

Subregional RTEP Committee FirstEnergy Supplemental Projects

Submission of Supplemental Projects for Inclusion in the Local Plan



Need Number: APS-2020-012

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan - 7/11/2023

Previously Presented:

Need Meeting 06/07/2022

Solution Meeting 09/06/2022

Project Driver:

Customer Service

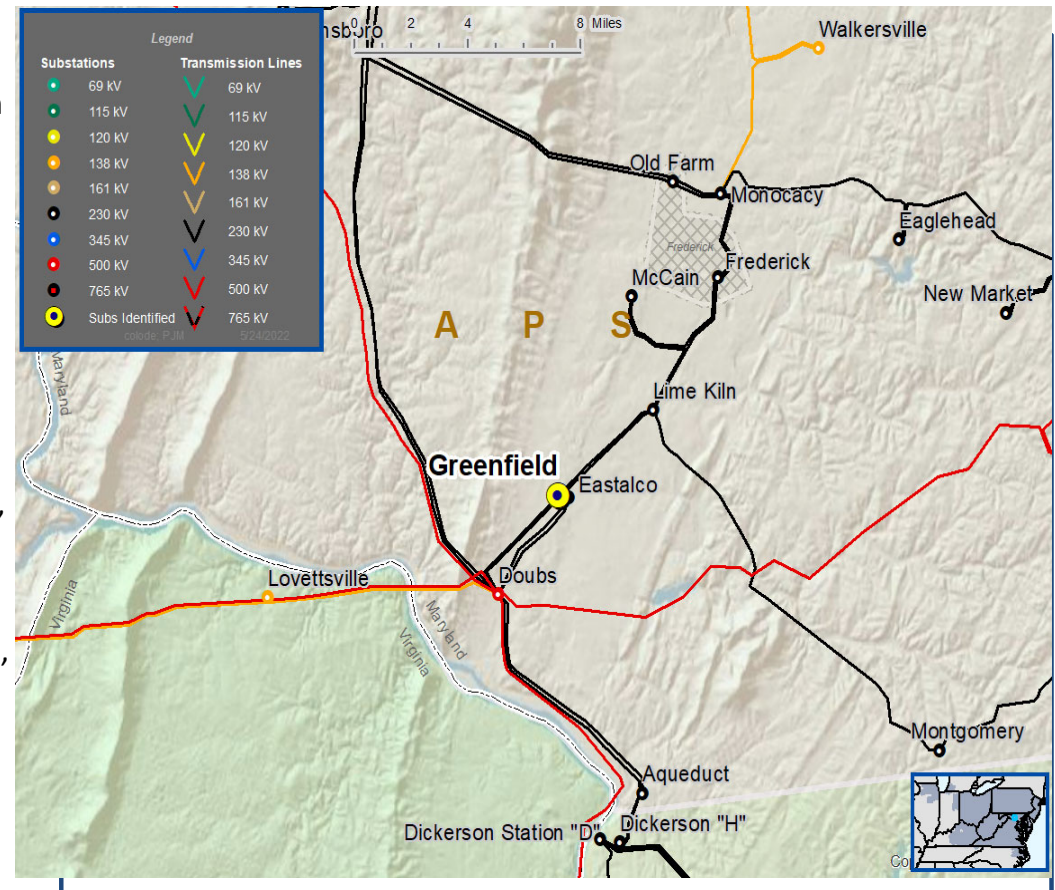
Specific Assumption Reference:

New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement:

New Customer Connection – A customer requested 230 kV service, anticipated load is 30 MW, location is near the Doubs – Monocacy 230 kV line.

Requested in-service date is November 2022.





Need Number: APS-2020-012

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan - 7/11/2023

Selected Solution:

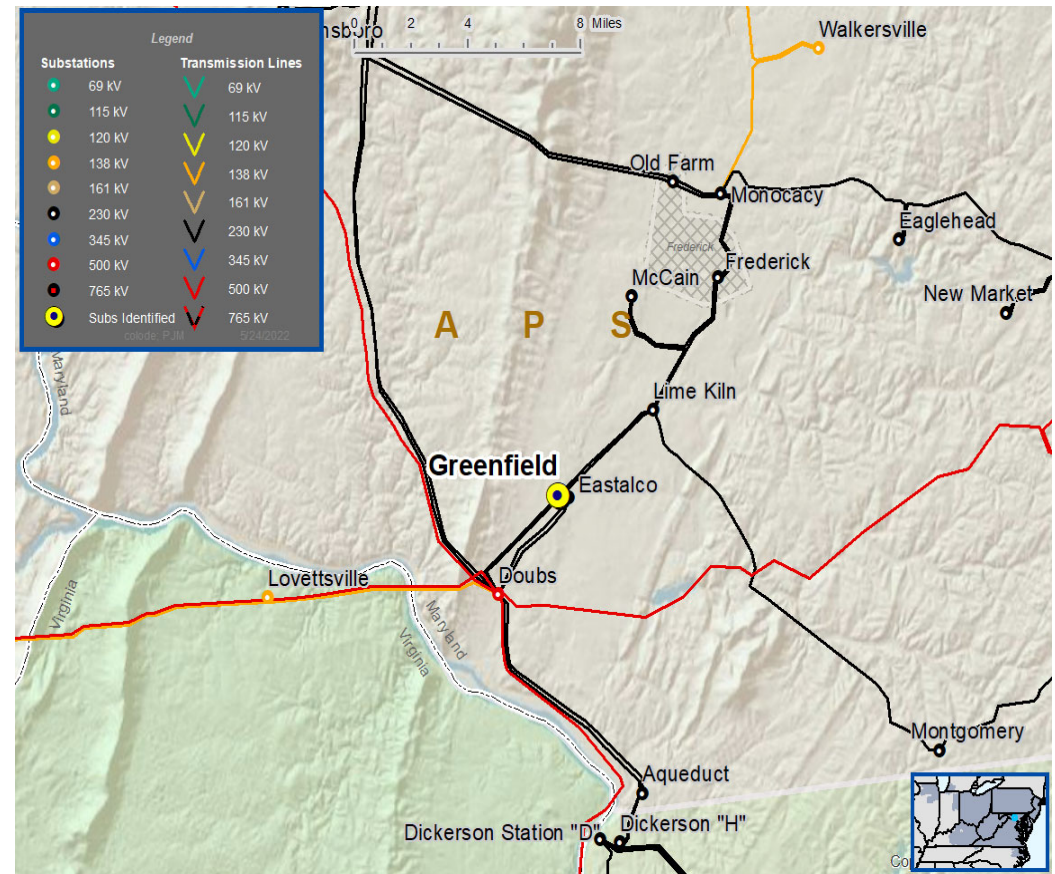
- Install 230 kV circuit breaker and associated equipment (switch, relaying, etc.) to feed a new 230-34.5 kV transformer.
- Loop the Doubs – Monocacy 230 KV line into the new station.

Estimated Project Cost: \$4.9M

Projected In-Service: 11/01/2022

Supplemental Project ID: s2880

Model: 2022 RTEP model for 2027 Summer (50/50)





APS Transmission Zone M-3 Process

Need Number: APS-2022-003

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan - 7/11/2023

Previously Presented:

Need Meeting 5/10/2022

Solution Meeting 09/06/2022

Project Driver:

Customer Service

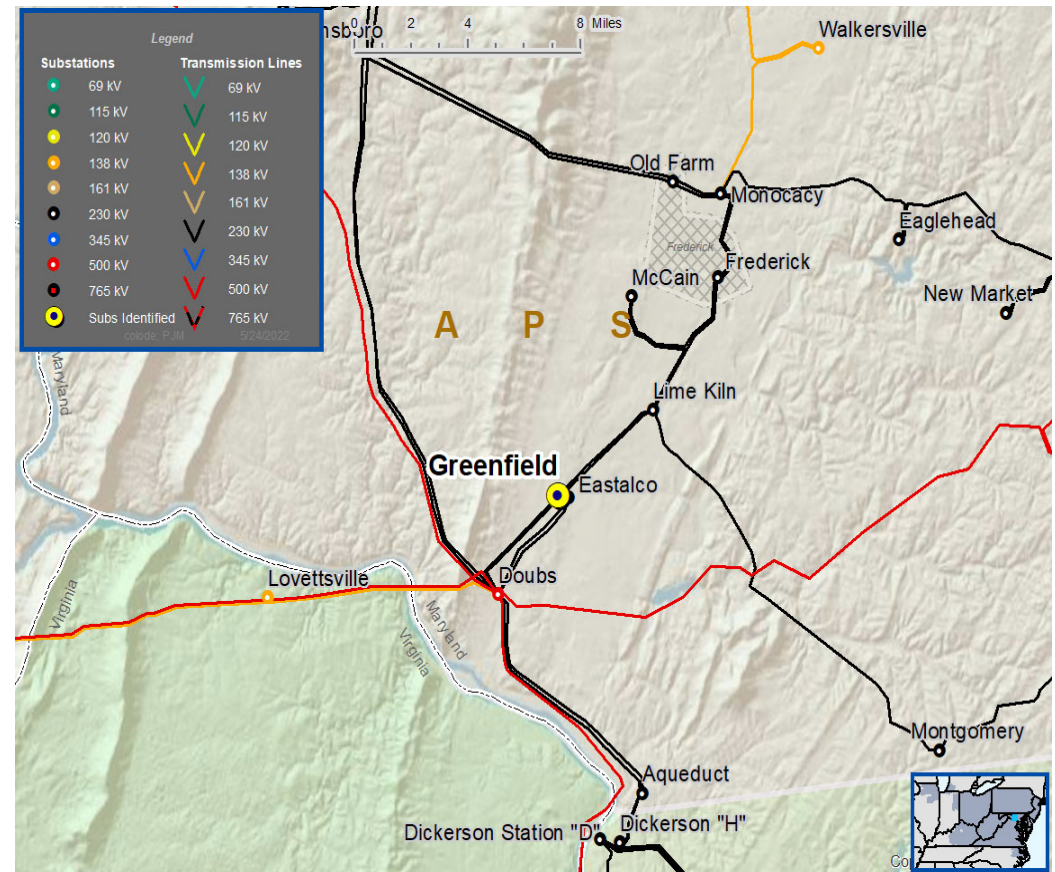
Specific Assumption Reference:

Customer request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement:

New Customer Connection – A customer requested 34.5 kV service; anticipated load is 240 MW. Location is near the Doubs – Eastalco 230 kV Lines.

Requested in-service date is April 1, 2024.





APS Transmission Zone M-3 Process

Need Number: APS-2022-003

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan - 7/11/2023

Selected Solution:

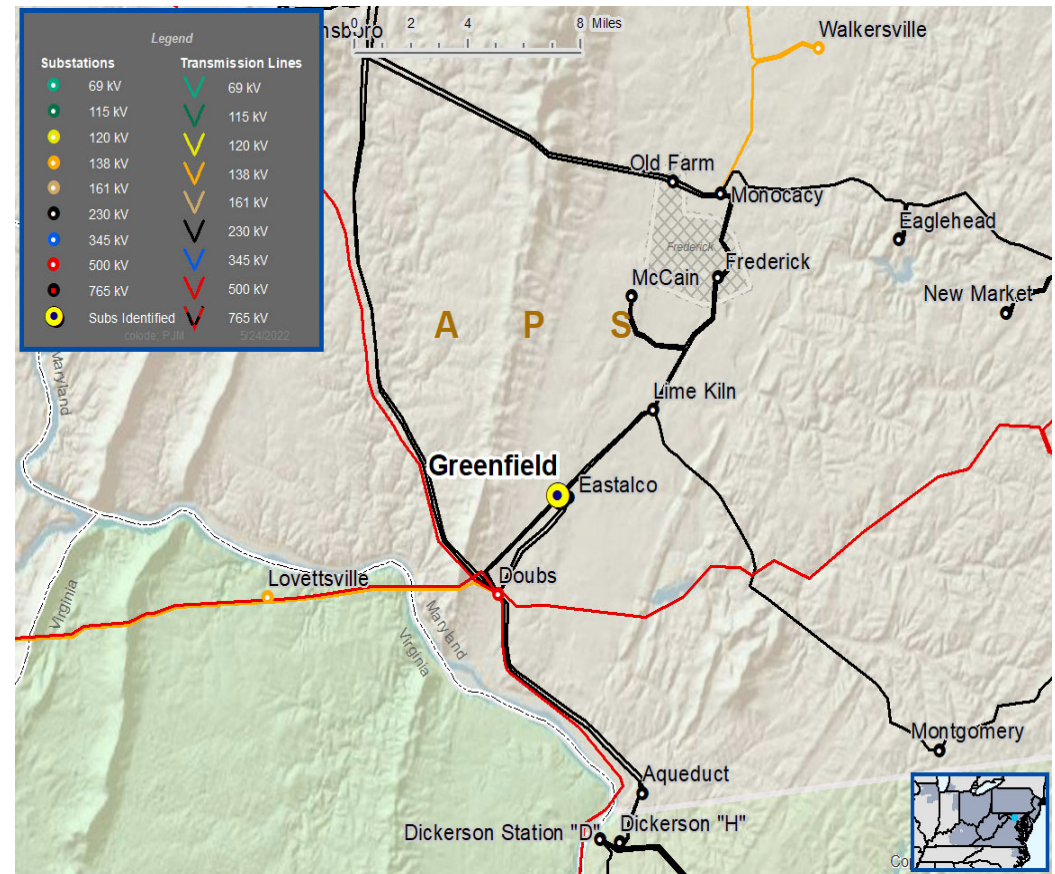
- Construct a new three breaker 230 kV ring bus named Sage Substation.
- Re-terminate the Doubs – Eastalco #205 230 kV Line at Doubs Substation.
- Terminate the Doubs – Eastalco #205 230 kV Line into the newly constructed Sage Substation.
- Re-Energize the Doubs – Eastalco #205 230 kV Line.
- Install fiber from Doubs Substation to the newly constructed Sage Substation.

Estimated Project Cost: \$15.1M

Projected In-Service: 04/01/2024

Supplemental Project ID: s2881

Model: 2022 RTEP model for 2027 Summer (50/50)





APS Transmission Zone M-3 Process

Need Number: APS-2021-011

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan - 7/11/2023

Previously Presented:

Need Meeting 06/15/2021

Solution Meeting 03/17/2023

Project Driver:

Customer Service

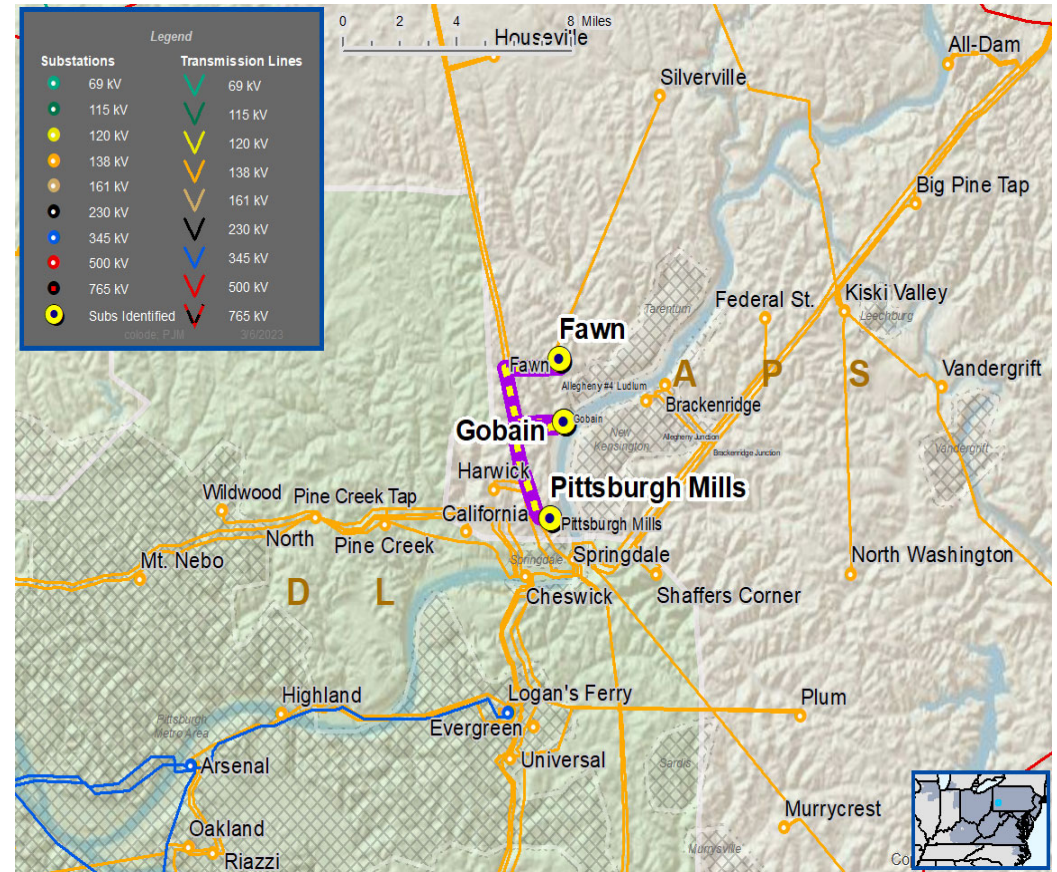
Specific Assumption Reference:

Customer request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement:

New Customer Connection – A customer requested 138 kV service to support 11 MVA of additional load at a site near Gobain 138 kV substation (New Kensington, PA) in the West Penn Power service territory.

Requested in-service date is 02/28/2023





APS Transmission Zone M-3 Process

Need Number: APS-2021-011

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan - 7/11/2023

Selected Solution:

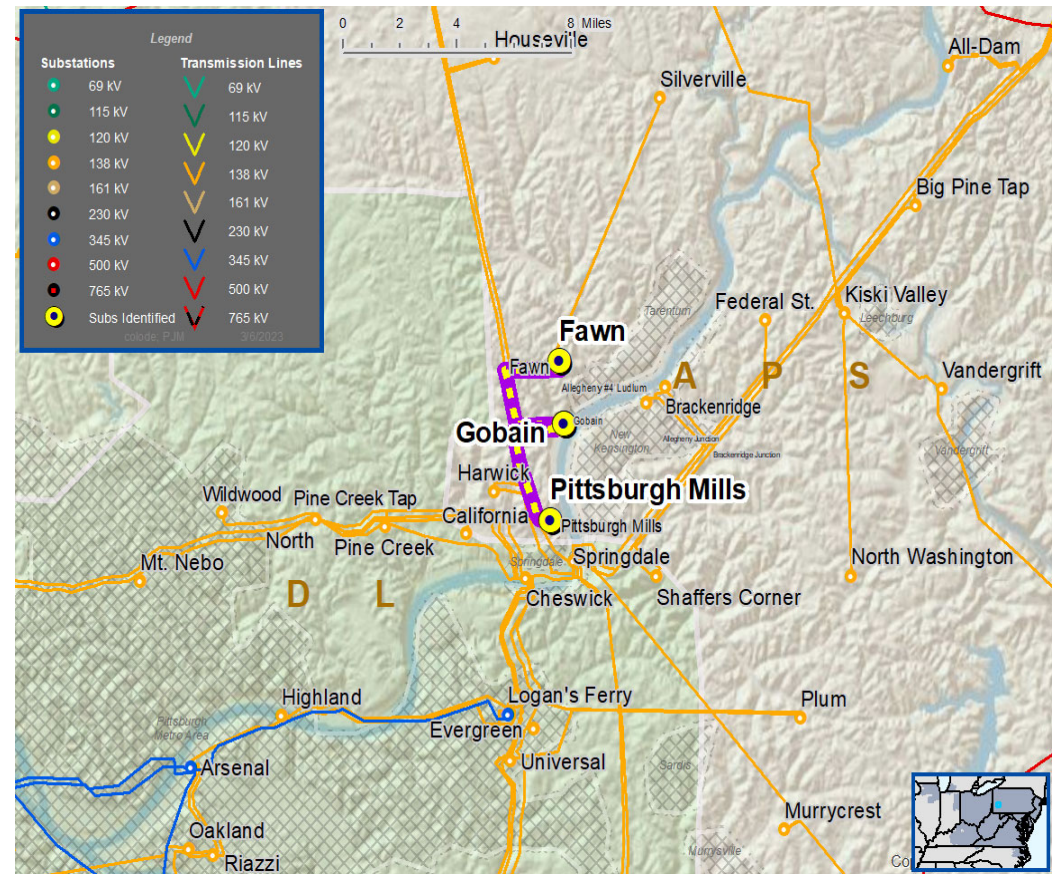
- Extend the Gobain 138 kV bus by installing (1) 138 kV breaker and associated facilities to provide service to the Customer.

Estimated Project Cost: \$4.1M

Projected In-Service: 06/16/2023

Supplemental Project ID: s2922

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





Need Number: APS-2023-002, PN-2023-001
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan - 10/18/2023
Previously Presented: Need Meeting 03/07/2023
 Solution Meeting 06/06/2023

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

Global Factors

- System reliability and performance
- Substation and 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

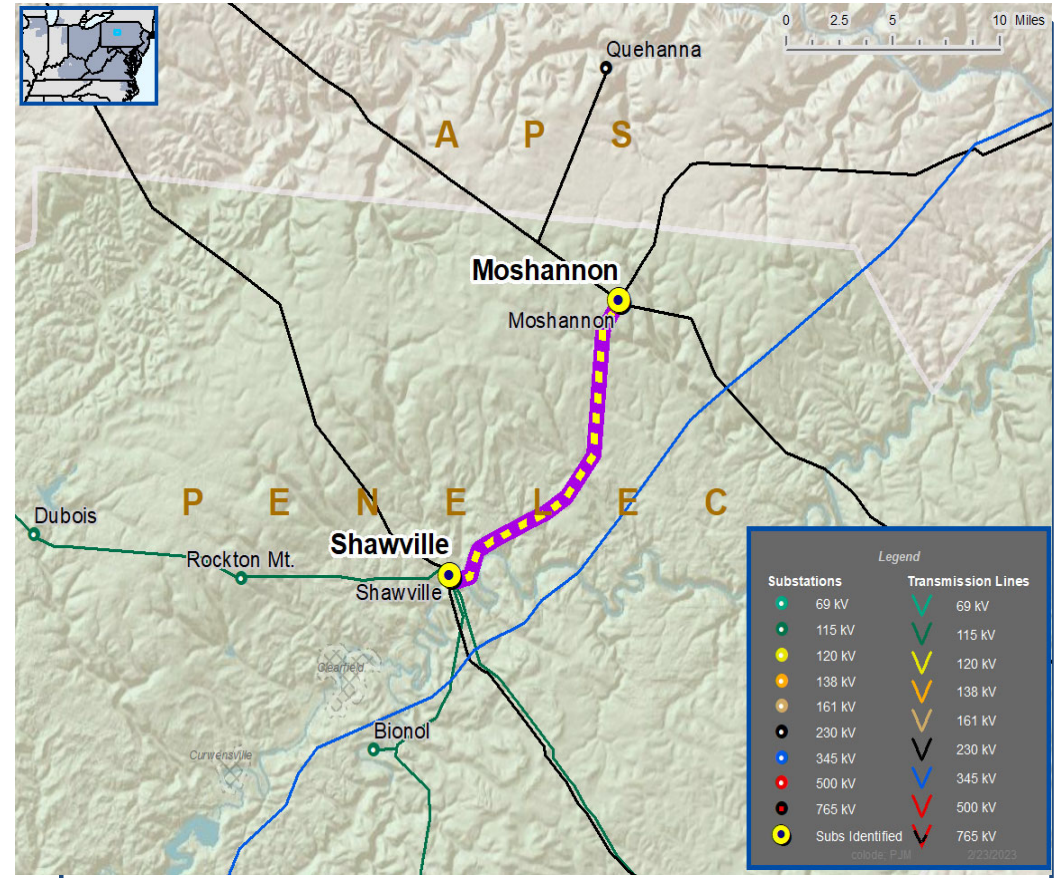
Problem Statement:

- 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 properly together during a fault
- The identified protection equipment cannot be effectively repaired for reasons such as lack of replacement parts and available expertise in the outdated technology.
- Newer equipment provides better monitoring, enhances capability of system event analysis, and performs more reliably
- Transmission line ratings are limited by terminal equipment

Shawville – Moshannon 230 kV Line

- Existing line rating: 445 / 587 MVA (SN / SE)
- Existing Transmission Conductor Rating: 546 / 666 MVA (SN / SE)

APS and Penelec Transmission Zones M-3 Process





APS and Penelec Transmission Zones M-3 Process

Need Number: APS-2023-002, PN-2023-001

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan - 10/18/2023

Selected Solution:

- Replace circuit breaker, wave trap, and relaying at Shawville
- Replace limiting substation conductor and relaying at Moshannon

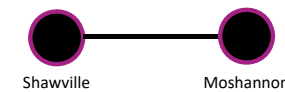
Transmission Line Ratings:

- Moshannon – Shawville 230 kV Line
 - Before Proposed Solution: 445 / 587 MVA (SN / SE)
 - After Proposed Solution: 546 / 666 MVA (SN / SE)

Estimated Project Cost: \$ 1.6 M

Projected In-Service: 12/8/2023

Supplemental Project ID: s2987



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



APS Transmission Zone M-3 Process Stoner Junction 138 kV Misoperation Relays

Need Numbers: APS-2023-011
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan - 10/18/2023
Previously Presented: Need Meeting 04/21/2023
 Solution Meeting 05/19/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

- Substation Condition Rebuild/Replacement

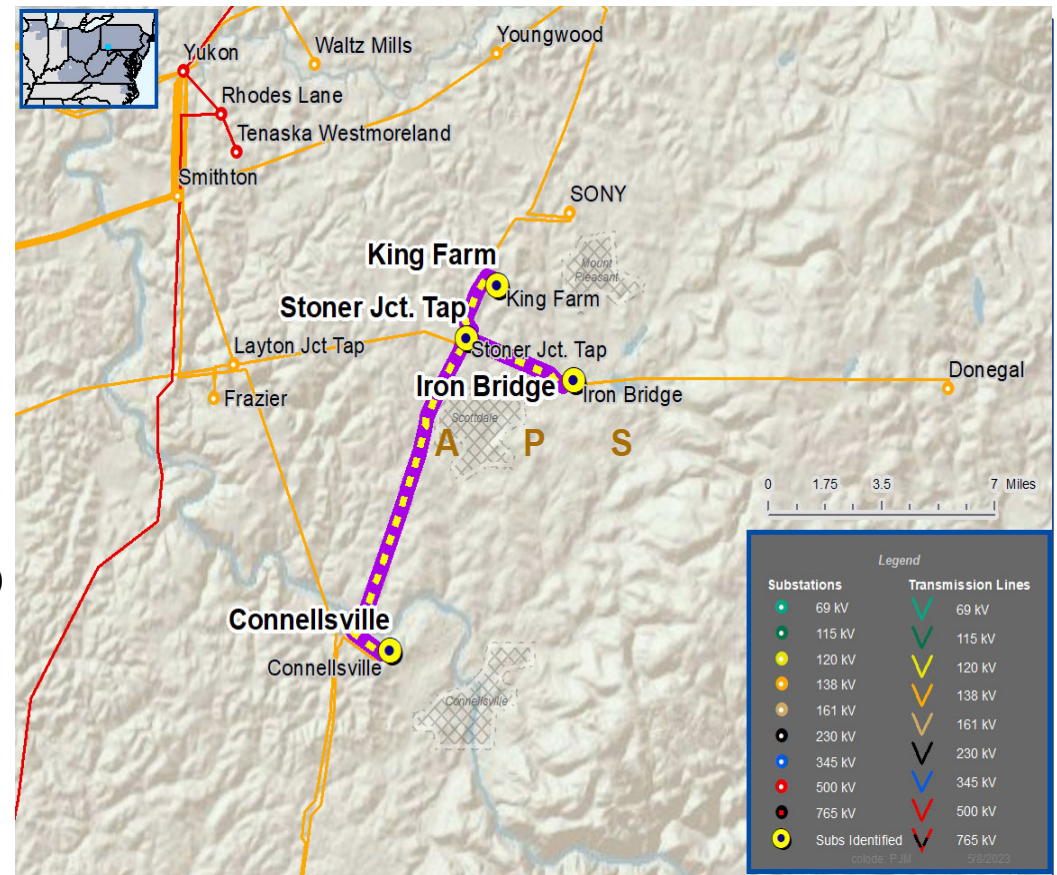
Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

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 parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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APS Transmission Zone M-3 Process Stoner Junction 138 kV Misoperation Relays

| Need # | Transmission Line / Substation Locations | Existing Line Rating (SN / SE) | Existing Conductor Rating (SN / SE) | Limiting Terminal Equipment |
|--------------|--|--------------------------------|-------------------------------------|--|
| APS-2023-011 | Connellsville – Stoner Junction 138 kV | 160 / 192 | 160 / 192 | Substation Conductor, Wave Trap, Relaying |
| | Stoner Junction – King Farm 138 kV | 293 / 343 | 308 / 376 | Substation Conductor, Circuit Breaker, Wave Trap, Relaying |
| | Stoner Junction – Iron Bridge 138 kV | 210 / 250 | 221 / 268 | Substation Conductor, Circuit Breaker, Wave Trap, Relaying |



APS Transmission Zone M-3 Process Stoner Junction 138 kV Misoperation Relays

Need Number: APS-2023-011

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan

Selected Solution:

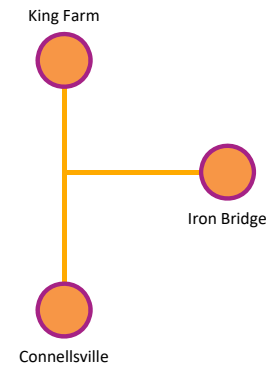
- Replace limiting substation conductor, wave trap, and relaying at Connellsville 138 kV substation
- Replace limiting substation conductor, wave trap, circuit breaker, and relaying at King Farm 138 kV substation
- Replace limiting substation conductor, wave trap, circuit breaker, and relaying at Iron Bridge 138 kV substation

| Need # | Transmission Line | Existing Line Rating (SN / SE) | Post Project Line Rating (SN / SE) |
|--------------|--|--------------------------------|------------------------------------|
| APS-2023-011 | Connellsville – Stoner Junction 138 kV | 160 / 192 | 160 / 192 |
| | Stoner Junction – King Farm 138 kV | 293 / 343 | 308 / 376 |
| | Stoner Junction – Iron Bridge 138 kV | 210 / 250 | 221 / 268 |

Estimated Project Cost: \$ 1.9 M

Projected In-Service: 12/15/2023

Supplemental Project ID: s2988



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



APS Transmission Zones M-3 Process

Need Numbers: APS-2022-006, 007, 008, 009, 010, 011, 012, and 013
Process State: Submission of Supplemental Project for Inclusion in the Local Plan - 10/18/2023
Previously Presented: Need Meeting 11/18/2022
 Solution Meeting 06/16/2023

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:
 System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

- Substation Condition Rebuild/Replacement

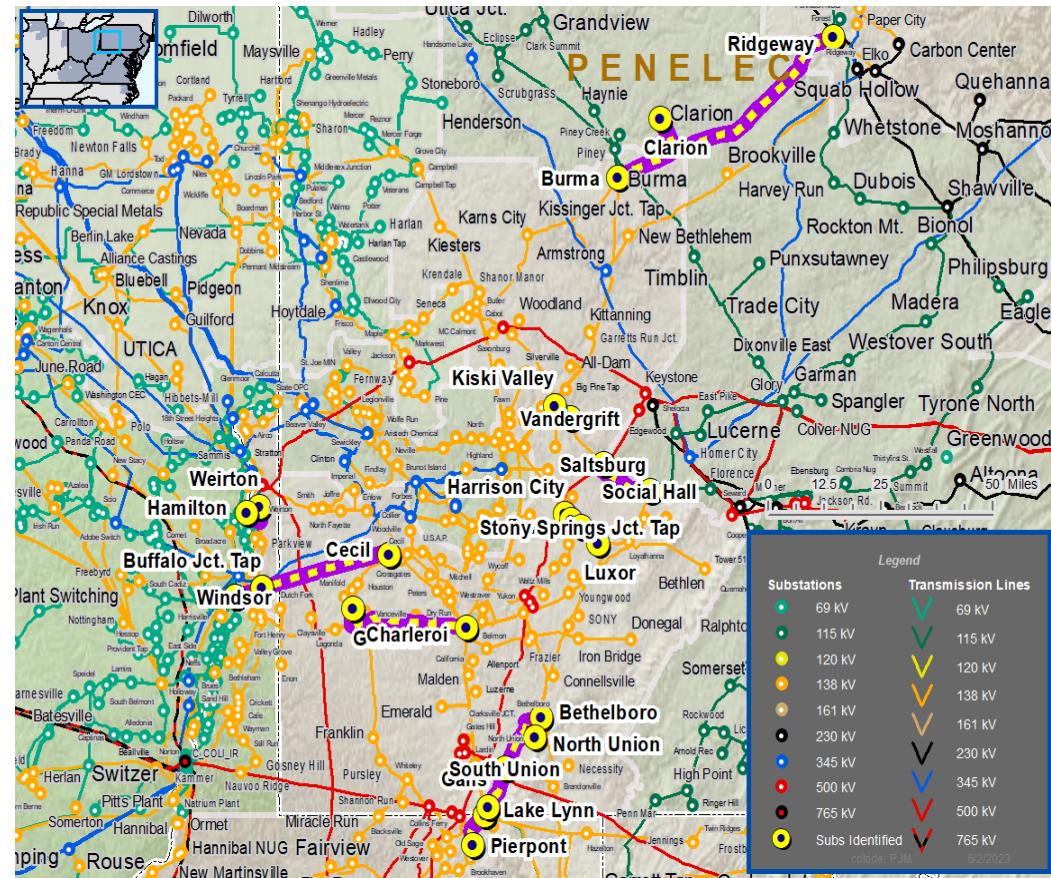
Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades

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 parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

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APS Transmission Zones M-3 Process

| Need # | Transmission Line / Substation Locations | Existing Line Rating (SN / SE) | Existing Conductor Rating (SN / SE) | Limiting Terminal Equipment |
|--------------|---|--------------------------------|-------------------------------------|--|
| APS-2022-006 | Cecil – Buffalo JCT 138 kV | 224/229 | 297/365 | SS Conductor, Line Trap, Relaying |
| | Windsor – Buffalo JCT 138 kV | 225/256 | 297/365 | SS Conductor, Line Trap |
| APS-2022-007 | Kiski Valley – Vandergrift 138 kV Line | 225/229 | 297/365 | SS Conductor, Line Trap, and Relaying |
| APS-2022-008 | Charleroi – Gordon 138 kV Line | 206/229 | 308/376 | SS Conductor, Wave Trap, Relaying, and CT |
| APS-2022-009 | Lake Lynn – Pierpoint 138 kV Line | 292/314 | 308/376 | Wave Trap, SS conductor, and Circuit Breaker |
| APS-2022-010 | Burma – Clarion 138 kV Line | 292/314 | 308/376 | Wave Trap, SS conductor |
| | Clarion – Ridgway 138 kV Line | 292/314 | 308/376 | Circuit Breaker. Wave Trap, SS Conductor |
| APS-2022-011 | Saltsburg – Social Hall 138 kV | 172/172 | 283/349 | Relay, SS Conductor, CT |
| APS-2022-012 | Harrison City – Penn 138 kV Line | 242/297 | 308/376 | Substation Conductor |
| | Stony Springs – Luxor 138 kV Line | 225/287 | 296/302 | Substation Conductor and Relaying |
| APS-2022-013 | Bethelboro North Union 2 138 kV Line | 292/314 | 297/365 | Wave Trap |
| | Gans – Lake Lynn 138 kV Line | 292/314 | 300/358 | Wave Trap SS conductor |
| | North Union 2 T – North Union 138 kV Line | 295/365 | 297/365 | Substation Conductor |
| | North Union 2 T – South Union 138 kV Line | 308/376 | 309/376 | Substation Conductor |
| | South Union – Gans 138 kV Line | 287/342 | 309/376 | Line Switcher |



APS Transmission Zone M-3 Process Misoperation Relay Project

Selected Solution:

| Need Number | Transmission Line / Substation Locations | Supplemental Project ID | New MVA Line Rating (SN / SE) | Scope of Work | Estimated Cost (\$ M) | Target ISD |
|---------------|--|-------------------------|-------------------------------|--|-----------------------|------------|
| APS-2022-006 | Cecil – Buffalo JcT 138 kV | s2989 | 297/365 | • Cecil - Replace line relaying, breaker, switches, substation conductor, line trap, current transformer | \$4.11 M | 11/17/2023 |
| | Windsor – Buffalo JcT 138 kV | | 297/365 | • Windsor - Replace line relaying, breaker, switches, substation conductor, line trap | | 10/20/2023 |
| | Weirton – Hamilton JcT 138 kV | | 308/376 | • Weirton - Replace line relaying, breaker, switches, substation conductor, line trap, current transformer | | |
| APS-2022-007 | Kiski Valley – Vandergrift 138 kV | s2990 | 297/365 | • Kiski - Replace line relaying, substation conductor, line trap • Vandergrift - Replace line relaying, breaker, switches, substation conductor, line trap, current transformers | \$2.99 M | 12/15/2023 |
| APS-2022-008 | Charleroi – Gordon 138 kV | s2991 | 308/376 | • Charleroi - Replace line relaying, line trap, current transformer • Gordon - Replace line relaying, breaker, switch, line trap, current transformer | \$1.57 M | 12/15/2023 |
| APS-2022-009 | Lake Lynn – Pierpont 138 kV | s2992 | 308/376 | • Lake Lynn - Replace line relaying, substation conductor, current transformers • Pierpont - Replace line relaying, breakers, switch, substation conductor, line trap, current transformers | \$2.33 M | 11/15/2023 |
| APS -2022-010 | Burma – Clarion 138 kV | s2993 | 308/376 | • Burma - Replace line relay, breaker, switches, substation conductor, line trap, current transformer • Clarion - Replace substation conductor | \$2.64 M | 11/17/2023 |
| | Clarion – Ridgway 138 kV | | 308/376 | • Ridgway - Replace line relaying, breaker, switches, substation conductor, line trap, current transformer | | |



APS Transmission Zone M-3 Process Misoperation Relay Project

Selected Solution:

| Need Number | Transmission Line / Substation Locations | Supplemental Project ID | New MVA Line Rating (SN / SE) | Scope of Work | Estimated Cost (\$ M) | Target ISD |
|--------------|--|-------------------------|-------------------------------|--|-----------------------|------------|
| APS-2022-011 | Saltsburg – Social Hall 138 kV | s2994 | 283/349 | <ul style="list-style-type: none"> Saltsburg - Replace line relaying, breakers, switches, line trap, current transformers Social Hall - Replace line relaying, breaker, switches, substation conductor, line trap, current transformer | \$2.98 M | 11/4/2023 |
| APS-2022-012 | Harrison City – Penn 138 kV | s2995 | 308/376 | <ul style="list-style-type: none"> Harrison City - Replace line relaying, substation conductor, current transformer | \$4.90 M | 12/29/2023 |
| | North Greensburg – Hempfield 138 kV | | 308/376 | <ul style="list-style-type: none"> Hempfield - Replace line relaying, breaker, switch, substation conductor, current transformer | | |
| | Stony Springs JcT – Luxor 138 kV | | 296/302 | <ul style="list-style-type: none"> Luxor - Replace line relaying, breaker, switch, substation conductor, current transformer | | |
| APS-2022-013 | Bethelboro – North Union 2 T 138 kV | s2996 | 308/376 | <ul style="list-style-type: none"> Bethelboro - Replace line relaying, breaker, switch, substation conductor, line trap, current transformer | \$3.32 M | 12/15/2023 |
| | Gans – Lake Lynn 138 kV | | 308/376 | <ul style="list-style-type: none"> Lake Lynn - Replace line relaying, breaker, switch, substation conductor, line trap, current transformer | | |



APS Transmission Zone M-3 Process

Need Number: APS-2023-001
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/18/2023
Previously Presented: Need Meeting 2/17/2023
 Solution Meeting 6/16/2023

Project Driver:
Operational Flexibility and Efficiency

Specific Assumption Reference:

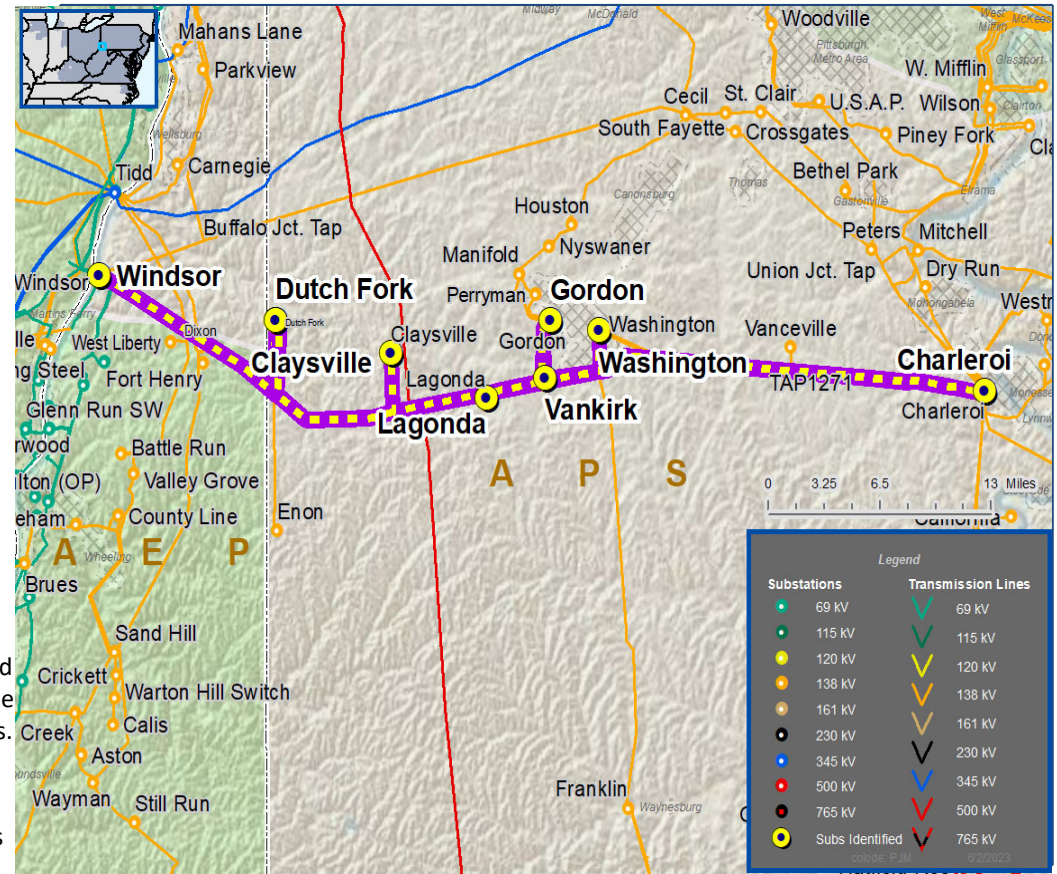
- Global
- System reliability and performance
- Load at risk in planning and operational scenarios
- System losses
- Add/Expand Bus Configuration
- Capability to perform substation maintenance

Problem Statement:

An N-1 loss of the Dutch Fork - Windsor 138 kV Line results in Enon, Dutch Fork, and Claysville substations being fed radially out of Washington Substation. The radial line serves approximately 110 MW of load at peak conditions and over 4,539 customers.

A subsequent N-1 loss of the Whitely - Pursley 138 kV Line adds Washington, Vanceville, Franklin, and Pursley substations to the radial line now served out of Charleroi Substation. This adds an additional 67 MW of load and 13,379 customers served from the radial line.

This radial line has approximately 177 MW and 17,918 customers. In this configuration Enon Substation has 73 miles of line exposure.



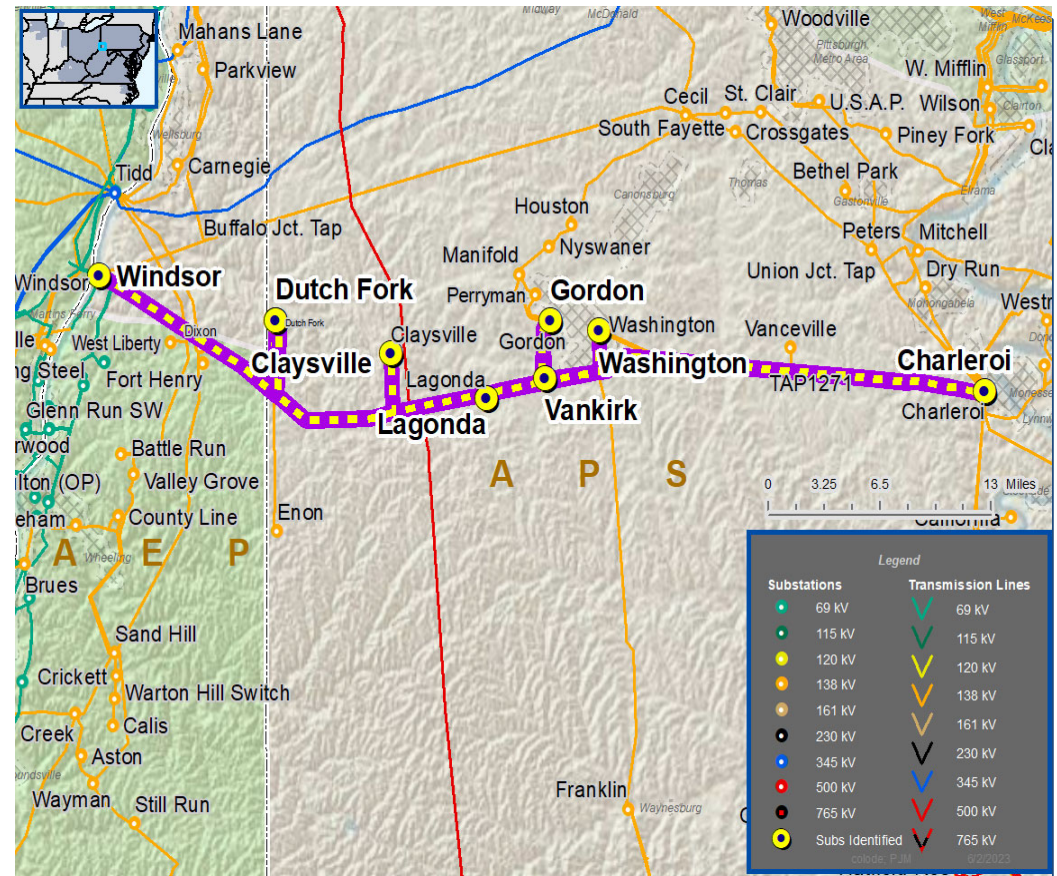


APS Transmission Zone M-3 Process

Need Number: APS-2023-001
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/18/2023

Selected Solution:

- Create the Vankirk Substation:
 - Construct a new 10 breaker 138 kV breaker-and-a-half substation
 - Loop in the Dutch Fork – Washington 138 kV Line
 - Loop in the Gordon – Lagonda 138 kV Line
 - Loop in the Gordon – Charleroi 138 kV Line
- At Washington:
 - Replace limiting substation conductor and wave trap
- At Dutch Fork:
 - Replace limiting substation conductor
- At Gordon:
 - Replace limiting substation conductor, relaying, and wave trap
- At Claysville:
 - Replace limiting substation conductor
- At Charleroi:
 - Replace limiting substation conductor and wave trap





APS Transmission Zone M-3 Process

Transmission Line Ratings:

Vankirk – Gordon East 138 kV (New line)

- Before Proposed Solution: N/A
- After Proposed Solution: 308/376 MVA (SN/SE)

Vankirk – Gordon West 138 kV (New line)

- Before Proposed Solution: N/A
- After Proposed Solution: 308/376 MVA (SN/SE)

Lagonda – Vankirk 138 kV (New line)

- Before Proposed Solution: N/A
- After Proposed Solution: 308/376 MVA (SN/SE)

Dutch Fork – Claysville 138 kV

- Before Proposed Solution: 216/270 MVA (SN/SE)
- After Proposed Solution: 297/365 MVA (SN/SE)

Claysville – Vankirk 138 kV (New line)

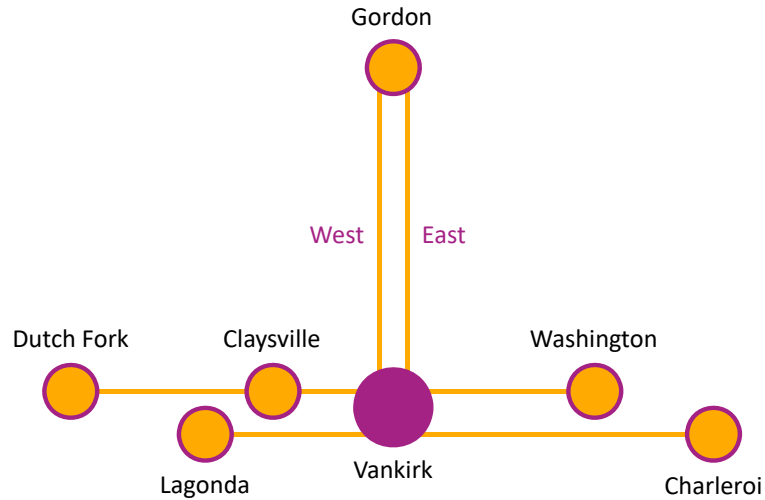
- Before Proposed Solution: N/A
- After Proposed Solution: 297/365 MVA (SN/SE)

Vankirk – Washington 138 kV (New line)

- Before Proposed Solution: N/A
- After Proposed Solution: 297/365 MVA (SN/SE)

Charleroi – Vankirk 138 kV (New line)

- Before Proposed Solution: N/A
- After Proposed Solution: 308/376 MVA (SN/SE)



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

Estimated Project Cost: \$31.7M

Projected In-Service: 12/31/2025

Supplemental Project ID: s2997



APS Transmission Zone M-3 Process Dutch Fork-Washington 138 kV New Customer

Need Number: APS-2023-007
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/18/2023
Previously Presented: Need Meeting – 4/21/2023
 Solution Meeting – 5/19/2023

Project Driver(s):
Customer Service

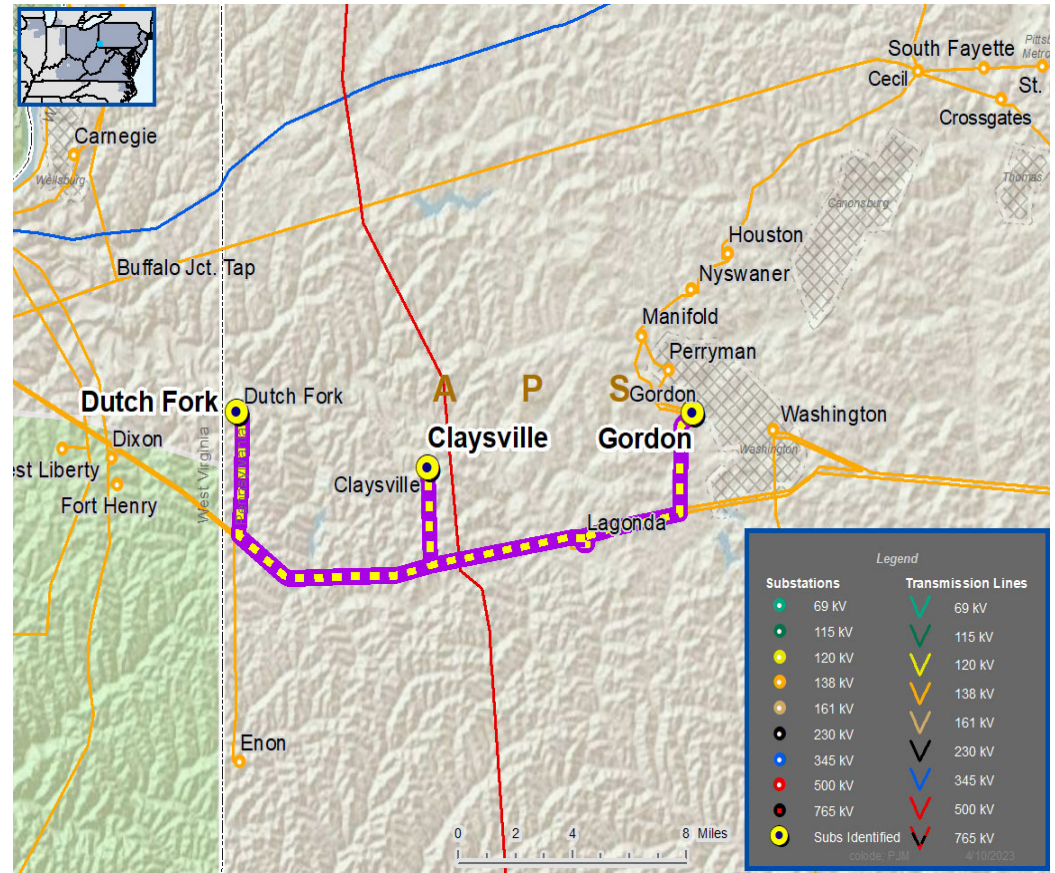
Specific Assumption Reference(s)

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

Problem Statement

New Customer Connection - has requested a new 138 kV delivery point near the Dutch Fork-Washington 138 kV line. The anticipated load of the new customer connection is 25 MVA.

Requested in-service date is 07/10/2024.





ATSI Transmission Zone M-3 Process Dutch Fork-Washington 138 kV New Customer- Solution

Need Number: APS-2023-007
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/18/2023

Selected Solution:

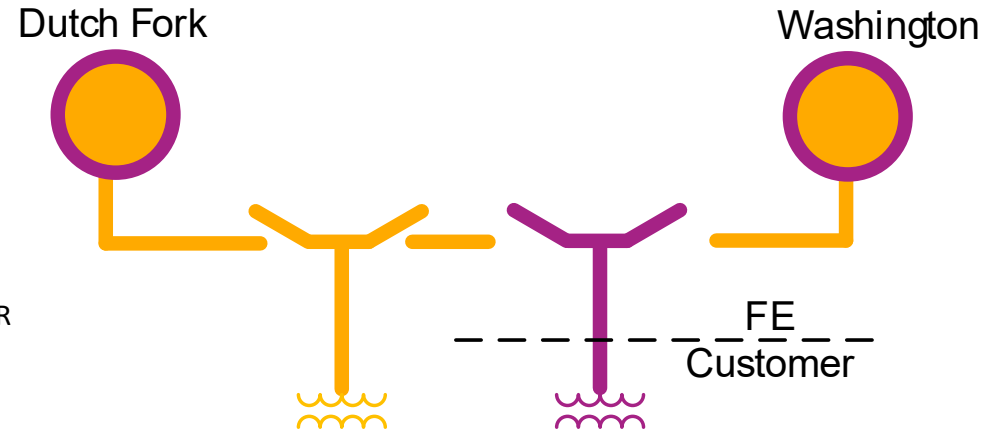
138 kV Transmission Line Tap

- Install three SCADA controlled transmission line switches
- Construct approximately 1.0 mile of transmission line using 1024.5 24/13 ACAR from tap point to customer substation
- Install one 138 kV revenue metering package at customer substation
- Adjust relay settings at remote end substations Dutch Fork and Washington

Estimated Project Cost: \$7.1m

Projected In-Service: 07/10/2024

Supplemental Project ID: s3001



| Legend | |
|---------|--|
| 500 kV | |
| 345 kV | |
| 138 kV | |
| 69 kV | |
| 34.5 kV | |
| 23 kV | |
| New | |



Revision History

7/11/2023 – V1 – Added original slides

10/18/2023 – V2 – Added s2987, s2988, s2989, s2990, s2991, s2992, s2993, s2994, s2995, s2996, s2997 & s3001