



Sub Regional RTEP Committee Mid-Atlantic First Energy MAAC Solution Meeting

November 28, 2018



JCP&L Transmission Zone

Need Number: JCPL-2018-001

Process Stage: Solution Meeting

Need Presented: 9/21/2018

Project Driver(s):

Operational Flexibility and Efficiency

Specific Assumption Reference(s)

Global Consideration

- Assess the risk associated with bus, stuck breaker, and N-2 contingencies to improve FERC tarified Transmission < 100 kV facilities.

Add/Replace Transformers

- Transformer that if added or replaced would alleviate loading conditions under contingency scenarios.

Add/Expand Bus Configuration

- Reduce the amount of exposed potential local load loss during contingency conditions.

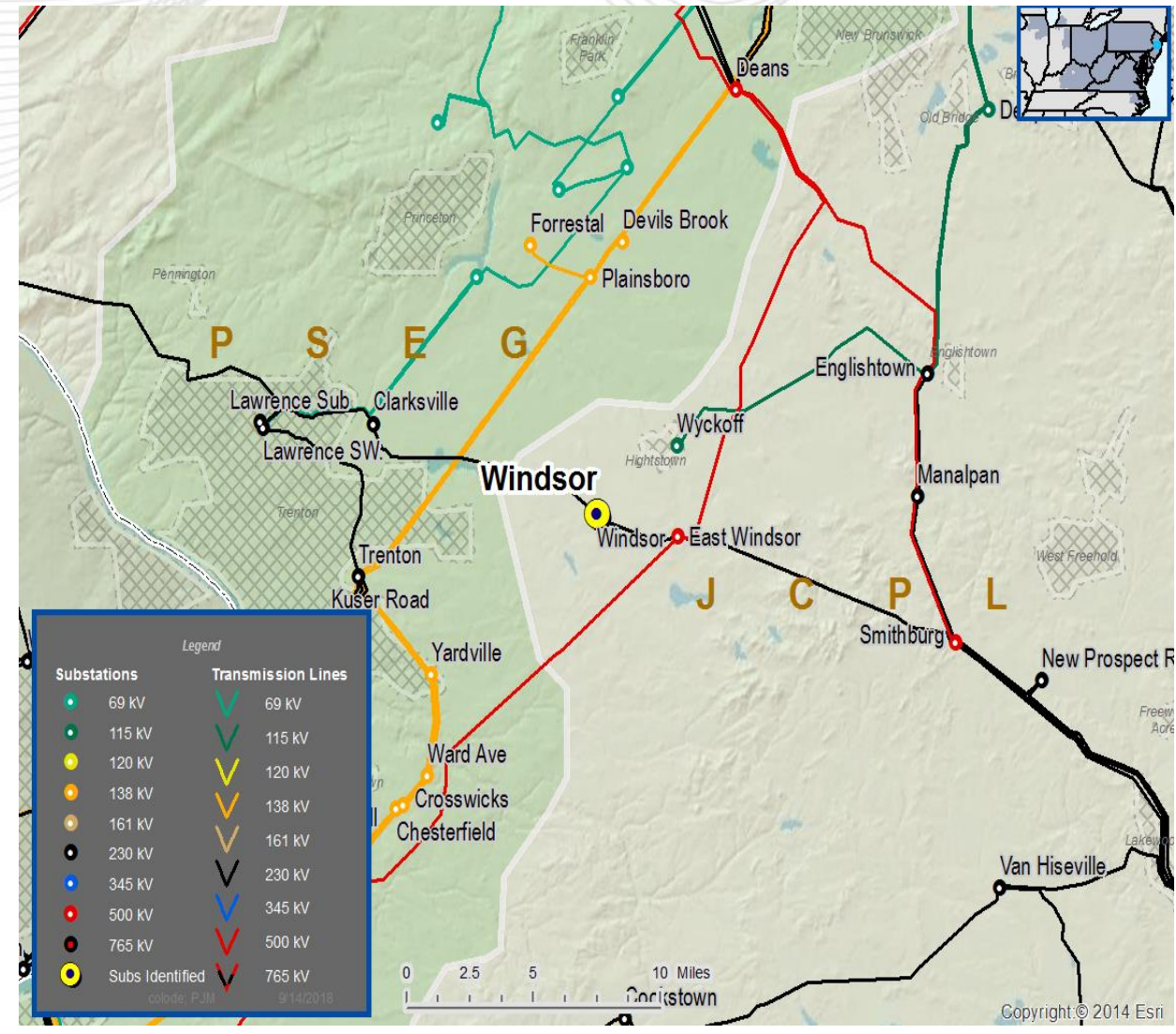
Reconductor/Rebuild Transmission Lines

- Transmission lines that are presently six-wired. Line should be evaluated to create two separate transmission circuits.

Problem Statement

At Windsor for the event of a stuck 230 kV bus tie breaker, both 230 kV feeds are outaged, along with two 230-34.5 kV transformers feeding the Windsor area distribution load.

In the current configuration, the 230 kV feeds the 34.5 kV bus via a 230-34.5 kV transformer. The 34.5 kV bus then feeds into the local 34.5 kV network. This arrangement creates a transmission path through lower voltage facilities.





Need Number: JCPL-2018-001

Proposed Solution:

East Windsor-Windsor 230 kV

- Convert 2.6 miles 1590 ACSR 6-wire circuit to (2) 3-wire circuits

Windsor 230 kV Substation and 3rd 230-34.5 kV Transformer

- Expand 230 kV bus to a 8 breaker-and-a-half 230 kV station
- Install four (4) new 34.5 kV breakers and one (1) new 230-34.5 kV transformer

East Windsor Substation

- Install one (1) new 230 kV breaker

Rating Information:

- East Windsor-Windsor 230 kV Line
 - Before Proposed Solution: 709 MVA SN / 869 MVA SE
 - After Proposed Solution: 709 MVA SN / 869 MVA SE
- East Windsor-Windsor #2 230 kV Line
 - Before Proposed Solution: N/A
 - After Proposed Solution: 709 MVA SN / 869 MVA SE
- Windsor 230-34.5 kV #3 Transformer
 - Before Proposed Solution: N/A
 - After Proposed Solution (Anticipated): 140 MVA SN / 150 MVA SE

Alternatives Considered:

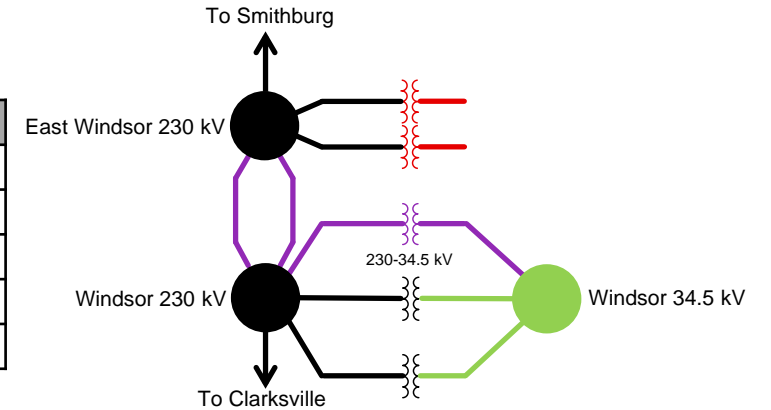
- Maintain existing configuration

Estimated Project Cost: \$32.4M

Projected IS Date: 12/31/2020

Status: Conceptual

Legend	
500 kV	
230 kV	
115 kV	
34.5 kV	
New	



Need Number: JCPL-2018-002

Process Stage: Solution Meeting

Need Presented: 9/21/2018

Project Driver(s):

Operational Flexibility and Efficiency, Performance and Risk

Specific Assumption Reference(s)

Global Consideration

- Assess the risk associated with bus, stuck breaker, and N-2 contingencies to improve FERC tarified Transmission < 100 kV facilities.

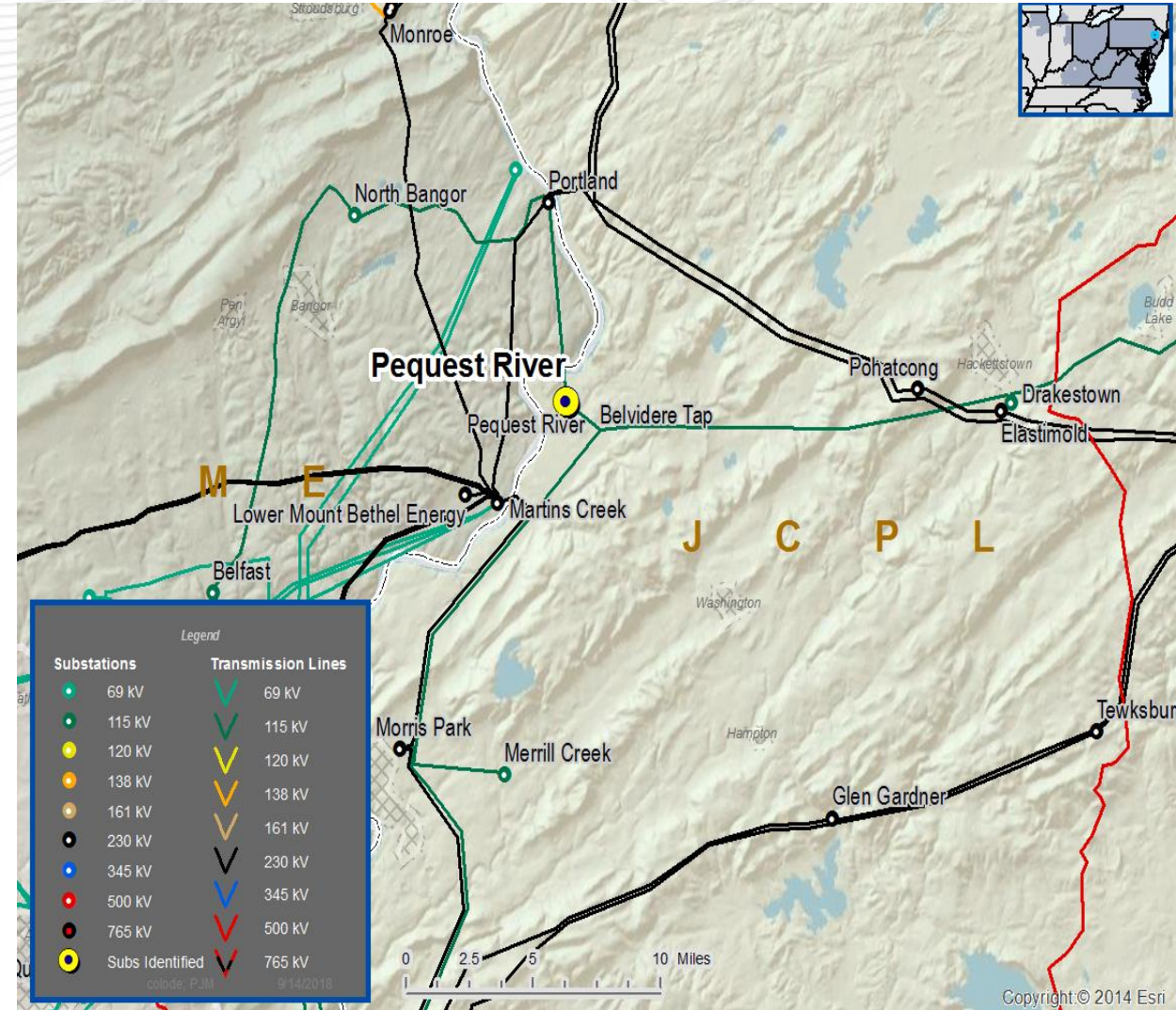
Add/Expand Bus Configuration

- Loss of substation bus adversely impacts transmission system performance.
- Reduce the amount of exposed potential local load loss during contingency conditions.
- Eliminate simultaneous outages to multiple networked elements (excluding capacitor banks) under N-1 analysis.
- Eliminate simultaneous outages to multiple networked elements for stuck breakers, bus outages, N-2 events, etc.

Problem Statement

In the event of a Pequest #1 115-34.5 kV transformer fault, the S919 line (3-terminal line) and the bus tie breaker are relied upon to clear the fault resulting in an additional loss of the Drakestown, Flanders, and Morris Park transformers.

At Pequest River, in the event of a stuck 115 kV bus tie breaker, both 115 kV feeds into Pequest River are outaged, along with two 115-34.5 kV transformers feeding the Pequest River area 34.5 kV network, the Drakestown #1, Flanders #2, and Morris Park #1 transformers.



Need Number: JCPL-2018-002

Proposed Solution:

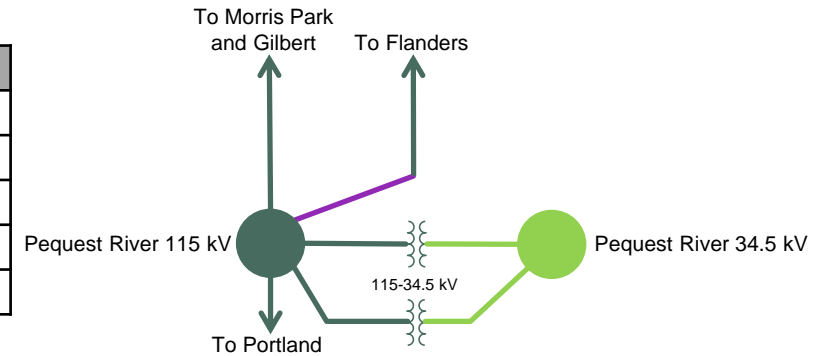
Pequest River 115 kV Ring Bus

- Expand Pequest River substation to a five breaker ring bus
- Loop in the Gilbert-Pequest River-Flanders (S919) 115 kV line into the 115 kV Ring bus

Rating Information:

- Pequest River-Flanders 115 kV Line
 - Before Proposed Solution: N/A
 - After Proposed Solution: 205 MVA SN / 245 MVA SE
- Pequest River-Gilbert 115 kV Line
 - Before Proposed Solution: N/A
 - After Proposed Solution: 184 MVA SN / 223 MVA SE

Legend	
500 kV	
230 kV	
115 kV	
34.5 kV	
New	



Alternatives Considered:

- Maintain existing configuration

Estimated Project Cost: \$17.5M

Projected IS Date: 06/01/2020

Status: Conceptual

Need Number: JCPL-2018-003

Process Stage: Solution Meeting

Need Presented: 9/21/2018

Project Driver(s):

Operational Flexibility and Efficiency

Specific Assumption Reference(s)

Global Consideration

- Assess the risk associated with bus, stuck breaker, and N-2 contingencies to improve FERC tariffed Transmission < 100 kV facilities.

Network Radial Lines

- Radial lines will be evaluated based on load at risk and/or customers impacted along with its proximity to other networked facilities.

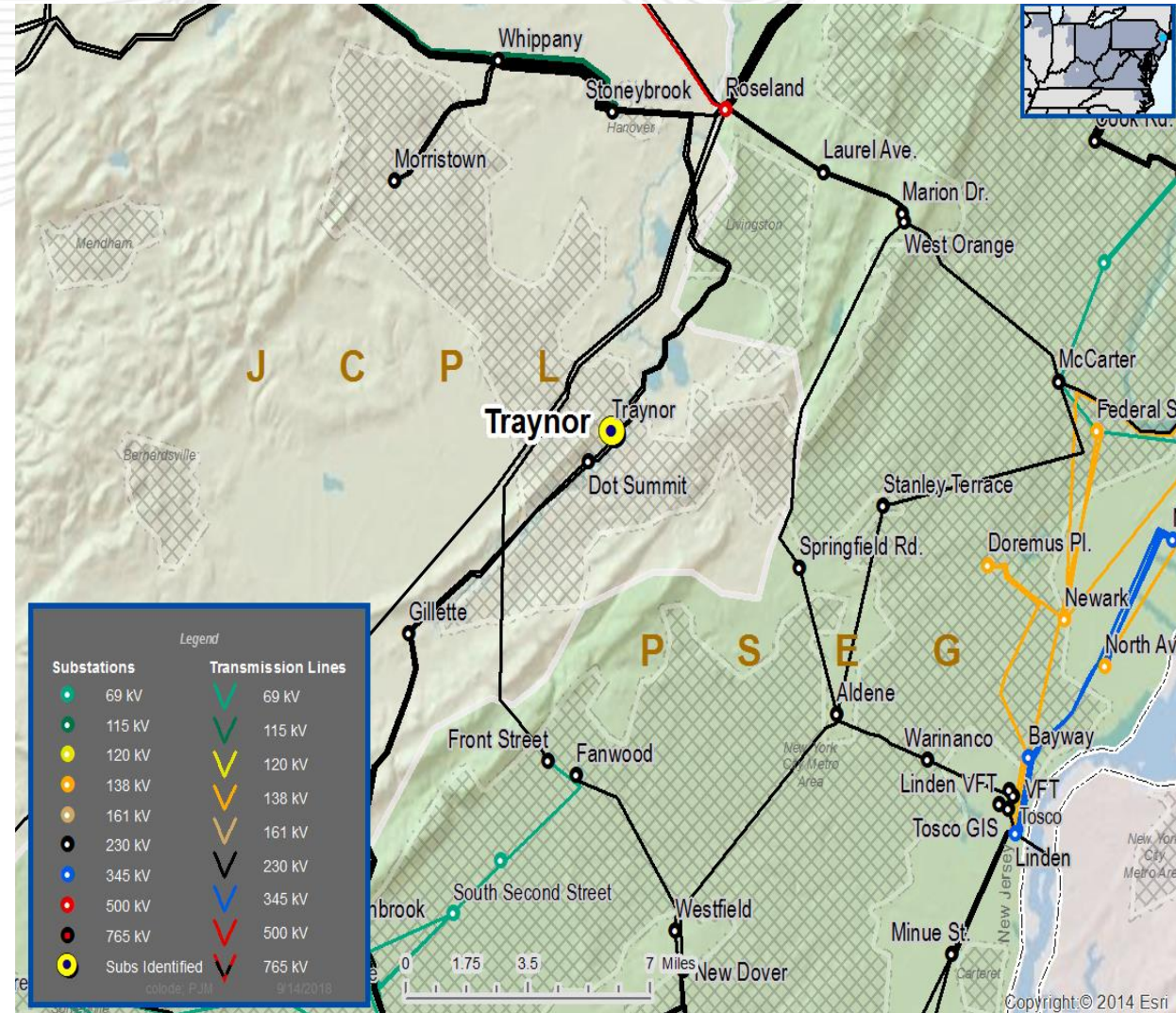
Add/Expand Bus Configuration

- Reduce the amount of exposed potential local load loss during contingency conditions.
- Eliminate simultaneous outages to multiple networked elements under N-1 analysis.

Problem Statement

N-1-1 outages result in loss of the 34.5 kV lines serving the area impacting approximately 7,700 customers and approximately 33 MW of load.

N-1-1 outage of the Traynor-Madison 34.5 kV and the Traynor-Livingston Switch Point 34.5 kV lines, thermal loading on the Traynor-Madison (N14) 34.5 kV line is greater than 105% of its 50 MVA limit.





Need Number: JCPL-2018-003

Proposed Solution:

Livingston 34.5 kV Five-Breaker Ring Bus

- Create a five breaker ring bus at the Livingston Switch Point to network the T72, N14, and C81 34.5 kV Lines.
- Loop the N14 Line into the new Livingston Substation Ring Bus

Rating Information:

- Academy-Livingston 34.5 kV (N14) Line
 - Before Proposed Solution: N/A
 - After Proposed Solution: 35 MVA SN / 44 MVA SE
- Livingston-Madison Sw. Point 34.5 kV (N14) Line
 - Before Proposed Solution: N/A
 - After Proposed Solution: 35 MVA SN / 44 MVA SE
- Academy-Livingston 34.5 kV (C81) Line
 - Before Proposed Solution: 41 MVA SN / 50 MVA SE
 - After Proposed Solution: 41 MVA SN / 50 MVA SE
- Canoe Brook-Livingston 34.5 kV (C81) Line
 - Before Proposed Solution: 41 MVA SN / 52 MVA SE
 - After Proposed Solution: 44 MVA SN / 53 MVA SE
- Livingston-Short Hills 34.5 kV (T72) Line
 - Before Proposed Solution: 41 MVA SN / 50 MVA SE
 - After Proposed Solution: 41 MVA SN / 50 MVA SE

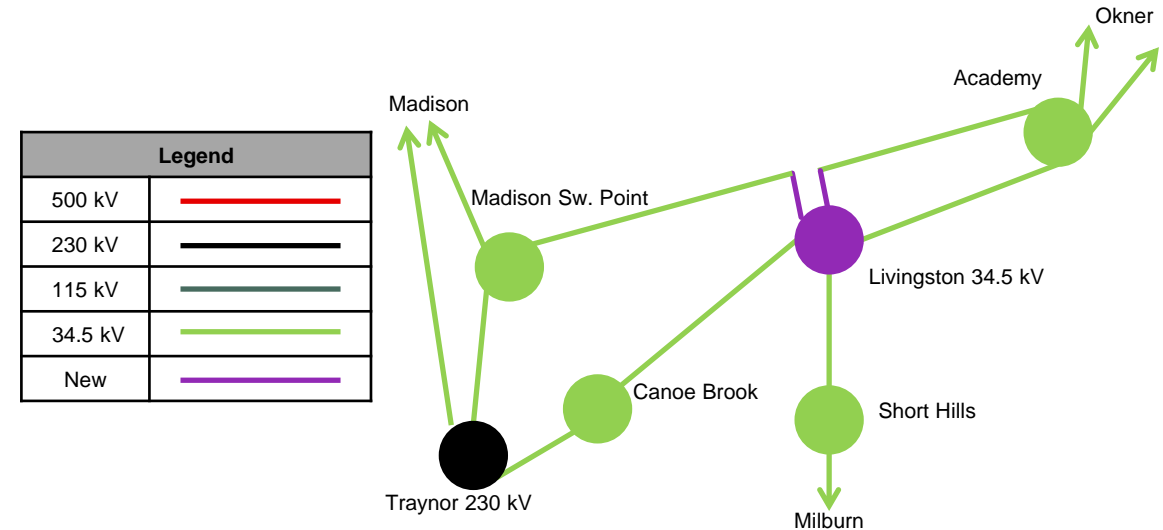
Alternatives Considered:

- Maintain existing configuration

Estimated Project Cost: \$5.8M

Projected IS Date: 12/31/2020

Status: Conceptual



Legend	
500 kV	
230 kV	
115 kV	
34.5 kV	
New	

Need Number: JCPL-2018-004

Process Stage: Solution Meeting

Need Presented: 9/21/2018

Project Driver(s):

Operational Flexibility and Efficiency, Performance and Risk

Specific Assumption Reference(s)

Global Consideration

- Assess the risk associated with bus, stuck breaker, and N-2 contingencies to improve FERC tarified Transmission < 100 kV facilities.

Add/Expand Bus Configuration

- Loss of substation bus adversely impacts transmission system performance
- Reduce the amount of exposed potential local load loss during contingency conditions.
- Eliminate simultaneous outages to multiple networked elements for stuck breakers, bus outages, N-2 events, etc.

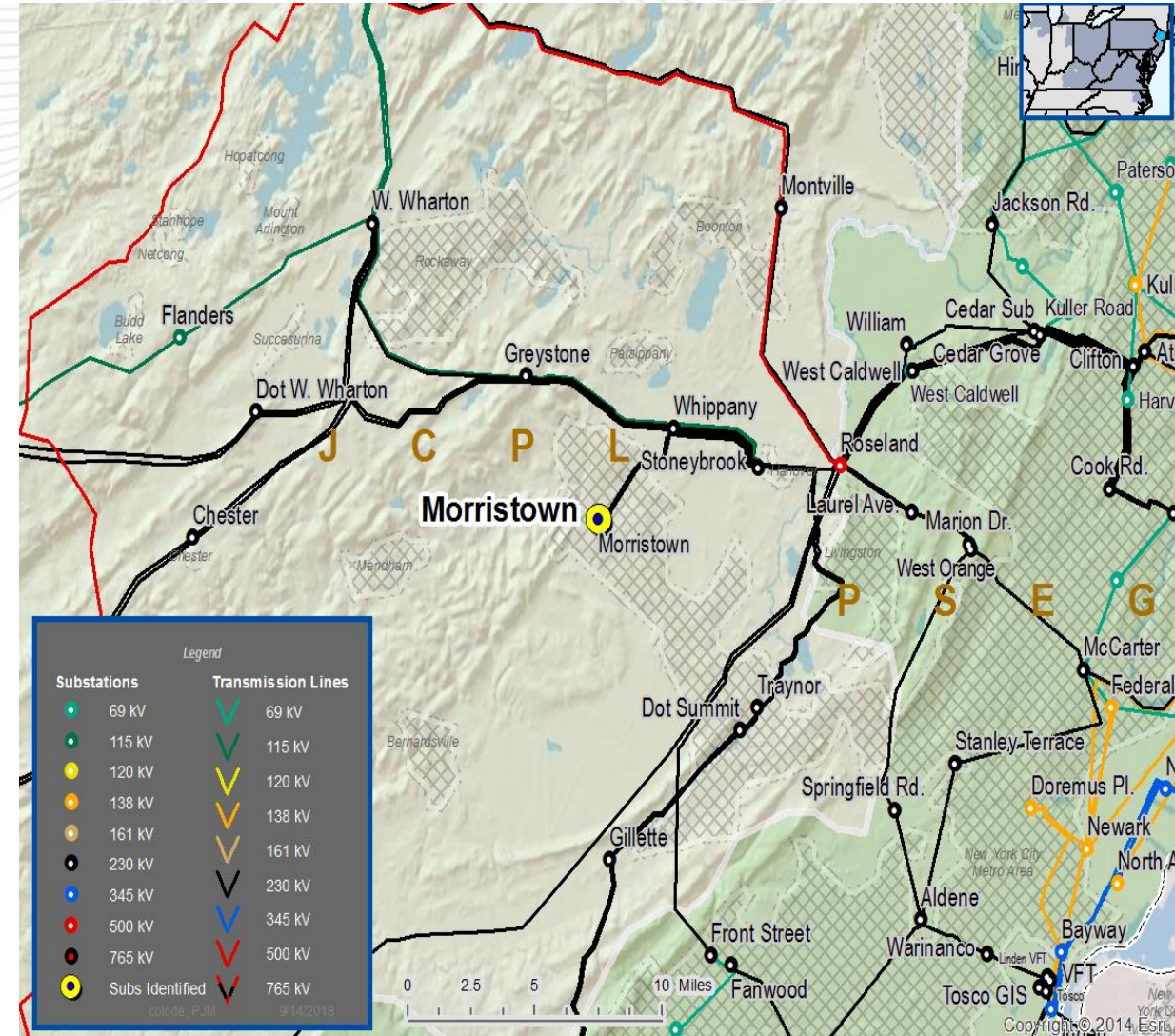
Network Radial Lines

- Radial lines will be evaluated based on load at risk and/or customers impacted along with its proximity to other networked facilities.

Problem Statement

At Morristown, in the event of a stuck 230 kV bus tie breaker, both 230 kV feeds are outaged, along with two 230-34.5 kV transformers feeding the Morristown area 34.5 kV network **impacting approximately 23,100 customers and approximately 155 MW of load.**

In the current configuration, the 230 kV feeds the 34.5 kV bus via 230-34.5 kV transformers. The 34.5 kV bus then feeds into the local 34.5 kV network which is operated in a radial configuration due to overdutied 34.5 kV breakers.



Need Number: JCPL-2018-004

Proposed Solution:

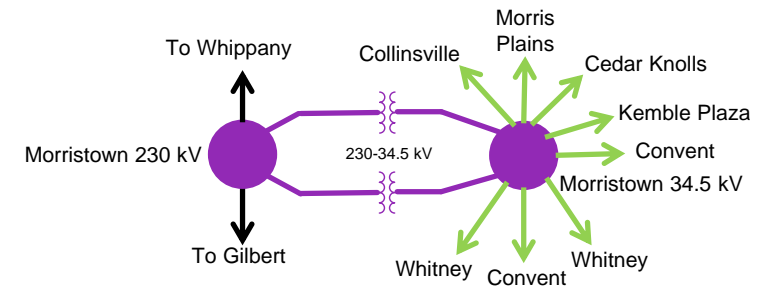
Morristown 230 & 34.5 kV Substation Reconfiguration

- Construct a four breaker 230 kV ring bus
- Construct a 34.5 kV breaker-and-a-half station with 18 breakers
- Replace the #5 and #6 230-34.5 kV with 230-34.5 kV 168 MVA transformers
- Replace all overduetied breakers at Whippany substation

Rating Information:

- Morristown 230-34.5 kV #5 Transformer
 - Before Proposed Solution: 138 MVA SN / 150 MVA SE
 - After Proposed Solution (Anticipated): 194 MVA SN / 194 MVA SE
- Morristown 230-34.5 kV #6 Transformer
 - Before Proposed Solution: 138 MVA SN / 150 MVA SE
 - After Proposed Solution (Anticipated): 194 MVA SN / 194 MVA SE

Legend	
500 kV	
230 kV	
115 kV	
34.5 kV	
New	



Alternatives Considered:

- Continue to operate the 34.5 kV system in a radial configuration
- Replace 34.5 kV breakers

Estimated Project Cost: \$22.6M

Projected IS Date: 06/01/2021

Status: Conceptual

Need Number: JCPL-2018-005
Process Stage: Solution Meeting
Need Presented: 9/21/2018
Project Driver(s):
Operational Flexibility and Efficiency

Specific Assumption Reference(s)

Network Radial Lines

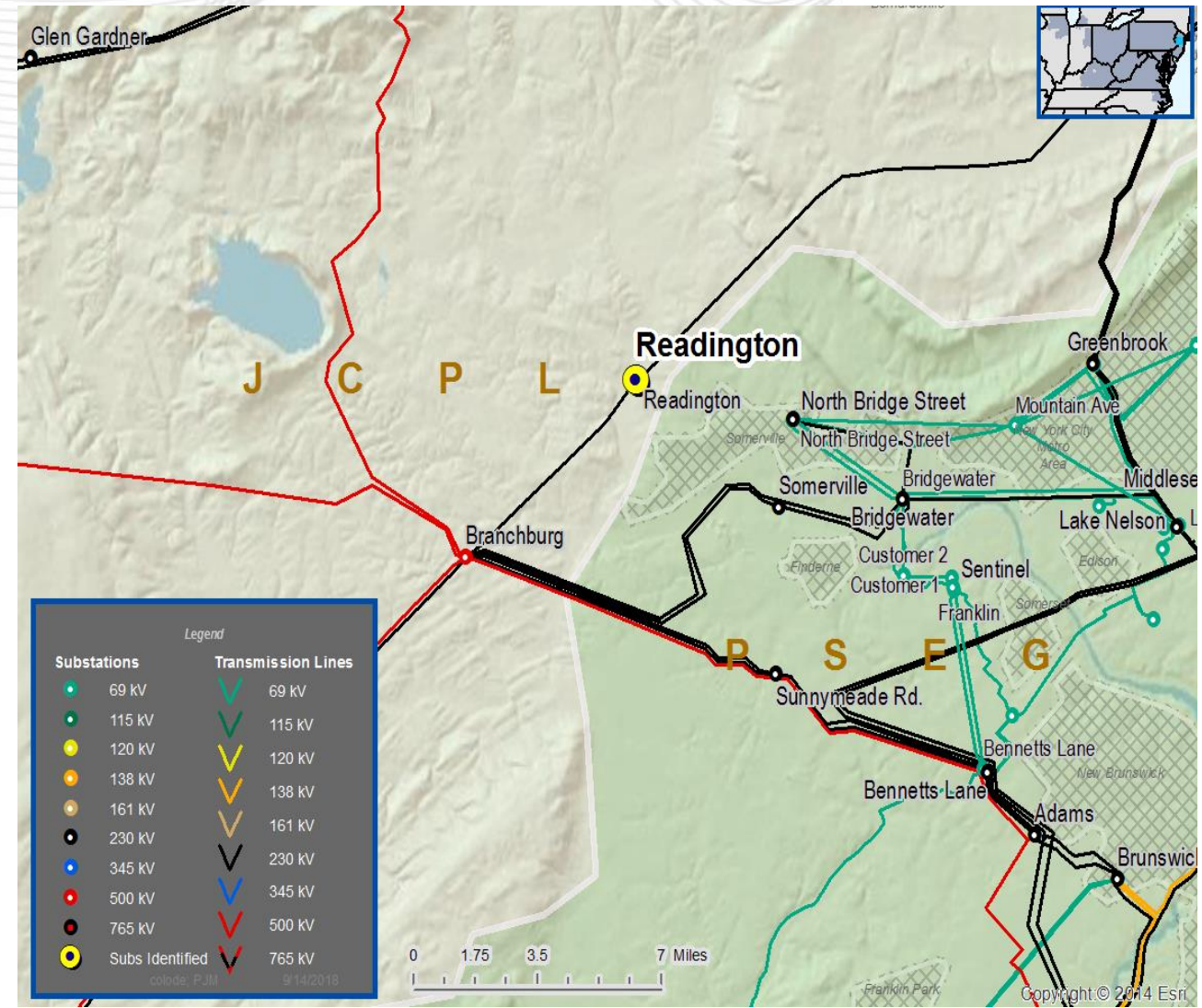
- Radial lines will be evaluated based on load at risk and/or customers impacted along with its proximity to other networked facilities.

Build New Transmission Line

- Network radial lines.

Problem Statement

Readington T774 34.5 kV line is radial. Line outage or contingency as well as 34.5 kV bus maintenance or outages result in loss of the T774 impacting approximately 1,700 customers and approximately 35 MW of load.



Need Number: JCPL-2018-005

Proposed Solution:

Readington-Old York 34.5 kV Line

- Extend Readington-Old York T774 34.5 kV line to East Flemington Substation
- Install SCADA switch at Imclone

East Flemington Substation new 34.5 kV Terminal

- Install new 34.5 kV terminal in breaker-and-a-half configuration with 3-34.5 kV breakers

Rating Information:

- East Flemington-Old York 34.5 kV Line
 - Before Proposed Solution: N/A
 - After Proposed Solution: 39 MVA SN / 48 MVA SE

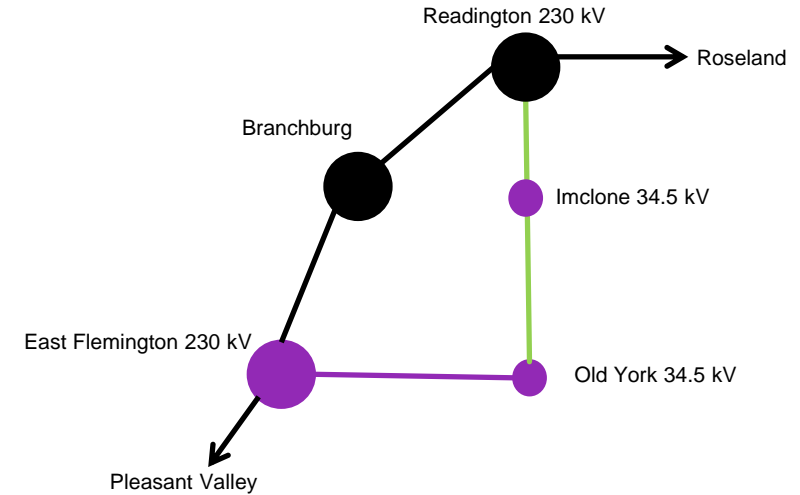
Alternatives Considered:

- Continue to operate as a radial line.

Estimated Project Cost: \$7.01M

Projected IS Date: 12/31/2020

Status: Conceptual



Legend	
500 kV	
230 kV	
115 kV	
34.5 kV	
New	

Need Number: ME-2018-003

Process Stage: Solutions Meeting

Need Presented : 9/21/2018

Project Driver(s):

Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)

Substation/Line Equipment Limits

Consider upgrading transmission line equipment (switches, conductor, splices, etc.) as well as terminal and protection equipment to meet or exceed the transmission line conductor rating.

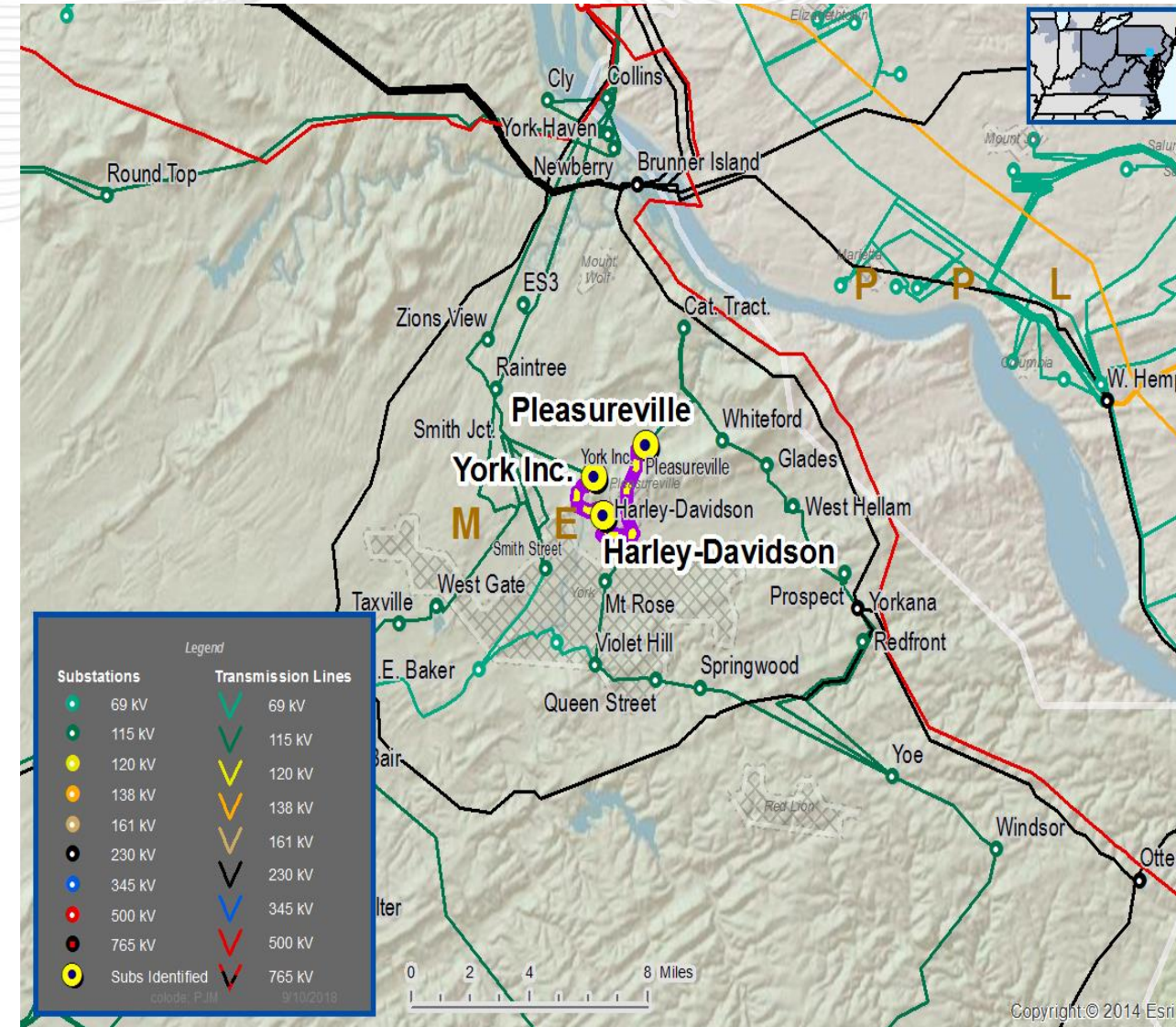
Problem Statement

Maintenance/rehab work will be performed on the Pleasureville-Harley Davidson-York Solid Waste 115 kV line.

Transmission line rating limited by terminal equipment.

Pleasureville – Harley Davidson 115 kV line: Existing emergency line rating is 263 MVA. Existing conductor emergency rating is 430 MVA.

Harley Davidson – York Inc. 115 kV line: Existing emergency rating is 263 MVA. Existing conductor emergency rating is 282 MVA.





Met-Ed Transmission Zone

Need Number: ME-2018-003

Proposed Solution:

Pleasureville – Harley Davidson – York Incinerator 115 kV Line Rehab

Pleasureville 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, line trap, CCVT, line tuner, coax, substation conductor, and breaker disconnect switches

York Incinerator 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, line trap, CCVT, line tuner, coax, substation conductor, circuit breaker, and disconnect switches

Transmission Line Ratings:

- Pleasureville – Harley Davidson 115 kV Line
 - Before Proposed Solution: 221 MVA SN / 263 MVA SE
 - After Proposed Solution: 297 MVA SN / 376 MVA SE
- Harley Davidson – York Incinerator 115 kV Line
 - Before Proposed Solution: 221 MVA SN / 263 MVA SE
 - After Proposed Solution: 232 MVA SN / 282 MVA SE

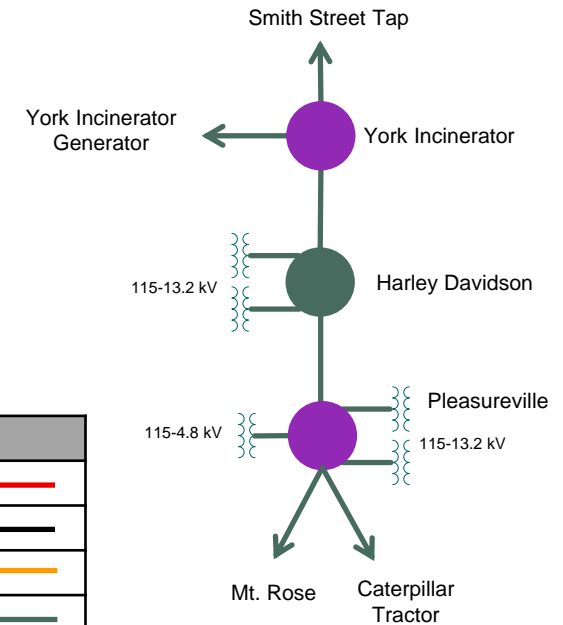
Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$3.9M

Projected IS Date: 12/22/2021

Status: Conceptual



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

Need Number: ME-2018-004 & ME-2018-012

Process Stage: Solution Meeting

Need Presented: 9/21/2018

Project Driver(s):

Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)

Upgrade Relay Schemes

Upgrade relay schemes that have historically high percentage of misoperation.

Substation/Line Equipment Limits

Consider upgrading transmission line equipment (switches, conductor, splices, etc.) as well as terminal and protection equipment to meet or exceed the transmission line conductor rating.

Problem Statement

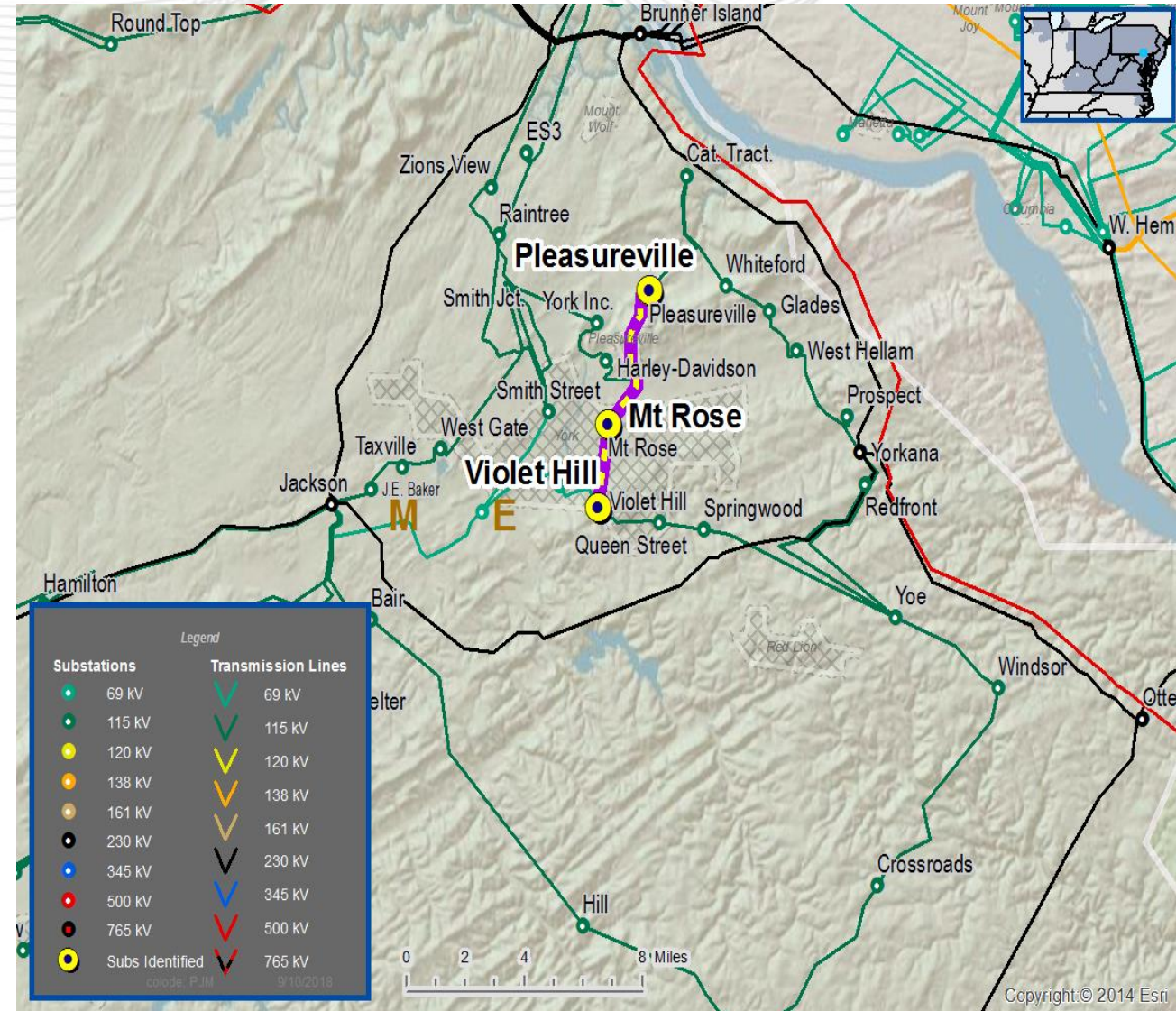
Maintenance/rehab work will be performed on the Pleasureville-Mt. Rose-Violet Hill 115 kV line.

Relays on Pleasureville – Violet Hill 115 kV line evaluated and determined to be obsolete and/or degraded condition. 204 MVA.

Transmission line rating limited by terminal equipment.

Pleasureville – Mt. Rose 115 kV line: Existing emergency line rating is the existing conductor emergency rating.

Mt. Rose – Violet Hill 115 kV line: Existing emergency line rating is 204 MVA SN / 266 MVA SE. Existing conductor rating is 232 MVA SN / 282 MVA SE.



Need Number: ME-2018-004
ME-2018-012

Proposed Solution:

Pleasureville – Mt. Rose – Violet Hill 115 kV line rehab & replace relays prone to misoperation

Violet Hill 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, line drops, CCVT, wave trap, line tuner, arresters, and breaker disconnect switches

Transmission Line Ratings:

- Mt. Rose – Violet Hill 115 kV Line
 - Before Proposed Solution: 204 MVA SN / 266 MVA SE
 - After Proposed Solution: 232 MVA SN / 282 MVA SE

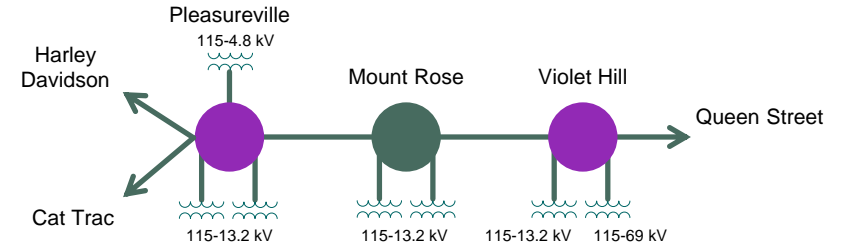
Alternatives Considered:

- Maintain existing condition and elevated risk of misoperation

Estimated Project Cost: \$0.9M

Projected IS Date: 12/31/2019

Status: Conceptual



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

Need Number: ME-2018-005

Process Stage: Solutions Meeting

Need Presented : 9/21/2018

Project Driver(s):

Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)

Line Condition Rebuild/Replacement

- Equipment characteristics are near or beyond existing service life or contain components that are obsolete.

Reconductor/Rebuild Transmission Lines

- Transmission lines with high loading while factoring in its overall condition assessment.

Substation/Line Equipment Limits

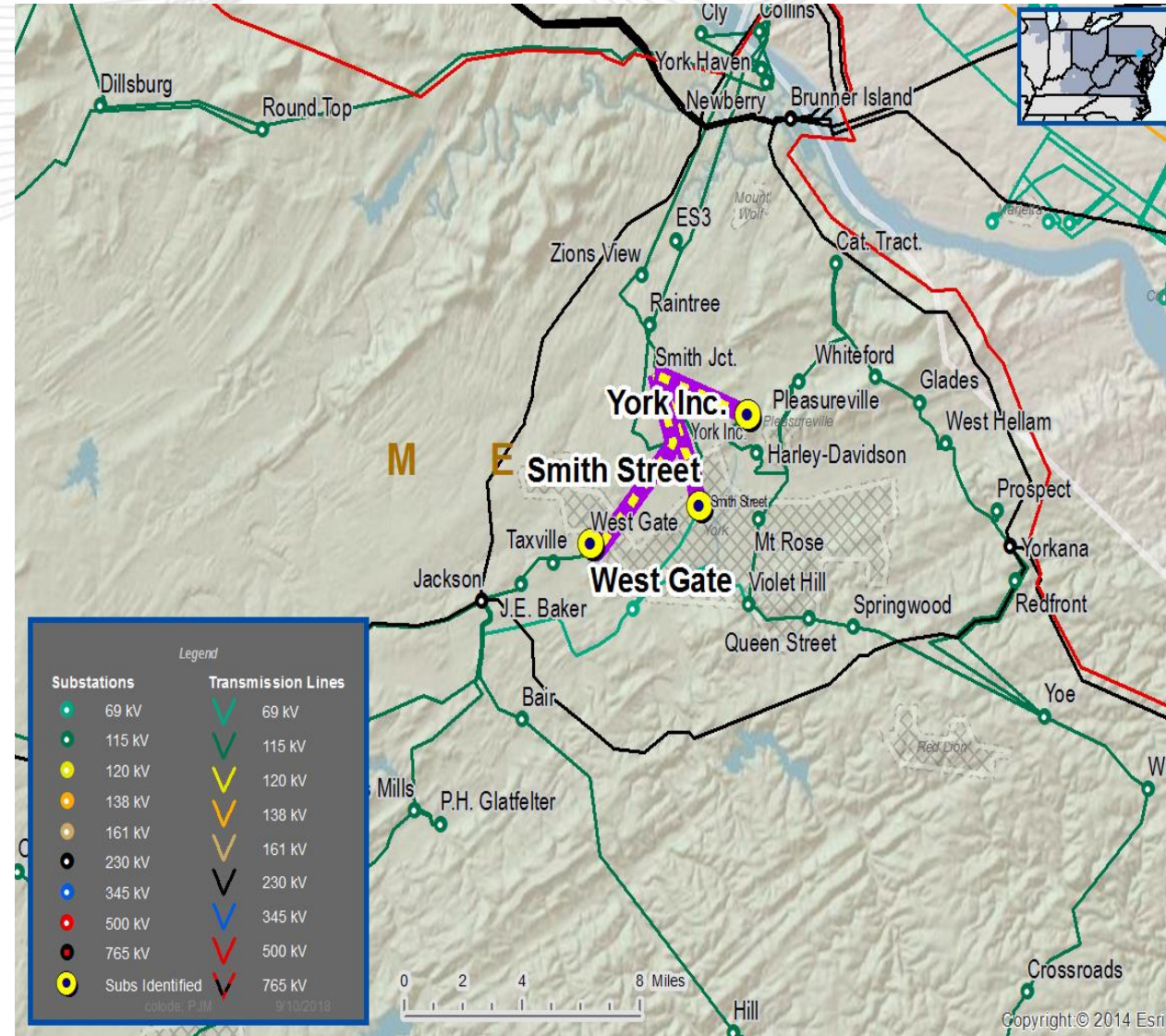
- Consider upgrading transmission line equipment (switches, conductor, splices, etc.) as well as terminal and protection equipment to meet or exceed the transmission line conductor rating.

Problem Statement

Segments of Smith Street-Westgate-York Solid Waste 115 kV line are at or beyond service life.

Transmission line rating limited by terminal equipment.

- Smith Street – Smith Street Tap 115 kV line: Existing emergency line rating is 152 MVA. Existing conductor emergency rating is 223 MVA.
- Westgate – Smith Street Tap 115 kV line: Existing emergency line rating is 263 MVA. Existing conductor emergency rating is 282 MVA.
- York Inc. – Smith Street Tap 115 kV line: Existing emergency line rating is the existing conductor emergency rating.





Need Number: ME-2018-005

Proposed Solution:

Smith Street – Smith Street Tap 115 kV Line Rebuild

- Rebuild approximately 1.3 miles of wood pole construction

Smith Street Tap – York Incinerator 115 kV Line Rebuild

- Rebuild/reconductor approximately 2 miles of wood pole construction

Smith Street 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, substation conductor, CCVT, circuit breaker and breaker disconnects

Westgate 115 kV Substation – Terminal equipment to be replaced includes:

- Substation conductor

York Incinerator 115 kV Substation – Terminal equipment to be replaced includes:

- Substation conductor

Transmission Line Ratings:

- Smith Street – Smith Street Tap 115 kV Line
 - Before Proposed Solution: 118 MVA SN / 152 MVA SE
 - After Proposed Solution: **232 MVA SN / 282 MVA SE**
- Westgate – Smith Street Tap 115 kV Line
 - Before Proposed Solution: 221 MVA SN / 263 MVA SE
 - After Proposed Solution: 232 MVA SN / 282 MVA SE
- York Incinerator – Smith Street Tap 115 kV Line
 - Before Proposed Solution: 184 MVA SN / 223 MVA SE
 - After Proposed Solution: 232 MVA SN / 282 MVA SE

Alternatives Considered:

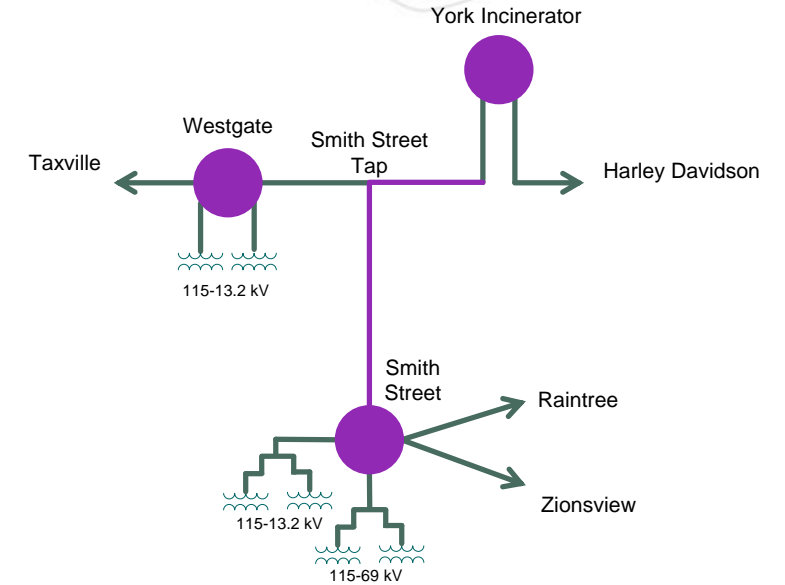
- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$6.4M

Projected IS Date: 6/1/2025

Status: Conceptual

Met-Ed Transmission Zone



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

Need Number: ME-2018-013

Process Stage: Solution Meeting

Need Presented: 10/29/2018

Project Driver(s):

Equipment Material Condition, Performance, and Risk

Specific Assumption Reference(s)

Substation Condition Rebuild/Replacement

System Performance Projects – Substation/Line Equipment Limits

Problem Statement

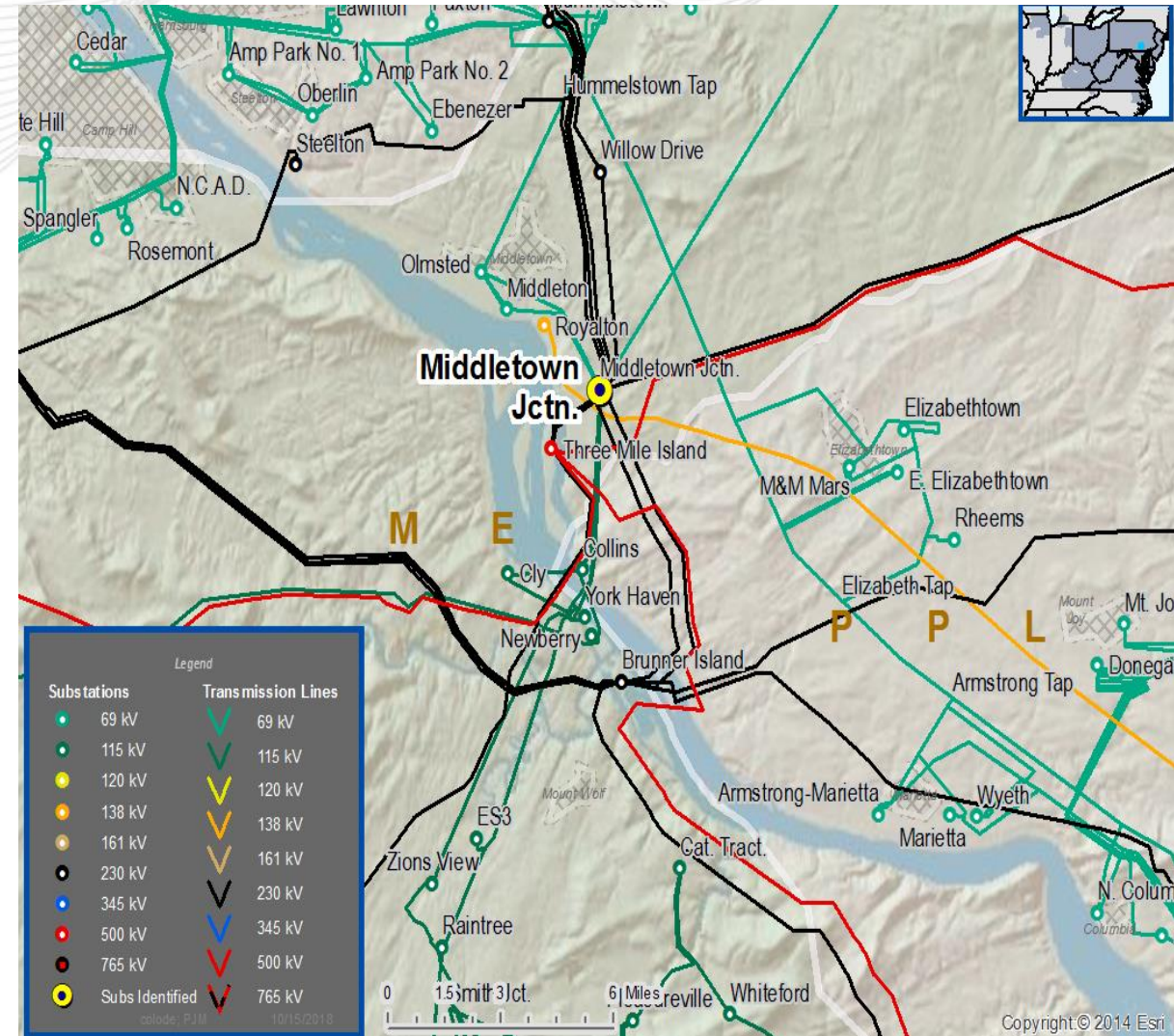
Middletown Junction #3 230-69 kV:

Transformer is 55 years old

There have been 44 maintenance orders since 2003

Multiple oil leaks in load tap changer

Combustible gasses found in load tap changer oil





Met-Ed Transmission Zone

Need Number: ME-2018-013

Proposed Solution:

Middletown Junction #3 230-69 kV transformer replacement

Middletown Junction Substation – Equipment to be replaced includes:

- 230-69 kV 100/134/168 MVA Transformer, grounding transformer, circuit breaker, breaker drops, bus conductor

Transformer Ratings:

- Middletown Junction #3 230-69 kV Transformer
 - Before Proposed Solution: 88 MVA SN / 106 MVA SE
 - After Proposed Solution (anticipated): 211 MVA SN / 232 MVA SE

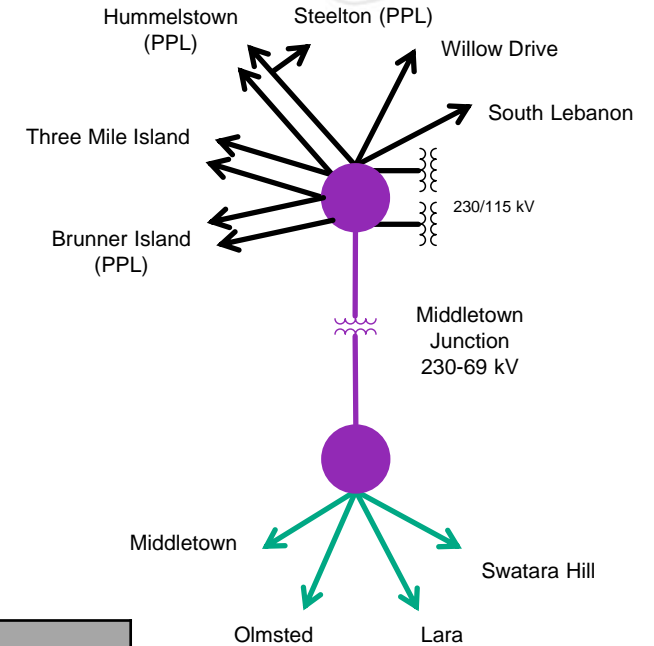
Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$2.6M

Projected IS Date: 12/31/2019

Status: Conceptual



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

Need Number: ME-2018-014
Process Stage: Solution Meeting
Need Presented: 10/29/2018

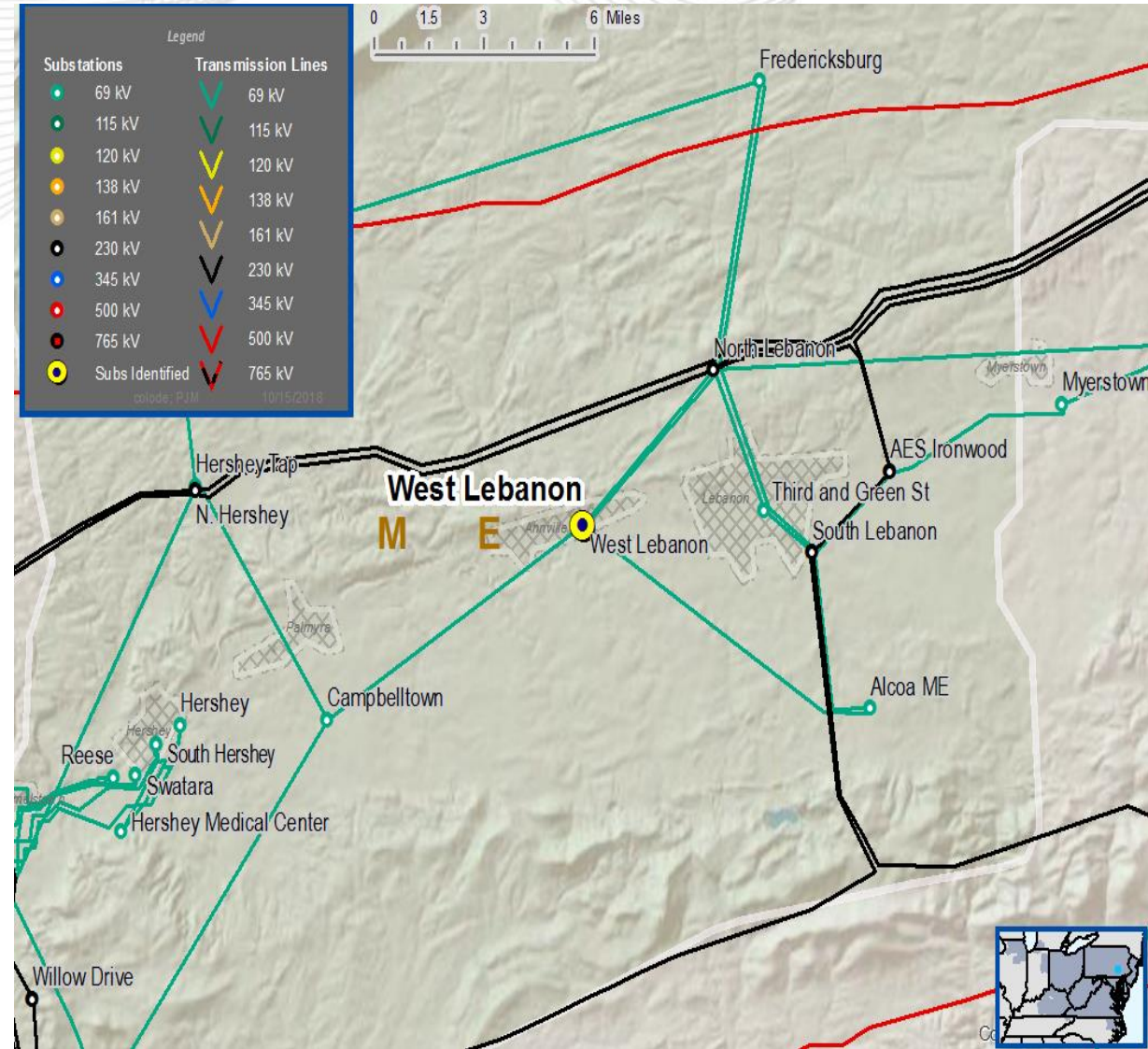
Project Driver(s):
Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)
 Substation Condition Rebuild/Replacement – Station system protection and controls – Electromechanical relays
 System Performance Projects – Substation/Line Equipment Limits
 Upgrade Relay Schemes

Problem Statement
 Relays on Broad Street – West Lebanon 69 kV line evaluated and determined to be obsolete and/or degraded condition.

Transmission line rating limited by terminal equipment. Existing line rating is 71 MVA SN / 91 MVA SE. Existing conductor rating is 111 MVA SN / 134 MVA SE.

(substation conductor and disconnect switches)



Need Number: ME-2018-014

Proposed Solution:

West Lebanon – Broad Street 69 kV replace relays prone to misoperation

West Lebanon 69 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, line drops, arresters, a circuit breaker, and disconnect switches

Broad Street 69 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, line drops, arresters, a circuit breaker, and disconnect switches

Transmission Line Ratings:

- West Lebanon – Broad Street 69 kV Line
 - Before Proposed Solution: 71 MVA SN / 91 MVA SE
 - After Proposed Solution: 111 MVA SN / 134 MVA SE

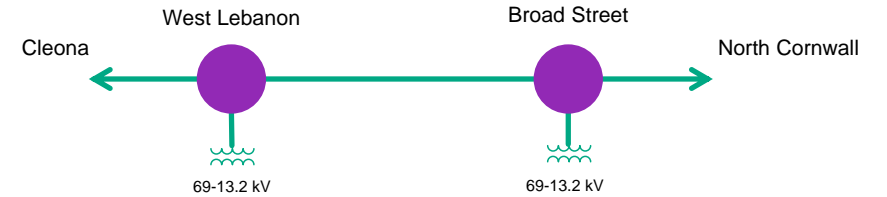
Alternatives Considered:

- Maintain existing condition and elevated risk of misoperation

Estimated Project Cost: \$0.7M

Projected IS Date: 12/31/2019

Status: Conceptual



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

Need Number: ME-2018-015

Process Stage: Solution Meeting

Need Presented: 10/29/2018

Project Driver(s):

Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)

- Substation Condition Rebuild/Replacement – Station system protection and controls – Electromechanical relays
- System Performance Projects – Substation/Line Equipment Limits
- Upgrade Relay Schemes

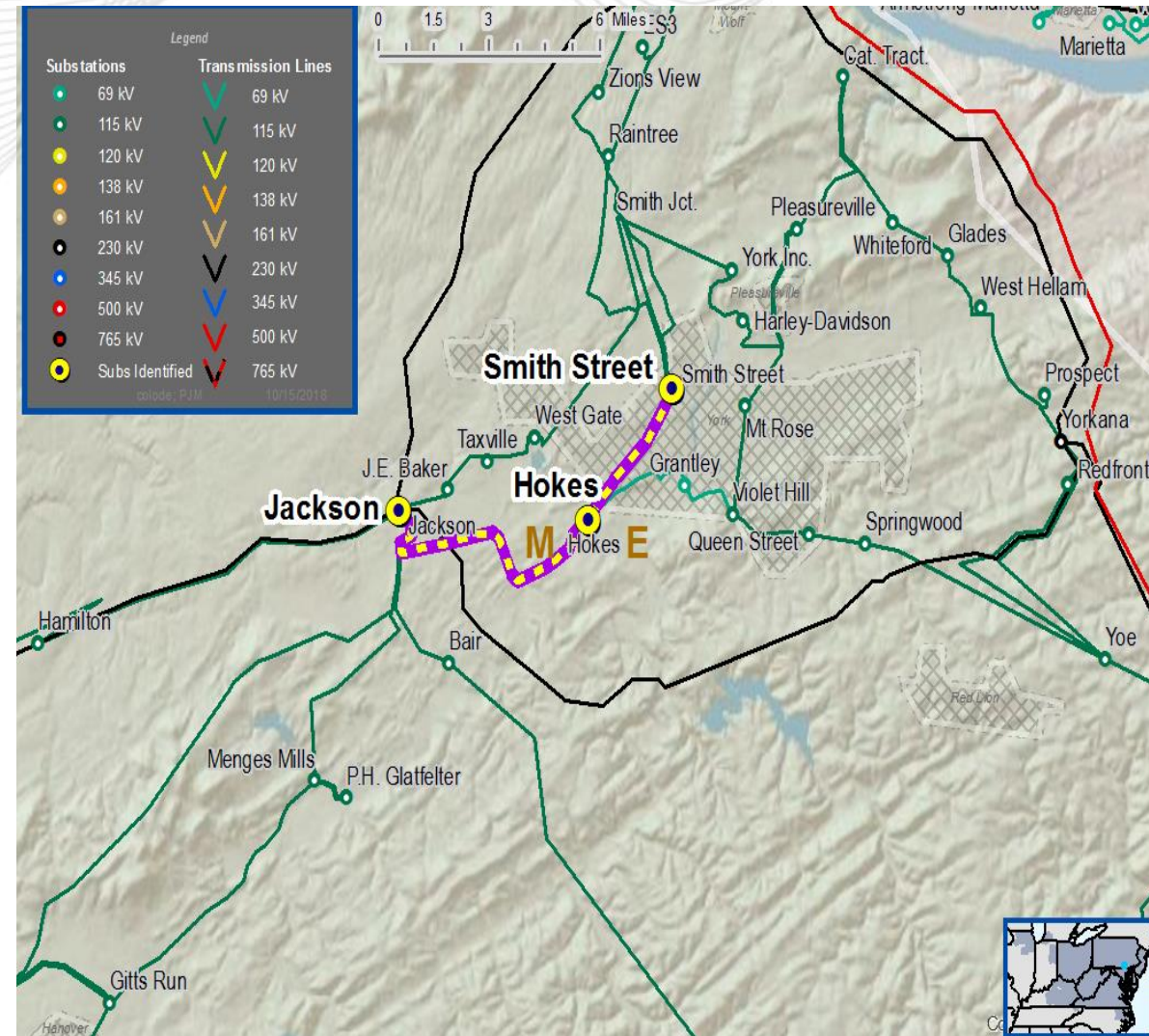
Problem Statement

Relays on Hokes – Smith St, Hokes – Lehigh Cement, & Hokes – Jackson 69 kV lines evaluated and determined to be obsolete and/or degraded condition.

Transmission line rating limited by terminal equipment.

Hokes – Jackson 69 kV line: Existing line rating is 51 MVA SN / 56 MVA SE. Existing conductor rating is 53 MVA SN / 56 MVA SE.

(substation conductor)





Met-Ed Transmission Zone

Need Number: ME-2018-015

Proposed Solution:

Hokes, Jackson, and Smith Street 69 kV Substations - replace relays prone to misoperation

At Hokes Substation:

Smith St Line Terminal – Terminal equipment to be replaced includes:

- Circuit breaker and disconnect switches

Jackson Line Terminal – Terminal equipment to be replaced includes:

- Circuit breaker, disconnect switches, and substation conductor

Lehigh Cement Terminal – Terminal equipment to be replaced includes:

- Circuit breaker and disconnect switches

At Jackson Substation:

Hokes Terminal – Terminal equipment to be replaced includes:

- Substation conductor

Transmission Line Ratings:

- Hokes – Jackson 69 kV Line
 - Before Proposed Solution: 51 MVA SN / 56 MVA SE
 - After Proposed Solution: 53 MVA SN / 56 MVA SE

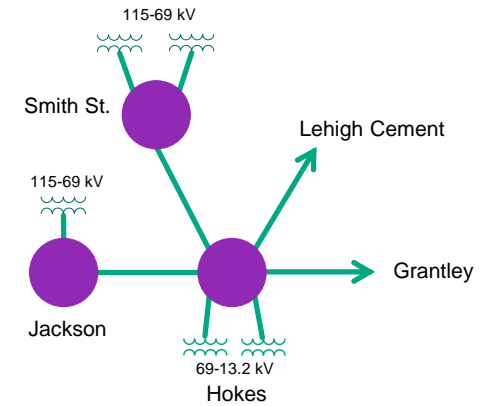
Alternatives Considered:

- Maintain existing condition and elevated risk of misoperation

Estimated Project Cost: \$1.6M

Projected IS Date: 12/31/2019

Status: Conceptual



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

Need Number: ME-2018-016

Process Stage: Solution Meeting

Need Presented: 10/29/2018

Project Driver(s):

Equipment Material Condition, Performance and Risk

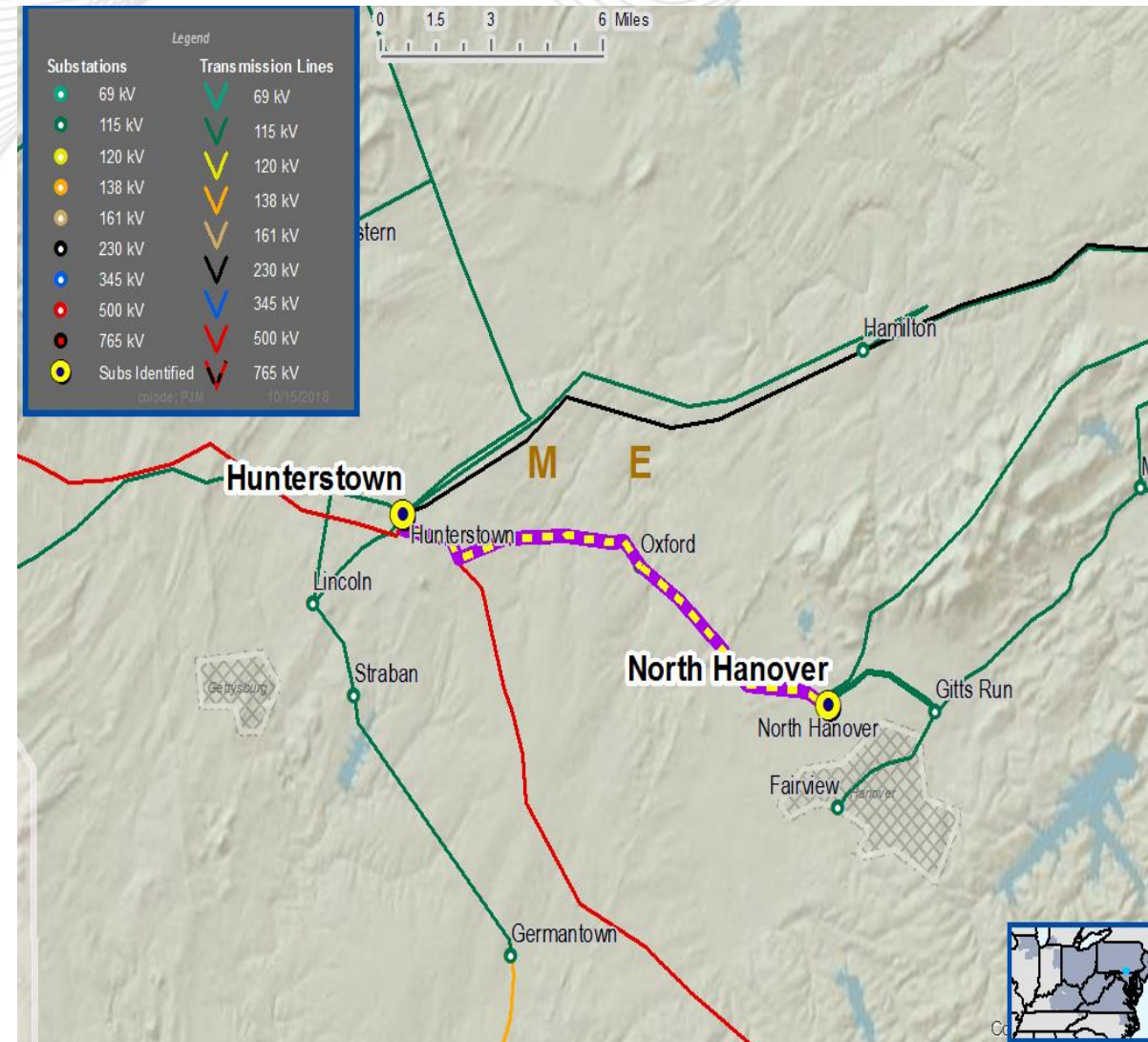
Specific Assumption Reference(s)

- Substation Condition Rebuild/Replacement – Station system protection and controls – Electromechanical relays
- System Performance Projects – Substation/Line Equipment Limits
- Upgrade Relay Schemes

Problem Statement

Relays on Hunterstown – North Hanover 115 kV line evaluated and determined to be obsolete and/or degraded condition.

Transmission line rating limited by terminal equipment. Existing line rating is 232 MVA SN / 277 MVA SE. Existing conductor rating is 232 SN / 282 MVA SE.
(line trap)



Need Number: ME-2018-016

Proposed Solution:

Hunterstown – North Hanover 115 kV replace relays prone to misoperation

Hunterstown 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, line trap, line tuner, arresters, and disconnect switches

North Hanover 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, CCVT, line trap, line tuner, arresters, and disconnect switches

Transmission Line Ratings:

- Hunterstown – North Hanover 115 kV Line
 - Before Proposed Solution: 232 MVA SN / 277 MVA SE
 - After Proposed Solution: 232 MVA SN / 282 MVA SE

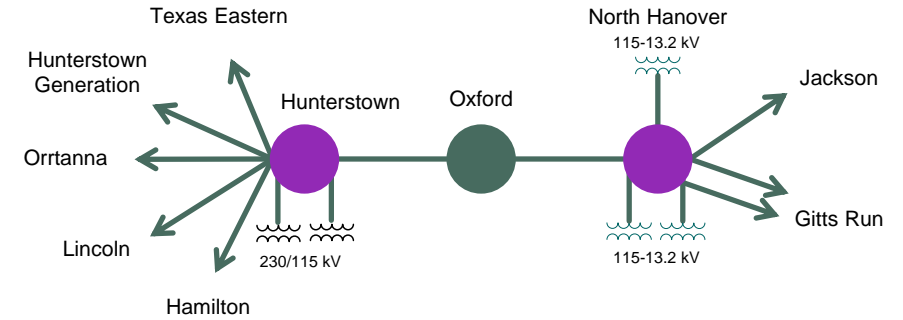
Alternatives Considered:

- Maintain existing condition and elevated risk of misoperation

Estimated Project Cost: \$0.8M

Projected IS Date: 12/31/2019

Status: Conceptual



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

Need Number: ME-2018-017

Process Stage: Solution Meeting

Need Presented: 10/29/2018

Project Driver(s):

Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)

- Substation Condition Rebuild/Replacement – Station system protection and controls – Electromechanical relays
- System Performance Projects – Substation/Line Equipment Limits
- Upgrade Relay Schemes

Problem Statement

Relays on Jackson – Westgate 115 kV line evaluated and determined to be obsolete and/or degraded condition.

Jackson - JE Baker 115 kV line: Existing line rating is 274 MVA SN / 344 MVA SE. Existing conductor rating is 373 MVA SN / 430 MVA SE.

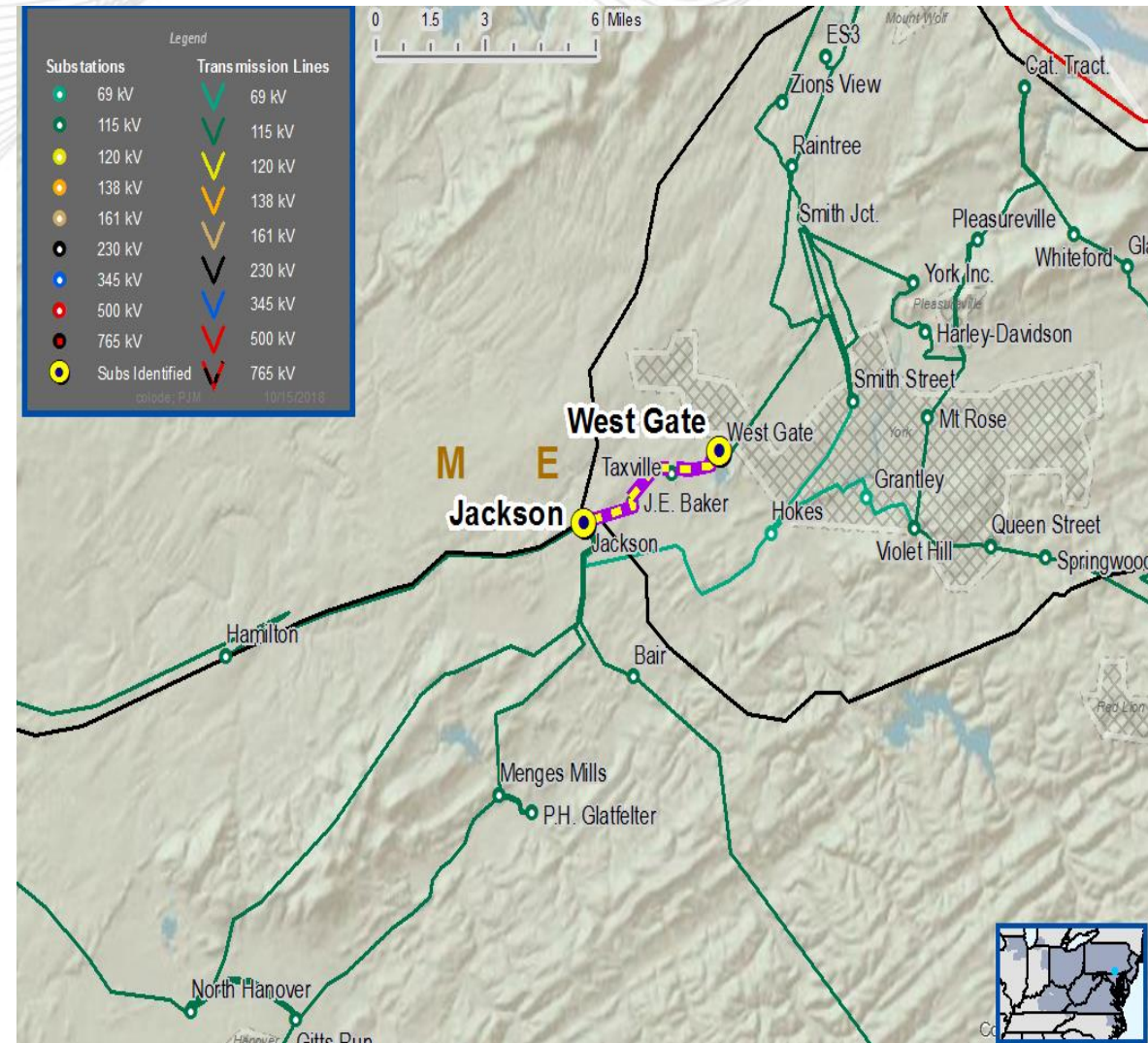
(substation conductor and disconnect switches)

JE Baker - Taxville 115 kV line: Existing line rating is 274 MVA SN / 344 MVA SE. Existing conductor rating is 373 MVA SN / 430 MVA SE.

(substation conductor and disconnect switch)

Taxville - Westgate 115 kV line: Existing line rating is 232 MVA SN / 277 MVA SE. Existing conductor rating is 232 MVA SN / 282 MVA SE

(line trap)



Need Number: ME-2018-017

Proposed Solution:

Jackson – Westgate 115 kV replace relays prone to misoperation

Jackson – Taxville 115 kV Line section equipment to be replaced includes:

- Line disconnect switches (JE Baker Tap)

Jackson 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, line drops, CCVT, line trap, line tuner, coax, substation conductor, and breaker disconnect switches

Westgate 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, CCVT, line trap, line tuner, and arresters

Transmission Line Ratings:

- Jackson – JE Baker 115 kV Line
 - Before Proposed Solution: 274 MVA SN / 344 MVA SE
 - After Proposed Solution: 373 MVA SN / 430 MVA SE
- JE Baker – Taxville 115 kV Line
 - Before Proposed Solution: 274 MVA SN / 344 MVA SE
 - After Proposed Solution: 365 MVA SN / 430 MVA SE
- Taxville – Westgate 115 kV Line
 - Before Proposed Solution: 232 MVA SN / 277 MVA SE
 - After Proposed Solution: 232 MVA SN / 282 MVA SE

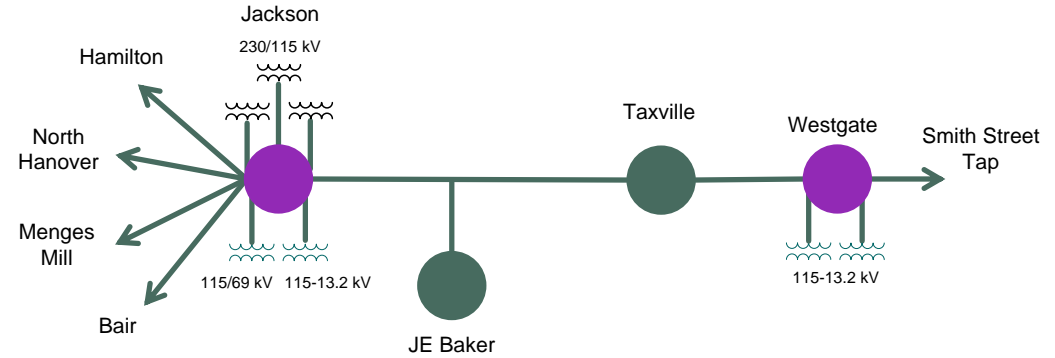
Alternatives Considered:

- Maintain existing condition and elevated risk of misoperation

Estimated Project Cost: \$1.1M

Projected IS Date: 12/31/2019

Status: Conceptual



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

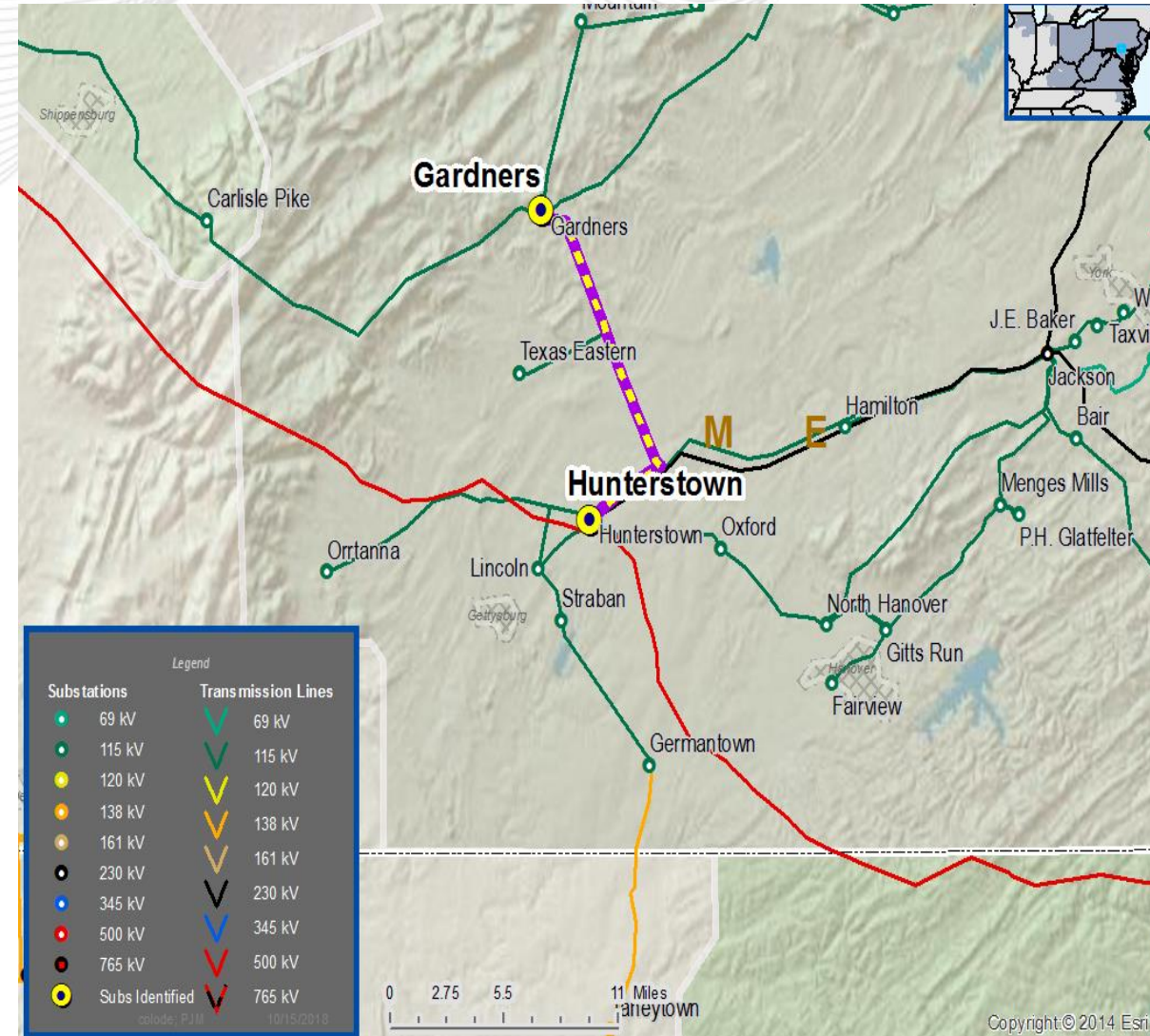
Need Number: ME-2018-018
Process Stage: Solution Meeting
Need Presented: 10/29/2018

Project Driver(s):
Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)
 Substation Condition Rebuild/Replacement – Station system protection and controls – Electromechanical relays
 System Performance Projects – Substation/Line Equipment Limits
 Upgrade Relay Schemes

Problem Statement
 Relays on Hunterstown – Gardners 115 kV line evaluated and determined to be obsolete and/or degraded condition.

Transmission line rating limited by terminal equipment. Existing line rating is 163 MVA SN / 185 MVA SE. Existing conductor rating is 232 MVA SN / 282 MVA SE.
(line trap, breaker, CTs, relay, and substation conductor)





Met-Ed Transmission Zone

Need Number: ME-2018-018

Proposed Solution:

Gardners – Hunterstown 115 kV replace relays prone to misoperation

Gardners 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, CCVT, line trap, line tuner, coax, arresters, substation conductor, circuit breaker and disconnect switches

Hunterstown 115 kV Substation – Terminal equipment to be replaced includes:

- Line relaying, CCVT, line trap, line tuner, coax, and arresters

Transmission Line Ratings:

- Gardners – Texas Eastern Tap 115 kV Line
 - Before Proposed Solution: 163 MVA SN / 185 MVA SE
 - After Proposed Solution: 232 MVA SN / 282 MVA SE

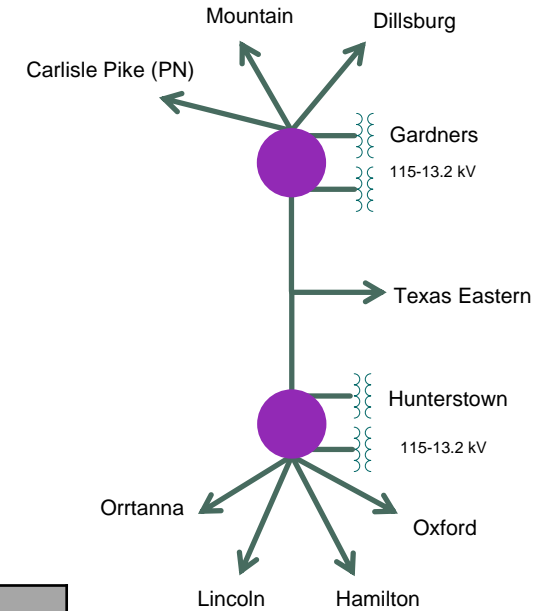
Alternatives Considered:

- Maintain existing condition and elevated risk of misoperation

Estimated Project Cost: \$2.6M

Projected IS Date: 12/31/2019

Status: Conceptual



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

Need Number: PN-2018-014
Process Stage: Solution Meeting
Need Presented: 10/29/2018

Project Driver(s):
Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)
 Substation Condition Rebuild/Replacement – Circuit Breakers
 System Performance Projects – Substation/line equipment limits

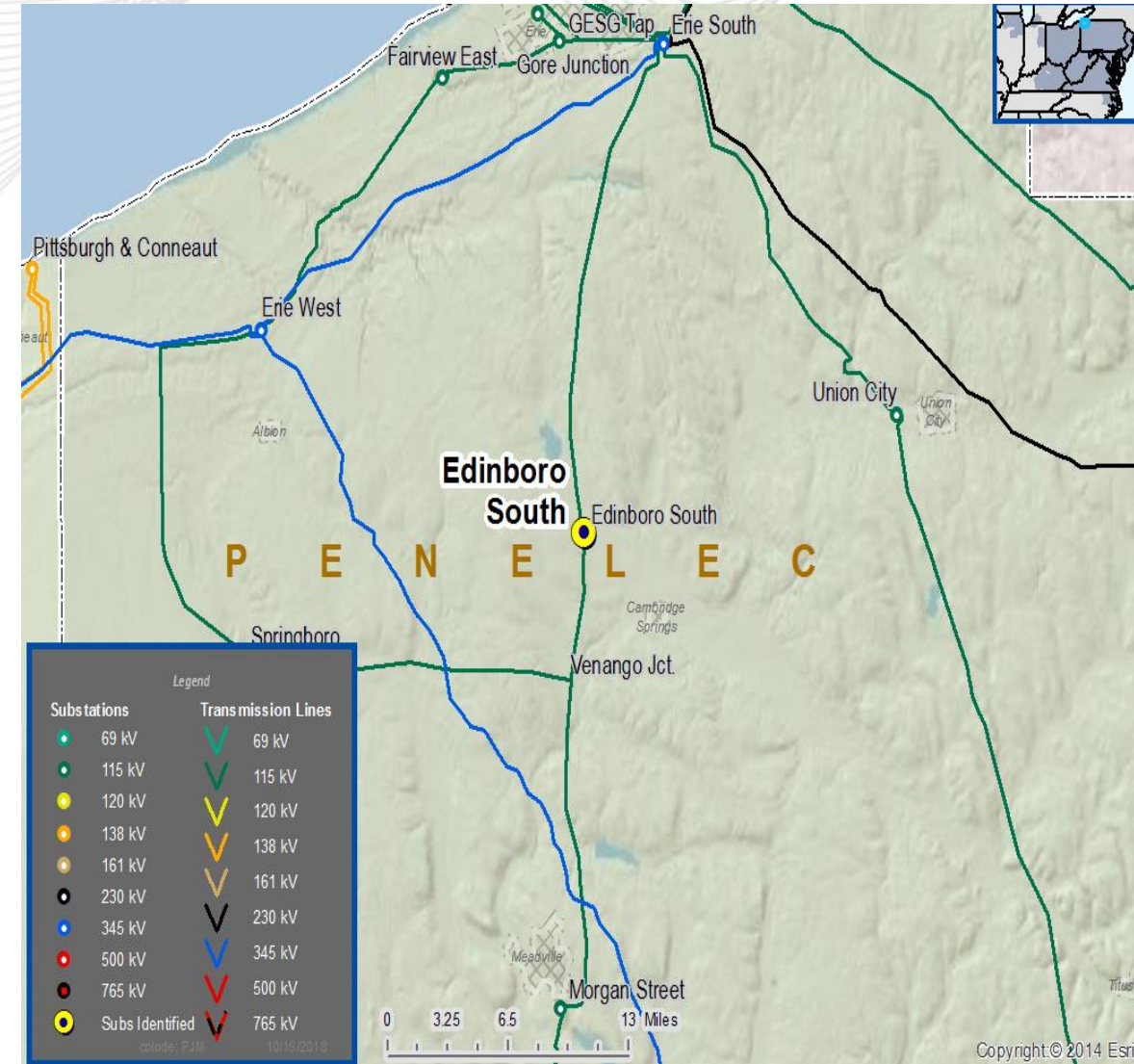
Problem Statement
 Bus section circuit breaker at Edinboro South 115 kV evaluated and determined to be in degraded condition. Since 2006, there have been 10 maintenance orders on this breaker (interrupting media, compressor, and other issues)

Transmission line rating limited by terminal equipment.
 Edinboro South – Erie South 115 kV line: Existing line rating is 163 MVA SN / 185 MVA SE. Existing conductor rating is 232 MVA SN / 282 MVA SE.

(line trap, substation conductor, line relaying, CTs)

Edinboro South – Venango Junction 115 kV line: Existing line rating is 163 MVA SN / 179 MVA SE. Existing conductor rating is 232 MVA SN / 282 MVA SE.

(line trap, substation conductor, line relaying, CTs)



Need Number: PN-2018-014

Proposed Solution:

Edinboro South 115 kV: Replace Bus Section Breaker and Upgrade Terminal Equipment

- Replace bus section breaker

Edinboro South 115 kV Substation – Terminal equipment to be replaced includes:

- Line traps, substation conductor, line relaying and CCVTs

Venango Junction 115 kV Substation – Terminal equipment to be replaced includes:

- Substation conductor, CCVT and arresters

Erie South 115 kV Substation – Terminal equipment to be replaced includes:

- Circuit breaker, arresters, CCVT, line trap, line relaying and substation conductor

Transmission Line Ratings:

- Edinboro South – Erie South 115 kV Line
 - Before Proposed Solution: 163 MVA SN / 185 MVA SE
 - After Proposed Solution: 232 MVA SN / 282 MVA SE
- Edinboro South – Venango Junction 115 kV Line
 - Before Proposed Solution: 163 MVA SN / 179 MVA SE
 - After Proposed Solution: 232 MVA SN / 282 MVA SE

Alternatives Considered:

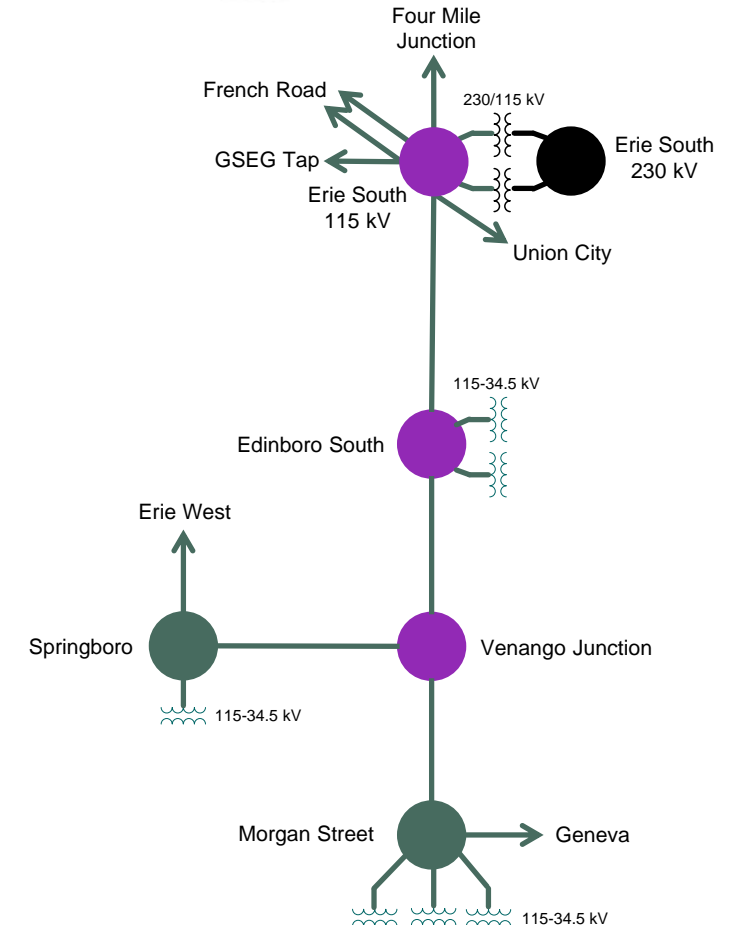
- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$2.1M

Projected IS Date: 6/1/2019

Status: Conceptual

Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	



Need Number: PN-2018-015

Process Stage: Solution Meeting

Need Presented: 10/29/2018

Project Driver(s):

Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)

Substation Condition Rebuild/Replacement

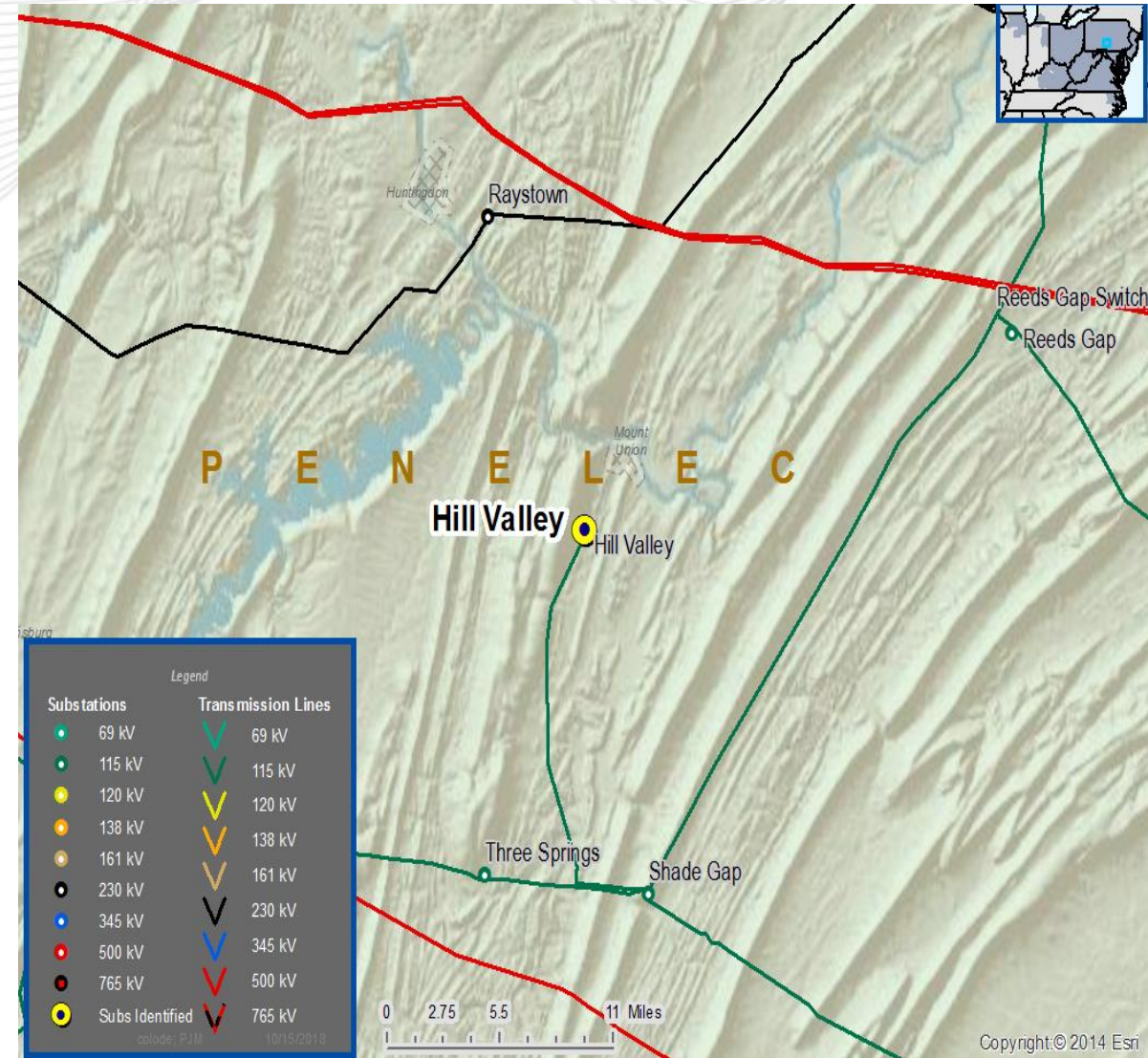
Problem Statement

Hill Valley #1 115/46 kV Transformer

Transformer has increased failure probability due to leaks, failed auxiliary equipment and damaged wiring.

Transformer is 57 years old.

Since 2004, there have been 25 maintenance orders on this transformer.



Need Number: PN-2018-015

Proposed Solution:

Replace Hill Valley #1 115/46 kV Transformer

- Replace the #1 115/46 kV transformer and associated equipment with 115/46 kV 45/60/75 MVA transformer

Transformer Rating:

- Hill Valley #1 115/46 kV Transformer
 - Before Proposed Solution: 32 MVA SN / 34 MVA SE
 - After Proposed Solution: 97 MVA SN / 97 MVA SE

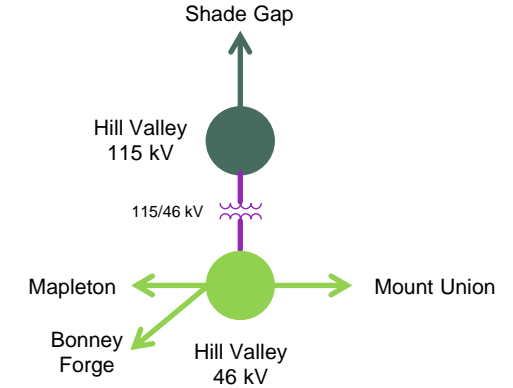
Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$3.0M

Projected IS Date: 12/1/2019

Status: Conceptual



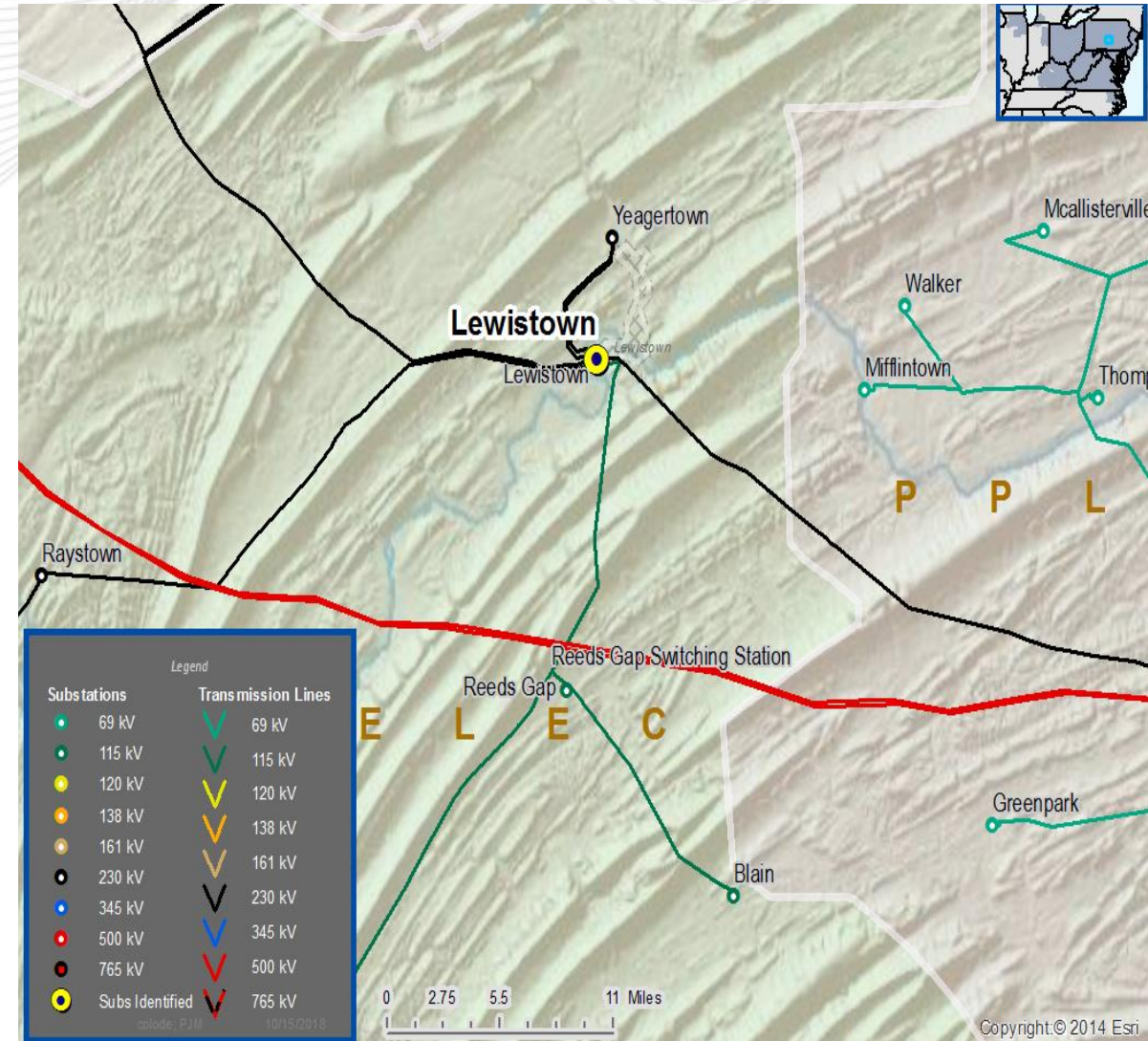
Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	

Need Number: PN-2018-016
Process Stage: Solution Meeting
Need Presented: 10/29/2018

Project Driver(s):
Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)
 Substation Condition Rebuild/Replacement

Problem Statement
 Lewistown #2 230/115-46 kV Transformer
 Transformer has an increased failure probability due to leaks and failed auxiliary equipment.
 Transformer is 65 years old.
 Since 2004, there have been 96 maintenance orders on this transformer.



Need Number: PN-2018-016

Proposed Solution:

Replace Lewistown #2 230/115-46 kV Transformer

- Replace the #2 230/115-46 kV transformer and associated equipment with 230-46 kV 60/80/100 MVA transformer

Replace Lewistown 46 kV Breakers

- Replace overdutied 46 kV breakers due to transformer replacement
(*Riverside (1LK), Viscose Hill (2LK), Mt Union, #2 Transformer and Bus Section breakers*)

Transformer Rating:

- Lewistown #2 230-46 kV Transformer
 - Before Proposed Solution (230/115 kV): 65 MVA SN / 72 MVA SE
 - Before Proposed Solution (115-46 kV): 62 MVA SN / 67 MVA SE
 - Before Proposed Solution (230-46 kV): 55 MVA SN / 67 MVA SE
 - After Proposed Solution (anticipated 230-46 kV): 120 MVA SN / 129 MVA SE

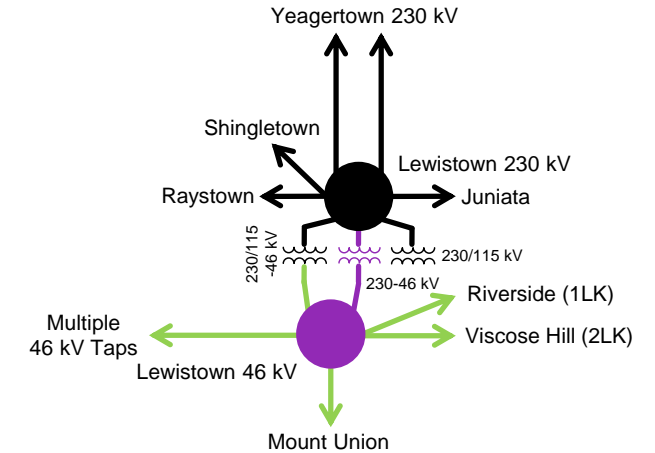
Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$3.3M (Transformer Replacement)
\$0.6M (46 kV Breaker Replacements)

Projected IS Date: 12/31/2020

Status: Conceptual



Legend	
500 kV	
230 kV	
138 kV	
115 kV	
69 kV	
46 kV	
New	



Sub Regional RTEP Committee Mid-Atlantic First Energy MAAC Need Meeting

November 28, 2018



Met-Ed Transmission Zone

Need Number: ME-2018-019

Process Stage: Need Meeting

Date: 11/28/2018

Project Driver(s):

Equipment Material Condition, Performance and Risk

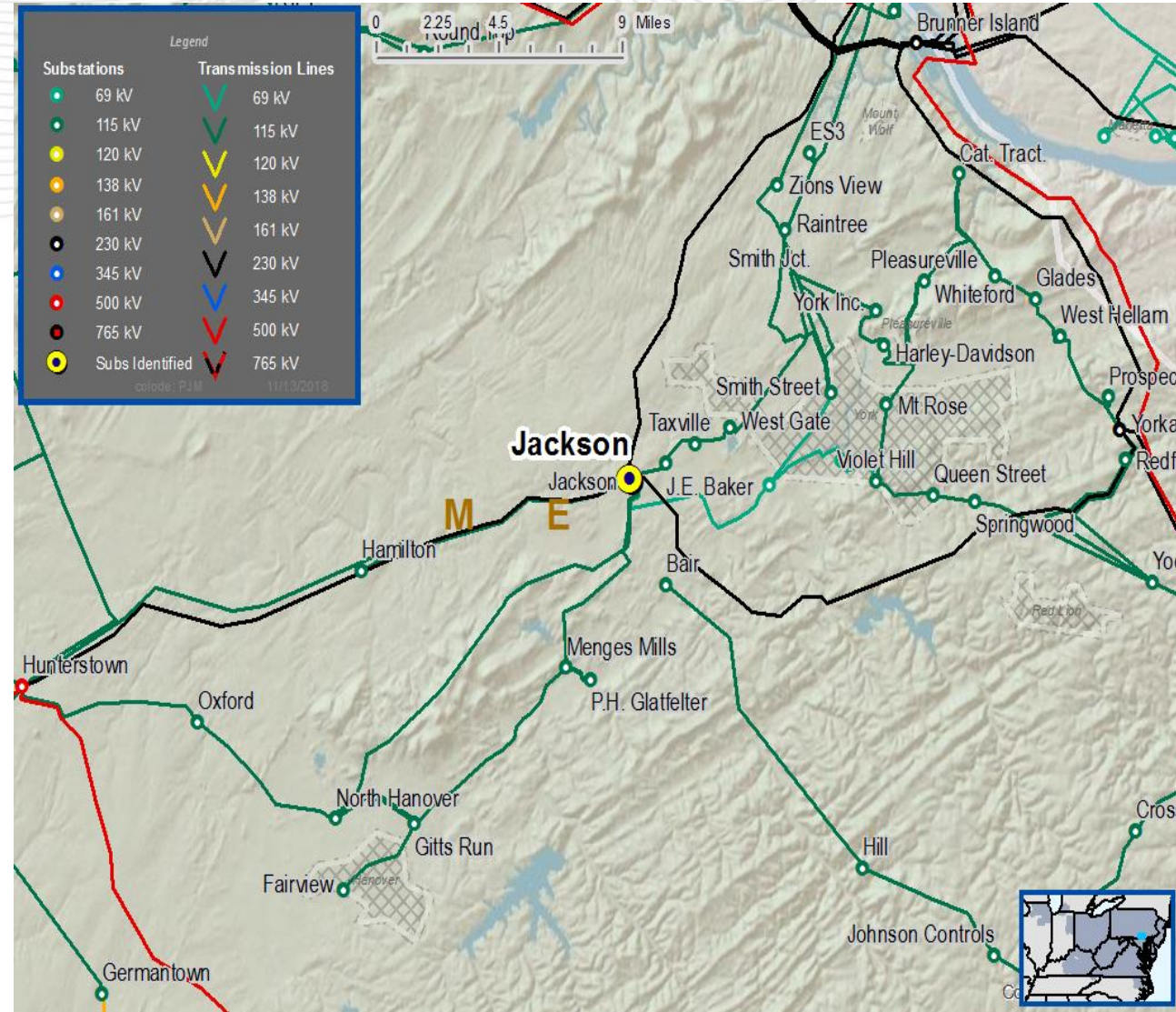
Specific Assumption Reference(s)

- Substation Condition Rebuild/Replacement

Problem Statement

Jackson #5 230/115 kV:

- Transformer is 48 years old
- Dissolved gas in oil
- History of oil leaks, compromising oil integrity



Need Number: ME-2018-020

Process Stage: Need Meeting

Date: 11/28/2018

Project Driver(s):

Equipment Material Condition, Performance and Risk

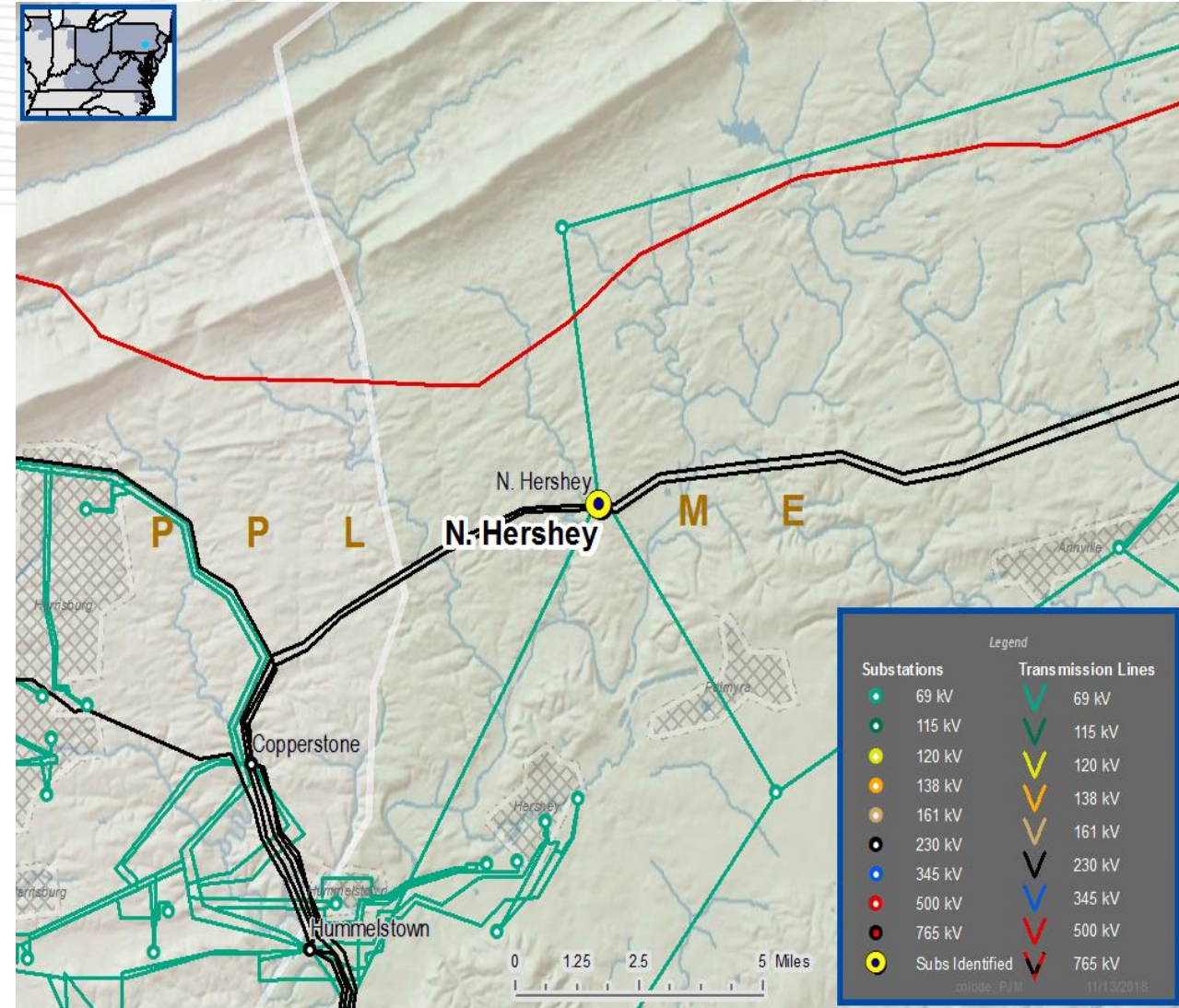
Specific Assumption Reference(s)

- Substation Condition Rebuild/Replacement

Problem Statement

North Hershey #1 230-69 kV:

- Transformer is over 40 years old
- Critical role in operation of 69 kV
- Transformer leaking



Need Number: ME-2018-021

Process Stage: Need Meeting

Date: 11/28/2018

Project Driver(s):

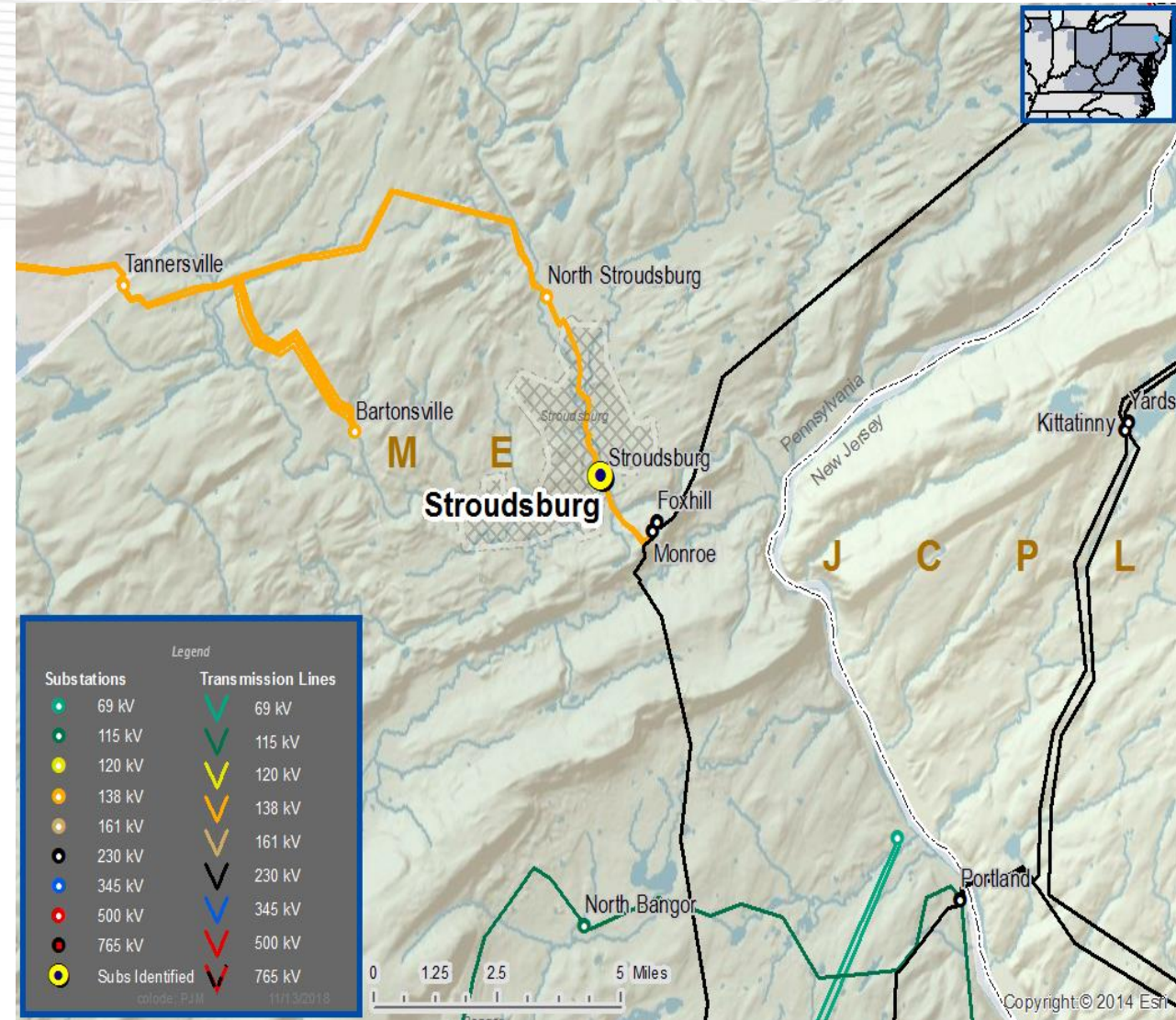
Customer Service (Reliability)

Specific Assumption Reference(s)

Customer request will be evaluated per FirstEnergy’s “Requirements for Transmission Connected Facilities” document and “Transmission Planning Criteria” document.

Problem Statement

- Customer requested transmission service in the Stroudsburg, PA area due to multiple outages over past several years.
- Limited outage restoration options in the area.





Revision History

11/16/2018 – V1 – Original version posted to pjm.com

4/28/2023 – V2 – Minor change in slide #17