

Transmission Expansion Advisory Committee FirstEnergy Supplemental Projects

December 5, 2023

Needs

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

Need Number: JCPL-2023-060

Process Stage: Need Meeting 12/05/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption References:

System Performance Projects Global Factors

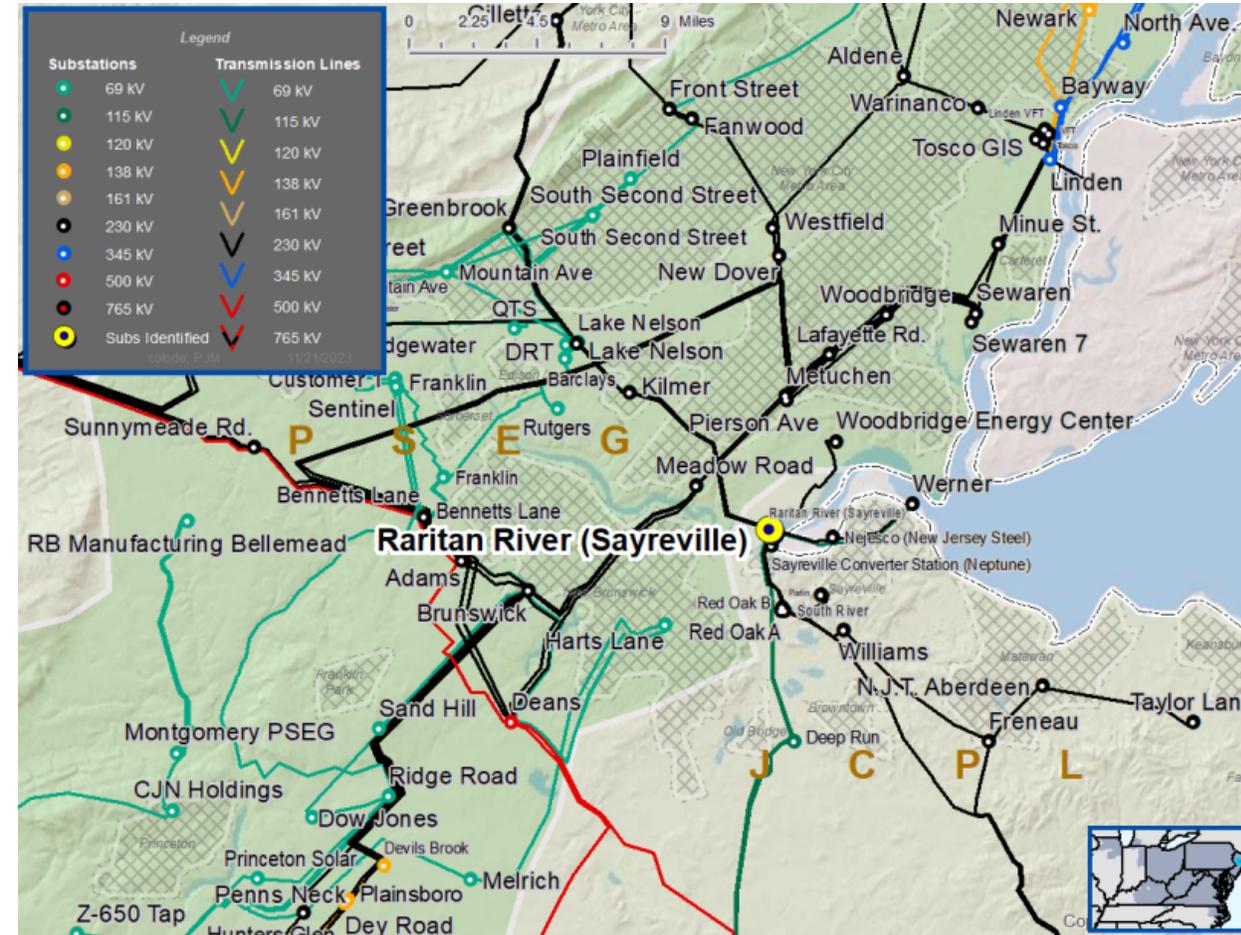
- System reliability and performance
- Reliability of Bulk Electric System (BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The 230/115 kV No. 13 Transformer at Raritan River Substation was manufactured over 60 years ago and is reaching end of life.
- The transformer has exhibited heavy oil leaks that have been difficult to repair due to the condition of the transformer.
- The transformers measured dielectric strength is below acceptable IEEE limits.
- Incidental oil leaks at end-of-life period along with current dielectric strength greatly increases risk of failure.
- Existing transformer ratings:
 - 256 / 323 MVA (SN/SSTE)



Need Number: JCPL-2023-062

Process Stage: Need Meeting 12/05/2023

Project Driver:

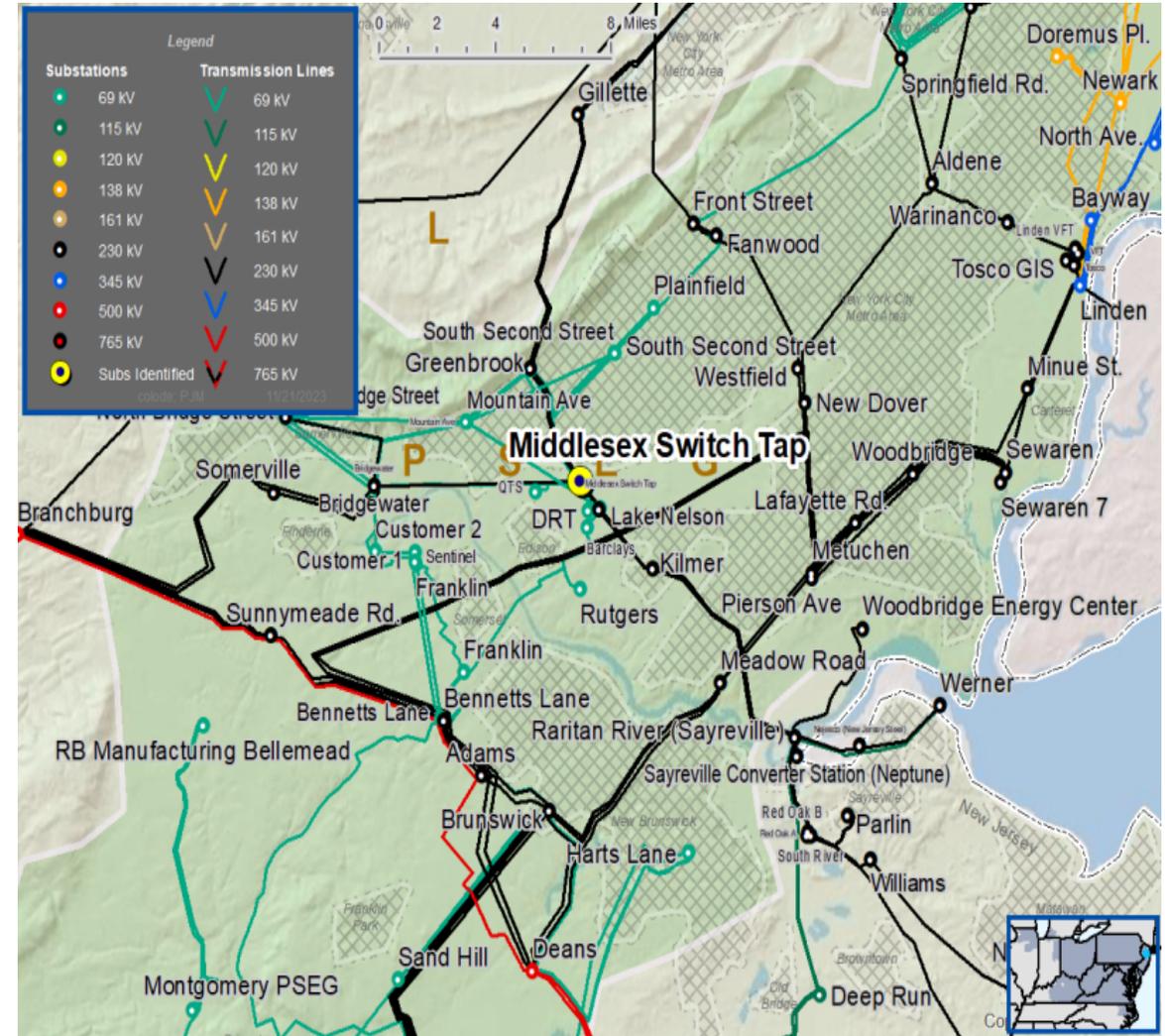
System Performance and Operational Flexibility

Specific Assumption Reference:

- System reliability and performance
- Add/Expand Bus Configuration
- Loss of substation bus adversely impacts transmission system performance
- Eliminate simultaneous outages to multiple networked elements
- Capability to perform substation maintenance

Problem Statement:

- The current configuration of the I1023 line is a three-terminal line with terminals at Lake Nelson Substation (PSEG), Bridgewater Substation (PSEG), and Gillette Substation.
- The Middlesex switching station serves as the connection point to the rest of the I1023 line for the Bridgewater section. The I1023 line is one of only a few transmission lines that interconnect the Jersey North and Jersey Central regions.
- Over the past five years, the Gillette-Lake Nelson-Bridgewater I1023 230 kV Line experienced two unscheduled outages



Need Number: JCPL-2023-064

Process Stage: Need Meeting 12/05/2023

Project Driver:

Operational Flexibility and Efficiency

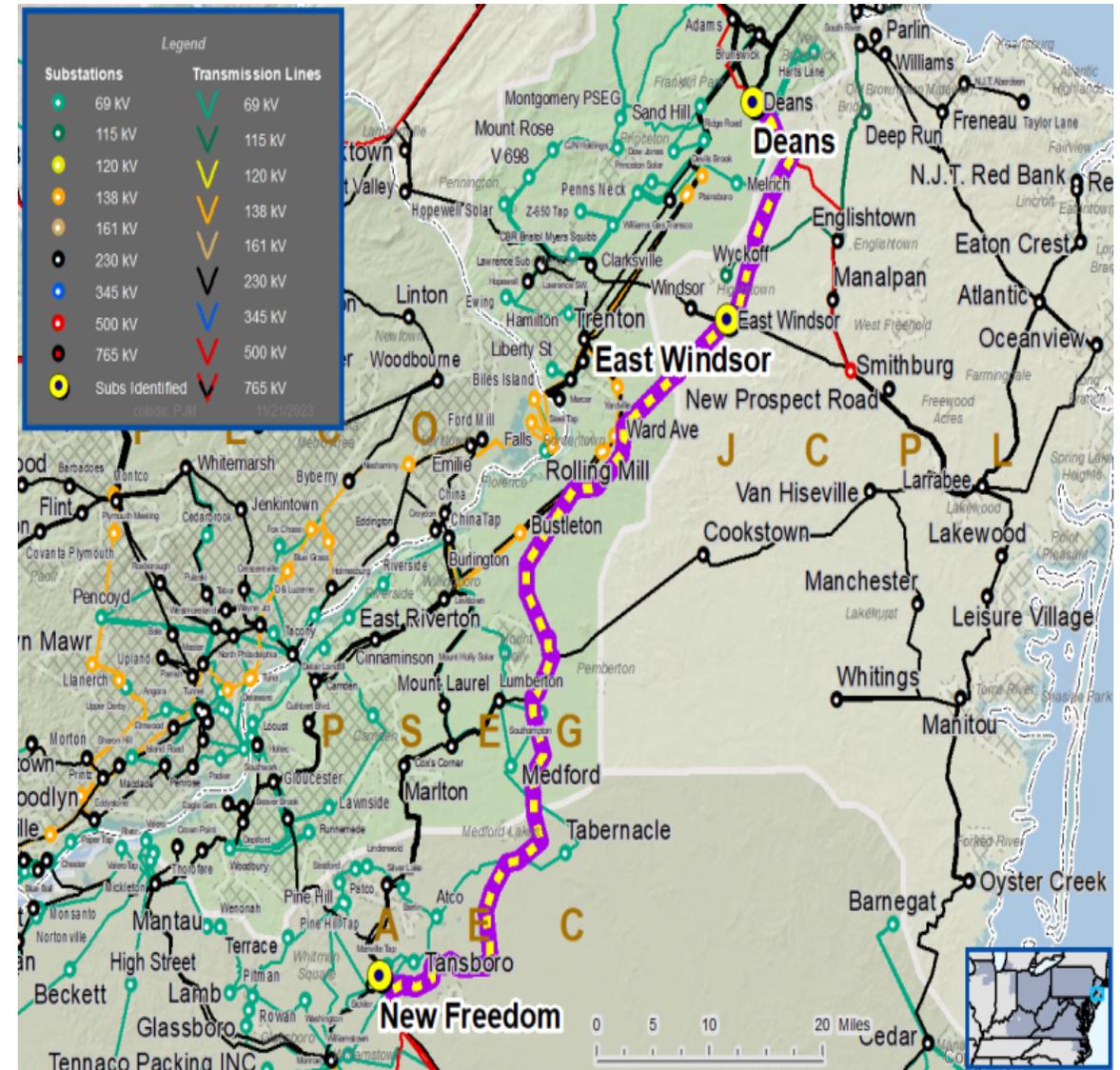
Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

Problem Statement:

- PSEG has identified a need (PSEG-2023-0013) at New Freedom and Deans substations to upgrade communication on the following lines:
 - Deans – East Windsor 500 kV 5022 Line
 - New Freedom – East Windsor 500 kV 5038 Line
- Existing communication equipment at East Windsor Substation is currently PLC.
- Transmission line ratings are limited by communication equipment.



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Need Number	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)
JCPL-2023-064	East Windsor – New Freedom 5038 500 kV Line East Windsor – Deans 5022 500 kV Line	2644 / 2844 2644 / 2844	2654 / 3016 2940 / 3733

Solutions

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

Need Number: JCPL-2022-005

Process Stage: Solution Meeting 12/5/2023

Previously Presented: Need Meeting 09/06/2022

Project Driver:

Operational Flexibility, Improved Reliability Performance

Specific Assumption Reference:

System Performance Projects Global Factors

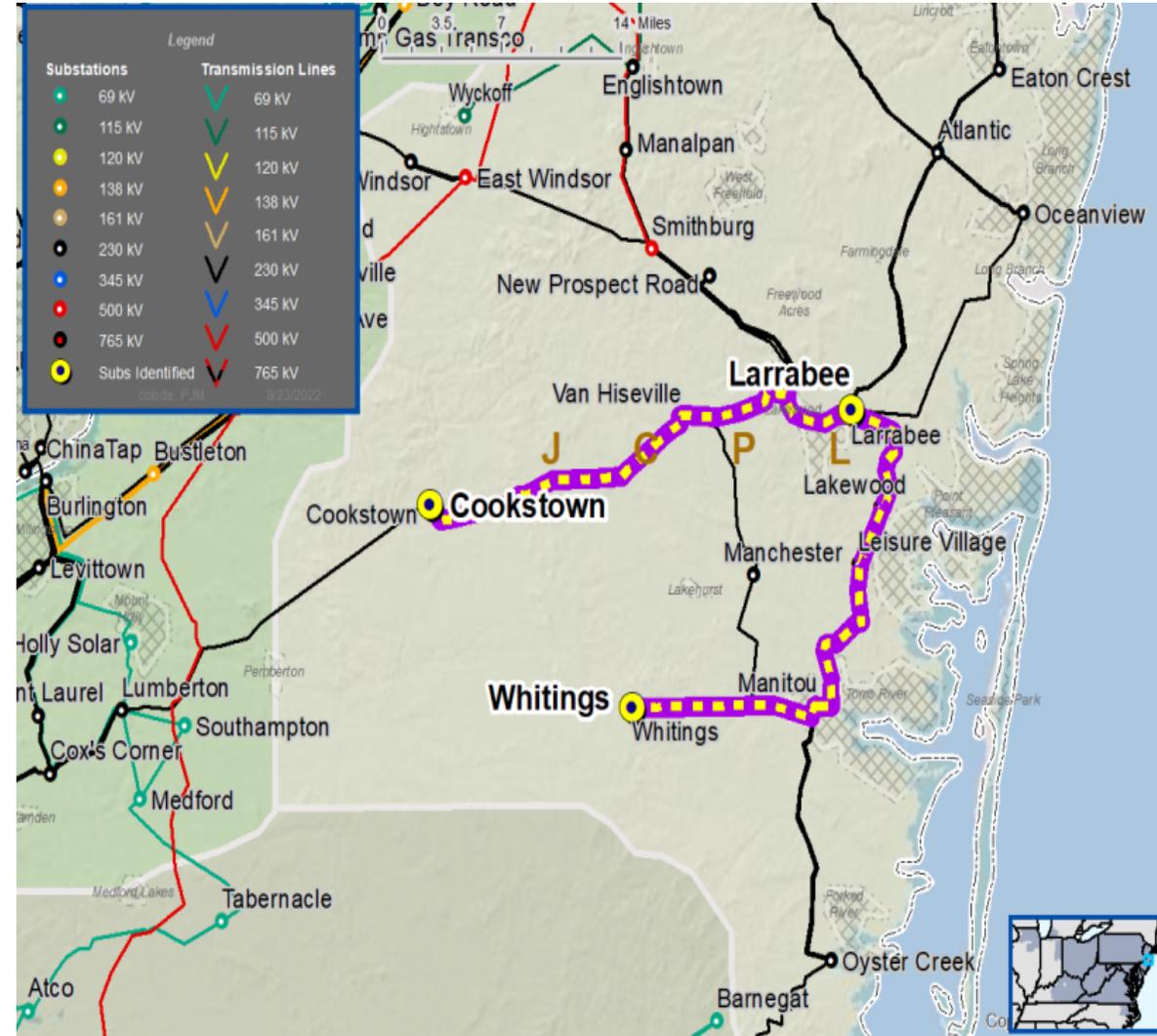
- Past system reliability and performance
- Add/Expand Bus Configuration
- Eliminate simultaneous outages to multiple networked elements

Reconductor/Rebuild Transmission Lines

- Three or more terminal transmission line.

Problem Statement:

The Cookstown – Larrabee – Whittings 230 kV Line is presently a 3-terminal line that removes multiple facilities from service under N-1 contingency scenarios.

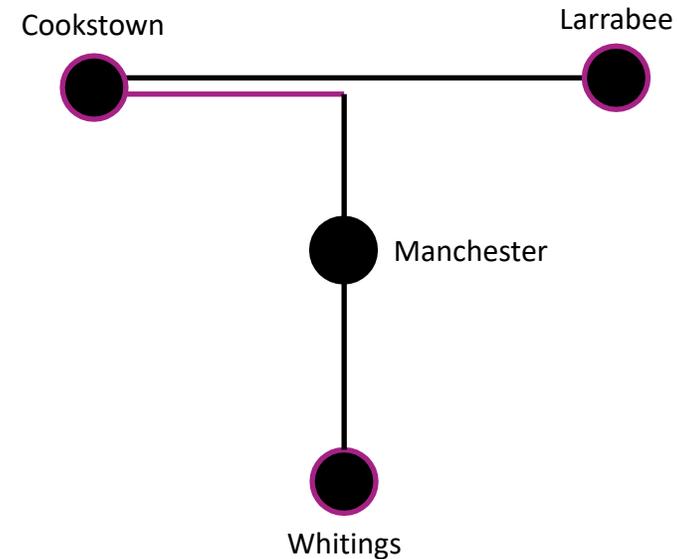


Need Number: JCPL-2022-005

Process Stage: Solution Meeting 06/06/2023

Proposed Solution:

- Expand Cookstown Substation from a four-breaker ring bus to a five-breaker ring bus
- Construct a new 230 kV circuit from Cookstown Substation to the Van Hiseville Junction on existing vacant circuit position, creating two new 230 kV lines:
 - Cookstown – Larrabee 230 kV
 - Cookstown – Whittings 230 kV
- At Cookstown Substation:
 - Replace circuit switcher, line trap and relaying
 - Install 230 kV circuit breaker, disconnect switches, and line trap
- At Larrabee Substation:
 - Replace line trap, substation conductor and relaying
- At Whittings Substation:
 - Replace line trap, substation conductor and relaying



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

Transmission Line Ratings:

Cookstown – Larrabee 230 kV (New line)

- Before Proposed Solution: N/A
- After Proposed Solution: 709/869 MVA (SN/SE)

Cookstown – Manchester 230 kV (New line)

- Before Proposed Solution: N/A
- After Proposed Solution: 709/869 MVA (SN/SE)

Manchester – Whitings 230 kV

- Before Proposed Solution: 678/813 MVA (SN/SE)
- After Proposed Solution: 709/869 MVA (SN/SE)

Alternatives Considered

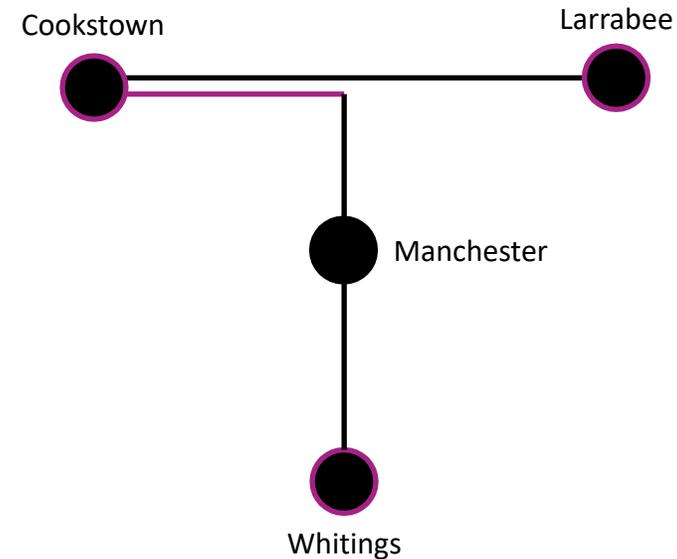
- Maintain line in existing condition, risk of single contingency events to outage multiple networked facilities

Estimated Project Cost: \$50.4M

Projected In-Service: 12/1/2024

Project Status: Engineering

Model: 2023 RTEP model for 2028 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: JCPL-2023-043

Process Stage: Solution Meeting 12/05/2023

Previously Presented: Need Meeting 10/31/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

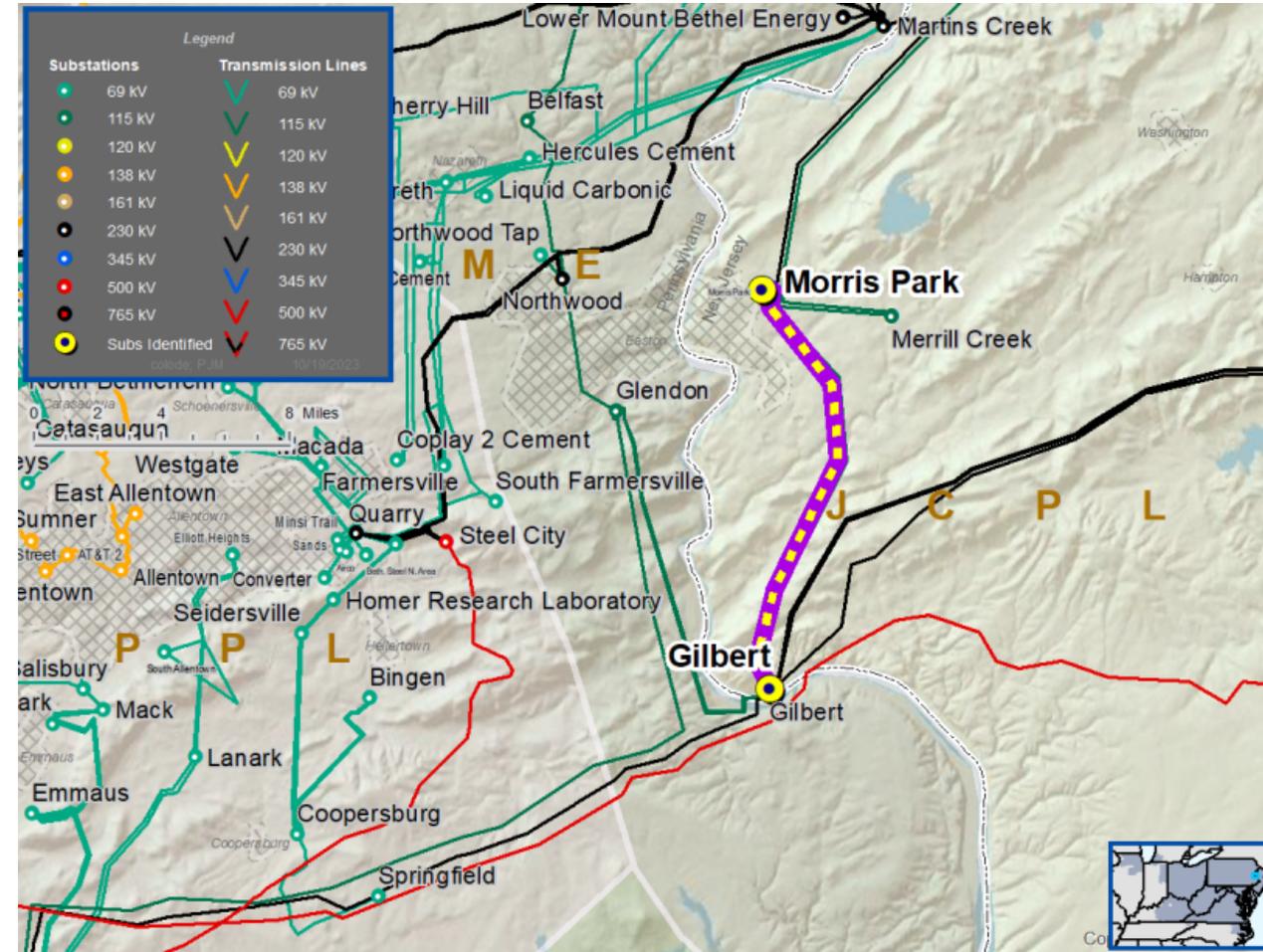
Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

Problem Statement:

- FirstEnergy has identified operational constraints when a single breaker is out of service for maintenance at Gilbert and substation on the Gilbert – Morris Park 230 kV P2016 line.
- The Gilbert – Morris Park 230 kV P2016 line is limited by terminal equipment:
 - Normal Ratings: 1306/1593/1593/1593 MVA (SN/SE/WN/WE)
 - Single Breaker Outage #1: 678/813/833/929 MVA (SN/SE/WN/WE)
 - Single Breaker Outage #2: 830/1000/1040/1171 MVA (SN/SE/WN/WE)





Need Number: JCPL-2023-043

Process Stage: Solutions Meeting 12/05/2023

Proposed Solution:

- Replace limiting substation equipment to meet or exceed the line (P2016) conductor rating at Gilbert substation:
 - Circuit breakers
 - Disconnect switches
 - Substation conductor

Transmission Line Ratings:

- Gilbert – Morris Park 230 kV Line
 - Before Proposed Solution:
 - Breaker Outage #1: 678/813/833/929 MVA (SN/SE/WN/WE)
 - Breaker Outage #2: 830/1000/1040/1171 MVA (SN/SE/WN/WE)
 - After Proposed Solution:
 - 1418/1739/1610/2062 MVA (SN/SE/WN/WE)

Alternatives Considered:

- Maintain existing condition with operational constraints when a single breaker is out of service

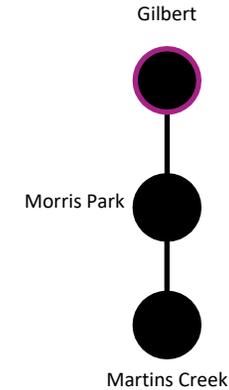
Project Cost: \$2.4M

Projected In-Service: 05/30/2024

Project Status: Engineering

Model: 2023 RTEP model for 2028 Summer (50/50)

JCPL Transmission Zones M-3 Process Gilbert Substation



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

Need Number: JCPL-2023-044, -045, -048

Process Stage: Solutions Meeting 12/05/2023

Previously Presented: Need Meeting 10/31/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption References:

Global Factors

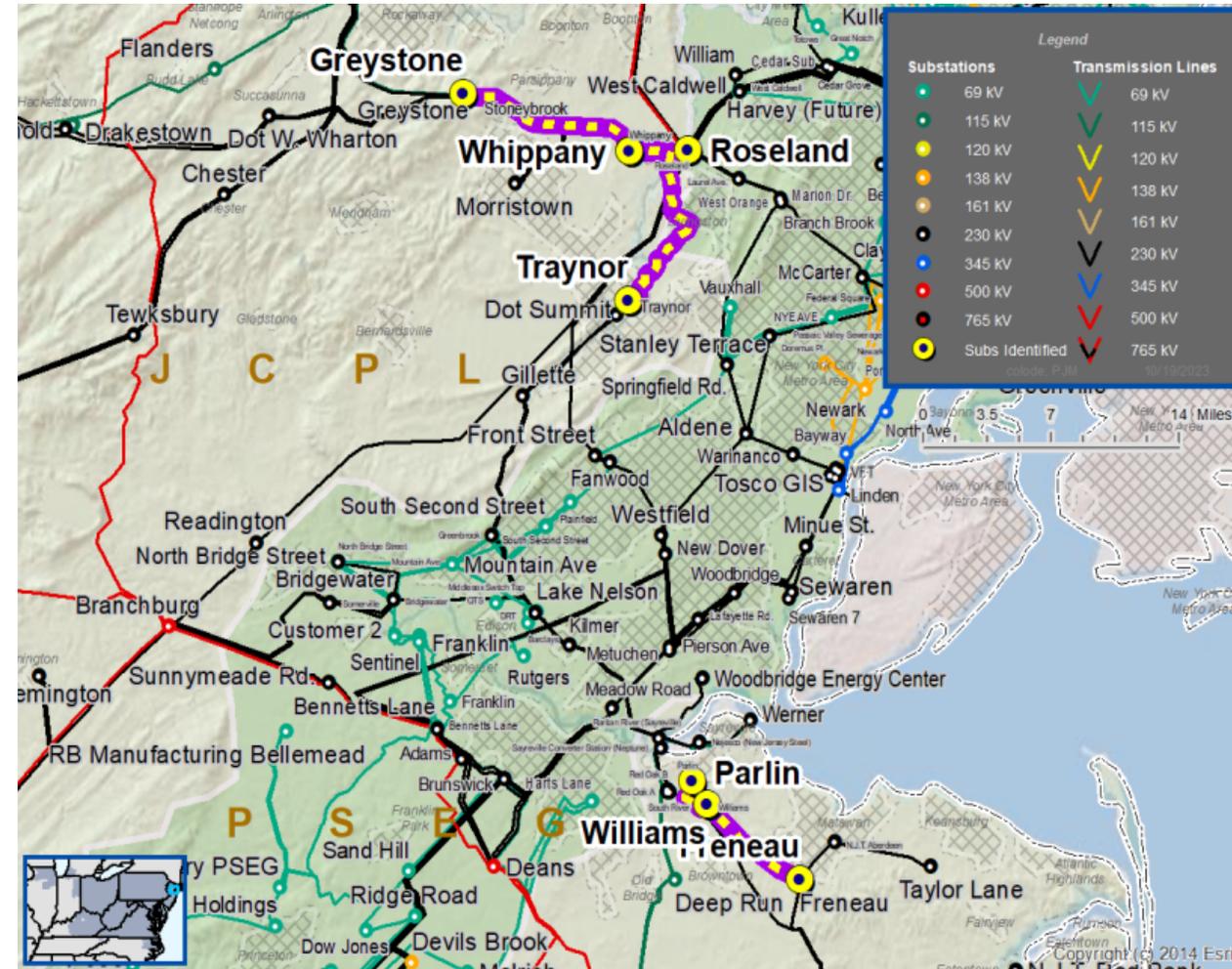
- System reliability and performance
- Substation / line equipment limits

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

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.





JCPL Transmission Zone M-3 Process Misoperation Relay Projects

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Need Number	Transmission Line / Substation Locations	Existing Line Rating (SN / SE / WN / WE)	Existing Conductor Rating (SN / SE / WN / WE)
JCPL-2023-044	Traynor – Whippany 230 kV Z1040 Line	574 / 574 / 574 / 574	709 / 869 / 805 / 1031
JCPL-2023-045	Greystone – Whippany 230 kV J1024 Line	649 / 698 / 723 / 762	709 / 869 / 805 / 1031
JCPL-2023-048	Parlin – Williams Gas 230 kV K1025 Line Williams Gas - Freneau 230 kV K1025 Line	709 / 869 / 805 / 952 709 / 869 / 805 / 1031	709 / 869 / 805 / 1031 709 / 869 / 805 / 1031

Need Number: JCPL-2023-044

Process Stage: Solution Meeting 12/05/2023

Proposed Solution:

- Replace relaying and limiting substation conductor at Traynor and Whippany substations

Transmission Line Ratings:

- Traynor – Whippany Z1040 230 kV Line
 - Before Proposed Solution: 574/574/574/574 MVA (SN/SE/WN/WE)
 - After Proposed Solution: 709/869/805/1031 MVA (SN/SE/WN/WE)

Alternatives Considered:

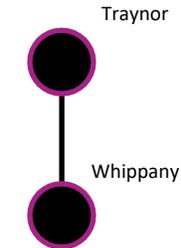
- Maintain line and vintage relay schemes with risk of misoperations

Project Cost: \$3.25M

Projected In-Service: 11/15/2024

Project Status: Engineering

Model: 2023 RTEP model for 2028 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: JCPL-2023-045

Process Stage: Solution Meeting 12/05/2023

Proposed Solution:

- Replace relaying and line trap at Greystone and Whippany substations.

Transmission Line Ratings:

- Greystone – Whippany J1024 230 kV Line
 - Before Proposed Solution: 649/698/723/762 MVA (SN/SE/WN/WE)
 - After Proposed Solution: 709/869/805/1031 MVA (SN/SE/WN/WE)

Alternatives Considered:

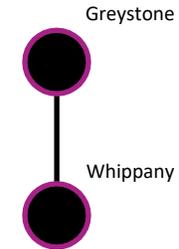
- Maintain line and vintage relay schemes with risk of misoperations

Project Cost: \$2.75M

Projected In-Service: 12/31/2024

Project Status: Engineering

Model: 2023 RTEP model for 2028 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: JCPL-2023-048

Process Stage: Solution Meeting 12/05/2023

Proposed Solution:

- Replace relaying and limiting substation conductor at Freneau, Williams Gas and Parlin substations

Transmission Line Ratings:

- Freneau-Williams Gas-Parlin K1025 230 kV Line
 - Before Proposed Solution: 709/869/805/952 MVA (SN/SE/WN/WE)
 - After Proposed Solution: 709/869/805/1031 MVA (SN/SE/WN/WE)

Alternatives Considered:

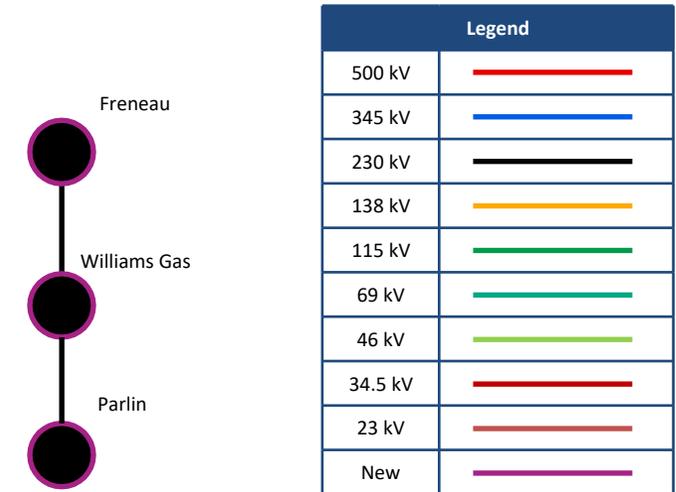
- Maintain line and vintage relay schemes with risk of misoperations

Project Cost: \$4.1M

Projected In-Service: 05/30/2025

Project Status: Engineering

Model: 2023 RTEP model for 2028 Summer (50/50)



Need Number: JCPL-2023-047

Process Stage: Solution Meeting 12/05/2023

Previously Presented: Need Meeting 10/31/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

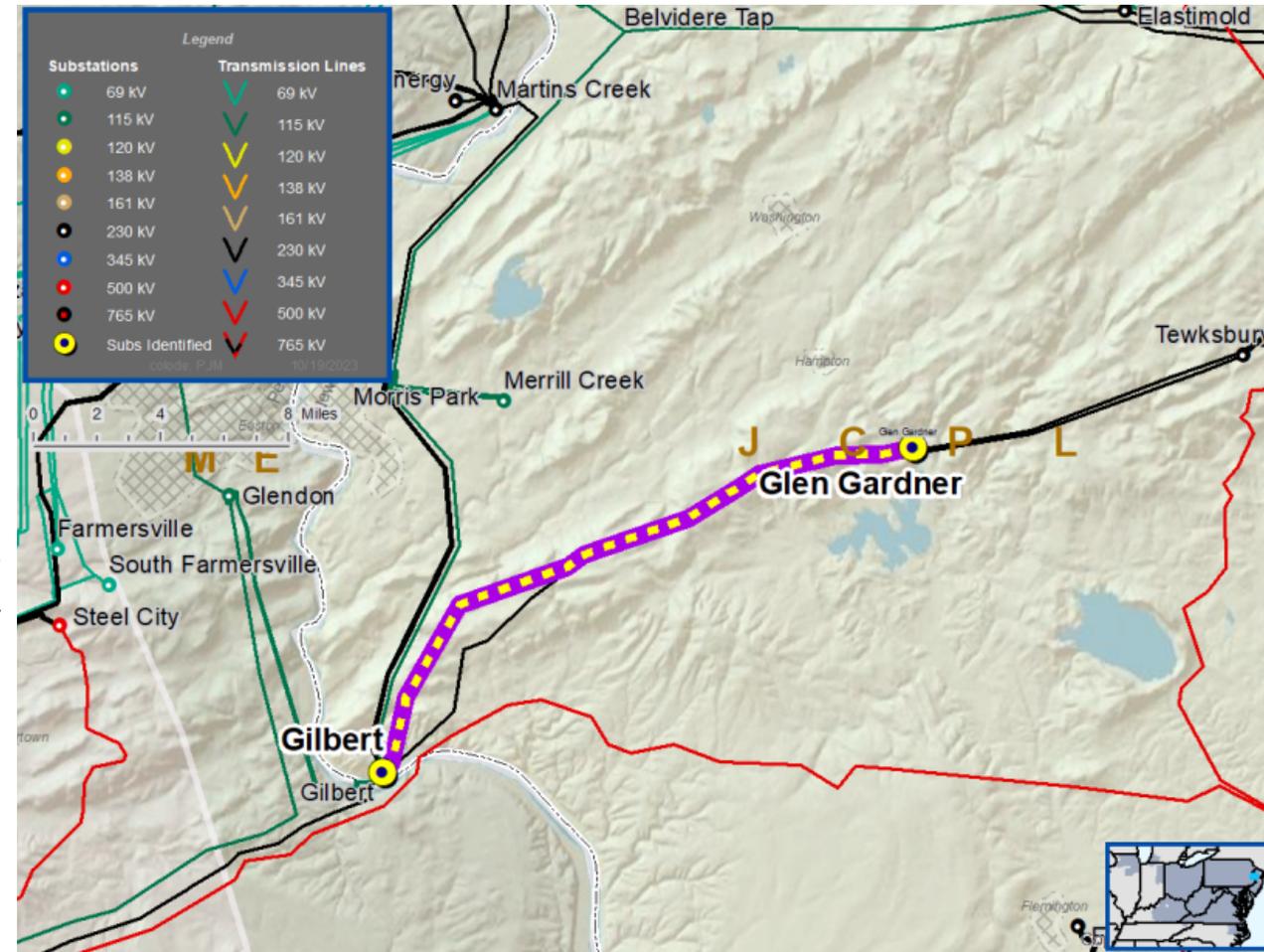
Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

Problem Statement:

- FirstEnergy has identified operational constraints when a single breaker is out of service for maintenance at Gilbert and Glen Gardner substations on the Gilbert - Glen Gardner 230 kV V1036 line.
- The Gilbert – Glen Gardner 230 kV V1036 line is limited by terminal equipment:
 - Normal Ratings: 913/1147/1139/1376 MVA (SN/SE/WN/WE)
 - Single Breaker Outage #1: 678/813/833/929 MVA (SN/SE/WN/WE)
 - Single Breaker Outage #2: 830/1000/1040/1171 MVA (SN/SE/WN/WE)
 - Single Breaker Outage #3 & #4: 909/1084/1119/1241 MVA (SN/SE/WN/WE)



Need Number: JCPL-2023-047

Process Stage: Solution Meeting 12/05/2023

Proposed Solution:

- Replace limiting substation equipment at Gilbert and Glen Gardner substations to meet or exceed the line (V1036) conductor rating:
 - Circuit breakers
 - Disconnect switches
 - Substation conductor

Transmission Line Ratings:

- Gilbert – Glen Gardner V1036 230 kV Line
 - Before Proposed Solution:
 - Breaker Outage #1: 678/813/833/929 MVA (SN/SE/WN/WE)
 - Breaker Outage #2: 830/1000/1040/1171 MVA (SN/SE/WN/WE)
 - Breaker Outage #3 & #4: 909/1084/1119/1241 MVA (SN/SE/WN/WE)
 - After Proposed Solution:
 - 1136/1311/1139/1379 MVA (SN/SE/WN/WE)

Alternatives Considered:

- Maintain existing condition with operational constraints when a single breaker is out of service

Project Cost: \$5.2M

Projected In-Service: 04/04/2025

Project Status: Engineering

Model: 2023 RTEP model for 2028 Summer (50/50)



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

Questions?



Appendix

High level M-3 Meeting Schedule

Assumptions	Activity	Timing
	Posting of TO Assumptions Meeting information	20 days before Assumptions Meeting
	Stakeholder comments	10 days after Assumptions Meeting
Needs	Activity	Timing
	TOs and Stakeholders Post Needs Meeting slides	10 days before Needs Meeting
	Stakeholder comments	10 days after Needs Meeting
Solutions	Activity	Timing
	TOs and Stakeholders Post Solutions Meeting slides	10 days before Solutions Meeting
	Stakeholder comments	10 days after Solutions Meeting
Submission of Supplemental Projects & Local Plan	Activity	Timing
	Do No Harm (DNH) analysis for selected solution	Prior to posting selected solution
	Post selected solution(s)	Following completion of DNH analysis
	Stakeholder comments	10 days prior to Local Plan Submission for integration into RTEP
	Local Plan submitted to PJM for integration into RTEP	Following review and consideration of comments received after posting of selected solutions

Revision History

11/22/2023 - V1 – Original version posted to pjm.com