

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.

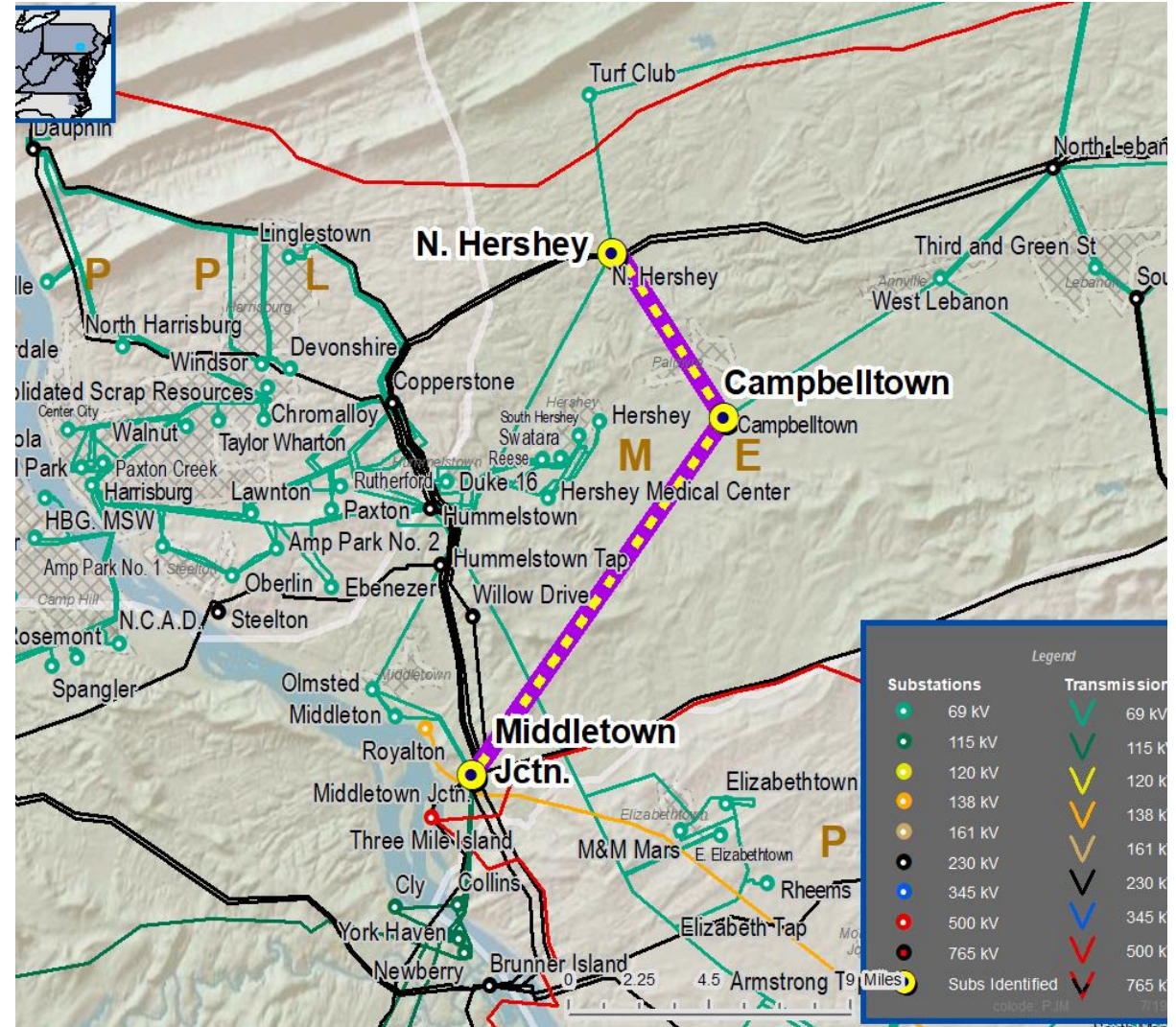
Transmission line ratings are limited by terminal equipment:

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)



Met-Ed Transmission Zone M-3 Process Campbelltown – Middletown – North Hershey 69 kV Line Rebuild

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

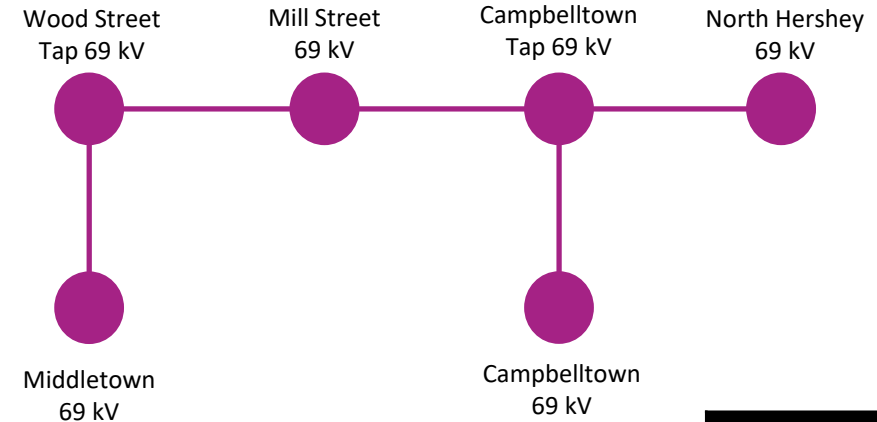
Transmission Line Ratings:

- 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)

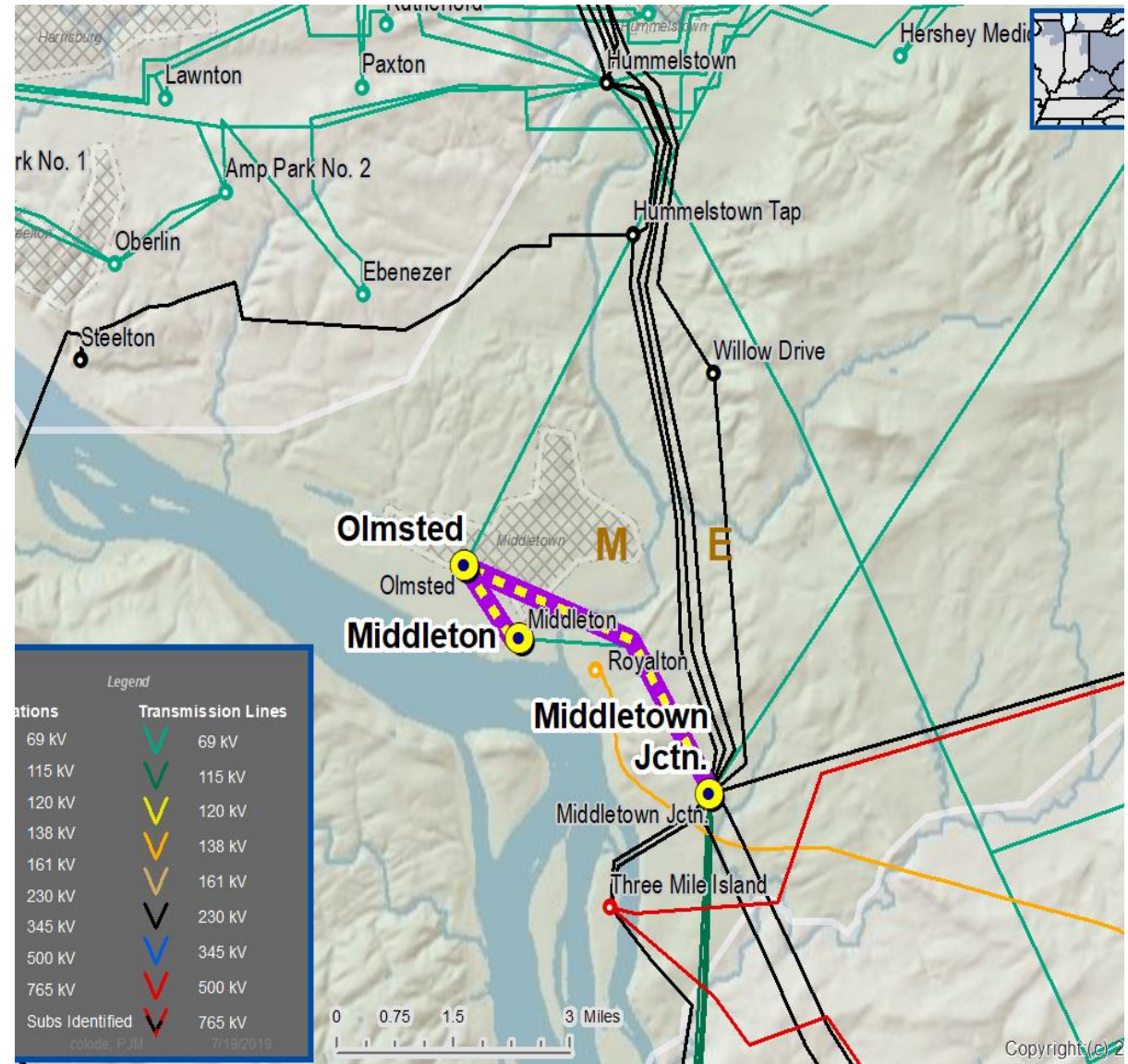
- Existing line rating: 62/72 MVA (SN/SE)
- Existing conductor rating: 62/77 MVA (SN/SE)

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

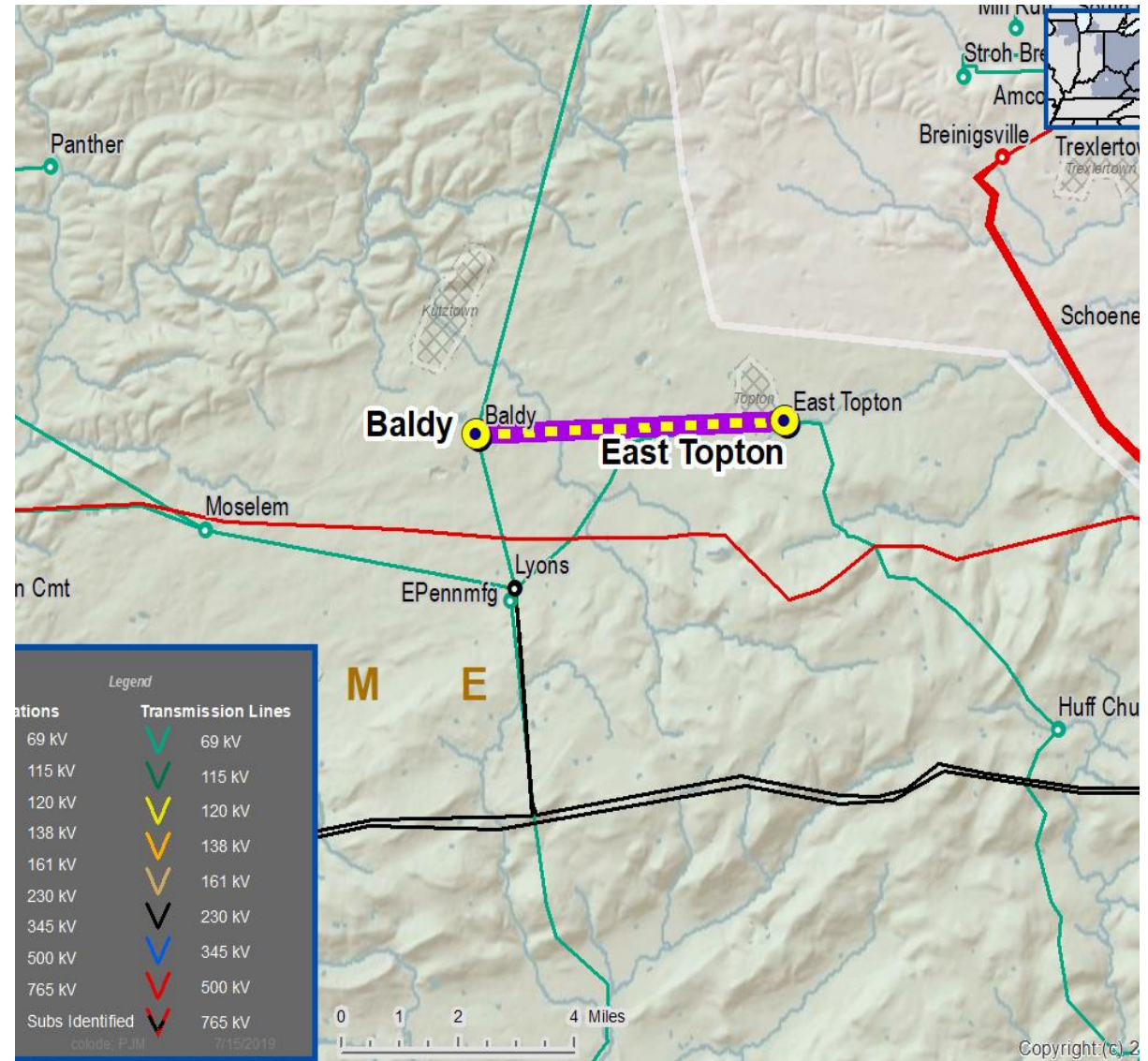
Transmission line rating is limited by terminal equipment:

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

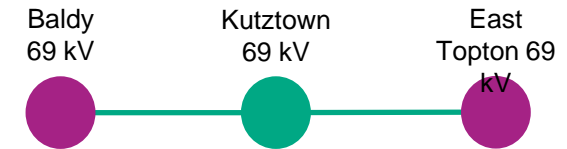
Transmission Line Ratings

- 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:

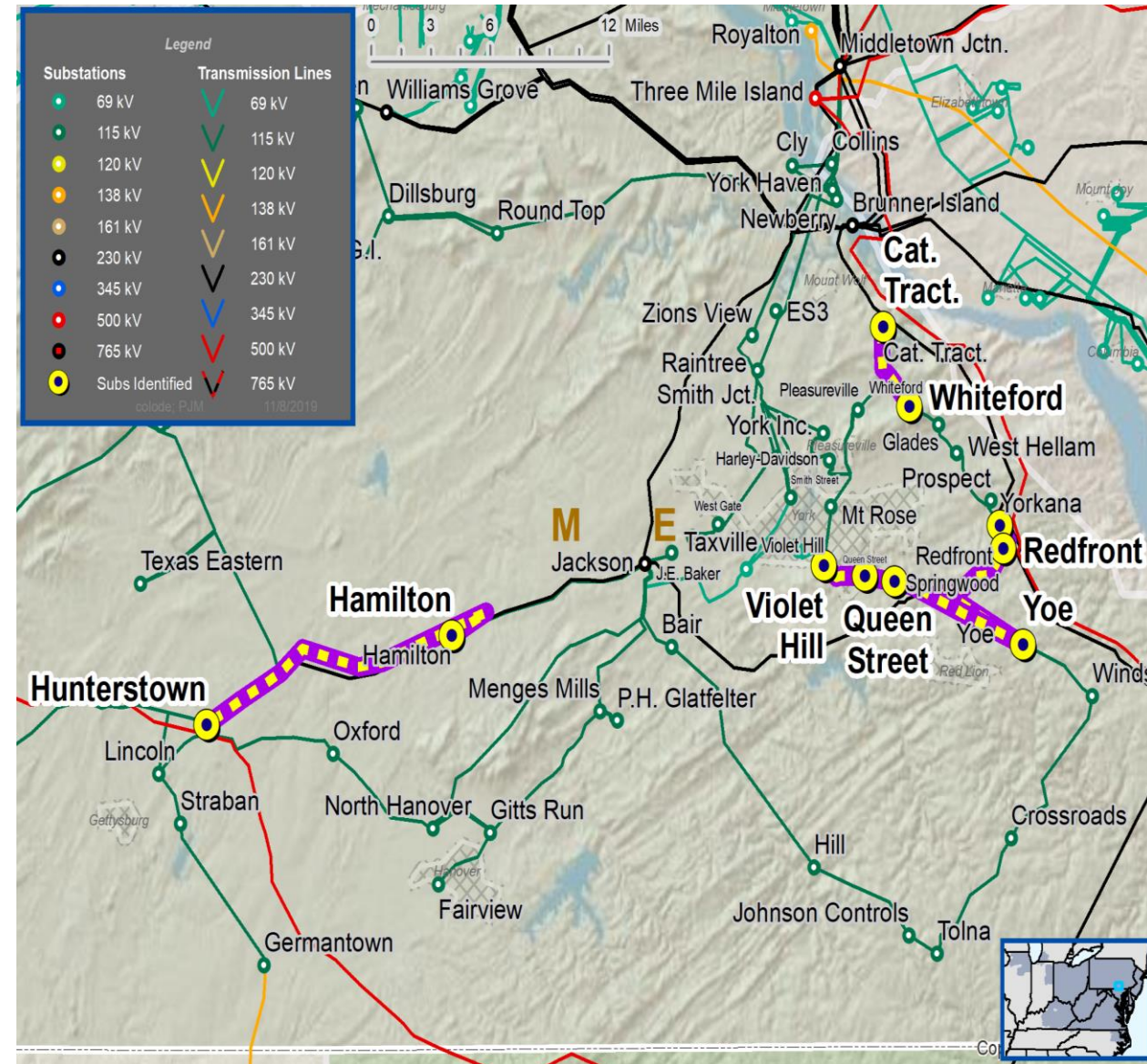
System Performance Projects Global Factors

- 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

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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 Whiteford – Glades 115 kV Line	232/277 184/223	232/282 184/223	Line Trap -
052	Violet Hill – Queen Street 115 kV Line Queen Street – Springwood 115 kV Line Springwood – Yoe 115 kV Line Yoe – Redfront 115 kV Line Redfront – Yorkana 115 kV Line	204/266 232/282 232/282 184/223 184/223	232/282 232/282 232/282 184/223 184/223	Substation Conductor - - - -

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, s2173.1, s2173.2	232/282	<ul style="list-style-type: none"> Hamilton 115 kV Substation – Replace line relaying, substation conductor, circuit breaker (s2173.1) Hunterstown 115 kV Substation – Replace line relaying (s2173.2) 	\$1.6M	6/1/2020
050	Caterpillar Tractor – Whiteford 115 kV Line Whiteford – Glades 115 kV Line	s2174, s2174.1, s2174.2	232/282 184/223	<ul style="list-style-type: none"> Caterpillar Tractor 115 kV Substation – Replace line relaying, line trap (s2174.1) Glades 115 kV Substation – Replace line relaying (s2174.2) 	\$1.0M	4/1/2021
052	Violet Hill – Queen Street 115 kV Line Queen Street – Springwood 115 kV Line Springwood – Yoe 115 kV Line Yoe – Redfront 115 kV Line Redfront – Yorkana 115 kV Line	s2175, s2175.1, s2175.2	232/282 232/282 232/282 184/223 184/223	<ul style="list-style-type: none"> Violet Hill 115 kV Substation – Replace line relaying, substation conductor (s2175.1) - - - Yorkana 115 kV Substation – Replace line relaying (s2175.2) 	\$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:

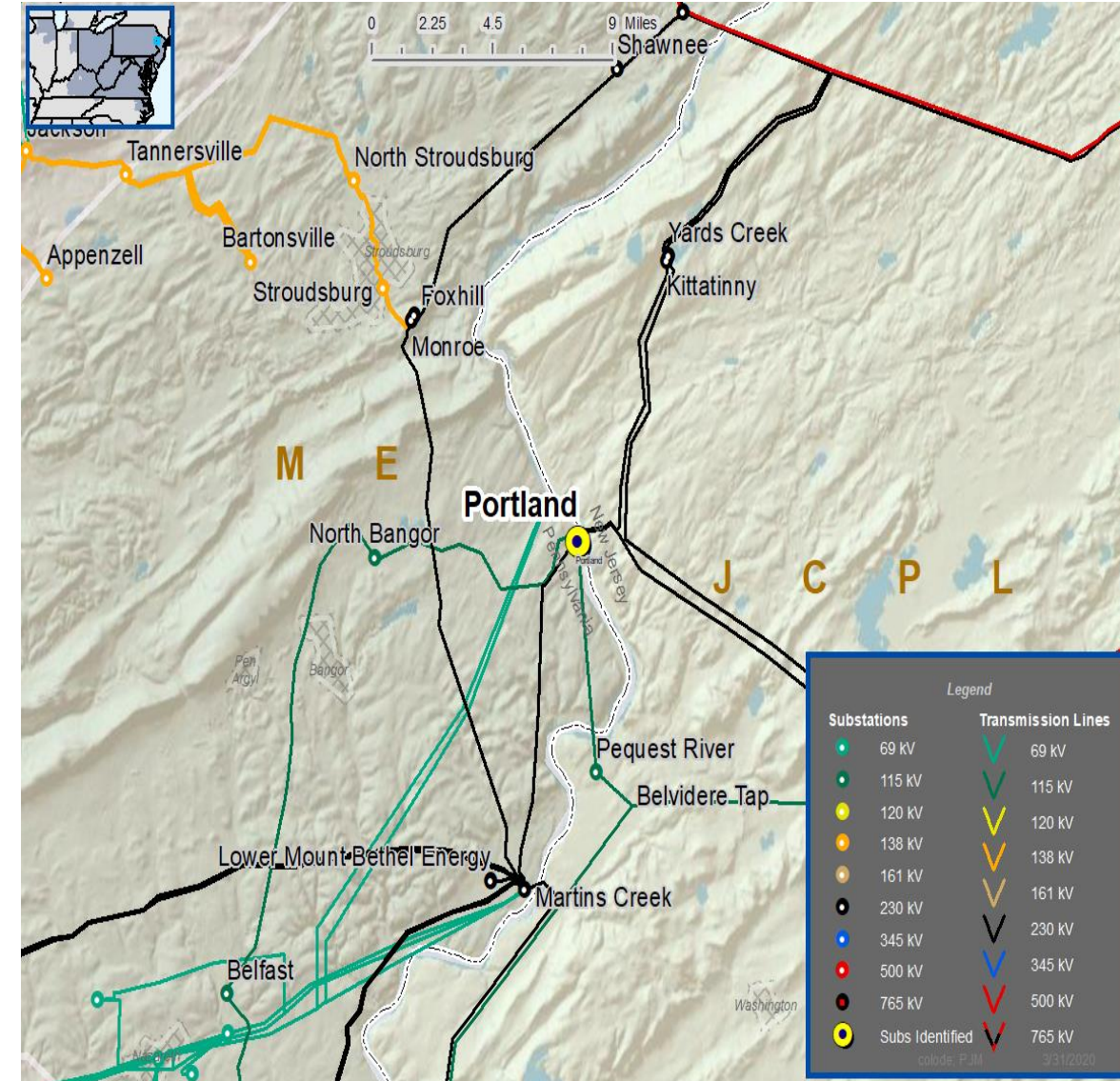
Equipment Material Condition, Performance and Risk

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

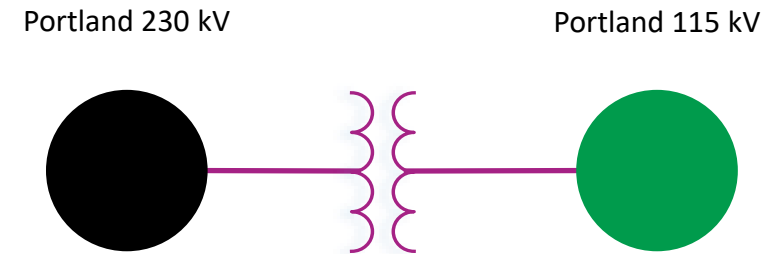
- Before Proposed Solution: 185 / 284 MVA (SN/SE)
- After Proposed Solution (anticipated): 329 / 386 MVA (SN/SE)

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

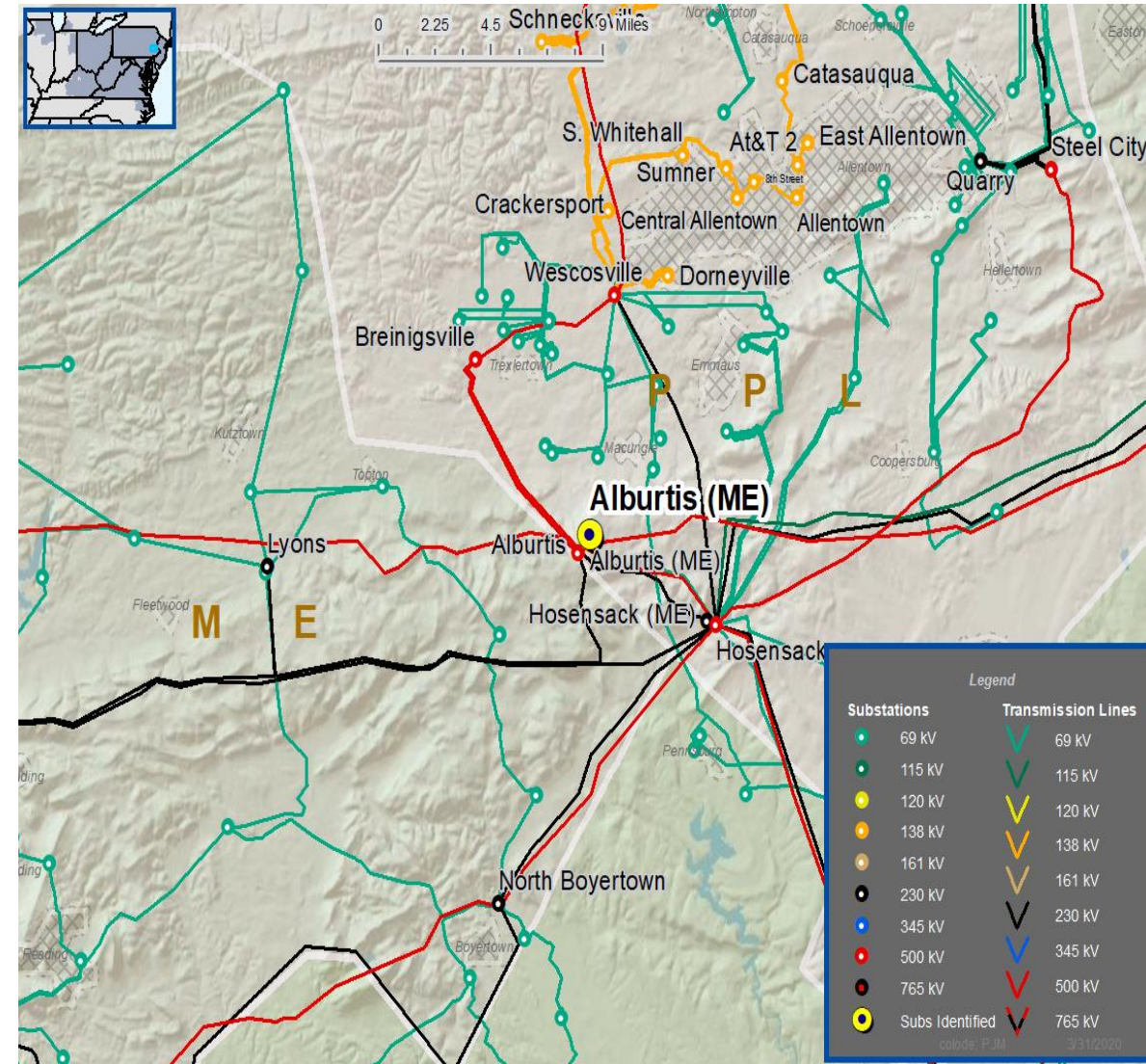
Specific Assumption Reference:

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

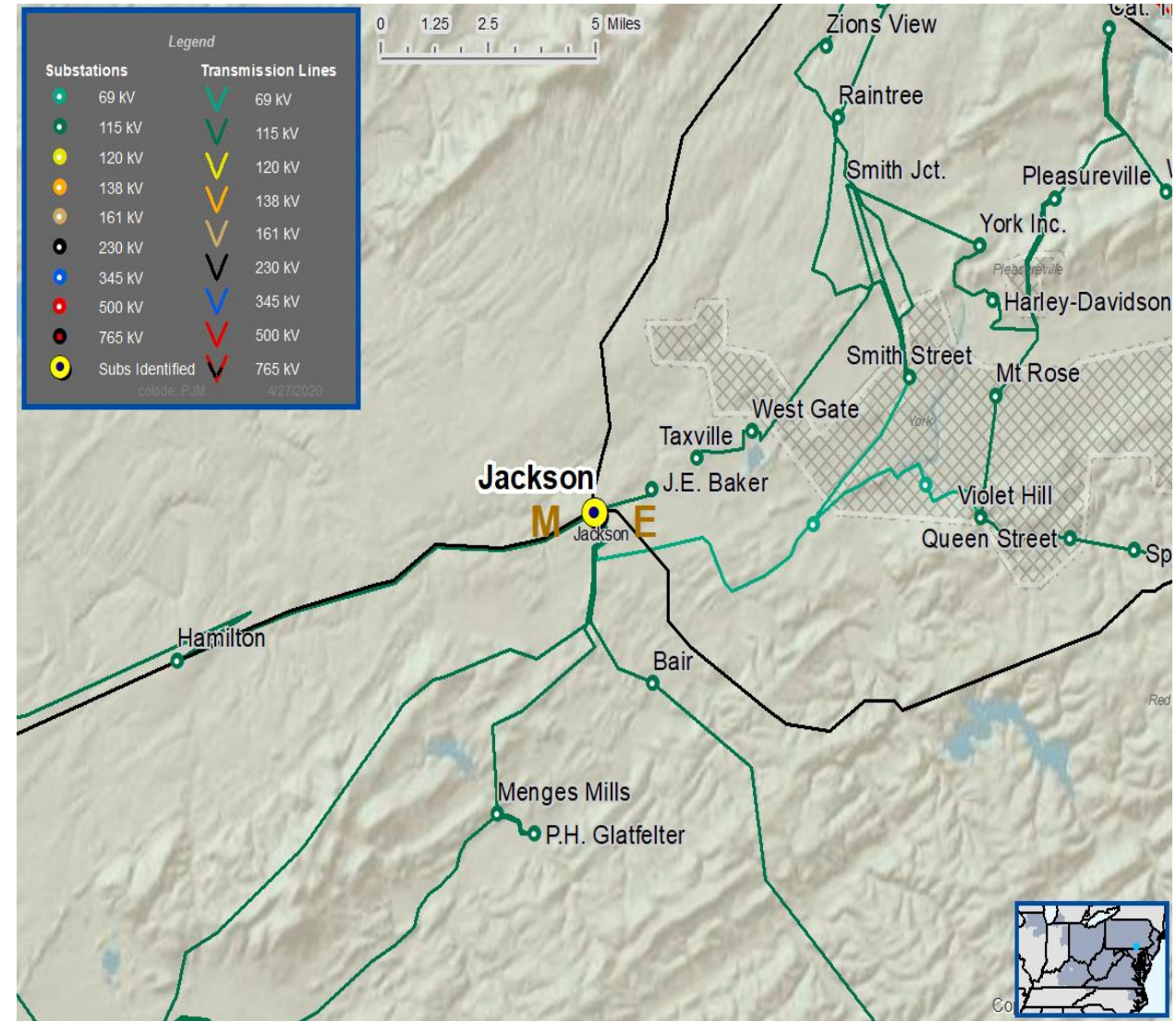
Specific Assumption Reference:

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:

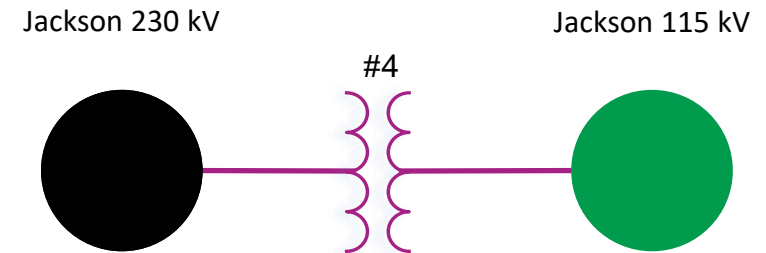
Jackson Substation

- 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.

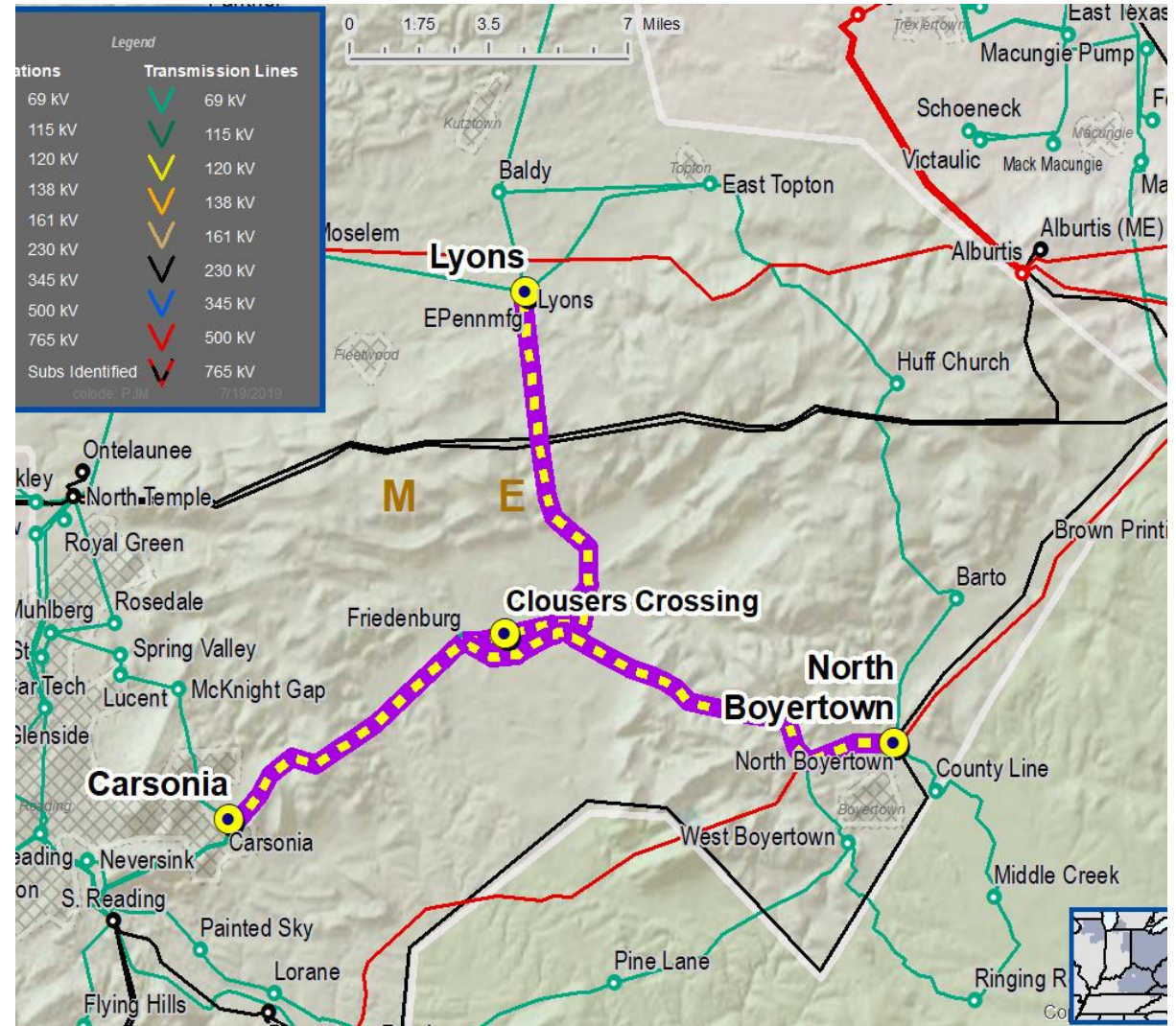
Thermal loading on the Clousers Crossing – North Boyertown 69 kV section is ~105% of the SE rating for the N-1-1 loss of the East Tipton – Huffs Church 69 kV line section (bus 204829 to bus 20867) & North Boyertown 230-69 kV transformer (ME-P1-2-230-003)

(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)

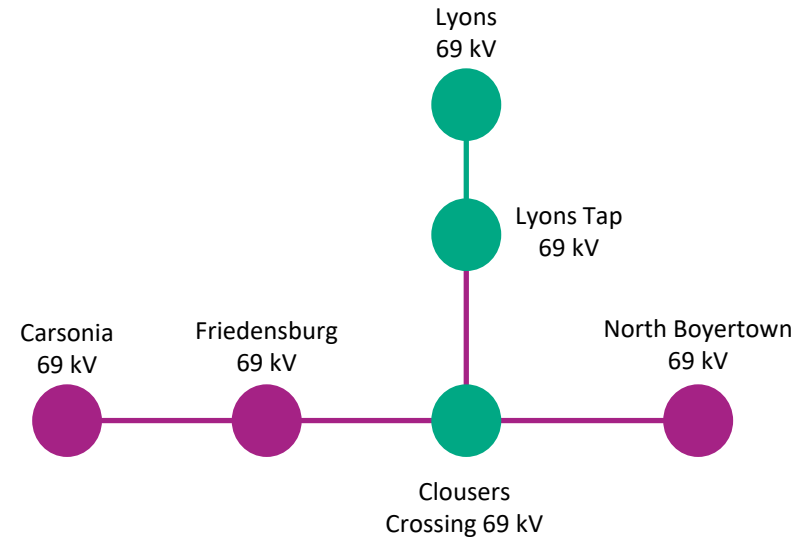
- Replace circuit breaker and disconnect switches

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)

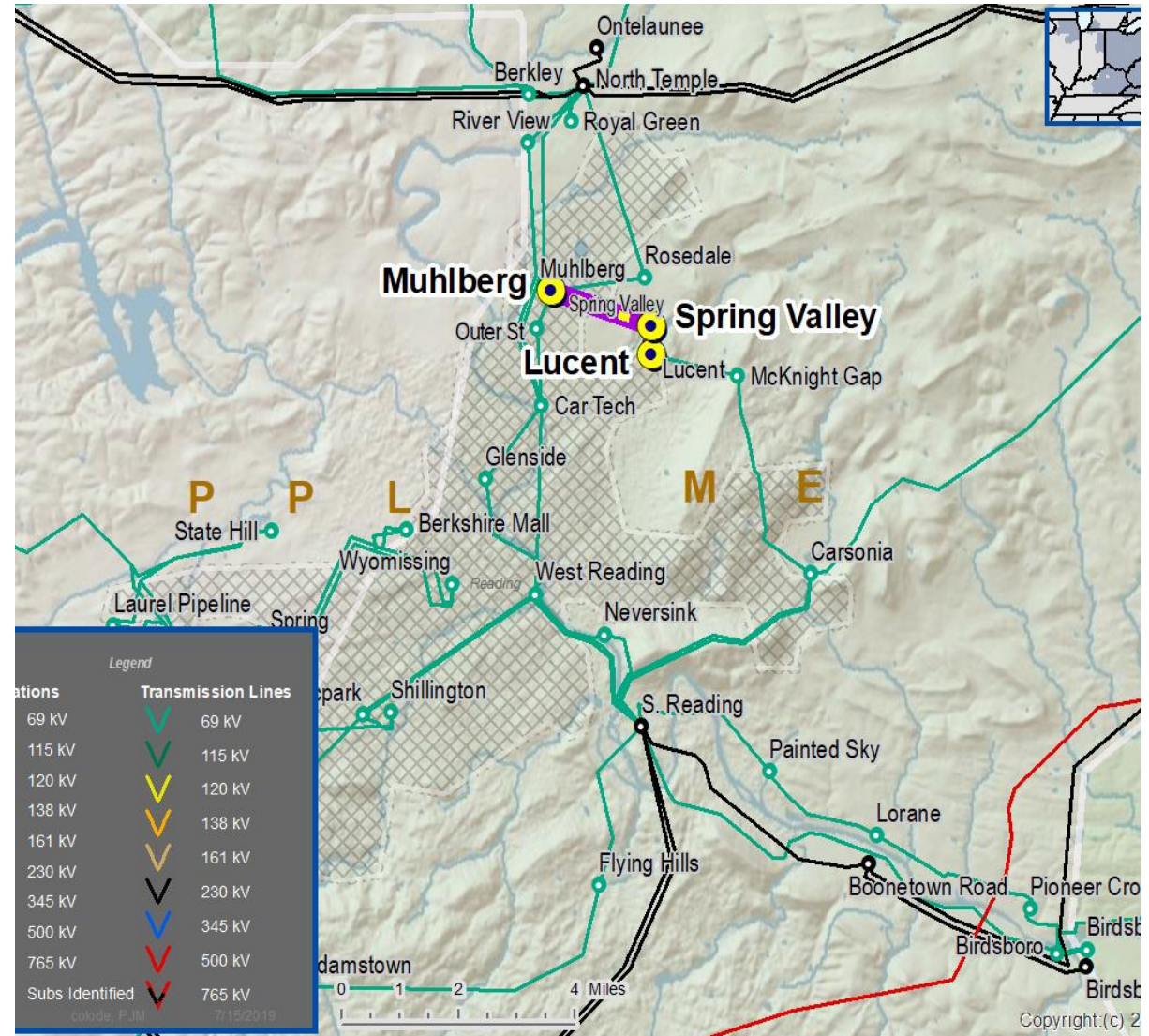
- Existing line rating: 71/91 MVA (SN/SE)
- Existing conductor rating: 111/134 MVA (SN/SE)

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

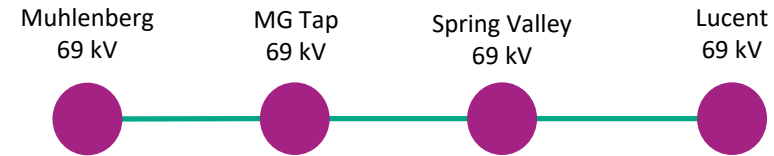
- Replace circuit breaker, disconnect switches, substation conductor, and line relaying

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