



# Sub Regional RTEP Committee Mid-Atlantic

July 20, 2018

# First Review

## Baseline Reliability and Supplemental Projects

# MetEd Transmission Zone: Supplemental Project Hunterstown – Lincoln (963) 115 kV Line & Orrtanna 115 kV Substation

## Problem Statement (Scope and Need/Drivers):

### *Operational Flexibility and Efficiency*

- Provide networked source for radial load that cannot be transferred to other substations

## Potential Solution:

### Hunterstown – Lincoln (963) 115 kV Line

- Loop the Hunterstown – Lincoln (963) 115 kV line ~9 miles into Orrtanna substation

### Orrtanna 115 kV Substation

- Construct a five (5) breaker 115 kV ring bus

## Alternatives Considered:

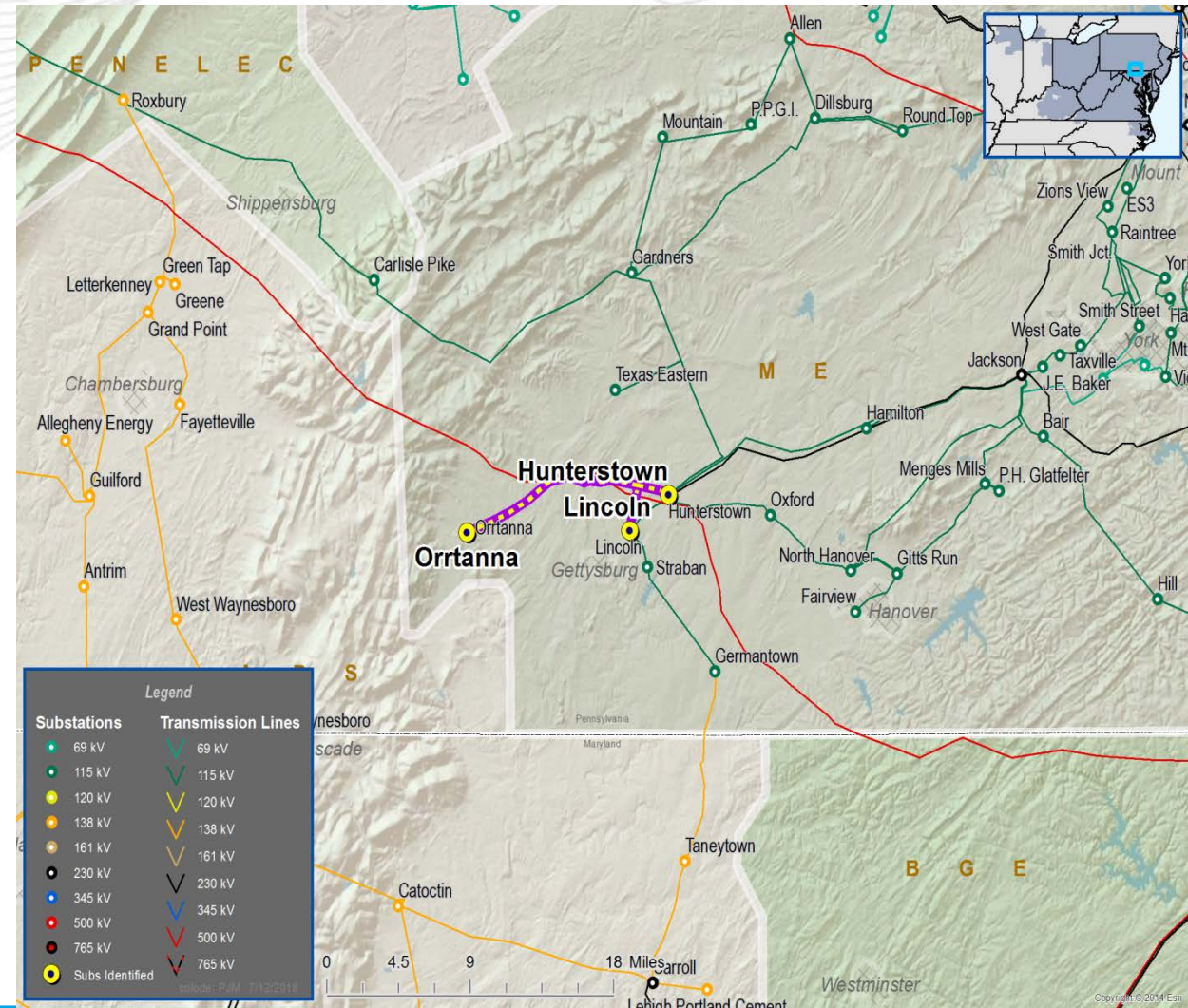
- No Feasible Alternatives

Estimated Project Cost (Line Loop): \$30.9M

Estimated Project Cost (Ring Bus): \$ 9.2M

Projected IS date: 12/31/2021

Status: Conceptual



## Problem Statement (Scope and Need/Drivers):

### *Operational Flexibility and Efficiency*

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss under contingency conditions.
- Eliminate the simultaneous outages to three or more system elements

## Potential Solution:

### South Reading Substation

- Expand the existing 69 kV yard to a breaker-and-a-half configuration

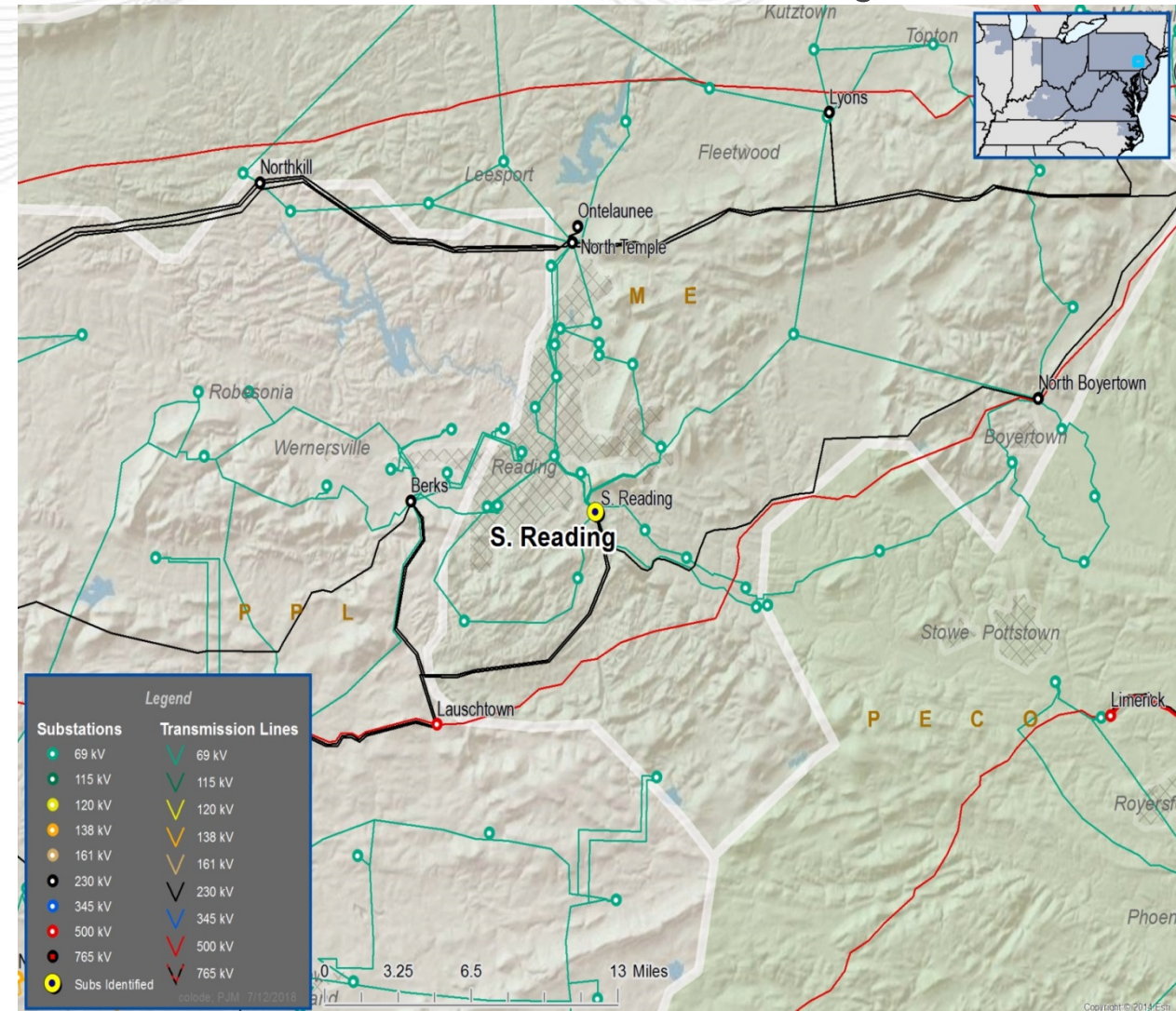
## Alternatives Considered:

- No Feasible Alternatives

Estimated Project Cost : \$19.4M

Projected IS date: 12/31/2020

Status: Conceptual



**Problem Statement (Scope and Need/Drivers):**

*Operational Flexibility and Efficiency*

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss under contingency conditions

**Potential Solution:**

Cly Substation

- Construct a five (5) breaker 115 kV ring bus.
- Loop the existing Middletown Jct. – Round Top and Middletown Jct. – Smith Street 115 kV line into the ring bus.

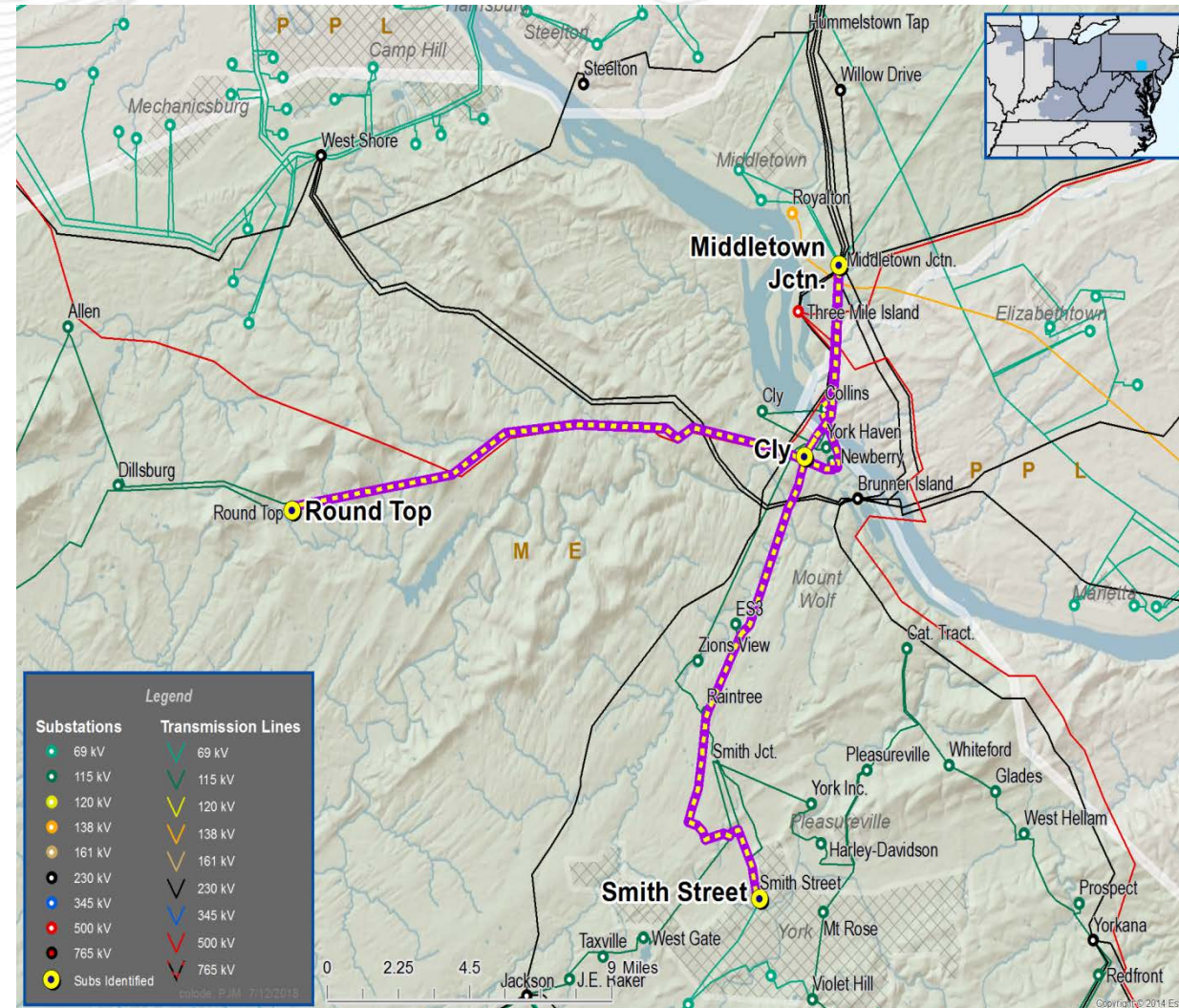
**Alternatives Considered:**

- No Feasible Alternatives

**Estimated Project Cost :** \$12.2M

**Projected IS date:** 12/31/2020

**Status:** Conceptual



## Problem Statement (Scope and Need/Drivers):

### *Operational Flexibility and Efficiency*

- Improve operational flexibility during maintenance and restoration efforts.
- Eliminate the simultaneous outages to three or more system elements

## Potential Solution:

### North Boyertown Substation

- Expand the 230 kV bus to a three (3) breaker 230 kV ring bus

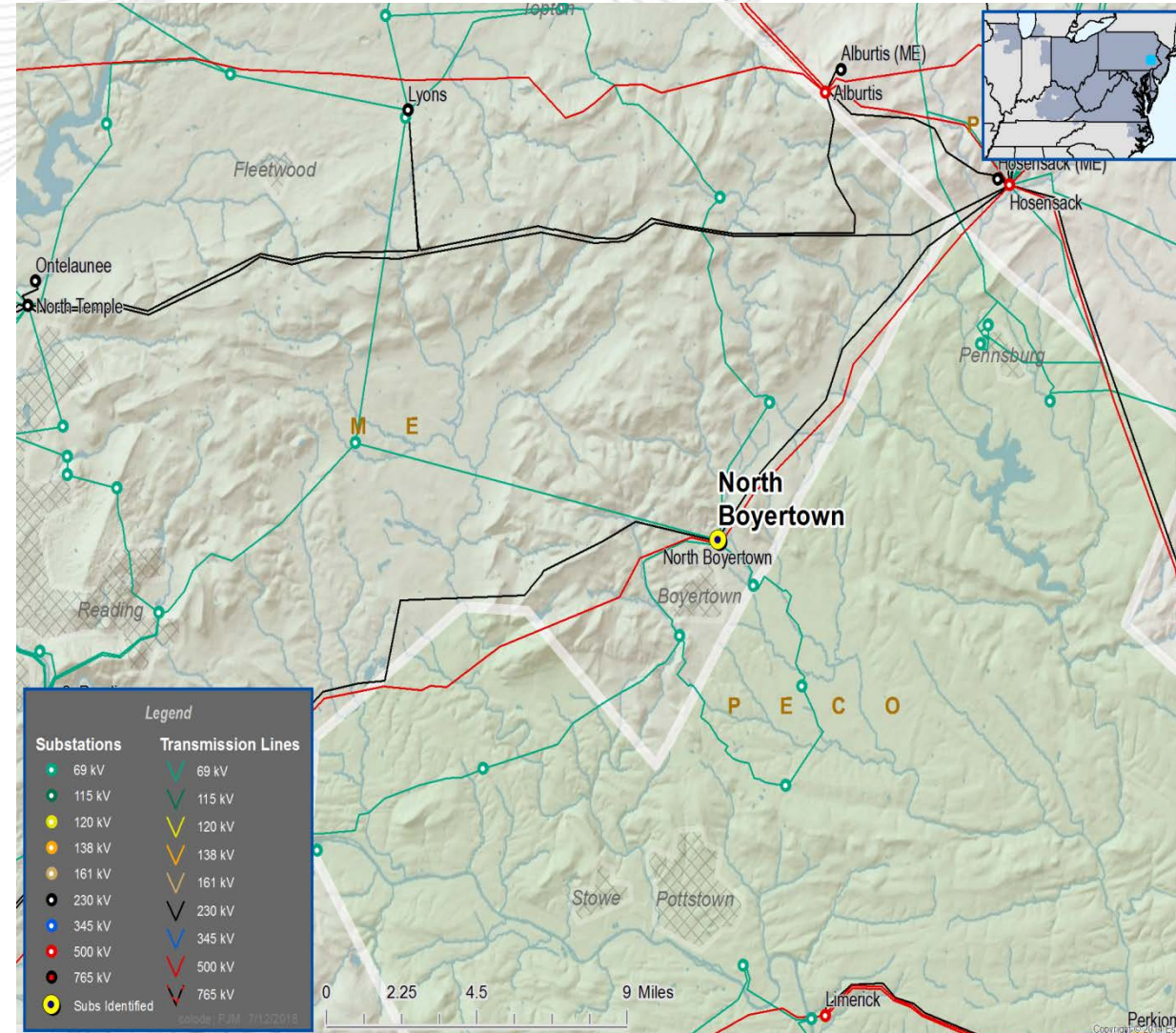
## Alternatives Considered:

- No Feasible Alternatives

Estimated Project Cost : \$ 10.8M

Projected IS date: 12/31/2020

Status: Conceptual



## Problem Statement (Scope and Need/Drivers):

### *Operational Flexibility and Efficiency*

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss under contingency conditions.
- Eliminate the simultaneous outages to three or more system elements

## Potential Solution:

### North Meshoppen Substation

- Expand the existing 115 kV yard to a breaker-and-a-half configuration

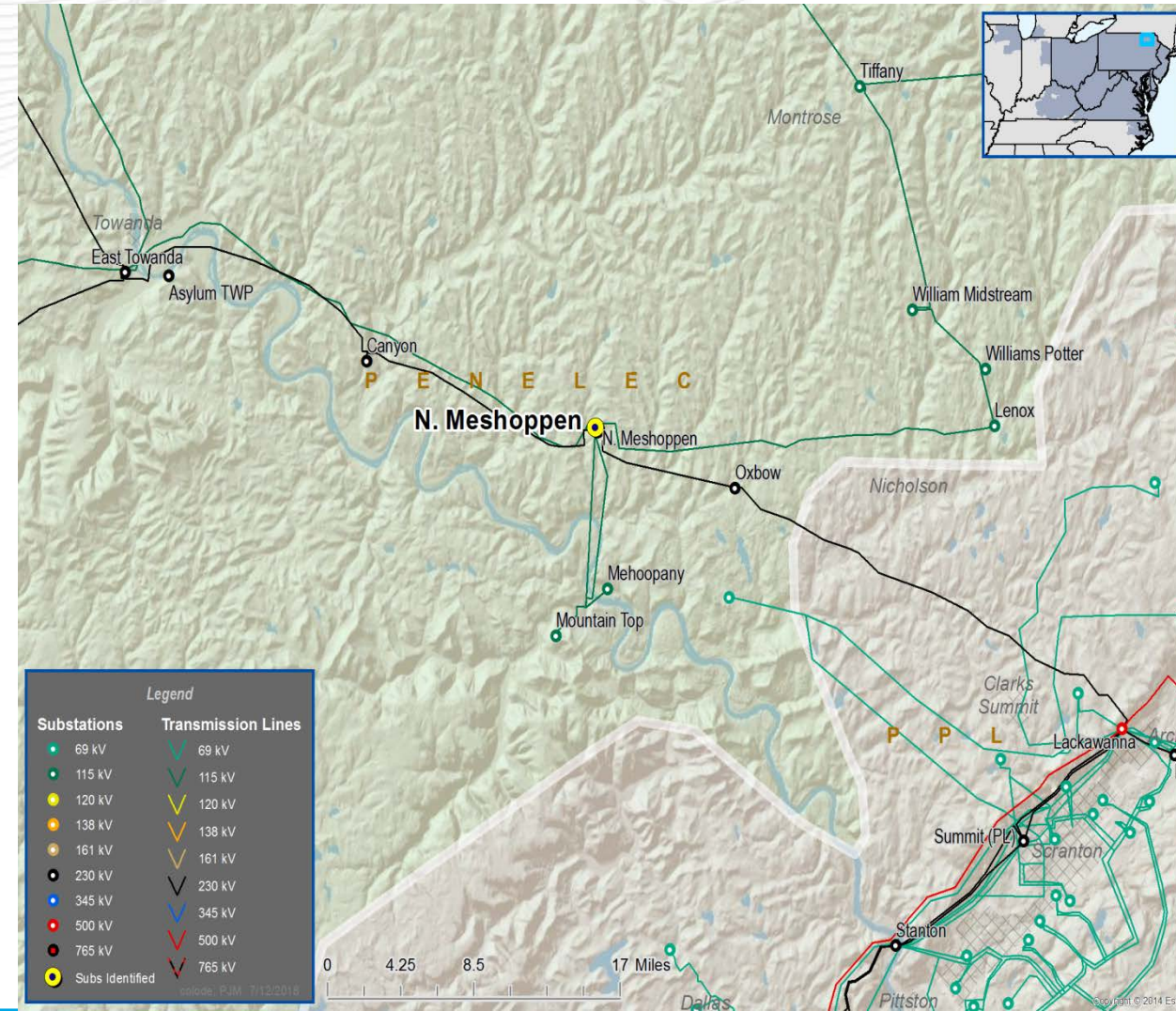
## Alternatives Considered:

- No Feasible Alternatives

Estimated Project Cost: \$17.6M

Projected IS date: 12/31/2020

Status: Conceptual



## Problem Statement (Scope and Need/Drivers):

### *Operational Flexibility and Efficiency*

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss under contingency conditions.
- Eliminate the simultaneous outages to three or more system elements.

## Potential Solution:

### Blairsville Substation

- Convert the Blairsville East 115 kV substation into a six (6) breaker ring bus

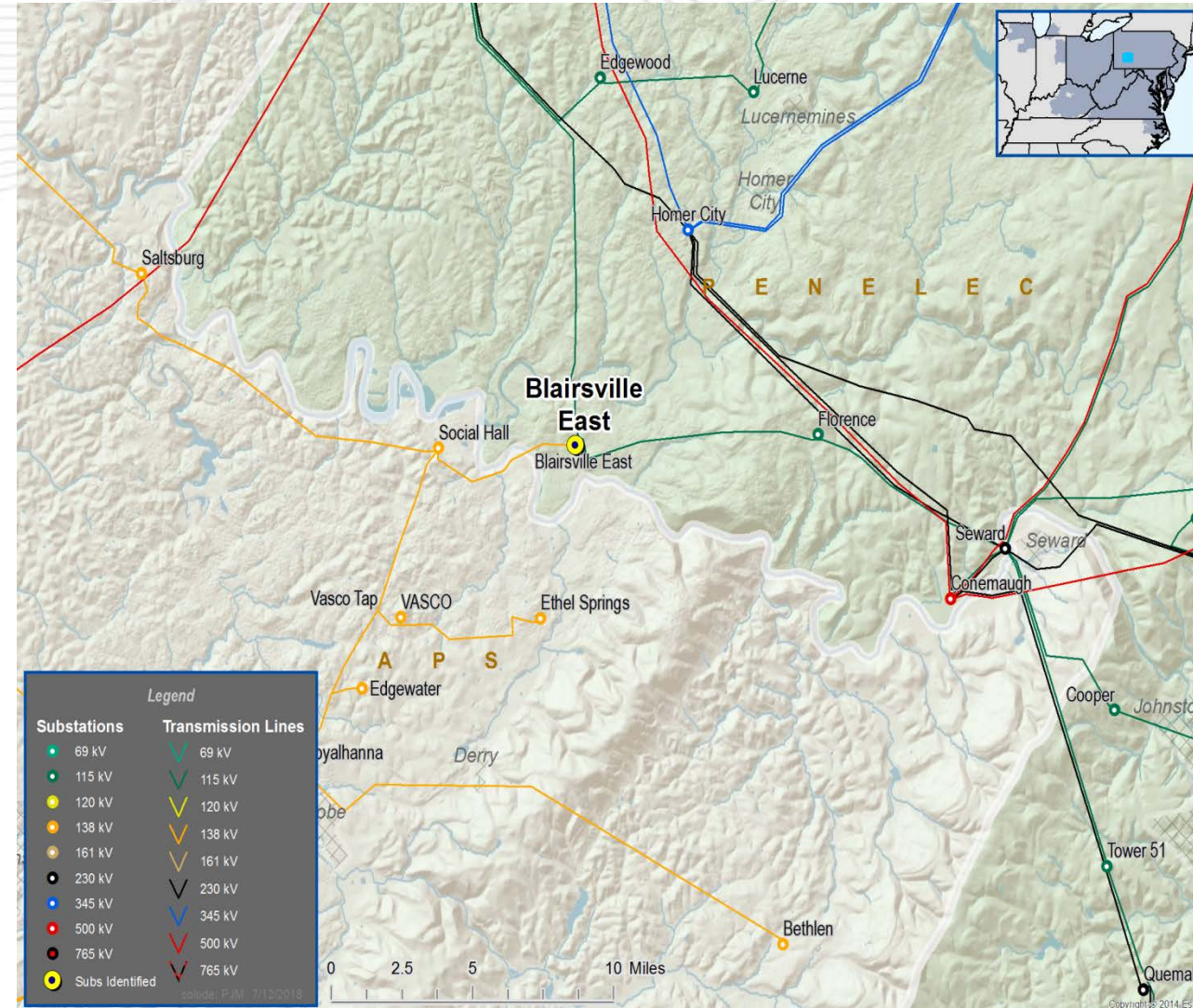
## Alternatives Considered:

- No Feasible Alternatives

Estimated Project Cost: \$9.0M

Projected IS date: 12/31/2019

Status: Conceptual





## Problem Statement (Scope and Need/Drivers):

### *Operational Flexibility and Efficiency*

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss under contingency conditions.
- Eliminate the simultaneous outages to three or more system elements.

## Potential Solution:

### Erie West Substation

- Convert the Erie West 115 kV substation into a five (5) breaker ring bus.

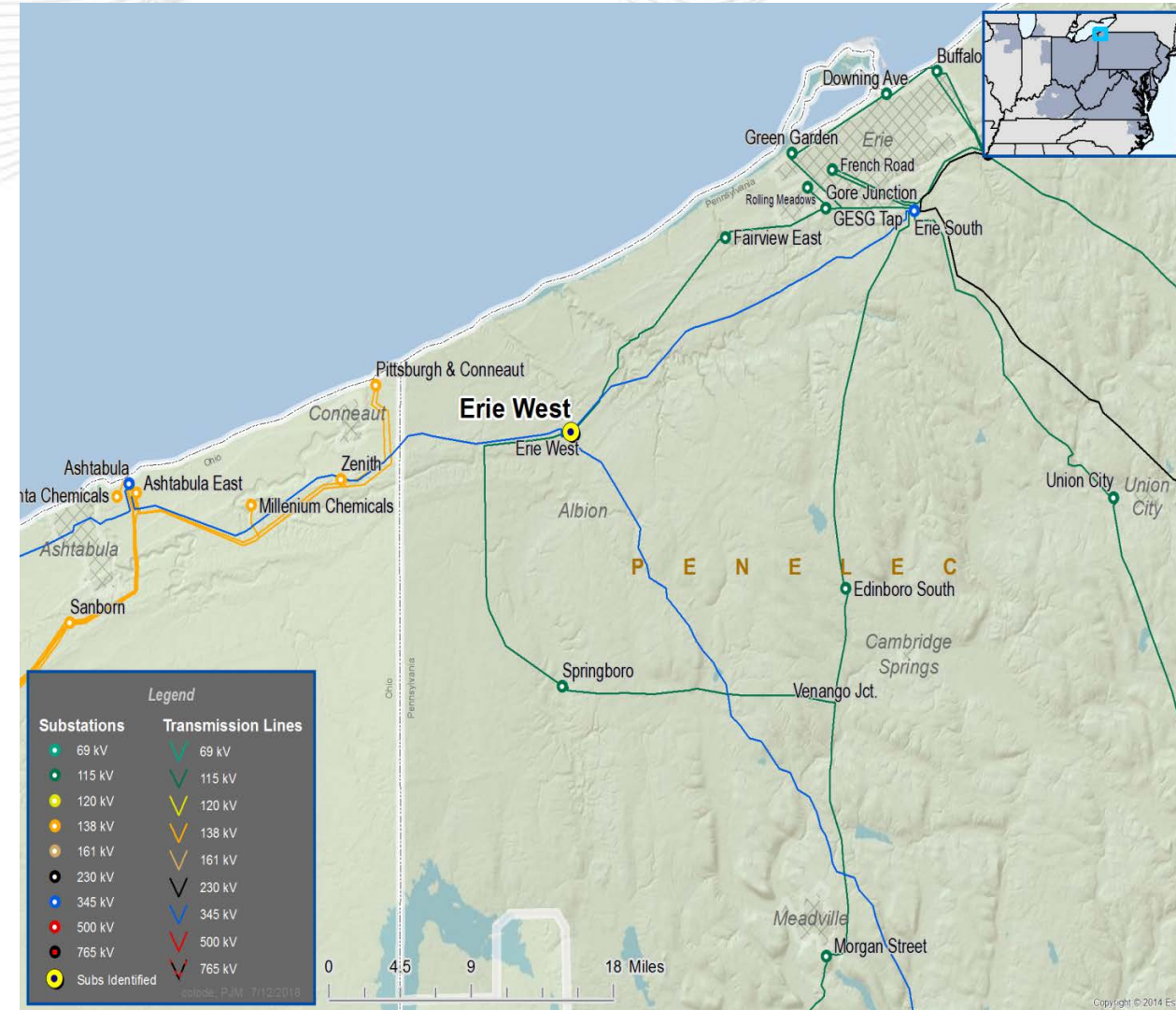
## Alternatives Considered:

- No Feasible Alternatives

Estimated Project Cost: \$4.8M

Projected IS date: 12/31/2019

Status: Conceptual



## Problem Statement (Scope and Need/Drivers):

### *Operational Flexibility and Efficiency*

- Improve operational flexibility during maintenance and restoration efforts.
- Reduce amount of potential local load loss under contingency conditions.
- Eliminate the simultaneous outages to three or more system elements

## Potential Solution:

### Raystown Substation

- Install a second 230-46 kV transformer (100 MVA).
- Install 3-230 kV circuit breakers to create a four (4) breaker 230 kV ring bus.

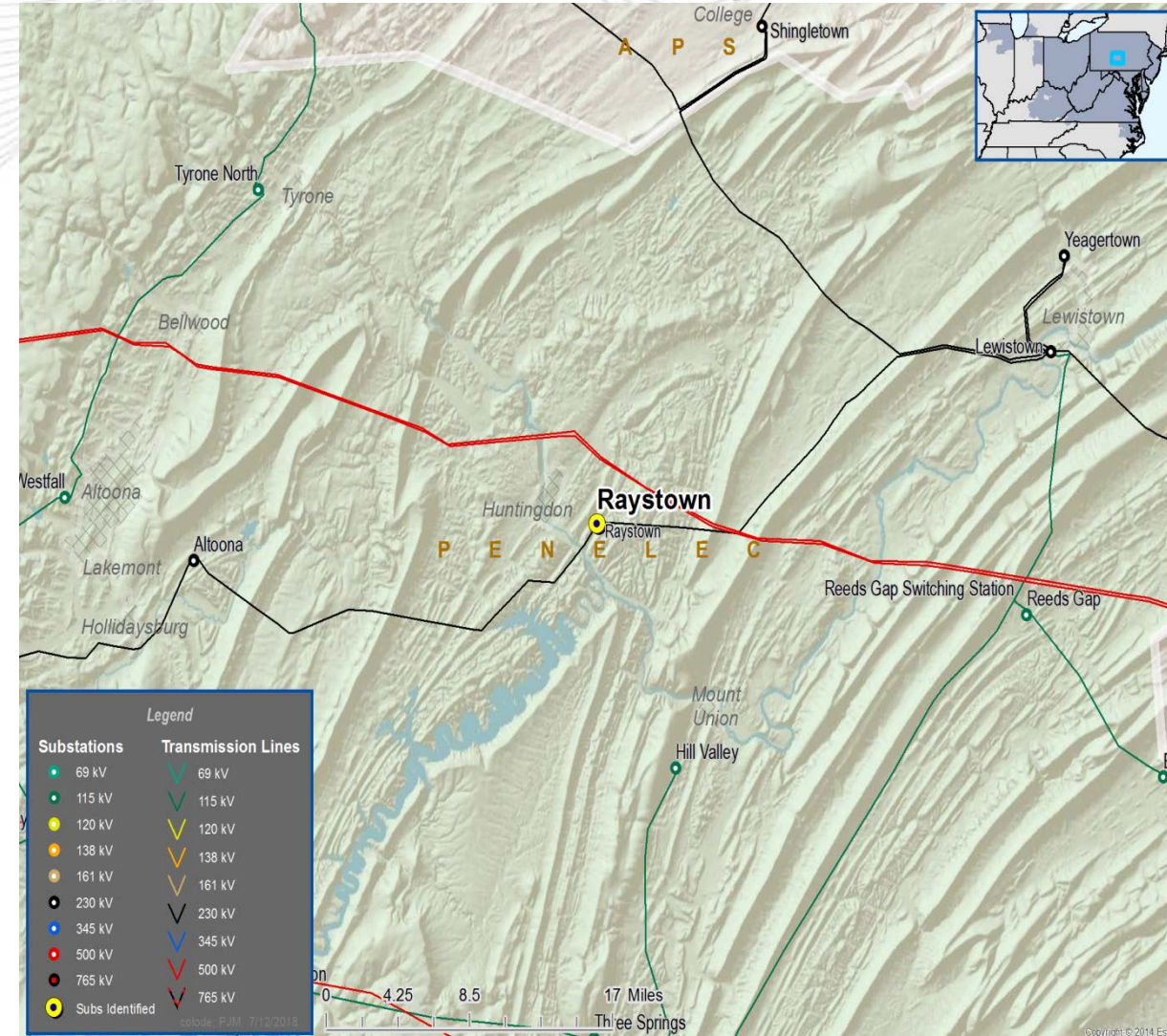
## Alternatives Considered:

- No Feasible Alternatives

**Estimated Project Cost: \$ 8.0M**

**Projected IS date: 4/1/2019**

**Status: Conceptual**



# Penelec Transmission Zone: Supplemental Project Hill Valley – Mount Union – Lewistown 46 kV Line

## Problem Statement (Scope and Need/Drivers):

### *Operational Flexibility and Efficiency*

- Improve operational flexibility during maintenance and restoration efforts.
- Transmission line that cannot be utilized for post contingency switching or networking normally open points

## Potential Solution:

### Hill Valley – Mount Union - Lewistown 46 kV Line

- Reconductor/Rebuild line and upgrade terminal equipment
- Replace line tap switches at Lewistown Industrial Park, Strodes Mill, McVeytown, and Atkins Mills

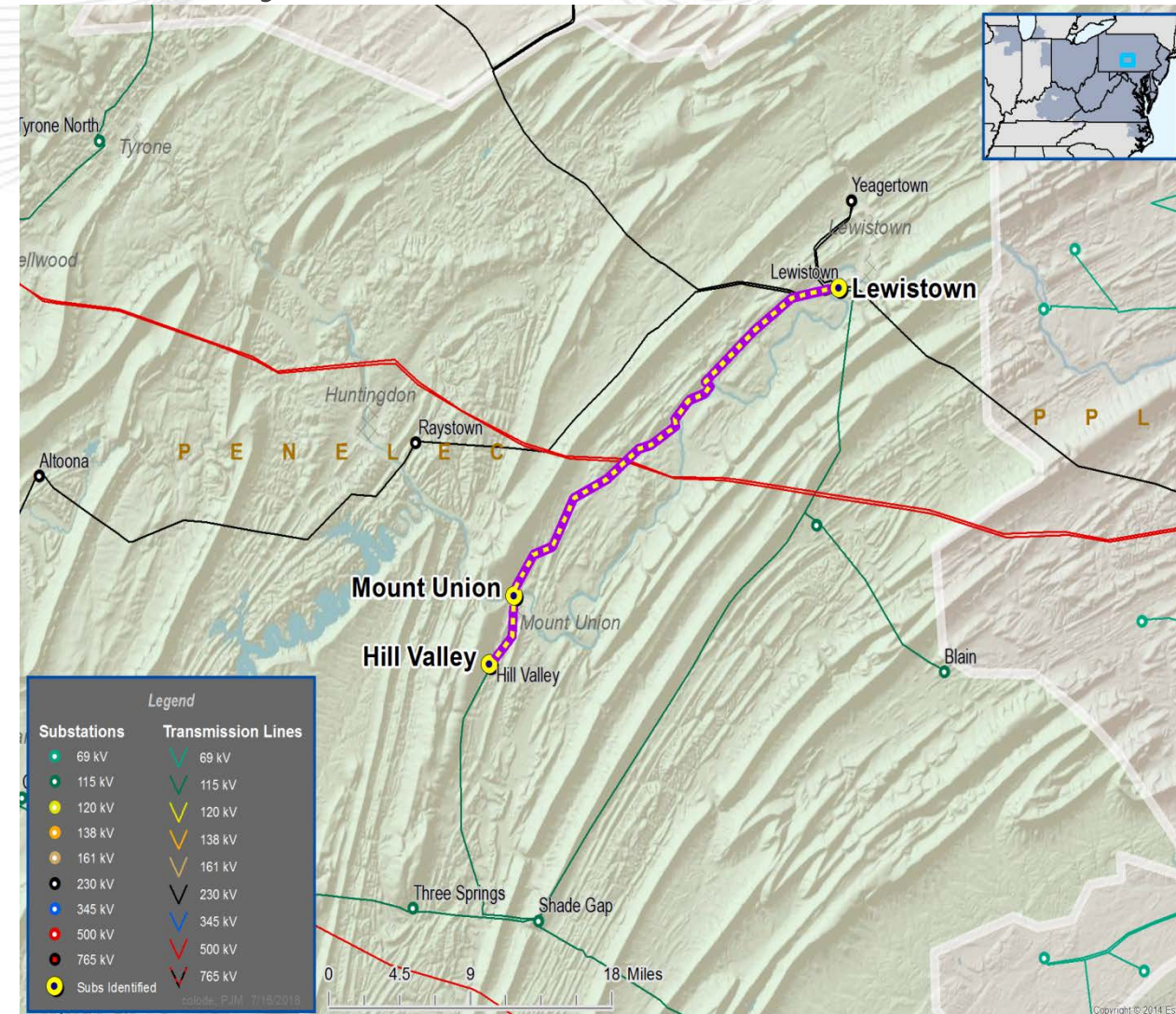
## Alternatives Considered:

- Convert Line to 115 kV

**Estimated Project Cost: \$37.2M**

**Projected IS date: 12/31/2020**

**Status: Conceptual**



## Problem Statement (Scope and Need/Drivers):

### *Operational Flexibility and Efficiency*

- Improve operational flexibility during maintenance and restoration efforts.
- Upgrade existing line switches to desired operating capability (i.e. line charging, loop splitting, etc.).

## Potential Solution:

### Tyrone North – Fowler 46 kV Line

- Upgrade terminal equipment at Tyrone North.
- Replace switches at Westvaco and Vail to provide appropriate interrupting capability.

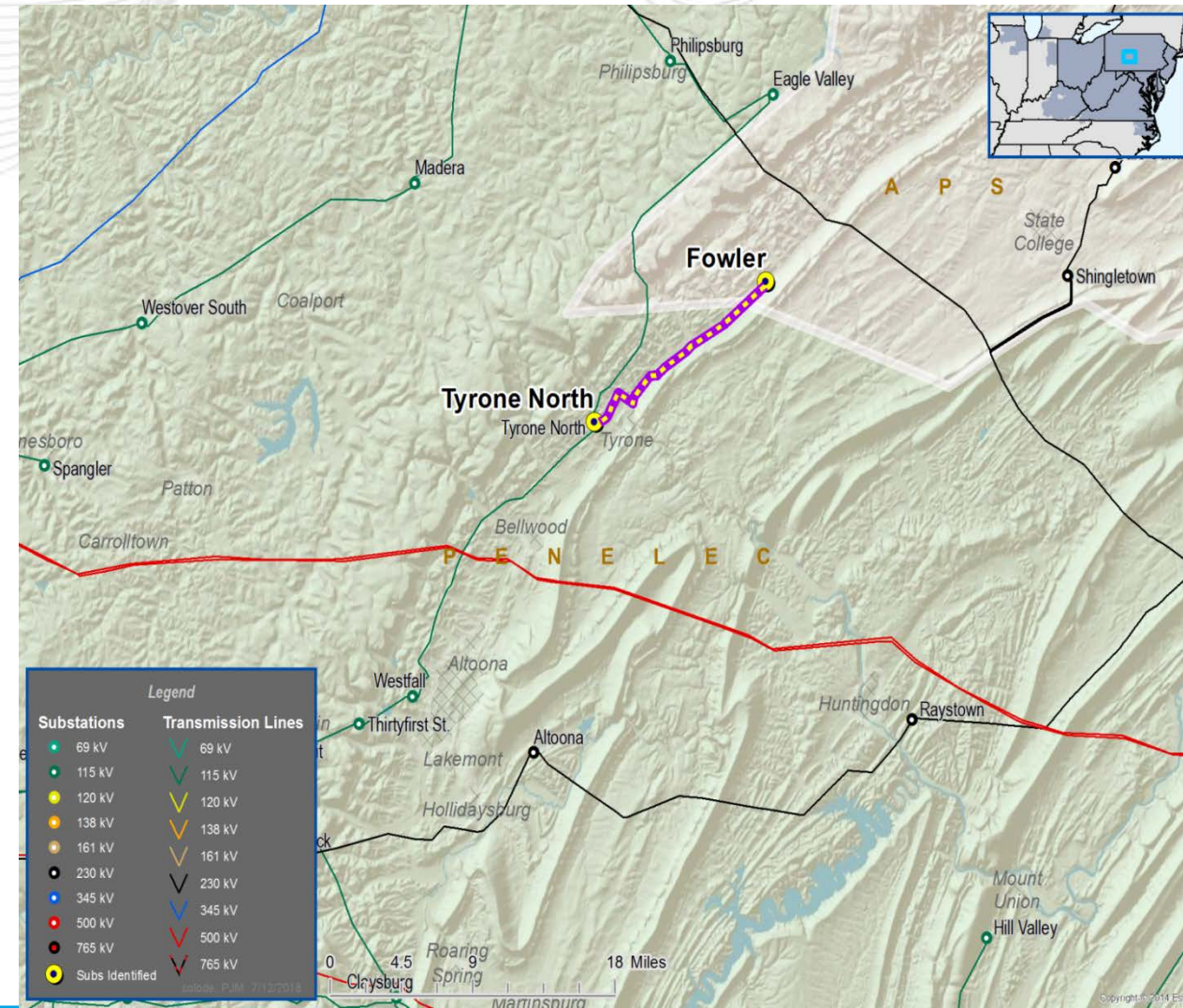
## Alternatives Considered:

- No Feasible Alternatives

Estimated Project Cost: \$1.5M

Projected IS date: 6/1/2019

Status: Conceptual



## Problem Statement (Scope and Need/Drivers):

*Equipment Material Condition, Performance and Risk*

- Improve system reliability and performance
- Remove obsolete & deteriorated equipment.
- Eliminate the simultaneous outages to three or more system elements

## Potential Solution:

Forest Substation

- Replace the existing 150 MVA 230/115 kV transformer.
- Convert the Forest 230 kV substation into a three (3) breaker ring bus.

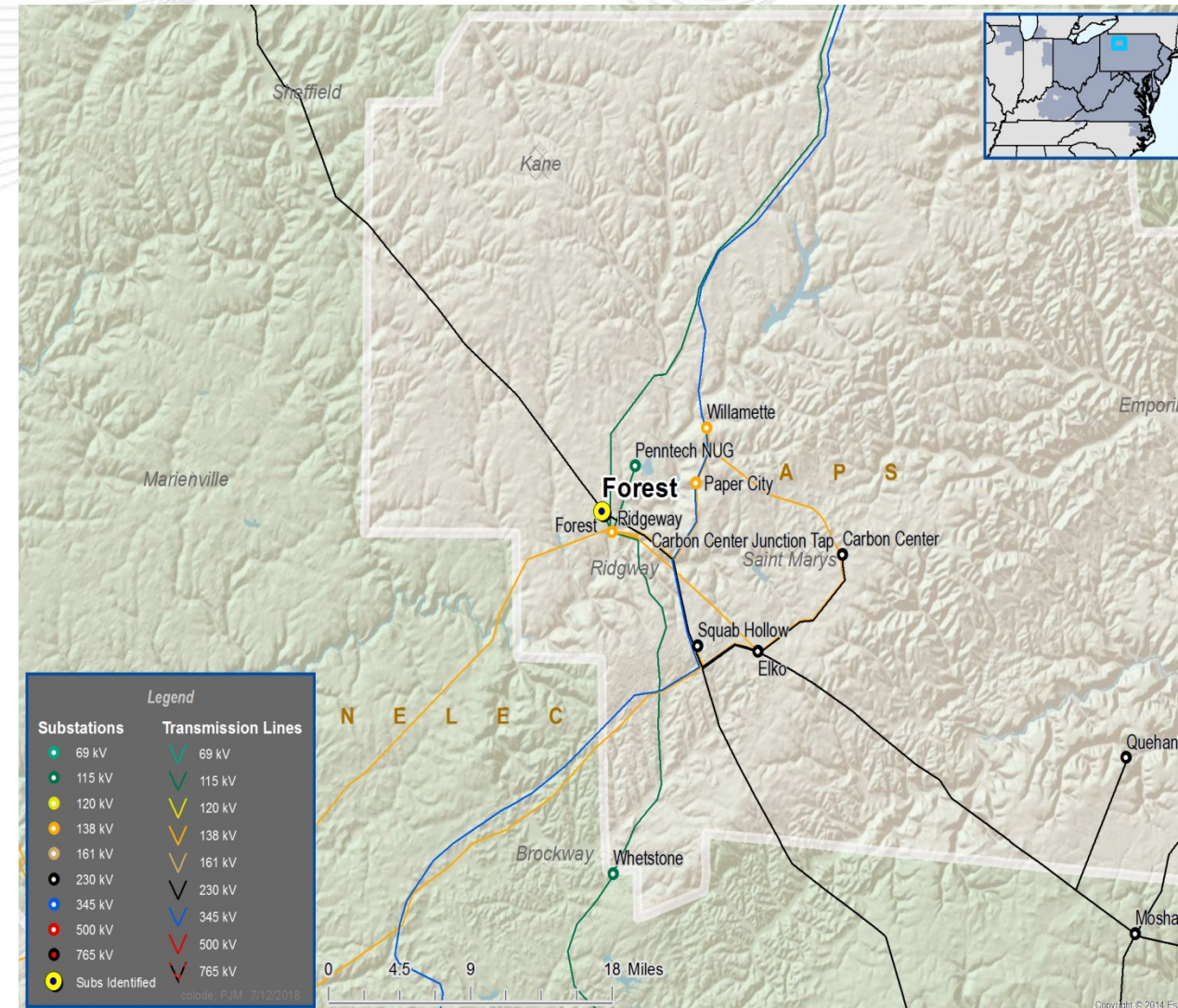
## Alternatives Considered:

- No Feasible Alternatives

Estimated Project Cost: \$9.1M

Projected IS date: 6/1/2020

Status: Conceptual



## Problem Statement (Scope and Need/Drivers):

*Equipment Material Condition, Performance and Risk*

- Improve system reliability and performance
- Remove obsolete & deteriorated equipment.

## Potential Solution:

Keystone Substation

- Replace the existing 351 MVA 500/230 kV transformer.
- Install a 500 kV high side breaker.

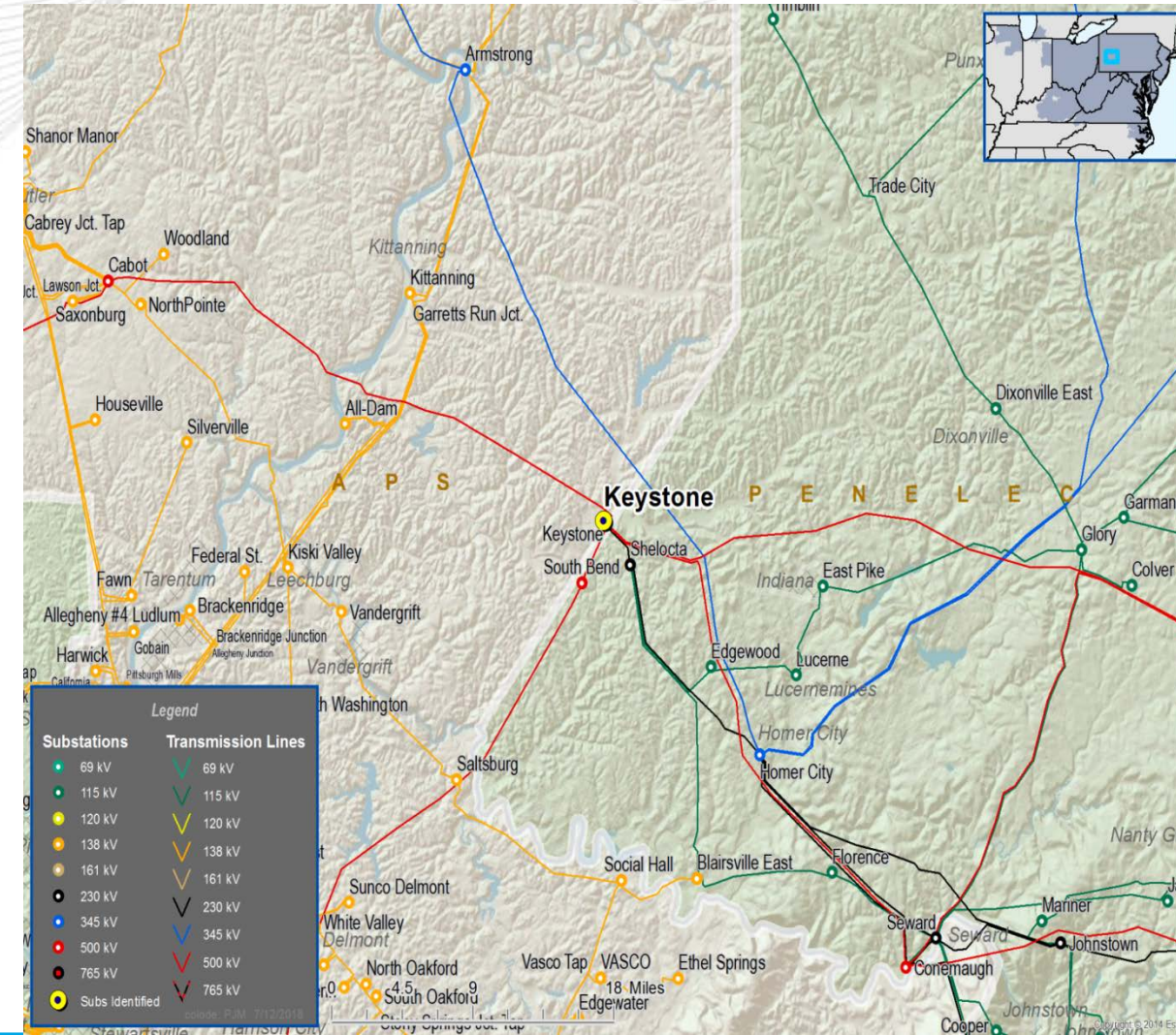
## Alternatives Considered:

- No Feasible Alternatives

Estimated Project Cost: \$ 21.7M

Projected IS date: 12/31/2019

Status: Conceptual



## Problem Statement (Scope and Need/Drivers):

RECO Planning Criteria (N-1 Criteria Violation)

- Loss of Line #75 (Orangeburg - West Nyack 69 kV) overloads the Line # 46 (Closter - Harings Corner 69 kV)
- To get below normal rating, over 9,000 customers would need to be shed.

## Potential Solution:

- Install 69 kV underground transmission line from Harings Corner Station terminating at Closter Station (about 3 miles).
- Reconfigure Closter Station to accommodate the UG transmission line from Harings Corner Station.
- The existing Line 751 will be terminated at Closter station while the rest of the line will continue to feed Cresskill Substation in parallel with the existing Line 61

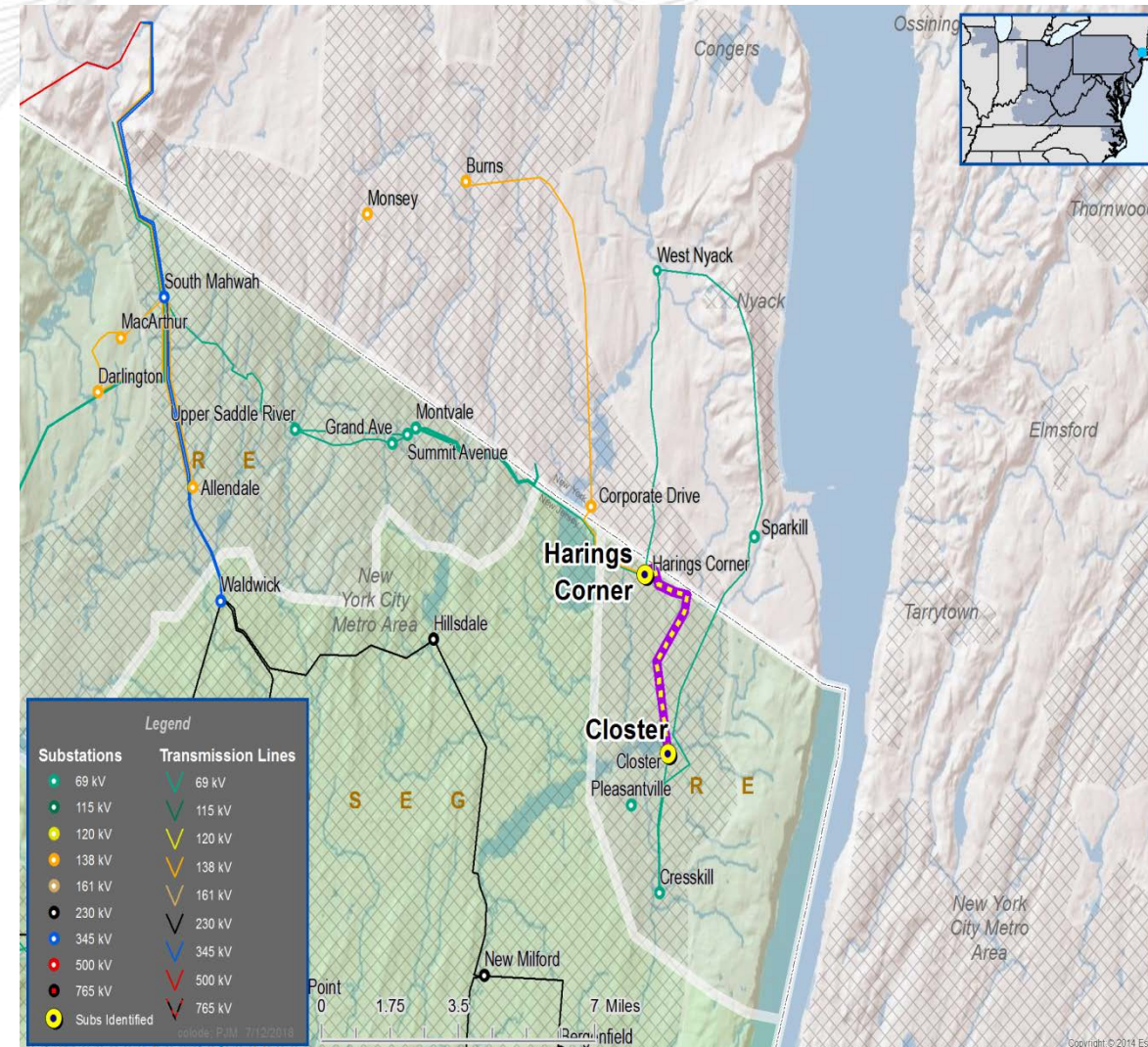
## Alternatives Considered:

- Install a new Tappan Station in Tappan, NJ bisecting the 69 kV loop.
  - Extend a new 69 kV transmission line from Harings Corner terminating at the new Tappan Station.
  - Terminate Line 751 at new Tappan Station with the northern tier (to be designated as Line 751) and the southern tier terminating at Cresskill Station.
  - Siting and permitting issues.
  - Estimated Cost: \$25M
- Re-conductor Line 75 (3.5 miles of 795 ACSR) and Line 46 (4.2 miles of 795 ACSR) with 1033 ACSR.
  - Replace existing towers/insulators to accommodate proposed conductor.
  - System Outage issues.
  - Estimated Cost: \$20M

Estimated Project Cost: \$ \$ 22M

Required IS date: 05/31/2020

Status: Planning and Engineering



## Problem Statement:

### Infrastructure Resilience:

Orange Valley is a 26kV station currently below FEMA 100 year flood elevations and is at risk in case of a major storm event.

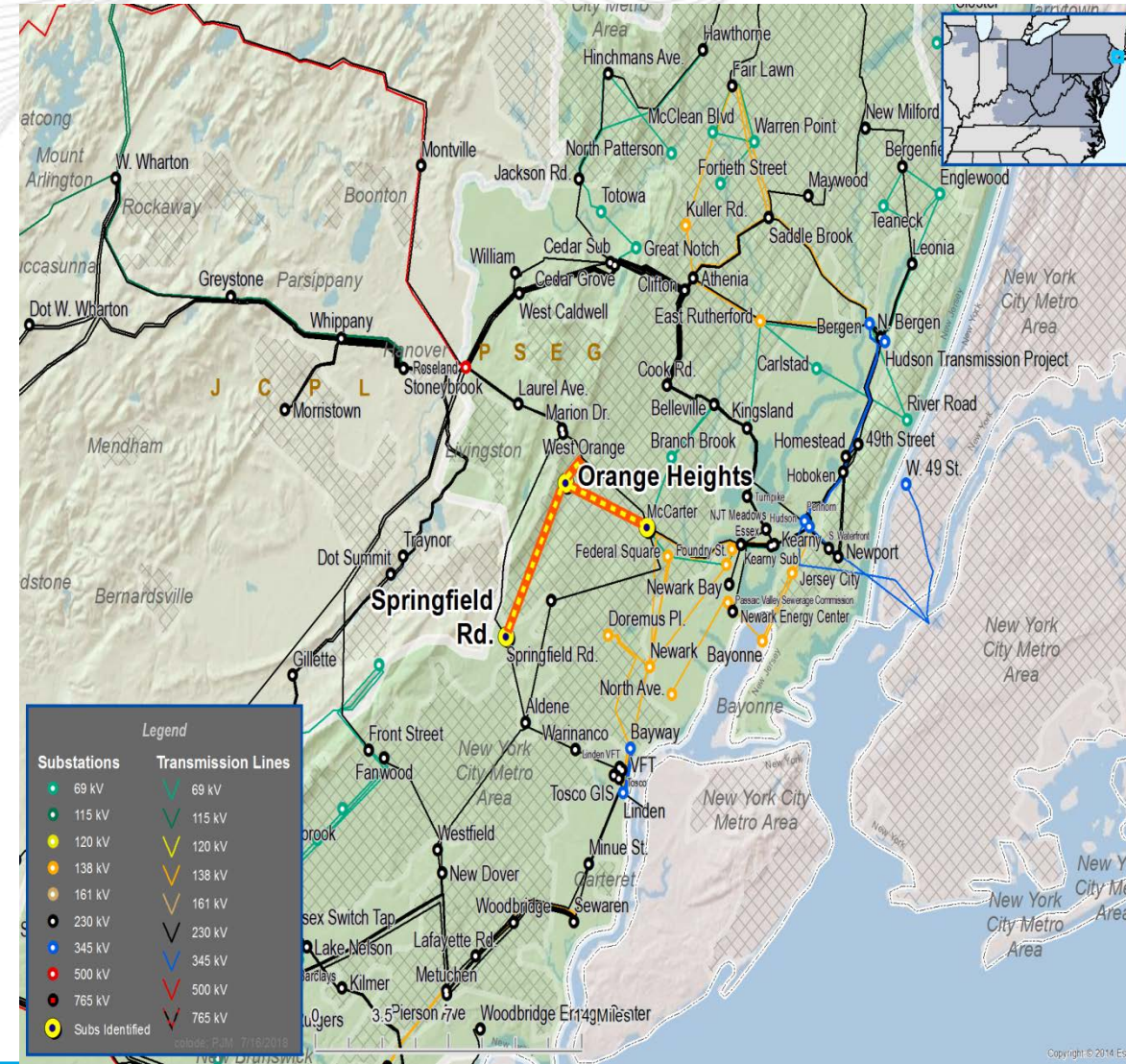
### Equipment Material Condition, Performance and Risk:

Station equipment at East Orange and Orange Valley 26kV supplied stations has been identified in our risk model as being in poor condition and must be addressed. Both of these stations are Type C stations, which PSE&G installed from 1940 until 1965. These stations have metal clad buildings that rust and leak over time, causing bus failures. To keep them in operation, PSE&G has used epoxy coatings to seal the leaks until they can be replaced or eliminated where possible. There are 65 stations of this type that need to be addressed over the next twenty years, all of which have been identified as a risk in our model. East Orange serves over 21,000 customers and 34 MW of load. Orange Valley serves over 7,000 customers and 16 MW of load.

## Potential/Alternative Solution:

1. Construct a 230/69/4kV station near the location of Orange Valley.
  - Purchase new property near Orange Valley.
  - Install a 230kV ring bus with one (1) 230/69kV transformer.
  - Install a 69kV breaker-and-a-half bus with three (3) 69/4kV transformers.
  - Construct a 69kV network between Lakeside, McCarter, Springfield Rd, and the new station.
  - **Estimated Project Cost:** \$ 328M (based on property availability)
2. Construct a 230/69/4kV station near the location of East Orange.
  - Purchase new property near East Orange.
  - Install a 230kV ring bus with one (1) 230/69kV transformer.
  - Install a 69kV breaker-and-a-half bus with three (3) 69/4kV transformers.
  - Construct a 69kV network between Lakeside, McCarter, Stanley Terrace, and the new station.
  - **Estimated Project Cost:** \$ 272M (based on property availability)

Status: Conceptual





## Problem Statement:

### Infrastructure Resilience:

Lakeside is a 26kV station that is currently below FEMA 100 year flood elevations and is at risk in case of a major storm event.

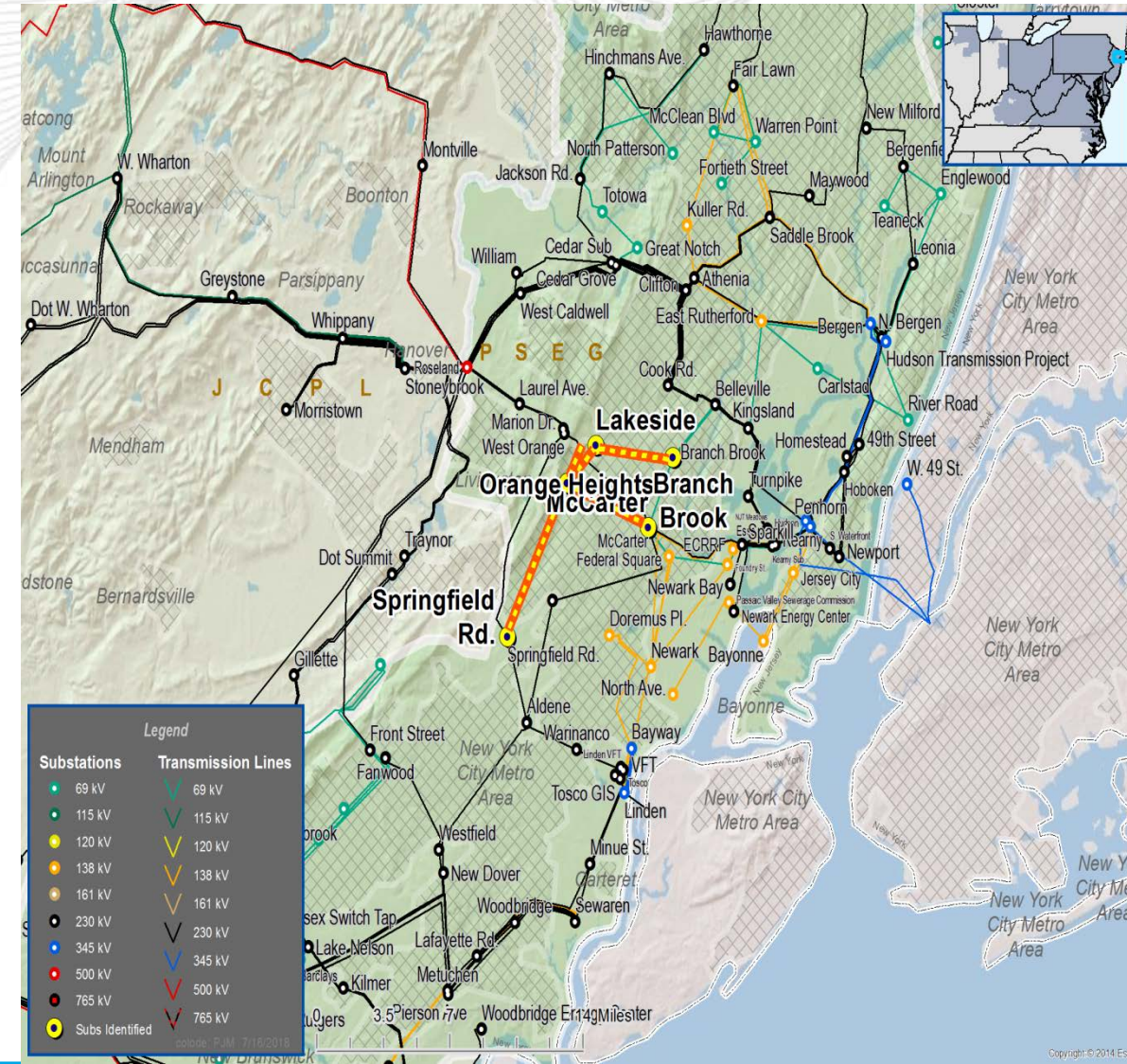
### Equipment Material Condition, Performance and Risk:

Station equipment at Lakeside has been identified in our risk model as being in poor condition because of its extreme age. In addition, the physical building is deteriorated and must be addressed. This station is a Type A station, which PSE&G designed in the 1920s. The majority of the equipment at the station is still original. There are about 60 stations of this type that need to be addressed over the next twenty years, all of which have been identified as a risk in our model. Lakeside serves over 10,000 customers and 22 MW of load.

## Potential/Alternative Solution:

1. Raise and rebuild Lakeside above FEMA flood elevation..
  - Purchase neighboring property to accommodate new construction.
  - Install a 69kV ring bus and three (3) 69/4kV transformers at Lakeside.
  - Construct a 69kV network between the following stations: Branch Brook, Lakeside, Orange Heights, and Toney's Brook.
  - **Estimated Project Cost: \$105M**
2. Relocate Lakeside outside of the FEMA flood zone.
  - Purchase property to relocate station.
  - Install a 69kV ring bus and three (3) 69/4kV transformers at the new property.
  - Construct a 69kV network between the following stations: Branch Brook, Orange Heights, Toney's Brook, and the new station.
  - **Estimated Project Cost: \$106M**

Status: Conceptual



**Problem Statement:**

*Infrastructure Resilience:*

Toney's Brook is a 26kV station that is currently below FEMA 100 year flood elevations and is at risk in case of a major storm event.

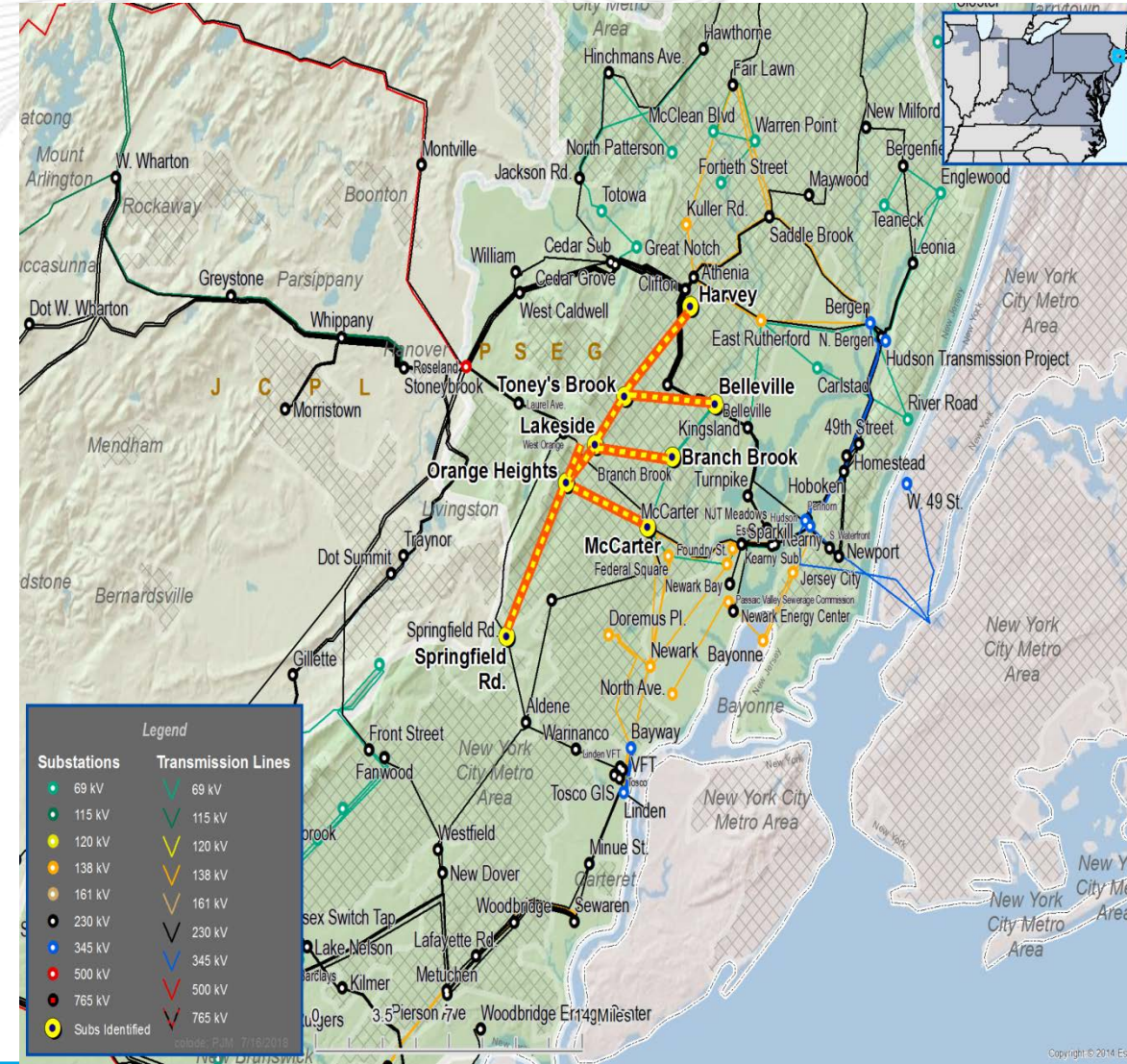
*Equipment Material Condition, Performance and Risk:*

Station equipment at Toney's Brook 26kV supplied station has been identified in our risk model as being in poor condition and must be addressed. Station equipment at Toney's Brook has been identified in our risk model as being in poor condition and must be addressed. This station is a Type C stations, which PSE&G installed from 1940 until 1965. These stations have metal clad buildings that rust and leak over time, causing bus failures. To keep them in operation, PSE&G has used epoxy coatings to seal the leaks until they can be replaced or eliminated where possible. There are 65 stations of this type that need to be addressed over the next twenty years, all of which have been identified as a risk in our model. Toney's Brook serves over 9,000 customers and 23 MW of load.

**Potential/Alternative Solution:**

1. Raise and rebuild Toney's Brook above FEMA flood elevation..
  - Purchase neighboring property to accommodate new construction.
  - Install a 69kV ring bus and three (3) 69/4kV transformers at Toney's Brook.
  - Construct a 69kV network between the following stations: Belleville, Harvey, Lakeside, and Toney's Brook.
  - **Estimated Project Cost: \$98M**
2. Relocate Toney's Brook outside of the FEMA flood zone.
  - Purchase property to relocate station. Property meeting the required criteria is not readily available in the area.
  - Install a 69kV ring bus and three (3) 69/4kV transformers at the new property.
  - Construct a 69kV network between the following stations: Belleville, Harvey, Lakeside, and the new station.
  - **Estimated Project Cost: \$105 - 120M (based on property availability)**

**Status:** Conceptual



# Second Review

## Baseline Reliability and Supplemental Projects

# BGE Transmission Zone: Supplemental Project Rebuild Five Forks – Windy Edge 115kV (110511, 110512)

Previously Presented : 05/25/2018

## Problem Statement:

### Aging Infrastructure

- The 20.7 mile Five Forks – Windy Edge 115kV (110511/110512) 115kV Circuit pair (Conductors/Towers/Foundations) was originally constructed during the period between 1910 and 1918
- Construction of the 115kV circuit pair is two single circuit lattice towers contained in a single ROW with a circuit configuration that is conducive to Avian related issues
- Original towers were re-conducted between 1965 and 1966 with 1033.5kcm 45/7 ACSR & 634.9kcm 12/7 ACAR conductor
- Foundations are grillage type foundations that have shown signs of rust, particularly at the air/surface line
- Porcelain insulation hardware is deteriorating/losing glaze preventing adequate washing, allowing dirt and dust to accumulate, compounded the tower location through farm fields where dirt is regularly disturbed
- Directly serves two BGE distribution substations and two transmission customers along with providing network transmission to BGE system

### Performance - BGE's 4th worst performing circuit pair

- Avian related issues as a result of conductor spacing/configuration
- Farm equipment tower hits
- Normalized outage rate of 6.1 operations/100mi/year (110511), 2.03 operations/100mi/year (110512)

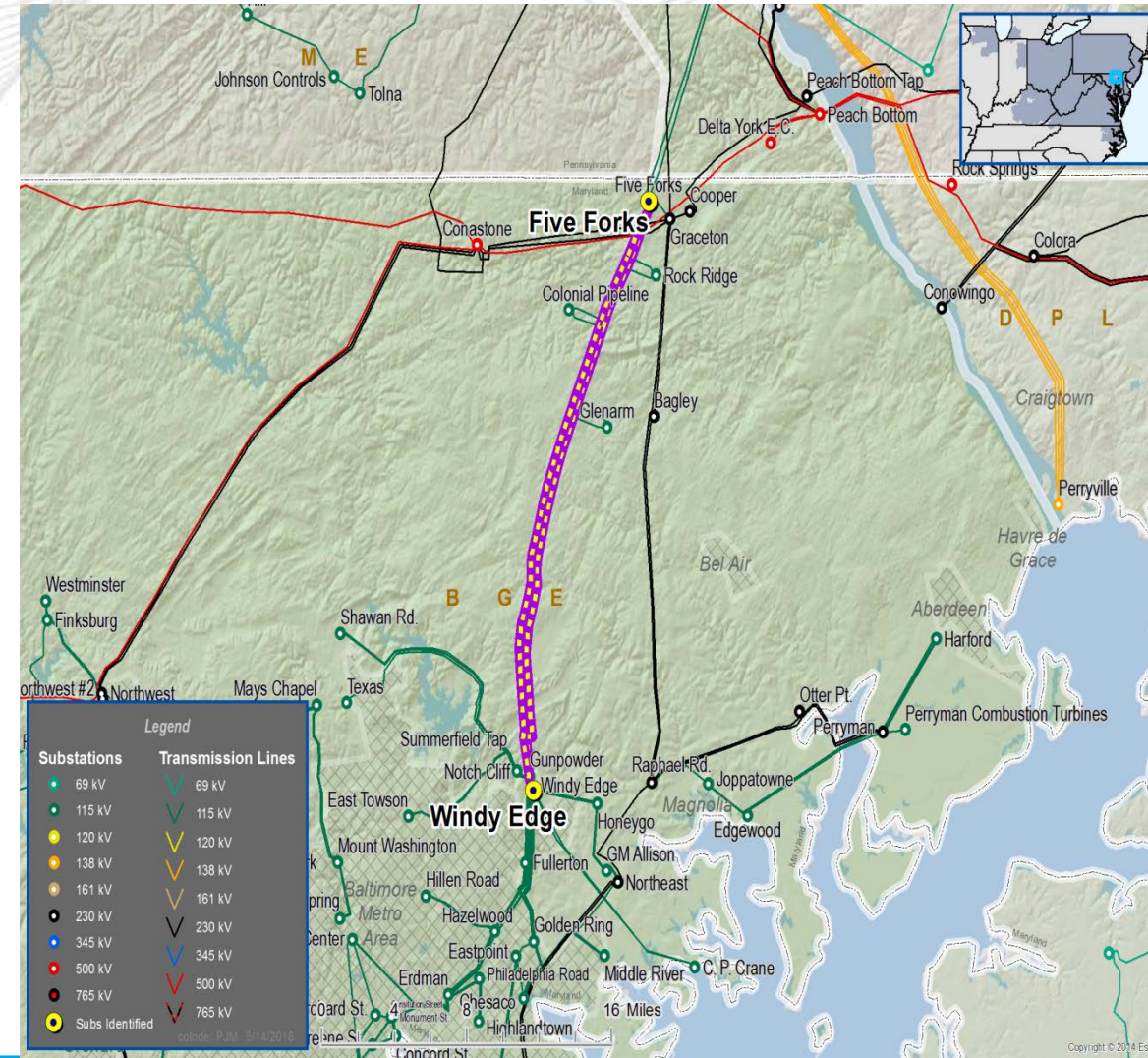
## Selected Solution:

- Rebuild both Five Forks – Windy Edge 115kV (110511, 110512) circuits using steel monopole, double circuit construction with sufficient capacity to support future needs. (\$1670)
- Addresses line and customer reliability, aging infrastructure, ground-line impact, future capacity requirements

Estimated Cost : \$60M

Expected In-Service: 12/31/2022

Status: Conceptual



Previously Presented : 05/25/2018

## Problem Statement:

- Redevelopment of the Sparrows Point peninsula
- Retirement of existing customer owned Finishing Mill and Steel Side substations
- Planned (BGE Distribution) construction of new 34kV&13kV (Fitzell) substation located near existing Steel Side substation to supply ~95 MW of new forecasted distribution customer demand on peninsula

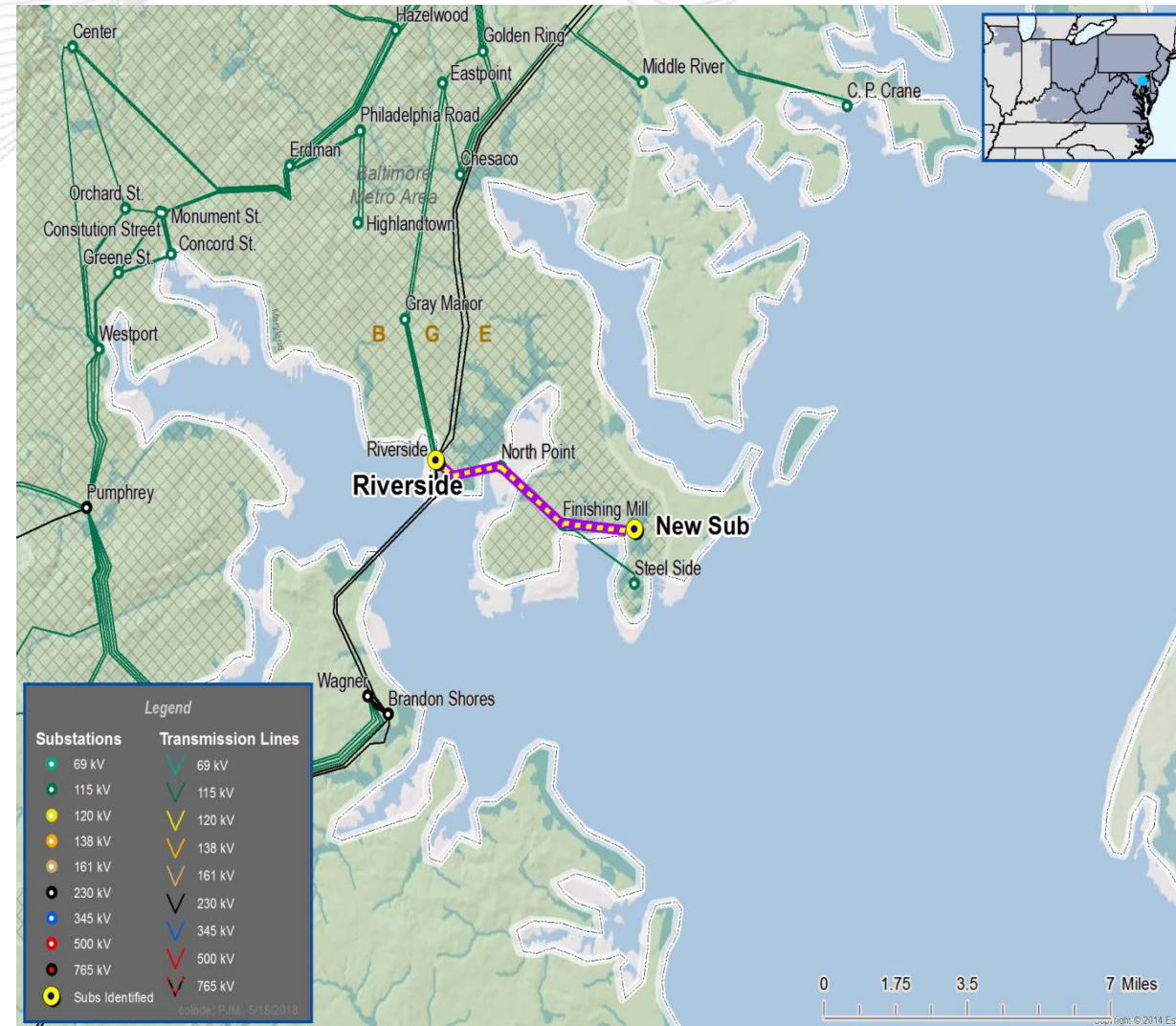
## Selected Solution:

- Build new 115kV station to supply 34kV & 13kV distribution station. (S1671)
- Provide diverse overhead transmission supplies from Riverside and Windy Edge substations to new 115kV station
- Retire remainder of unused transmission infrastructure at Finishing Mill and Steel Side Substations.

Estimated Project Cost: \$45M

Expected In Service Date: 12/1/2026

Status: Conceptual



Previously Presented : 05/25/2018

## Problem Statement:

- Chestertown is currently an open ring bus. Closing in this substation will provide operational flexibility and provide high side protection for the existing transformers.

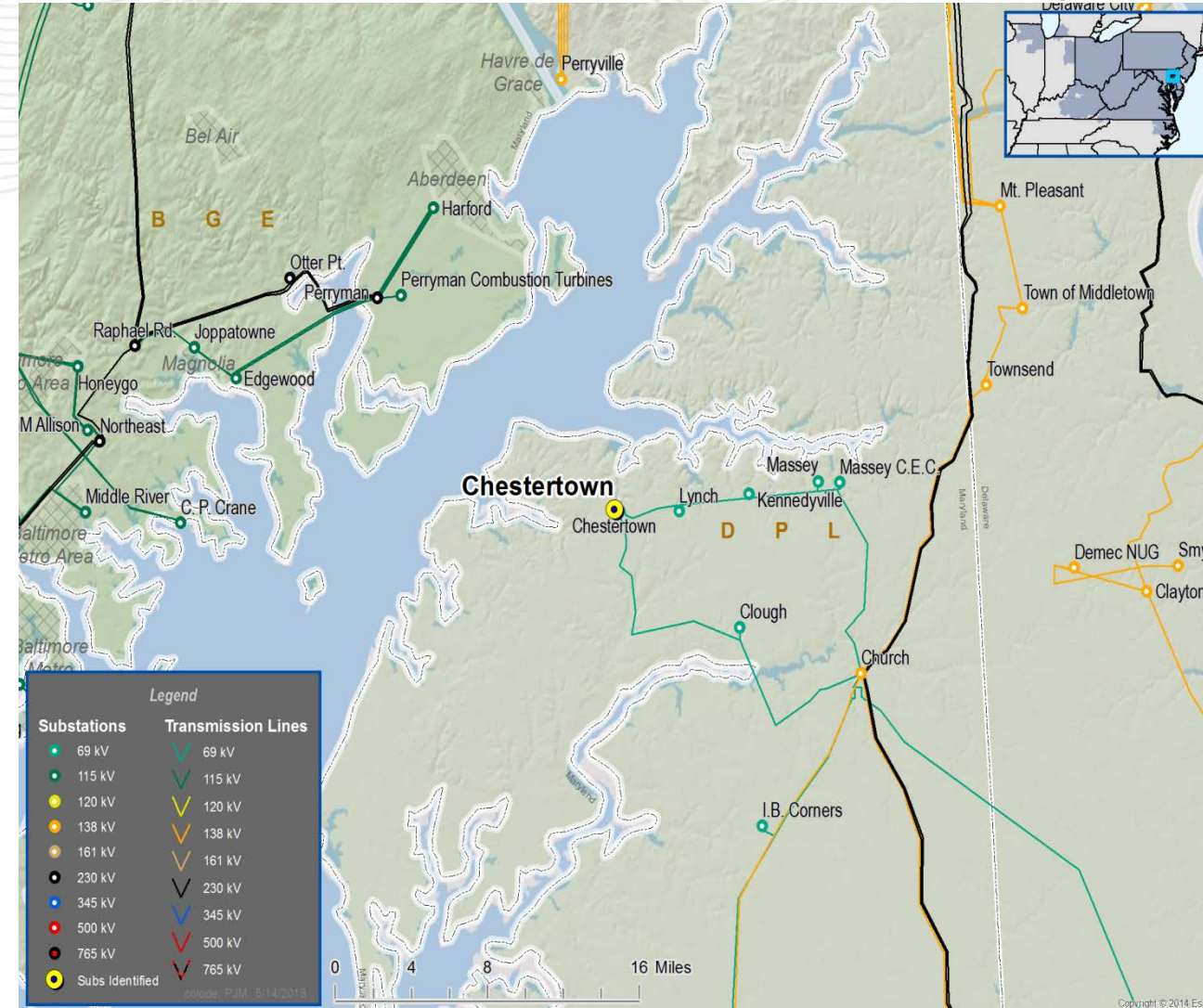
## Selected Solution:

- Close the Chestertown 69 kV ring bus by installing a new circuit breaker and line relaying. **(\$1673)**

Estimated Project Cost: \$2.0M

Projected In-Service: 12/31/2019

Status: Engineering



Previously Presented : 05/25/2018

## Problem Statement:

### Equipment Material Condition, Performance and Risk

- Enhance system reliability and performance.
- Upgrade equipment due to degraded equipment performance, material condition, and obsolescence.

### Operational Flexibility and Efficiency

- Improve long-term overall system reliability and performance of the system.
- Improve operational flexibility during maintenance, outage, and restoration.
- Reduce amount of potential local load loss under contingency conditions

## Selected Solution:

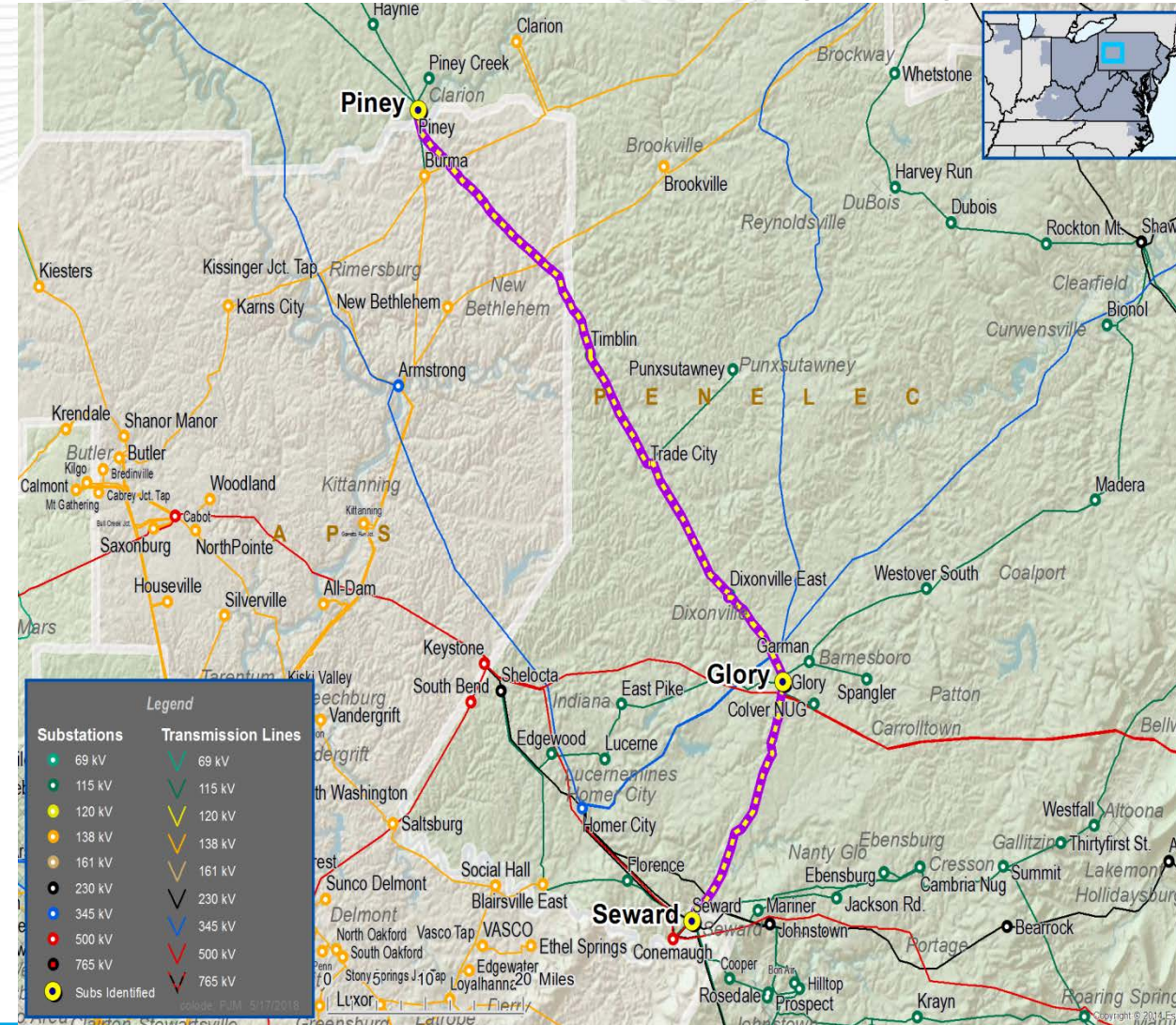
Rebuild Seward-Glory-Piney 115 kV line . (**\$1672**)

- Rebuild ~66 miles of 115 kV line using double circuit 230 kV construction.
- Install 1033 ACSR conductor (six-wired) energized at 115 kV.

Estimated Project Cost: \$150M - \$200M (subject to detailed design)

Expected In-Service: 12/01/2023

Status: Conceptual



Previously Presented : 05/25/2018

**Problem Statement:**

*FERC Form 715:*

Doremus Place Substation is supplied by two underground 138kV circuits. Doremus Place supplies almost 45,000 customers with load in excess of 120 MVA. An N-1-1 event would result in a complete loss of electric supply to the station for more than 24 hrs.

*Equipment Material Condition, Performance and Risk:*

The majority of the equipment at 19<sup>th</sup> Ave Substation is over 60 years of age and must be addressed.

**Recommended Solution:**

Construct two (2) new 69/13kV stations in the Doremus area and relocate the Doremus load to the new stations. **(B3025)**

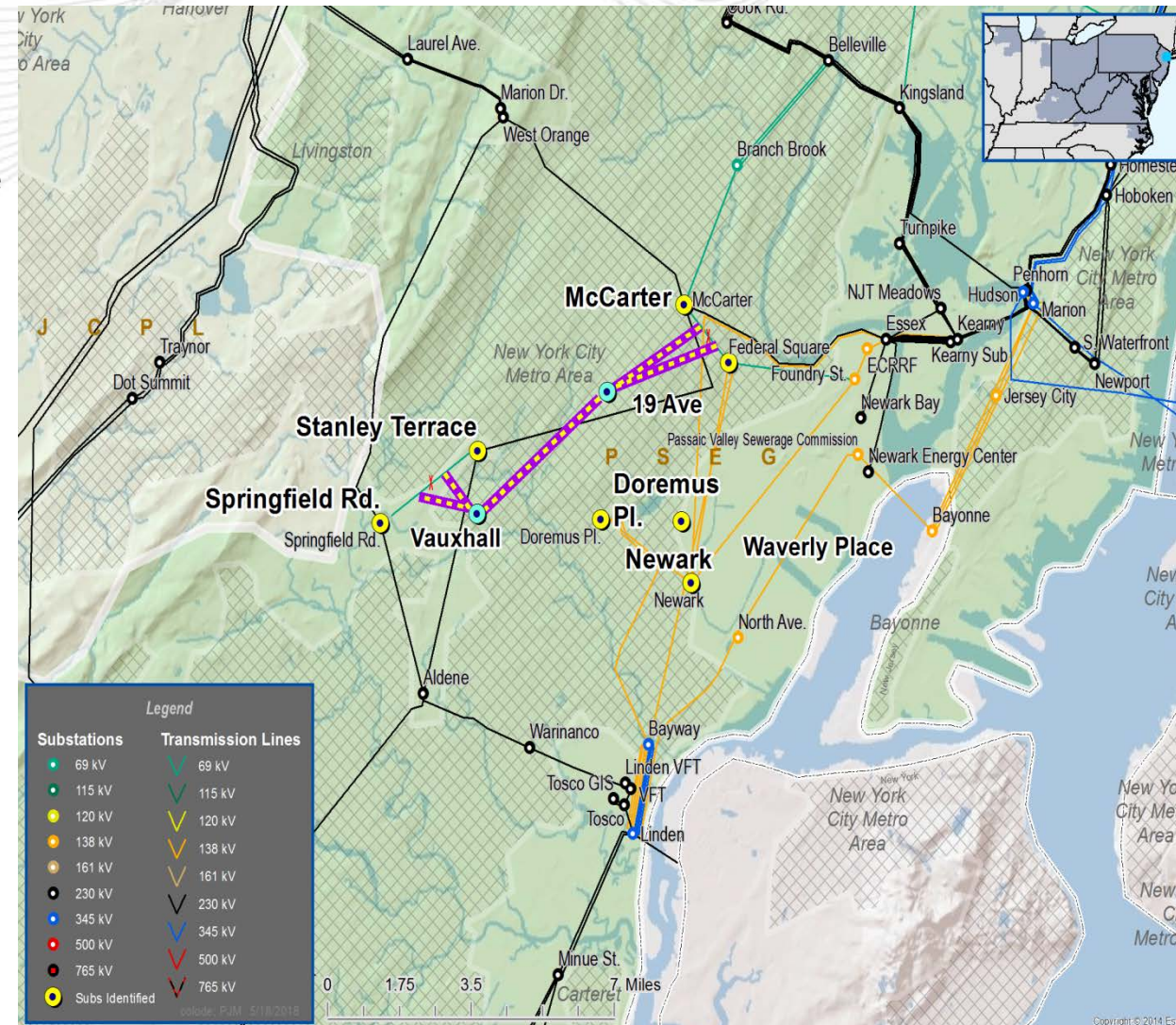
- At each of two (2) new locations, install a 69kV ring bus and two (2) 69/13kV transformers.
- Construct a 69kV network between Stanley Terrace, Springfield Road, McCarter, Federal Square, and the two new stations.
- This alternative allows for elimination of 19<sup>th</sup> Ave Substation.

Estimated Project Cost: 155M

Required IS Date: 06/01/2018

Expected IS Date: 06/01/2022

Status: Engineering





## Problem Statement:

### Infrastructure Resilience:

Academy St is currently below FEMA 100 year flood elevations and is at risk in case of a major storm event.

### Equipment Material Condition, Performance and Risk:

The majority of the equipment at Academy St is over 60 years of age and must be addressed.

## Selected Solution:

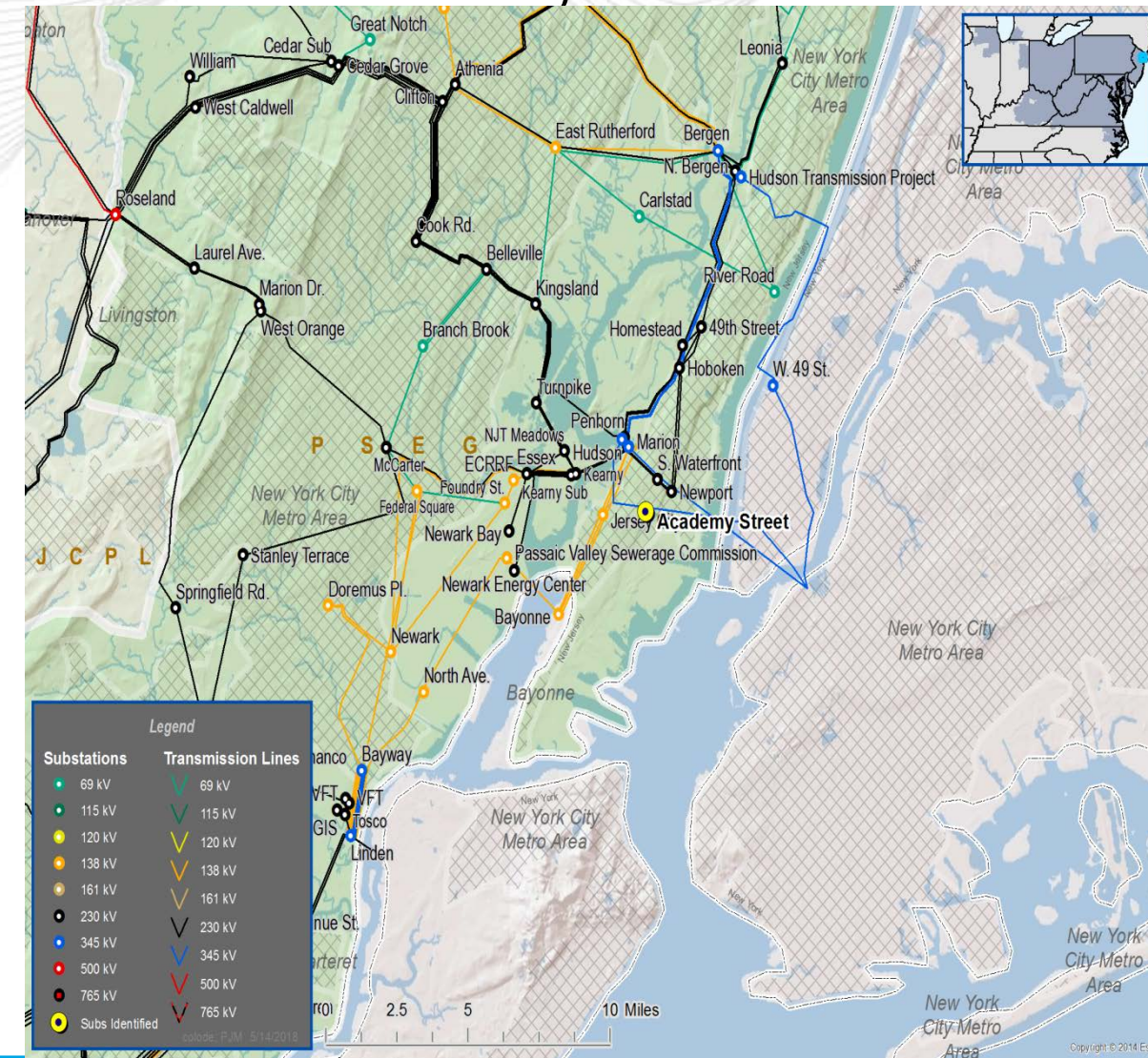
Eliminate Academy St and construct a new station at a nearby location. **(S1674)**

- Purchase new property in Jersey City. Property negotiations are ongoing
- Install a 69kV ring bus and two (2) 69/13kV transformers at the new property.
- Construct a 69kV network between the following stations: Greenville, Kearny, Madison, and the new station.
- Easier constructability and logistics.

Estimated Project Cost: 90M

Expected IS Date: 12/31/2022

Status: Engineering





# PSEG Transmission Zone: Supplemental Project Woodlynne & State Street 69kV Conversions

## Problem Statement:

### Infrastructure Resilience:

State Street and Woodlynne are currently below FEMA 100-year flood elevations and are at risk in case of a major storm event.

### Equipment Material Condition, Performance and Risk:

The majority of the equipment at State St and Woodlynne is over 60 years of age and must be addressed.

## Selected Solution:

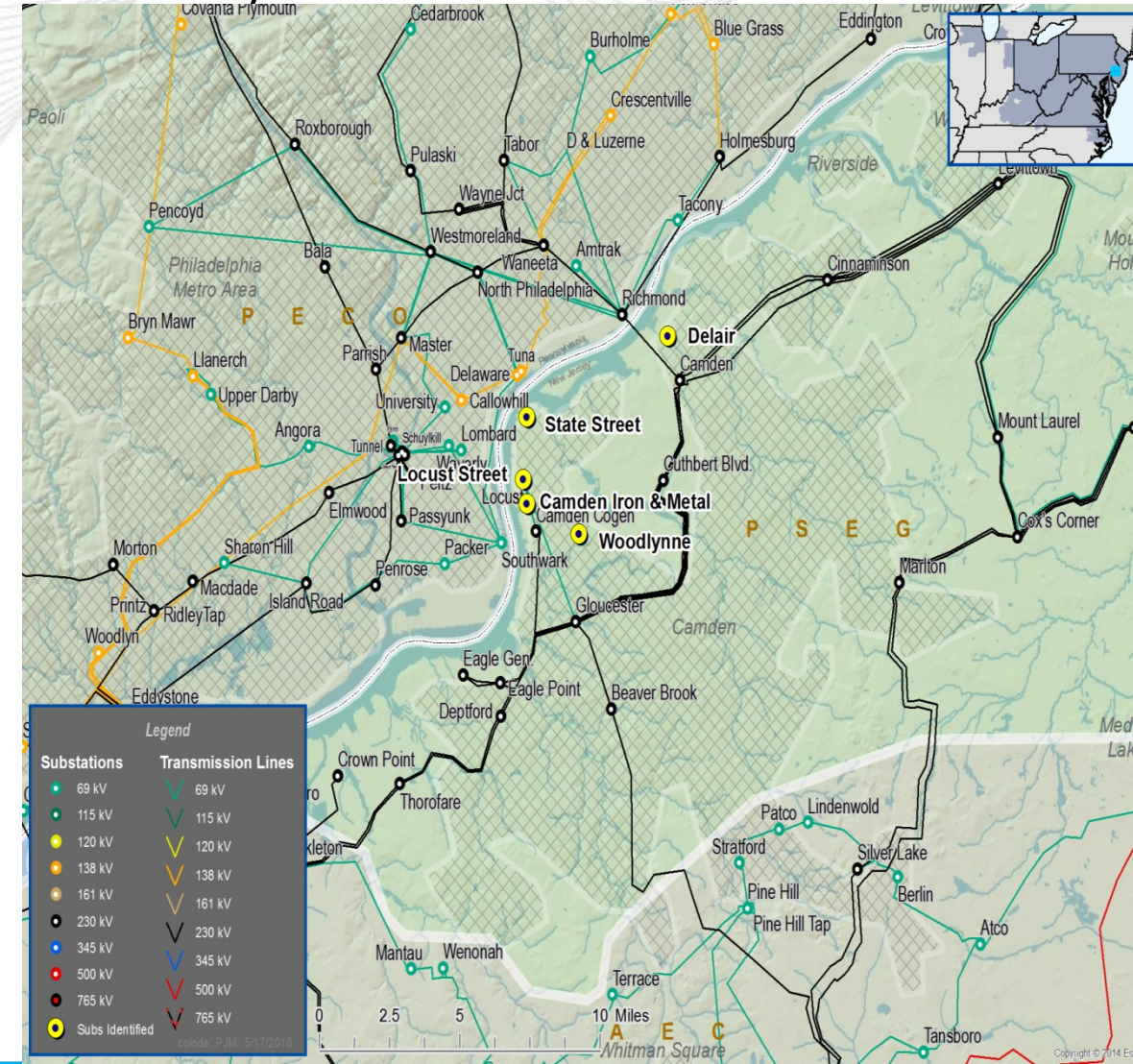
Eliminate State St and construct a new station at a nearby location. Raise and rebuild Woodlynne above FEMA flood elevation. **(\$1675)**

- At a new location, install a 69kV ring bus and three (3) 69/4kV transformers to feed State St load.
- At Woodlynne, purchase adjacent property and install a 69kV ring bus with two (2) 69/13kV transformers.
- Construct a 69kV network between the following stations: Camden, Gloucester, Delair, Locust St, Woodlynne, and the new station.

Estimated Project Cost: 153M

Expected IS Date: 06/01/2022

Status: Engineering



# Short Circuit

## Problem: Short Circuit

*(Immediate Need & Below 200kV)*

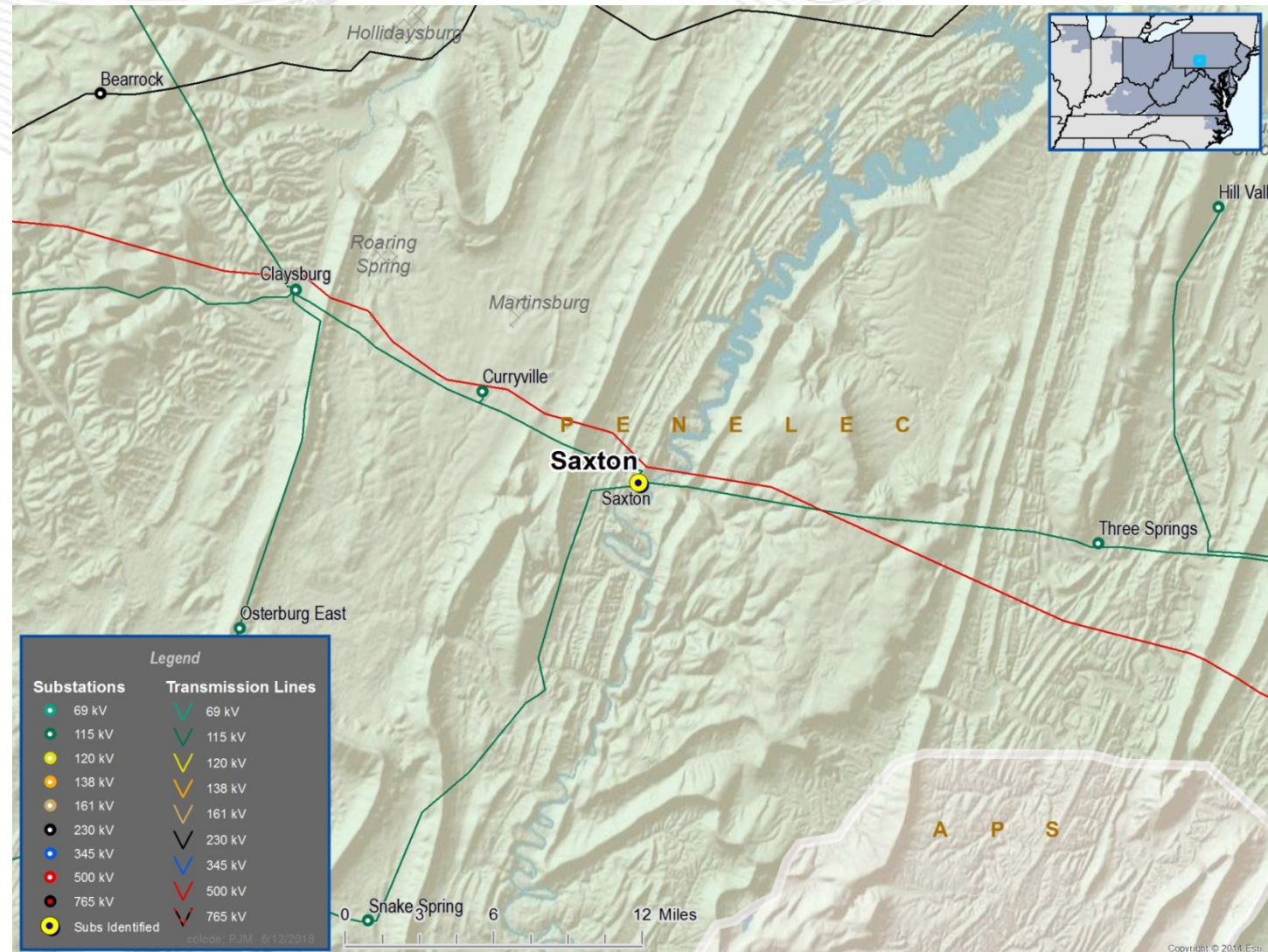
- The Saxton 115kV breaker 'BUS TIE' is overdutied.

## Recommended Solution:

- Replace Saxton 115kV breaker 'BUS TIE' with a 40kA breaker (b3022)

Estimated Project Cost: \$214,570

Required IS Date: June 1, 2020



### Problem: Short Circuit

*(Immediate Need & Below 200kV)*

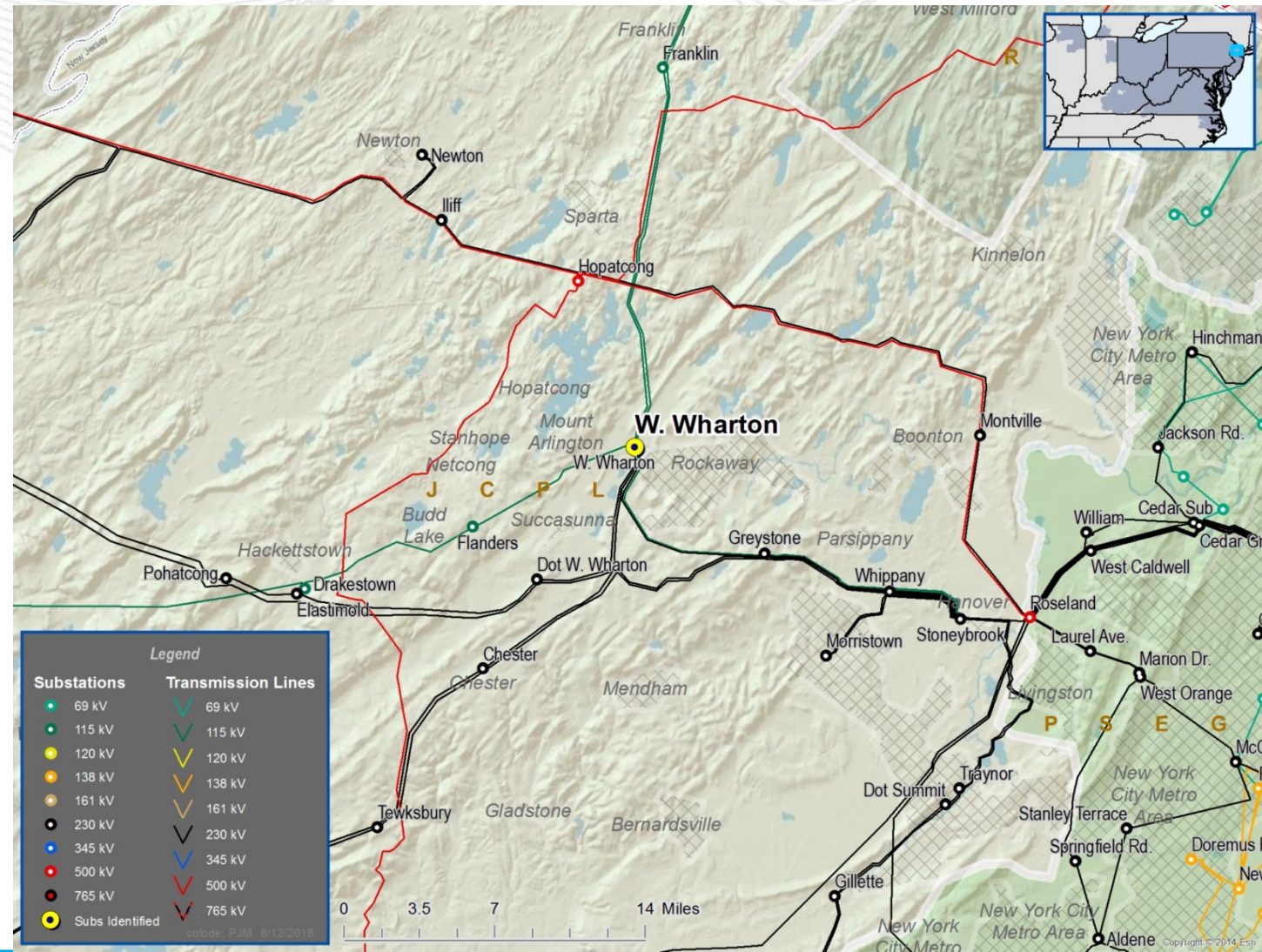
- The West Wharton 115kV breakers 'G943A' and 'G943B' are overdutied.

### Recommended Solution:

- Replace West Wharton 115kV breakers 'G943A' and 'G943B' with 40kA breakers (b3023)

Estimated Project Cost: \$398,000

Required IS Date: June 1, 2020



# Next Steps

Mid-Atlantic	Start	End
8/24/2018	8:30	12:30
9/21/2018	8:30	12:30
10/26/2018	8:30	12:30
11/28/2018	8:30	12:30



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





# Revision History

7/16/2018 – V1 – Original version posted to [pjm.com](http://pjm.com)