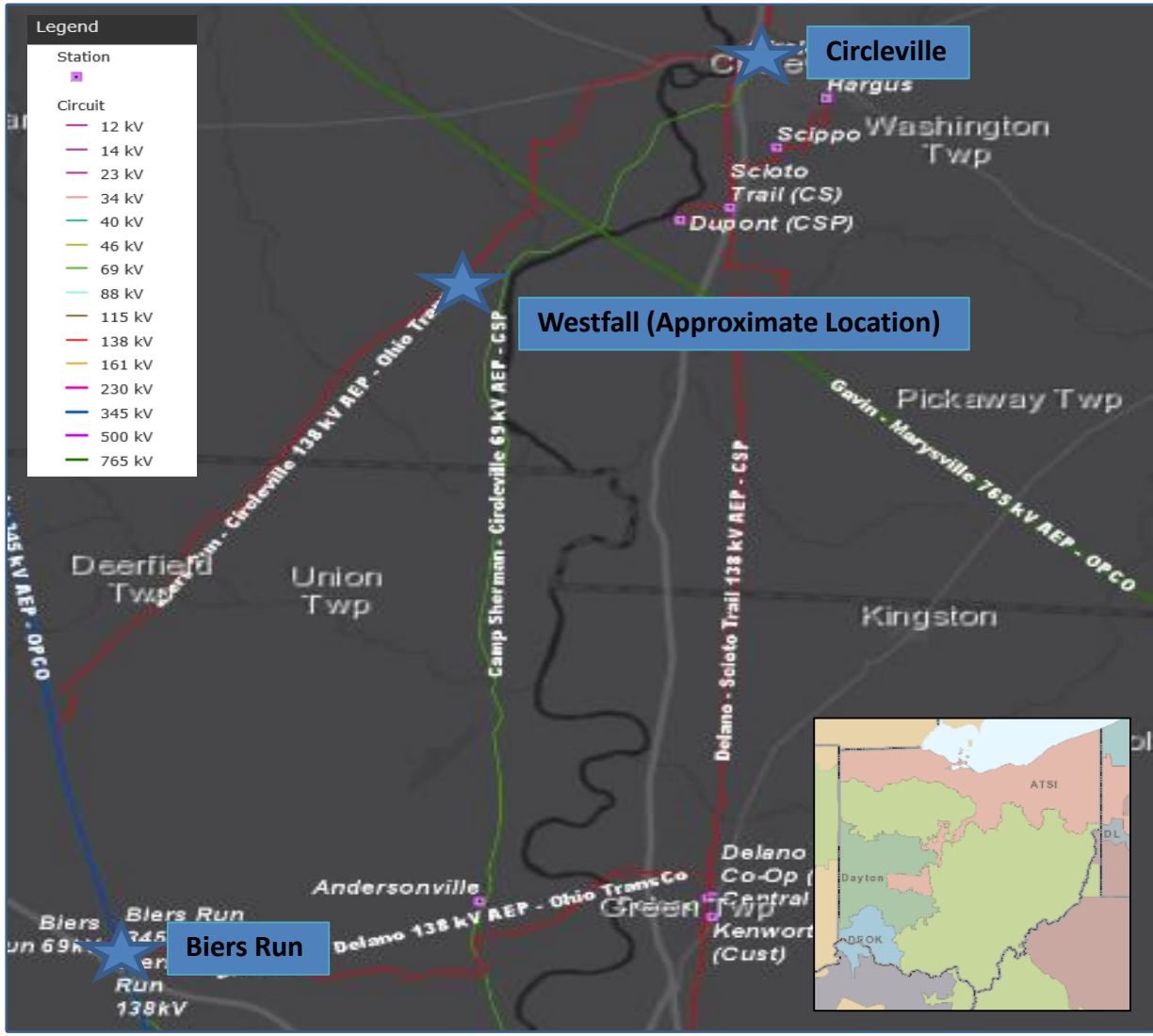
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

Westfall Delivery Point (SCP) 138kV:

- Buckeye Power Inc., on behalf of South Central Power Company, has requested transmission service in Wayne Township, Pickaway County, Ohio.
- SCP currently has a radial 69 kV line served out of AEP's West Lancaster Station with a load of approximately 42.5 MW in 2022 and growth at a rate of 2% per year.
- South Central Power Company would like a new transmission delivery point on the on the other end of this long 69 kV radial line (44 miles of exposure; 5 delivery points).
- Service is requested by March 2022.



AEP Transmission Zone M-3 Process
Westfall Delivery Point

Need Number: AEP-2020-OH049

Process Stage: Solutions Meeting 7/16/21

Proposed Solution:

Westfall 138 kV Station: Build a new greenfield 138 kV three breaker ring configured station. The three breakers installed will be 138kV 40kA 3000A. 138 kV revenue metering equipment will be installed. **Estimated Cost: $5.316 M**

Westfall-Westfall (SCP) Customer 138 kV: Install a 0.02 mile 138 kV single circuit line between Westfall and Westfall (SCP) customer station. **Estimated Cost: $0.116 M**

Biers Run-Circleville 138kV: Tap the existing Biers Run-Circleville 138kV line, removing 0.1 miles and adding 2 dead-end structures in order to cut the line into the new AEP Westfall station. Extend the telecom fiber into Westfall station for relaying / communication. **Estimated Cost: $1.005 M**

Circleville 138 kV Station: Update remote end relay settings and telecom electronics. **Estimated Cost: $0.04 M**

Lutz 138 kV Station: Update remote end relay settings and telecom electronics. **Estimated Cost: $0.04 M**

Total Estimated Transmission Cost: $6.517 M

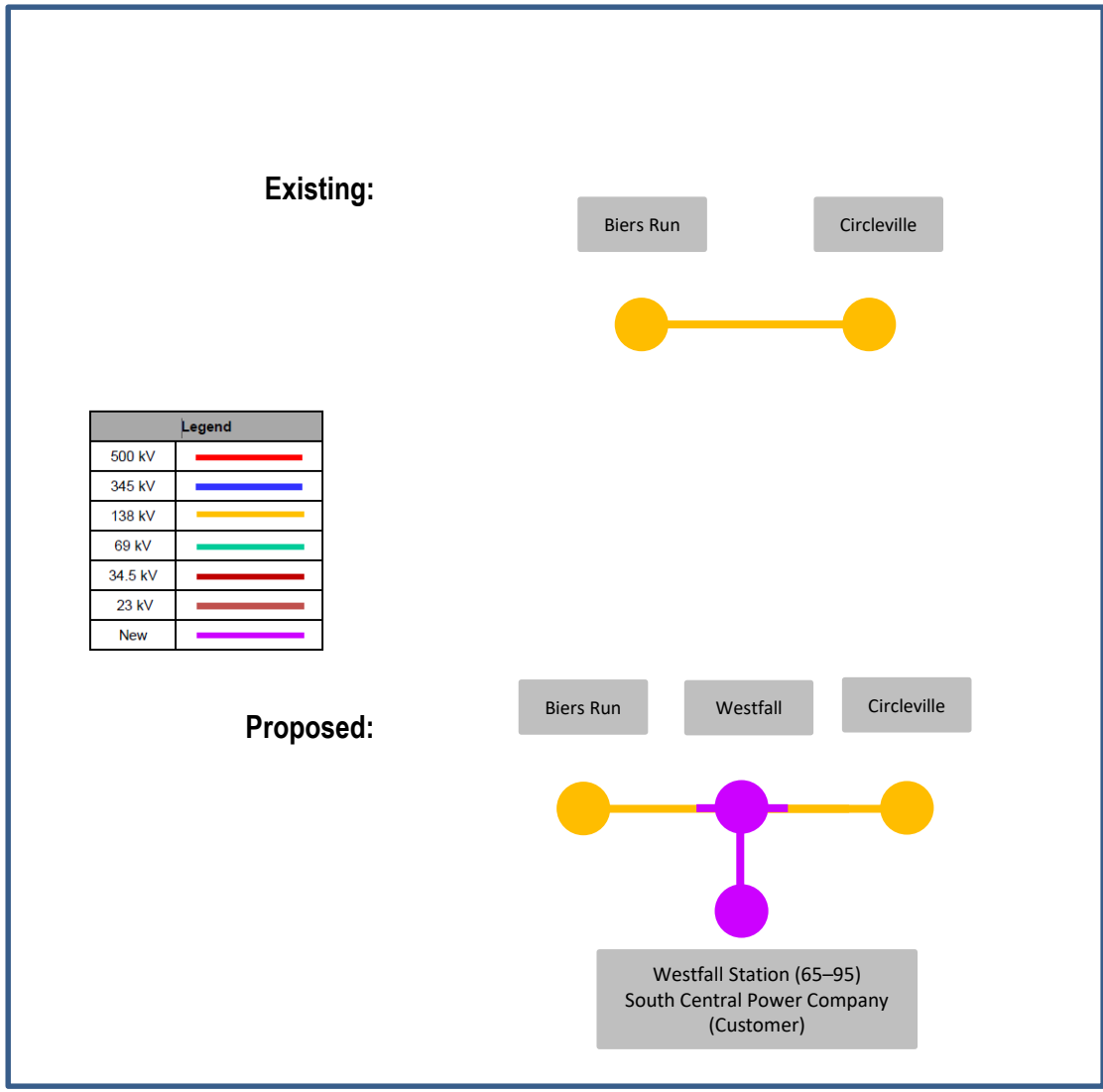
Alternatives Considered:

Considering the location of the requested customer delivery point, no other viable alternates were considered.

Projected In-Service: 3/1/2023

Project Status: Scoping

Model: 2025 RTEP



AEP Transmission Zone M-3 Process
Lawrence County, OH

Need Number: AEP-2021-OH017

Process Stage: Solutions Meeting 07/16/2021

Previously Presented: Need Meeting 04/16/2021

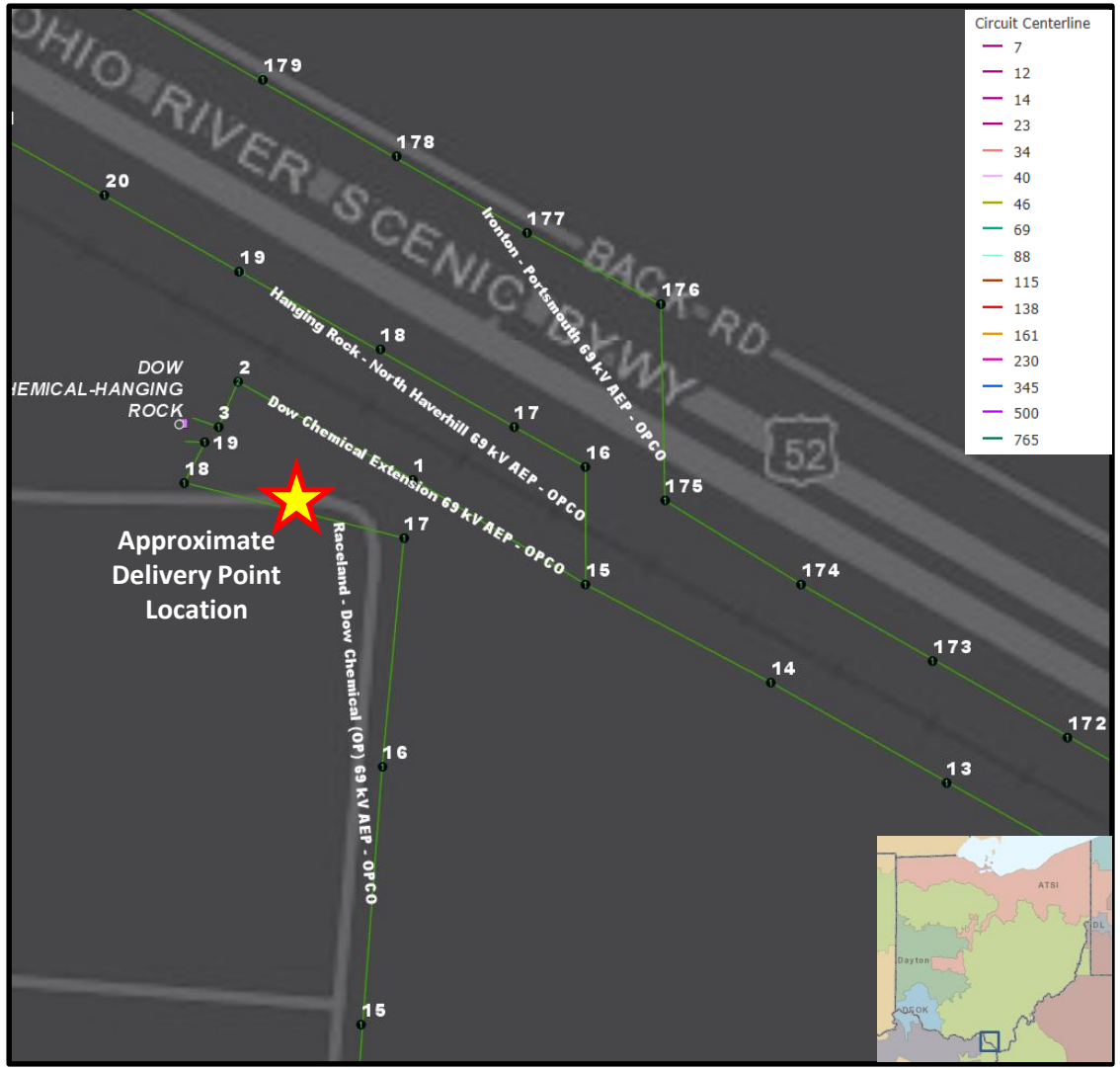
Project Driver: Customer Service

Specific Assumption Reference:

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

Problem Statement:

PureCycle has requested 69kV service in Lawrence County, Ohio on the Dow Chemical – Highland line by February 2022. The anticipated load is approximately 22 MW.



AEP Transmission Zone M-3 Process
Gervais Switch

Need Number: AEP-2021-OH017

Process Stage: Solutions Meeting 07/16/2021

Proposed Solution:

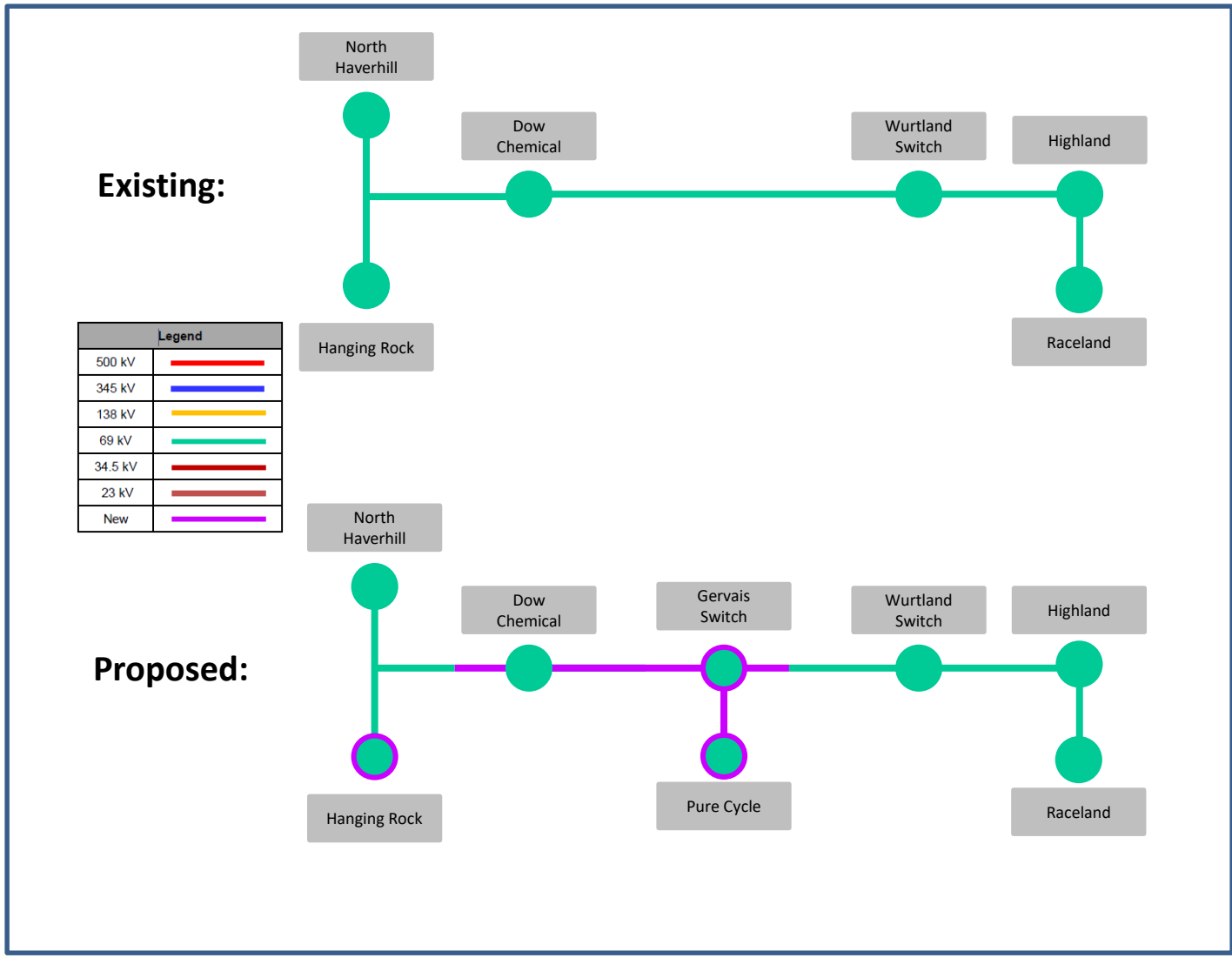
- Dow Chemical Extension: Rebuild Str. 1, 2, & 3 as double circuit to include the Dow Chemical – Highland 69kV & Dow Chemical – Hanging Rock circuits. ACSR Osprey 556.5 (18/1) conductor (SE 126 MVA) will be used. **Estimated Cost: $1.16M**
- Raceland – Dow Chemical 69kV: Replace Str. 16 for new alignment. Remove Str. 17, 18, & replace Str. 19 to facilitate new tie in arrangement. Reconfigure line from new Str. 16 to Gervais Switch. ACSR Osprey 556.5 (18/1) conductor (SE 126 MVA) will be used. **Estimated Cost: $0.39M**
- Gervais Switch: Install a new 3 way 69 kV 1200A 61kA phase-over-phase switch with one SCADA controlled MOAB (toward Dow Chemical) and one auto controlled MOAB (toward Wurtland Switch) to serve new PureCycle delivery point. Install a 69 kV revenue meter outside of customer station on monopole steel structure. **Estimated Cost: $0.92M**
- Purecycle Extension: Install ~0.1 miles of single circuit line to connect the customer to Gervais Switch. ACSR Hawk 477 (26/7) conuctor (SE 128 MVA) **Estimated Cost: $0.33M**
- Hanging Rock: Install the remote end SFP in the CES at Hanging Rock Station to provide the connection for the CGR router at Gervais Switch. **Estimated Cost: $0.04M**

Total Estimated Transmission Cost: $2.84M

Alternatives Considered: Considering the location of the customer request, no other viable alternatives were identified

Projected In-Service: 03/01/2022

Project Status: Scoping



AEP Transmission Zone M-3 Process
Tidd 69kV Breaker Replacement

Need Number: AEP-2021-OH028

Process Stage: Solution Meeting 07/16/2021

Previously Presented: Need Meeting 05/21/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

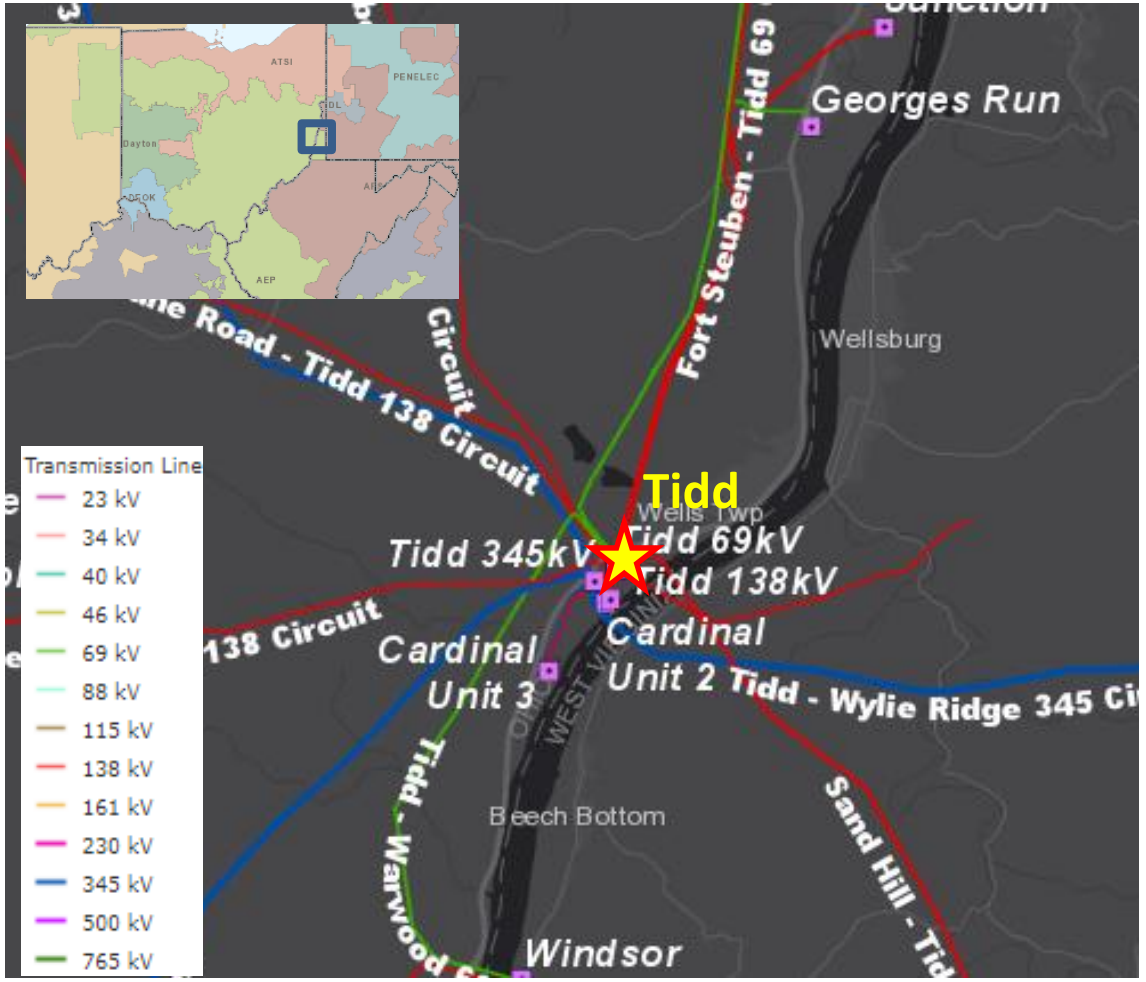
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 13)

Problem Statement:

Transmission Circuit Breaker Concerns (69 kV): AN

Tidd 69kV circuit breaker 'AN' failed in April 2021. Failure documented by very high sulfur dioxide (SO_2) readings in the SF6 gas, due to past fault activity. The SO_2 can cause internal corrosion, leading to mechanical and operational defects.

- Breaker Age: 1997 (installed in 1998)
- Interrupting Capability: 31.5 kA
- Ampacity Rating: 2000 A
- Interrupting Medium: SF6 Gas
- Number of Fault Operations: 38



AEP Transmission Zone M-3 Process
Tidd 69kV Breaker Replacement

Need Number: AEP-2021-OH028

Process Stage: Solution Meeting 07/16/2021

Previously Presented: Need Meeting 05/21/2021

Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption Reference:

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

Proposed Solution: Replace the failed 69kV circuit breaker with a spare 69kV SF6 gas breaker (3000A / 40kA nameplate).

Alternatives Considered: No cost effective alternatives identified.

Project Cost: $0.1M

Projected In-Service: 6/24/2021

Project Status: In Service

Model: 2025 PJM Short Circuit Model

Single 69kV circuit breaker replacement. Bubble diagram not applicable.

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

7/6/2021 – V1 – Original version posted to pjm.com

7/15/2021 – V2 – Removed Slide #16 (AEP-2021-OH034)

7/16/2021 – V3 – Slide #30, Corrected the estimated costs

9/1/2021 – V4 – Slide #39, Corrected the total estimated costs

– Slide #52, Corrected the total estimated costs