



Sub Regional RTEP Committee PJM West

September 28, 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 200 kV: 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

Immediate Need

Problem Statement:

2018 RTEP N-1 Thermal Violation Winter 2023 Case

- Thermal overload of Ronceverte 138 kV tie line(N1-W31).

Recommended Solution:

Ronceverte Cap Bank and Adjust CT tap ratio (**B3051.1** and **B3051.2**)

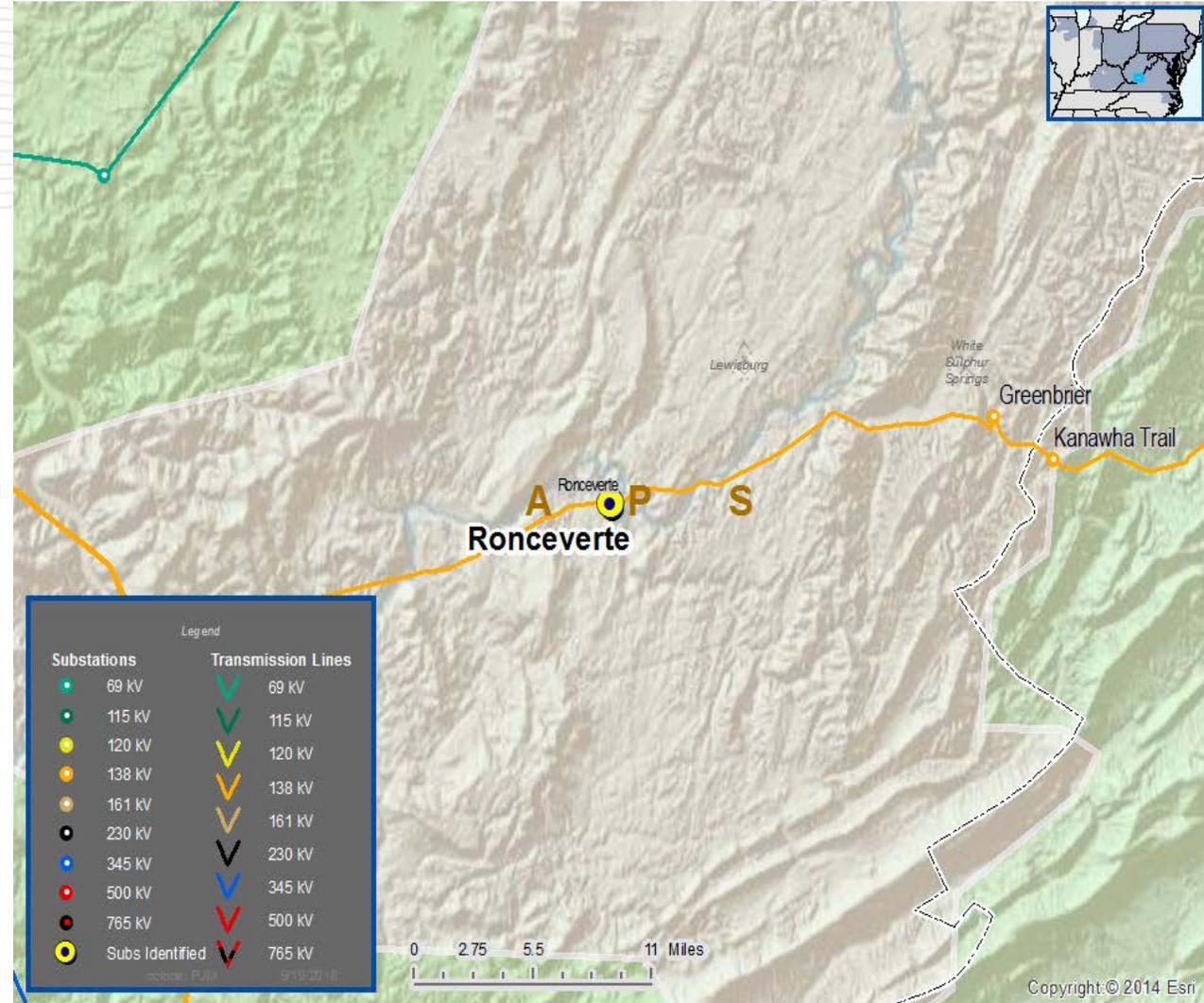
- Install 2 stage capacitor bank (2-5.612 MVAR effective capacitors) at Ronceverte 46 kV. - APS - \$0.72M
- Adjust CT tap ratio at Ronceverte 138 kV – AEP - \$5K
 - Old rating: 104 / 108 MVA WN / WE
 - New rating: 109 / 138 MVA WN / WE

Estimated Project Cost: \$0.725 M

Required IS Date: Immediate Need

Projected IS Date: 12/1/2019

Status: Scoping



Baseline Reliability Projects

FERC 715 (TO Criteria):

Problem Statement:

- The Cooper – Summerset 69 kV circuits are overloaded for the loss of LG&E/KU's Brown 3 unit followed by the outage of either of LG&E/KU's Elihu 161/69 kV transformer which clears the Elihu 161 kV bus.

Recommended Solution:

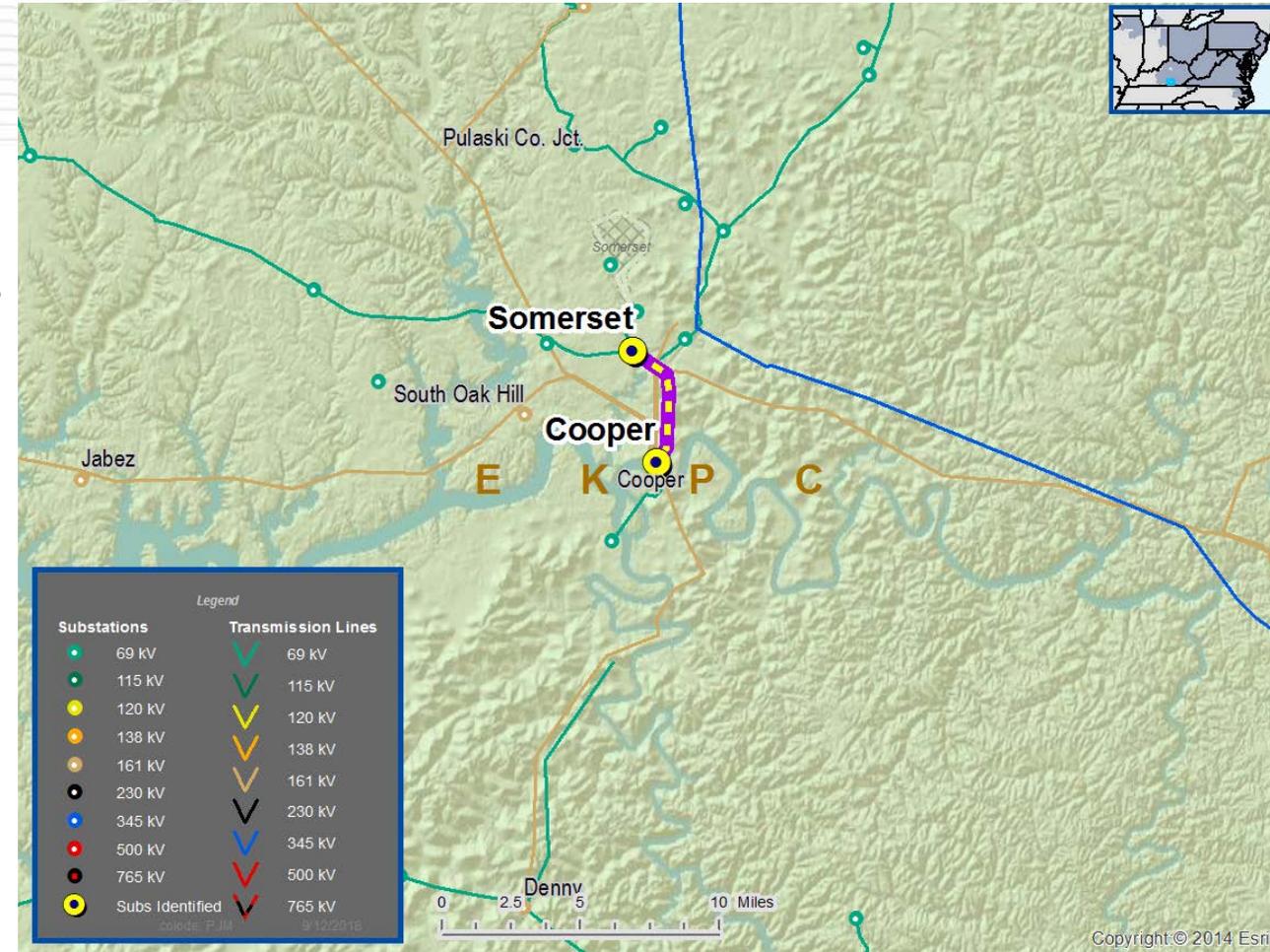
- Increase the MOT of the double circuit Cooper-Summerset 69 kV line 266.8 MCM conductor from 212° F to 266° F (B3044)

Estimated Project Cost : \$0.35 M

Required IS Date: 6/1/2019

Projected IS date: 6/1/2020

Status: Scoping



FERC 715 (TO Criteria):

Problem Statement:

- The Liberty Church Tap - Bacon Creek Tap 69 kV circuit is overloaded for the loss of EKPC's Cooper 1&2 units followed by the outage of LG&E/KU's Farley - US Steel 69 kV line.

Recommended Solution:

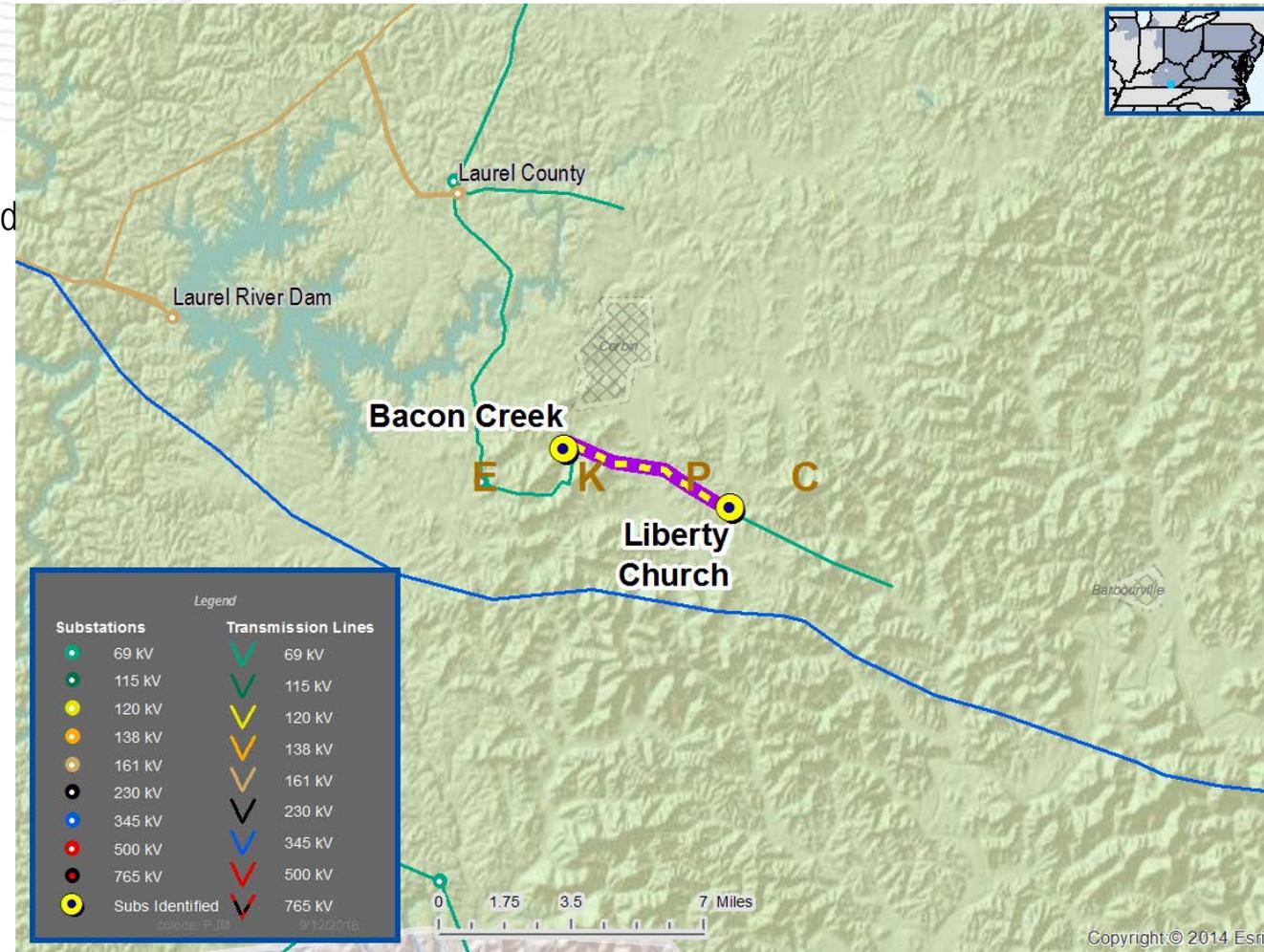
- Increase the MOT of Liberty Church Tap-Bacon Creek Tap 69 kV line 266.8 MCM conductor from 212° F to 266° F (B3045)

Estimated Project Cost : \$0.25 M

Required IS Date: 6/1/2020

Projected IS date: 6/1/2020

Status: Planning



FERC 715 (TO Criteria):

Problem Statement:

- The Summer Shade-JB Galloway Jct. 69 kV line is overloaded for the loss of LG&E/KU's Brown 3 unit followed by the outage of EKPC's Green County to Summer Shade 161 kV line section.

Recommended Solution:

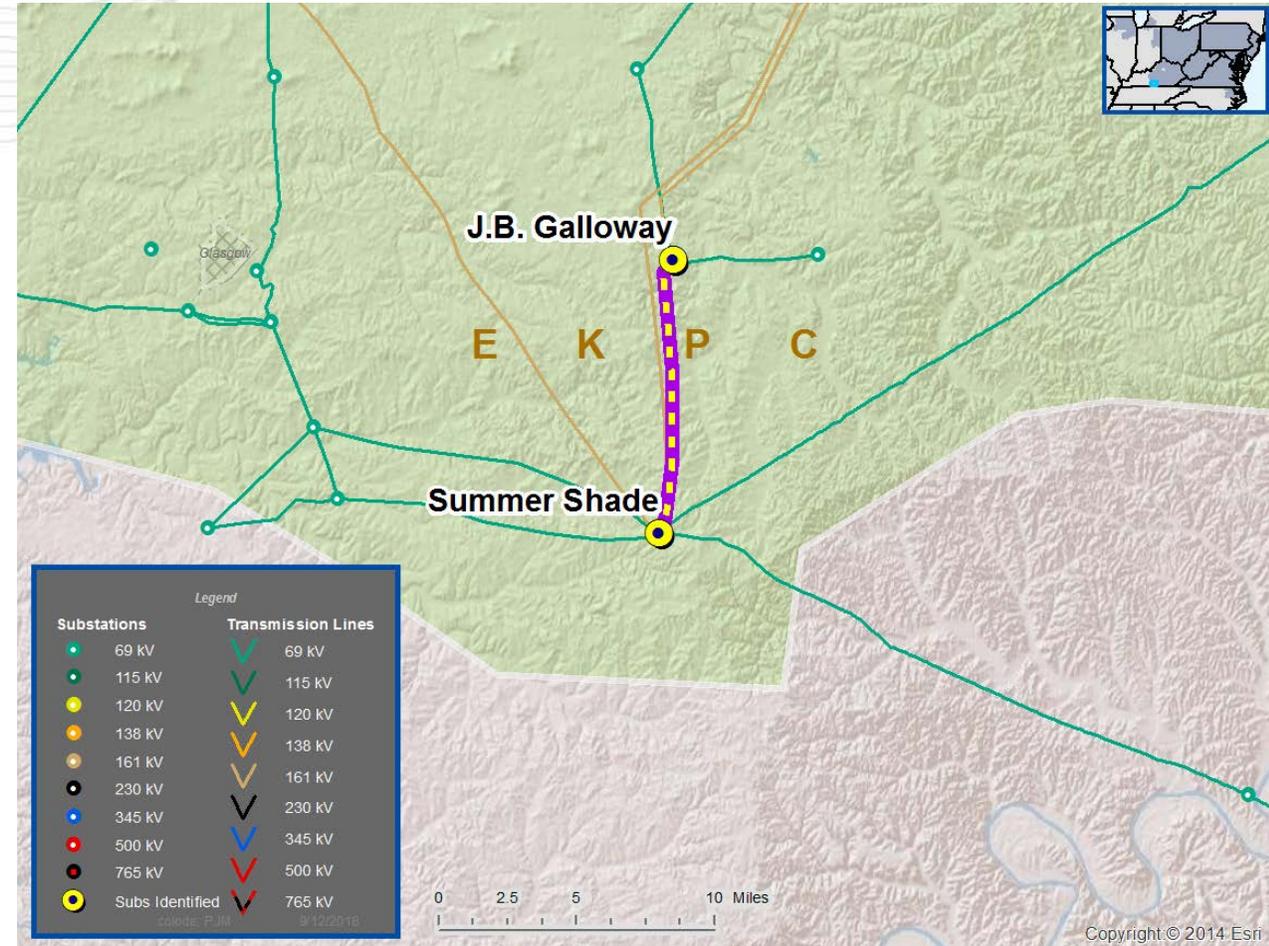
- Increase the MOT of Summer Shade-JB Galloway Jct. 69 kV line 266.8 MCM conductor from 167° F to 212° F. **(B3046)**

Estimated Project Cost : \$0.75 M

Required IS Date: 6/1/2019

Projected IS date: 6/1/2020

Status: Planning



FERC 715 (TO Criteria):

Problem Statement:

- The Green Co-KU Greensburg 69 kV circuit and the Green Co 161/69 kV transformer disconnect switch (69 kV) are overloaded for the loss of the LG&E/KU's Brown 3 unit followed by the outage of EKPC's Green County to Marion County 161 kV breaker to breaker line section.

Recommended Solution:

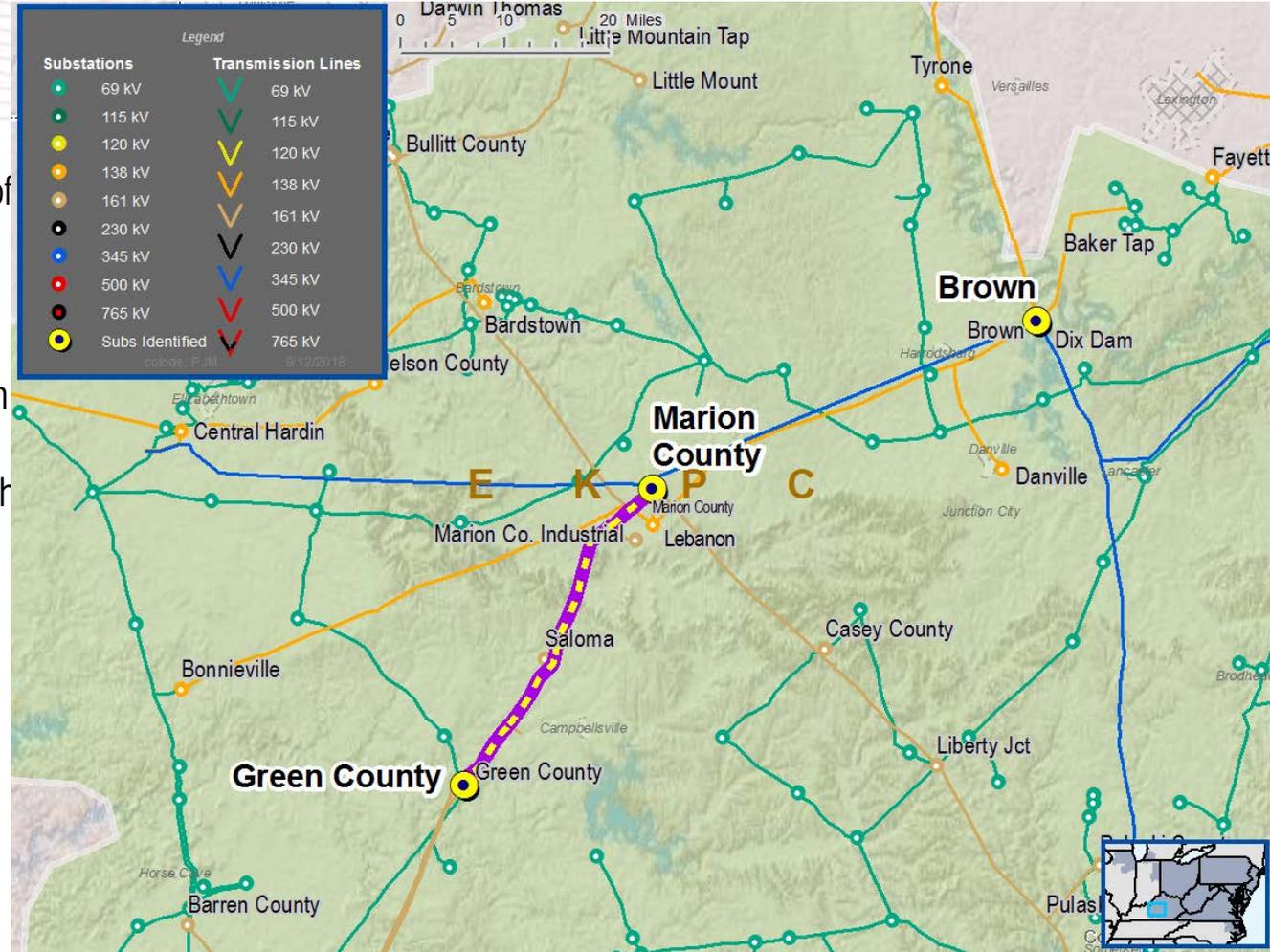
- Upgrade the existing 4/0 CU line jumpers with double 500 MCM CU on the Green Co-KU Greensburg 69 kV line section. Also, replace the existing 69 kV 600 A disconnect switch with a 69 kV 1200 A switch with the Green Co 161/69 kV transformer. **(B3047)**

Estimated Project Cost : \$0.25 M

Required IS Date: 6/1/2019

Projected IS date: 6/1/2020

Status: Scoping



Short Circuit

Immediate Need

Problem Statement:

South Canton 138 kV breakers 'L' and 'L2' are overdutied.

Selected Solution:

Replace South Canton 138 kV breakers 'L' and 'L2' with 80 kA breakers. (B2733)

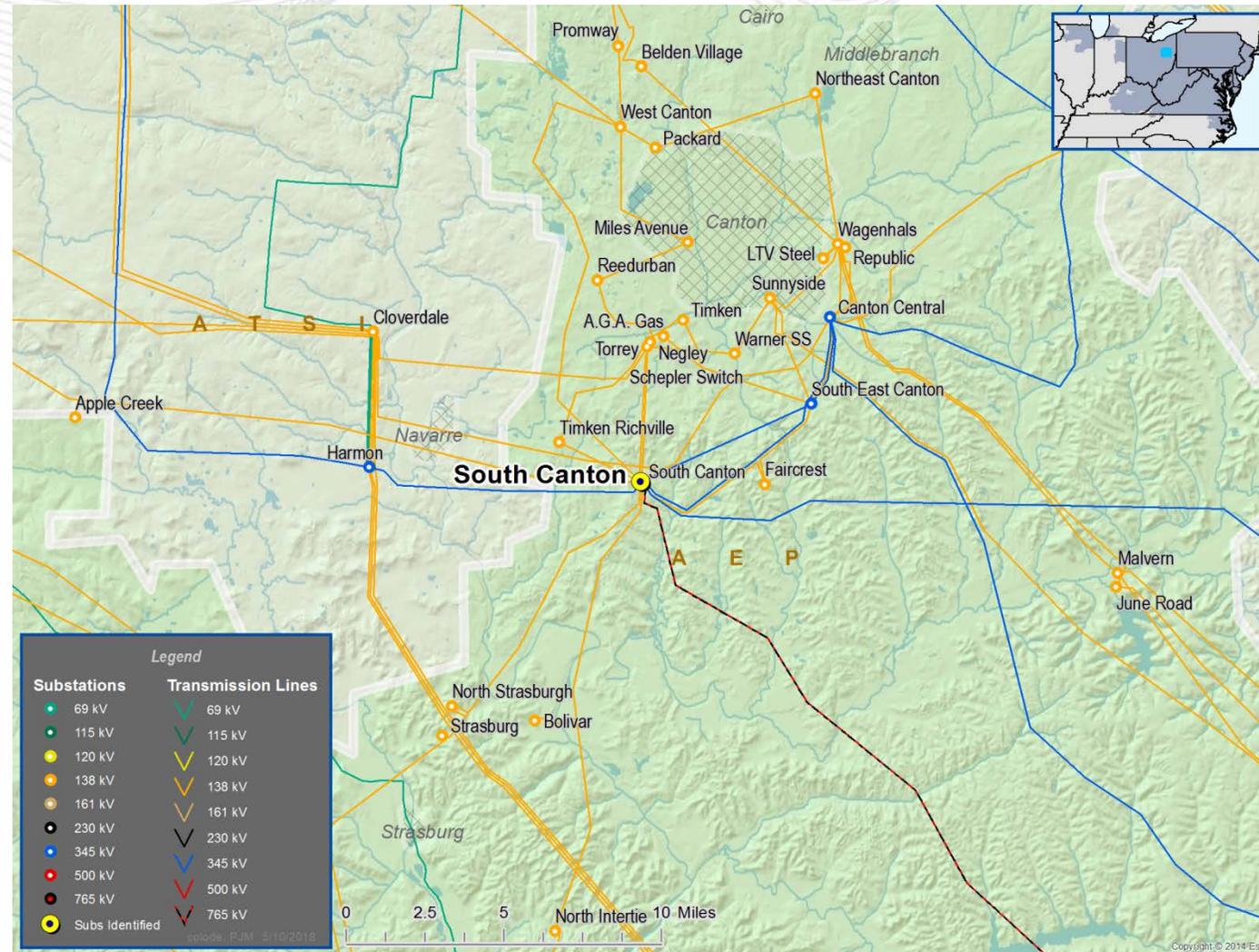
Alternatives:

No feasible alternative is considered due to the immediate need.

Estimated Project Cost: \$0.78 M

Revised IS Date: 06/01/2020

Status: Engineering



Immediate Need

Problem Statement:

South Canton 138 kV breakers 'M' are overdutied.

Selected Solution:

Replace South Canton 138 kV breakers 'M' with 80 kA breakers.
(B2873)

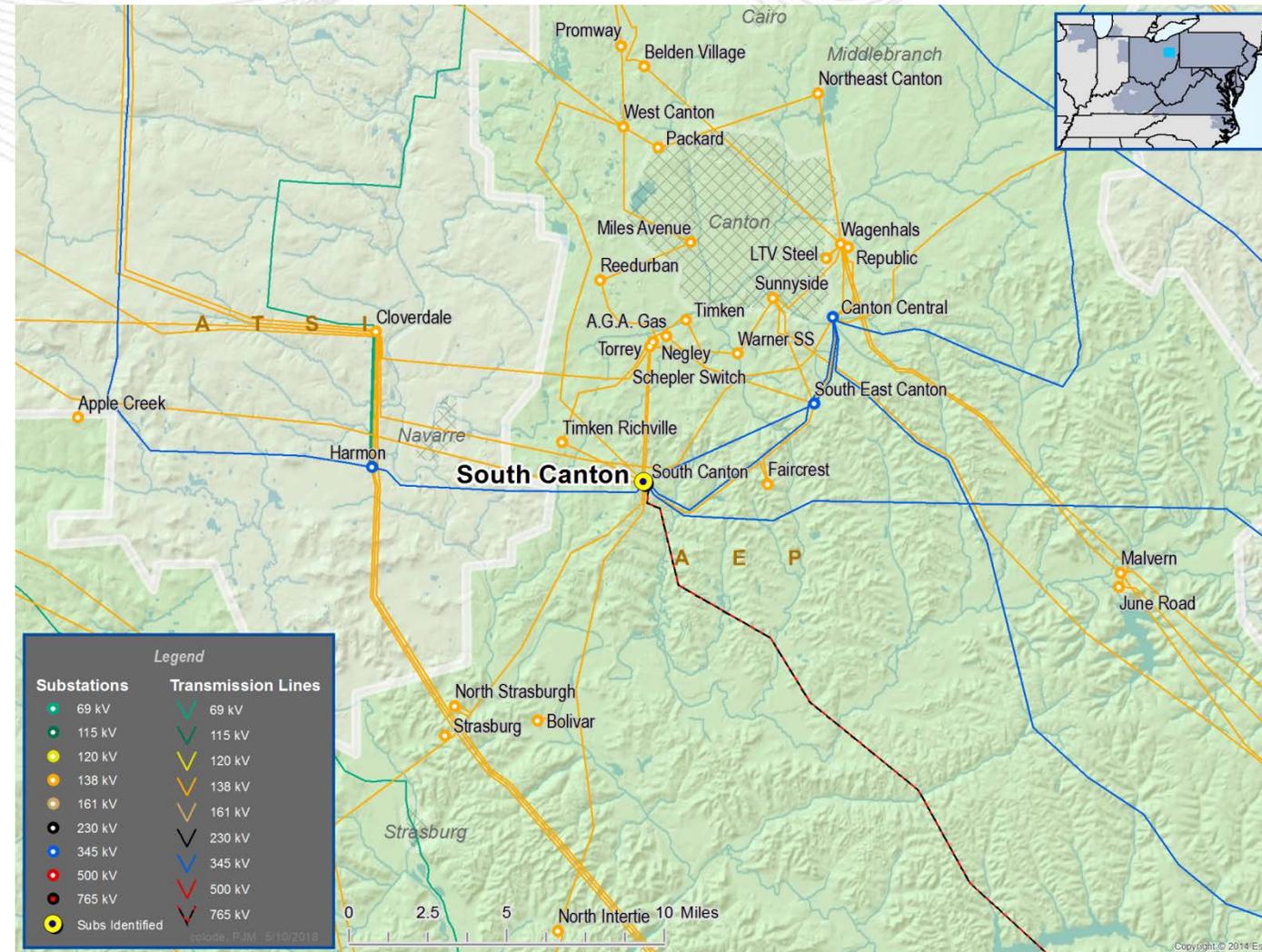
Alternatives:

No feasible alternative is considered due to the immediate need.

Estimated Project Cost: \$0.6 M

Revised IS Date: 06/01/2020

Status: EP



Immediate Need

Problem Statement:

South Canton 138 kV breakers 'M2' are overdutied.

Recommended Solution:

Replace South Canton 138 kV breakers 'M2' with 80 kA breakers.
(B2874)

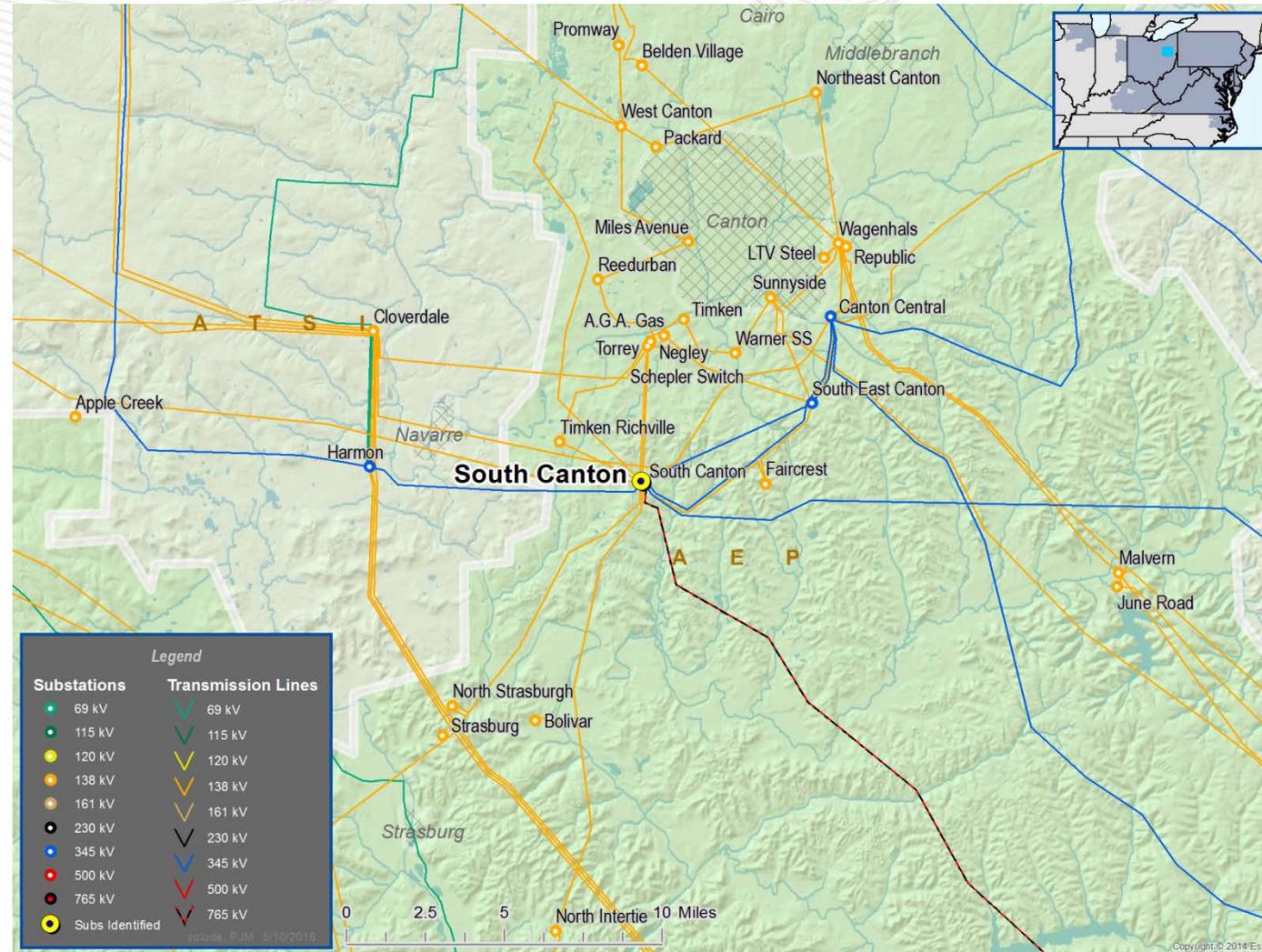
Alternatives:

No feasible alternative is considered due to the immediate need.

Estimated Project Cost: \$0.6 M

Revised IS Date: 06/01/2020

Status: EP



Second Review

Baseline Reliability Projects

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Previously Presented: 8/31/2018 SR RTEP

Generator Deliverability and Common Mode Outage (Winter)

Below 200 kV

Problem Statement:

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

Recommended Solution:

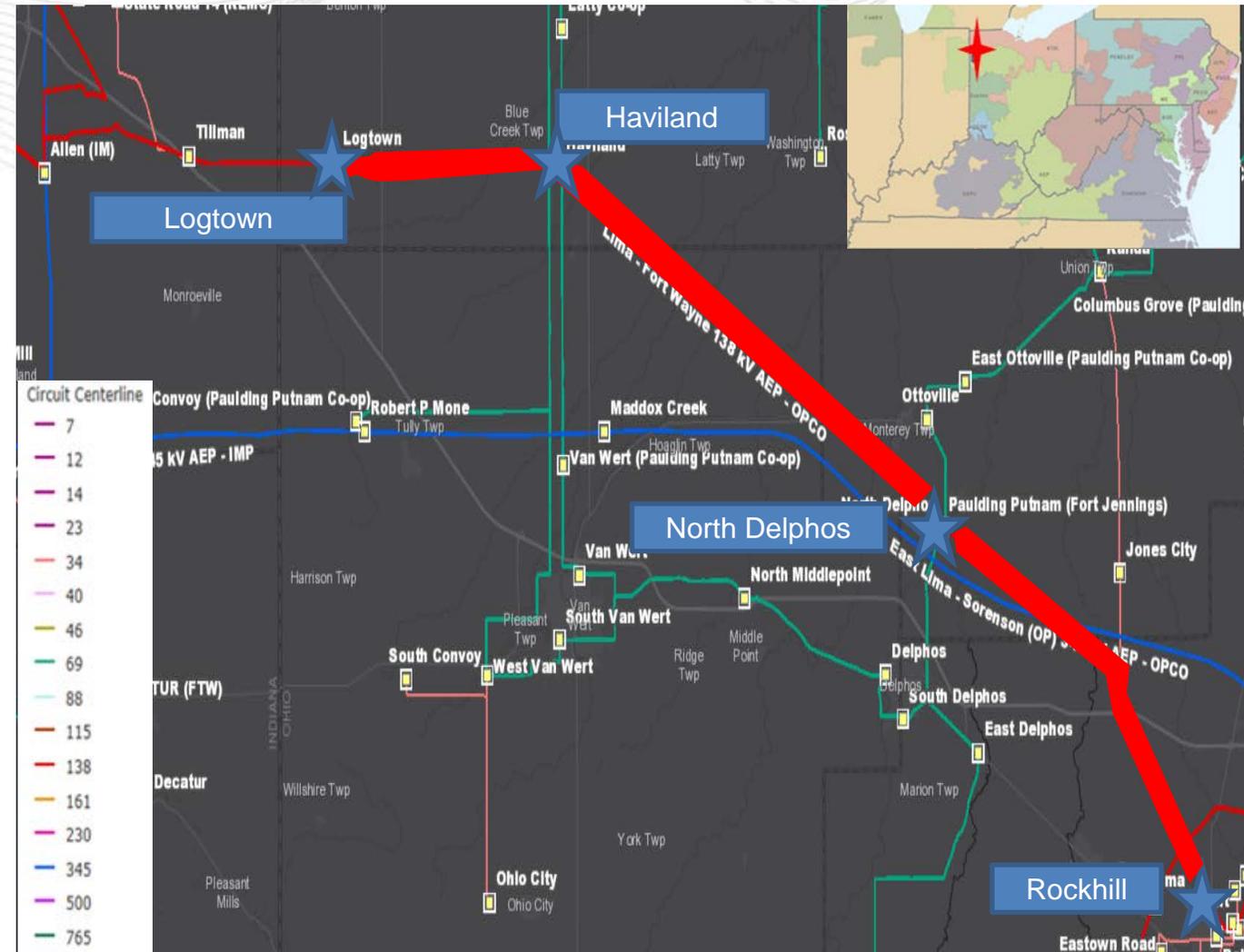
- Convert S1563.2 into baseline (B3036)
- S1563.2: North Delphos – Rockhill 138 kV: Rebuild 15.4 miles of double circuit 138 kV line utilizing 1033 ACSR 1033 ACSR conductor (296 MVA rating)

Estimated Project Cost : \$24.5 M

Required IS Date: 12/1/2023

Projected IS date: 12/18/2020

Status: Engineering





AEP Transmission Zone: Baseline Project

Previously Presented: 8/31/2018 SRRTEP

N-1-1 Voltage (Summer and Winter)

Below 200 kV

Problem Statement:

Planning Criteria Violation:

The low voltage and voltage drop violation at the Natrium 138 kV bus for loss of the Kammer - Natrium 138 kV circuit and the Natrium - George Washington 138 kV 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 138 kV cap bank, plus 138 kV bus #2 (opens breakers to Summerfield, George Washington, and 138 kV breakers N, R, & BT2 and 69 kV 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 138 kV bus #2 and cap bank from disturbances.

Recommended Solution:

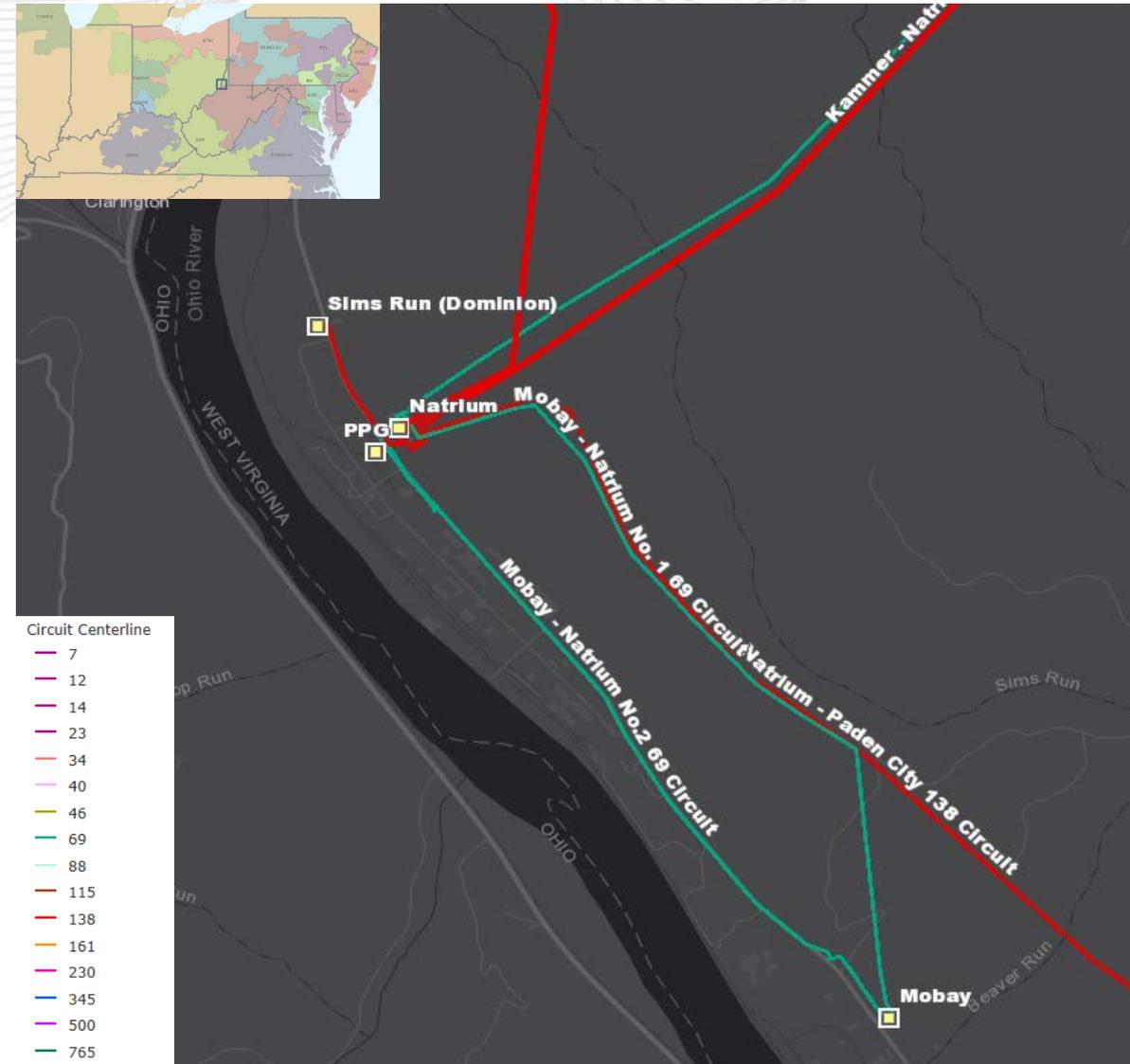
At the Natrium substation in WV, install a 138 kV circuit breaker on the high-side of the existing 138-69 kV transformer #2; new breaker to be rated 3000 A/40 kA. Install associated microprocessor-based relaying and incorporate into 138 kV bus protection. Install standard SCADA functionality as well. (B3037)

Estimated Project Cost : \$1.1 M

Required IS Date: 6/1/2023

Projected IS date: 6/1/2023

Status: Scoping



Previously Presented: 8/31/2018 SRRTEP

Common Mode Outage and Basecase Analysis (Winter)

Below 200 kV

Problem Statement:

- The Capitol Hill – Coco 138 kV 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)

Recommended Solution:

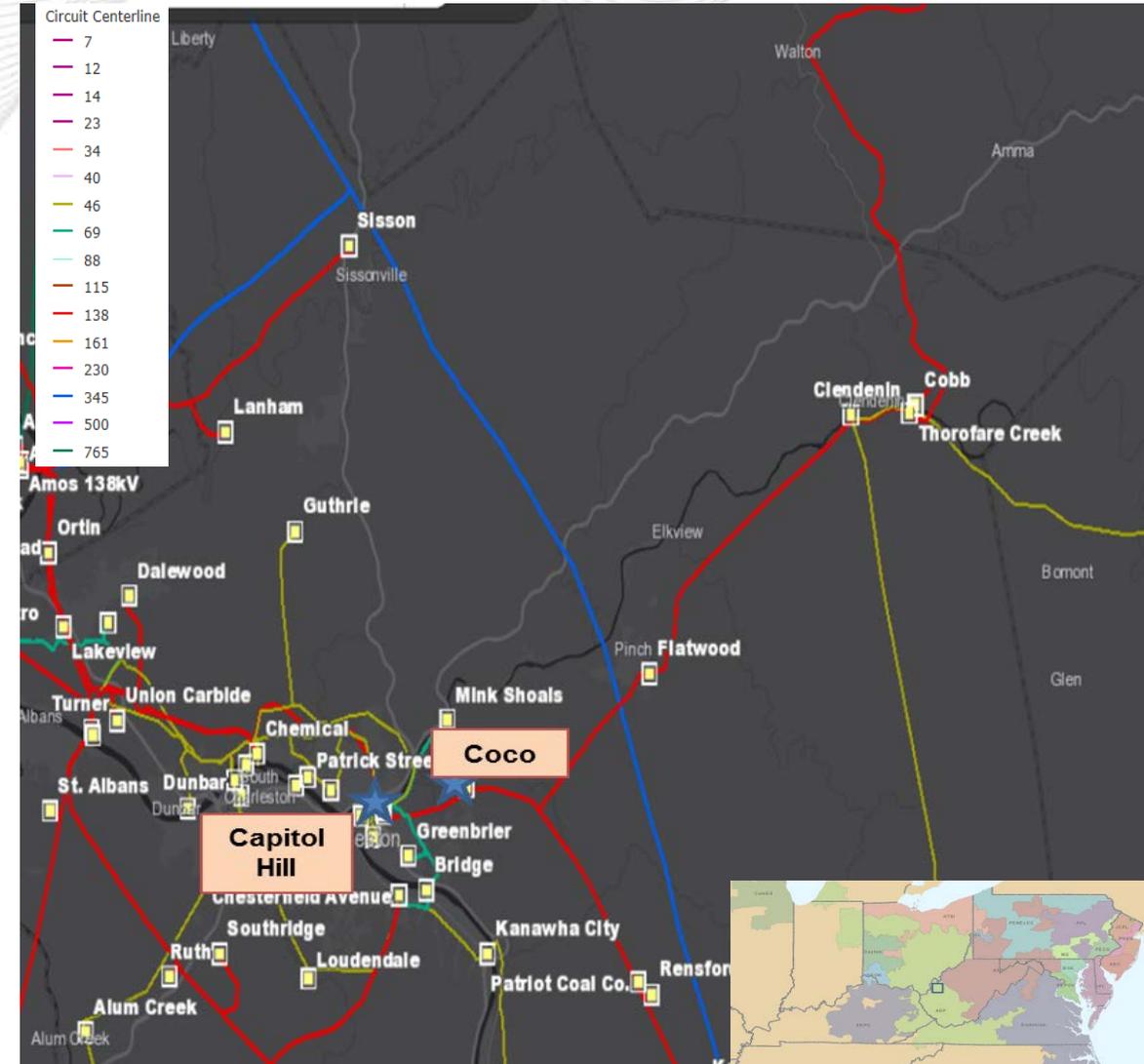
Reconductor the Capitol Hill – Coco 138 kV line section (~2.8 miles), utilizing 795 26/7 ACSR conductor (W.N. 325 MVA, W.E. 404 MVA). **(B3038)**

Estimated Project Cost : \$3.8 M

Required IS Date: 12/1/2023

Projected IS date: 12/1/2023

Status: Scoping



Previously Presented: 8/31/2018 SR RTEP

Common Mode Outage (Winter)

Below 200 kV

Problem Statement:

- The Muskingum – S. Caldwell 138 kV 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)

Recommended Solution:

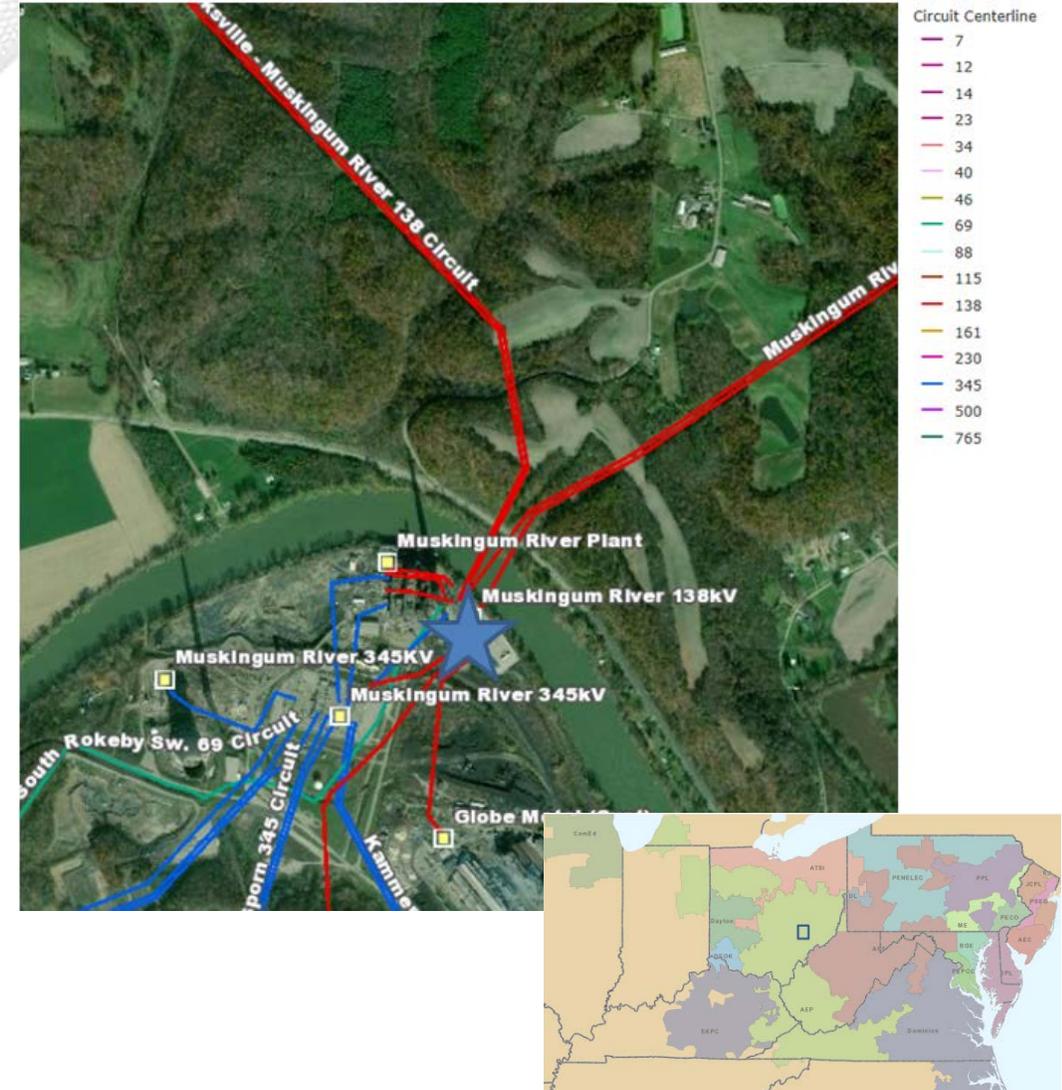
Relocating 'Muskingum – South Caldwell 138 kV circuit' from bus 2 to bus 1 and 'Muskingum – West Cambridge 138 kV circuit' from bus 1 to bus 2 at Muskingum 138 kV Station to mitigate PJM criteria thermal violations. (B3039)

Estimated Cost: \$0.1 M

Required IS Date: 12/1/2023

Projected IS date: 6/1/2023

Status: Scoping



Previously Presented: 8/31/2018 SRRTEP

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.

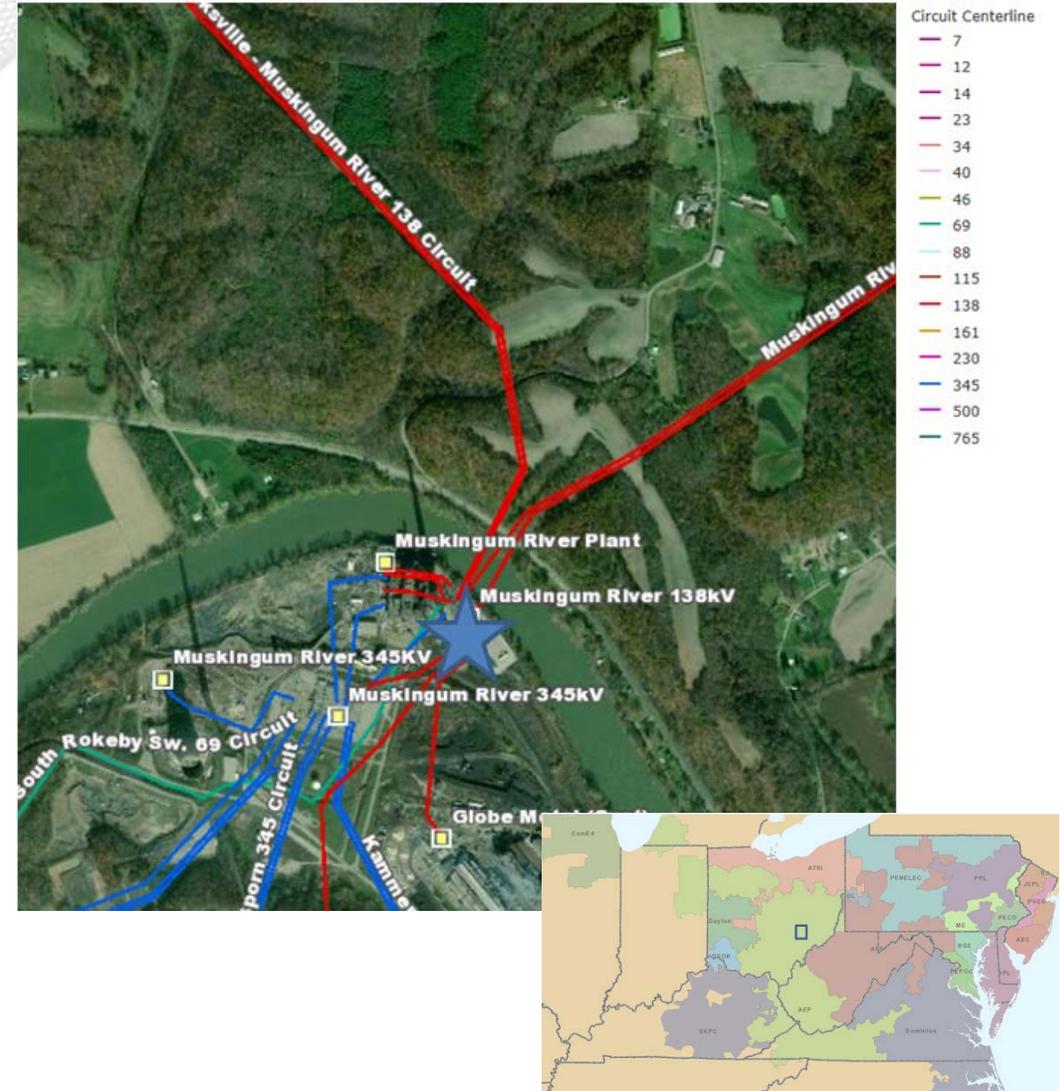
Selected Solution:

Upgrading jumpers/risers and 4 disconnect switches (3000 A) for 138 kV breakers HA and HB at Muskingum 138 kV station. (\$1748)

Estimated Supplemental Cost: \$0.3 M

Projected IS date: 6/1/2023

Status: Scoping



Previously Presented: 8/31/2018 SRRTEP

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 (~9.31 mi) 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 (~23.41 mi) 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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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.

Recommended 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). **(B3040.1) Estimated Cost: \$39.2 M**
- 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). **(B3040.2) Estimated Cost: \$23.6 M**
- Sarah Lane: Install new 3-way phase over phase switch to replace the retired switch at Cottageville. **(B3040.3) Estimated Cost: \$1.0 M**
- 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. **(B3040.4) Estimated Cost: \$3.5 M**
- South Buffalo: Install 28.8 MVar Cap Bank **(B3040.6) Estimated Cost: \$0.8 M**

Total Estimated Transmission Cost: \$68.1 M

Non-Transmission:

- Mill Run: Retire station. **(B3040.5) Estimated Cost: \$0.0 M**
- Ravenswood: Replace existing cap switcher 'AA'. Replace electromechanical relays and install DICM. **(B3040.7) Estimated Cost: \$0.0 M**

Required In-service: 6/1/2022

Projected In-service: 6/1/2021

Project Status: Scoping



Previously Presented: 8/31/2018 SRRTPEP

Problem Statement:

A reliability issue has been identified on the 69 kV line from Cisco Substation to Botkins Substation. The line was constructed in the 1950s with wood poles and crossarms. The line has several sleeves and many have failed in recent years, impacting customers in the area.

Selected Solution:

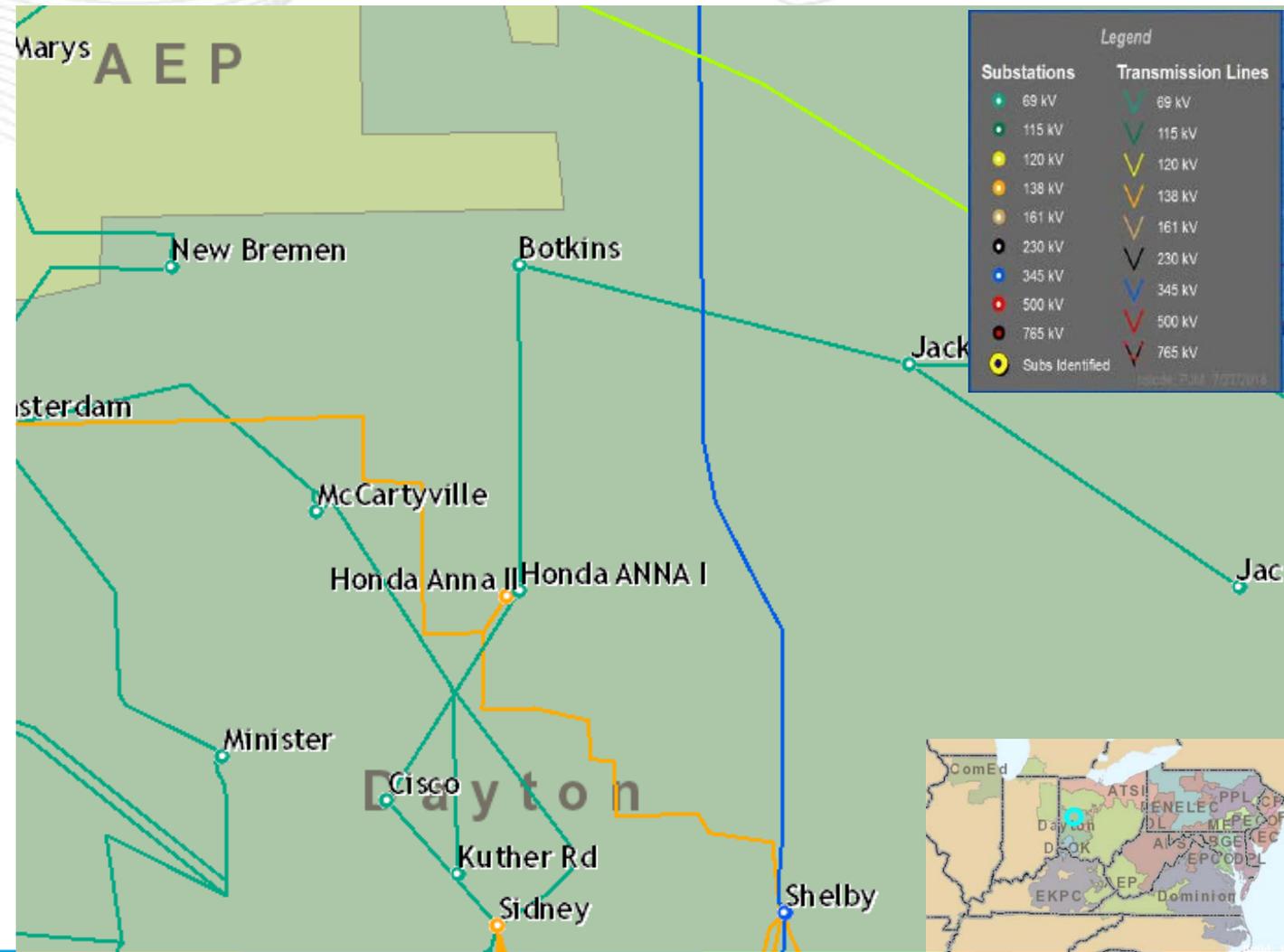
Rebuild the 69 kV line (6631) from Cisco Substation to Botkins Substation. (**\$1746**)

Old conductor: 477 ACSR (18x1); New conductor: 1351 AAC
 Cisco-Anna 69 kV Old Rating: SN/SE (80/98), Anna-Botkins 69 kV Old Rating SN/SE (80/98); Cisco-Anna 69 kV New Rating: SN/SE (151/187), Anna-Botkins 69 kV Old Rating SN/SE (151/165)

Estimated Transmission Cost: \$7.425 M

Required In-Service: 12/31/2019

Status: Engineering



Previously Presented: 8/31/2018 SRRTPEP

Problem Statement:

This project proposes to replace the existing switch on 13827 with an automatic 138 kV sectionalizing switch on the 13827 line (Amsterdam – Honda Anna 138 kV 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.

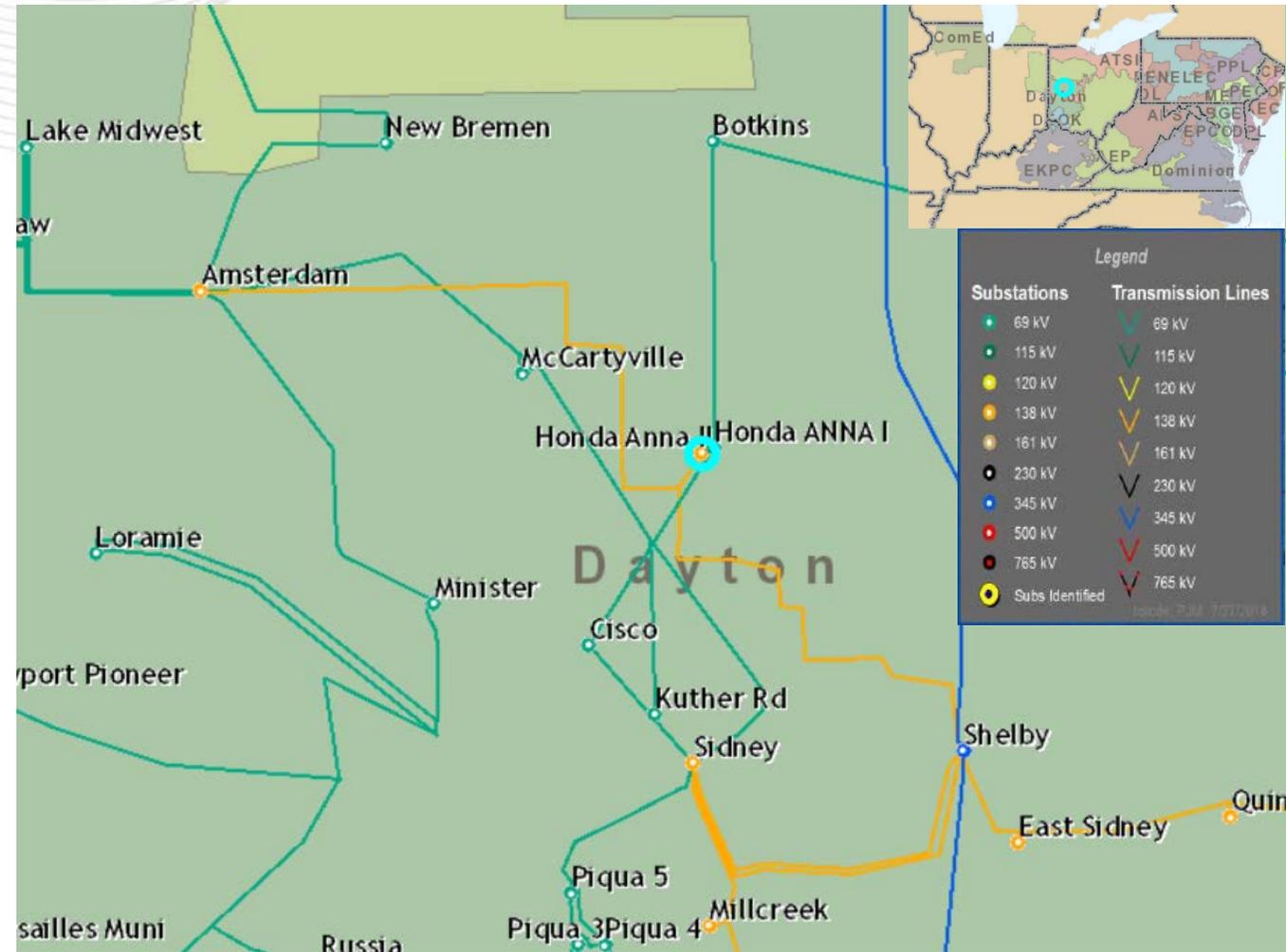
Selected Solution:

Install a 138 kV automatic sectionalizing switch at Honda Anna 138 kV tap on the Amsterdam – Shelby 138 kV line with remote operation capability. (S1747)

Estimated Cost: \$376 K

Required In-Service: 12/31/2019

Status: Engineering



Previously Presented: 8/31/2018 SR RTEP

Problem Statement:

Continued load growth in the Mt. Zion area requires additional capacity.

Driver: Customer Service

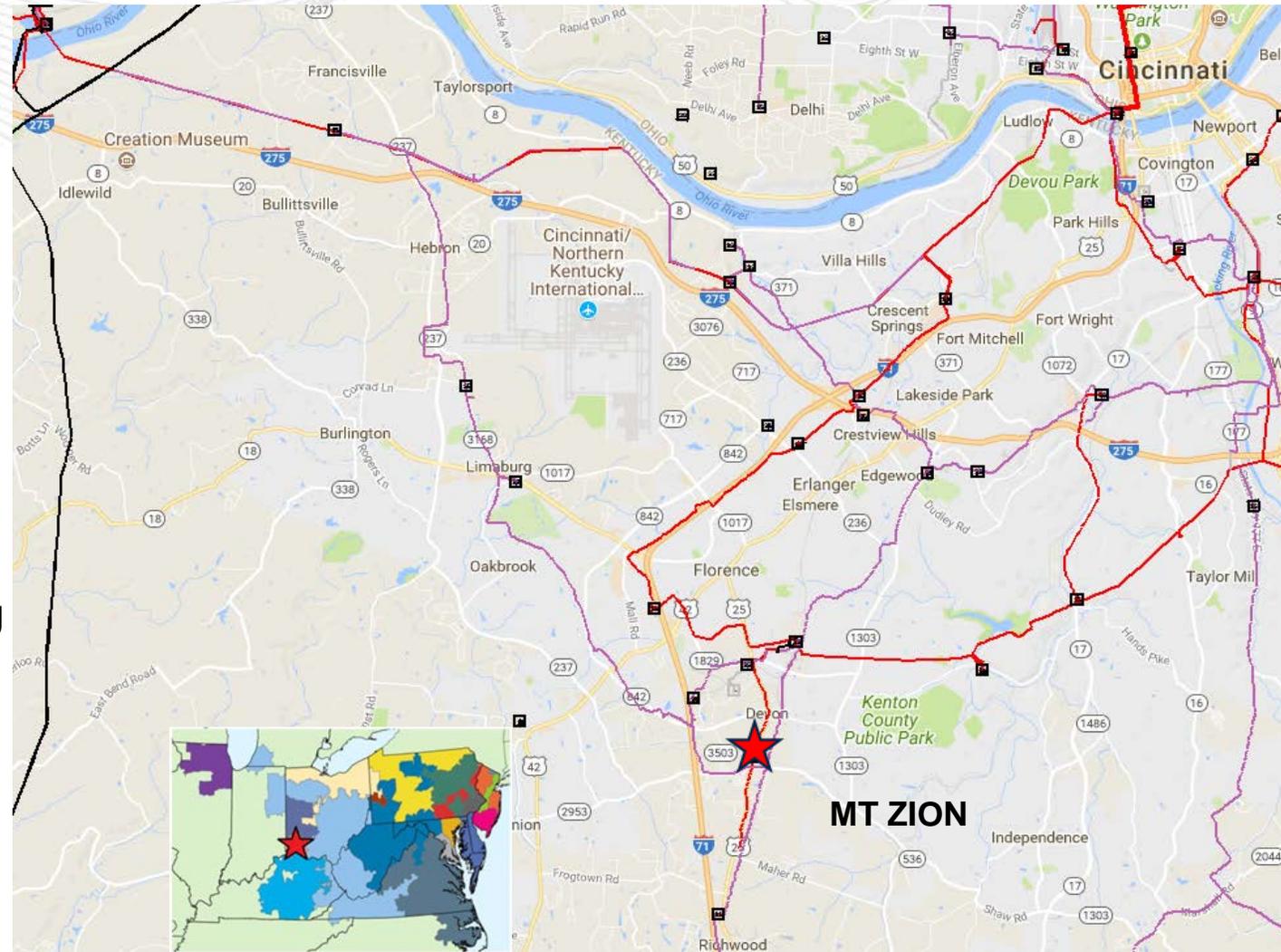
Selected Solution:

Expand the Mt. Zion Substation installing equipment to support two additional distribution circuits including the installation of a 138/13 kV transformer. The transmission scope includes installing a 138 kV circuit breaker, breaker disconnects and bus work, relocating transmission structure, replacing CCVTs, adding relaying, and installing a 138 kV line switch. (**\$1739**)

Estimated Cost: \$2.12 M (transmission assets only)

Projected In-service: 12-31-2019

Project Status: Engineering



Previously Presented: 8/31/2018 SRTEP

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

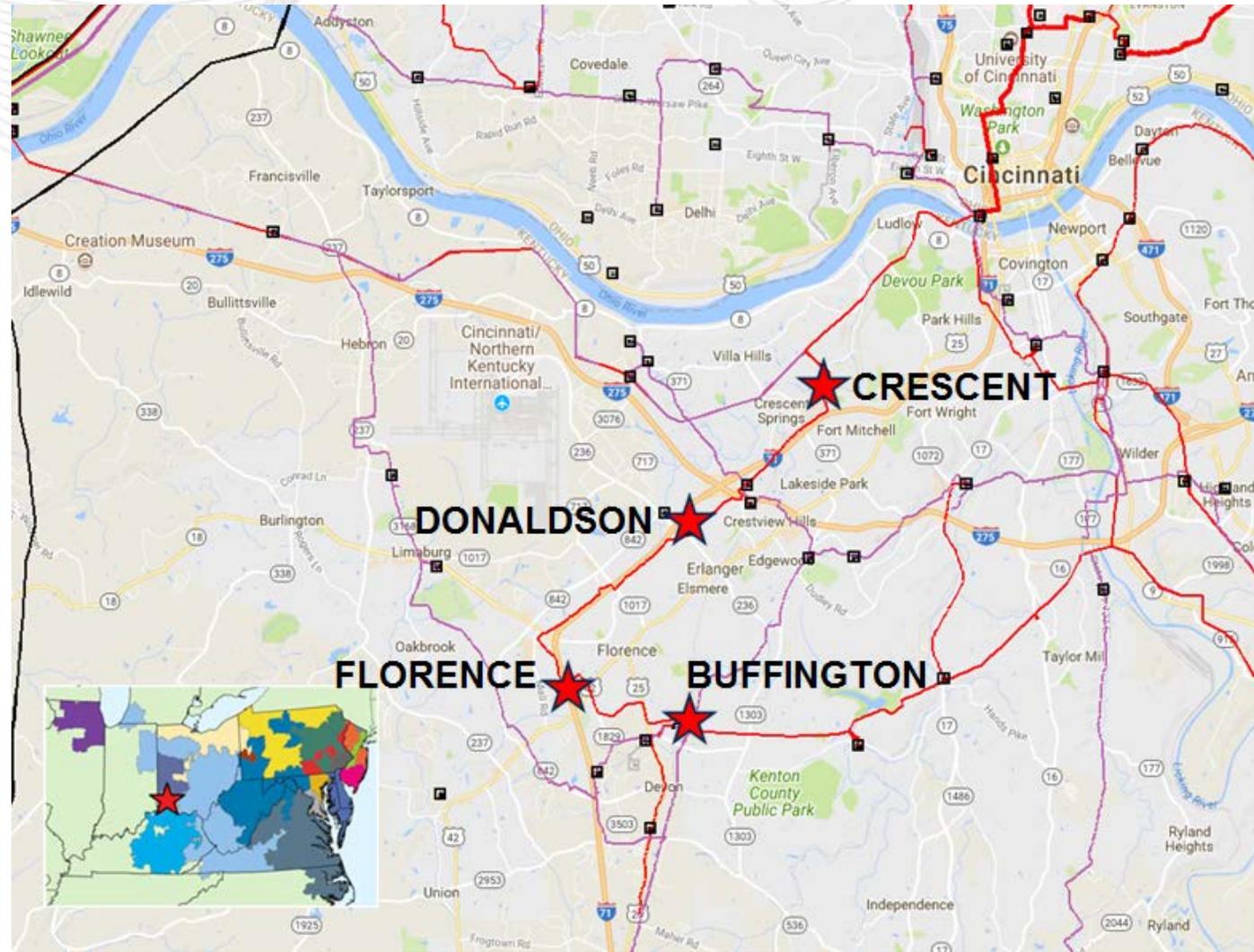
Selected Solution:

Expand the Donaldson Substation installing equipment to support four additional distribution circuits including two 138/13 kV transformers. The transmission scope includes installing a 4-breaker 138 kV ring bus with four new 138 kV breakers, associated breaker disconnects, new bus work, new structure, new CCVTs, relaying, and line disconnects. (**\$1740**)

Estimated Cost: \$4.14 M (transmission assets only)

Projected In-service: 12-31-2019

Project Status: Engineering



Previously Presented: 8/31/2018 SR RTEP

Problem Statement:

Buffington 139/69/13 kV 100/100/35 MVA 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

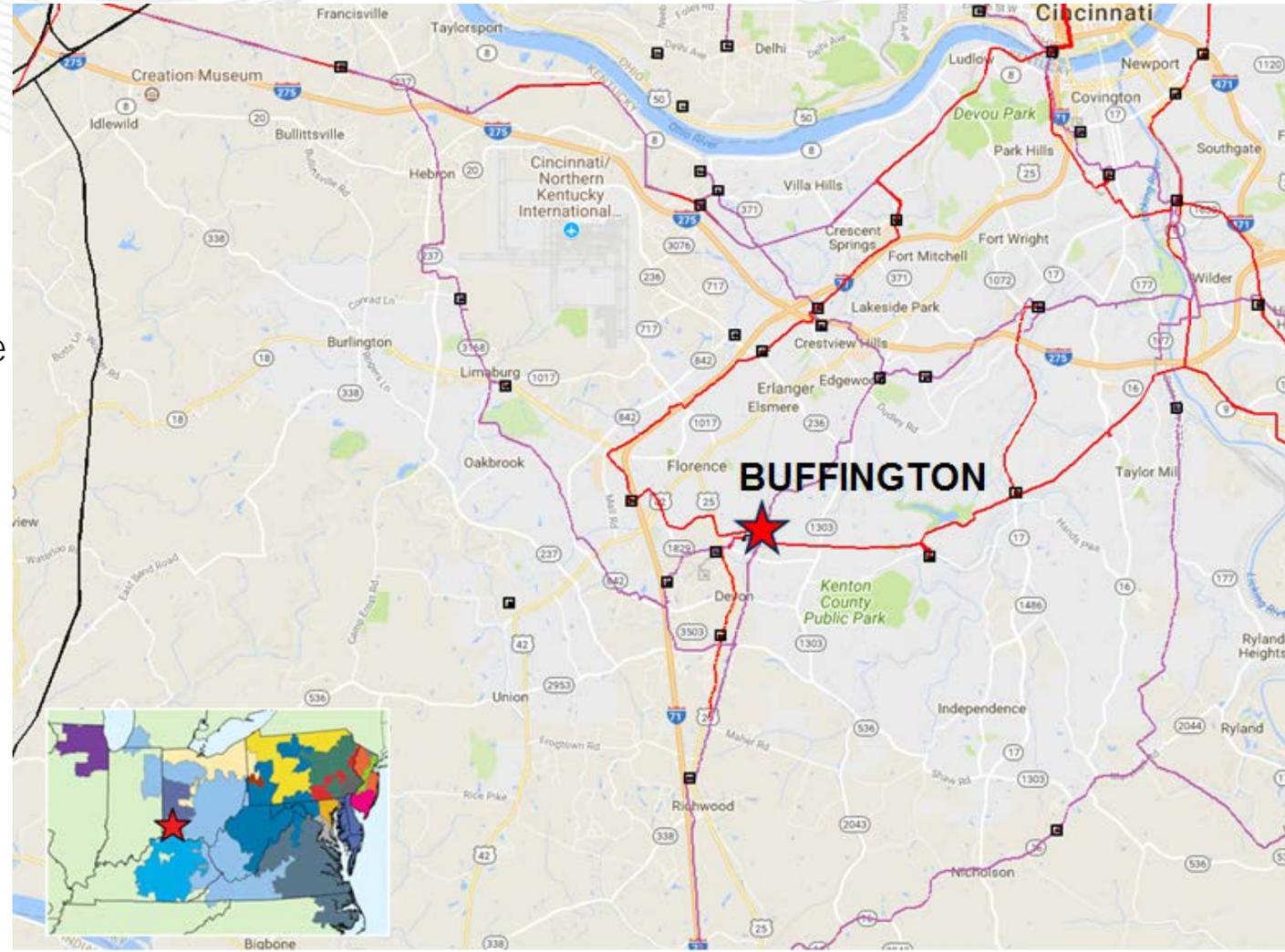
Selected Solution:

Remove the 3 phase grounding/regulating transformer. Replace TB1 with a 138/69 kV 150 MVA transformer with no tertiary winding. (S1741)

Estimated Cost: \$2.90 M

Projected In-service: 12-31-2020

Project Status: Scoping



Previously Presented: 8/31/2018 SR RTEP

Problem Statement:

Villa 69/13 kV 22.4 MVA 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 13 kV Bus 2 switchgear. TB2 needs to be moved for the switchgear replacement. The 69 kV 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.

Driver: Equipment Condition, Operational Flexibility, Resilience

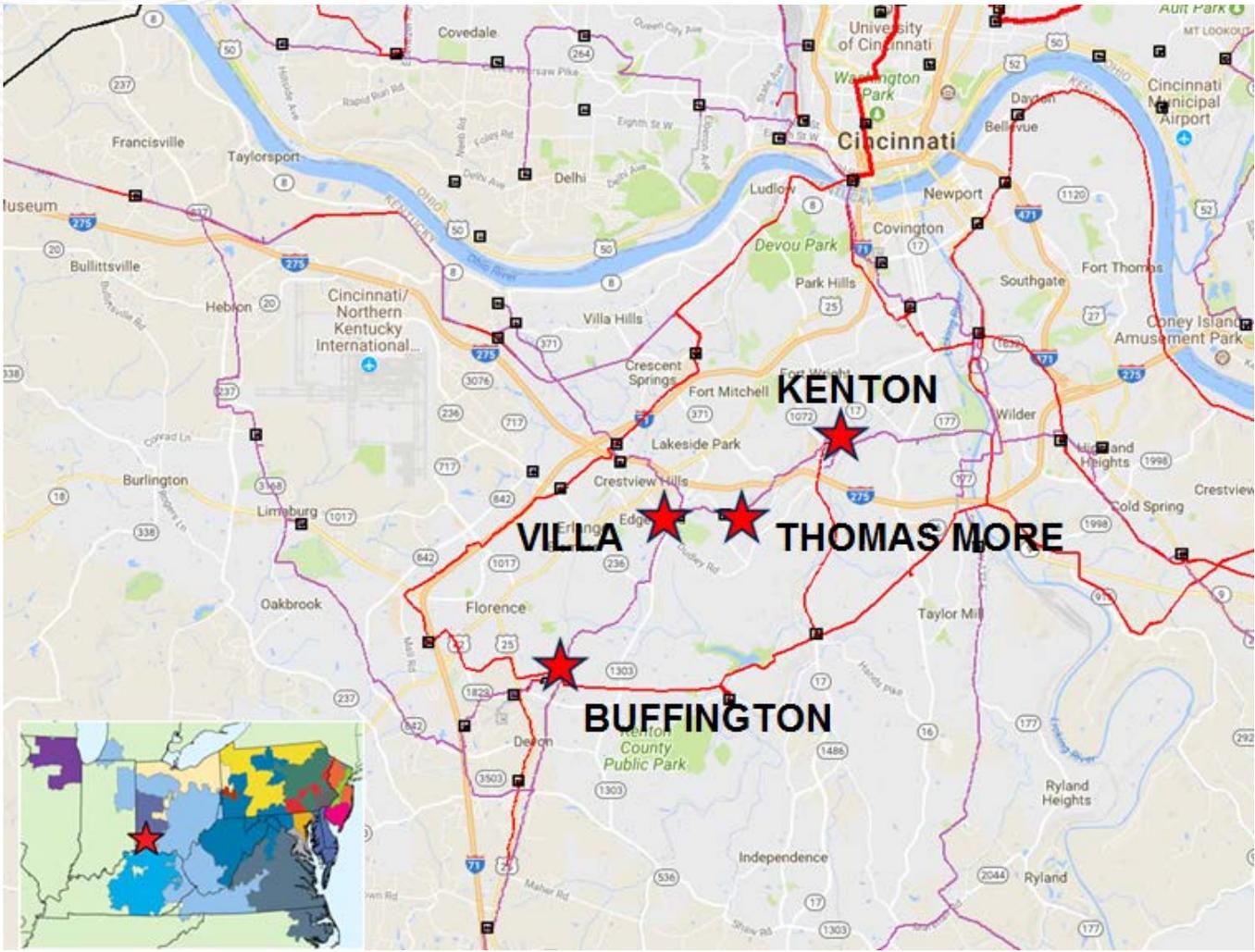
Selected Solution:

Replace TB2 with a transformer of the same capacity. Reconfigure Villa into a 4-breaker 69 kV ring bus with three new 69 kV breakers, associated breaker disconnects, new bus work, new structure, relaying, and line disconnects. (S1742)

Estimated Cost: \$4.34 M (transmission assets only)

Projected In-service: 12-31-2019

Project Status: Engineering



Previously Presented: 8/31/2018 SR RTEP

Problem Statement:

Distribution is replacing switchgear on Trenton buses 1 and 2. 69/13 kV 20 MVA 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

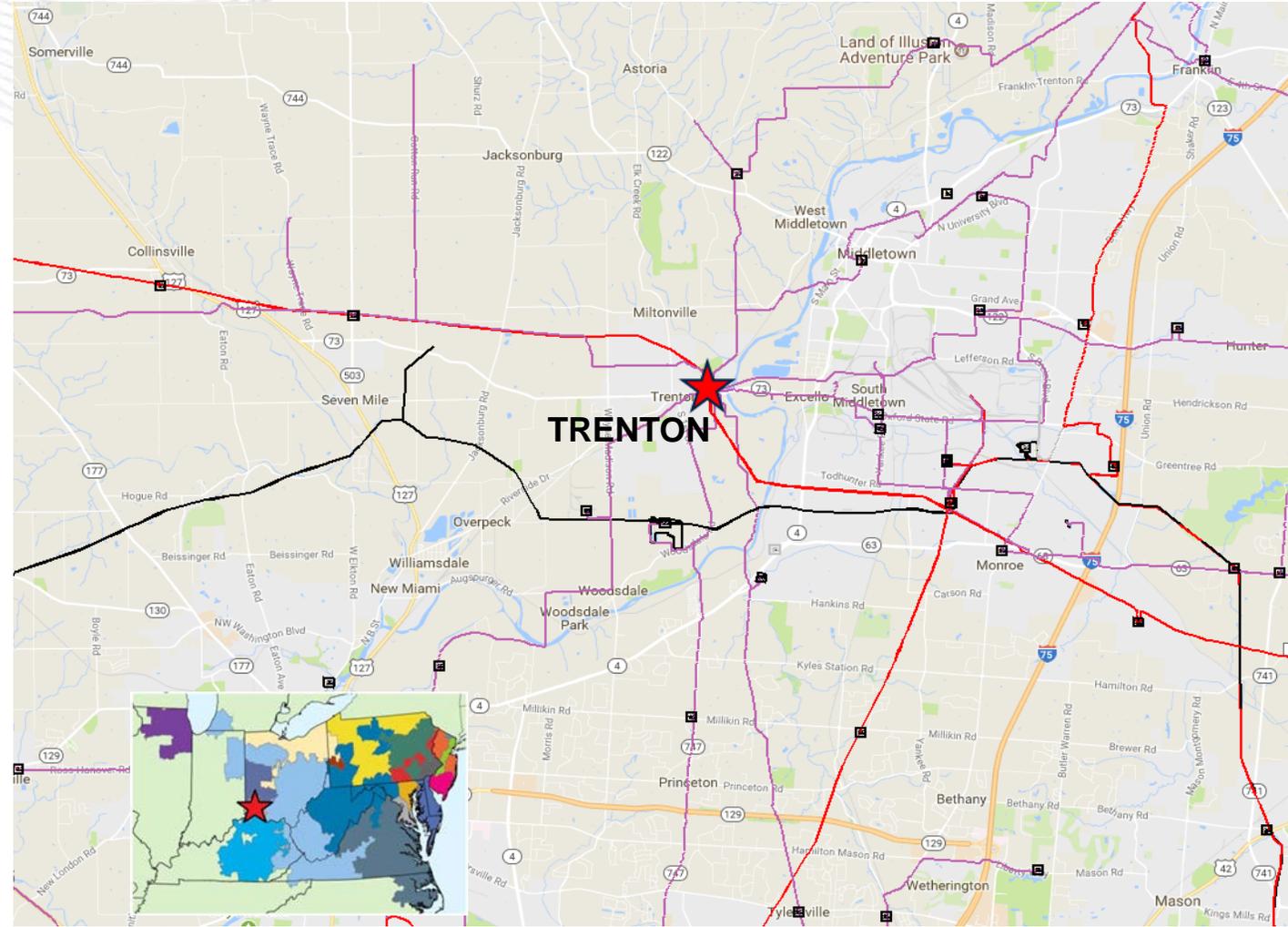
Selected Solution:

Replace TB7 with a 138/13 kV 22.4MVA transformer connecting to the 138 kV bus. Install a 138 kV breaker with breaker disconnects to connect TB7. Install/replace relaying for both the breaker and transformer. (\$1743)

Estimated Cost: \$0 M

Projected In-service: 12-31-2019

Project Status: Engineering



Previously Presented: 8/31/2018 SR RTEP

Problem Statement:

Remington Substation has two 138 kV buses, each serving switched 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

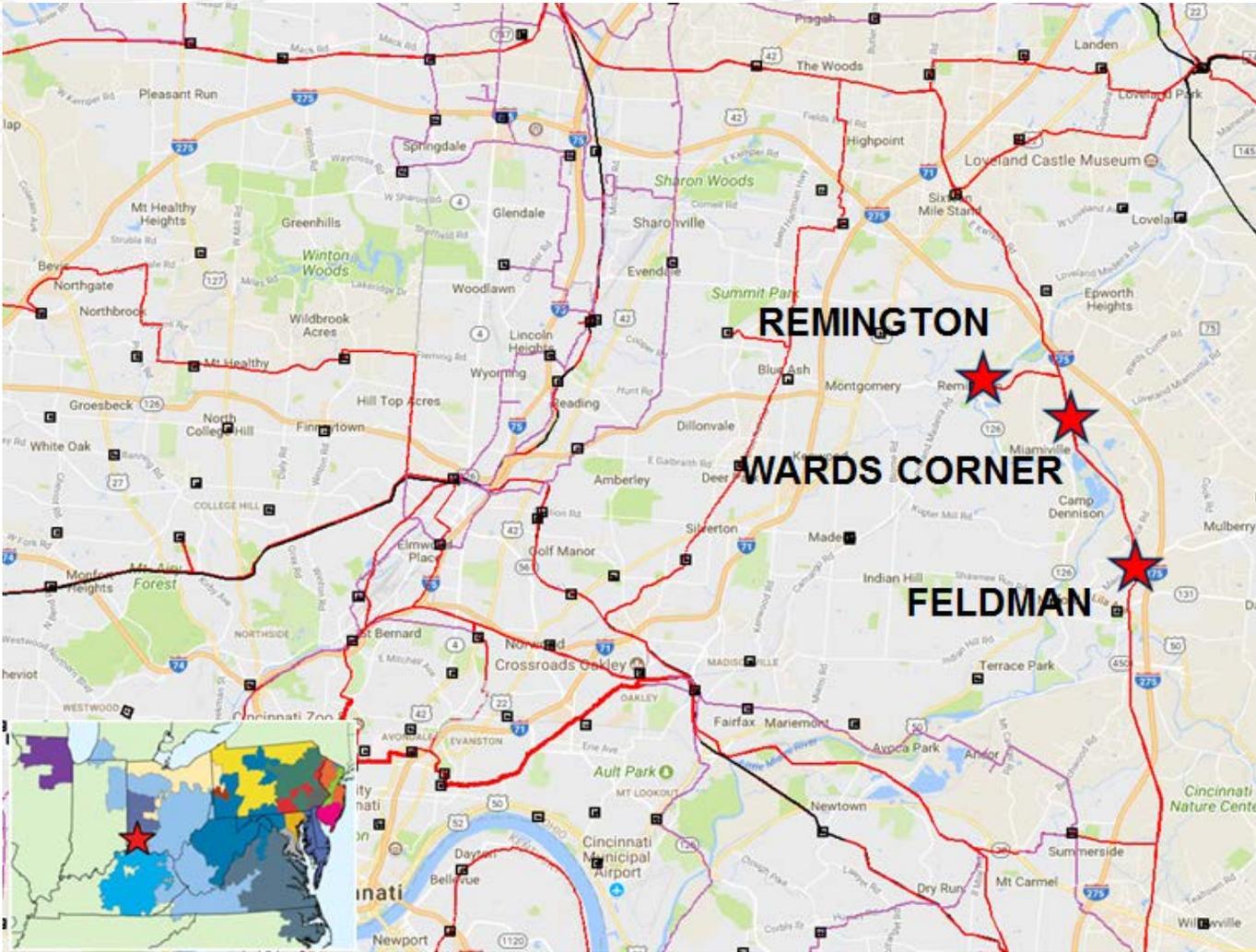
Selected Solution:

Replace the bus tie circuit breaker. Install three additional 138 kV circuit breakers, associated breaker disconnects, new bus work, new structure and relaying to reconfigure the substation into 4-position ring bus. **(\$1744)**

Estimated Cost: \$4.95 M

Projected In-service: 12-31-2019

Project Status: Engineering



Previously Presented: 8/31/2018 SR RTEP

Problem Statement:

Ebenezer TB6 is a 138/69/33 kV 140/140/56 MVA transformer that feeds both a 69 kV transmission bus, and with a tertiary winding feeds a 33 kV distribution bus. The 33 kV 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 138 kV 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 bus tie breaker is oil filled and obsolete. The failure of the tie breaker will interrupt service to 138/13 kV TB3, 138/69 kV TB5, TB6 (total of 222 MVA of capacity), and interrupt the 138 kV path between Miami Fort Generating Station and Terminal Substation.

Driver: Equipment Condition, Operational Flexibility, Resiliency

Selected Solution:

Replace TB6 with a 138/69 kV 150 MVA transformer to feed the 69 kV bus. Install a new 138/33 kV 22.4 MVA transformer to feed the 33 kV 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. (S1745)

Estimated Transmission Cost: \$9.0 M

Projected In-service: 12-31-2020

Project Status: Scoping



Previously Presented: 8/31/2018 SRRTEP

Problem Statement:

On April 25, a landslide near Wilmerding substation caused multiple transmission structures on the radial Wilmerding-WABCO (Z-98) 138 kV 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

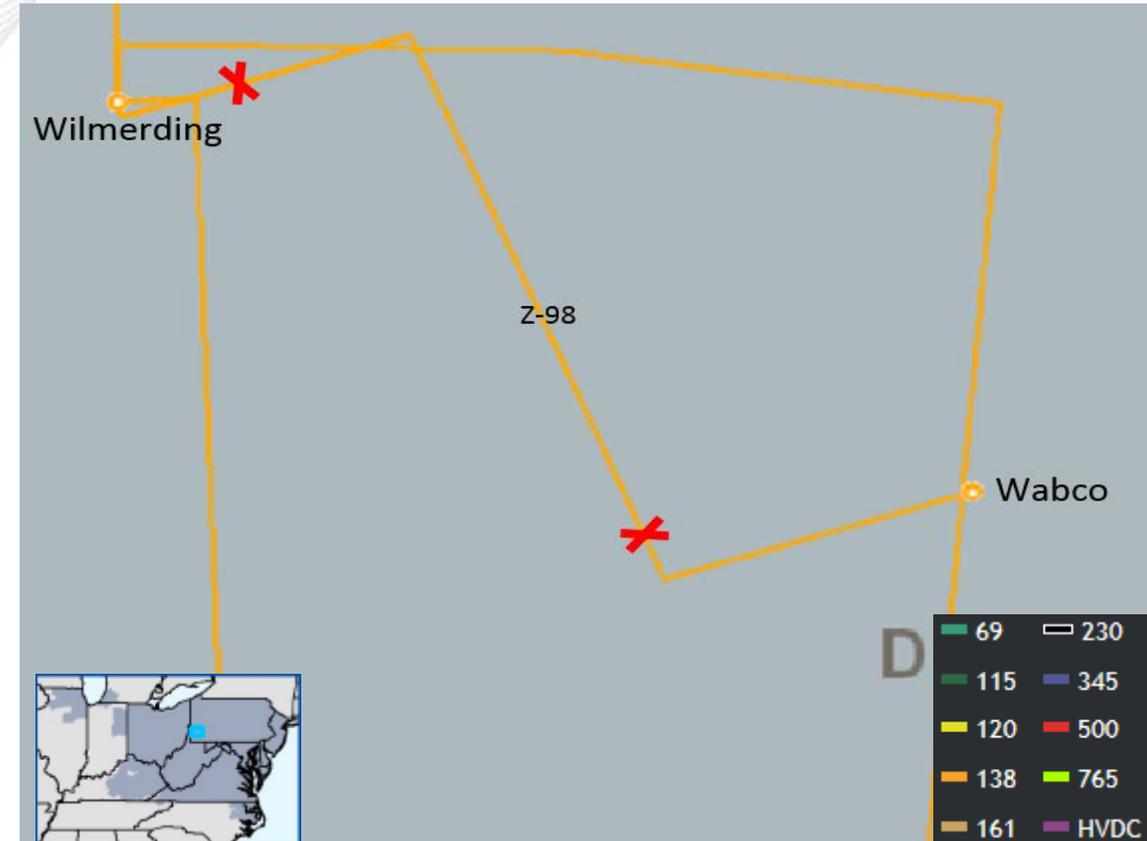
Selected Solution:

Remove the 2000 A Wilmerding-WABCO (Z-98) 138 kV line breaker at the Wilmerding substation, the 1600 A Wilmerding-Dravosburg (Z-76) 138 kV line breaker at the Wilmerding substation, and ~0.5 miles of the radial from service to retire the Wilmerding-WABCO (Z-98) 138 kV line. **(\$1737)**

Estimated Project Cost: \$300 K

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

Status: Construction



Previously Presented: 8/31/2018 SRRTEP

Problem Statement:

Currently NOVA Chemical is being served by the Valley-Hopewell 69 kV 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 138 kV 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

Selected Solution:

Eliminate the existing Kobuta substation and the 69 kV tap and replace it with a new 138 kV transmission line from the Potter substation to the newly constructed NOVA Chemical substation, which is being built by the customer. (S1738.1)

Install a #6-#7 3000 A 63kA 138 kV bus tie breaker and associated protection and control equipment at Potter substation. Install the new Potter-NOVA Chemical (Z-180) 138 kV line using 853.7 ACAR 24/13. (S1738.2)

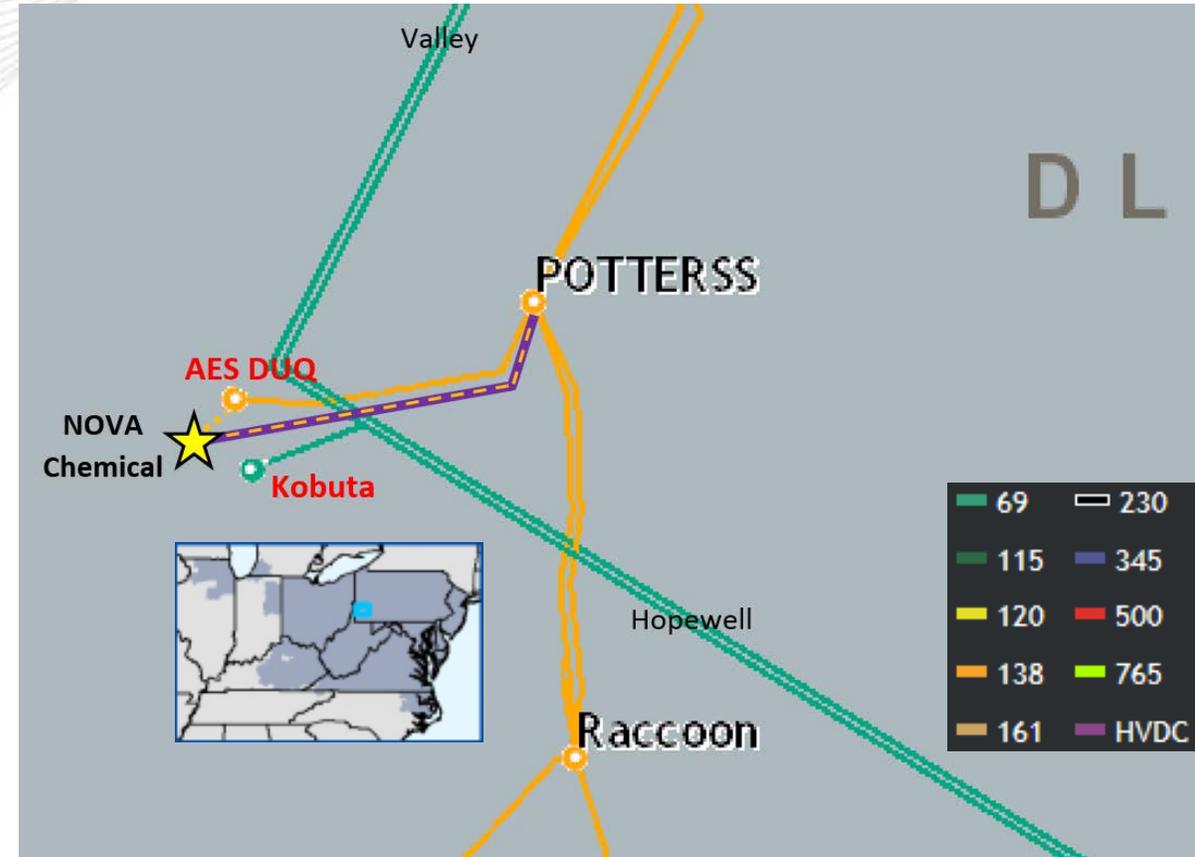
Install two 138 kV disconnect switches, protection, communications, and metering equipment at the newly constructed NOVA Chemical customer substation. (S1738.3)

Eliminate the 69 kV Kobuta tap and associated customer substation from the Valley-Hopewell 69 kV line. Remove all associated equipment from the AES substation to establish Potter-NOVA Chemical (Z-80). (S1738.4)

Estimated Project Cost: \$4 M

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

Status: Engineering



**Previously Presented: 8/31/2018 SR RTEP
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).

Recommended Solution:

Greenfield-NASA 138 kV Terminal Upgrades (B3032)

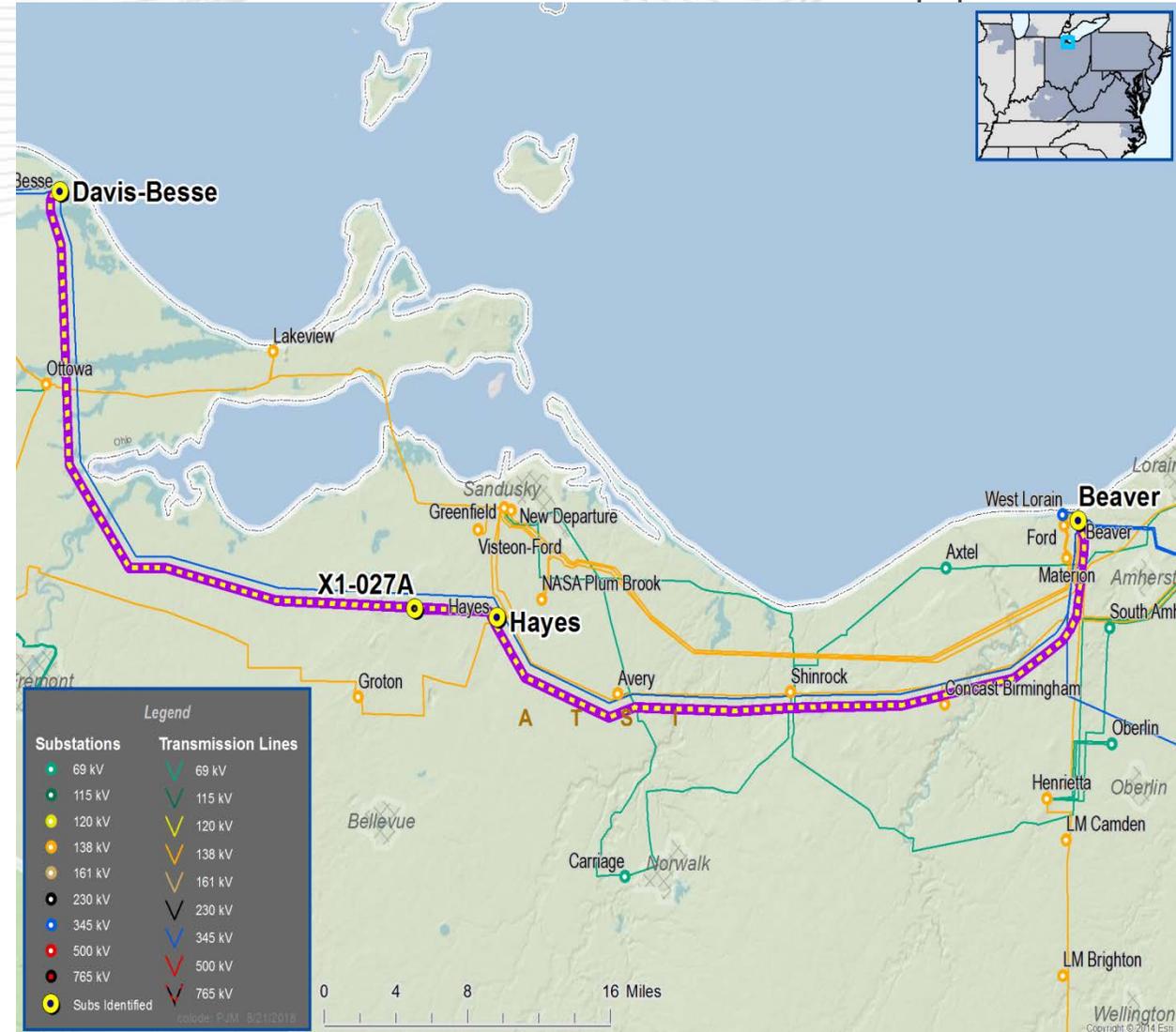
- NASA Substation, Greenfield exit: Revise CT tap on Breaker B22 and adjust line relay settings.
- Greenfield Substation, NASA exit: Revise CT tap on Breaker B1 and adjust line relay settings; replace 336.4 ACSR line drop with 1033.5 AL.
 - Old rating: 186 / 205 MVA WN / WE
 - New rating: 315 / 401 MVA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

Estimated Project Cost: \$0.1 M

Required IS Date: 12/01/2023

Projected IS Date: 12/01/2023

Status: Conceptual



Previously Presented: 8/31/2018 SR RTEP

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).

Recommended Solution:

Ottawa-Lakeview 138 kV Reconductor and Substation Upgrades (B3033)

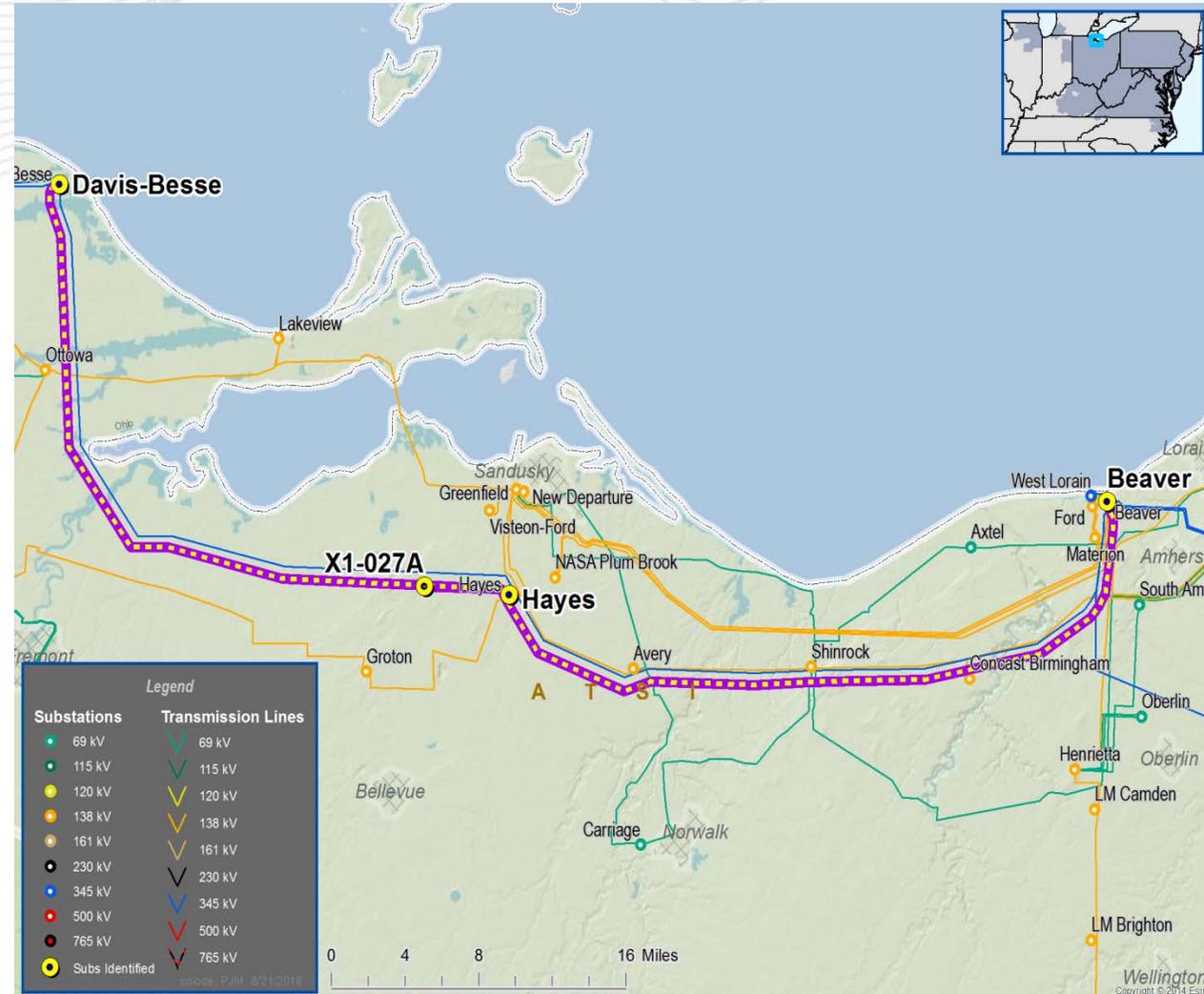
- At Ottawa substation, Lakeview exit, replace 954 ACSR line drop conductor with 795 ACSS; replace 1272 SAC substation conductor with 1590 ACSS.
- At Lakeview substation, Ottawa exit, replace 636 ACSR line drop conductor with 795 ACSS; replace 1590 ACSR substation conductor with 1590 ACSS. replace 1600A 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



Previously Presented: 8/31/2018 SRRTEP

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).

Recommended Solution:

Lakeview-Greenfield 138 kV Reconductor and Substation Upgrades (B3034)

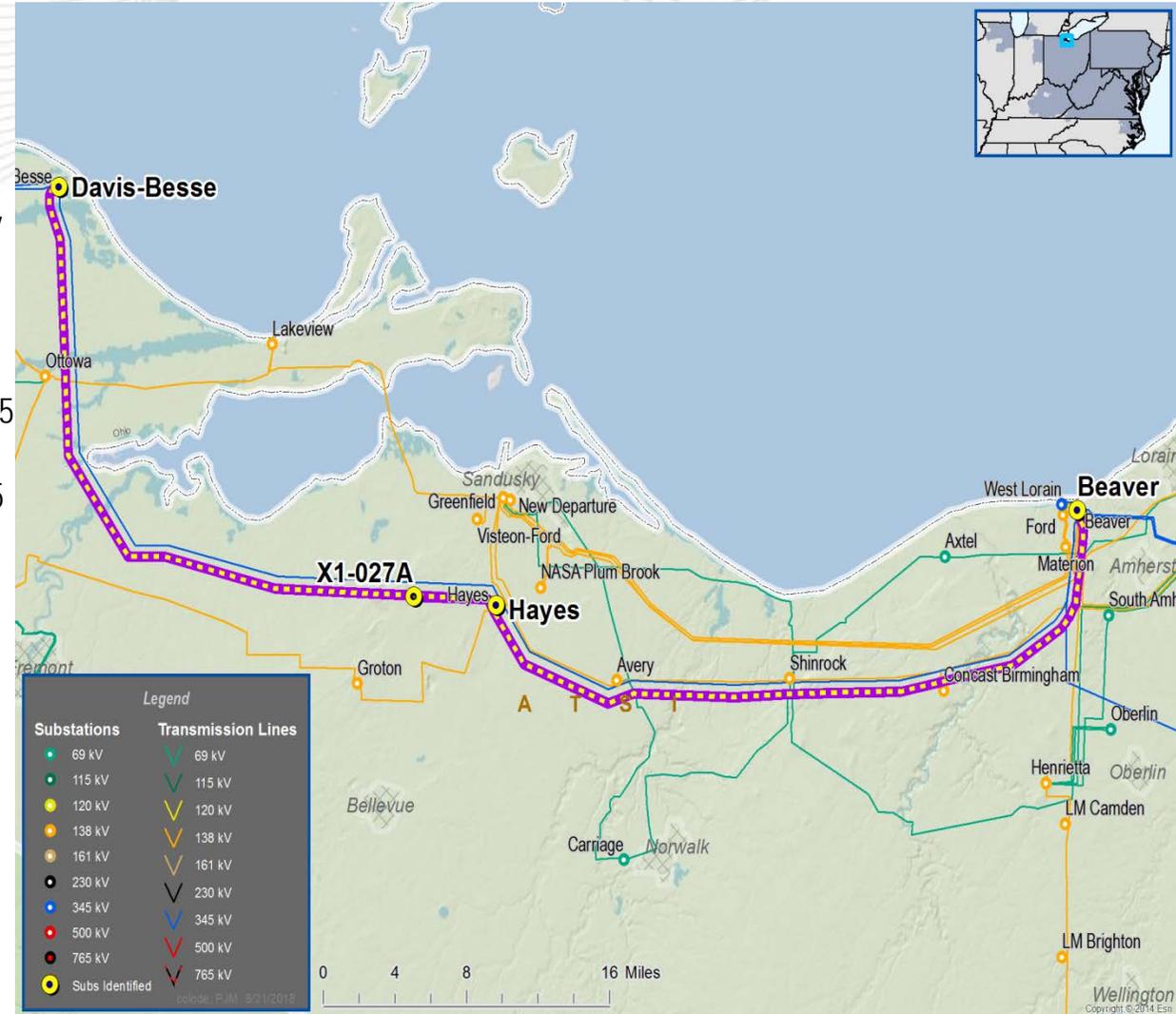
- At Lakeview substation, Greenfield exit, replace 795 ACSR substation conductor with 795 ACSS; upgrade relays to standard relay panel.
- At Greenfield substation, Lakeview exit, replace 795 ACSR line drop and 1000 CU & 795 ACSR substation conductors with 795 ACSS; upgrade relays to standard relay panel.
- 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



Previously Presented: 8/31/2018 SRRETP

Problem Statement (Scope and Need/Drivers):

Customer Service

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

Selected Solution:

138 kV Line Extension to Customer Substation (Substation Name TBD) (S1694)

- 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)

Estimated Project Cost: \$3.5 M

Projected IS Date: 04/30/2019

Status: Conceptual



Previously Presented: 8/31/2018 SRRETP

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.

Selected Solution:

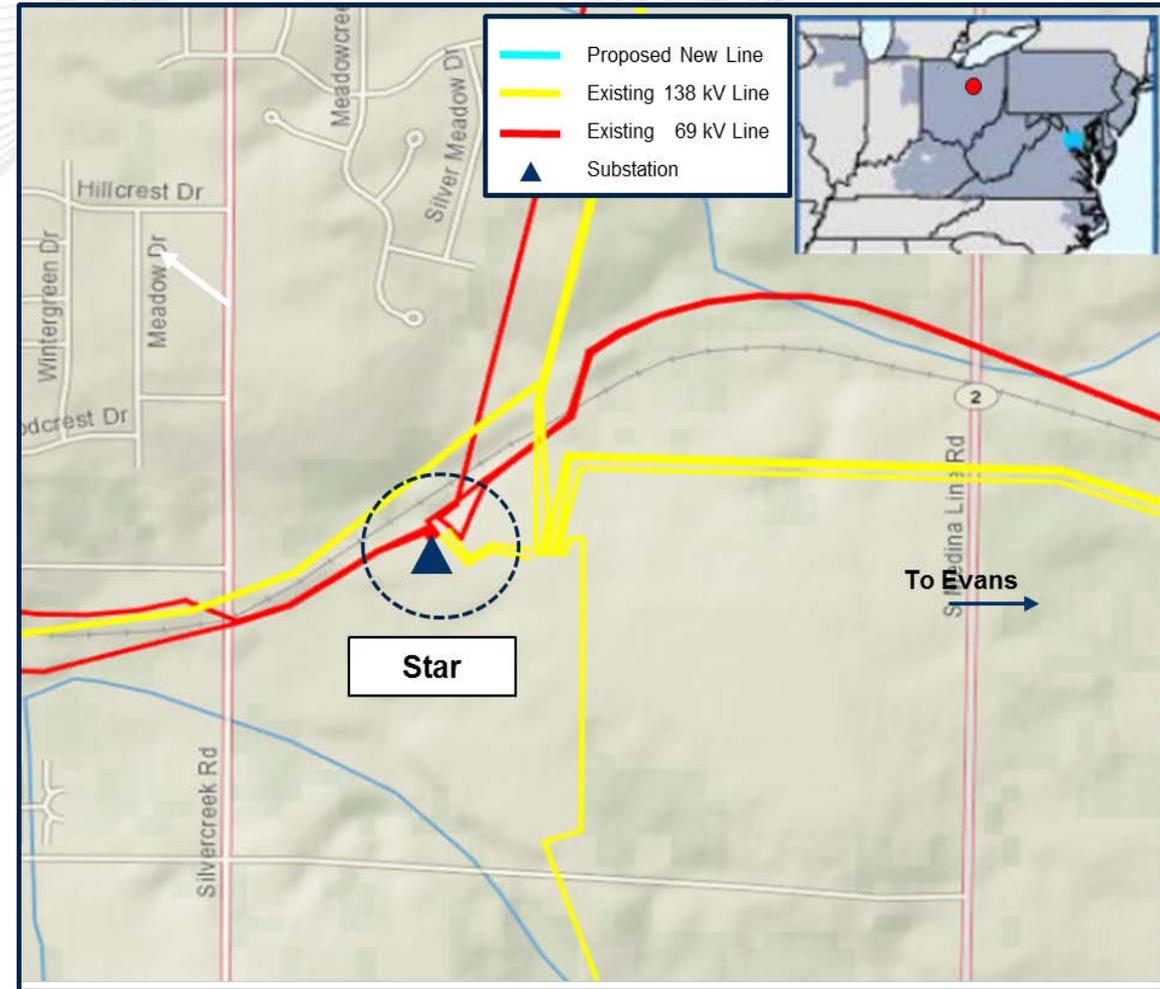
Star 138 kV Substation Project (S1695)

- 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.

Estimated Project Cost: \$3.3 M

Projected IS Date: 12/31/2019

Status: Conceptual





ATSI Transmission Zone: Supplemental Crissinger 138 kV Ring Bus Expansion

Previously Presented: 8/31/2018 SR RTEP

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.

Selected Solution:

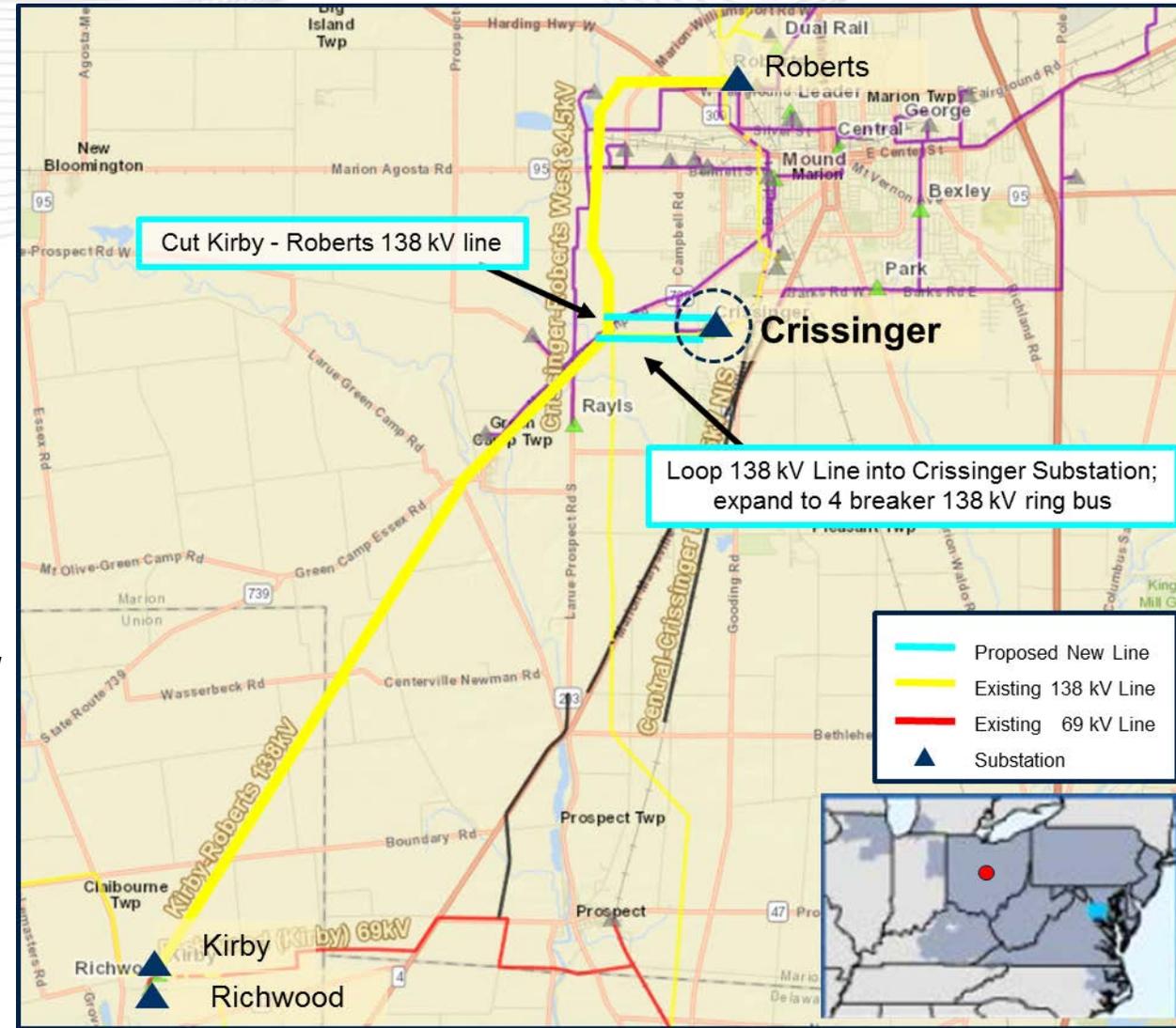
Crissinger 138 kV Ring Bus Expansion (\$1696)

- 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

Estimated Project Cost: \$5.8 M

Projected IS Date: 12/31/2019

Status: Engineering



Previously Presented: 8/31/2018 SRRTEP

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.

Selected Solution:

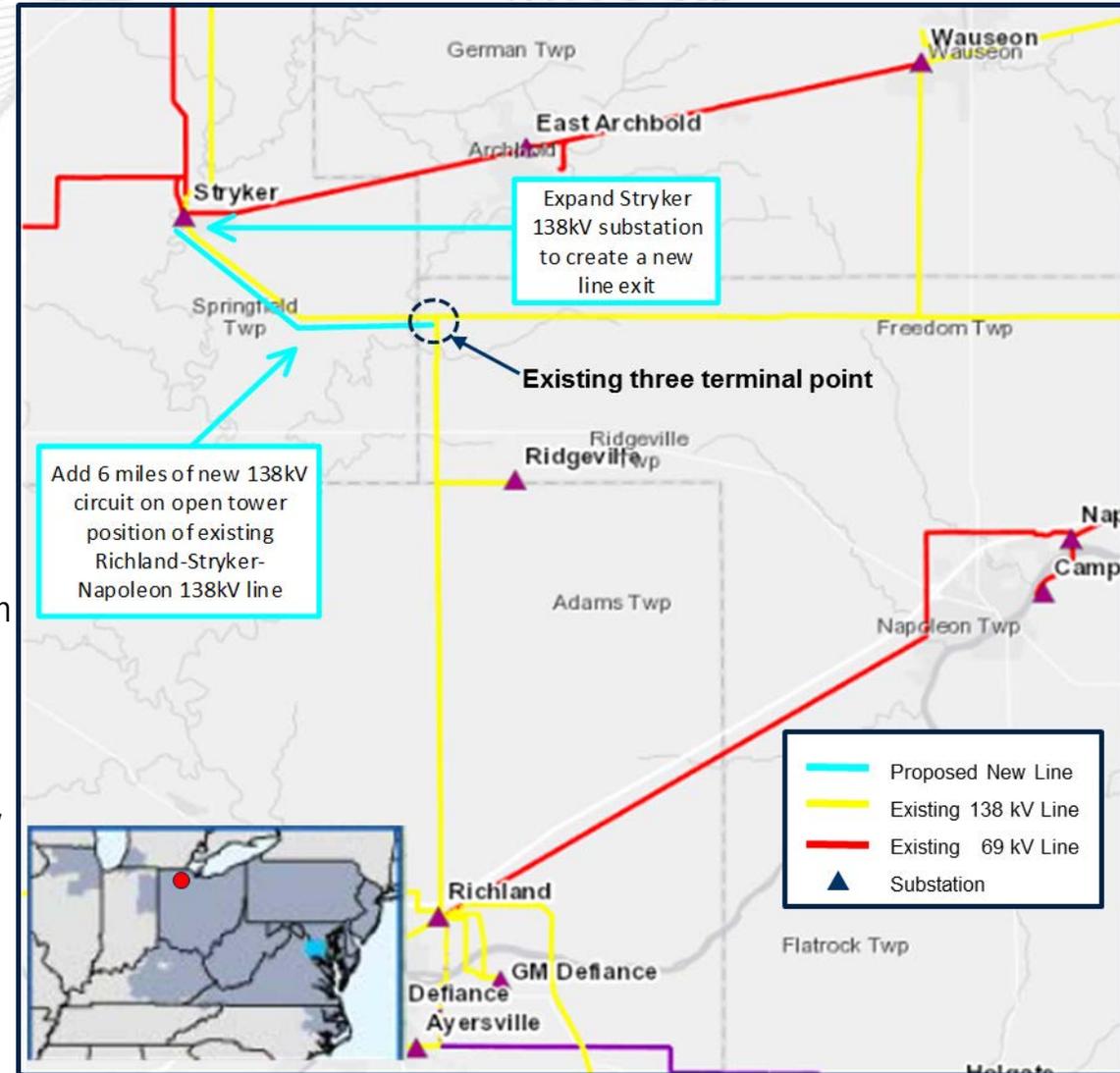
Richland-Stryker-Napoleon 138 kV Three-Terminal Line Elimination Project (S1697)

- 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

Estimated Project Cost: \$4.2 M

Projected IS Date: 12/31/2019

Status: Engineering





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

Previously Presented: 8/31/2018 SRRTPEP

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-Fulton 138 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.

Selected Solution:

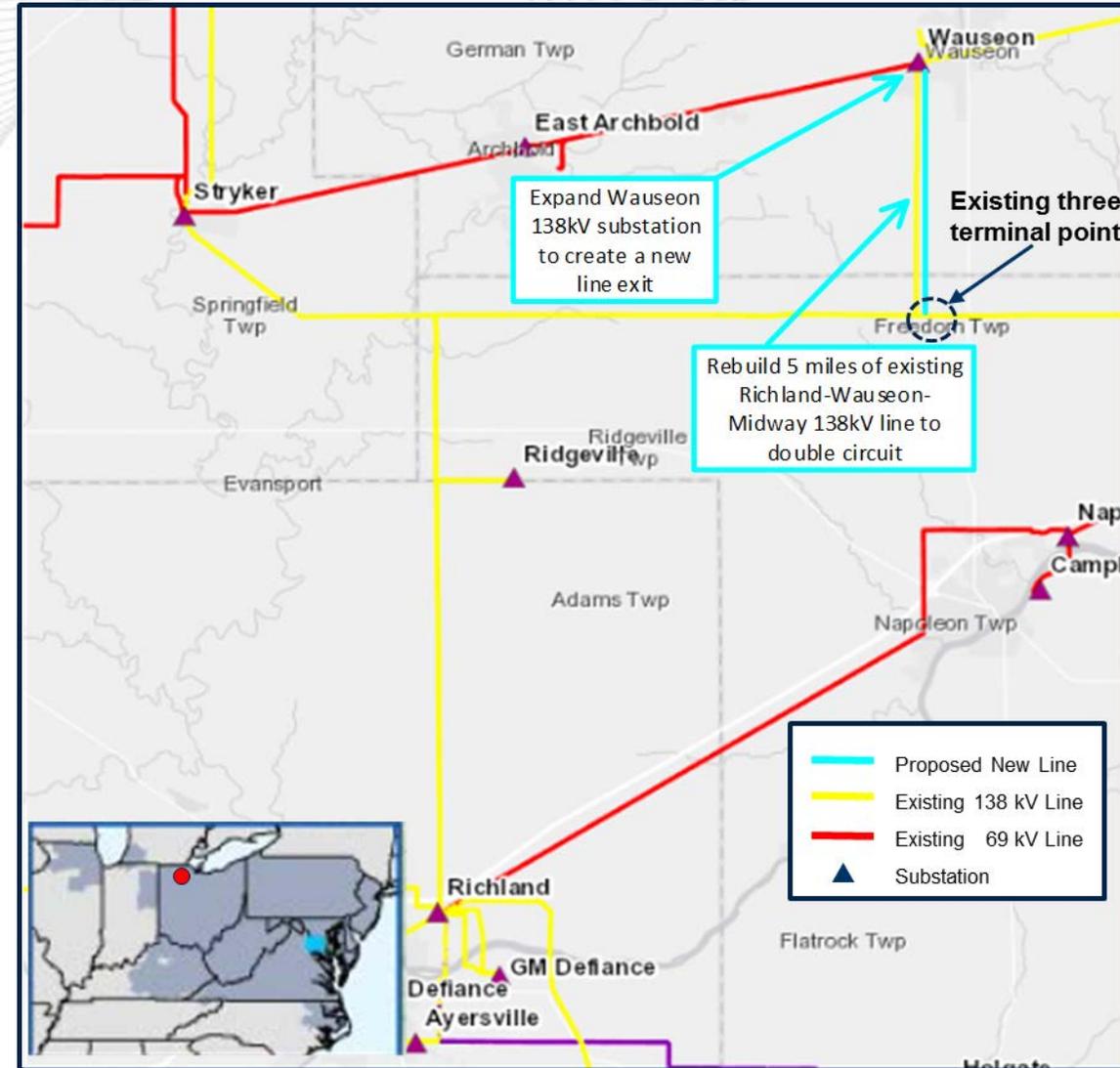
Richland-Wauseon-Midway 138 kV Three-Terminal Line Elimination Project (\$1698)

- 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

Estimated Project Cost: \$7.7 M

Projected IS Date: 06/01/2020

Status: Conceptual



Previously Presented: 8/31/2018 SR RTEP

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 ("B_LINE1_WR_016").

Selected Solution:

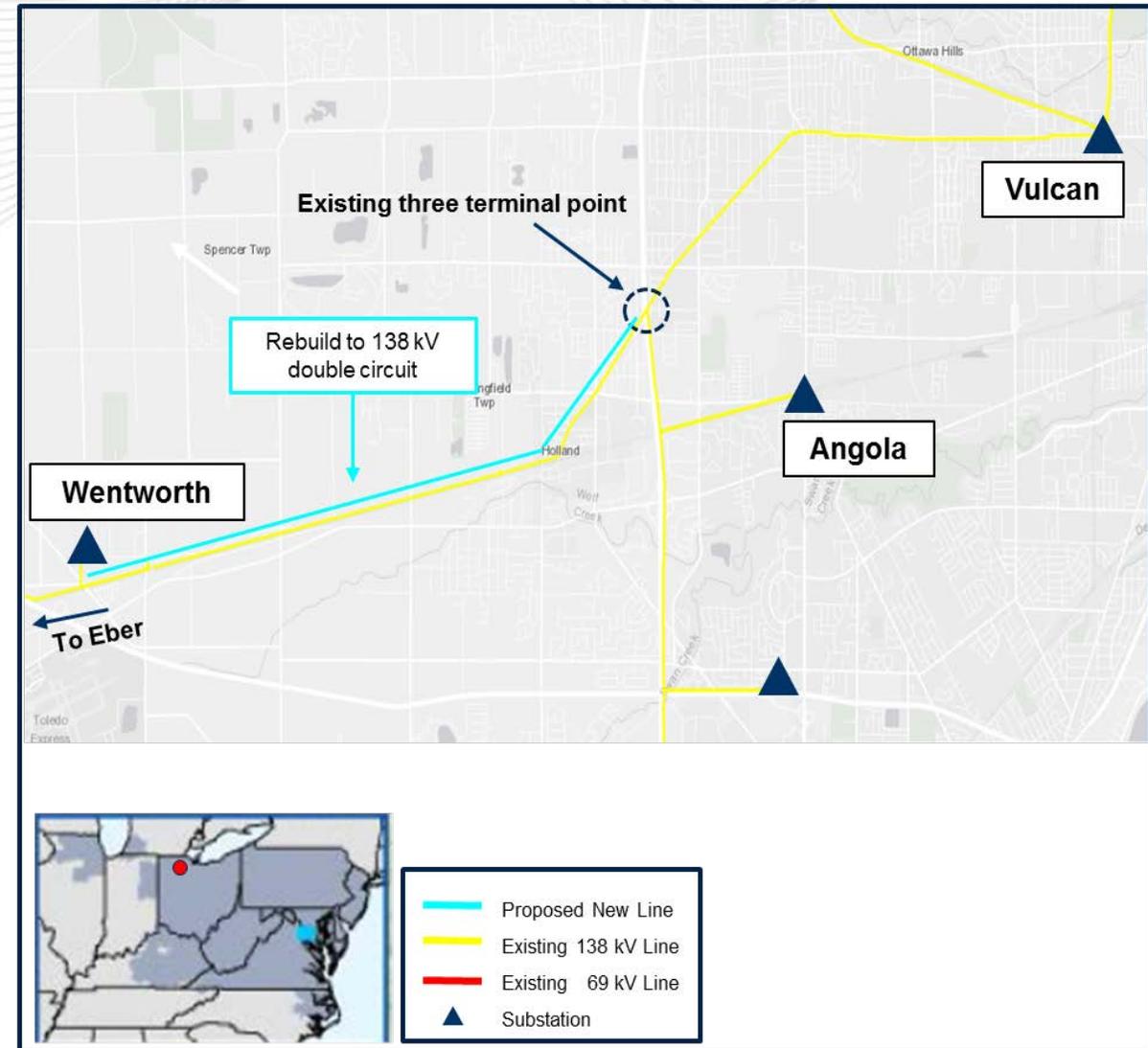
Angola-Eber-Vulcan 138 kV Three-Terminal Line Elimination Project (\$1700)

- 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

Estimated Project Cost: \$13.4 M

Projected IS Date: 12/31/2020

Status: Conceptual



Previously Presented: 8/31/2018 SRRTPEP

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.

Selected Solution:

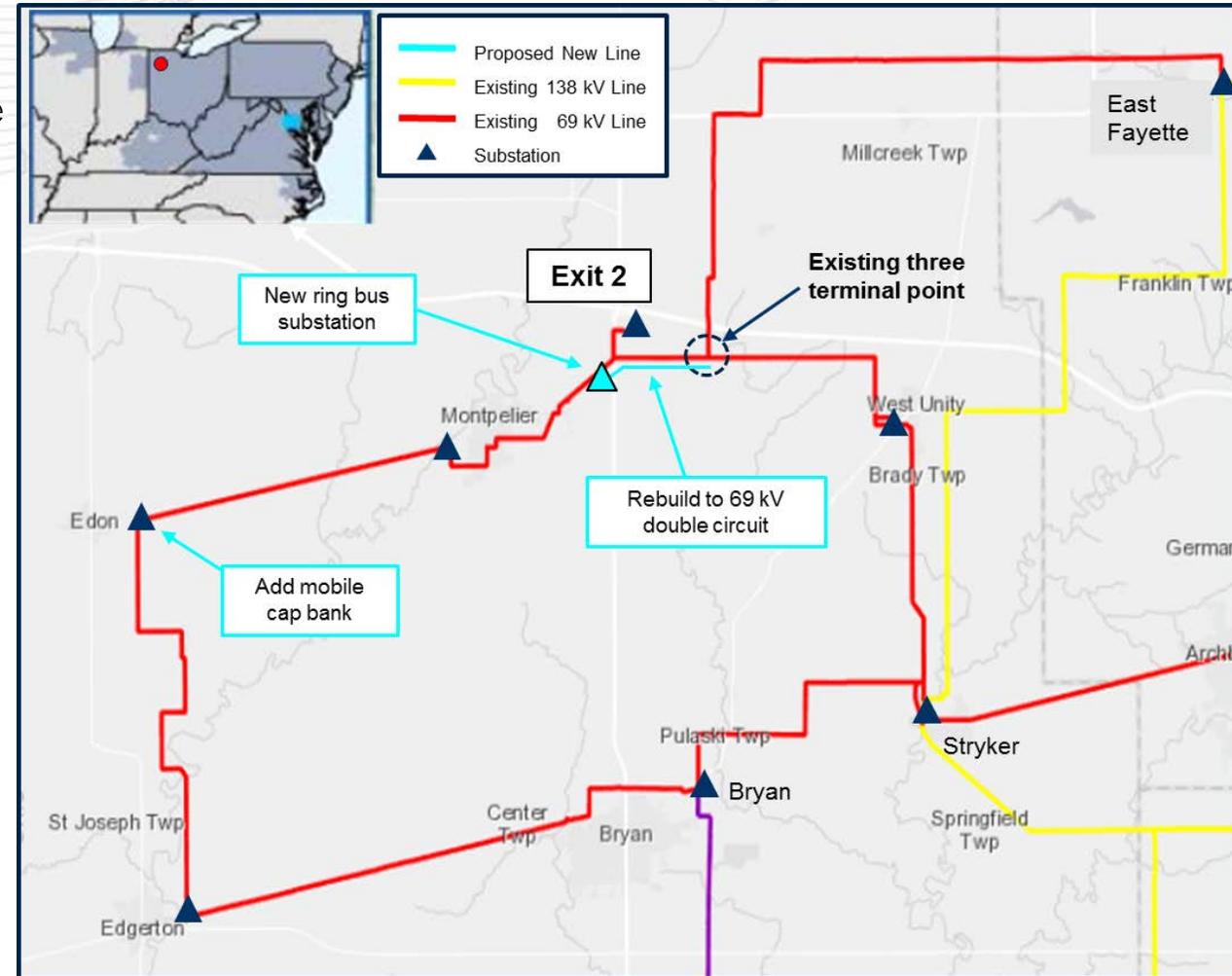
New Snyder 69 kV Substation Project (\$1701)

- 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.

Estimated Project Cost: \$13.2M

Projected IS Date: 06/01/2020

Status: Engineering



Previously Presented: 8/31/2018 SR RTEP

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.

Selected Solution:

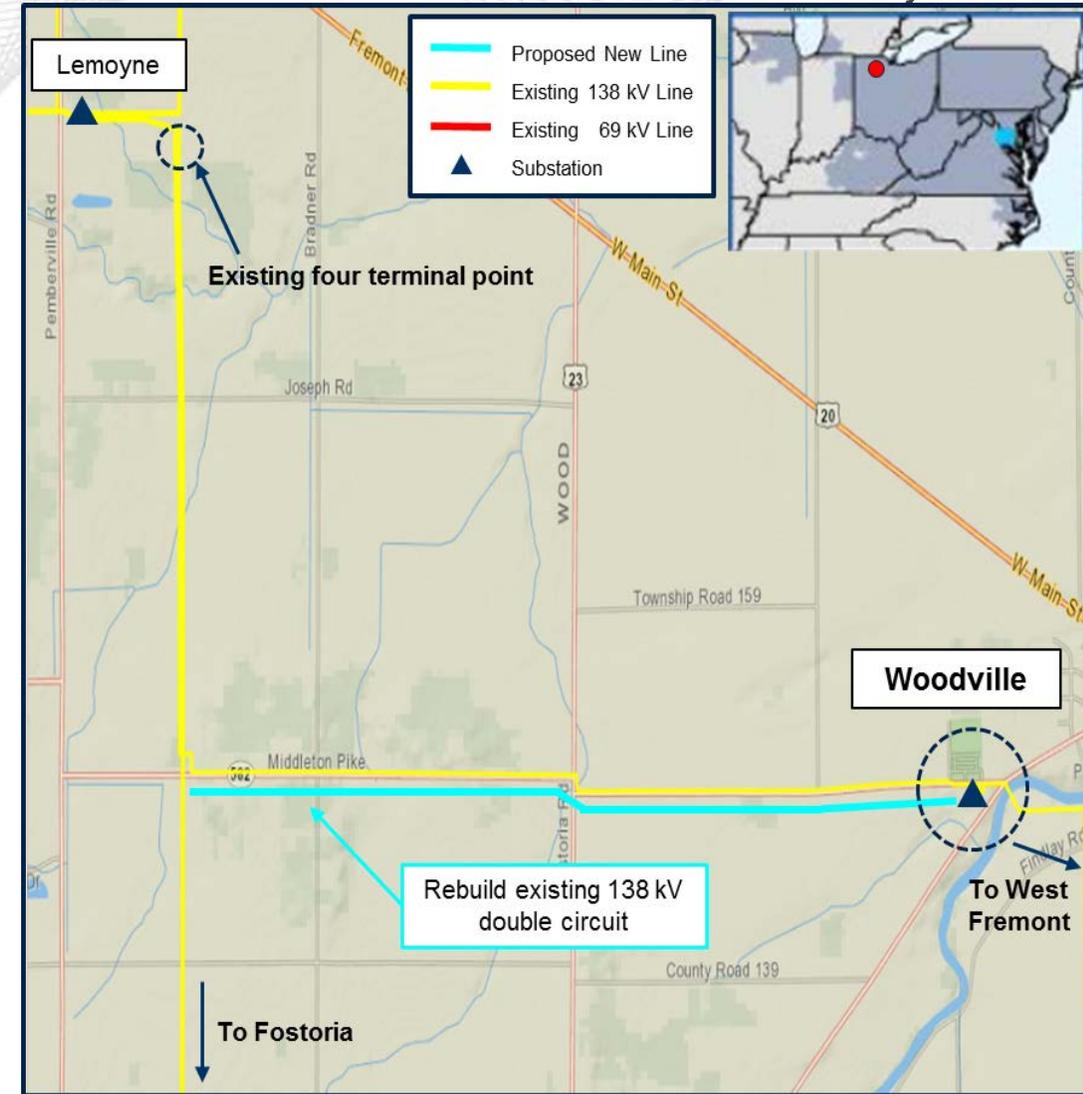
Lemoyne-Woodville-Fostoria 138 kV Four-Terminal Line Elimination Project (S1702)

- 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

Estimated Project Cost: \$11.3 M

Projected IS Date: 06/01/2020

Status: Conceptual



Previously Presented: 8/31/2018 SRRETP

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.

Selected Solution:

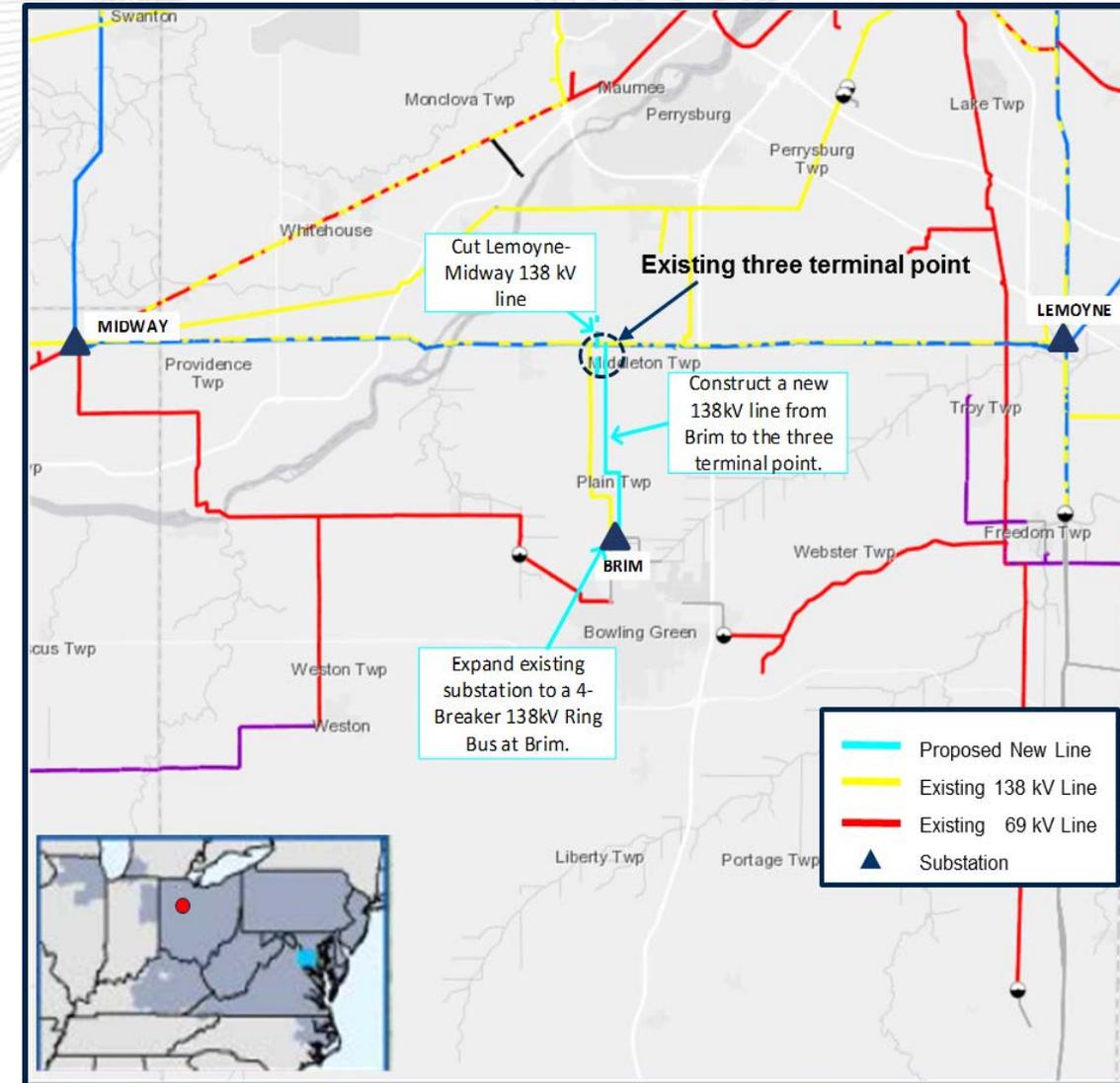
Brim 138/69 kV Substation Expansion (S1703)

- 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.

Estimated Project Cost: \$19.9 M

Projected IS Date: 6/1/2020

Status: Engineering





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

Previously Presented: 8/31/2018 SR RTEP

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.

Selected Solution:

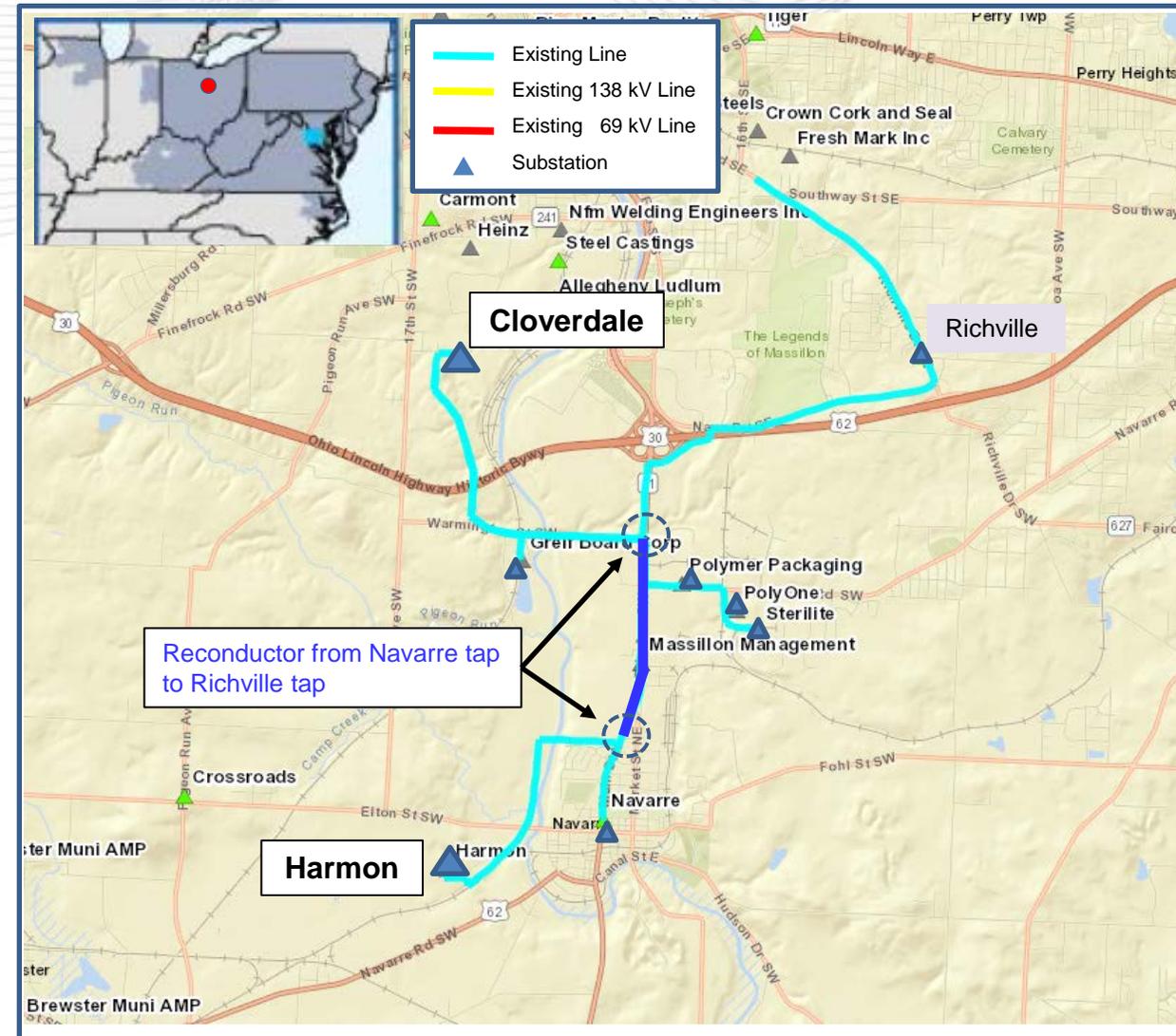
Cloverdale-Harmon No1 69 kV Line Section Reconductor Project (S1704)

- 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

Estimated Project Cost: \$2.3 M

Projected IS Date: 04/15/2020

Status: Conceptual



Previously Presented: 8/31/2018 SRRTEP

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.

Selected Solution:

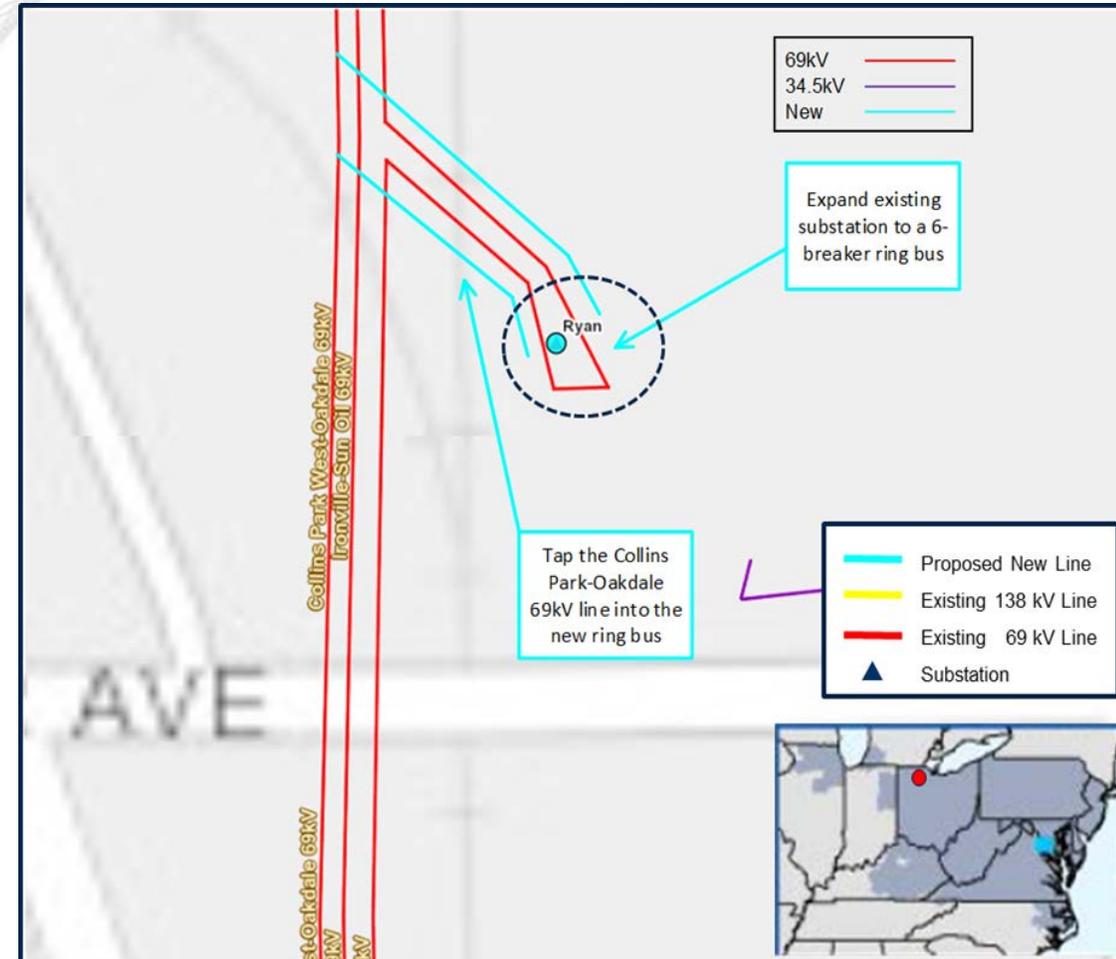
Ryan 69 kV Ring Bus Project (\$1705)

- 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.

Estimated Project Cost: \$10.8 M

Projected IS Date: 3/1/2020

Status: Engineering



Previously Presented: 8/31/2018 SRRTEP

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.

Selected Solution:

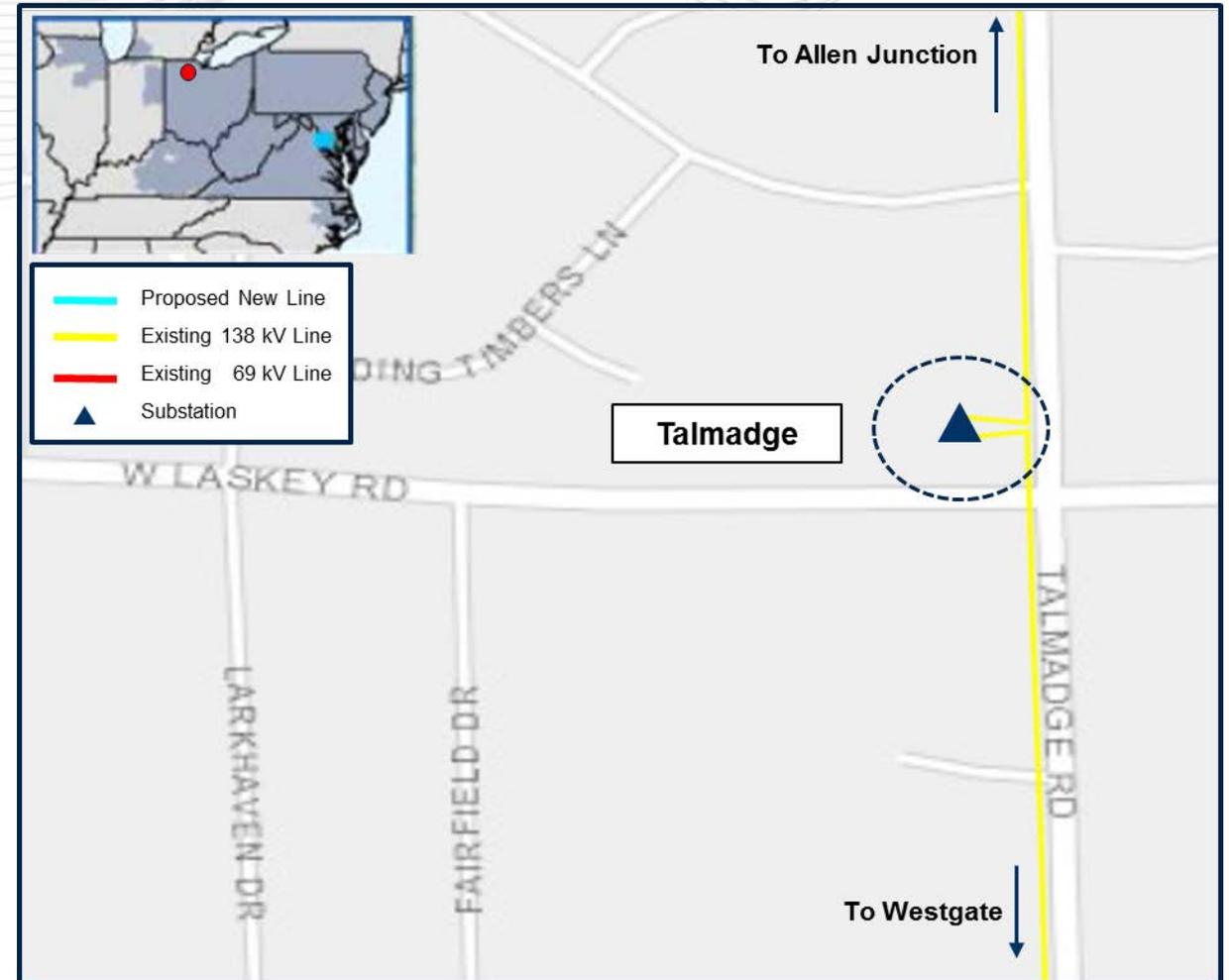
Talmadge 138 kV Ring Bus Project (S1706)

- 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.

Estimated Project Cost: \$6.1 M

Projected IS Date: 12/31/2020

Status: Conceptual



Previously Presented: 8/31/2018 SRRTPEP

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.

Selected Solution:

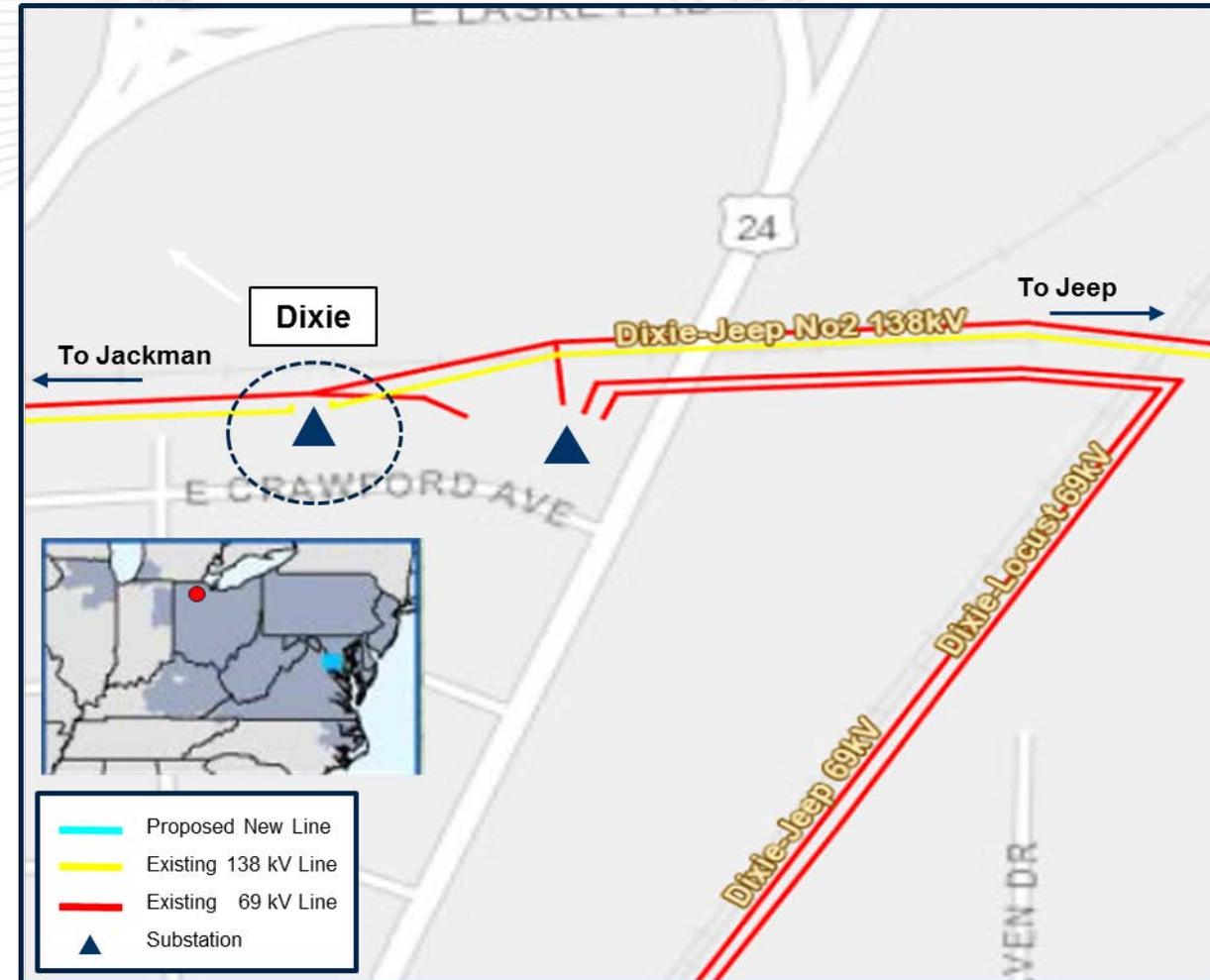
Dixie 138 kV Ring Bus Project (S1707)

- 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

Estimated Project Cost: \$7.7 M

Projected IS Date: 6/1/2020

Status: Engineering



Previously Presented: 8/31/2018 SRRTEP

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 conditions. (P6)
 - 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.

Selected Solution:

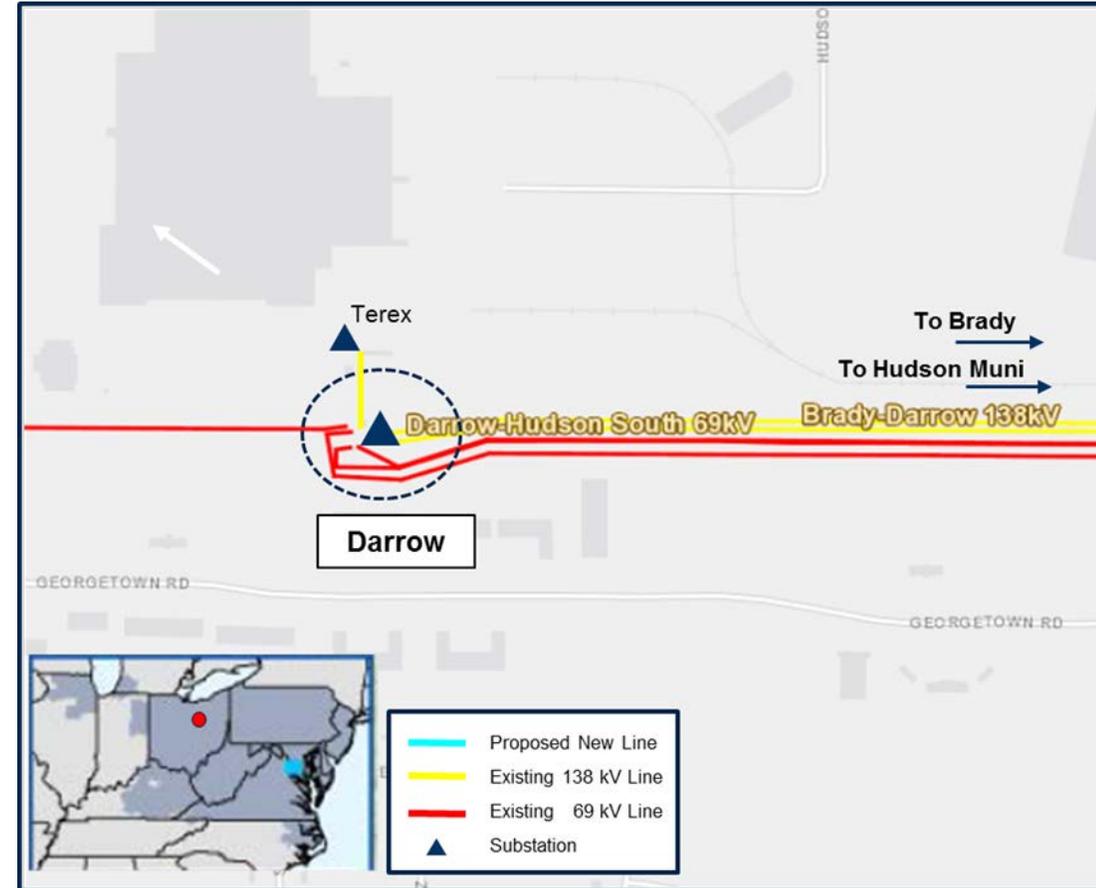
Darrow 138 kV Ring Bus Project (\$1708)

- 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

Estimated Project Cost: \$8.1 M

Projected IS Date: 5/23/2020

Status: Engineering



Previously Presented: 8/31/2018 SR RTEP

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.

Selected Solution:

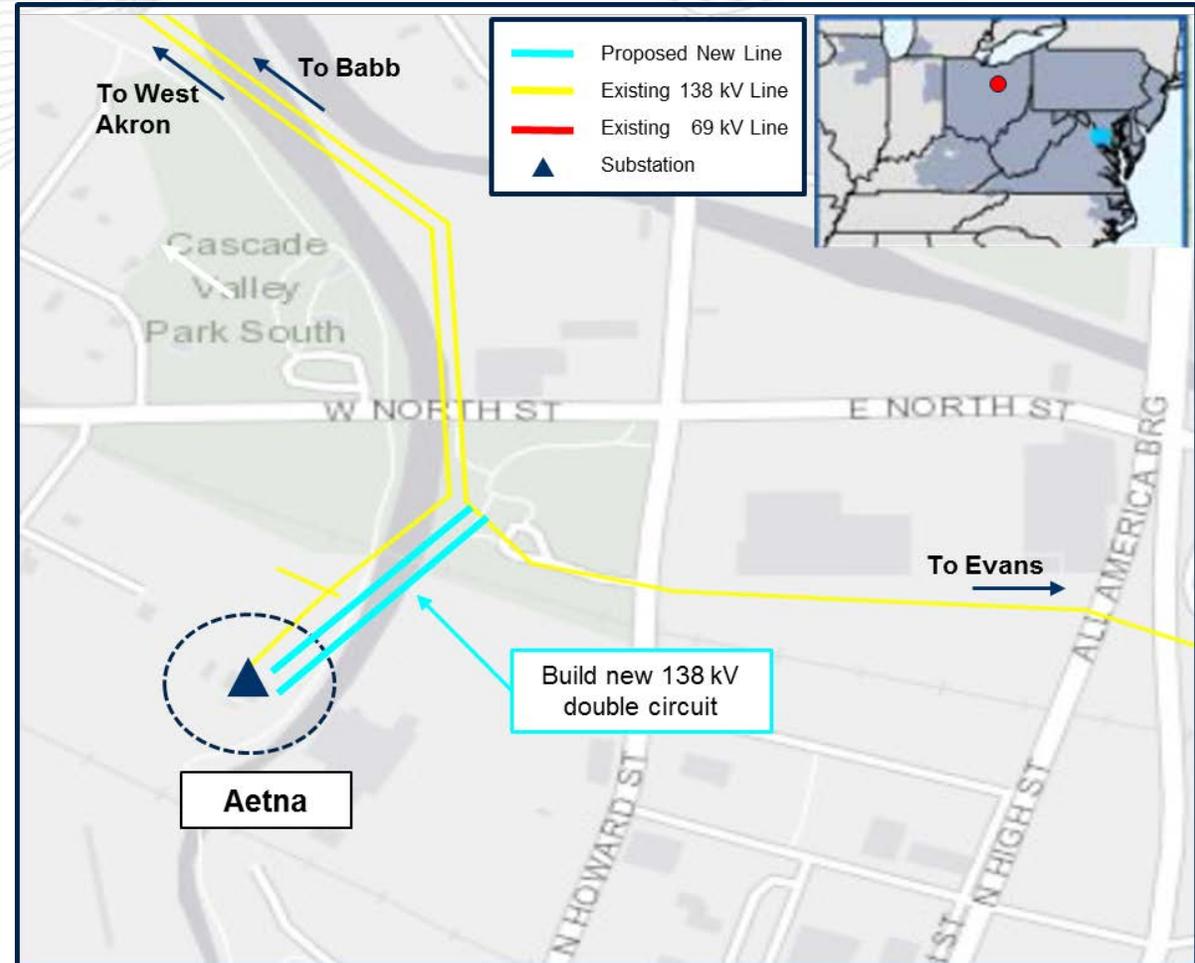
Aetna 138 kV Ring Bus Project (S1709)

- 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.

Estimated Project Cost: \$6.5 M

Projected IS Date: 12/31/2021

Status: Conceptual



Previously Presented: 8/31/2018 SR RTEP

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

Selected Solution:

Seville 69 kV Ring Bus Project (\$1710)

- 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

Estimated Project Cost: \$4.4 M

Projected IS Date: 12/31/2020

Status: Conceptual



Previously Presented: 8/31/2018 SRRTEP

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

Selected Solution:

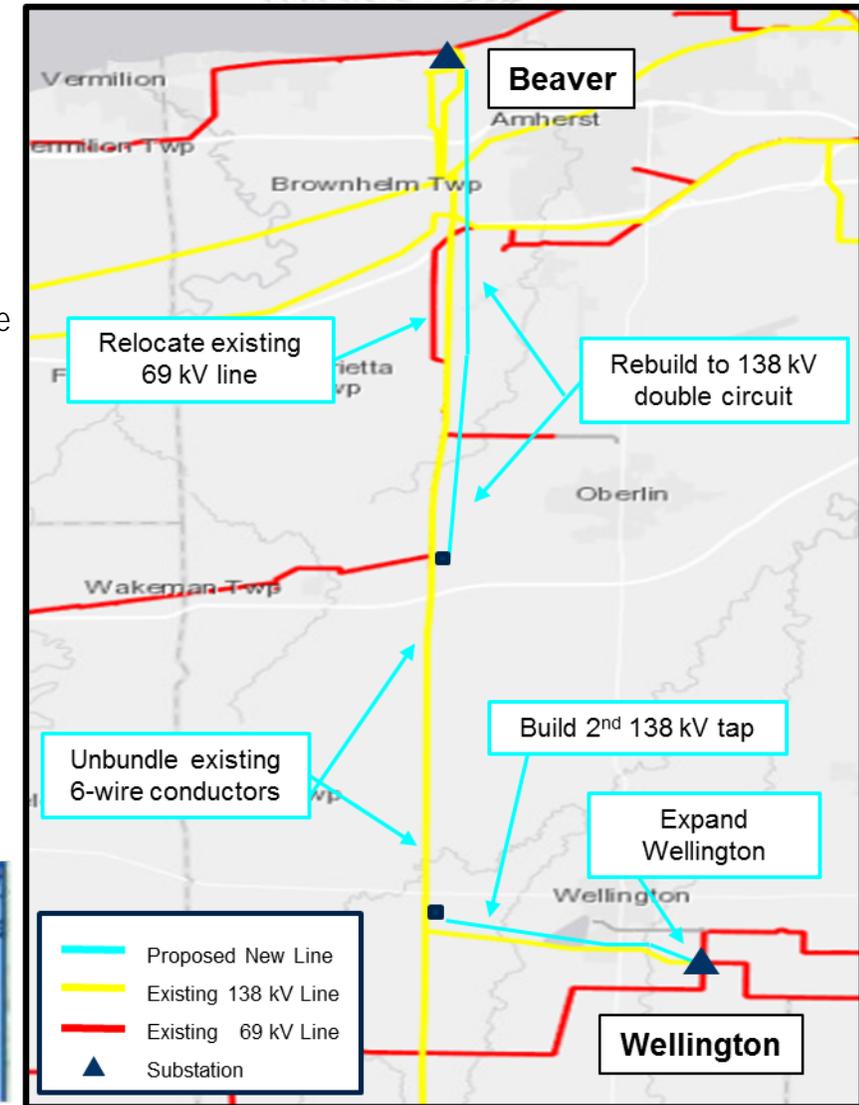
Rebuild Beaver-Wellington 138 kV line to 138 kV double circuit (S1711)

- 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.

Estimated Project Cost: \$20 M

Projected IS Date: 12/31/2020

Status: Engineering



Previously Presented: 8/31/2018 SRRTEP

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 worst 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.

Selected Solution:

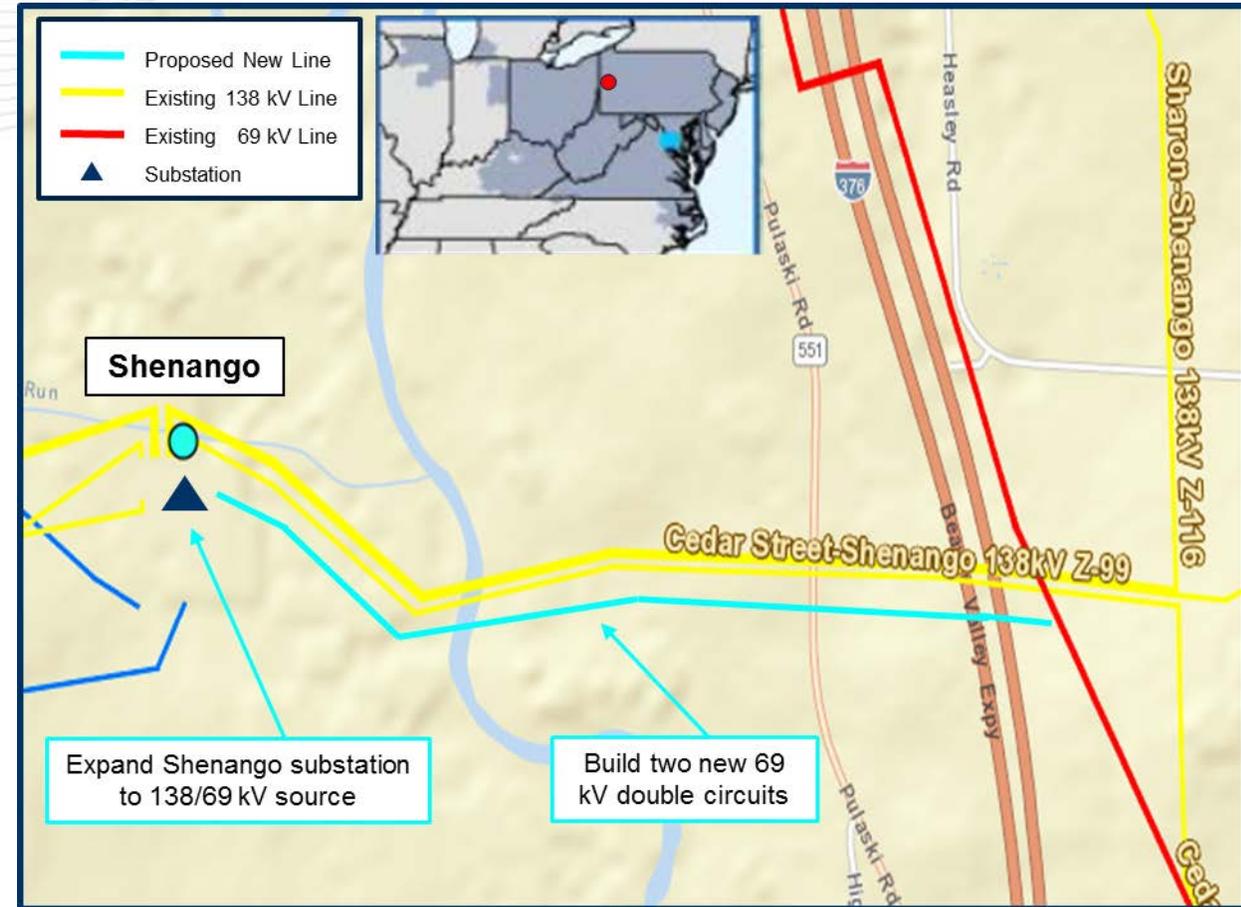
Shenango 69 kV Switching Station (S1712)

- 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.

Estimated Project Cost: \$16.3 M

Projected IS Date: 12/31/2021

Status: Conceptual



Previously Presented: 8/31/2018 SRRTEP

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.

Selected Solution:

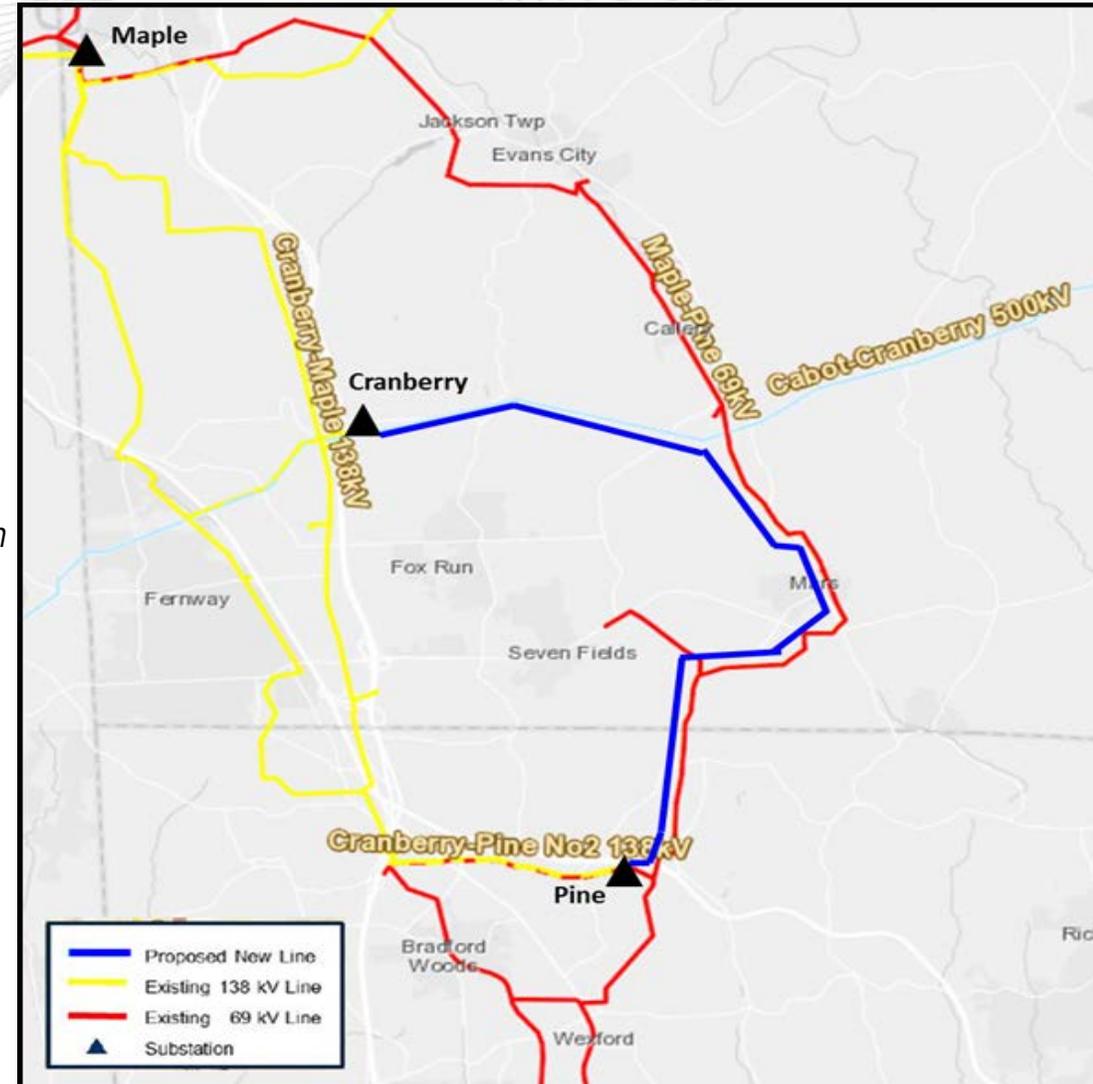
Pine-Cranberry #3 138 kV Line (S1713)

- 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)

Estimated Project Cost: \$27.0 M

Projected IS Date: 05/23/2021

Status: Conceptual



Previously Presented: 8/31/2018 SR RTEP

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

Selected Solution:

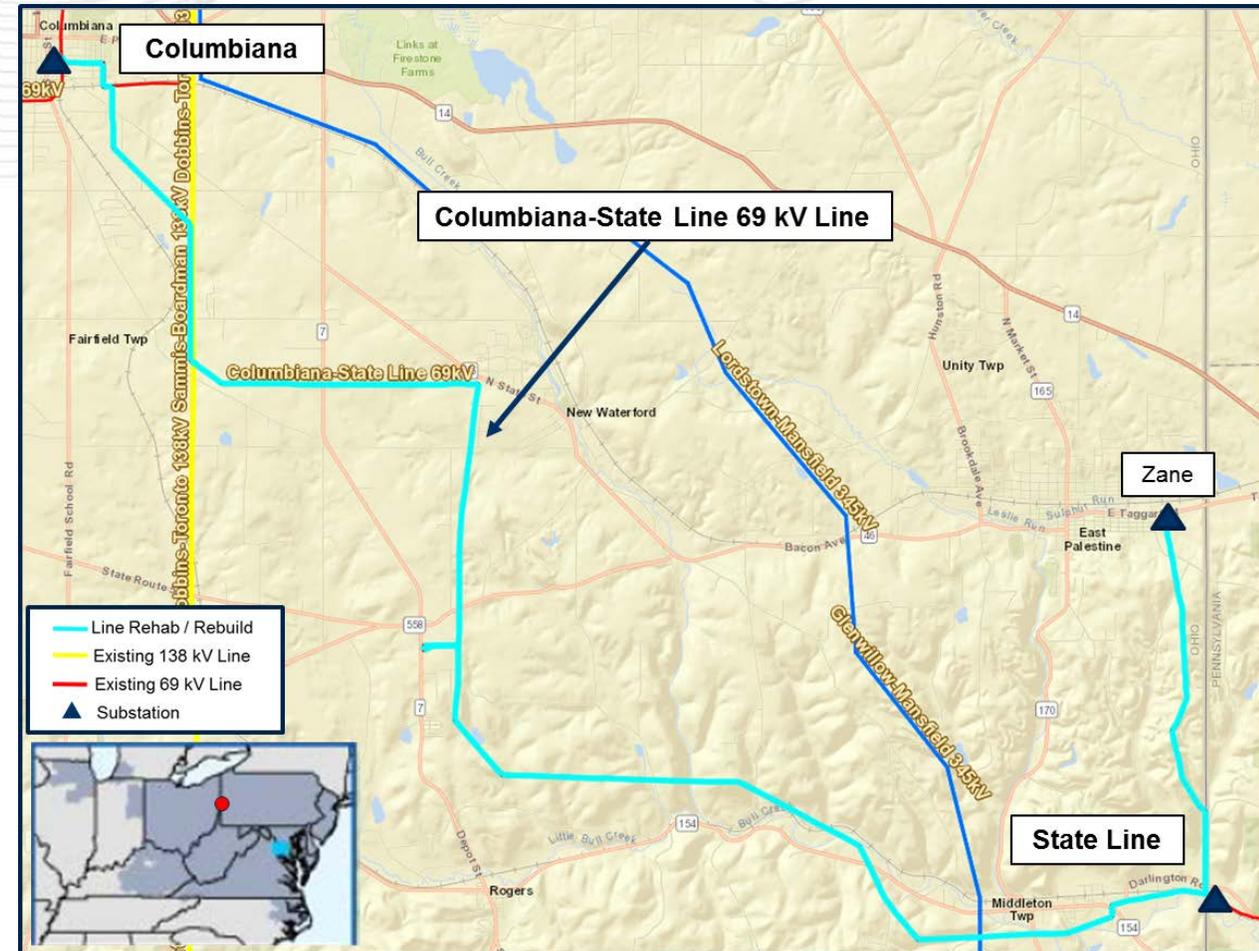
Columbiana-State 69 kV line rebuild (\$1715)

- 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

Estimated Project Cost: \$16.7M

Projected IS Date: 12/31/2020

Status: Engineering



Previously Presented: 8/31/2018 SRTEP

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

Selected Solution:

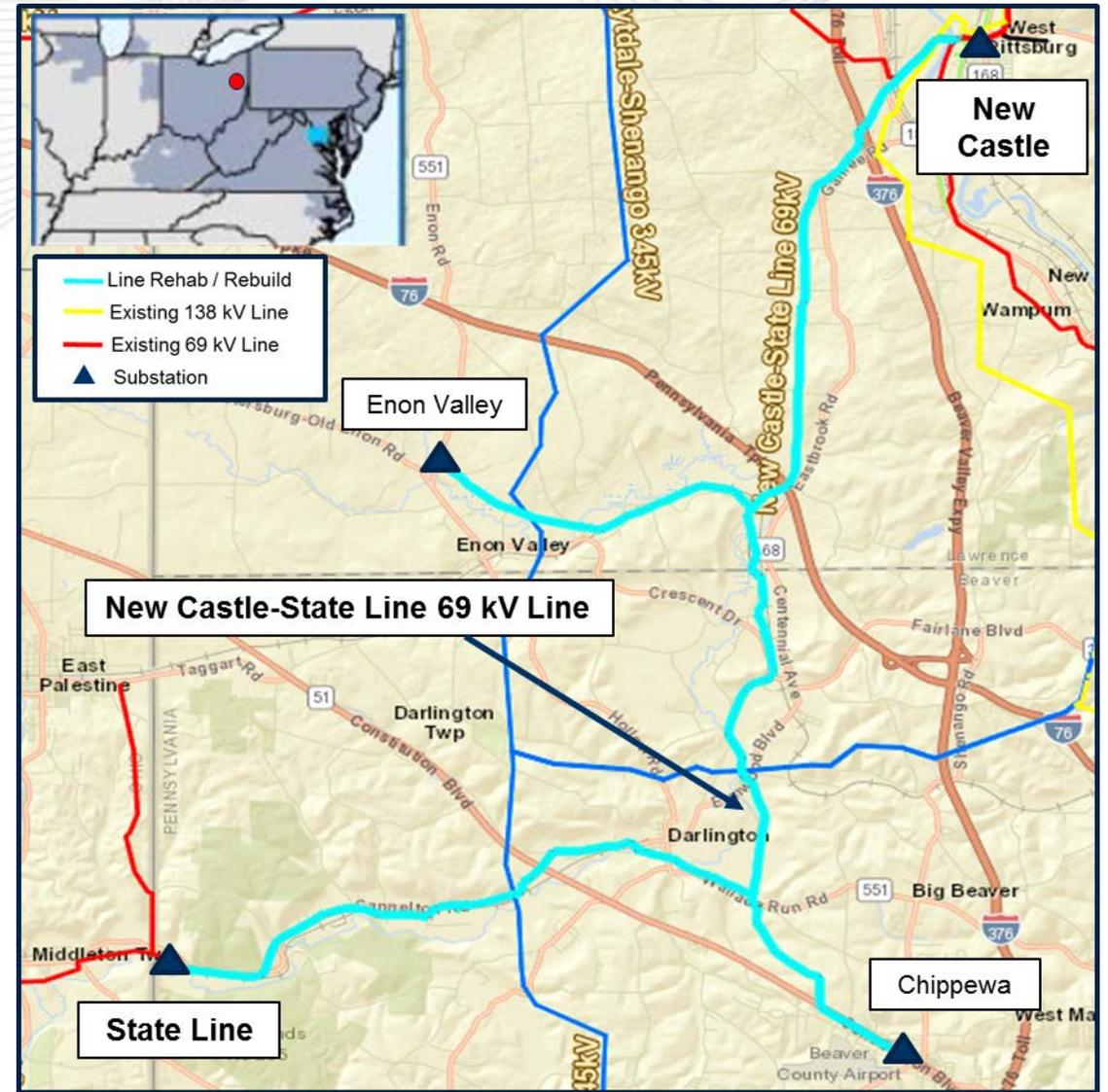
New Castle-State 69 kV line rebuild (S1716)

- 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

Estimated Project Cost: \$29.2M

Projected IS Date: 12/31/2019

Status: Engineering



Previously Presented: 8/31/2018 SRRTEP

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.

Selected Solution:

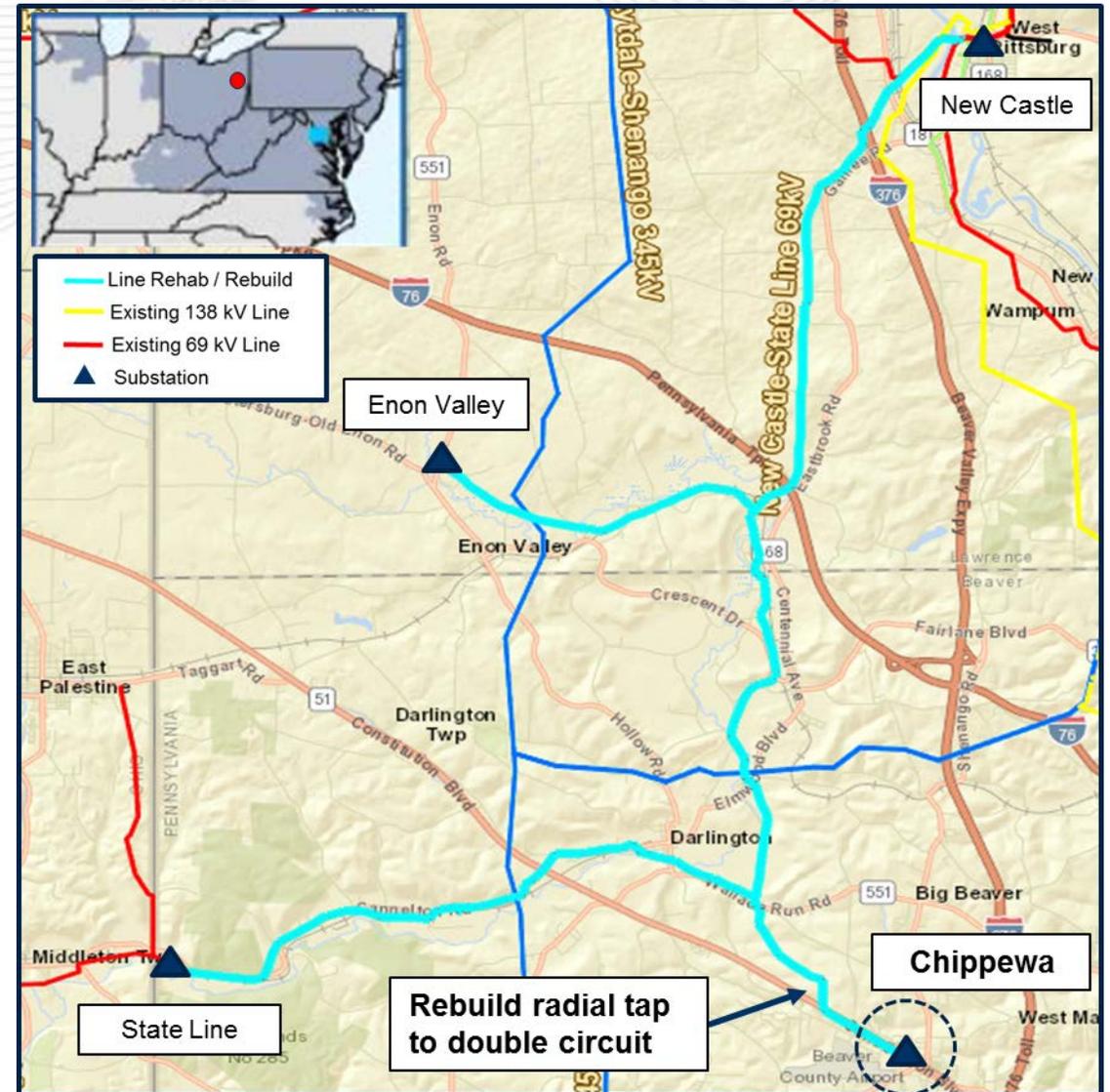
Chippewa 69 kV Ring Bus (S1717)

- 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

Estimated Project Cost: \$9.1 M

Projected IS Date: 6/1/2021

Status: Conceptual





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

Previously Presented: 8/31/2018 SRRTPEP

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.

Selected Solution:

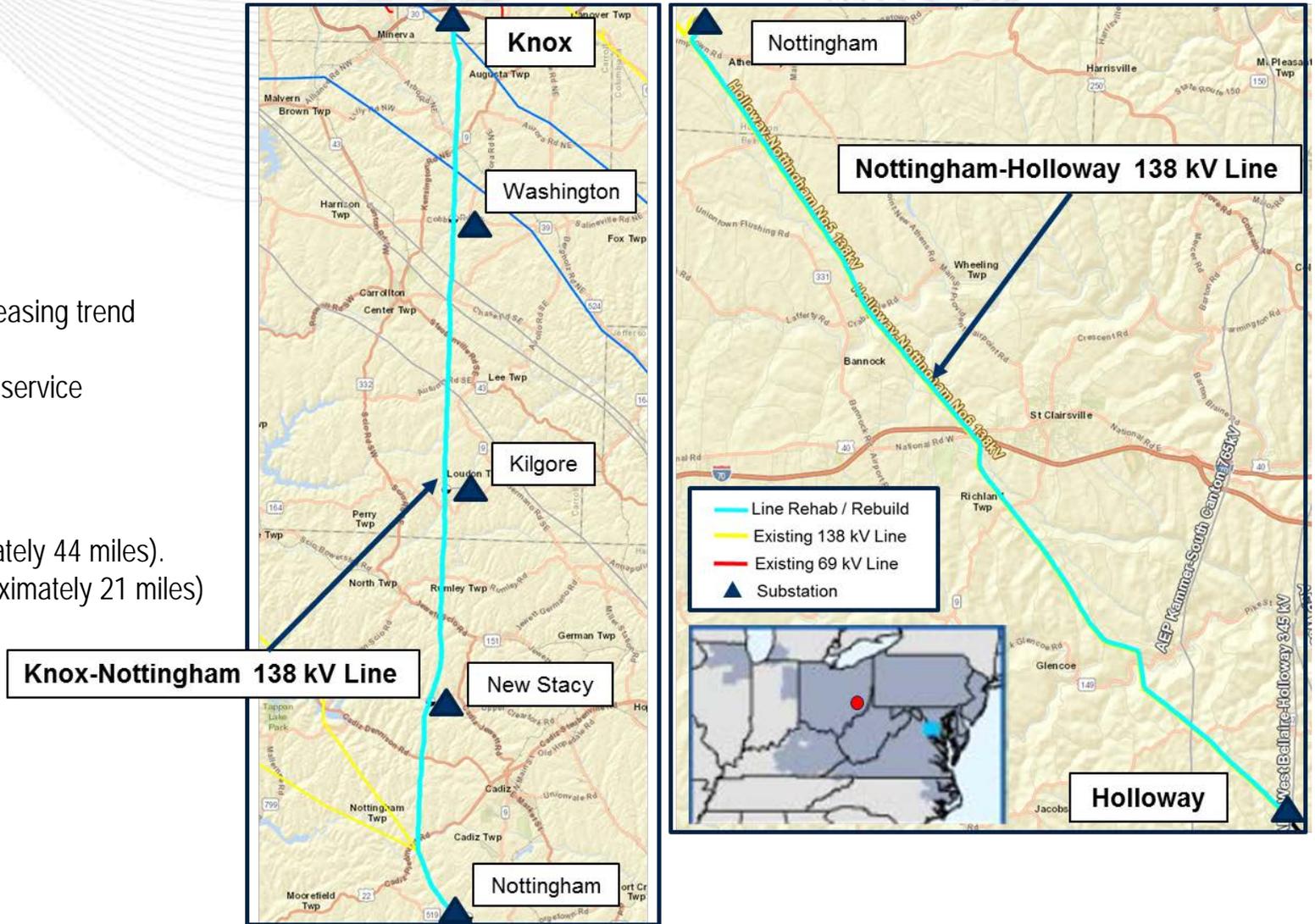
Holloway-Nottingham-Knox 138 kV line rebuild (\$1718)

- 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

Estimated Project Cost: \$79.9M

Projected IS Date: 06/01/2021

Status: Engineering



Next Steps

Upcoming Western SRRTEP Dates

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

Questions?



Revision History

9/17/2018 – V1 – Original version posted to pjm.com

9/19/2018 – V2 - Added slides 4,34-60

9/26/2018 – V3 – Slide 15 removed

9/27/2018 – V4 – Updates to problem statements, recommended solutions, required and projected In service dates on slides 6-9

10/10/2018 – V5:

- Slide 4 - Description and cost updated, baseline ID added
- Slide 11 – Status updated
- Slide 13 – Updated “Selected” to “Recommended”
- Slide 22 – Updated Total Transmission cost
- Slide 16 – Updated the map

10/15/2018 – V6:

- Slide 42: Updated Contingency Description
- Slide 55: Updated Map

10/29/2018 – V7:

- Slide 22: Removed the S3040.7; Move S3040.4 to Transmission part and move sS3040.5 to Non – Transmission Part.