



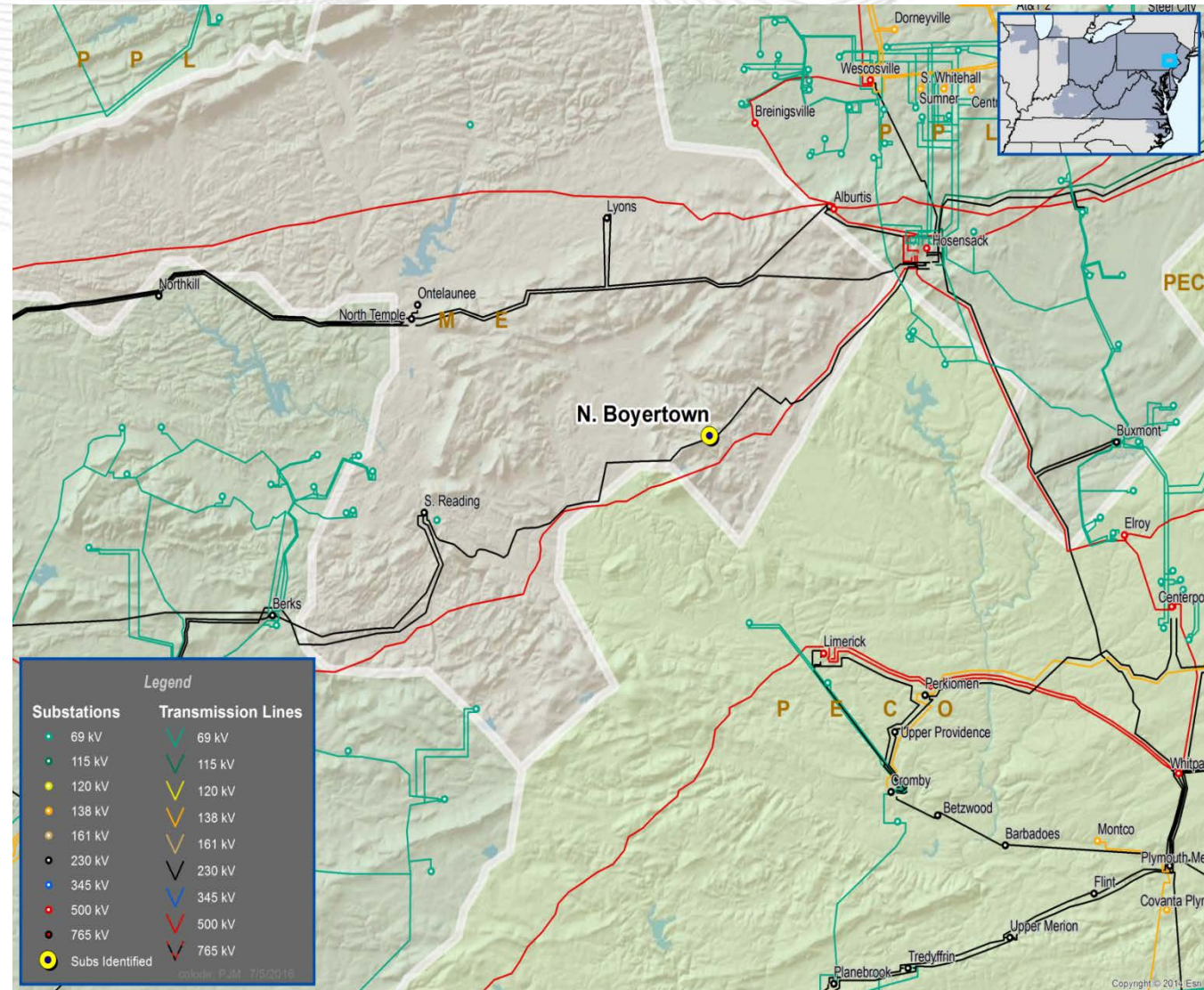
Sub Regional RTEP Committee Mid-Atlantic

July 26, 2016

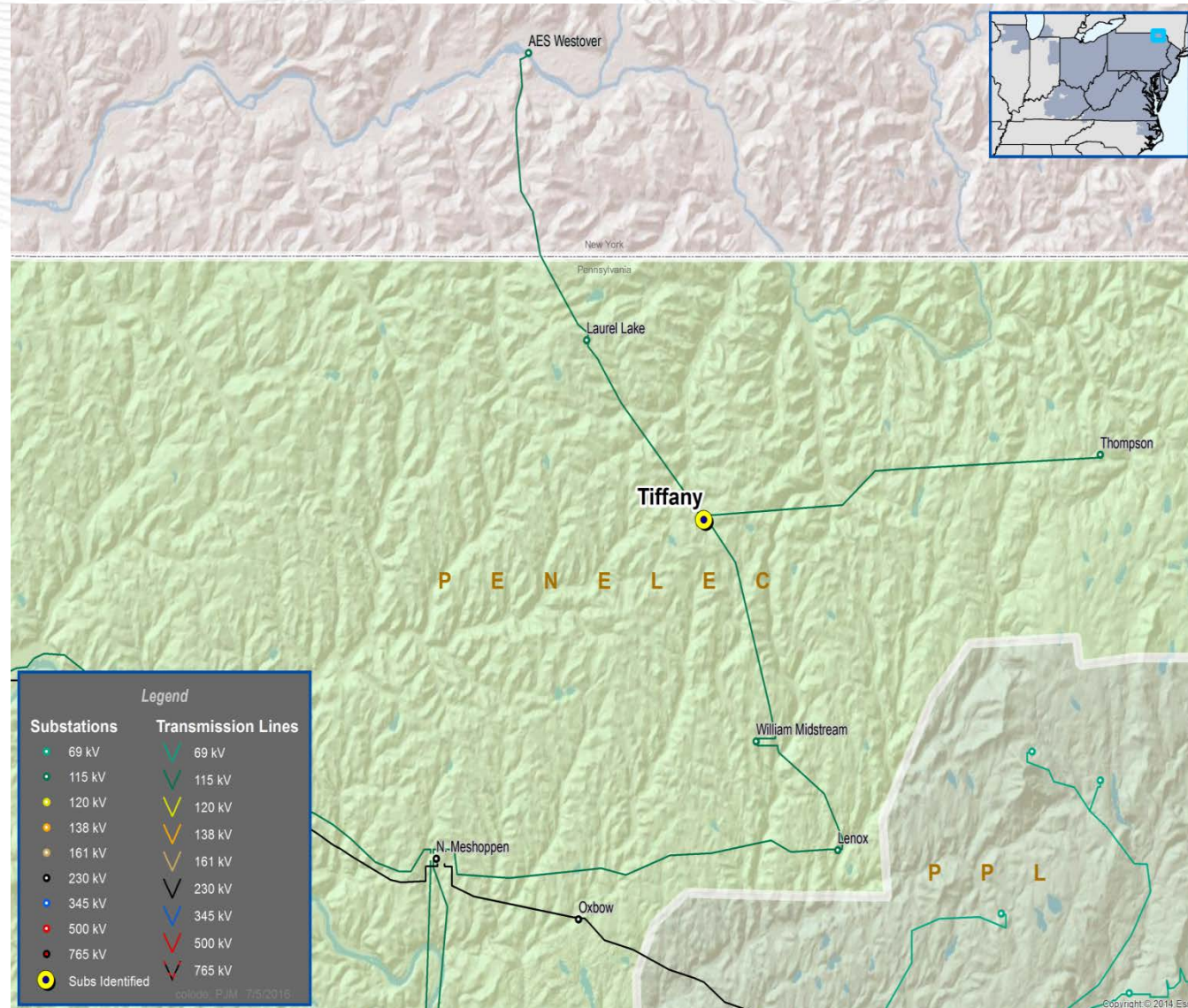


Reliability Analysis Update

- **N-1 First Energy Planning Criteria (FERC Form 715):**
- The North Boyertown – West Boyertown 69 kV is overloaded for a single contingency outage of the North Boyertown – Cabot Tap 69 kV circuit.
- **Immediate Need:**
 - Due to the time – sensitive nature and current issue this problem presents, MetEd (Local TO) will be the Designated Entity
- **Alternatives Considered:**
 - Do to the immediate need of the project, no alternative solution was considered.
- **Proposed Solution:**
 - Replace relay at West Boyertown 69 kV station - on the West Boyertown to North Boyertown 69 kV circuit. (B2749)
- **Estimated Project Cost:**
\$ 0.05 M
- **Projected IS Date:**
6/1/2017



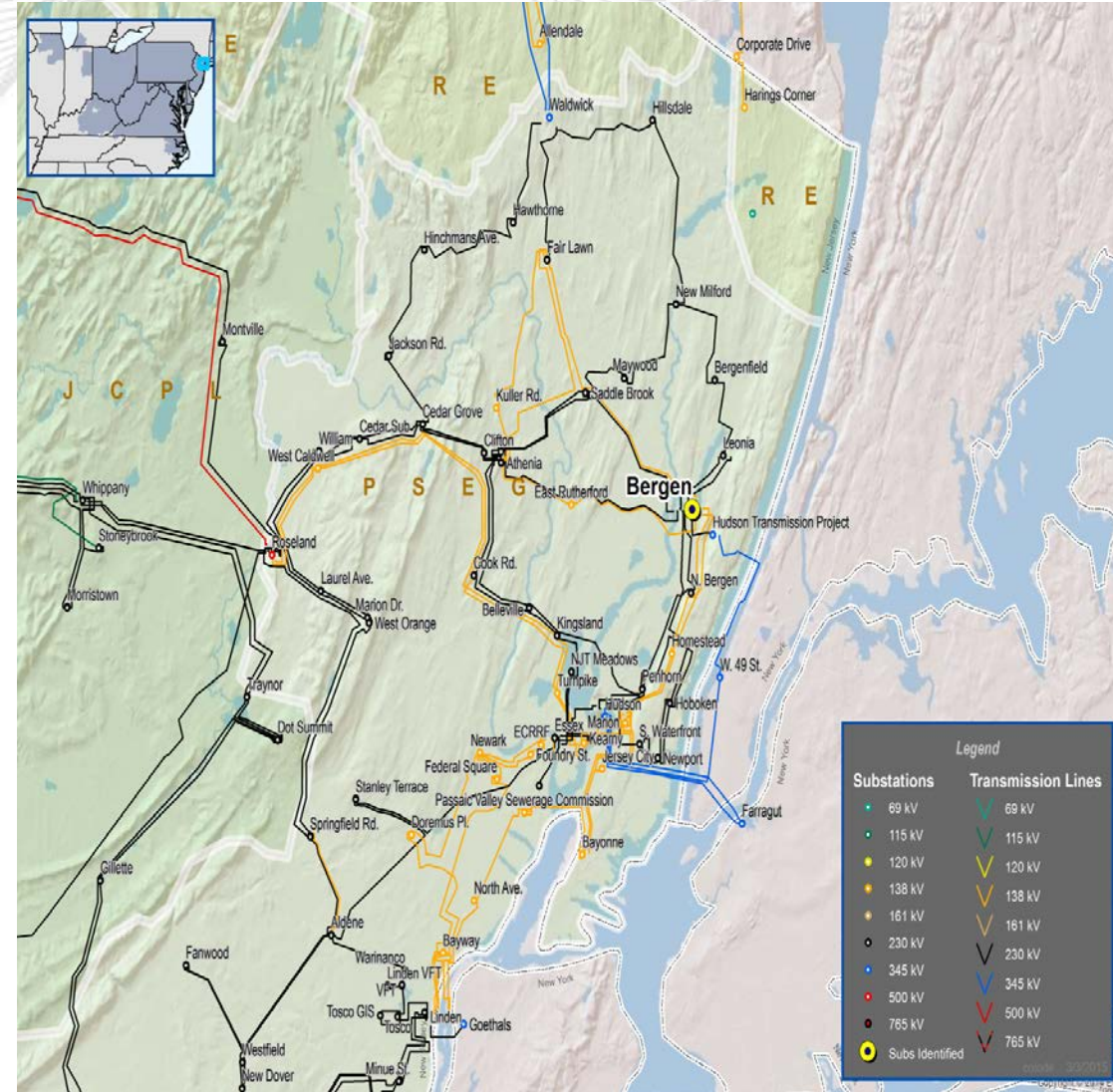
- **N-1 First Energy Planning Criteria (FERC Form 715):**
- Voltage violation in the Tiffany 115 kV vicinity for several contingencies.
- **Immediate Need:**
 - Due to the time – sensitive nature and current issue this problem presents, PenElec (Local TO) will be the Designated Entity
- **Alternatives Considered:**
 - Do to the immediate need of the project, no alternative solution was considered.
- **Proposed Solution:**
 - Install 2 - 28 MVAR capacitors at Tiffany 115 kV substation. (B2748)
- **Estimated Project Cost:**
\$ 2.5 M
- **Projected IS Date:**
6/1/2017



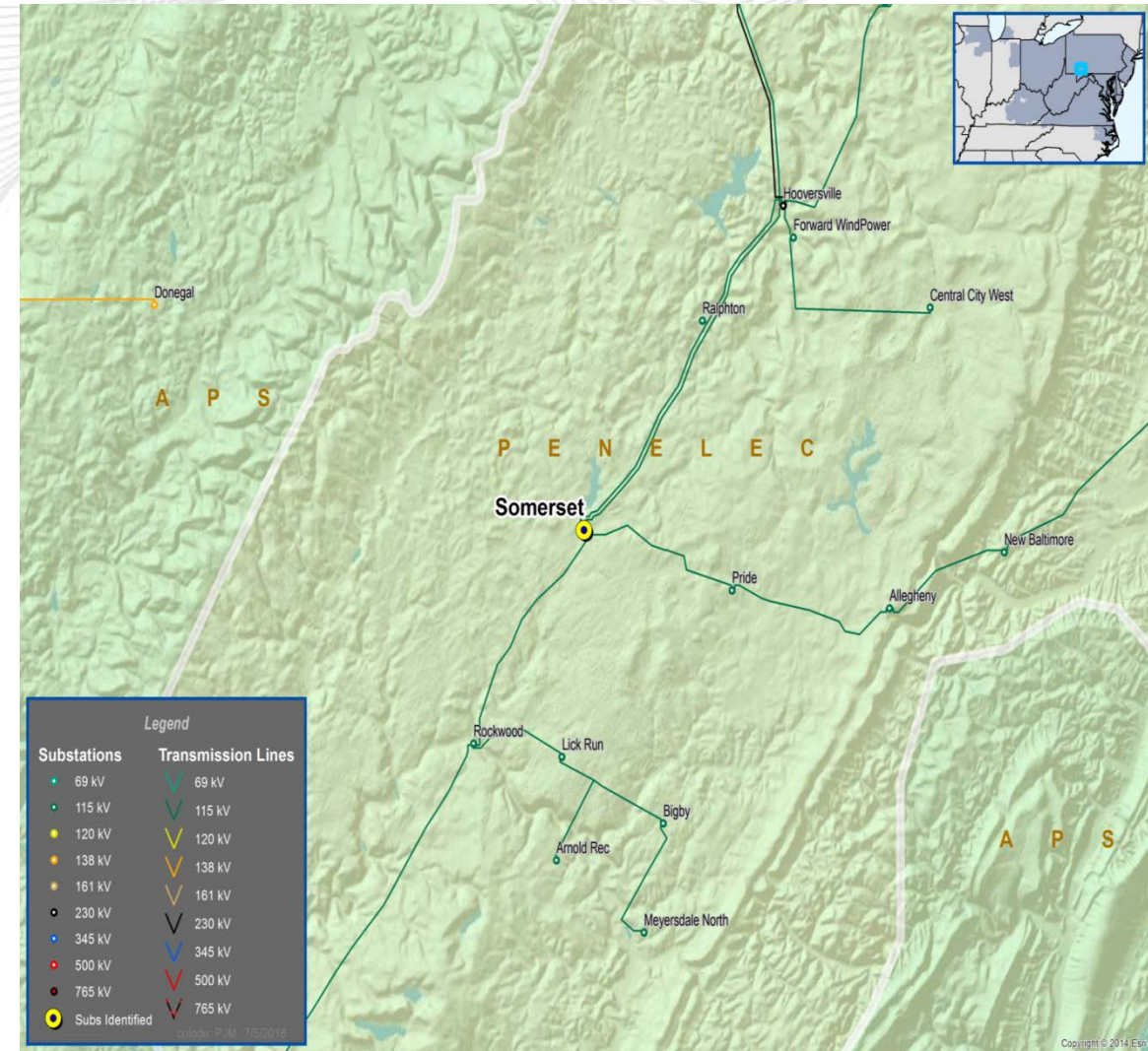


Supplemental Projects

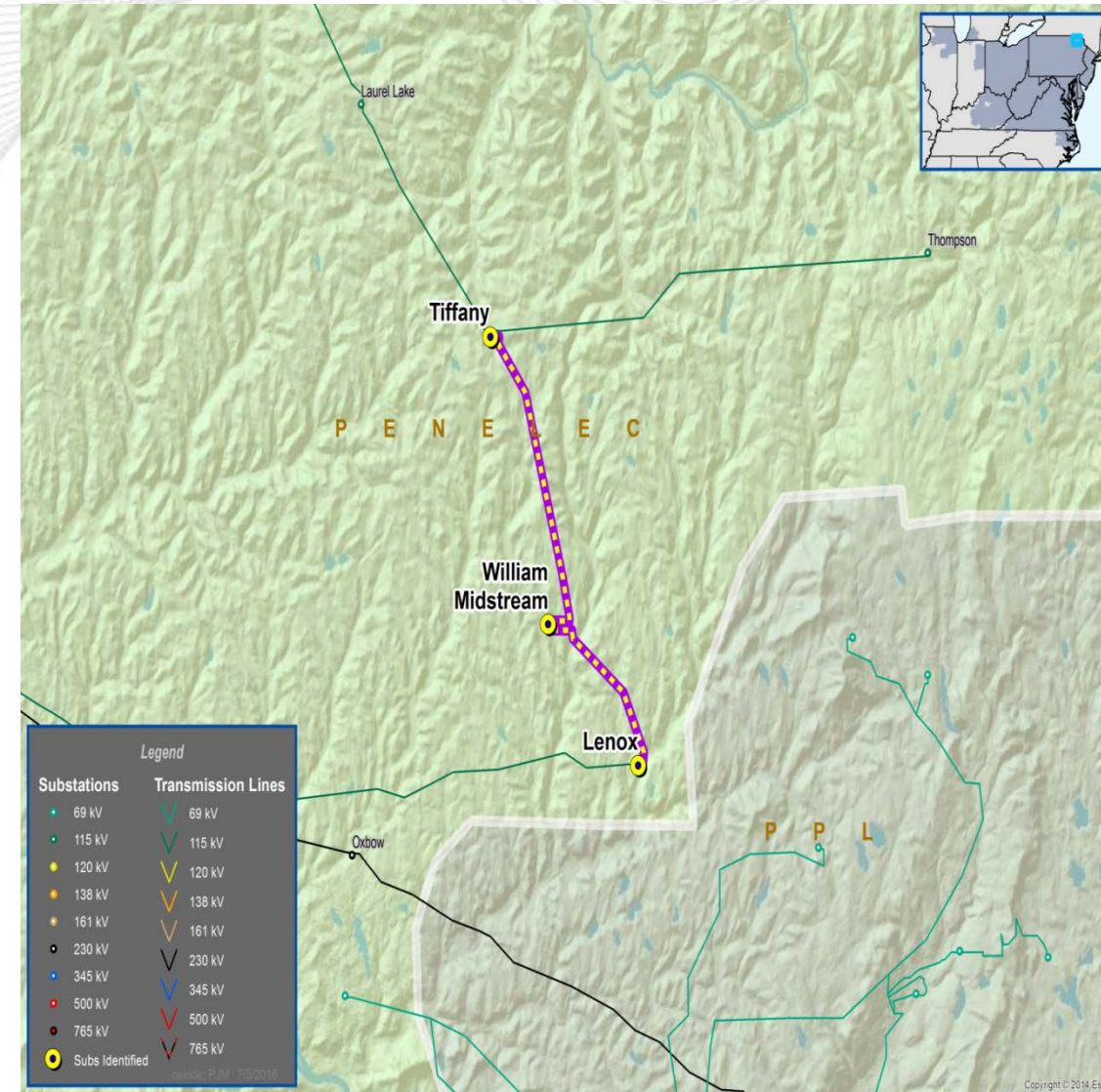
- **Problem Statement**
 - There is currently a baseline upgrade to replace the Bergen 40P and 90P breakers owned by PSEG Fossil, and PSEG Fossil requested to move the breakers from PSEG Power Bergen 138 kV station to Bergen generation station.
- **Proposed Solution**
 - Relocate the Bergen 138kV '40P' and '90P' breakers to the Bergen generation station and install additional one 138 kV breaker (S0879.1).
- **Alternatives:**
 - Due to the nature of the project alternative was not considered
- **Estimated Project Cost:**
\$ 6.155 M
- **Projected IS Date:**
12/31/2017



- Problem Statement
 - Somerset REC requested to connect at the High Point 115 kV substation.
- Proposed Solution
 - Install adjoining bus conductor, 1-115 kV circuit breaker and 1-115 kV disconnect switch at High Point 115 kV substation, to provide service to a customer (Somerset REC).(S1144)
- Alternatives:
 - Due to the nature of the project alternative was not considered
- Estimated Project Cost:
\$ 0.2 M
- Projected IS Date:
12/31/2016



- Problem Statement
 - Williams Midstream - Potter Facility requested to connect on the Lennox - Tiffany 115 kV circuit .
- Proposed Solution
 - Tap the Lennox - Tiffany 115 kV circuit and install all required equipments to provide a service to a customer (Williams Midstream - Potter Facility).(S1145)
- Alternatives:
 - Due to the nature of the project alternative was not considered
- Estimated Project Cost:
\$ 0.2 M
- Projected IS Date:
10/30/2016





PPL Transmission Zone

Face Rock – Five Forks (8.5 mile) 115kV Line Reconductor

Problem Statement:

- The majority of the transmission structures on this 6-conductor line are in excess of 100 years old. The existing lattice steel towers are experiencing structure corrosion, hardware deterioration
- The aluminum conductor is nearly 100 years old with multiple signs of corrosion, over 300 known tensions splices, and known conductor annealing. All tensions splices have exceeded the 40-60 expected service life for conductor tension connectors, with actual failures in recent years.

Proposed Solution:

- Evaluate all lattice steel towers for condition and determine structure member repair and remediation.
- Reconductor the PPL portion (8.5 miles) of the tie-line as a 3-conductor line with a modern high capacity conductor. BGE plans to rebuild their portion of the line within the next 5 years. (S1154)

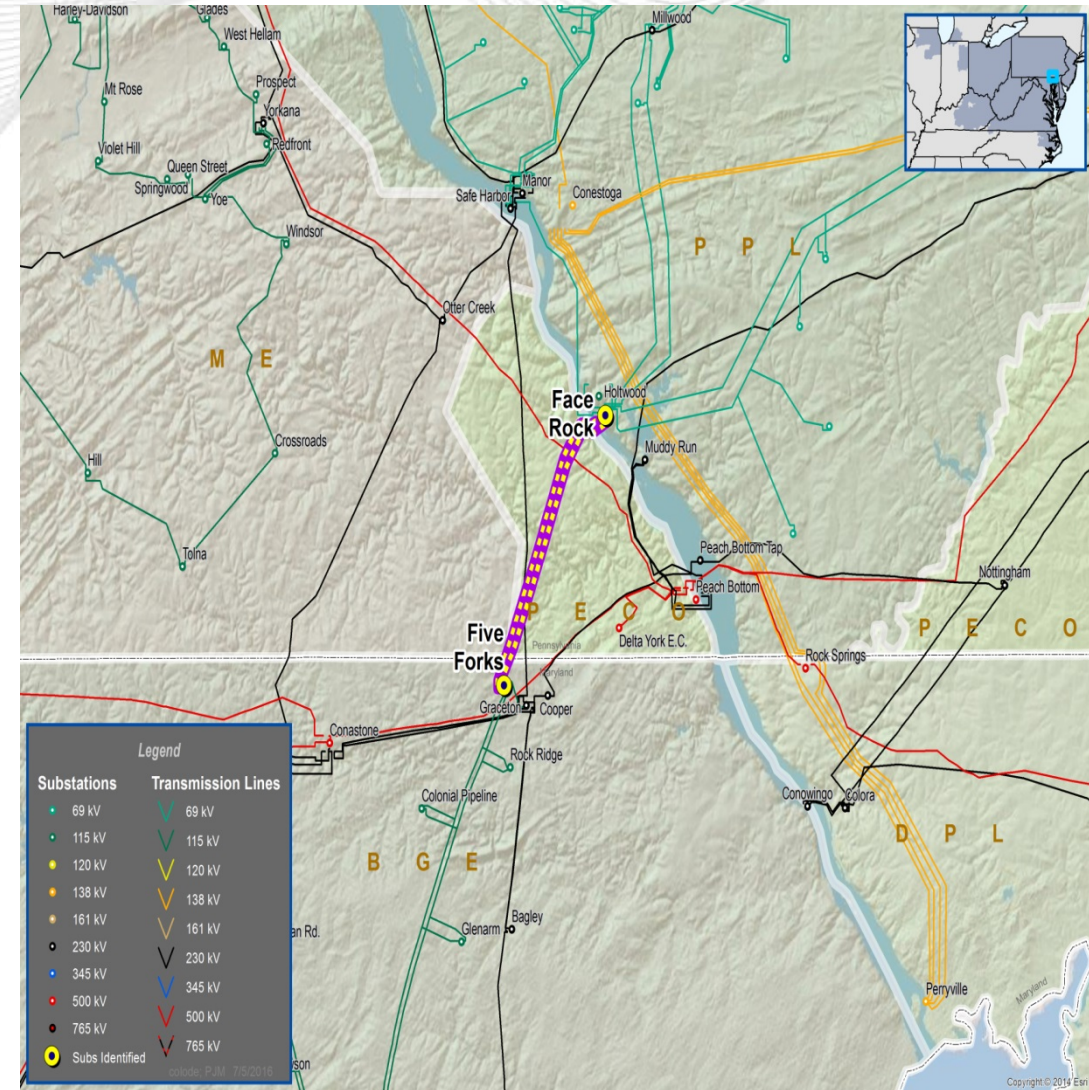
Alternatives:

- Abandon line: This is not viable because the Face Rock-Five Forks 115kV line serves as a tie line with BGE. This line is also needed as a networked outlet for the Holtwood Hydro Generation plant.
- Shunt every existing splice on all six conductors. Due to the brittle condition of the line, this is a stop-gap measure until a reconductor project can be executed.

Estimated Cost: \$10.8 M

Scheduled IS Date: 12/31/2019

Project Status: Project Development and Engineering



Remove Two (2) 7.2 MVAR, 69kV Cap Banks at Wagners 69-12kV Sub

Problem Statement:

- The controllers for both (2) 69kV, 7.2MVAR capacitor banks at Wagners 69-12kV substation have failed and remain at the substation without use.
- These capacitor banks are no longer needed for 69 or 12kV voltage control in today's system configuration.
- Allowing failed cap banks to remain in yard, in engineering drawings, and in system models can be the cause of analysis errors which could potentially lead to unnecessary spend, voltage violations, and undesired MVAR flow on the system.
- If the failed equipment was to be energized for some reason, this could also cause safety concerns.

Proposed Solution:

- Remove both 69kV capacitor banks and their associated equipment
- Update any associated system drawings and models.
- Pulverize concrete capacitor bank pads and resurface pads to be level with ground, eliminating tripping hazard in the yard. (S1155)

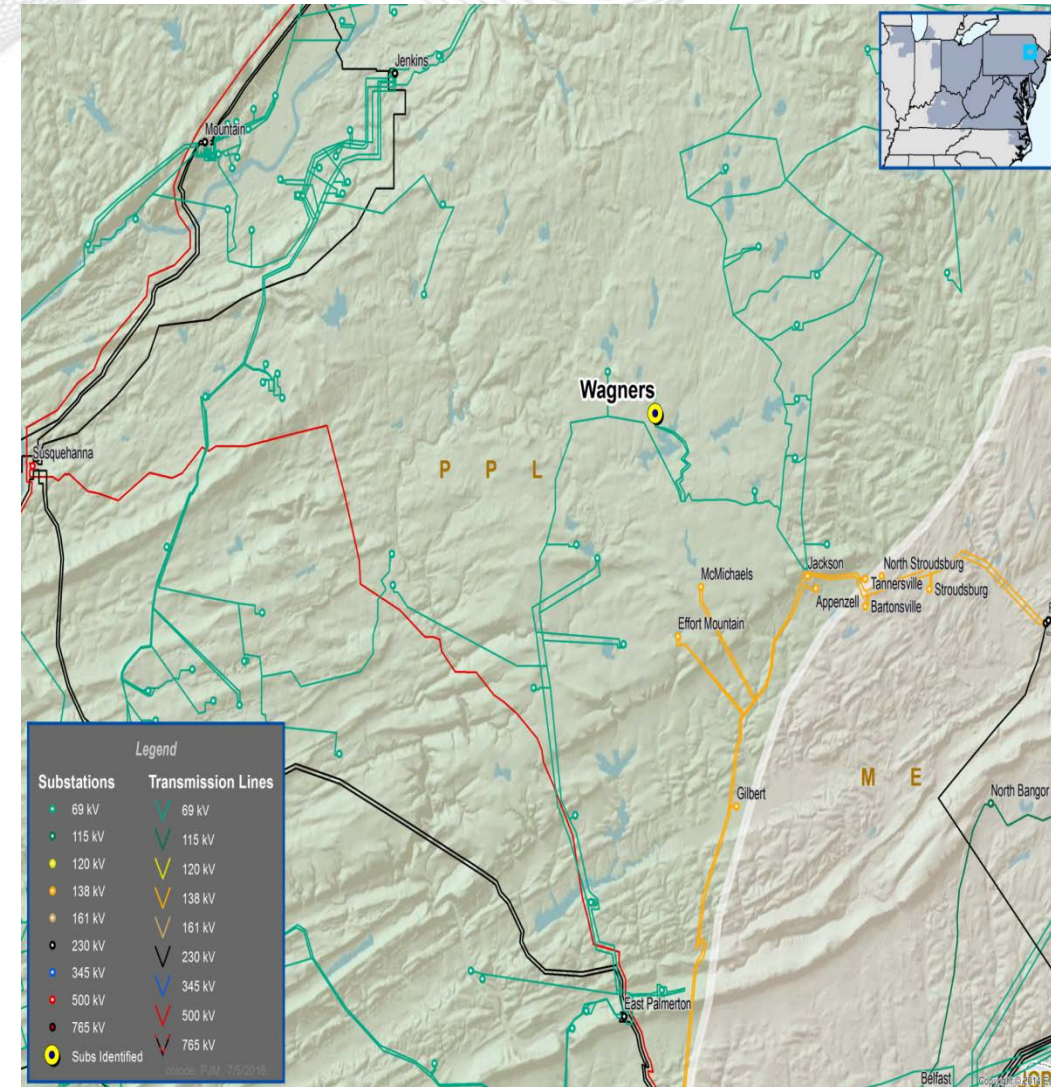
Alternatives:

- Replace both 69kV capacitor banks. This alternative was eliminated as the capacitors are no longer needed to control voltage. New capacitors would not ever be used and would just be a maintenance expense.

Estimated Cost: \$0.053 M

Scheduled IS Date: 12/31/2016

Project Status: Asset Planning



Install 43 MVAR 69 kV Cap Bank at Breinigsville substation

Problem Statement:

- Breinigsville 500-138-69 kV substation has excess MVAR flow from 500 kV to 69 kV system to compensate for the inductive load in the area.

Proposed Solution:

- Install a 43 MVAR cap bank at Breinigsville 69kV bus. (S1153)

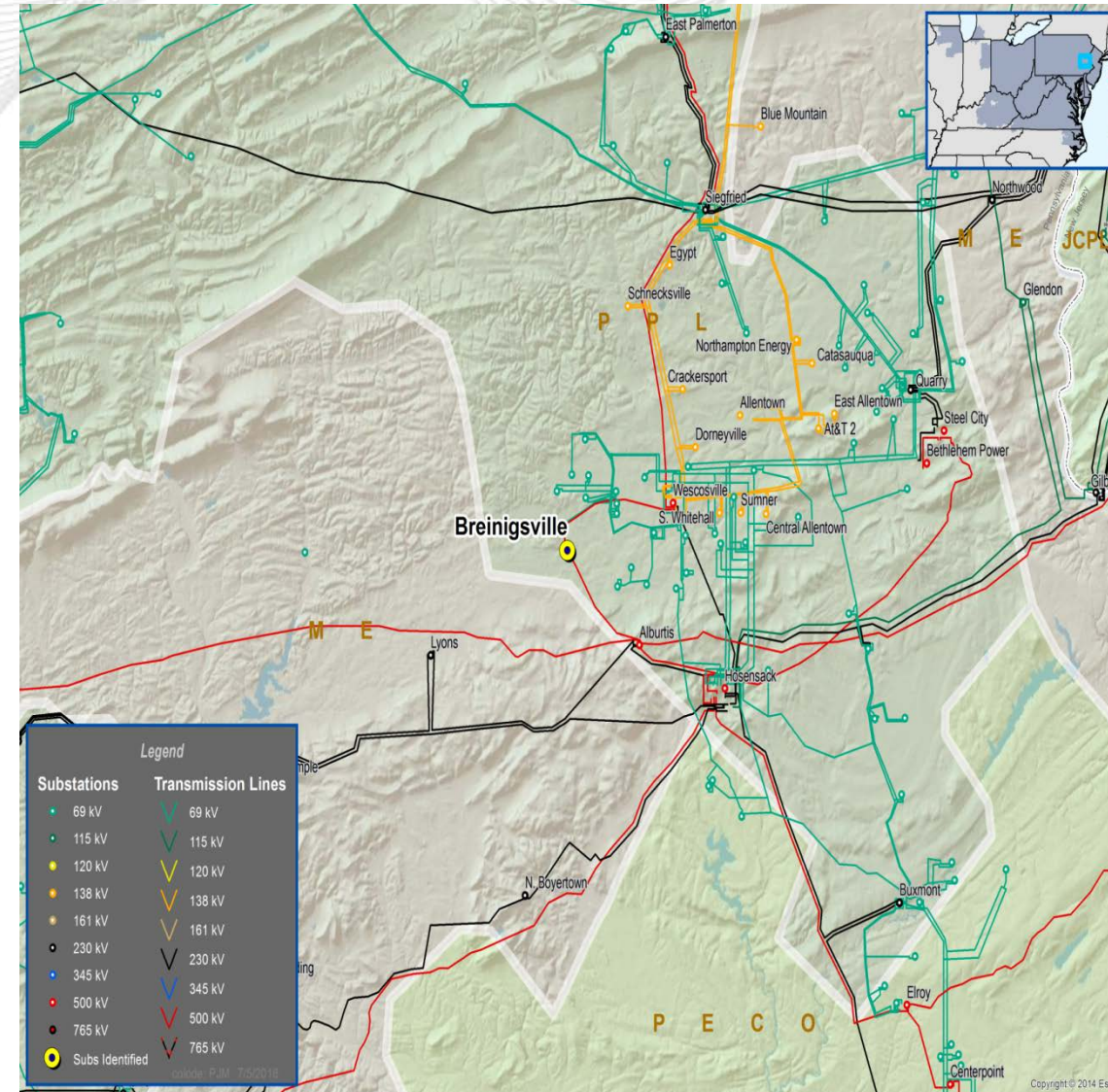
Alternatives:

- No other viable solutions. Installing Cap bank is the cost effective solution to address cross MVAR flow from 500 kV to 69 kV system.

Estimated Cost: \$1.5 M

Scheduled IS Date: 11/30/2019

Project Status: Asset Planning



Brunner Island 230kV Line Reactor Removal

Problem Statement:

- This 2% line reactor on the Brunner Island-W.Hempfield 230kV line located that the Brunner Island terminal is no longer needed to control flow on this line due to topology changes in the area.

Proposed Solution:

- At Brunner Island Substation, remove the 230kV reactor and 230kV bypass circuit breaker on the Brunner Island-W.Hempfield 230kV line. (S1152)

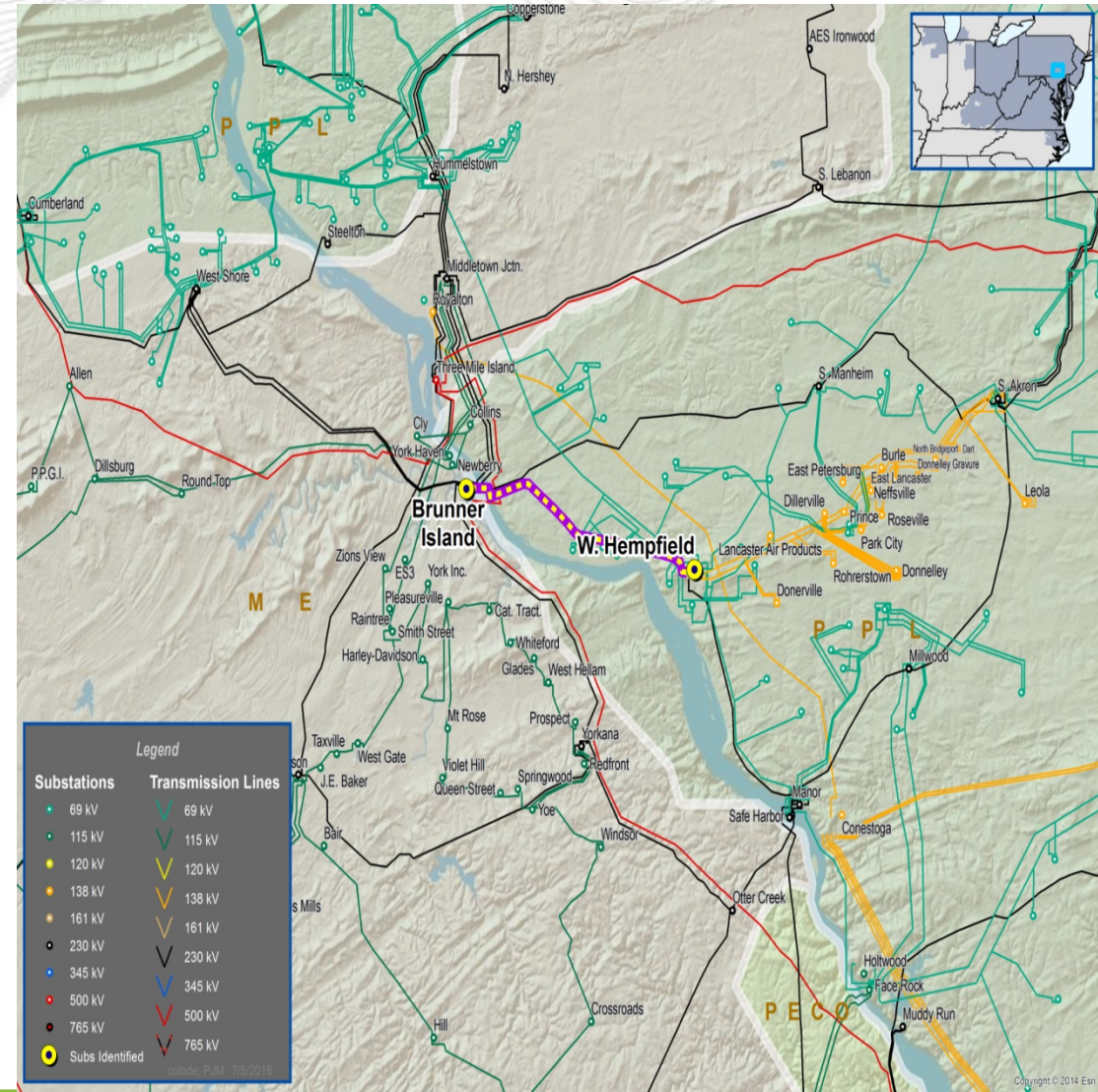
Alternatives:

- No viable alternatives as the series reactor is no longer required.

Estimated Cost: \$93 K

Scheduled IS Date: 12/1/2019

Project Status: Asset Planning



Upgrade West Orange Switching Station Light and Power System

Problem Statement:

- The existing 440 VAC switchgear at West Orange is vintage equipment, comprised of two open air copper bus sections, two oil-filled main circuit breakers with associated open air disconnect switches, and one open air bus tie disconnect switch.
- There are operational, reliability and safety issues due to the configuration and condition assessment of this switchgear.

Proposed Solution:

- Upgrade the 440 V feeds and SL&P transformers at West Orange station. (S1136)

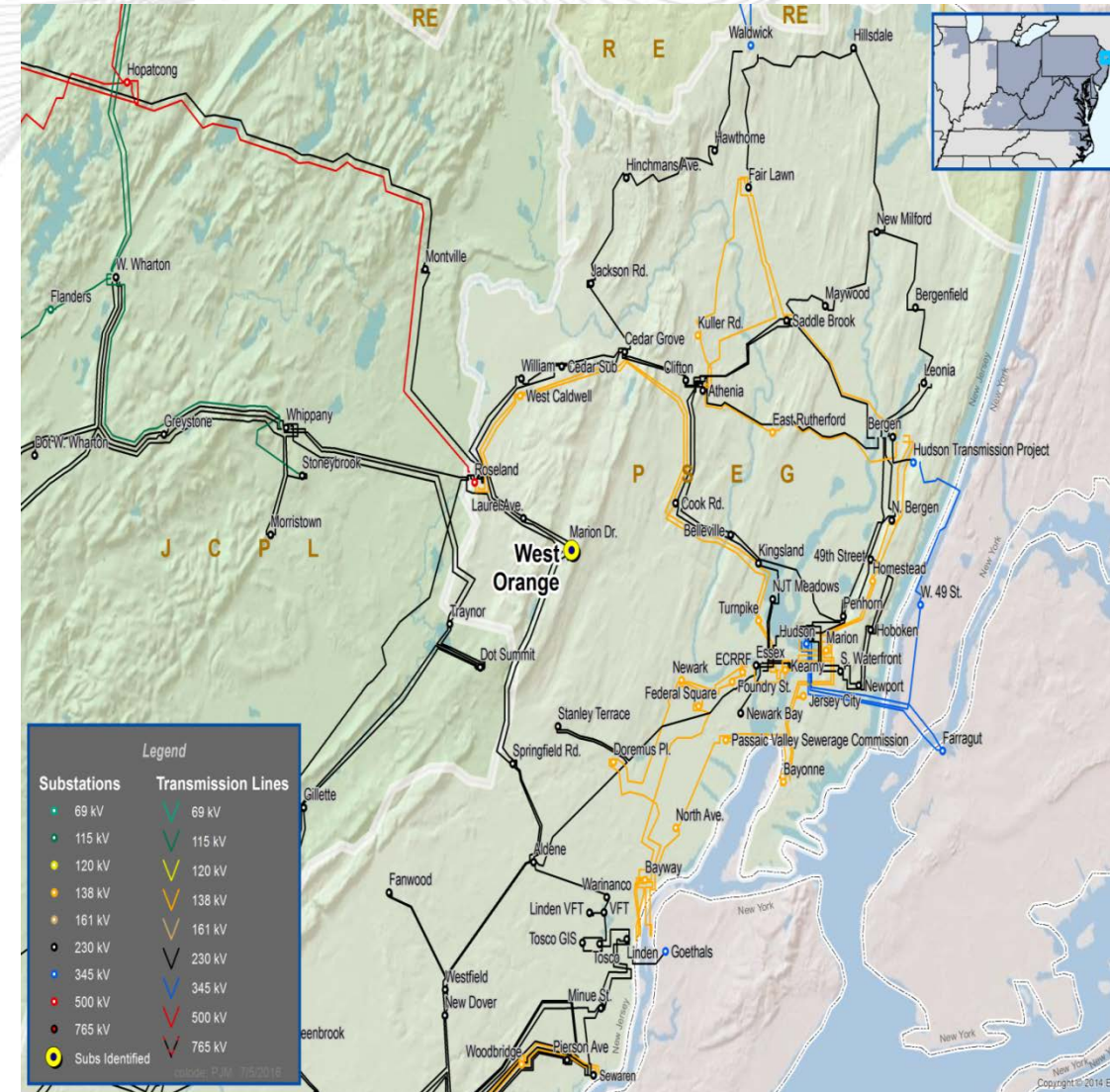
Alternatives:

- Continue with the existing design which indicates that this bus tie is normally open. However, in practice the bus tie is always kept closed.
- This will result in paralleling of two sources (at 230kV CH LV Switchgear) through 440V bus and this is not a desired solution for operating conditions.

Estimated Cost: \$2.5 M

Scheduled IS Date: 12/31/2016

Project Status: Project Development and Engineering



Install Penhorn T-1 Transformer Monitoring

Problem Statement:

- PSE&G uses TMP to pro-actively monitor transformers by providing Asset Management team real-time data on our largest, most expensive asset. The transformer monitoring project (TMP) provides instantaneous load data, transformer oil temperatures and uses IEEE calculations to determine cooling performance.

Proposed Solution:

- Install microprocessor relays, transformer equipments, SCADA systems and alarm panels for Penhorn T1 230/13 kV transformer . (S1137)
- PSE&G initiates a real time transformer health condition monitoring program for 230 kV transformers including Penhorn 230/13 T1 transformer. It will enhance existing transformer condition algorithms and provide improved load management.

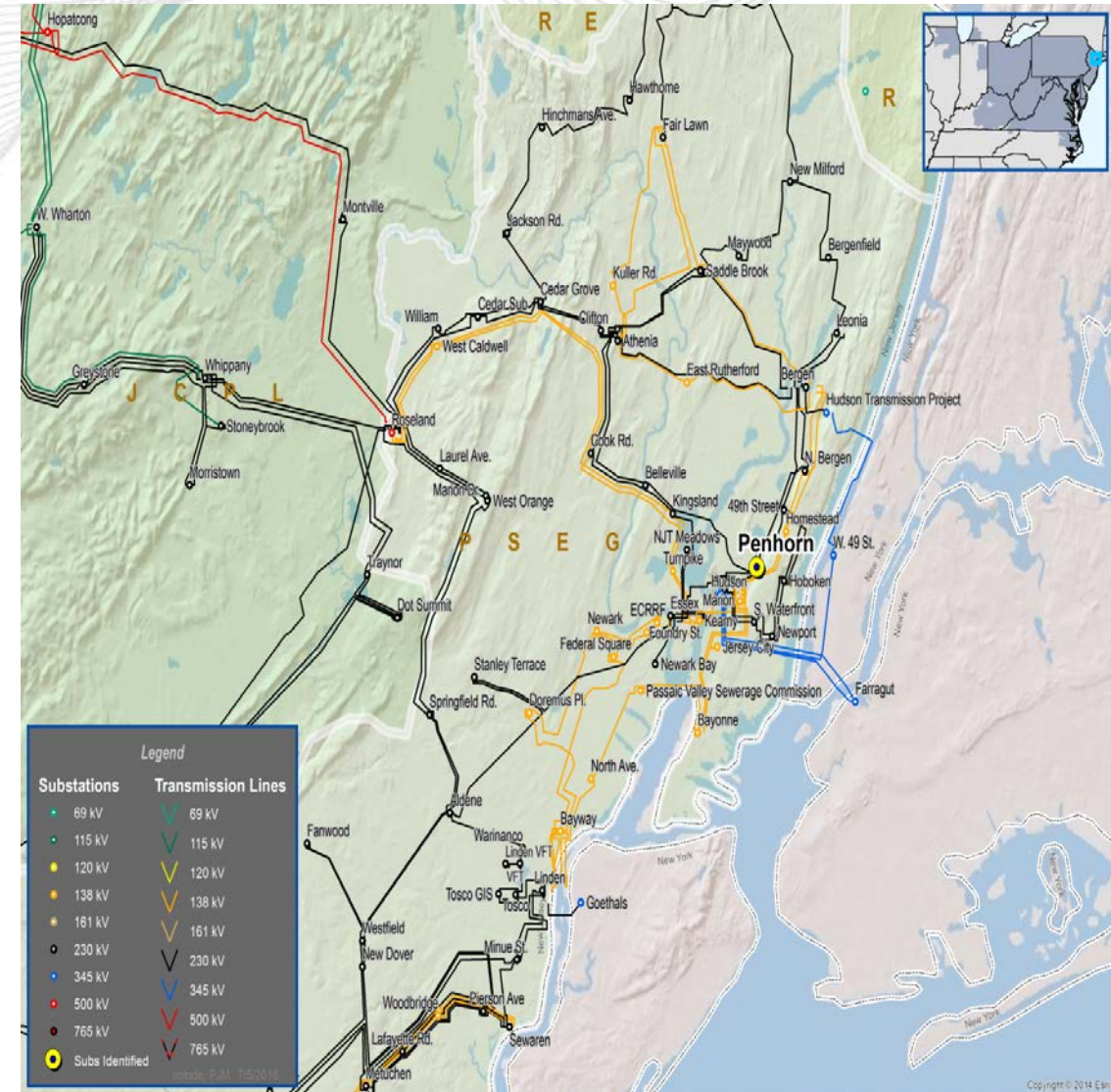
Alternatives:

- Utilize periodic maintenance instead of this real time transformer health monitoring and replace expensive high voltage, old transformer when it fails.

Estimated Cost: \$ 1.7M

Scheduled IS Date: 12/31/2016

Project Status: Project Development and Engineering



Replace Lake Nelson T-1 Transformer

Problem Statement:

- This unit is being replaced because of multiple oil leaks on top, and on the drain valves
- To repair the leaks and add transformer monitoring (SEL-2414) is very expensive

Proposed Solution:

- Replace Lake Nelson 230/13 kV T-1 transformer. (S1138)

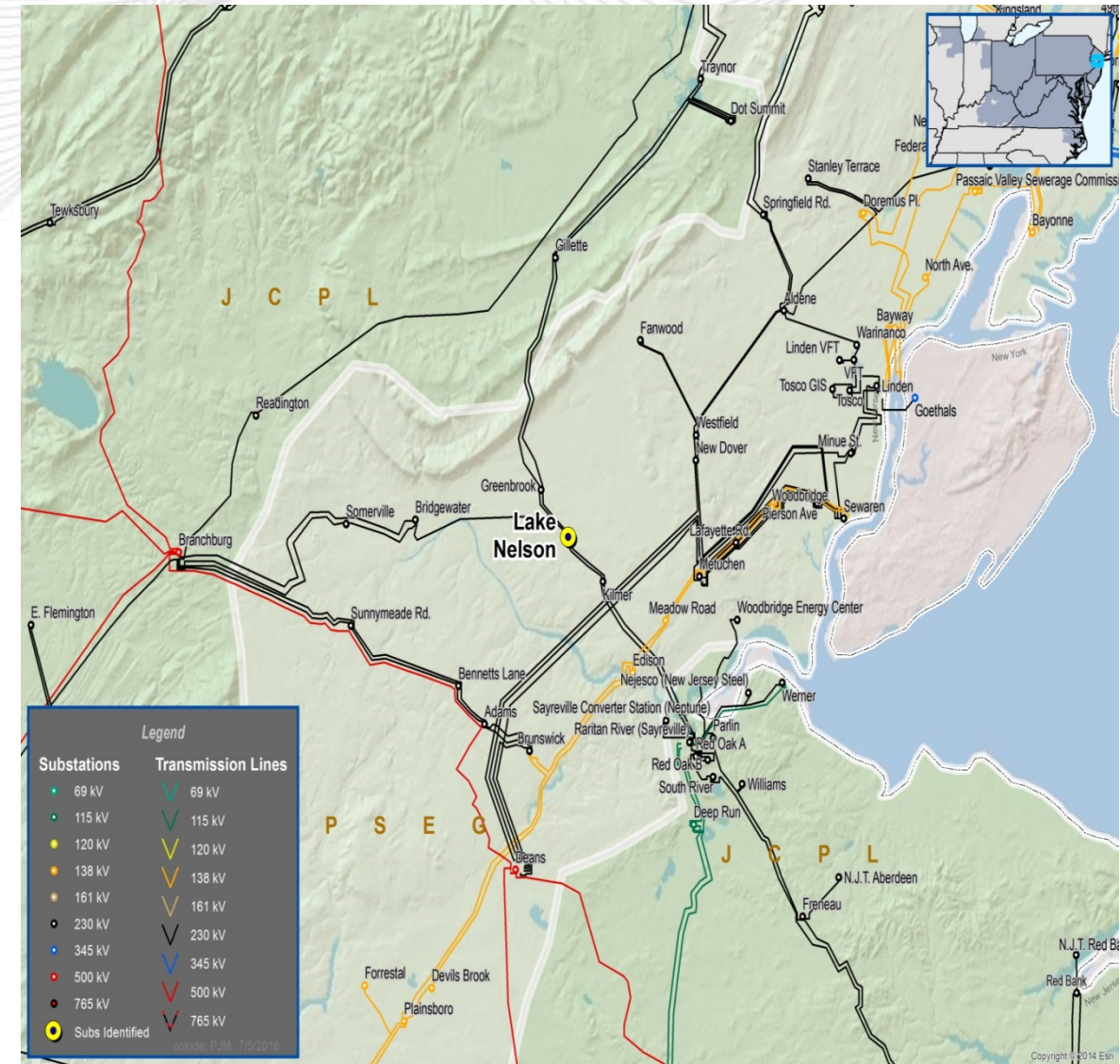
Alternatives:

- Further examination and to accurately identify all of the oil leaks, the transformer must be washed and then checked for leaks.
- The transformer must be drained and fully re-gasket. This includes oil processing, disassembling and reassembling the transformer's fittings. This cost in itself will be over \$1M and will not guarantee all leaks will be fixed.

Estimated Cost: \$ 4.9 M

Scheduled IS Date: 12/31/2016

Project Status: Project Development and Engineering



Install Lake Nelson 220-1 Transformer Monitoring

Problem Statement:

- PSE&G uses TMP to pro-actively monitor transformers by providing Asset Management team real-time data on our largest, most expensive asset. The transformer monitoring project (TMP) provides instantaneous load data, transformer oil temperatures and uses IEEE calculations to determine cooling performance.

Proposed Solution:

- Install microprocessor relays, transformer equipments, SCADA systems and alarm panels for Lake Nelson 220-1 230/69 kV transformer. (S1139)
- PSE&G initiates a real time transformer health condition monitoring program for 230 kV transformers including Lake Nelson 230/69 220-1 transformer. It will enhance existing transformer condition algorithms and provide improved load management.

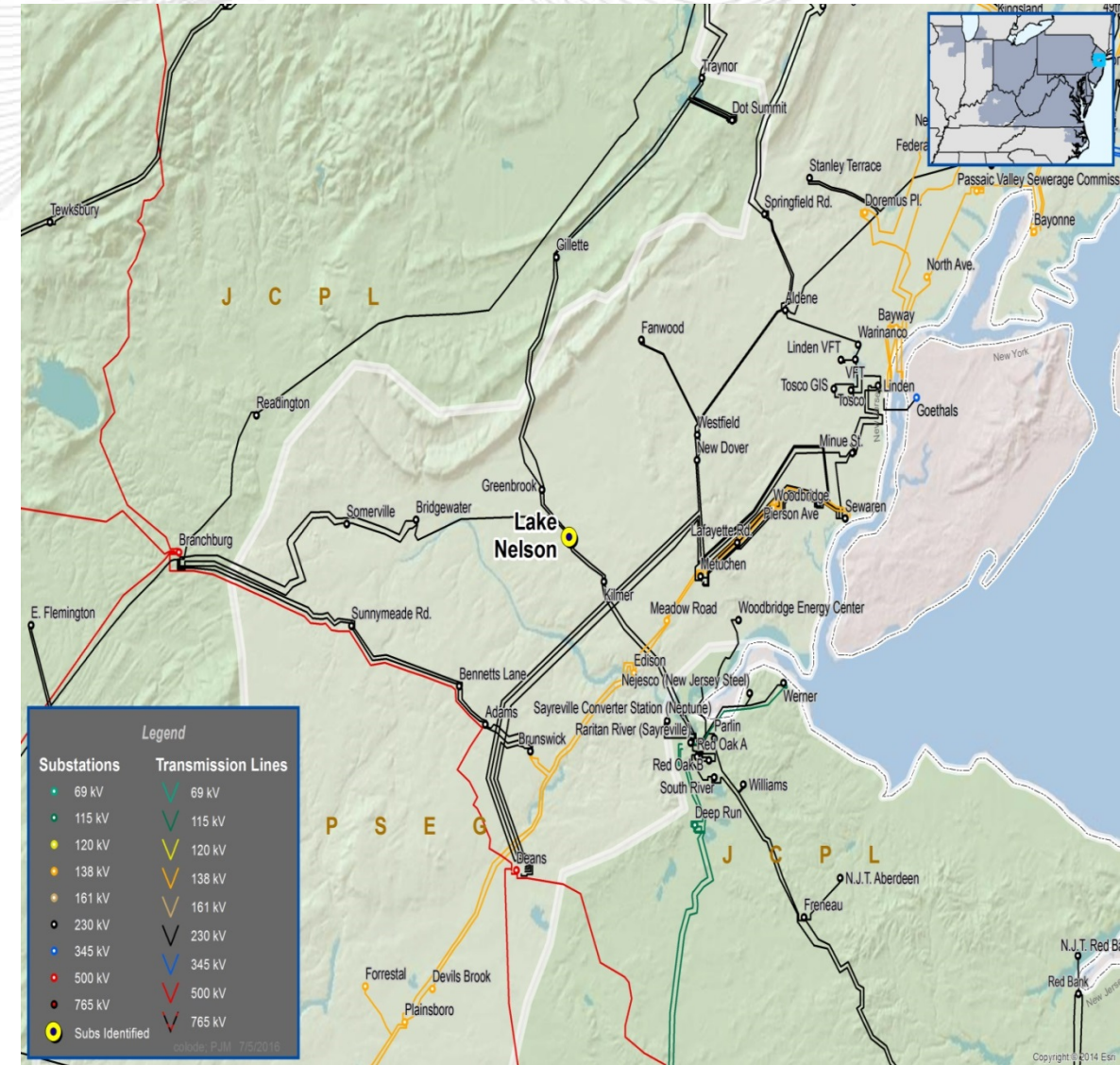
Alternatives:

- Utilize periodic maintenance instead of this real time transformer health monitoring and replace expensive high voltage, old transformer when it fails.

Estimated Cost: \$ 1.7M

Scheduled IS Date: 12/31/2016

Project Status: Project Development and Engineering



Install Fiber and OPGW N-1340 OH Circuit

Problem Statement:

- There is an incomplete fiber path over N-1340 at Trenton, Brunswick, and Plainsboro.
- This project is designed to improve protective relaying on the 138kv line between the Trenton, Brunswick, and Plainsboro stations.

Proposed Solution:

- Install OPGW (Optical Ground Wire) on the N-1340 Trenton - Plainsboro - Brunswick 138 kV circuit. (S1140)

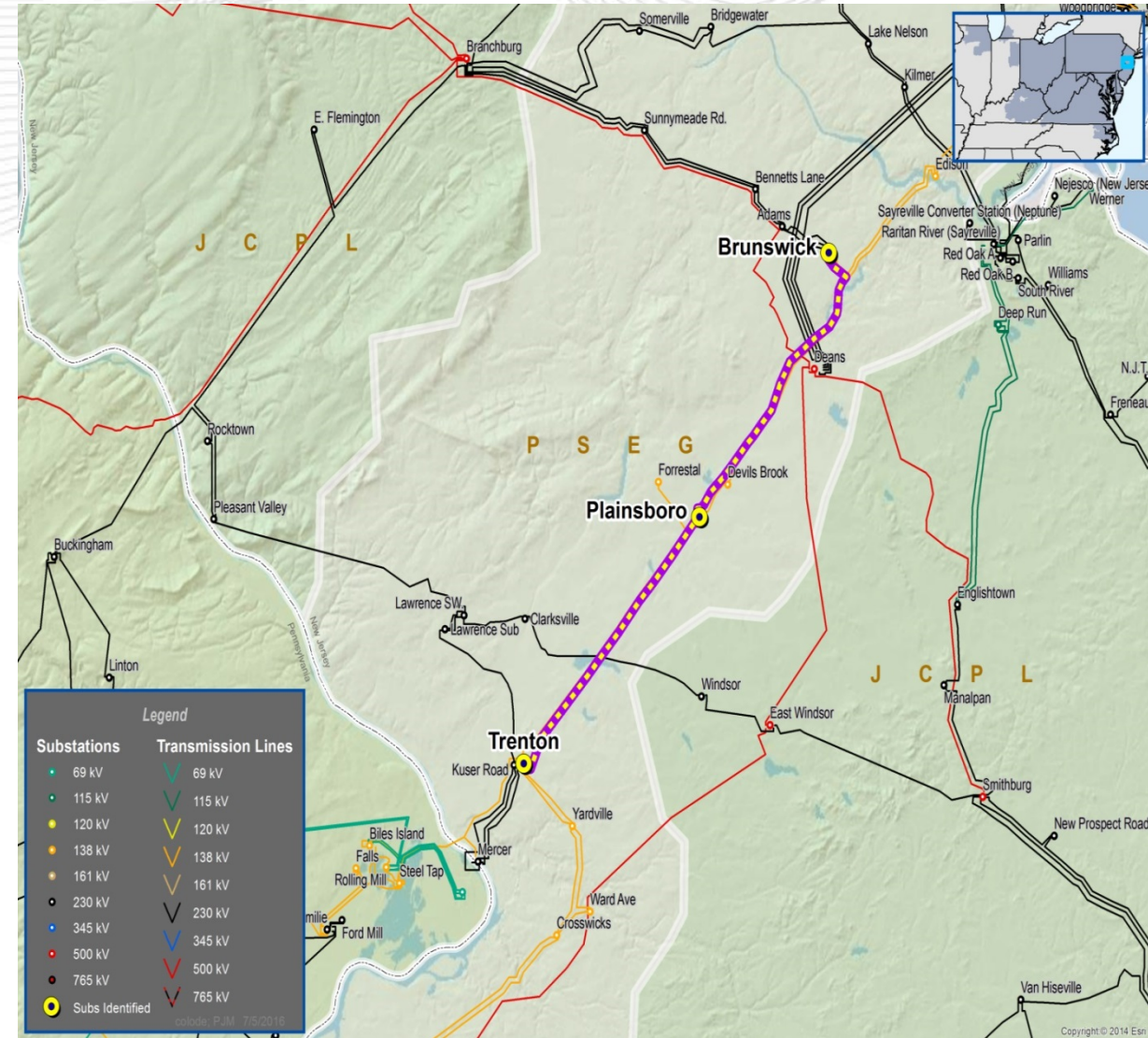
Alternatives:

- If this investment is not performed, the current Transmission Systems are at high risk of technical obsolescence with loss of ability to assure their continued reliable operations, slow communications, and resultant impacts to reliability of the Transmission system

Estimated Cost: \$2.6 M

Scheduled IS Date: 12/31/2016

Project Status: Project Development and Engineering



Build a new 13 kV class-H substation in Kingsland

Problem Statement:

- The Kingsland Class H Station been loaded to, or above its capacity 4 times in the last 10 years.

Proposed Solution:

- Build a new 13 kV class-H substation in Kingsland with two new 230/13kV transformers.
- This project will support the future load growth in the area and establish more 13 kV ties to other stations. (S1151)

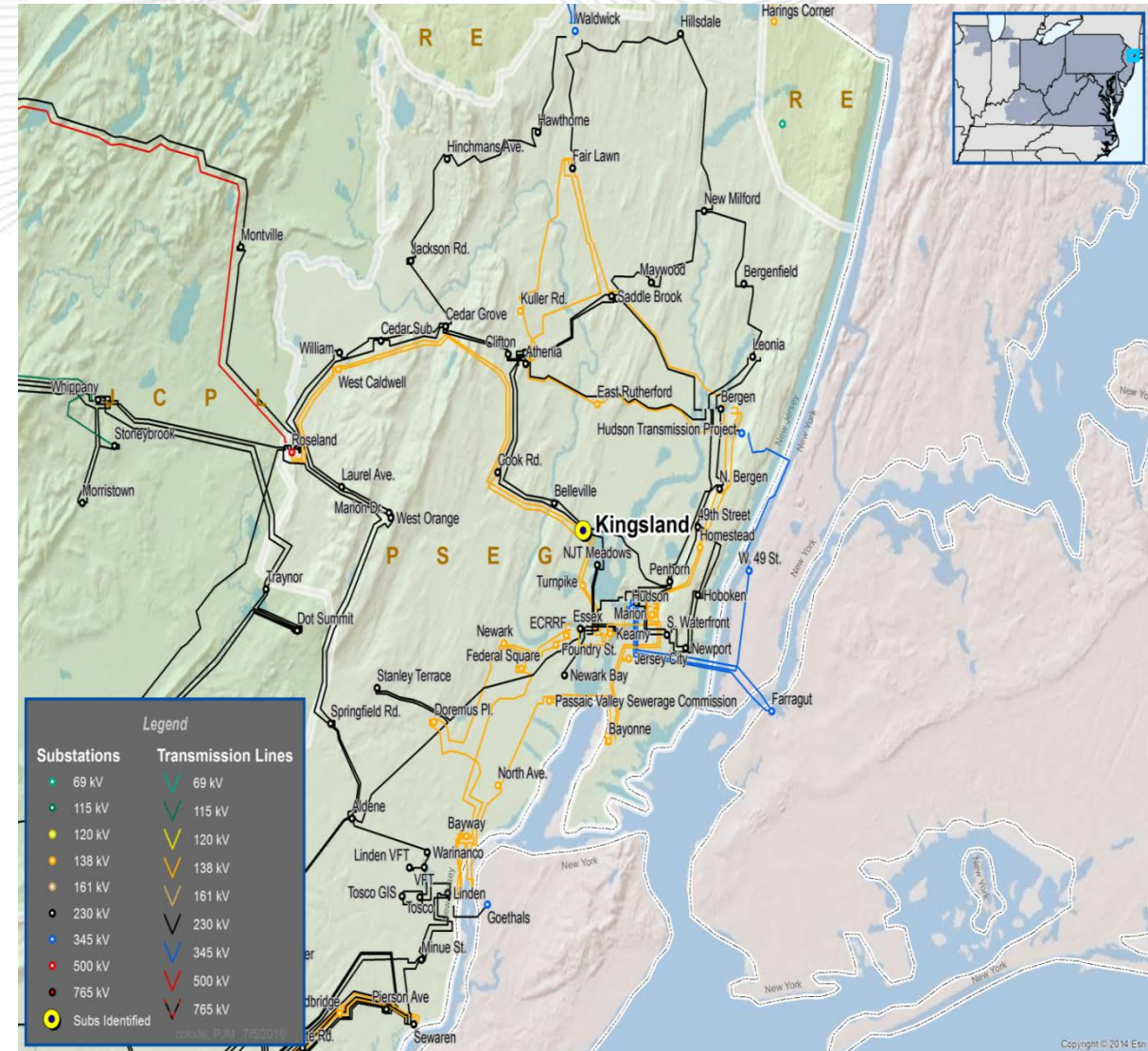
Alternatives:

- No alternatives were considered because of the nature of this project.

Estimated Cost: \$ 29. 6 M

Scheduled IS Date: 6/1/2018

Project Status: Project Development and Engineering



Short Circuit Upgrades

Problem: Short Circuit

- The Mickleton 69kV breakers “PCB A,” “PCB B,” “PCB C,” and “PCB D,” are overstressed

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:

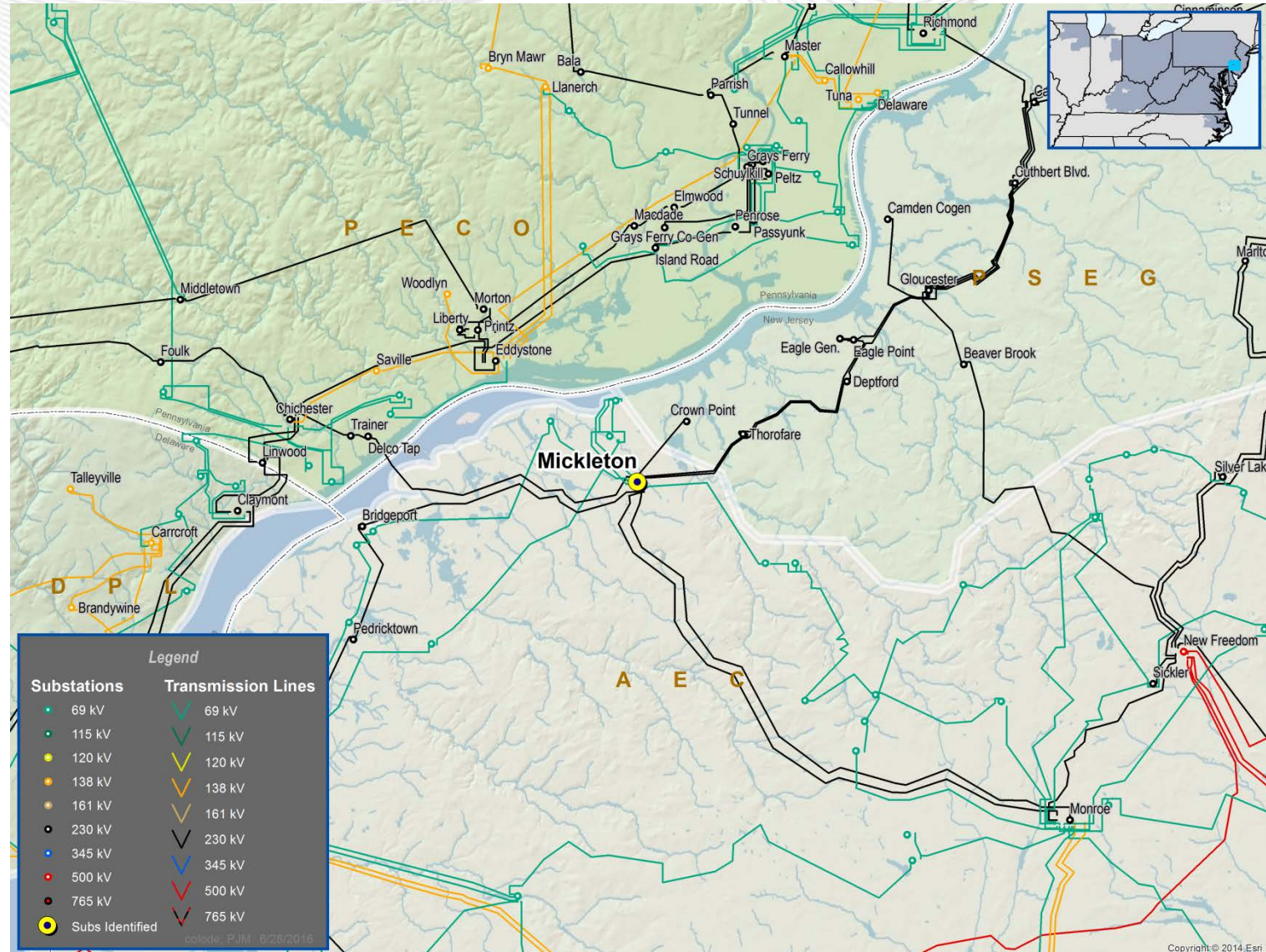
- Due to the immediate need of the project no alternatives were considered

Proposed Solution:

- Replace the Mickleton 69kV breakers “PCB A,” “PCB B,” “PCB C,” and “PCB D,” with 63kA breakers (b2723.1-b2723.4)

Estimated Project Cost: June 1, 2018

Required IS Date: \$357 K per breaker



Problem: Short Circuit

- The Warren 115kV breakers are overstressed.

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:

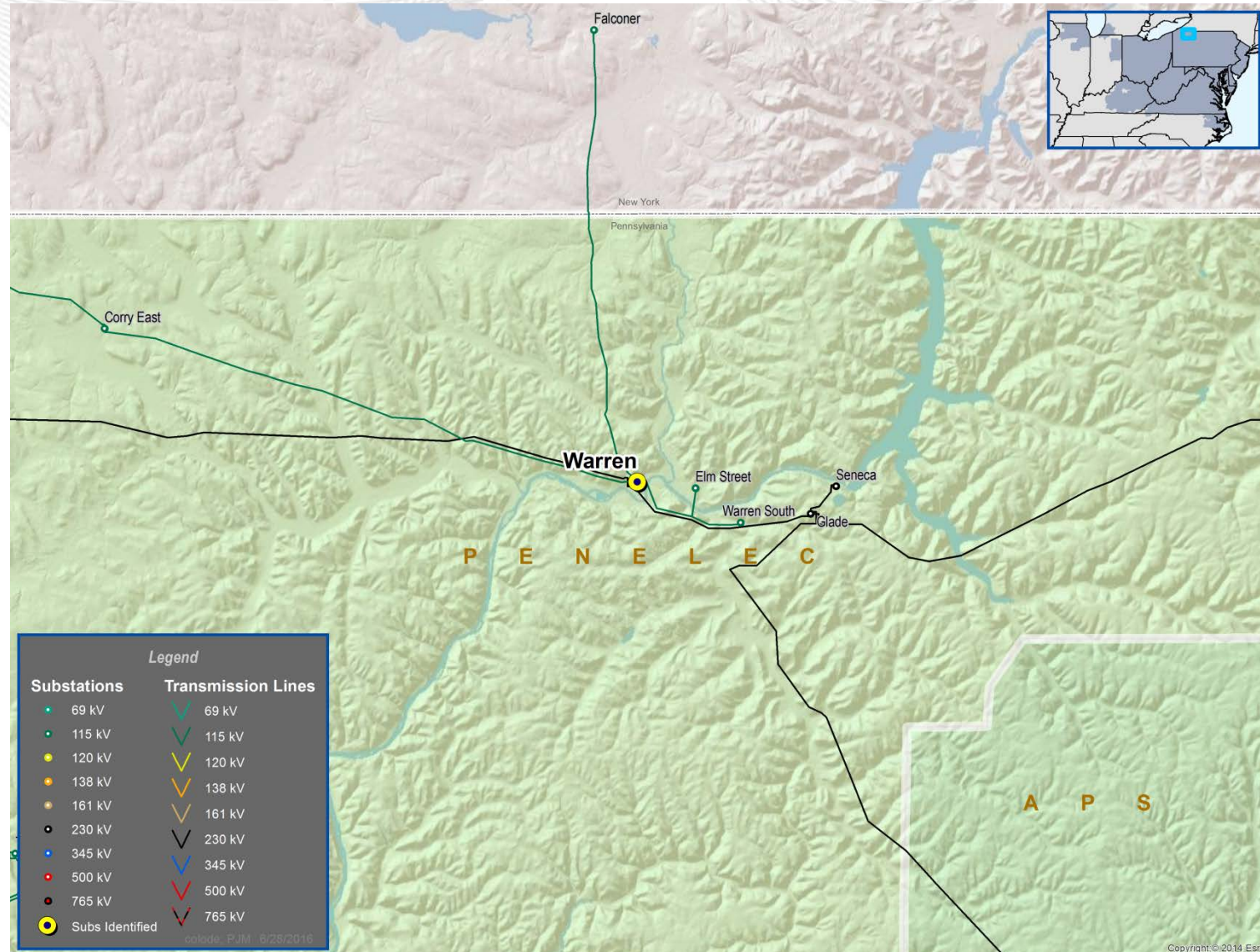
- Due to the immediate need of the project no alternatives were considered

Proposed Solution:

- Replace the Warren 115kV breakers (b2735 – b2739)

Estimated Project Cost: \$1.15 M

Required IS Date: June 1, 2018



Problem: Short Circuit

- The Hooversville 115kV breakers 'Ralphton' & 'Statler Hill' are overstressed.

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:

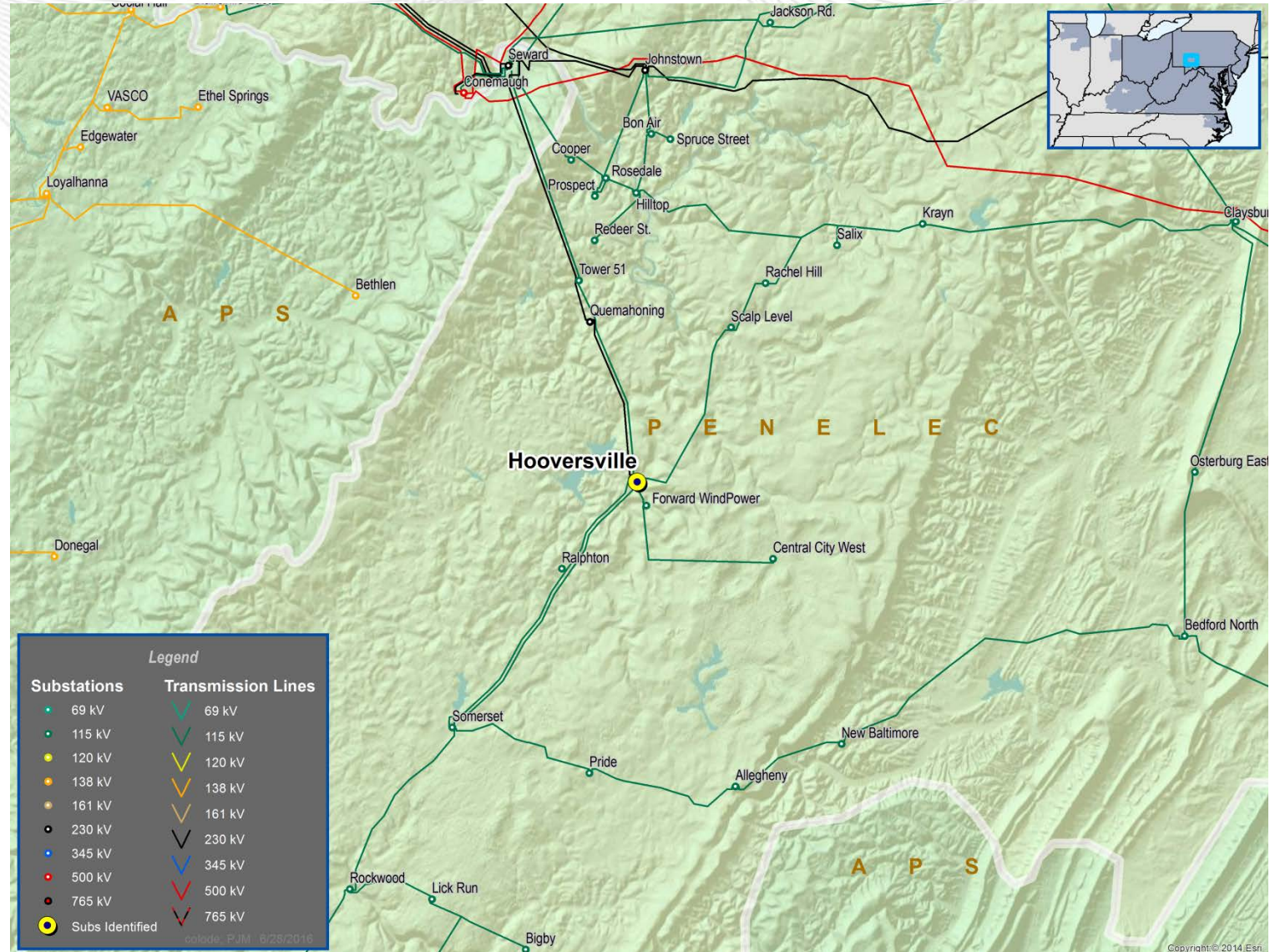
- Due to the immediate need of the project no alternatives were considered

Proposed Solution:

- Revise the reclosing of the Hooversville 115 kV 'Ralphton' & 'Statler Hill'

Estimated Project Cost: \$10 K per breaker

Required IS Date: June 1, 2018



Problem: Short Circuit

- The Linden 138kV breakers '1APA' and '2BPB' are overstressed

Significant Driver:

Hardening PSE&G's electric system due to the effects of previous severe storm damage to substations (s0644)

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:

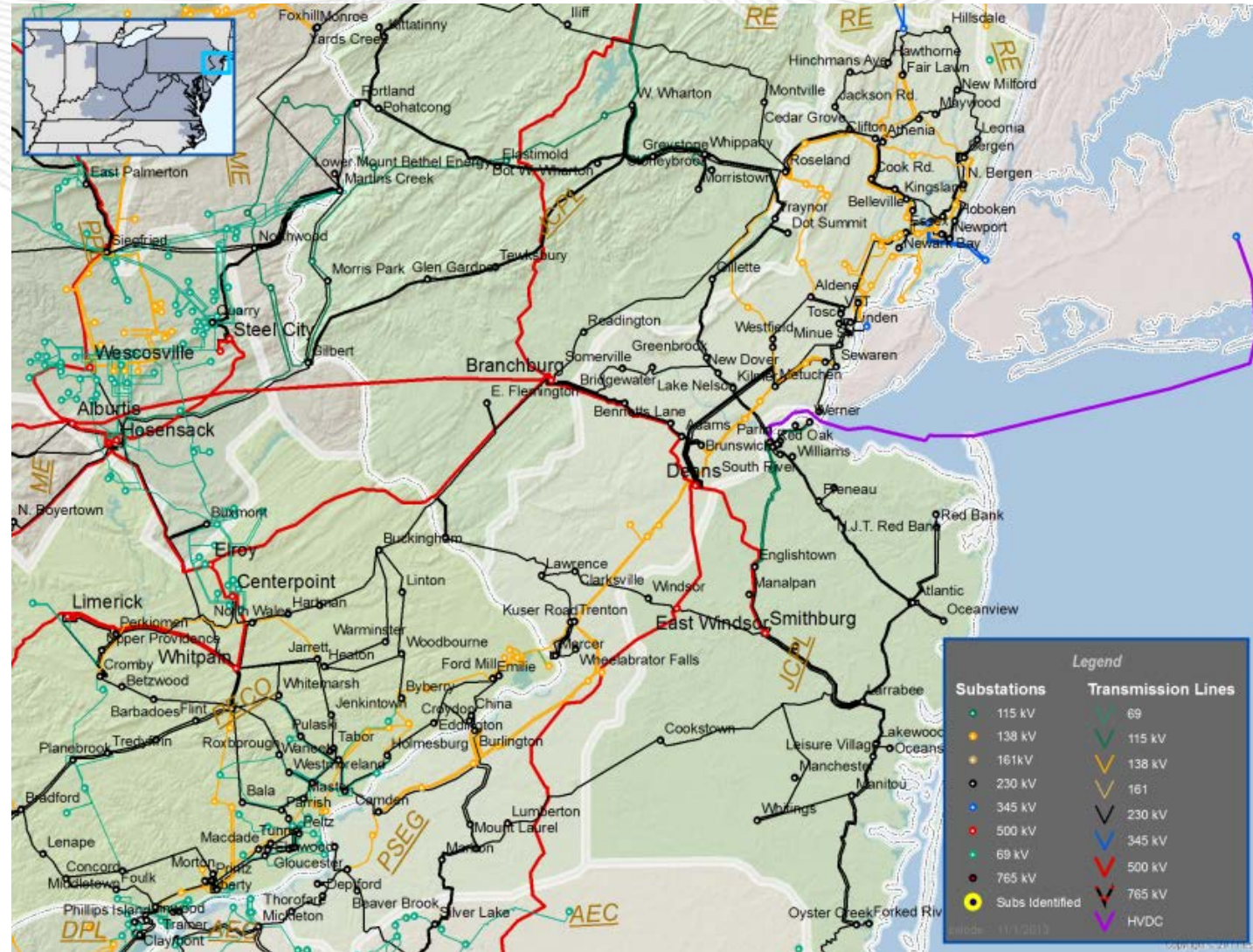
- Due to the immediate need of the project no alternatives were considered

Proposed Solution:

- Replace Linden 138 kV breakers '1APA' and '2BPB' with 80kA breakers (s0644.1)

Estimated Project Cost: \$3.57 M

Projected In-Service Date: 12/31/2018



Problem: Short Circuit

- The South Canton 138 kV 'K', 'J', 'J1', and 'J2' breakers are overstressed

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:

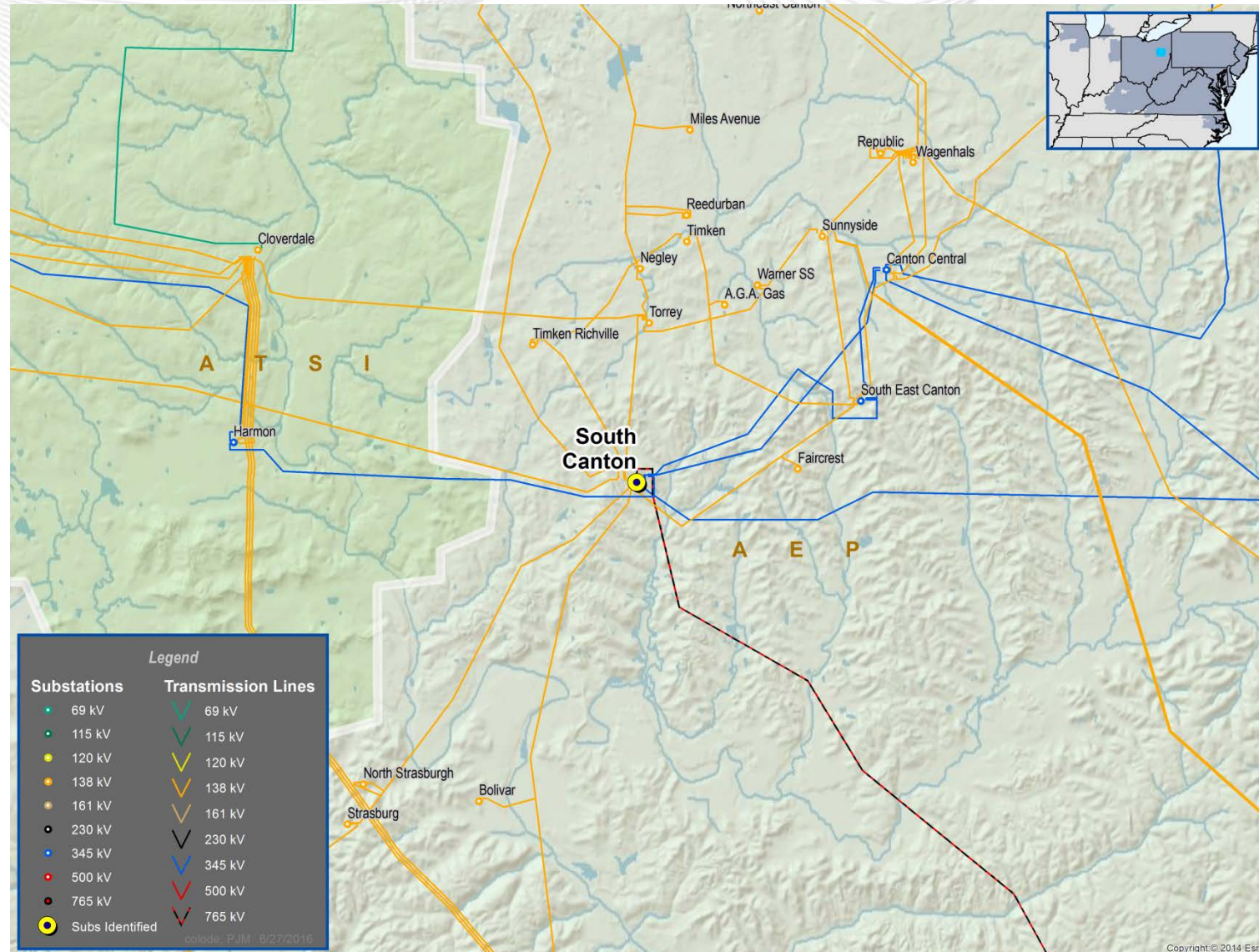
- Due to the immediate need of the project no alternatives were considered

Proposed Solution:

- Replace the South Canton 138 kV breakers 'K', 'J', 'J1', and 'J2' with 80 kA breakers (b2727)

Estimated Project Cost: \$1.2M

Required IS Date: 6/1/2018



Problem: Short Circuit

- The Hoytdale 138 kV '83-B-26' and '83-B-30' breakers are overstressed

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:

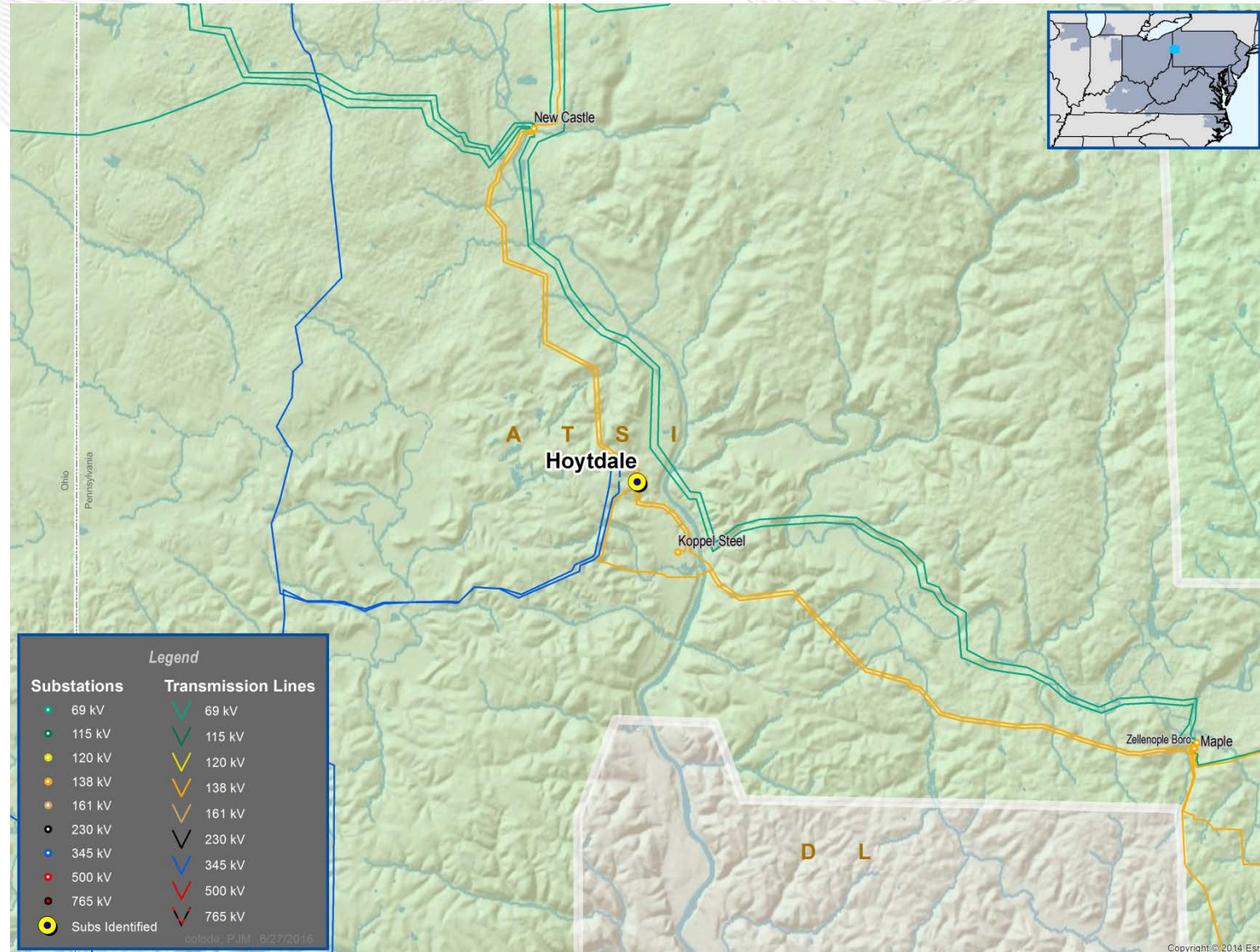
- Due to the immediate need of the project no alternatives were considered

Proposed Solution:

- Replace the Hoytdale 138 kV '83-B-26' and '83-B-30' breakers with 63 kA breakers (b2742)

Estimated Project Cost: \$410K

Required IS Date: 6/1/2017



Questions?

Email: RTEP@pjm.com

- Revision History
 - V1 – 7/8/2016 – Original Version Posted to PJM.com
 - V2 – 11/17/2016 – Per ODEC and AMP request, added additional information to most supplemental project descriptions and information.