Sub Regional RTEP Committee
PJM West

August 31, 2018

- The following definitions explain the basis for excluding flowgates and/or projects from the competitive planning process and designating projects to the incumbent Transmission Owner.
- Flowgates/projects excluded from competition will include the underlined language on the corresponding slide.
  - Immediate Need Exclusion: Due to the immediate need of the violation (3 years or less), the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity. - Operating Agreement, Schedule 6 § 1.5.8(m)
  - Below 200kV: Due to the lower voltage level of the identified violation(s), the driver(s) for this project are excluded from the competitive proposal window process. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(n)
  - FERC 715 (TO Criteria): Due to the violation need of this project resulting solely from FERC 715 TO Reliability Criteria, the driver(s) for this project are excluded from the competitive proposal window process. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(o)
  - Substation Equipment: Due to identification of the limiting element(s) as substation equipment, the driver(s) for this project are excluded from the competitive proposal window process. As a result, the local Transmission Owner will be the Designated Entity - Operating Agreement, Schedule 6 § 1.5.8(p)

Immediate Need

Baseline Reliability and Supplemental Projects

APS Transmission Zone: Baseline Project

Common Mode Outage (Summer)

Immediate Need

Problem Statement:

- The William – Parsons 138kV line is overloaded for multiple contingencies in the summer case. (FG# GD-S698 and GD-S699)

Recommended Solution:

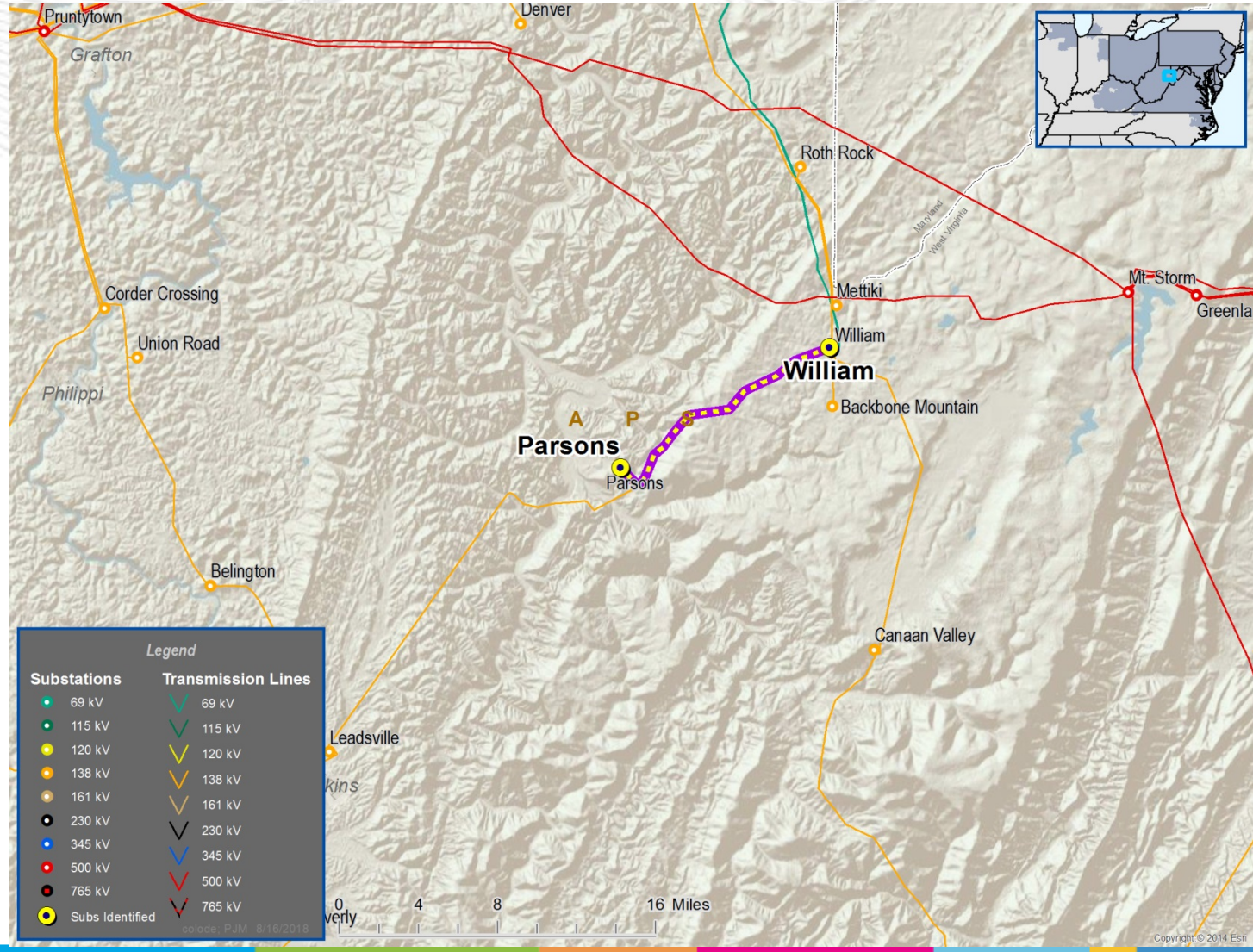
- Upgrade substation disconnect leads at William 138 kV Substation (b3028)

Estimated Project Cost : $28.5K

Required IS Date: 6/1/2021

Projected IS date: 6/1/2021

Status: Conceptual



ATSI Transmission Zone: Baseline
Pawnee 138 kV

Immediate Need

Problem Statement:

2018 RTEP Gen Deliv and P1 Thermal Violation Summer 2023 Case

- Identified missing contingency definitions in previous RTEP studies.
- Violation identified starting in 2021 RTEP case
- For failure of the Eastlake 138 kV Breaker Q4S, results in the thermal overload of a section of the Leroy Center-Mayfield Q2 138 kV line, from Leroy Center to Pawnee tap (N1-S88, GD-S617).

Recommended Solution:

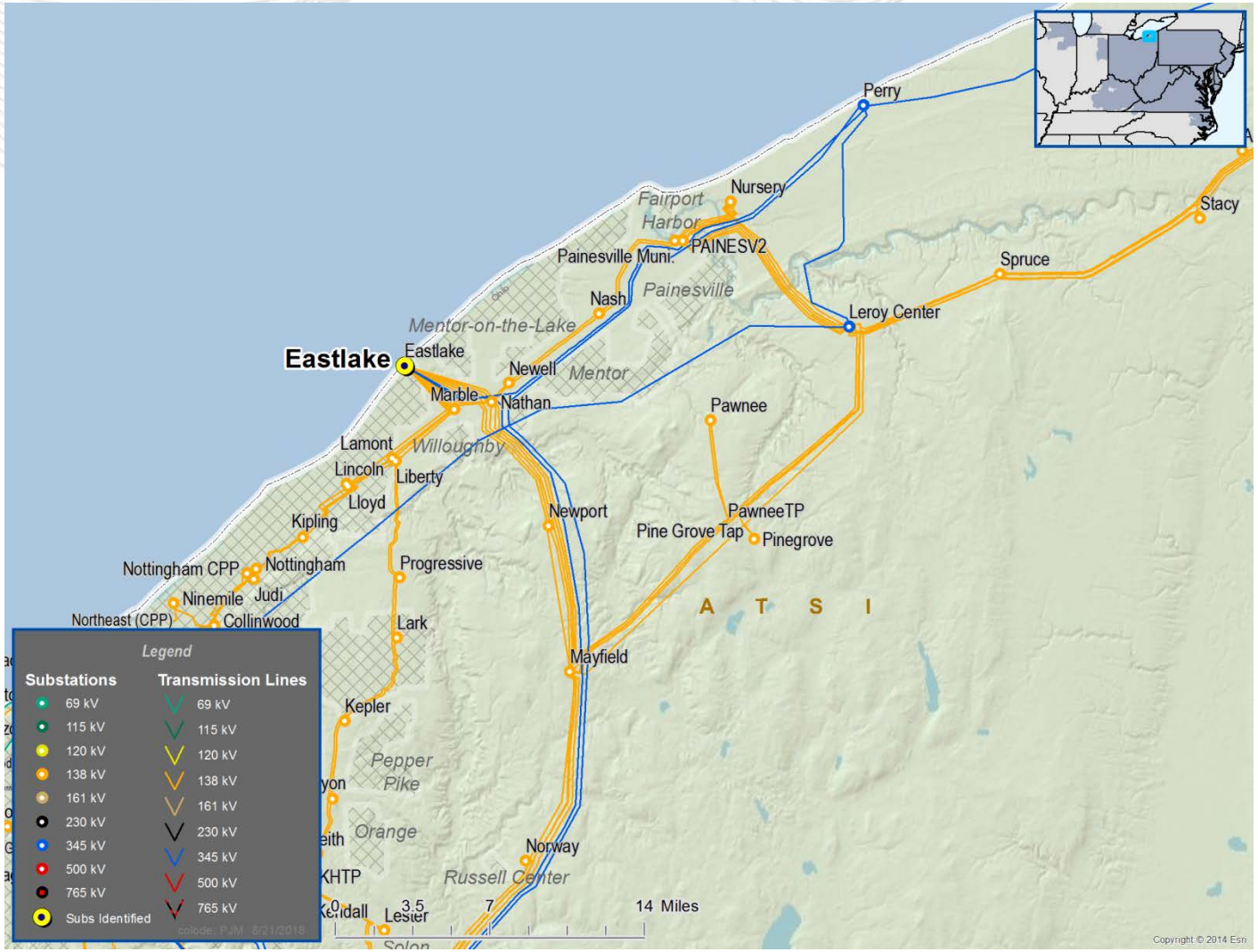
Pawnee 138 kV Substation Transmission Connection (B3031)

- Transfer load off of the Leroy Center-Mayfield Q2 138 kV line by reconfiguring the Pawnee Substation primary source, via the existing switches, from the Leroy Center-Mayfield Q2 138 kV line to the Leroy Center-Mayfield Q1 138 kV line.

Estimated Project Cost: $0.1 M

Projected IS Date: 06/01/2021

Status: Conceptual



First Review

Baseline Reliability and Supplemental Projects

Cancel B2790, which was previously presented on 4/21/2017 and 5/31/2017 SRRTEP

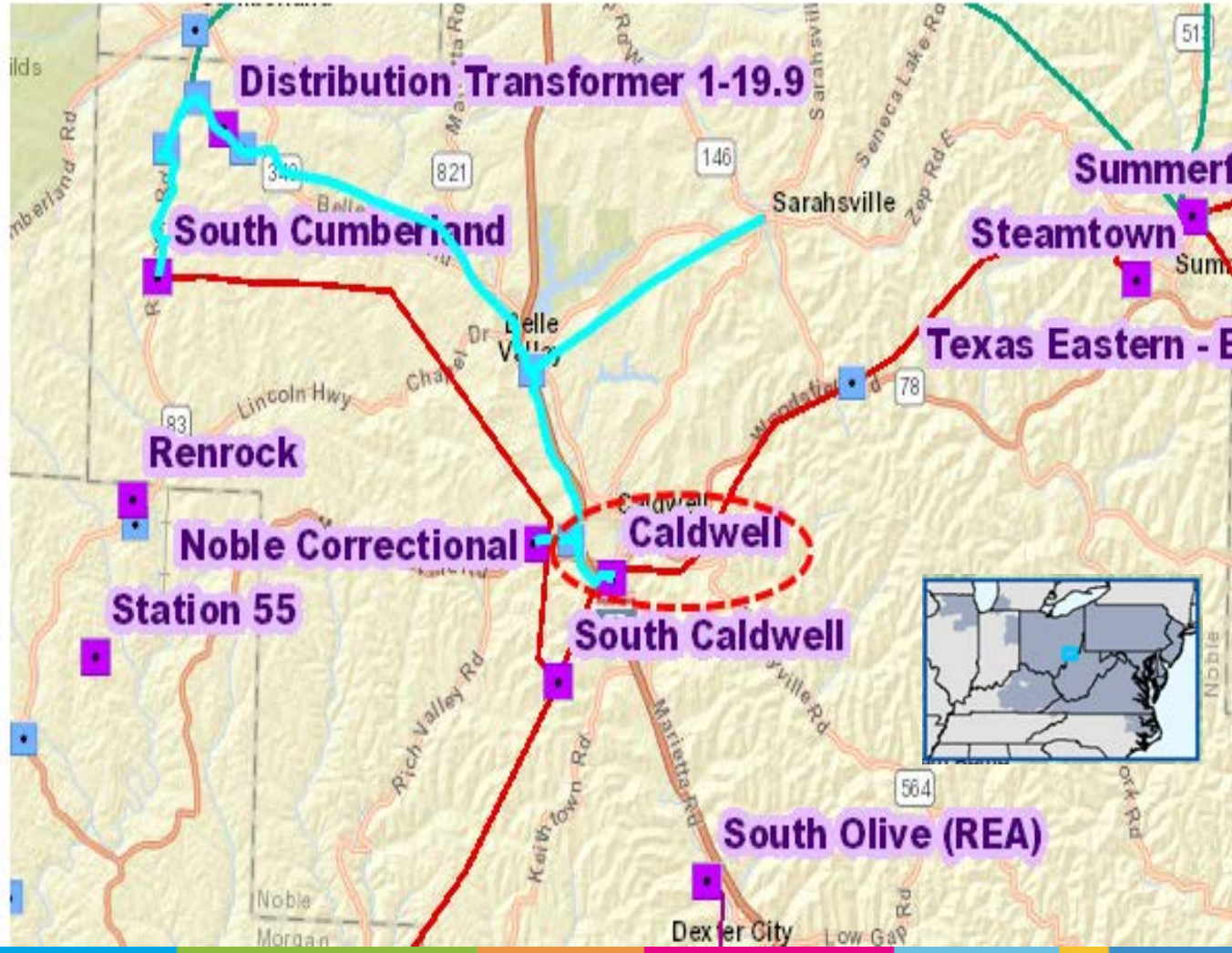
B2790: Install a 3 MVAR, 34.5kV cap bank at Caldwell substation. (B2790)

Original Driver: AEP TO criteria violation
Low voltage violation (0.915 pu) at Sarahsville 34.5 kV bus for a Caldwell 138/34.5kV transformer fault or bus fault contingencies at Caldwell in the 2021 RTEP case. –Noble County, Ohio

Estimated Project Cost: $0.426M

Required IS Date: 6/1/2021

Reason for Cancellation: Wrong impedance for branches nearby Caldwell station and errors in the load model at South Cumberland station in that 2021 case. With updated impedance and load modeling, no violation is identified.



AEP Transmission Zone: Baseline Project

N-1-1 Voltage (Winter)

Below 200kV

Problem Statement:

- The voltage drop violation at the West New Philadelphia 138kV bus for loss of the Hillview – Newcomerstown – South Coshocton 138 kV circuit and the South Canton – Bolivar – North Intertie 138kV circuit in the winter case. (FG# N2-WVD1)

Potential Solution:

- Covert S1567.2 into baseline
- S1567.2: At Newcomerstown station, install a new 69kV 3000 A 40 kA circuit breaker for the Sugarcreek Terminal line exit. Remove the 34.5 kV Circuit Breaker "I". Replace the 50 MVA transformer with a 90 MVA transformer and install a high side and low side circuit breaker.

Alternatives Considered:

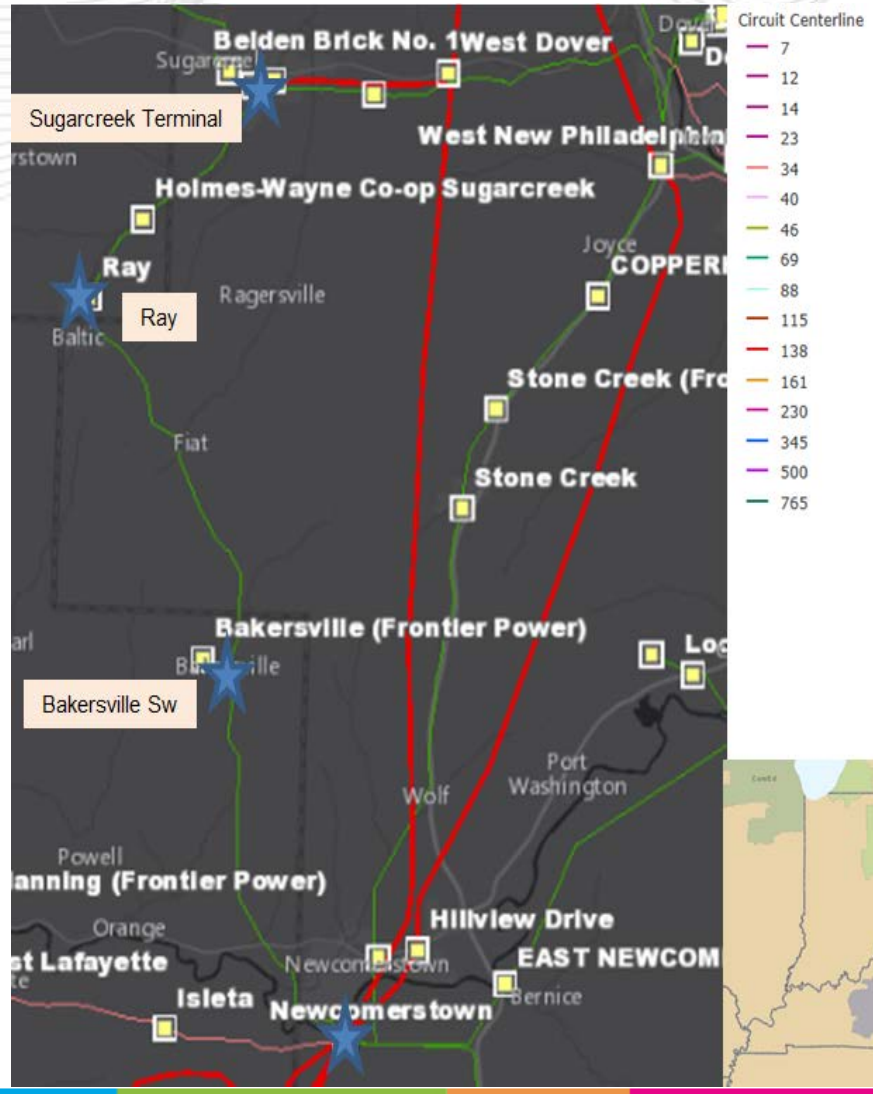
- None

Estimated Project Cost : $10.7M

Required IS Date: 12/1/2023

Projected IS date: 12/21/2018

Status: Under Construction



AEP Transmission Zone: Baseline Project

Generator Deliverability and Common Mode Outage (Winter)

Below 200kV

Problem Statement:

- The Logtown – North Delphos 138kV line is overloaded for multiple contingencies in the winter case. (FG# GD-W290, GD-W291, GD-W39 and GD-W40)

Potential Solution:

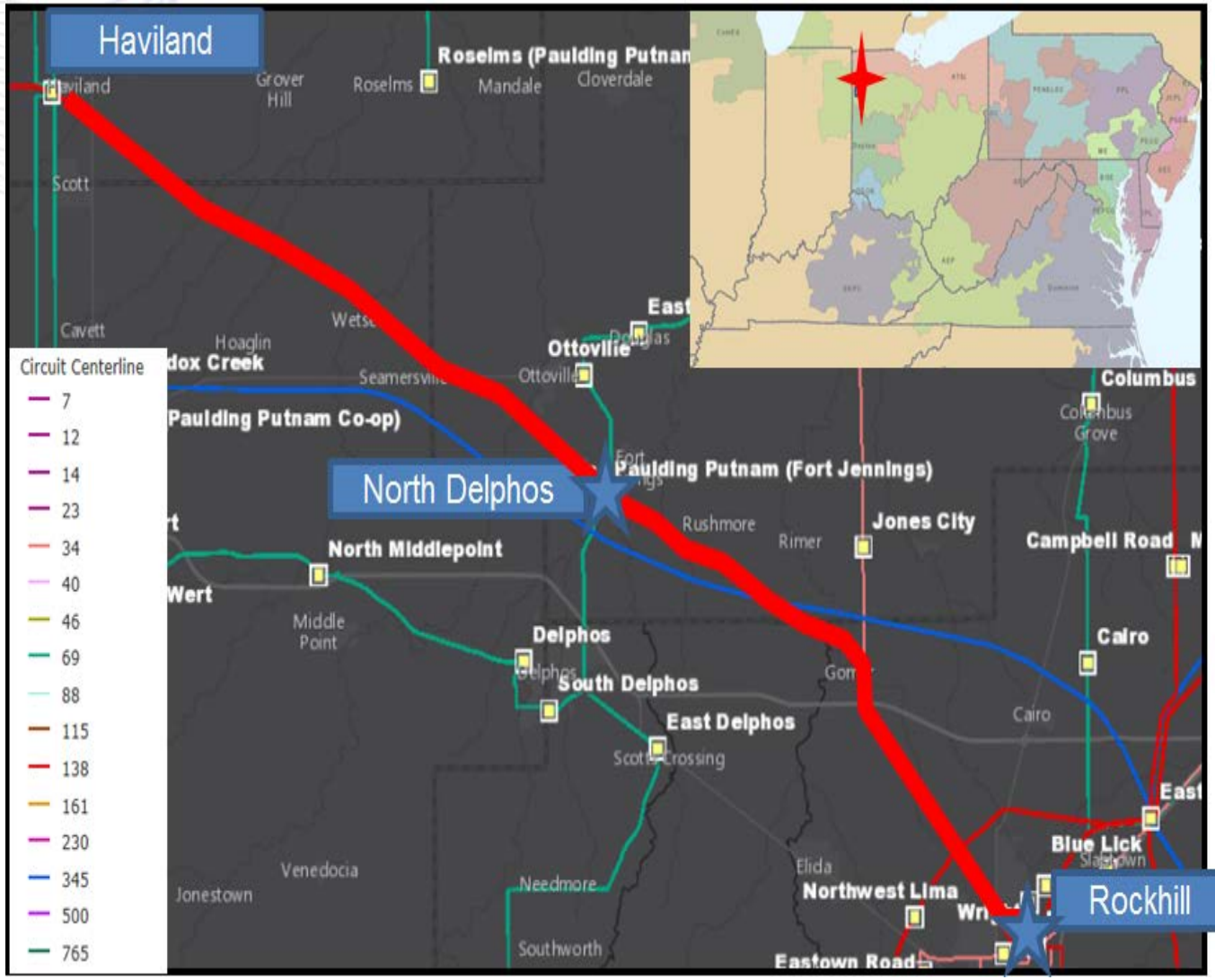
- Convert S1563.2 into baseline
- S1563.2: North Delphos – Rockhill 138kV: Rebuild 15.4 miles of double circuit 138kV line utilizing 1033 ACSR 1033 ACSR conductor (296 MVA rating)

Alternatives Considered:

- None

Estimated Project Cost : $24.5M

Required IS Date: 12/1/2023
Projected IS date: 12/18/2020
Status: Engineering



AEP Transmission Zone: Baseline Project

N-1-1 Voltage (Summer and Winter)

Below 200kV

Problem Statement:

Planning Criteria Violation:

The low voltage and voltage drop violation at the Natrium 138kV bus for loss of the Kammer - Natrium 138 kV circuit and the Natrium - George Washington 138kV circuit in both the summer and winter cases. (FG# N2-SVM1, N2-SVM2, N2-SVD1, N2-SVD2, N2-WVM3, N2-WVM4, and N2-WVD2)

Operational Flexibility and Efficiency:

Due to the lack of a high-side interrupting device, a fault on XFMR #2 currently takes out the 138kV cap bank, plus 138kV bus #2 (opens breakers to Summerfield, George Washington, and 138kV breakers N, R, & BT2 and 69kV breaker B). This is a total of 7 breakers operating (counting the cap-switcher). Installing a breaker on the high-side of XFMR #2 will contain the fault to just the transformer, and properly isolate the 138kV bus #2 and cap bank from disturbances.

Potential Solution:

- At the Natrium substation in WV, install a 138kV circuit breaker on the high-side of the existing 138-69kV transformer #2; new breaker to be rated 3000A/40kA. Install associated microprocessor-based relaying and incorporate into 138kV bus protection. Install standard SCADA functionality as well.

Estimated Project Cost : $1.1M

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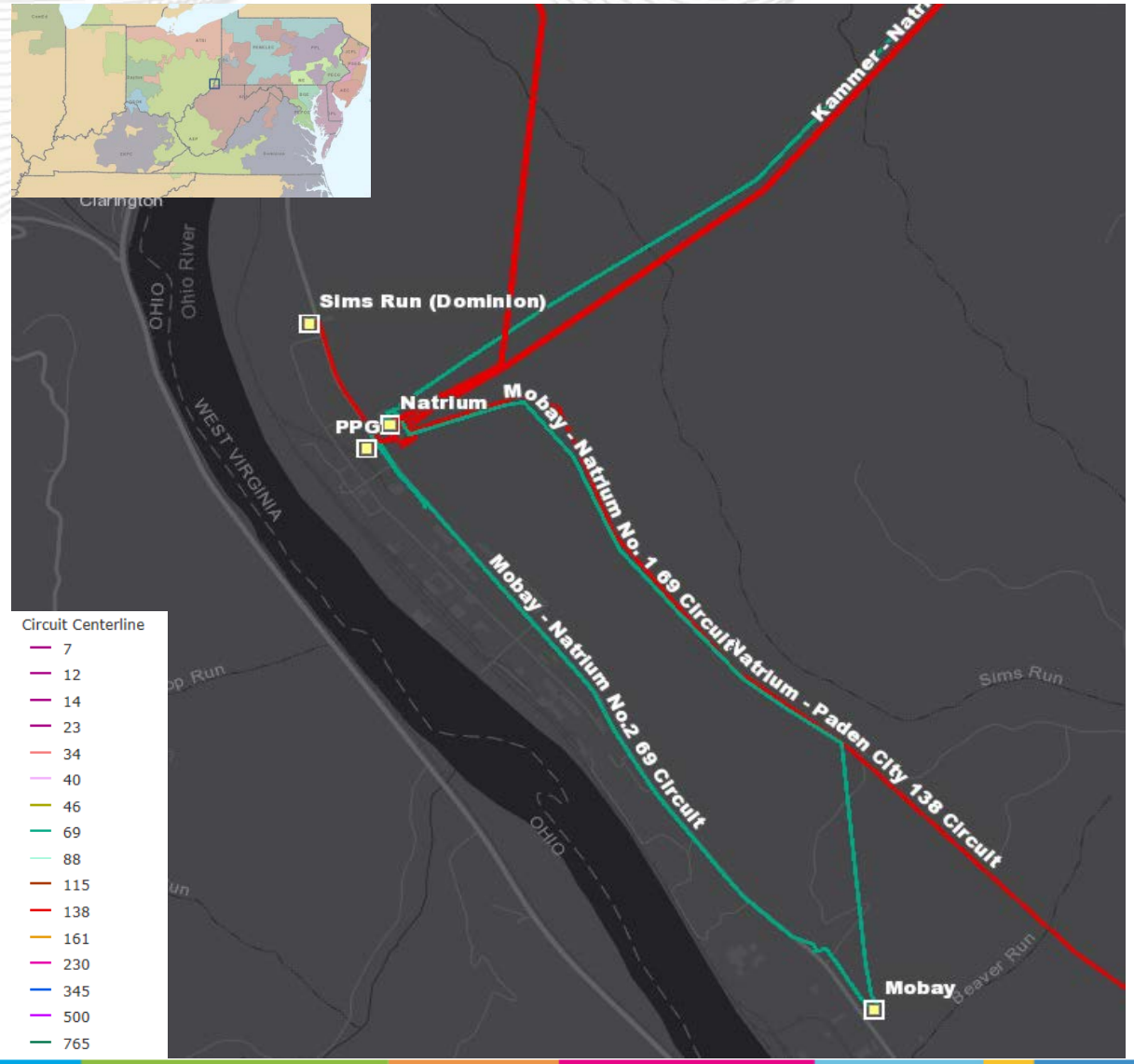

AEP Transmission Zone: Baseline Project

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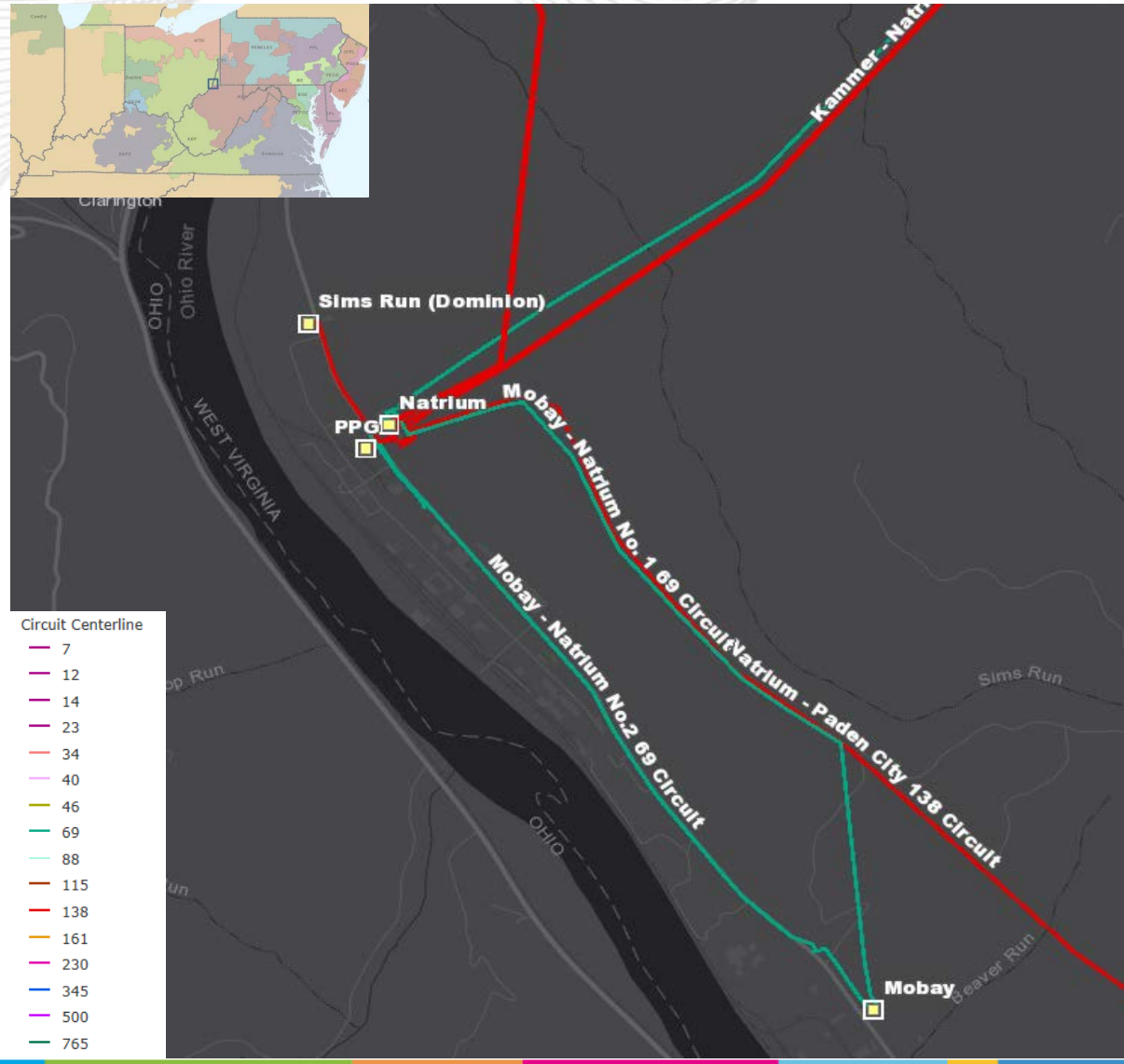
Alternatives Considered:

- Relocate the Natrium 138kV cap bank to bus #4, so that it is not taken out for a 138-69kV XFMR #2 fault. However, doing this only raises the post-contingency voltage at Natrium 138kV to 91.7% (for Summer N-1-1), so would remain a violation. As an additional step, increasing the cap bank size from 28.8 MVAR to 57.6 MVAR and relocating the cap bank to bus 4 was explored. This would raise the post-contingency voltage to 93.8% (for Summer N-1-1), so doesn't provide much margin above the criteria of 92%; the preferred option raises the voltage to 96.8% (for Summer N-1-1) so is a better long-term solution. However, an initial desktop review by Station Engineering indicated that expanding the cap bank and relocating to bus 4 is not feasible, due to space constraints at the station. The new placement of the cap would interfere with the station drive path and not have adequate clearances. Therefore, this alternative was not pursued as it would require substantial station expansion and was deemed infeasible.

Required IS Date: 6/1/2023

Projected IS date: 6/1/2023

Status: Scoping



AEP Transmission Zone: Baseline Project

Common Mode Outage and Basecase Analysis (Winter)

Below 200kV

Problem Statement:

- The Capitol Hill – Coco 138kV line is overloaded for tower outage of the John Amos – Kanawha and Kanawha – Sporn 345kV circuits in the winter case. (FG# GD-W223 and N1-W32)

Potential Solution:

- Reconductor the Capitol Hill – Coco 138 kV line section (~2.8 miles), utilizing 795 26/7 ACSR conductor (W.N. 325 MVA, W.E. 404 MVA).

Estimated Project Cost : $3.8M

Alternatives Considered:

<u>Alternate #1</u>

String the other side of the double circuit towers and 6 wire the Capitol Hill – Coco 138 kV (~2.8 mile) line section, matching the existing 556.6 ACSR conductor. This alternate was not pursued further due to cost as well as to keep the other side of the double circuit tower clear for future flexibility.

Cost Estimate: $4.1M

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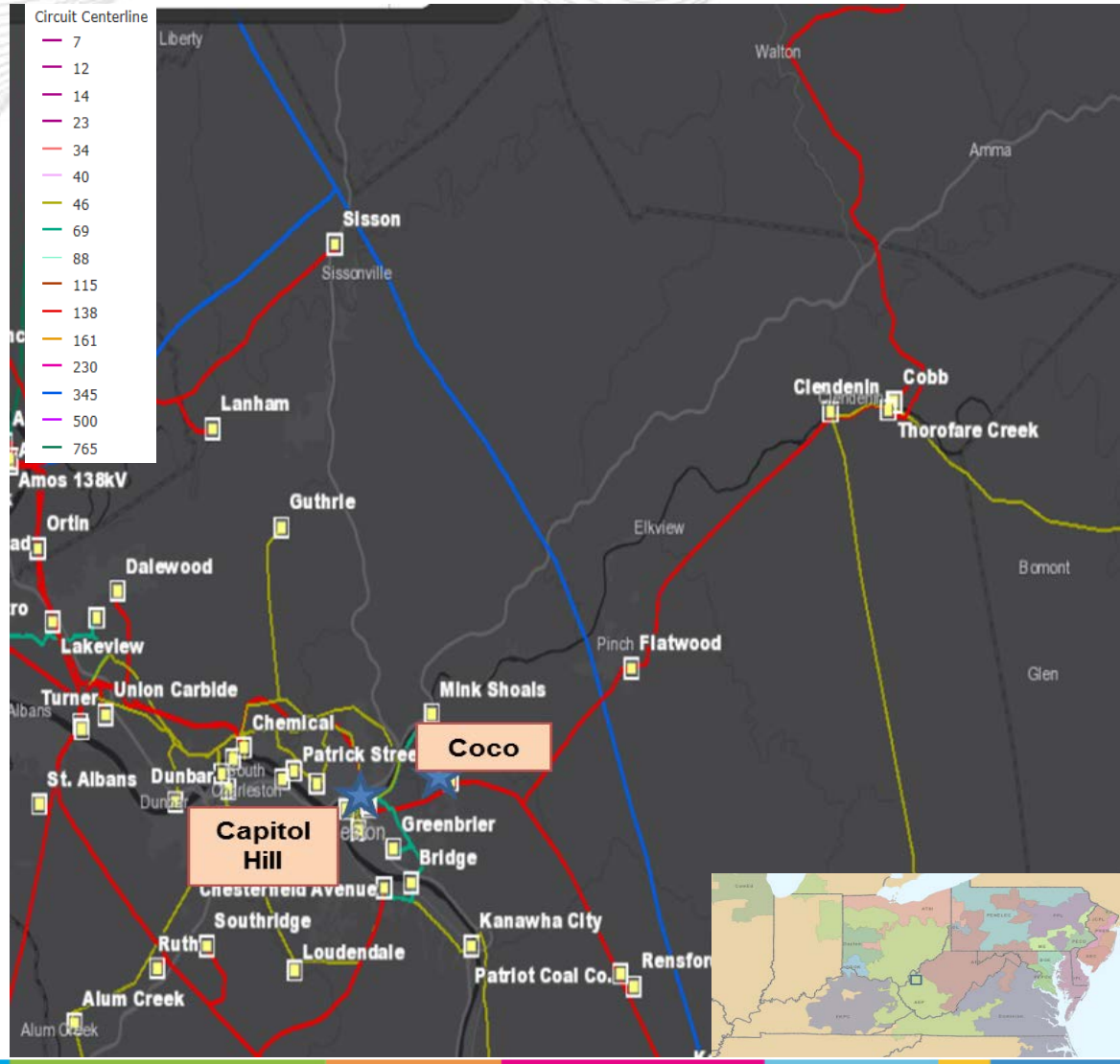

AEP Transmission Zone: Baseline Project

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Alternate #2

String the other side of the double circuit towers and energize a second 138 kV circuit from Capitol Hill – Kanawha River. (~17.5 miles). This was not pursued any further due to cost. Along with the greater cost to construct this option, it also could create a new thermal violation on the Chemical – Capitol Hill 138 kV under the same scenario causing the original violation. A secondary project would be needed to address the violation on the Chemical – Capitol Hill 138 kV line which is not captured in this cost estimate.

Cost Estimate: $27.5M

Alternate #3

Construct a new 138 kV line from Sisson – Ambler Ridge (~16 miles). Install two 138 kV CBs at Sisson 138 kV Station and one 138 kV CB at Ambler Ridge Station. This option was not pursued any further due to the cost.

Cost Estimate: $49.8M

Alternate #4

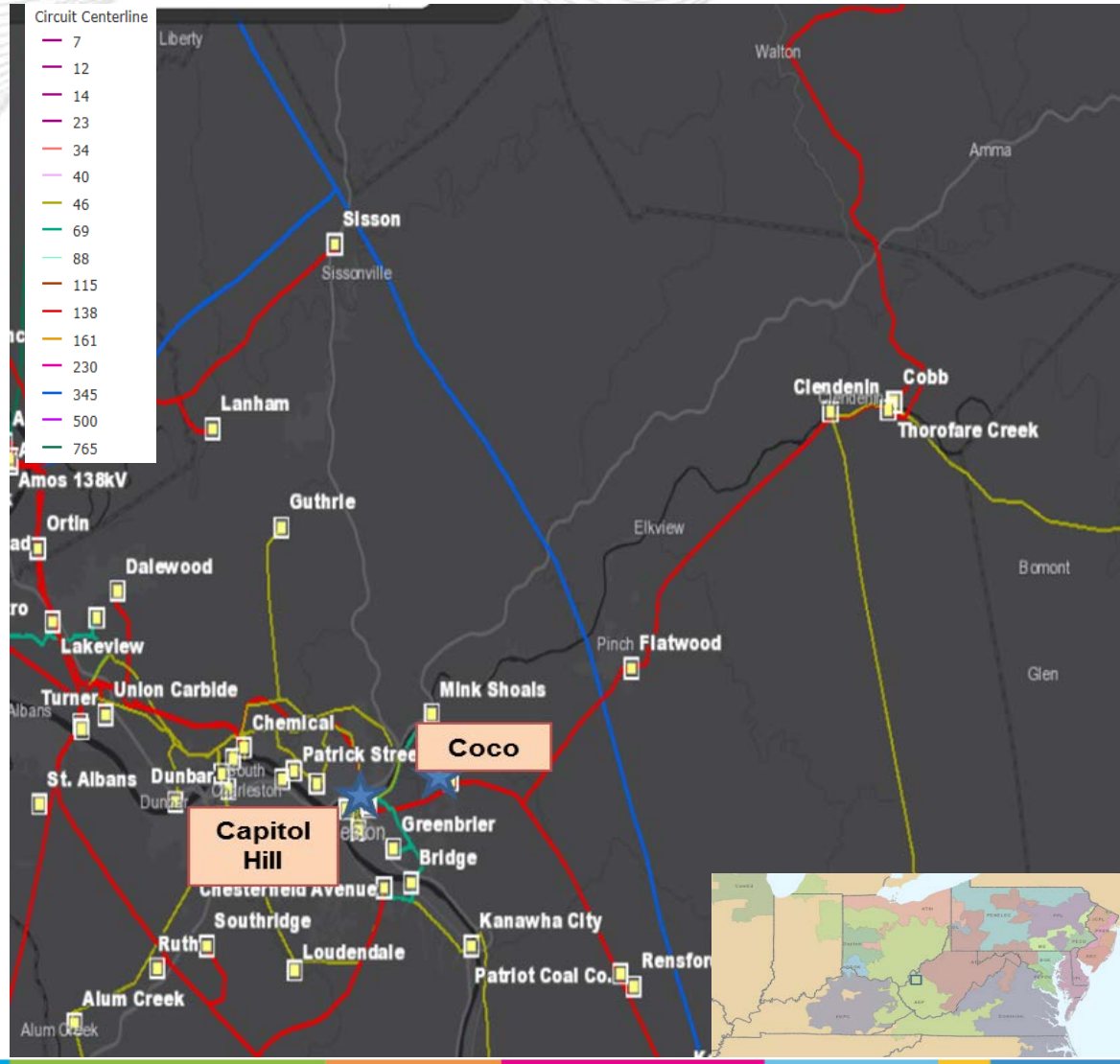
Install a reactor on the Capitol Hill – Coco 138 kV line at Capitol Hill station. This option is not feasible due to space constraints and lack of ability to expand the station due to significant elevation drops adjacent to the station.

No cost estimate due to option not being feasible.

Required IS Date: 12/1/2023

Projected IS date: 12/1/2023

Status: Scoping



AEP Transmission Zone: Baseline Project

Common Mode Outage (Winter)

Below 200kV

Problem Statement:

- The Muskingum – S. Caldwell 138kV line is overloaded for multiple contingencies in the winter case. (FG# GD-W203, GD-W305, GD-W305, GD-W306, GD-W307, GD-W308 and GD-W309)

Potential Solution:

Relocating 'Muskingum – South Caldwell 138kV circuit' from bus 2 to bus 1 and 'Muskingum – West Cambridge 138 kV circuit' from bus 1 to bus 2 at Muskingum 138 kV Station to mitigate PJM criteria thermal violations.

Estimated Cost: $0.1M

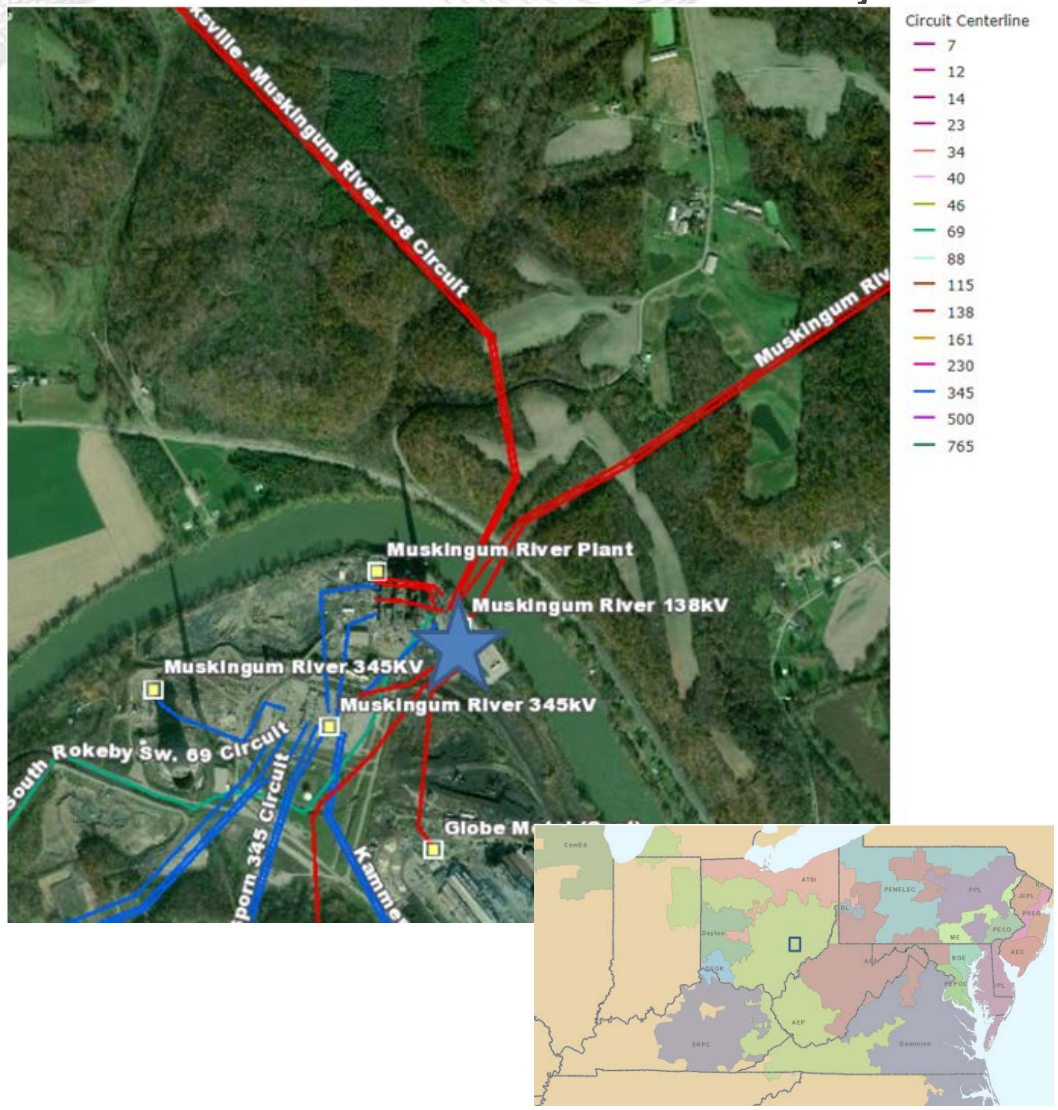
Alternatives Considered:

- Rebuild the 11 mile long double circuit Muskingum – South Caldwell 138 kV line. There are no current asset condition drivers to rebuild this line. Estimated cost: $29.1M

Required IS Date: 12/1/2023

Projected IS date: 6/1/2023

Status: Scoping



AEP Transmission Zone: Supplemental Project

Supplemental Project

Problem Statement:

Operational Flexibility and Efficiency:

- Jumpers & risers for the 138 kV breakers HA and HB are the low rated conductors at Muskingum 138 kV station. This could cause the potential overload later if this is retained. Operation has requested to retain CBs so that they can be used as bus tie CBs when its needed. Four disconnect switches for the breakers are 2500 A now.

Potential Solution:

Upgrading jumpers/risers and 4 disconnect switches (3000A) for 138kV breakers HA and HB at Muskingum 138kV station.

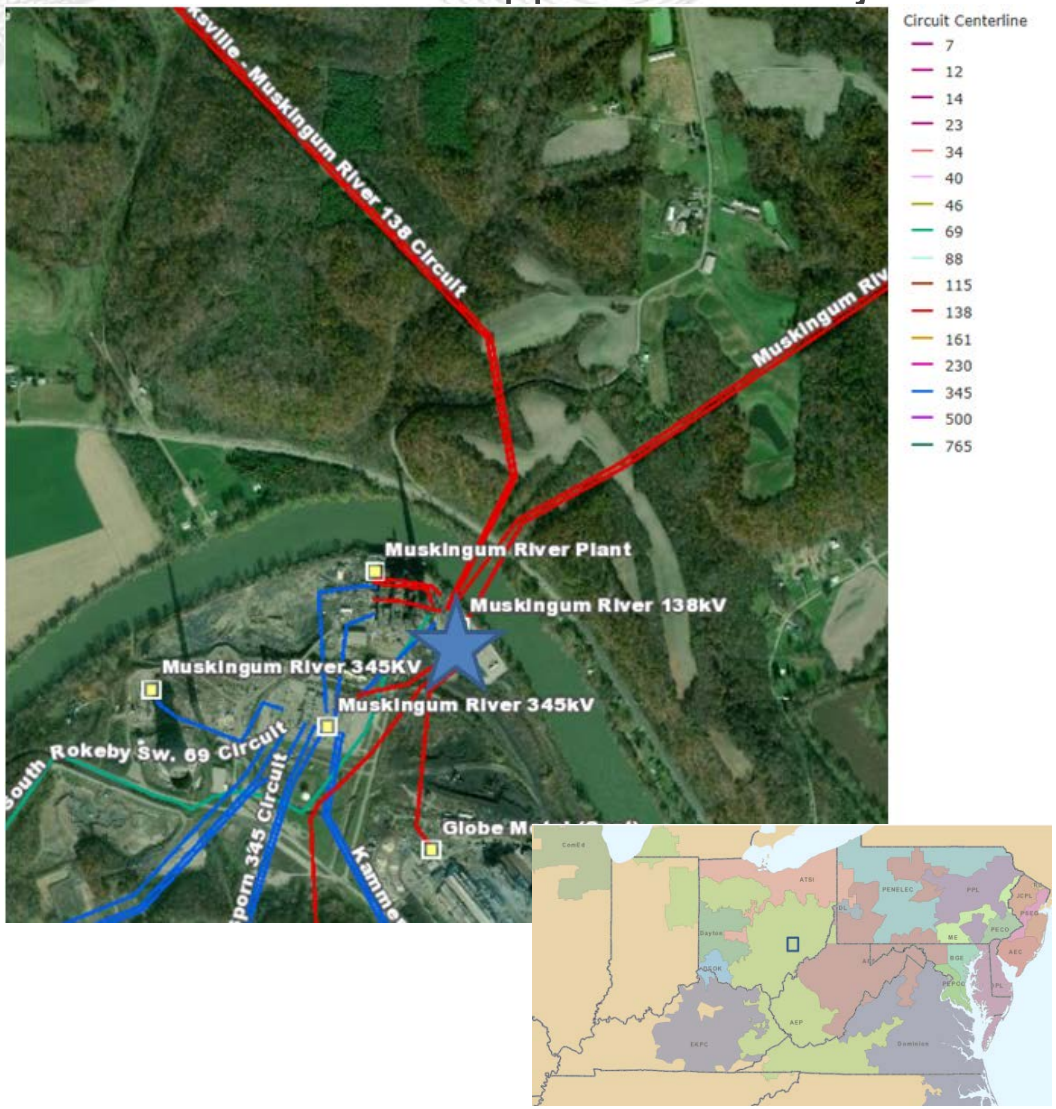
Estimated Supplemental Cost: $0.3M

Alternatives Considered:

- None

Projected IS date: 6/1/2023

Status: Scoping



AEP TO Criteria Violation

Problem Statement:

Planning Criteria Violations:

In the 2022 RTEP Summer Case, the Racine – Ravenswood 69 kV circuit is overloaded (110 % of 50 MVA emergency rating) under N-1-1 conditions including the loss of the Gavin – Meigs 69 kV circuit plus the loss of the Leon – Ripley 138 kV circuit (previously Leon – Ravenswood 69 kV circuit); the Ravenswood – Ripley 69 kV circuit is overloaded (144% of 50 MVA emergency rating) under N-1-1 conditions including the loss of the Leon – Sporn 138 kV circuit plus the Amos – South Buffalo 138 kV circuit. Under both N-1-1 scenarios above there are also low voltage violations at Mill Run (0.89pu), Ravenswood (0.87pu) Ripley (0.68pu), Leon (0.65pu), S. Buffalo (0.64pu).

Equipment Material/Condition/Performance/Risk:

The Ravenswood – Ripley 69 kV circuit (~9.31mi) currently has 98 open conditions on 47/69 structures. These conditions include rot top and woodpecker damage. The majority of the circuit is constructed with 1950s wood structures.

The Racine – Ravenswood 69 kV circuit (~23.41mi) currently has 269 open conditions on 100/195. From 2014-2016 the line has experienced 23 momentary and 3 permanent outages resulting in 1.3 million customer minutes of interruption. The majority of the circuit is constructed with 1950s/60s wood structures.

Non-Transmission: Circuit Switcher AA is a MARK V unit which have presented AEP with a large amount of failures and mis-operations resulting in large amounts of customer interruptions. Due to the critical functionality as the interrupting device for the capacitor bank, AEP has determined that all MARK V's will be replaced and upgraded with the latest AEP cap-switcher design standard.

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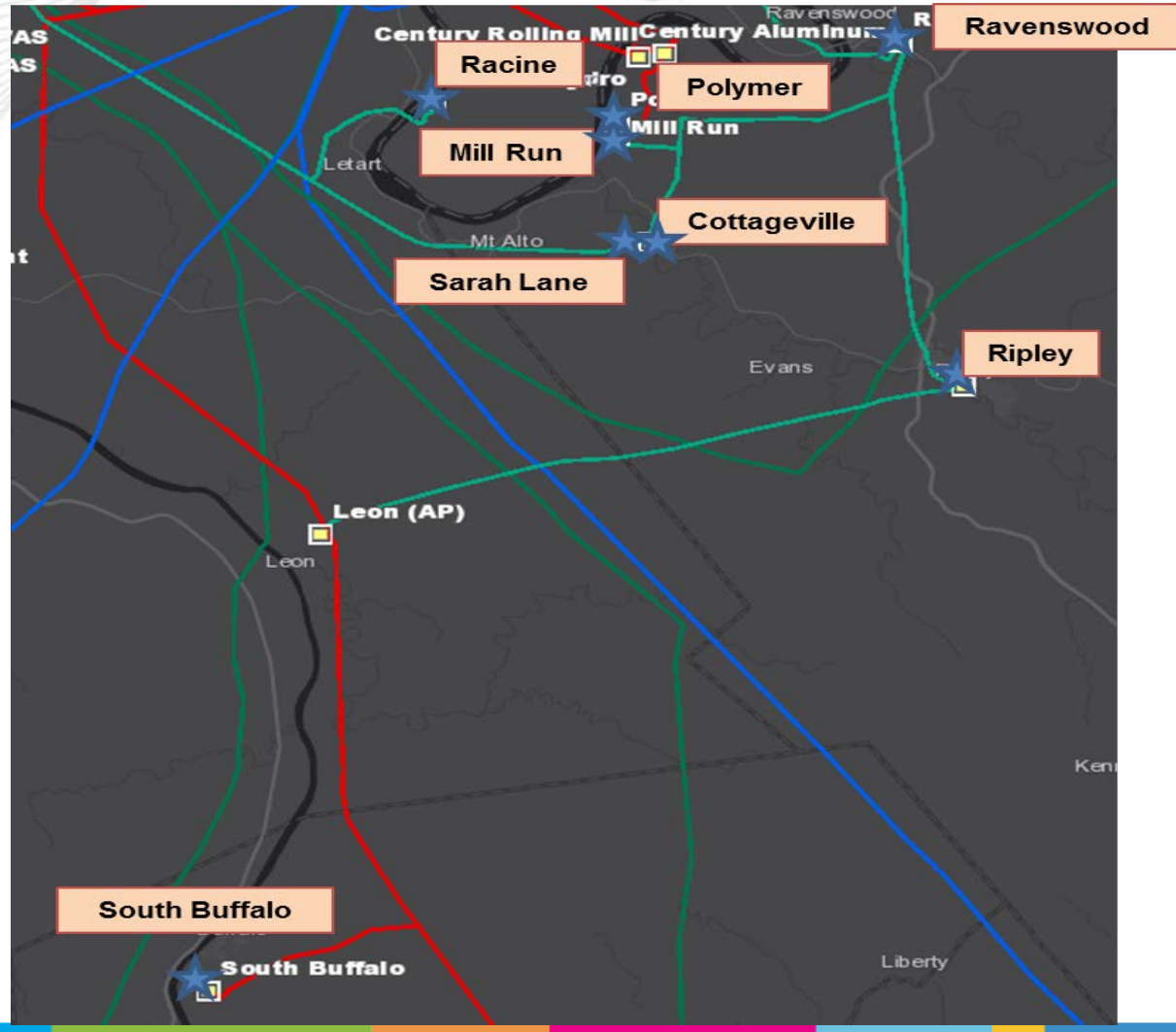

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Equipment Material/Condition/Performance/Risk:

The existing 2-Way switch at Cottageville station is mounted on a wood pole. In the indoor environment of the AEP Training Center these switches become mis-aligned with each operation. The existing switch will also be limiting the new conductor's thermal capability, so it will be replaced with a new 3-way phase over phase switch.

Potential Solution:

Rebuild Ravenswood – Racine Tap 69 kV line section (~15 miles) to 69 kV standards, utilizing 795 26/7 ACSR conductor (S.N. 129 MVA, S.E. 180 MVA). Estimated Trans Cost: $39.2M

Rebuild existing Ripley – Ravenswood 69 kV circuit (~9 miles) to 69 kV standards, utilizing 795 26/7 ACSR conductor (S.N. 129 MVA, S.E. 180 MVA). Estimated Trans Cost: $23.6M

Sarah Lane: Install new 3-way phase over phase switch to replace the retired switch at Cottageville. Estimated Cost: $1.0M

Polymer: Install new 138/12 kV 20 MVA XFR to transfer load from Mill Run Station to help address overload on the 69 kV network. Estimated Trans Cost: $3.5M

Mill Run: Retire station. Estimated Trans Cost: $0.0M

South Buffalo: Install 28.8 MVAr Cap Bank Estimated Trans Cost: $0.8M

Total Estimated Transmission Cost: $68.1M

Non-Transmission:

Ravenswood: Replace existing cap switcher 'AA'. Replace electromechanical relays and install DICM. Estimated Trans Cost: $0.0M

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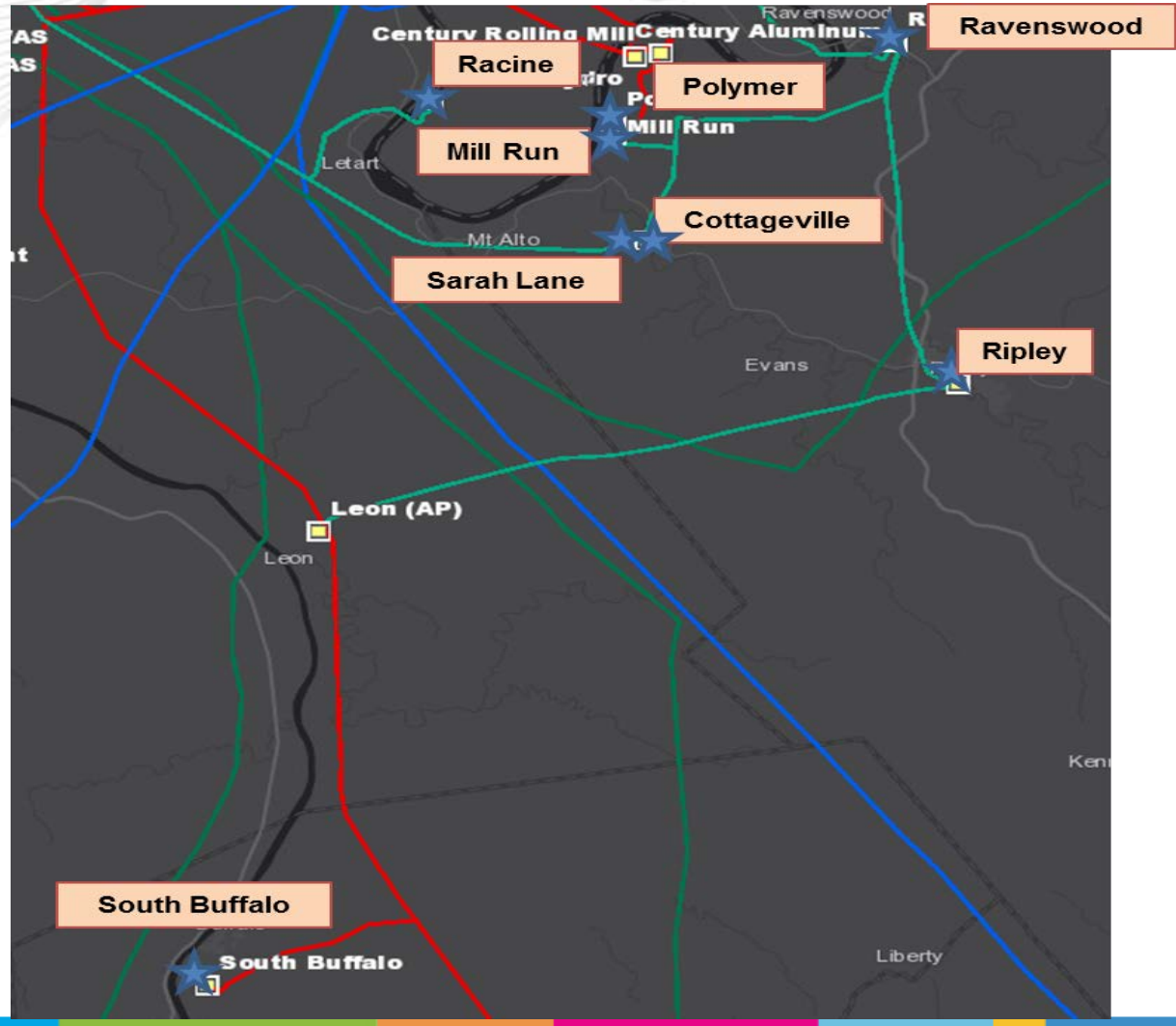

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Alternatives:

Construct approximately half a mile of new 138 kV line from Polymer – Mill Run. Establish a new 138 kV bus at Mill Run Station. Install a new 138/69 kV XFR at Mill Run Station. Rebuild and convert existing Mill Run – Ravenswood 69 kV circuit (approximately 7 miles) to 138 kV. Establish a new 138 kV bus at Ravenswood station. Install a new 138/69 kV XFR at Ravenswood. Rebuild and convert existing Ravenswood – Ripley 69 kV (approximately 9 miles) to 138 kV. Although this would resolve the thermal/voltage concerns due to the N-1-1 scenarios, it would not address the asset renewal needs on the existing Mill Run – Cottageville – Racine 69 kV circuit. The line from Mill Run – Cottageville – Racine will still need to be addressed from an asset health perspective. . This proposal was not pursued further due to cost.

Estimated Cost: $87M

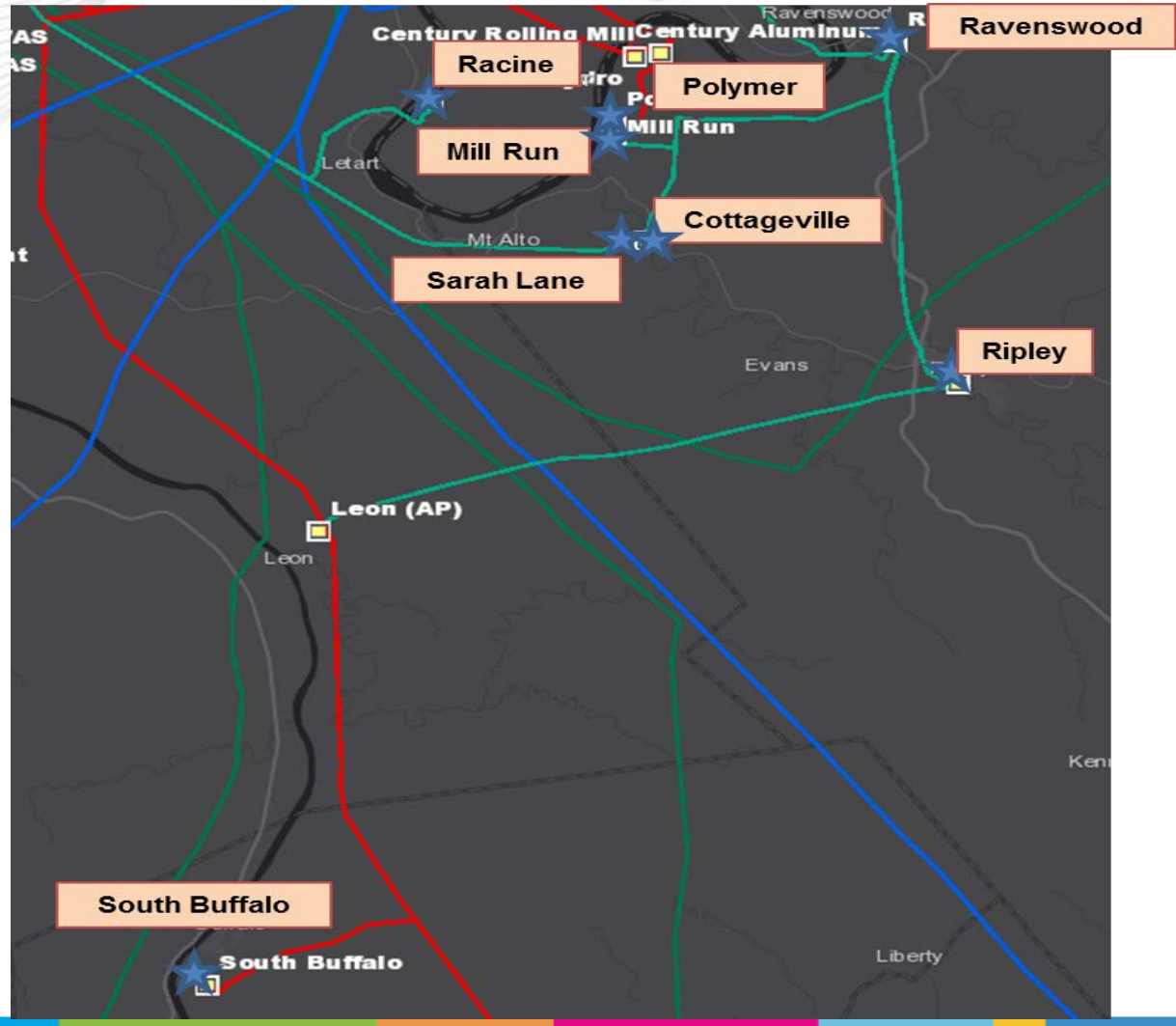
Rebuild the existing Ripley – Ravenswood 69 kV circuit with higher capacity conductor. Rebuild the existing Ravenswood – Mill Run 69 kV line with higher capacity conductor. Rebuild the existing Mill Run – Cottageville – Racine 69 kV line with higher capacity conductor. Install a 28.8 MVAr capacitor at South Buffalo 138 kV station. This project was not pursued further due to the increased cost to rebuild the double circuit in/out section to Mill Run. Also, alternate #2 would have an additional 2 miles of line length between Ravenswood and Mill Run. With the proposed option, we are able to eliminate additional line mileage and retire Mill Run Station.

Estimated Cost: $68.6M

Required In-service: 6/1/2022

Projected In-service: 6/1/2021

Project Status: Scoping



Dayton Transmission Zone: Supplemental
Rebuild 69kV Line (6631) from Cisco Substation to Botkins Substation

Problem Statement:
A reliability issue has been identified on the 69kV line from Cisco Substation to Botkins Substation. The line was constructed in the 1950s with wood poles and crossarms. In last 5 years: 7 Permanent Outages, 10 Momentary Outages. The line has several sleeves and many have failed in recent years, impacting customers in the area.

Potential Solution:
The proposed project will rebuild the 69kV line (6631) from Cisco Substation to Botkins Substation. This project addresses transmission performance concerns due to the degradation of this line over time.
Old conductor: 477 ACSR (18x1); New conductor: 1351 AAC
Cisco-Anna 69kV Old Rating: SN/SE (80/98), Anna-Botkins 69kV Old Rating SN/SE (80/98); Cisco-Anna 69kV New Rating: SN/SE (151/187), Anna-Botkins 69kV Old Rating SN/SE (151/165)

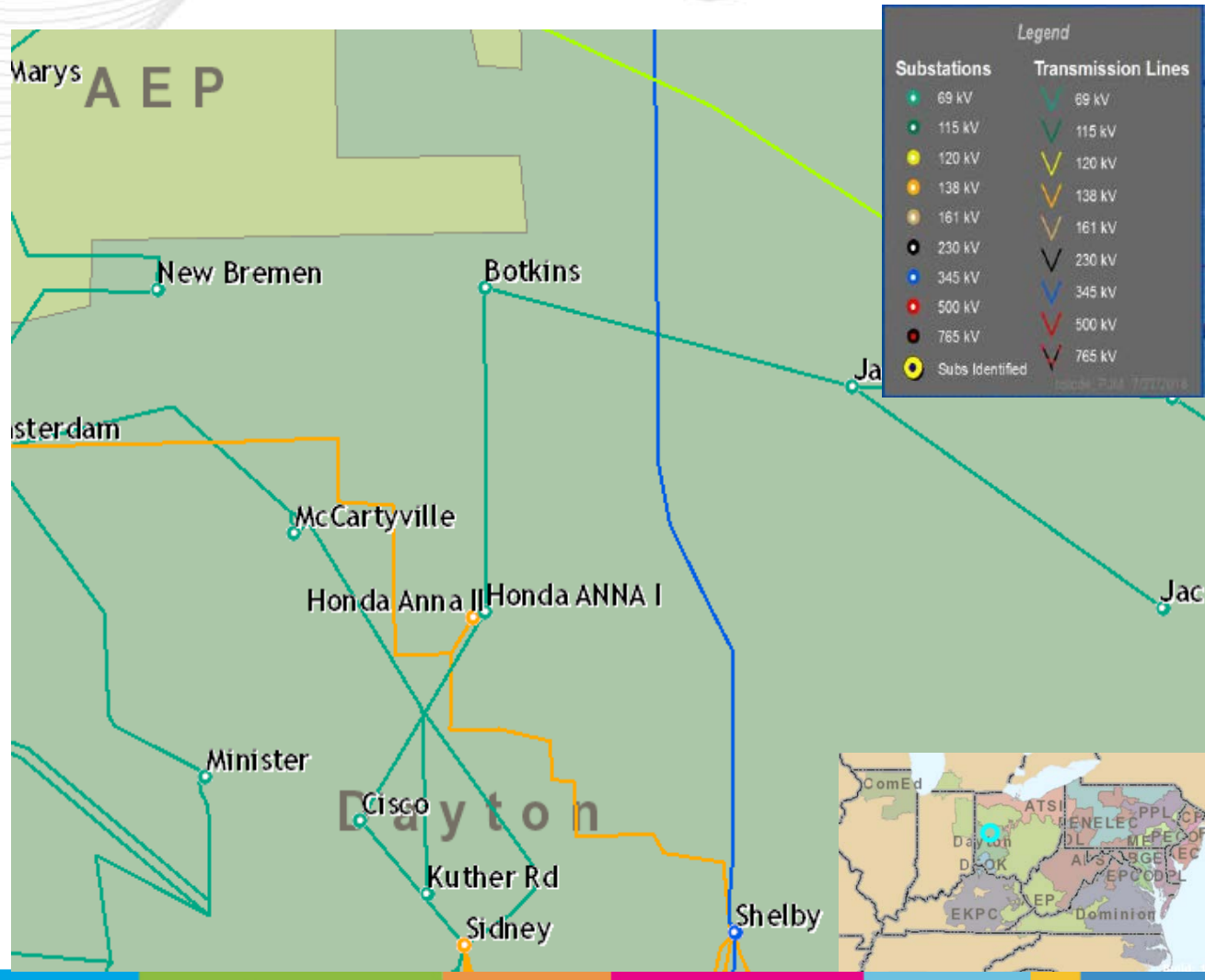
Estimated Cost: $7.425M

Alternatives:
- Reconductor the 69kV line (6631) from Cisco Substation to Botkins Substation. **Estimated Cost:** $3.5M

The alternative is not recommended because the line is more than 60 years old with wood poles and crossarms, and some of the structures need to be replaced.

Required In-Service: 12/31/2019

Status: Engineering



Dayton Transmission Zone: Supplemental
Replace 13827 Switch

Problem Statement:
This project proposes to replace the existing switch on 13827 with an automatic 138kV sectionalizing switch on the 13827 line (Amsterdam – Honda Anna 138kV line). This sectionalizing switch is needed to serve a large industrial customer and is a critical path to maintain reliability in the area. This will give DP&L System Operations the ability to sectionalize the transmission system remotely.

Potential Solution:
Install a 138kV automatic sectionalizing switch at Honda Anna 138kV tap on the Amsterdam – Shelby 138kV line with remote operation capability.

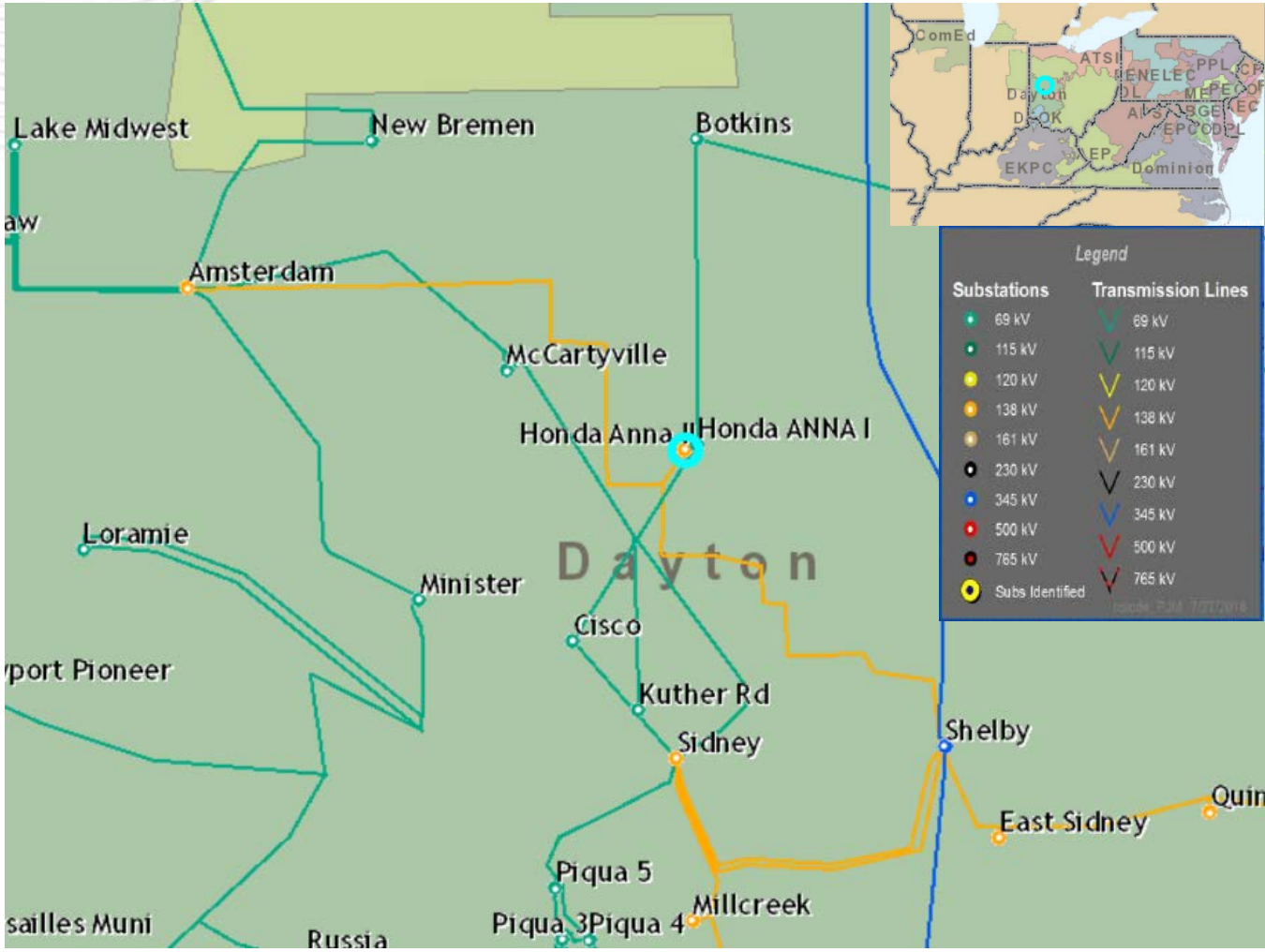
Estimated Cost: $376k

Alternatives:

- Install a new switching station structure. **Estimated Cost:** $1M

Required In-Service: 12/31/2019

Status: Engineering



DEOK Transmission Zone: Supplemental
Mt. Zion Expand Substation

Problem Statement:
Continued load growth in the Mt. Zion area requires additional capacity.
Driver: Customer Service

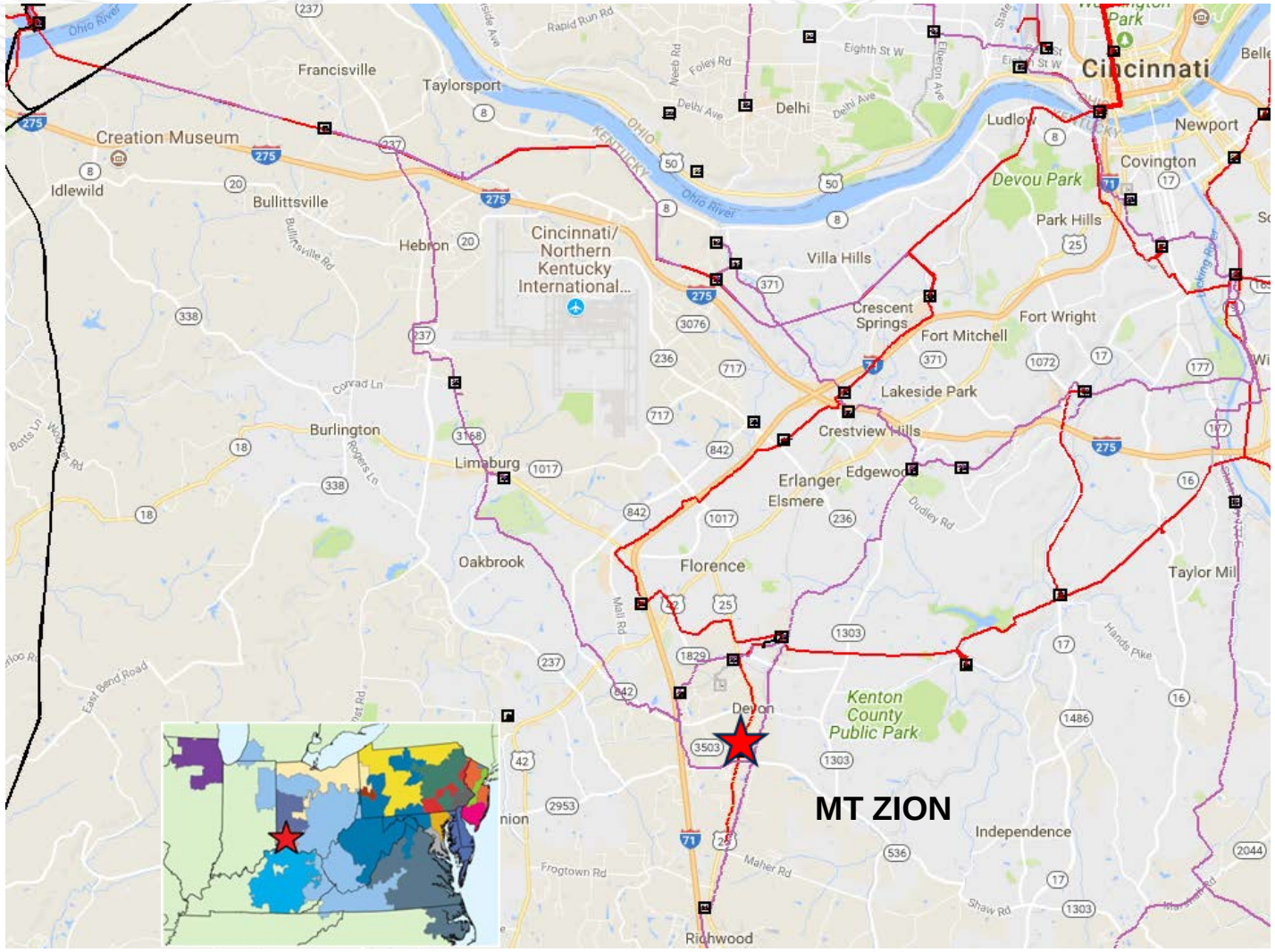
Potential Solution:
Expand the Mt. Zion Substation installing equipment to support two additional distribution circuits including the installation of a 138/13kV transformer. The transmission scope includes installing a 138kV circuit breaker, breaker disconnects and bus work, relocating transmission structure, replacing CCVTs, adding relaying, and Installing a 138kV line switch.

Estimated Cost: $2.12M (transmission assets only)

Alternatives:
none

Projected In-service: 12-31-2019

Project Status: Scoping



DEOK Transmission Zone: Supplemental Donaldson Reconfigure Substation

Problem Statement:
Continued load growth in the Donaldson area requires additional capacity. With the current substation arrangement any of five breaker, seven transformer, or four bus faults have the potential to trip nine transmission to distribution transformers on the feeder from Buffington to Florence to Donaldson to Crescent.
Driver: Customer Service, Operational Flexibility, Resilience

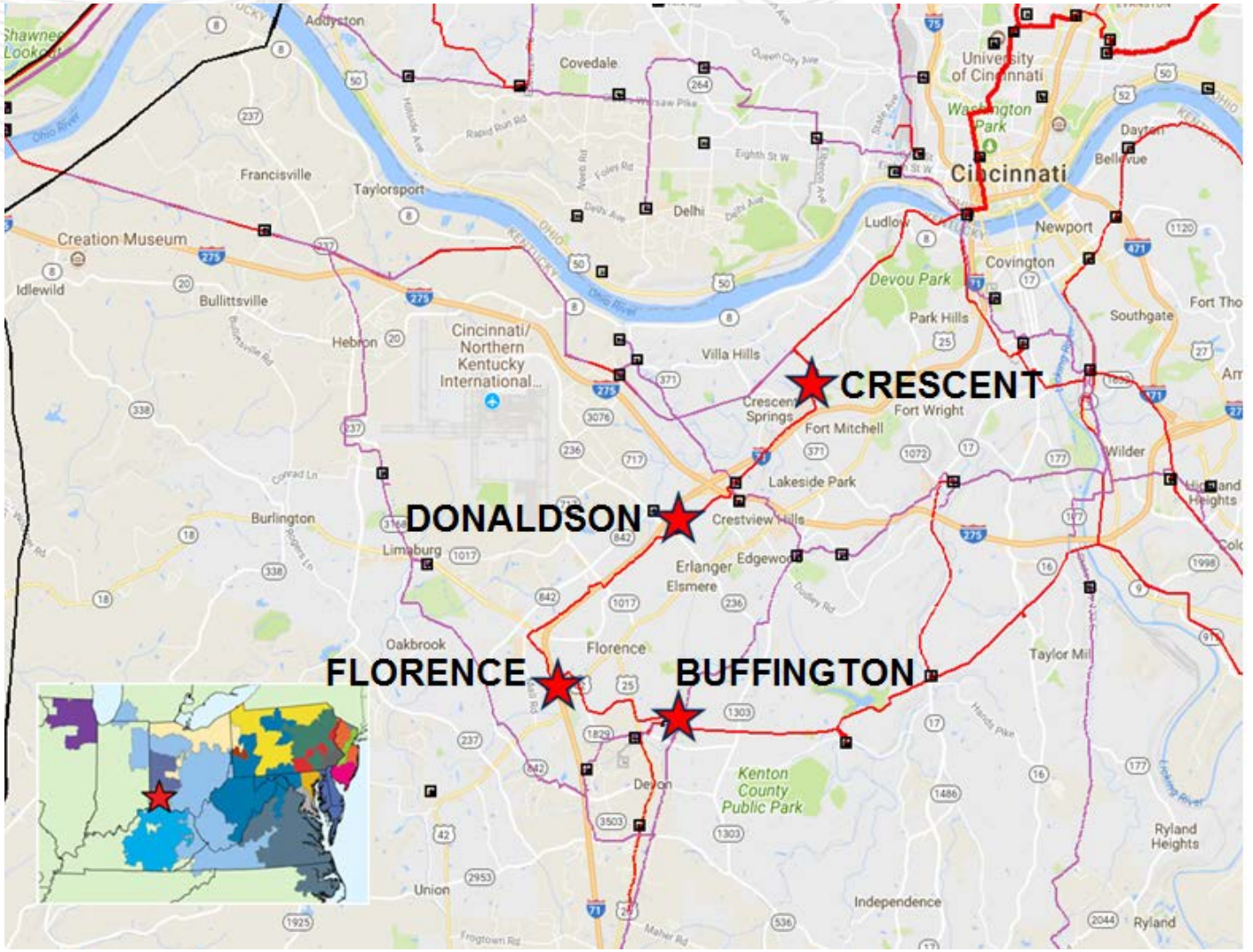
Potential Solution:
Expand the Donaldson Substation installing equipment to support four additional distribution circuits including two 138/13kV transformers. The transmission scope includes installing a 4-breaker 138kV ring bus with four new 138kV breakers, associated breaker disconnects, new bus work, new structure, new CCVTs, relaying, and line disconnects.

Estimated Cost: $4.14M (transmission assets only)

Alternatives:
none

Projected In-service: 12-31-2019

Project Status: Scoping



DEOK Transmission Zone: Supplemental Buffington Replace Transformer

Problem Statement:
Buffington 139/69/13kV 100/100/35MVA Transformer TB1 is 60 years old and has shown increasing levels of acetylene and ethylene gasses over the past three years. TB1's tertiary winding is connected to a 3 phase grounding/regulating transformer which exposes TB1 to distribution faults. If TB1 has to be replaced in an emergency situation it would take an extended length of time. The existing transformer foundation will not accept the replacement transformer.

Driver: Equipment Condition, Resilience

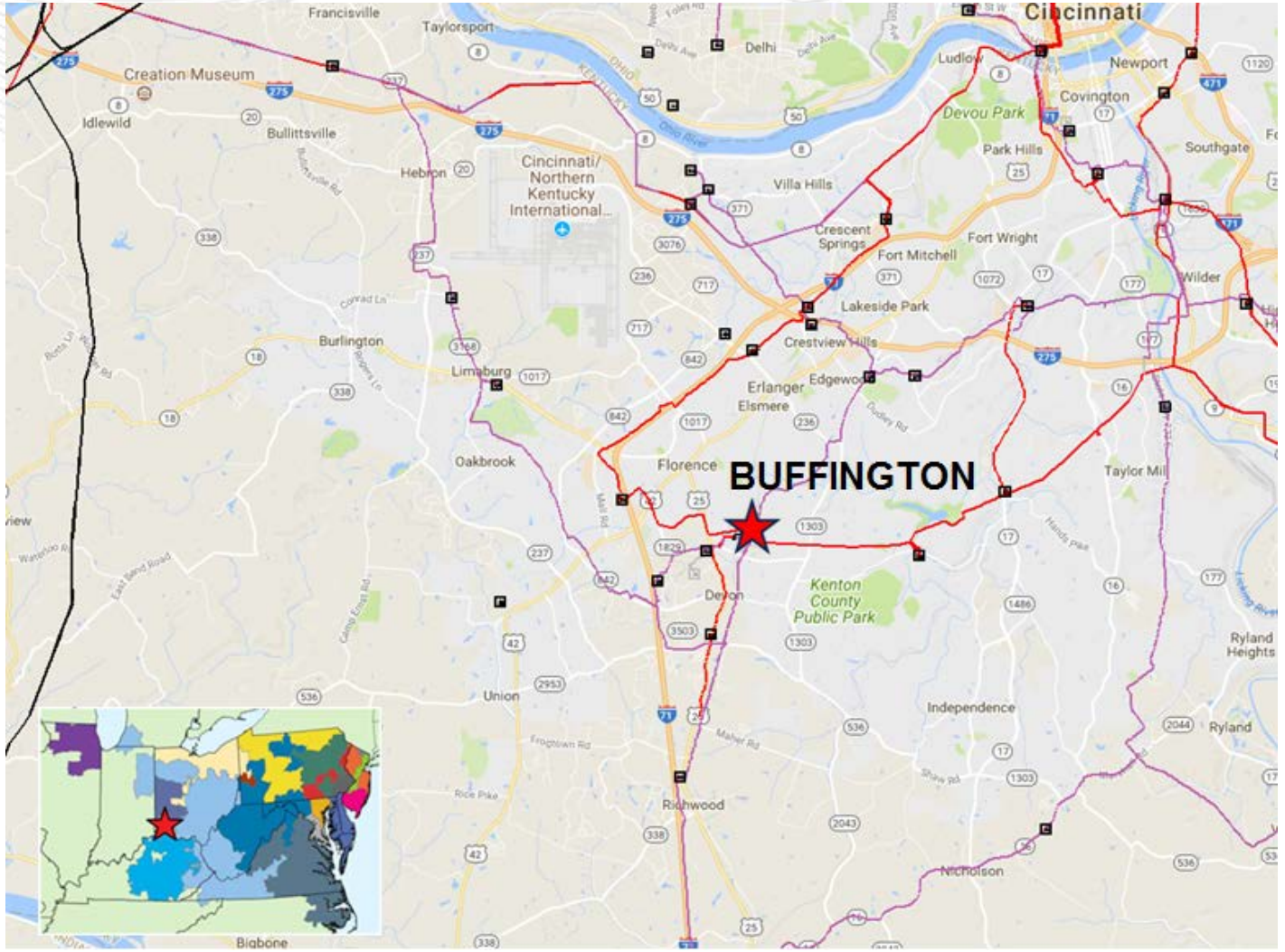
Potential Solution:
Remove the 3 phase grounding/regulating transformer. Replace TB1 with a 138/69kV 150MVA transformer with no tertiary winding.

Estimated Cost: $2.90M

Alternatives:
none

Projected In-service: 12-31-2020

Project Status: Scoping



DEOK Transmission Zone: Supplemental
Villa Reconfigure Substation

Problem Statement:
Villa 69/13kV 22.4MVA transformer TB2 feeding Bus 2 is 52 years old. The in-oil tap changer is arcing and requires more maintenance than the newer style vacuum tap changers. This transformer also has a throat connected low side (enclosed bus work) which makes replacement difficult in case of emergency. Distribution is replacing 13kV Bus 2 switchgear. TB2 needs to be moved for the switchgear replacement. The 69kV circuit from Buffington to Villa to Kenton substations is connected in a 3-terminal configuration at Villa. A fault on any leg of the circuit, any of five breaker failures, or two transformer faults will result in the loss of the entire circuit, interrupting service to Villa TB2 and the Thomas More Substation.

Potential Solution:
Replace TB2 with a transformer of the same capacity. Reconfigure Villa into a 4-breaker 69kV ring bus with three new 69kV breakers, associated breaker disconnects, new bus work, new structure, relaying, and line disconnects.

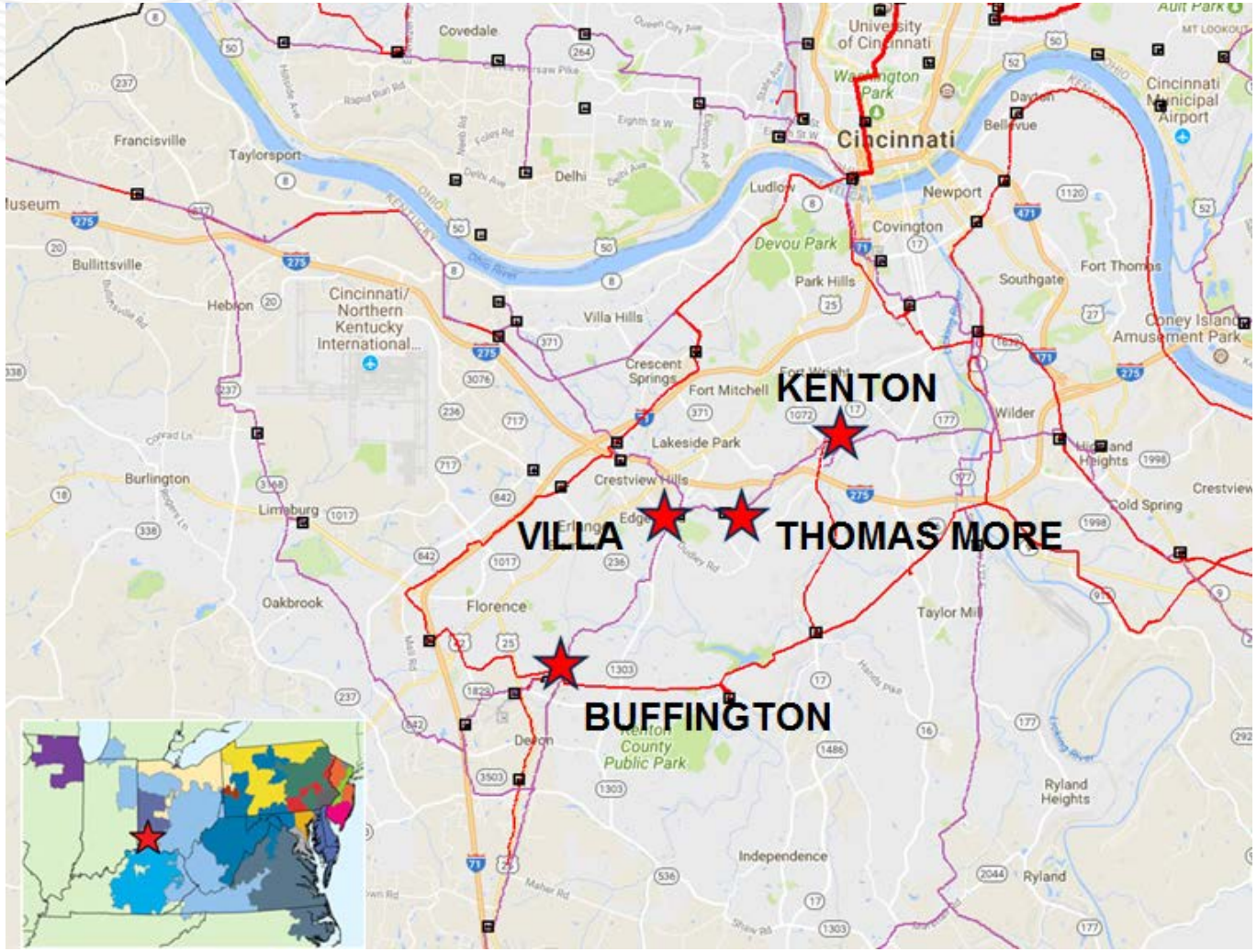
Driver: Equipment Condition, Operational Flexibility, Resilience

Estimated Cost: $4.34M (transmission assets only)

Alternatives:
none

Projected In-service: 12-31-2019

Project Status: Scoping



DEOK Transmission Zone: Supplemental Trenton Replace Transformer

Problem Statement:
Distribution is replacing switchgear on Trenton buses 1 and 2. 69/13kV 20MVA TB7 feeds the bus 2 switchgear was installed in 1958 and has shown increasing levels of both acetylene and ethylene over the past four years. It is throat connected on the low side (enclosed bus work) which makes replacement difficult in case of emergency and frequently overheats due to cooling issues. It's current location will not work with the new substation configuration.

Driver: Equipment Condition

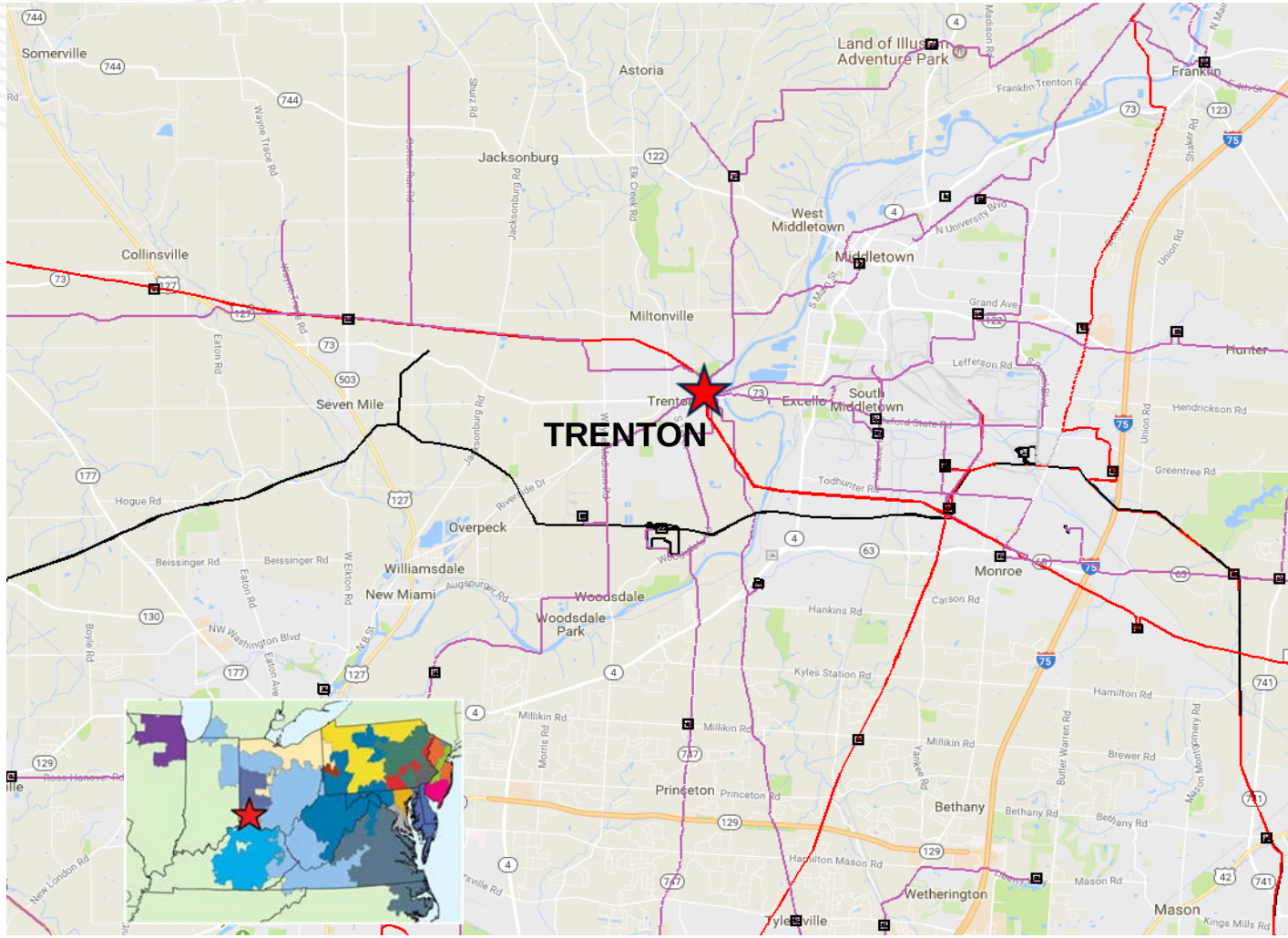
Potential Solution:
Replace TB7 with a 138/13kV 22.4MVA transformer connecting to the 138kV bus. Install a 138kV breaker with breaker disconnects to connect TB7. Install/replace relaying for both the breaker and transformer.

Estimated Cost: $0M

Alternatives:
none

Projected In-service: 12-31-2019

Project Status: Scoping



DEOK Transmission Zone: Supplemental Remington Reconfigure Substation

Problem Statement:
Remington Substation has two 138kV buses, each serving switch-tied distribution transformers. A feeder is connected to Bus 1 with a switch. Bus 1 is connected to Bus 2 with a tie breaker. A feeder is connect to Bus 2 with a breaker. The bus tie breaker is oil filled and obsolete. The failure of the breaker will interrupt all loads supplied by Remington, Wards Corner and Feldman substations.
Driver: Equipment Condition, Operational Flexibility, Resilience

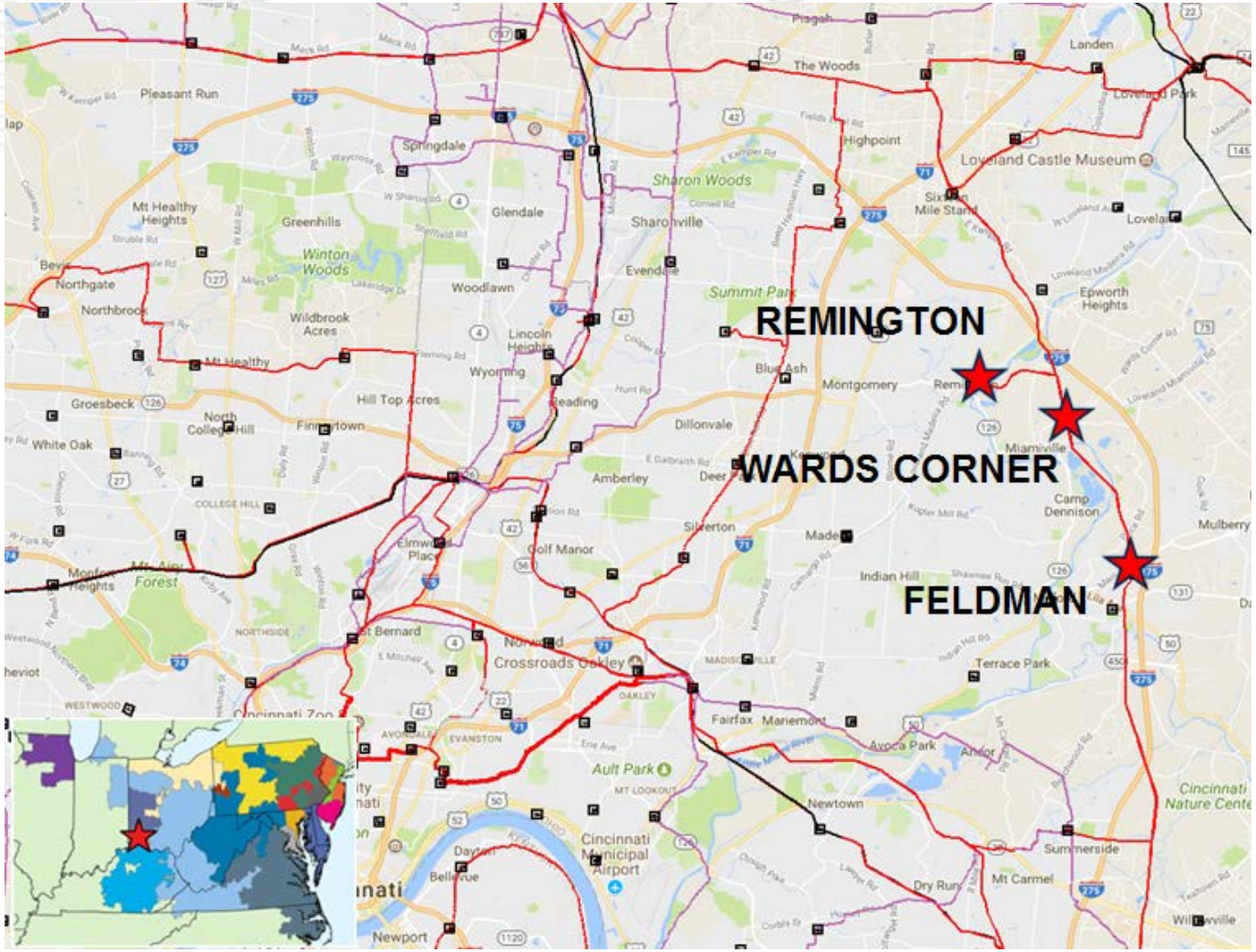
Potential Solution:
Replace the bus tie circuit breaker. Install three additional 138kV circuit breakers, associated breaker disconnects, new bus work, new structure and relaying to reconfigure the substation into 4-position ring bus.

Estimated Cost: $4.95M

Alternatives:
none

Projected In-service: 12-31-2019

Project Status: Scoping



DEOK Transmission Zone: Supplemental
Ebenezer Expand and Reconfigure Substation

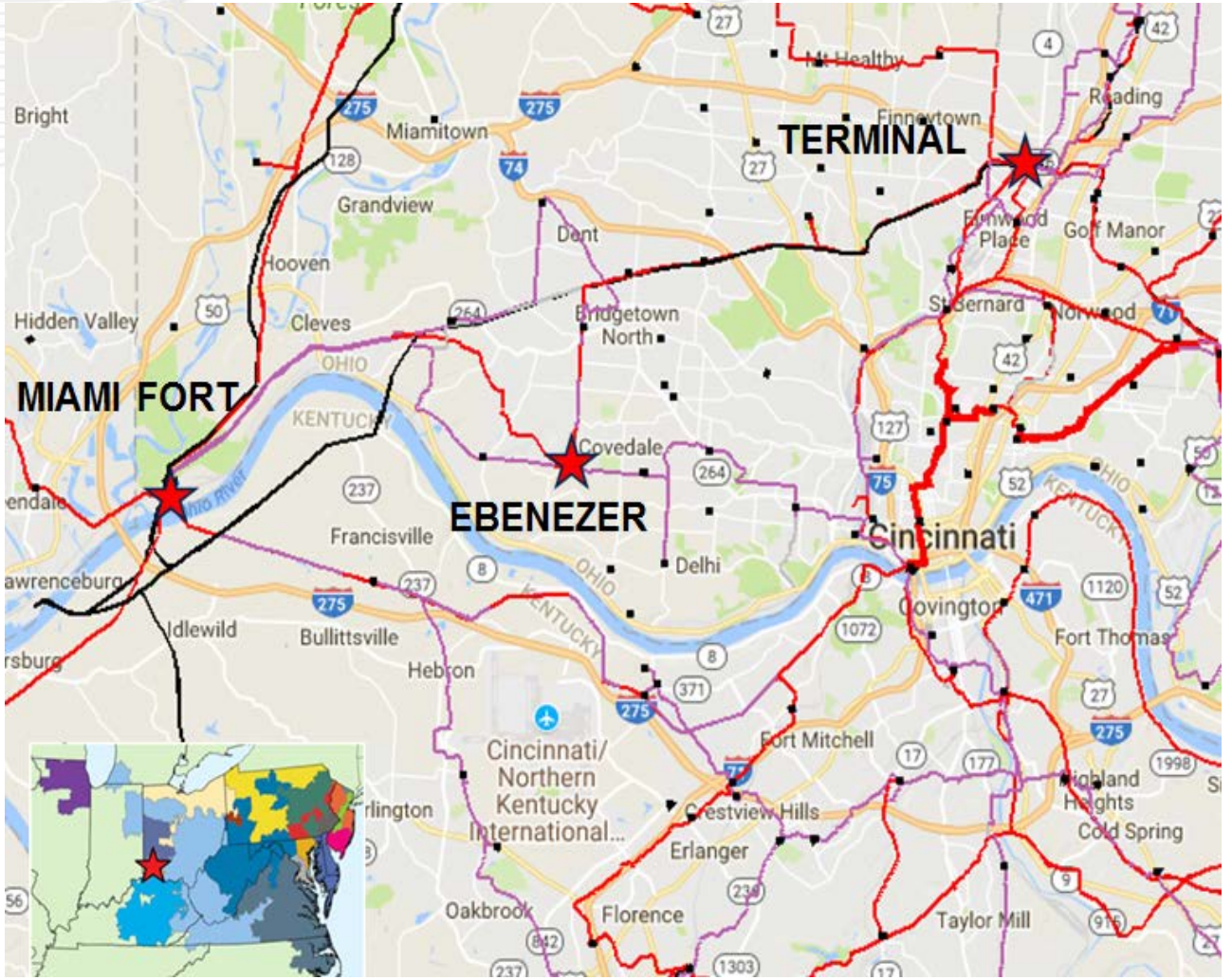
Problem Statement:
Ebenezer TB6 is a 138/69/33kV 140/140/56MVA transformer that feeds both a 69kV transmission bus, and with a tertiary winding feeds a 33kV distribution bus. The 33kV winding exposes the transformer to faults from the distribution system. The transformer is 47 years old, and has been trending upwards with acetylene and ethylene gasses. Ebenezer Substation has two 138kV buses. A feeder is connected to Bus 1 with a breaker. Bus 1 is connected to Bus 2 with a tie breaker. A feeder is connect to Bus 2 with a breaker. The feeder breakers are first generation gas breakers. Their protection and physical configurations do not match the other breakers that will be installed. The failure of the tie breaker will interrupt service to 138/13kV TB3, 138/69kV TB5, TB6 (total of 222MVA of capacity), and interrupt the 138kV path between Miami Fort Generating Station and Terminal Substation.

Potential Solution:
Replace TB6 with a 138/69kV 150MVA transformer to feed the 69kV bus. Install a new 138/33kV 22.4MVA transformer to feed the 33kV bus. Replace the tie breaker and feeder breakers, and with 3 additional breakers form a six-breaker ring bus. The project includes the installation of associated breaker disconnects, new bus work, new structure, and relaying.

Driver: Equipment Condition, Operational Flexibility, Resiliency
Estimated Cost: $9.0M (transmission assets only)

Projected In-service: 12-31-2020

Project Status: Scoping



DLCO Transmission Zone: Supplemental WABCO Project

Problem Statement:
On April 25, a landslide near Wilmerding substation caused multiple transmission structures on the radial Wilmerding-WABCO (Z-98) 138kV transmission line to shift and caused the conductors to fault. The land which the current Wilmerding-WABCO transmission line remains unstable and, as such, the Wilmerding-WABCO radial line cannot be returned to service without redesign and modifications to the impacted transmission structures. As a result, a new solution is needed to address the changing customer need and site vulnerability.

Drivers:
Equipment Material Condition, Performance and Risk; Infrastructure Resilience; Customer Service

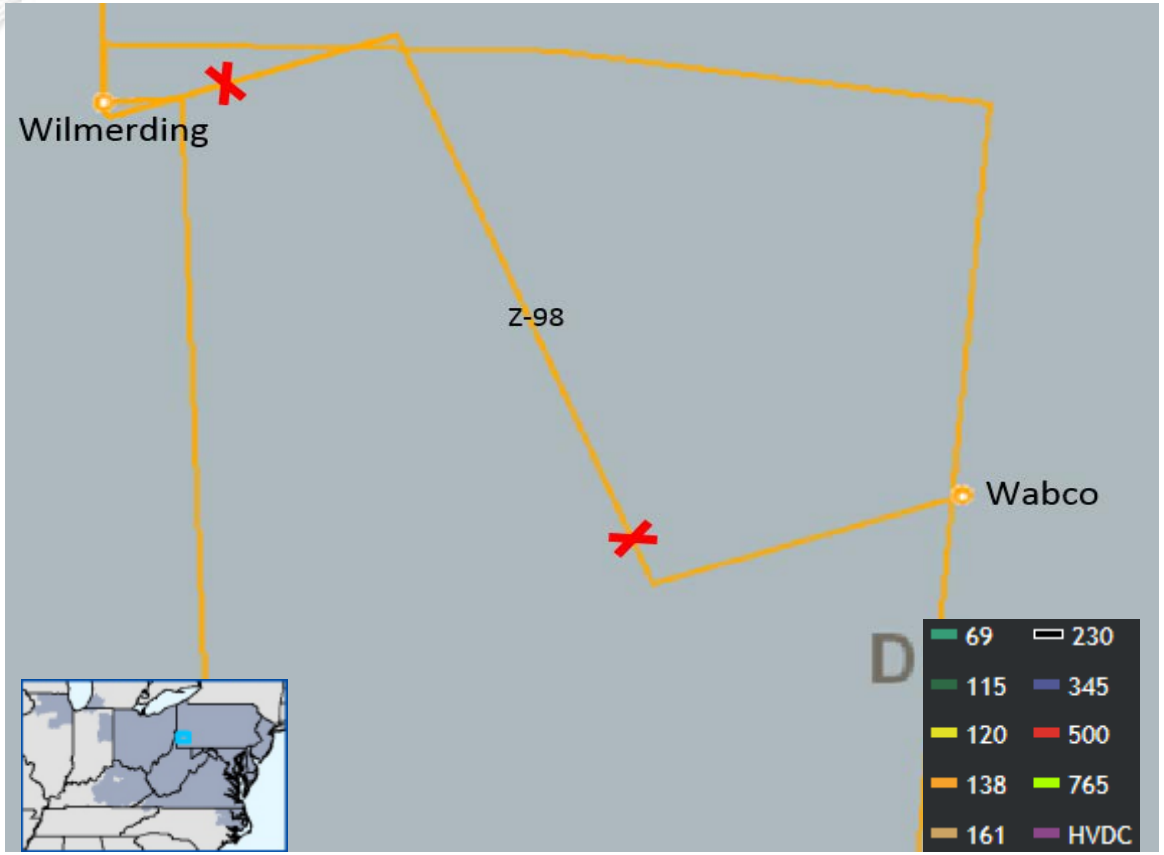
Potential Solution:
Because of load decrease, WABCO was able to be connected to a 23kV distribution circuit for restoration of service. The 2000A Wilmerding-WABCO (Z-98) 138kV line breaker at the Wilmerding substation, the 1600A Wilmerding-Dravosburg (Z-76) 138kV line breaker at the Wilmerding substation, and ~0.5 miles of the radial transmission line will be removed from service to retire the Wilmerding-WABCO (Z-98) 138kV line.

Alternatives Considered:
No cost effective alternatives.

Estimated Project Cost: $300K

Projected IS Date (Expected IS Date): 3/31/2019

Status: Construction



DLCO Transmission Zone: Supplemental
Potter – NOVA Chemical 138kV line

Problem Statement:
Currently NOVA Chemical is being served by the Valley-Hopewell 69kV transmission line tap to the Kobuta substation, which provides one of two electrical connections to NOVA Chemical. The Valley-Hopewell 69 kV tap is at the end of its useful life. The other service to the customer is from the Potter-AES 138kV transmission line. The customer has requested to retain two redundant electrical sources to maintain reliability because of their critical business processes.

Drivers:
Customer Service, Equipment Material Condition

Potential Solution:
Due to the customer's service request and the deteriorated condition of the Valley-Hopewell 69kV tap, the proposed solution is to eliminate the existing Kobuta substation and the 69kV tap. The existing tap is to be replaced with a new 138kV transmission line from the Potter substation to the newly constructed NOVA Chemical substation, which is being built by the customer.

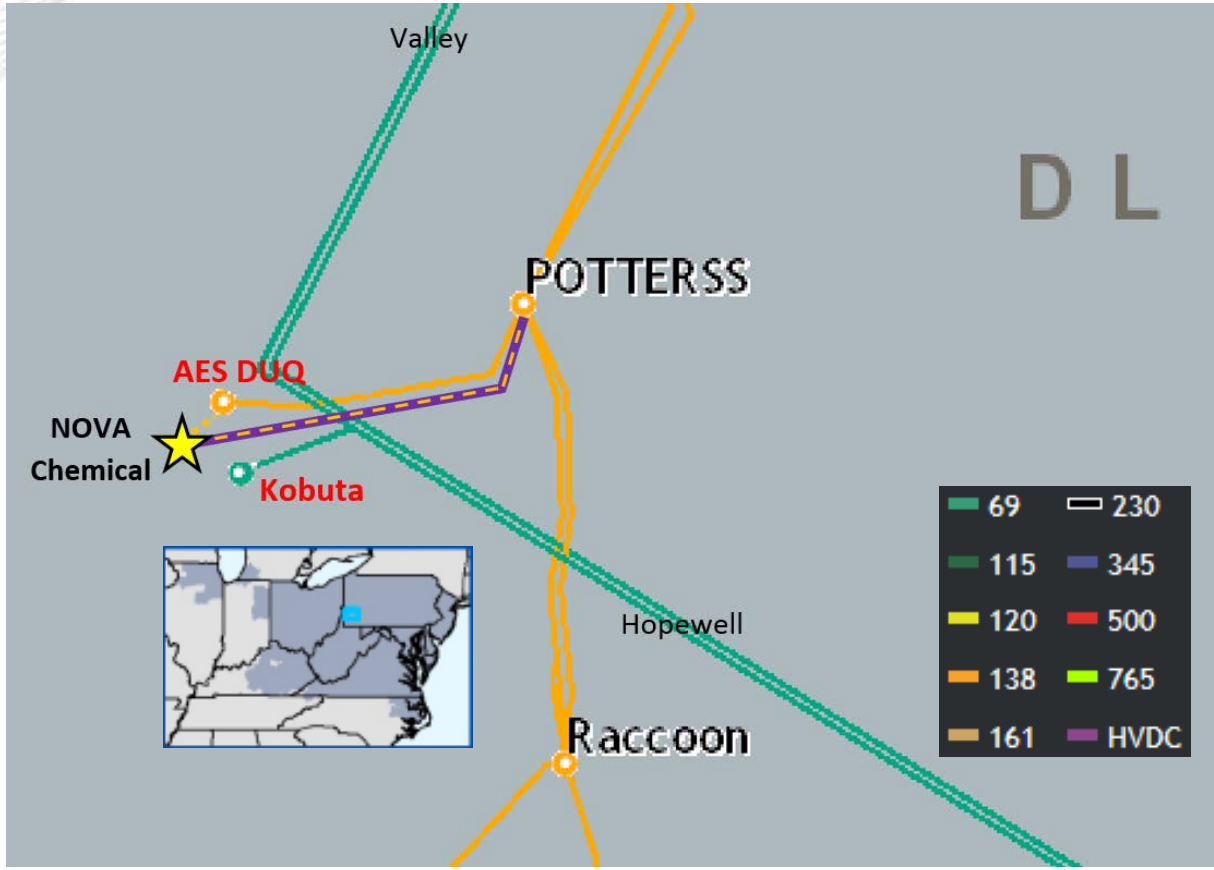
Install a #6-#7 3000A 63kA 138kV bus tie breaker and associated protection and control equipment at Potter substation. Install the new Potter-NOVA Chemical (Z-180) 138kV line using 853.7 ACAR 24/13. Install two 138kV disconnect switches, protection, communications, and metering equipment at the newly constructed NOVA Chemical customer substation. Eliminate the 69kV Kobuta tap and associated customer substation from the Valley-Hopewell 69kV line. Remove all associated equipment from the AES substation to establish Potter-NOVA Chemical (Z-80).

Alternatives Considered:
No cost effective alternatives.

Estimated Project Cost: $4M

Projected IS Date (Expected IS Date): 7/31/2019

Status: Engineering



ATSI Transmission Zone: Baseline
Greenfield-NASA 138 kV Terminal Equipment

Substation Equipment

Problem Statement:

2018 RTEP Gen Deliverability Thermal Violation Winter 2023 Case

- For a common-tower fault tripping X1-027A – Beaver & Beaver – Hayes 345 kV lines or common-tower fault tripping Davis Besse – X1-027A & Beaver – Hayes 345 kV lines, results in the thermal overload of Greenfield-NASA 138 kV line (GD-W244, GD-W245).

Potential Solution:

Greenfield-NASA 138 kV Terminal Upgrades

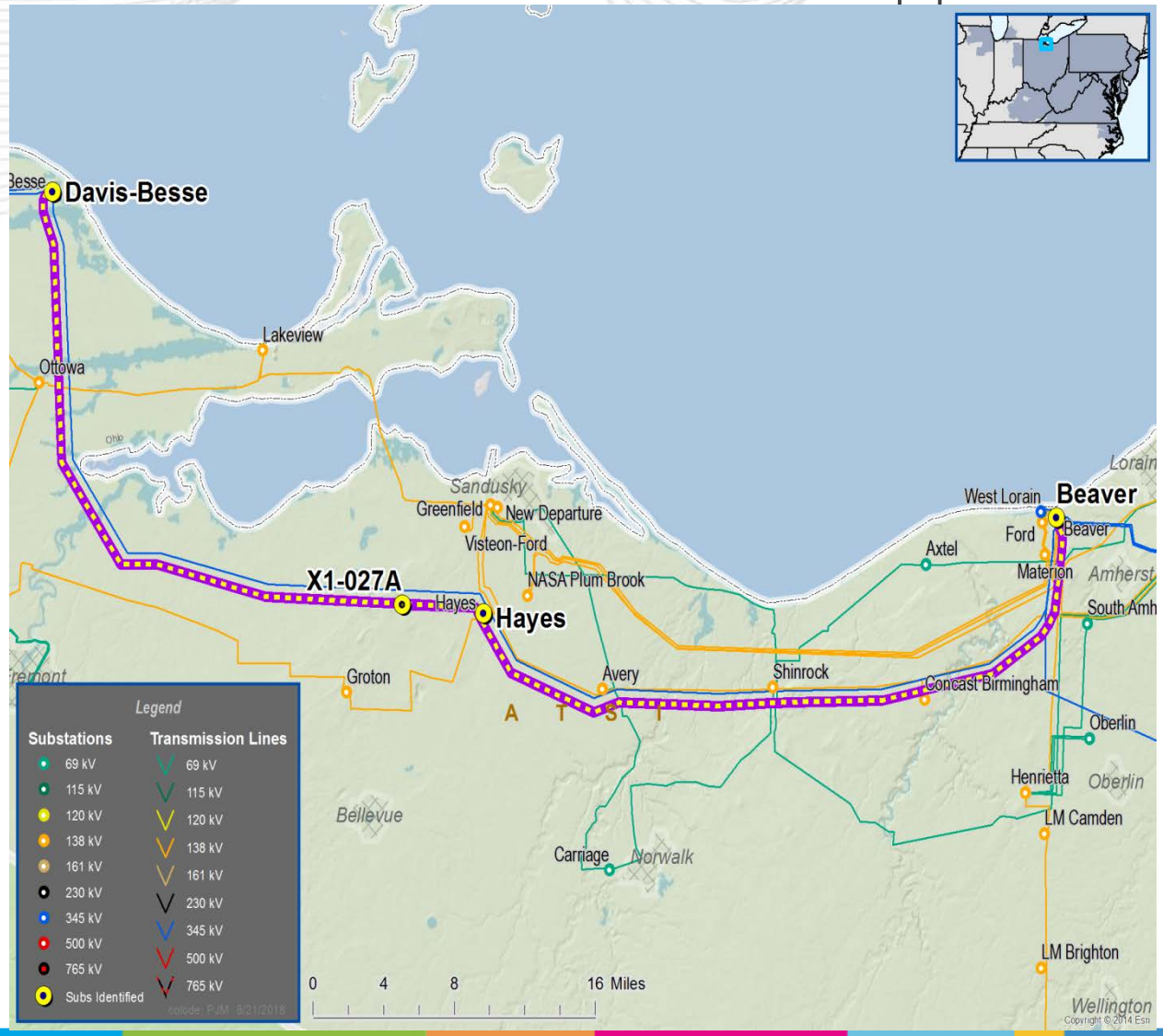
- NASA Substation, Greenfield exit: Revise CT tap on Breaker B22 and adjust line relay settings.
- Greenfield Substation, NASA exit: Revise CT tap on Breaker B1 and adjust line relay settings; replace 336.4 ACSR line drop with 1033.5 AL.
  - Old rating: 186 / 205 MVA WN / WE
  - New rating: 315 / 401 MVA WN/WE

Estimated Project Cost: $0.1 M

Required IS Date: 12/01/2023

Projected IS Date: 12/01/2023

Status: Conceptual



ATSI Transmission Zone: Baseline
Ottawa-Lakeview 138 kV Reconductor and Upgrades

Below 200kV

Problem Statement:

2018 RTEP Gen Deliverability Thermal Violation Winter 2023 Case

- For the common tower failure tripping Davis Besse – X1-027A & Beaver – Hayes 345 kV Lines, results in the thermal overload of Ottawa-Lakeview 138 kV line (GD-W218).

Potential Solution:

Ottawa-Lakeview 138 kV Reconductor and Substation Upgrades

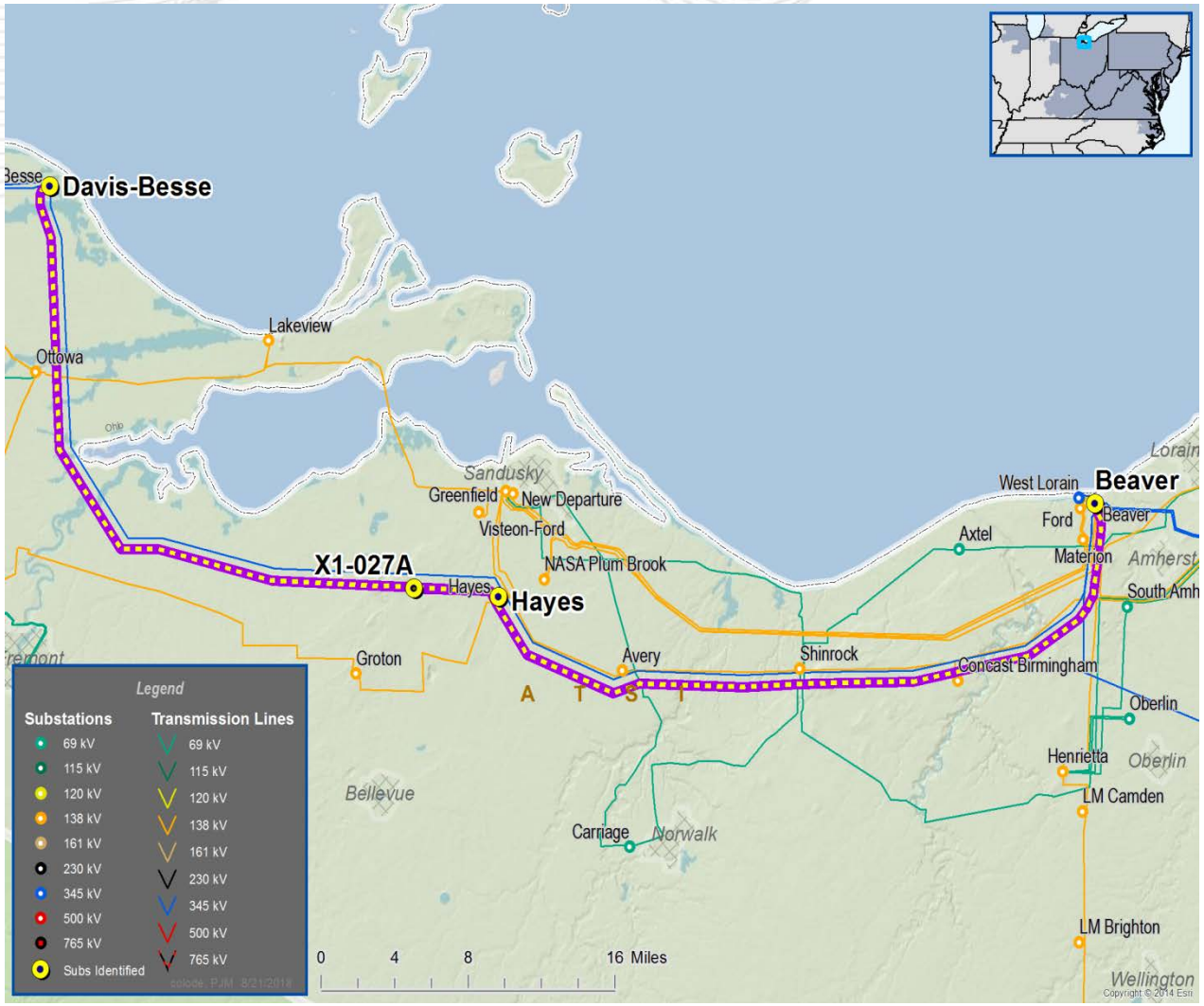
- At Ottawa substation, Lakeview exit, replace 954 ACSR line drop conductor with 795 ACSS; replace 1272 SAC substation conductor with 1590 ACSS.
- At Lakeview substation, Ottawa exit, replace 636 ACSR line drop conductor with 795 ACSS; replace 1590 ACSR substation conductor with 1590 ACSS. replace 1600A wave-trap with 2000A wave-trap.
- For the Ottawa-Lakeview 138 kV line, reconductor the existing 336 ACSR six-wired conductor (~ 7.6 miles) with 336 ACSS six-wired; replace single span of 954 ACSR, at Ottawa end, with 795 ACSS.
  - Old rating: 353 / 450 MVA WN / WE
  - New rating: 448 / 543 MVA WN / WE

Estimated Project Cost: $20.0 M

Projected IS Date: 12/01/2023

Required IS Date: 12/01/2023

Status: Conceptual



ATSI Transmission Zone: Baseline
Lakeview-Greenfield 138 kV Reconductor and Upgrades

Below 200kV

Problem Statement:

2018 RTEP Gen Deliverability Thermal Violation Winter 2023 Case

- For the common tower failure tripping Davis Besse – X1-027A & Beaver – Hayes 345 kV Lines, results in the thermal overload of Lakeview-Greenfield 138 kV line (GD-W215).

Potential Solution:

Lakeview-Greenfield 138 kV Reconductor and Substation Upgrades

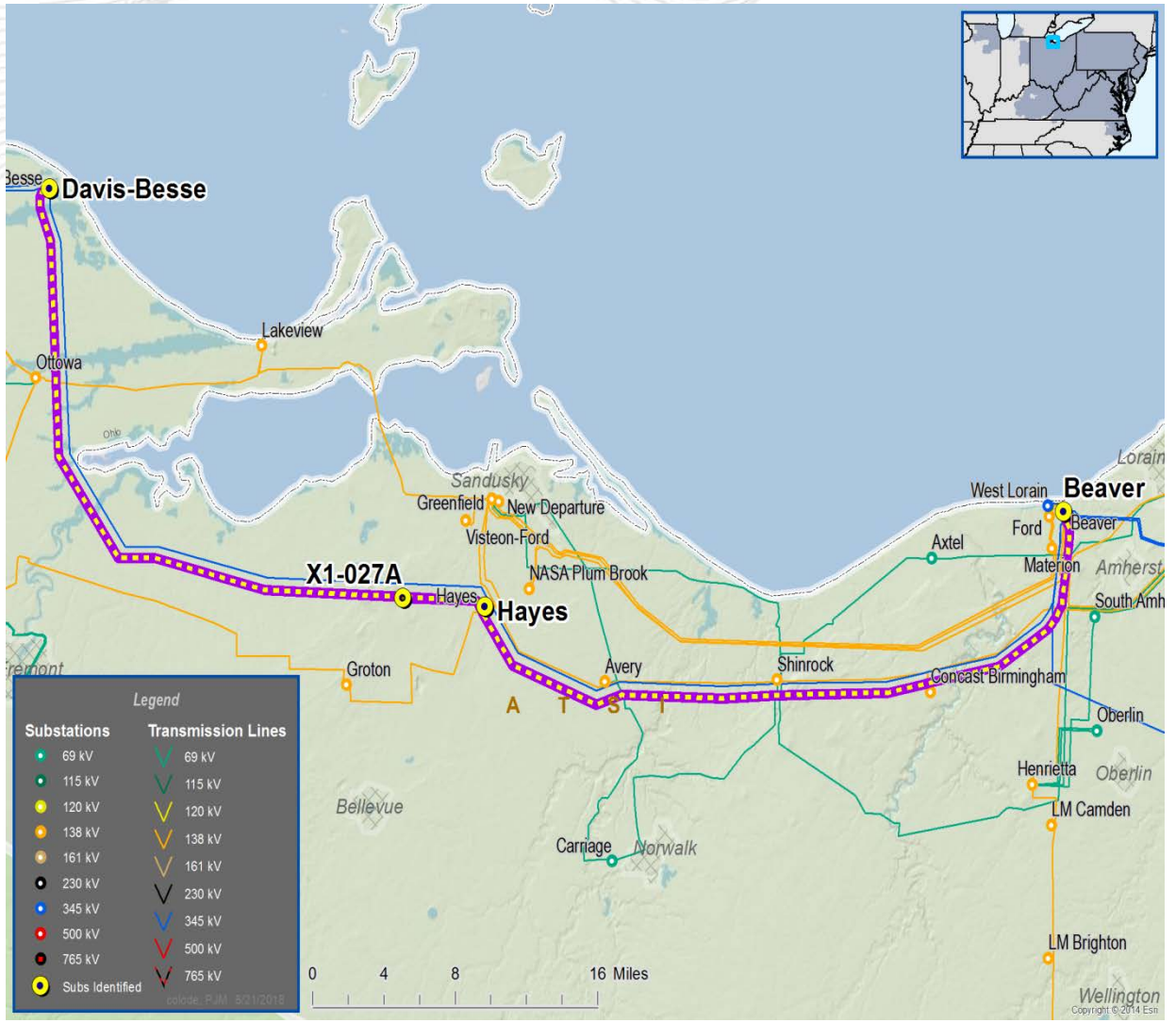
- At Lakeview substation, Greenfield exit, replace 795 ACSR substation conductor with 795 ACSS; upgrade relays to standard relay panel.
- At Greenfield substation, Lakeview exit, replace 795 ACSR line drop and 1000 CU & 795 ACSR substation conductors with 795 ACSS; upgrade relays to standard relay panel.
- For the Lakeview-Greenfield 138 kV line, reconductor the existing 795 ACSR conductor (approximately 1.2 miles at Lakeview end and last span at Greenfield end) with 795 ACSS.
  - Old rating: 315 / 361 MVA WN / WE
  - New rating: 360 / 456 MVA WN / WE

Estimated Project Cost: $2.4 M

Projected IS Date: 12/01/2023

Required IS Date: 12/01/2023

Status: Conceptual



ATSI Transmission Zone: Supplemental
138 kV Line Extension to Customer Substation

Problem Statement (Scope and Need/Drivers):

Customer Service

- Provide 138 kV service to new customer.
- Customer proposed load is approximately 35 MWs

Potential Solution:

138 kV Line Extension to Customer Substation (Substation Name TBD)

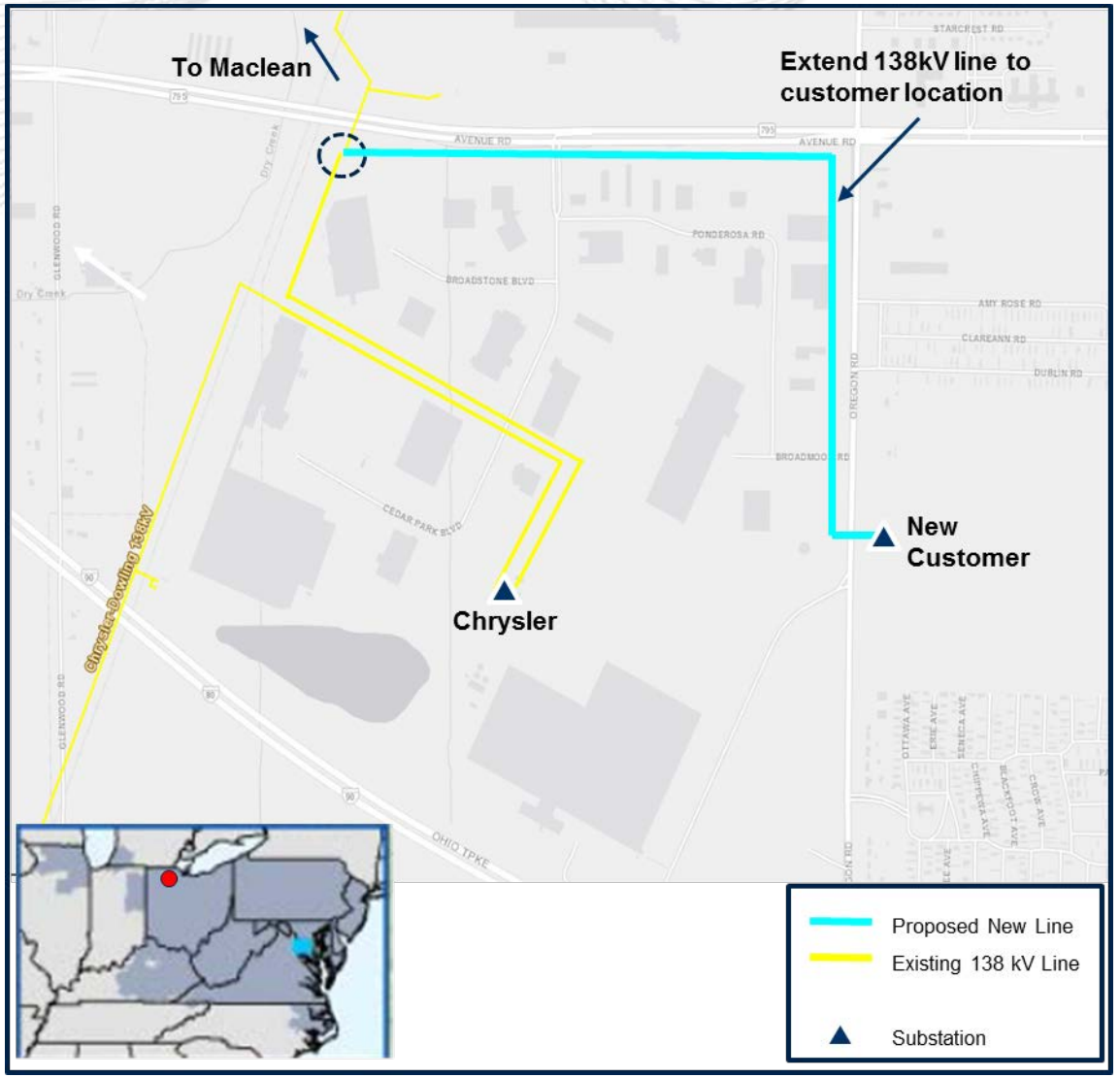
- Tap the Chrysler-Maclean 138 kV line and build a new 138kV line extension approximately 1.5 miles to new customer substation.
- Line extension conductor 336 ACSR (161 MVA SN)

Alternatives Considered: None

Estimated Project Cost: $3.5M

Projected IS Date: 04/30/2019

Status: Conceptual



ATSI Transmission Zone: Supplemental
Star 138 kV Substation Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approximately 55 MWs) under contingency conditions.
- Mitigate non-planning criteria voltage concerns on the > 100 kV system under contingency (P6) condition; system back-feed condition.
- Loss of Medina-West Medina 138kV and Star #5 138/69kV transformer (results in path end outage of Star-Seville 138kV Line at Star)
  - Results in the low voltage (0.84 p.u.) and potential local voltage collapse at multiple substations: West Medina, Ryan, Seville Muni, and Seville substations.

Potential Solution:

Star 138 kV Substation Project

- Expand the existing 138 kV substation at Star substation by adding three (3) 138 kV breakers to complete a breaker and half configuration.
- Reconfigure transformer and line exit configurations to improve contingency loss impact by separating line and 138/69 kV transformer connections.

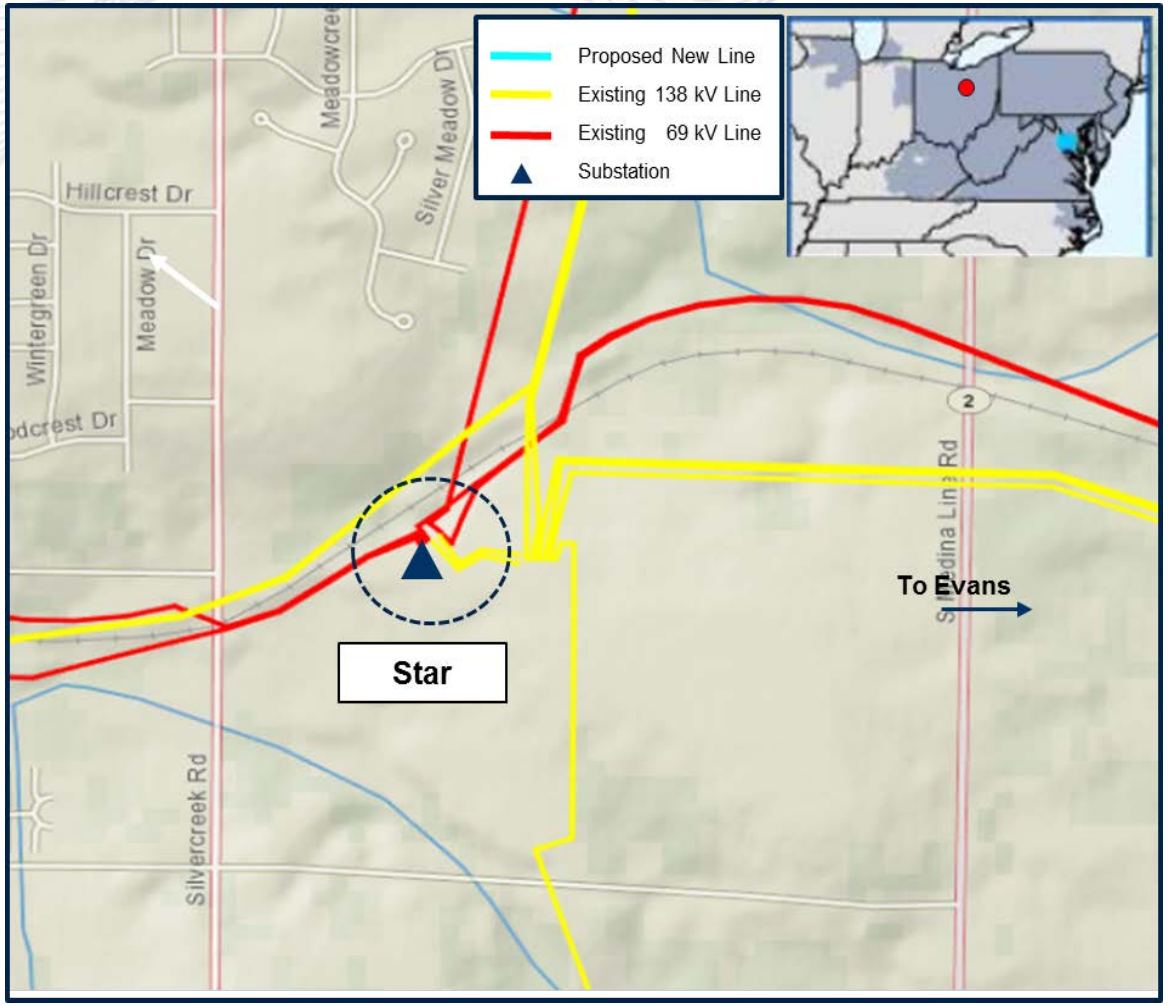
Alternatives Considered:

Build new 138 kV line into the planning area.

Estimated Project Cost: $3.3M

Projected IS Date: 12/31/2019

Status: Conceptual



ATSI Transmission Zone: Supplemental Crissinger 138 kV Ring Bus Expansion

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts
- Reduce amount of potential local load loss (Approximately 99 MWs) under contingency conditions
- Mitigate non-planning criteria voltage concerns on the < 100 kV system under contingency (P6) conditions.
  - Loss of Crissinger-Roberts 138 kV and Crissinger-Tangy 138 kV Lines
  - Results in potential local voltage collapse on the 34.5 kV sub-transmission system.

Potential Solution:

Crissinger 138 kV Ring Bus Expansion

- Expand existing Crissinger substation from a four (4) breaker to a six (6) breaker 138 kV ring bus.
- Cut and extend the Kirby-Roberts 138 kV line to Crissinger substation. (Approximately 1.0 mile)
- Reconfigure Crissinger substation to include terminals for:
  Crissinger – Kirby 138 kV Line and Crissinger – Roberts #1 138 kV Line
  Crissinger – Roberts #2 138 kV Line and Crissinger – Tangy 138 kV Line

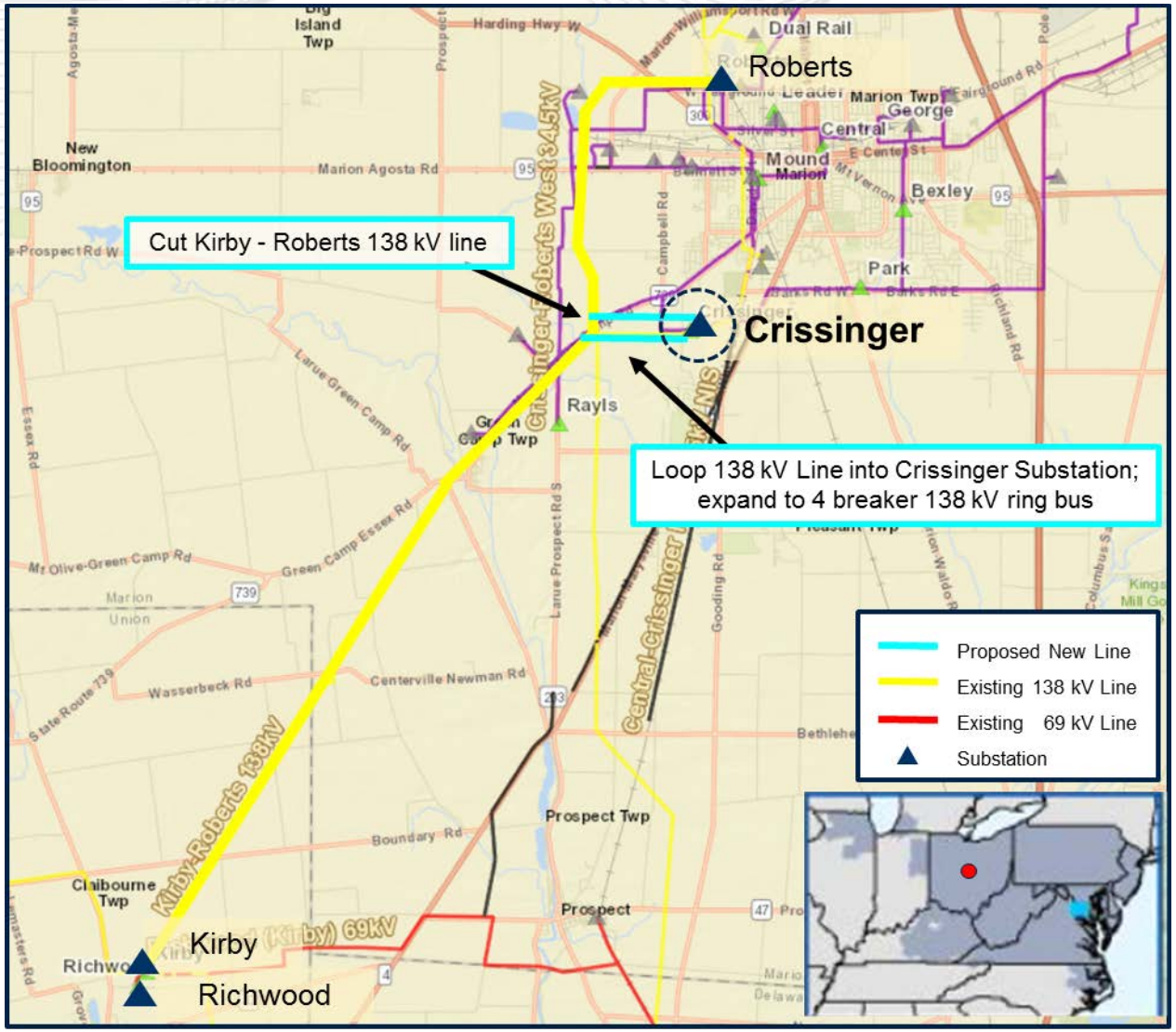
Alternatives Considered:

Add capacitor bank at Crissinger 138 kV substation

Estimated Project Cost: $5.8M

Projected IS Date: 12/31/2019

Status: Engineering



ATSI Transmission Zone: Supplemental
Richland-Stryker-Napoleon 138 kV Three-Terminal Line Elimination Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve system protection, coordination, and fault location under existing three-terminal line configuration.
- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss under (P6) contingency conditions.
  - *Loss of Allen Junction-Lyons 138 kV and Richland-Stryker-Napoleon 138 kV line*
  - *Results in potential 69 kV low voltage or local voltage collapse on the Stryker 69 kV system with load at risk approaching 65 MWs.*

Potential Solution:

Richland-Stryker-Napoleon 138 kV Three-Terminal Line Elimination Project

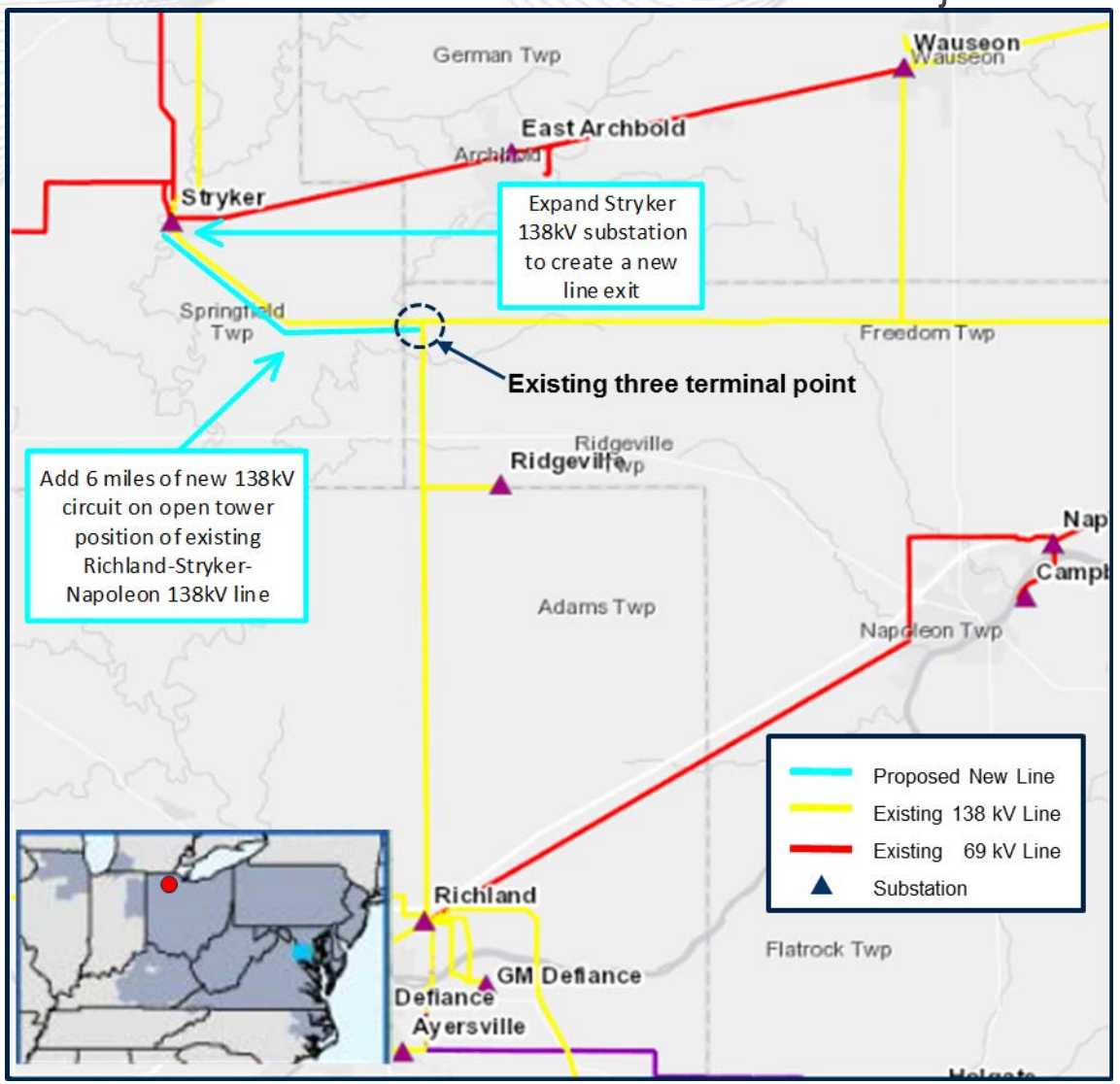
- Eliminate three terminal point on the Richland-Stryker-Napoleon 138 kV line.
- Add 6.0 miles of new 336 ACSR conductor to open tower position of Richland-Stryker-Napoleon 138 kV line.
- Reconfigure the existing Stryker tap location to create:
  - Richland – Stryker 138 kV line
  - Stryker – Napoleon 138 kV line
- Expand the existing 138 kV Stryker substation to incorporate a new line exit; install new 138 kV circuit breaker

Alternatives Considered: None

Estimated Project Cost: $4.2M

Projected IS Date: 12/31/2019

Status: Engineering



ATSI Transmission Zone: Supplemental
Richland-Wauseon-Midway 138 kV Three-Terminal Line Elimination Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve system protection, coordination, and fault location under existing three-terminal line configuration.
- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss under (P6) contingency conditions.
  - Loss of Delta-Fulton138 kV and Richland-Wauseon-Midway 138 kV line
  - Results in potential low voltage or local voltage collapse on the Wauseon 69 kV system with load at risk approaching 97 MWs.

Potential Solution:

Richland-Wauseon-Midway 138 kV Three-Terminal Line Elimination Project

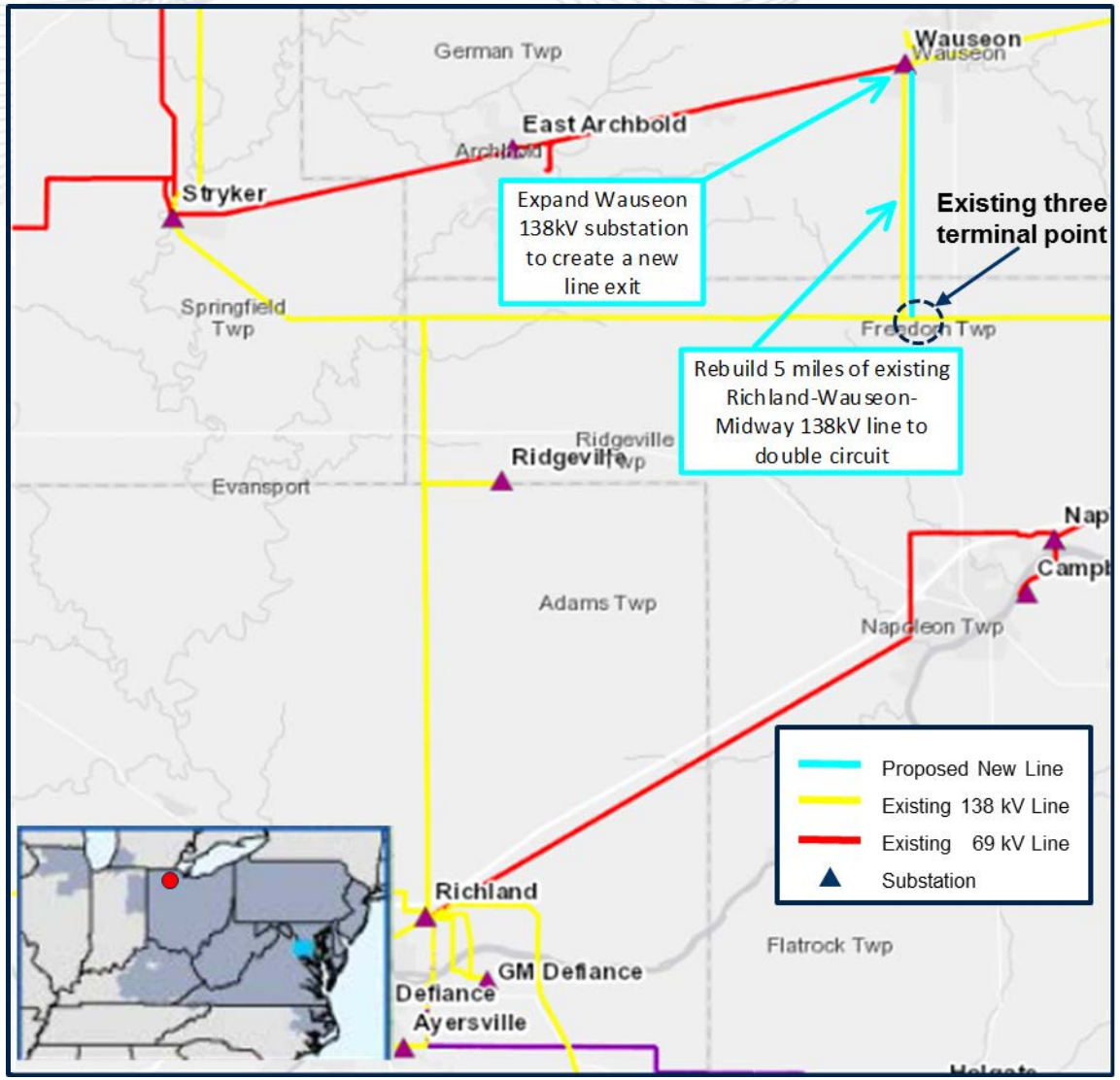
- Rebuild 5.0 miles of existing Richland-Wauseon-Midway 138 kV line to double circuit with 336.4 ACSR conductor
- Reconfigure the existing Wauseon tap location to create:
  - Richland – Wauseon 138 kV line
  - Wauseon – Midway 138 kV line
- Expand the existing 138 kV substation at Wauseon to incorporate a new line exit; install new 138 kV circuit breaker

Alternatives Considered: None

Estimated Project Cost: $7.7M

Projected IS Date: 06/01/2020

Status: Conceptual



ATSI Transmission Zone: Supplemental
Angola-Eber-Vulcan 138 kV Three-Terminal Line Elimination Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve system protection, coordination, and fault location under existing three-terminal line configuration.
- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approximately 65 MWs) under contingency loss of the Angola-Eber-Vulcan 138kV.

Potential Solution:

Angola-Eber-Vulcan 138 kV Three-Terminal Line Elimination Project

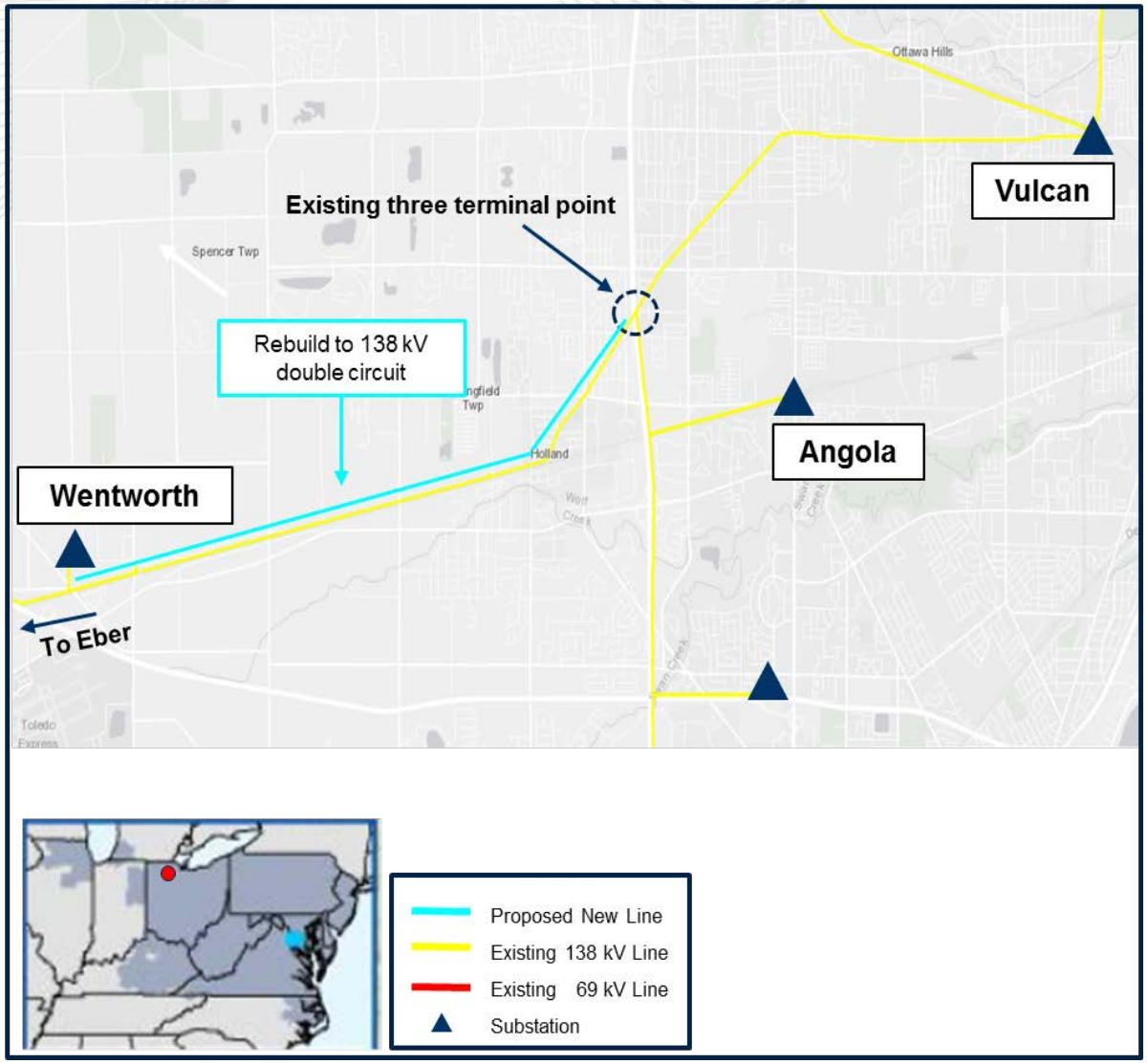
- Eliminate three terminal point on the Angola-Eber-Vulcan 138 kV line.
- Rebuild approximately 2.0 miles from the Angola tap location to Wentworth substation to 138 kV double circuit with 954 ACSR conductor.
- Reconfigure the existing Angola tap location to create:
  - Vulcan – Wentworth 138 kV line
  - Wentworth – Eber 138 kV line
  - Wentworth – Angola 138 kV line
- Expand the existing 138 kV Wentworth substation to five (5) breaker (future 6-breaker) ring bus

Alternatives Considered: None

Estimated Project Cost: $13.4M

Projected IS Date: 12/31/2020

Status: Conceptual



ATSI Transmission Zone: Supplemental
New Snyder 69 kV Substation Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve system protection, coordination, and fault location under existing three-terminal line configuration.
- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approximately 33 MWs) under contingency loss of the East Fayette transformer or the East Fayette-Edon 138kV line.
- Improve system voltage after post contingency switching (0.80 p.u.) close normally open point at Edon substation on the 69kV system.

Potential Solution:

New Snyder 69 kV Substation Project

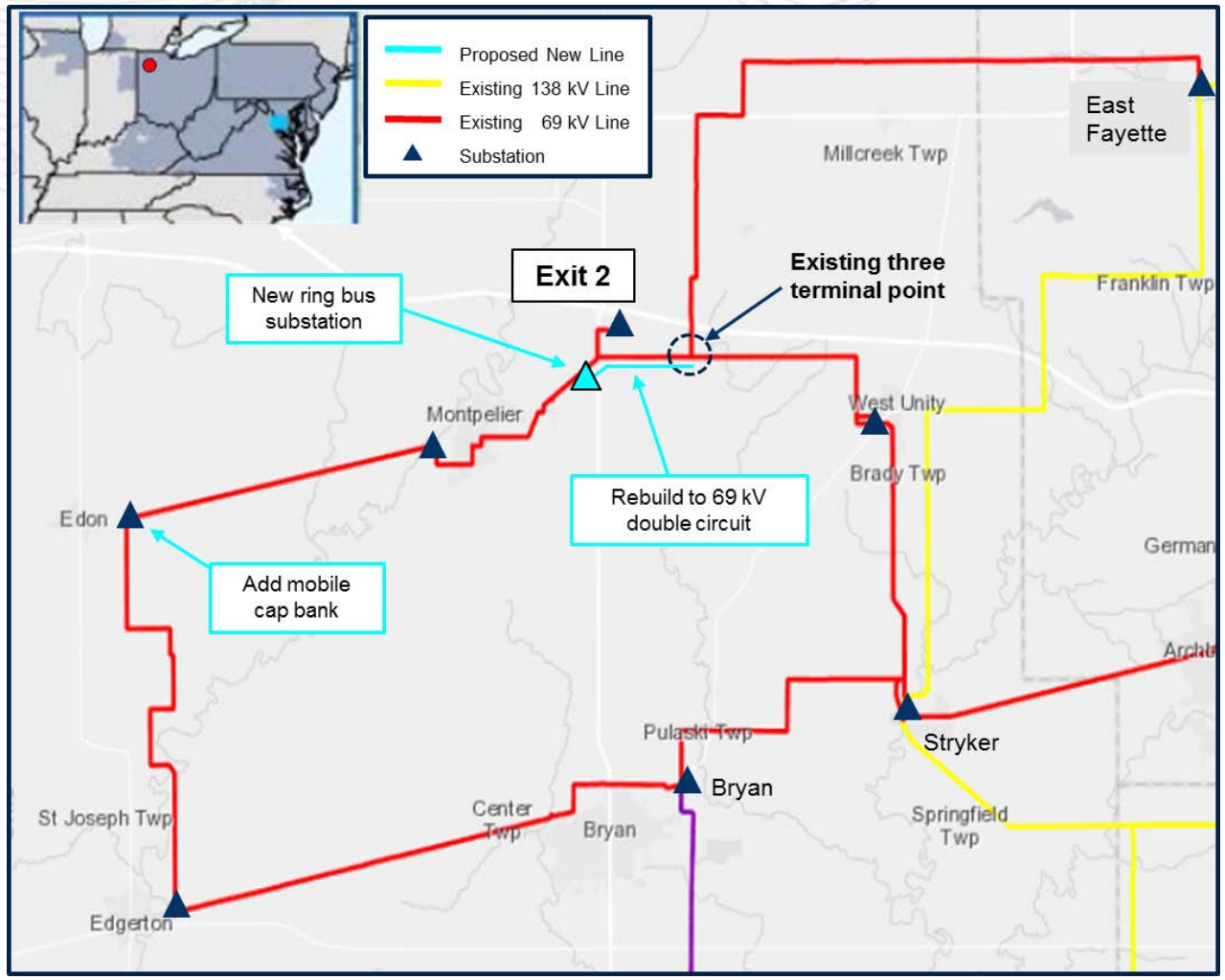
- Network radial 69 kV system with new switching station (Snyder)
- Build Snyder substation, a new three (3) breaker (future 6-breaker) 69 kV ring bus located near Exit 2 substation. The new switching station to create:
  - East Fayette-Exit 2 – Snyder 69 kV line
  - Stryker-West Unity – Snyder 69 kV line
  - Bryan-Edon – Snyder 69 kV line
- Rebuilt existing 69 kV line (approximately 2.6 miles) from three terminal line point to new Snyder substation.
- Install 20 MVAR mobile capacitor bank at Edon substation.

Alternatives Considered: None

Estimated Project Cost: $13.2M

Projected IS Date: 06/01/2020

Status: Engineering



ATSI Transmission Zone: Supplemental
Lemoyne-Woodville-Fostoria 138 kV Four-Terminal Line Elimination Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve system protection, coordination, and fault location under existing four-terminal line configuration. Line exposure is greater than 28 miles.
- Improve operational flexibility during maintenance and restoration efforts.
- Provide additional load and voltage support for the Woodville 34.5 kV system.

Potential Solution:

Lemoyne-Woodville-Fostoria 138 kV Four-Terminal Line Elimination Project

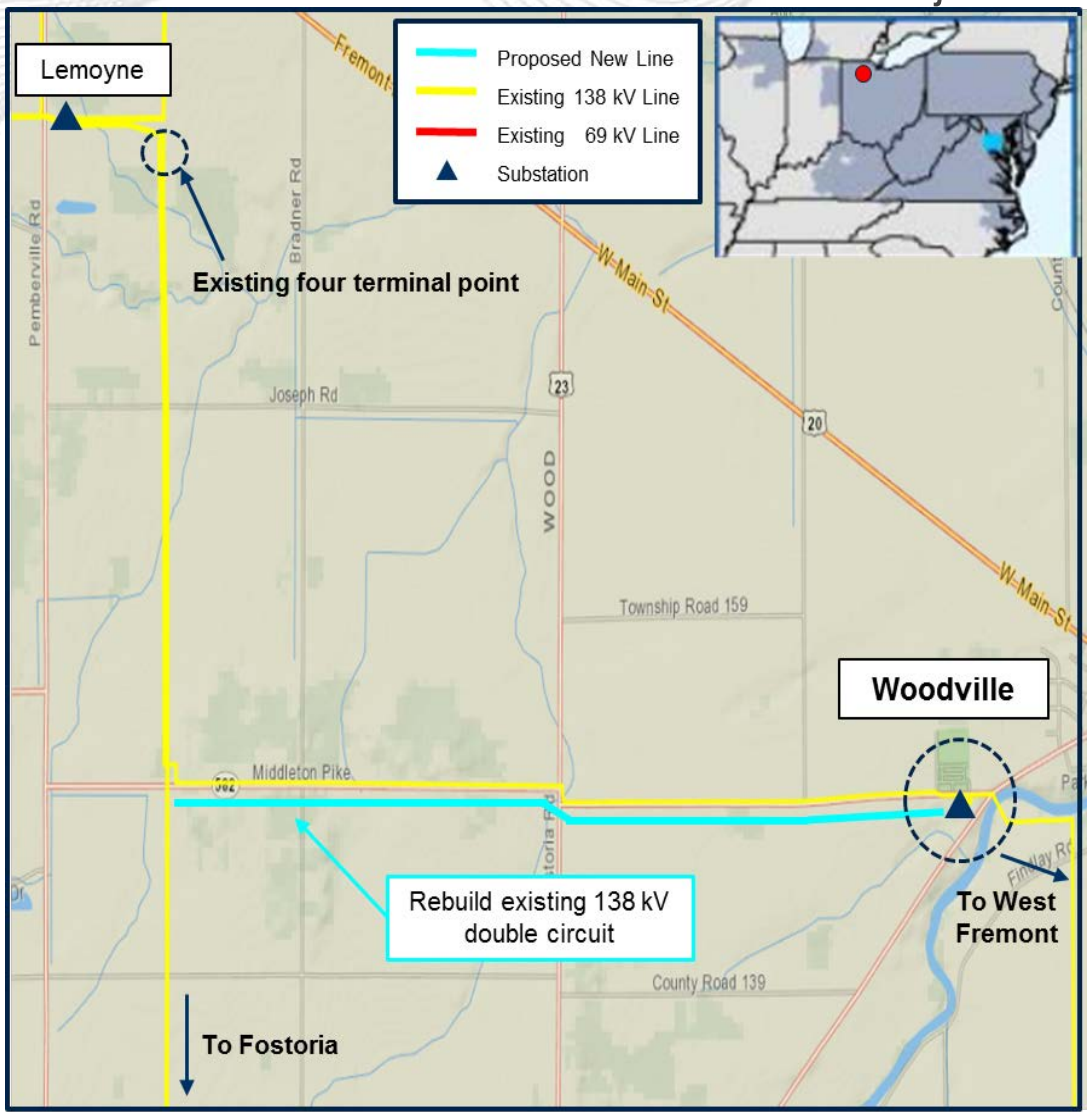
- Eliminate four terminal point on the Lemoyne-Woodville-Fostoria 138 kV line.
- Rebuild approximately 3.1 miles of existing 138 kV line to double circuit with 477 ACSR conductor.
- Expand the existing 138 kV Woodville substation to a five (5) breaker (future 6-breaker) ring bus.
- Reconfigure the existing Woodville tap location and Woodville substation to create:
  - Lemoyne-Woodville 138 kV line
  - Woodville-Fostoria 138 kV line
  - Woodville-West Fremont 138 kV line

Alternatives Considered: None

Estimated Project Cost: $11.3M

Projected IS Date: 06/01/2020

Status: Conceptual



ATSI Transmission Zone: Supplemental Brim 138/69 kV Substation Expansion

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Improve system protection, coordination, and fault location under existing three-terminal line configuration.
- Reduce the amount of local load loss (Approaching 87MWs) under contingency conditions.
- Mitigate non-planning criteria voltage concerns on the < 100 kV system under contingency (P6) condition.
  - *Loss of Midway-Lemoyne 138 kV and Midway-Bowling Green 2 69 kV line*
  - *Results in potential low voltage or local voltage collapse in Bowling Green and other local distribution substations with load at risk approaching 87 MWs.*

Potential Solution:

Brim 138/69 kV Substation Expansion

- Eliminate the three terminal point on the Lemoyne-Midway 138 kV line.
- Construct a new diverse route 138 kV line (Approximately 5 miles) from Brim substation to a location near the three terminal point with 336 ACSS conductor.
- Add four (4) breaker 138 kV ring bus at Brim substation
- Add a 2nd 138/69 kV transformer.

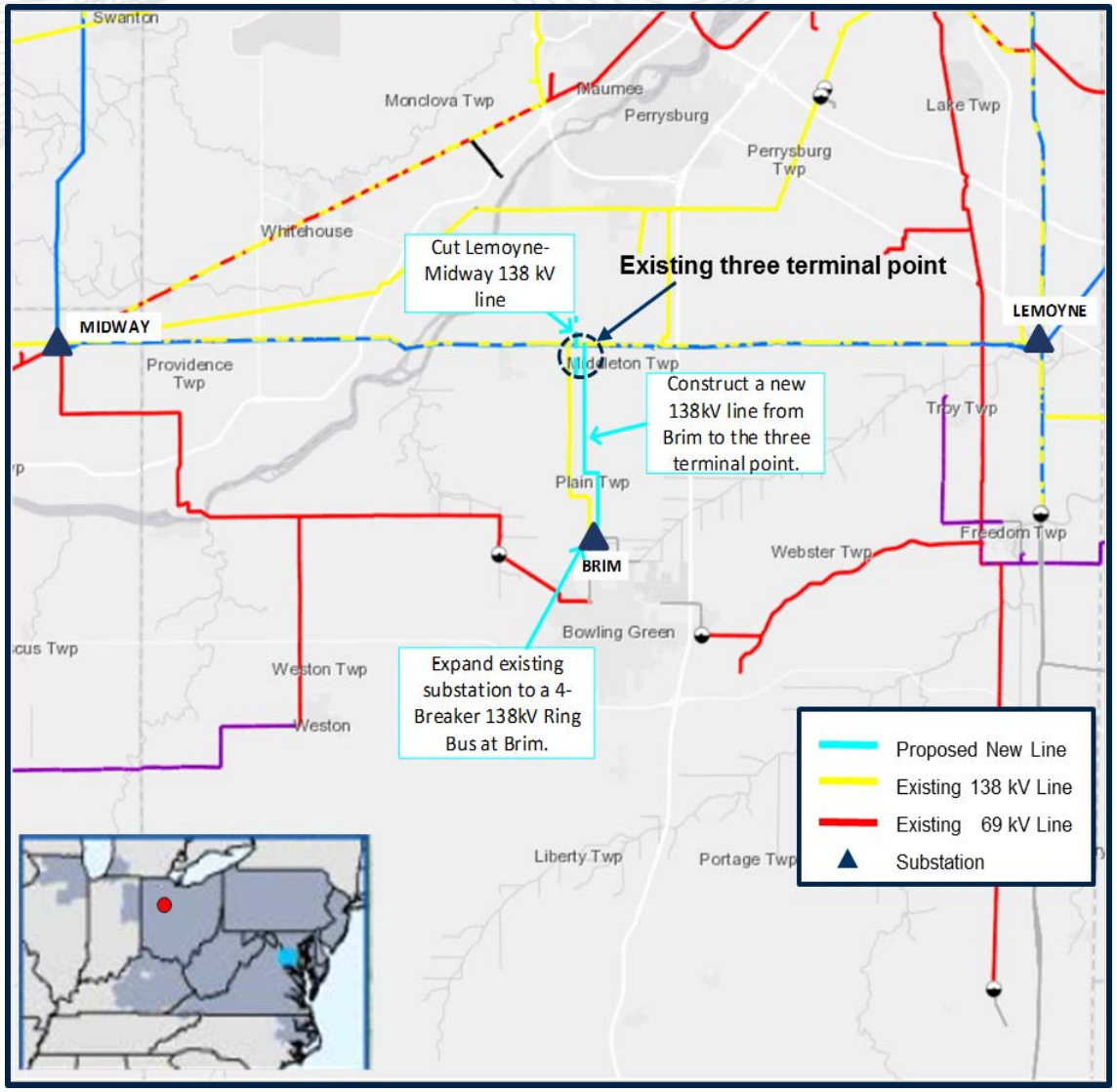
Alternatives Considered:

Bring a fourth 69 kV source from Pemberville.

Estimated Project Cost: $19.9M

Projected IS Date: 6/1/2020

Status: Engineering



ATSI Transmission Zone: Supplemental
Cloverdale-Harmon No1 69 kV Line Section Reconductor Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approaching 45 MWs) under contingency conditions.
- Mitigate non-planning criteria thermal concerns on the < 100 kV system under contingency (P6) condition.
  - *Loss of Cloverdale-Harmon #1 138 kV and Cloverdale-Harmon #2 138 kV line*
  - *Results in potential thermal overload (Approximately 130% of its 56 MVA SE rating) on the Cloverdale-Harmon 69 kV Line.*

Potential Solution:

Cloverdale-Harmon No1 69 kV Line Section Reconductor Project

- Rebuild a portion of the Cloverdale-Harmon 69 kV line (approximately 1.4 miles) from Navarre tap to Richville tap with 477 ACSR conductor, replace line switch with 1200A switch.
- Existing Conductor: 3/0 Conductor
- Future Conductor: 477 ACSR
- Old Rating 47 MVA SN New Rating 100 MVA SN

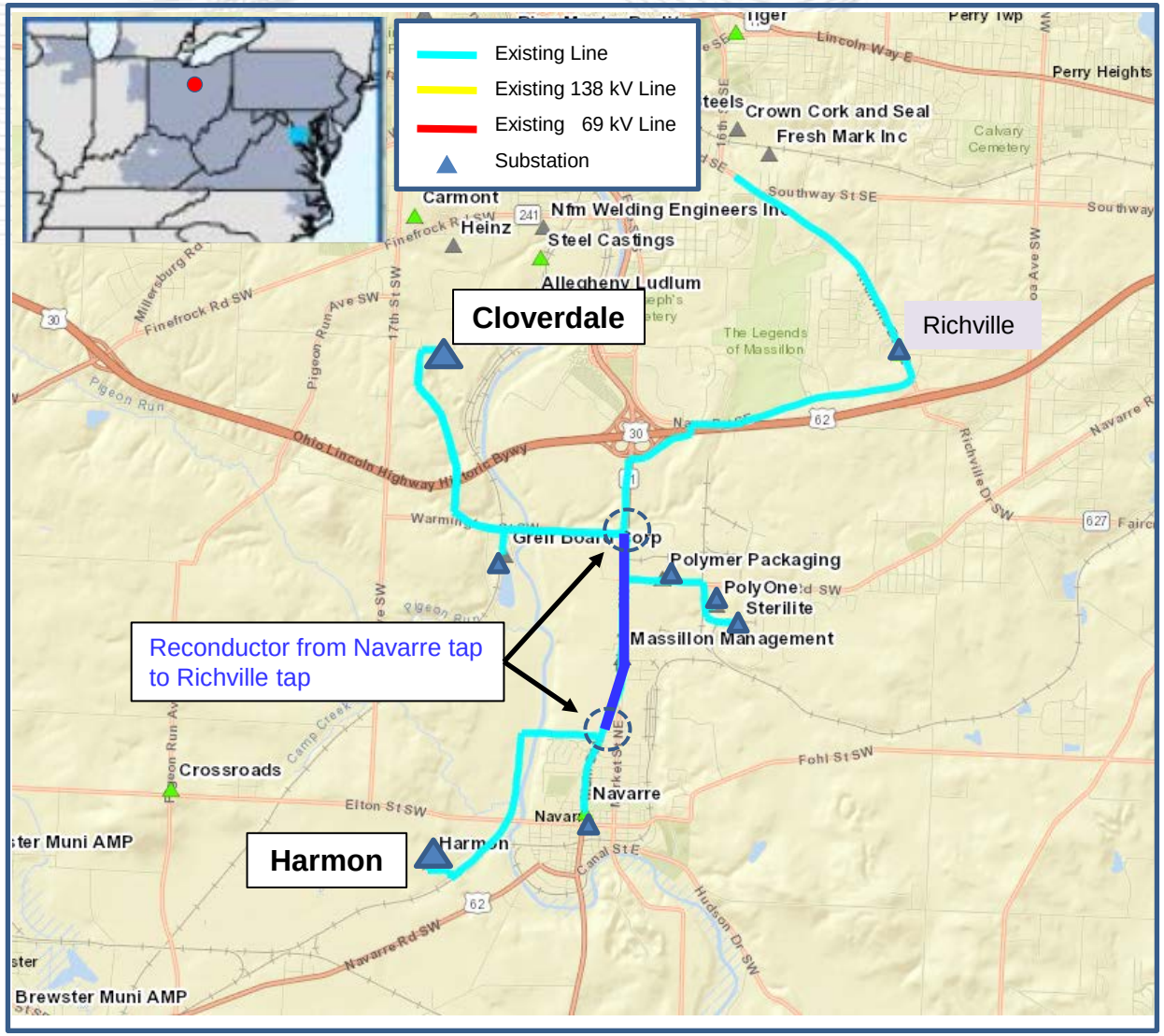
Alternatives Considered:

Maintain existing condition

Estimated Project Cost: $2.3M

Projected IS Date: 04/15/2020

Status: Conceptual



ATSI Transmission Zone: Supplemental
Ryan 69 kV Ring Bus Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approximately 45 MWs) under contingency conditions.
- Mitigate non-planning criteria thermal and voltage concerns on the < 100 kV system under contingency (P6 and Maintenance) condition.
  - *Loss of Locust-Ryan 69kV line and Maclean-Sun Oil #1 69kV line*
  - *Results in potential local voltage collapse near Ryan and Sun Oil Substations.*
  - *Loss of Dixie-Locust 69 kV line and Ironville breaker failure on Ironville-Locust 69kV line.*
  - *Results in potential thermal overload (103% of its 132 MVA SE rating) on the Maclean-Sun Oil #1 69 kV line.*

Potential Solution:

Ryan 69 kV Ring Bus Project

- Expand the existing 69 kV substation at Ryan to a 6-breaker ring bus.
- Reconfigure the existing Sun Oil-Locust Street 69 kV line exits for the ring bus configuration.
- Tap and terminate the Collins Park-Oakdale 69 kV line into the new ring bus substation (Approximately 300 feet) with 636 AA conductor.

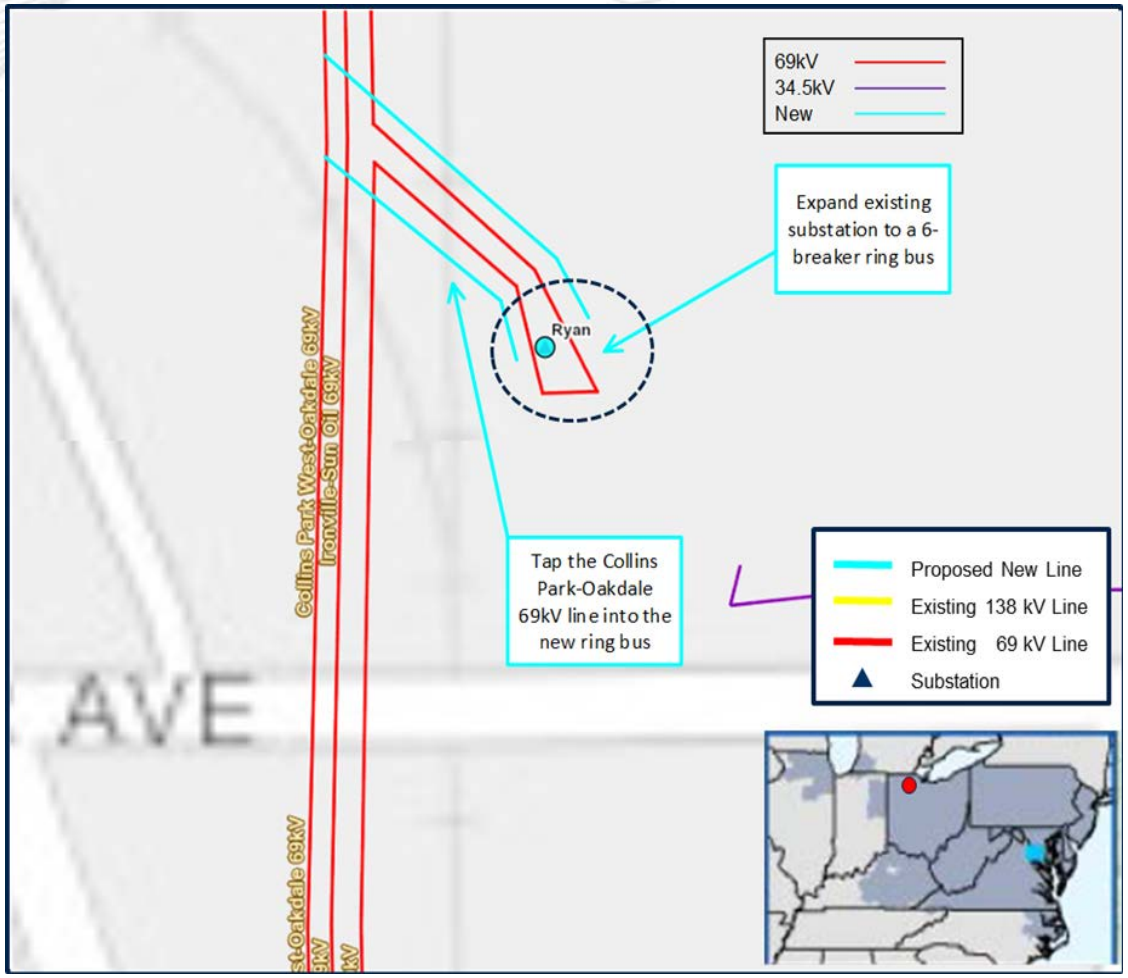
Alternatives Considered:

None

Estimated Project Cost: $10.8M

Projected IS Date: 3/1/2020

Status: Engineering



ATSI Transmission Zone: Supplemental
Talmadge 138 kV Ring Bus Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approximately 87 MWs) under (P2) contingency conditions (bus or breaker failure) at Talmadge substation.

Potential Solution:

Talmadge 138 kV Ring Bus Project

- Expand the existing 138 kV substation at Talmadge to a 4-breaker ring bus.
- Reconfigure Talmadge substation to include terminals for:
  - Talmadge-Westgate 138 kV line
  - Talmadge-Allen Junction 138 kV line
  - Three (3) load connection 138-12.5 kV transformers
- Add new control building to accommodate expansion.

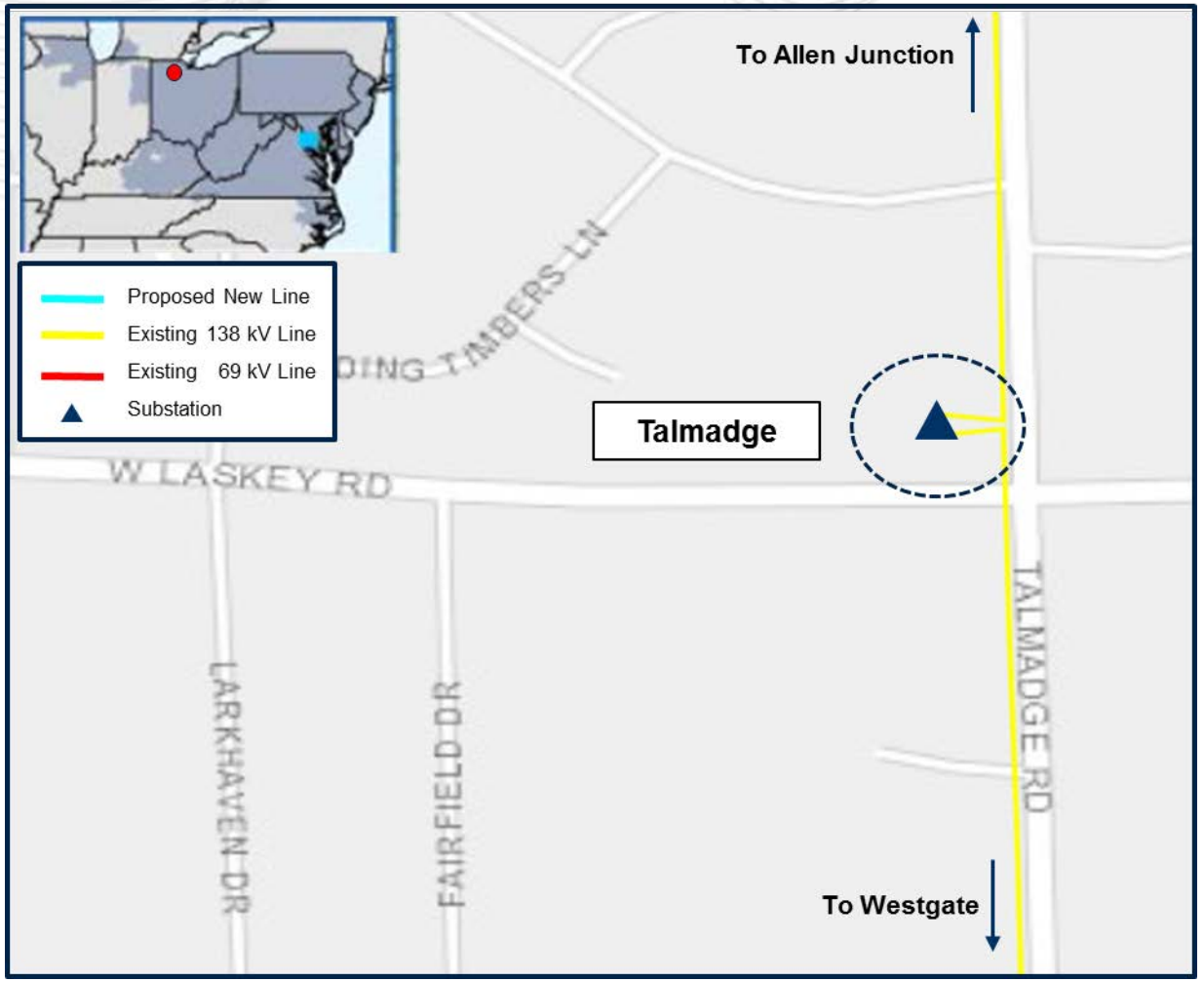
Alternatives Considered:

None

Estimated Project Cost: $6.1M

Projected IS Date: 12/31/2020

Status: Conceptual



ATSI Transmission Zone: Supplemental
Dixie 138 kV Ring Bus Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approximately 33 MWs) under (P2) contingency conditions (bus or breaker failure) at Dixie substation.
- Strengthen 138 kV system voltage under contingency (P6) condition; backfeed condition.
  - *Loss of Bayshore-Jeep #2 138 kV and Dixie-Jackman 138 kV line*
  - *Results in lower 138 kV system voltage (0.91 p.u.) under backfeed condition.*

Potential Solution:

Dixie 138 kV Ring Bus Project

- Expand the existing 138 kV substation at Dixie to a 6-breaker ring bus.
- Reconfigure Dixie substation to include terminals for:
  - Dixie-Jeep 138 kV line
  - Dixie-Jackman 138 kV line
  - One (1) 138/69 kV transformer
  - Two (2) load connection 138-12.5 kV transformers and a mobile 28 MVAR cap bank

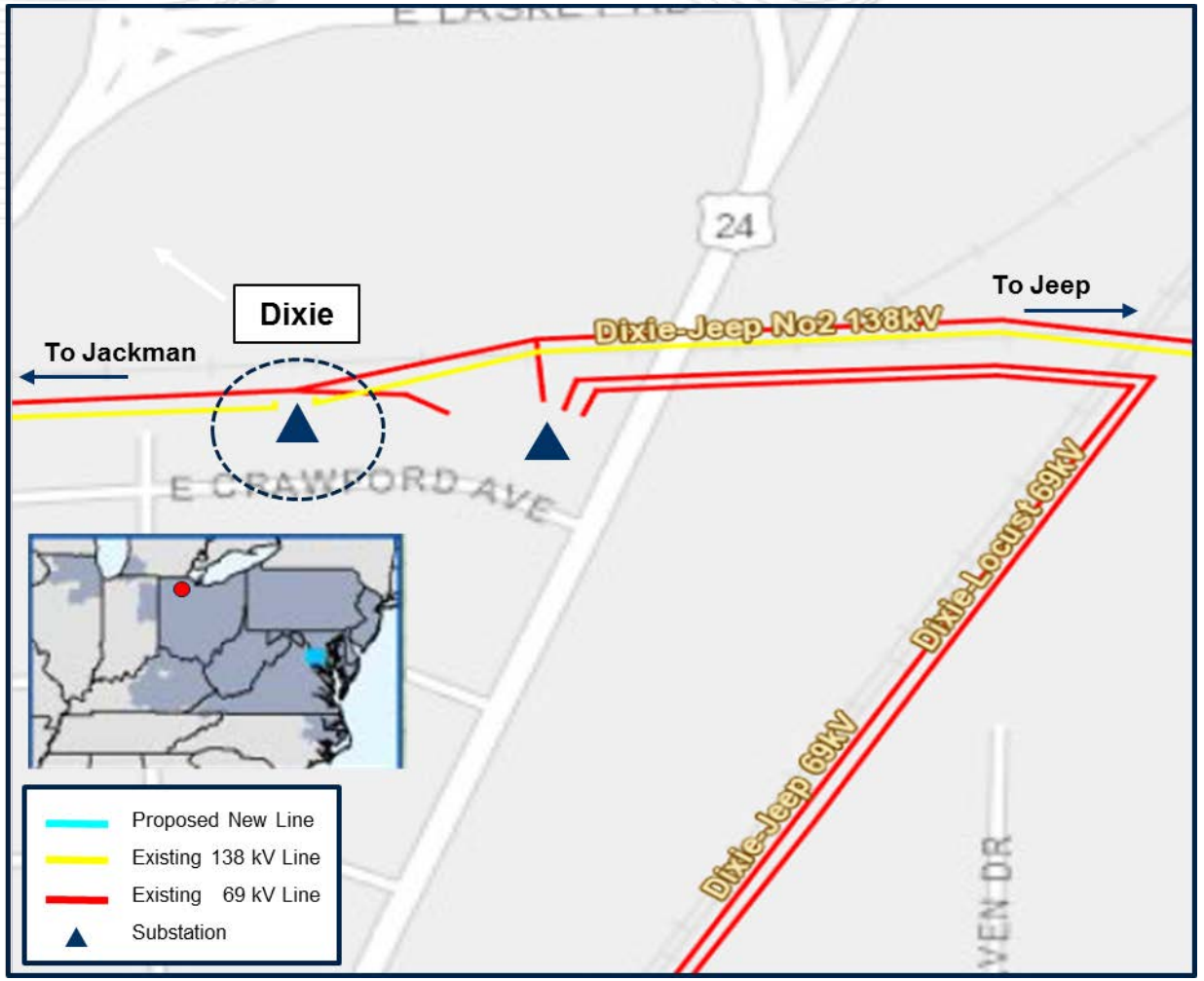
Alternatives Considered:

Build second Dixie-Jackman 138kV line

Estimated Project Cost: $7.7M

Projected IS Date: 6/1/2020

Status: Engineering



ATSI Transmission Zone: Supplemental
Darrow 138 kV Ring Bus Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approximately 65 MWs) under contingency conditions.
- Eliminate the loss of three or more network elements under contingency conditions.
  —Darrow transformer #1, transformer #2 and 138 kV Bus for a P1 / P2 contingency.
- Mitigate non-planning criteria thermal concerns on the < 100 kV system under contingency (P6) conditions.
  - *Loss of Hanna-Shalersville 138 kV and Darrow 138kV bus, breaker or transformer failure.*
  - *Results in potential thermal overload (Approximately 102% of its 92 MVA SE rating) on the Kent-Ravenna 69 kV Line.*

Potential Solution:

Darrow 138 kV Ring Bus Project

- Expand the existing 138 kV substation at Darrow to a 5-breaker (future 6 breaker) ring bus.
- Reconfigure Darrow substation to include terminals for:
  Darrow-Hudson Muni 138 kV line, Darrow-Brady 138 kV line & Darrow-Terex 138 kV line
  Two (2) 138/69 kV transformers

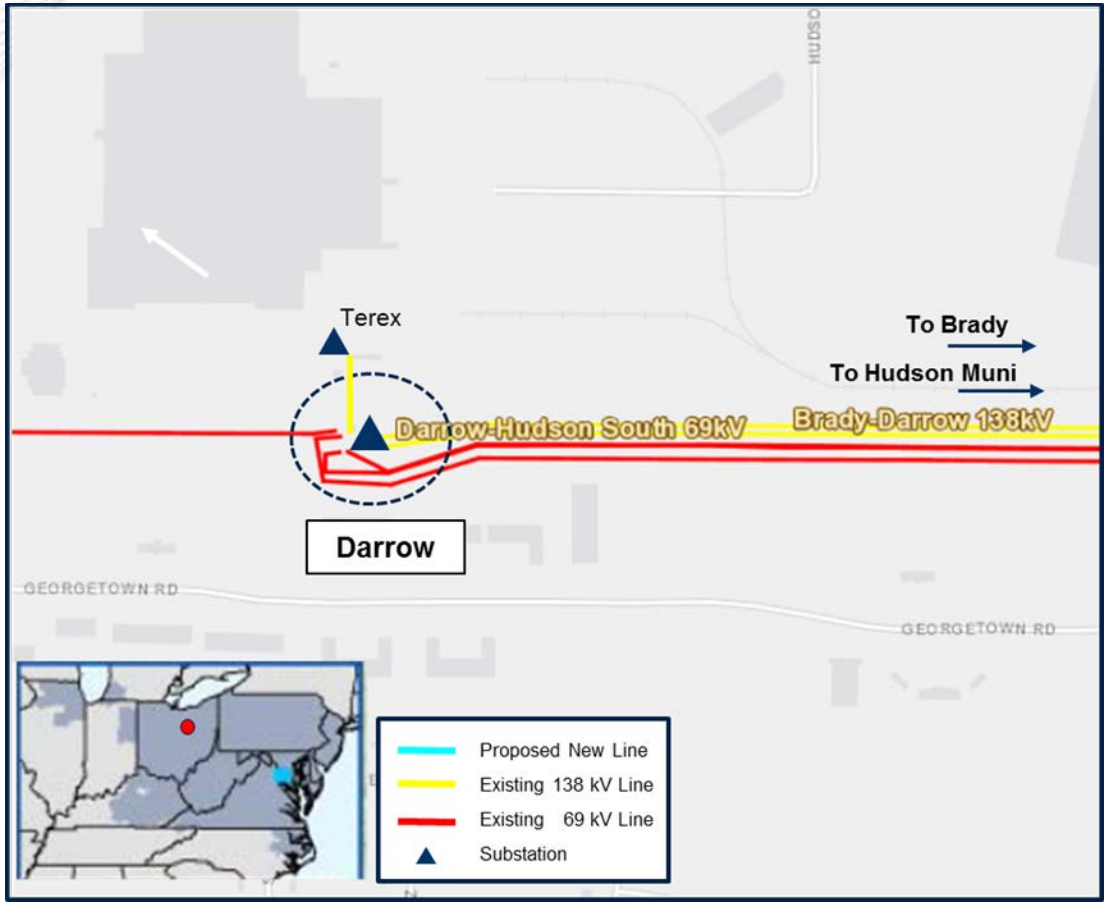
Alternatives Considered:

Install high side breakers on 138/69 kV transformers.

Estimated Project Cost: $8.1M

Projected IS Date: 5/23/2020

Status: Engineering



ATSI Transmission Zone: Supplemental
Aetna 138 kV Ring Bus Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approximately 28 MWs) under P1 contingency loss of the radial West Akron-Aetna 138kV line; provide additional load and voltage support for the Akron downtown 23 kV system.

Potential Solution:

Aetna 138 kV Ring Bus Project

- Network radial 138 kV line feed into planning area.
- Expand the existing 138 kV substation at Aetna to a 5-breaker (future 6 breaker) ring bus; extend the Babb-Evans 138 kV line approximately 0.1 miles as a double circuit in/out of Aetna substation.
- Reconfigure Aetna substation to include terminals for:
  - Aetna-West Akron 138 kV line
  - Aetna-Babb 138 kV line
  - Aetna-Evans 138 kV line
  - One (1) 138-23 kV transformer and one (1) 138/22.86 kV transformer.

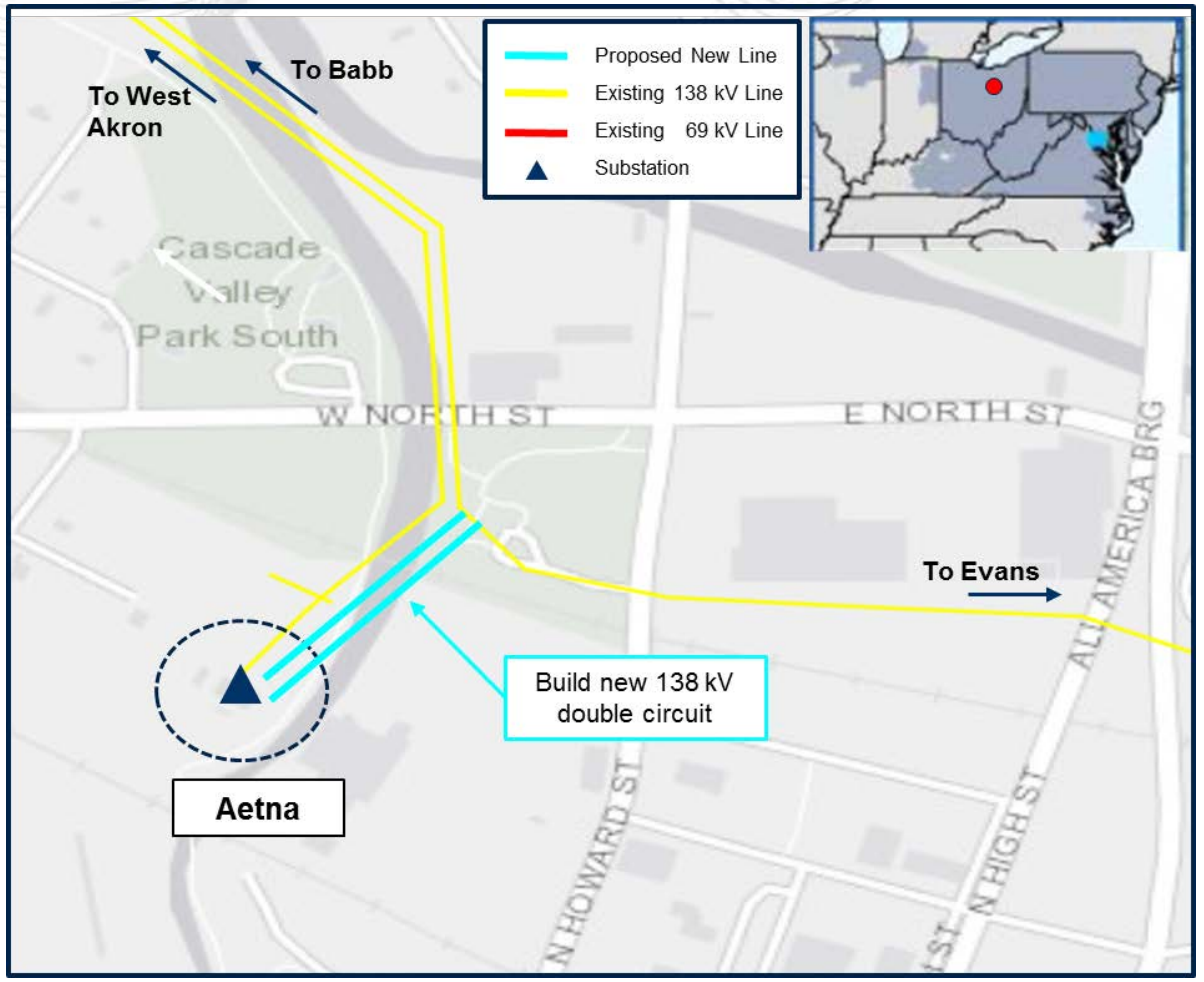
Alternatives Considered:

Maintain existing configuration.

Estimated Project Cost: $6.5M

Projected IS Date: 12/31/2021

Status: Conceptual



ATSI Transmission Zone: Supplemental
Seville 69 kV Ring Bus Project

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce the amount of local load loss (Approximately 30 MWs) under P1 contingency loss of the radial Star-Rittman 69kV line

Potential Solution:

Seville 69 kV Ring Bus Project

- Network radial 69 kV line feed into planning area.
- Expand the existing 138/69 kV substation at Seville to a 4-breaker 69 kV ring bus; extend the Seville-Star 69 kV line (Approximately 300 feet) into Seville substation.
- Add a 138 kV circuit breaker to the existing 138/69 kV transformer.
- Replace mobile capacitor bank with permanent capacitor bank.
- Reconfigure Seville substation to include terminals for:
  - Seville-Homer 69 kV line
  - Seville-Star 69 kV line
  - One (1) 69 kV capacitor bank

Alternatives Considered:

Maintain existing configuration.

Estimated Project Cost: $4.4M

Projected IS Date: 12/31/2020

Status: Conceptual

ATSI Transmission Zone: Supplemental
Rebuild Beaver-Wellington 138 kV line to 138 kV double circuit

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss under contingency conditions.
- Mitigate non-planning criteria voltage concerns on the < 100 kV system under contingency (P2 / P6) condition; radial Brookside-Wellington 138 kV line feeds Wellington substation; loss of source for 69 kV system at Wellington and Brookside substations.
  - *Loss of Brookside-Wellington 138 kV line via Brookside line, stuck breaker, or bus outage.*
  - *Results in potential low voltage (0.83 p.u.) on the Wellington 69 kV system*

Potential Solution:

Rebuild Beaver-Wellington 138 kV line to 138 kV double circuit

- Rebuild a part of the existing 138 kV line as a double circuit (~ 4 miles).
- Unbundle existing 138 kV six-wire to make two circuits on remaining sections (~ 12 miles).
- Move existing 69 kV circuit from existing 138 kV tower line to a new 69 kV line in existing ROW (~ 3 miles)
- Build 2nd 138 kV line tap to Wellington substation on new pole structures (~ 4 miles).
- Create 138 kV 4-Breaker Ring Bus at Wellington substation.
- Add 2nd 138/69 kV transformer at Wellington substation.
- Expand 69 kV breaker configuration to accommodate the new 138/69 kV transformer and line exits.

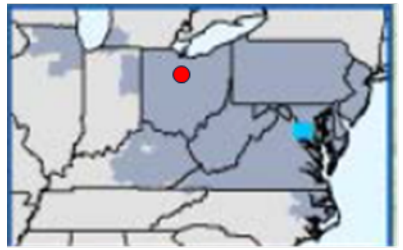
Alternatives Considered:

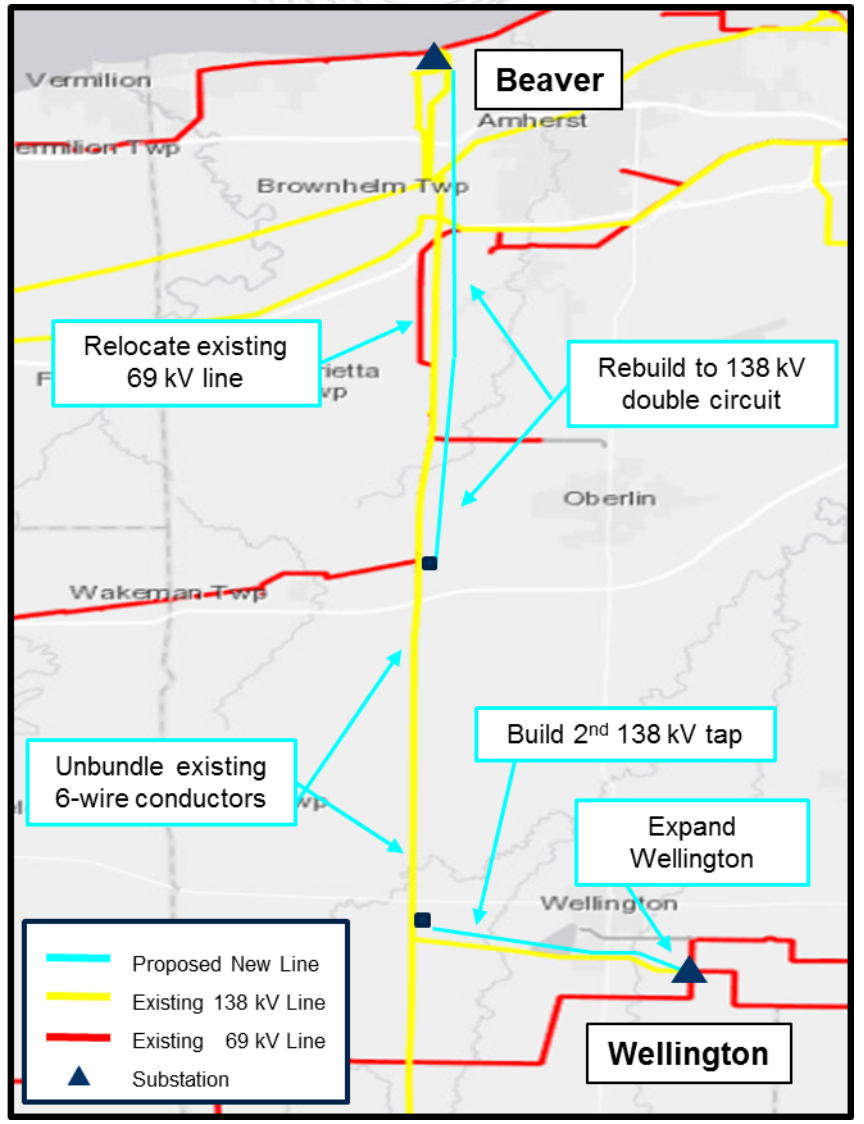
Maintain existing condition

Estimated Project Cost: $20M

Projected IS Date: 12/31/2020

Status: Engineering





ATSI Transmission Zone: Supplemental
Shenango 69 kV Switching Station

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss (Approximately 35 MWs worse case) under multiple (P1) contingency conditions on the 69 kV system.
  - Loss of the Cedar Street-Cascade (Walmo) 69 kV normally open radial line.
- Improve relay coordination and network normally open 69 kV lines.

Potential Solution:

Shenango 69 kV Switching Station

- Network radial 69 kV system by constructing two double circuit 477 ACSR 69 kV lines (~ 1.2 miles) to create four (4) new 69 kV circuits from the new Shenango 69 kV station
  - Shenango-Masury 69 kV line
  - Shenango-Sharon 69 kV line
  - Shenango-Cedar Street #1 69 kV line
  - Shenango-Cedar Street #2 69 kV line
- Install two (2) 138/69 kV transformers at Shenango.
- Expand Shenango substation to create a six (6) breaker 69 kV ring bus.

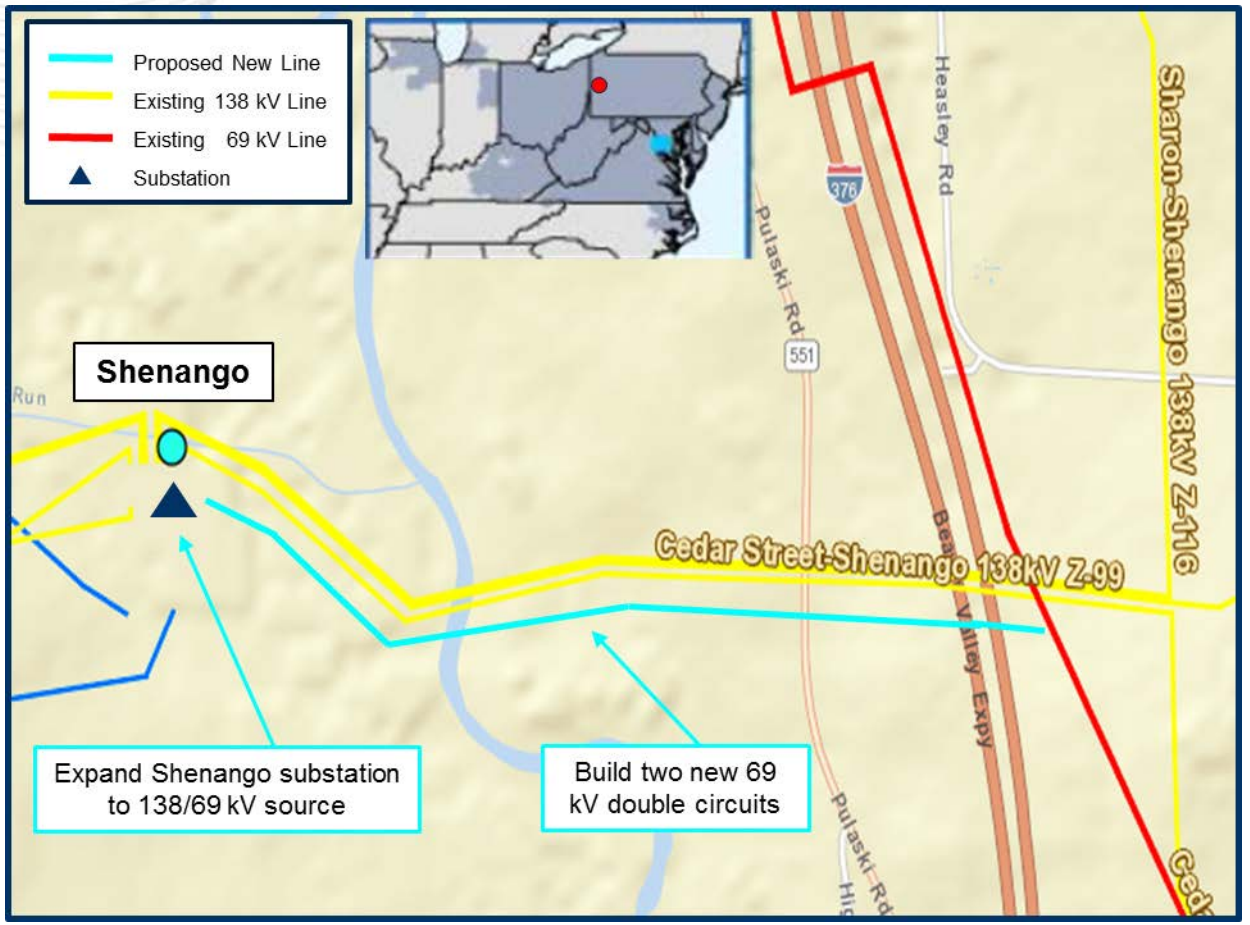
Alternatives Considered:

Maintain existing system configuration.

Estimated Project Cost: $16.3M

Projected IS Date: 12/31/2021

Status: Conceptual



ATSI Transmission Zone: Supplemental
Pine-Cranberry #3 138 kV Line

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss under contingency conditions.
- Resolve PJM issued PCLLRWs for the local area.
- Mitigate non-planning criteria voltage concerns on the < 100 kV system under contingency (P2 / P6) condition.
  - *Loss of Cranberry-Pine #1 and #2 138 kV lines into Pine substation*
  - *Results in potential local voltage collapse on the Pine 69kV system and increases thermal loading on the Maple-Pine 69kV support line.*

Potential Solution:

Pine-Cranberry #3 138 kV Line

- Convert Pine substation into a breaker and a half configuration and allow for new 138 kV line terminal
- Extend existing Cranberry 138 kV breaker and a half scheme to allow for a new 138 kV line terminal
- Build 138 kV Line (477 ACSR) within the Cabot-Cranberry 500 kV line ROW (~ 4.0 miles)
- Build 138 kV Line (477 ACSR) on the existing Maple-Pine 69 kV line open tower position.(~ 7.0 miles)

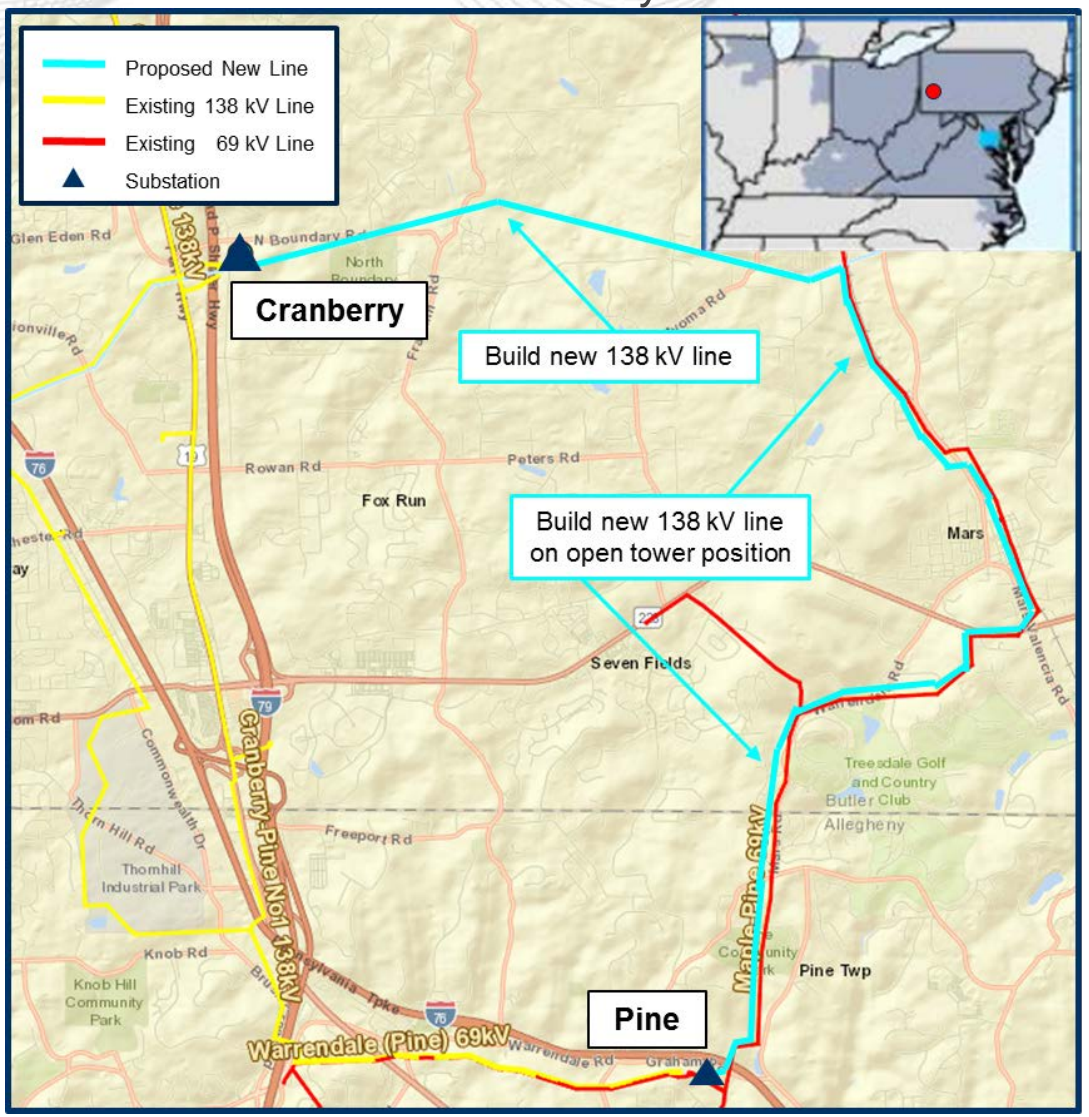
Alternatives Considered:

Convert Pine to breaker and a half.

Estimated Project Cost: $27.0M

Projected IS Date: 05/23/2021

Status: Conceptual



ATSI Transmission Zone: Supplemental
New Ashland 138/69 kV Substation

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts
- Reduce amount of potential local load loss (Approximately 78 MWs) under contingency conditions
- Mitigate non-planning criteria voltage concerns on the < 100 kV system under contingency (P2) conditions.
  - *Loss of Brookside 138 kV bus or 138 kV stuck breaker.*
  - *Results in potential local voltage collapse on the Brookside 69 kV system.*

Potential Solution:

New Ashland 138/69 kV Substation

- Build new Ashland 138/69 kV substation
- Network radial 69 kV system new Ashland 138/69 kV station
- Configure Ashland substation to include terminals for:
  - Ashland – Brookside 138 kV and Ashland – Howard 138 kV lines
  - Ashland – Dell (Brookside) 69 kV Line,
  - Ashland – Fairview (Brookside) 69 kV Line,
  - Ashland – Hale (Brookside) 69 kV Line

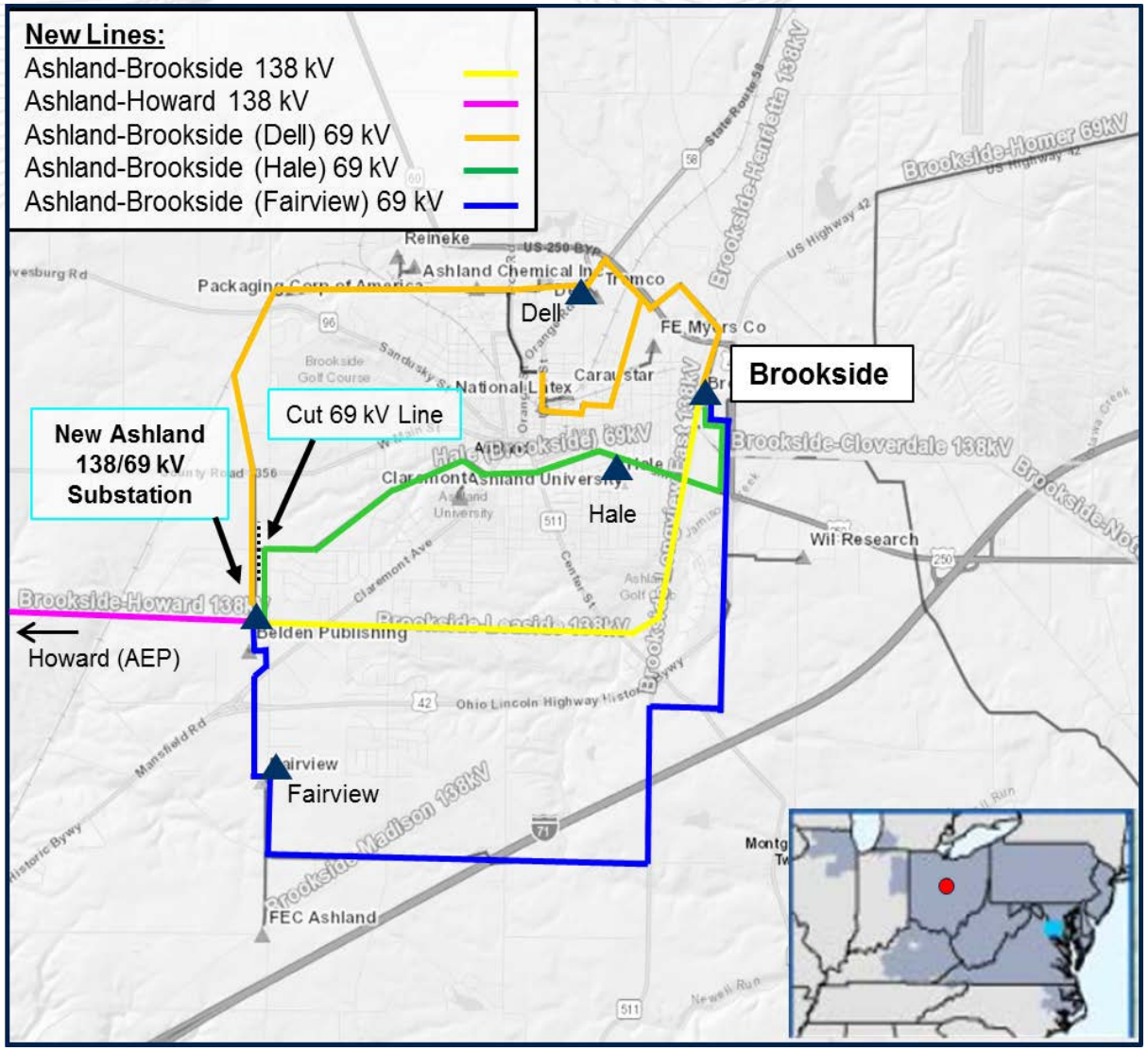
Alternatives Considered:

- Rebuild Brookside Substation to breaker and a half.
- Add capacitor bank at Brookside 69 kV substation for pre-contingency switching

Estimated Project Cost: $12.9M

Projected IS Date: 08/28/2020

Status: Conceptual



ATSI Transmission Zone: Supplemental
Columbiana-State 69 kV line rebuild

Problem Statement (Scope and Need/Drivers):

Equipment Material Condition, Performance and Risk

- Improve system reliability and performance
- Remove obsolete and deteriorated equipment.
  - 61 year old construction
  - 88% Inspection rejection rate.
  - Approximately 16 repair records over the past 3 years.
- Upgrade to current standards

Potential Solution:

Columbiana-State 69 kV line rebuild

- Rebuild the existing Columbiana-State Line 69 kV line (Approximately 19 miles).
- Existing Conductor: Mixed conductor 336 ACSR & 605 ACSR
- Future Conductor: 477 ACSR
- Old Rating 71 MVA SN New Rating 100 MVA SN
- Replace line switches as necessary

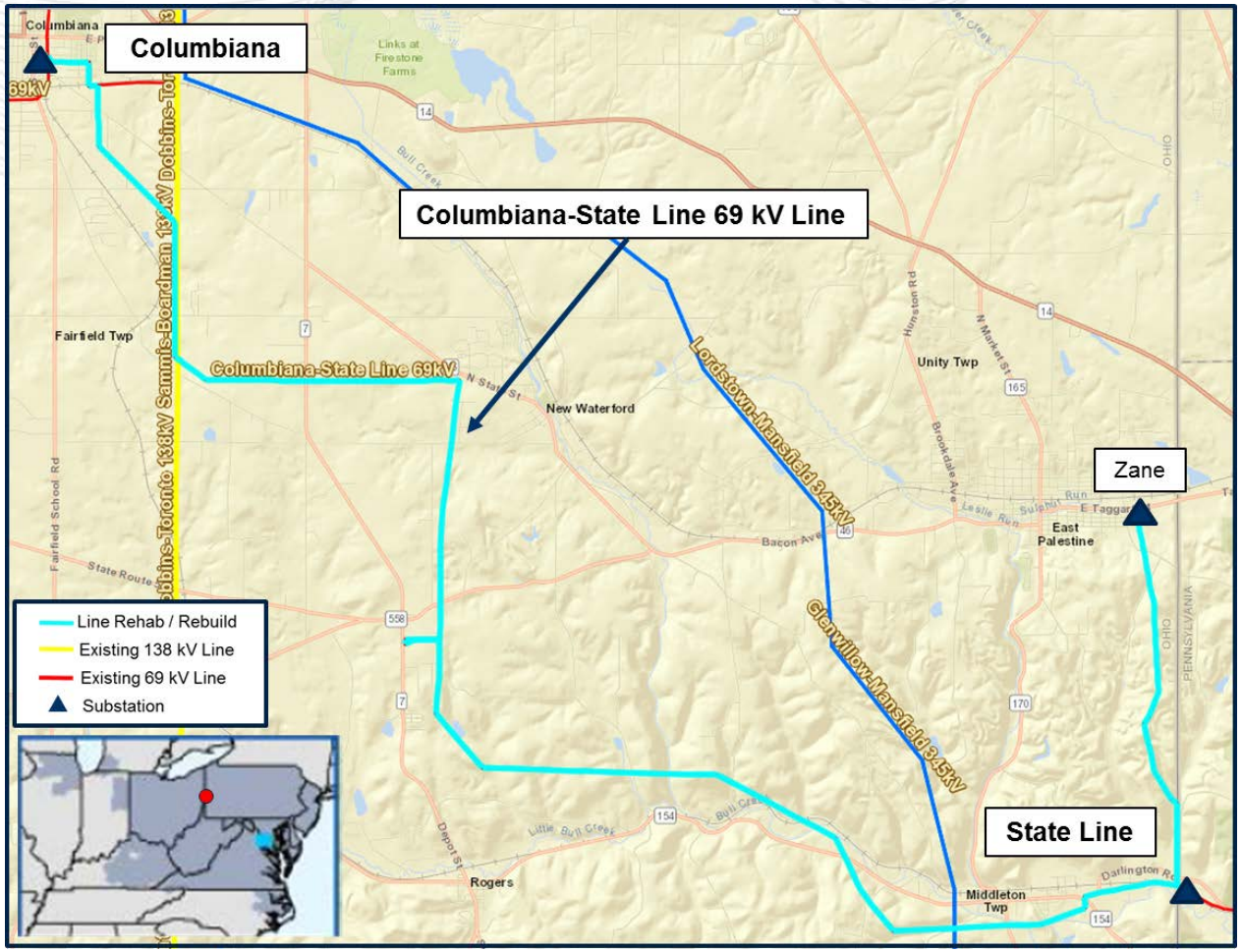
Alternatives Considered:

- Maintain existing condition; increasing maintenance costs

Estimated Project Cost: $16.7M

Projected IS Date: 12/31/2020

Status: Engineering



ATSI Transmission Zone: Supplemental
New Castle-State 69 kV line rebuild

Problem Statement (Scope and Need/Drivers):

Equipment Material Condition, Performance and Risk

- Improve system reliability and performance
- Remove obsolete and deteriorated equipment.
  - 64 year old construction.
  - 87% Inspection rejection rate.
  - Six (6) line switches greater than 50 years old.
  - Approximately 20 repair records over the past 4 years.
- Upgrade to current standards

Potential Solution:

New Castle-State 69 kV line rebuild

- Rebuild the existing New Castle-State Line 69 kV line (Approximately 24 miles).
- Existing Conductor: 336 ACSR
- Future Conductor: 477 ACSR
- Old Rating 71 MVA SN New Rating 100 MVA SN
- Replace line switches as necessary

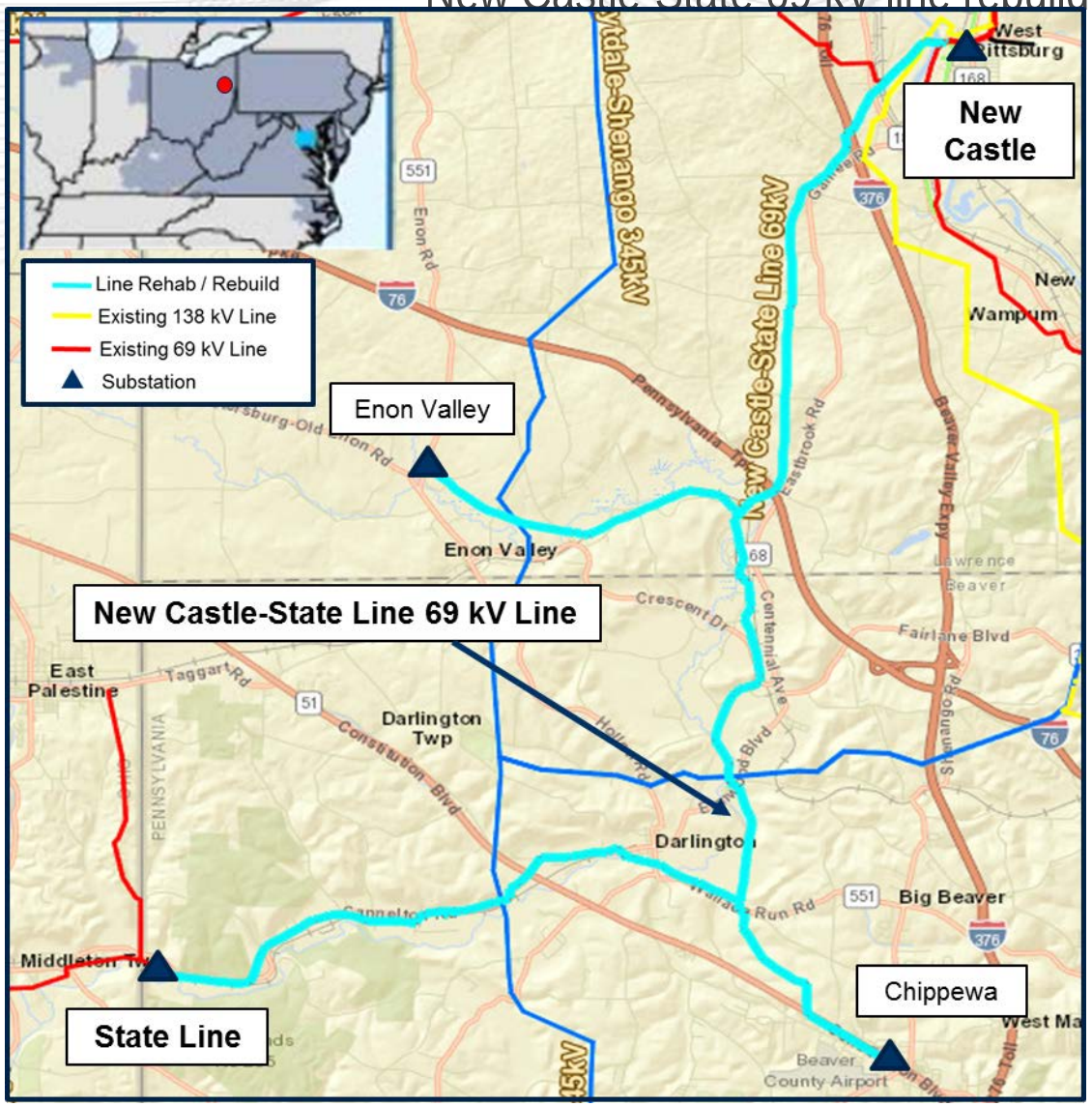
Alternatives Considered:

- Maintain existing condition; increasing maintenance costs.

Estimated Project Cost: $29.2M

Projected IS Date: 12/31/2019

Status: Engineering



ATSI Transmission Zone: Supplemental Chippewa 69 kV Ring Bus

Problem Statement (Scope and Need/Drivers):

Operational Flexibility and Efficiency

- Improve operational flexibility during maintenance and restoration efforts.
- Improve reliability to customers; circuit line exposure is approximately 24 miles.
- Reduce amount of potential local load loss (Approximately 36 MWs) under (P1) contingency conditions.
  - *Loss of the New Castle-State Line 69 kV line.*

Potential Solution:

Chippewa 69 kV Ring Bus

- Construct a 5-breaker ring bus at Chippewa substation
- Install one 12.6 MVAR cap at Chippewa
- Rebuild approximately 2.5 miles of 477 ACSR to double circuit 69 kV line to convert radial tap to networked line and load at Chippewa substation.
- New Castle-State Line 69 kV line is being rebuilt under separate project to 477 ACSR
  - Old Rating 71 MVA SN New Rating 100 MVA SN

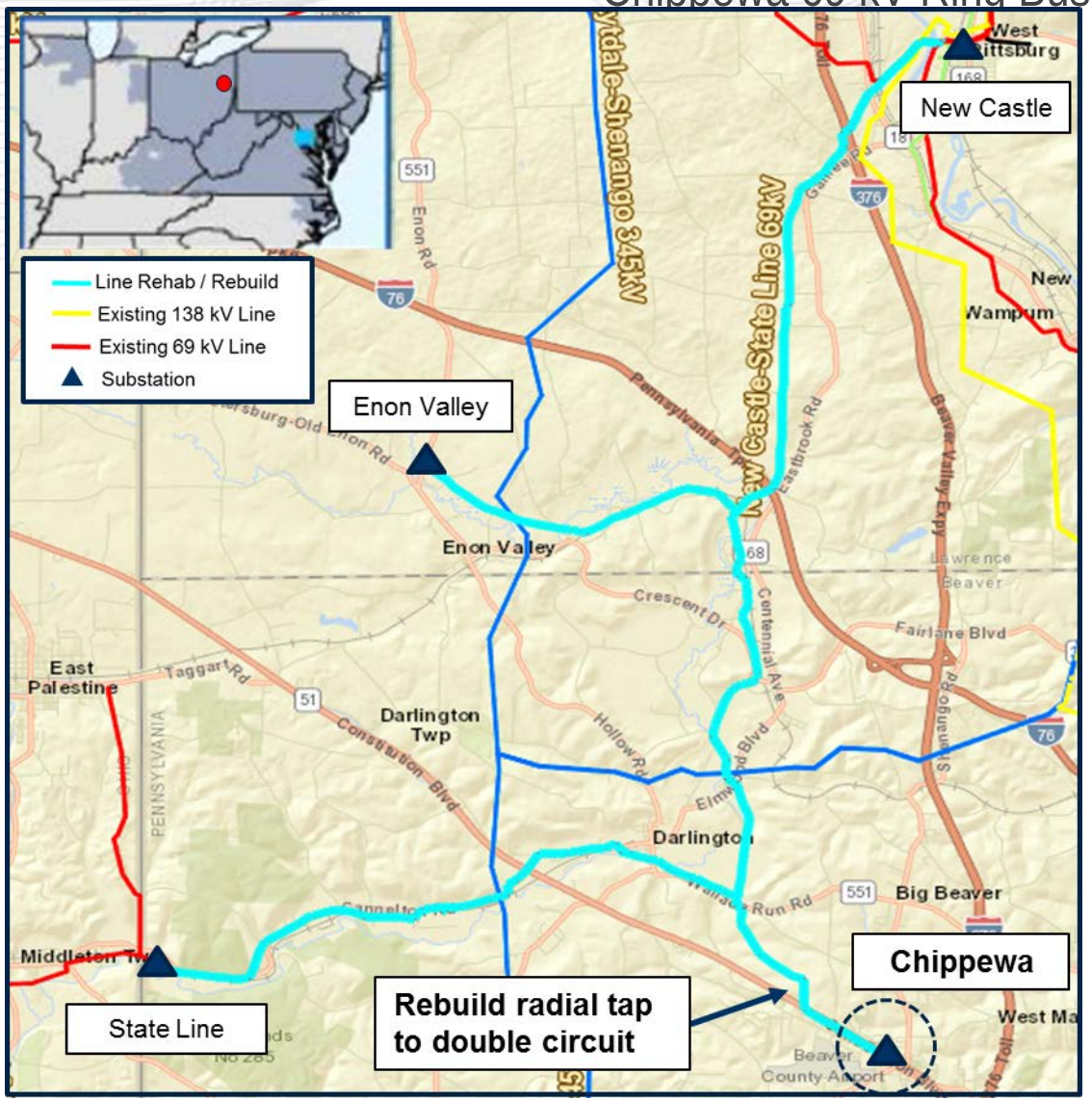
Alternatives Considered:

Maintain existing system configuration

Estimated Project Cost: $9.1M

Projected IS Date: 6/1/2021

Status: Conceptual



ATSI Transmission Zone: Supplemental
Holloway-Nottingham-Knox 138 kV line rebuild

Problem Statement (Scope and Need/Drivers):

Equipment Material Condition, Performance and Risk

- Improve system reliability and performance
- Remove obsolete and deteriorated equipment.
  - 53 to 82 year old construction.
  - 57% Inspection rejection rate.
  - Approximately 29 repair records over the past 3 years; increasing trend
- Upgrade to current standards
- Support shale gas load growth area; multiple (6) transmission service connections.

Potential Solution:

Holloway-Nottingham-Knox 138 kV line rebuild

- Rebuild the existing Knox-Nottingham 138 kV Line (Approximately 44 miles).
- Rebuild the existing Nottingham-Holloway 138 kV Line (Approximately 21 miles)
- Existing Conductor: Mixed conductor 795 ACSR & 477 ACSR
- Future Conductor: 795 ACSR
- Old Rating 158 MVA SN New Rating 275 MVA SN

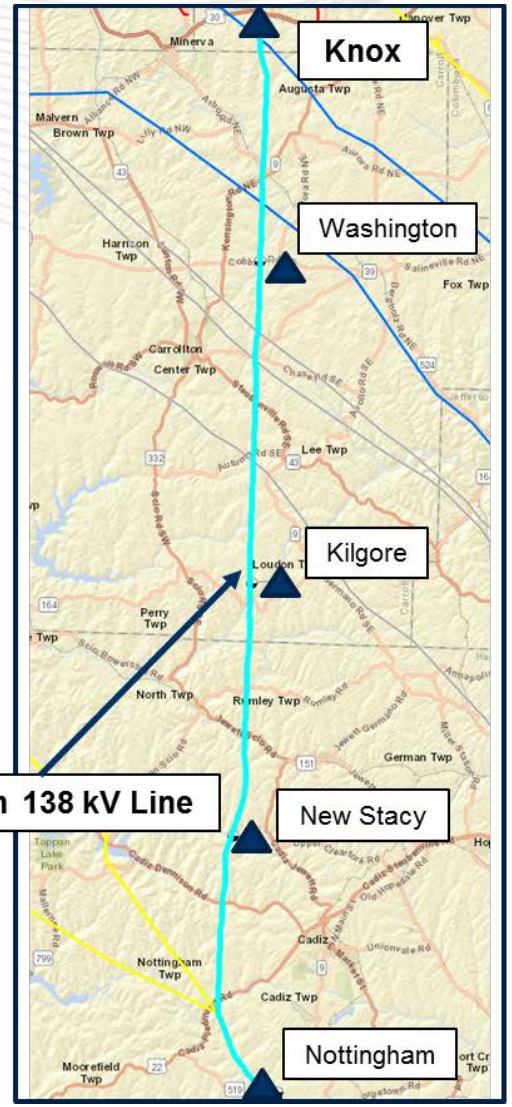
Alternatives Considered:

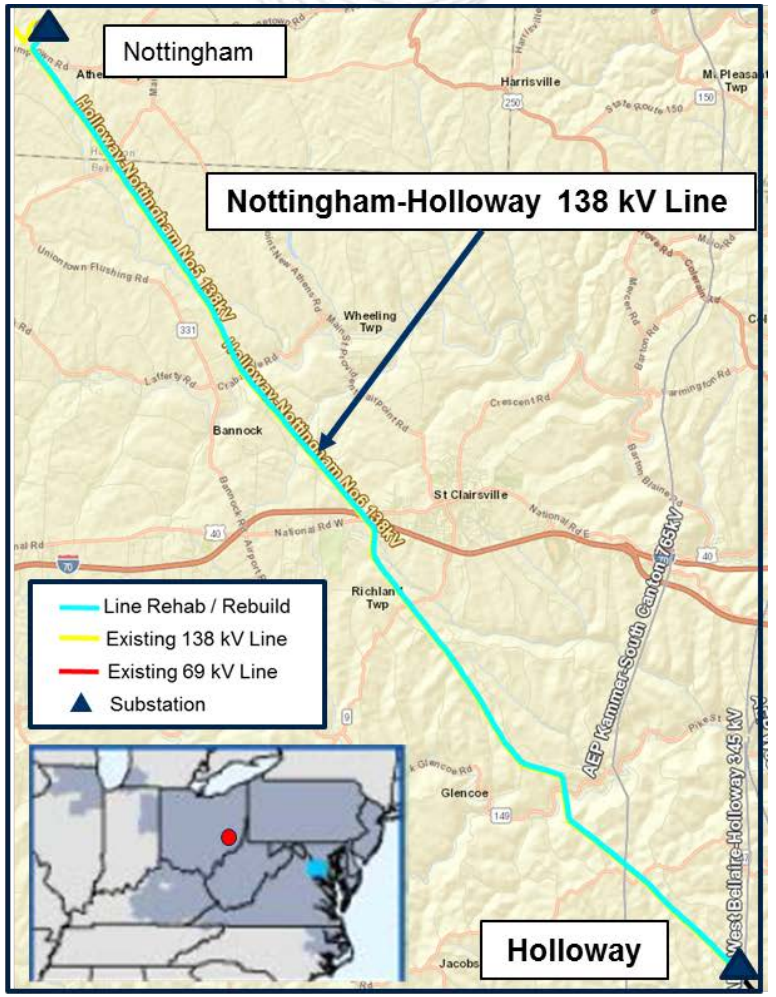
Maintain existing condition.

Estimated Project Cost: $79.9M

Projected IS Date: 06/01/2021

Status: Engineering





Second Review

Baseline Reliability and Supplemental Projects

DEOK Transmission Zone: Supplement
Silver Grove Replace 345/138 kV Transformer

Previously Presented: 7/27/2018 SRRTEP

Problem Statement:
400 MVA TB 23 shows high levels of dissolved combustible gasses. There is no breaker between the high side of TB 23 and the 345kV bus. If TB 23 faults or its low side breaker fails the 345kV circuit between Zimmer, Silver Grove and Red Bank substations is lost. The low side circuit breaker connecting TB 23 to the 138kV bus is oil filled, obsolete and spare parts are no longer available.

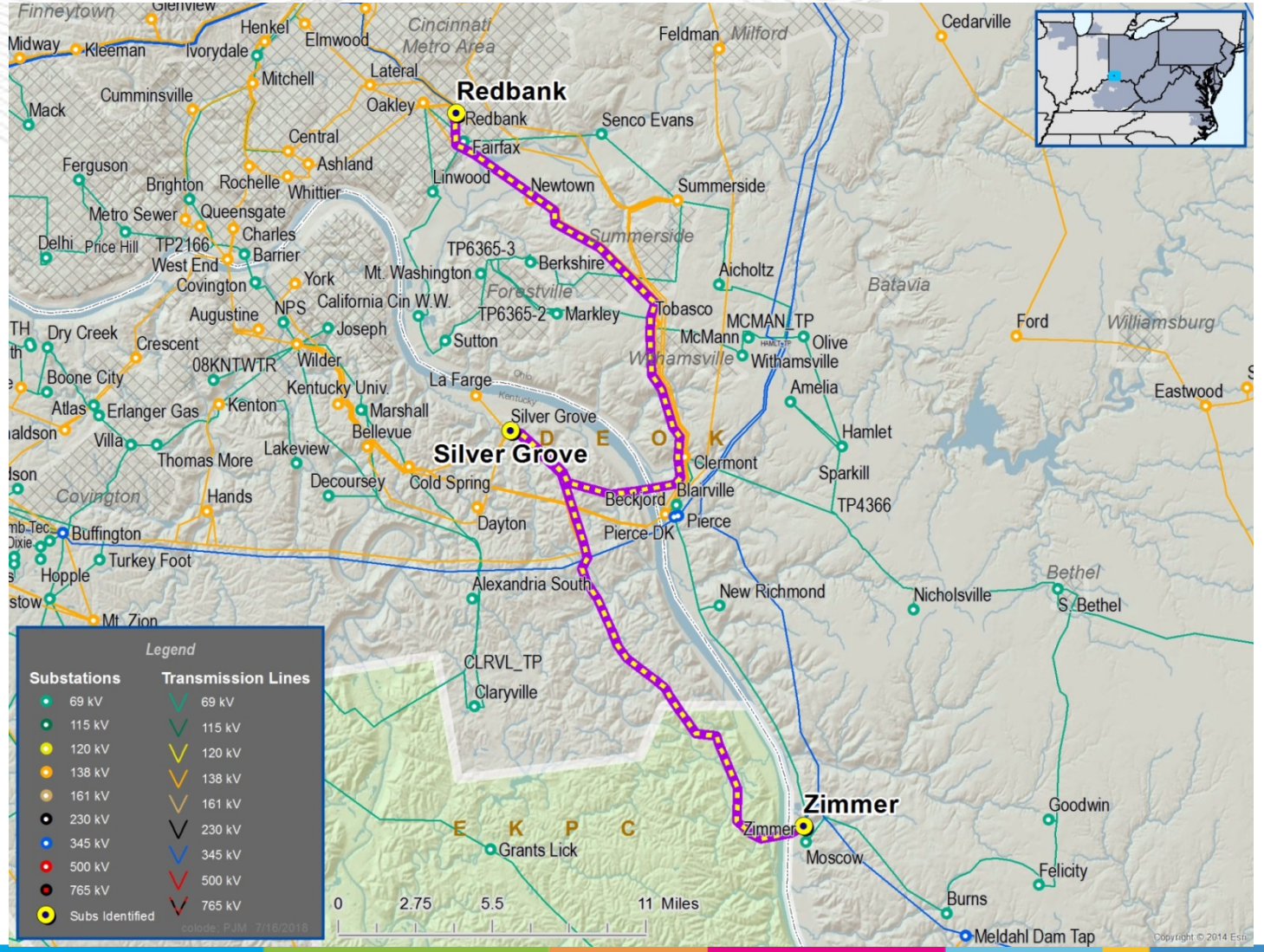
Driver: Equipment Condition, Performance and Risk

Selected Solution:
Replace the Sliver Grove 345/138kV transformer 23 with a transformer of the same capacity, install a circuit breaker on the high side keeping the 345kV circuit in service for the fault or failure, replace the low side circuit breaker. (S1683)

Estimated Cost: $7.8 M

Projected In-service: 12-31-2019

Project Status: Engineering



Previously Presented: 7/27/2018 SRRTEP

Problem Statement (Immediate Need):

Customer Service

- Provide 138 kV service to new customer
- Customer load 14 MW

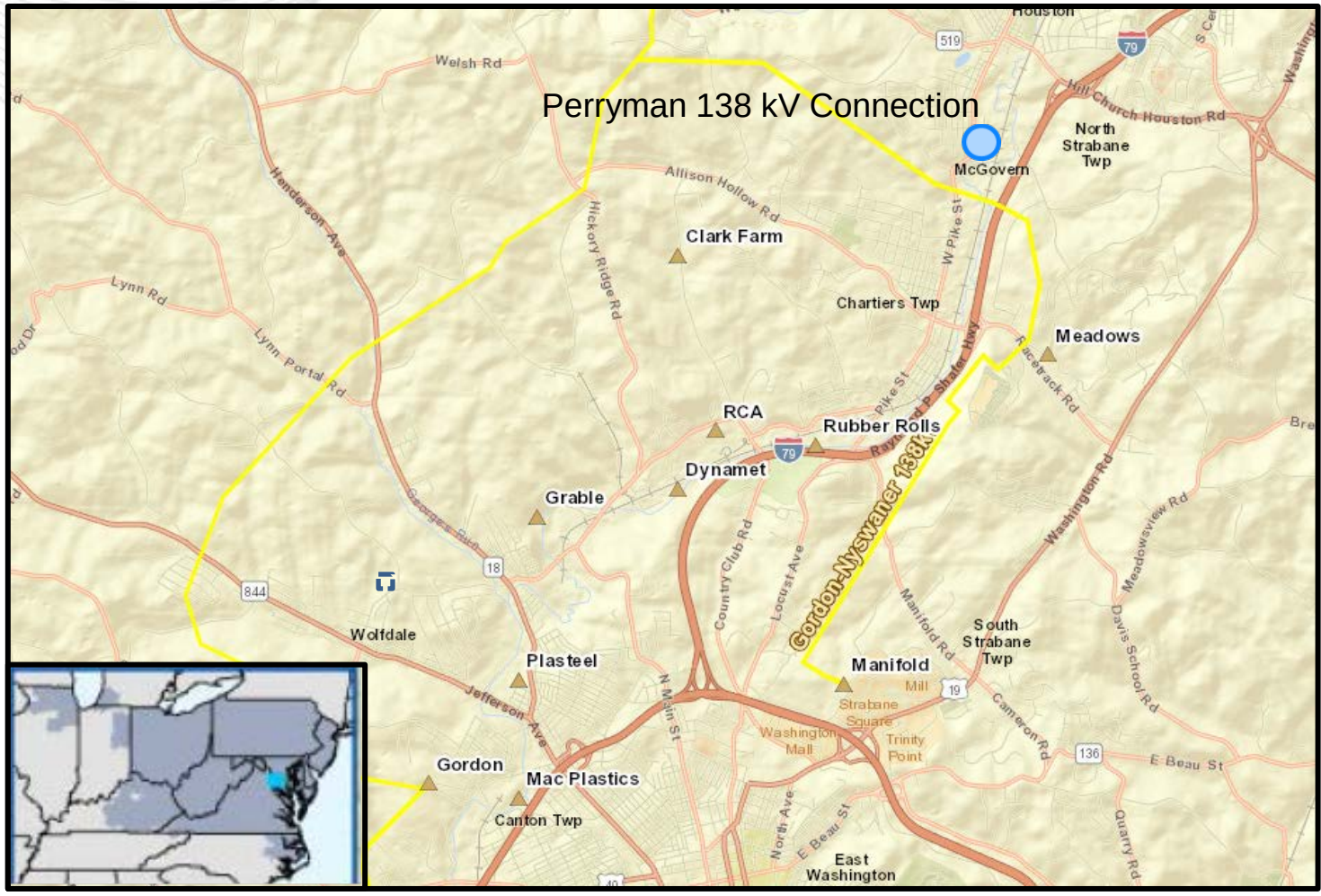
Selected Solution:

Perryman Company- Provide 138 kV Service (S1682)

- Tap the existing Manifold – Gordon 138 kV line.
- Install 2 – 138 kV Line Switches
- Install 138 kV Wavetrap at tap
- Install 138 kV Tap Switch
- Construct ~500 ft of 336 ACSR 138 kV line to Customer Substation
- **Estimated Project Cost:** $0.13 M

Projected IS Date: 9/01/2019

Status: Conceptual



ComEd Transmission Zone: Supplement
Chicago Heights Hardening

Previously Presented: 7/27/2018 SRRTEP

Problem Statement:

2017 emergent project to replace failed 138kV line 11712 breaker moved Chicago Heights transformer 79 from line 11712 to line 7306

Transformer 79 is still connected to a transmission line

Chicago Heights substation is a straight bus with multiple elements on the same bus

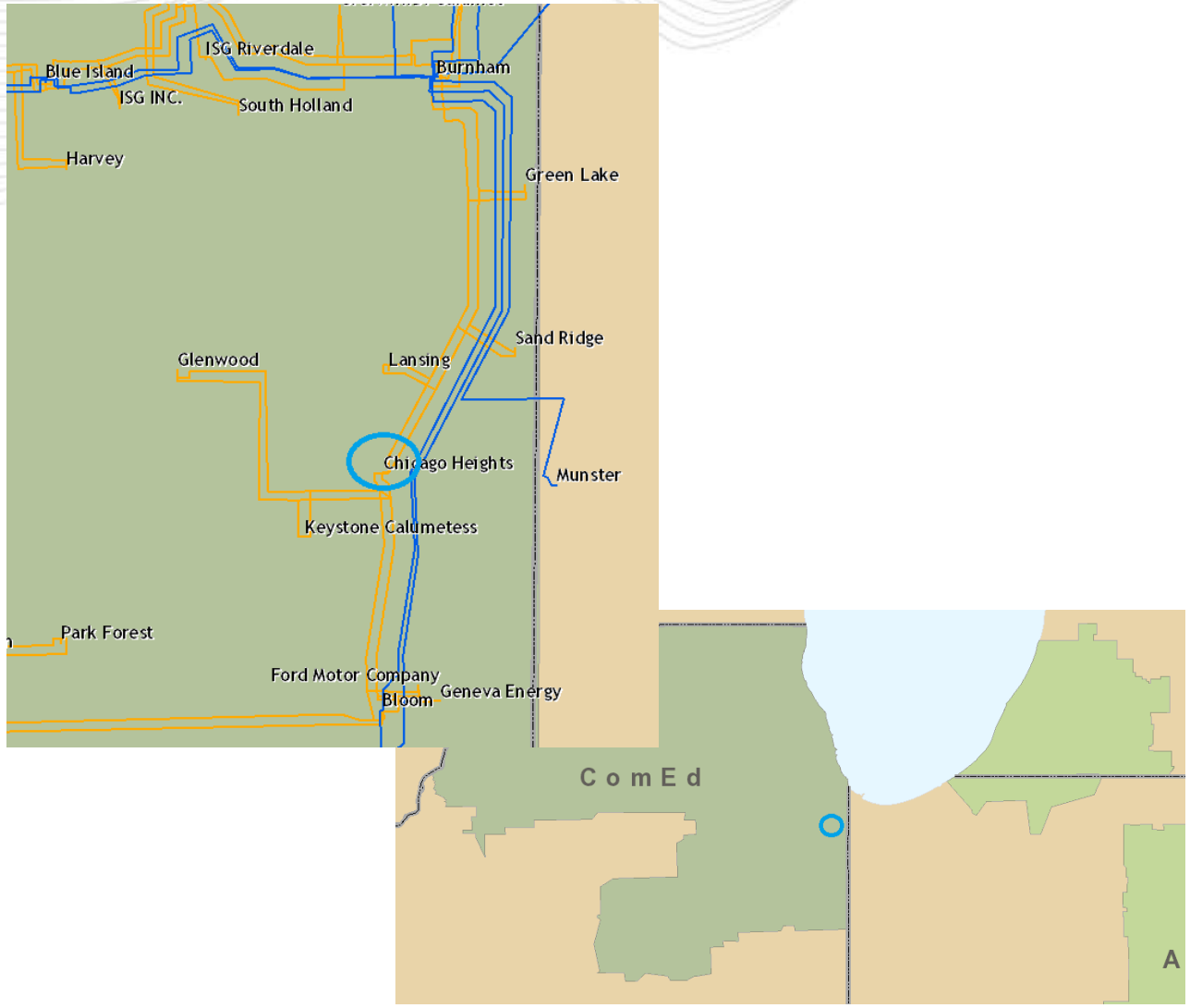
Selected Solution:

Install new 138kV bus tie breaker at Chicago Heights Station and Install new transformer high side breaker and move transformer connection from 138KV line 7306 (from TSS 179 Bloom to TSS 73 Chicago Heights) to the 138kV bus (S1685)

Estimated Cost: $2.25M Transmission cost and $2.25M Distribution cost

Projected In-service: 12/31/2018

Project Status: Engineering



ComEd Transmission Zone: Supplement
Continue Itasca Expansion

Previously Presented: 7/27/2018 SRRTEP

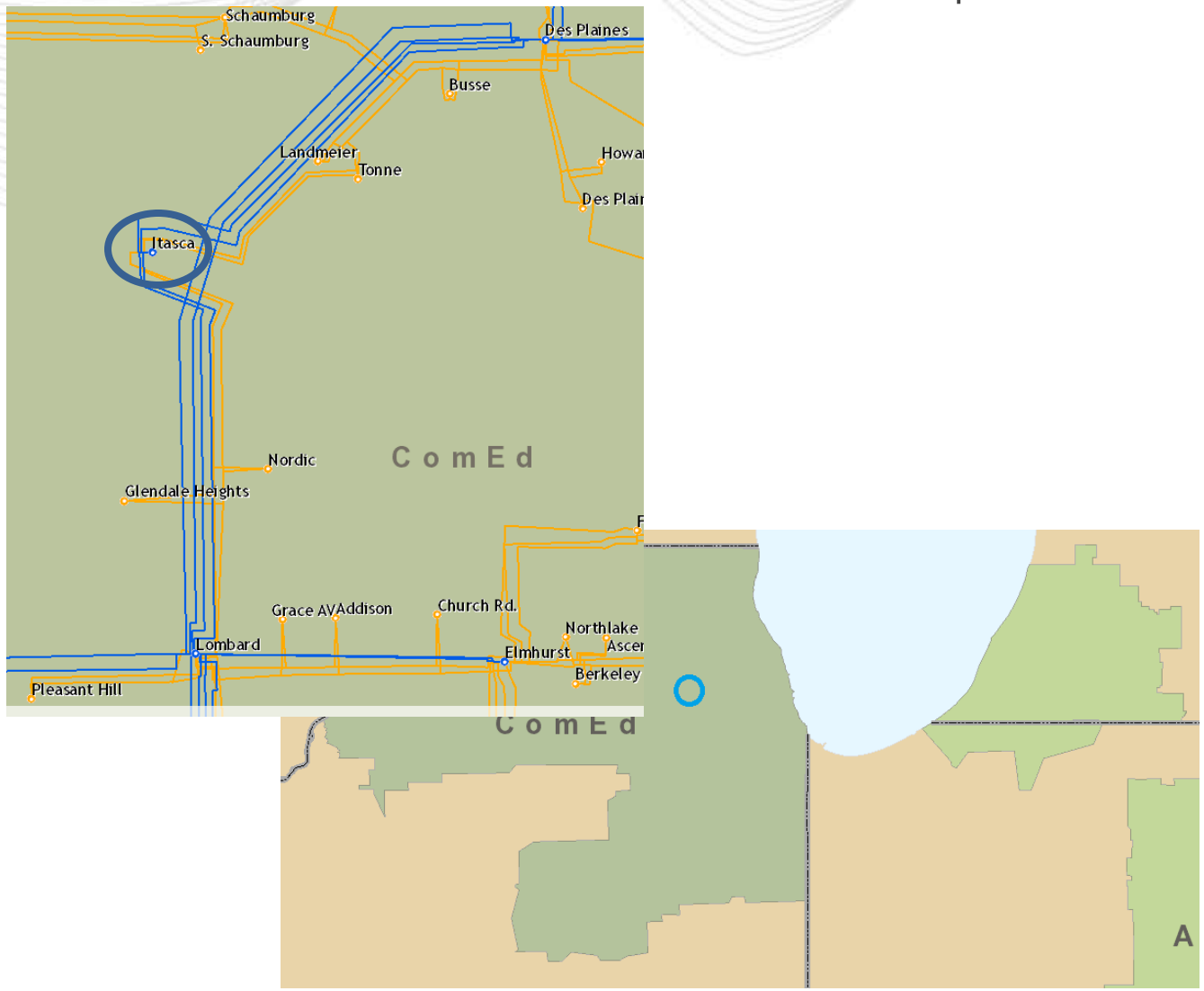
Problem Statement:
Continued load growth in the Elk Grove Village area requires additional 34kV capacity.

Selected Solution:
Install third 138kV to 34kV transformer at Itasca station.
Move 138kV line 12015 (from TSS 120 Lombard to TSS 101 Itasca) to the 138kV Itasca bus extension (S1686)

Estimated Cost: $2.2M Transmission

Projected In-service: 6/1/2019

Project Status: Engineering



AEP Transmission Zone: Supplemental Service to Braidy Aluminum

Previously Presented: 7/27/2018 SRRTEP

Problem Statement:

Customer Service:

Braidy Industries has requested electric service with a peak demand of 60 MW for their Aluminum Mill operation at the EastPark Industrial Center in Boyd County, KY.

Kentucky Power Distribution has requested a new delivery point (Ramey station) to provide load relief to nearby distribution circuits and stations along with a reduction of distribution line exposure.

Kentucky Power Distribution has requested a new delivery point at the proposed Moore Hollow station to serve industrial customers at the EastPark Industrial Center and to reduce exposure on customers served out of the existing Princess station.

Operational Flexibility and Efficiency

The 69/34.5 kV transformer at Princess station utilizes a ground switch MOAB scheme as part of the high side transformer protection.

The 69/12 kV transformer at Hoods Creek station utilizes a ground switch MOAB scheme as part of the high side transformer protection.

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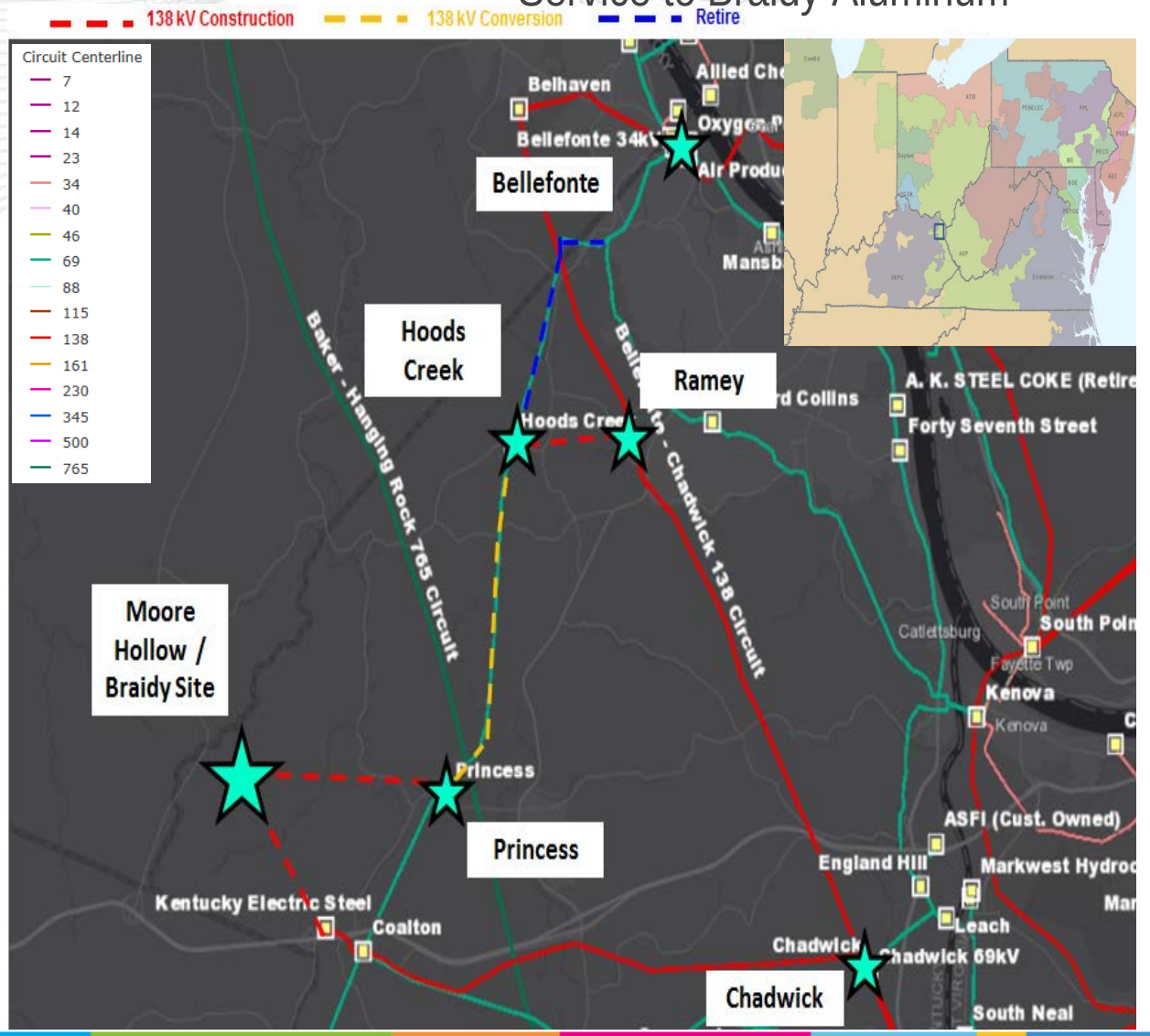

AEP Transmission Zone: Supplemental Service to Braidy Aluminum

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Equipment Material/Condition/Performance/Risk:

The 69/12 kV Transformer #1 at Hoods Creek station is 1969 vintage and is showing dielectric breakdown (insulation), accessory damage (bushings/windings) and short circuit breakdown (due to through faults). Hoods Creek station is comprised of a four pole wood crib design. The wood poles that make up the station show condition issues associated with rot and wood pecker holes. The existing transformer at Hoods Creek is currently sitting on a wood tie foundation.

The 69/34.5 kV Transformer #1 at Princess station is 1962 vintage and is showing dielectric breakdown (insulation), accessory damage (bushings/windings) and short circuit breakdown (due to through faults). The existing transformer at Princess station is currently sitting on a wood tie foundation.

The 69 kV circuit breaker 'Z' at Bellefonte is an FK oil type breaker that was manufactured in 1971. 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. Bellefonte breaker 'Z' has experienced 17 fault operations respectively. The manufacturer's recommendation for this type of breaker is 10.

The 34.5 kV circuit breakers 'A' and 'B' at Princess station are VWVE oil type breakers manufactured in 1992. VWVE breakers carry similar concerns to those of the FK breaker listed above. Princess circuit breakers 'A' and 'B' have experienced 66 and 36 fault operations respectively. The manufacturer's recommendation for this type of breaker is 20. S&C circuit switcher 'AA' at Princess station is an S&C 2030 type with no gas monitor, sister units on the AEP system have a history of gas loss, interrupter failures, and operating mechanism failures.

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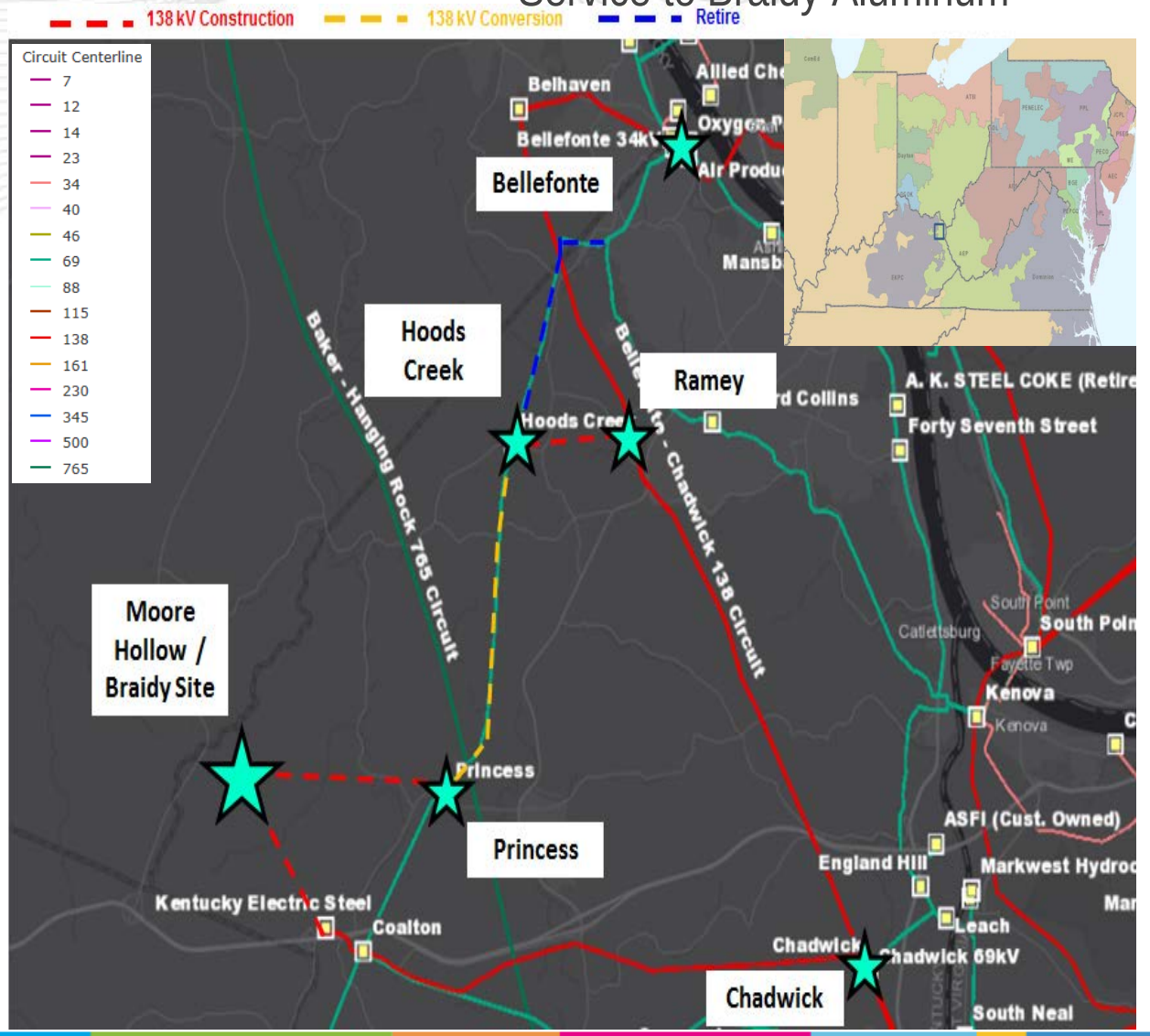

AEP Transmission Zone: Supplemental Service to Braidy Aluminum

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Selected Solution

Construct a new greenfield station named Moore Hollow. Six 138 kV CBs (3000 A 40 kA) will be installed as well as a 138/34.5 kV transformer (30 MVA) and a 57.6 MVAR capacitor at the station. (S1687.1) Estimated Cost: $ 13.6M

Construct a 2.7 mile 138 kV line extension between Moore Hollow and Kentucky Electric Steel. At this time the existing KES metering structure will be retired due to the announced closure of the KES plant. (S1687.2) Estimated Cost: $ 8.4M

At Chadwick Station, remote end relaying work will be required. (S1687.3) Estimated Cost: $0.4M

Construct a new greenfield station, named Ramey, tapping the Bellefonte – Grangston 138 kV circuit. Four 138 kV CBs (3000 A 40 kA) will be installed as well as a 138/12kV XF (25 MVA). AEP already owns the land at the proposed Ramey station site. (S1687.4) Estimated Cost: $ 0M

Construct a new 2.8 mile 138 kV extension from Ramey to the existing Bellefonte – Coalton line. (S1687.5) Estimated Cost: $10.5M

Convert the existing Bellefonte to Coalton 69 kV line between Bellefonte and Princess to 138 kV (line is built to 138 kV standards). (S1687.6) Estimated Cost: $3.8M

Retire CB 'Z' at Bellefonte station. (S1687.7) Estimated Cost: $0.1M

Convert Hoods Creek station to 138 kV by rebuilding the station in the adjacent lot with a 138/12 kV XF. (S1687.8) Estimated Cost: $ 0M

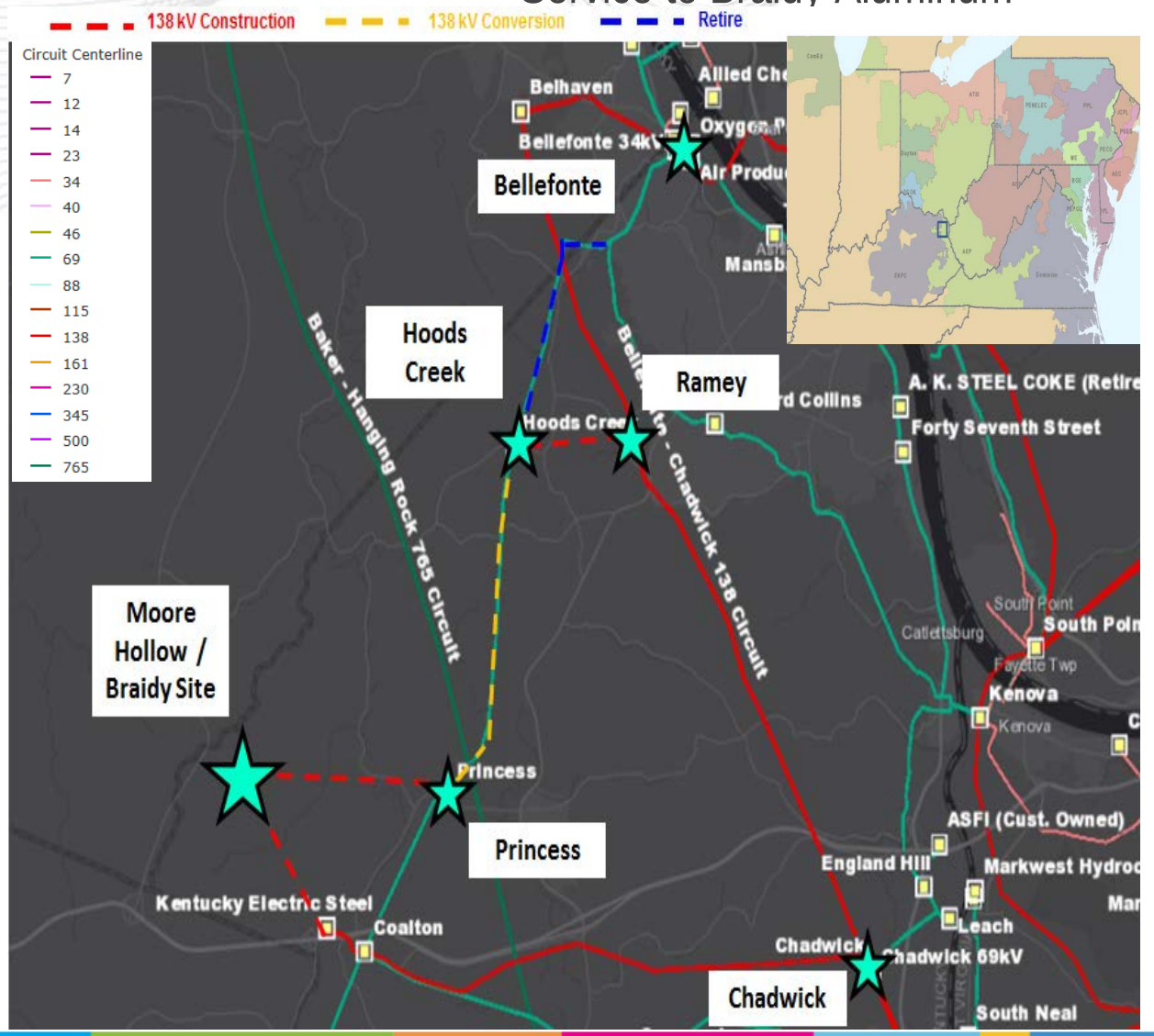
Convert Princess station to 138 kV by installing five 138 kV CBs (3000 A 40 kA), a 138/69 kV XF (to Coalton), and a 138/34.5 kV XF. (S1687.9) Estimated Cost: $5.7M

Construct 3.4 mile 138 kV line between Princess and Moore Hollow stations. (S1687.10) Estimated Cost: $11.5M

Total Estimated Transmission Cost: $54M - $63.4M

Projected In-service: 12/1/2021

Project Status: Scoping



AEP Transmission Zone: Supplemental Hammondsville 69kV Station Upgrades

Previously Presented: 7/27/2018 SRRTEP

Problem Statement:

Equipment Material/Condition/Performance/Risk:

The Hammondsville 69-12kV station is in need of major upgrade, due to the poor condition of the equipment. The station serves as a local hub of the sub-transmission network, with 4- circuit connections. Performing these needed upgrades at the same time as the B2606 baseline project is beneficial from an engineering/construction standpoint.

69kV circuit breakers A, B, & C are oil breakers without oil containment. Oil breaker maintenance has become more difficult in recent years due to the handling requirements and the potential for environmental risks. These 3 breakers are GE 'FK' style, which have been prioritized as needing upgraded, due to subpar reliability and lack of spare parts. The breakers were made between 1969-1975 and have experienced fault operations of 34, 70 and 81, far above the recommended limit of 10.

The station has 46 protective relays, and 41 are in immediate need of replacement (40 electromechanical and 1 static). The relays are more prone to misoperation and lack fault data collection and retention capability. In addition, the current system protection to North Wellsville uses a pilot wire communications scheme (dependent on phone company), which has been in an abnormal state for several years, placing customer load at risk. The protection to South Toronto uses a dated custom high-speed relaying scheme, which is prone to misoperations.

Customer Service:

Hammondsville serves one 69-12kV AEP distribution transformer. The fusing will be replaced with a high-side circuit switcher & relaying, permitting trip and reclose functionality for momentary faults. This will reduce the duration of outages for local customers.

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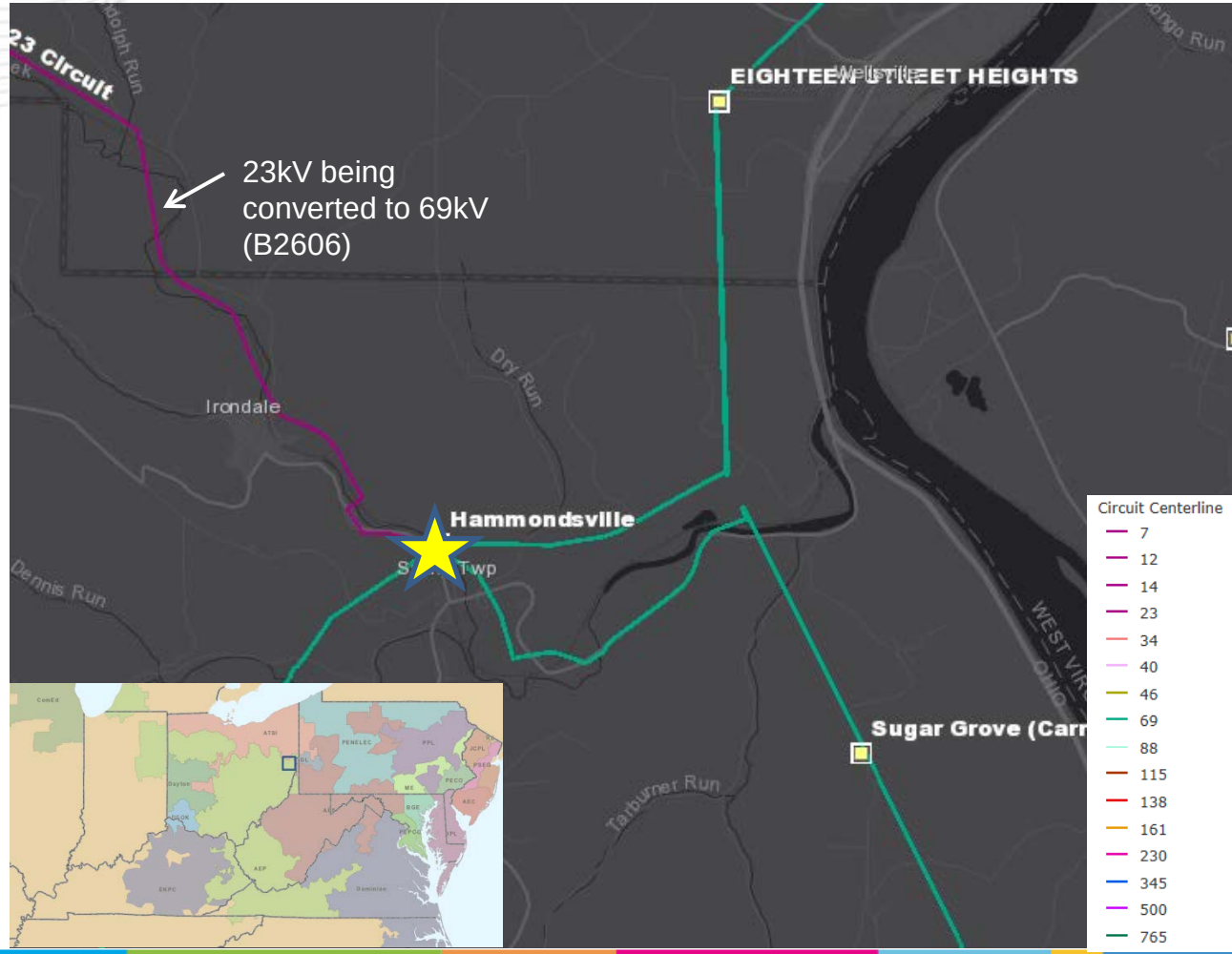

AEP Transmission Zone: Supplemental Hammondsville 69kV Station Upgrades

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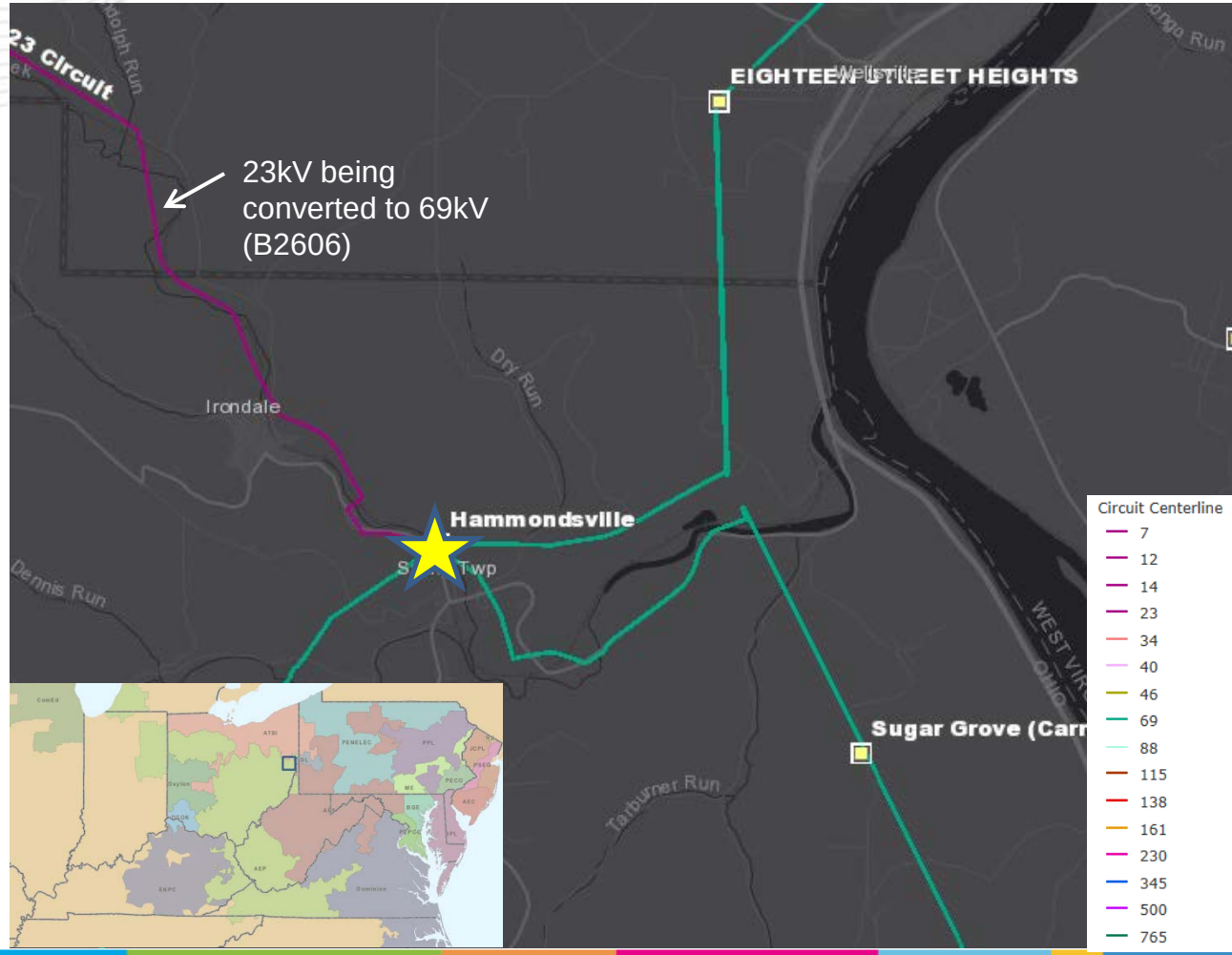
Selected Solution:

At Hammondsville 69kV station: replace 69kV oil circuit breakers A, B, & C with gas breakers, replace disconnect switches & CCVT's; upgrade line relays; upgrade bus differential protection; install a new DICM (old control building to be removed); add SCADA. Replace transformer fuses with a circuit switcher. (S1688)

Estimated Transmission Cost: $3.9 M

Projected In-service: 12/1/2019

Project Status: Scoping



AEP Transmission Zone: Supplemental
Divelbiss 69 kV switching station and Academia station upgrades

Previously Presented: 7/27/2018 SRRTEP

Problem Statement:

Equipment Material/Condition/Performance/Risk:

Academia station 69 kV circuit breakers “A” and “D” are showing signs of deterioration. Circuit breaker “A” has had 115 fault operations and circuit breaker “D” has had 259 fault operations (manufacturer recommended limit is 10). These breakers are oil breakers. Oil breaker maintenance has become more difficult due to the oil handling required to maintain them. Academia station transformer #1 138/69/12 kV is showing significant signs of deterioration. Drivers for replacement include dielectric strength breakdown (winding insulation), short circuit strength breakdown (due to the amount of through fault events), and accessory damage (bushings).

Operational Flexibility and Efficiency:

A scope change is being done to S0770 as Divelbiss (previously know as East Fredericktown Switch). This station will be built into a 69 kV four circuit breaker ring bus versus a 69 kV two circuit breaker box bay configuration as originally proposed. There have been approximately 2 million customer minutes of interruptions. There is approximately 28 MW of load. It is optimal for sectionalizing because this prevents taking out customers or stations unnecessarily. This is also optimal for protection because each line will have its own protection zone. With a single breaker towards a radial circuit, bypasses or outages would be needed to the customers when maintenance is required. With a ring maintenance outages do not require customer outages. This project will replace S0770, which will be cancelled.

S0770 : Replace 69 kV GOAB switch and BOAB switch "W" at East Fredericktown Switch with 69 kV circuit breakers

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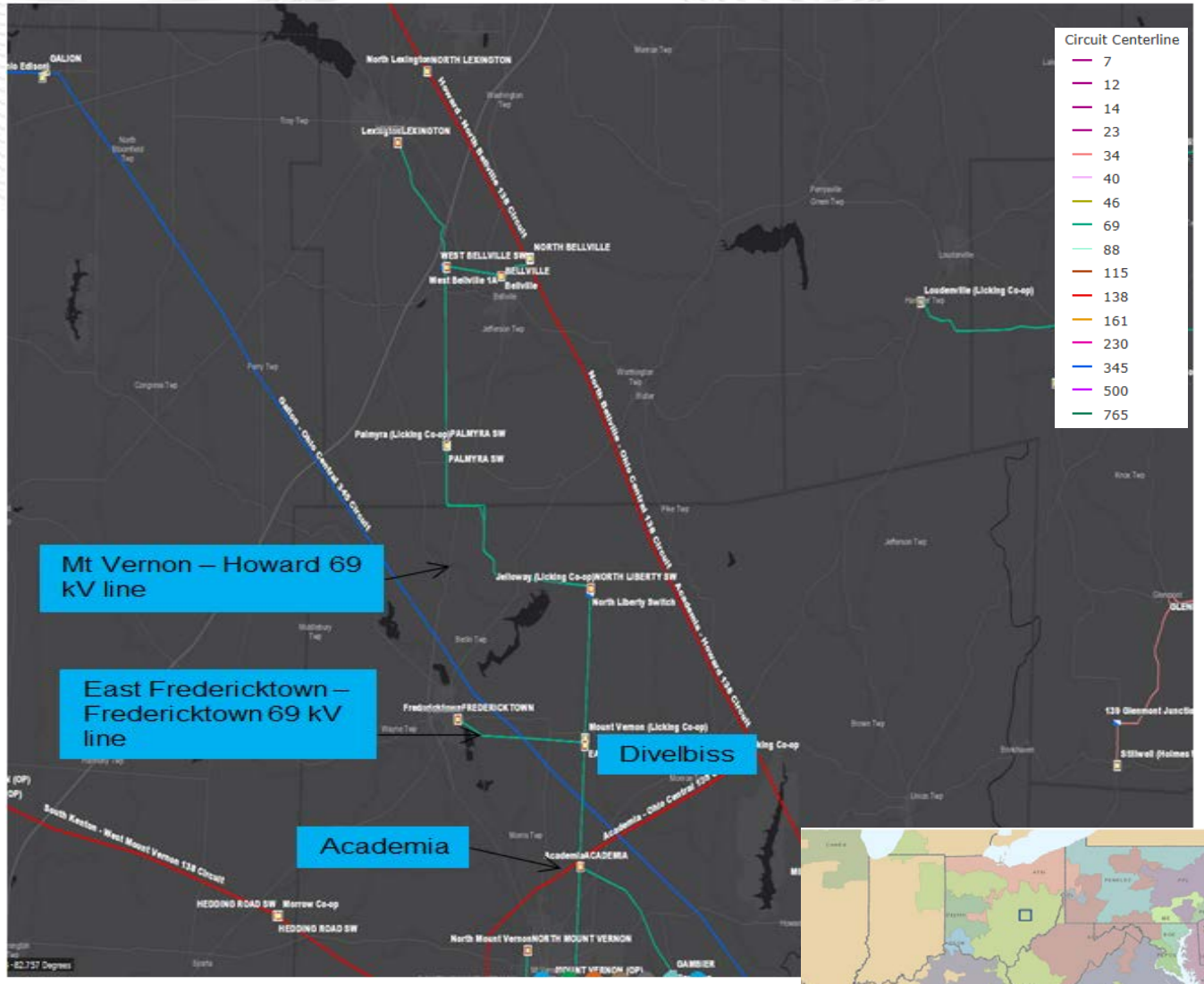

AEP Transmission Zone: Supplemental
Divelbiss 69 kV switching station and Academia station upgrades

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Selected Solution

At Divelbiss station install four 69 kV 2000 A 40 kA circuit breakers in a ring bus configuration. Also install fiber cable extension at the station. (S1689.1) Estimated Cost: $7.5M

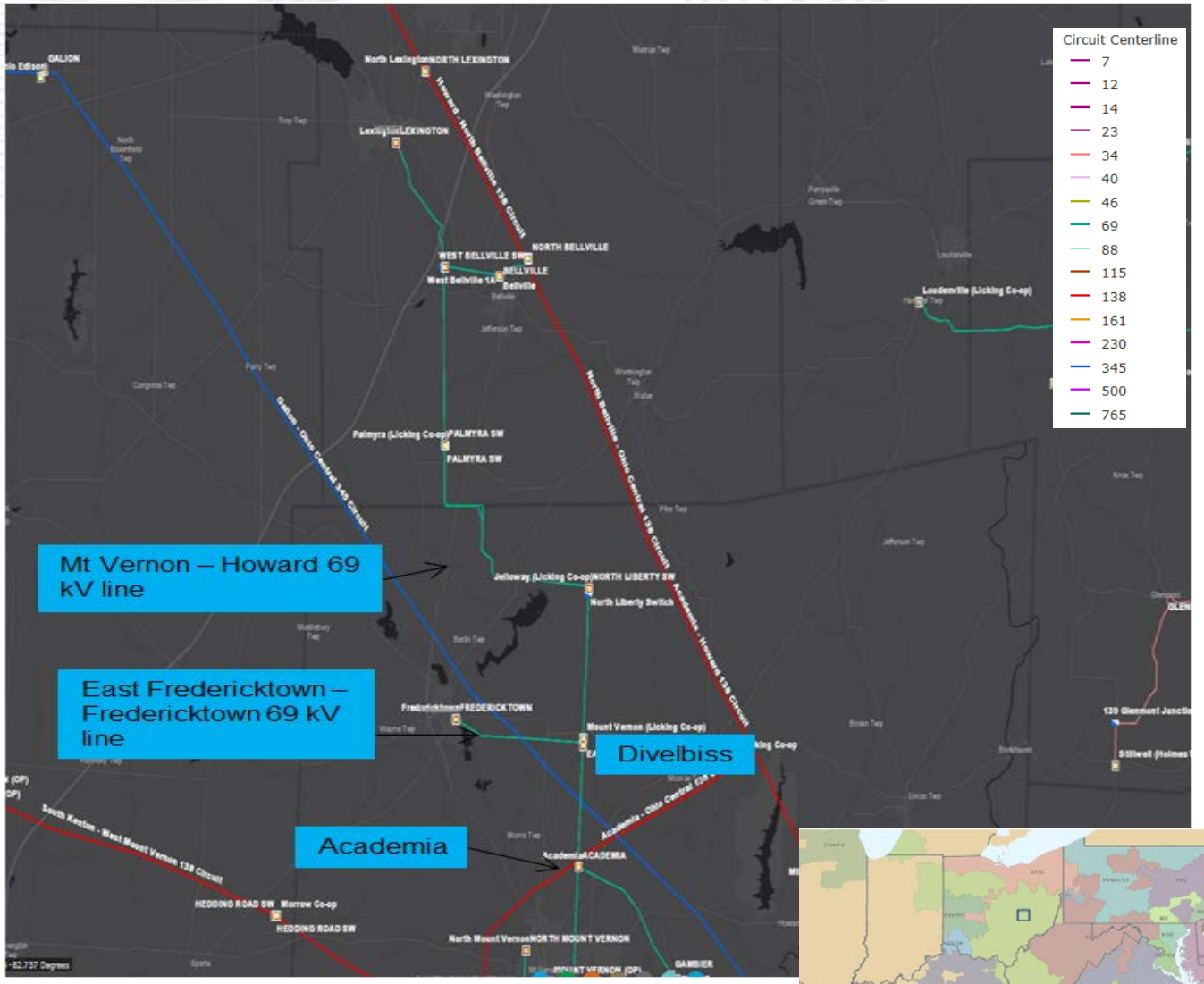
At Academia station, replace the138/69/12 kV 115 MVA transformer with a 138/69 kV 130 MVA transformer. Replace the 69 kV circuit breaker “A" and circuit breaker “D" each with 3000 A 40 kA circuit breakers. (S1689.2) Estimated Cost: $4.5M

Relocate the Mt Vernon – Howard 69 kV line and the East Fredericktown – Fredericktown 69 kV line to the new Divelbiss switch station. Additionally, install two deadend structures at the East Fredericktown – Licking CO-OP – Mount Vernon 69 kV line to accommodate the new Divelbiss switch station (S1689.3) Estimated Cost: $1.3M

Total Estimated Transmission Cost: $13.3M

Projected In-service: 12/31/2019

Project Status: Engineering



AEP Transmission Zone: Supplemental Gable

Previously Presented: 7/27/2018 SRRTEP

Problem Statement:

Equipment Material/Condition/Performance/Risk:

The Dillonvale-Smithfield 69kV circuit was originally built in the 1930's and consists of #1 copper and 4/0 ACSR conductor. Retiring this asset and transferring load to Gable will improve reliability for customers. Installing a transformer at the existing Gable station will permit the aging Smithfield station and radial 69kV circuit from Dillonvale to be retired. The Gable source will be more reliable, due to having 3- 138kV sources.

Customer Service:

AEP Ohio has a forecasted transformer overload at Smithfield in 2019 (7 MVA nameplate; capability of 8.2 MVA summer & 9.4 MVA winter; forecasted peak of 8.7 MVA summer & 11 MVA winter). This is due to large block load additions from area shale gas customers.

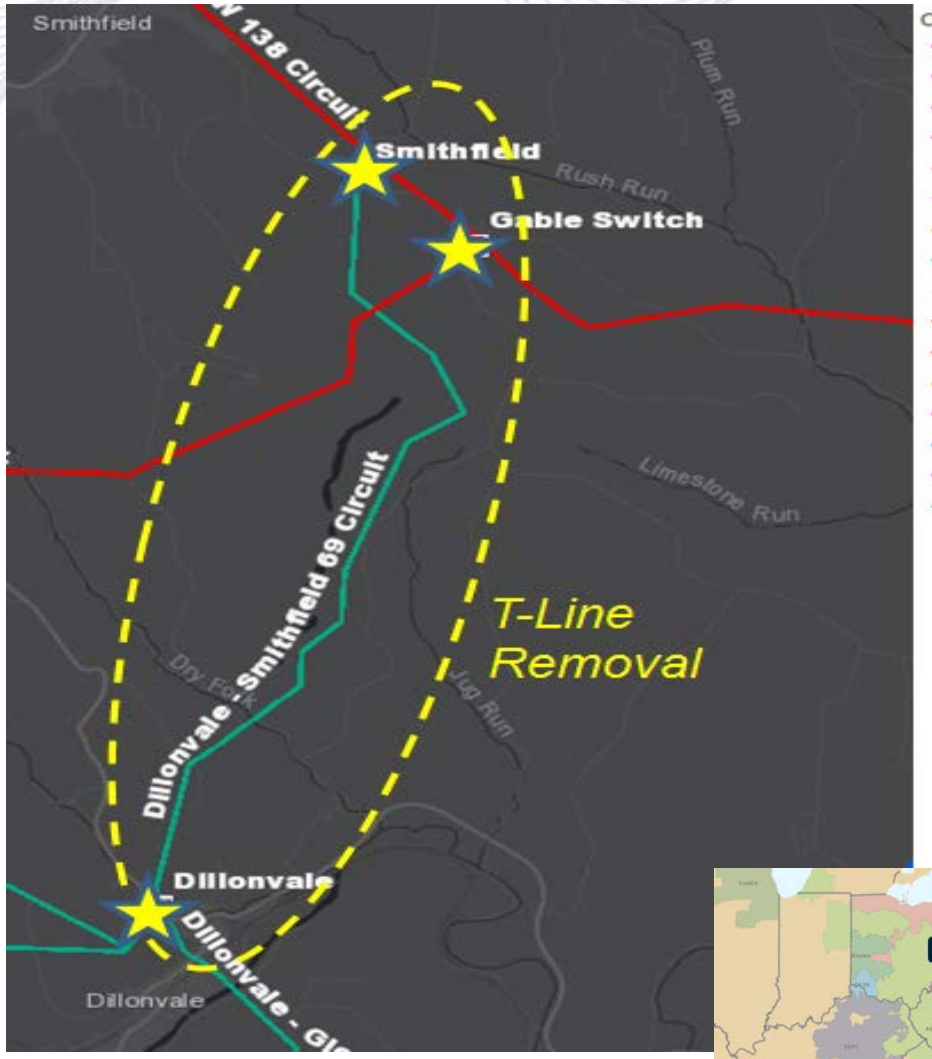
Selected Solution

Retire the 4.5-mile radial 69kV circuit between Dillonvale and Smithfield and Smithfield station. (S1690)

Estimated Transmission Cost: $3.1M

Projected In-service: 06/01/2019

Project Status: Scoping



Previously Presented: 7/27/2018 SRRTEP

Problem Statement:

Customer Service:

AEP Ohio has indicated their existing 50MVA transformer at Jug Street is projected to overload in the very near future and, as a result, has requested connection for a second 50 MVA transformer at Jug Street.

Selected Solution:

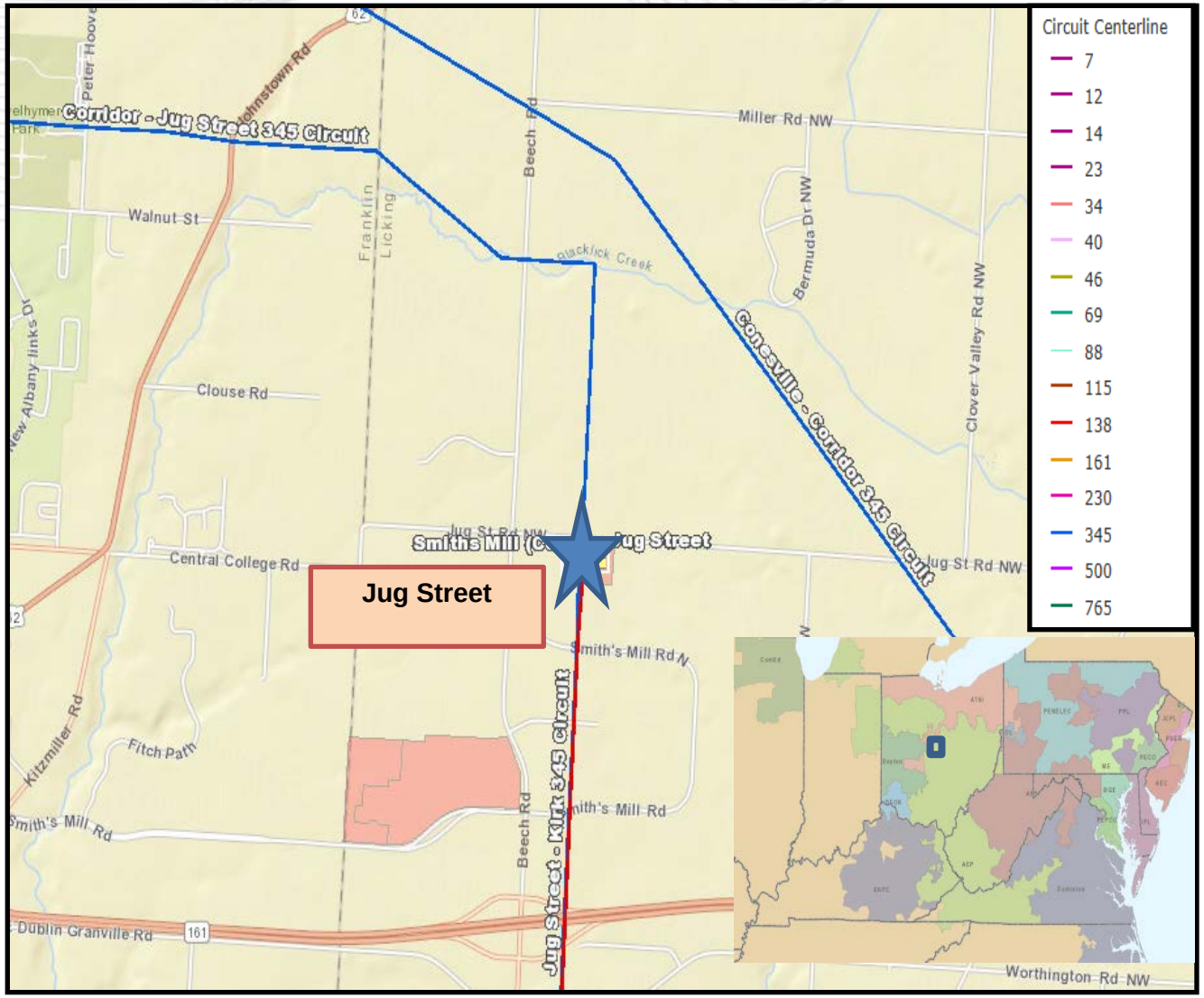
At Jug Street, install a new 3,000A 138kV 63kA CB to accommodate the new transformer. (S1691)

Estimated Cost: $0.5M

Total Estimated Transmission Cost: $0.5M

Projected In-service: 06/01/2019

Project Status: Scoping



AEP Transmission Zone: Supplemental Friendship Loop

Previously Presented: 7/27/2018 SRRTEP

Problem Statement:

Equipment Material/Condition/Performance/Risk:

The 17-mile long 69 kV Central Portsmouth-North Portsmouth line was built between 1959 and 1966 using wood-pole structures with a combination of 176.9 ACSR and 336 ACSR conductor, with a 41 MVA summer thermal rating. The 176.9 ACSR is an uncommon conductor used in the past and spare parts are an issue. There are 192 open A conditions distributed among the 139 poles on this line. The conditions include: rotten cross-arms, burnt/broken insulators, and loose/broken conductor hardware. The Central Portsmouth-North Portsmouth 69 kV circuit has an MPOI of 350 with 2,141,467 customer-minutes of interruption over the last three years.

At North Portsmouth the 138-69 kV transformer T1 (installed 1958) is recommended for replacement with factors such as moisture content, oil quality, and age. The 138 kV oil-filled breakers C (installed 1948), D (installed 1975) and 69 kV CB A (installed 1954) are at over 80% of their fault interrupting capability for 3-phase faults, and have experienced 27, 7 and 53 operations respectively, with C and A exceeding the manufacturer recommended limit of 10 fault operations. Other factors driving the replacement are age and scarce availability of spare parts.

The central Portsmouth breakers G and H are both 1975 oil-filled breakers with 29 and 25 operations respectively, exceeding the manufacturer recommendation of 10 fault operations. The breakers both exceed AEP's threshold for replacement with conditions including: age; bushing problems; unavailability of spare parts; lifetime fault operations count; and high moisture readings. In general, oil breakers have become increasingly difficult to maintain due to the oil handling associated with them. Oil spills are frequent with failures and routine maintenance which is also an environmental hazard.

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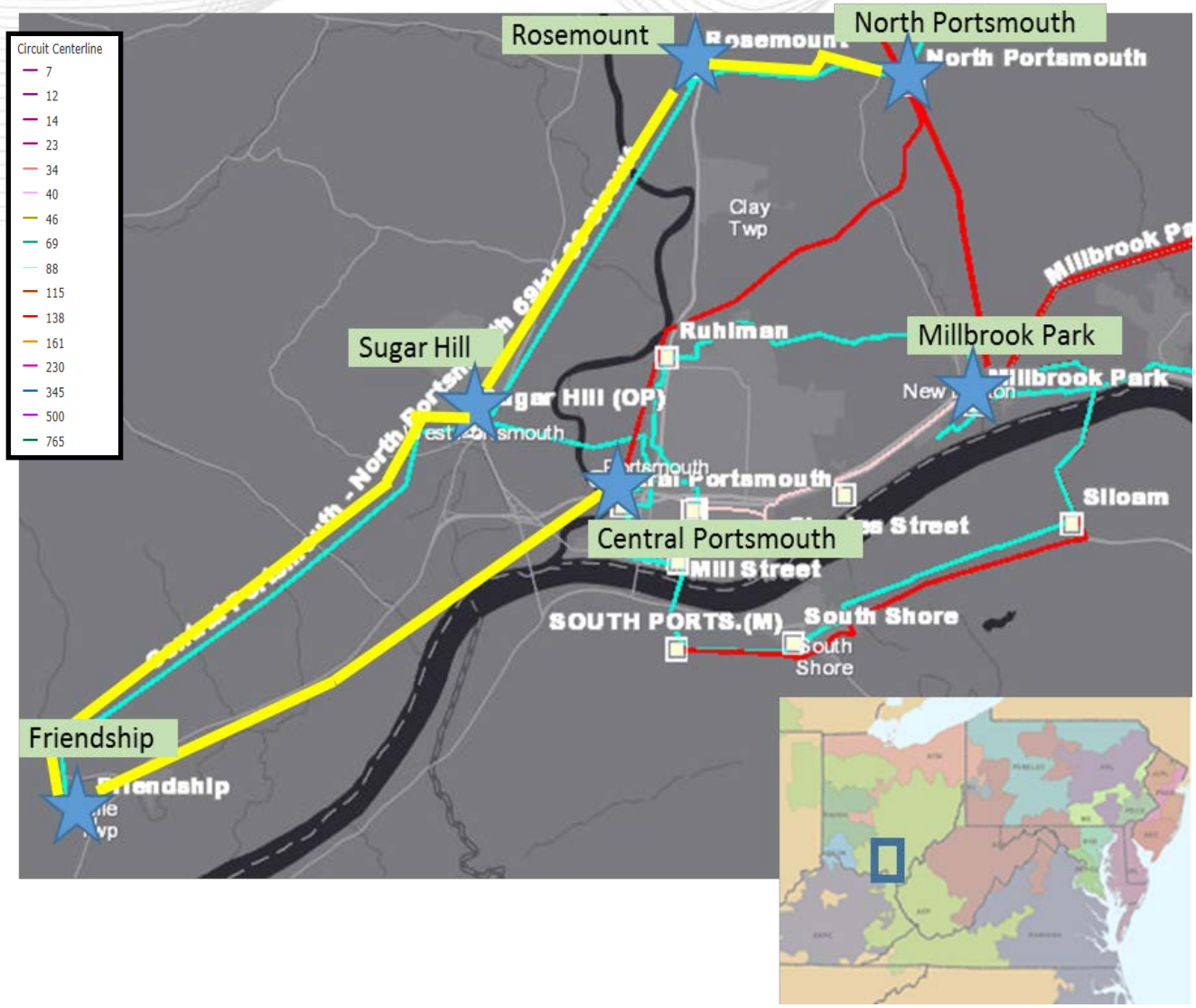

AEP Transmission Zone: Supplemental Friendship Loop

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Selected Solution:

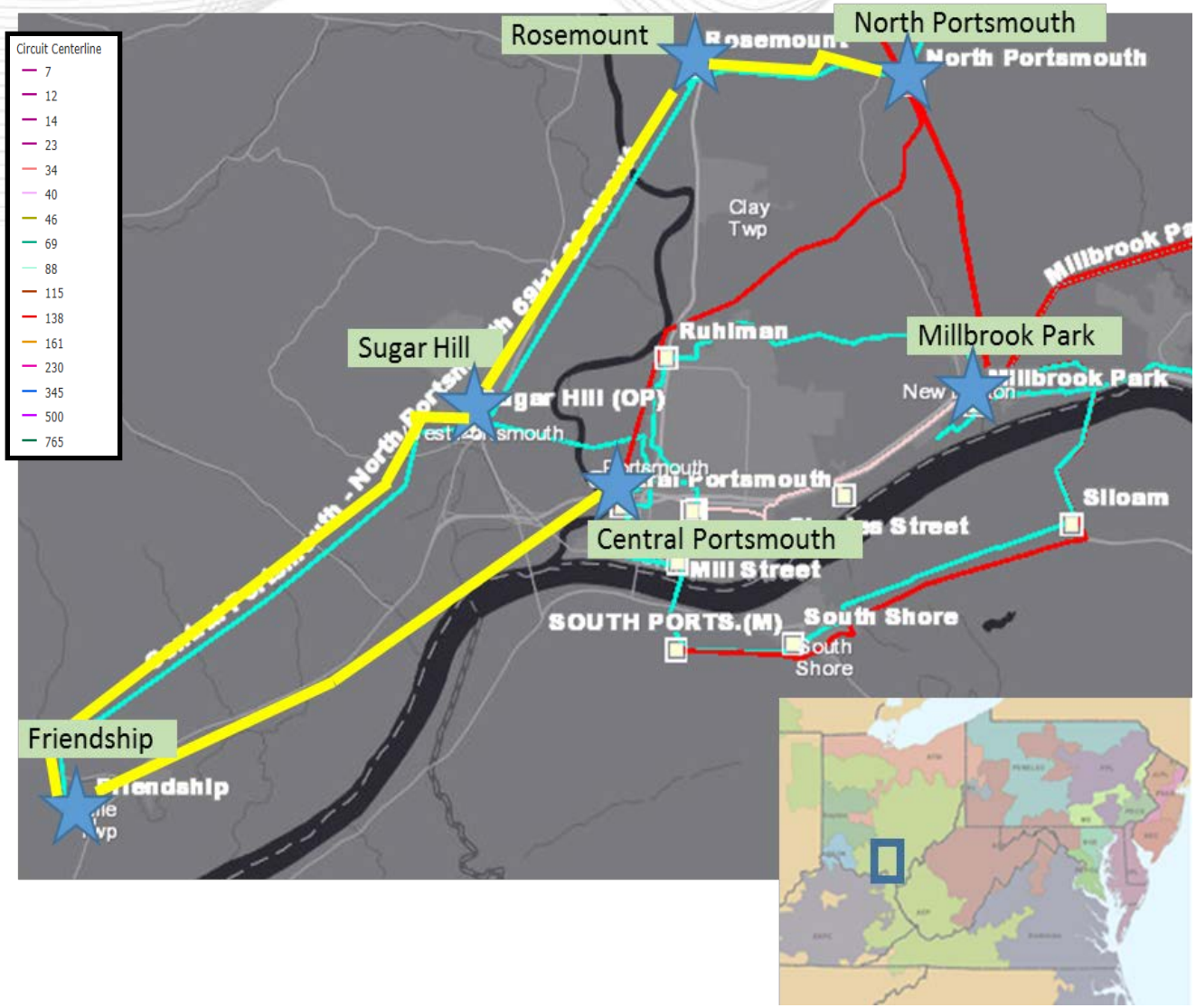
Build a new 8.5 mile 69kV line from Friendship Station to Central Portsmouth Station, using 556 ACSR (102MVA) and remove the old Central Portsmouth-Sugar Hill Line. Rebuild the remaining 13.9 miles of the Friendship Loop from North Portsmouth to Rosemount, from Rosemount to Sugar Hill and from Sugar Hill to Friendship using 556 ACSR (102 MVA) and ADSS. (S1692.1)
Estimated Cost: $41.8M

At Friendship station, install a 69kV line CB & line MOAB. At Sugar Hill station, upgrade bus though-path and replace switches to accommodate the line reconfigurations. At North Portsmouth, replace 138-69kV transformer with a 90 MVA unit with a 138kV circuit switcher, replace 138kV CB C and 69kV CB A. Remove bus tie 138kV CB D and install a new 138kV CB to isolate Millbrook Park line. Install a new 69kV CB on low side of the transformer. At Millbrook Park, replace relay & install a CCVT on North Portsmouth Line. At Central Portsmouth, replace 138kV CBs G & H. At Rosemount, install two line MOAB switches inside substation and replace the ground switch MOAB with a 69kV circuit switcher. (S1692.2) Estimated Cost: $12.6M

Total Estimated Transmission Cost: $54.4M

Projected In-service: 04/01/2023

Project Status: Scoping



Previously Presented: 7/27/2018 SRRTEP

Problem Statement:

Customer Service:

AEP Ohio Distribution requested a new delivery point to serve their Ridgely station by 6/2020. The initial load is approximately 27 MVA with future growth anticipated. The initial 27 MVA load is being transferred from four adjacent Stations, but future new load is expected.

Selected Solution:

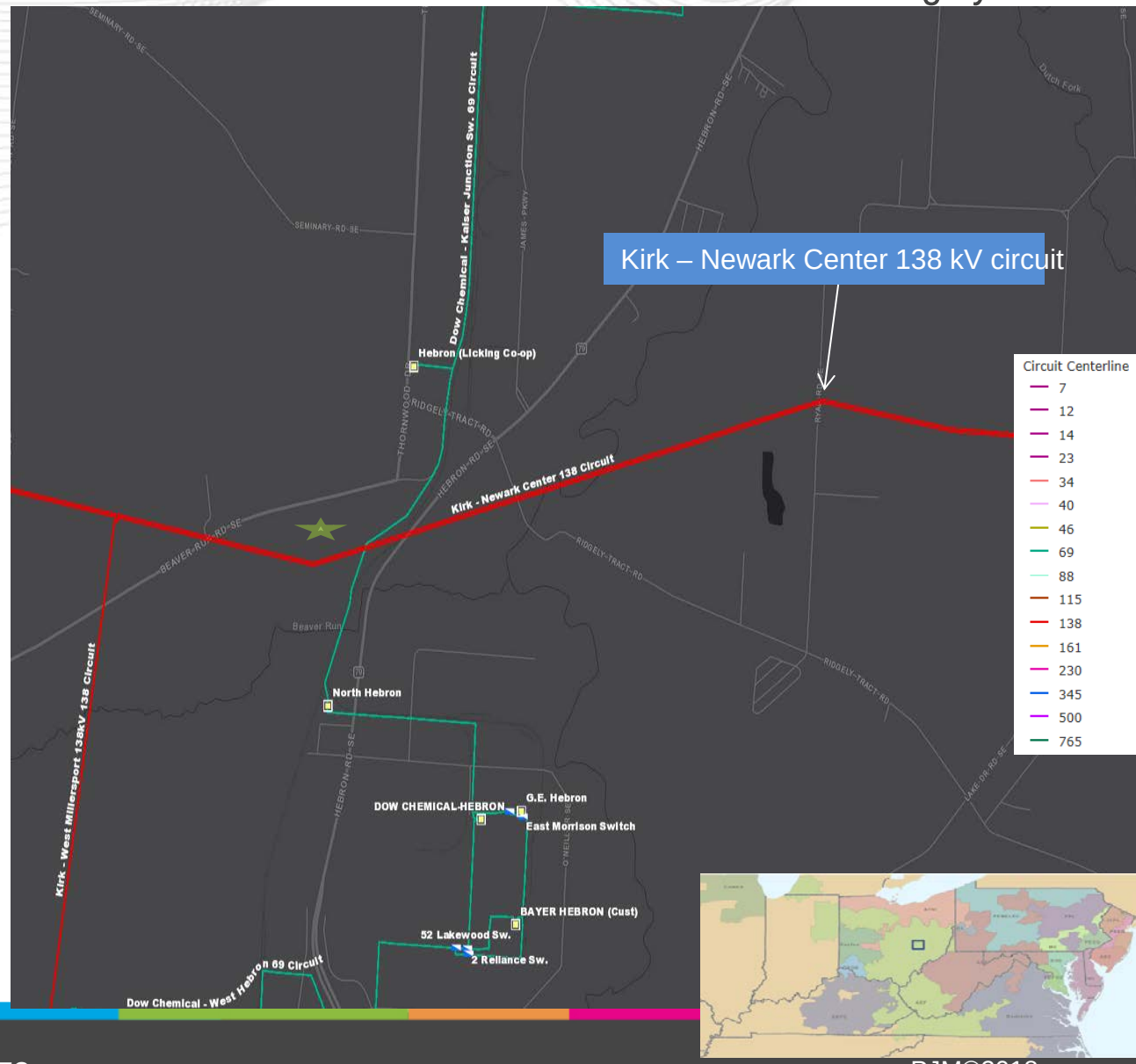
Install a new 0.1 miles 138 kV loop from Ridgely station to the Kirk – Newark Center 138 kV circuit (Conesville – Kirk 138 kV line) with the conductor size 1590 ACSR 54/19. (S1693.1) **Estimated Cost: $0.7M**

At Ridgely station install a new 138 kV bus with two 2000 A line Moab switches. The station will have space to expand in the future if needed. Fiber will also be installed at Ridgely station. (S1693.2) **Estimated Cost: $1.6M**

Total Estimated Transmission Cost: $2.3M

Projected In-service: 06/30/2020

Project Status: Engineering



Next Steps

Upcoming Western SRRTEP Dates

West	Start	End
9/28/2018	12:00	4:00
10/26/2018	12:00	4:00
11/29/2018	12:00	4:00
12/5/2018	12:00	4:00

RTEP@pjm.com to Be Retired

- PJM will retire the RTEP@pjm.com email address as of September 1, 2018. Stakeholders with questions about planning updates or planning windows should use the Planning Community.
- PJM is enhancing the way we communicate to follow industry standards and maintain its standing as an industry leader.
- The Planning Community is a vital avenue for PJM members and staff to collaborate on planning updates, including RTEP windows, and get their questions answered.

Revision History

8/27/2018 – V1 – Original version posted to pjm.com

8/28/2018 – V2

- Slide #21 -#27: Refine the maps
- Slide #23: Remove the red text notes
- Slide #5: Clarified first occurrence of violation
- Slide #5,30,31,32: Added status
- Slide #33-56: Corrected Map formatting

9/5/2018 – V3

- Slide #27: Scope/Cost change
- Slide #19: Added old/new conductor type and rates and provided outage details
- Slide #30,31,32: Added Req. IS Date