



Sub Regional RTEP Committee Western Region AEP

November 29, 2018

Need Number: AEP-2018-AP009

Process Stage: Needs Meeting 11/29/18

Process Chronology: Needs Meeting 11/29/18

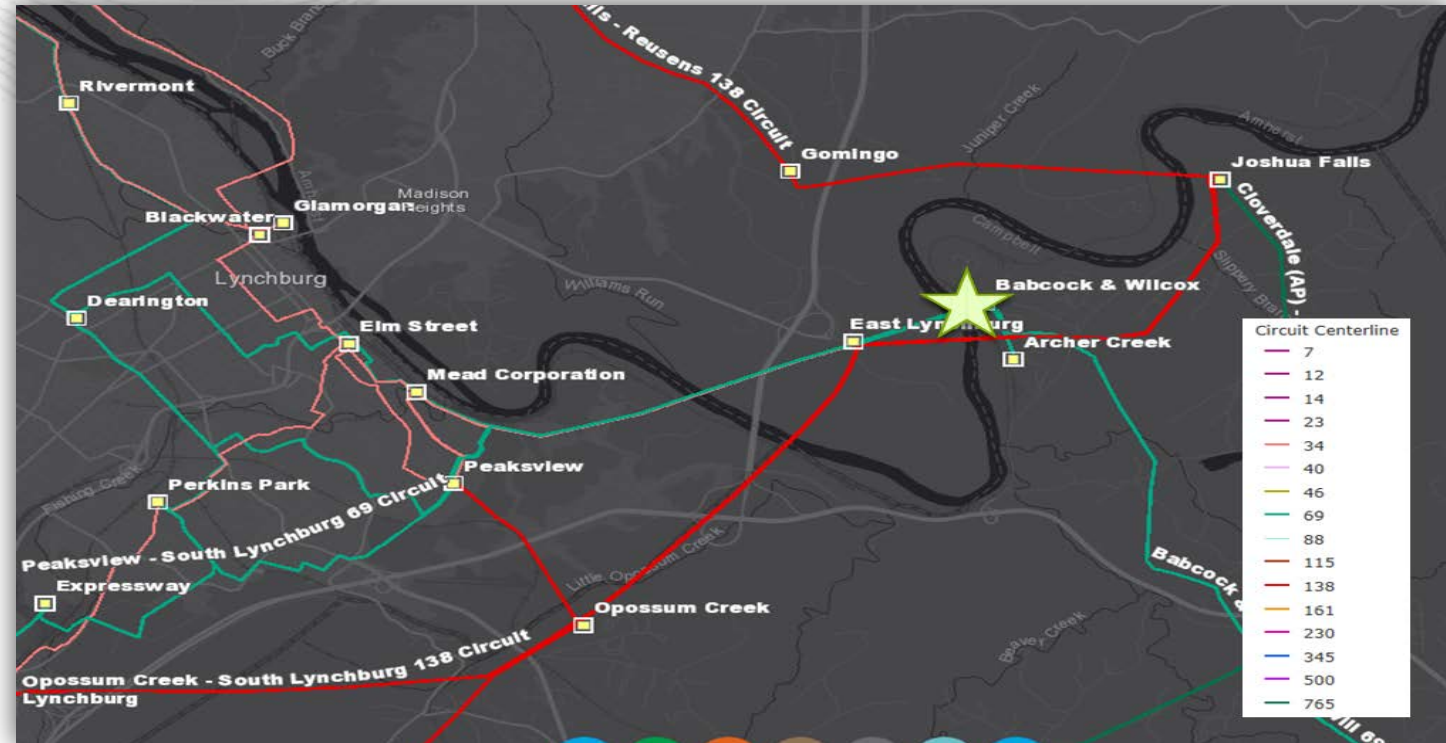
Supplemental Project Driver: Customer Service

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

Problem Statement:

Customer Service:

Babcock & Wilcox (B&W) requested to upgrade their existing 12 kV service to 69 kV and be served directly from the B&W 69 kV bus. Expected peak demand is approximately 16 MVA.





AEP Transmission Zone: Supplemental Paintsville, KY

Need Number: AEP-2018-AP010

Process Stage: Needs Meeting 11/29/18

Process Chronology: Needs Meeting 11/29/18

Supplemental Project Driver: Equipment Condition/Performance/Risk

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

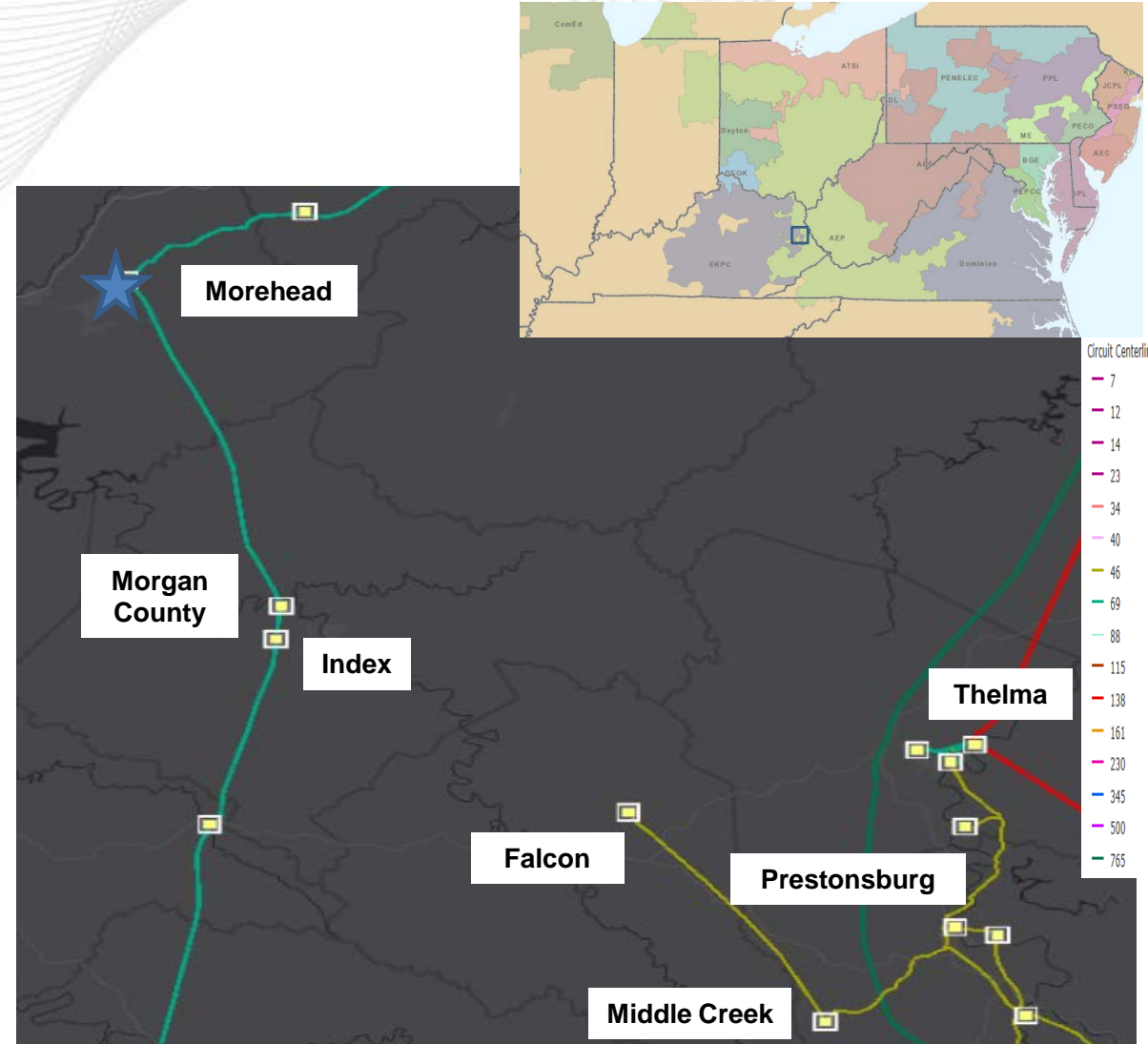
Problem Statement:

69 kV circuit breakers 'B' and 'E' at Morehead are CF-48 oil type breakers that were manufactured in 1967. These are oil breakers that have become more difficult to maintain due to the required oil handling. There is an increased potential for oil spills during routine maintenance and failures with these types of breakers. Other drivers include damage to bushings and an excessive number of fault operations exceeding the manufacturers recommendations. Morehead breakers 'B' and 'E' have experienced 42 and 97 fault operations respectively. The manufacturer's recommendation for this type of breaker is 10.

From 2013-2018 the Morehead – Morgan County 69 kV circuit (~ 20 miles) has experienced 29 momentary and permanent outages. The 21 mile 69 kV line section between Morehead and Index has 255 category A open conditions associated with the structures and conductors that make up the line. These conditions include damaged/rotted poles and damaged guy wires, cross arms. The majority of this circuit utilizes 1950s wood structures and 3/0 ACSR conductor.

From 2013-2018 the Falcon –Prestonsburg 46 kV circuit (~ 23 miles) has experienced 19 momentary and permanent outages. Over the last three years the circuit has experienced 1.77 million customer minutes of interruption. The ~14.5 mile 46 kV line section between Falcon and Middle Creek has 84 category A open conditions associated with the structures that make up the line. These conditions include damaged/rotted poles and damaged guy wires, cross arms. The majority of this line utilizes 1950s wood structures and 3/0 ACSR conductor. The ~8.5 mile 46 kV line section between Middle Creek and Prestonsburg has 27 category A open conditions associated with the structures that make up the line. These conditions include damaged/rotted poles and damaged guy wires, cross arms. About half the structures that make up the line are 1940s wood structures with the majority of the line utilizing 1/0 Cu. conductor.

From 2013-2018 the Prestonsburg - Thelma 46 kV circuit (~ 16 miles) has experienced 22 momentary and permanent outages. The circuit has 34 category A open conditions associated with the structures that make up the line. These conditions include damaged/rotted poles and damaged guy wires, cross arms. The majority of this circuit utilizes 1960s wood structures and 336.4 ACSR conductor.



Need Number: AEP-2018-AP011

Process Stage: Needs Meeting 11/29/18

Process Chronology: Needs Meeting 11/29/18

Supplemental Project Driver: Equipment Condition/Performance/Risk

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

Problem Statement:

Capacitor switchers ‘BB’ and ‘CC’ at Inez station are Mark V model which no longer support modern relaying packages. Mark V’s have been historically prone to mechanism failures and are being replaced system wide where possible. S&C circuit switcher ‘AA’ at Inez station is an S&C 2030 type with no gas monitor.

The Inez 138 kV yard was designed as a breaker and a half station, but the ‘B’ string was never completed leaving dissimilar zones of protection between the #1 bus and 20+ mile Inez to Johns Creek 138 kV circuit. Dissimilar zones of protection also exist between the 138 kV bus #2, 138/69 kV transformer #1, and the 138 kV circuit to the Martiki coal service point.



Need Number: AEP-2018-OH018

Process Stage: Needs Meeting 11/29/18

Process Chronology: Needs Meeting 11/29/18

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

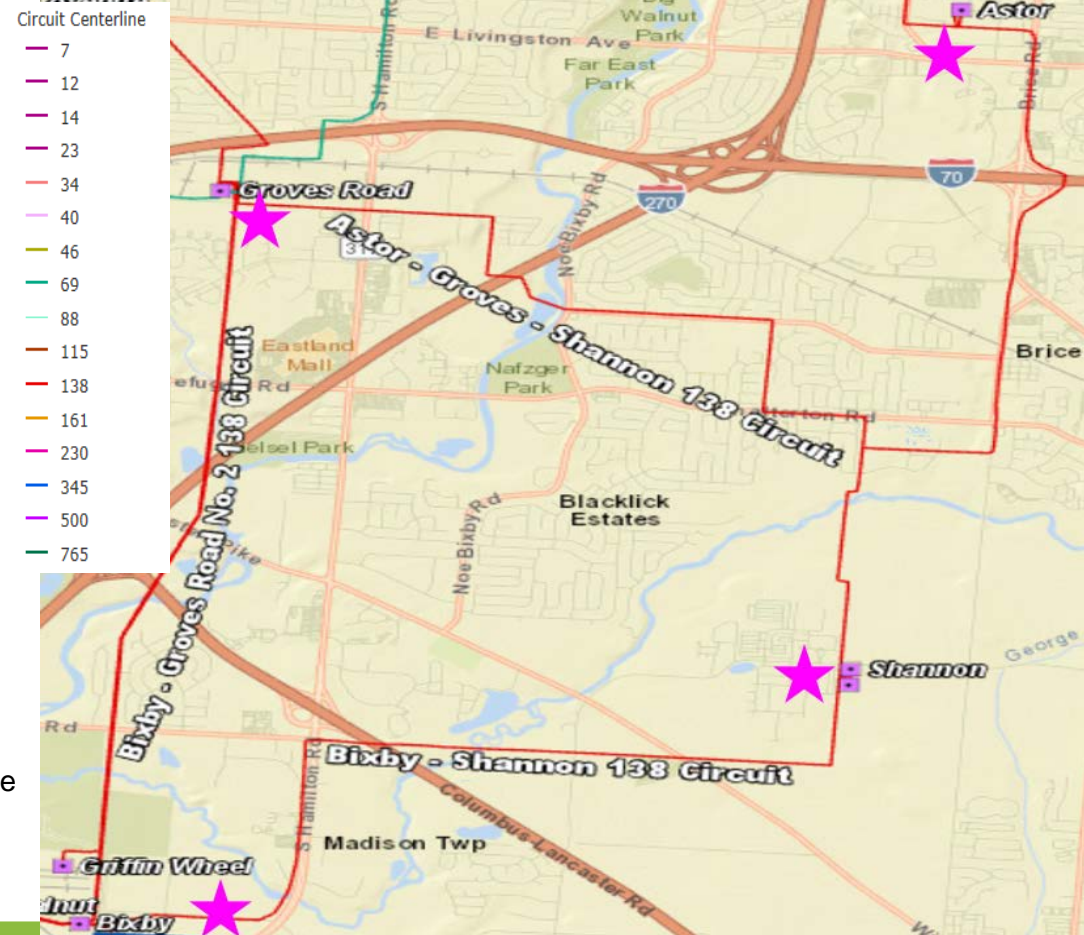
Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (slide 8)

Problem Statement:

- A study of the current physical loading capability of the structures along the Astor-Shannon-Groves & Shannon – Bixby 138 kV circuits revealed that many of the poles are currently overloaded under NESC Heavy Loading Conditions. Additionally, the line structures are unable to handle the addition of telecom fiber, which is needed to improve communications in this area.

Existing NESC Heavy Loading Conditions:

- 36% of poles on the Astor-Bixby 138 kV circuit show overloading.
 - 29% of poles on the Bixby – Shannon 138 kV circuit show overloading.
 - 20% of the poles on the Shannon – Refugee 138 kV circuit show overloading.
 - 58% of poles on the Refugee – (Future) Brice 138 kV circuit show overloading.
 - 35% of poles on the (Future) Brice – Astor 138kV circuit show overloading.
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- Primarily 1952 wood poles (57% of total line)
 - Conductor is all from 1952
 - 43 (out of 155) structures on the circuit have at least 1 open condition (28%), with a total count of 63 open conditions.
23 reported closed conditions – 1 forestry, 4 conductor, 18 structure
 - No outage history (0 CMI/CI)
 - The Astor-Groves-Shannon 138 kV circuit is a three-terminal line, which limits sectionalizing and can cause mis-operations and over tripping.
 - Astor 138 kV Station has ground switch MOAB's on both 138/13 kV transformers. Ground switch MOABs cause intentional high side faults, which can damage nearby equipment.



Need Number: AEP-2018-OH019

Meeting Date: 11/29/2018

Process Chronology: Needs Meeting 11/29/2018

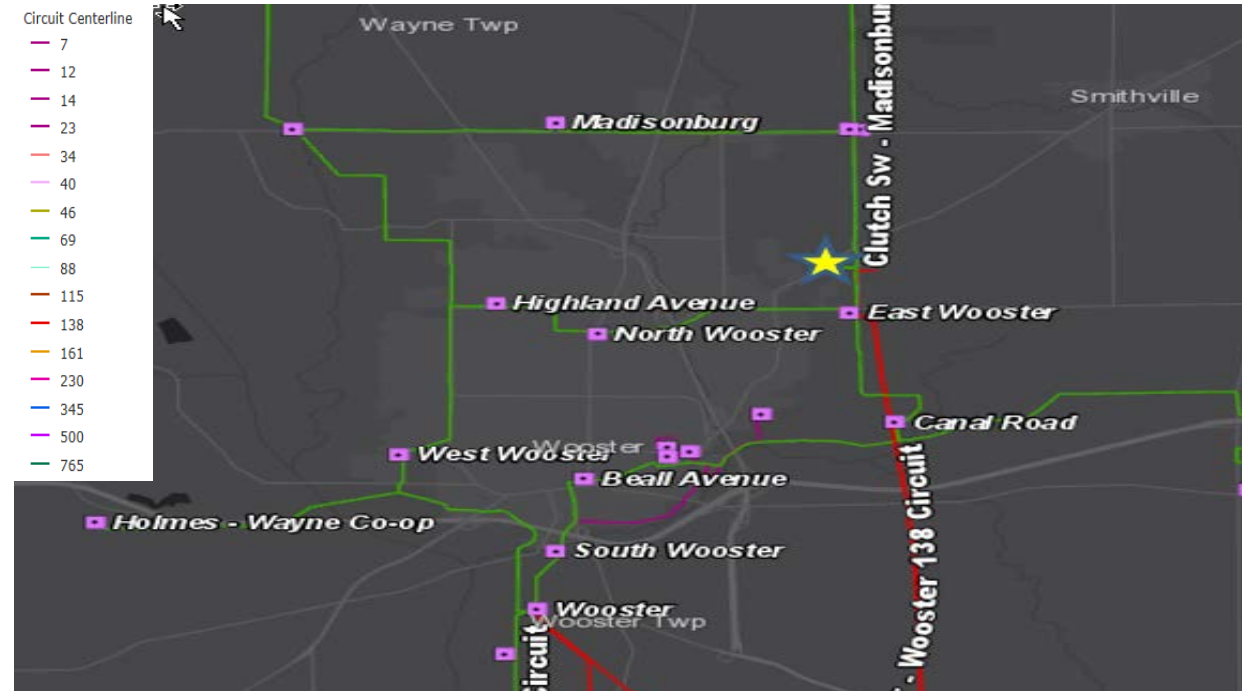
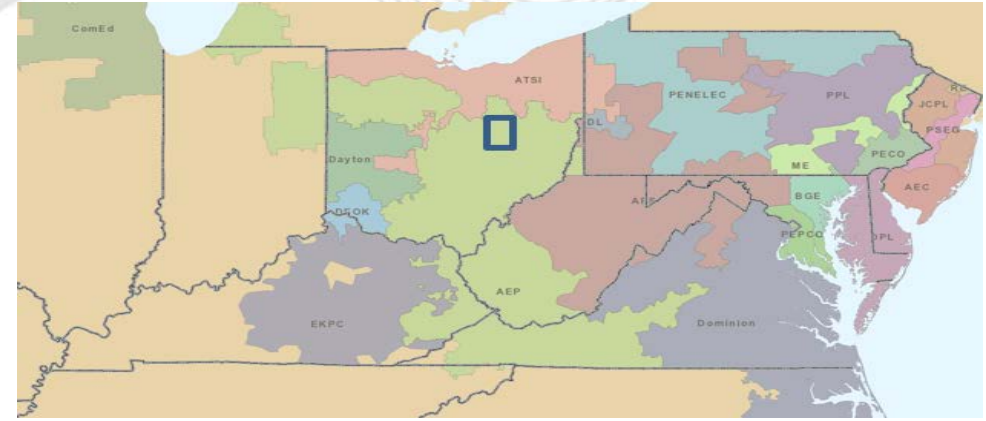
Supplemental Project Driver: Customer Service

Specific Assumption References:

AEP Connection Requirements for the AEP Transmission System (slide 7)

Problem Statement:

A transmission customer has requested new 69kV service on the northeast side of Wooster, Ohio. The total peak demand is 11 MVA.



Need Number: AEP-2018-OH021

Meeting Date: 11/29/2018

Process Chronology: Needs Meeting 11/29/2018

Supplemental Project Driver: Equipment

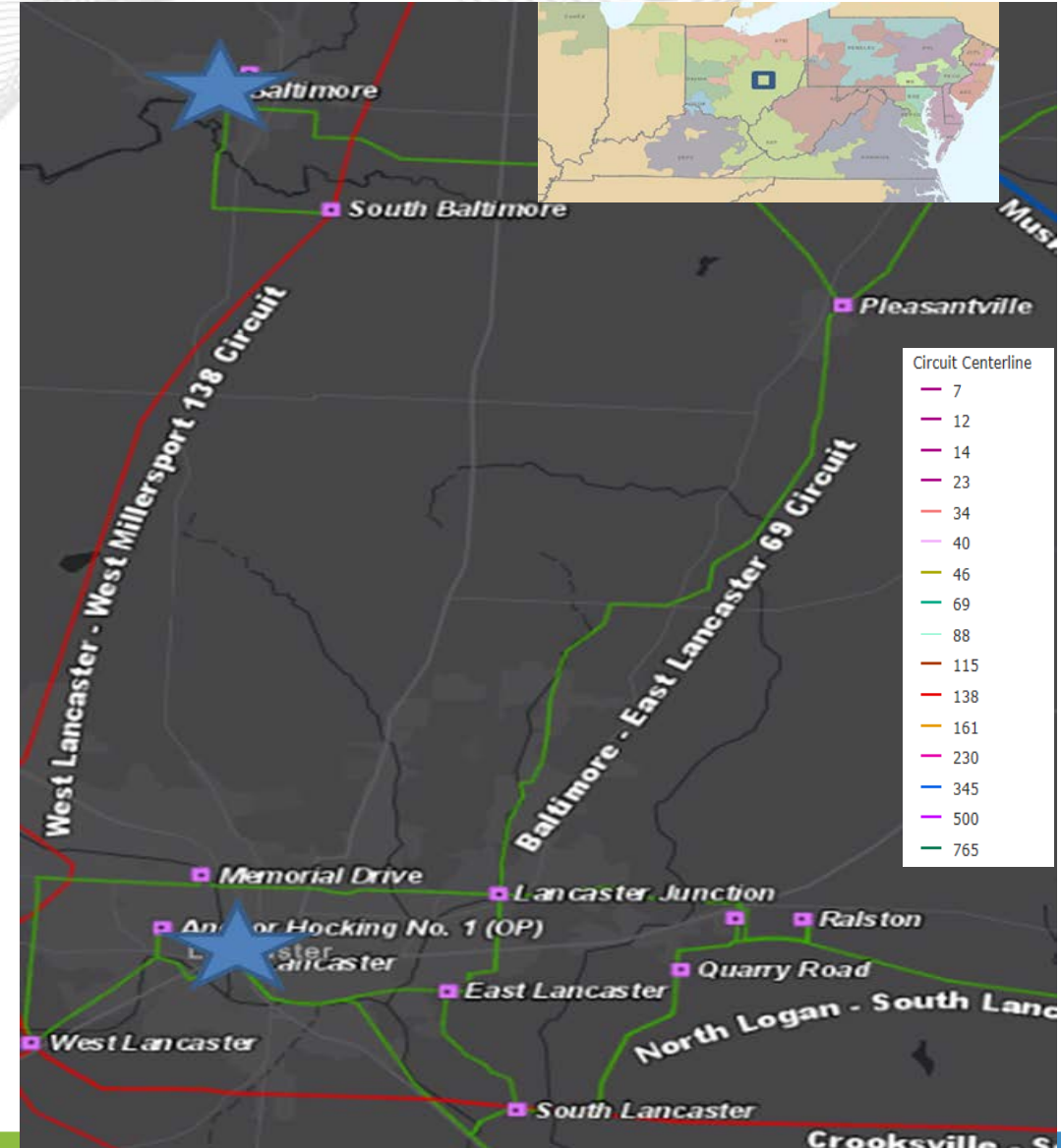
Material/Condition/Performance/Risk:

Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs (slide 8)

Problem Statement:

- Baltimore 69kV CBs E and F are oil type breakers (vintage 1951) and have been identified for replacement due to lack of spare part availability, historical reliability, and lack of vendor support. Oil breakers are difficult to maintain due to oil handling requirements. Oil spills can occur during maintenance and fixes. The breakers have experienced the following fault operations: CB E (5), CB F (5).
- Baltimore currently has 20 electro-mechanical relays employed. EM relays have limited spare part availability, a lack vendor support, no SCADA functionality, and no fault data collection ability.
- Lancaster 69kV CBs B and D are oil type breakers (vintage 1989) and have been identified for replacement due to lack of spare part availability, historical reliability, and lack of vendor support. Oil breakers are difficult to maintain due to oil handling requirements. Oil spills can occur during maintenance and fixes. The breakers have experienced the following fault operations: CB B (4), CB D (18).
- Lancaster currently has 46 electro-mechanical relays employed. EM relays have limited vendor support, lack SCADA functionality, and don't offer fault data collection.



Need Number: AEP-2018-OH022

Meeting Date: 11/29/2018

Process Chronology: Needs Meeting 11/29/2018

Supplemental Project Driver: Equipment

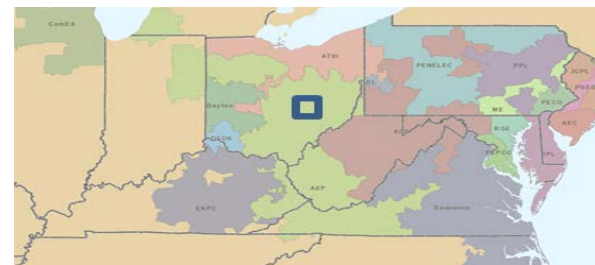
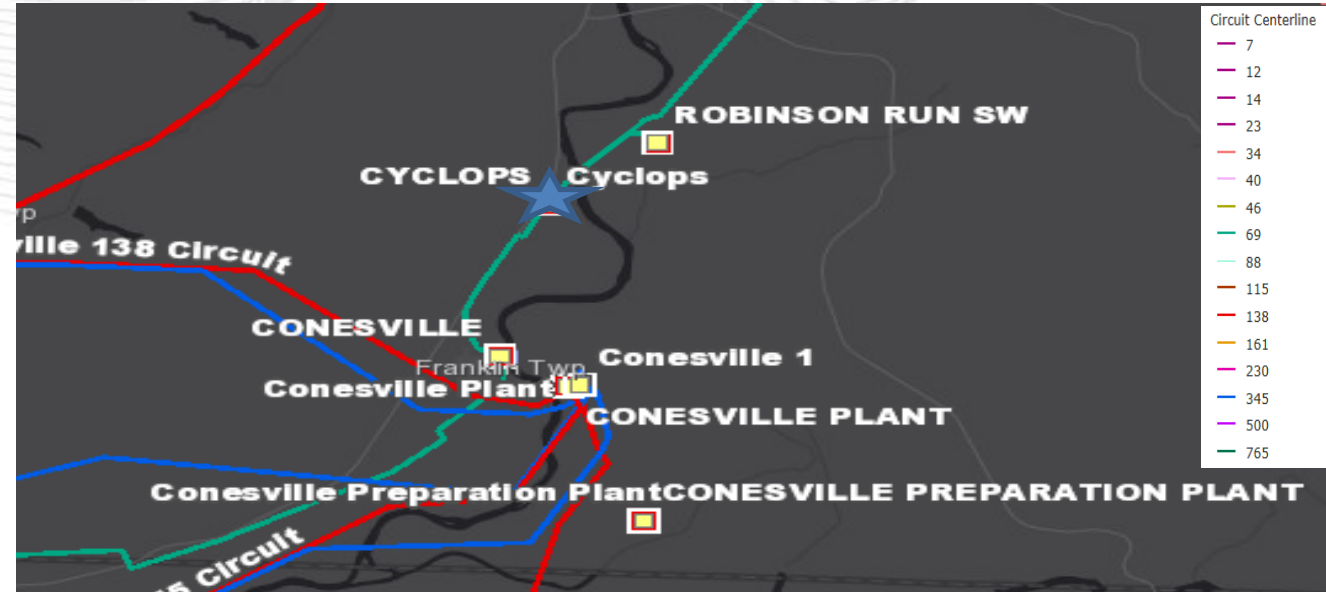
Material/Condition/Performance/Risk

Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs (slide 8)

Problem Statement:

- Cyclops 69kV circuit switcher A is currently being used as a line CB. This model has limited spare parts availability and reliability concerns. This circuit switcher has also experienced 41 fault operations.
- Cyclops 69kV CB B is an oil type breaker (vintage 1955) that has exceeded the manufacturers recommended number of fault operations (36 total faults). Oil breakers are difficult to maintain due to oil handling requirements. Oil spill can occur during maintenance and fixes.
- Cyclops station currently has 19 electro-mechanical relays employed. EM relays have limited spare part availability, a lack vendor support, no SCADA functionality, and no fault data collection ability.
- Cyclops station is currently built upon a four-pole wooden bay that is progressively deteriorating.



Need Number: AEP-2018-OH023

Meeting Date: 11/29/2018

Process Chronology: Needs Meeting 11/29/2018

Supplemental Project Driver: Equipment

Material/Condition/Performance/Risk

Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

- East Cambridge 34.5kV CB “D”, 69kV CB “A” and 69kV CB “C” are vintage (1970-1975) circuit breakers. Oil breakers are difficult to maintain due to oil handling requirements and risk of oil spills during maintenance and failures. In addition, these CB’s have exceeded the manufacturers recommended fault operations: CB A (8), CB C (28), and CB D (91).
- East Cambridge circuit switcher AA (vintage 1970) is recommended for replacement due to reliability concerns and lack of spare part availability.
- East Cambridge currently has 36 electro-mechanical relays employed. EM relays have limited spare part availability, a lack vendor support, no SCADA functionality, and no fault data collection ability.



Need Number: AEP-2018-OH024

Meeting Date: 11/29/2018

Process Chronology: Needs Meeting 11/29/2018

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

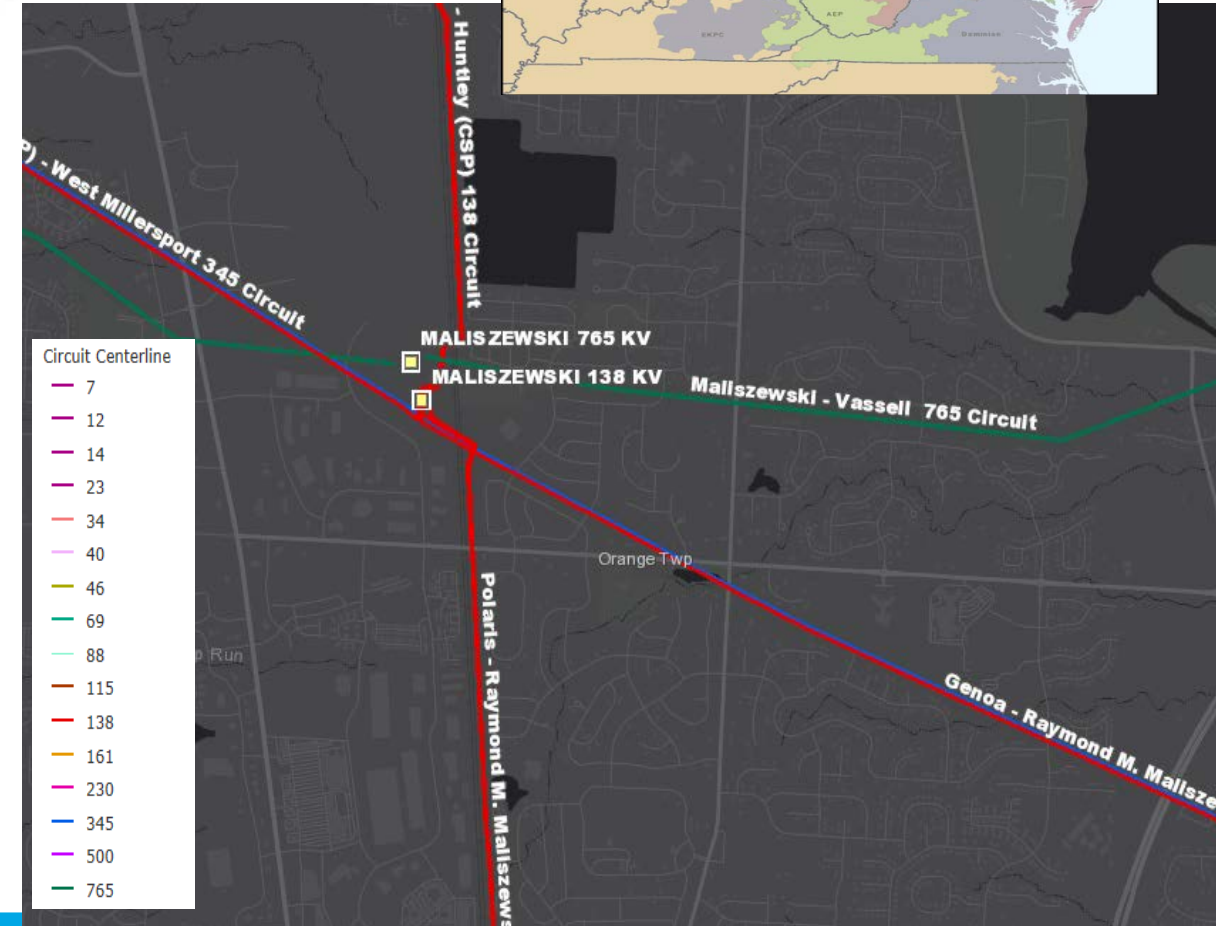
Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs (slide 8)

Problem Statement:

The 138kV riser is currently the Most Limiting Series Element on the 765/138 kV transformer at Maliszewski, reducing the summer normal rating by 170MVA. With customer load requests in the area, we anticipate this limitation overloading in the future.

A transformer outage is already scheduled so utilizing already mobilized crews to save on costs in the long run would be desirable.



Need Number: AEP-2018-OH025

Meeting Date: 11/29/2018

Process Chronology: Needs Meeting 11/29/2018

Supplemental Project Driver: Equipment

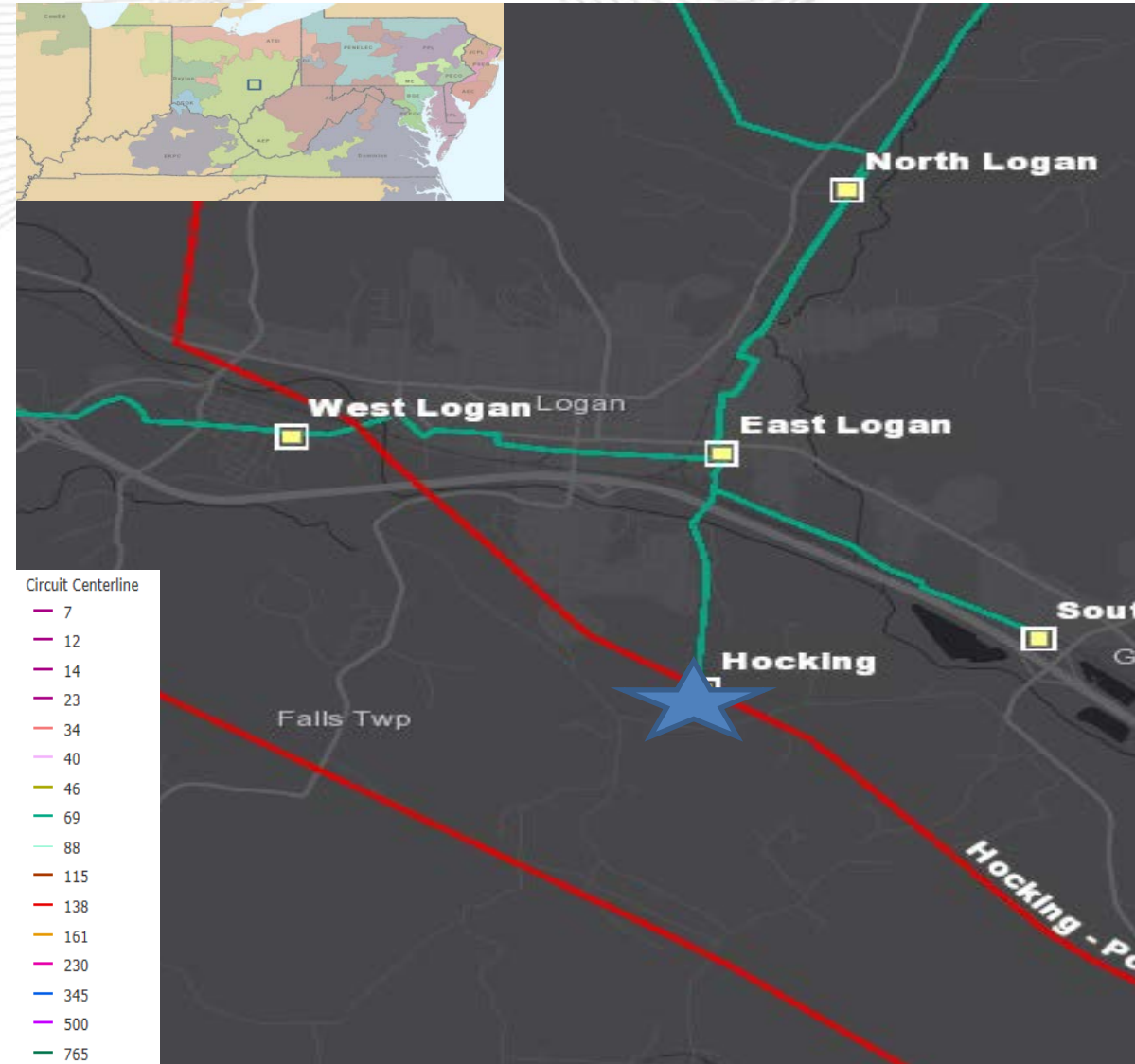
Material/Condition/Performance/Risk:

Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs (slide 8)

Problem Statement:

- Hocking 138kV MOAB “W” is in a failed state. When operating, arcing occurs, resulting in the tripping of remote breakers/circuit switchers.
- The structures supporting this MOAB will not allow for a like for like replacement due to the extra weight.



Need Number: AEP-2018-OH026

Meeting Date: 11/29/2018

Process Chronology: Needs Meeting 11/29/2018

Supplemental Project Driver: Equipment

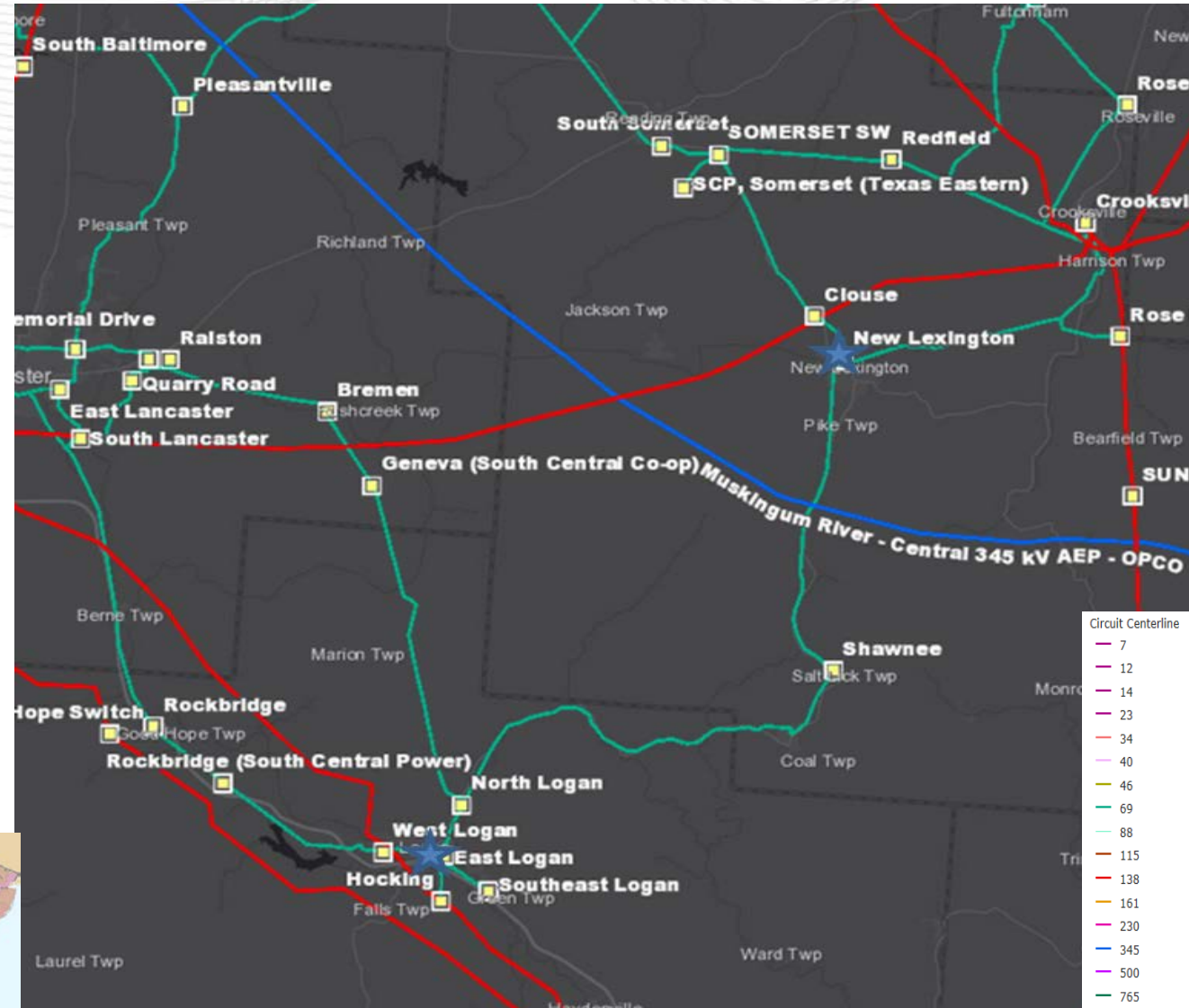
Material/Condition/Performance/Risk

Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs (slide 8)

Problem Statement:

- The New Lexington – East Logan 22.3 mile 69 kV (vintage 1916) was built using wood pole structures with conductors ranging from #1 Copper 3 conductor (31 MVA rating) to 336.4 KCM ACSR 18/1 (73 MVA rating).
- There are 139 open A conditions on this line, including burnt/broken conductors, and broken structures. The New Lexington – East Logan 69 kV circuit has experienced over three million customer minutes of interruption in the past three years.



Need Number: AEP-2018-OH027

Meeting Date: 11/29/2018

Process Chronology: Needs Meeting 11/29/2018

Supplemental Project Drivers: Equipment Material/Condition/Performance/Risk, Operational Flexibility and Efficiency

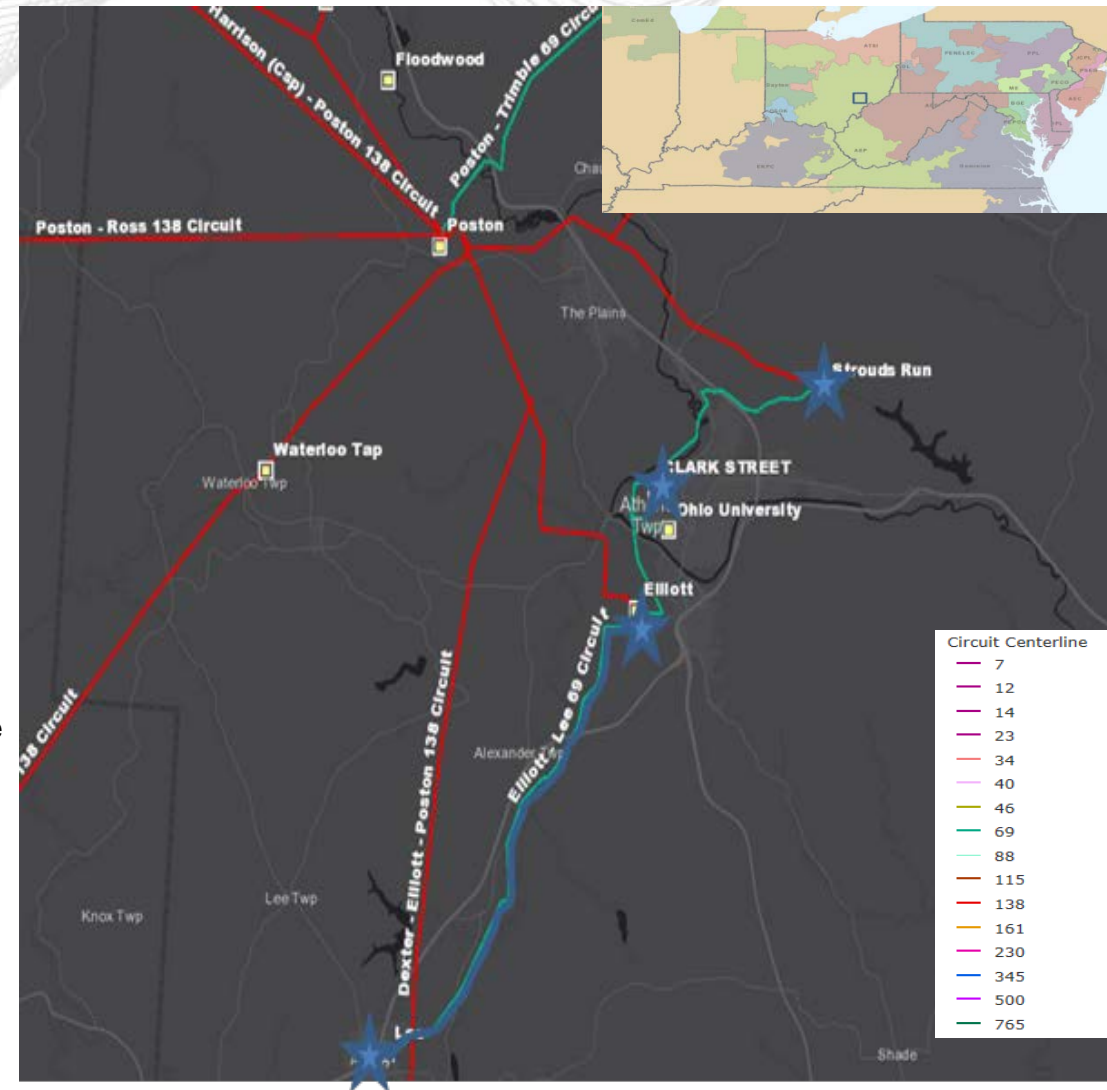
Specific Assumption References:

AEP Guidelines for Transmission Owner Identified Needs (slide 8)

Problem Statement:

Equipment Material / Condition / Performance / Risk:

- Elliott 138 kV circuit breaker 102 (vintage 1956) is an oil type breaker recommended for replacement due to bushing damage, reliability, and lack of spare part availability.
- Elliot 69kV circuit breakers 61, 66, and 67 (vintage 1972) have experienced the following numbers of fault operations: CB-102 (38), CB-67 (10), CB-66 (40), and CB-61 (1). These breakers are oil type breakers recommended for replacement due to reliability and lack of spare part availability.
- Strouds Run 69kV circuit breakers 63 and 66 (vintage 1969-1973) are oil breakers recommended to replace due to reliability and lack of spare part availability. Maintenance has become more difficult due to the oil handling required to maintain them. They have experienced the following fault operations: CB 63 (24), CB 66 (0).
- Strouds Run 138kV Circuit switchers “CS-TR1” and “CS-TR2” are Mark type switchers. Mark switchers are being recommended for replacement system wide due to their inability to coordinate with modern relaying packages. Circuit switchers have experienced the following fault operations: CS-TR1 (17), CS-TR2 (18).
- Strouds Run 138/69 kV 33.6MVA transformer #1 (vintage 1972) is also showing significant signs of deterioration. Drivers for replacement include dielectric strength breakdown, short circuit strength breakdown, and bushing damage.
- Clark Street 69 kV circuit breakers 61 and 64 (vintage 1968) are oil filled breakers that have been recommended for replacement due to oil handling requirements, no longer has vendor support, lacks sufficient spare part availability, and has a history of malfunctions. The breakers have had the following fault operations: CB 61 (8) and CB 64 (15).



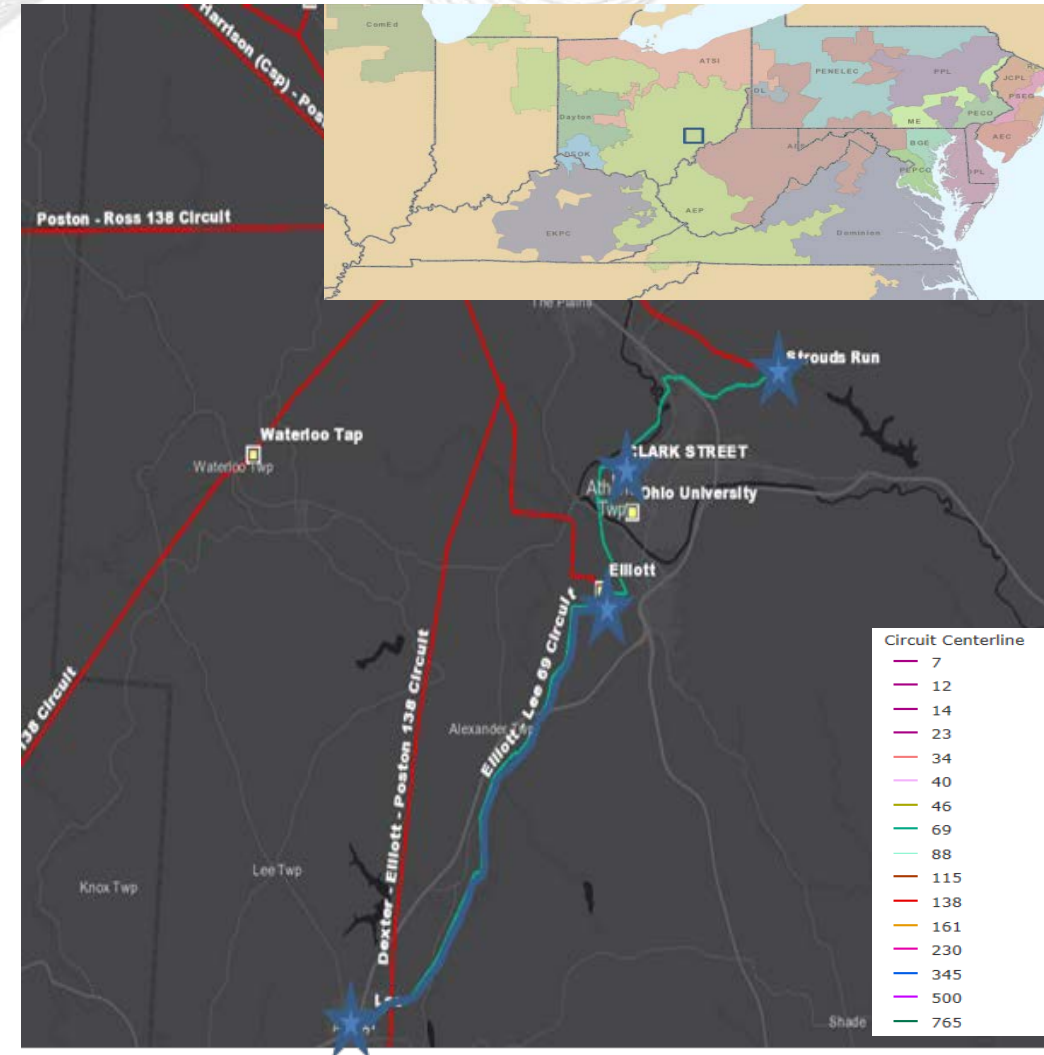
Problem Statement (continued):

Equipment Material / Condition / Performance / Risk:

- The Elliot – Lee 69kV 8 mile, 69 kV line (vintage 1974) was constructed using wood pole structures with 336.4 KCM ACSR 18/1 conductor (73 MVA rating).
- There are 106 open A conditions on this line, including rotten structures, burnt/broken insulators, and loose/broken/sagging conductor sections, improperly installed shield wires and woodpecker damaged structures.
- These stations still have the following amount of electromechanical relays employed: Elliot (29), Strouds Run (78), Clark Street (25). EM relays have limited vendor support, lack SCADA functionality, and don't offer fault data collection.

Operational Flexibility and Efficiency:

- The Crooksville – Poston – Strouds Run 138kV circuit is a three-terminal line, which limits sectionalizing and can cause mis-operations and over tripping.
- The Dexter – Elliot – Poston 138kV circuit is a three-terminal line, which limits sectionalizing and can cause mis-operations and over tripping.





Need Number: AEP-2018-OH010

Process Stage: Solution Meeting 11/29/2018

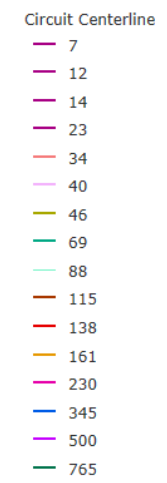
Needs Presented: 10/26/2018

Supplemental Project Driver: Customer Service

Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs

Problem Statement:

- **Customer Service #1:** AEP Ohio has requested a connection to the Crooksville – North Newark 138 kV circuit. Isabella station will replace their Redfield station. Redfield Distribution equipment is in need of rehab and it is distant from Distribution load centers. The starting load at Isabella will be 3.5 MVA and the ultimate load will be 10 MVA. Load will be transferred load from Redfield and South Fultonham. The existing Redfield 69kV Station has experienced 1,730,000 CMI over a three year period.
- **Customer Service #2:** Roseville is still being evaluated.



Need Number: AEP-2018-OH010

Proposed Solution:

- Build a new 138 kV in and out station with Moab switches to connect to the Crooksville – North Newark 138 kV circuit.
- Build a new 0.17 mile 138 kV extension to Isabella Station.

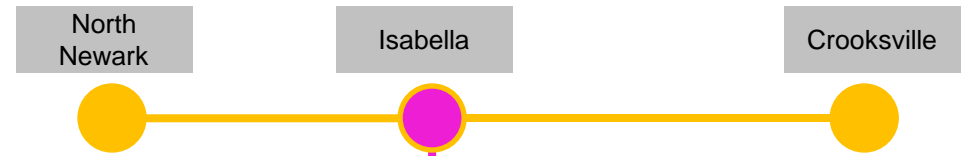
Alternatives:

- Rebuilding Redfield Station is not a cost effective option and is physically located away from the load center.

Total Estimated Transmission Cost: \$2.07M

Projected IS Date: 6/15/2019

Project Status: Engineering



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

AEP Ohio Load

Need Number: AEP-2018-IM005

Process Stage: Solution Meeting 11/29/2018

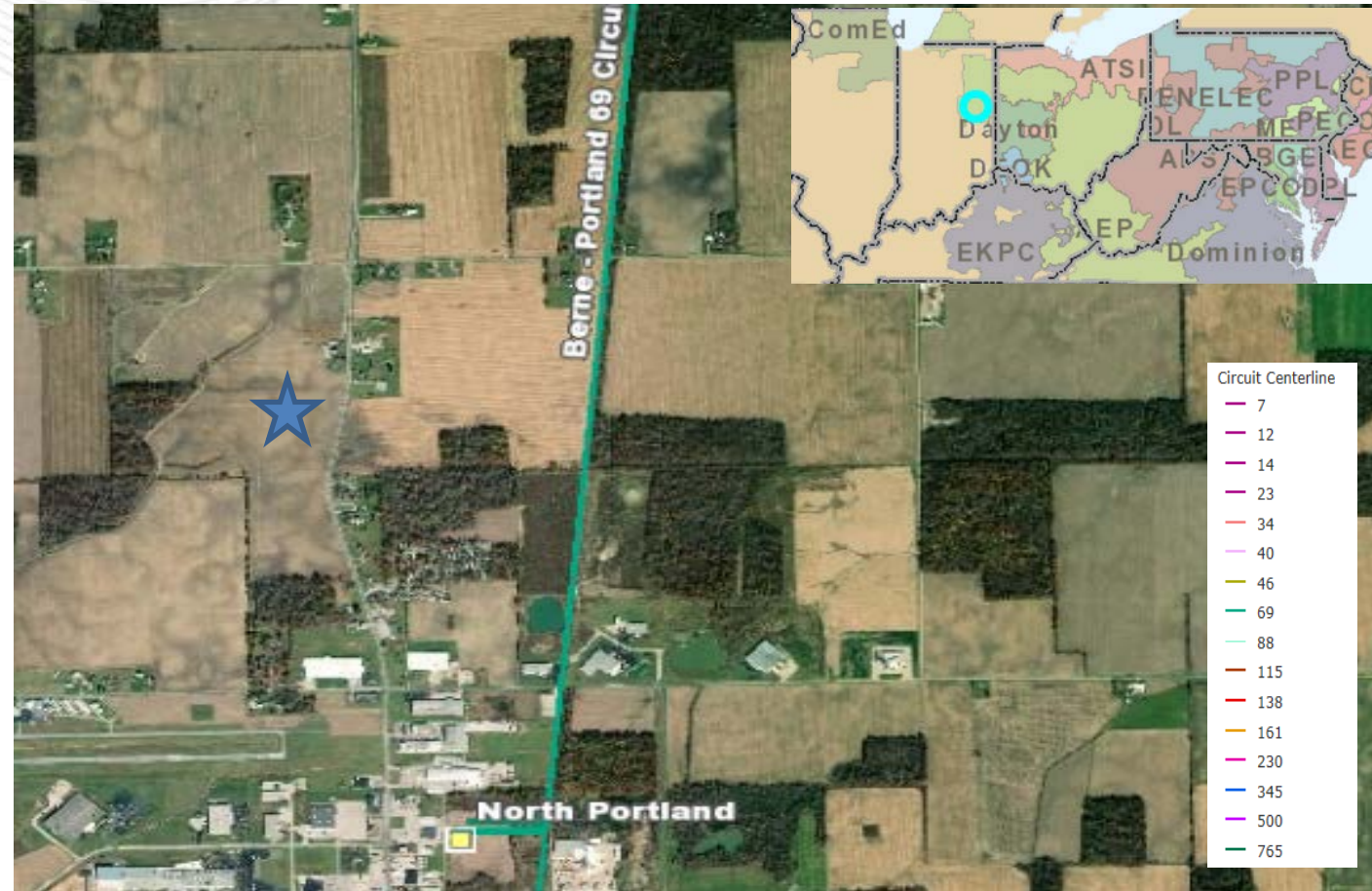
Needs Presented: 10/26/2018

Supplemental Project Driver: Customer Request

Specific Assumptions Reference: AEP Guidelines for Transmission Owner Identified Needs (AEP Assumptions Slide 7)

Problem Statement:

A customer has requested connection of a 2.3MVA load off of the Berne – Portland 69kV line.



Need Number: AEP-2018-IM005

Proposed Solution:

Install a 3-way PoP switch called Bockoven Switch with line MOABs with automatic sectionalizing.

Install 0.5 mile extension to customer with 556 ACSR conductor.

Alternatives:

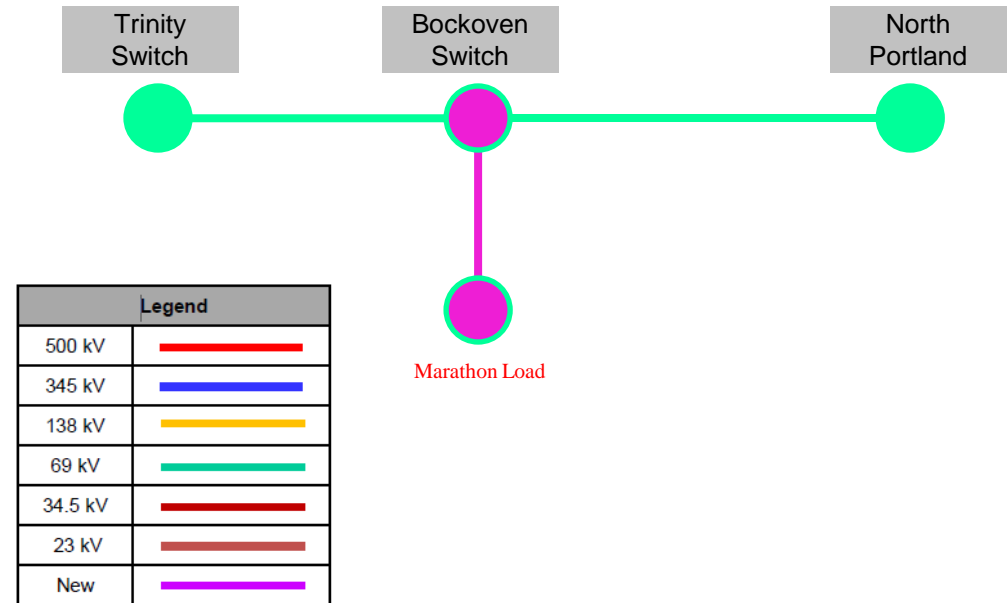
Only install 1 MOAB on the Bockoven Switch pole.

The Berne – Portland line is a significantly exposed line on the edge of AEP’s territory. With almost 2.79 Million CMI on this circuit, mostly due to weather and vehicle events, automatic sectionalizing of this line is required.

Total Estimated Transmission Cost: \$2.6M

Projected IS Date: 1/15/2019

Project Status: Engineering



Revision History

11/16/2018 – V1 – Original version posted to pjm.com

11/27/2018 – V2 – Slide #5, Change AEP-2018-OH0017 to AEP-2018-OH0018

3/19/2019 – V3 – Slide #5, Change AEP-2018-OH0018 to AEP-2018-OH018

- Slide #6, Change AEP-2018-OH0019 to AEP-2018-OH019

- Slide #7, Change AEP-2018-OH0021 to AEP-2018-OH021

- Slide #8, Change AEP-2018-OH0022 to AEP-2018-OH022

- Slide #9, Change AEP-2018-OH0023 to AEP-2018-OH023

- Slide #10, Change AEP-2018-OH00024 to AEP-2018-OH024

- Slide #11, Change AEP-2018-OH00025 to AEP-2018-OH025

- Slide #12, Change AEP-2018-OH0026 to AEP-2018-OH026

- Slide #13, Change AEP-2018-OH00027 to AEP-2018-OH027

- Slide #15,16, Change AEP-2018-OH0010 to AEP-2018-OH010