

SRRTEP Committee Western AEP Supplemental Projects

July 24, 2019

Needs

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

AEP Transmission Zone M-3 Process Fayette County, WV

Need Number: AEP-2019-AP023

Process Stage: Need Meeting 7/24/2019

Supplemental Project Driver:

Equipment Condition/Performance/Risk

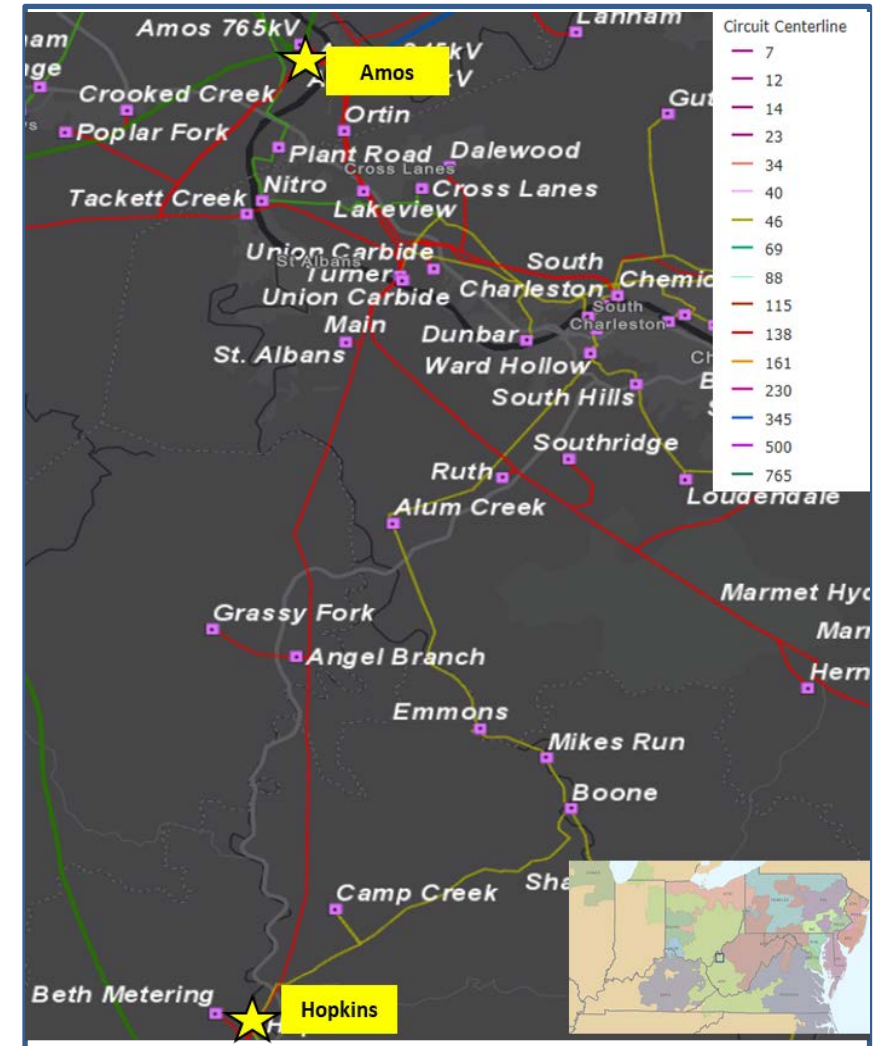
Specific Assumption References:

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

Problem Statement:

Amos – Hopkins 138 kV (~31.37 miles)

- Majority of the circuit is constructed with 1920s lattice structures
 - The lattice towers used for this line are approximately 94 years old. Structure loading does meet the NESC 250B, 250C and 250D standards for all structures that were analyzed.
 - Steel lattice towers and hardware are currently exhibiting medium to heavy rust
- The shield wire and conductor for this line is 94 years old. Current shielding for the majority of the line does not comply with current standards.



AEP Transmission Zone M-3 Process Wyoming/McDowell Counties, WV

Need Number: AEP-2019-AP024

Process Stage: Needs Meeting 7/24/2019

Supplemental Project Driver:

Equipment Condition/Performance/Risk

Specific Assumption References:

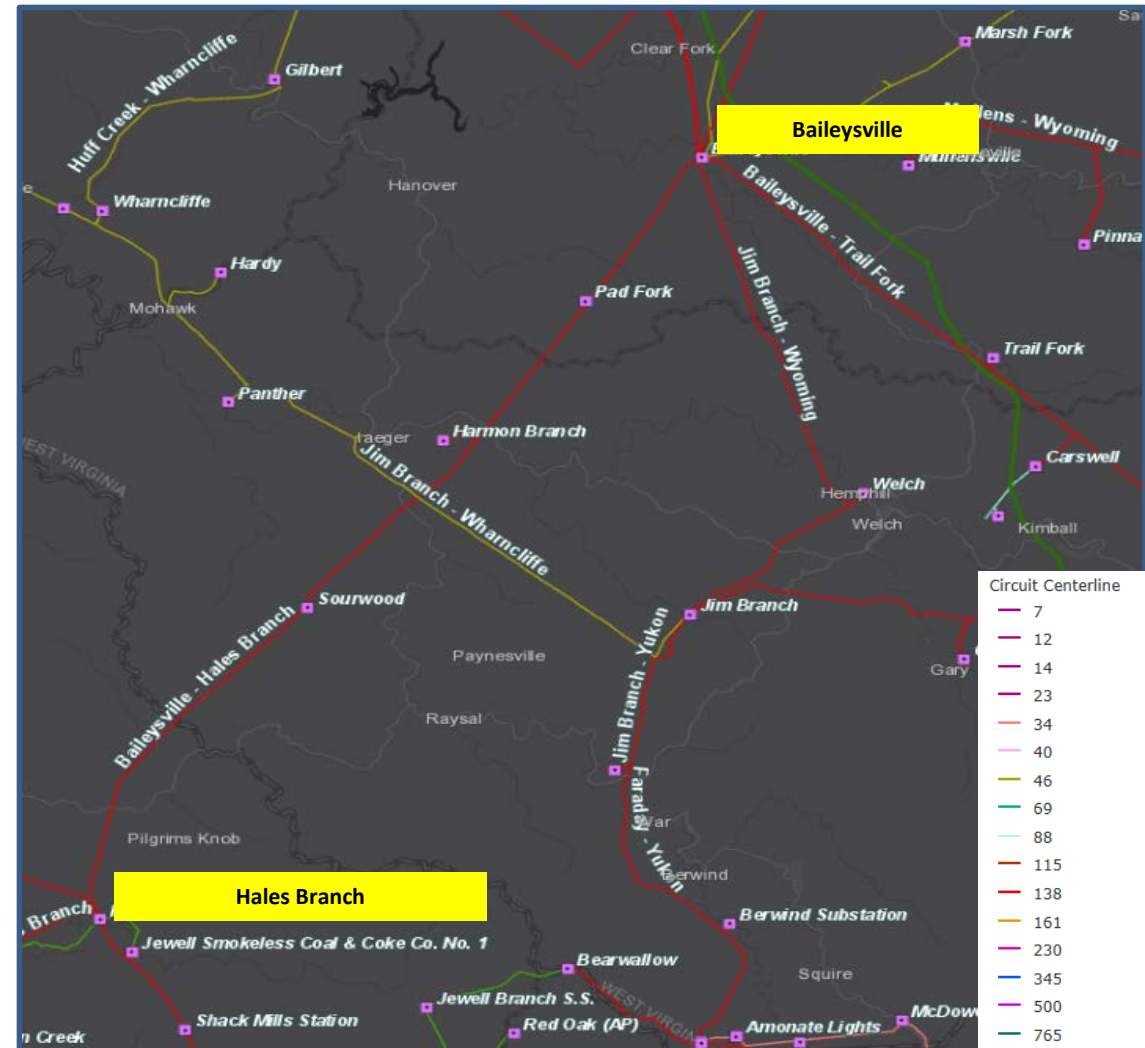
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

Model: N/A

Problem Statement:

Baileysville – Hales Branch 138 kV (~27.8 miles)

- Majority of the circuit is constructed with 1970s wood structures.
- Between 2015-2018 the circuit experienced 24 momentary outages.
 - All momentary outages are attributed to lightening, insufficient shielding and aging towers as the structures, conductor, hardware, and insulators on the line are displaying issues associated with their age
- The circuit currently has 54 open conditions
 - Open conditions include: Rotten Tops, Woodpecker damage, Split Poles, Corroded Crossarms, Rotten Shells, Broken Ground Lead Wires, and Buildings Encroachment in Right Of Way
- Structures loading does not meet current NESC standards.



AEP Transmission Zone: Supplemental Floyd County, Kentucky

Need Number: AEP-2019-AP025

Process Stage: Needs Meeting 07/24/2019

Supplemental Project Driver:

Equipment Material/ Condition/Performance/Risk

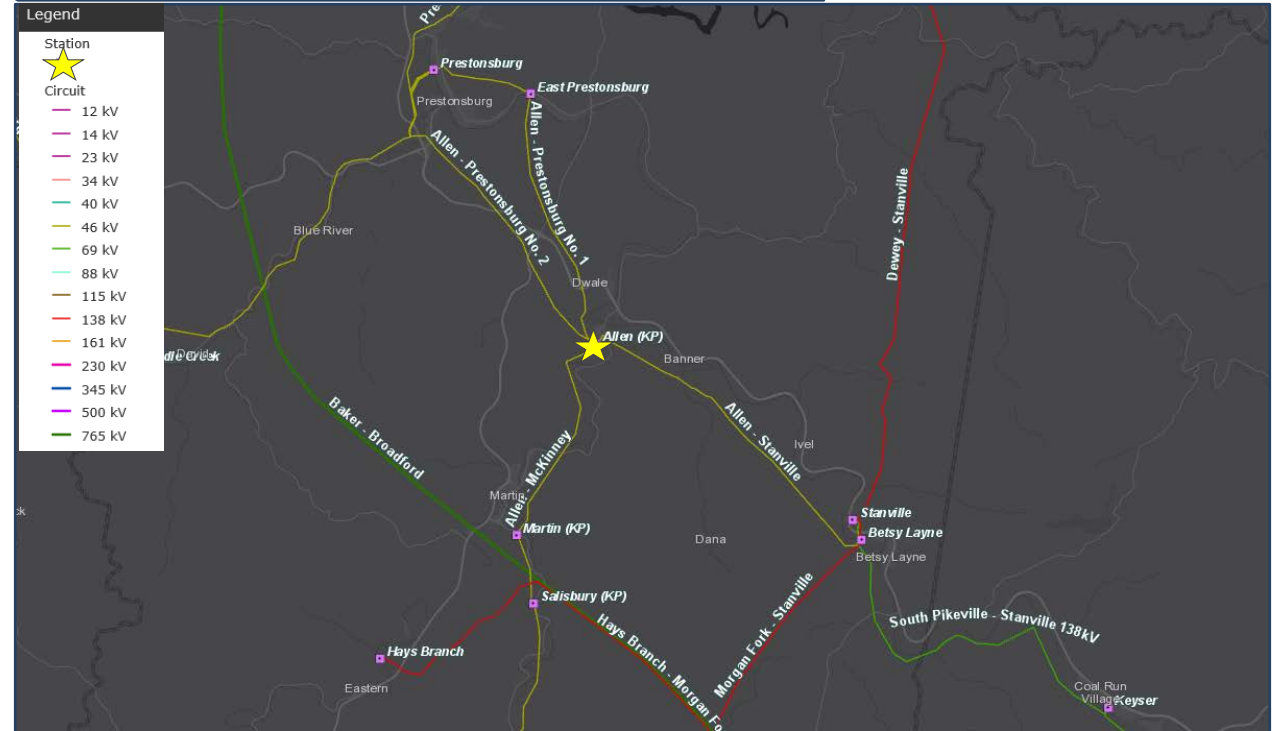
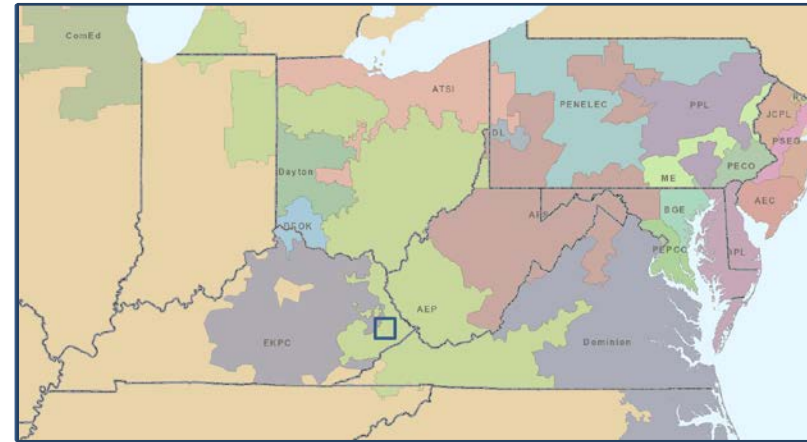
Specific Assumption References:

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

Model: N/A

Problem Statement:

- The existing Allen station has historically experienced severe flooding due to the stations current location in the flood plain. Historical flooding issues have lead to significant deterioration of the stations foundations and structures.
- The 46 kV Circuit Breakers (CBs) A, B, C, & D are oil filled breakers without oil containment manufactured in 1960s. Oil filled breakers have much more maintenance required due to oil handling that their modern, SF6 counterparts do not require. These units comprise 4 of the remaining 12 of the FZO-69-1500P model family on the AEP System. Spare parts for these units are difficult to impossible to procure, and this model type is no longer vendor supported.
- The circuit breakers have experienced the following fault operations, CB A (27), C (20), and D (17). The manufacturer recommendation is 10 fault operations during it's in-service life. In addition, all CBs have documented malfunction records with A, C, and D having at least 1 documented since 2016. These include mainly air leaks, a broken trip latch component, and a trip test switch malfunction. The platform foundations that these are mounted on are crumbling in several locations.
- The 46 kV CS AA is a VBM-69 model type, 1 of 15 remaining on the AEP System. Spare parts for these units are difficult to impossible to procure, and this model type is no longer vendor supported. These circuit switcher models are poor cold weather performers. This unit has 8 documented malfunction records including multiple failures to trip on poles 2 and 3 and one instance in 2011 in which the unit failed to close.



AEP Transmission Zone M-3 Process Fayette County, WV

Need Number: AEP-2019-AP026

Process Stage: Need Meeting 7/24/2019

Supplemental Project Driver:

Equipment Condition/Performance/Risk, Operational Flexibility and Efficiency

Specific Assumption References:

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

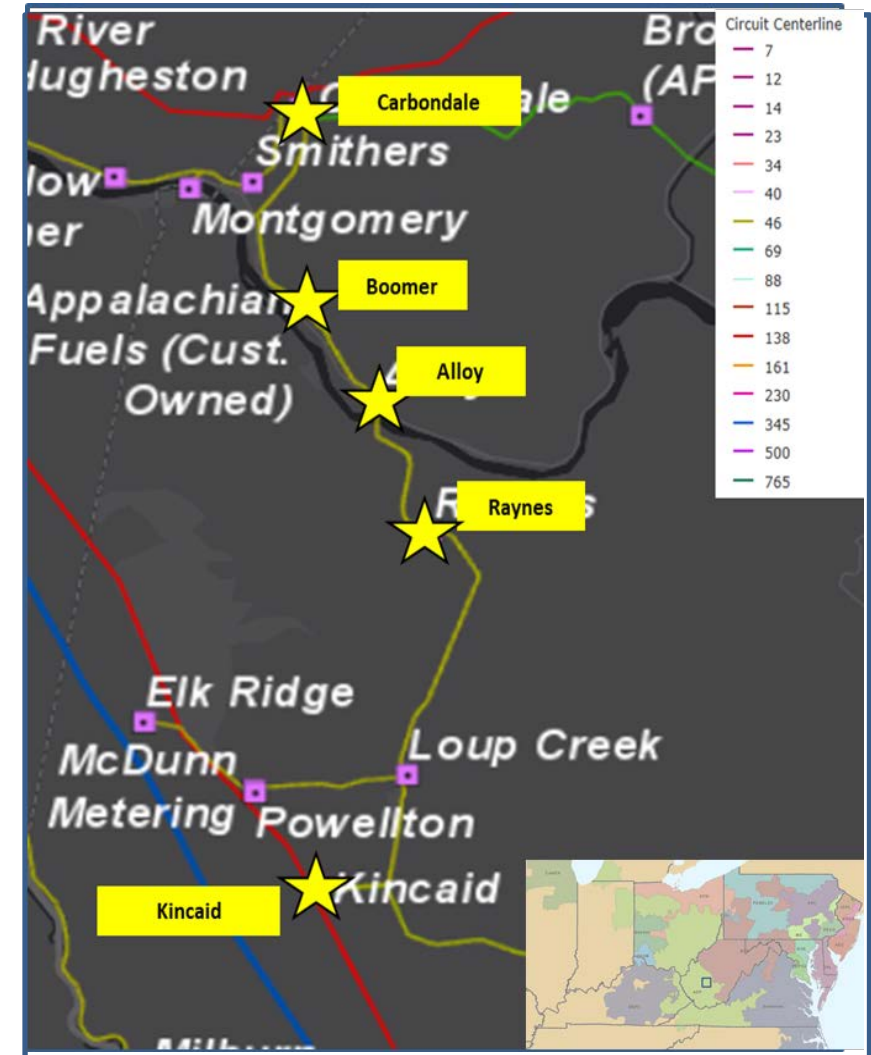
Problem Statement:

Carbondale – Kincaid 46 kV #1 (~14.8 miles)

- Majority of the circuit is constructed with 1950s wood and lattice structures
- The conductor is greater than 65 years old. Grounding on this line does not meet current standards.
- Between 2015-2018 the circuit experienced 16 momentary and 6 permanent outage resulting in approximately 140k customer minutes of interruption

Carbondale – Kincaid 46 kV #2 (~18.6 miles)

- Majority of the circuit is constructed with 1950s wood and lattice structures
- The conductor is greater than 65 years old. Grounding on this line does not meet current standards.
- From 2015-2018 the circuit has experienced 16 momentary and 7 permanent outages resulting in approximately 390k customer minutes of interruption

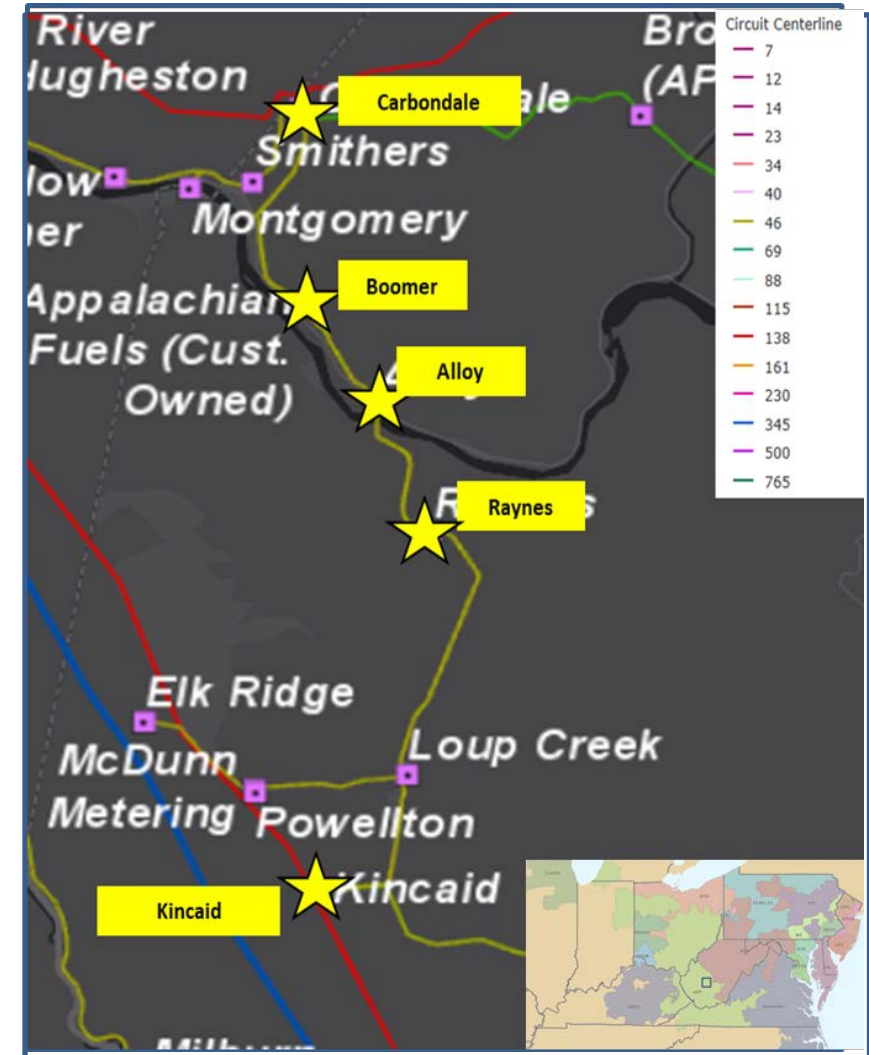


AEP Transmission Zone M-3 Process Fayette County, WV

Problem Statement (cont'd):

Carbondale 138/69/46 kV Station

- 46 kV and 69 kV CBs A, B, C, D, F and G are all 1968, CF-48-69-2500 type breakers.
 - Spare parts for these units are difficult to impossible to obtain, and this model type is no longer vendor supported
 - These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling
 - These breakers have each exceeded the designed number of full fault operations (10). CB-A: 154, CB-B: 49, CB-C: 78, CB-D: 75, CB-F: 94, CB-G: 100
- Carbondale 138/69/46 kV transformer TR-1, manufactured in 1972, has experienced a sharp increase in combustible gas concentrations in January 2016.
 - Numerous gasses have remained at elevated levels, including acetylene at IEEE Condition 4 and ethylene at IEEE Condition 2.
 - The concentrations present are strongly correlated to electrical discharges of high energy and thermal faults in excess of 700° C.
 - Despite declining moisture levels and improving interfacial tension, oil power factor levels are on the rise, and dielectric strength is declining. This supports contamination in the oil from the high energy discharges and thermal faults.
- The current MOAB/Ground SW configuration on TR-1 creates a fault in the station to signal the remote end breakers to open; this is a known safety hazard in legacy station designs.
- The 138 kV line section towards Kanawha River terminates directly into the bus which creates a lack of operational flexibility when switching for faults on the circuit.
- Carbondale Substation currently deploys 64 relays, implemented to ensure the adequate protection and operation of the substation.
 - 36 of the 64 relays (56% of all station relays) are in need of replacement.
 - 36 of the electromechanical which have significant limitations with regards to fault data collection and retention. Spare parts for these relays are difficult to obtain.

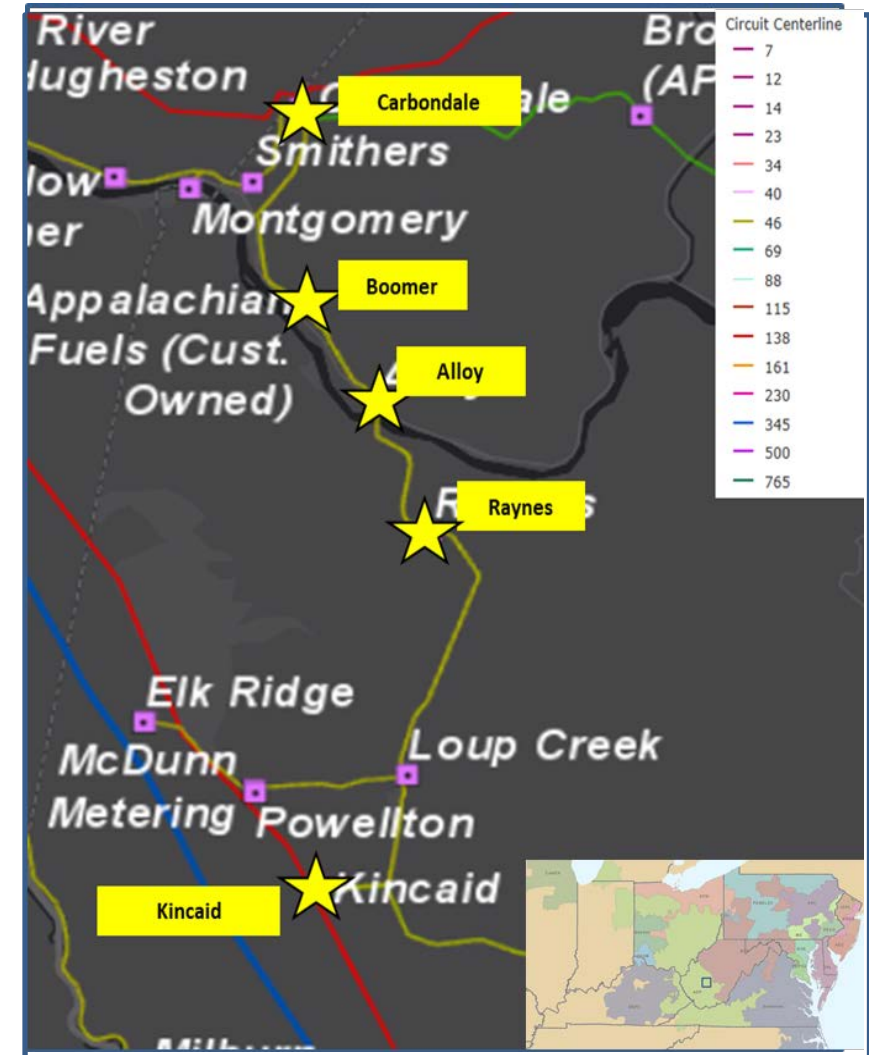


AEP Transmission Zone M-3 Process Fayette County, WV

Problem Statement (cont'd):

Kincaid 138/69/46 kV Station

- 46 kV CBs A, B, and J are all 1972 FK-72.5-27000-9 type breakers, accounting for 3 of 21 remaining of this model remaining on the AEP system.
 - Spare parts for these units are not available and this model type is no longer vendor supported
 - These breakers are oil filled without oil containment; oil filled breakers have much more maintenance required due to oil handling
 - These breakers have each exceeded the designed number of full fault operations (10). CB-A: 61, CB-B: 123, CB-J: 72
- GND transformer PH 1-3
 - All three single phase units of GND TR are experiencing similar health deterioration.
 - There are elevated levels of Acetylene at IEEE condition 2 and Carbon Dioxide at IEEE Condition 2 or 3.
 - The presence of excess acetylene may be a product of arcing causing overheating on this unit. High levels of carbon dioxide support this observation.
 - In addition, significantly diminished oil interfacial tension corroborates the frequent overheating events. Sludge has likely developed in the oil from particulate formation during arcing and other fault events. This sludge impairs the natural circulation of oil.
 - Moisture levels are on the rise which can lead to diminished dielectric strength over time.
- The current 138 kV MOAB/Ground SW configuration on TR-1 creates a fault in the station to signal the remote end breakers to open; this is a known safety hazard in legacy station designs.



AEP Transmission Zone M-3 Process Fayette County, WV

Problem Statement (cont'd):

- Kincaid Substation currently deploys 51 relays, implemented to ensure the adequate protection and operation of the substation.
 - Currently, 45 of the 51 relays (88% of all station relays) are in need of replacement.
 - There are 45 of the electromechanical which have significant limitations with regards to fault data collection and retention. Of these relays, 18 are in the top 90th percentile of relays on the AEP system targeted for replacement by PCE.
 - There appears to be little room in the existing control house to accommodate a relay replacement of this suggested magnitude.
- The existing RTU installed at Kincaid is a GE D200MEII/Ethernet and has 2 documented malfunction records

Boomer 46 kV Station

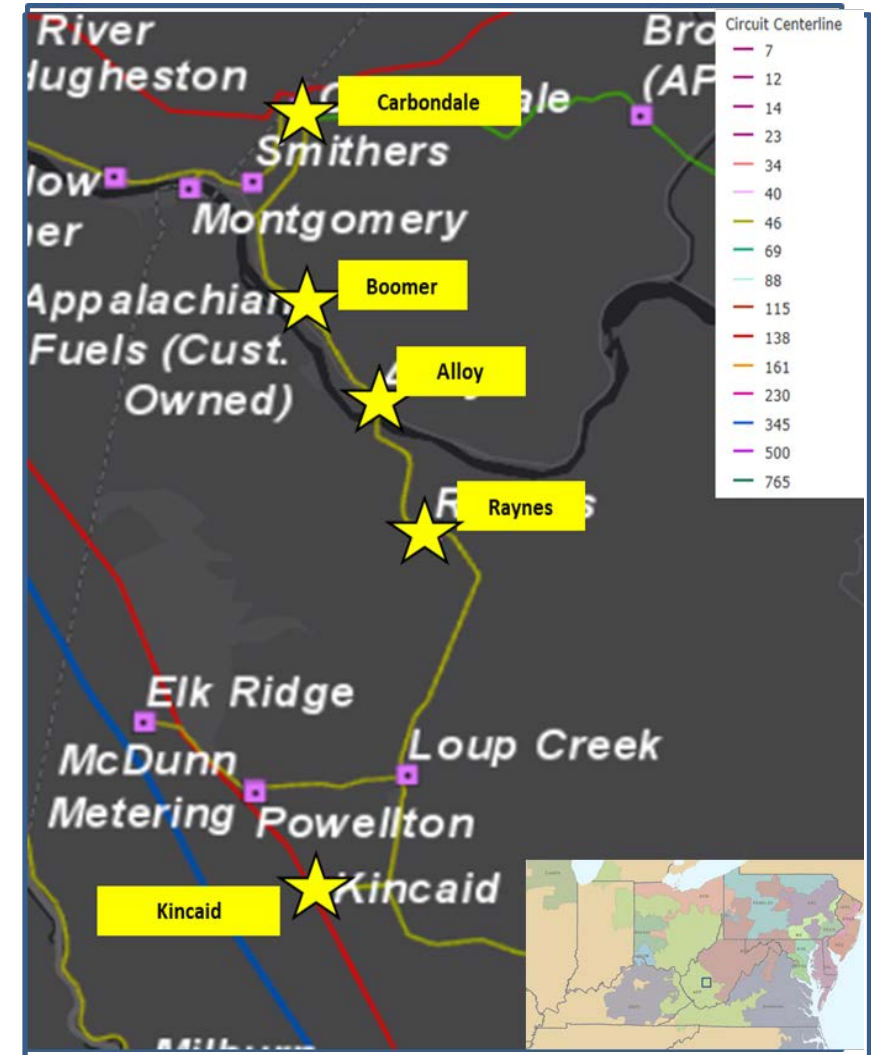
- Customer no longer served from this station, no load at this station.

Raynes 46 kV Station

- Customer no longer served from this station, no load at this station.

Alloy 46 kV Station Hard Tap

- Hard taps are difficult to maintain due to required outages or temporary jumper configurations in lieu of a switch.
- Hard taps can also result in extended outages to customers due to the inability to sectionalize faulted facilities.



AEP Transmission Zone M-3 Process Hocking, Ohio

Need Number: AEP-2019-OH042

Process Stage: Need Meeting 7/24/2019

Supplemental Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption References:

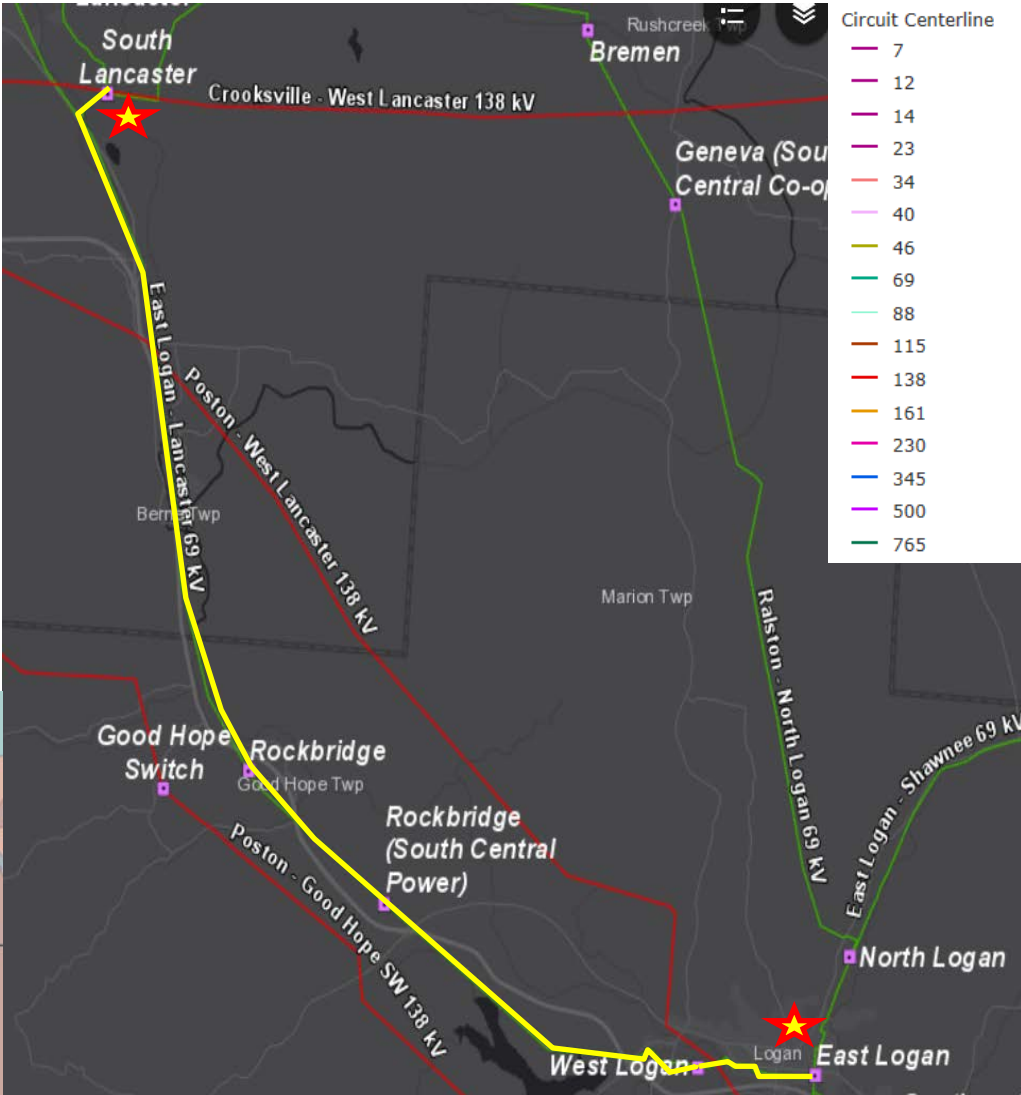
AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 8)

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

Model: N/A



AEP Transmission Zone M-3 Process Newark, Ohio

Need Number: AEP-2019-OH43

Process Stage: Need Meeting 7/24/2019

Supplemental Project Driver:

Equipment Material/Condition/Performance/Risk

Specific Assumption References:

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

Problem Statement:

North Newark – Sharp Road 138 kV (vintage 1951)

- Length: 19.38 Miles
- Original Construction Type: Wood Pole
- Original Conductor Type: 477 kcmil Hawk
- Number of open conditions: 68
 - Open conditions include: Burnt insulators, insect damage, pole rot, woodpecker damage

Model: N/A



AEP Transmission Zone M-3 Process Vinton, Ohio

Need Number: AEP-2019-OH044

Process Stage: Need Meeting 7/24/2019

Supplemental Project Driver:

Customer Service

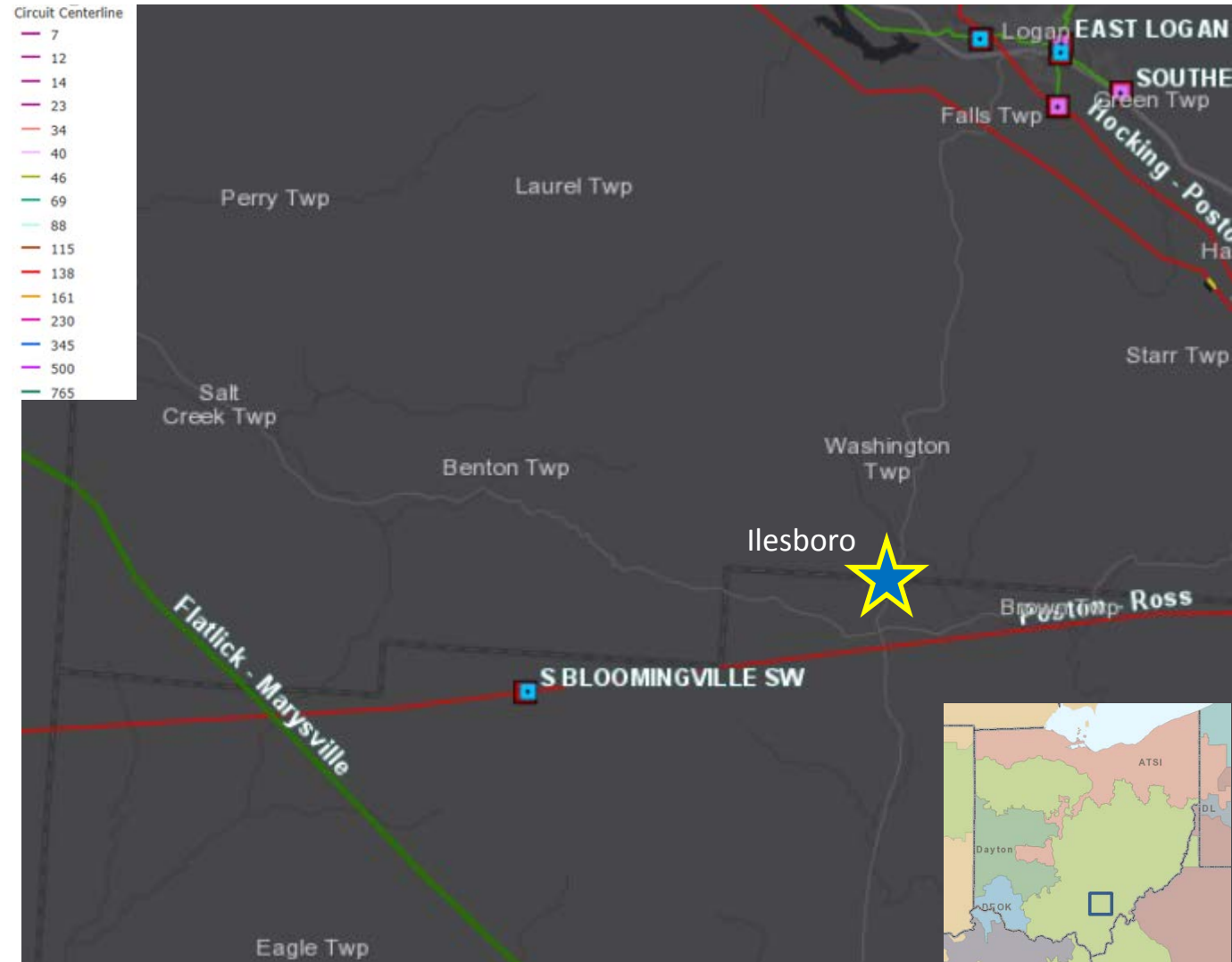
Specific Assumption Reference:

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

Problem Statement:

- South Central Power is requesting a new 138 kV delivery point on the Lemaster – Ross 138 kV circuit by September 2020. Anticipated load is about 4 MW.

Model: 2023 Summer RTEP



AEP Transmission Zone M-3 Process Washington County, Ohio

Need Number: AEP-2019-OH045

Process Stage: Needs Meeting 07/24/2019

Supplemental Project Driver:

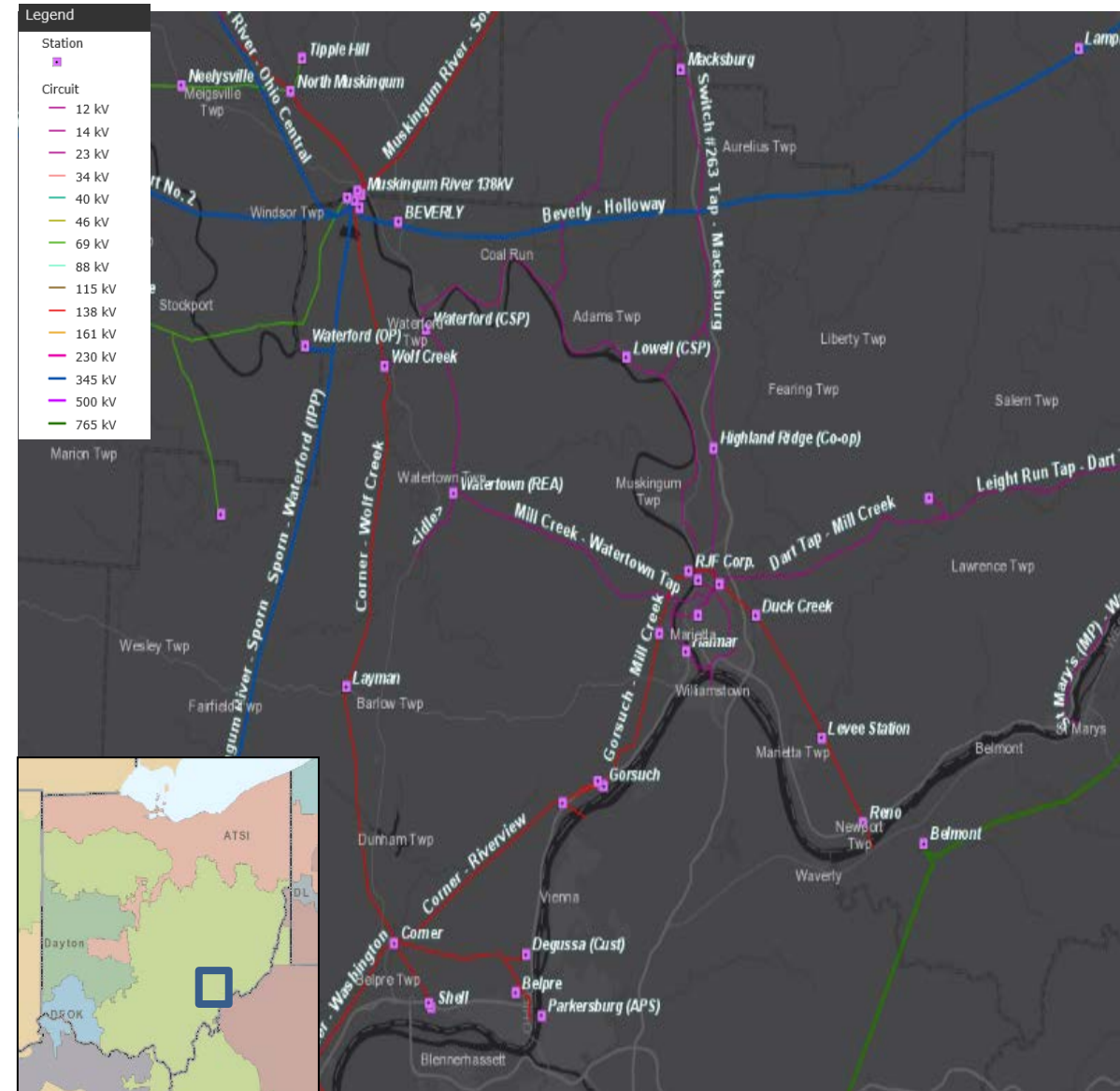
Equipment Condition, Operational Flexibility, and Customer Service

Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions slide 8); AEP Connection Requirements for the AEP Transmission System (AEP Assumptions Slide 7)

Problem Statement:

- Buckeye Power, on behalf of Washington Electric Cooperative, has requested transmission service in western Washington County, Ohio.
- Washington Electric Cooperative customers are currently connected to radial 23 kV and 12 kV AEP Ohio distribution lines in the area.
- The delivery points connected to the 23 kV system have consistently been identified as having poor reliability by Buckeye.
- Washington Electric Cooperative has reported approximately 745 thousand customer-outage minutes (CMI) over a three year period (2015-2017).



AEP Transmission Zone M-3 Process Wayne County, Ohio

Need Number: AEP-2019-OH046

Process Stage: Needs Meeting 07/24/2019

Supplemental Project Driver:

Operational Flexibility and Customer Service

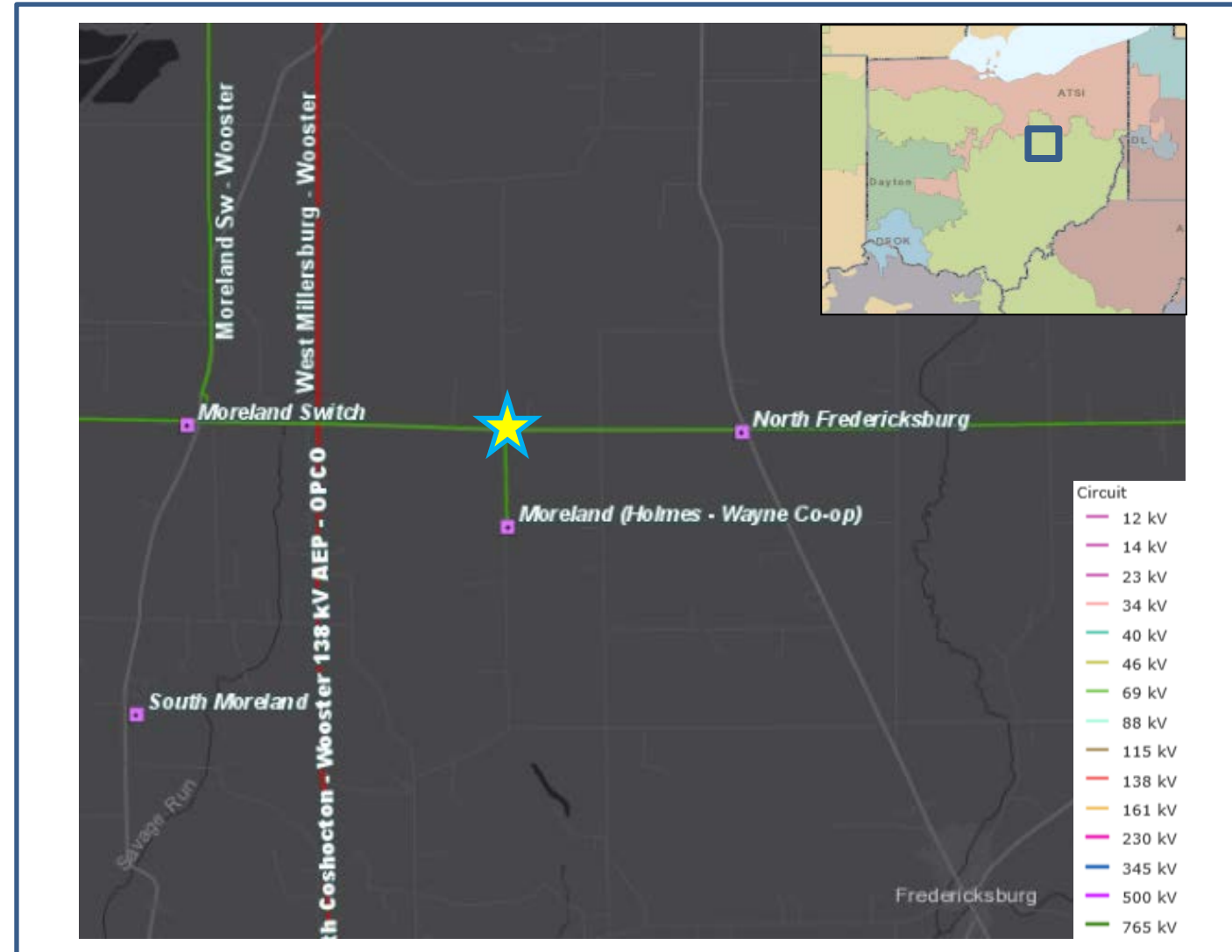
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

- Holmes-Wayne Co-op's Moreland delivery point is served via a hard tap from the Beartown-Moreland 69kV circuit, with no line sectionalizing switches present. The hard tap limits operational capabilities in the area. It is difficult to coordinate maintenance efforts because the T-line cannot be removed from service without a customer outage for Holmes-Wayne Co-op.
- Load is approximately 7 MVA.
- CMI: .155 M reported by Holmes Wayne (2015-2018)

Model: N/A



AEP Transmission Zone M-3 Process Senecaville/Summerfield, Ohio

Need Number: AEP-2019-OH047

Process Stage: Need Meeting 7-24-2019

Supplemental Project Driver:

Equipment Material/Condition/Performance/Risk

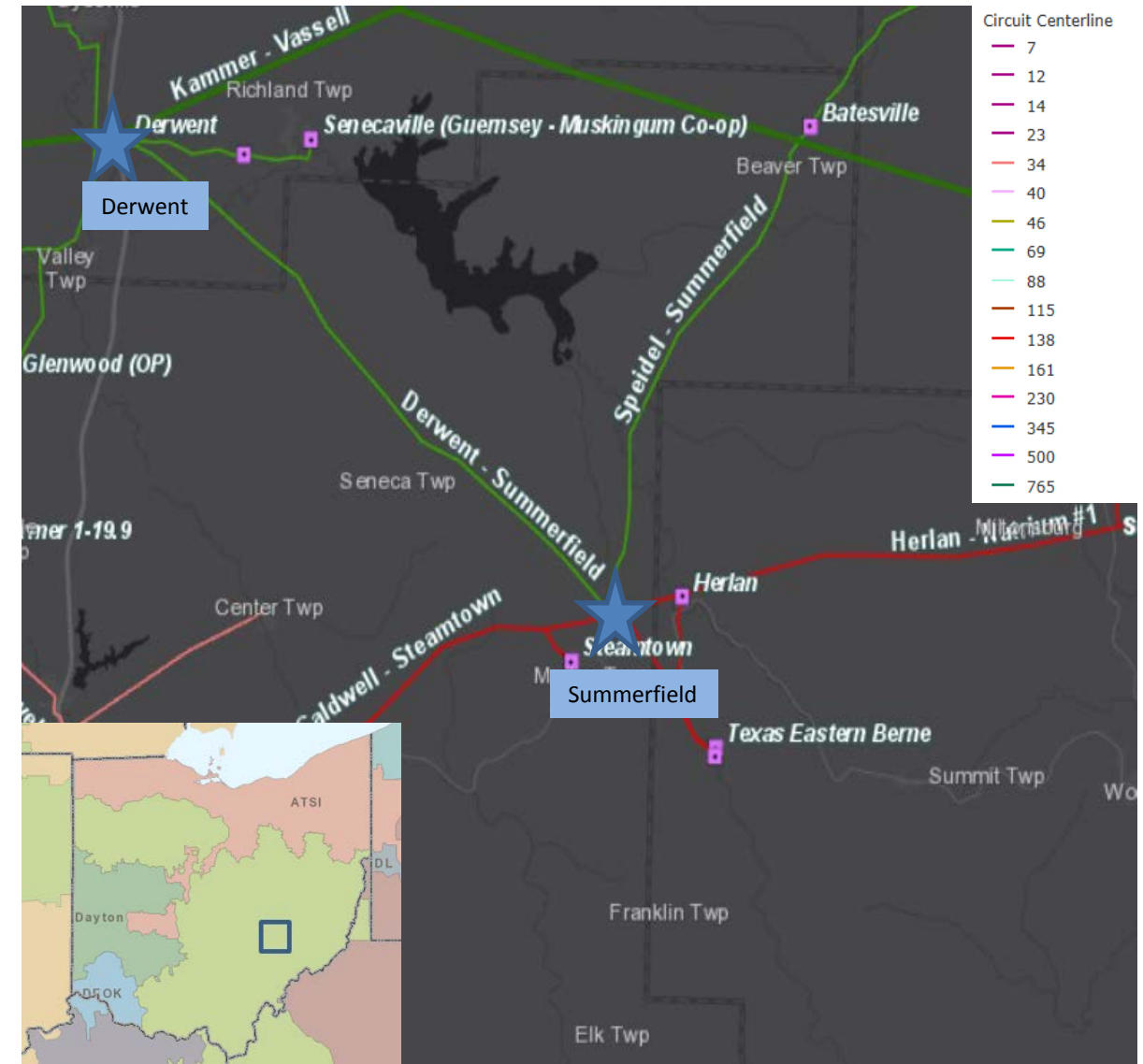
Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

Derwent – Summerfield 69 kV

- Majority of 13.8 mile circuit utilizes wood structures installed in 1962.
- Circuit utilizes 336.4 kcmil ACSR 30/7 Oriole conductor installed in 1962.
- Five momentary and permanent outages over last three years.
- 62 Open Structure/Conductor conditions
 - Insect damage, woodpecker holes, along with rotted and cracked structures.



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 Glencoe-Somerton 69 kV Upgrade

Need Number: AEP-2019-OH001

Process Stage: Solutions Meeting 7/24/2019

Previously Presented: Needs Meeting 2/20/2019

Supplemental Project Driver:

Equipment Material/ Condition/Performance/Risk & Operational Flexibility

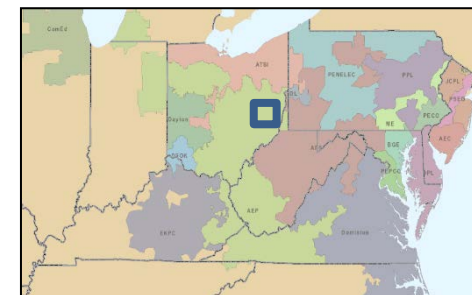
Specific Assumption Reference:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

- The Glencoe-Somerton 69 kV circuit is 22.5 miles in length and has numerous condition issues. Within the last 5 years, it has experienced 18 momentary outages (3.6 per year) and 7 permanent (sustained) outages (1.4 per year). The average outage duration has been 13.7 hours. AEP and South Central Power Co-op customers served from this circuit suffered nearly 3.5 million minutes of customer interruption (CMI) during the 2015-2018 timeframe.
- The circuit currently has 148 open conditions (43 structural, 23 on conductor, 5 for shielding/grounding, 24 for hardware, and 53 for forestry/ROW). The majority of the wood poles were installed in 1953 and 1970 (84% of circuit length). The conductor was also primarily installed in 1953 (219 kcmil ACSR) and 1970 (336 kcmil ACSR). The majority of the outage causes have been attributed to T-Line condition issues.
- The two 69 kV delivery points for South Central Power Co-op's Beallsville and Pipe Creek stations are connected via hard taps (no sectionalizing switches present). This requires an outage to the customer whenever maintenance or emergency repairs must be done on either side of the customer tap.

Model: N/A



AEP Transmission Zone M-3 Process Glencoe-Somerton 69 kV Upgrade

Need Number: AEP-2019-OH001

Process Stage: Solutions Meeting 7/24/2019

Proposed Solution:

Rebuild the Glencoe-Somerton 69 kV circuit (22 miles) with single-circuit 795 ACSR conductor.

Estimated Cost: \$59.8 M

Replace the Pipe Creek hard tap with a 1200 A-rated 3-way switch (Jacobsburg Switch).

Estimated Cost: \$0.7 M

Replace the Beallsville hard tap with a 1200 A-rated 3-way switch (Beallsville Switch).

Estimated Cost: \$1.0 M

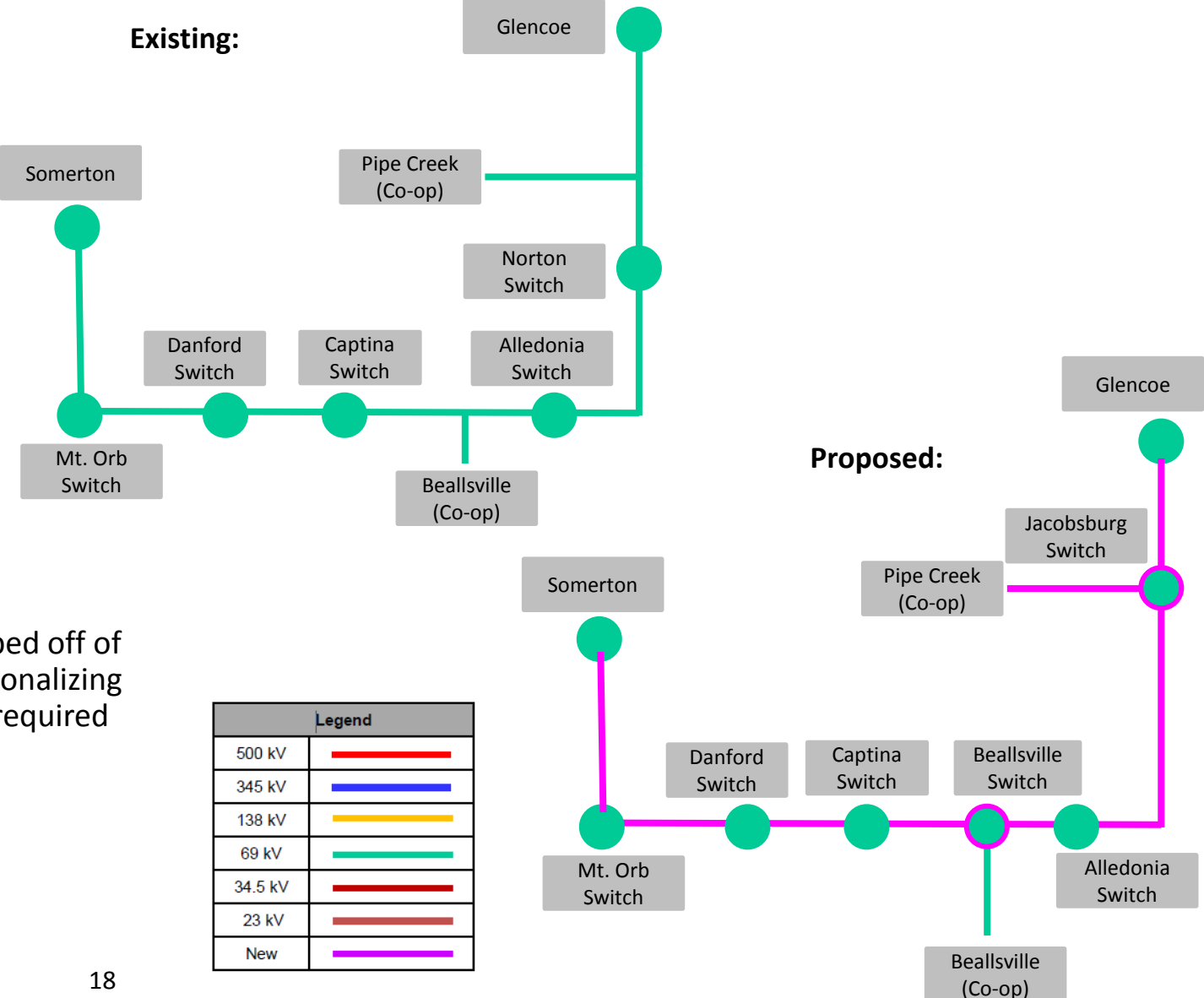
Total Estimated Transmission Cost: \$61.5 M

Alternatives Considered:

No alternatives due to the large number of customer stations tapped off of the circuit. A retirement or re-route is not feasible. Installing sectionalizing breakers in the middle was considered; however this would have required building a new station, and still left the customers vulnerable to transmission line faults, due to the poor condition of the T-line.

Projected In-Service: 6/1/2022

Project Status: Scoping



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

7/11/2019 – V1 – Original version posted to pjm.com

7/17/2019 – V2 – Correction to the CMI in problem statement for project AEP-2019-OH046 (Slide 14)