Reliability Analysis Update

Transmission Expansion Advisory Committee

April 5, 2018

2018 RTEP Analysis Update

2018 Proposed schedule

2nd-3rd week of April	Preliminary case available
May-June	Post violations
May/June to July/August	Reliability Window (60 day window)

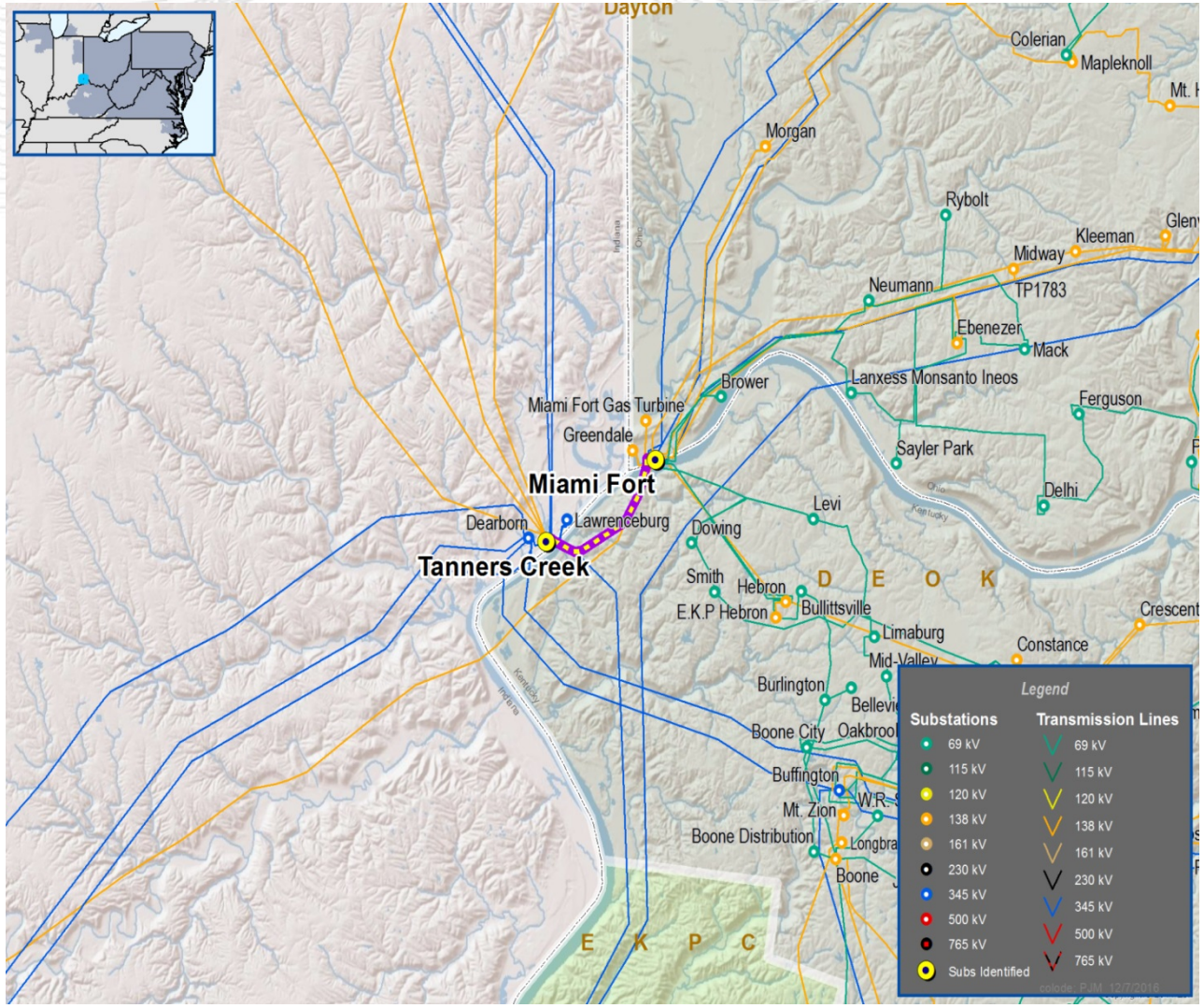
Baseline RTEP Projects

DEOK Transmission Zone: Baseline B2831.2 Scope Change

B2831.2 Original Scope: Upgrade the Tanner Creek - Miami Fort 345 kV circuit (DEOK portion) to achieve new ratings of 2151 MVA Summer Normal and 2151 MVA Summer Emergency
Original Estimated Cost: $7.81M
Original Required IS Date: 6/1/2018

New Scope: Rebuild the Tanner Creek – Miami Fort 345kV line (DEOK portion) to achieve a capacity of 2390 MVA.
New Estimated Cost: $11.1M
New Required IS Date: 6/1/2018

Reason for the change: During preliminary engineering of the original scope of the project, it turns out that 5 structures need to be replaced. The rebuild would require the replacement of 6 structures. The loading is expected to incrementally increase on this circuit in the coming years. The rebuild will bring a 20% margin over the violation Vs. the 8% margin in the original scope. The incremental cost is $3.29M, which includes the replacement of an additional structure and the general increase in cost for line work from 2016 to 2018.



ComEd Transmission Zone: Baseline
Davis Creek RAS removal

Davis Creek SPS: Auto-closes a normally open 345kV bus tie at Davis Creek following loss of the specified line, which is described in ComEd System Planning Operating Guide (SPOG) 2-24 and PJM Manual 3. It is to prevent thermal overloads following loss of a 345kV line connected to TSS 86 Davis Creek.

Reasons for the removal:

B1841: Install the 3rd 345/138 kV transformer at TSS 86 Davis Creek; Already in service

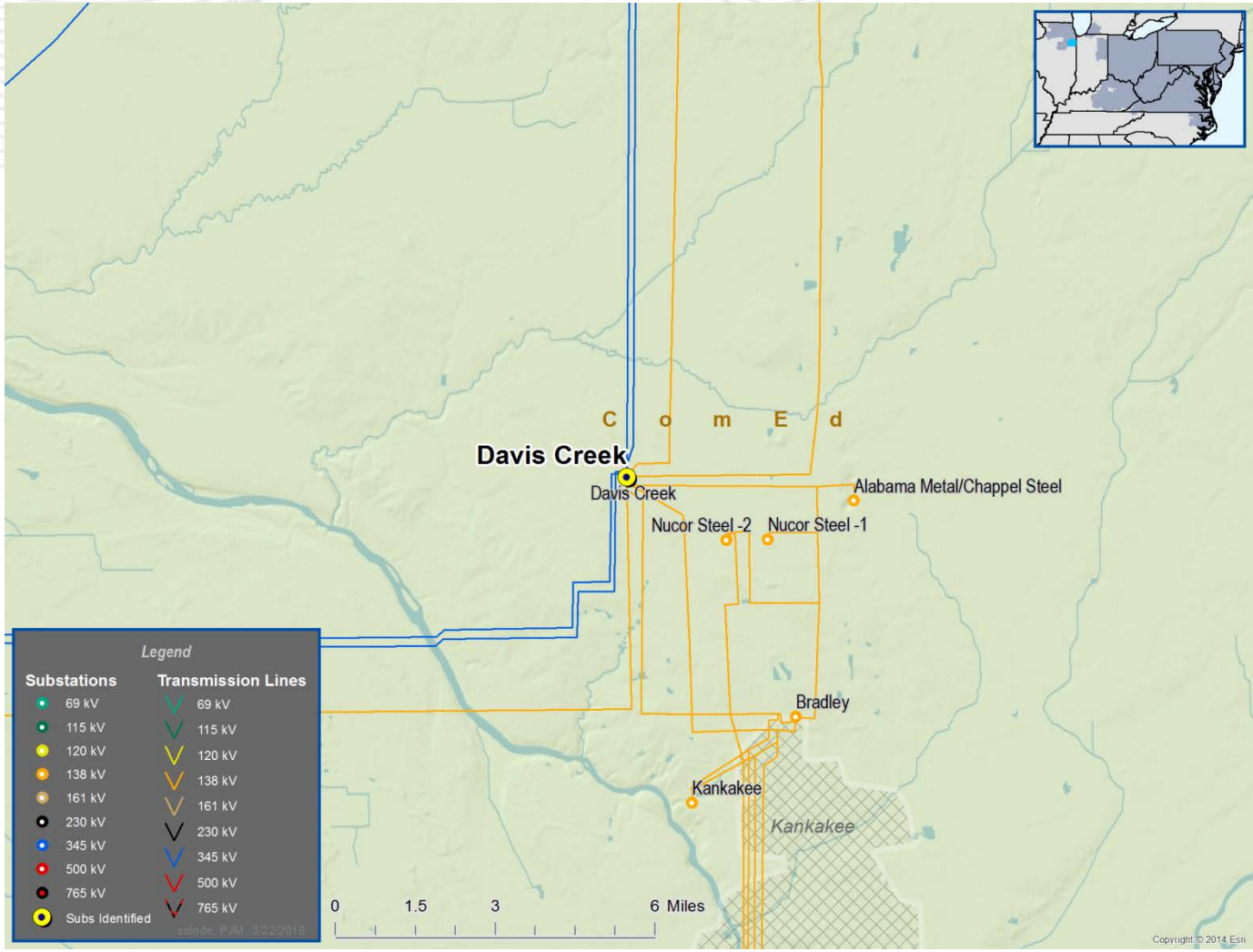
S1444: Expand Davis Creek 345kV straight busses to breaker and half; Projected IS date: 12/1/2018

With only B1841, there is currently no need for the RAS at Davis Creek. S1444 will further improve the performance around Davis Creek.

Recommended Solution: Remove Dave Creek RAS (B2995)

Estimated Cost: $0M

Required IS Date: 12/31/2018



ComEd Transmission Zone: Baseline Operational Performance

Problem Statement (Previously discussed on 12/14/2017 TEAC):

- High voltage in Powerton area (Katydid and Mole Creek 345kV buses) in real time: Powerton unit 6 is required to run to control 345kV voltages in Powerton area
- Significant Uplift Charges

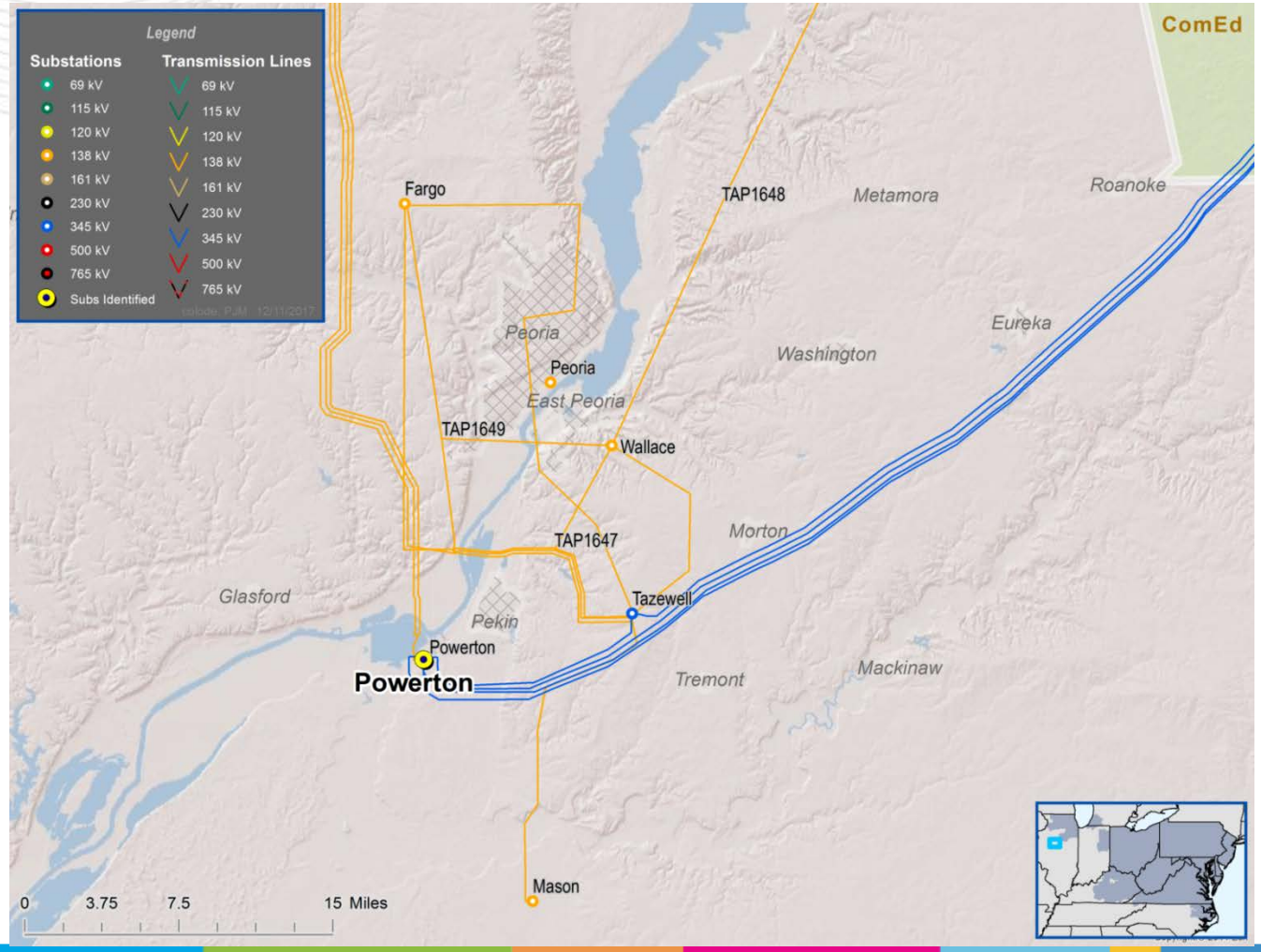
Immediate Need:
Due to the immediate need, the timing required for an RTEP proposal window is infeasible. As a result, the local Transmission Owner will be the Designated Entity.

Potential Solution:
Install a shunt inductors at TSS 196 Katydid and TSS 908 Mole Creek ($12M plus land purchase that may be required)
Estimated Cost: $12M + land purchase that may be required

Alternatives considered:
At TSS 908 Mole Creek cut in three additional 345kV Powerton lines (Powerton – Katydid, Powerton - Goodings and Tazewell - Dresden)

- Would require purchasing additional property
- Potential thermal issues on Lasalle - Mazon 138kV line
- Breaker and a half layout
- Estimated cost: $33M plus land purchase that may be required

Required IS Date: Now
Projected IS Date: TBD



TO Criteria Baseline Projects

Supplemental Projects
First Review

AEP Transmission Zone: Supplemental
Delaware-Desoto Line

Supplemental Project

Problem Statement:

Equipment Material/Condition/Performance/Risk:

The College Corner – Delaware 138kV circuit is a 1941 vintage line that has been responsible for 10 sustained outages in the last 10 years. The circuit has 12 open category A conditions and has a ~1 mile long underground section that has caused 2,000+ hours of outages. Due to past performance and conditions, this section of line will have to be addressed.

The Delaware – Deer Creek ~2 mile section being rebuilt is a 1927 vintage construction with 397 ACSR conductor (167 MVA rating) that has 46 open conditions across 11 structures. Rebuilding this portion is required if we retire the underground portion.

Operational Flexibility and Efficiency

The Tanners Creek 345kV line is hard tapped onto the Desoto 345kV bus 1. This means that any time this 48 mile line needs maintenance, AEP has to take a critical EHV bus outage. This is unacceptable from an operational standpoint and sectionalizing it with a breaker is required.

Both transformers are tapped to the 345kV bus with MOAB's. Due to the high speed protections schemes associated with EHV systems and the challenges associated with keeping all three phases of the EHV MOAB's aligned, AEP standard is to install high side breaker protection on each transformer.

Desoto 138kV station is exposed to 12.55 miles of Desoto - Jay and 25.24 miles of Desoto – Madison 138kV lines. These lines were constructed in 1964 and 1928 respectively and have contributed to 12 momentary outages and 2 permanent outages in the last 10 years. Since Desoto station is a critical EHV source for the area, it is required to install a new breaker string to reduce the fault exposure seen by Desoto.

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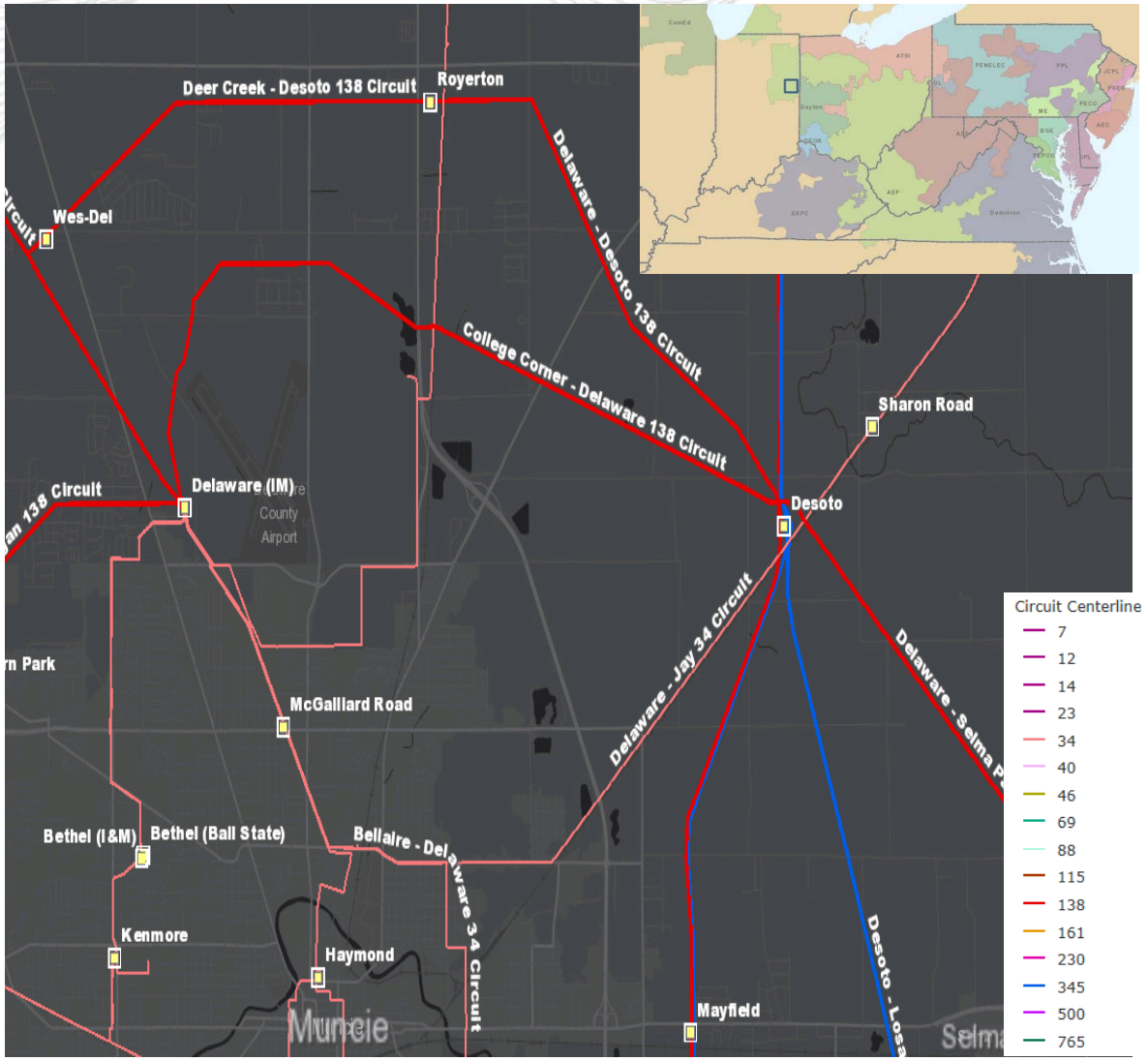

AEP Transmission Zone: Supplemental Delaware-Desoto Line

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Potential Solution

At Desoto station, install 4 345kV 5000A 63kA breakers in the 345kV yard with breaker B1 & B2 protecting the Tanners Creek #1 line, breaker D2 protecting transformer 1's high side and breaker D1 protecting transformer 2's high side. Install 5 138kV 3000A 63kA breakers; 3 to construct the new G string, 1 to finish the M string and 1 to protect the low side of transformer 2.

Estimated Cost: $9.9M

At Delaware station, retire exits toward College Corner and Selma Parker. Upgrade risers and busses on Deer Creek and Desoto exits.

Estimated Cost: $0.3M

Retire 7 miles of the Delaware-College Corner/Selma Parker double circuit 138 kV line and re-terminate it into Desoto station.

Estimated Cost: $4.7M

Rebuild roughly 2 miles of the Delaware-Deer Creek/Desoto line using 795 ACSR (257 MVA rating)

Estimated Cost: $6.2M

Total Estimated Transmission Cost: $21.1M

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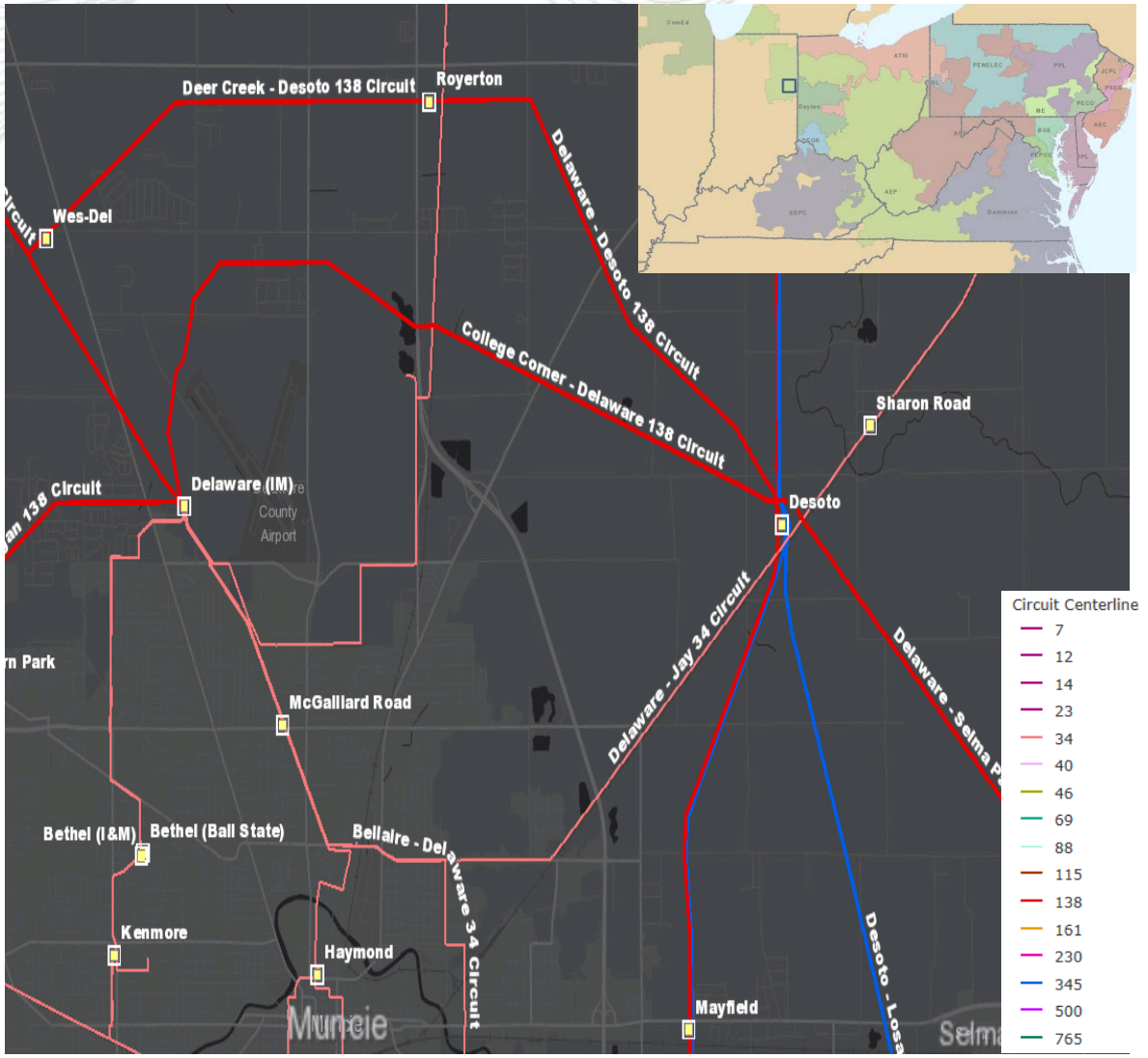

AEP Transmission Zone: Supplemental Delaware-Desoto Line

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Alternatives:

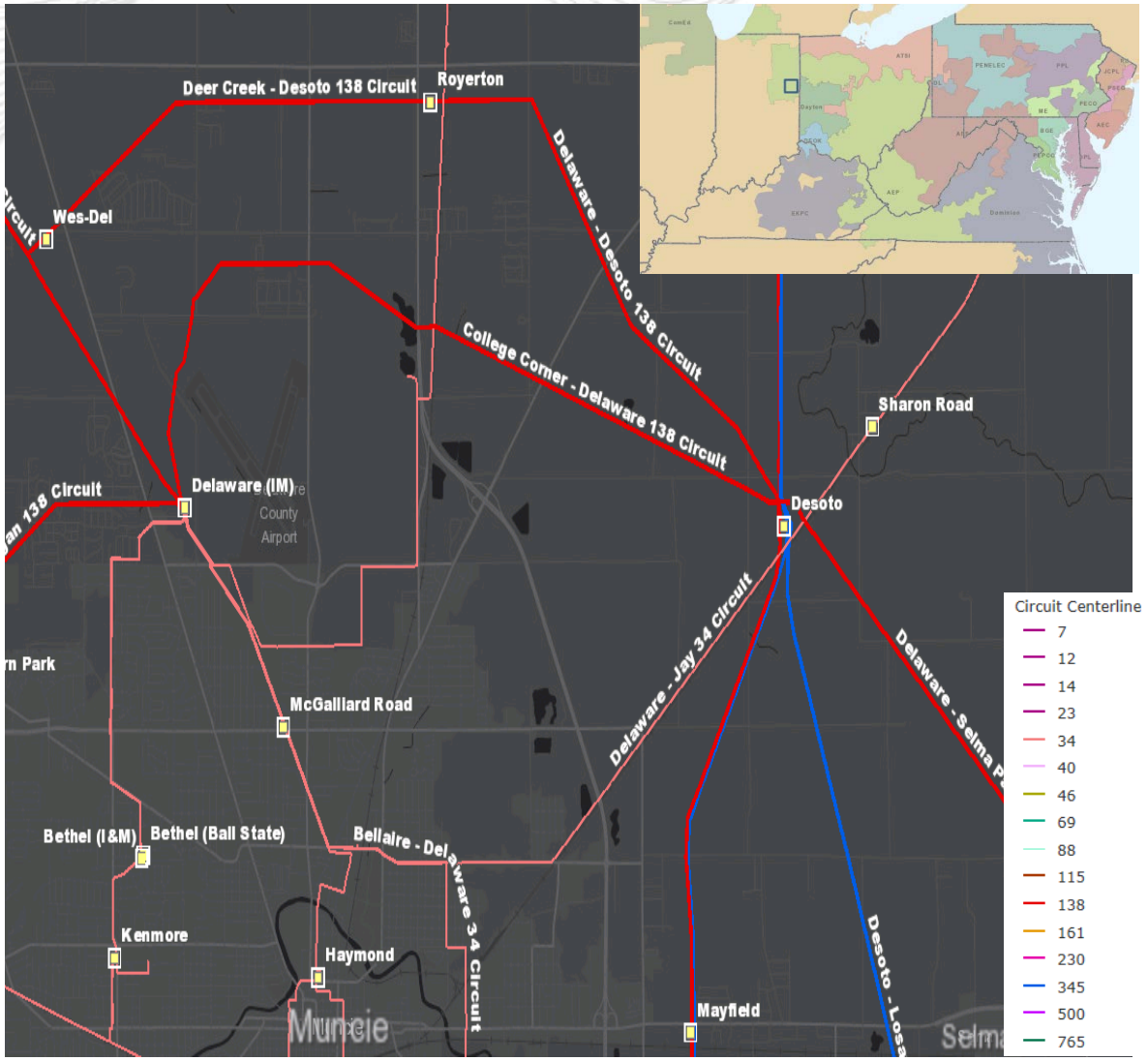
Rebuild the 7 mile portion from Delaware-structure 39 overhead. Rebuilding this section overhead would pose significant difficulties. The section that is currently underground can not be rebuilt overhead in the existing ROW as it is in close proximity to an airport. In order for AEP to rebuild it, there would be a significant re-route required which would be expensive. Due to relative low loading, it is a better choice to simply retire the line and upgrade the limiting portion of the Delaware – Desoto line.

Complete the D breaker string at Desoto 345kV yard and terminate transformer 2 into a breaker string. While this is the standard arrangement, having a breaker fault take out multiple system sources is inadvisable. So adding breaker D is not recommended. Estimated Cost: $1M

Terminating the transformer 2 into a low side breaker string would be possible if the station was expanded, but due to the location of all the line exits out of this station, the line crossings 2 spans north of the station and the railroad to the south and east expansion of this station would be a costly endeavor that would involve relocating almost all of the 138kV station equipment and lines. For these reasons, this option was not chosen.

Projected In-service: 04/29/2019

Project Status: Scoping



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Supplemental Project

Problem Statement:

Equipment Material/Condition/Performance/Risk:

Approximately 75% of the 21.62 mile long South Bend – New Carlisle 138kV Line conductor is 1930's vintage built with 397 ACSR (167 MVA rating) and there are 128 open conditions along the entire line asset.

The Twin Branch – South Bend 138kV Line has 93% of the 4.86 miles constructed in 1925 with 397 ACSR (167 MVA rating) and there are 20 open conditions along the line asset. Multiple locations have ROW encroachment issues, several broken shield wires and conductor strands, woodpecker holes and broken aerial markers. This line also crosses a river and US route 31.

The 1966 vintage 69kV circuit breakers F at Olive Substation has operated through 8 fault operations. This oil 69KV CB is an FK model and has no oil containment. Without oil containment, environmental concerns are present. Recent inspections have also found this breaker to have issues with close operations. The velocity calculated has either been too fast or too slow. Probable causes may be a faulty damper or high pressure in the pneumatic storage tank.

Transformer #3 20 MVA 138/69kV at Olive Station was manufactured in 1950 and is showing high CO2 and Ethane measurements. It currently has failed pumps and fans, so it cannot reliably be loaded up to the name plate. The flow gauges on the pumps have also failed. It currently has oil leaks along the outlet valves. Finally the control cable for this transformer has a green substance that has been tested in other sites and is a sign of PCB contamination.

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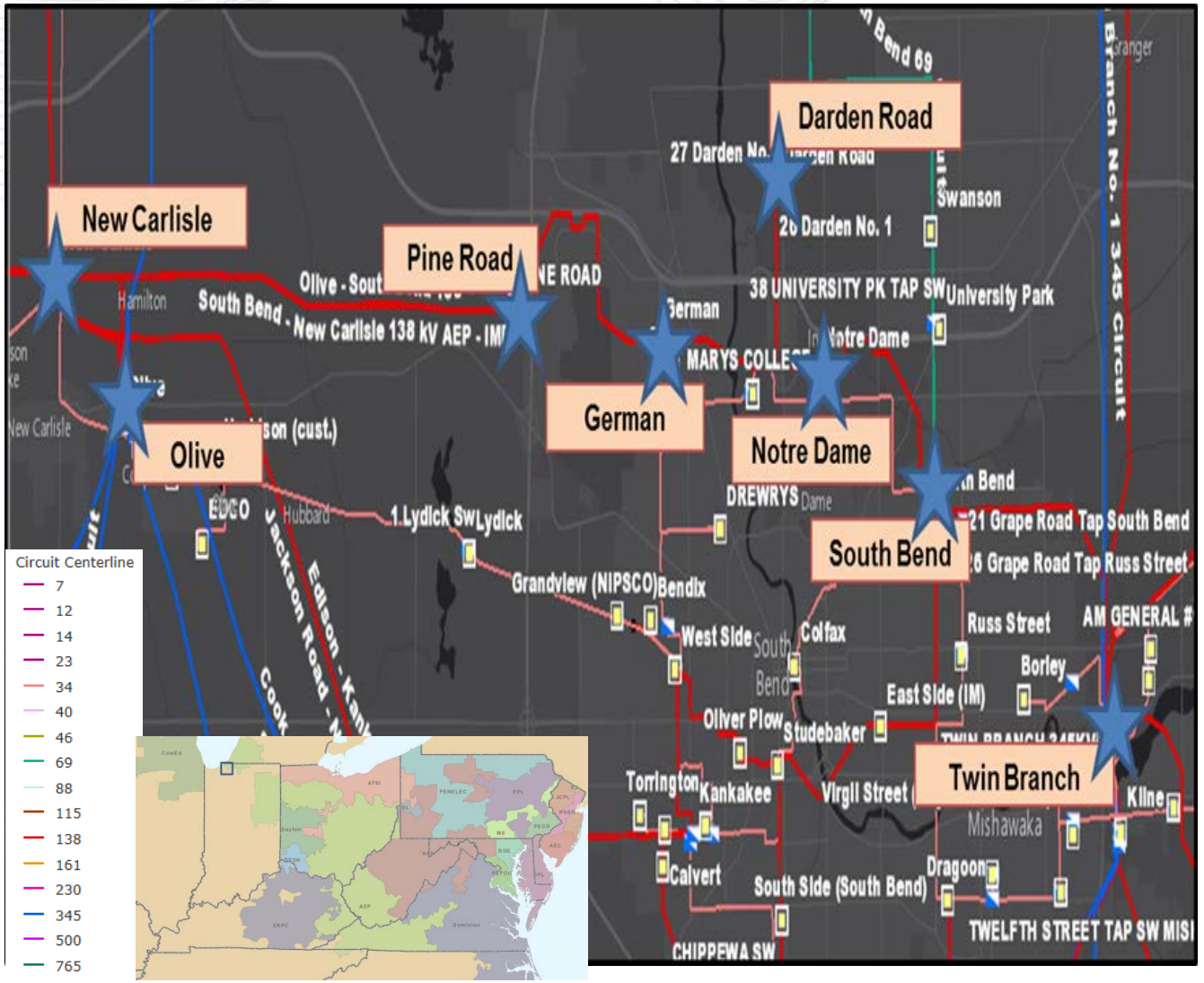

AEP Transmission Zone: Supplemental
South Bend Line Rebuild

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Operational Flexibility and Efficiency

The 345/138 kV transformer at Olive is tapped directly off the bus and includes overlapping zones of protection. The 138/69 kV transformer at Olive is tapped directly off the 138 kV bus and includes overlapping zones of protection. These overlapping zones can lead to misoperations and relay coordination challenges.

There are currently four MOABs in series on this line, which is against current AEP standards. Breakers will be installed at German station to eliminate this potential source of misoperations.

Potential Solution

At German Station, install 3000A 40 kA 138kV line Breakers towards South Bend Station and Olive Stations. Estimated Cost: $3.1M

At South Bend Station, upgrade risers towards Olive and Twin Branch. Estimated Cost: $0.7M

At Twin Branch Station, upgrade risers towards South Bend. Estimated Cost: $1.8M

At Olive Station, install one 345kV CB, one 138kV CB, replace 69kV CB F and replace 138/69/34kV TR#3 with 60 MVA 138/69kV TR#3. Estimated Cost: $5.2M

Rebuild existing double circuit South Bend - New Carlisle 138 kV line asset with 795 ACSR (257 MVA rating), approximately 18.74 miles. Estimated Cost: $45.0M

Rebuild existing six wired Twin Branch – South Bend 138 kV line asset with single circuit line with 795 ACSR (257 MVA rating), approximately 4.8 miles. Estimated Cost: $9.9M

Rebuild existing double circuit Olive Entrance B 138kV Line asset with 795 ACSR (257 MVA rating), approximately 1 mile. Estimated Cost: $2.9M

Split the East Side - South Bend line off of the South Bend – Twin Branch shared pole. Estimated Cost: $0.2M

Total Estimated Transmission Cost: $68.8M

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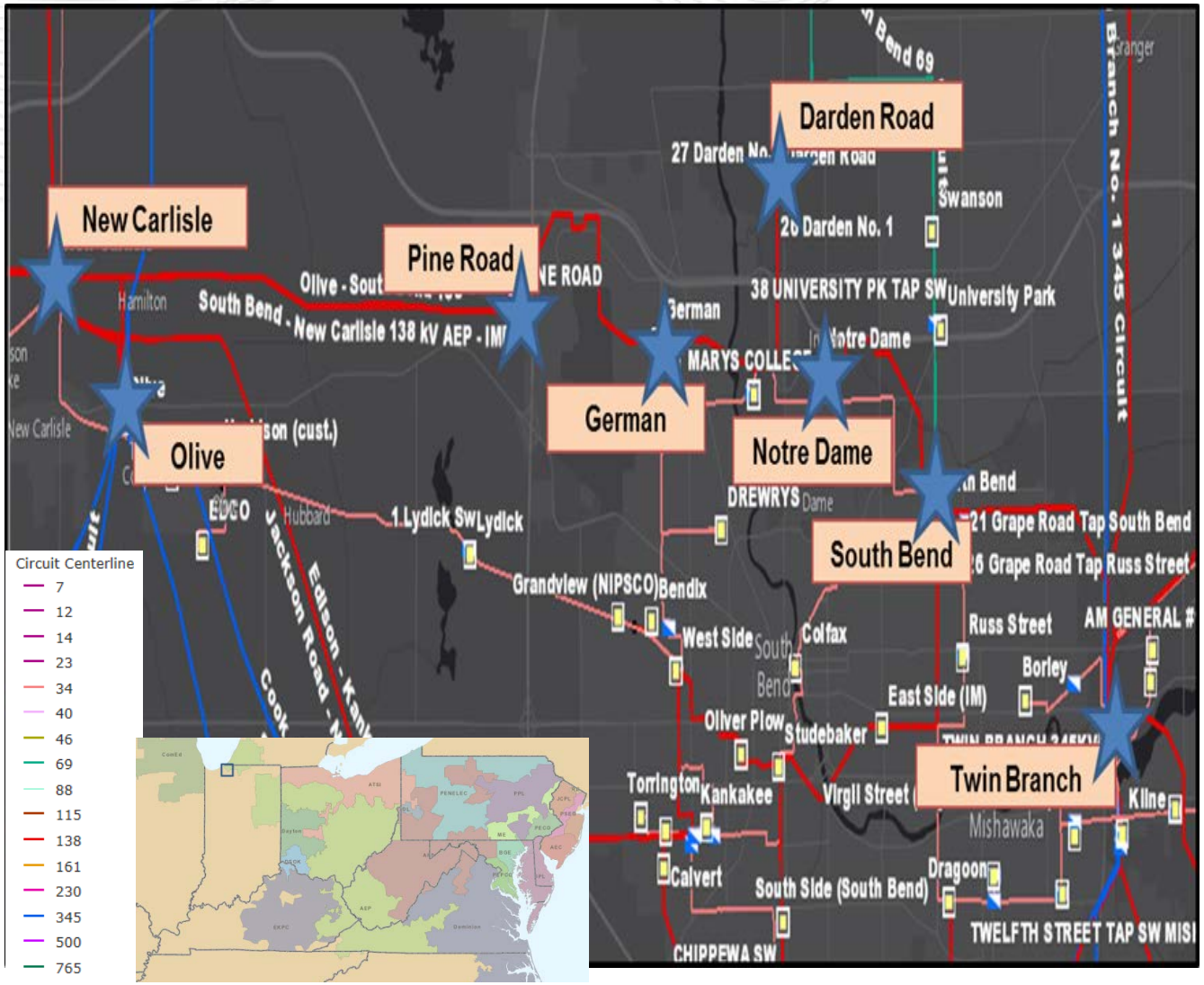

AEP Transmission Zone: Supplemental
South Bend Line Rebuild

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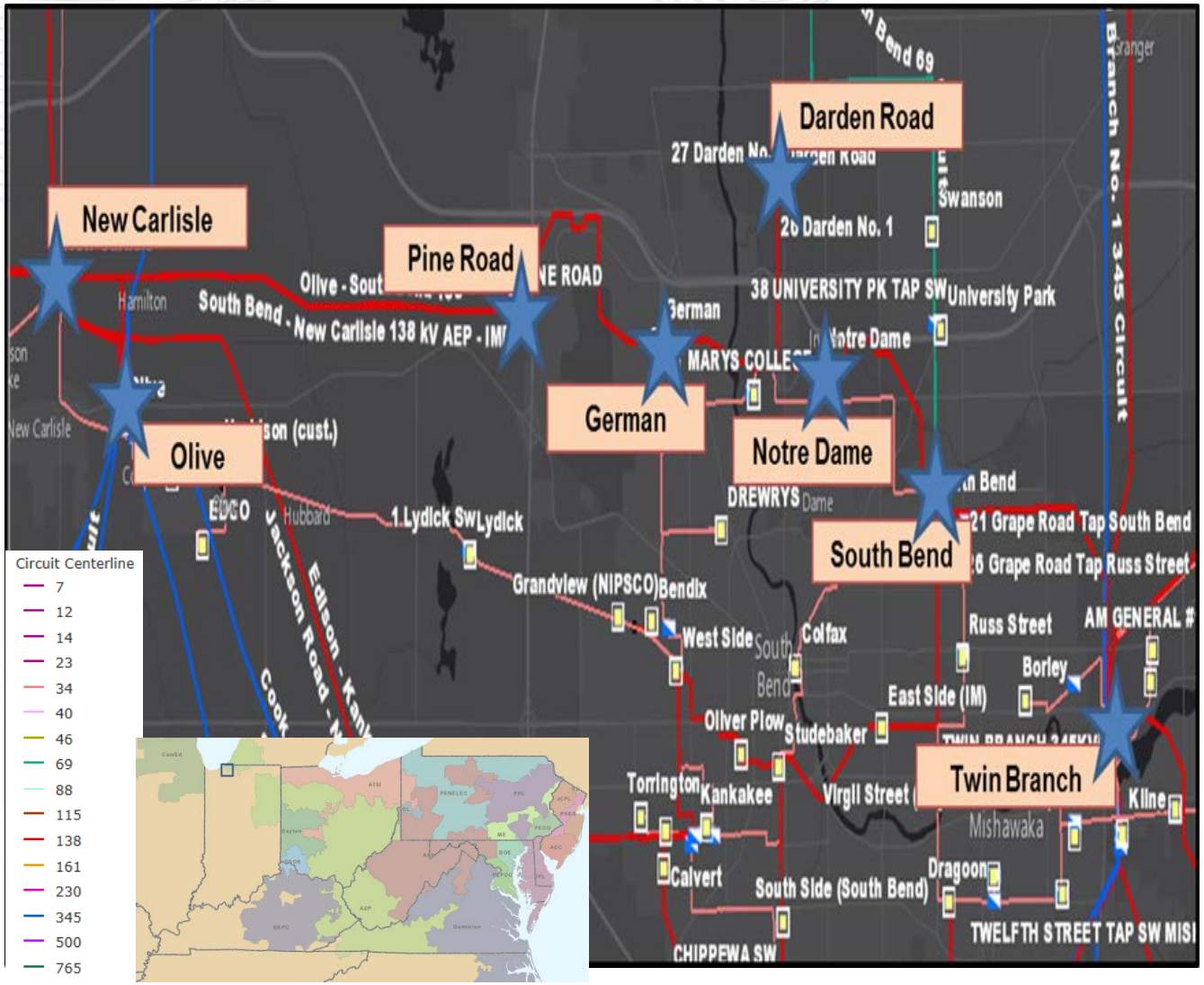
Alternatives:
Replace broken/burnt insulators and worn/broken shield wires individually dispersed along 26.48 miles of line. This would improve the assets' health but will not address the aging conductor and structures that were installed in 1925 and 1930, which will be increasingly problematic overtime.

Projected In-service: 06/30/2020

Project Status: Engineering



Supplemental Projects
Second Review

AEP Transmission Zone: Supplemental Darwin Bypass

Supplemental Project
Previously Reviewed at 3/8/2018 TEAC

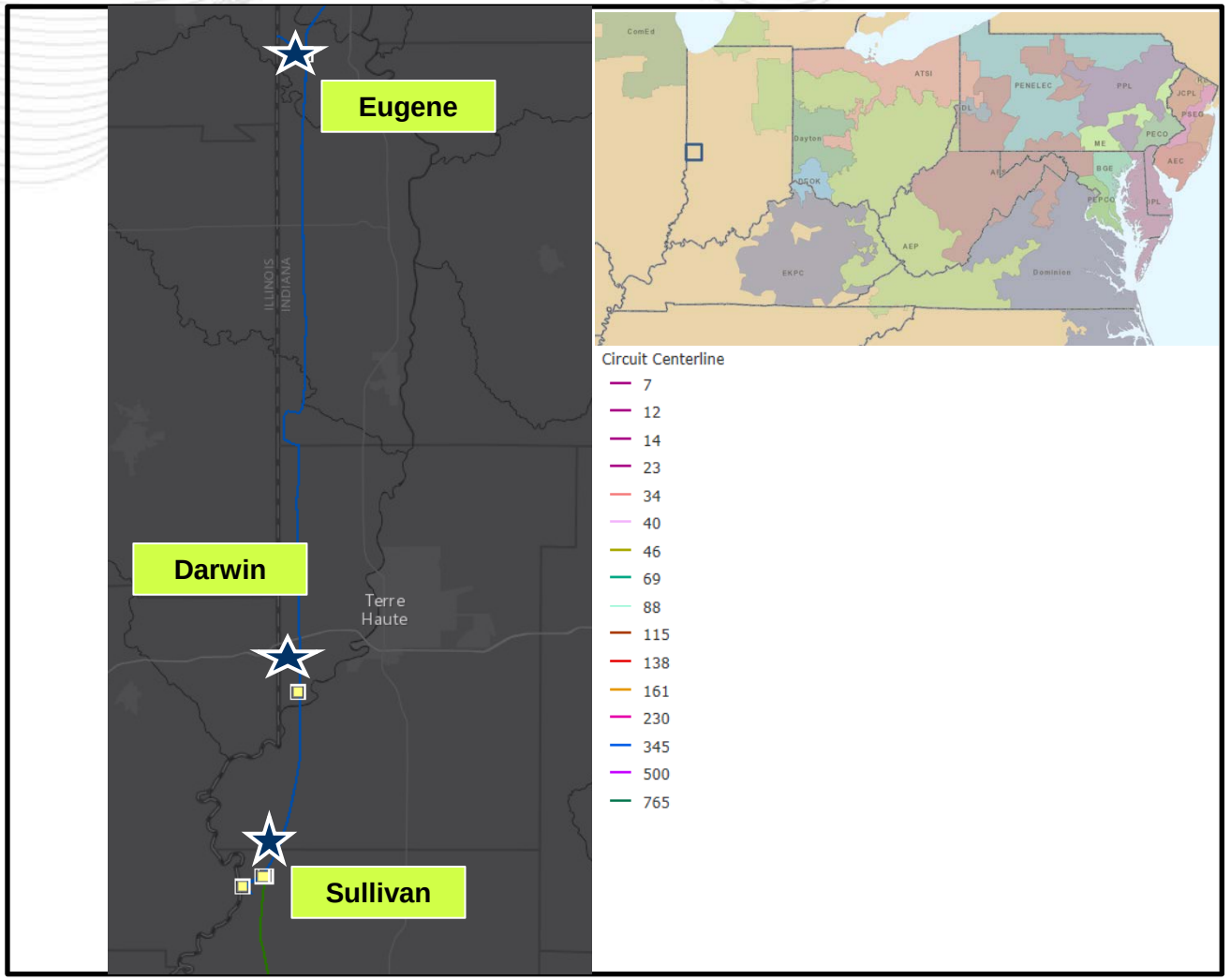
Problem Statement:
Equipment Material/Condition/Performance/Risk:
Darwin station (NIPSCO) was built to connect Sugar Creek IPP (Mirant station) into the PJM market. Sugar Creek IPP no longer has the rights or intention to sell power into PJM. In December 2016, the electrical connection between Mirant and Darwin stations was removed. This reduces Darwin into a mere switching station between Sullivan and Eugene. There are no grid needs to have Darwin station present between Sullivan and Eugene. Therefore, bypass and retirement of AEP owned assets at Darwin station is proposed. AEP owned assets at Darwin include 345 kV relays and metering. This project will assist to reduce AEP O&M costs and responsibilities.

Selected Solution:
Station Description
Disconnect Darwin 345kV station from the Eugene – Sullivan 345kV line and retire all AEP owned equipment at Darwin. (S1579)

Total Estimated Trans Cost: $0.9M

Projected In-service: 05/01/2018

Project Status: Engineering



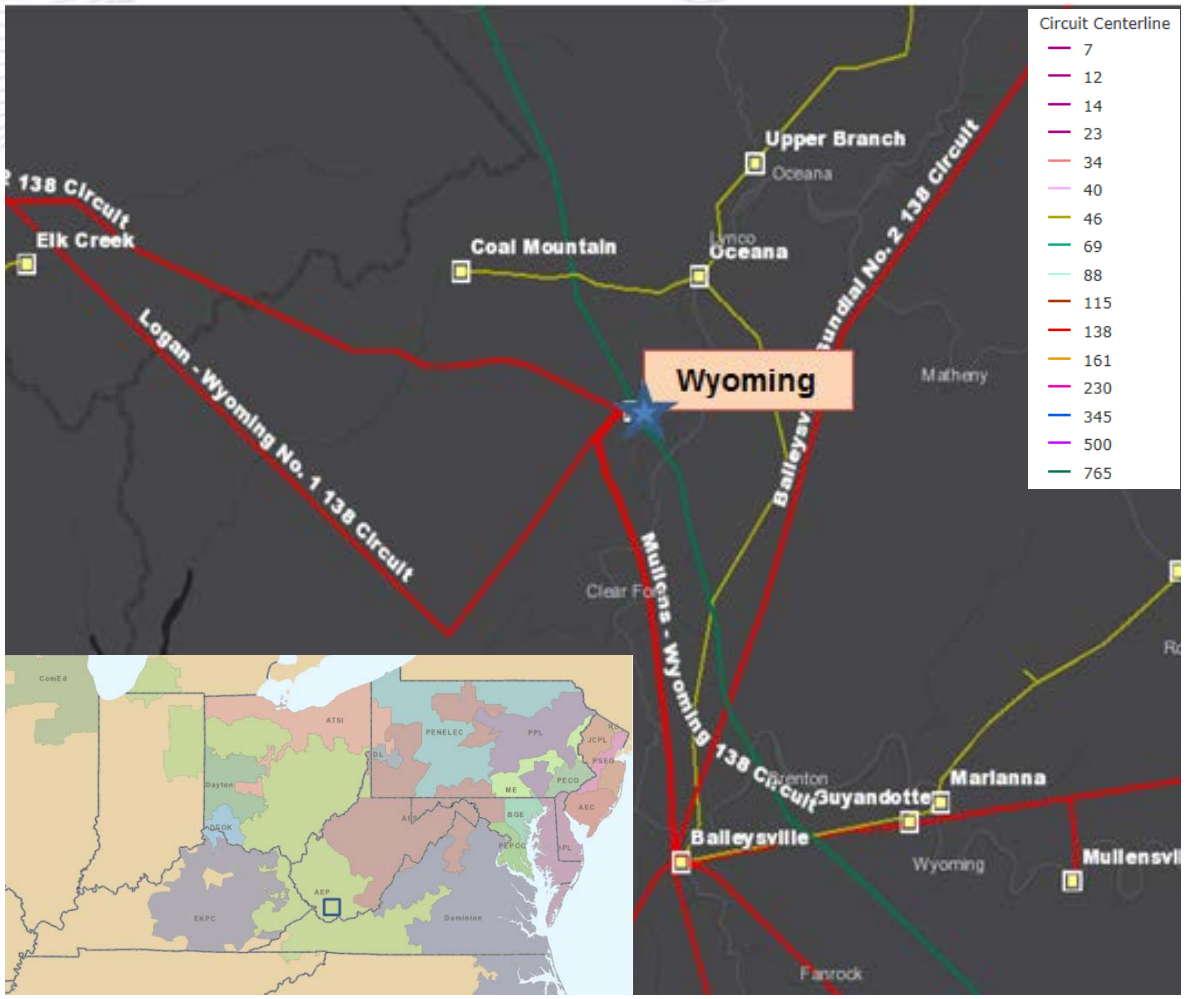
Supplemental Project
Previously Reviewed at 3/8/2018 TEAC

Problem Statement:

Equipment Material/Condition/Performance/Risk:

Transformer #2/Phase 3 unit and three sister units at Wyoming Station (Transf #1/Phase 1, Transf #2/Phase 1, and Transf #2/Phase 2) are all showing similar signs of accelerated aging from through fault events resulting in gassing, overheating, carbonization of insulating paper, decreased interfacial oil tension, and/or elevated bushing power factor levels. Bushing replacements on legacy units are difficult because matching the connecting point with a spare is complicated and would require an outage to take the measurements of the existing bushings. Also, spares of the same era are not readily available and newer bushings do not follow the same design standards of the legacy units. Transformer #1/Phases 2 & 3 also have accelerated aging from through fault events resulting in gassing, overheating, and/or carbonization of insulating paper. There have been cooling control issues reported to and repaired by field personnel as a stop-gap measure to enable continued operation until these units can be replaced. Due to the deteriorated conditions, AEP Equipment Standards indicates that these units can no longer be loaded to their full nameplate capability. By replacing these transformers with new units, loading capability will be able to meet daily system operation. When a similar unit failed at Joshua Falls Substation in APCo – Virginia, Transformer #1/Phase 1 was removed and taken to serve as the replacement transformer. Since that time, the only spare for 1 BANK and 2 BANK has been in service for this removed phase.

The 765 kV shunt reactor on the Wyoming – Culloden line is showing dielectric strength breakdown and elevated operating temperatures.



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AEP Transmission Zone: Supplemental
Wyoming 765 XFR Replacement

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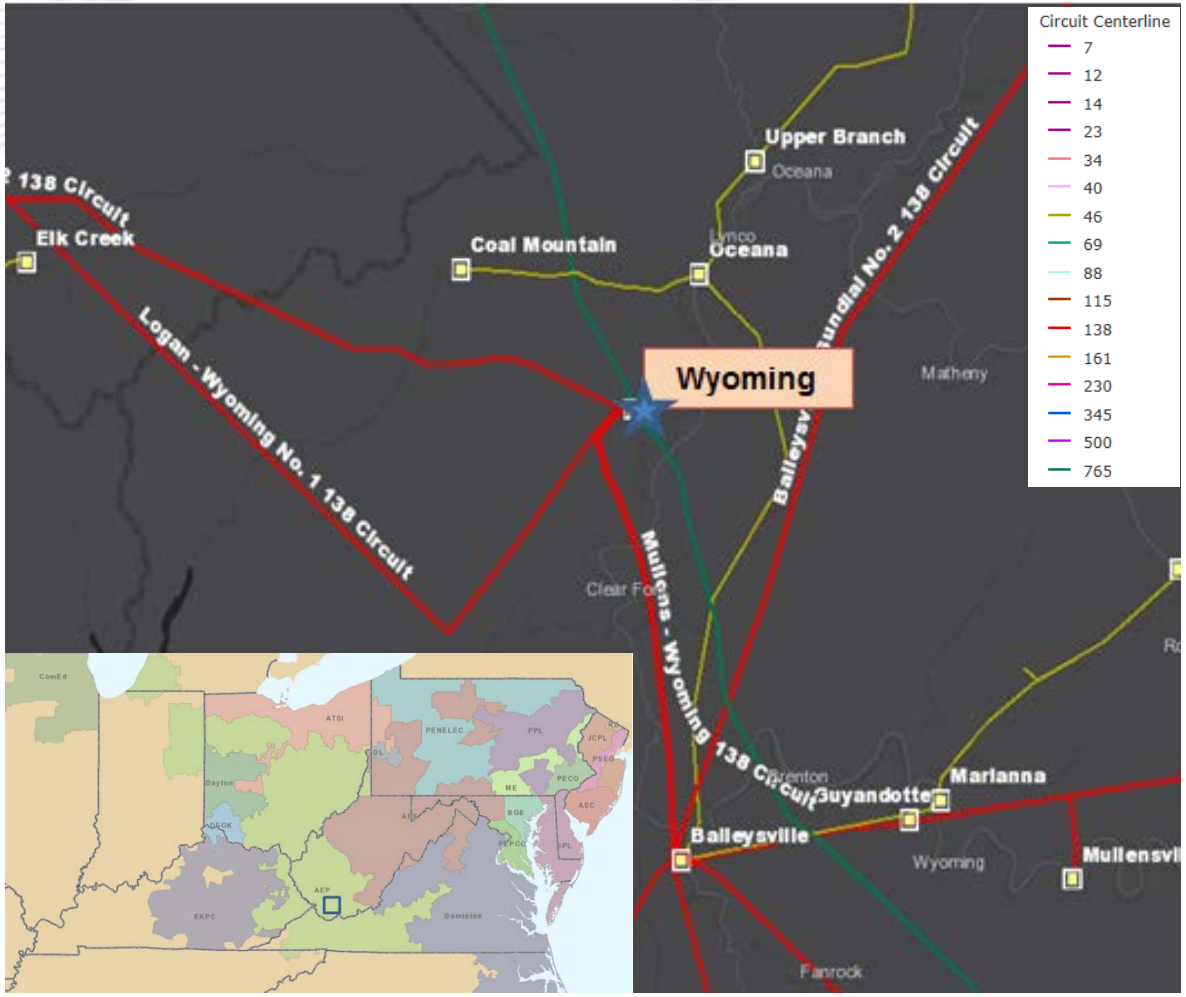
Selected Solution:

Wyoming 765 kV Yard: Replace existing 765/138 kV 750 MVA XF #1 with a new 765/138 kV 750 MVA XF. Replace existing 765/138 kV 750 MVA XF #2 with a new 765/138 kV 750 MVA XF. Install a new switchable spare 250 MVA XF. Replace existing 300 MVAR reactor bank on the Wyoming – Culloden 765 kV line and 40 kA switcher with a new 300 MVAR reactor bank and 50 kA switcher. Make the spare reactor switchable. (S1580)

Estimated Cost: $53M

Projected In-service: 12/31/2020

Project Status: Engineering



AEP Transmission Zone: Supplemental Cloverdale Area Improvements

Supplemental Project
Previously Reviewed at 3/8/2018 TEAC

Problem Statement:

Equipment Material/Condition/Performance/Risk:

Cloverdale 765/345 kV Transformer #10, 1968 vintage, is currently in a poor physical and operational condition. Transformer #10 phase 1 is showing short circuit strength breakdown caused by the amount of thermal through fault events, mostly in the 300°C to 700°C range, this has lead to an increased gassing of the unit. Transformer #10 phase 2 is showing short circuit strength breakdown caused by the amount of thermal through fault events, mostly under 300°C but some in excess of 700°C, has lead to minor gassing of the unit. In addition, the high side, low side, and tertiary Y2 bushing power factor ratings have been trending in excess of 0.5 which indicates a possible issue with the bushing. Transformer #10 phase 3 has an upward trending of oil moisture content resulting in downward trending to the oil dielectric strength. Increasing moisture content is a resultant of water ingress and/or break down of paper insulation of TF windings. Numerous thermal through faults of under 300°C has lead to an major and upward trending gassing of the unit, and significant carbonization of the insulating paper. This unit has experienced significant degradation of its internal materials. Transformer #10 spare has an upward trending of oil moisture content resulting in relatively stagnant trending to the oil dielectric strength. Increasing moisture content is a resultant of water ingress and/or break down of paper insulation of TF windings. More recently, the moisture content has decreased, yet the dielectric strength has responded with a more severe drop in value. Short circuit strength breakdown caused by the amount of thermal through fault events has lead to consistent gassing of the unit, and significant overheating events in excess of 250°C. The CO/CO2 ratio has consistently been above the warning level.

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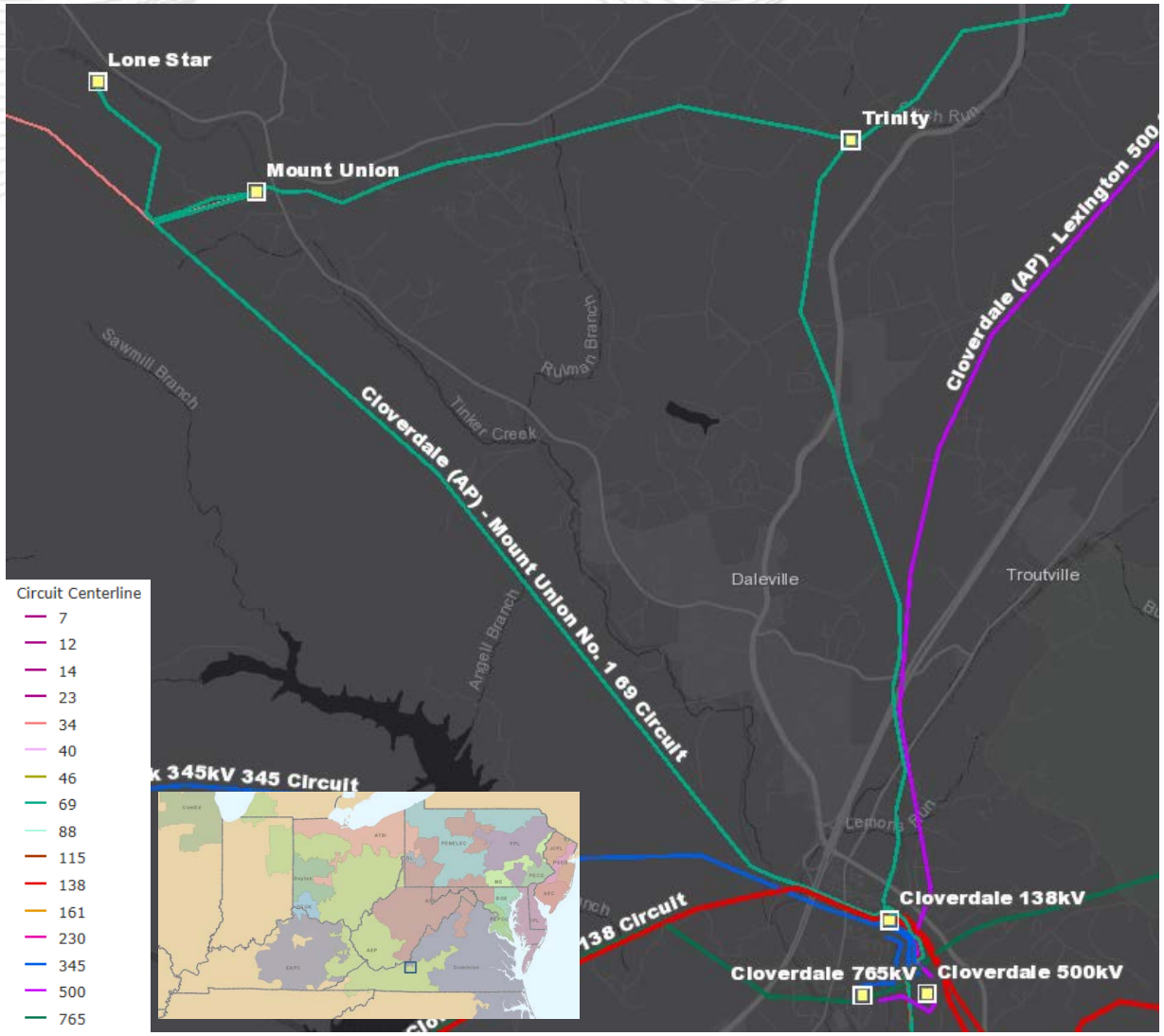

AEP Transmission Zone: Supplemental Cloverdale Area Improvements

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The 765kV CB's "AA1" &"AA2" are air blast breakers, which have a tendency to fail catastrophically. During failures, sharps pieces of porcelain from their bushings are typically expelled, which, can be a potential safety hazard to field personnel. In addition, the ability to get spare parts for these breakers is becoming increasingly difficult. The Manufacturers recommended number of fault operations is 10. CB "AA1" has experienced 34 operations and CB "AA2" has experienced 21 operations.

138/69/34 kV transformer #4 (will be retired) at Cloverdale is a 1959 vintage which has seen short circuit strength breakdown caused by the amount of thermal through fault events, mostly in the 300°C to 700°C range, minor gassing of the unit, numerous overheating events, and carbonization of the insulating paper. 138/69/34 kV transformer #1 (will be replaced) is showing short circuit strength breakdown caused by the amount of thermal through fault events, mostly in the 300°C to 700°C range, has lead to an increased gassing of the unit. In addition, the tertiary Y2 bushing power factor rating has been trending well in excess of 0.5 which indicates possible issues with the bushing. The 69 kV CB"F" is an oil type breaker without oil containment. These are oil breakers that have come more difficult to maintain due to the required oil handling. In general, oil spills occur often during routine maintenance and failures with these types of breakers. Other drivers include PCB content, damage to bushings. CB "F" has experienced 29 operations.

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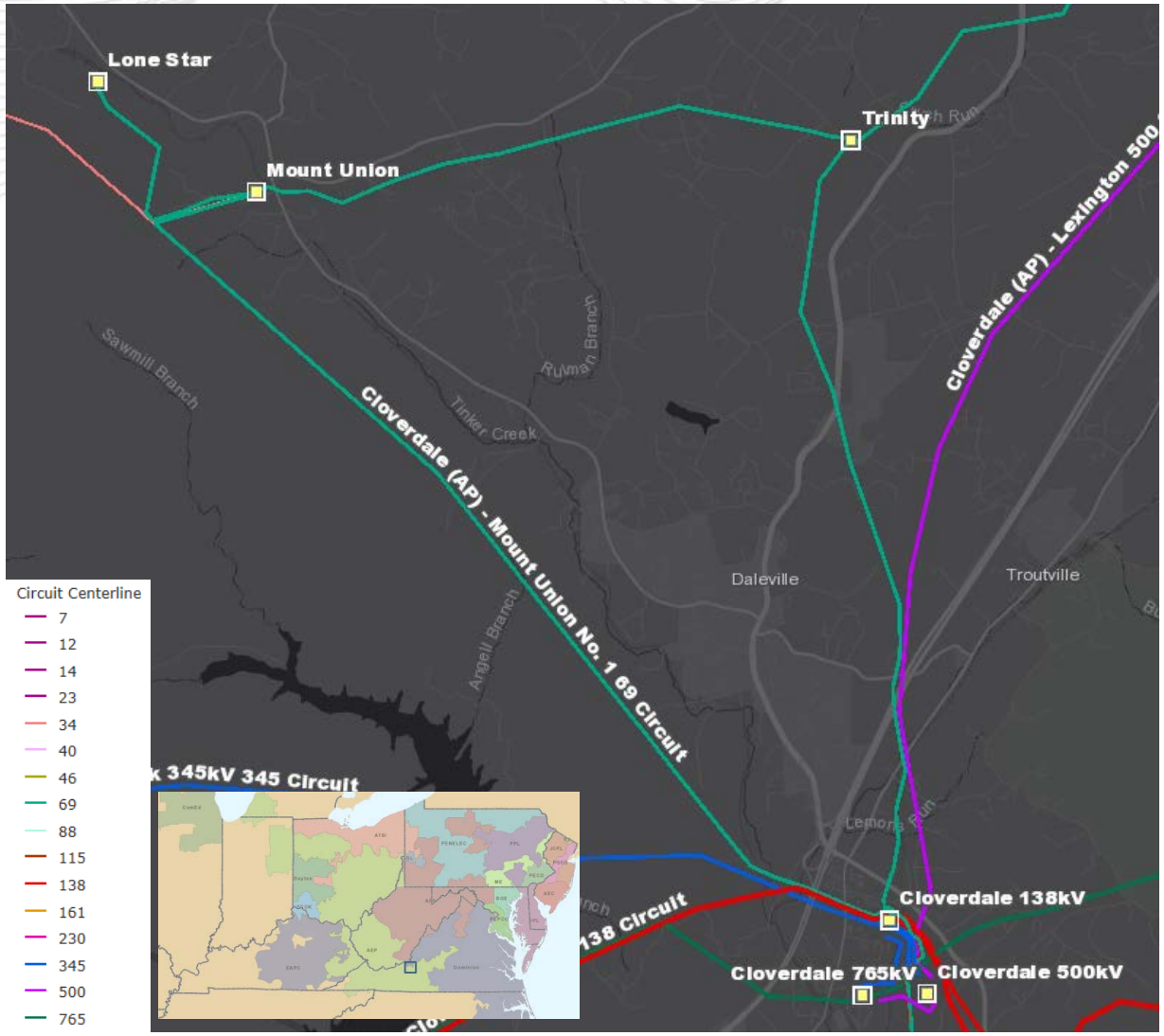

AEP Transmission Zone: Supplemental Cloverdale Area Improvements

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Operational Flexibility and Efficiency

Two new 765 kV circuit breakers "DD" & "DD2" will be installed to bring the 765/345kV transformer #10 into a breaker and a half position. This configuration allows for separation of two dissimilar zones of projection on the 765 kV system (transformer and bus), which can lead to mis-operations/over tripping. Two new 138kV kV, 3000 A/63 kA circuit breakers "G" & "G2" will be installed to bring the 138/69 kV transformer # 1 into a breaker and a half position. This configuration allows for separation of two dissimilar zones of projection on the 138 kV system (transformer and bus). Install 138 kV, 3000 A/63 kA circuit breaker "E" on the Reusens line. This will provide operations with another source on the Reusens line when maintenance/outages occur on existing breaker E2.

The Cloverdale – Mt. Union line (7.41 miles) is built to 138kV standards which allow us to replace the transformer at Mt. Union and energize the line to 138kV. Energizing the line to 138 kV standards allows up to fully utilize the line to full capacity as intended.

The 34.5kV tertiary feeds to Huntington Court from 138/69/34 kV transformer #1 and #4 have been de-energized because the load at Blue Ridge is being served at distribution level from Lake Forest Station. Because of this the 34.5 kV system at Cloverdale will be retired.

Customer Service:

Mt. Union serves CBEC (wholesale customer) and Roanoke Cement Co. (retail customer). Both customers will see improvement in voltage regulation with new 138kV source. Increase in transformer MVA is due to expected increase load in the area with a new industrial park being served from the 69 kV network.

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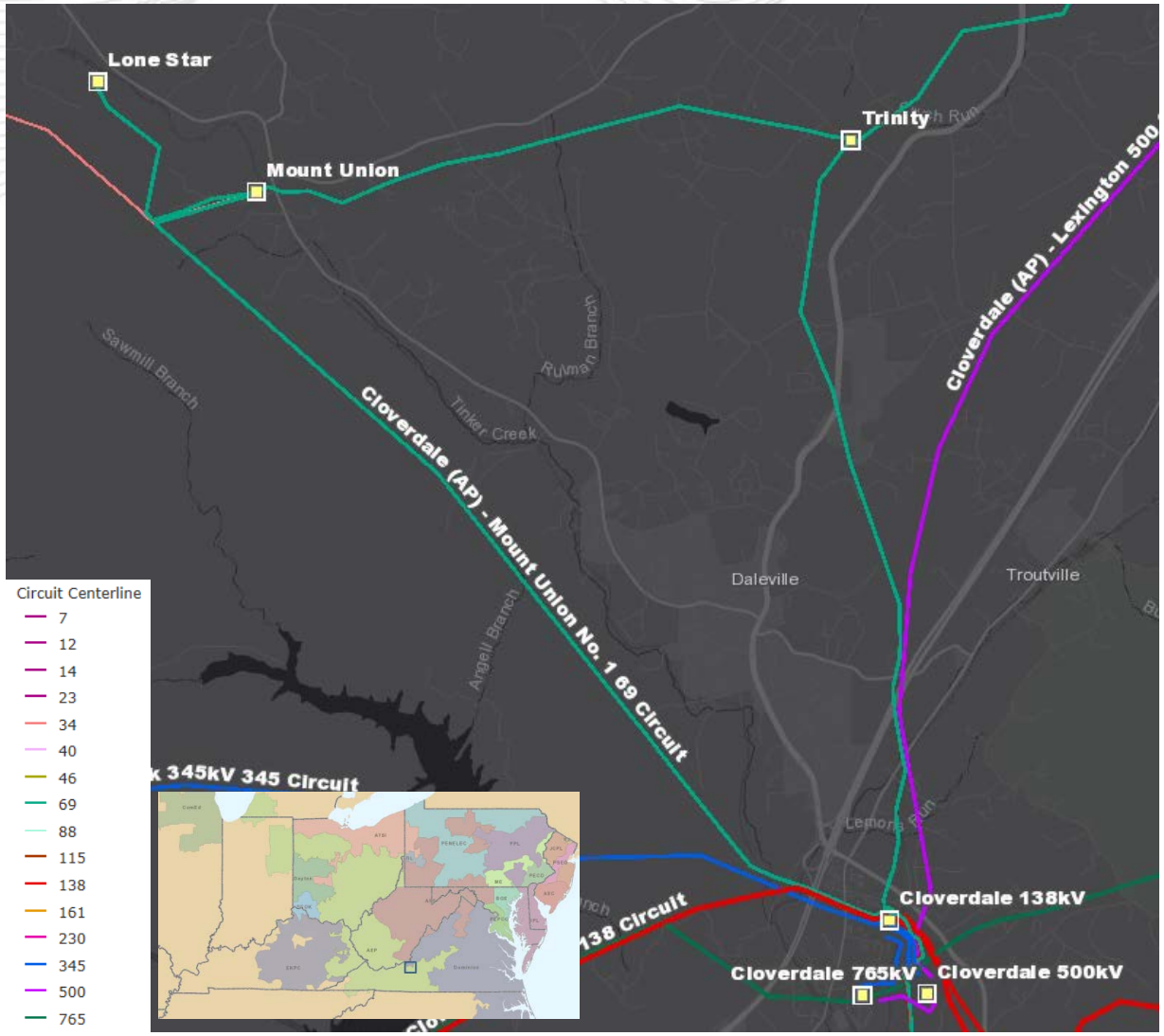

AEP Transmission Zone: Supplemental Cloverdale Area Improvements

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Selected Solution:

At Cloverdale station, replace all four single phase 500 MVA 765/345 kV TR #10 units with new AEP standard 750 MVA/phase units (switchable spare). TR #10 will be moved from the 765 kV bus #1 position into a new string between CB's "DD" & CB "DD2" (4000 A, 63 kA). (S1581.1)

Replace 90 MVA 138/69/34 kV TR #1 with a 130 MVA unit relocated from bus #2 position into a new string between CB's "G"& "G2" (3000 A 63 kA). (S1581.2)

Retire 138/69/34kV TR #4 (New 138/69 kV TR will be installed at Mt Union Station). Retire 34 kV CB "H", the Huntington Court 34.5 kV line, and associated 34 kV bus equipment. (S1581.3)

Add 138 kV CB's "D" & "D2" (3000 A, 63 kA) in order to bring the newly energized 138 kV Mt Union #1 line (already built to 138 kV standards) into a new string position. (S1581.4)

Replace 1800 A 27 kA 69 kV CB "F" with new CB (3000 A, 40 kA). (S1581.5)

Replace the Cloverdale – Huntington Court 138 kV line relays; Replace the Cloverdale – Roanoke 138 kV line relay; Replace Cloverdale – Mount Union #2 69 kV line relays. (S1581.6)

Replace 138kV Station Service Transformer. (S1581.7)

Replace 3000 A 41 kA 765 kV CB "AA2" with new 4000 A, 63 kA breaker. Retire 765 kV CB's "AA1" & CB "CC1". (S1581.8)

Estimated Cost: $49.9M

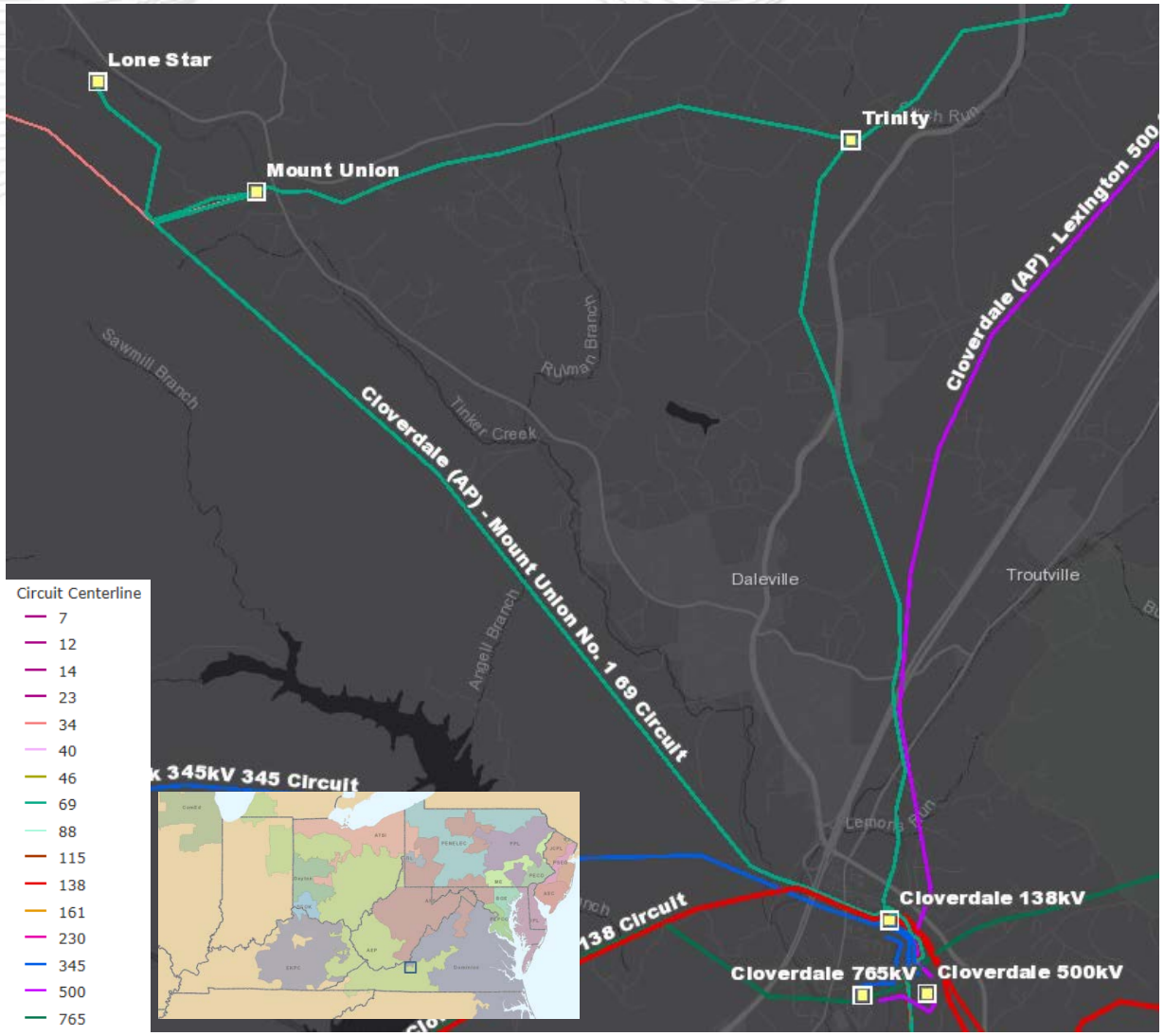
Install new 138/69 kV 130 MVA transformer at Mount Union station and retire 138/69/34kV 75 MVA transformer #4 at Cloverdale Station. The Cloverdale – Mount Union #1 69 kV line is built to 138 kV standards and will be energized to 138 kV after the transformer installation. Replace Cloverdale – Mount Union #2 69 kV line relays. (S1581.9)

Estimated Cost: $4.8M

Total Estimated Cost: $54.7 M

Projected In-service: 12/18/2020

Project Status: Engineering



Supplemental Project
Previously Reviewed at 3/8/2018 TEAC

Problem Statement:
Equipment Material/Condition/Performance/Risk:

The 138kV Circuit Breakers B, B1, B2, C, C2, C1 at Jackson Road Station are 3000A 50kA PK type air blast breakers manufactured in 1972, that has fault operations exceeding the manufacturer recommendation of 10 (26, 31, 18, 54, and 29 respectively). Air breakers tend to fail violently and their porcelain bushings usually blow up, dispersing particles in the surrounding area which is a safety concern. Drivers for replacement include age, number of fault operations, and a lack of available repair parts.

Transformer #3 345/138 kV at Jackson Road manufactured in 1972 is showing signs of deterioration. Drivers for replacement include dielectric strength breakdown (winding insulation), short circuit strength breakdown (due to the amount of through fault events), accessory damage (bushings), and high temperature (winding thermal condition). It also has high levels of Ethylene, Ethane, and Carbon Dioxide dissolved in the gas.

Operational Flexibility and Efficiency

When more than 4 breakers are required to operate to clear a line fault significantly increases the chances of a misoperation and increases the complexity of the protection circuits. Currently a line fault on the 138kV Twin Branch 2 line or a line fault on either of the 345kV lines requires 6 breakers to operate to clear the fault. In addition to this, the 345kV bus relay zone is combined with the two line relay zones and a transformer relay zone. Having three dissimilar relay zones joined together is an unacceptable arrangement, reducing the reliability of the protection equipment and increasing the chance of misoperations. The 345kV EHV lines are currently sectionalized with MOABS. Due to the higher required operation speed that goes along with EHV systems, MOABS can cause misoperations and result in failed sectionalizing.

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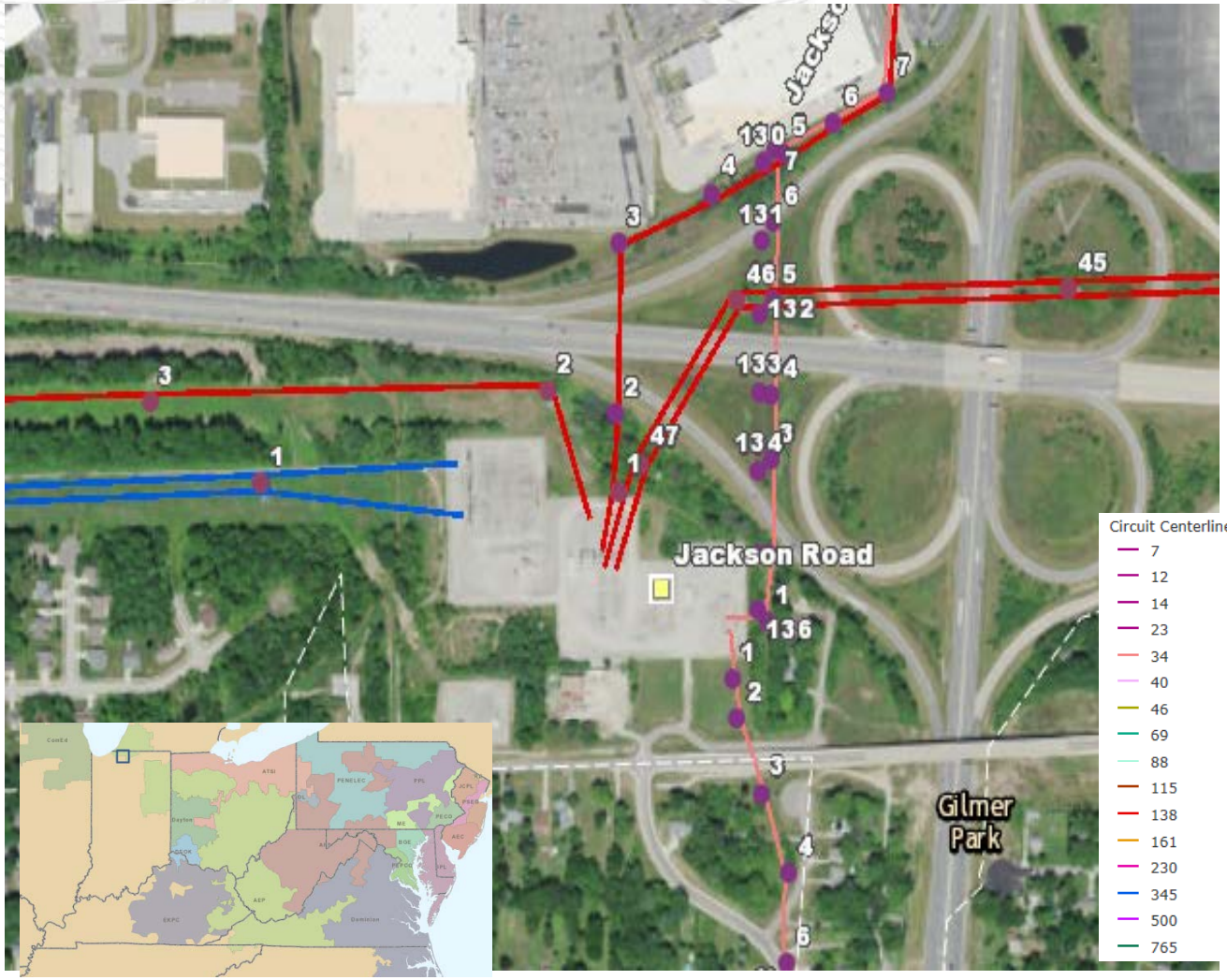

AEP Transmission Zone: Supplemental
Jackson Road Improvements

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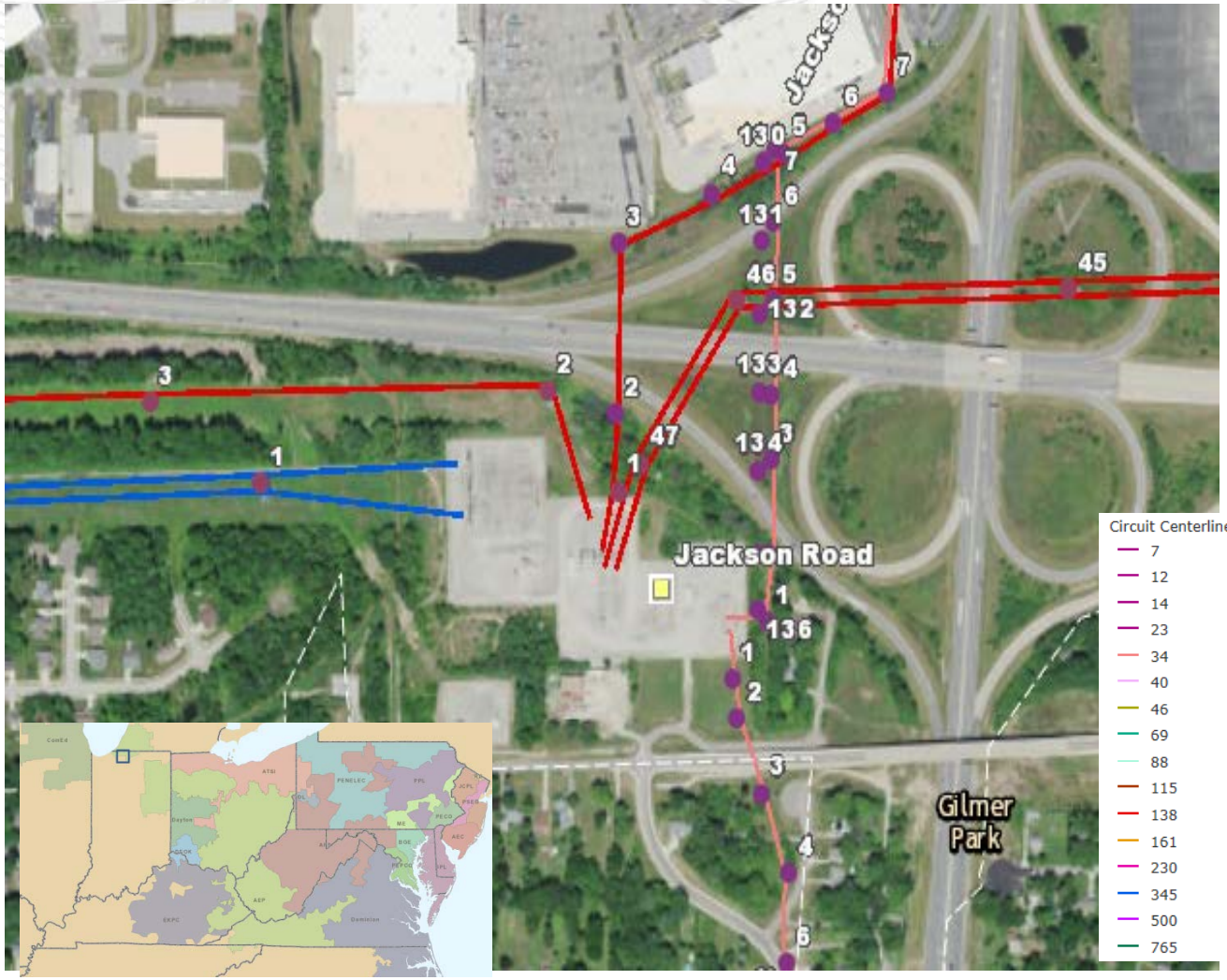
Selected Solution

At Jackson Road station, replace 138kV CB B, B1, B2, C, C1, C2 PK type air blast breakers with new 3000A 63kA circuit breakers. Install five new 3000A 63 kA 138kV breakers J1, J2, M, M1, M2. Install three new 345kV CB A, A1, A2 with 5000A 63kA model. Replace 345/138/34.5kV TR#3 with a 675 MVA unit. (S1582)

Estimated Cost: $25.4M

Projected In-service: 12/31/2018

Project Status: Under Construction



Supplemental Project
Previously Reviewed at 3/8/2018 TEAC

Problem Statement:

Equipment Material/Condition/Performance/Risk:

Breakers “Q”, “Q2”, and “P2” at Baker are Air Blast type breakers. Air blast breakers are being replaced across the AEP system due to reliability concerns, intensive maintenance, and their tendency to catastrophically fail. During failures, sharps pieces of porcelain from their bushings are typically expelled, which, can be a potential safety hazard to field personnel. In addition, the ability to get spare parts for these breakers is becoming increasingly difficult. Circuit breakers “Q”, “Q2”, and “P2” have experienced 50, 40, and 114 fault operations compared to the manufacturer recommendation of 10.

The 345/138 kV transformer #200 (1974 vintage) is also being replaced due to dielectric breakdown (insulation), accessory damage (bushings/windings) and short circuit breakdown (due to amount of through faults).

Operational Flexibility and Efficiency

The additional 345 kV breaker is being installed to complete the “J” string and break up dissimilar zones of protection (bus and transformer), which could cause misoperations and over tripping.

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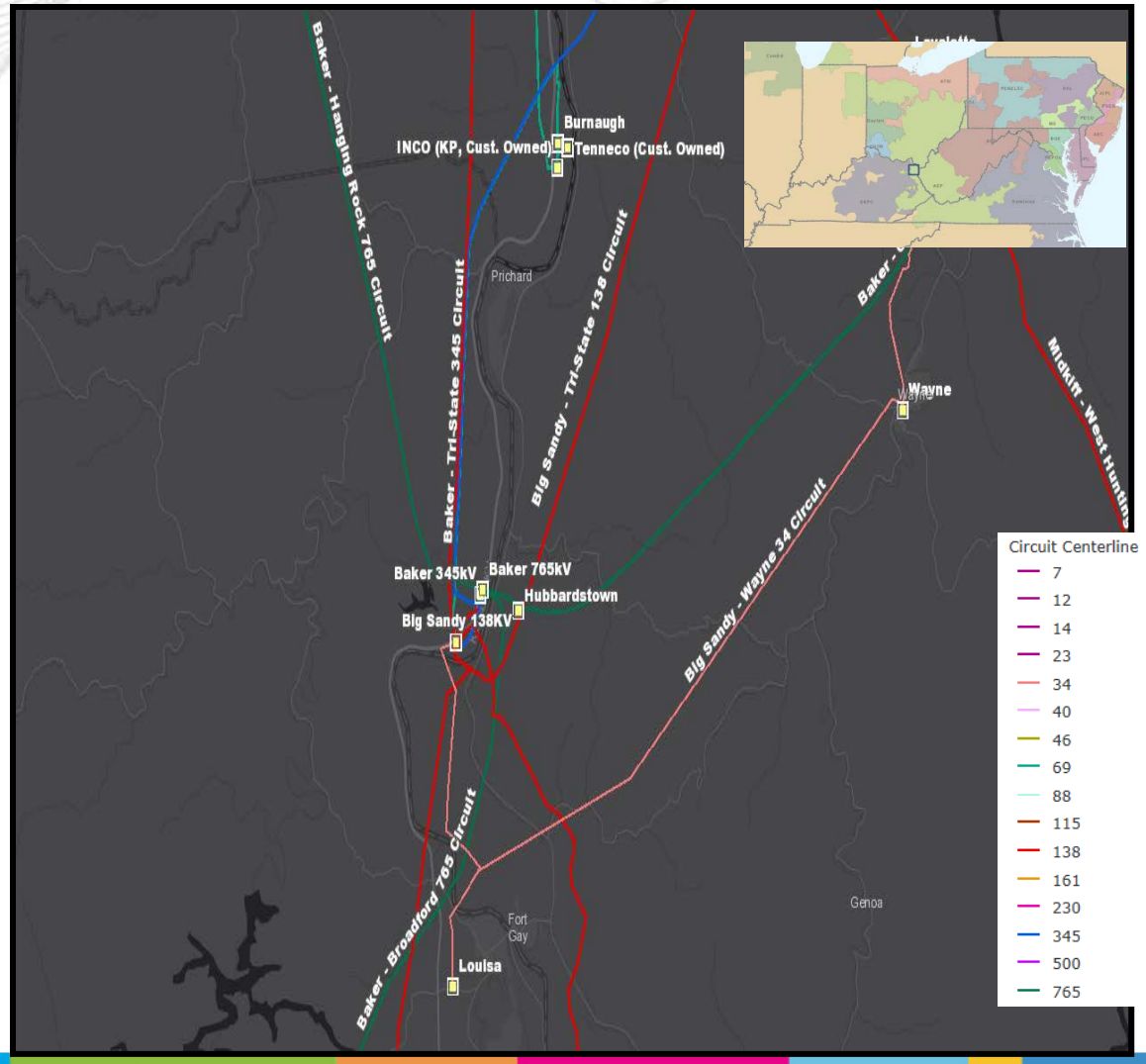

AEP Transmission Zone: Supplemental
Baker Station

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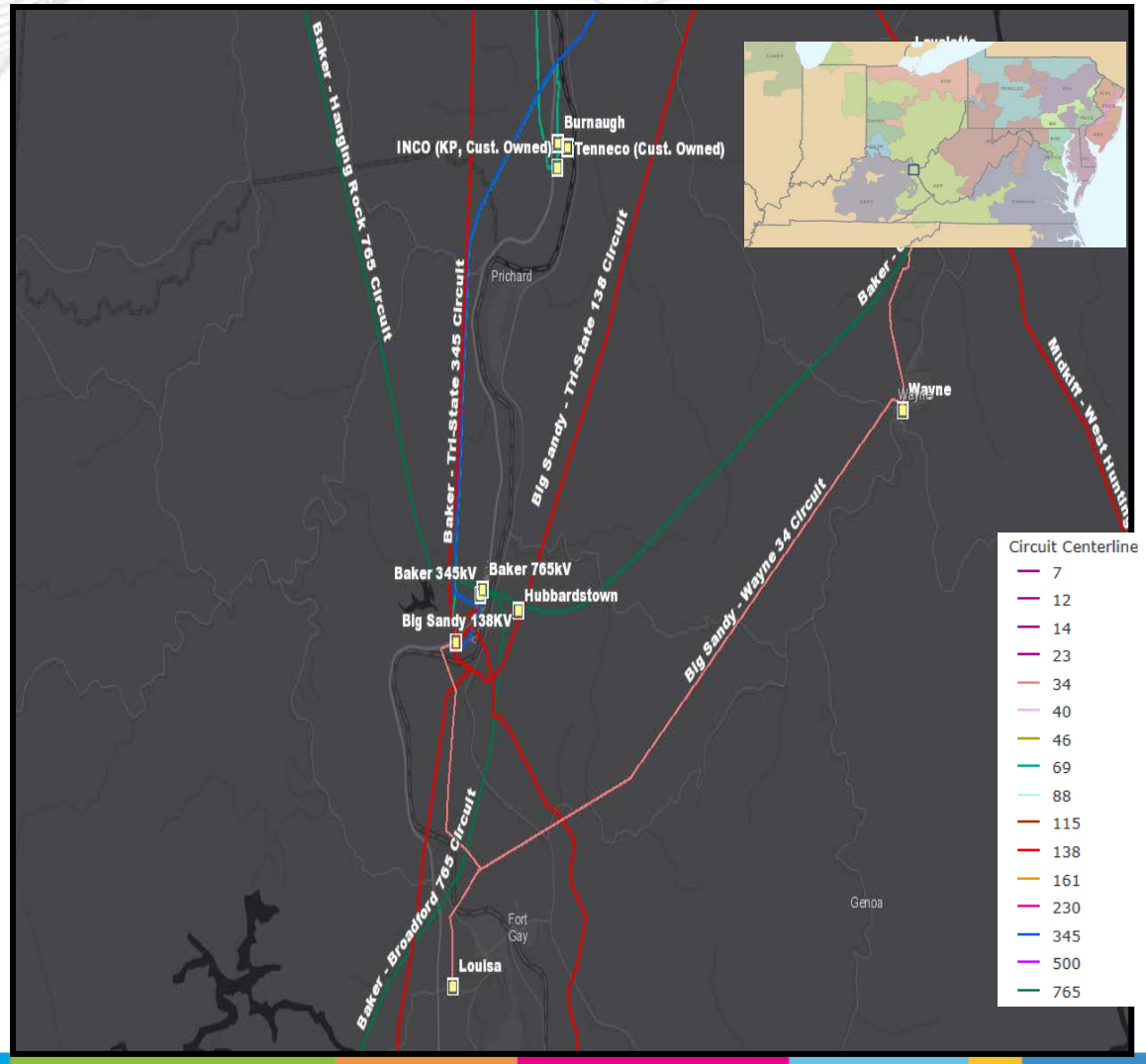
<u>Selected Solution</u>

At Baker Station, replace the existing 765 kV 3000 A 50 kA circuit breakers “Q”, “Q2”, and “P2” with new 765 kV 4000 A 63 kA breakers. Install a new 345 kV 3000 A 63 kA breaker to complete the “J” string. Replace the existing 600 MVA transformer #200 with a new 345/138 kV 675 MVA unit that will be relocated from the 345 kV bus #2 position to the newly created position between the existing breakers “J” and the newly installed breaker “J1”. (S1583)

Estimated Cost: $26.9M

Projected In-service: 12/1/2018

Project Status: Engineering



AEP Transmission Zone: Supplemental Dumont Breaker Addition

Supplemental Project
Previously Reviewed at 3/8/2018 TEAC

Problem Statement:

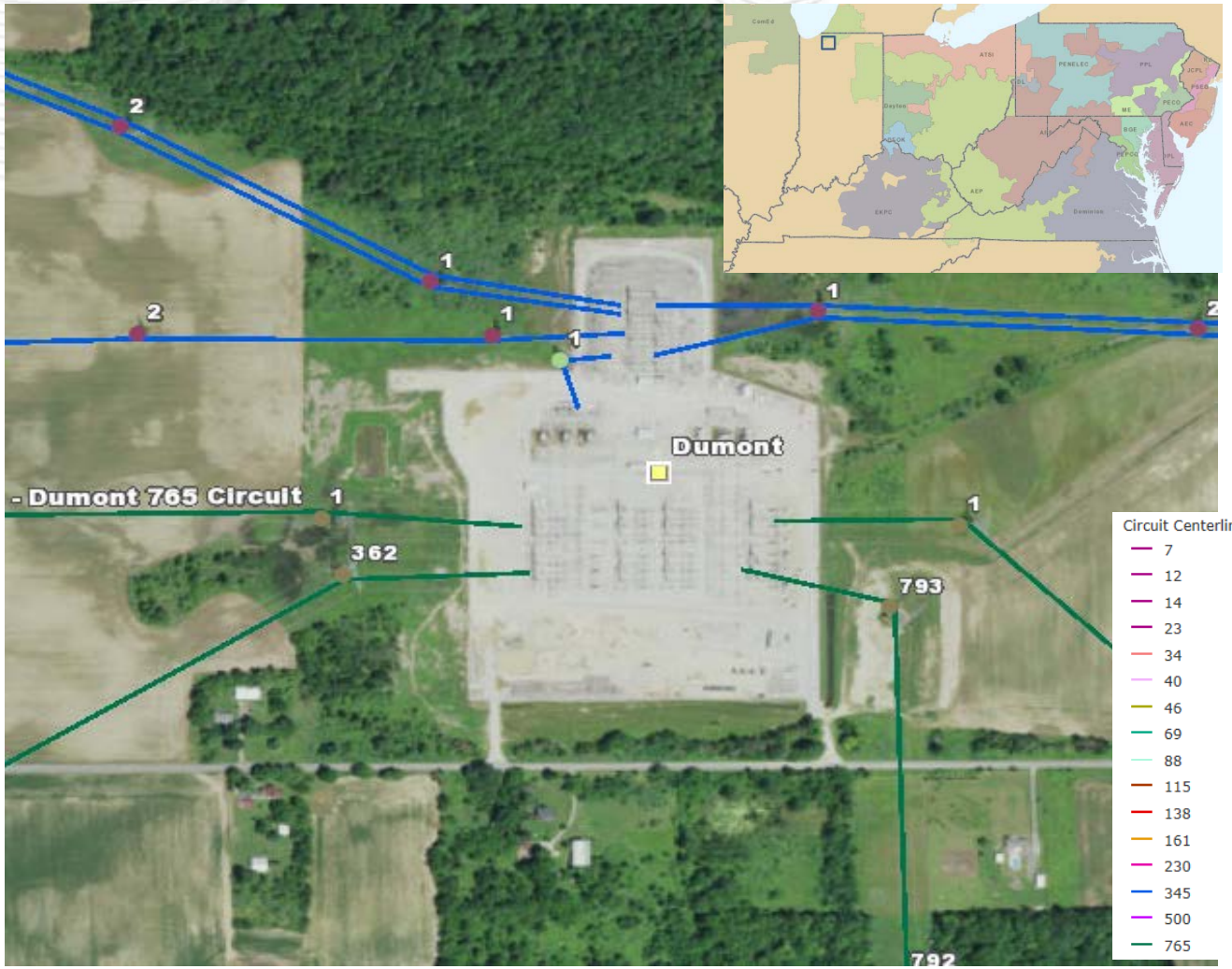
Equipment Material/Condition/Performance/Risk:
Due to the critical nature of EHV buses to AEP's system, having a 345kV line hard tapped on a bus is not acceptable. In addition to this, due to the high speed protections schemes associated with EHV systems and the challenges associated with keeping all three phases of the EHV MOAB's aligned, AEP standard is to use breakers for sectionalization in EHV voltage classes. For these reasons, two breakers will be installed at Dumont station.

Selected Solution
Install 2-345kV Type HVB 5000A 63kA breakers G and G1 at Dumont Station. (S1584)
Estimated Cost: $2.5M

Alternatives:
No viable cost-effective alternatives could be identified.

Projected In-service: 12/31/2020

Project Status: Engineering



Dominion Transmission Zone: Supplemental
National Welders Substation – Switch Replacement

Date Project Last Presented: 3/8/2018 TEAC

Problem Statement:

- National Welders substation 230kV Line #2049 switches have been identified for replacement based on age and operating issues.

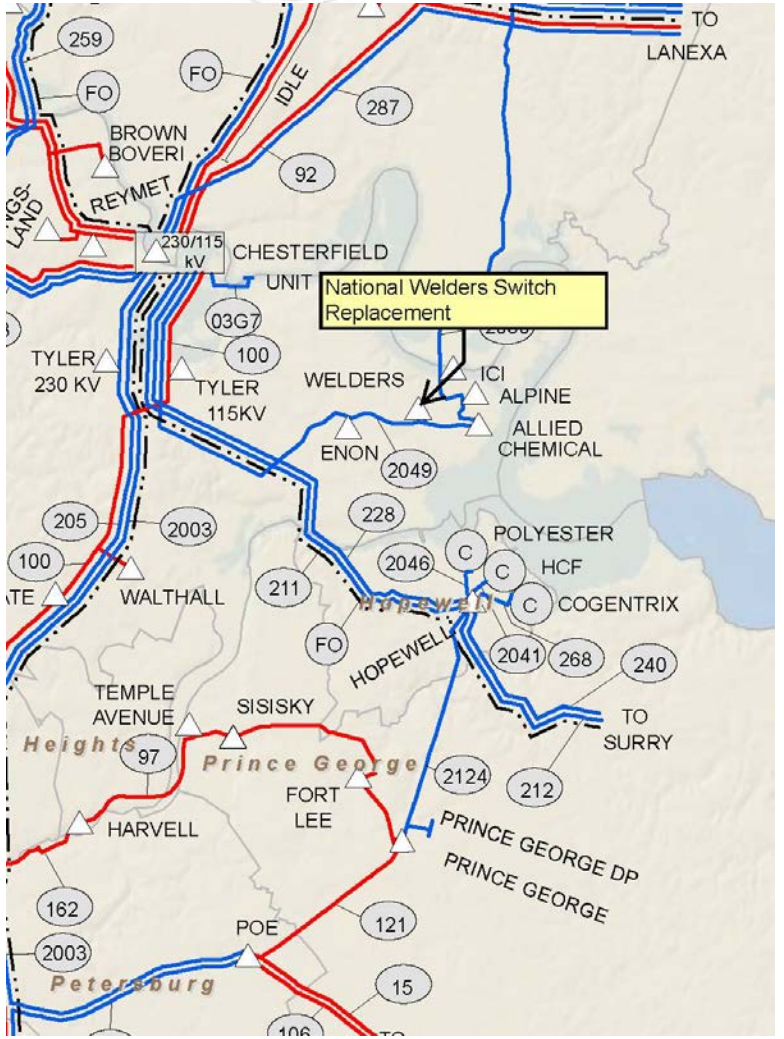
Selected Solution:

- Replace two 230kV Line #2049 2000A switches with 3000A switches. National Welders – Allied segment summer emergency ratings will be increased from 956MVA to 1047MVA. **(s1585)**

Estimated Project Cost: $360 K

Projected In-service Date: 10/30/2018

Project Status: Engineering



COLOR	VOLTAGE	TRANSMISSION LINE NUMBER
	500 KV.	500 thru 599
	230 KV.	200 thru 299 & 2000 thru 2099
	115 KV.	1 thru 199
	138 KV.	AS NOTED
	69 KV.	AS NOTED

Dominion Transmission Zone: Supplemental
Reeves Ave Substation – New 230kV Circuit Switcher

Date Project Last Presented: 3/8/2018 TEAC

Problem Statement:

- Dominion Distribution has identified the need to replace the existing 84MVA 115/34.5kV transformer #2 at Reeves Ave substation. The existing transformer's proximity to the Elizabeth River causes environmental risks that should be addressed. The location also inhibits maintenance activities. To resolve these issues Dominion Distribution proposes to move the load to the 230 kV within the existing station and install a 84MVA 230/34.5kV transformer.

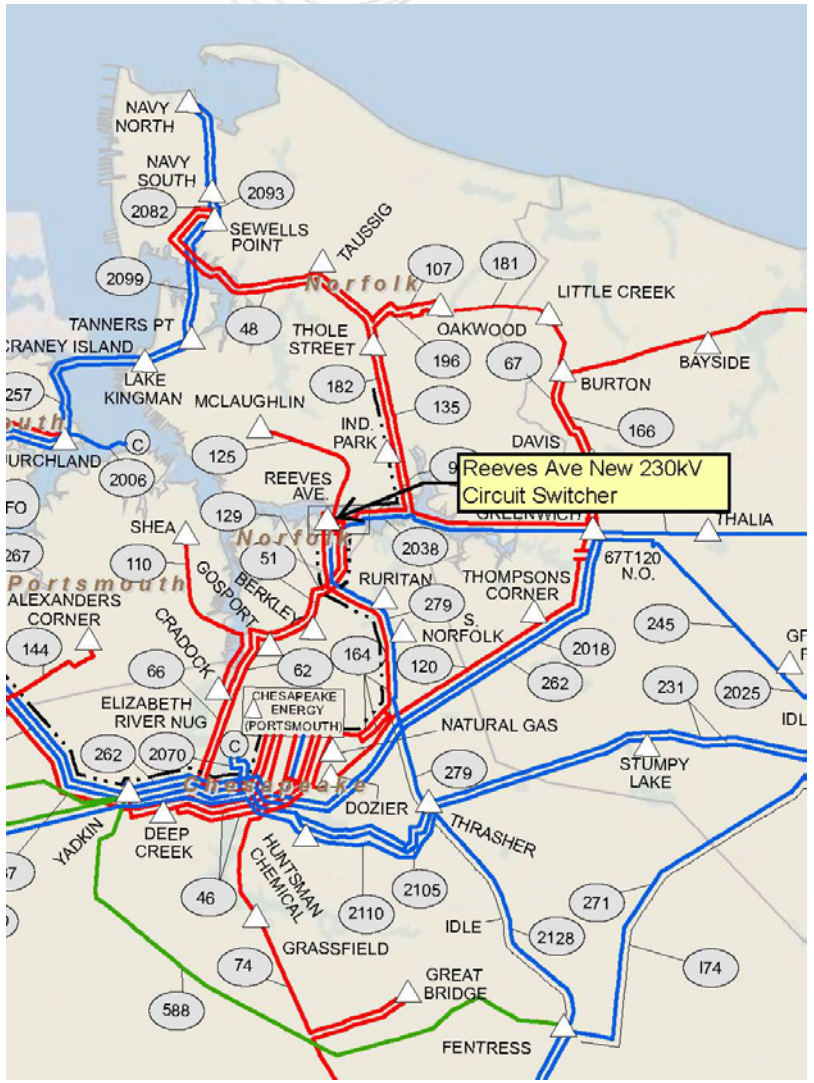
Selected Solution:

- Install a 230kV circuit switcher, high side switch and perform necessary bus work for the new transformer. **(s1586)**

Estimated Project Cost: $500 K

Projected In-service Date: 09/30/2018

Project Status: Conceptual



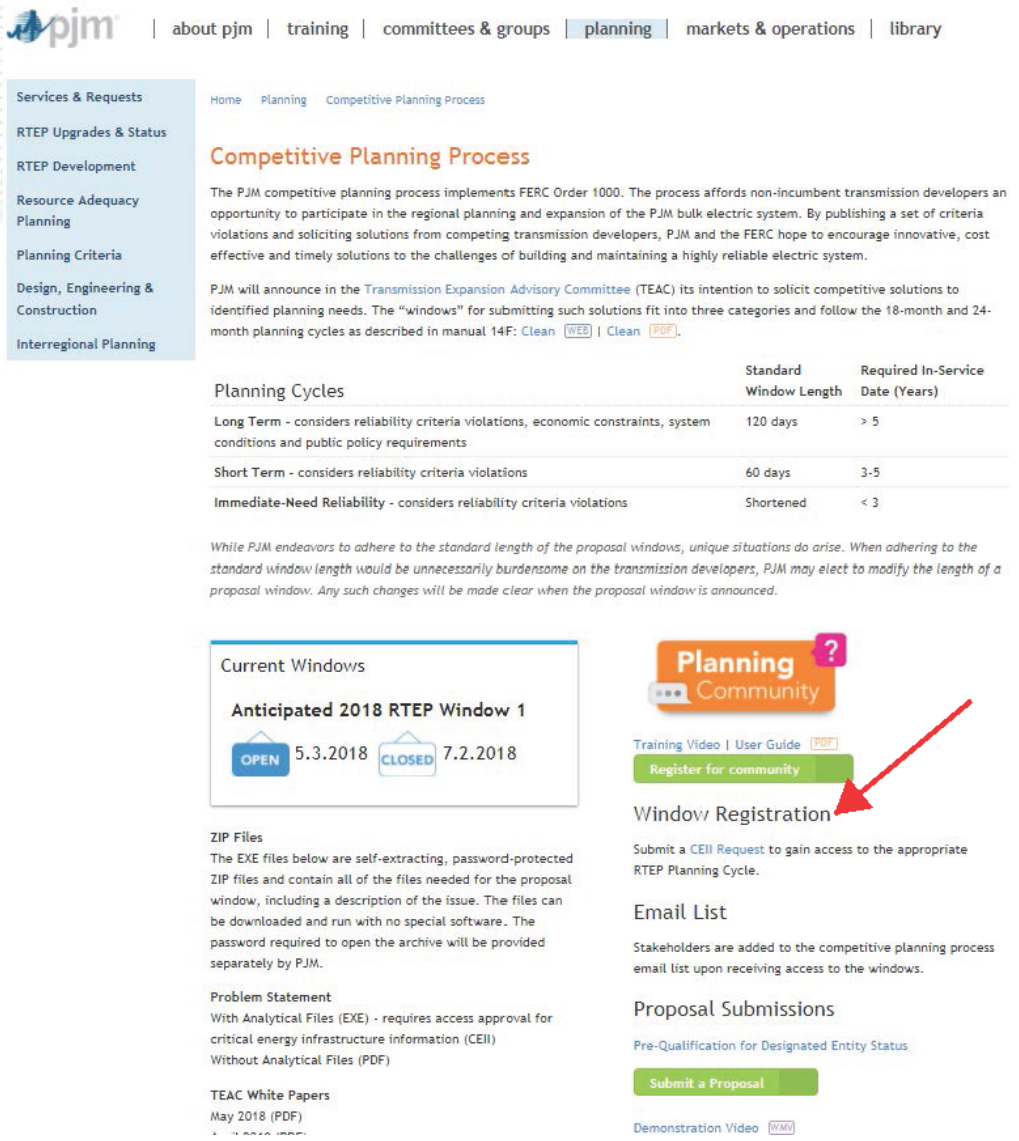
COLOR	VOLTAGE	TRANSMISSION LINE NUMBER
	500 KV.	500 thru 599
	230 KV.	200 thru 299 & 2000 thru 2099
	115 KV.	1 thru 199
	138 KV.	AS NOTED
	69 KV.	AS NOTED

2018 RTEP Proposal Window

Register for the 2018 RTEP window 1 at

http://www.pjm.com/planning/competitive-planning-process.aspx

Everyone must register to access the data regardless of prior participation in the PJM Competitive Process.



Upcoming TEAC Meetings

2018

- TEAC meetings are the following Thursdays in 2018
- 1/11, 2/8, 3/8, 4/5, **5/3, 6/7, 7/12, 8/9, 9/13, 10/11, 11/8, 12/13**

Questions?

Revision History

- V1 – 3/30/2018 – Original Slides Posted
- V2 – 4/02/2018 – Add Slides #10-12 (Delaware-Desoto Line project)
- V3 – 4/04/2018 – Remove Slides #13-15 (Hyatt Station project)
- V4 – 4/10/2018 –Slide #6, Corrected B2955 to B2995
- V5 – 4/12/2018 –Slide #5, Corrected Original/New Required IS Date from 12/1/2021 to 6/1/2021
- V6 – 4/16/2018 –Slide #5, Corrected Original/New Required IS Date from 6/1/2021 to 6/1/2018