

Transmission Expansion Advisory Committee FirstEnergy Supplemental Projects

February 06, 2024

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-2024-003

Process Stage: Need Meeting 02/06/2024

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption References:

System Performance Projects Global Factors

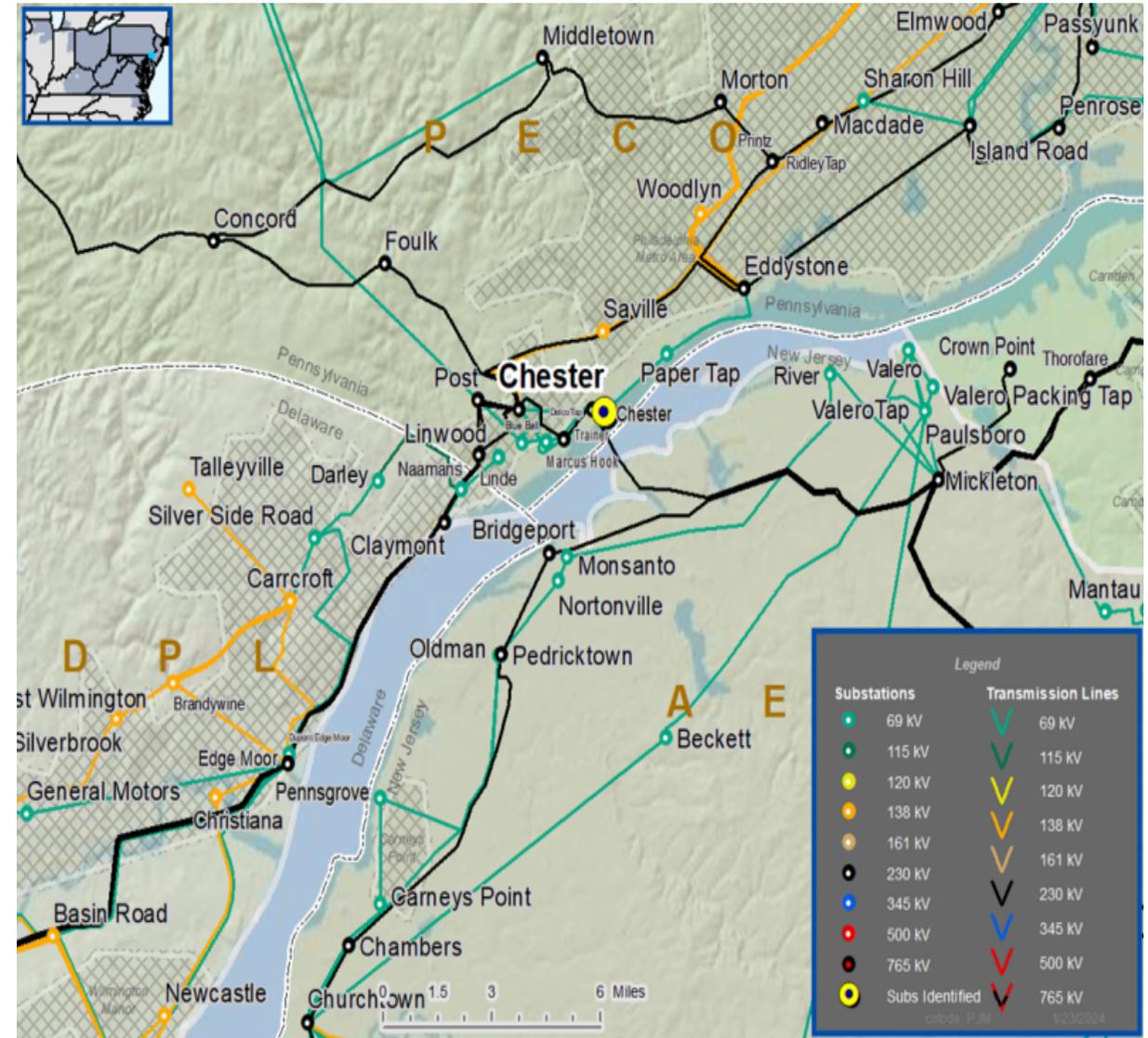
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The 230-34.5 kV No. 1 Transformer at Chester Substation was manufactured approximately 60 years ago and is reaching end of life.
 - Recent DGA revealed high moisture and high carbon monoxide levels indicating degradation of the paper insulation.
- Existing transformer ratings:
 - 99/124/125/137 MVA (SN/SSTE/WN/WSTE)
- Chester Substation serves approximately 30 MW of load via two 230-34.5 kV transformers. An N-1-1 contingency loss of the Chester – West Wharton 230 kV H2034 Line and the Kittatinny – Pohatcong 230 kV L2012 Line result in the Chester 230-34.5 kV No. 1 Transformer loading greater than 90% of its summer emergency rating.



Need Number: JCPL-2024-004

Process Stage: Need Meeting 02/06/2024

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

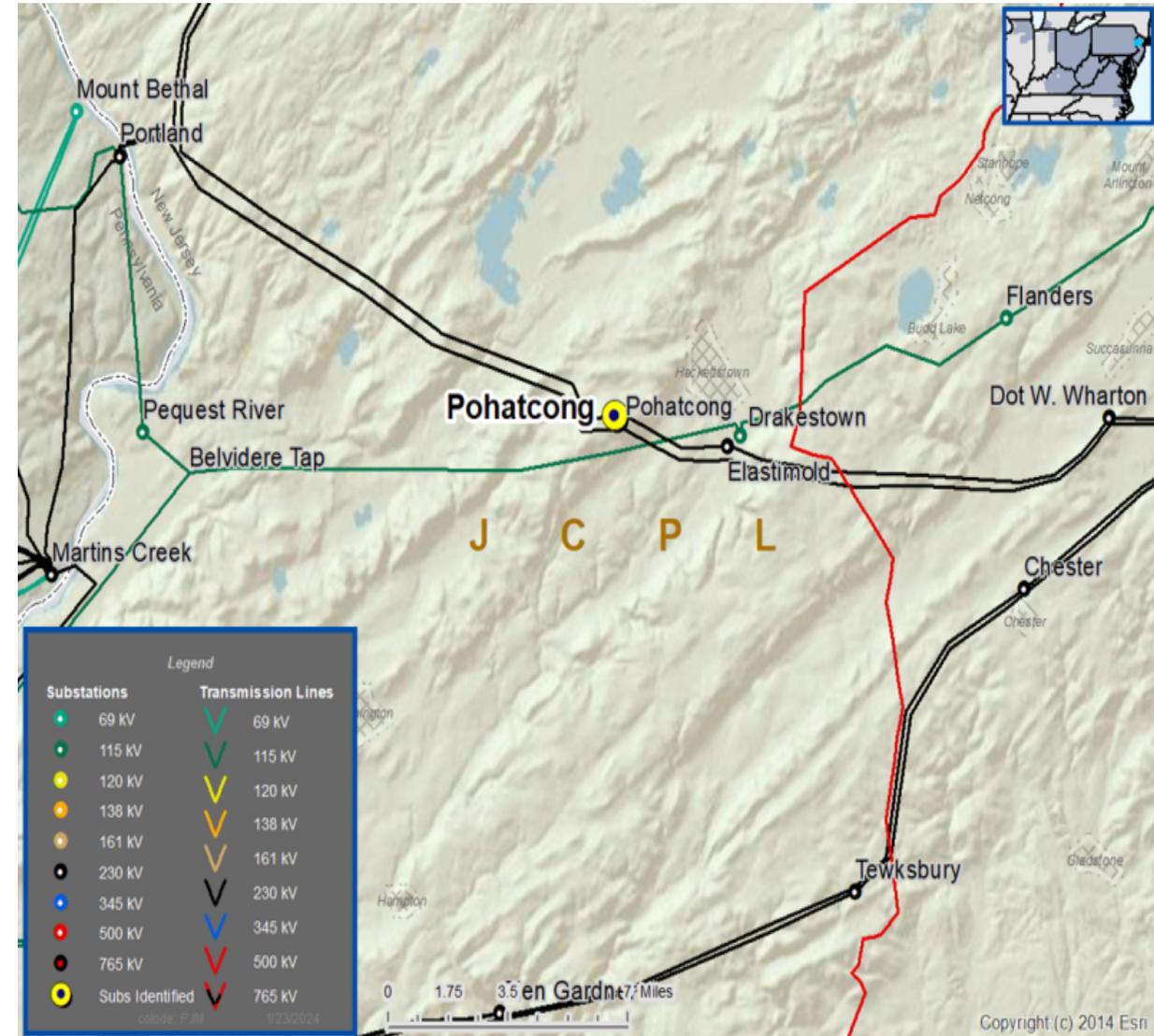
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities
- Add/Expand Bus Configuration
- Add/Replace Transformers
- Past System Reliability/Performance
- Substation / line equipment limits

Upgrade Relay Schemes

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

Problem Statement:

- The 230-34.5 kV No. 1 Transformer at Pohatcong Mountain Substation was manufactured approximately 50 years ago and is reaching end of life.
 - Recent dissolved gas analysis (DGA) showed elevated ethane and methane gas levels compared to IEEE standards.
 - The transformer’s dielectric strength is also measuring below acceptable IEEE limits.
- Existing transformer ratings:
 - 142/178/180/199 MVA (SN/SSTE/WN/WSTE)

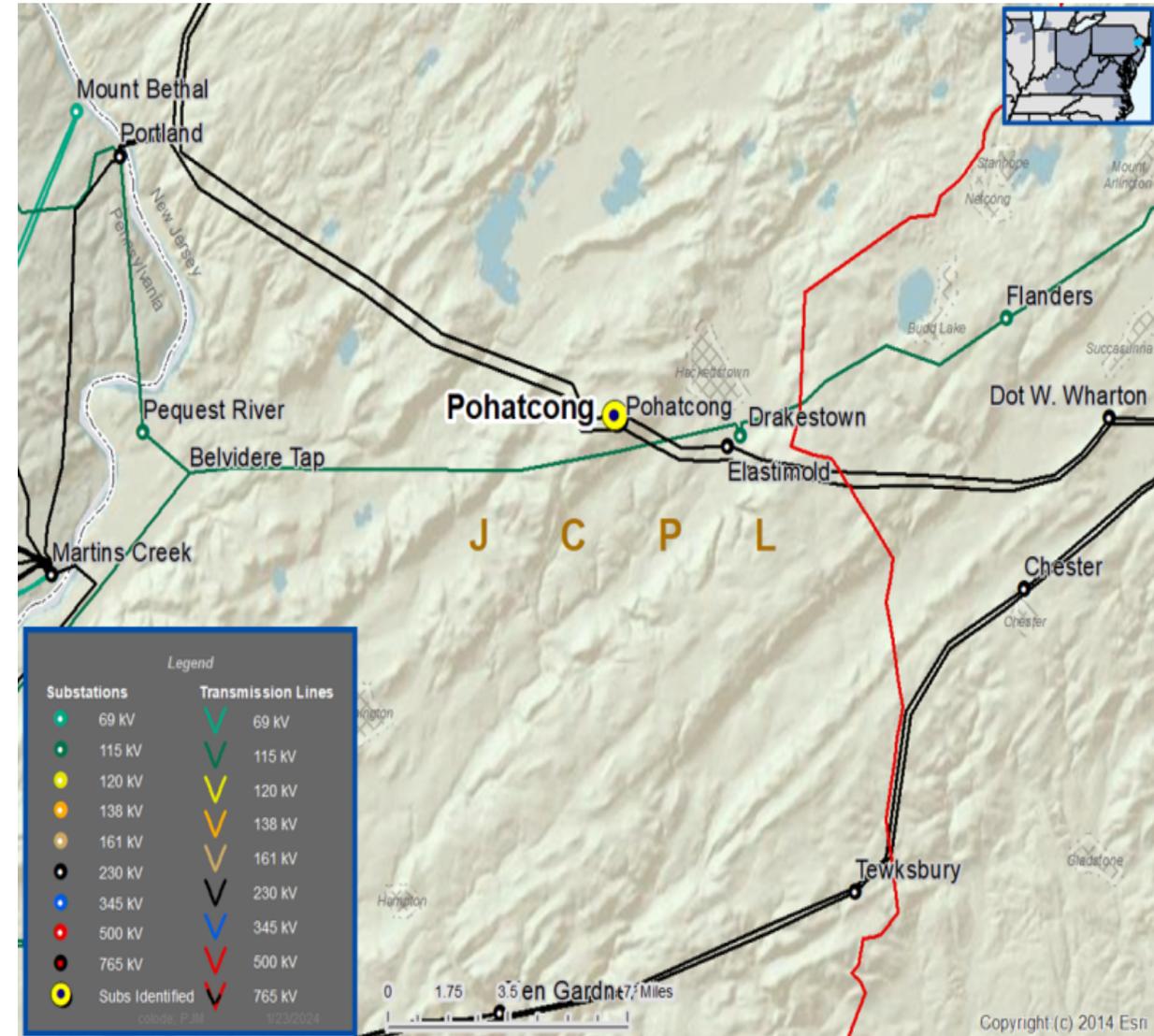


Need Number: JCPL-2024-004

Process Stage: Need Meeting 02/06/2024

Problem Statement (continued):

- The Pohatcong Mountain Substation is configured with a single circuit switcher and single circuit breaker feeding a 230-34.5 kV transformer. An outage on the Kittatinny – Pohatcong 230 kV L2012 Line or a fault on the transformer will remove the 230-34.5 kV transformer from service.
 - There is a lack of automatic restoration of 34.5 kV lines following tripping events without the intervention of Transmission Operators.
 - Manual restoration increases the risk of system constraints on adjacent facilities, especially for critical lines as identified by Transmission Operations.
 - Obsolete electromechanical relay schemes. In many cases, the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
 - Proper operation of the protection scheme requires all the separate components perform adequately during a fault.
 - Transmission line ratings are limited by terminal equipment.



Transmission Line / Substation Locations	Existing Line Rating (SN/SE/WN/WE MVA)	Existing Conductor Rating (SN/SE/WN/WE MVA)
Pohatcong Mountain – Washington 34.5 kV Q719 Line	42/50/50/57	44/53/50/63
Pohatcong Mountain – Flanders 34.5 kV R772 Line	42/48/48/48	44/53/50/63
Pohatcong Mountain – Chester 34.5 kV E733 Line	42/50/50/57	44/53/50/63
Pohatcong Mountain – Hacketstown 34.5 kV J738 Line	44/48/48/48	44/53/50/63

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-2023-050

Process Stage: Solution Meeting 02/06/2024

Previously Presented: Need Meeting 10/31/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

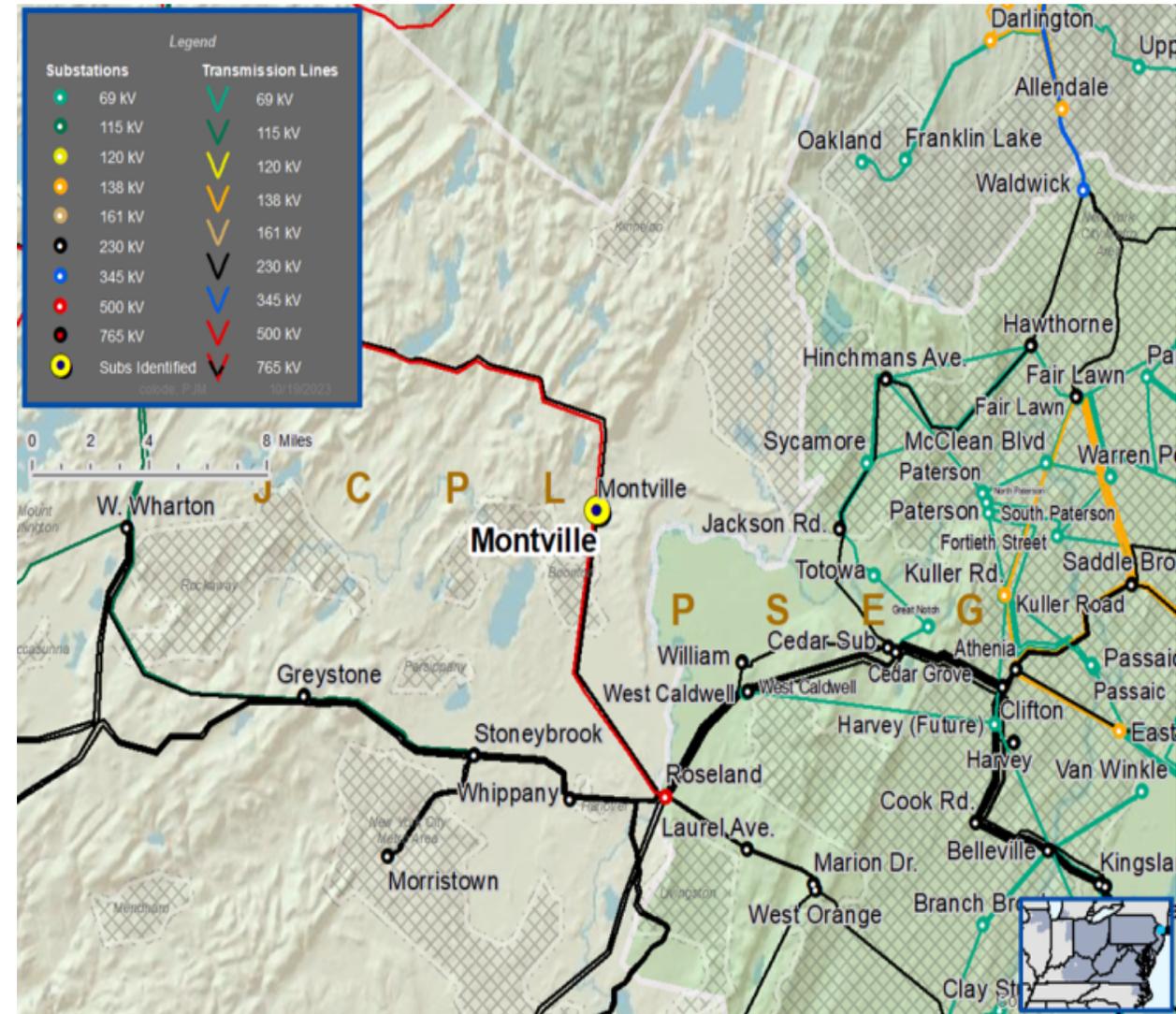
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The parallel 230-34.5 kV No. 3A and 3B Transformers at Montville Substation are approximately 55 and 60 years old, respectively, and are reaching end of life.
- Recent dissolved gas analysis (DGA) showed elevated Ethane gas levels compared to IEEE standards.
- Existing transformer ratings:
 - 175/194/200/220 MVA (SN/SLTE/WN/WLTE)



Need Number: JCPL-2023-050

Process Stage: Solution Meeting 02/06/2024

Proposed Solution:

- Replace the 230-34.5 kV No. 3A and 3B transformers at Montville Substation with a single 168 MVA unit.
- Upgrade transformer relaying

Transformer Ratings:

- Montville 230-34.5 kV No. 3A and 3B Transformer:
 - Before Proposed Solution: 175/194/200/220 MVA (SN/SLTE/WN/WLTE)
 - After Proposed Solution: 216/216/279/282 MVA (SN/SLTE/WN/WLTE)

Alternatives Considered:

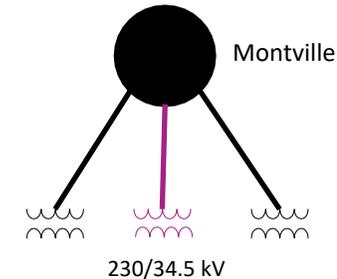
- Maintain transformer in existing condition with elevated risk of failure

Estimated Project Cost: \$8.55M

Projected In-Service: 04/01/2026

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-2023-062

Process Stage: Solution Meeting 02/06/2024

Previously Presented: Need Meeting 12/05/2023

Project Driver:

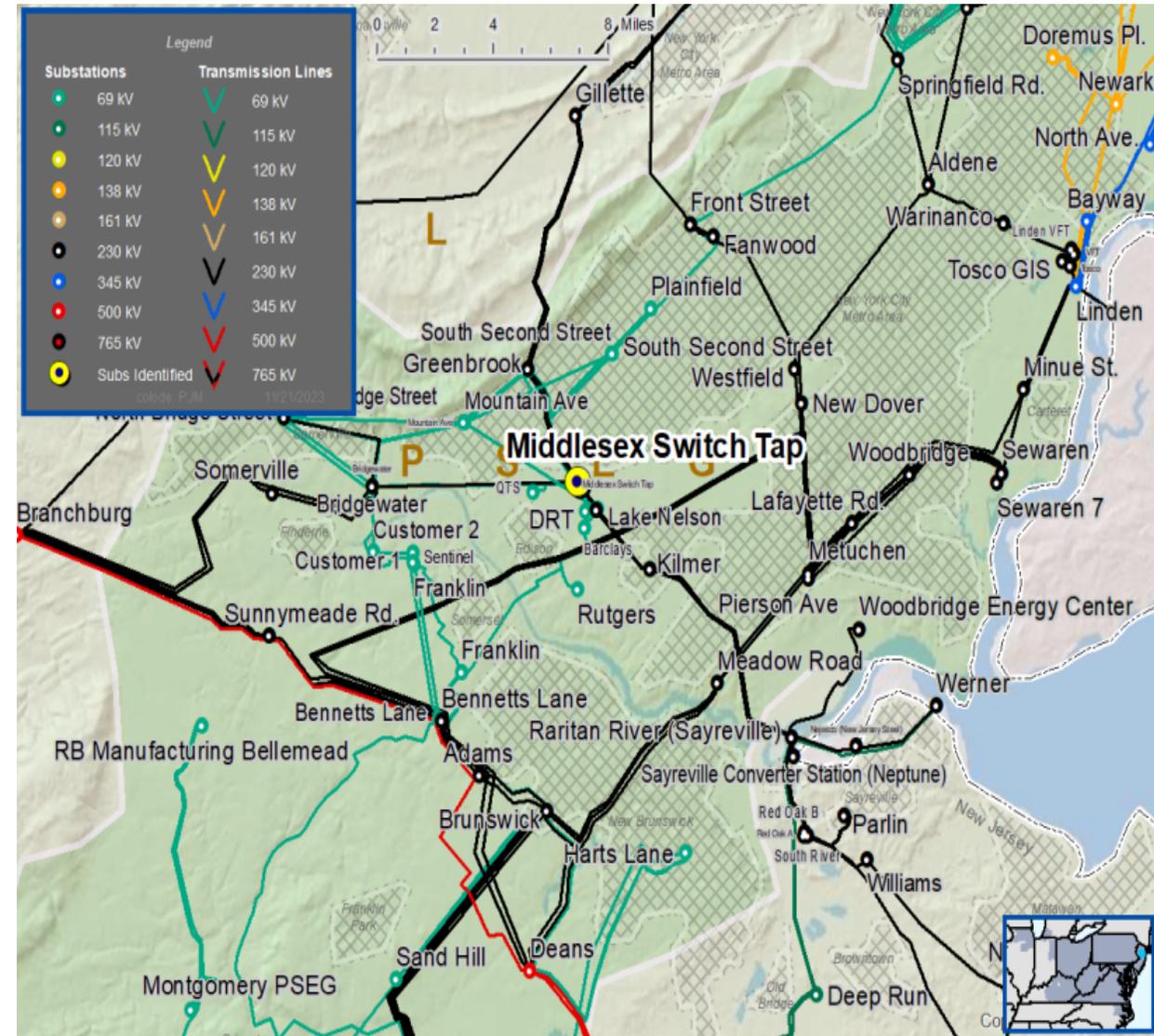
System Performance and Operational Flexibility

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 (PSEG), Bridgewater (PSEG), and Gillette substations.
- 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 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-2023-062

Process Stage: Solution Meeting 02/06/2024

Proposed Solution:

- Convert the existing Middlesex 230 kV Switching Station to a three (3) breaker ring bus.
- Upgrade limiting switches and TL drops at the Middlesex 230 kV Switching Station.

Transmission Line Ratings:

- Bridgewater(PSEG) - Middlesex 230 kV Line:
 - Before Proposed Solution: 709/ 819 / 797 / 819 MVA (SN/SE/WN/WE)
 - After Proposed Solution: 732 / 887 / 823 / 980 MVA (SN/SE/WN/WE)
- Lake Nelson(PSEG) – Middlesex 230 kV Line:
 - Before Proposed Solution: 709/ 819 / 797 / 819 MVA (SN/SE/WN/WE)
 - After Proposed Solution: 709 / 869 / 805 / 1031 MVA (SN/SE/WN/WE)
- Gillette – Middlesex 230 kV line section:
 - Before Proposed Solution: 709/ 819 / 797/ 819 MVA (SN/SE/WN/WE)
 - After Proposed Solution: 709 / 869 / 805/ 1031 MVA (SN/SE/WN/WE)

Alternatives Considered:

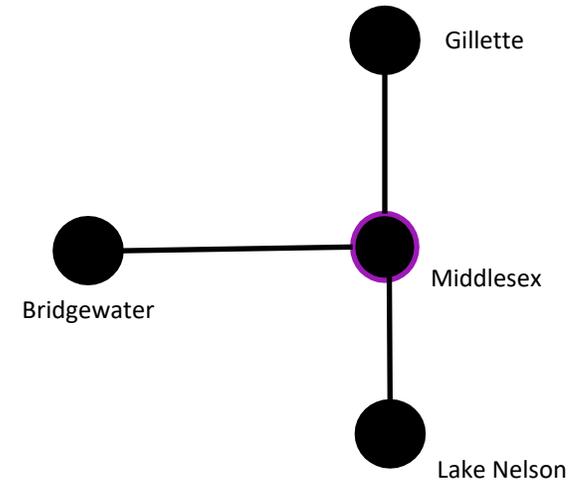
- Maintain existing configuration with simultaneous outages to multiple networked elements under contingency scenarios.

Estimated Project Cost: \$8.85M

Projected In-Service: 6/1/2026

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-2023-064

Process Stage: Solution Meeting 02/06/2024

Previously Presented: Need Meeting 12/05/2023

Project Driver:

Operational Flexibility and Efficiency

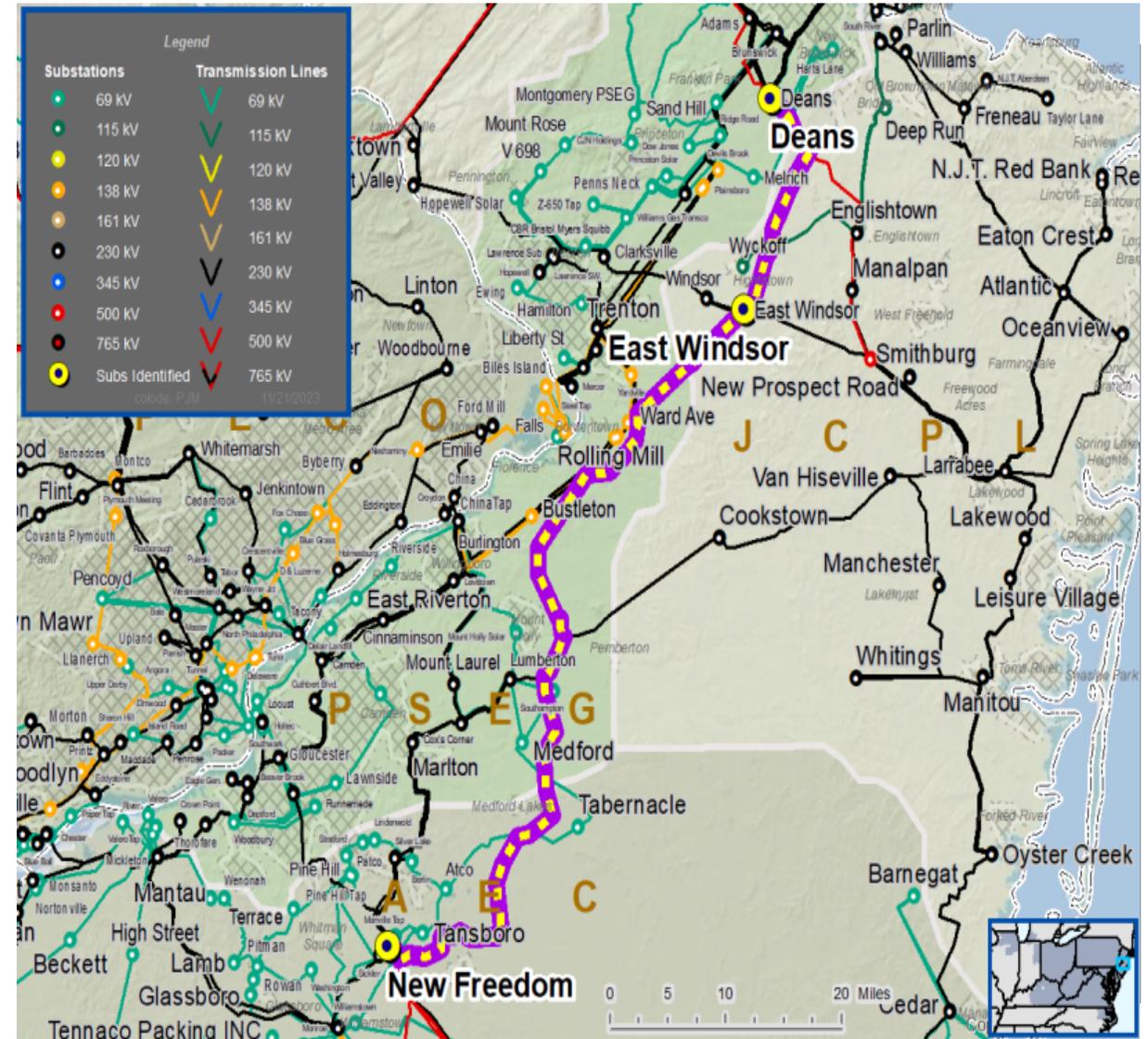
Specific Assumption Reference:

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	2940 / 3733 2940 / 3733

Need Number: JCPL-2023-064

Process Stage: Solution Meeting 02/06/2024

Proposed Solution:

- Upgrade communication equipment from PLC to fiber at East Windsor Substation on the 5022 and 5038 500 kV lines
 - Retire line traps, tuners and carrier equipment
 - Replace static wire
 - Replace line relays

Transmission Line Ratings:

- East Windsor – Deans 5022 500 kV Line:
 - Before Proposed Solution: 2644/2844/2946/3106 MVA (SN/SE/WN/WE)
 - After Proposed Solution: 2940/3733/3618/4424 MVA (SN/SE/WN/WE)
- East Windsor – New Freedom 5038 500 kV Line:
 - Before Proposed Solution: 2644/2844/2917/3106 MVA (SN/SE/WN/WE)
 - After Proposed Solution: 2940/3386/3478/3827 MVA (SN/SE/WN/WE)

Alternatives Considered:

- Maintain existing PLC communication equipment. This project is in coordination with PSEG-2023-0013.

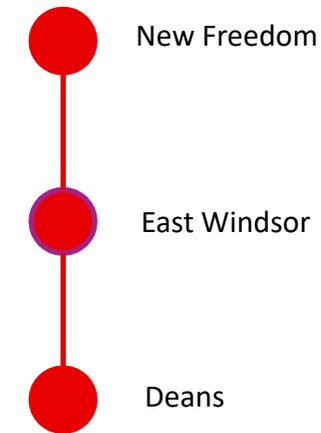
Project Cost: \$2.00M

Projected In-Service: 12/2025 (East Windsor – Deans 5022 500 kV Line)

and 6/2027 (East Windsor – New Freedom 5038 500 kV Line)

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

1/26/2024 - V1 – Original version posted to pjm.com