



# Reliability Analysis Update

Transmission Expansion Advisory  
Committee

February 8, 2018



# 2018 RTEP Analysis Update



# Transmission Service Update



# Agreement Changes Included in 2018 RTEP

- Linden VFT
  - Previous agreements:
    - VFT
      - 2017 RTEP 330 MW FTWRs (withdrawal) and 315 MW Capacity Transmission Injection Rights
    - HTP
      - 2017 RTEP 320 MW FTWRs (withdrawal) and 353 MW NFTWRs (withdrawal)
  - Current agreement:
    - VFT
      - 2018 RTEP 330 MW NFTWRs (withdrawal) and 315 MW Capacity Transmission Injection Rights
    - HTP
      - 2018 RTEP 0 MW FTWRs and 673 MW NFTWRs (withdrawal)
- RTEP modeling impact observations
- Next Steps
  - Evaluate updated parameters as part of the 2018 RTEP

# PSE&G FERC 715 Local Criteria - Equipment Assessment

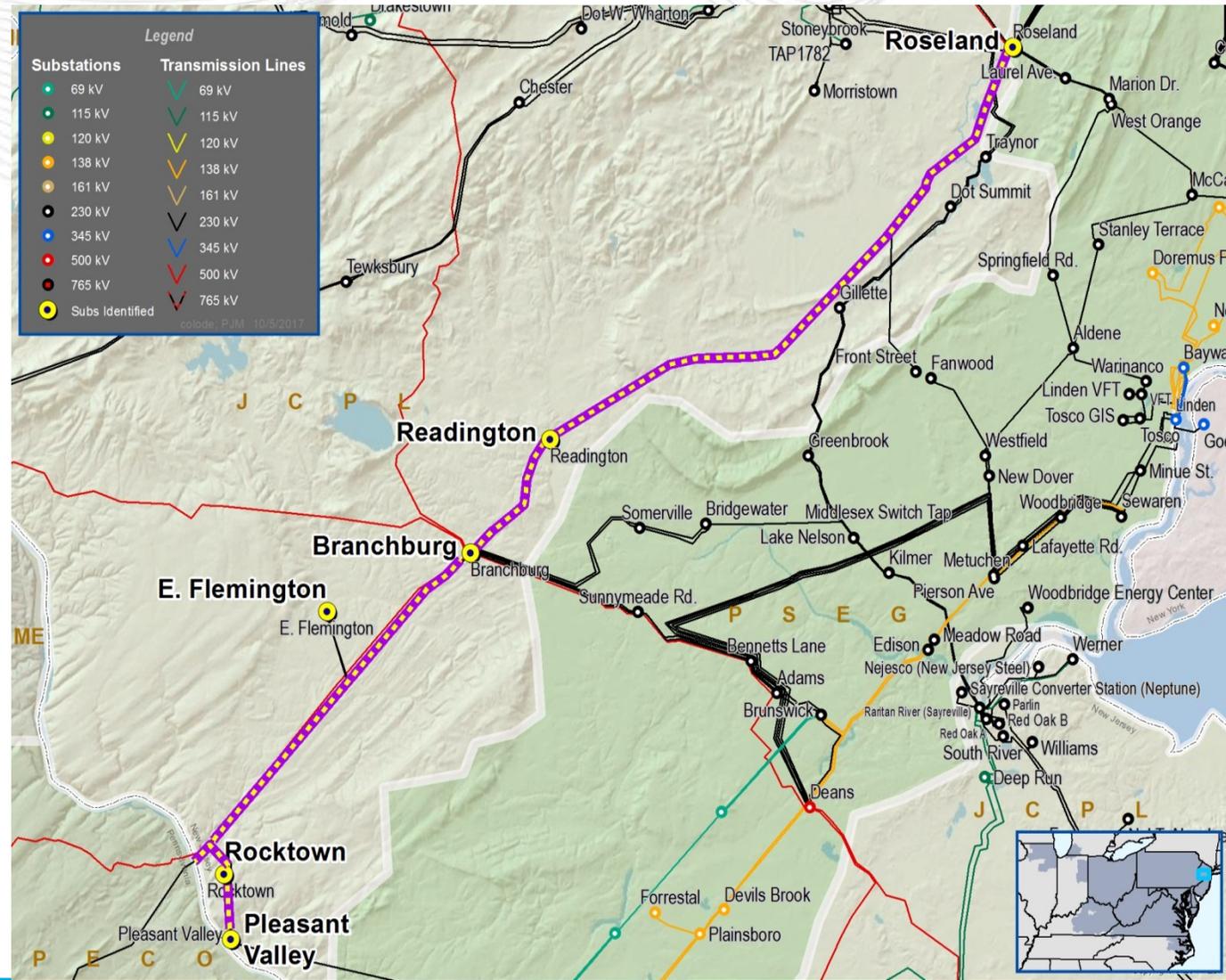
Roseland – Branchburg – Pleasant Valley  
Corridor



# PSE&G Transmission Zone

## Roseland – Branchburg – Pleasant Valley Corridor

- PSE&G's FERC 715 Transmission Owner criterion addresses equipment condition assessments
  - PSE&G assessed the condition of the Roseland to Branchburg to Pleasant Valley 230 kV circuits.



- Refer to PSE&G criteria:

## VII. EQUIPMENT ASSESSMENT AND STORM HARDENING

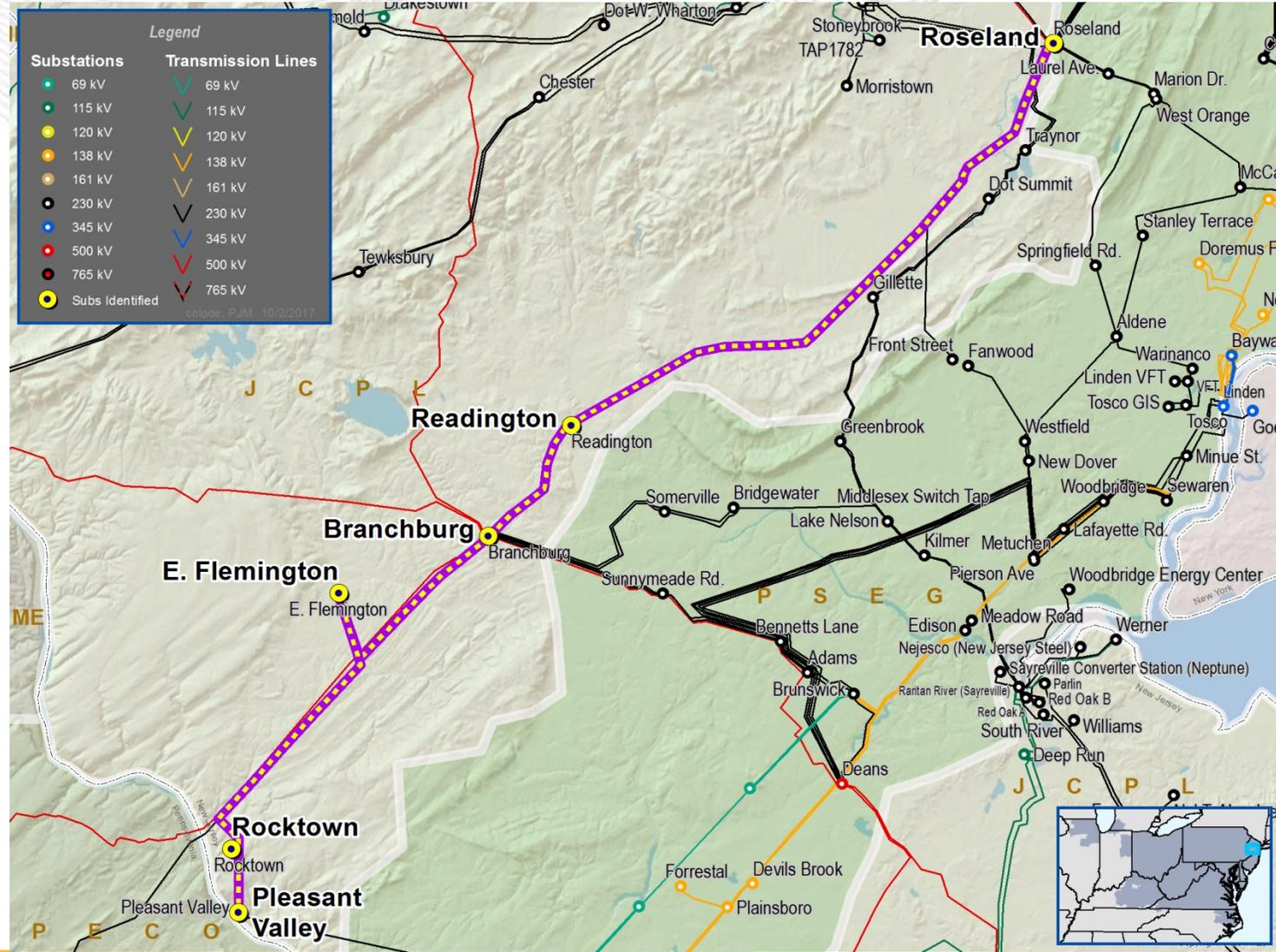
<http://www.pjm.com/~media/planning/planning-criteria/PSE&G-planning-criteria.ashx>

- Roseland to Branchburg is approximately 30 miles of 230 kV circuit and the average structure age is approximately 90 years.
- Branchburg to Pleasant Valley is approximately 22 miles of 230 kV circuit and the average structure age is approximately 90 years.
- Parallel to Roseland-Branchburg 500kV corridor
- The terrain is variable and includes rural, National Wildlife Refuge and municipalities
- This facility also serves 240 MVA sub-transmission load in adjacent territory (JCP&L)

### Problem:

### PSE&G FERC 715 local Transmission Owner Criteria

- Equipment condition assessment for the entire corridor
- Equipment has reached its end of life



1. Remove and retire the 230 kV corridor without replacing
2. Install new parallel circuit on new right-of-way and remove existing 230 kV corridor
3. Replace the existing 230 kV single-circuit corridor with new dual-circuit structures and initially string one 230 kV circuit

- Reliability Analysis Result and consequences for the Remove and Retire Option
- PJM performed reliability analysis without the Roseland – Branchburg – Pleasant Valley 230 kV on the 2022 RTEP summer basecase.
- Removing the circuit causes severe voltage issue on the JCPL 34.5 kV network system:
  - The voltage for Fourteen 34.5 kV stations dropped by > 40%, with a new value of less than 0.65 pu.
  - The voltage for Ten 34.5 kV stations dropped by 20-40%, with a new value less than 0.62-0.80 pu
  - The voltage for Ten 34.5 kV stations dropped by 5-20%, with a new value less than 0.82-0.91 pu
- The following analysis also show further voltage issues:
  - N-1 analysis resulted in several thermal and severe voltage issue on the JCPL 34.5 kV system
  - N-1-1 voltage analysis resulted in wide spread voltage violation
  - Working on the N-1-1 thermal analysis.
- This is a very poor alternative from a system reliability performance perspective



# Recommended Solution: Roseland - Branchburg – PV Corridor:

## **Recommended solution:**

- Replace the existing Roseland – Branchburg – Pleasant Valley 230 kV corridor with new structures.

**Estimated Project Cost:** \$ 546 M

**Required IS date:** 2018

**Projected IS date:** 6/1/2022

**Project status:** Engineering

# Short Circuit Projects Update

**Problem: Short Circuit**

- The Twin Branch 345kV breaker “JM” is 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

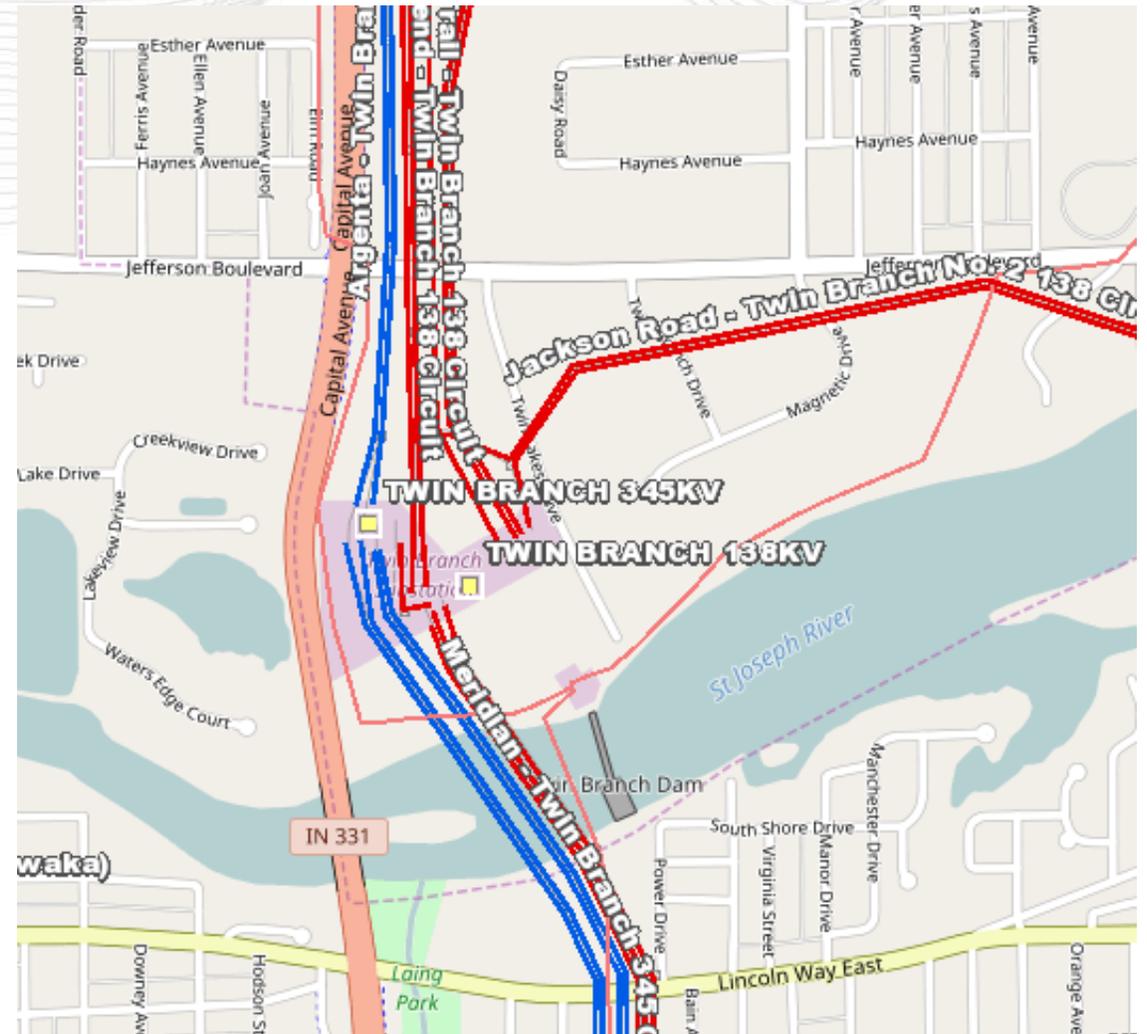
**Recommended Solution:**

- Replace the Twin Branch 345kV breaker “JM” with 63 kA breaker (B2988)

**Estimated Project Cost: \$2M**

**Required IS Date: 10/1/ 2020**

**Projected IS Date: 6/1/2020**



# Supplemental Projects First Review



## Problem Statement:

- Two 230 kV oil circuit breakers at Howard and two oil circuit breakers at Jericho Park are at risk of poor performance, environmental concerns, and parts availability issues.

## Potential Solution:

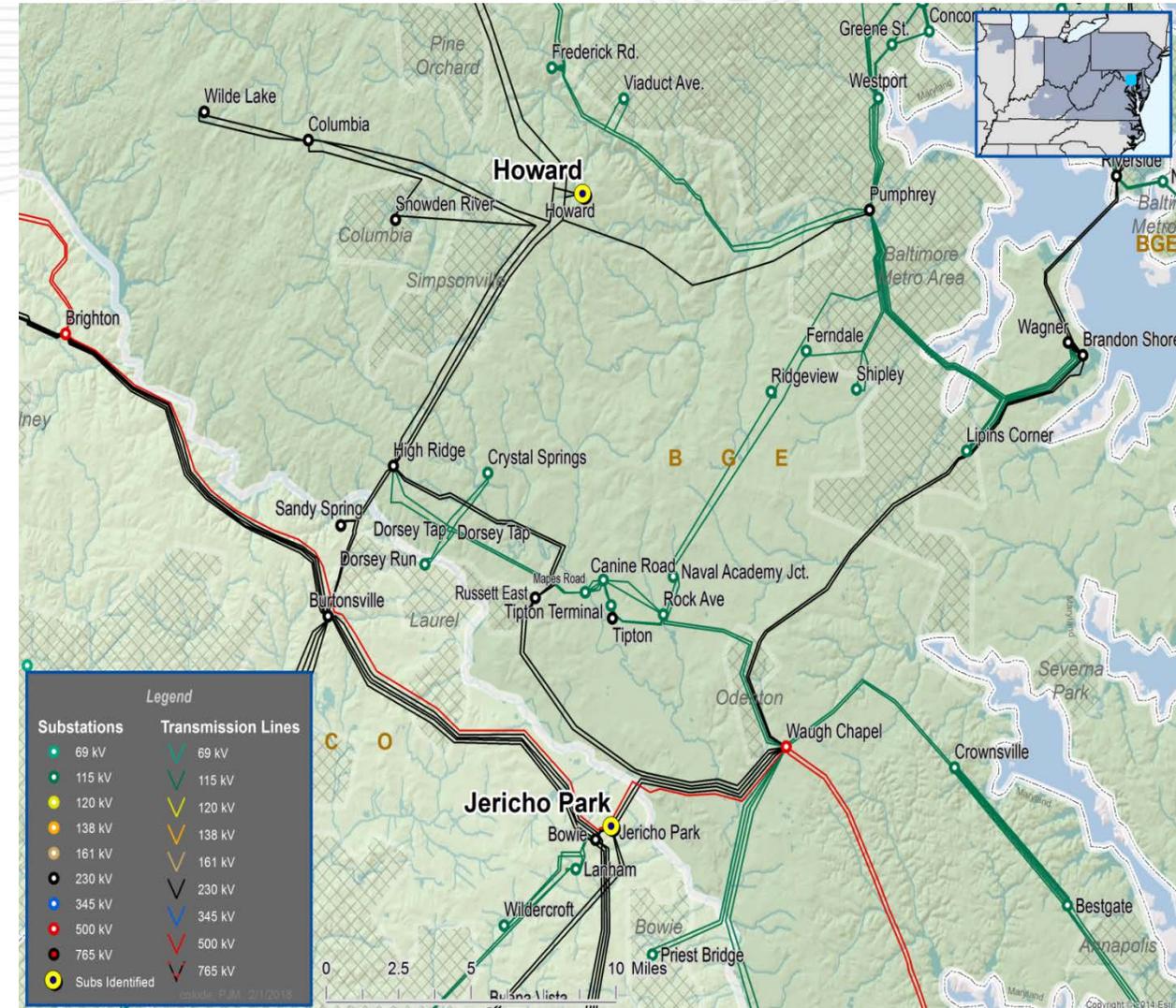
- Replace two breakers at Howard 230 kV and two breakers at Jericho Park 230 kV with new 63 kA rated gas circuit breakers
- Estimated Cost: \$1.308 M

## Alternative Solution:

- No feasible alternatives

**Expected In-Service:** 12/1/2018

**Status:** Engineering



# BGE Transmission Zone: Supplemental Project Calvert Cliffs Nuclear Power Plant Swing Transformer Upgrade

## Problem Statement:

- Calvert Cliffs is planning to add an additional (third) plant service transformer to:
  - Improve reliability in case of a plant service transformer failure
  - Further protect against loss of offsite power sources
  - Improve operational flexibility during maintenance outages

## Potential Solution:

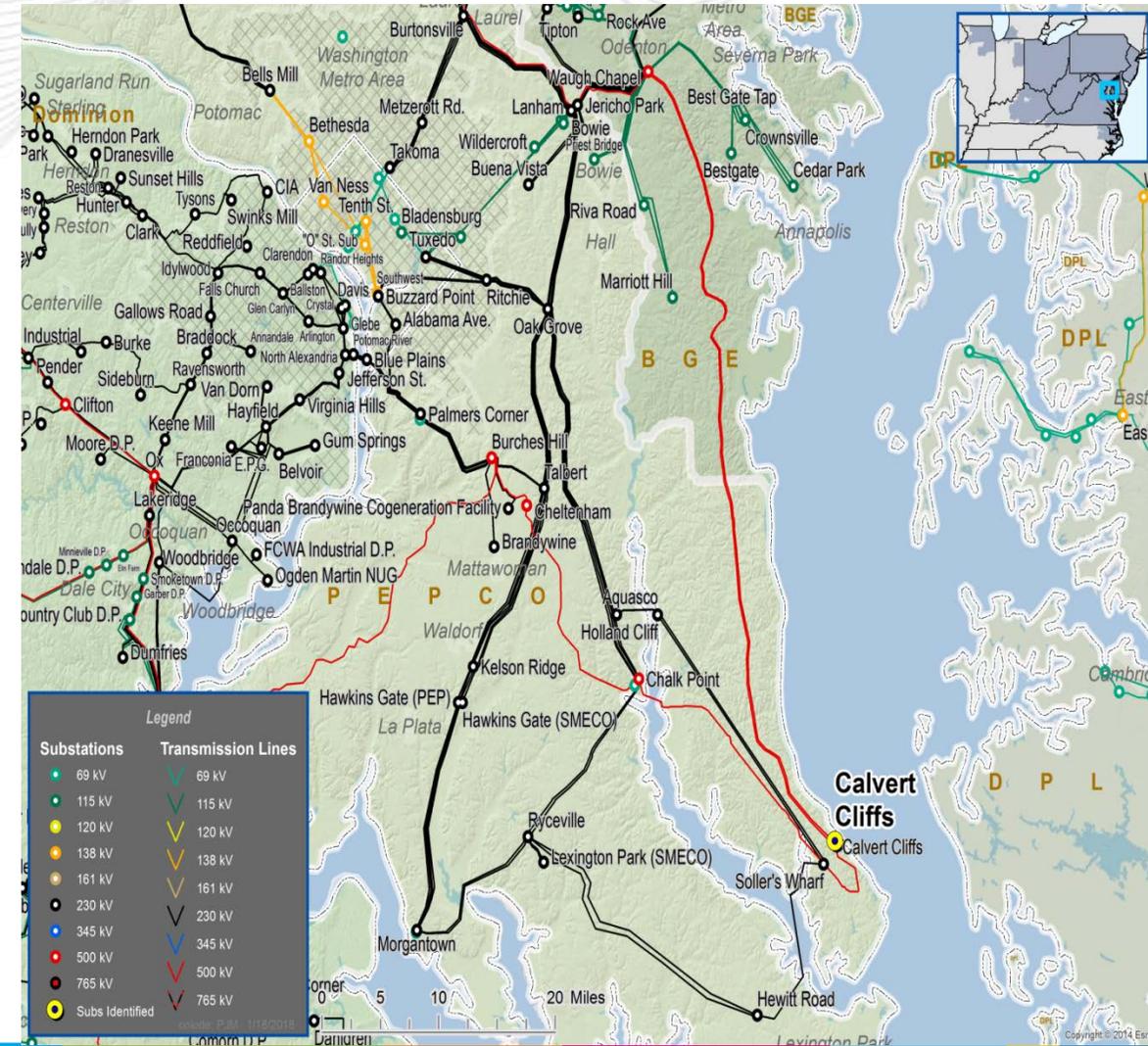
- Connection of the new plant service transformer requires modification to the BGE 500 kV switchyard, including the addition of four breakers in a new 500 kV bay
- Two additional breakers will be installed for the current plant service transformers

## Alternative Solution:

- Not Applicable. The project is generator driven and funded.

**Expected In-Service:** 9/30/2020

**Project Status:** Engineering





## Supplemental Project

### Problem Statement:

Lisle 345kV bus is currently configured as two separate straight buses with no line breakers and one transformer high side breakers

- A line fault will trip 345-138kV transformer on the same bus
- A transformer fault will trip the 345kV transmission line on the same bus for three of the four transformers

### Potential Solution:

Install a 345kV red/blue bus tie and breaker

Close the new and existing red/blue bus ties creating a large hybrid ring bus

- Each bus contains a transmission line and a transformers
- Install four 345kV line breakers
- Install two 345kV high side transformer breakers
- Third transformer high side breaker will be installed with the transformer is replaced

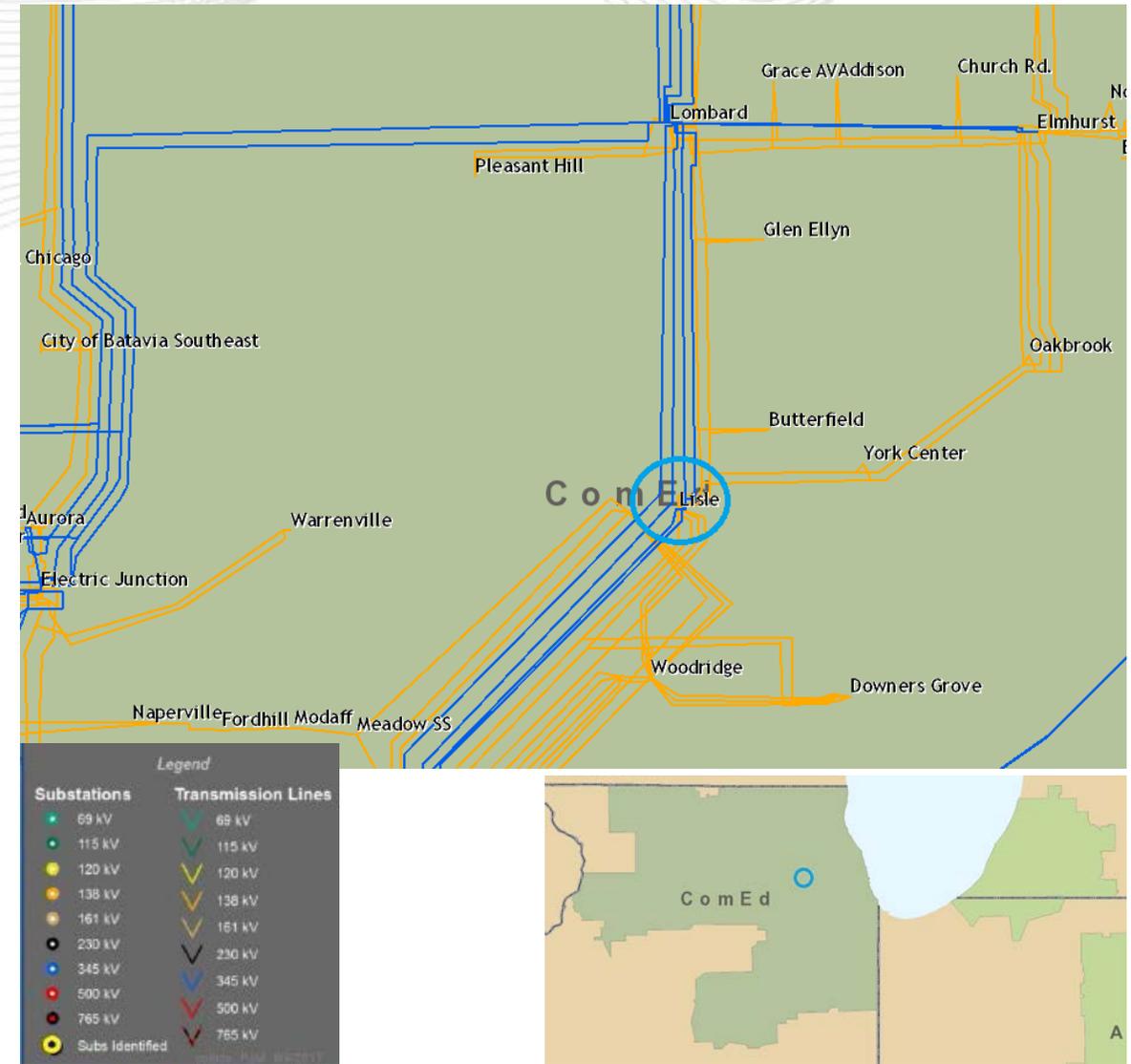
Estimated Cost: \$30M

### Alternatives:

- Rebuild Lisle 345kV as a breaker and a half using GIS equipment
  - Not enough land for open air construction
 Estimated Cost of \$45M + land purchase

Projected In-service: 12/31/2019

Project Status: Engineering





# ComEd Transmission Zone: Supplement Wayne 345-138kV Transformer 84 Replacement

## Supplemental Project

### Problem Statement:

Wayne 345-138kV auto-transformer 84

- Westinghouse 7-million series shell form
- Susceptible to static electrification
- Cannot be re-blocked
- Acoustic testing show high vibration and sharp increases in frequencies associated with looseness in the core assembly.
- Low ability to withstand through fault

Transformer 84 shares a bus position with 345kV line 14419 (Wayne-Aurora E.C.)

Tertiary cap banks no longer allowed.

Tertiary cap bank failures stress the 345-138kV transformers and have caused transformer failures in the past.

### Potential Solution:

Replace Wayne 345-138kV transformer

Finish ring bus on red 345kV bus - Install two 345kV breakers

Retire Tertiary cap bank

Install 138kV cap bank

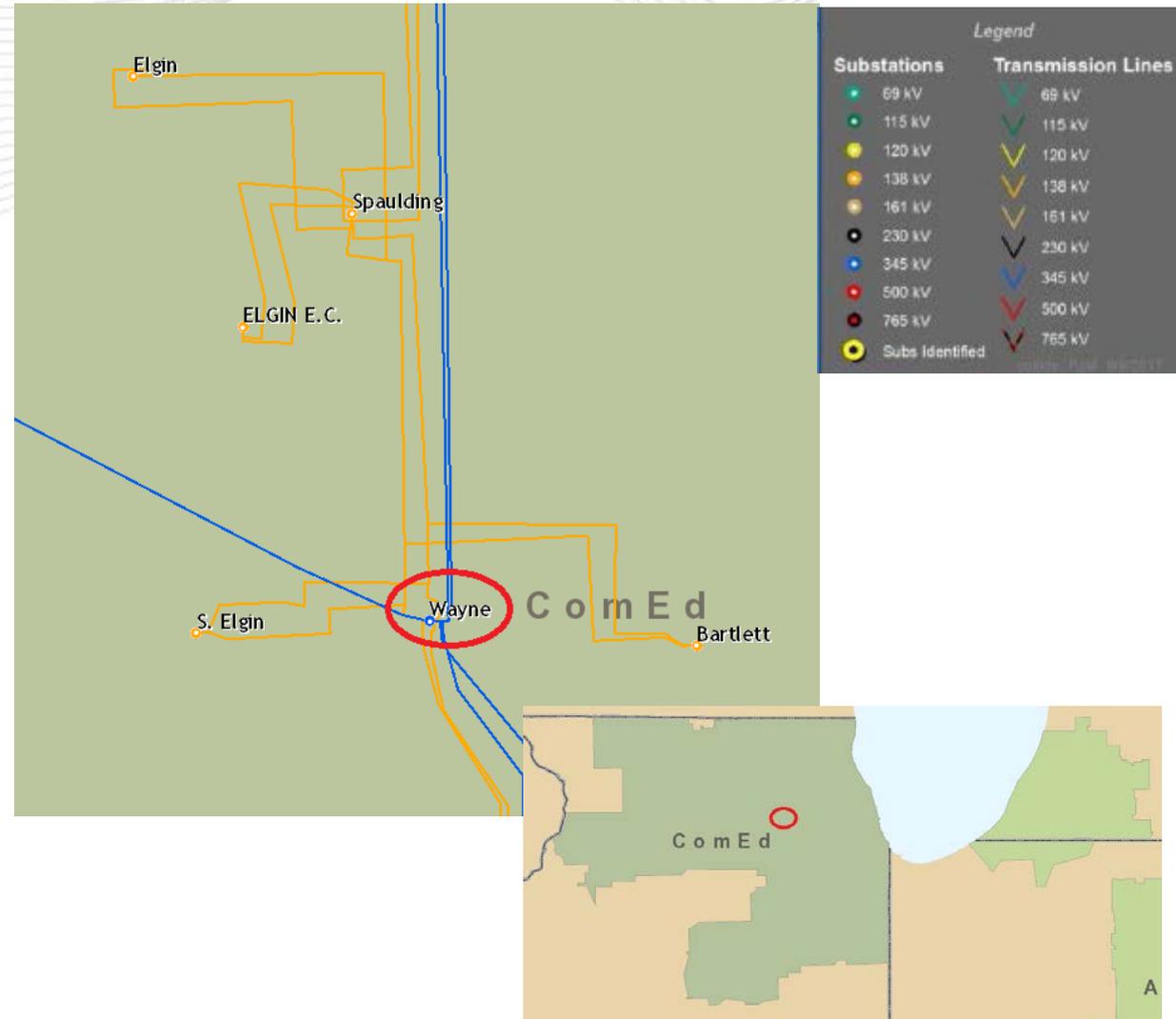
Estimated Cost: \$15M

### Alternatives:

- No feasible alternatives

Projected In-service: 12/31/2019

Project Status: Engineering



# Supplemental Projects – Second Review

Previously Presented: 1/11/2018

**Problem Statement:**

Equipment Material/Condition/Performance/Risk:

CB's J2, K2, and L1 at Twin Branch are all PK-type air blast breakers installed in the late 60's or early 70's. These four breakers are showing significant signs of deterioration. Drivers include age, number of fault operations, and a lack of available repair parts.

Breakers J2 and L1 are PK 3000A 41kA models. Breaker K2 is a PK 3000A 50kA model.

**Selected Solution:**

Remove and replace 345kV circuit breakers L1, K2 and J2 with 5000A 63kA models. (S1464)

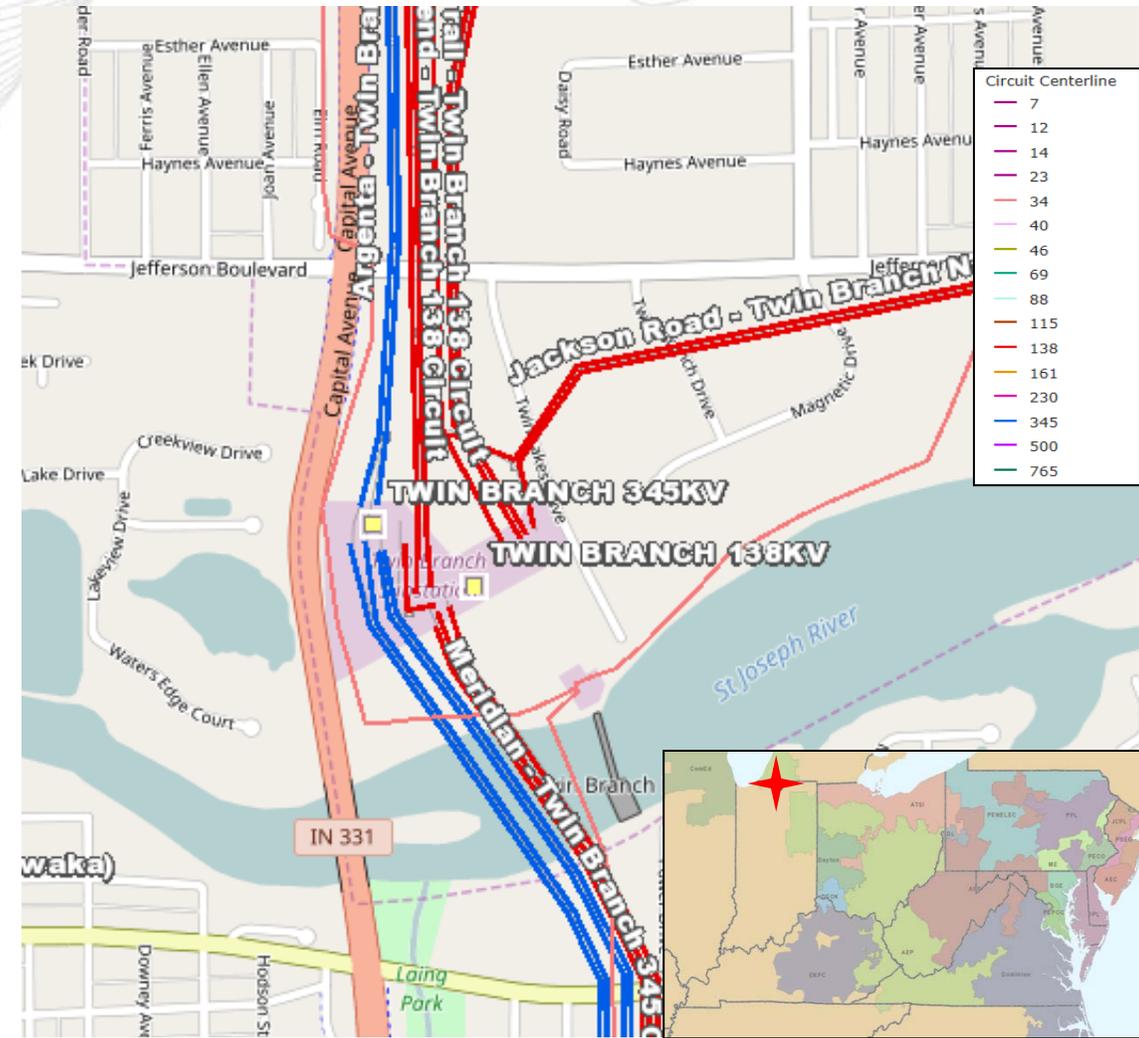
**Estimated Transmission Cost: \$6.4 M**

**Alternatives:**

No viable cost effective alternates were identified

**Projected In-service: 6/1/2020**

**Project Status: Engineering**



# 2018 RTEP Next Steps

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?



- V1 – 2/2/2018 – Original Slides Posted
- V2 – 2/5/2018 – Slide #4 – Transmission Service - updated with improved descriptions
- V3 – 2/6/2018 – Slide #15 – Add AEP supplemental for Jefferson breakers
- V4 – 2/20/2018 – Slide #13 – Add Projected IS Date
- V5 – 3/1/2018 – Slides #13 and #21 – Change Projected IS Date to 6/1/2020