Reliability Analysis Update

Subregional RTEP Committee

PJM West

January 24, 2017

Project Cost Increase (B2750.1 and B2750.2)

B2750.1: Retire Betsy Layne station and replace it with the greenfield Stanville station about a half mile north of the existing Betsy Layne station.

B2750.2: Relocate the capacitor bank to the 69 kV bus at Stanville and increasing the size (the current 9.6 MVAr capacitor at Betsy Layne is located on the 46 kV bus) to 14.4 MVAr.

The cost for that project has increased after AEP finalized detailed scoping and engineering for the project.

- The initial cost estimate did not have the benefit of detailed engineering and was therefore much lower than reality.
- The increase is driven mostly by the line work to connect the existing lines to the new station.
- The mountainous terrain surrounding both the Betsy Lane station and the new Stanville station site increased the line costs from an original ~$2M estimate to now $11M due to the number and size of structures required to cross the terrain.
- The greenfield station cost increased from $10M to $14M after detailed engineering.

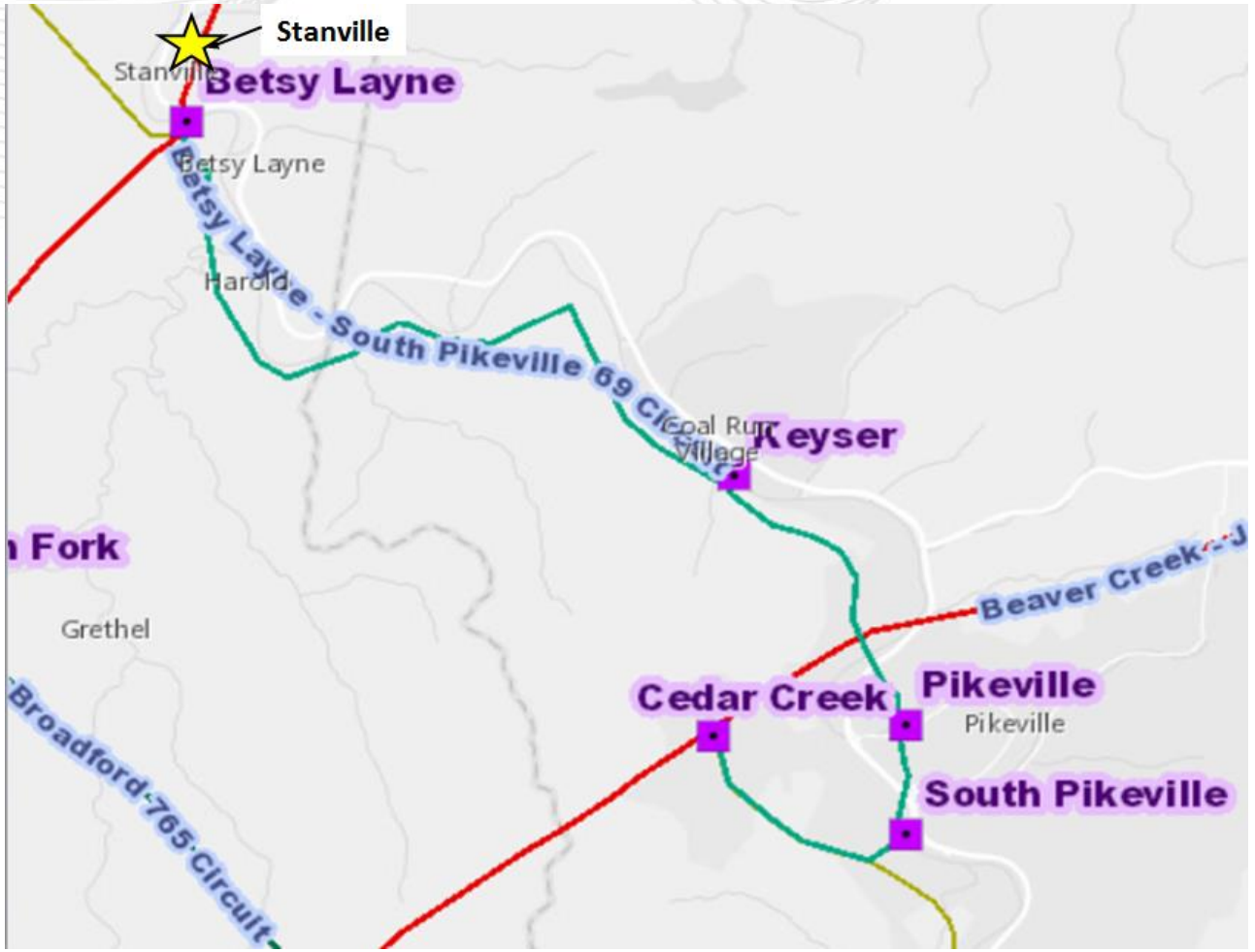
Old Estimated Project Cost: $14.0M

New Estimated Project Cost: $28.1

Required IS Date: 12/1/2016

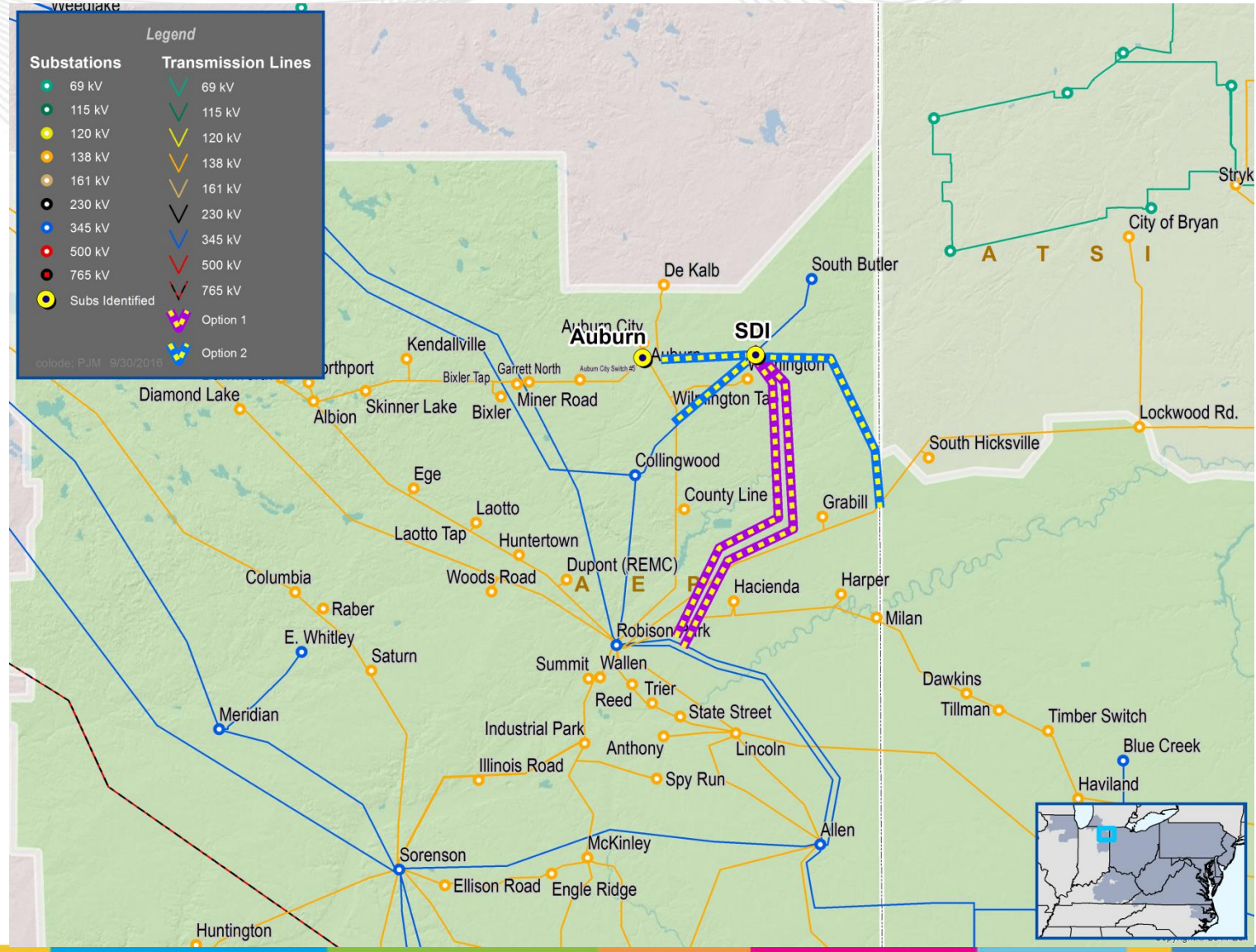
Projected IS Date: 12/1/2018

Project Status: Detailed Engineering; under construction in 3-4 months



AEP Transmission Zone

- **PJM Criteria Violation – Load Loss Limit**
- Load model update -- Consequential Load Loss is greater than 300MW for the loss of the South Butler – Collingwood 345kV line
- **Immediate Need**
- Due to the timing of the need for the reinforcement an RTEP proposal window is infeasible
- **Alternatives Considered**
  - Option 1: Construct a new 345 kV switching station near the customer (SDI); Tap the Rob Park –Allen 345 kV line and extend a new double circuit 345KV line (around 17 miles) into this new station ($76.5M)
  - Option 2: Construct a new 138 kV station, Campbell Road, by tapping into the Grabill – South Hicksville138kV line; Reconstruct sections of the Butler-N.Hicksville and Auburn-Butler 69kV circuits as 138kV double circuit and extend 138kV from Campbell Road station; Construct a new 345/138kV SDI Wilmington Station which will be sourced from Collingwood 345KV and serve the SDI load at 345KV and 138 kV respectively; 138Kv circuits will be looped in-out of the new SDI Willington station resulting in a direct circuit to Auburn and in direct circuit to Auburn and Rob Park via Dunton Lake, and a circuit to Campbell Road; Reconductor 138kV line section between Dunton Lake – SDI Wilmington; Expand 138kV bus at Auburn ($107.7M)



- **Comparison of two Options**

	Estimated Cost (M)	Right of way Width (feet)	Additional ROW (miles)	Addresses Local Area Needs?	Ease of future area Outage Scheduling?
Option 1 (345kV double circuit)	$ 76.5	150	~17	No	No
Option 2 (138 kV solution)	$107.7	100	~7 (~15.5 existing)	Yes*	Yes

* Local 69kV lines built in the 1950s with wood pole construction with distribution class cross arms and the existing conductor is 4/0 ACSR.
* During 2013-2016, there were 6 outages on Auburn-Butler 69kV line and 4 outages on Butler-North Hicksville 69kV line.
* For the Auburn-Butler and Butler-North Hickville 69kV lines, there are 5 towers in A1 condition, 79 towers in A2 conditions, and 22 towers in A3 conditions.
* The existing 69 kV line passes through an industrial zone and continued area industrial growth is anticipated.
* Local wholesale distribution cooperative is also served from the 69 kV line of similar vintage and construction. This cooperative just West of this area has experienced multiple forced and momentary outages in the recent past.

NOTE: The 138KV option will use 795ACSR conductor. The cost difference between 556 ACSR and 795 ACSR is about 2-3% of the overall project cost and the rating difference are show in the following table:

Conductor Type	SN/SE (MVA) 69 kV	SN/SE (MVA) 138 kV
4/0 ACSR Penguin (existing)	50/50	N/A
556 ACSR Dove	102/142	205/284
795 ACSR Drake	129/180	257/360

- **Recommended Solution:**

– Construction a new 138 kV station, Campbell Road, tapping into the Grabill – South Hicksville138kV line (B2779.1)
– Reconstruct sections of the Butler-N.Hicksville and Auburn-Butler 69kV circuits as 138kV double circuit using 795ACSR and extend 138kV from Campbell Road station (B2779.2)
– Construct a new 345/138kV SDI Wilmington Station which will be sourced from Collingwood 345KV and serve the SDI load at 345KV and 138 kV respectively; (B2779.3)
– 138Kv circuits will be looped in-out of the new SDI Willington station resulting in a direct circuit to Auburn and in direct circuit to Auburn and Rob Park via Dunton Lake, and a circuit to Campbell Road; Reconductor 138kV line section between Dunton Lake – SDI Wilmington; (B2779.4)
– Expand 138kV bus at Auburn (B2779.5)

- **Estimated Project Cost:** $107.7M
- **Required IS Date:** Immediate Need
- **Expected IS Date:** 6/1/2019

❖ **This recommendation had been presented in 12.15.2016 TEAC, 11.3. 2016 TEAC and 10.6.2016 TEAC**

Cost Details

138 kV Station on Rob Park-S Hicksville line, Campbell Road	$4.8
138 kV line single and double ckt sections, 22.5 mi	$33.0
138 kV Dunton Lake-Wilmington Reconductor, 9.5 mi	$13.3
345/138 kV South Butler station, (5) 345 kV and (8) 138 kV CBs, (2) 345/138 kV XF, (2) 138 kV Cap Bank and CS, & Land	$41.5
138kV Expansion at Auburn, (1) 138 kV CB	$1.0
Total	$93.6
15% Contingency	$14.1
Grand Total (Million)	**$107.7**

AEP Transmission Zone

Problem: Short Circuit

- The Delaware 138 kV 'P' breaker is overstressed-current rating: 16.7KA

Proposed Solution:

- Replace the Delaware 138 kV 'P' breaker with a 40 kA breaker (b2817)

Immediate Need:

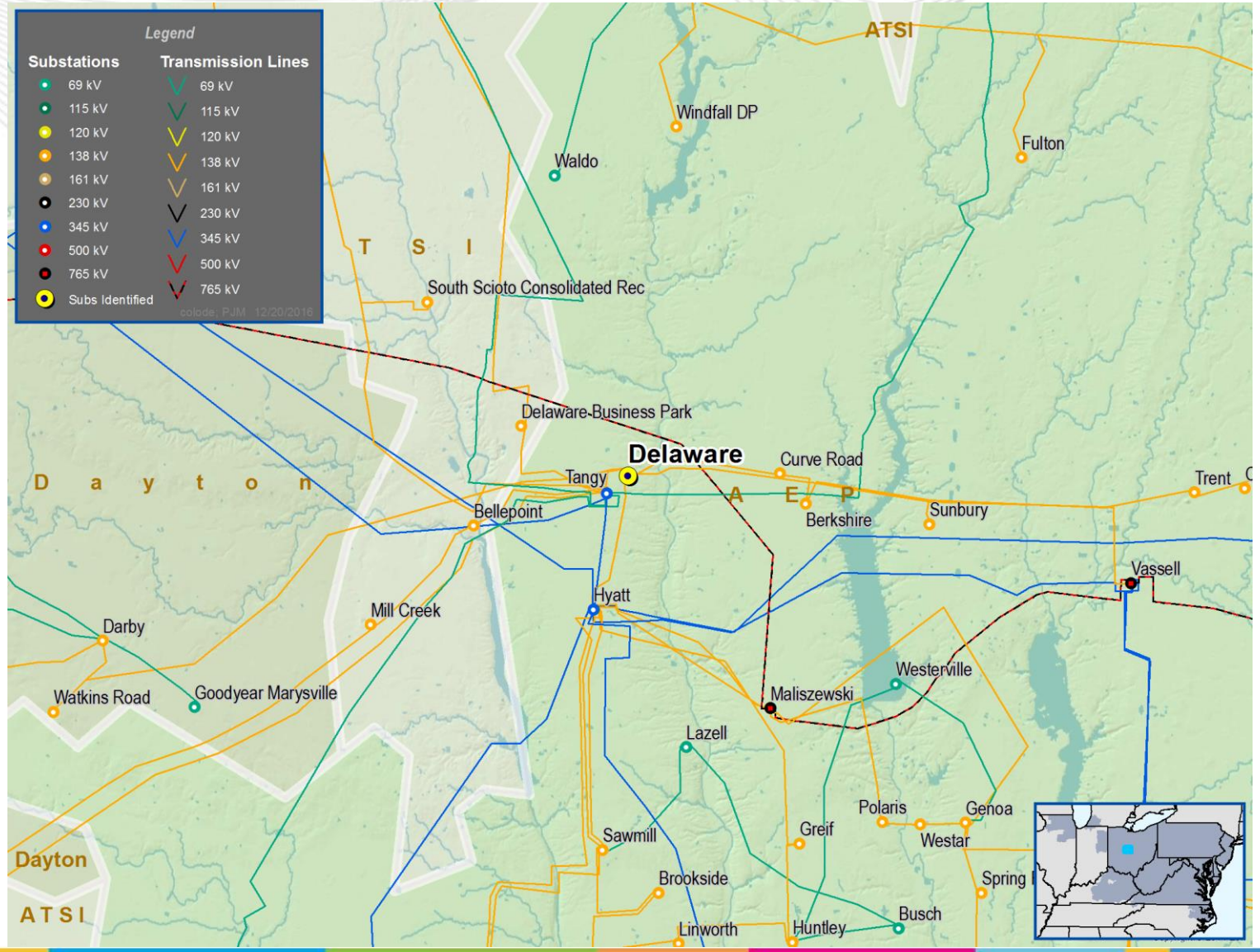
- Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

Alternatives Considered:

- Due to the immediate need of the project no alternatives were considered

Estimated Project Cost: $1 M

Required IS Date: 6/1/2019



AEP Transmission Zone

Problem: Short Circuit

- The West Huntington 138 kV 'F' breaker is overstressed-current rating: 16.7KA

Proposed Solution:

- Replace the West Huntington 138 kV 'F' breaker with a 40 kA breaker (b2818)

Immediate Need:

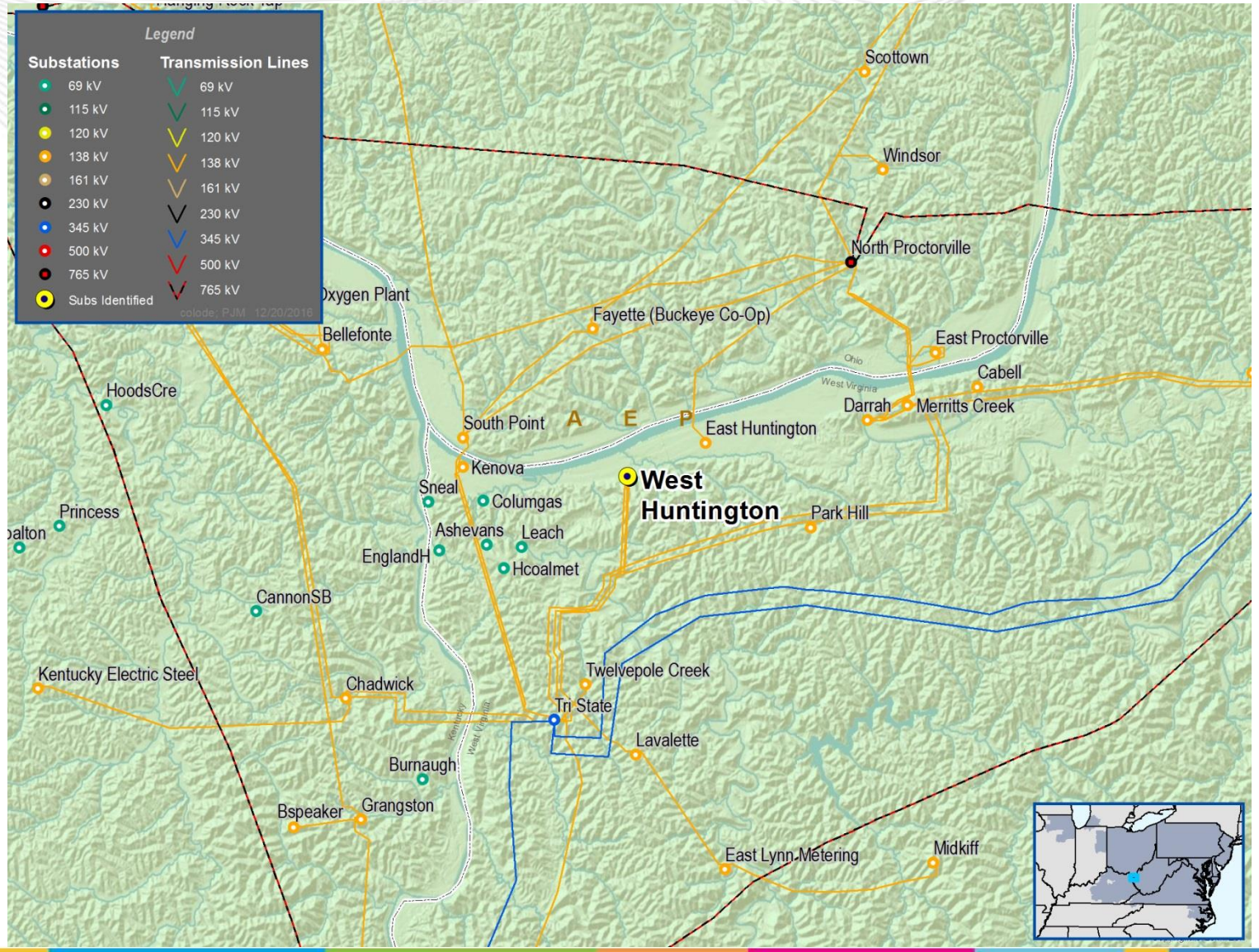
- Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

Alternatives Considered:

- Due to the immediate need of the project no alternatives were considered

Estimated Project Cost: $1 M

Required IS Date: 6/1/2019



AEP Transmission Zone

Problem: Short Circuit

- The Madison 138 kV 'V' breaker is overstressed-current rating: 16.7KA

Proposed Solution:

- Replace the Madison 138 kV 'V' breaker with a 63 kA breaker (b2819)

Immediate Need:

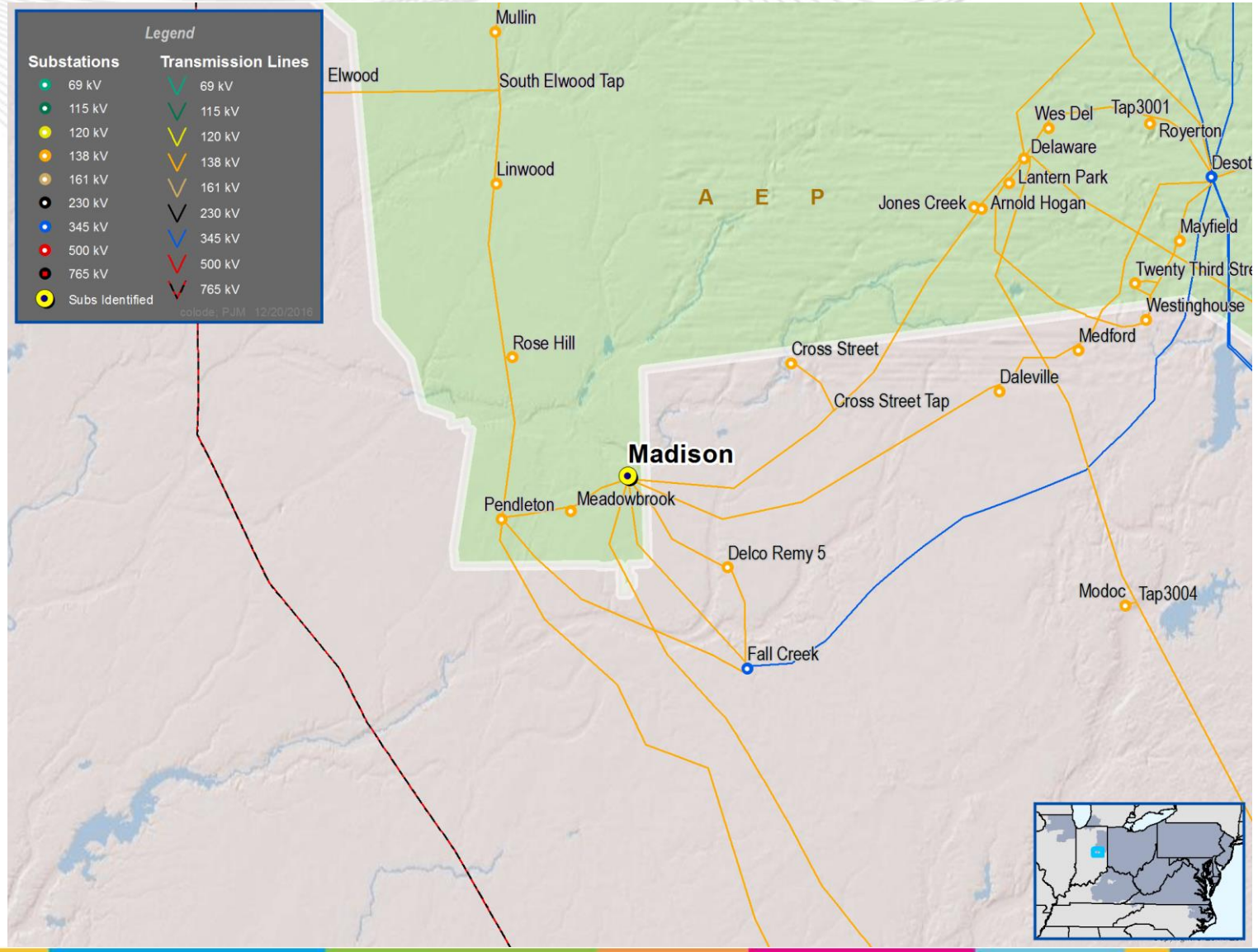
- Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

Alternatives Considered:

- Due to the immediate need of the project no alternatives were considered

Estimated Project Cost: $1 M

Required IS Date: 6/1/2019



AEP Transmission Zone

Problem: Short Circuit

- The Sterling138 kV 'G' breaker is overstressed-current rating: 16.7KA

Proposed Solution:

- Replace the Sterling138 kV 'G' breaker with a 40 kA breaker (b2820)

Immediate Need:

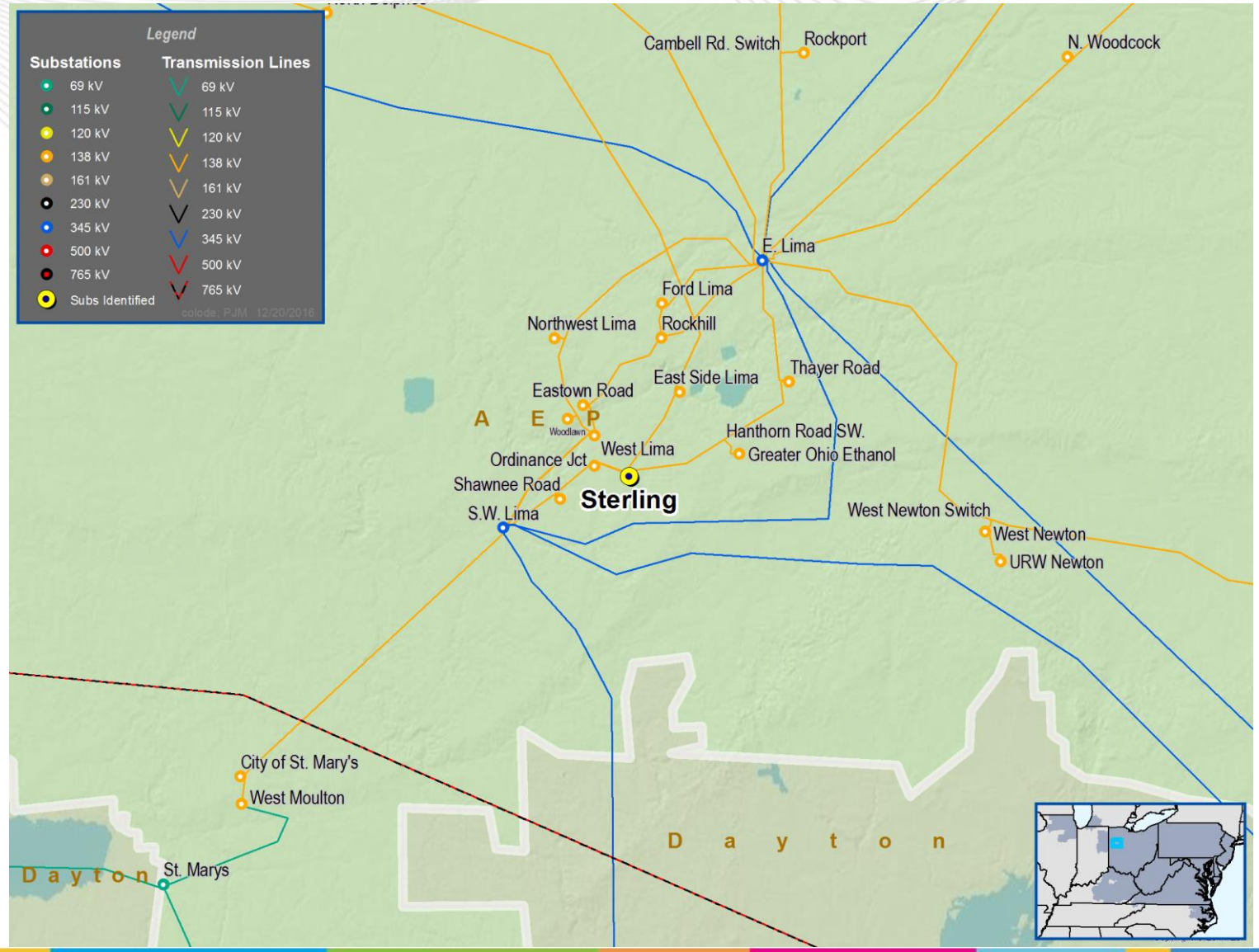
- Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

Alternatives Considered:

- Due to the immediate need of the project no alternatives were considered

Estimated Project Cost: $1 M

Required IS Date: 6/1/2019



AEP Transmission Zone

Problem: Short Circuit

- The Morse 138 kV '103', '104', '105', and '106' breakers are overstressed-current rating: 40KA

Proposed Solution:

- Replace the Morse 138 kV '103', '104', '105', and '106' breakers with 63 kA breakers (b2821)

Immediate Need:

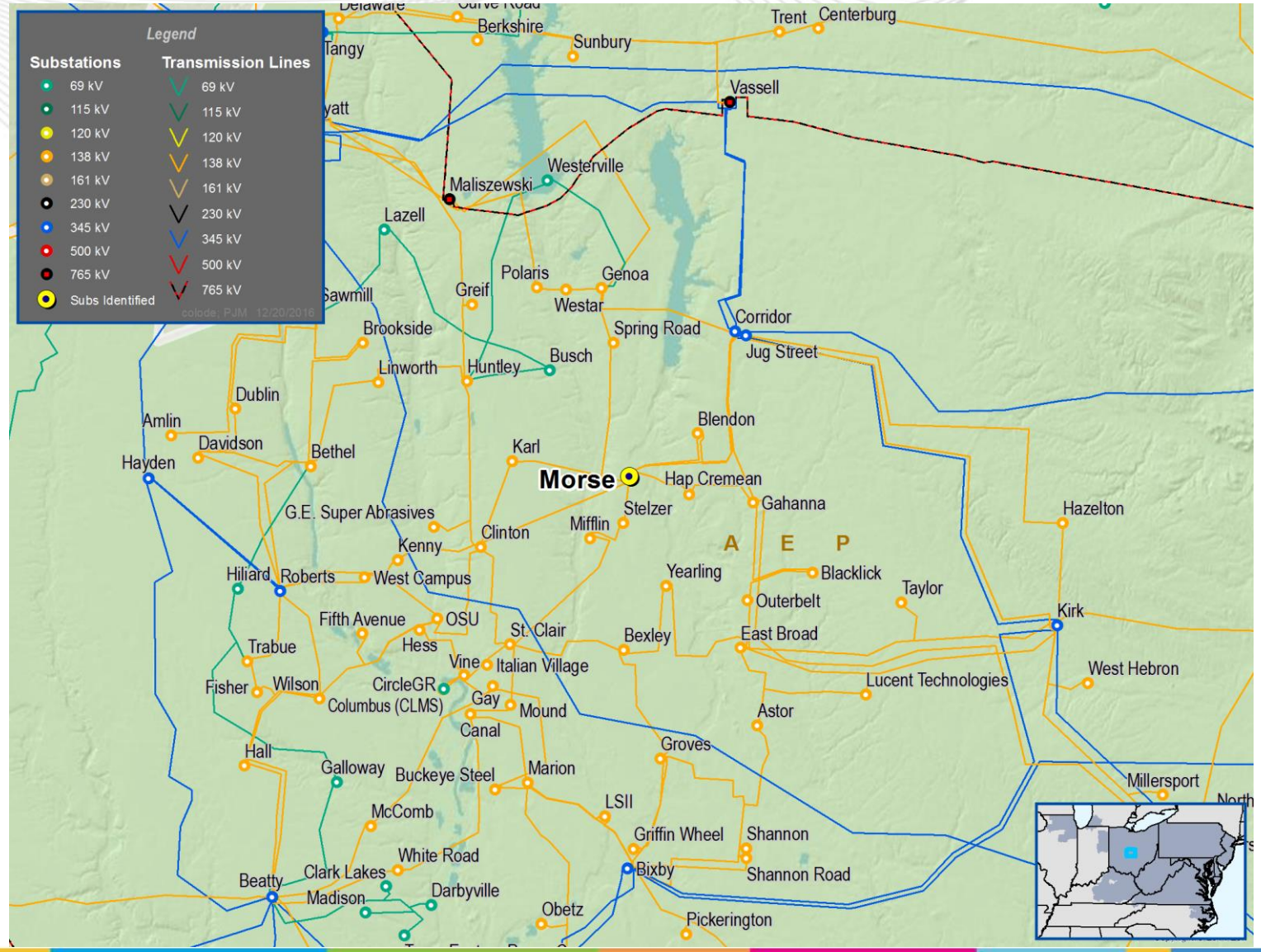
- Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

Alternatives Considered:

- Due to the immediate need of the project no alternatives were considered

Estimated Project Cost: $1 M per breaker

Required IS Date: 6/1/2019



AEP Transmission Zone

Problem: Short Circuit

- The Clinton 138 kV '105' and '107' breakers are overstressed-current rating: 40KA

Proposed Solution:

- Replace the Clinton 138 kV '105' and '107' breakers with 63 kA breakers (b2822)

Immediate Need:

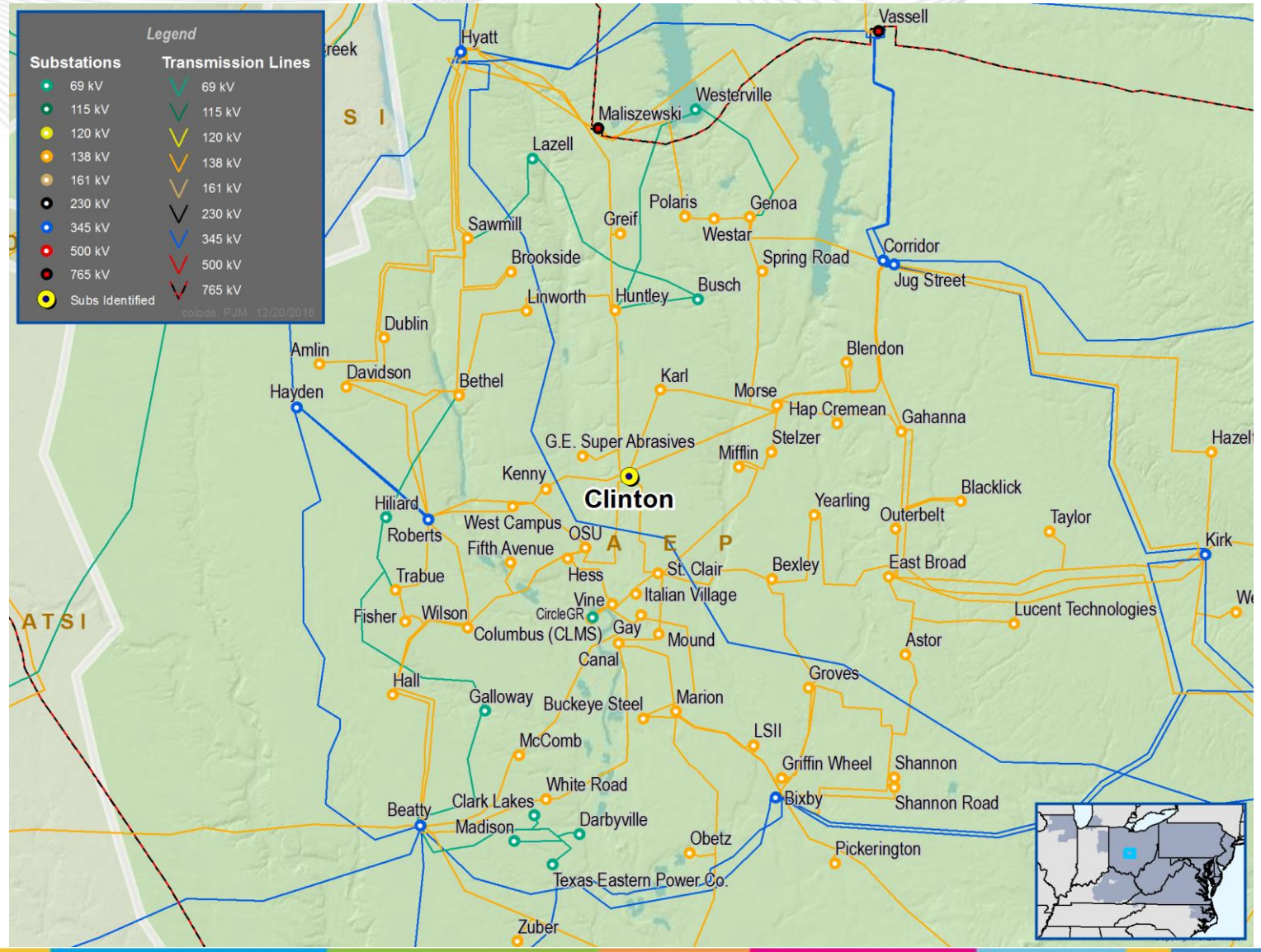
- Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

Alternatives Considered:

- Due to the immediate need of the project no alternatives were considered

Estimated Project Cost: $1 M per breaker

Required IS Date: 6/1/2019



AEP Transmission Zone

Problem: Short Circuit

- The Ross138 kV '106' breaker is overstressed-current rating: 14KA

Proposed Solution:

- Replace the Ross138 kV '106' breaker with a 40 kA breakers (b2823)

Immediate Need:

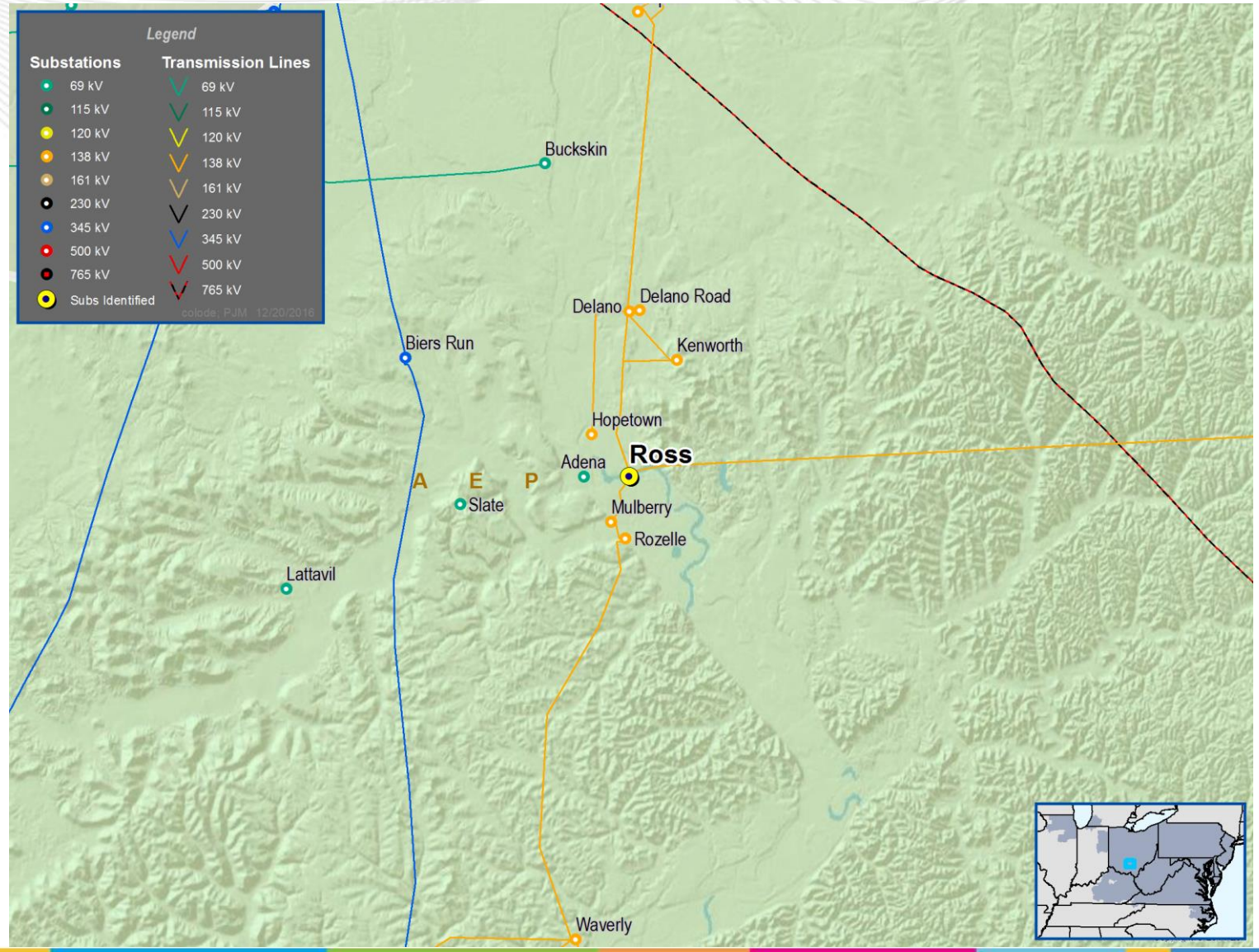
- Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

Alternatives Considered:

- Due to the immediate need of the project no alternatives were considered

Estimated Project Cost: $1 M

Required IS Date: 6/1/2019



Supplemental Projects

EKPC Transmission Area

Supplemental Project

Problem Statement:

Avoid outages for a 69 kV bus fault at Shelby County, which is about half Shelby Energy's total peak load, and a substantial level of industrial/commercial load is served from these substations. A temporary project is needed until the long term project is completed. the long term project is the Bekaert/LGE Interconnection project below.

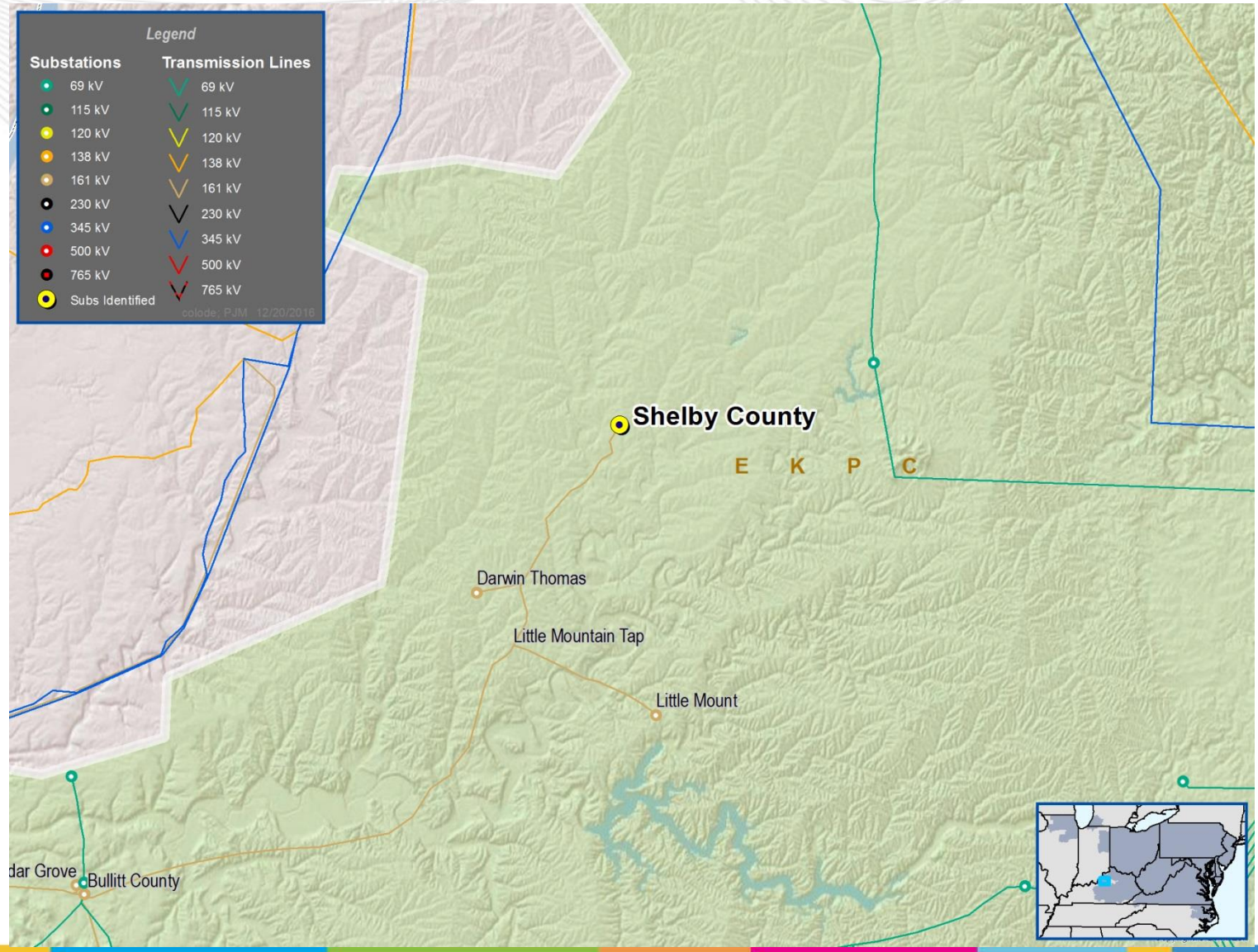
Recommended Solution:

Install a 69 kV breaker adjacent to the existing Shelby County 69kV substation with a 69 kV line added to connect this breaker to both the Shelby County-LG&E/KU 69 kV tie line and the Logan-Budd 69 kV line. This breaker would be operated normally-open. (S1244)

Alternatives Considered:

1. Build approximately 1 mile of 69 kV line from near Bekaert to the LGE/KU Simpsonville-Shelbyville 69 kV line and a 69 kV switching station at the connection point. Estimated cost of $5.1 Million.
2. Build a 161 kV box structure at Shelby County substation, add a second 161/69 kV transformer, and build a 69 kV line from this new transformer to Bekaert to create a 69 kV loop feed from two separate Shelby County transformers/69 kV buses. Estimated cost of $7.5 Million.
3. Build a 69 kV box structure at Veechdale, and build approximately 1.25 miles of 69 kV line from Veechdale to the LGE/KU Simpsonville-Shelbyville 69 kV line, and build approximately 2.75 miles of 69 kV line from Veechdale to Bekaert. A 69 kV switching station would be constructed at the point of connection to the LGE/KU Simpsonville-Shelbyville line. Estimated cost of $9.0 Million.
4. Build a 69 kV switching station and a short (approx. 0.1-mile) 69 kV line between the existing Shelby County-KU 69 kV tieline and the Logan-Budd 69 kV line to provide a continuous source to Logan/Budd/Bekaert from the KU tieline during a bus outage. Estimated cost of $3.7 Million.

Estimated Project Cost: $0.35M
Possible IS Date: 5/01/2017
Project Status: Engineering



EKPC Transmission Area

Supplemental Project

Problem Statement:

There have been some operational concerns related to the sizing of the bus jumpers on the 69 kV bus at Cooper. The main bus is 2 1/2" IPS, but the bus jumpers are 1". These 1" bus jumpers are the limiting element on that bus. EKPC has had PJM issued PCLLRW's related to the limitations on this bus rating. In addition to this concern, the existing lightning arrestors on the 69 kV lines at this station are porcelain. These type of arrestors are a reliability and safety concern due to their age. This station was built in 1965. Replace the 1" IPS bus jumpers on the 69 kV bus with 2.5" IPS jumpers.

Recommended Solution:

Replace the existing porcelain lightning arrestors on the 69 kV lines (all the three lines) at Cooper 69kV station. Replace other jumpers as necessary as determined at project scoping. Add a 69 kV station service transformer.(S1245)

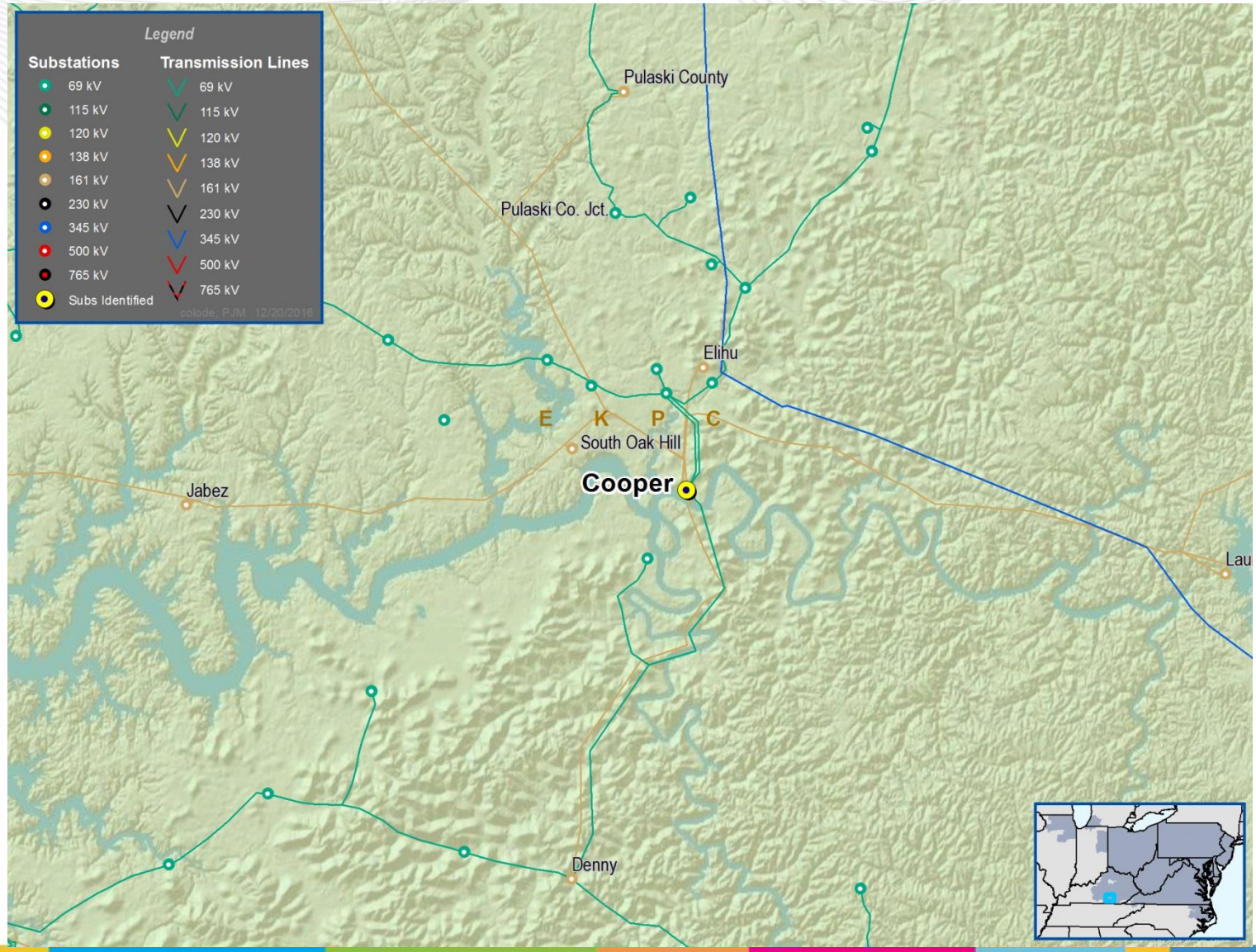
Alternatives Considered:

Alternatives include breaking this proposed solution into parts and completing only a selection of those parts. However, this is not recommended as the entire amount of work can be completed during one outage and the cost is not prohibitive.

Estimated Project Cost: $0.2M

Possible IS Date: 12/01/2017

Project Status: Scoping



EKPC Transmission Area

Supplemental Project

Problem Statement:

The Falcon 624 breaker is a critical tie for EKPC. This breaker has seen over 3,000 operations, and is difficult to take out for maintenance. Because of the limited maintenance performed on this breaker and the importance of this AEP tie, this is a reliability concern. The EKPC control building is fed from a station service transformer off of the AEP bus. Outages at the AEP station cause an outage of the station service source to our control building and station. The restoration of the station service is dependent on the restoration of the AEP bus. Also, this station was built in the 1960's, and the station has cap and pin insulators which are a reliability concern. The 624 breaker has no bypass capability.

Recommended Solution:

Falcon 69kV station: Replace all 69kV Switches, cap & pin insulators, bus, jumpers, breaker 614 (1952 vintage), 69kV PT's, paint structure & replace the tie line and bus differential panel (both panels contain electromechanical relays) & cables on 614 & 624.(S1246)

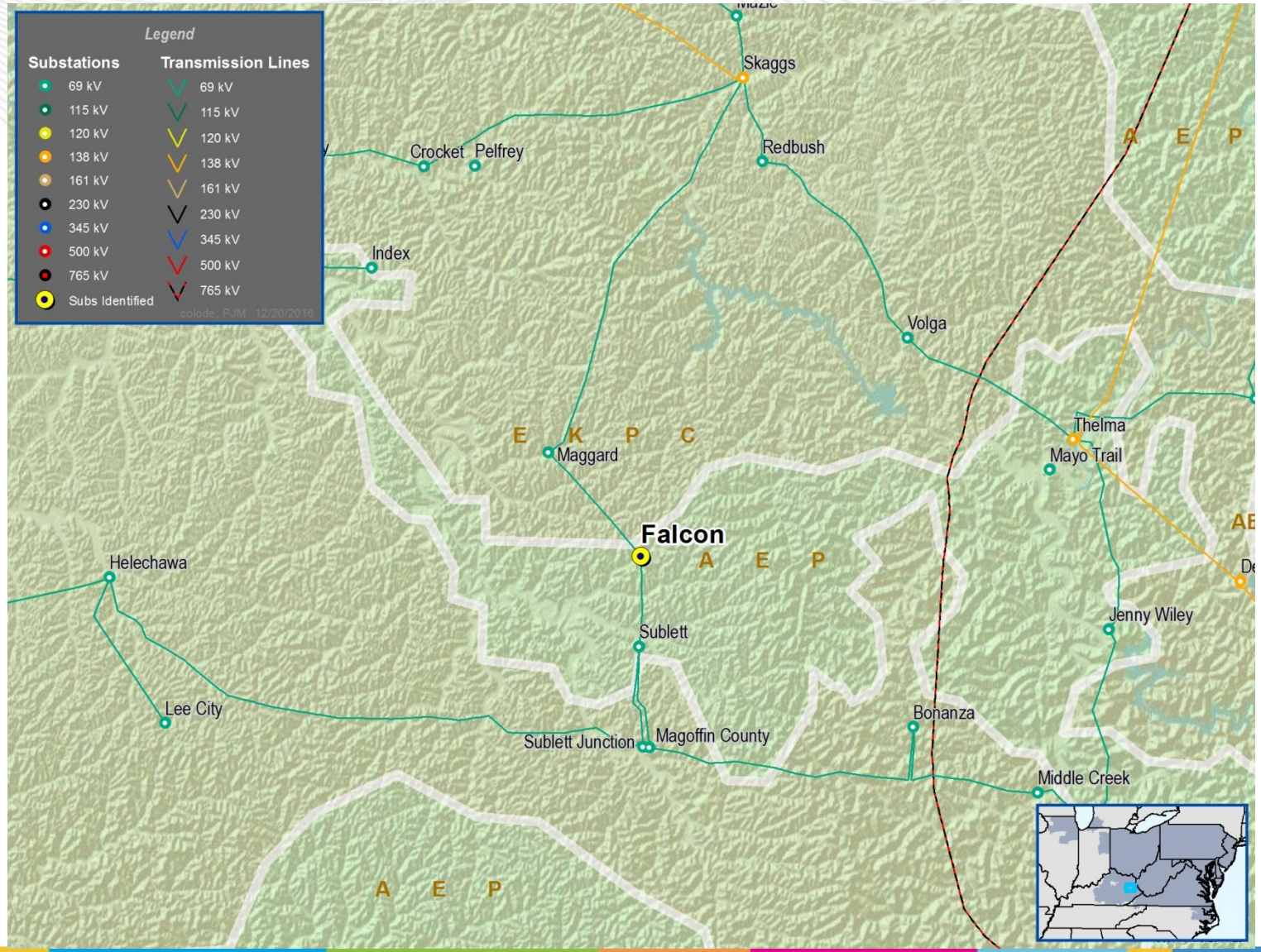
Alternatives Considered:

1. Replace one 69 kV breaker, relay panels, and station service - Estimated cost of $200,000.
2. Rebuild the station in a new location - Estimated cost of $3.6 Million.

Estimated Project Cost: $0.55M

Possible IS Date: 12/01/2017

Project Status: Design/Engineering



EKPC Transmission Area

Supplemental Project

Problem Statement:

Avon is set up for a breaker and a half scheme, but is currently a ring bus which makes it difficult to take outages for maintenance and testing.

Recommended Solution:

Reconfigure the 138 kV physical bus at Avon to have a breaker and a half arrangement, including the conversion of the protection scheme and the replacement of the 345 kV circuit switcher N83-1408 with a 345 kV breaker. (S1247)

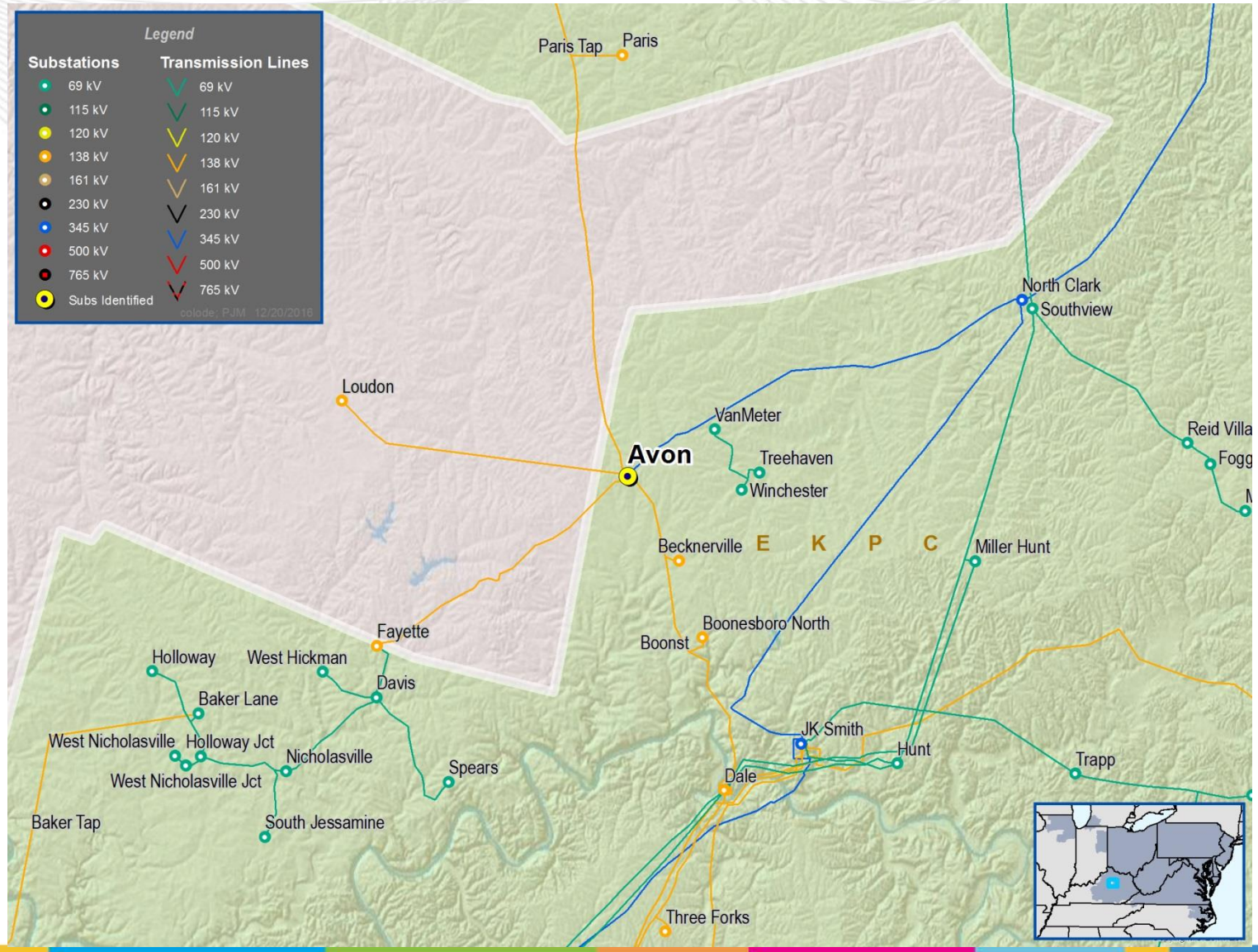
Alternatives Considered:

1. Convert protection scheme only and replace N83-1408 with a breaker. Estimated cost of $900,000.
2. Leave existing bus configuration and protection scheme in place. Replace N83-1408 with a breaker. Estimated cost of $675,000.

Estimated Project Cost: $1.45M

Possible IS Date: 12/01/2018

Project Status: Scoping



EKPC Transmission Area

Supplemental Project

Problem Statement:

Reliability issues at the Hope substation, specifically related to the electromechanical relays and the lack of a 69 kV breaker on the Hope to Powell County 69 kV Line exit. The Hope - Goddard and Hope - Morgan County on EKPC's list of worst performing locations on our system. Currently, a fault on the Hope - Powell County line causes an operation of both the Goddard and Morgan County breakers at Hope. Adding a breaker on this line will eliminate this issue, however, age and condition of control building is a concern, and there is not enough room to add panels for new breaker in the existing control building.

Recommended Solution:

Add a 69 kV breaker on the Powell County line, and replace breaker 614 (this breaker has had recent operational issues and requires replacement) & replace the existing control building. (S1248)

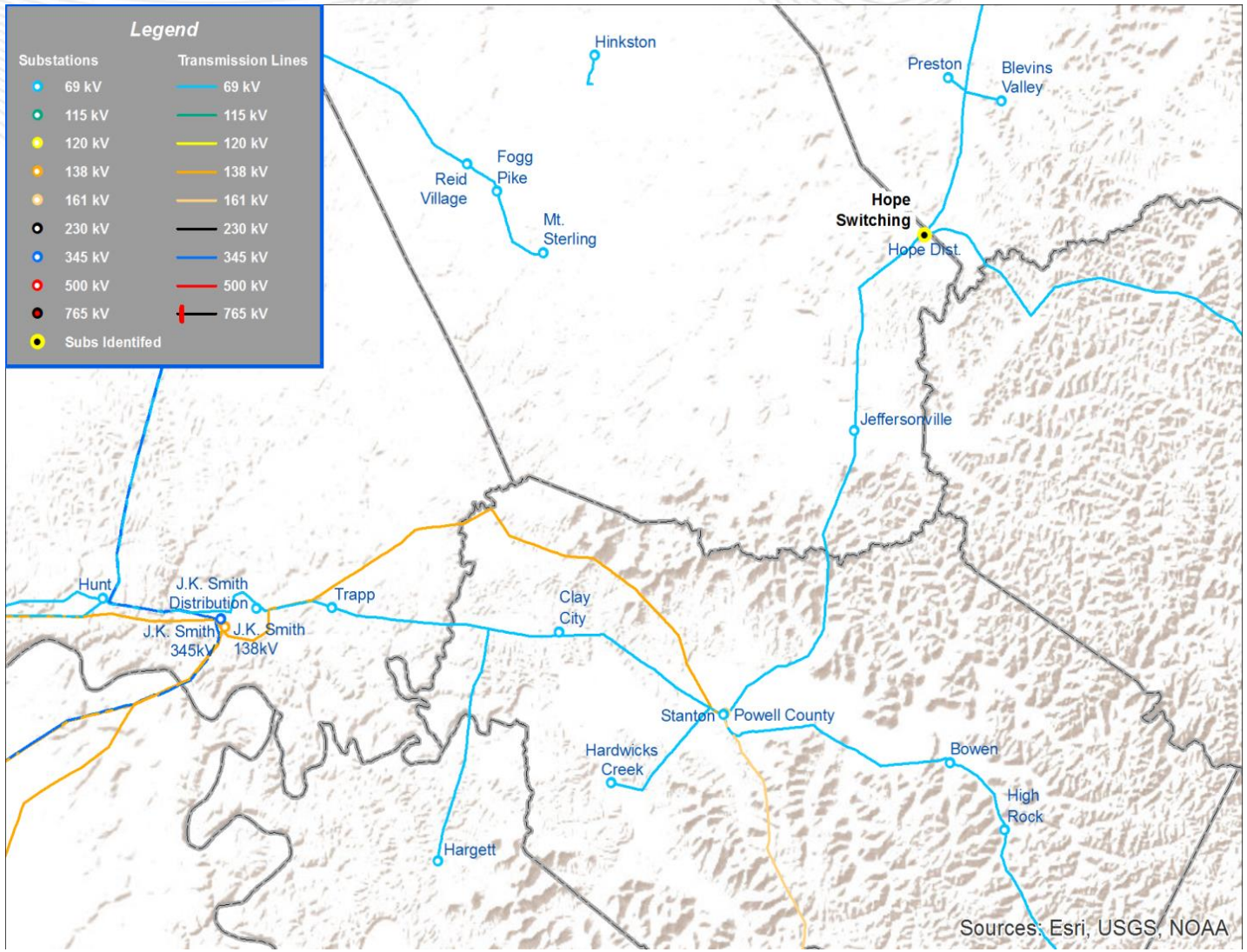
Alternatives Considered:

Add a 69kV breaker on the Powell County Line only. Estimated cost of $128,000.

Estimated Project Cost: $0.65M

Possible IS Date: 12/01/2018

Project Status: Design/Engineering



EKPC Transmission Area

Supplemental Project

Problem Statement:

Improve operational flexibility and efficiency

Recommended Solution:

Tie the Summershade 161kV side of the autotransformer to the main bus through a circuit switcher and remove the key interlock scheme. Make TVA 924 breaker tie to the main bus through breaker 1024 (in place of 1025-1 switch) and make existing breaker 1039 a dedicated transfer breaker. Add a new control house and panels to bring station up to date with new cabling, event collection, and drawings.(S1249)

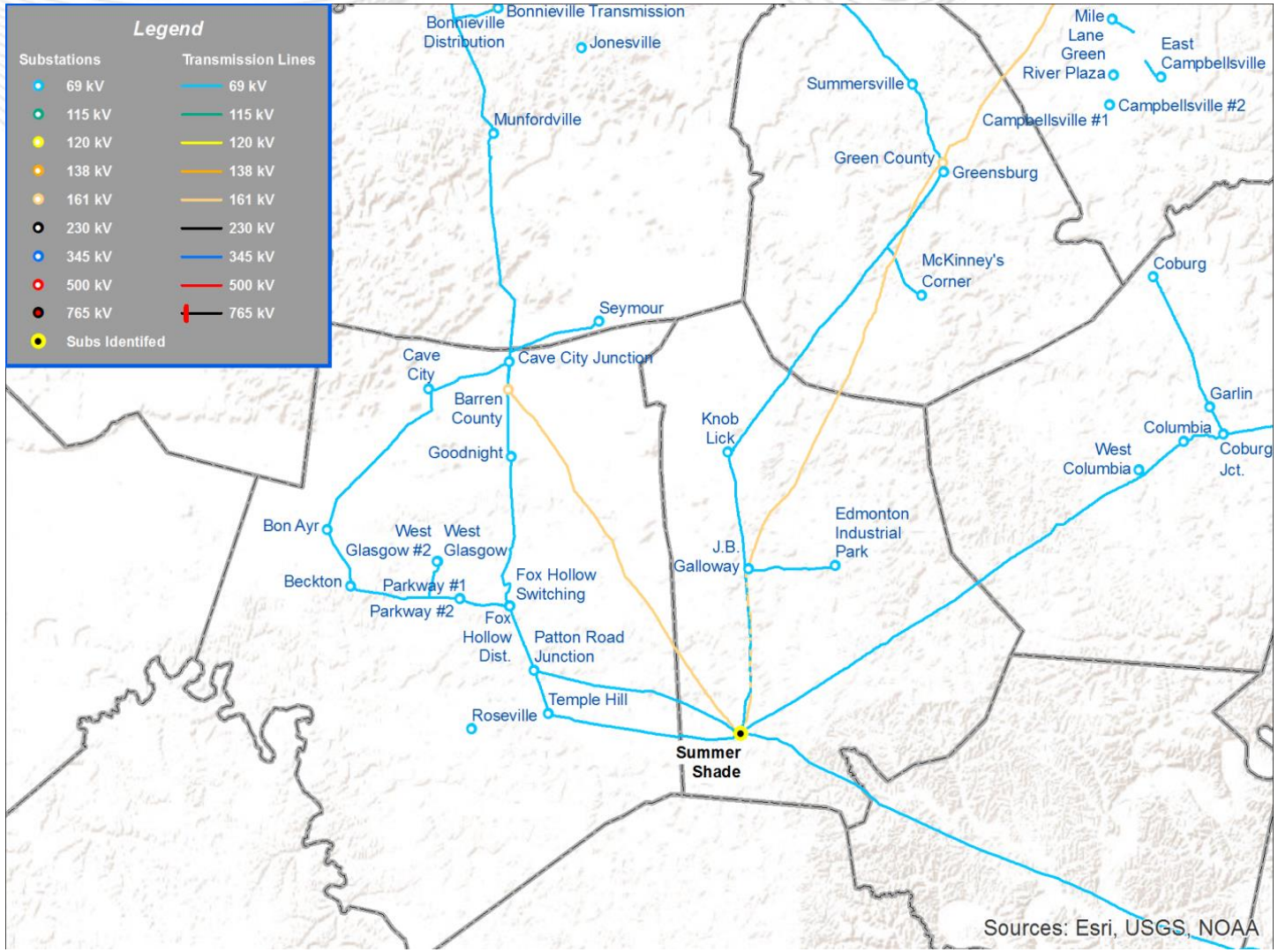
Alternatives Considered:

1. Add a circuit switcher. This would remove the confusing key interlock scheme and move TVA tie 924 from BUS #2 to BUS #1 (1025-1 would be NC and 1025-2 would be NO). Complete the relay change-out as planned. Estimated cost of $900,000.
2. Bullitt County line going straight into EK or TVA Summershade. Add a second 161kV tie between EK and TVA. Estimated cost of $3.6 Million.
3. New breaker and half station. Estimated cost of $6.0 Million..

Estimated Project Cost: $1.5M

Possible IS Date: 12/01/2018

Project Status: Scoping



EKPC Transmission Area

Supplemental Project

Problem Statement:

A bus outage at the Shelby Co. 69 kV bus results in outages at seven Shelby RECC distribution substations, including six substations that serve several industrial customers. An outage of Shelby Co. - Logan Tap 69 kV line also results in these same outages as it is a radial feed out of Shelby Co. There have been 5 outages at this station, 3 of those in the last three years.

Recommended Solution:

Build approximately 1 mile of 69 kV line from near Bekaert to the LGE/KU Simpsonville-Shelbyville 69 kV line and a 69 kV switching station at the connection point. (S1250)

Alternatives Considered:

1. Build a 161 kV box structure at Shelby County substation, add a second 161/69 kV transformer, and build a 69 kV line from this new transformer to Bekaert to create a 69 kV loop feed from two separate Shelby County transformers/69 kV buses. Estimated cost of $7.5 Million.

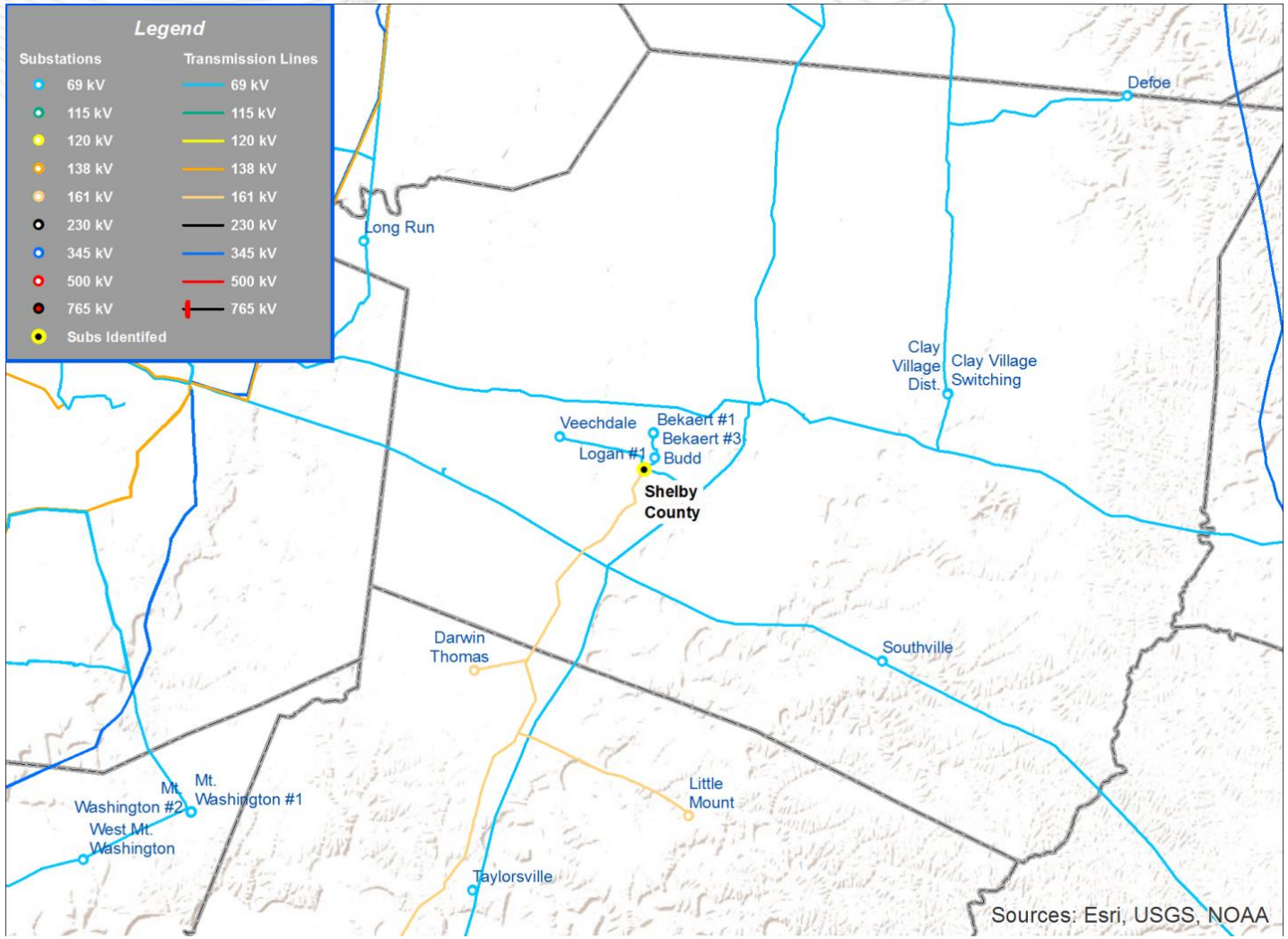
2. Build a 69 kV box structure at Veechdale, and build approximately 1.25 miles of 69 kV line from Veechdale to the LGE/KU Simpsonville-Shelbyville 69 kV line, and build approximately 2.75 miles of 69 kV line from Veechdale to Bekaert. A 69 kV switching station would be constructed at the point of connection to the LGE/KU Simpsonville-Shelbyville line. Estimated cost of $9.0 Million.

3. Build a 69 kV switching station and a short (approx. 0.1-mile) 69 kV line between the existing Shelby County-KU 69 kV tieline and the Logan-Budd 69 kV line to provide a continuous source to Logan/Budd/Bekaert from the KU tieline during a bus outage. Estimated cost of $3.7 Million.

Estimated Project Cost: $5.1M

Possible IS Date: 12/01/2019

Project Status: Scoping



EKPC Transmission Area

Supplemental Project

Problem Statement:

The Millers Creek substation has continued to show up on the list of Worst Performing areas for several years, and is currently the second worst performing location on the EKPC system based on SAIDI and the 5 year history of the number of outages . It is served on the KU transmission line between Beattyville and West Irvine.

Recommended Solution:

Build a new Miller's Creek substation at 161kV next to the existing 69kV substation and a new 0.6 mile 161kV tap line from the new substation to the KU Delvinta – EK Beattyville – EK Powell County 161kV line section, transfer distribution circuits to new substation and remove old 69kV substation.(S1251)

Alternatives Considered:

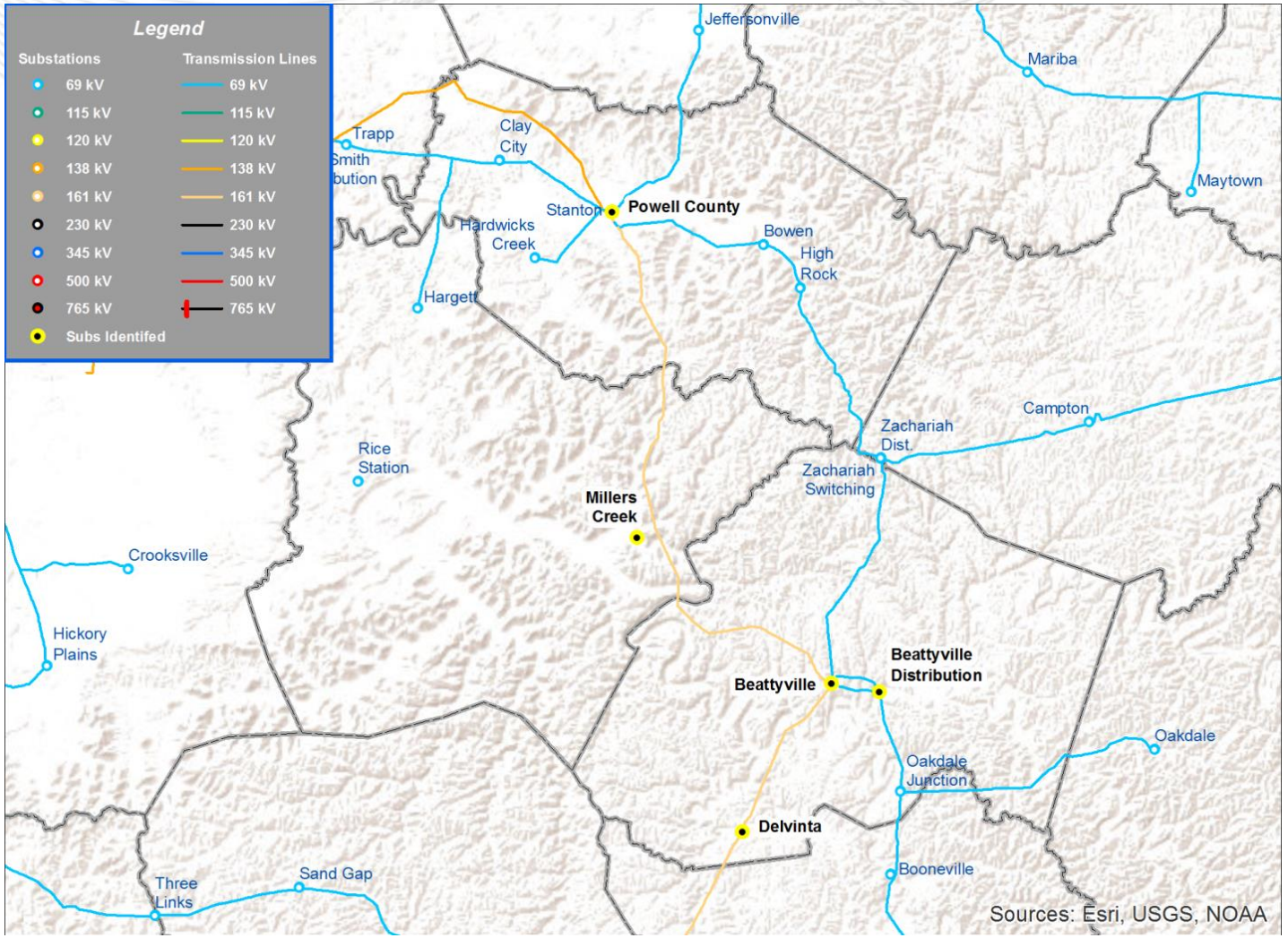
1. Build New 69kV Tap Line from Beattyville – Zachariah 69kV. Build new 8.5 mile 69kV tap from the Miller's Creek 69kV substation to EK Beattyville – Zachariah 69kV line. Remove existing 69kV tap from the KU Beattyville – KU West Irvine 69kV line section. Estimated cost is $5.3 Million.

2. Build New 69kV Tap Line from KU West Irvine 69kV Switching Station. Build new 9.5 mile 69kV tap from KU West Irvine 69kV switching station. Remove existing 69kV tap from the KU Beattyville – KU West Irvine 69kV line section. Estimated cost of $6.4 Million.

Estimated Project Cost: $2.2M

Possible IS Date: 12/01/2019

Project Status: Scoping



EKPC Transmission Area

Supplemental Project

Problem Statement:

The Baker Lane 69 KV breaker addition is needed due to relay coordination difficulties during a fault on the Holloway tap line under the current configuration at the Baker Lane station. During those fault conditions the 608 and 644 breakers at Baker Lane will open. When the 608 breaker opens the 138 KV source at Baker Lane is lost, increasing the fault current at Baker Lane. This could cause the 608 breaker at Fayette to open, resulting in the loss of Davis, Nicholasville, South Jessamine, West Nicholasville and Holloway. Adding a 653 breaker at Baker Lane will reduce the load loss to only Holloway during such an event.

Recommended Solution:

Install a 69 KV breaker at the Baker Lane switching station for the Baker Lane-Holloway line section.(S1252)

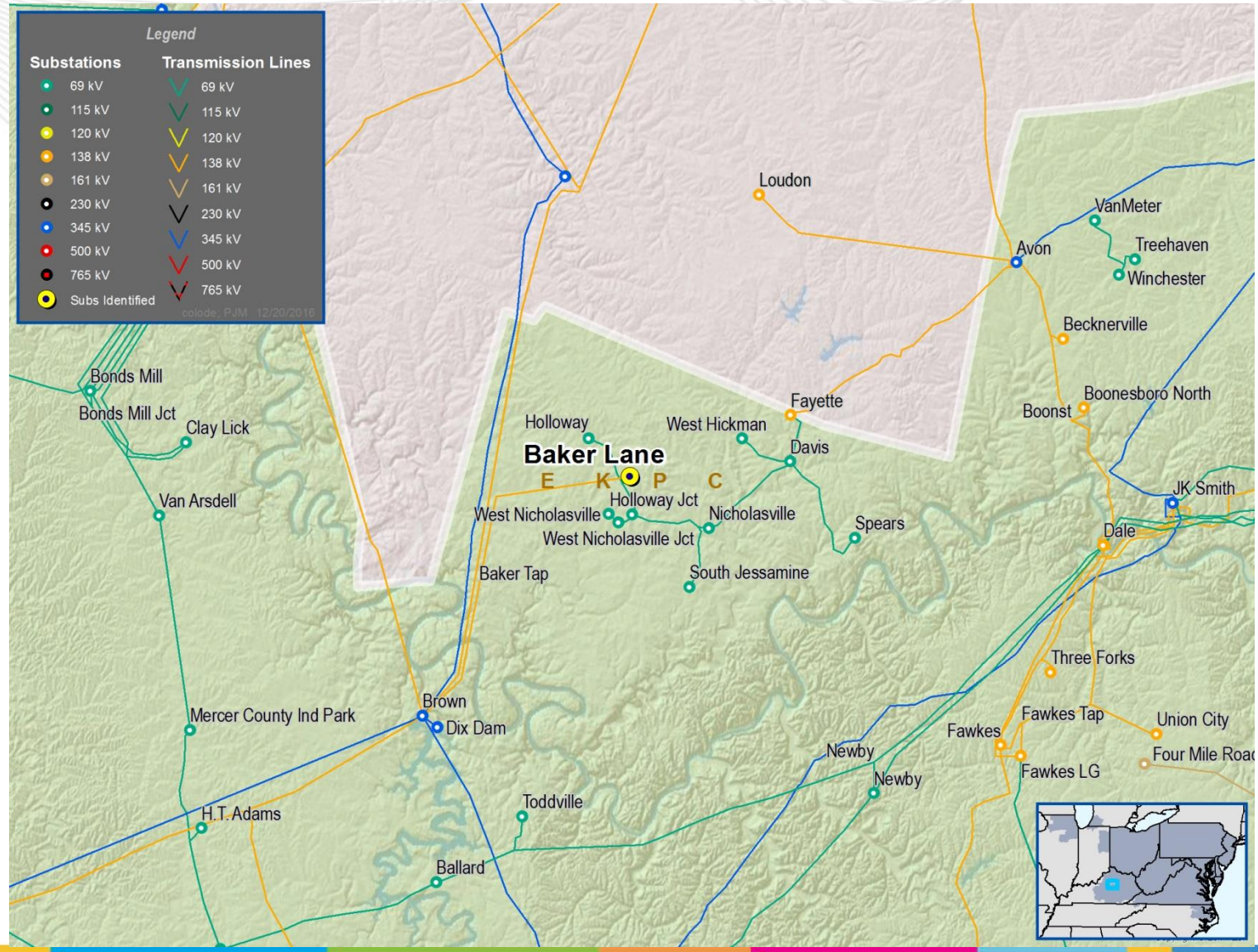
Alternatives Considered:

No other alternatives considered

Estimated Project Cost: $0.128M

Possible IS Date: 12/01/2020

Project Status: Scoping



Supplemental Projects-Presented in Dec. SRTEAC

NEW CUSTOMER SERVICE REQUESTS

AEP Transmission Zone

Supplemental Project

Problem Statement:

Provide service to a new load.

Submitted to SRRTEP on execution of customer agreement.

Recommended Transmission Solution:

Install a new a phase-over-phase switch and metering structure for the new 3MW load close to the existing Markwest-Hopedale plant near Blackhawk Station. (S1184)

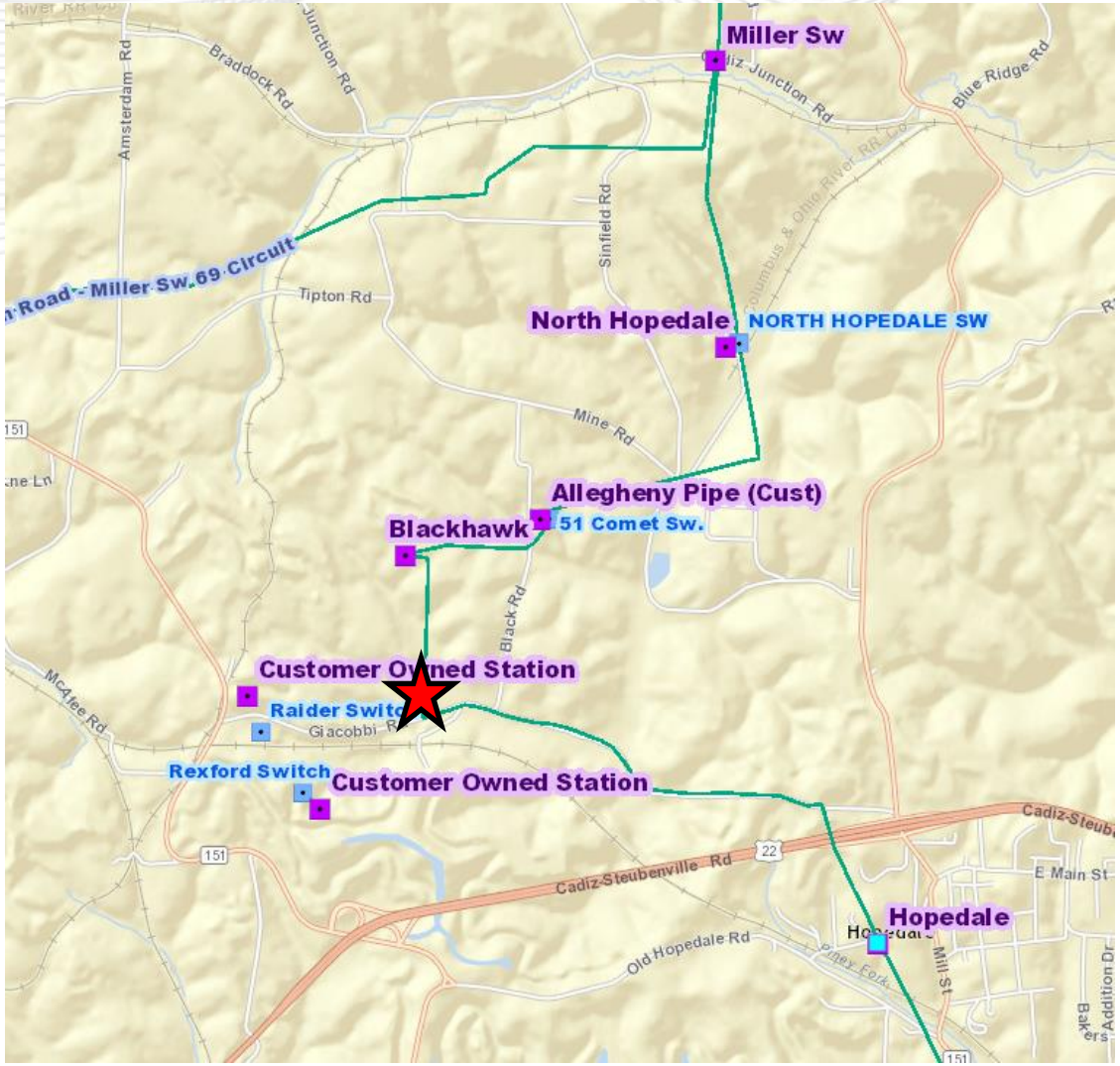
Transmission Alternates Considered:

Construct a new 69 kV line from the Crimm Road – Miller Switch line to feed the customer. More costly.

Estimated Transmission Cost: $1.09M

IS Date: 10/14/2016

Status: In-service



AEP Transmission Zone

Supplemental Project

Problem Statement:

Provide service to a new load. Load projections from customer are 190 MVA.

Submitted to SRRTEP on execution of customer agreement.

Recommended Transmission Solution:

Construct 138 kV Britton Station, tapping the existing Davidson – Dublin underground circuit to serve new customer owned station and load. (S1185.1)

Build a new 138 kV overhead circuit from Britton to Davidson. (S1185.2)

Reconfigure Davidson Station to improve reliability. (S1185.3)

Remote end work at Dublin, Bethel Road, and Roberts Stations. (S1185.4)

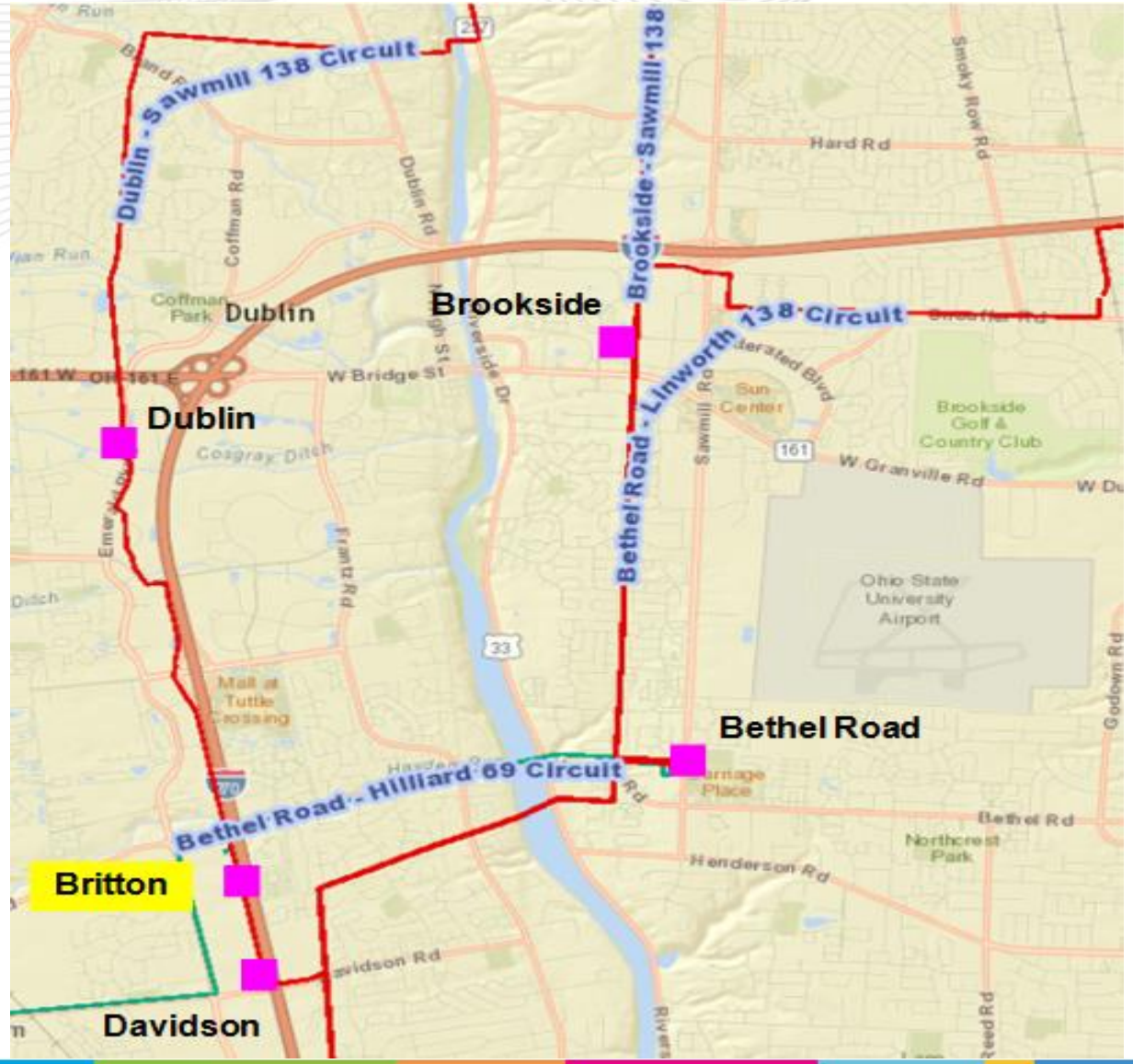
Transmission Alternates Considered:

Extend Bethel Road – Hilliard 69 kV line to serve Britton station. More costly option due to criteria violations (thermal constraints) driving significant upgrades.

Estimated Transmission Cost: $16.0M

Projected IS Date: 6/30/2017

Status: Under Construction



AEP Transmission Zone

Supplemental Project

Problem Statement:

Provide service to a new load. Load projections from customer are 190 MVA.

Submitted to SRRTEP on execution of customer agreement.

Recommended Transmission Solution:

Construct 138 kV Sumac Station to serve the new customer station and load adjacent to Amlin station. Construct Cole 345/138 kV station by tapping the Beatty – Hayden 345 kV circuit. String a 138 kV circuit from Cole to Amlin on existing towers, providing a second source to Amlin. Remote end work at Beatty and Hayden Stations. (S1189)

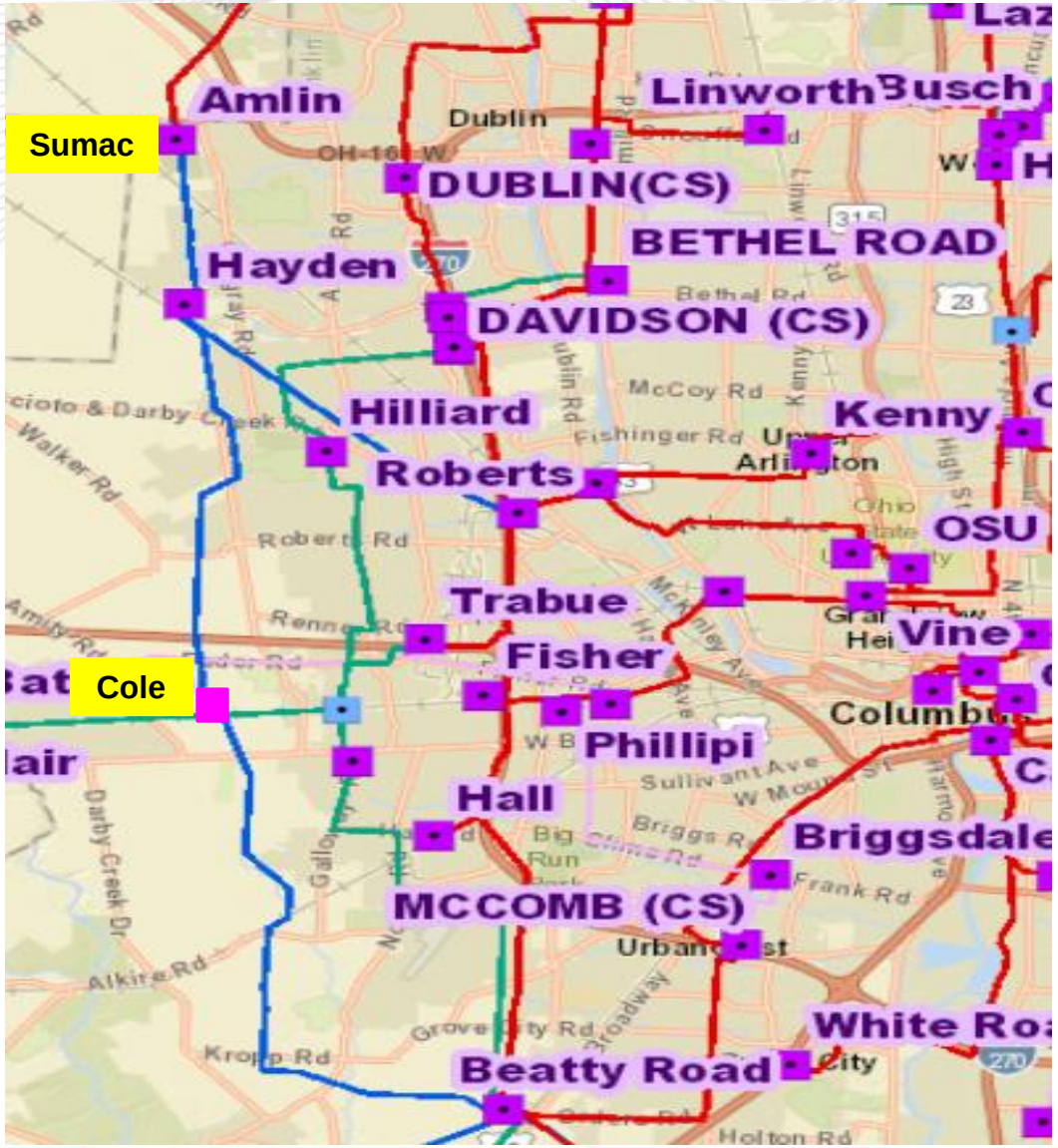
Transmission Alternatives Considered:

Add 345/138 kV source at Hayden station. Space limitations at Hayden will require significant expansion making this a more costly option.

Estimated Transmission Cost: $42.1M

Projected IS Date: 6/30/2018

Status: Under Construction



Supplemental Project

Problem Statement:

Provide new service to Columbia Gas.

Submitted to SRRTEP on execution of customer agreement.

Recommended Transmission Solution:

Construct new Marriett 138/12kV Station, which is tapped into the Twelve Pole Creek – Tri-State 138 kV line. (S1192)

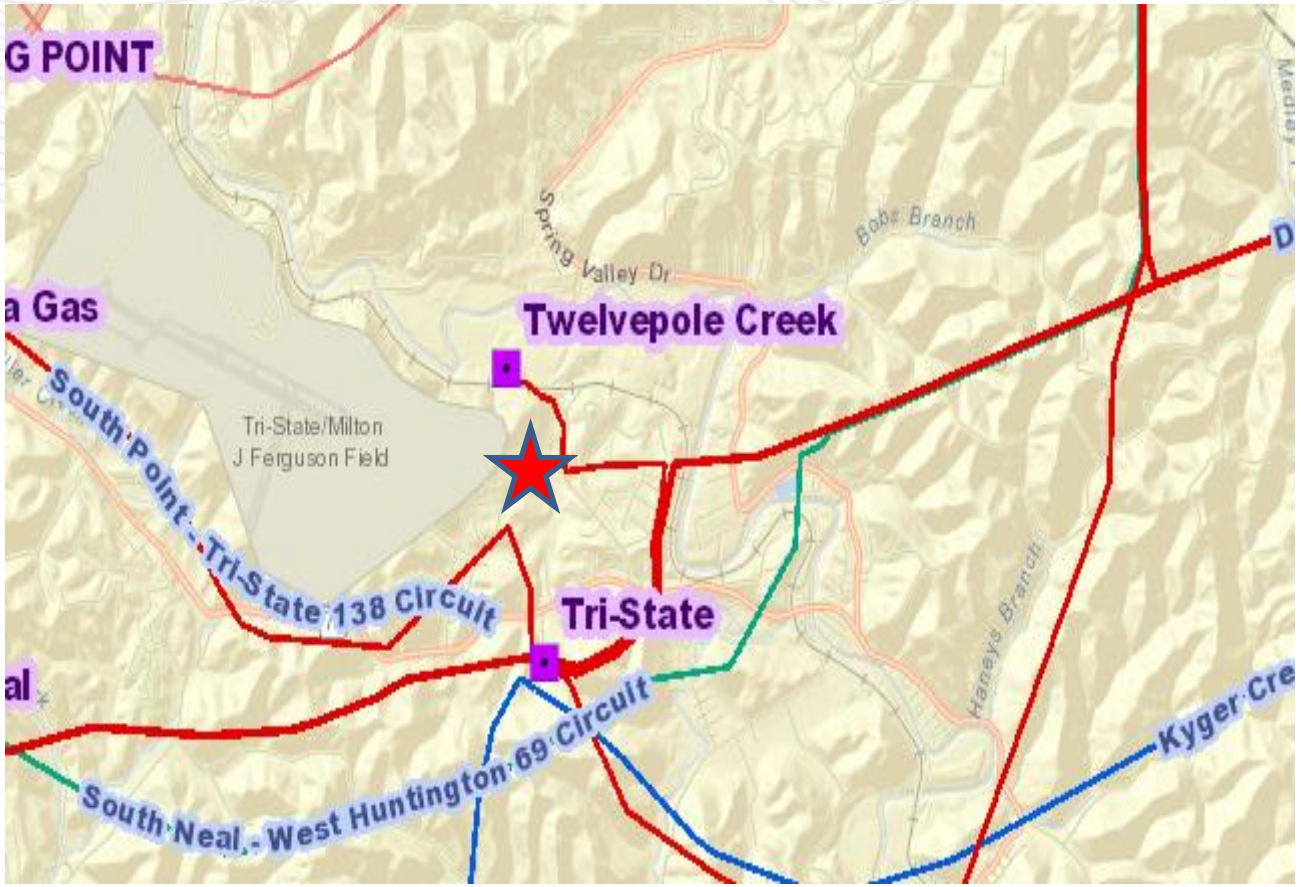
Transmission Alternatives Considered:

Provide new service from the South Point – Tri-State 138 kV line. Requires additional line facilities based on the customer location. More costly due to length of transmission extension needed.

Estimated Transmission Cost: $8.6M

Projected IS Date: 6/1/2017

Status: Engineering



Supplemental Project

Problem Statement:

Provide service to a new load.

Recommended Transmission Solution:

Construct a new 138/12 kV Aviation station and approximately 4.7 miles of new 138 kV line from Waynedale Station and a newly established Dalman Road switching station. (S1200.1)

Waynedale Station will be upgraded with modifications to the 138 kV and 12 kV systems. (S1200.2)

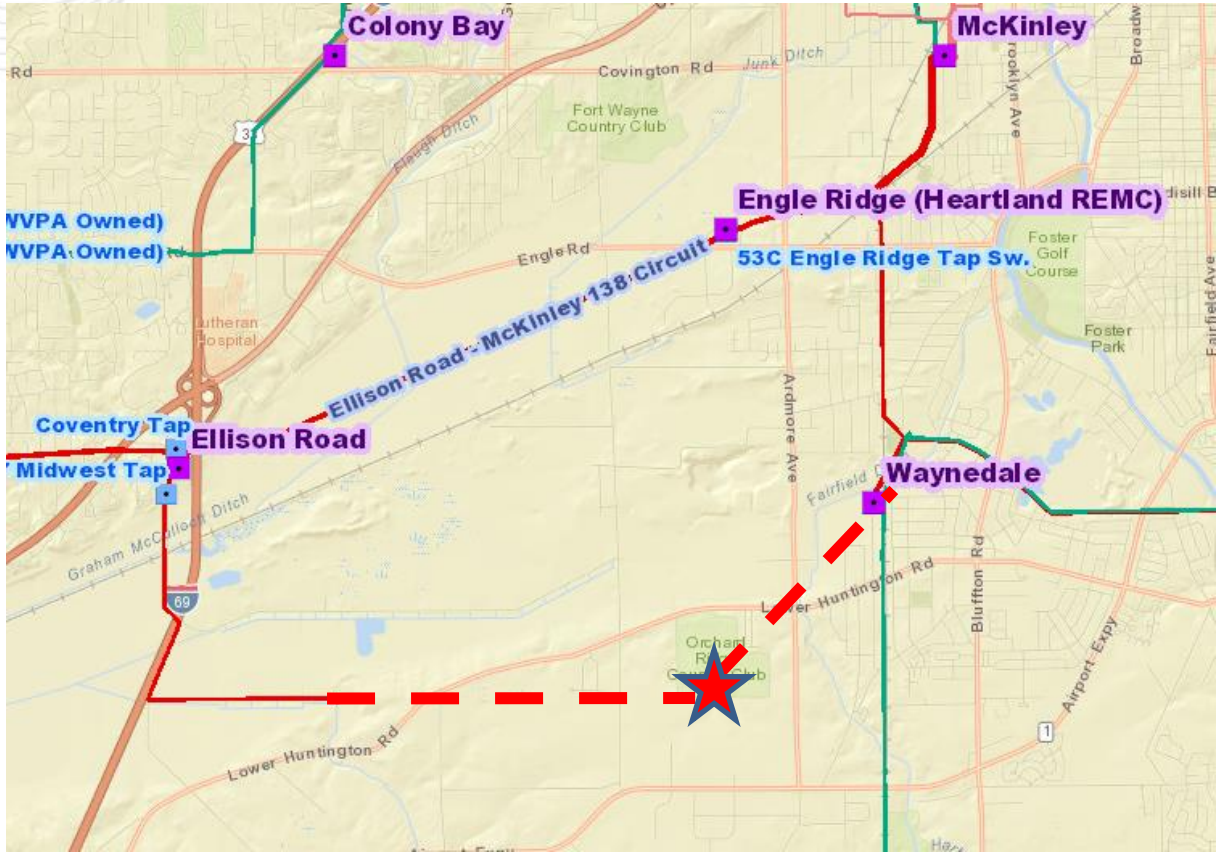
Transmission Alternatives Considered:

Construct 69 kV facilities from the Waynedale – Ferguson 69 kV line to feed customer. 138 kV option provides dual service to a coop (REA) station while addressing the service request at same cost.

Estimated Transmission Cost: $11.6M

Projected IS Date: 12/31/2017

Status: Engineering



EXISTING CUSTOMER SERVICE REQUESTS

Supplemental Project

Problem Statement:

Provide service to existing customers at the request of Indiana Michigan Power Company.

Recommended Transmission Solution:

Construct a new 138/12 kV distribution bay at Milan station to transfer the existing distribution load at Woodburn Station. This new distribution bay at Milan will be tapped off of the 138 kV bus #2 and the 138 kV yard will operate as a ring bus. (S1193)

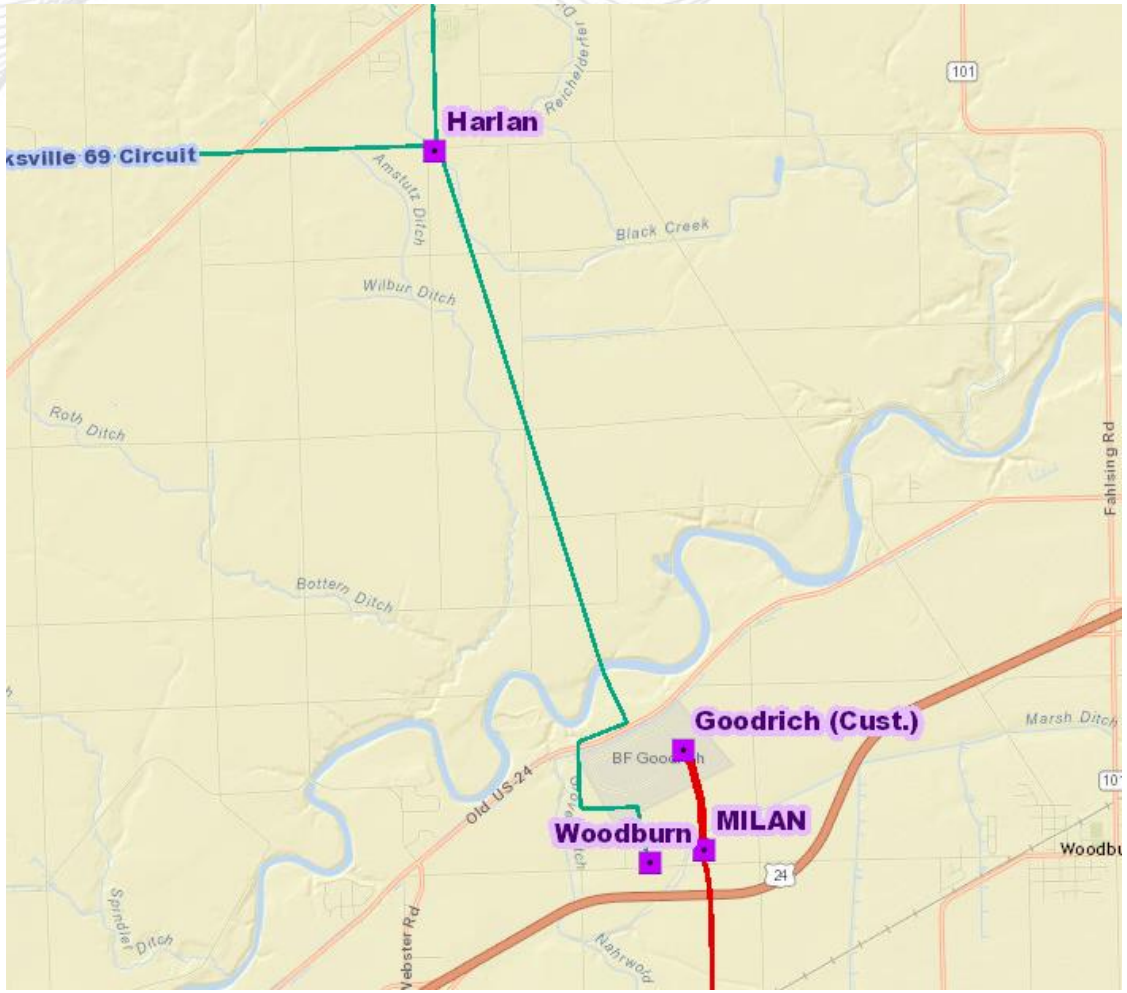
Transmission Alternatives Considered:

Install 138/69 kV and a new 69 kV line at Milan station to provide service to Woodburn. More costly.

Estimated Transmission Cost: $1.0M (removal only)

Projected IS Date: 6/1/2018

Status: Scoping



Supplemental Project

Problem Statement:

Provide service to existing customers at the request of Appalachian Power Company.

Submittal to SRRTEP was pending final station and route locations as requested by Distribution, which completed after the July SRRTEP meeting.

Recommended Transmission Solution:

Construct new Owen's Drive 69/12kV substation with a new 69kV transmission line extension tapped into the Meadowview – Glade circuit. (S1186)

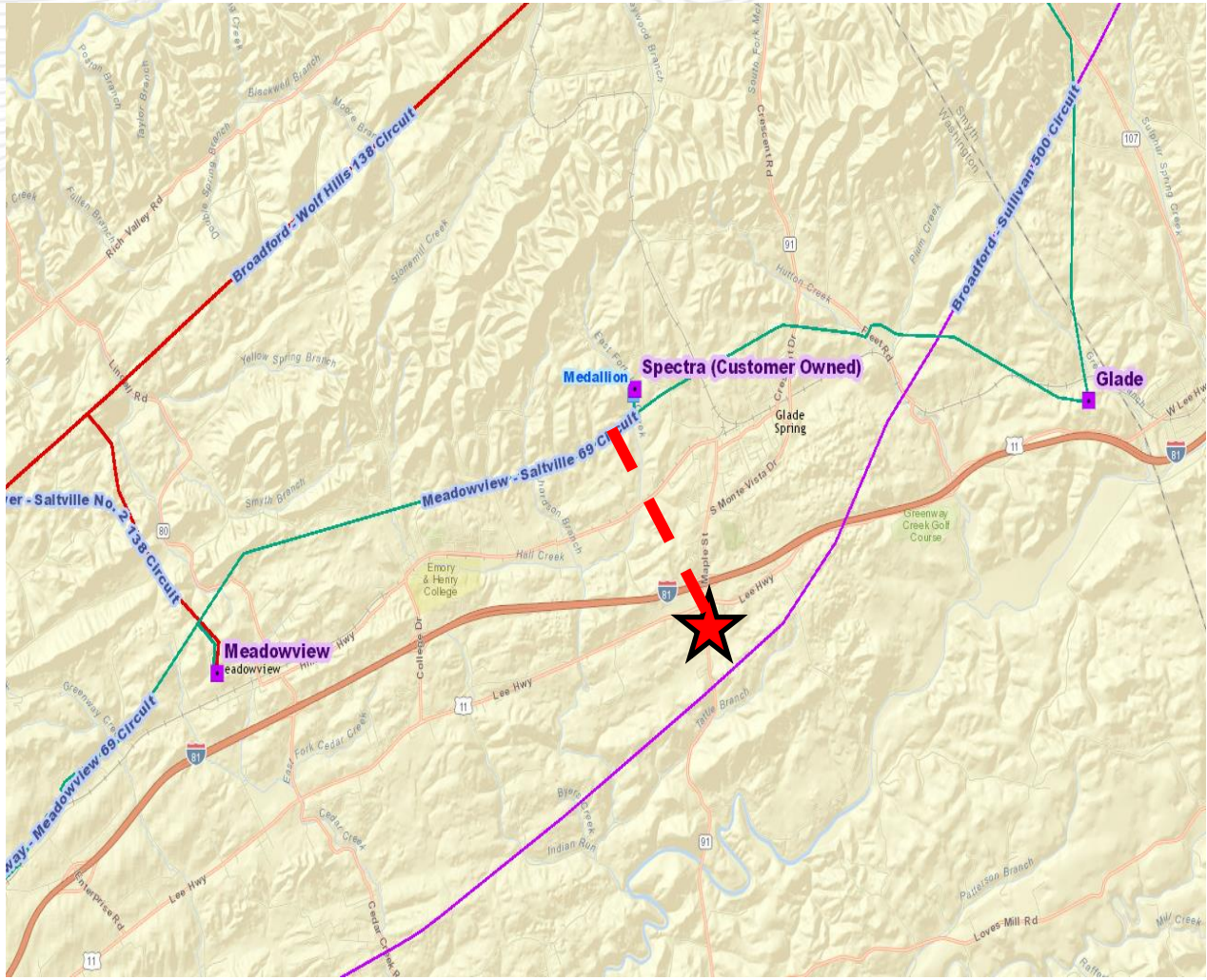
Transmission Alternates Considered:

Construct a new 138/12 kV Owen's Drive Station and a new radial 138 kV line from Meadowview to Owen's Drive. More costly.

Estimated Transmission Cost: $12.0M

Projected IS Date: 01/10/2017

Status: Under Construction



Supplemental Project

Problem Statement:

Improve service to existing customers at the request of Appalachian Power Company.

Submittal to SRRTEP was pending final station location as requested by Distribution, which occurred after the July SRRTEP meeting

Recommended Transmission Solution:

Construct McConville station to serve distribution load on the Brookville-Graves Mill 138 kV line. (S1187)

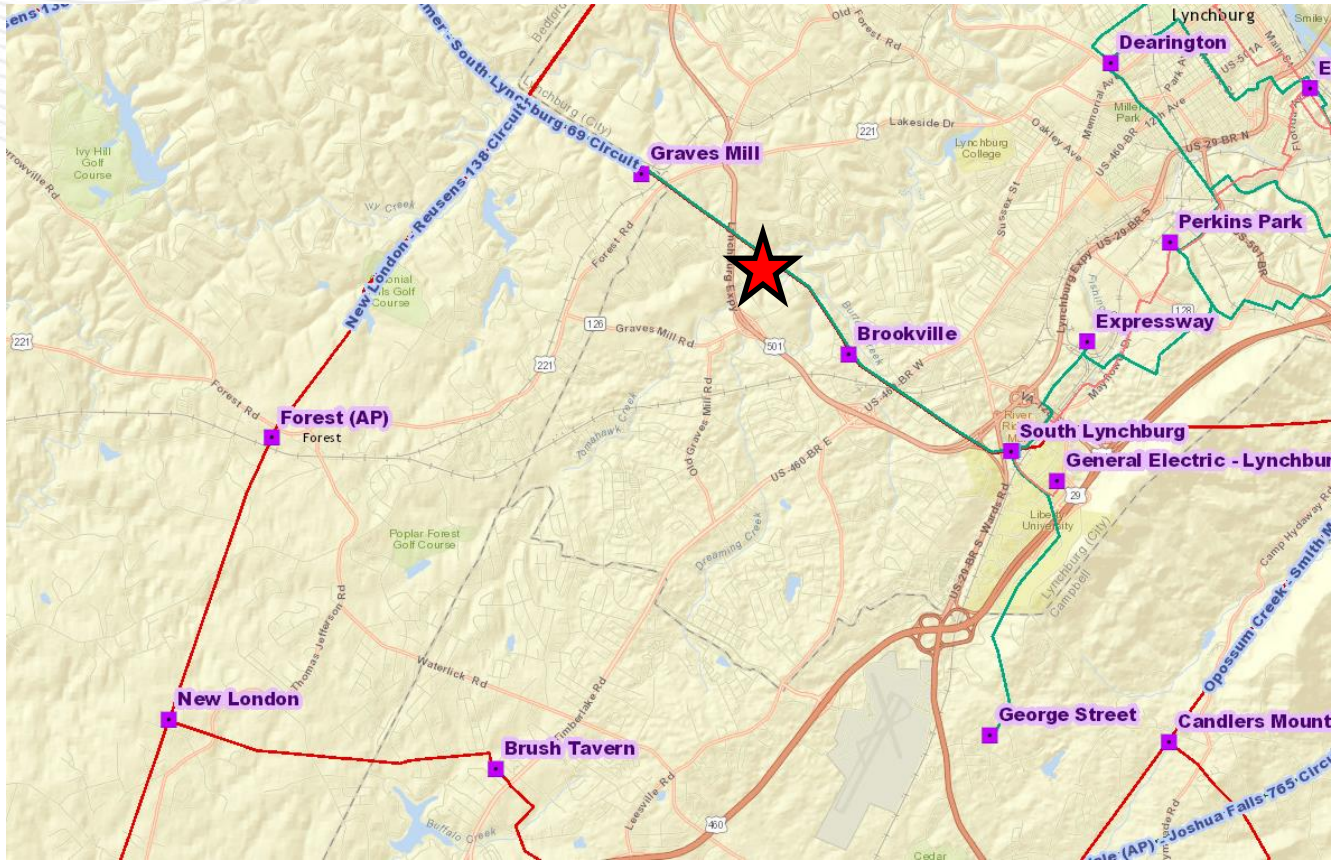
Transmission Alternatives Considered:

Construct McConville station and tap New London – Reusens 138 kV line to serve the new station as an in-and-out station. More costly.

Estimated Transmission Cost: $7.4M

Projected IS Date: 6/30/2017

Status: Under Construction



Supplemental Project

Problem Statement:

Provide service to existing customers at the request of AEPOhio.

Recommended Transmission Solution:

Construct new 138kV Bolton station to serve load in the southwestern potion of Columbus, OH with a new delivery point requested by AEPOhio. Perform sag study mitigation on the Beatty – Wilson 138 kV line to allow for future load growth. (S1188)

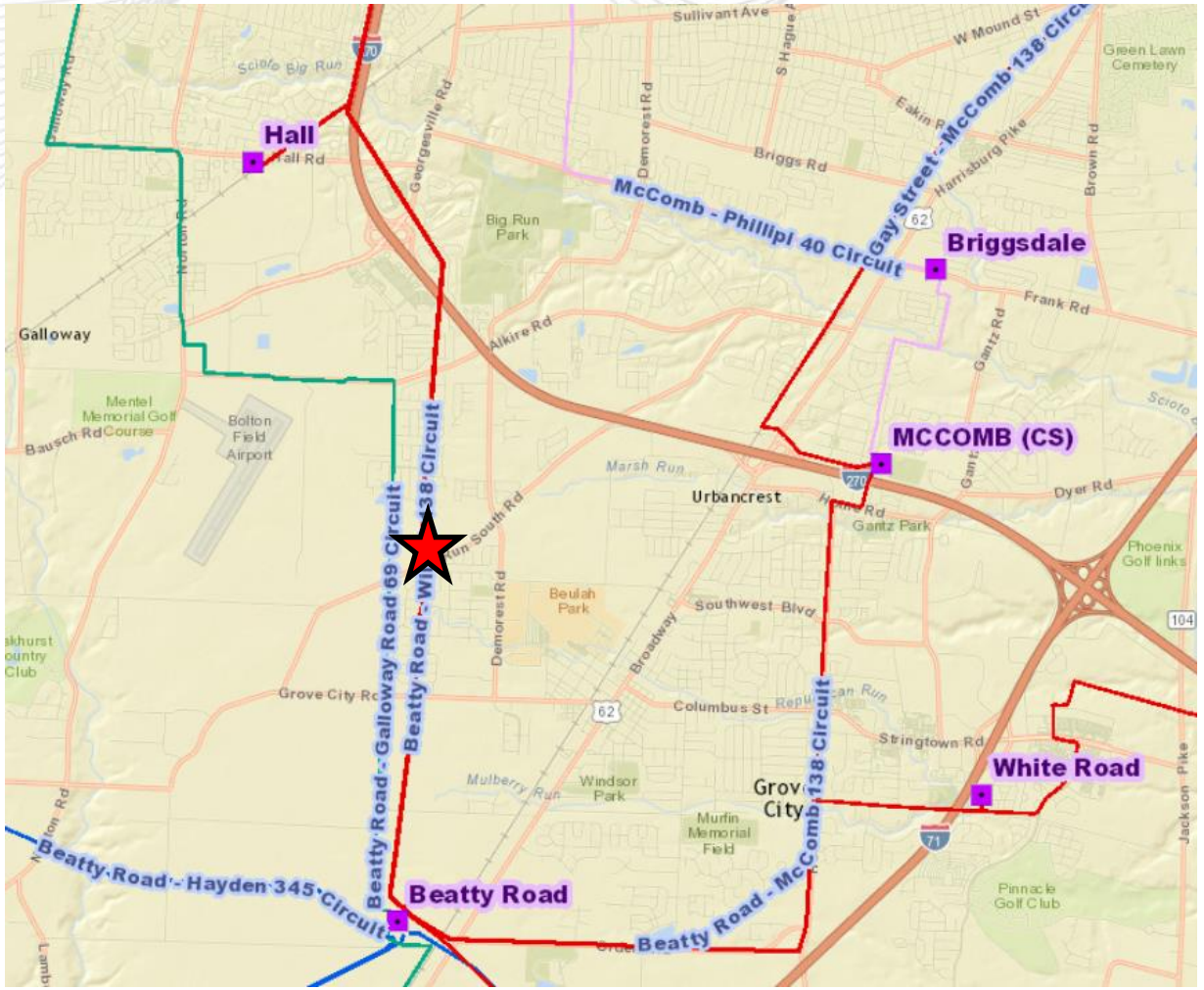
Transmission Alternatives Considered:

Construct a new 69 kV Bolton station and tap Beatty Road – Galloway Road 69 kV line to serve the new station. More costly option due to substantial 69 kV upgrades that would be required.

Estimated Transmission Cost: $4.4M

Projected IS Date: 5/31/2018

Status: Engineering



AEP Transmission Zone

Supplemental Project

Problem Statement:

Improve service to existing customers at the request of AEPOhio. AEPOhio owns the rights-of-way and land for future station locations for the proposed line path. This project is the transmission line construction portion of the AEP Distribution request.

Recommended Transmission Solution:

Build 69 kV line between Lincoln and a new 138/69 kV Berrywood station to provide loop service. (S1194)

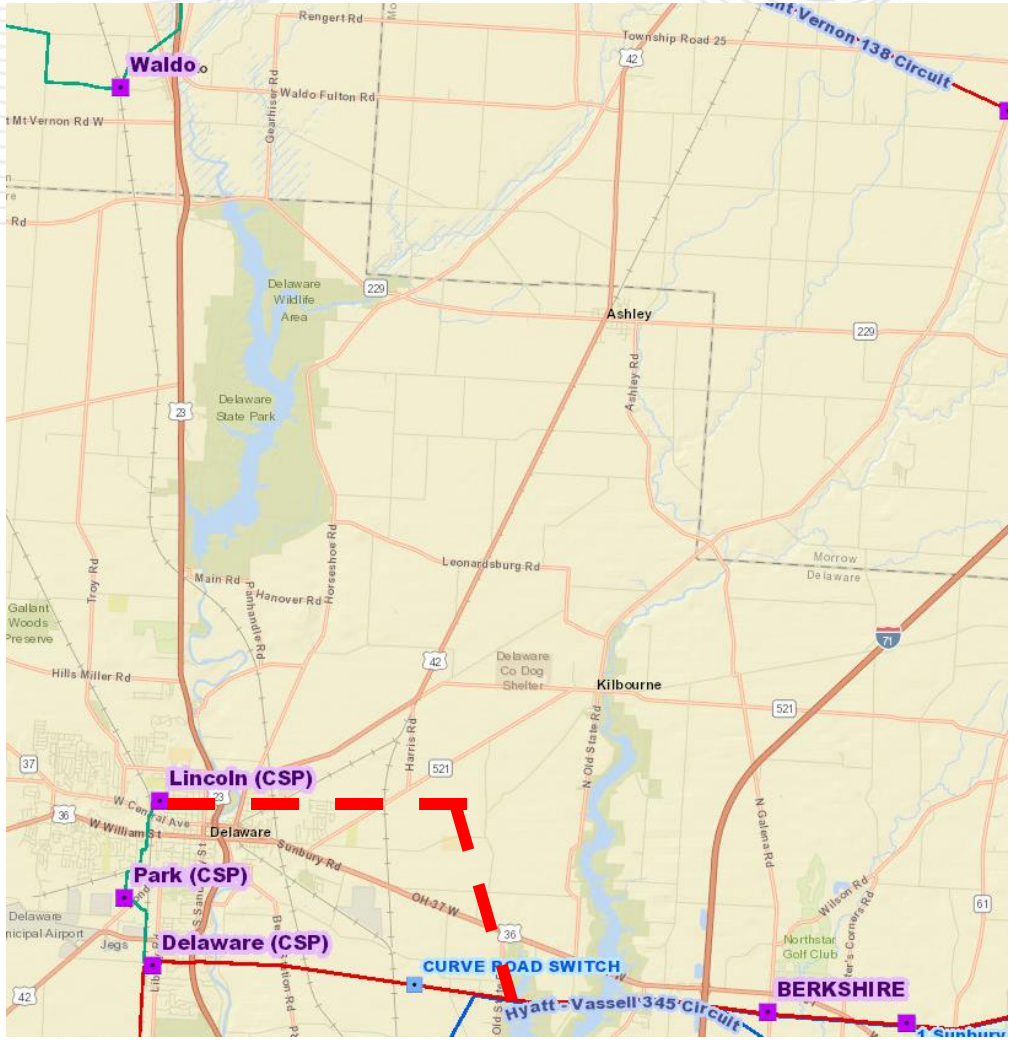
Transmission Alternatives Considered:

Construct new 69 kV line from Lincoln to Waldo station. Does not include the Distribution requested delivery points along the proposed route and higher cost due to new easement and land acquisition.

Estimated Transmission Cost: $38.7M

Projected IS Date: 12/01/2018

Status: Engineering



Supplemental Project

Problem Statement:

Improve service reliability to existing customers in downtown Fort Wayne at the request of Indiana Michigan Power Company.

Recommended Transmission Solution:

Tap the existing Hadley-McKinley 69 kV circuit and construct a new 69 kV double circuit extension to a new Melita 69 kV station, retiring Webster station and converting existing 34.5 kV transmission lines from Hillcrest to Melita (formerly Webster). (S1195)

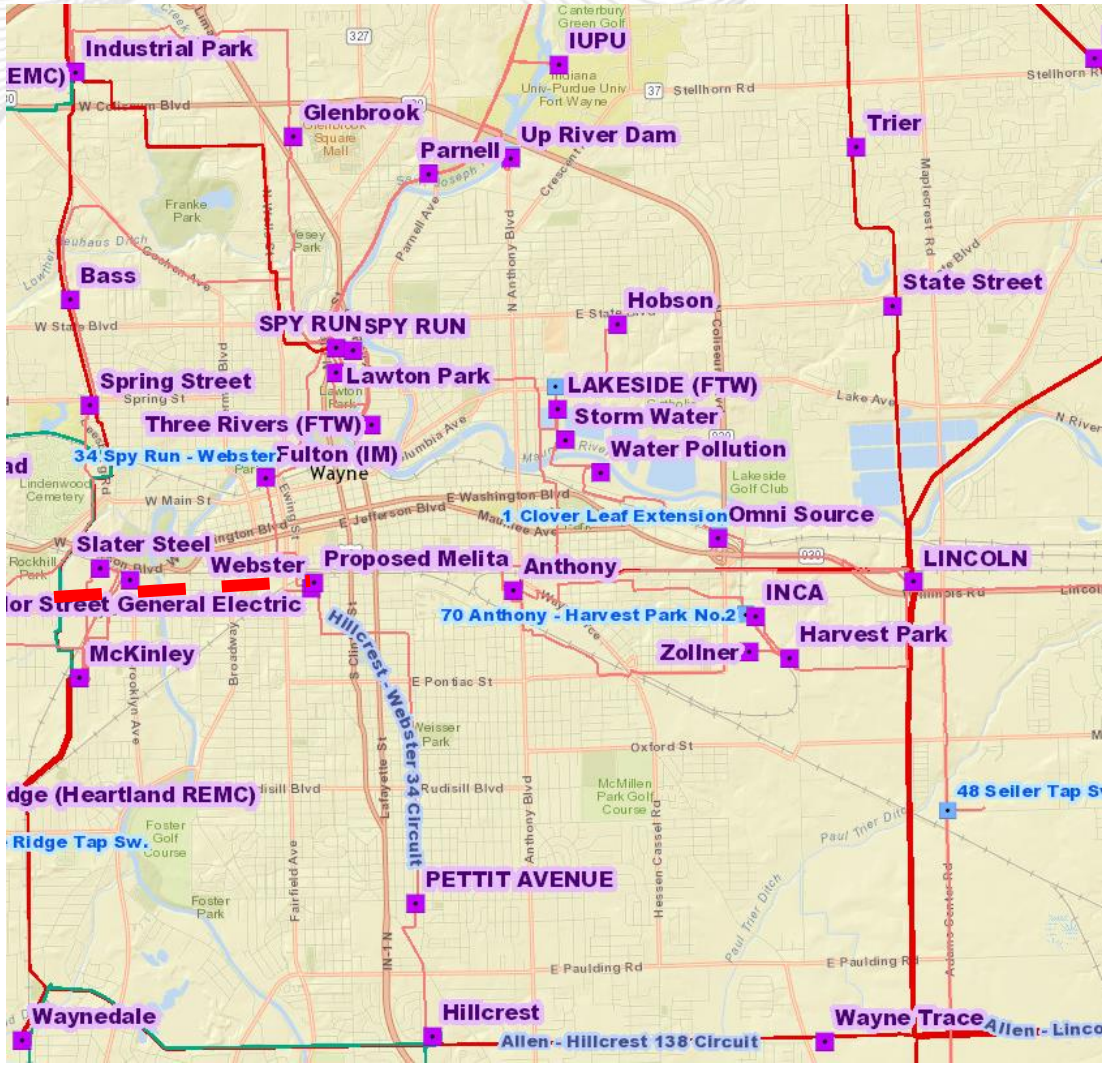
Transmission Alternatives Considered:

Construct new 138 kV line between Lincoln and McKinley stations via Melita. Infeasible due to construction limitations (building 138 kV through downtown Fort Wayne, IN) and higher cost than selected option.

Estimated Transmission Cost: $24M

Projected IS Date: 12/13/2017

Status: Engineering



AEP Transmission Zone

Supplemental Project

Problem Statement:

Improve service to existing customers at the request of Appalachian Power Company.

Recommended Transmission Solution:

Construct Redwood station to serve distribution load and allow retirement of the Glade Hill 34.5 kV station. (S1199)

Transmission Alternatives Considered:

Construct 138 kV facilities from the Smith Mountain – Westlake 138 kV line and rebuild Glade Hill station in the same location. More costly involving significant land impact.

Estimated Transmission Cost: $5.6M

Projected IS Date: 10/01/2017

Status: Engineering

Supplemental Project

Problem Statement:

Back-up delivery point requested by AMP City of Dover.

Recommended Transmission Solution:

Tap the East Dover-West Dover 69kV circuit with a new 69 kV 3-way switch to provide back-up service to the City of Dover, operated normally open. Upgrade the relaying at East Dover & West Dover terminals with fiber-based relaying, due to Dover's behind-the-meter generation. Install revenue metering and SCADA functionality. (S1198)

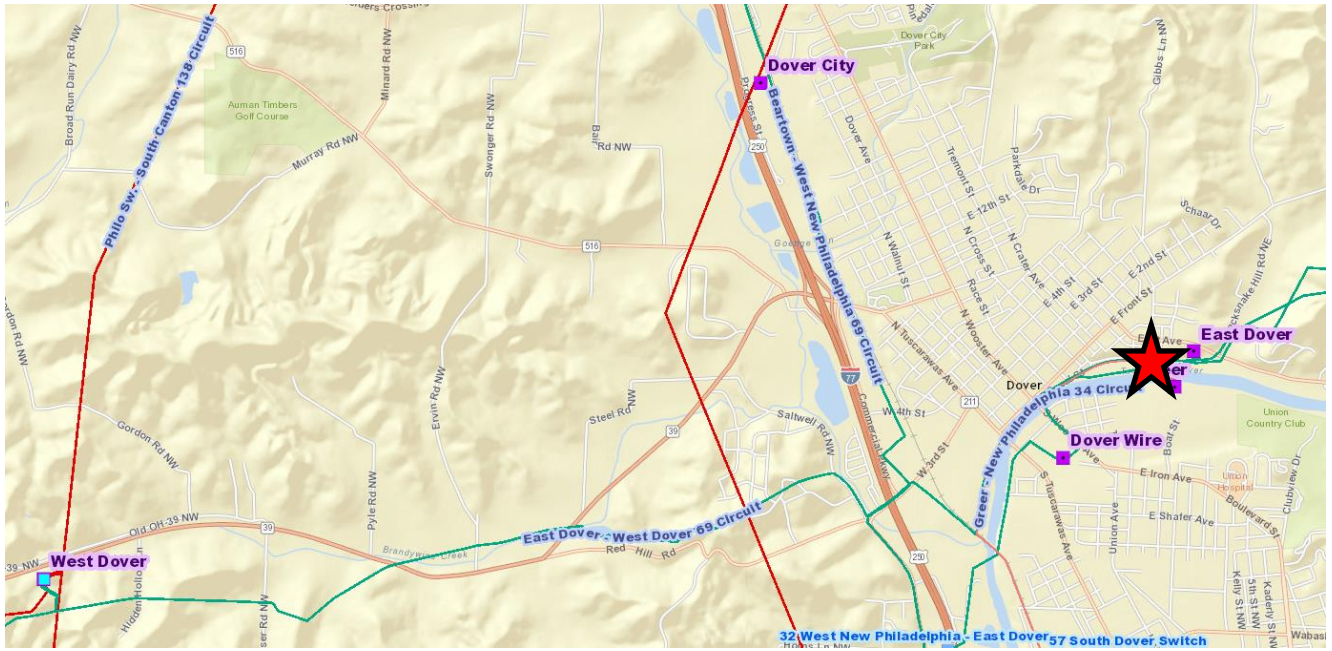
Transmission Alternatives Considered:

Provide service from the Beartown – West New Philadelphia 69 kV line. Cost of alternate was not evaluate due to preference by City of Dover.

Estimated Transmission Cost: $1M

Projected IS Date: 3/31/2017

Status: Under Construction



MATERIAL CONDITION & PERFORMANCE

Supplemental Project

Problem Statement:

AEP received complaints from Buckeye Power concerning the reliability of service at their 69 kV delivery points in the Somerset area. The New Lexington-South Fultonham line has experienced 7 outages over the past three years. This poor performance is due to condition of the line and the lack of sectionalizing. Inspection of the line revealed 91 conditions that require mitigation. AEP worked with Buckeye Power to develop solutions in this area.

Recommended Transmission Solution:

Install a new Clouse 138/69 kV station at the intersection of the West Lancaster – Zanesville 138 kV line and the South Fultonham – New Lexington 69 kV line. (S1190)

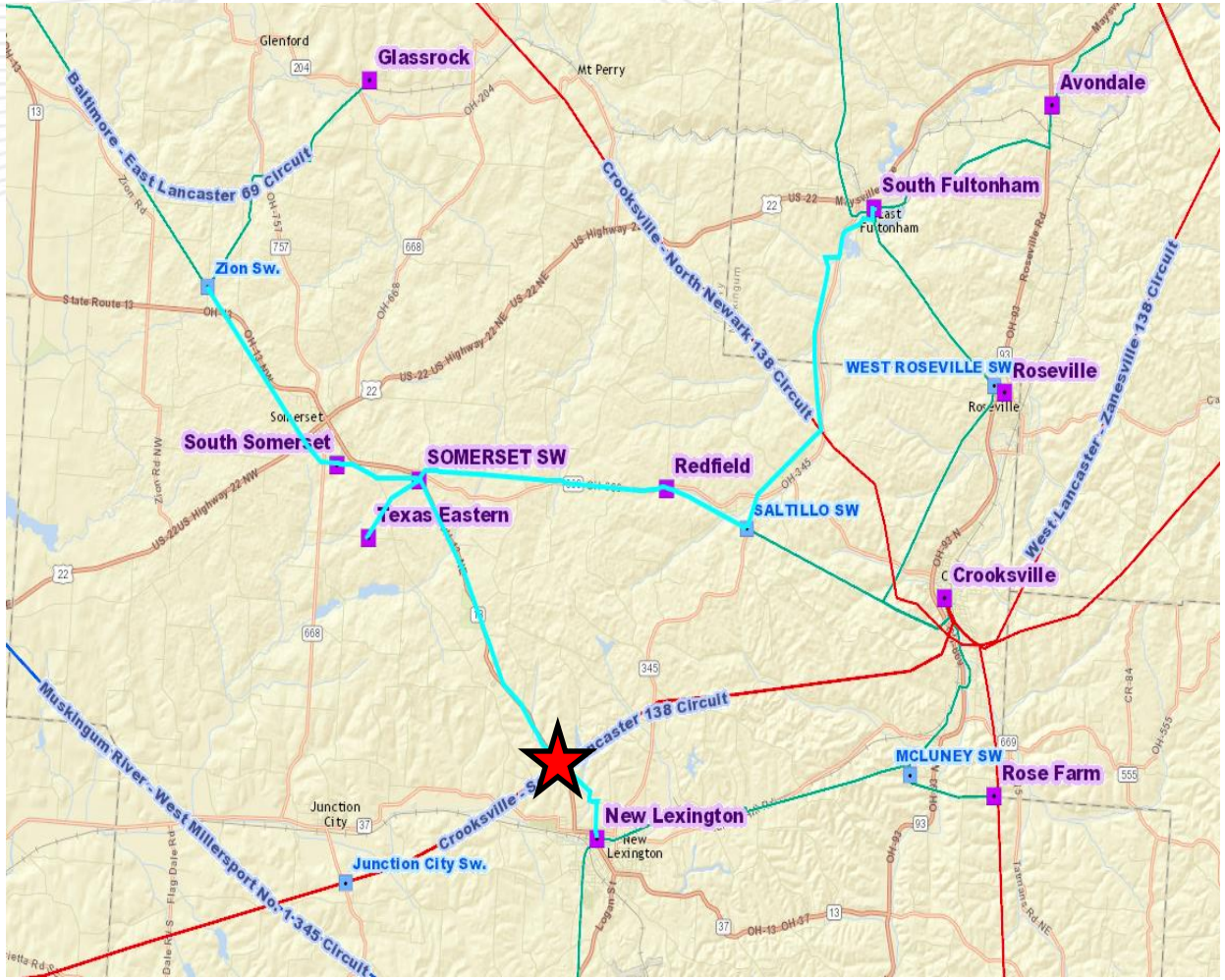
Transmission Alternatives Considered:

Install 138/69 kV at intersection of Crooksville – North Newark 138 kV line and Somerset – South Fultonham 69 kV line. This option was more costly due to significant upgrades 69 kV facilities in the area due to undersized, aged conductors.

Estimated Transmission Cost: $18.1M

Projected IS Date: 12/15/2017

Status: Scoping



Supplemental Project

Problem Statement:

AEP received complaints from Midwest REA concerning prolonged outages on three delivery points on the Almena – Schoolcraft 69 kV line. This line section has experienced 6 permanent outages over the past three years and has 74 conditions that require mitigation. Key conditions include failing insulators and grounding wires due to the line's proximity to an interstate highway that is routinely treated for icy conditions..

Recommended Transmission Solution:

Establish sectionalizing on this 19 mile long line by constructing a new 69kV in line switching station named Frosty, located adjacent to Prairie Ronde station. Frosty station will include a 7.2 MVAR cap bank, two (2) 69kV circuit breakers going towards the Almena – Schoolcraft 69kV lines and a switch going towards Prairie Ronde customer station. (S1196)

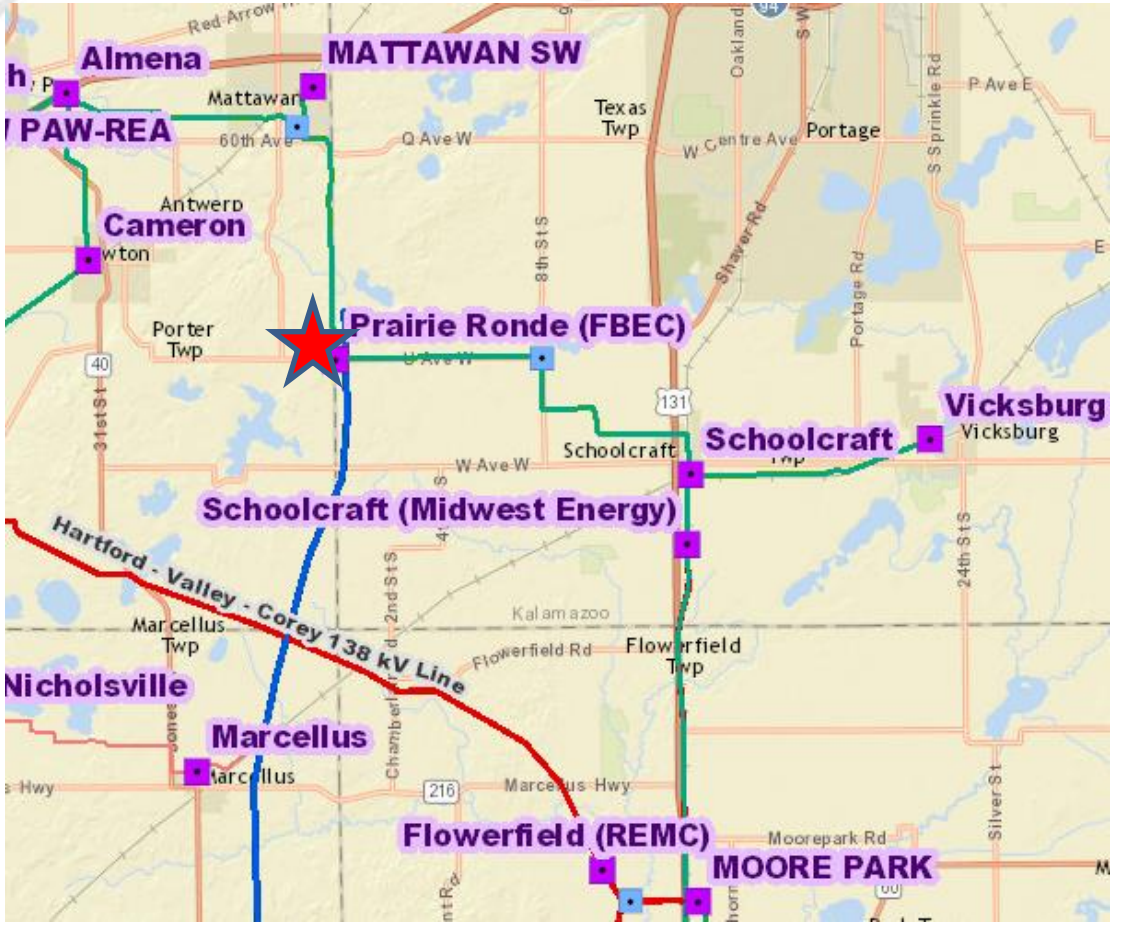
Transmission Alternatives Considered:

Rebuild the Almena – Schoolcraft 69 kV line. Roughly $40 million in cost – 10 times.

Estimated Transmission Cost: $4.75M

Projected IS Date: 4/1/2018

Status: Scoping



Supplemental Project

Problem Statement:

Jug Street currently serves several sensitive customers, including a single load with a projection of 190 MVA. A plan to introduce a third source to the area was developed by AEP Transmission in conjunction with local and state economic development groups to help serve the existing customers and to prepare for future load growth and development in the area.

Recommended Transmission Solution:

Rebuild the Corridor – Jug Street 345 kV line as a double circuit line with one side served at 345 kV and the other at 138 kV to provide a third source to Jug Street station. (S1191)

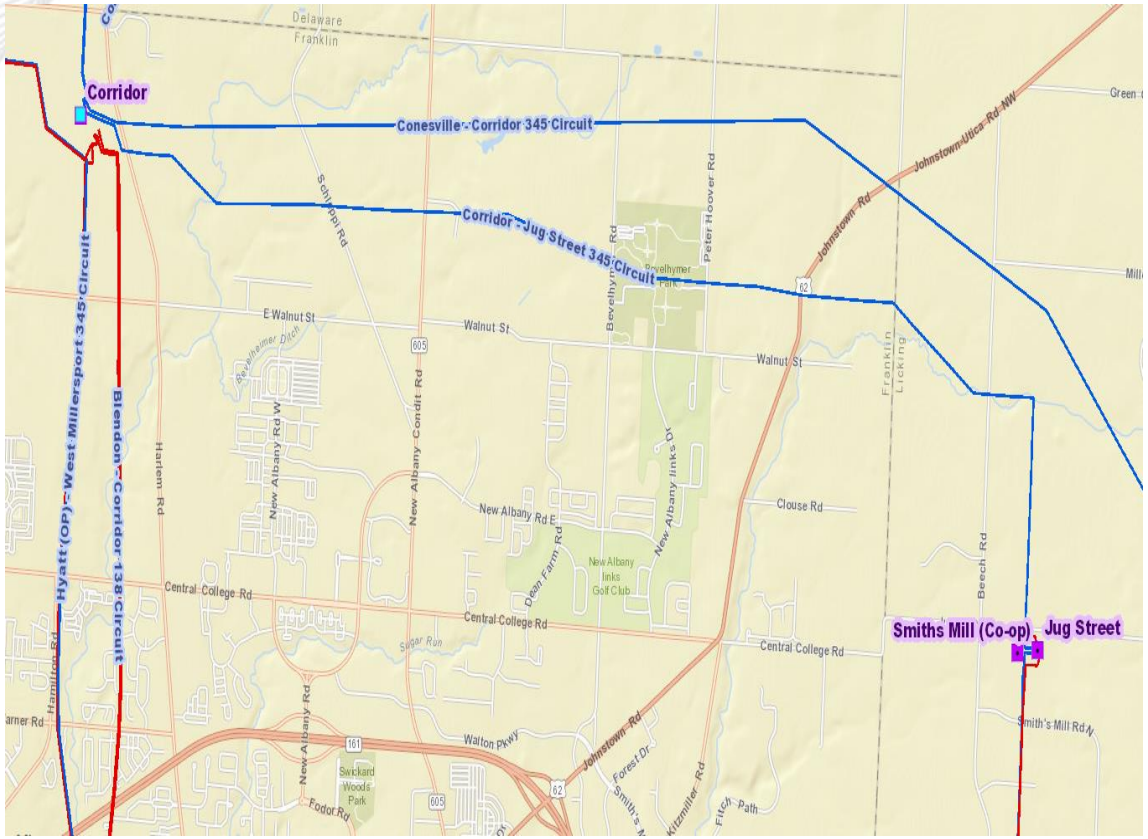
Transmission Alternatives Considered:

Construct a new 345/138 kV spur to Jug Street from the Conesville – Corridor 345 kV line. More costly option that requires new rights=of-way and a new station to serve as a new 138 kV source.

Estimated Transmission Cost: $17M

Projected IS Date: 12/1/2019

Status: Engineering



AEP Transmission Zone

Supplemental Project

Problem Statement:

AEP analysis in collaboration with economic development in eastern Ohio suggests improvements will be needed to serve projected shale growth. A sag mitigation will allow increased capacity for this circuit by roughly 50 MVA.

Recommended Transmission Solution:

Complete sag study mitigation on the Muskingum – Natrium 138 kV line. (S1197)

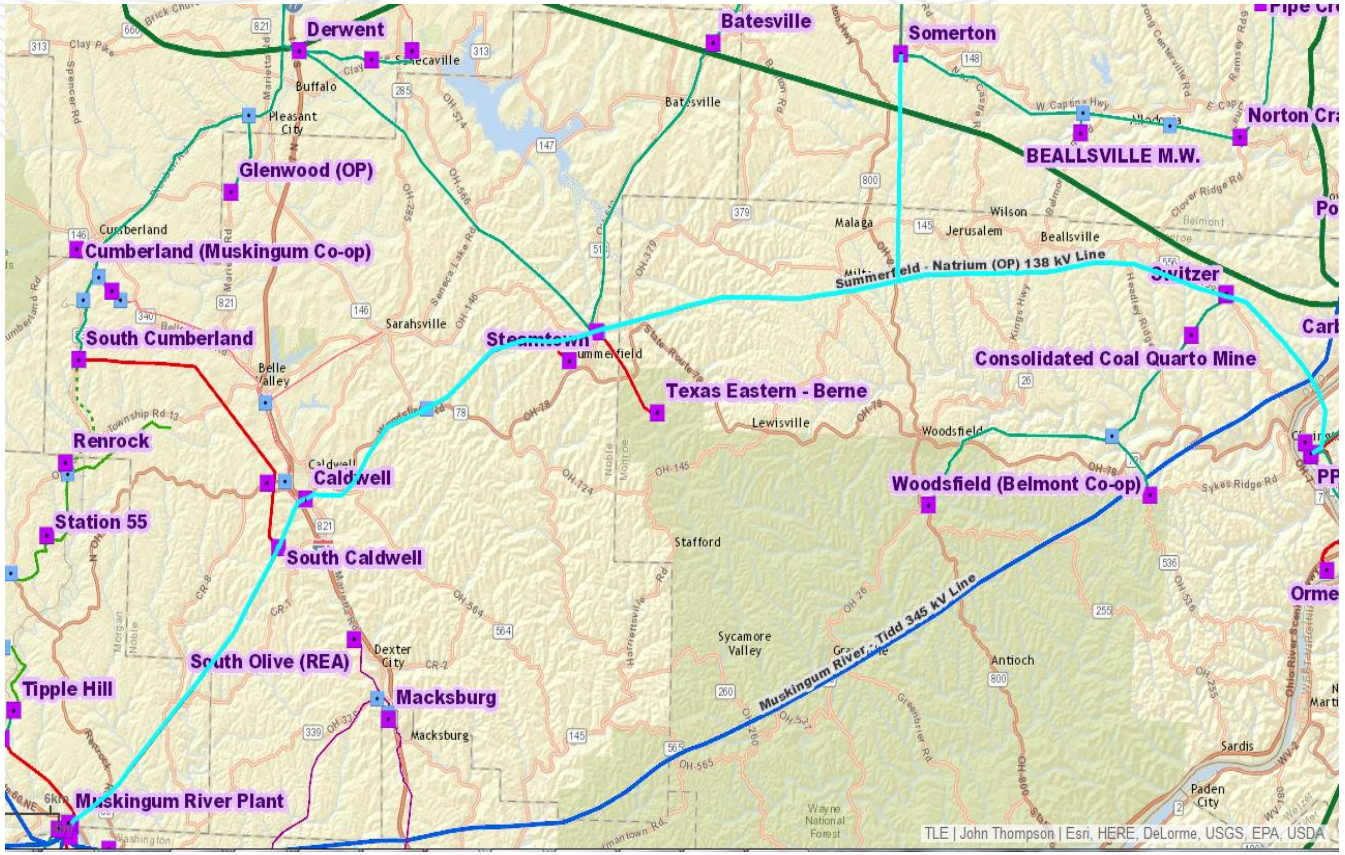
Transmission Alternatives Considered:

Reconductor with 556 ACSS conductor. More costly.

Estimated Transmission Cost: $2.8M

Projected IS Date: 06/01/2017

Status: Engineering



Supplemental Project

Problem Statement:

PJM originally identified an overload on the Lincoln – Sterling 138 kV line in the 2012 RTEP analysis (b1881). AEP identified the overloaded elements as terminal equipment at Sterling station. During the detailed scoping and engineering stage of the baseline project, it was determined to rebuild the entire station in the clear to help alleviate aging infrastructure concerns with other existing station equipment at Sterling. Sterling station houses transformers from 1947 and 1951 that leak oil and seven circuit breakers dating from between 1952 and 1955 that have no spare parts and are no longer supported by the vendor. The station was constructed in 1943 and the majority of the station structures are original.

Recommended Transmission Solution:

Rebuild Sterling 138kV station in the clear. (S1206)

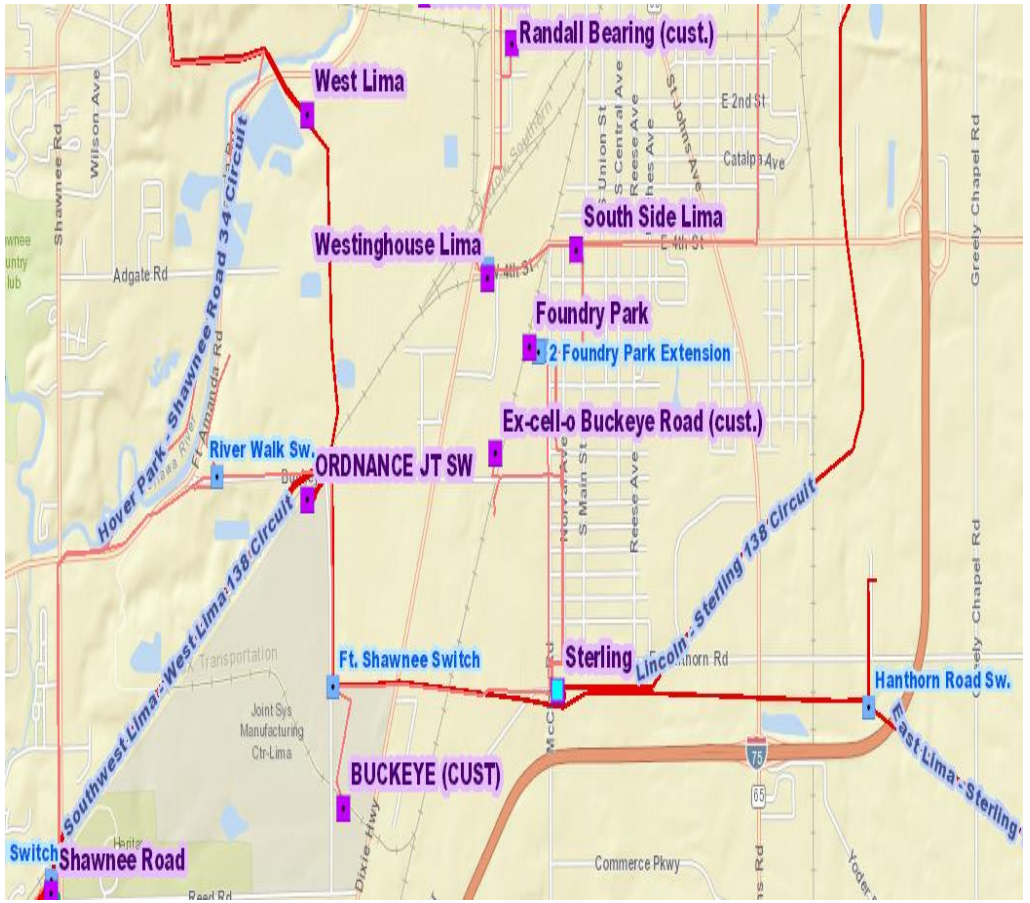
Transmission Alternates Considered:

No good alternates. The station is in extremely poor condition and any attempt to upgrade the terminal equipment will be short lived. Also, workers will be exposed to unsafe conditions due to poor station records pertaining to live cables buried at the station in the early 1940s.

Estimated Transmission Cost: $9.0M

Projected IS Date: 11/1/2018

Status: Engineering



Supplemental Project

Problem Statement:

The North Waldo – West Mount Vernon line was built in the 1950s and has 239 conditions that require mitigation. The key conditions include rotten wood structures, broken cross arms, and wood pecker and insect damage. This line has been subjected to 5 outages over the past three years.

Recommended Transmission Solution:

Rebuild West Mount Vernon-South Kenton 138kV Line between West Mount Vernon and North Waldo (477ACSR). (S1201)

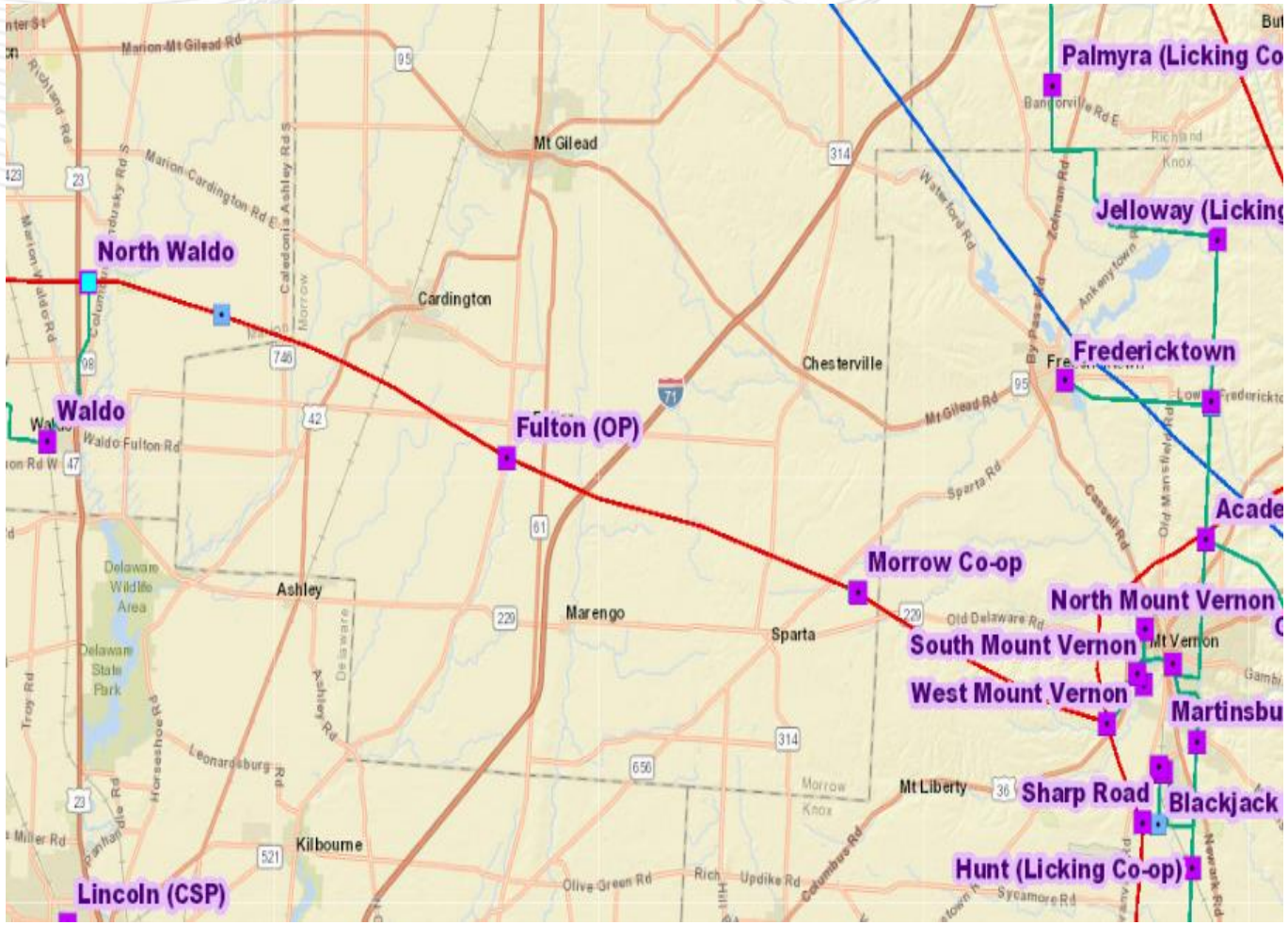
Transmission Alternatives Considered:

No good alternative besides rebuild. Poor conditions exist throughout the entire line and sectionalizing is not projected to reduce customer minutes of interruptions.

Estimated Transmission Cost: $70.3M

Projected IS Date: 12/1/2020

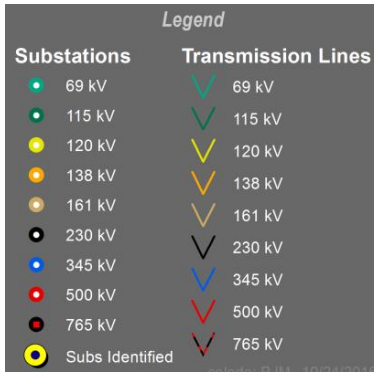
Status: Engineering

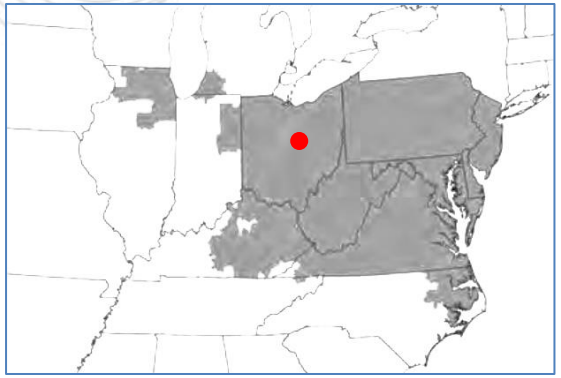


ATSI Transmission Zone

Supplemental Project

Tangy Substation– 69kV Ring Bus Expansion





Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages; Provide continuity of supply by eliminating simultaneous outages to two or more network elements. Improve overall system protection coordination; including the elimination of a three terminal line.
- **Operational Performance:** Improve operational switching capabilities and flexibility for system maintenance and restoration

Recommended Solution:

- Convert Tangy from a main / transfer bus to a five (5) breaker ring bus.
- Create two (2) lines Tangy-Kirby 69kV Line and Tangy-Cardington 69kV Line by eliminating three terminal line just outside of Tangy substation.
- Network normally open point on the Tangy-Kirby 69kV line.
- (S1209)

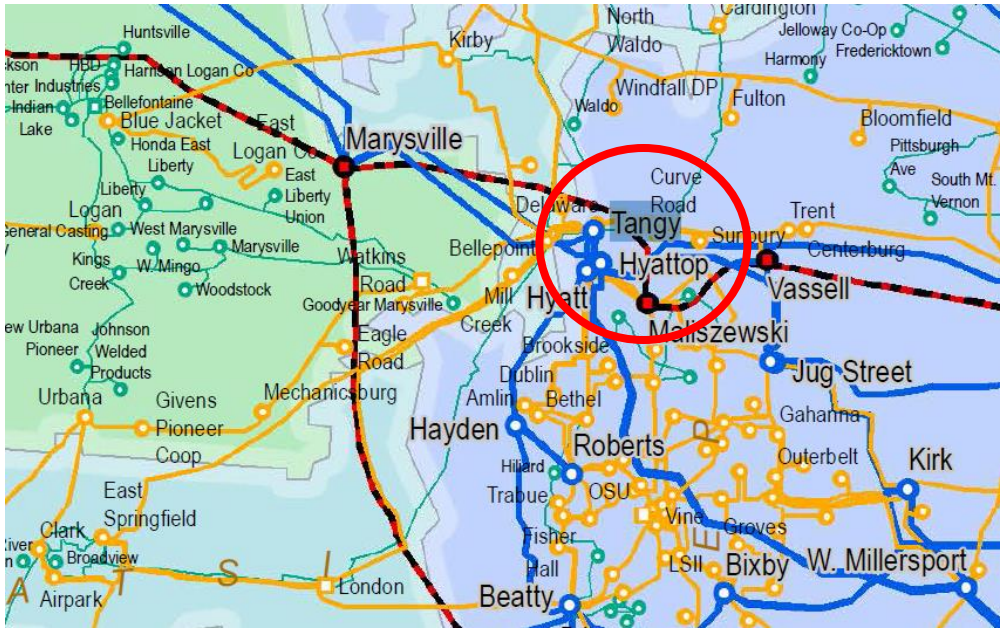
Alternatives:

- None

Estimated Cost: $4 M

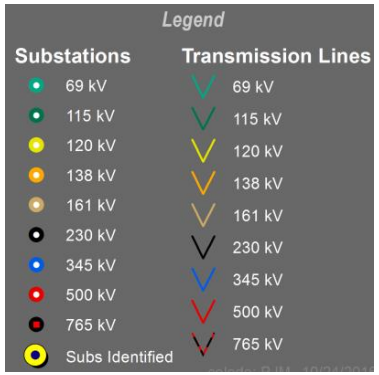
Scheduled IS Date: 12/31/2018

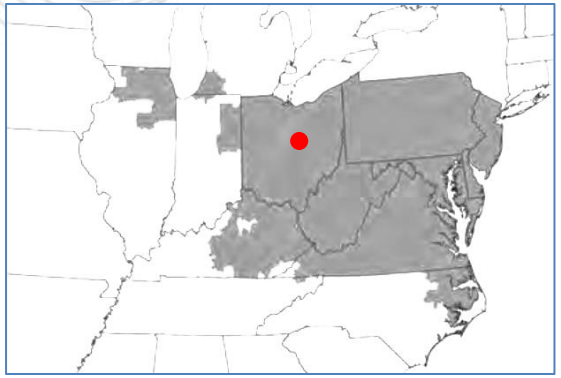
Project Status: Engineering and Planning



Supplemental Project

Broadview Substation – Add 138kV Switchyard & Transformation 138/69kV





Problem Statement:

- **Reliability:** Improve system performance and voltage of a large urban area for loss of transformation (138 / 69kV) at Clark Substation. Mitigate potential thermal overloads on 69kV lines and transformers in the area.
- **Operational Flexibility:** Improve operational switching capabilities and flexibility for system maintenance and restoration

Recommended Solution:

Provide another 138/69kV source near Springfield, Ohio.

- Loop the Clark-Urbana 138kV line (~5 miles) and East Springfield-Tangy 138kV line (~3,5 miles) into the existing 69kV Broadview Substation with 336 ASCR conductor.
- Add two (2) 138/69kV transformers at Broadview substation.
- (S1210)

Alternatives:

- None

Estimated Cost: $32 M

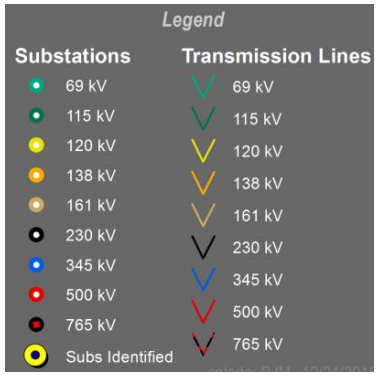
Scheduled IS Date: 12/31/2019

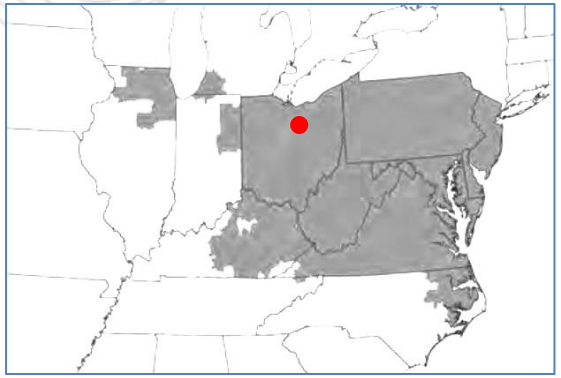
Project Status: Engineering

ATSI Transmission Zone

Supplemental Project

Carriage-Hanville 69kV Line– New 69kV Line to Network Radial Line



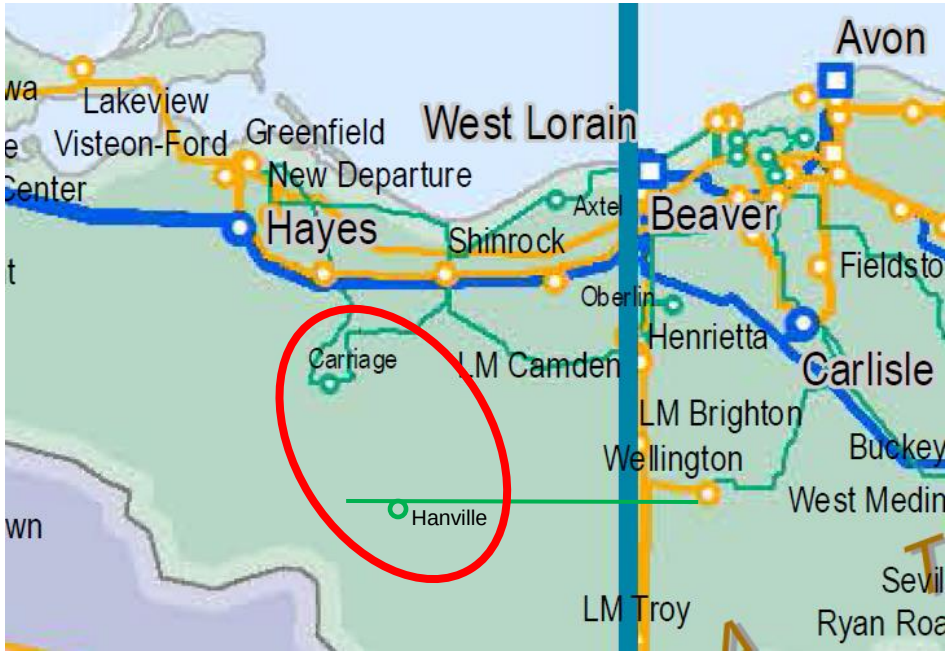


Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages on a radial line with multiple customer service points.
- **Operational Flexibility:** Improve operational flexibility for system maintenance and restoration by providing the ability to transfer load to other sources.

Recommended Solution:

- Network a radial line with multiple customer service points
- Build a new 69kV line from Hanville to Carriage substation (approximately 12 miles) with 477 ACSR conductor.
- Rebuild Hanville into a four (4) breaker ring substation and Carriage into a five (5) breaker ring bus substation.
- (S1211)



Alternatives:

- None

Estimated Cost: $27 M

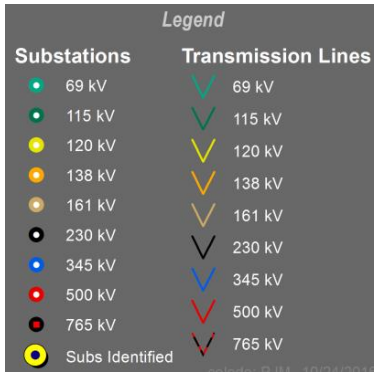
Scheduled IS Date: 05/31/2017

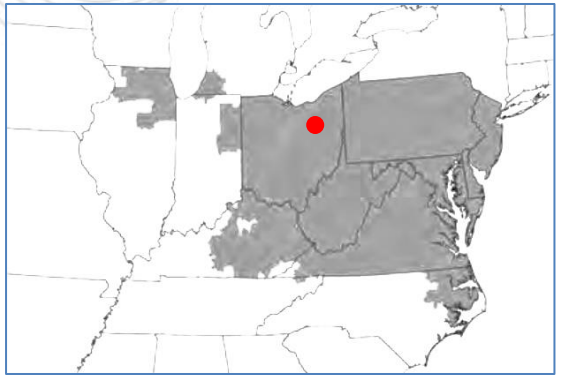
Project Status: Construction

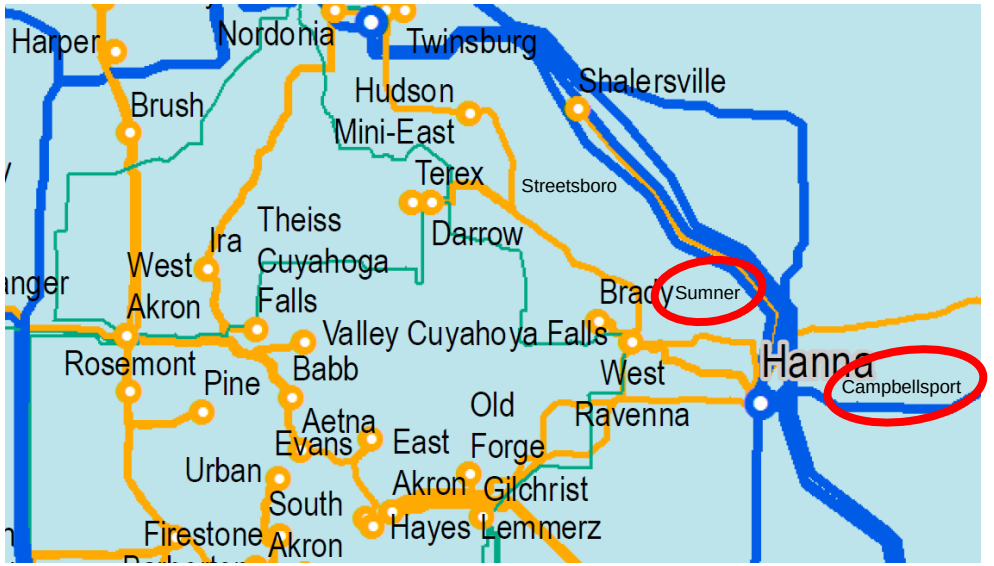
ATSI Transmission Zone

Supplemental Project

Campbellsport 69kV Substation– Expand Substation and New 69kV Line to Network Radial Line







Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages on two (2) radial lines with multiple customer service points. **I**mprove overall system protection coordination; including the elimination of a three terminal line.
- **Operational Flexibility:** Improve operational flexibility for system maintenance and restoration by providing the ability to transfer load to other sources

Recommended Solution:

- Rebuild approximately 1.5 miles of 69kV Line from Ravenna to Sumner tap as double circuit (477 ACSR). (S1212.1)
- Build a new single circuit 69kV Line, approximately 6 miles, from Sumner radial tap to Campbellsport substation (477 ACSR). (S1212.2)
- Rebuild approximately 2.5 miles of 69kV as double circuit (477 ACSR) to loop the Ravenna – West Ravenna 69kV Line into Campbellsport(S1212.3)
- Expand Campbellsport to a six breaker ring bus. (S1212.4)

Alternatives:

- None

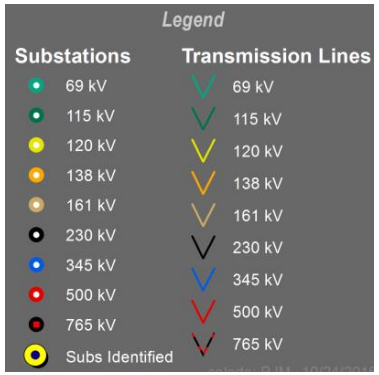
Estimated Cost: $17 M

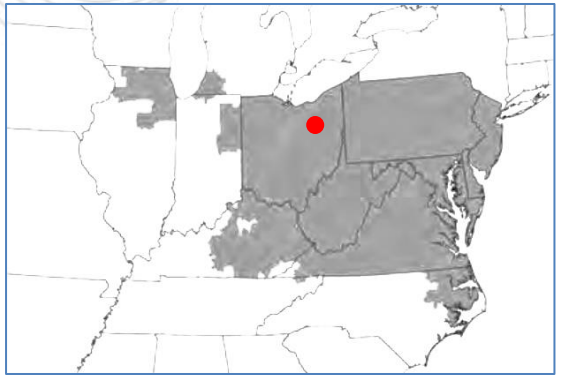
Scheduled IS Date: 12/31/2017

Project Status: Construction

Supplemental Project

Aurora 69kV Substation– Expand Substation to ring bus





Problem Statement:

- **Reliability:** To provide continuity of supply by eliminating simultaneous outages to two or more network elements. Improve overall system protection coordination by networking a three terminal point.
- **Operational Performance:** Improve operational flexibility for system maintenance and restoration by providing the ability to transfer load to other sources.

Recommended Solution:

- Convert Aurora into six (6) breaker 69kV Ring Bus
- (S1213)

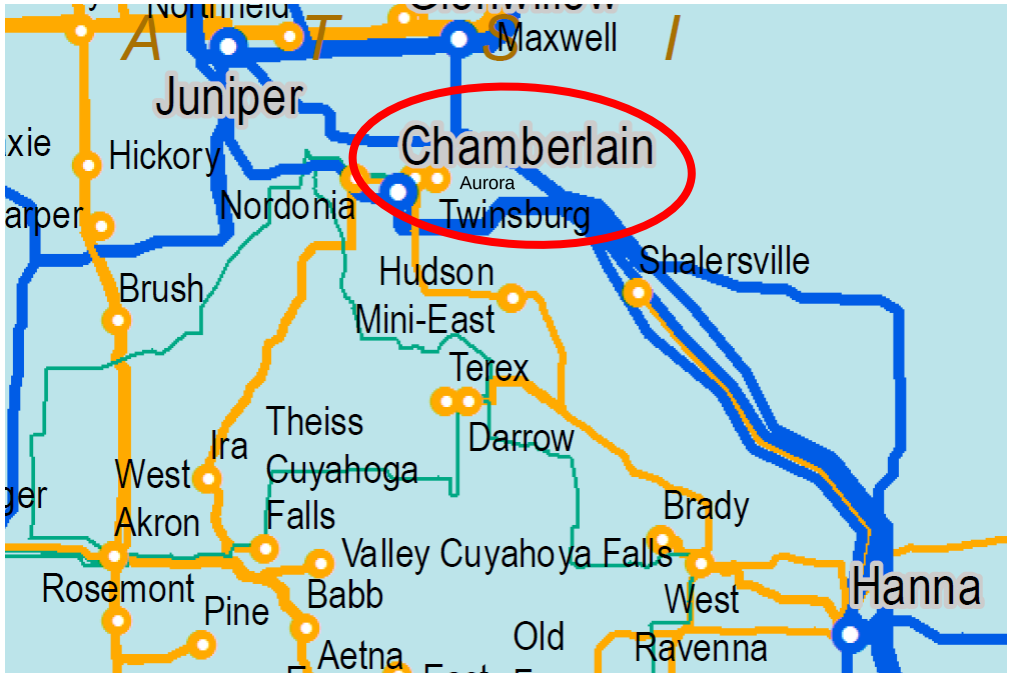
Alternatives:

- None

Estimated Cost: $6 M

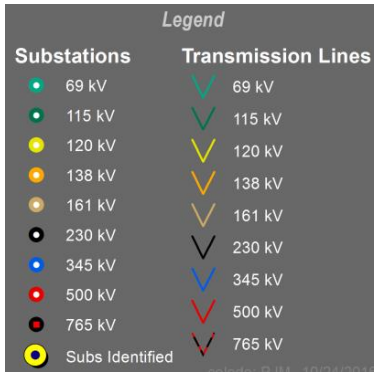
Scheduled IS Date: 07/31/2017

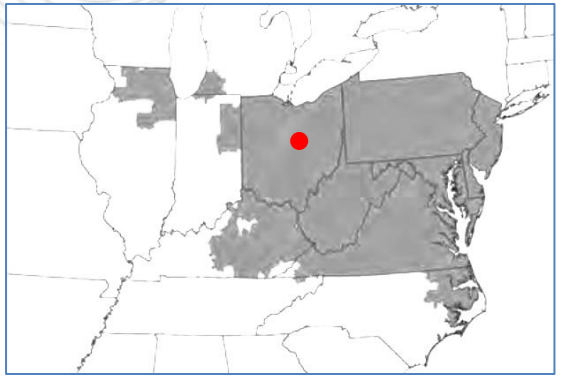
Project Status: Construction



Supplemental Project

Bingham 69kV Substation– Expand Substation to Ring Bus Configuration





Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages; Provide continuity of supply by eliminating simultaneous outages to two or more network elements. Improve overall system voltage and protection coordination; including the elimination of a three terminal line.
- **Operational Performance:** Improve operational switching capabilities and flexibility for system maintenance and restoration

Recommended Solution:

- Expand Bingham substation for a five (5) breaker ring configuration
- Add 2-14.4 MVAR Capacitor Bank.
- Allow for future ring bus expansion to 6 breakers and cap bank(s)
- Relay terminal end upgrades required.
- (S1214)

Alternatives:

- None

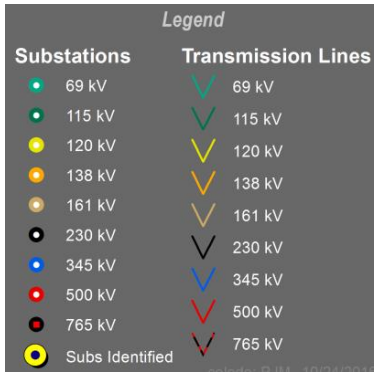
Estimated Cost: $7 M

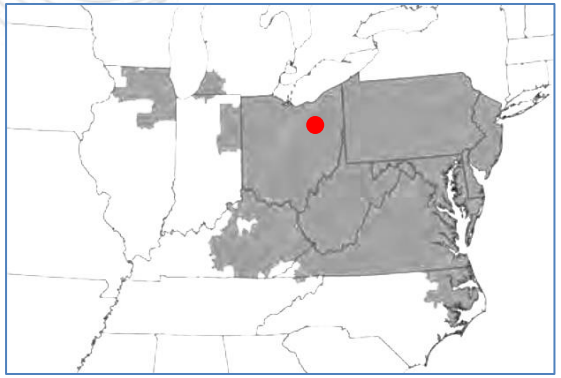
Scheduled IS Date: 12/31/2017

Project Status: Engineering

Supplemental Project

Dublin 69kV Substation– Expand Substation to Ring Bus Configuration





Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages; Provide continuity of supply by eliminating simultaneous outages to two or more network elements. Improve overall system protection coordination; including the elimination of a three terminal line.
- **Operational Flexibility:** Improve operational switching capabilities and flexibility for system maintenance and restoration.

Recommended Solution:

- Expand Dublin substation for a four (4) breaker ring configuration and reconfigure for a line-load-line-load lay-out.
- Relay upgrades required at terminal ends.
- (S1215)

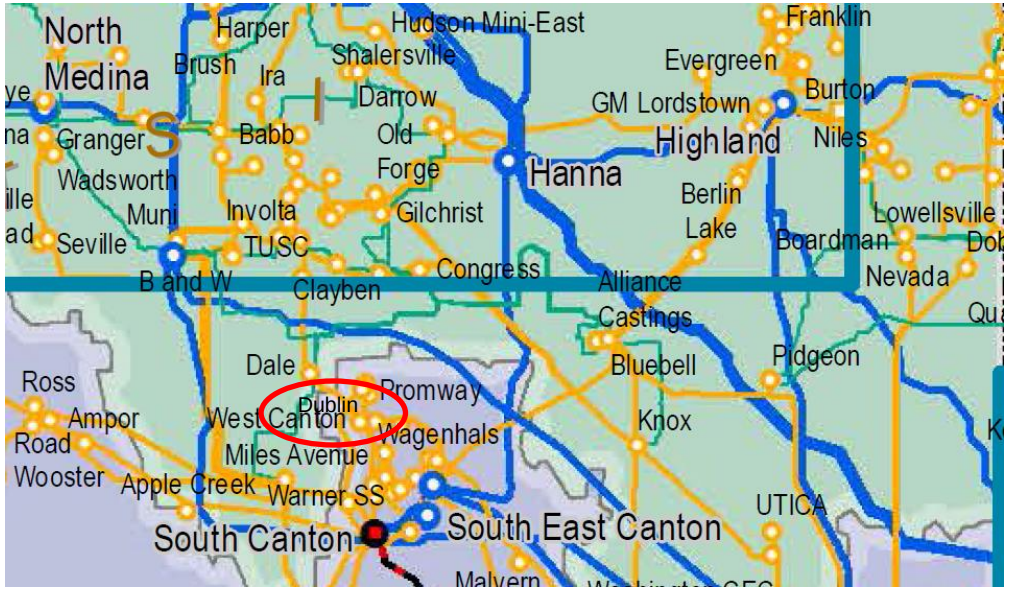
Alternatives:

- None

Estimated Cost: $6 M

Scheduled IS Date: 12/31/2017

Project Status: Engineering



Supplemental Project

Ontario 138kV Substation– Expand Substation to Ring Bus Configuration

Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages; Improve overall system protection coordination.
- **Operational Flexibility:** Improve operational switching capabilities and flexibility for system maintenance and restoration.

Recommended Solution:

- Expand Ontario substation for a four (4) breaker ring configuration and reconfigure for a line-load-line-load lay-out .
- Relay terminal end upgrades required.
- (S1216)

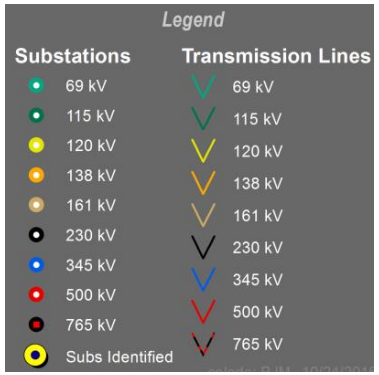
Alternatives:

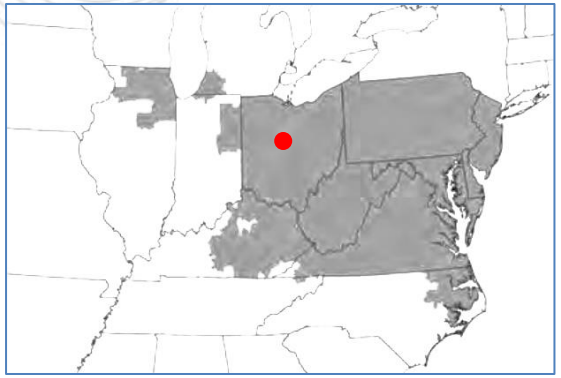
- None

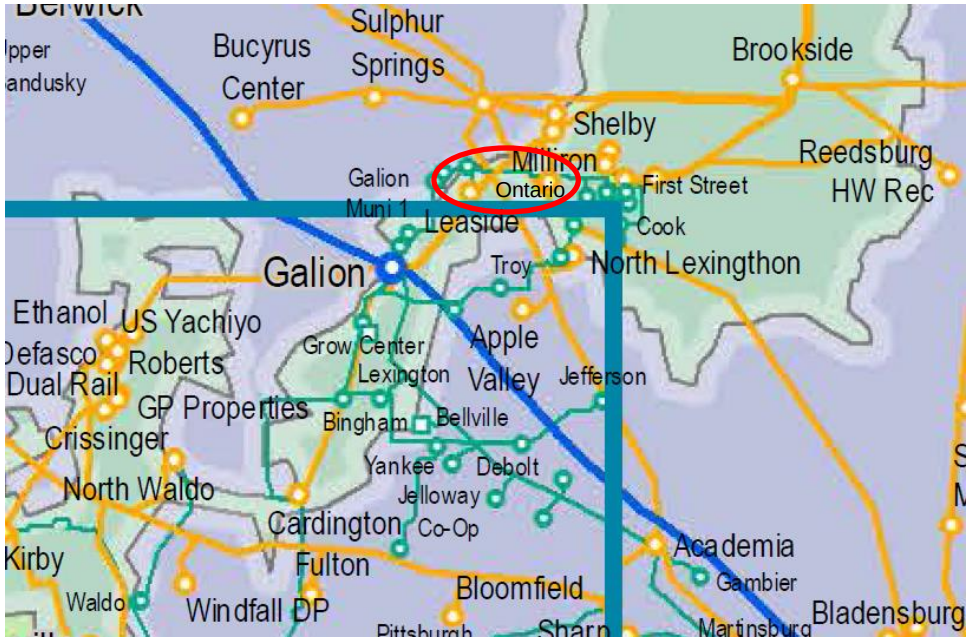
Estimated Cost: $5 M

Scheduled IS Date: 12/31/2017

Project Status: Engineering







Supplemental Project

Madison 138kV Substation– Expand Substation to Ring Bus Configuration

Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages; Improve overall system protection coordination.
- **Operational Flexibility:** Improve operational switching capabilities and flexibility for system maintenance and restoration.

Recommended Solution:

- Add three (3) breakers at Madison substation to complete a three breaker ring bus configuration.
- Relay terminal end upgrades required.
- (S1217)

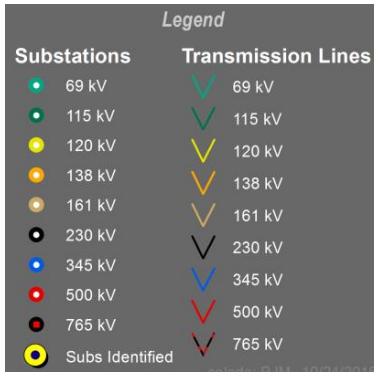
Alternatives:

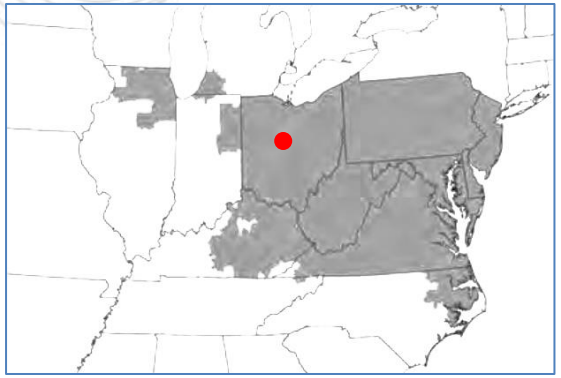
- None

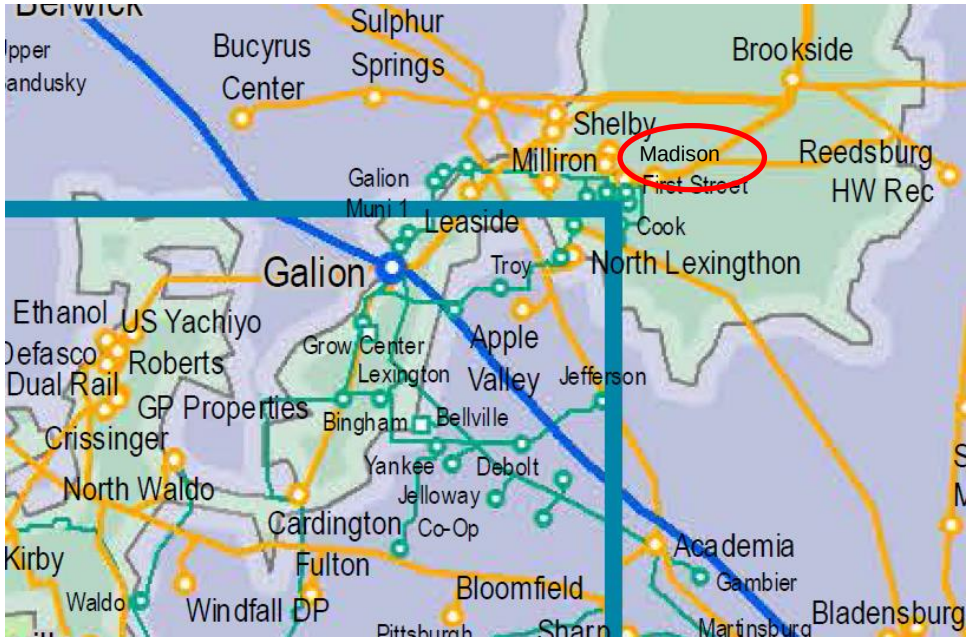
Estimated Cost: $4 M

Scheduled IS Date: 12/31/2017

Project Status: Engineering



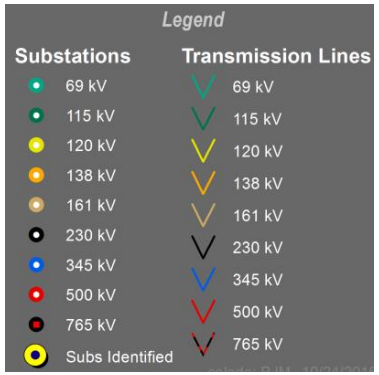


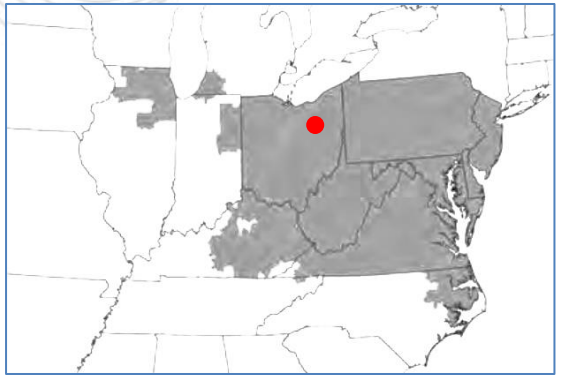


ATSI Transmission Zone

Supplemental Project

Lakemore 138kV Substation– Expand Substation to Ring Bus Configuration





Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages; Improve overall system protection coordination.
- **Operational Flexibility:** Improve operational switching capabilities and flexibility for system maintenance and restoration.

Recommended Solution:

- Add two (2) breakers at Lakemore substation to complete a three breaker ring bus configuration.
- Relay and communication upgrades required at terminal ends.
- (S1218)

Alternatives:

- None

Estimated Cost: $4 M

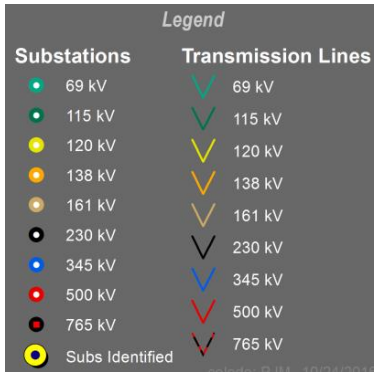
Scheduled IS Date: 12/31/2017

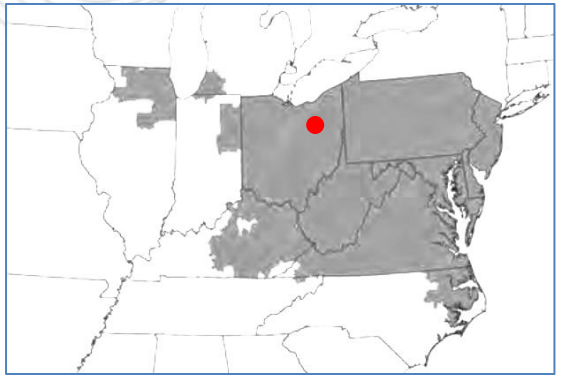
Project Status: Engineering

ATSI Transmission Zone

Supplemental Project

Evans 138kV Substation– Expand Substation to Ring Bus Configuration





Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages; Improve overall system protection coordination.
- **Operational Flexibility:** Improve operational switching capabilities and flexibility for system maintenance and restoration

Recommended Solution:

- Add 2 new 138kV breakers for ring bus
- Rearrange bus configuration for Line-Load-Line-Load layout.
- (S1219)

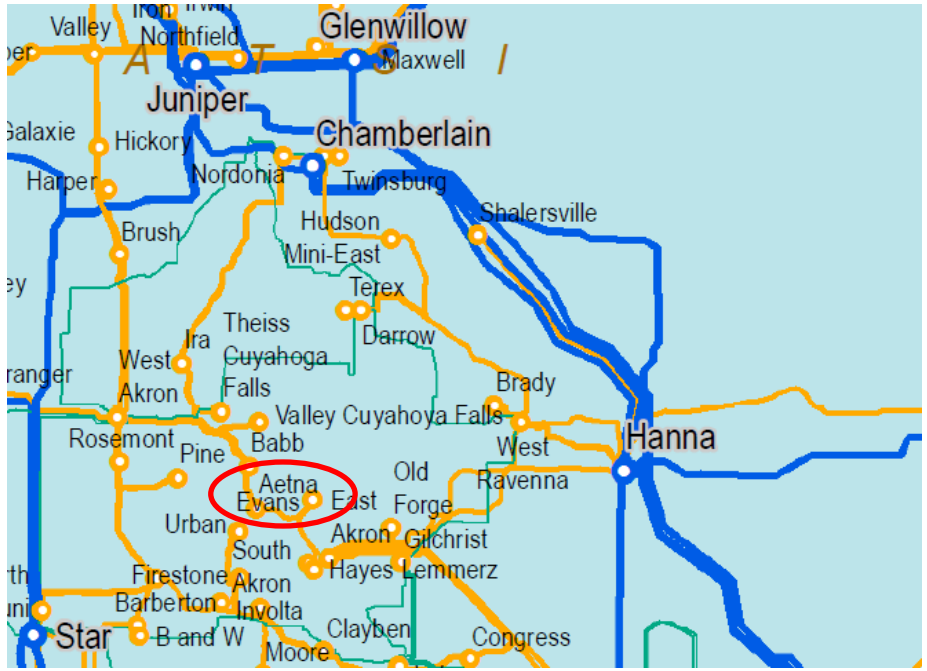
Alternatives:

- None

Estimated Cost: $3 M

Scheduled IS Date: 12/31/2017

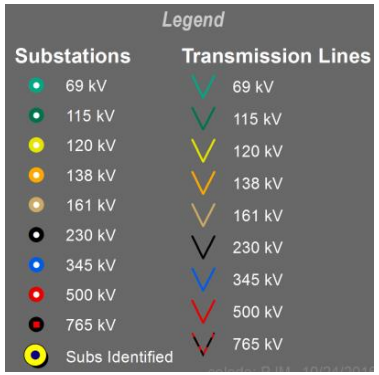
Project Status: Engineering

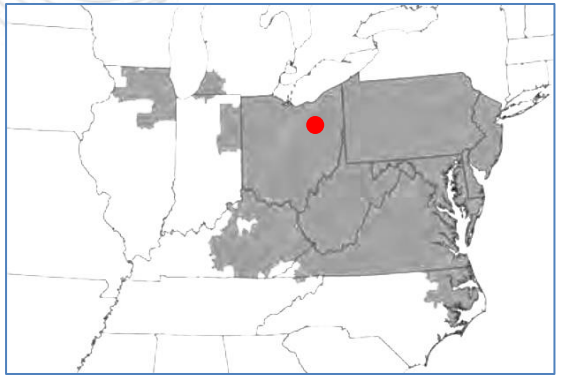


ATSI Transmission Zone

Supplemental Project

Chittenden 69kV Substation– Expand Substation to Ring Bus Configuration; Network 69kV Lines





Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages; Provide continuity of supply by eliminating simultaneous outages to two or more network elements. Improve overall system protection coordination; including the elimination of a three terminal line
- **Operational Performance:** Improve operational switching capabilities and flexibility for system maintenance and restoration.

Recommended Solution:

- Rebuild approximately 4 miles of 69kV line to a double circuit (336 ACSR) on existing ROW.
- Expand Chittenden substation to a five (5) CB ring bus and create the following lines:
  - Chittenden-Darrow 69kV and Darrow-West Akron 69kV
  - Chittenden-Hudson Municipal 69kV and Chittenden-Macedonia 69kV
- (S1220)

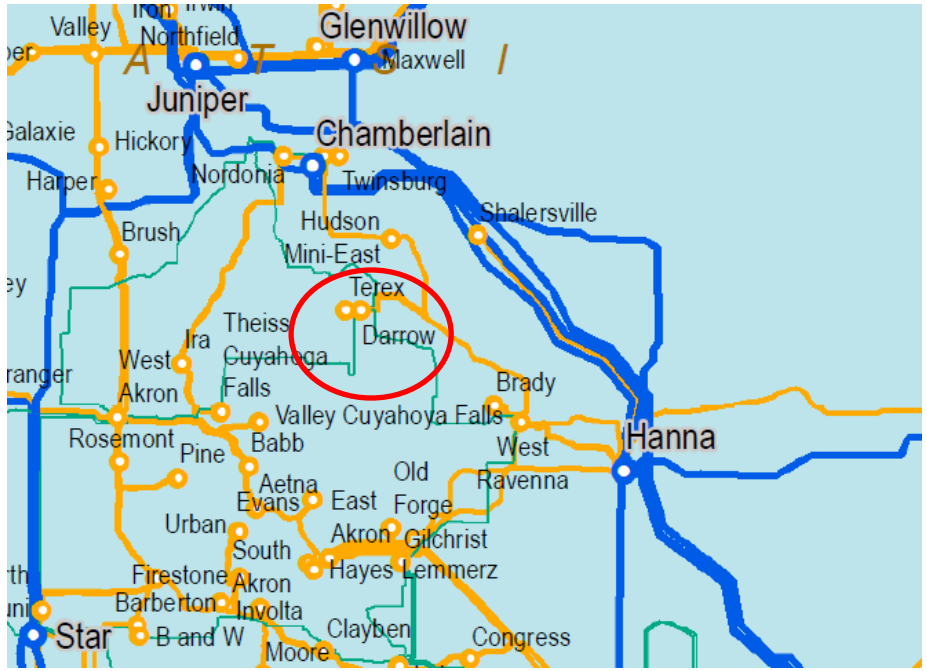
Alternatives:

- None

Estimated Cost: $10 M

Scheduled IS Date: 12/31/2018

Project Status: Engineering



Supplemental Project

Ryan 138kV Substation– Expand Substation to Ring Bus Configuration

Problem Statement:

- **Reliability:** Reduce customer exposure and load loss due to outages; Improve overall system protection coordination.
- **Operational Flexibility:** Improve operational switching capabilities and flexibility for system maintenance and restoration

Recommended Solution:

- Add two (2) breakers at Ryan substation to complete a three breaker ring bus configuration.
- Relay terminal end upgrades required.
- (S1221)

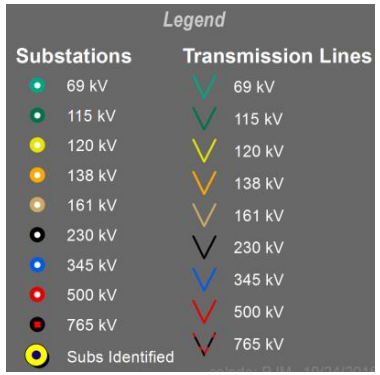
Alternatives:

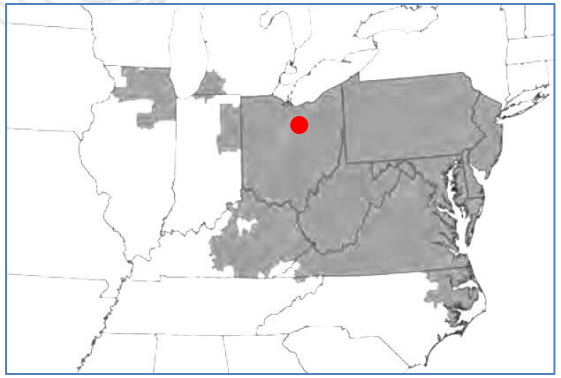
- None

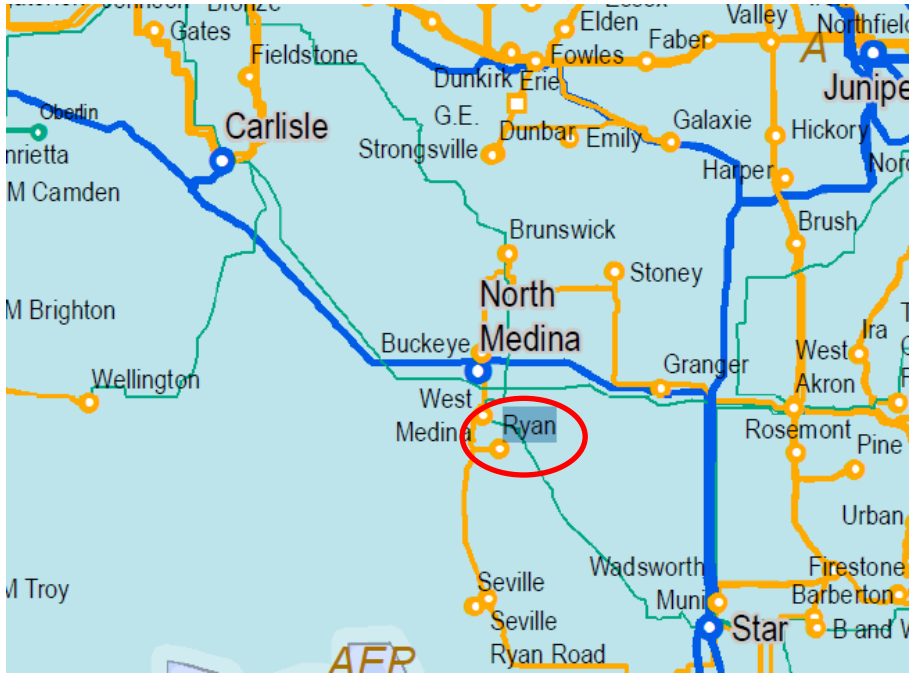
Estimated Cost: $3 M

Scheduled IS Date: 12/31/2017

Project Status: Engineering







Supplemental Project

Cleveland Area Substations – Add Additional 138kV Breakers

Problem Statement:

- **Reliability:** Eliminates the outage of three or more elements under certain contingencies; Reduces line exposure and impact to multiple customer service points under outage conditions.
- **Operational Flexibility:** Improve operational switching capabilities and flexibility for system maintenance and restoration.

Recommended Solution:

Add 138kV breakers to open positions at existing 138kV substation locations around the Cleveland area:

- **Mayfield 138kV:** Install four (4) 138 kV breakers in open bay positions on the Q1, Q2,Q3 and Q4 138 kV lines (S1222.1)
- **Harding 138kV:** Install four (4) 138 kV breakers in open bay positions on the Q11, Q12, Q13 and Q14 138kV lines. (S1222.2)
- **Juniper 138kV:** Install two (2) 138 kV breakers in open bay positions on the Q2 and Q4 138 kV lines. (S1222.3)
- **Jennings 138kV:** Install one (1) 138 kV breaker in open bay position on the Q13 138 kV line. (S1222.4)
- **Fox 138kV:** Install four (4) 138kV breakers in open bay positions on the Q11, Q12, Q13 and Q14 138kV lines. (S1222.5)
- **Northfield 138kV:** Install two (2) 138 kV breakers in open bay positions on the Q1 and Q3 138 kV lines. (S1222.6)
- **Fowles 138kV:** Install two (2) 138 kV breakers in open bay positions on the Q2 and Q4 138 kV lines(S1222.7)
- **Ivy 138kV:** Install one (1) 138 kV breaker in the open bay position on the Q14 138kV line. (S1222.8)

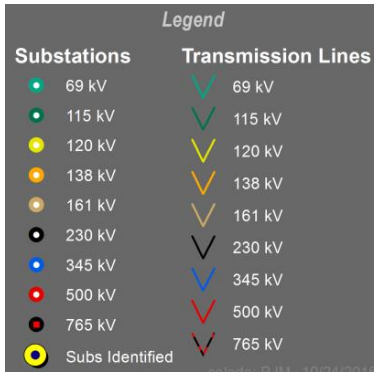
Alternatives:

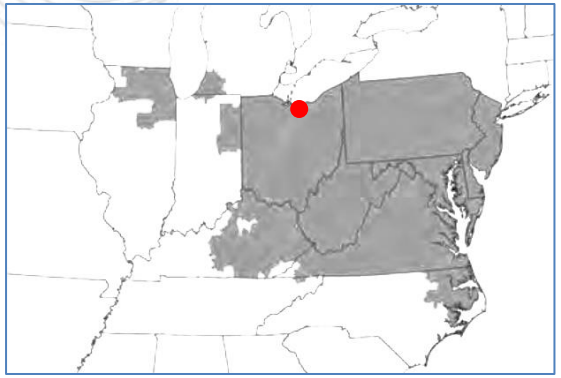
- None

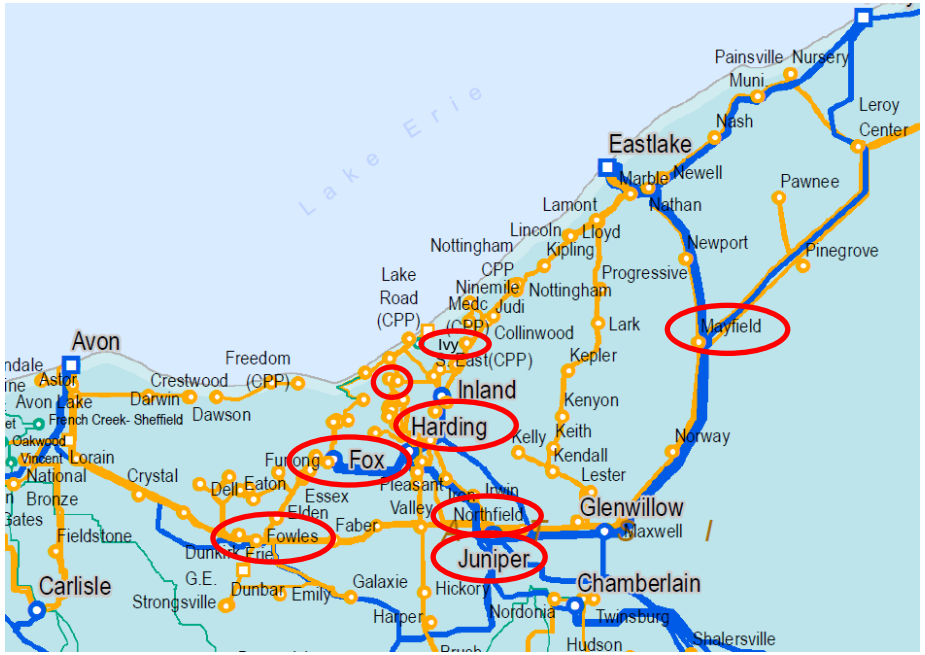
Estimated Cost: $29 M

Scheduled IS Date: Various Dates in 2017 and 2018 Depending on outage requests. Overall ISD 12/31/2018

Project Status: Engineering



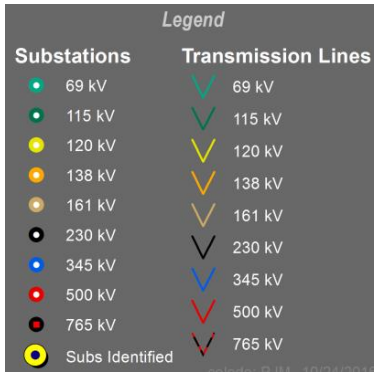


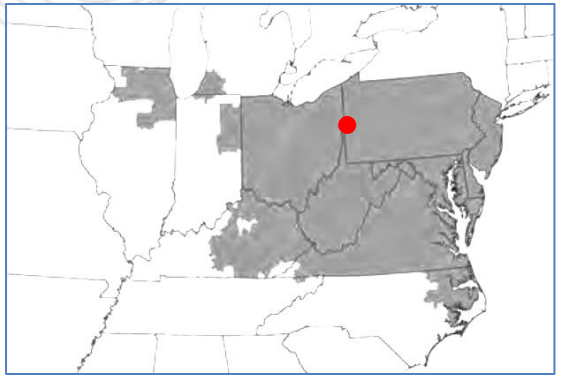


ATSI Transmission Zone

Supplemental Project

Cedar Street-Frisco East/West – Rehab 69kV Line





Problem Statement:

Transmission line at or beyond existing service life.

- Age of the transmission line is greater than 40 years.
- Field inspections results in greater than 50% of poles failing criteria.
- Increasing maintenance repairs.
- Negative impact on reliability and customer outages
- A few or more outages resulting from failing equipment.

Recommended Solution:

- Rehab Cedar Street-Frisco East & West 69kV Circuits (approximately 13 pole miles) for improved reliability and to extend life. (S1223.1)
- Includes inspect and treat grillage foundations, replace select poles, insulators and conductor. (S1223.2)
- Remove mixed conductor types & sizes, replace all with 336 ACSR (S1223.3)

Alternatives:

- Complete rebuild of line: Steel towers have remaining life if grillage repaired and treated.

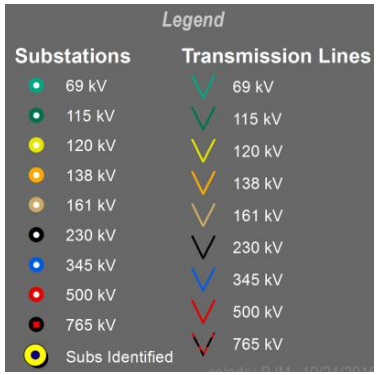
Estimated Cost: $15 M

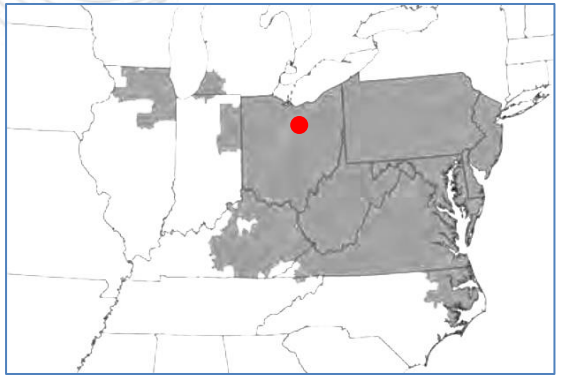
Scheduled IS Date: 12/31/2017

Project Status: Engineering

ATSI Transmission Zone

Supplemental Project
Galion-Leaside – Rebuild 69kV Line





Problem Statement:

Transmission line at or beyond existing service life.

- Age of the transmission line is greater than 40 years.
- Field inspections results in greater than 50% of poles failing criteria.
- Deteriorating reliability due to hardware failures.
- Negative impact on reliability and customer outages
- A few or more outages resulting from failing equipment.

Recommended Solution:

- Galion-Leaside 69 kV Line: Rebuild the Galion-Leaside 69 kV circuit, approximately 13 miles, and replace 7 line switches; reconductor with 477 ACSR, replacing multiple conductor types. (S1224.1)
- Crestline Substation: Replace 69kV disconnect switches A8, A10 & A29 and upgrade main bus conductor. (S1224.2)
- Leaside Substation: Replace 69kV line relaying on B20 to Galion. (S1224.3)

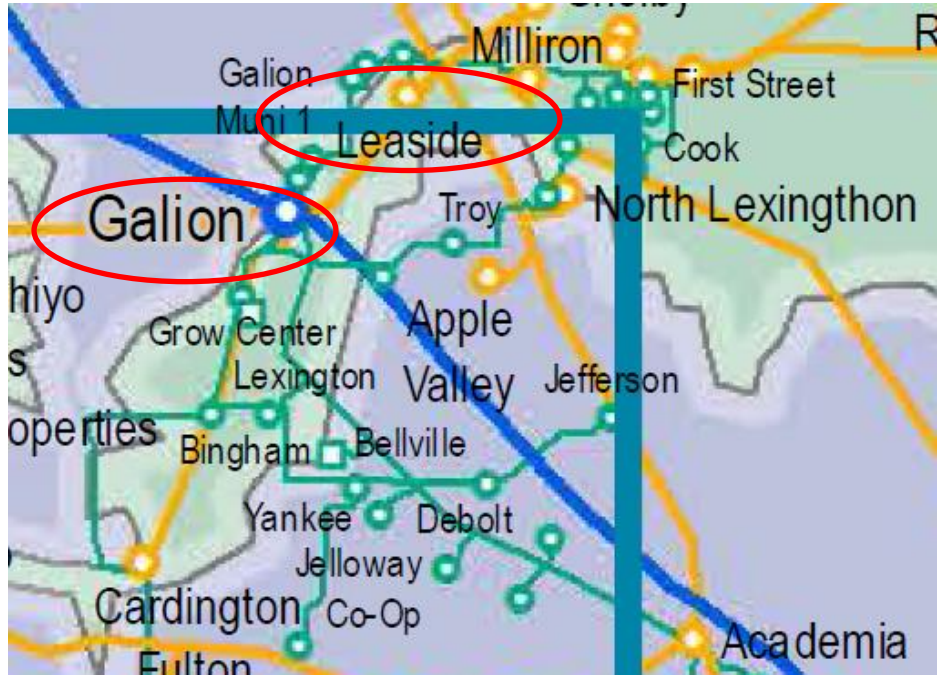
Alternatives:

- Rehab line rather than rebuild: Remaining life of remaining poles and hardware not sufficient to justify

Estimated Cost: $15 M

Scheduled IS Date: 07/31/2017

Project Status: Engineering



ComEd Transmission Area

Supplemental Project (previously presented 12/1/16)

Problem Statement:

L15625 reroute is being driven by 14.2 mile NERC Facility Ratings Alert project on radial distribution line 17105 (Wempletown – Roscoe Bert – Harlem – Sand Park – Argyle – Belvidere), which was built in 1948. 2.6 miles of line 17105 run through a state park.

Presently Transmission line 15625 runs in parallel with 17105, but bypasses the state park by utilizing an unused position on a 345 kV tower line that goes around the north edge of the park. Ultimate plans call for a 345 kV line to occupy that position, which will require 15625 to be moved to the state park ROW.

This project will install double circuit 138 kV through the state park and move 15625 to these new towers. This will shorten 15625 by 2.3 miles and prevent having to disturb the state park a second time in the future.

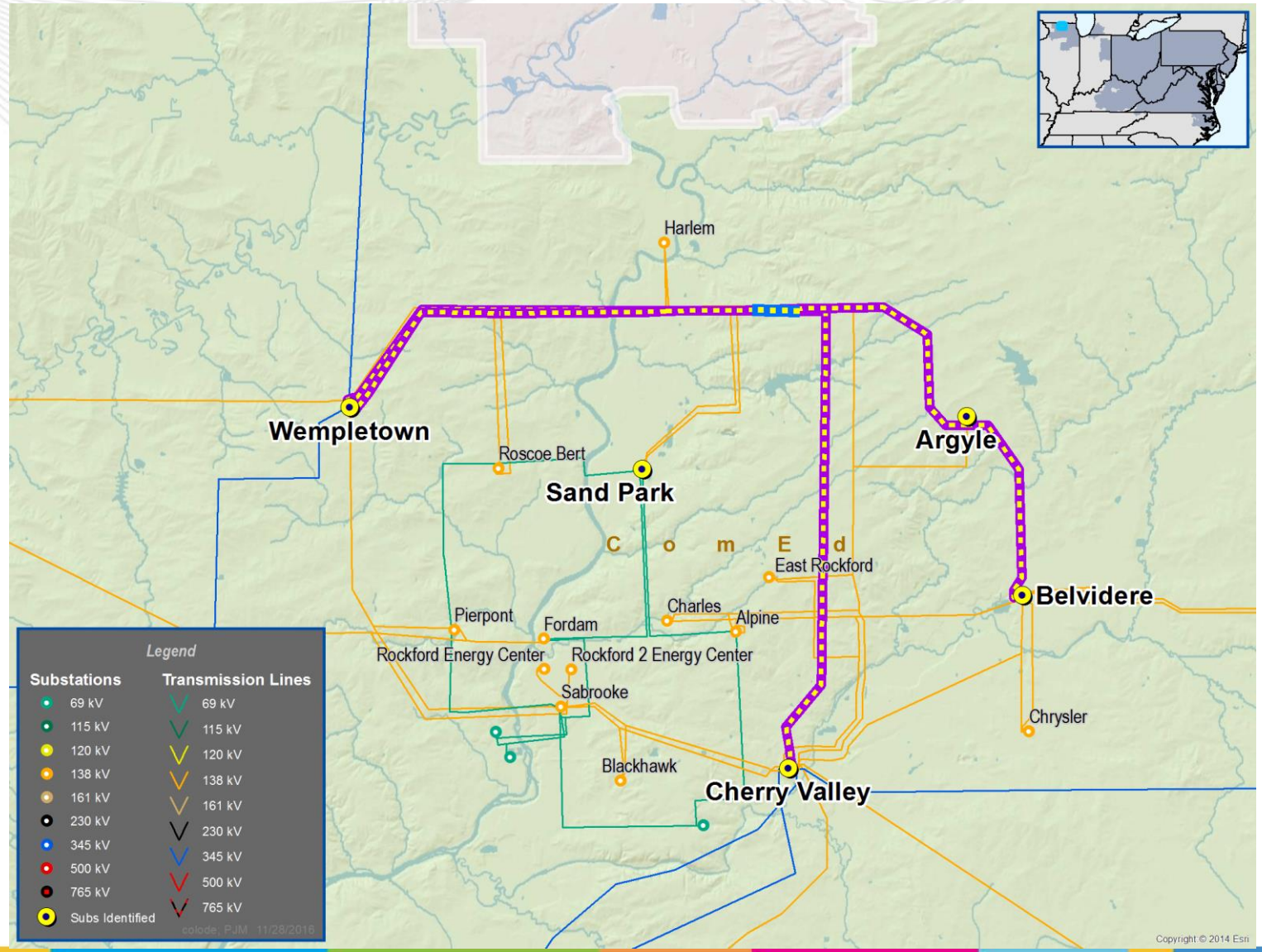
Recommended Project:

Reroute 138 kV line 15625 (Sand Park - Argyle 138kV line) with a new sectionalizing switch on line 15625 to allow for restoration of load at Sand Park in the event of a ROW contingency. (S1202)

Estimated Project Cost: $1.0M

Projected IS Date: 12/31/2017

Project Status: Engineering



ComEd Transmission Area

Supplemental Project (Previously presented 12/1/16)

Problem Statement:

Blue Island line 7611 Circuit breaker was installed in 1968 (48 years old) and is a 10,000 MVA symmetrically rated oil CB

Blue Island has four 345/138 kV autotransformers and experiences high fault duties.

In the early 1980's a temporary sectionalizing scheme was installed to prevent overdutying several circuit breakers. The sectionalizing scheme trips a bus tie CB following the initial line breaker operation to limit the fault current seen by the line breaker for subsequent reclose attempts.

Failure of the sectionalizing scheme would result in 109% fault duty on 7611 CB

This is the last CB on the ComEd system with this type of sectionalizing scheme.

Replacement of this CB will allow removal of the sectionalizing scheme.

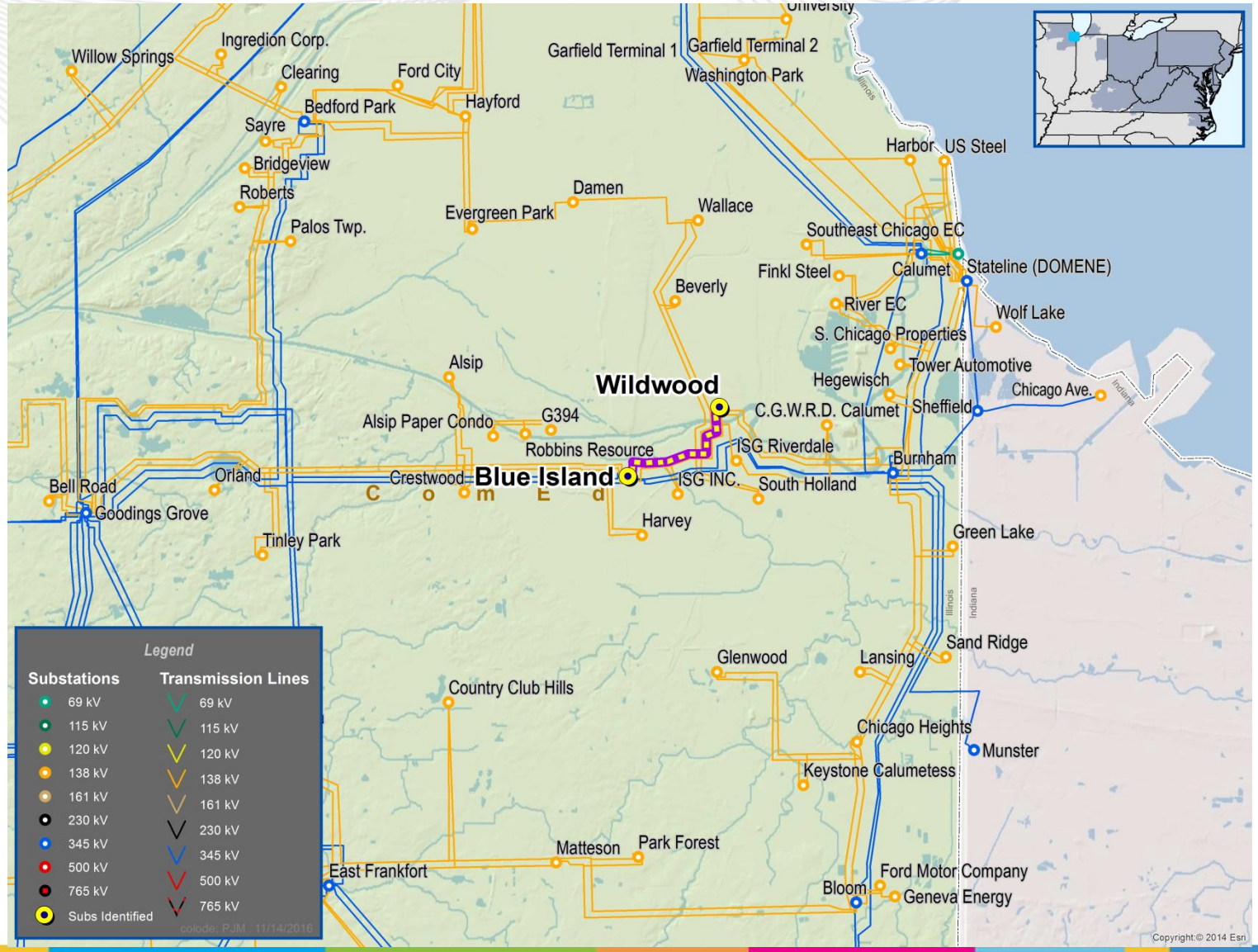
Recommended Project:

Replace line 7611 (Blue Island – Wildwood 138kV line) CB at Blue Island.(S1203)

Estimated Project Cost: $1.75M

Projected IS Date: 12/31/2017

Project Status: Engineering



DLCO Transmission Area

Supplemental Project

Problem Statement:

Aging Infrastructure at Brunot Island. The age of the breakers are beyond the operational life as determined by industry survivor curves. This will also mitigate oil spill concerns and environmental issues.

Driver:

(1) Equipment Material Condition, Performance and Risk

(2) Infrastructure Resilience

Recommended Solution:

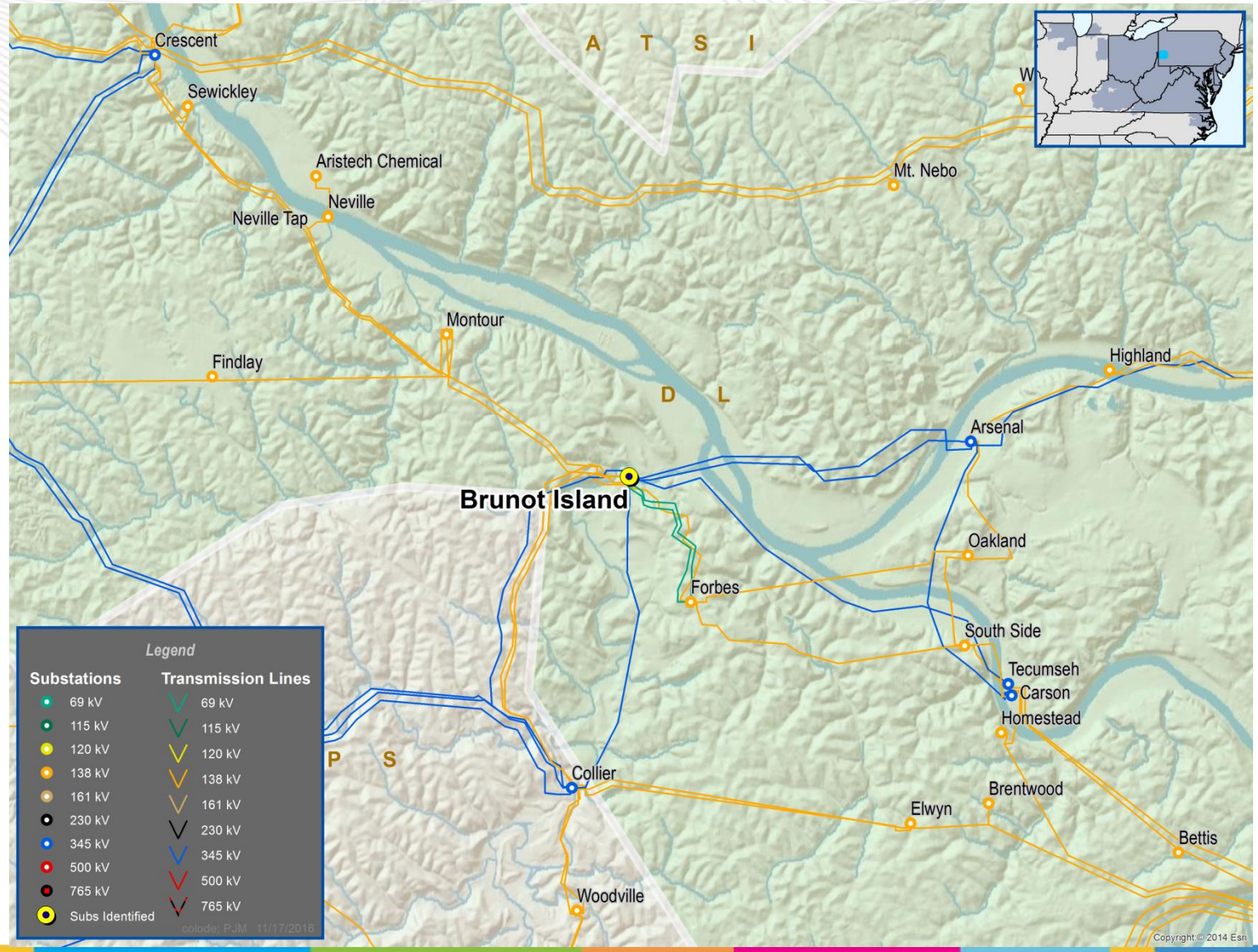
Replace aged-oil Brunot - #3/9 138kV bus tie breaker with current standard SF6 breaker (Present rating: 63kA, Future Rating: 63kA). (S1226)

Replace aged-oil Brunot - Sewickley Z43 138kV breaker with current standard SF6 breaker (Present rating: 63kA, Future Rating: 63kA). (S1227)

Estimated Project Cost: $0.33M each

Possible IS Date: 6/1/2017

Project Status: Engineering



DLCO Transmission Area

Supplemental Project

Problem Statement:

Aging Infrastructure at Beaver Valley. The breaker dry fired in the field and needs to be replaced as it is not recommended for continued use by the manufacturer.

Driver:

(1) Equipment Material Condition, Performance and Risk

(2) Infrastructure Resilience

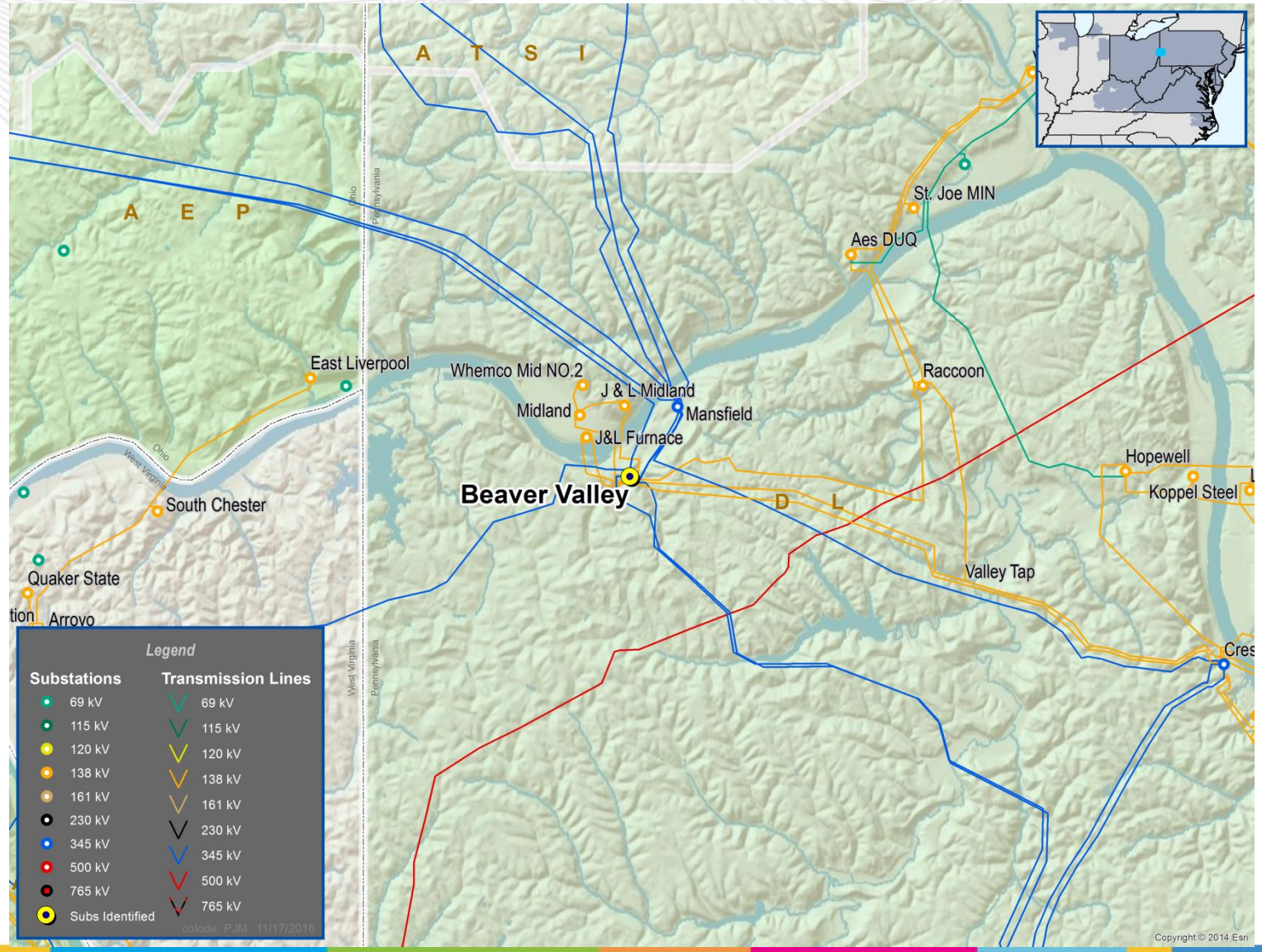
Recommended Solution:

Replace Beaver Valley - 2B SSST breaker 138kV (Present rating: 63kA, Future Rating: 63kA). (S1228)

Estimated Project Cost: $0.4M

Possible IS Date: 6/1/2017

Project Status: Engineering



DLCO Transmission Area

Supplemental Project

Problem Statement:

Aging Infrastructure at Raccoon. The age of this breaker is beyond the operational life as determined by industry survivor curves. This will also mitigate oil spill concerns and environmental issues.

Driver:

(1) Equipment Material Condition, Performance and Risk

(2) Infrastructure Resilience

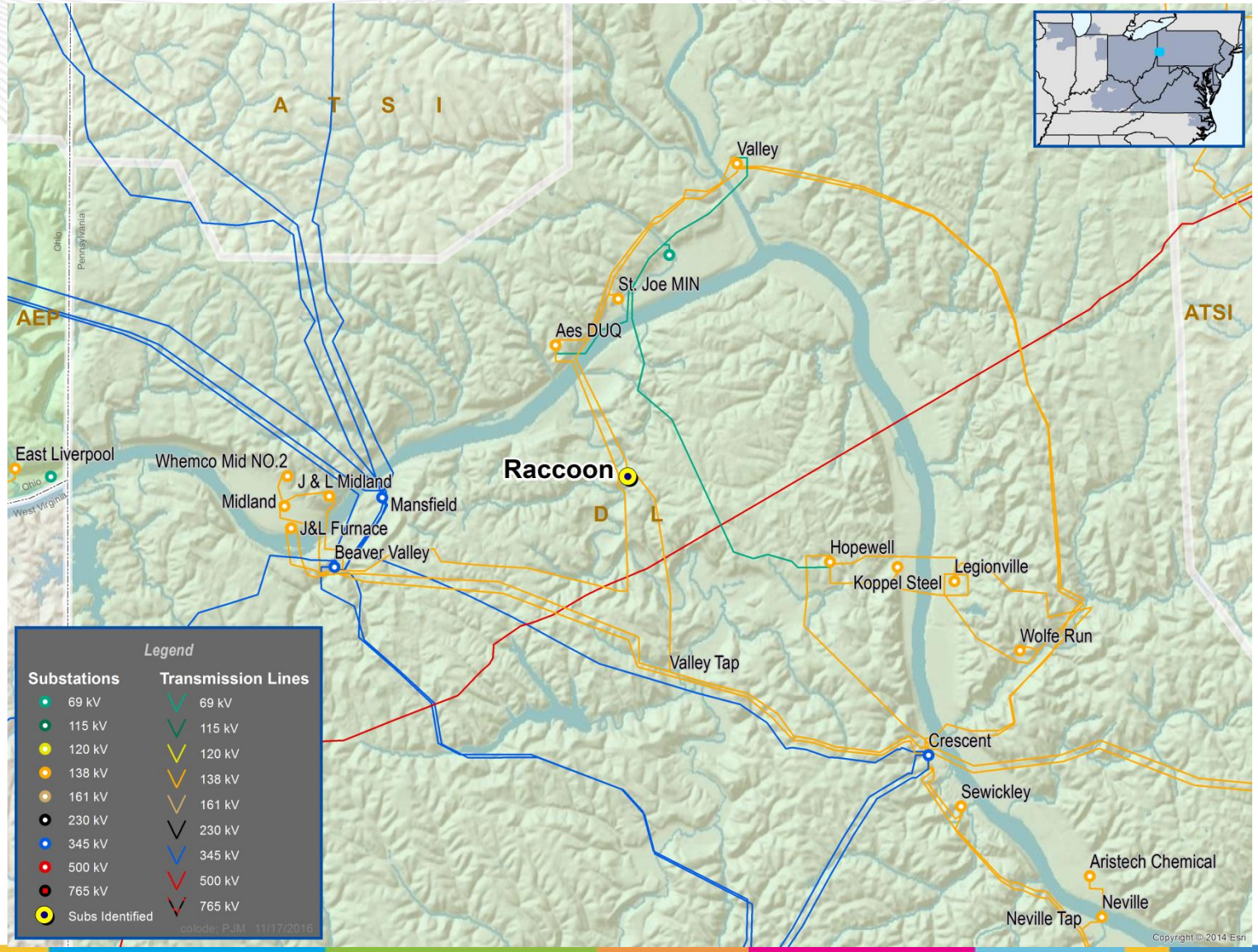
Recommended Solution:

Replace aged-oil Raccoon Sub – Valley Z83 138kV breaker with current standard SF6 breaker (Present rating: 63kA, Future Rating: 50kA). (S1229)

Estimated Project Cost: $0.25M

Possible IS Date: 9/1/2017

Project Status: Engineering



DLCO Transmission Area

Supplemental Project

Problem Statement:

Aging Infrastructure at Raccoon. The age of this breaker is beyond the operational life as determined by industry survivor curves. This will also mitigate oil spill concerns and environmental issues.

Driver:

(1) Equipment Material Condition, Performance and Risk

(2) Infrastructure Resilience

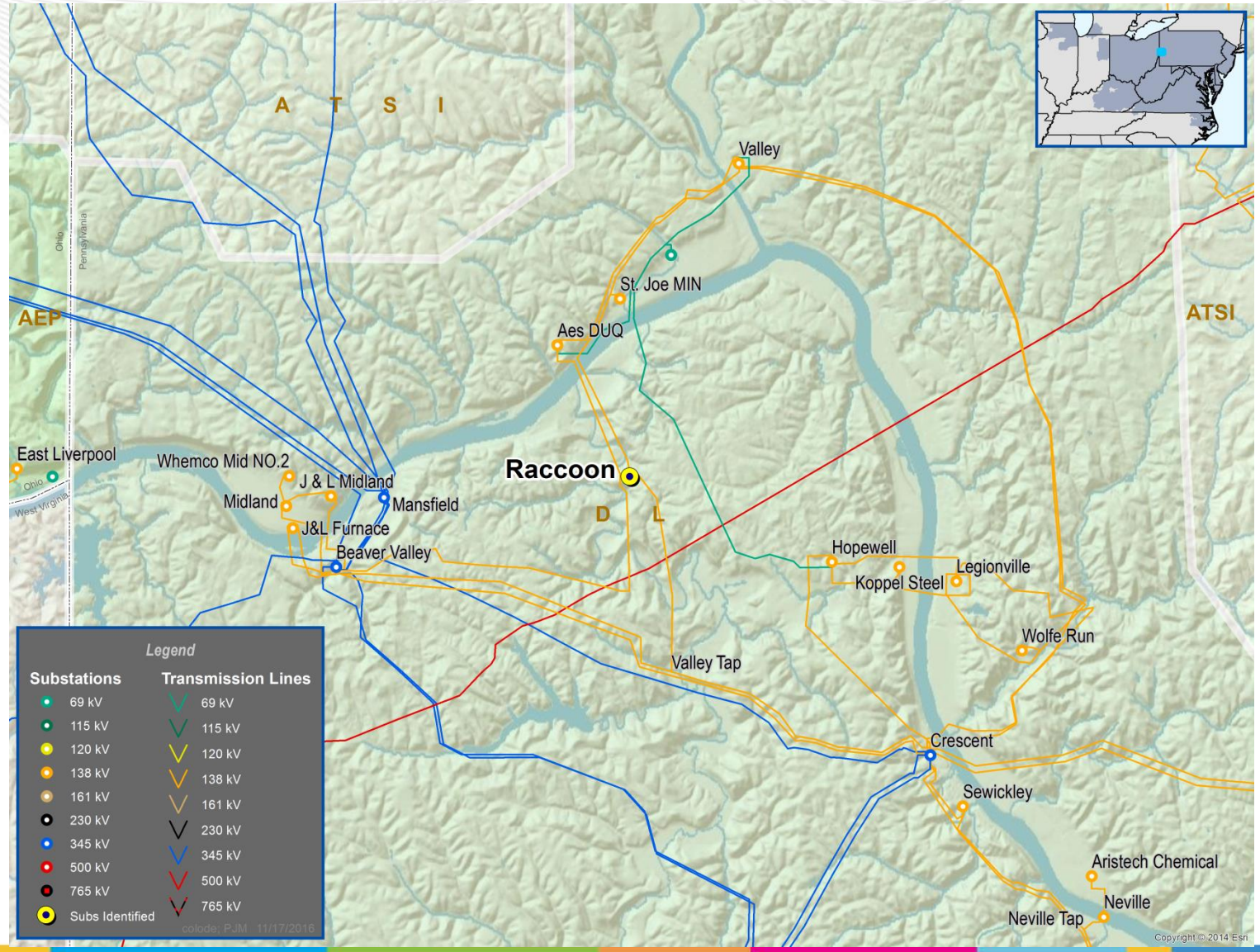
Recommended Solution:

Replace aged-oil Raccoon Sub – #1/2 138kV bus tie breaker with current standard SF6 breaker (Present rating: 63kA, Future Rating: 50kA). (S1230)

Estimated Project Cost: $0.25M

Possible IS Date: 12/31/2017

Project Status: Engineering



DLCO Transmission Area

Supplemental Project

Problem Statement:

Aging Infrastructure at Cheswick. The age of this breaker is beyond the operational life as determined by industry survivor curves. This will also mitigate oil spill concerns and environmental issues.

Driver:

(1) Equipment Material Condition, Performance and Risk

(2) Infrastructure Resilience

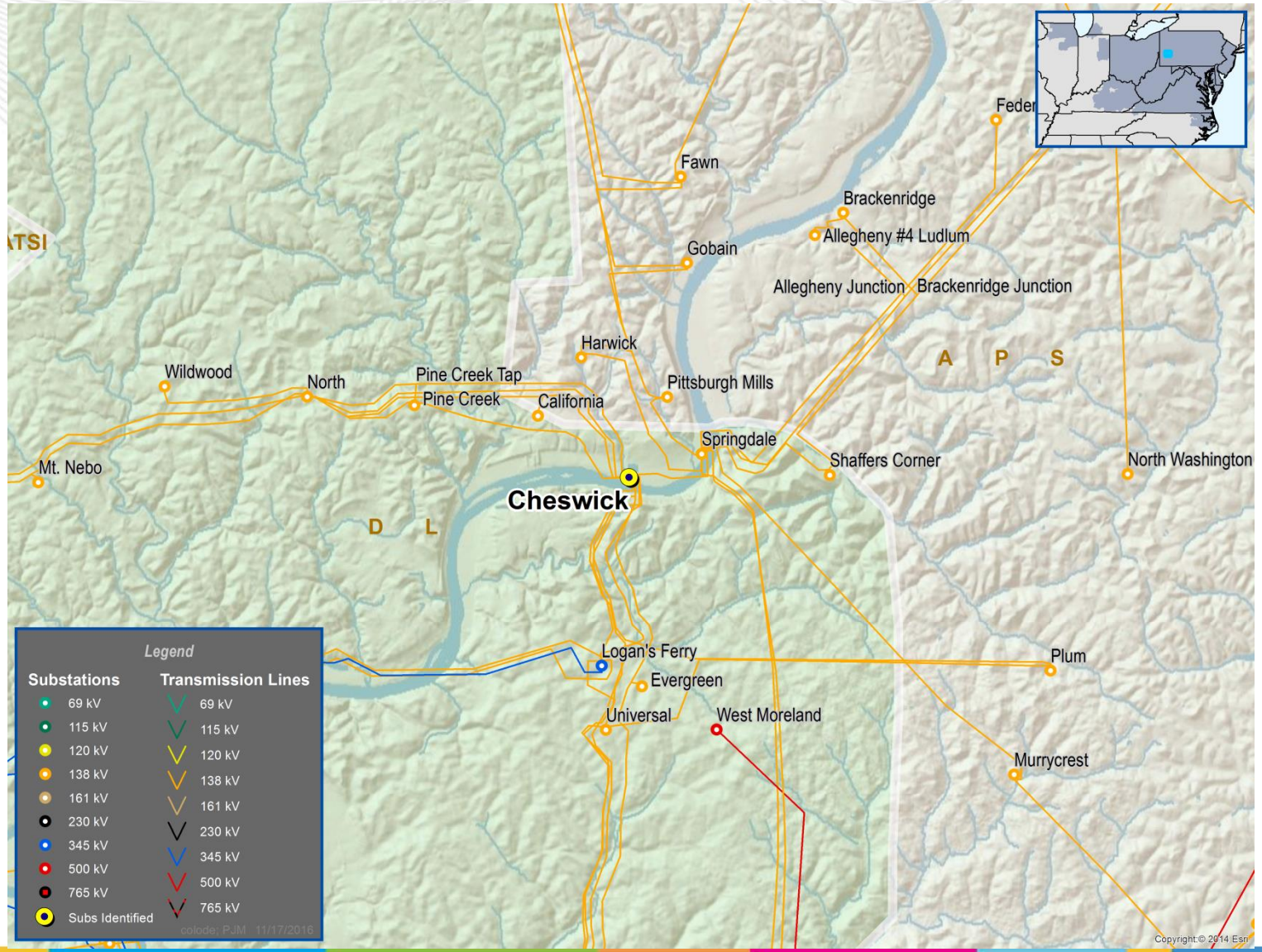
Recommended Solution:

Replace aged-oil Cheswick SS - #88 138kV breaker at North Z-56 Bus #4 with current standard SF6 breaker(Present rating: 63kA, Future Rating: 63kA). (S1233)

Estimated Project Cost: $0.33M

Possible IS Date: 12/31/2017

Project Status: Engineering



DLCO Transmission Area

Supplemental Project

Problem Statement:

Aging Infrastructure at Collier. The age of the breakers are beyond the operational life as determined by industry survivor curves. This will also mitigate oil spill concerns and environmental issues.

Driver:

(1) Equipment Material Condition, Performance and Risk

(2) Infrastructure Resilience

Recommended Solution:

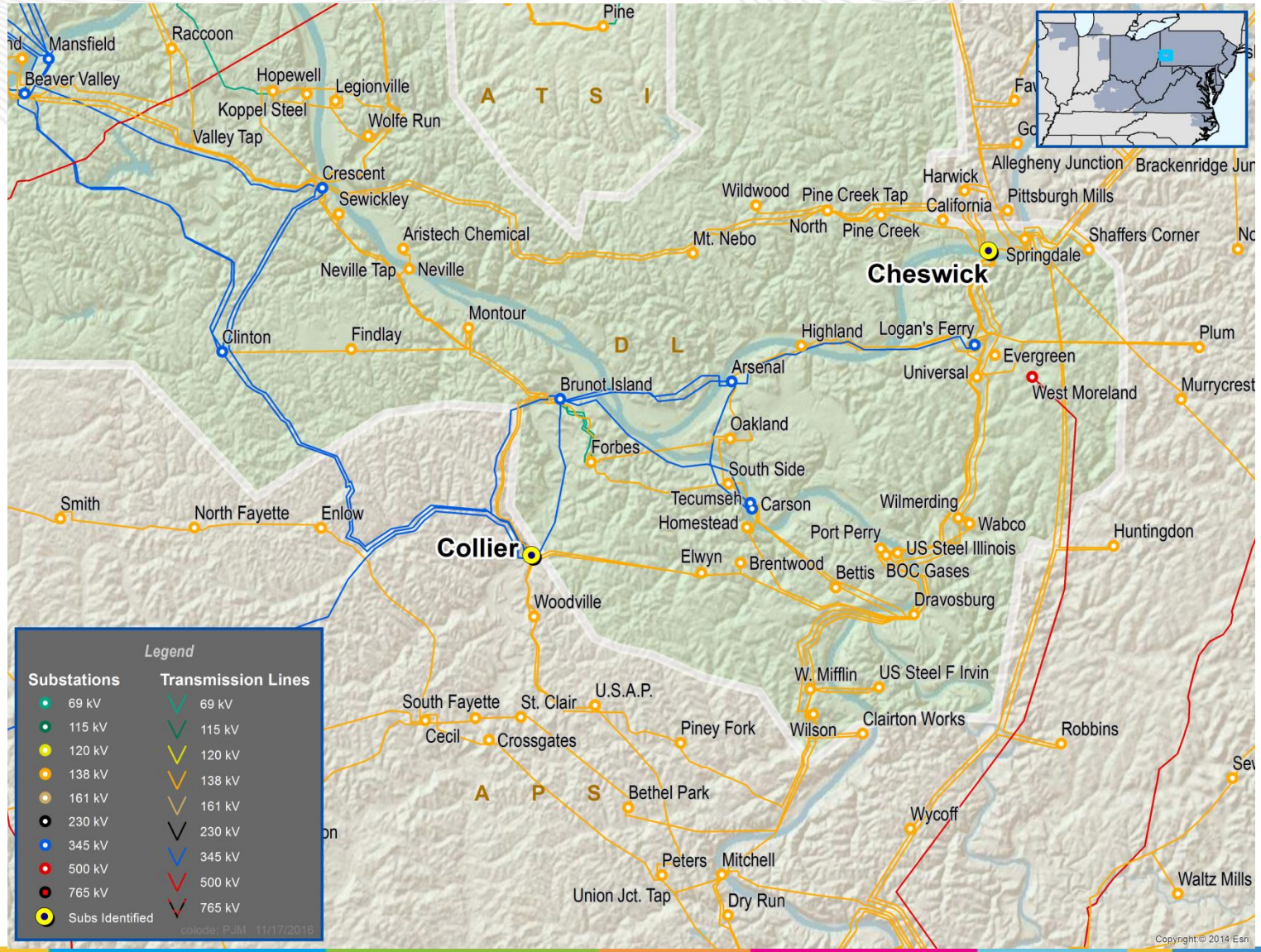
Replace aged-oil Collier SS – 1A transformer 138kV breaker with current standard SF6 breaker (Present rating: 50kA, Future Rating: 63kA). (S1234)

Replace aged-oil Collier SS – 2A transformer 138kV breaker with current standard SF6 breaker (Present rating: 50kA, Future Rating: 63kA). (S1235)

Estimated Project Cost: $0.33M each

Possible IS Date: 12/31/2017

Project Status: Engineering



DEOK Transmission Area

Supplemental Project

Problem Statement:

- New, sensitive customer load. Feeders to this substation are on common towers/right-of-way. Loss of any of the towers or the failure of the one breaker at this station will drop all load in this area.

Recommended Solution:

- Reroute a 1 mile section of feeder to a different path into the Morgan 138kV substation. Install three 138kV breakers, replace one aging breaker. Reconfigure to a ring bus. (S1236)

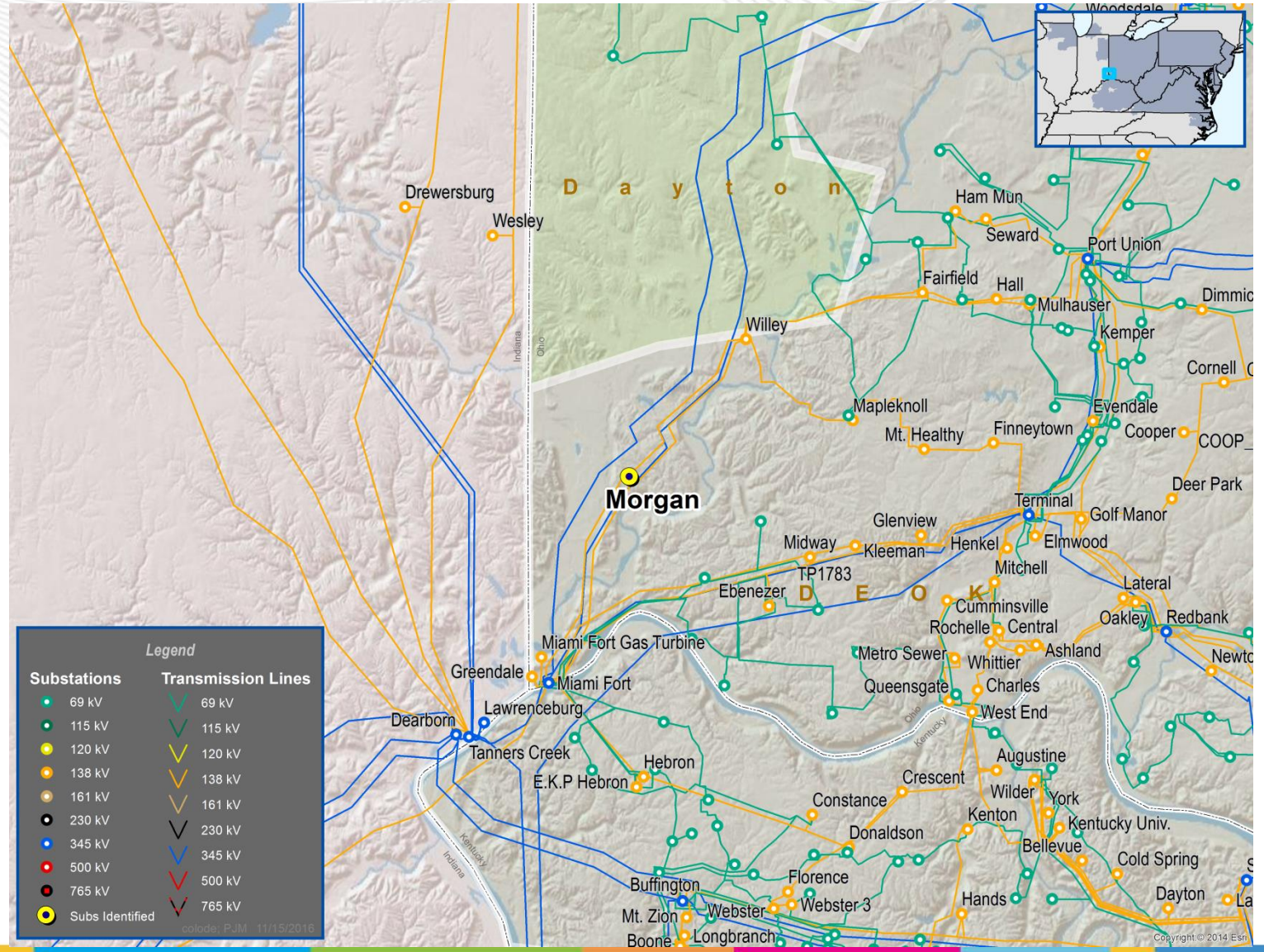
Alternatives:

- Eight miles of new 138kV feeder on new right-of-way, or a new 345kV substation connected to local circuit. Either could not be built in time and the expense of each would be greater.

Estimated Project Cost: $5.37M

Possible IS Date: 12/31/2017

Project Status: Preliminary Engineering



Questions?

Email: RTEP@pjm.com

Revision History

1/13/2017 – Original version posted to PJM.com

1/19/2017 – Updated slides #64-#70, added more details

1/25/2017 – Updated slides #14-#22 and #64-#70, changed “Potential Solution” to “Recommended Solution”

– Added title “Supplemental Projects” for slides #46-#61

– Updated slides #46-#63, changed “Proposed Project” to “Recommended Project”

– Added conductor size for slides #45