

# First Energy (MetEd) Local Plan Submission for the 2020 RTEP

**Need Number:** ME-2019-039

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/20/2020

**Previously Presented:**

Need Meeting 7/31/2019

Solutions Meeting 11/18/2019

**Project Driver:**

*Equipment Material Condition, Performance and Risk*

**Specific Assumption Reference:**

Line Condition Rebuild/Replacement

- Age/condition of wood pole transmission line structures
- Age/condition of steel tower or steel pole transmission line structures
- Age/condition of transmission line conductors

System Performance Projects

- Substation/line equipment limits

**Problem Statement:**

Campbelltown – Middletown – North Hershey 69 kV line sections are exhibiting deterioration.

- Total line distance is approximately 19.7 miles.
- 260 out of 407 structures failed inspection (64% failure rate).
- Failure reasons include age, decay, woodpecker holes.

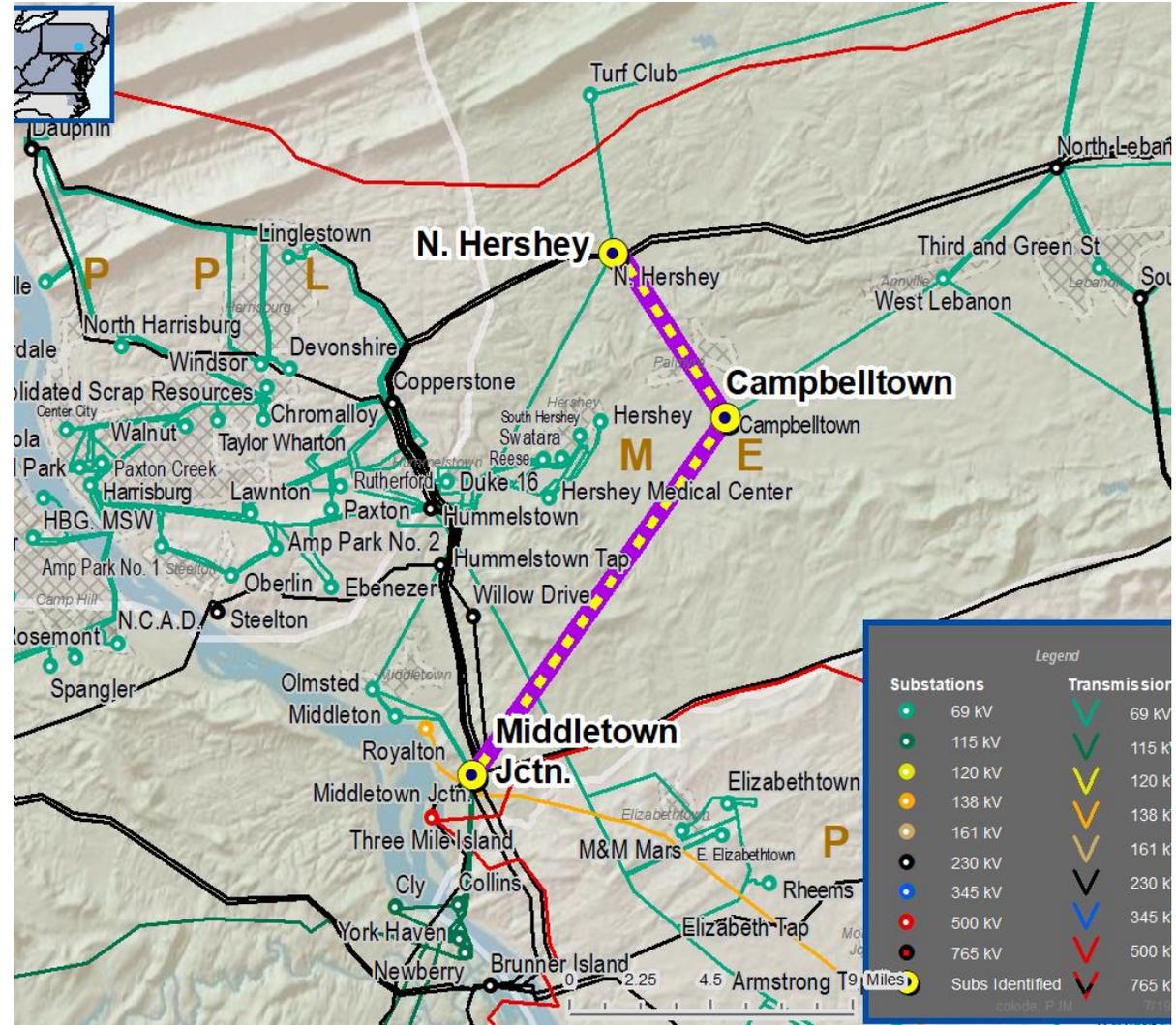
Transmission line ratings are limited by terminal equipment

Campbelltown – Campbelltown Tap 69 kV line (substation conductor, disconnect switches, relaying)

- Existing line rating: 71/91 MVA (SN/SE)
- Existing conductor rating: 139/169 MVA (SN/SE)

Middletown – Wood St Tap 69 kV line (disconnect switches, line relaying, substation conductor)

- Existing line rating: 82/103 MVA (SN/SE)
- Existing conductor rating: 139/169 MVA (SN/SE)



**Need Number:** ME-2019-039

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/20/2020

**Selected Solution:**

Rebuild and reconductor approximately 15.1 miles of the 19.7 mile line (s2170.1)

Replace line relaying, substation conductor, and disconnect switches (s2170.2-5)

Cost \$30.9 M

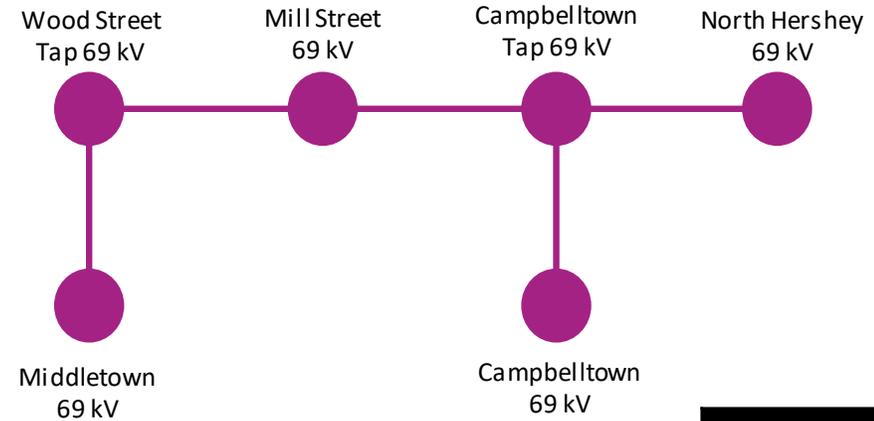
**Transmission Line Ratings:**

- Middletown – Wood St Tap 69 kV Line:
  - Before Proposed Solution: 82/103 MVA (SN/SE)
  - After Proposed Solution: 139/169 MVA (SN/SE)
- Wood St Tap – Mill Street 69 kV Line:
  - Before Proposed Solution: 80/96 MVA (SN/SE)
  - After Proposed Solution: 139/169 MVA (SN/SE)
- Mill Street – Campbelltown Tap 69 kV Line:
  - Before Proposed Solution: 74/90 MVA (SN/SE)
  - After Proposed Solution: 139/169 MVA (SN/SE)
- Campbelltown Tap – North Hershey 69 kV Line:
  - Before Proposed Solution: 74/90 MVA (SN/SE)
  - After Proposed Solution: 136/169 MVA (SN/SE)
- Campbelltown – Campbelltown Tap 69 kV Line:
  - Before Proposed Solution: 71/91 MVA (SN/SE)
  - After Proposed Solution: 82/103 MVA (SN/SE)

**Projected In-Service:** 6/30/2021

**Supplemental Project ID:** s2170, s2170.1, s2170.2, s2170.3, s2170.4, s2170.5

**Model:** 2019 RTEP model for 2024 Summer (50/50)



| Legend  |  |
|---------|--|
| 500 kV  |  |
| 345 kV  |  |
| 230 kV  |  |
| 138 kV  |  |
| 115 kV  |  |
| 69 kV   |  |
| 46 kV   |  |
| 34.5 kV |  |
| 23 kV   |  |
| New     |  |

**Need Number:** ME-2019-042

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/20/2020

**Previously Presented:**

Need Meeting 7/31/2019

Solutions Meeting 11/18/2019

**Project Driver:**

*Equipment Material Condition, Performance and Risk*

**Specific Assumption Reference:**

System Condition Projects

- Substation Condition Rebuild/Replacement

System Performance Projects

- Substation/line equipment limits

**Problem Statement:**

Middletown Junction – Olmsted - Middletown 69 kV line – Terminal equipment has an increased risk of failure (circuit breaker, disconnect switches, line relaying) due to obsolescence of equipment. Limited spare parts are available.

- Circuit breakers are 50+ years old with Type U bushings
- Circuit breakers have a history of failed compressor belt
- Circuit breaker has failing dielectric strength

Transmission line rating is limited by terminal equipment

Middletown Junction – Olmsted 69 kV line (line relaying)

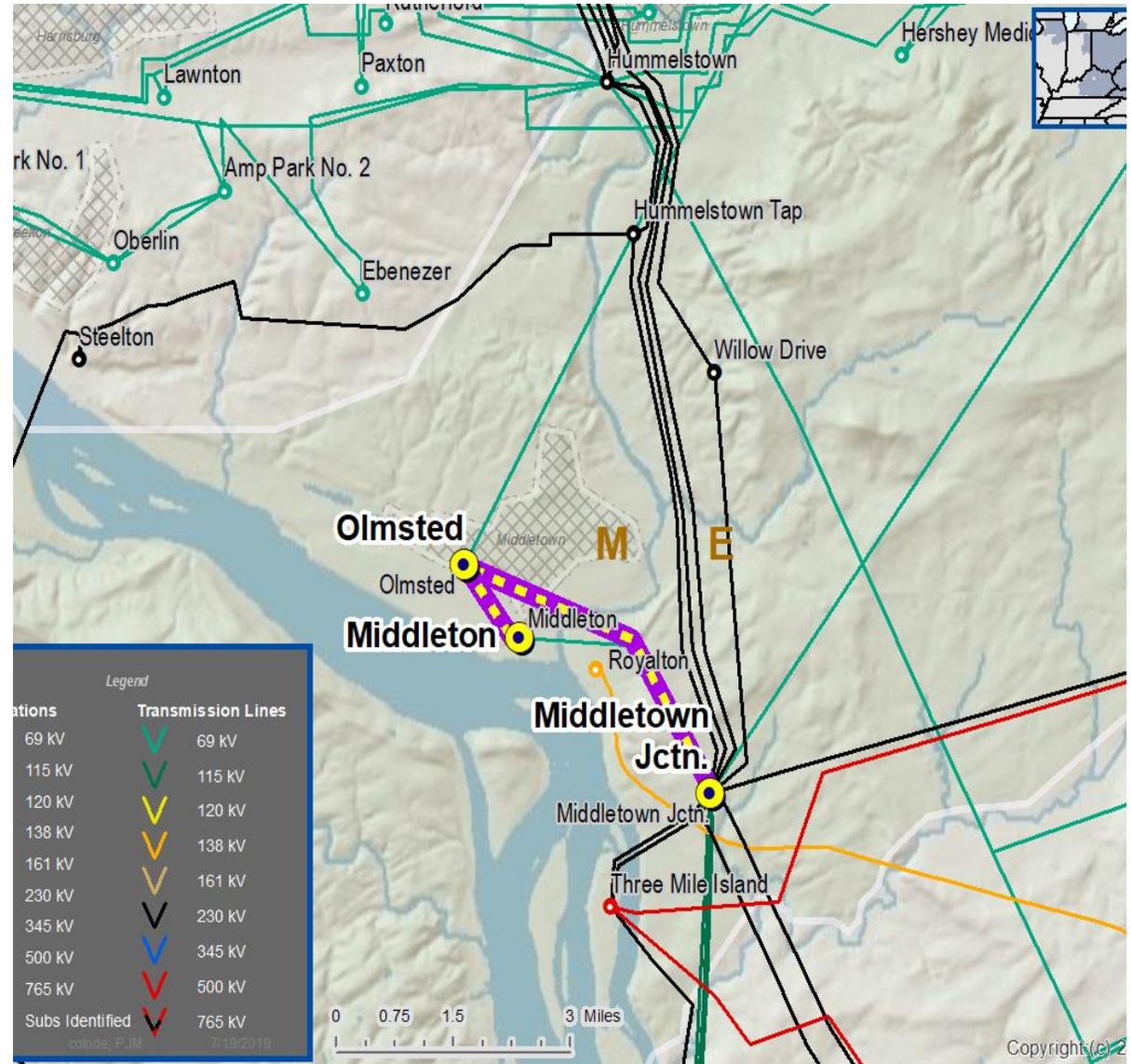
- Existing line rating: 62/72 MVA (SN/SE)
- Existing conductor rating: 62/77 MVA (SN/SE)

Wood Street Tap – Wood Street 69 kV line (substation conductor)

- Existing line rating: 38/49 MVA (SN/SE)
- Existing conductor rating: 53/64 (SN/SE)

Wood Street Tap – Middletown 69 kV line (substation conductor, disconnect switches, relaying)

- Existing line rating: 51/66 MVA (SN/SE)
- Existing conductor rating: 139/169 MVA (SN/SE)



**Need Number:** ME-2019-042

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/20/2020

**Selected Solution Solution:**

Middletown Junction 69 kV substation:

- Replace circuit breaker, disconnect switches, line relaying (s2171.1)

Middletown 69 kV substation:

- Replace circuit breaker, disconnect switches, line relaying, substation conductor (s2171.2)

Cost \$1.6 M

**Transmission Line Ratings:**

- Middletown Junction – Olmsted 69 kV line
  - Before Proposed Solution: 62/72 MVA (SN/SE)
  - After Proposed Solution: 62/77 MVA (SN/SE)
- Wood St Tap – Middletown 69 kV line
  - Before Proposed Solution: 51/66 MVA (SN/SE)
  - After Proposed Solution: 139/169 MVA (SN/SE)

**Projected In-Service:** 12/31/2020

**Supplemental Project ID:** s2171, s2171.1, s2171.2

**Model:** 2019 RTEP model for 2024 Summer (50/50)



| Legend  |  |
|---------|--|
| 500 kV  |  |
| 345 kV  |  |
| 230 kV  |  |
| 138 kV  |  |
| 115 kV  |  |
| 69 kV   |  |
| 46 kV   |  |
| 34.5 kV |  |
| 23 kV   |  |
| New     |  |

**Need Number:** ME-2019-045

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/20/2020

**Previously Presented:**

Need Meeting 7/31/2019

Solutions Meeting 11/18/2019

**Project Driver:**

*Equipment Material Condition, Performance and Risk*

**Specific Assumption Reference:**

System Condition Projects

- Substation Condition Rebuild/Replacement

System Performance Projects

- Substation/line equipment limits

**Problem Statement:**

Baldy – East Tipton 69 kV line – Terminal equipment has an increased risk of failure (circuit breaker and line relaying) due to obsolescence of equipment. Limited spare parts are available.

- East Tipton circuit breaker is 40+ years old with Type U bushings and has a history of failed oil dielectric strength

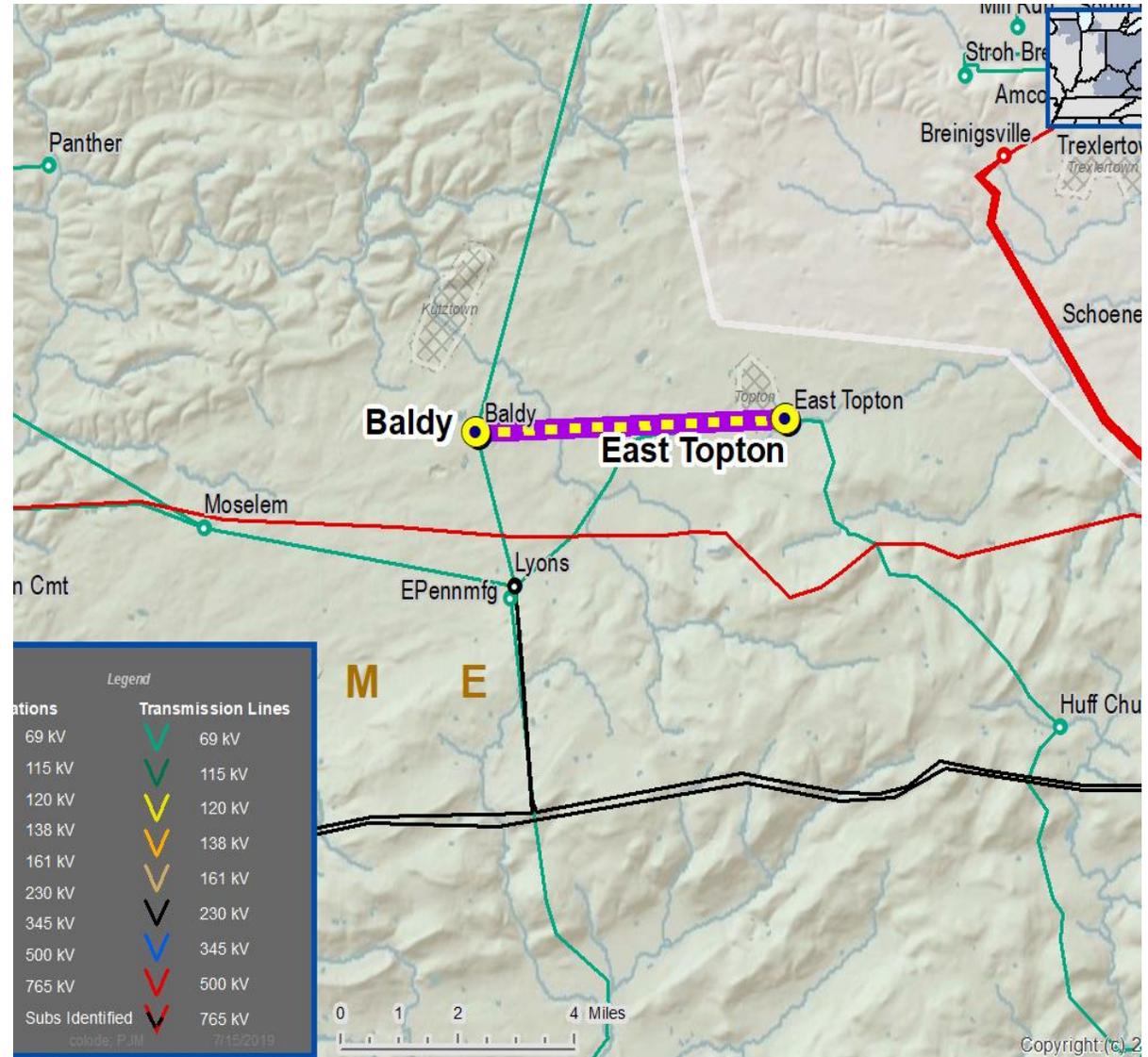
Transmission line rating is limited by terminal equipment

Baldy – Kutztown 69 kV line (substation conductor)

- Existing line rating: 76/90 MVA (SN/SE)
- Existing conductor rating: 80/96 MVA (SN/SE)

Kutztown – East Tipton 69 kV line (substation conductor, line relaying)

- Existing line rating: 62/62 MVA (SN/SE)
- Existing conductor rating: 80/96 MVA (SN/SE)



**Need Number:** ME-2019-045

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/20/2020

**Selected Solution:**

Baldy 69 kV substation

- Replace line relaying and substation conductor (s2172.1)

East Tipton 69 kV substation

- Replace circuit breaker, line relaying, and substation conductor (s2172.2)

Cost: \$0.7 M

**Transmission Line Ratings**

- Baldy – Kutztown 69 kV line
  - Before Proposed Solution: 76/90 MVA (SN/SE)
  - After Proposed Solution: 80/96 MVA (SN/SE)
- Kutztown – East Tipton 69 kV line
  - Before Proposed Solution: 62/62 MVA (SN/SE)
  - After Proposed Solution: 80/96 MVA (SN/SE)

**Projected In-Service:** 12/31/2020

**Supplemental Project ID:** s2172, s2172.1, s2172.2

**Model:** 2019 RTEP model for 2024 Summer (50/50)



| Legend  |  |
|---------|--|
| 500 kV  |  |
| 345 kV  |  |
| 230 kV  |  |
| 138 kV  |  |
| 115 kV  |  |
| 69 kV   |  |
| 46 kV   |  |
| 34.5 kV |  |
| 23 kV   |  |
| New     |  |

**Need Number:** ME-2019-046, ME-2019-050, and ME-2019-052

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 3/20/2020

**Previously Presented:**

Need Meeting 7/31/2019

Solutions Meeting 11/18/2019

**Project Driver:**

*Equipment Material Condition, Performance and Risk, Operational Flexibility and Efficiency*

**Specific Assumption Reference:**

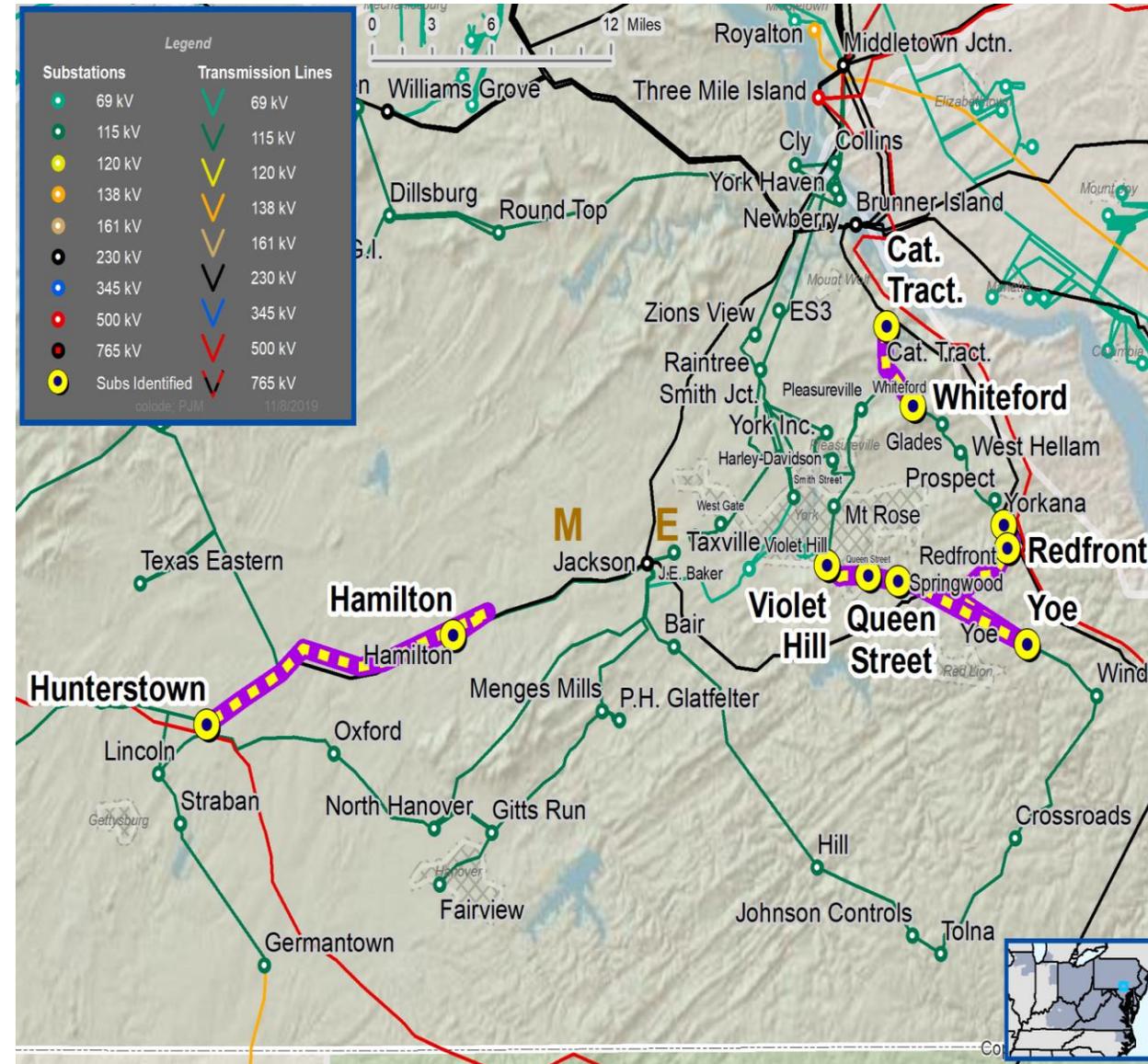
System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

Upgrade Relay Schemes

- Relay schemes that have a history of misoperation
- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades
- Bus protection schemes

**Continued on next slide...**



**Problem Statement:**

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
- In many cases the protection equipment cannot be repaired due to a lack of replacement part and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

| ME-2019- | Transmission Line / Substation Locations  | Existing Line Rating (SN / SE)                      | Existing Conductor Rating (SN / SE)                 | Limiting Terminal Equipment              |
|----------|---|---|---|--|
| 046      | Hamilton – Hunterstown 115 kV Line  | 221/263   | 232/282   | Substation Conductor                     |
| 050      | Caterpillar Tractor – Whiteford 115 kV Line<br>Whiteford – Glades 115 kV Line   | 232/277<br>184/223                                  | 232/282<br>184/223                                  | Line Trap<br>-                           |
| 052      | Violet Hill – Queen Street 115 kV Line<br>Queen Street – Springwood 115 kV Line<br>Springwood – Yoe 115 kV Line<br>Yoe – Redfront 115 kV Line<br>Redfront – Yorkana 115 kV Line | 204/266<br>232/282<br>232/282<br>184/223<br>184/223 | 232/282<br>232/282<br>232/282<br>184/223<br>184/223 | Substation Conductor<br>-<br>-<br>-<br>- |

**Selected Solution:**

| ME-2019- | Transmission Line / Substation Locations  | Supplemental Project ID       | New MVA Line Rating (SN / SE)                       | Scope of Work   | Estimate Costs (\$ M) | Target ISD |
|----------|---|-------------------------------|---|---|-----------------------|------------|
| 046      | Hamilton – Hunterstown 115 kV Line  | s2173,<br>s2173.1,<br>s2173.2 | 232/282   | <ul style="list-style-type: none"> <li>Hamilton 115 kV Substation – Replace line relaying, substation conductor, circuit breaker (s2173.1)</li> <li>Hunterstown 115 kV Substation – Replace line relaying (s2173.2)</li> </ul>                | \$1.6M                | 6/1/2020   |
| 050      | Caterpillar Tractor – Whiteford 115 kV Line<br>Whiteford – Glades 115 kV Line   | s2174,<br>s2174.1,<br>s2174.2 | 232/282<br>184/223                                  | <ul style="list-style-type: none"> <li>Caterpillar Tractor 115 kV Substation – Replace line relaying, line trap (s2174.1)</li> <li>Glades 115 kV Substation – Replace line relaying (s2174.2)</li> </ul>                                      | \$1.0M                | 4/1/2021   |
| 052      | Violet Hill – Queen Street 115 kV Line<br>Queen Street – Springwood 115 kV Line<br>Springwood – Yoe 115 kV Line<br>Yoe – Redfront 115 kV Line<br>Redfront – Yorkana 115 kV Line | s2175,<br>s2175.1,<br>s2175.2 | 232/282<br>232/282<br>232/282<br>184/223<br>184/223 | <ul style="list-style-type: none"> <li>Violet Hill 115 kV Substation – Replace line relaying, substation conductor (s2175.1)</li> <li>-</li> <li>-</li> <li>-</li> <li>Yorkana 115 kV Substation – Replace line relaying (s2175.2)</li> </ul> | \$0.7M                | 12/1/2020  |

No topology changes, no bubble diagram required.  
**Model:** 2019 RTEP model for 2024 Summer (50/50)

**Need Number:** ME-2020-001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Previously Presented:**

Need Meeting 4/14/2020

Solution Meeting 07/07/2020

**Project Driver:**

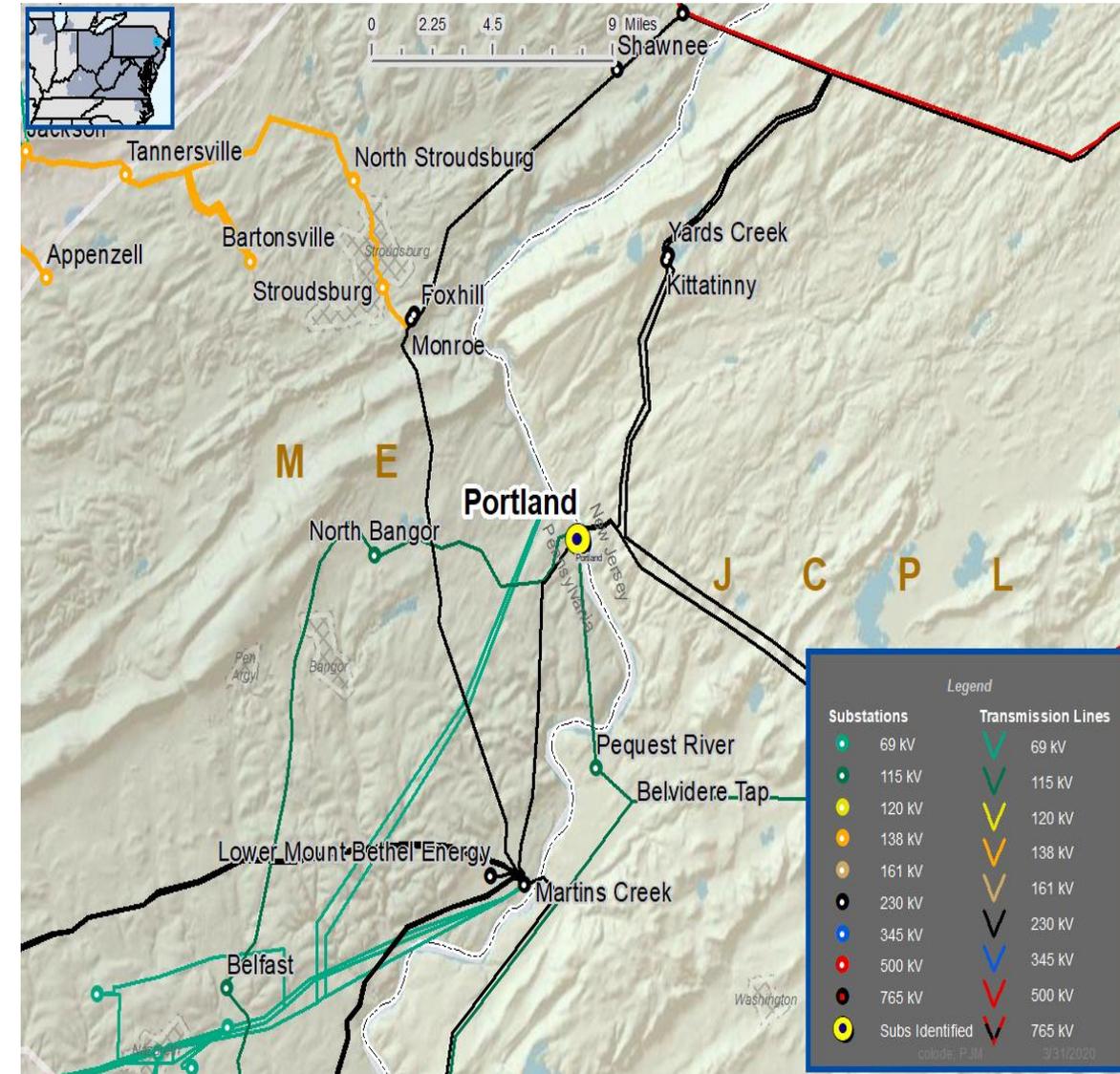
*Equipment Material Condition, Performance and Risk*

**Specific Assumption Reference:**

Equipment Failure

**Problem Statement:**

Portland 230/115 kV #3 Transformer was replaced with a spare transformer as a result of a failure in 2017. The transformer was installed on a temporary pad with temporary oil containment.



**Need Number:** ME-2020-001

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Selected Solution:**

*Portland Substation*

- Replace the #3 230/115 kV transformer and associated equipment with a 180/240/300 MVA transformer

**Transformer Rating:**

Portland #3 230/115 kV Transformer

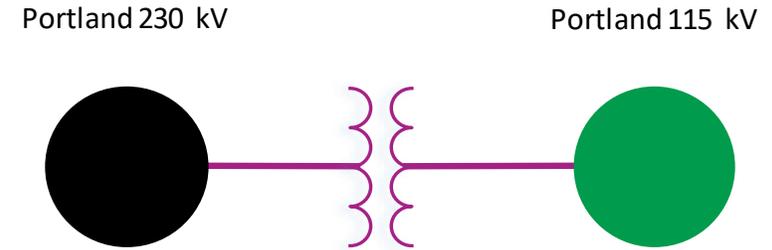
- Before Proposed Solution: 185 / 284 MVA (SN/SE)
- After Proposed Solution (anticipated): 329 / 386 MVA (SN/SE)

**Estimated Project Cost:** \$6.9M

**Projected IS Date:** 6/30/2021

**Supplemental Project ID:** s2301

**Model:** 2020 Series 2025 Summer RTEP 50/50



| Legend  |  |
|---------|--|
| 500 kV  |  |
| 345 kV  |  |
| 230 kV  |  |
| 138 kV  |  |
| 115 kV  |  |
| 69 kV   |  |
| 46 kV   |  |
| 34.5 kV |  |
| 23 kV   |  |
| New     |  |

**Need Number:** ME-2020-003

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Previously Presented:**

Need Meeting 4/14/2020

Solution Meeting 07/07/2020

**Project Driver:**

*Operational Flexibility and Efficiency*

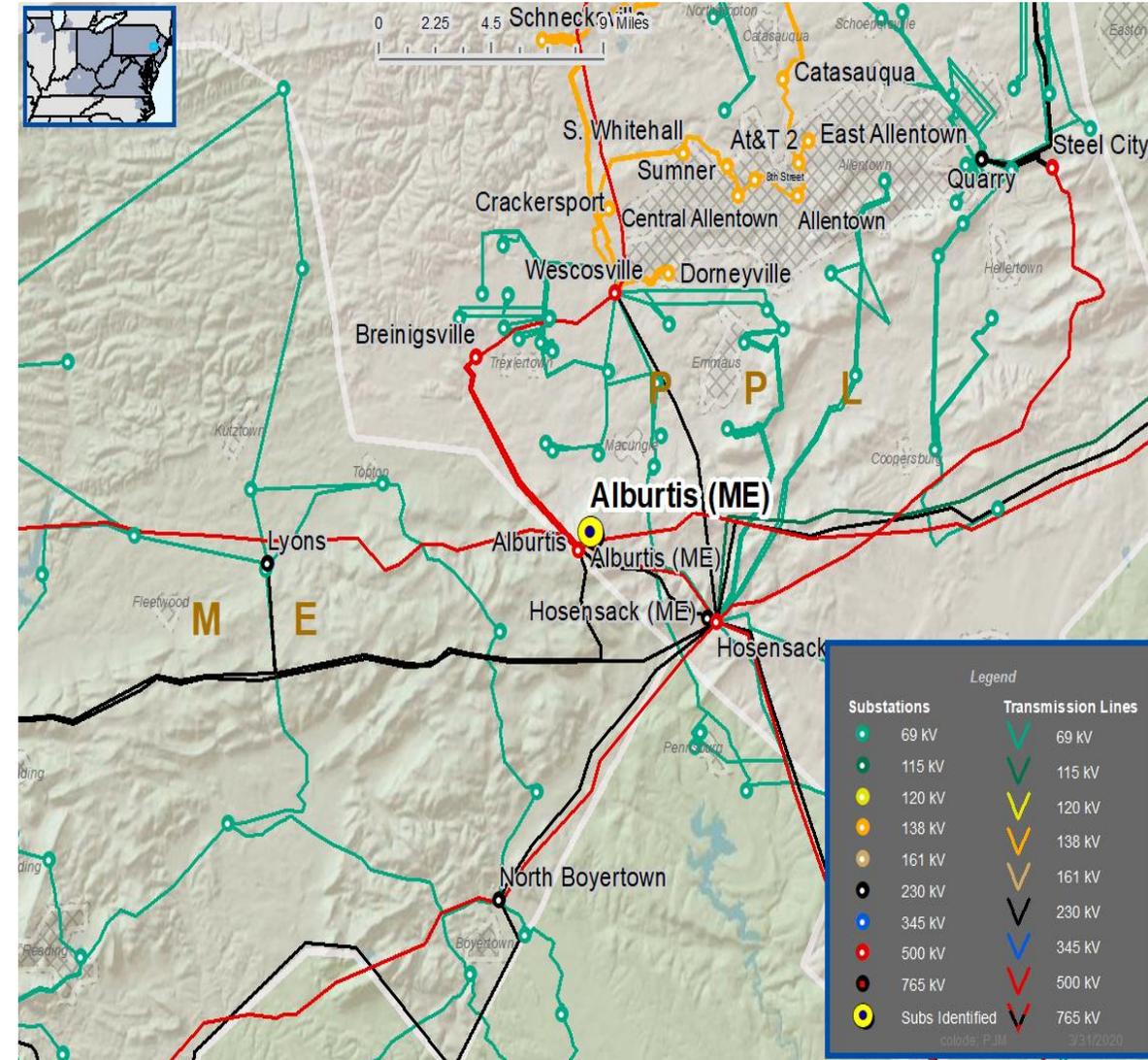
**Specific Assumption Reference:**

Add/Expand Bus Configuration

- Eliminate simultaneous outages to multiple networked elements

**Problem Statement:**

Current Alburtis configuration has two 230 kV lines and one 500/230 kV transformers connected to a straight bus. A bus outage or breaker failure would result in the loss of these three elements.



**Need Number:** ME-2020-003

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Selected Solution:**

*Alburtis Substation*

- Convert the Alburtis 230 kV substation into a 3 breaker 230 kV ring bus

**Transmission Line Ratings:**

*Alburtis 500/230 kV transformer (substation conductor)*

- Before Proposed Solution: 610/780 MVA (SN/SE)
- After Proposed Solution: 784/1122 MVA (SN/SE)

**Estimated Project Cost:** \$4M

**Projected IS Date:** 12/31/2021

**Supplemental Project ID:** s2302

**Model:** 2020 Series 2025 Summer RTEP 50/50

Alburtis 230 kV



| Legend |   |
|--------|---|
| 500 kV |    |
| 345 kV |    |
| 230 kV |    |
| 115 kV |    |
| 69 kV  |  |
| 46 kV  |  |
| Other  |  |
| New    |  |

**Need Number:** ME-2020-008

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Previously Presented:**

Need Meeting 5/12/2020

Solution Meeting 7/07/2020

**Project Driver:**

*Equipment Material Condition, Performance and Risk*

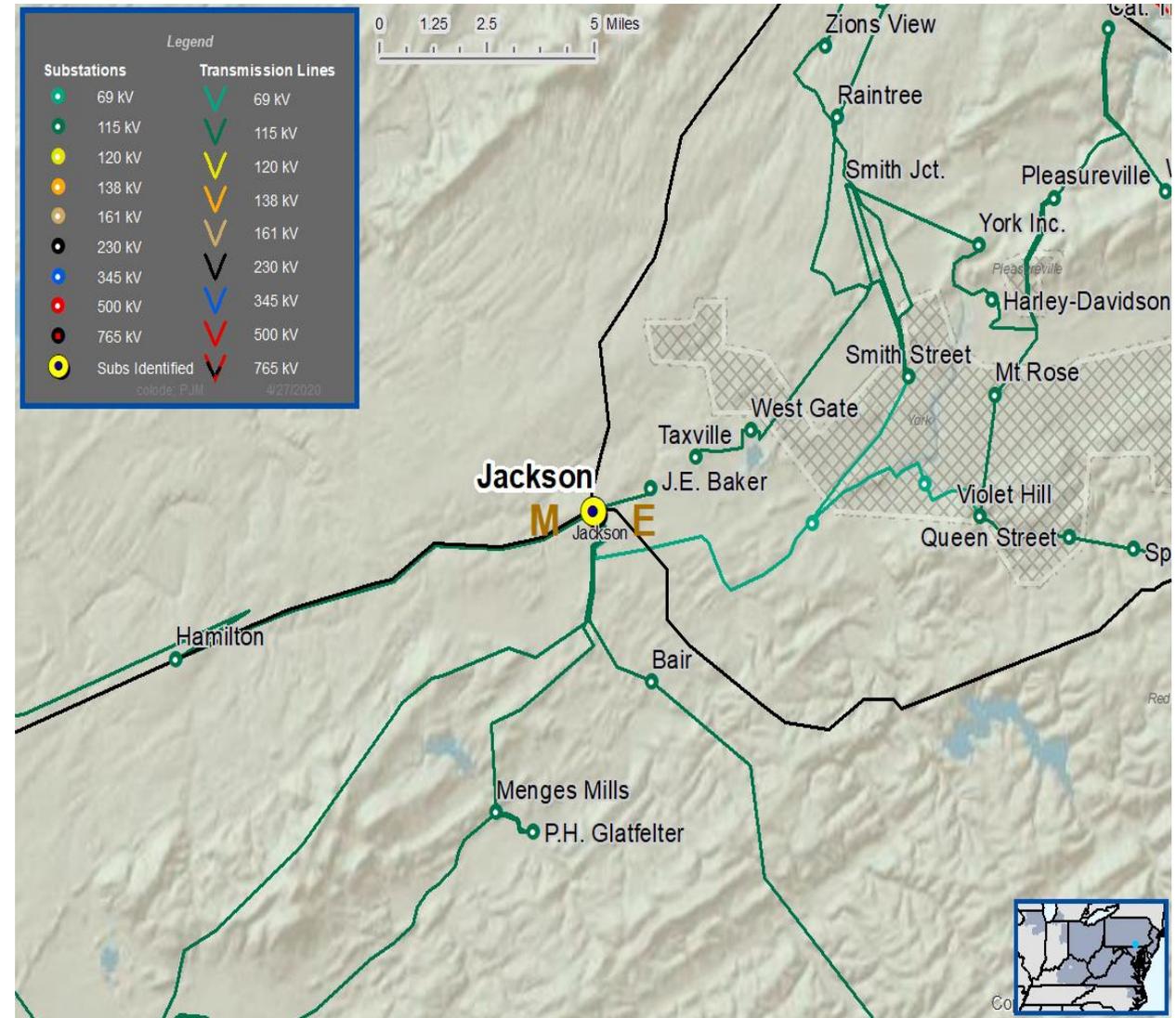
**Specific Assumption Reference:**

Substation Condition Rebuild/Replacement

**Problem Statement:**

The Jackson 230/115 kV #4 transformer

- Transformer is 55 years old
- Experiencing nitrogen gas leaks
- Deteriorated bushings
- Obsolete parts
- Deteriorated gaskets and seals



**Need Number:** ME-2020-008

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Selected Solution:**

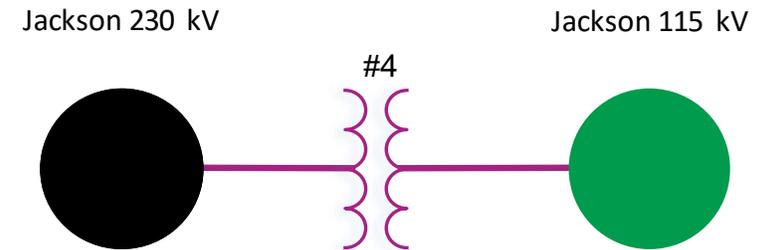
*Jackson Substation*

- Retire the Jackson 230/115 kV #4 transformer and remove from service

**Supplemental Project ID:** s2303

**Projected IS Date:** 12/31/2022

**Model:** 2020 Series 2025 Summer RTEP 50/50



| Legend  |  |
|---------|--|
| 500 kV  |  |
| 345 kV  |  |
| 230 kV  |  |
| 138 kV  |  |
| 115 kV  |  |
| 69 kV   |  |
| 46 kV   |  |
| 34.5 kV |  |
| 23 kV   |  |
| New     |  |

**Need Number:** ME-2019-040

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Previously Presented:**

Need Meeting 07/31/2019

Solution Meeting 07/16/2020

**Project Driver:**

*Equipment Material Condition, Performance and Risk*

**Specific Assumption Reference:**

Line Condition Rebuild/Replacement

- Age/condition of wood pole transmission line structures
- Age/condition of steel tower or steel pole transmission line structures
- Age/condition of transmission line conductors

System Performance Projects

- Substation/line equipment limits

**Problem Statement:**

Carsonia – Lyons – North Boyertown 69 kV line is exhibiting deterioration.

- Total line distance is approximately 22.8 miles.
- 339 out of 447 structures failed inspection (76% failure rate).
- Failure reasons include age, woodpecker holes, bayonet pole, top rot.

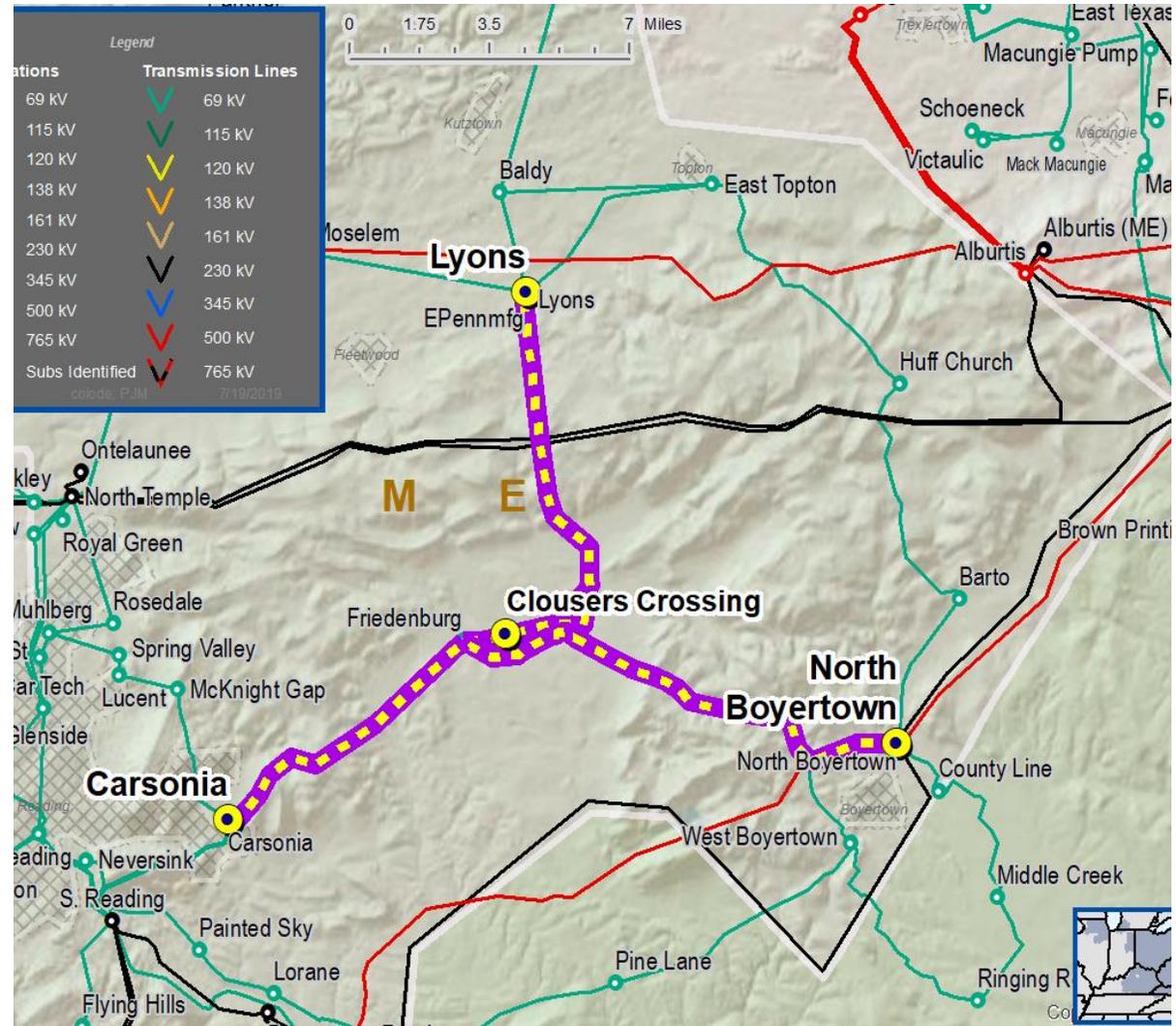
Thermal loading on the Clousers Crossing – North Boyertown 69 kV section is ~105% of the SE rating for the N-1-1 loss of the East Tipton – Huffs Church 69 kV line section (bus 204829 to bus 20867) & North Boyertown 230-69 kV transformer (ME-P1-2-230-003)

*(2018 RTEP Model – 2023 Summer)*

Transmission line ratings are limited by terminal equipment

Lyons – Lyons tap 69 kV line (line relaying)

- Existing line rating: 167/167 MVA (SN/SE)
- Existing conductor rating: 218/251 MVA (SN/SE)



**Need Number:** ME-2019-040

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Selected Solution:**

Rebuild and reconductor Carsonia – Lyons – North Boyertown 69 kV line (s2310.1)

*Carsonia 69 kV Substation (s2310.2)*

- Replace disconnect switches, substation conductor, and line relaying

*Friedensburg 69 kV Substation (s2310.3)*

- Replace disconnect switches and substation conductor

*North Boyertown 69 kV Substation (s2310.4)*

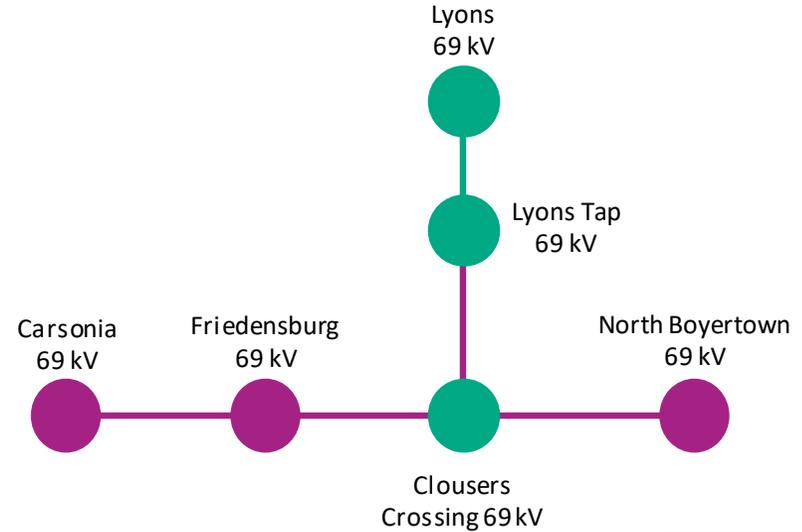
- Replace circuit breaker and disconnect switches

**Estimated Project Cost:** \$26.4 M

**Projected IS Date:** 12/31/2025

**Supplemental Project ID:** s2310.1 s2310.2 s2310.3 s2310.4

**Model:** 2020 RTEP model for 2025 Summer (50/50)



**Transmission Line Rating:**

Clousters Crossing – North Boyertown 69 kV line:

- Before Proposed Solution: 55/56 MVA (SN/SE)
- After Proposed Solution: 111/134 MVA (SN/SE)

Clousters Crossing – Lyons Tap 69 kV line:

- Before Proposed Solution: 53/64 MVA (SN/SE)
- After Proposed Solution: 111/134 MVA (SN/SE)

Lyons Tap – Lyons 69 kV line:

- Before Proposed Solution: 167/167 MVA (SN/SE)
- After Proposed Solution: 218/251 MVA (SN/SE)

Clousters Crossing – Friedensburg 69 kV line:

- Before Proposed Solution: 55/56 MVA (SN/SE)
- After Proposed Solution: 111/134 MVA (SN/SE)

Friedensburg – Carsonia 69 kV line:

- Before Proposed Solution: 55/56 MVA (SN/SE)
- After Proposed Solution: 111/134 MVA (SN/SE)

| Legend  |  |
|---------|--|
| 500 kV  |  |
| 345 kV  |  |
| 230 kV  |  |
| 138 kV  |  |
| 115 kV  |  |
| 69 kV   |  |
| 46 kV   |  |
| 34.5 kV |  |
| 23 kV   |  |
| New     |  |

**Need Number:** ME-2019-041

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Previously Presented:**

Need Meeting 07/31/2019

Solution Meeting 07/16/2020

**Project Driver:**

*Equipment Material Condition, Performance and Risk*

**Specific Assumption Reference:**

System Condition Projects

- Substation Condition Rebuild/Replacement

System Performance Projects

- Substation/line equipment limits

**Problem Statement:**

Lucent– Muhlenberg 69 kV line – Terminal equipment has an increased risk of failure (circuit breaker, disconnect switches, line relaying) due to obsolescence of equipment. Limited spare parts are available.

- Circuit breakers are 50+ years old with Type U bushings and have a history of oil leaks
- Lucent disconnect switch has bad contacts
- Line relays have a history of overtripping

Transmission line rating is limited by terminal equipment

Lucent– Spring Valley 69 kV line (substation conductor, disconnect switches)

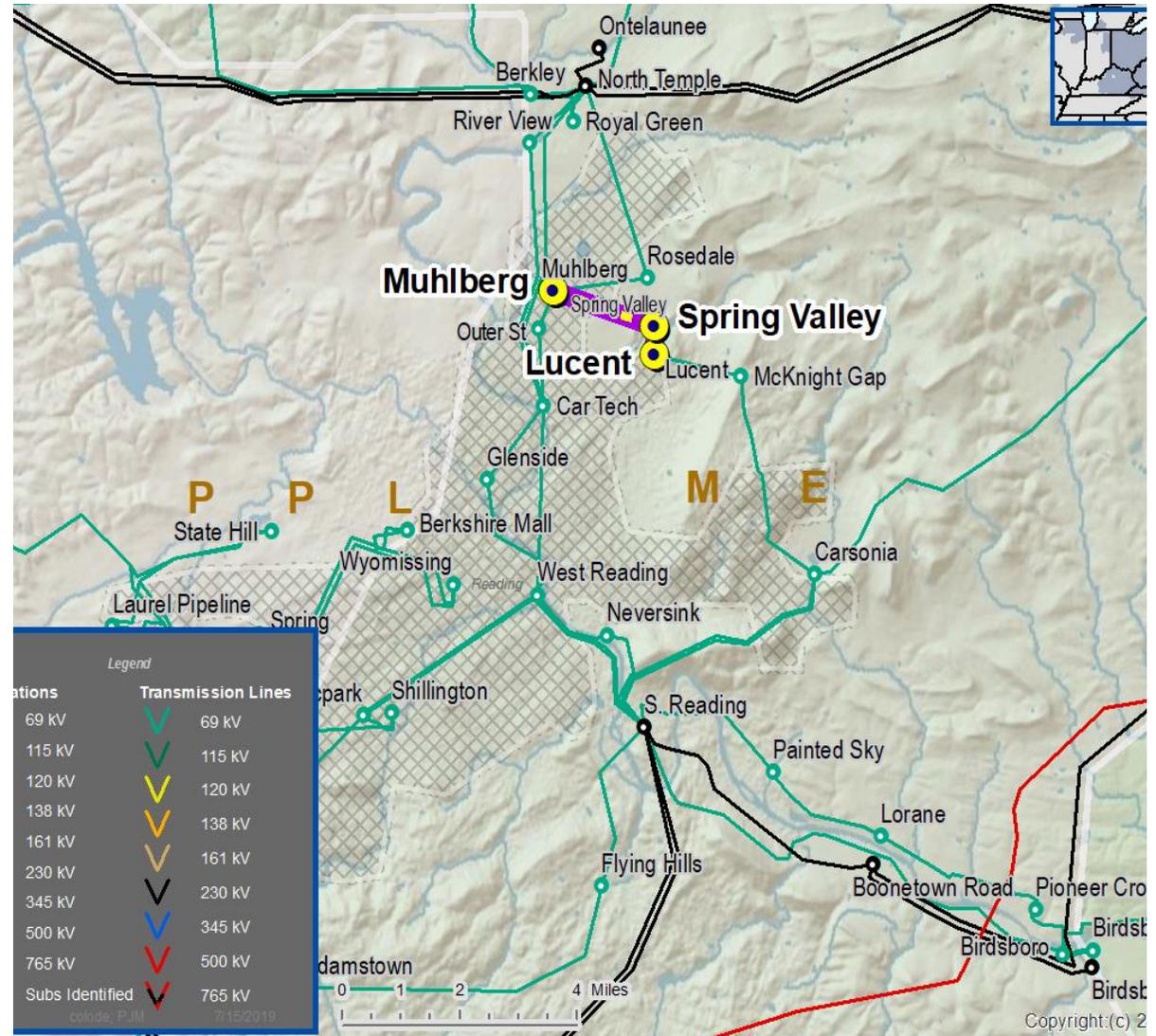
- Existing line rating: 71/91 MVA (SN/SE)
- Existing conductor rating: 111/134 MVA (SN/SE)

Spring Valley – MG Tap 69 kV line (substation conductor, disconnect switches)

- Existing line rating: 82/103 MVA (SN/SE)
- Existing conductor rating: 111/134 MVA (SN/SE)

MG Tap – Muhlenberg 69 kV line (substation conductor, disconnect switches)

- Existing line rating: 71/91 MVA (SN/SE)
- Existing conductor rating: 111/134 MVA (SN/SE)



**Need Number:** ME-2019-041

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Proposed Solution:**

*Lucent 69 kV Substation*

- Replace circuit breaker, disconnect switches, substation conductor, and line relaying

*Spring Valley 69 kV Substation*

- Replace disconnect switches and substation conductor
- *MG Tap*  
Replace disconnect switches

*Muhlenberg 69 kV Substation*

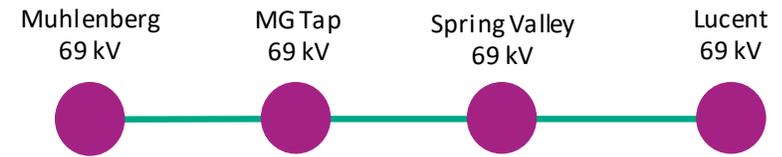
- Replace circuit breaker, disconnect switches, substation conductor, and line relaying

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

**Projected In-Service:** 11/12/2021

**Supplemental Project ID:** s2311

**Model:** 2020 RTEP model for 2025 Summer (50/50)



**Transmission Line Rating:**

Lucent – Spring Valley 69 kV line:

- Before Proposed Solution: 71/91 MVA (SN/SE)
- After Proposed Solution: 111/134 MVA (SN/SE)

Spring Valley – MG Tap 69 kV line:

- Before Proposed Solution: 82/103 MVA (SN/SE)
- After Proposed Solution: 111/134 MVA (SN/SE)

MG Tap – Muhlenberg 69 kV line:

- Before Proposed Solution: 71/91 MVA (SN/SE)
- After Proposed Solution: 111/134 MVA (SN/SE)

| Legend  |  |
|---------|--|
| 500 kV  |  |
| 345 kV  |  |
| 230 kV  |  |
| 138 kV  |  |
| 115 kV  |  |
| 69 kV   |  |
| 46 kV   |  |
| 34.5 kV |  |
| 23 kV   |  |
| New     |  |

# Questions?



# Revision History

3/20/2020 – V1 – Original version posted to pjm.com. Included S2170, S2171, S2172, S2173, S2174 and S2175

10/16/2020 – V2 - Added local plan for s2301, s2302, s2303, s2310, and s2311