

Transmission Expansion Advisory Committee FirstEnergy Supplemental Projects

October 31, 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-2023-044 -045, -046, -048

Process Stage: Need Meeting 10/31/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption References:

Global Factors

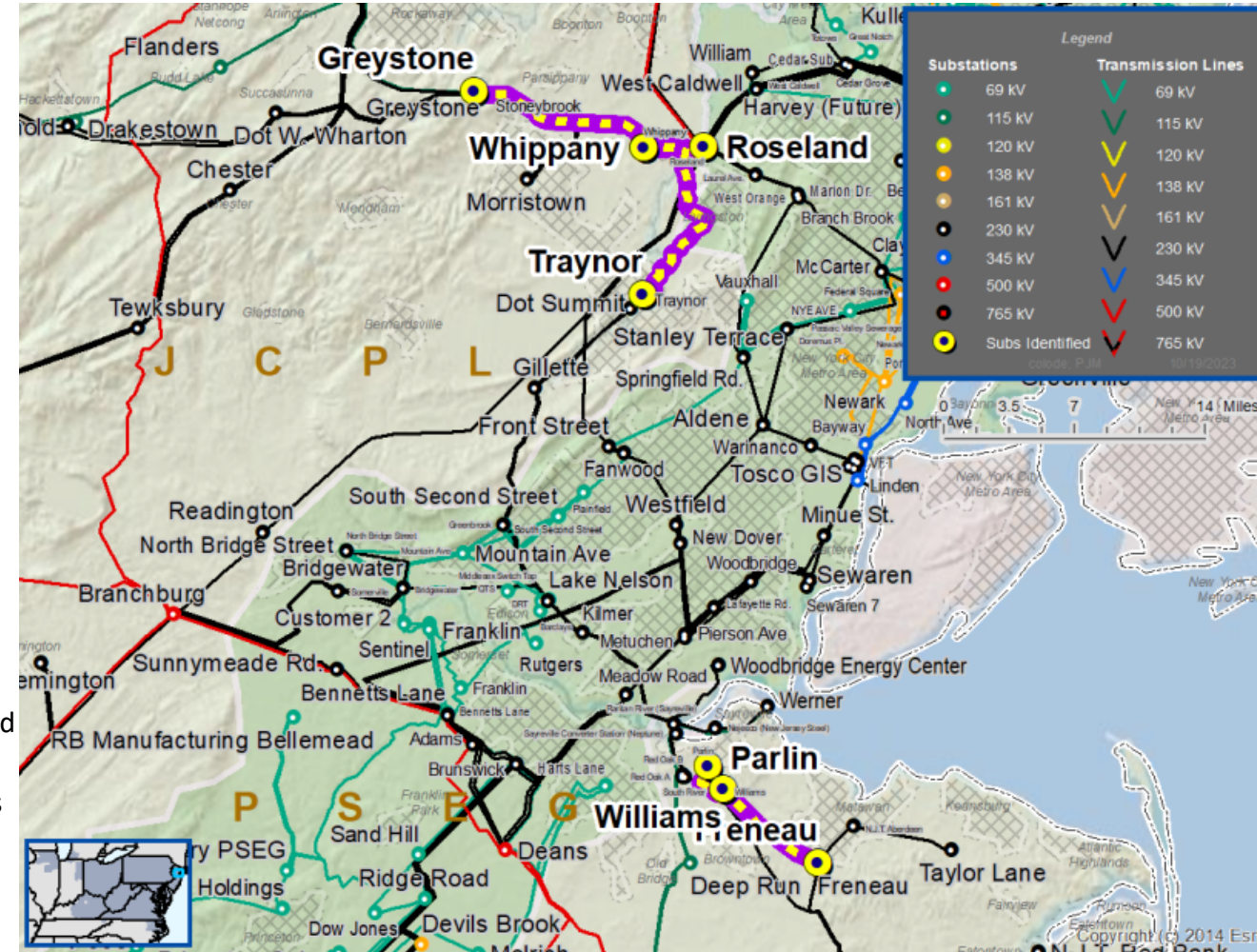
- System reliability and performance
- Substation / line equipment limits

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cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.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-2023-046	Roseland – Whippany 230 kV A941 Line	1306 / 1697 / 1610 / 1905	2228 / 2570 / 2232 / 2704
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-2023-043

Process Stage: Need Meeting 10/31/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

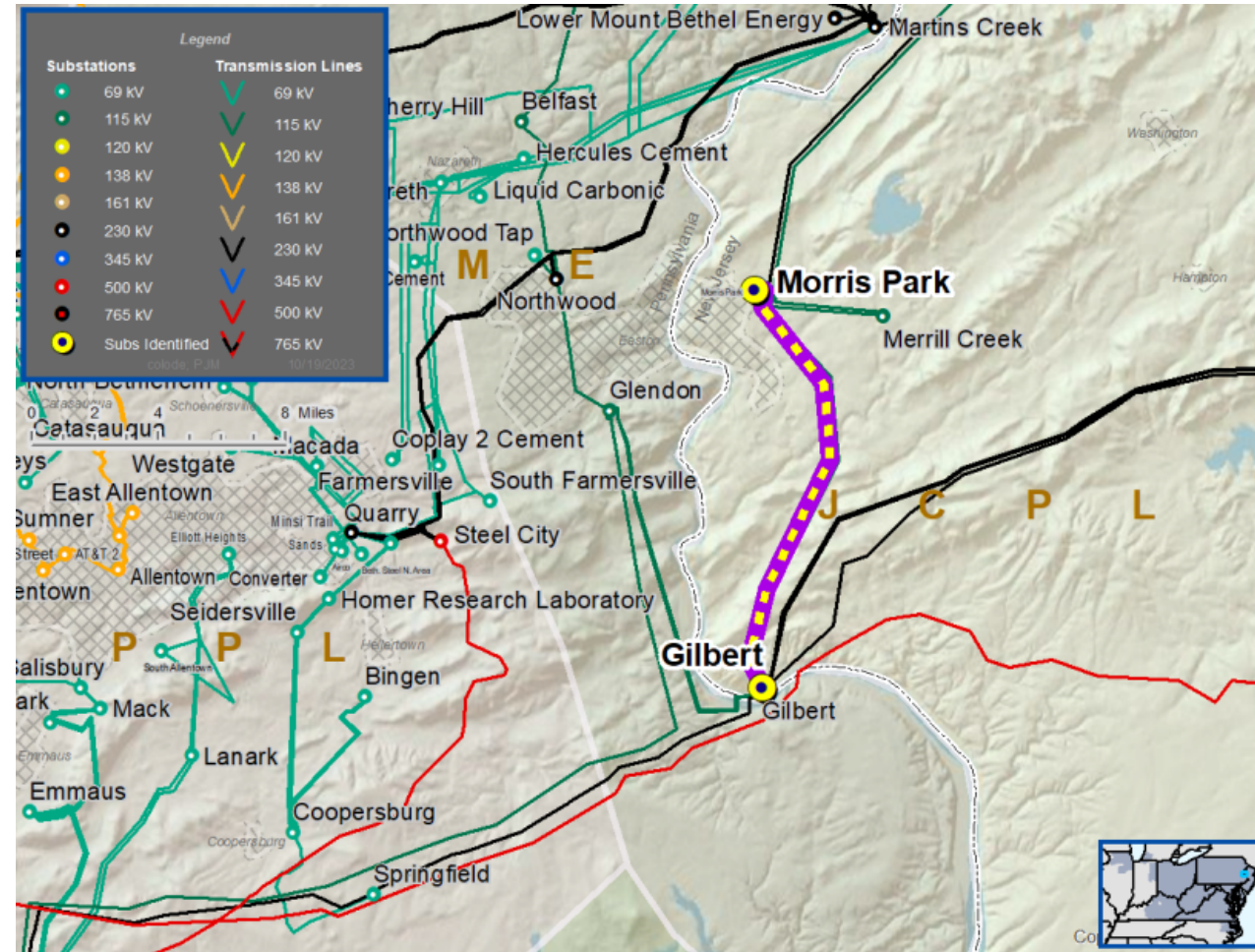
Specific Assumption Reference:

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-2023-047

Process Stage: Need Meeting 10/31/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

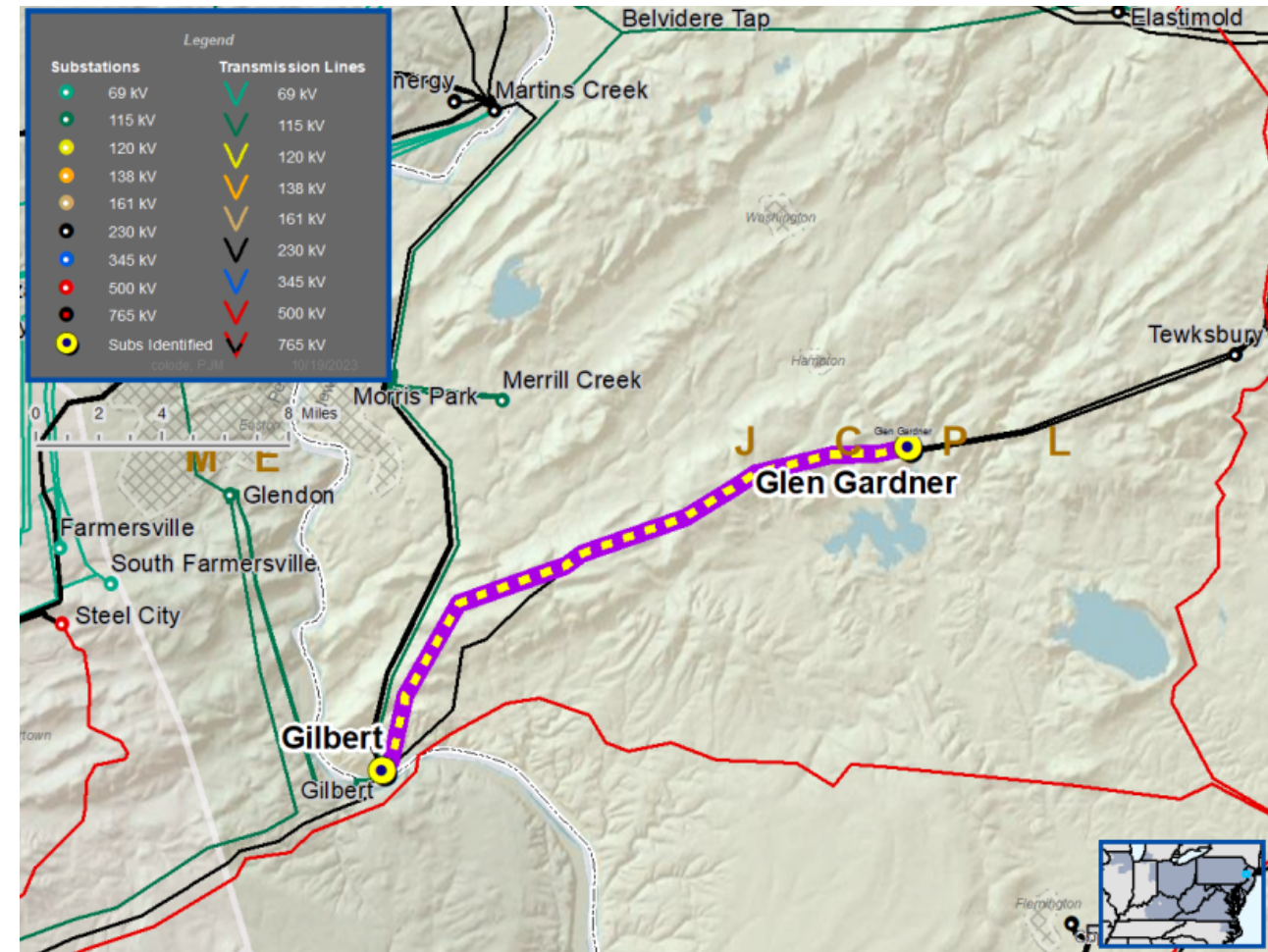
Specific Assumption Reference:

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-2023-049

Process Stage: Need Meeting 10/31/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

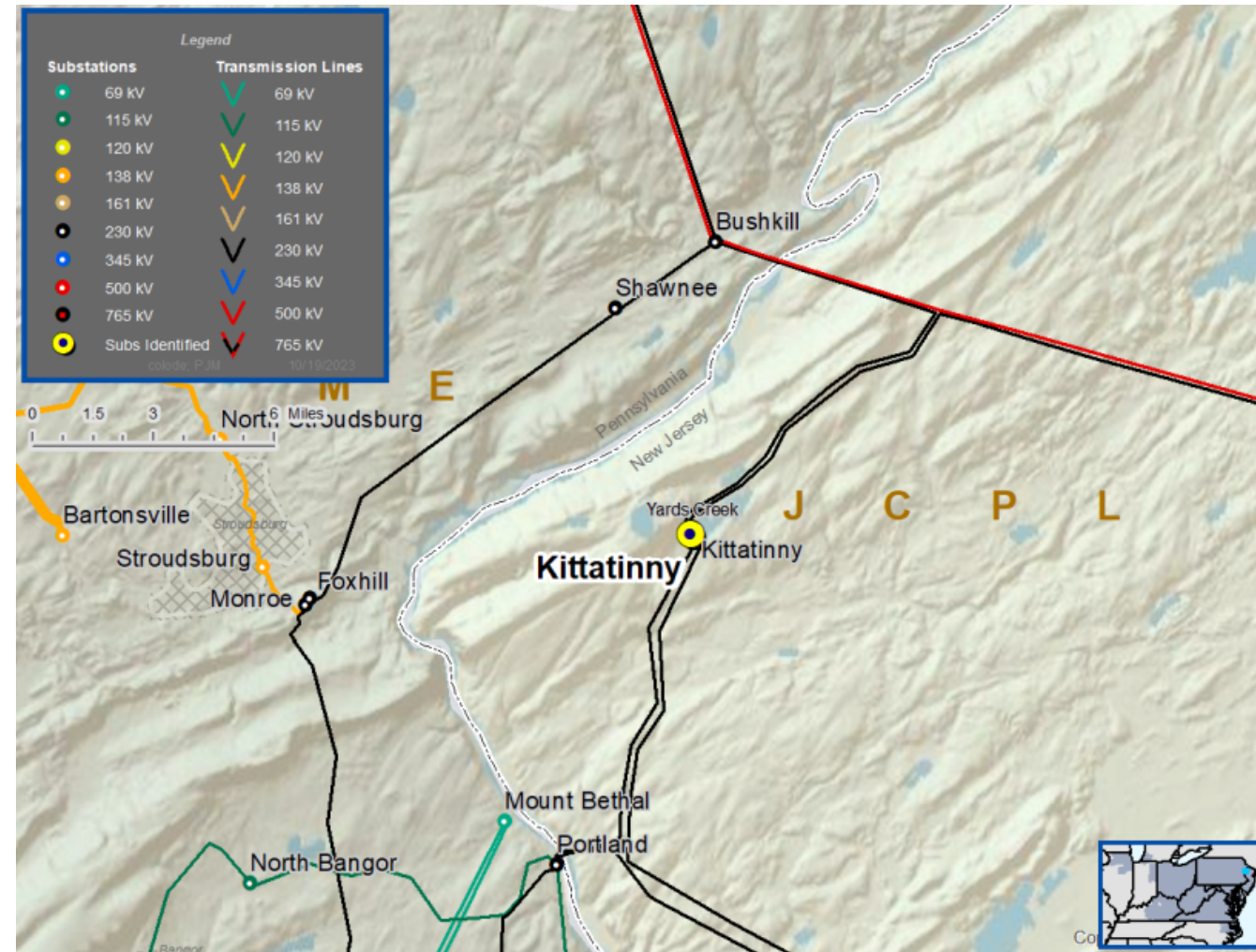
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The 230-34.5 kV No. 1 Transformer at Kittatinny is approximately 60 years old and is reaching end of life.
- Recent dissolved gas analysis (DGA) showed elevated Ethane gas levels compared to IEEE standards.
- Carbon oxide gas production also suggests thermal stressing of paper insulation.
- Existing transformer ratings:
 - 60/63/76/77 MVA (SN/SLTE/WN/WLTE)



Need Number: JCPL-2023-050

Process Stage: Need Meeting 10/31/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

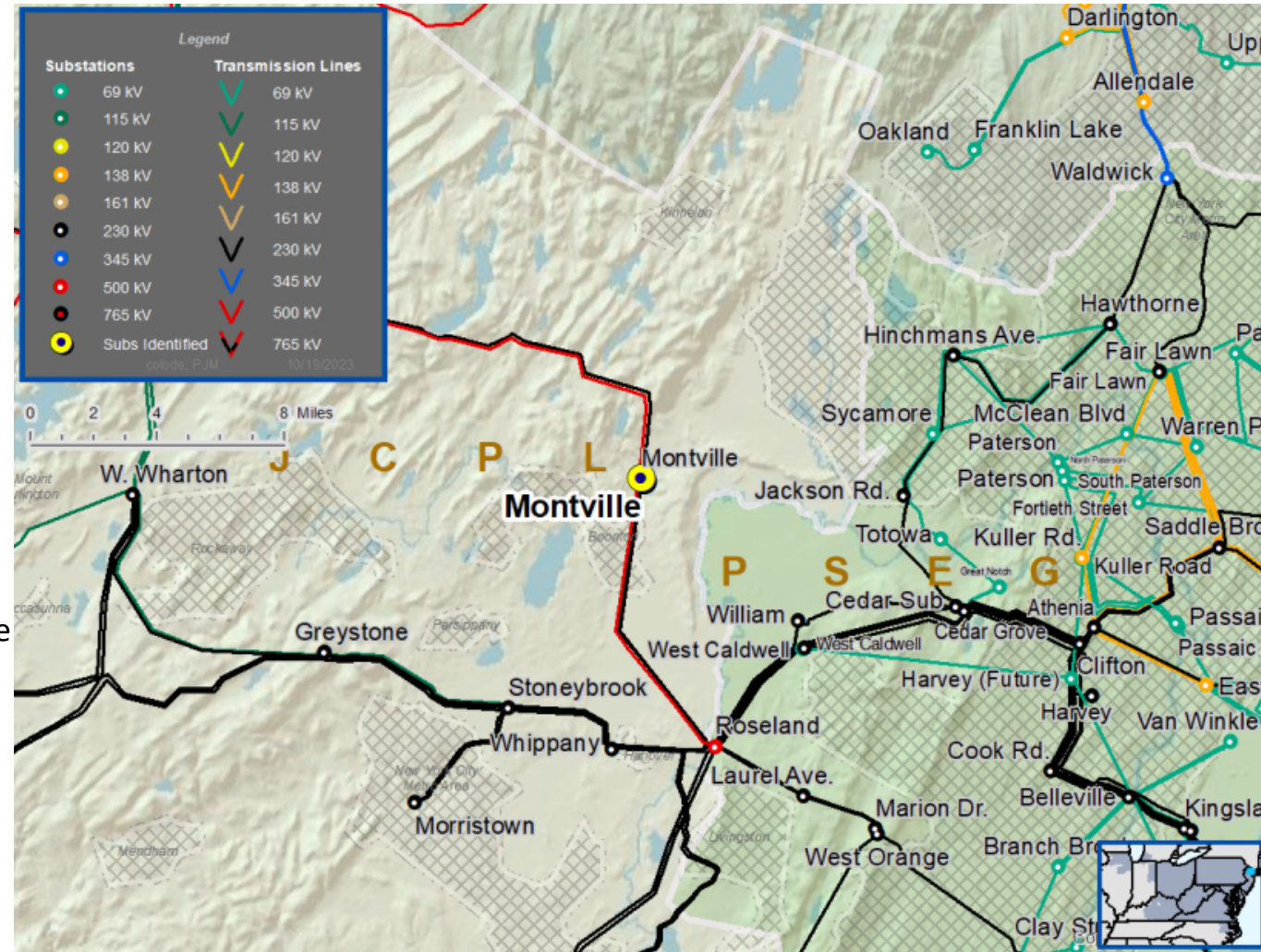
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The parallel 230-34.5 kV No. 3A and 3B Transformers at Montville 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-2023-051

Process Stage: Need Meeting 10/31/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

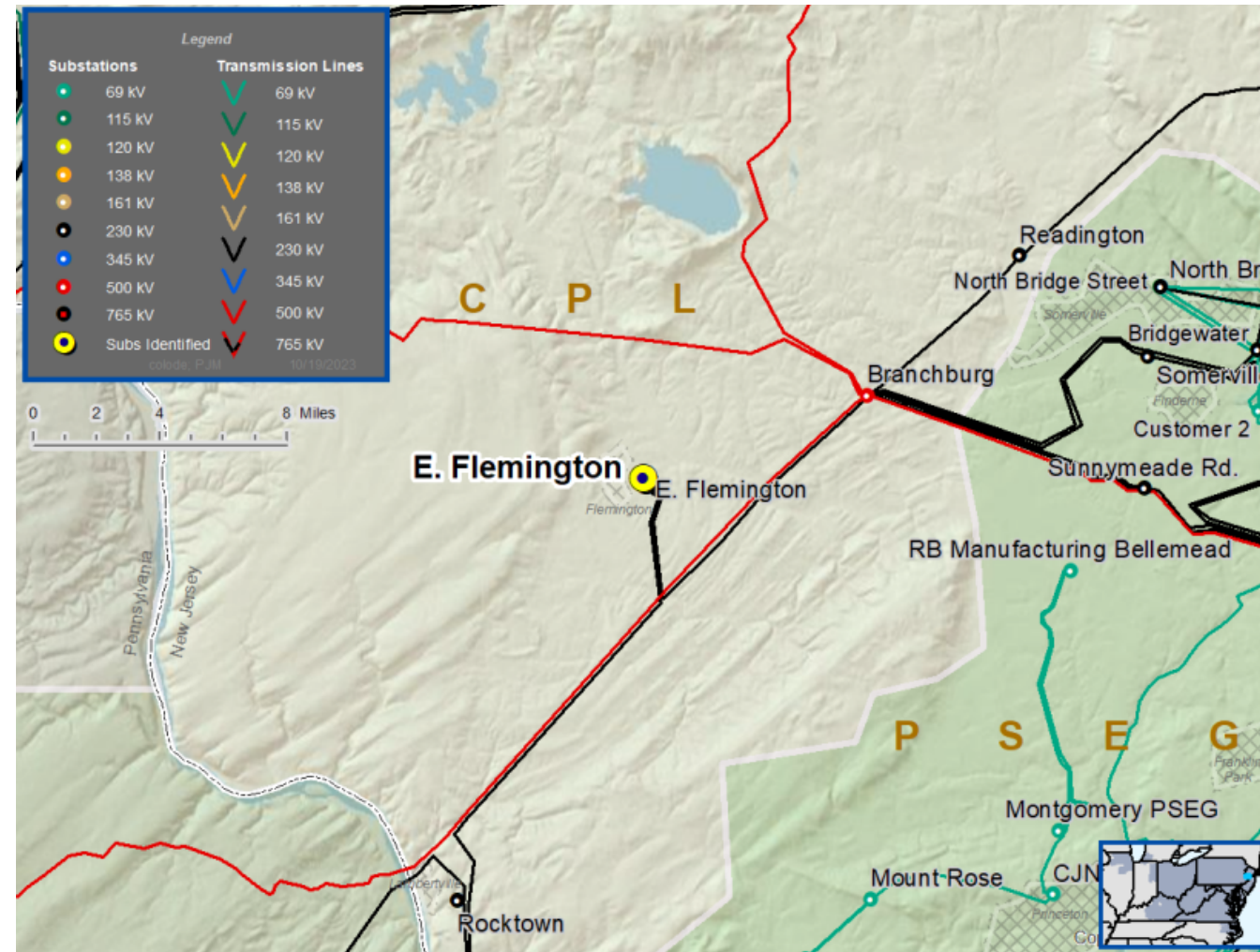
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The 230-34.5 kV No. 3 Transformer at East Flemington is approximately 45 years old and is reaching end of life.
- Recent dissolved gas analysis (DGA) showed elevated Ethane gas levels compared to IEEE standards.
- Existing transformer ratings:
 - 77/81/97/99 MVA (SN/SLTE/WN/WLTE)



Need Number: JCPL-2023-052

Process Stage: Need Meeting 10/31/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

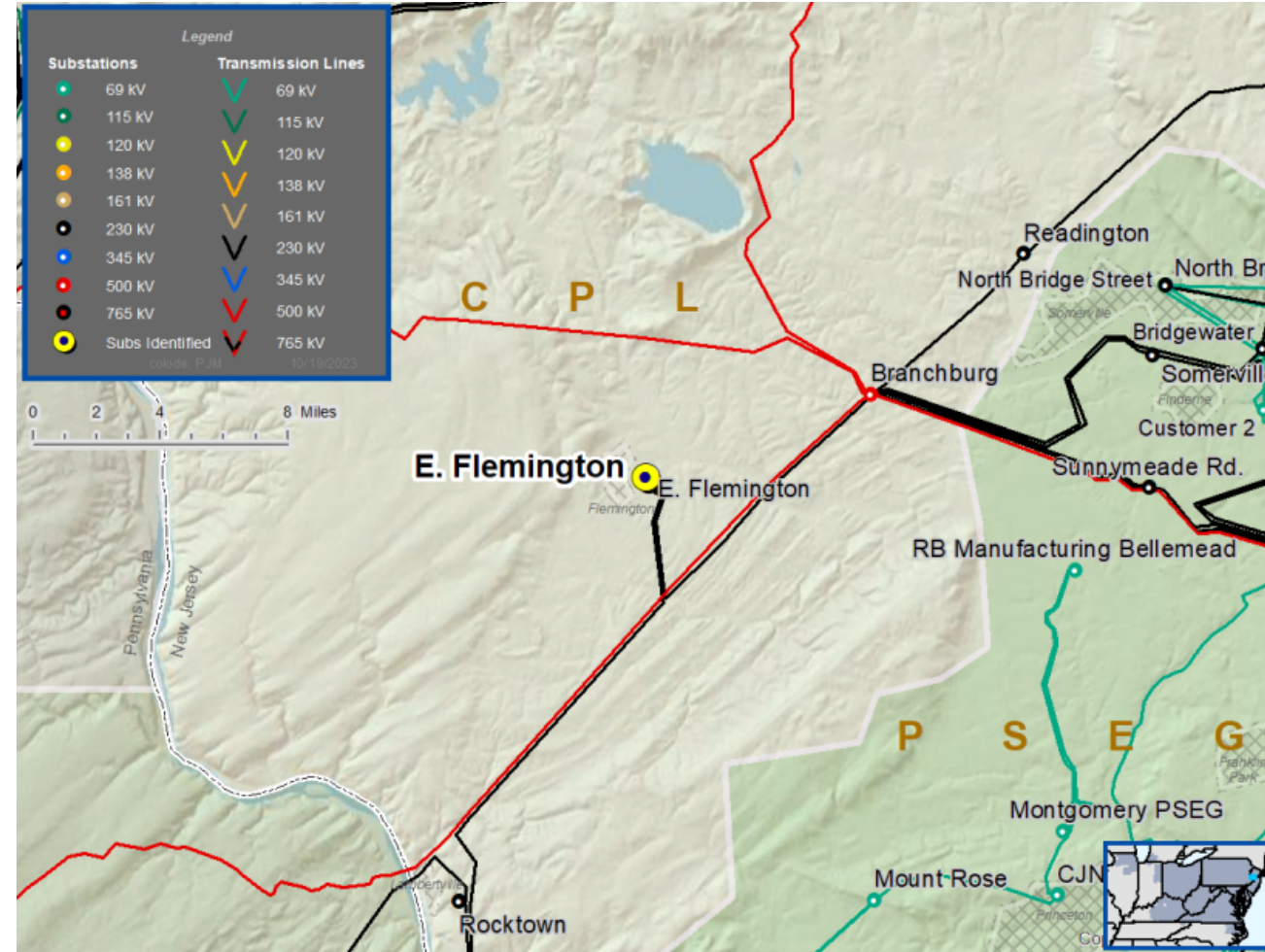
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The 230-34.5 kV No. 4 Transformer at East Flemington is approximately 45 years old and is reaching end of life.
- In recent months, the transformer exhibited oil leaks that needed repaired. Incidental oil leaks at end-of-life period increases risk of failure.
- Existing transformer ratings:
 - 76/81/97/99 MVA (SN/SLTE/WN/WLTE)



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-2023-010

Process Stage: Solution Meeting – 10/31/2023

Previously Presented: Need Meeting – 09/05/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

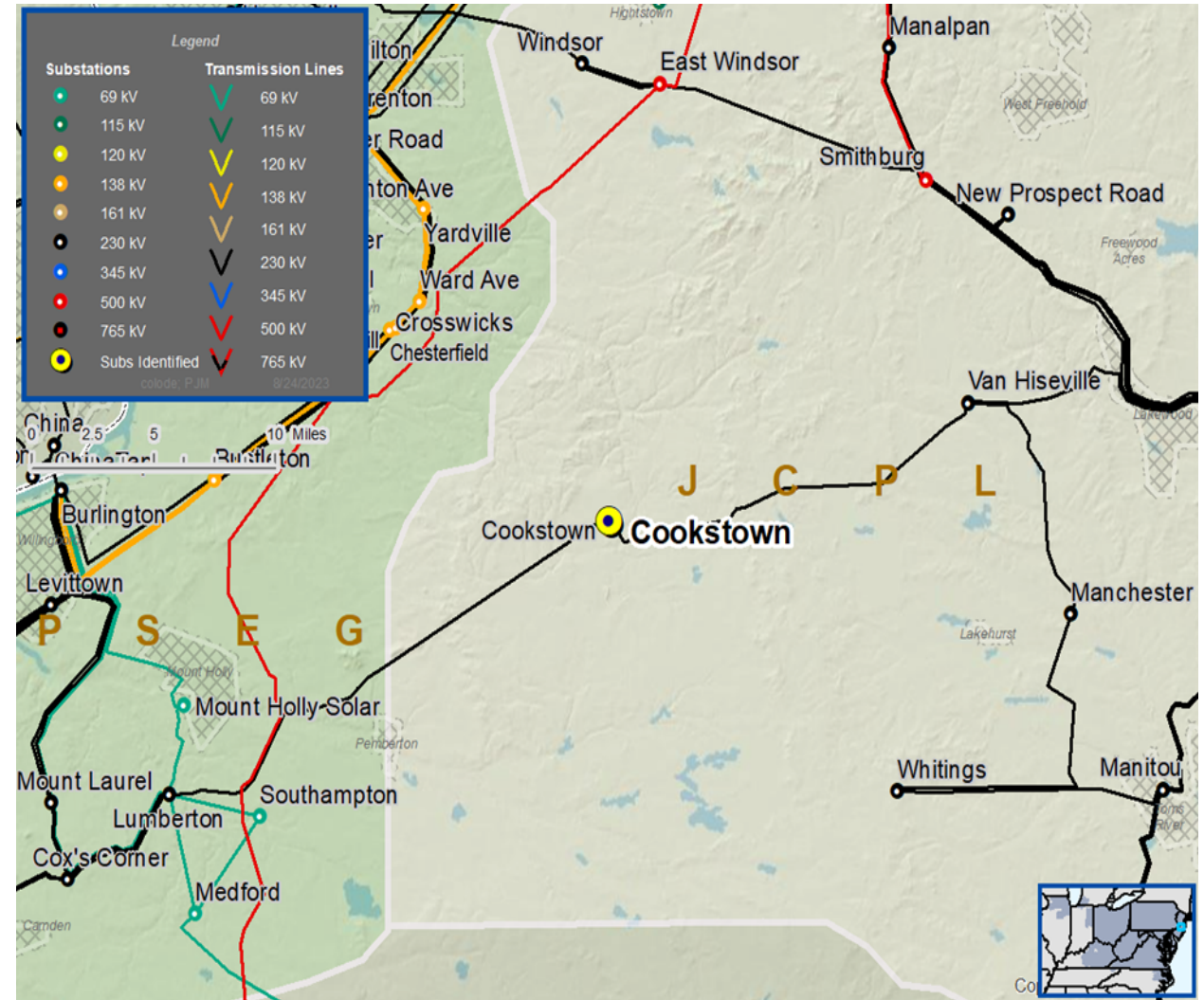
- System reliability and performance
- Reliability of Non-Bulk Electric System (Non-BES) Facilities

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The 230 – 34.5 kV No. 2 Transformer at Cookstown was installed 49 years ago and is approaching end of life.
 - Ethane gas has consistently been exhibited as elevated compared to IEEE standards.
- Existing TR Ratings:
 - 141 / 141 MVA (SN / SLTE)



Need Number: JCPL-2023-010

Process Stage: Solution Meeting 10/31/2023

Proposed Solution:

- Replace the 230-34.5 kV No. 2 Transformer at Cookstown with a 168 MVA unit.
- Upgrade transformer relaying

Transformer Ratings:

- Cookstown 230 – 34.5 kV No. 2 Transformer:
 - Before Proposed Solution: 141 / 141 MVA (SN / SE)
 - After Proposed Solution: 216 / 216 MVA (SN / SE)

Alternatives Considered:

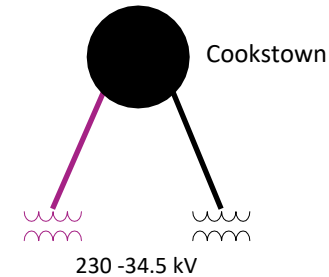
- Maintain transformer in existing condition & replace upon failure

Estimated Project Cost: \$ 7.95 M

Projected In-Service: 1/31/2024

Project Status: Construction

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(s): JCPL-2019-008, -009
Process Stage: Solution Meeting 10/31/2023
Previously Presented: Need Meeting 04/11/2019

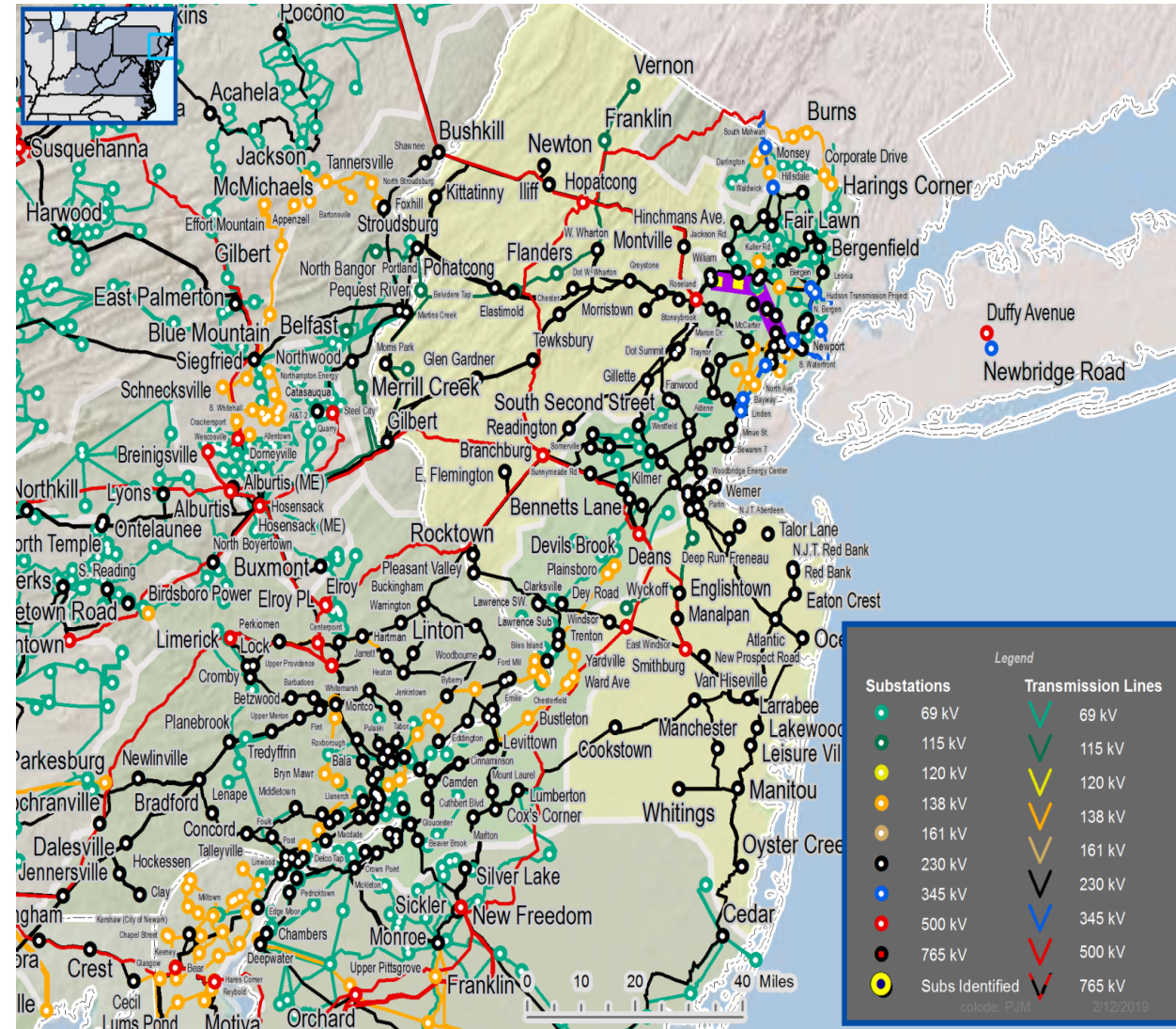
Project Driver(s):
*Equipment Material Condition, Performance and Risk
 Operational Flexibility and Efficiency*

Specific Assumption Reference(s)

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

Need Number	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)
JCPL-2019-008	Atlantic – Red Bank (S1033) 230 kV Line	678 / 780	709 / 869
JCPL-2019-009	Atlantic – Eaton Crest – Red Bank (T2020) 230 kV Line	678 / 780	709 / 869

Need Numbers: JCPL-2019-008

Process Stage: Solution Meeting 10/31/2023

Proposed Solution:

- Replace relaying and limiting substation conductor at Atlantic and Red Bank 230 kV Substations

Transmission Line Ratings:

- Atlantic – Red Bank S 1033 230 kV Line
 - Before Proposed Solution: 678 / 780 MVA (SN / SE)
 - After Proposed Solution: 709 / 869 MVA (SN / SE)

Alternatives Considered:

- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: \$ 2.0 M

Projected In-Service: 04/17/2026

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 Numbers: JCPL-2019-009

Process Stage: Solution Meeting 10/31/2023

Proposed Solution:

- Replace limiting substation conductor at Eaton Crest 230 kV
- Replace relaying at Atlantic and Red Bank 230 kV substations

Transmission Line Ratings:

- Atlantic – East Crest 230 kV
 - Before Proposed Solution: 678 / 813 MVA (SN / SE)
 - After Proposed Solution: 709 / 869 MVA (SN / SE)
- Eaton Crest – Red Bank 230 kV
 - Before Proposed Solution: 678 / 813 MVA (SN / SE)
 - After Proposed Solution: 709 / 869 MVA (SN / SE)

Alternatives Considered:

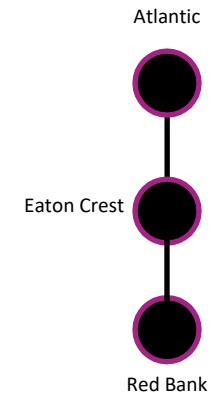
- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: \$ 2.0 M

Projected In-Service: 11/20/2026

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-2019-021

Process Stage: Solutions Meeting 10/31/2023

Previously Presented: Need Meeting 03/25/2019

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption References:

Global Factors

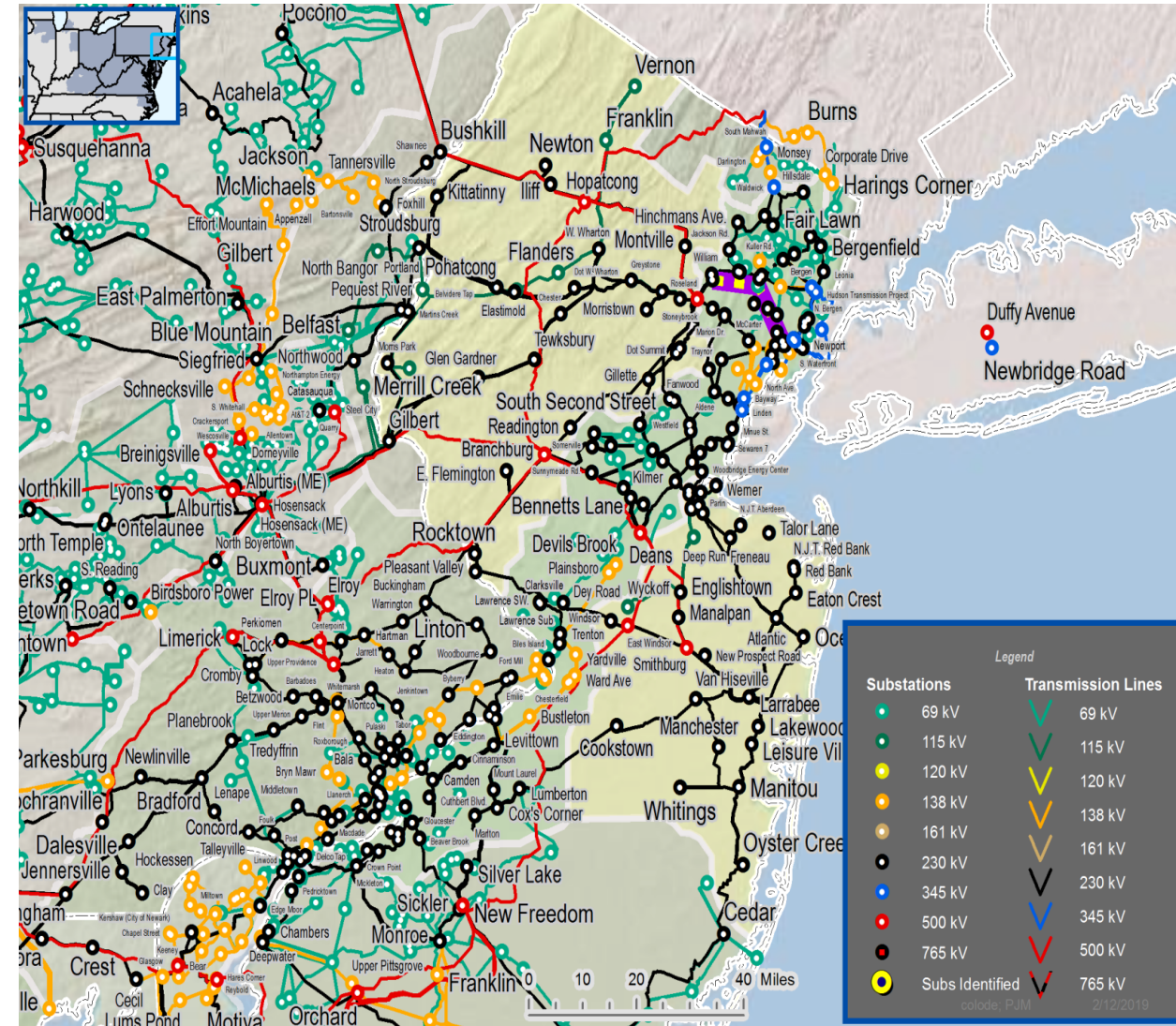
- System reliability and performance
- Substation / line equipment limits

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

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Need Number	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)
JCPL-2019-021	Chester-West Wharton 230 kV M1027 Line	650 / 817	709 / 869

Need Numbers: JCPL-2019-021

Process Stage: Solution Meeting 10/31/2023

Proposed Solution:

- Replace relaying and limiting substation conductor at Chester and West Wharton 230 kV Substations

Transmission Line Ratings:

- Chester-West Wharton H2034 230 kV Line
 - Before Proposed Solution: 650 / 817 MVA (SN / SE)
 - After Proposed Solution: 709 / 869 MVA (SN / SE)

Alternatives Considered:

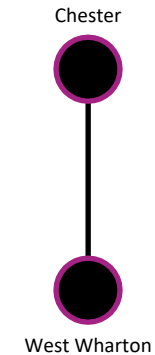
- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: \$ 2.0 M

Projected In-Service: 10/11/2024

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-2023-035

Process Stage: Solution Meeting – 10/31/2023

Previously Presented: Need Meeting –10/03/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption References:

Global Factors

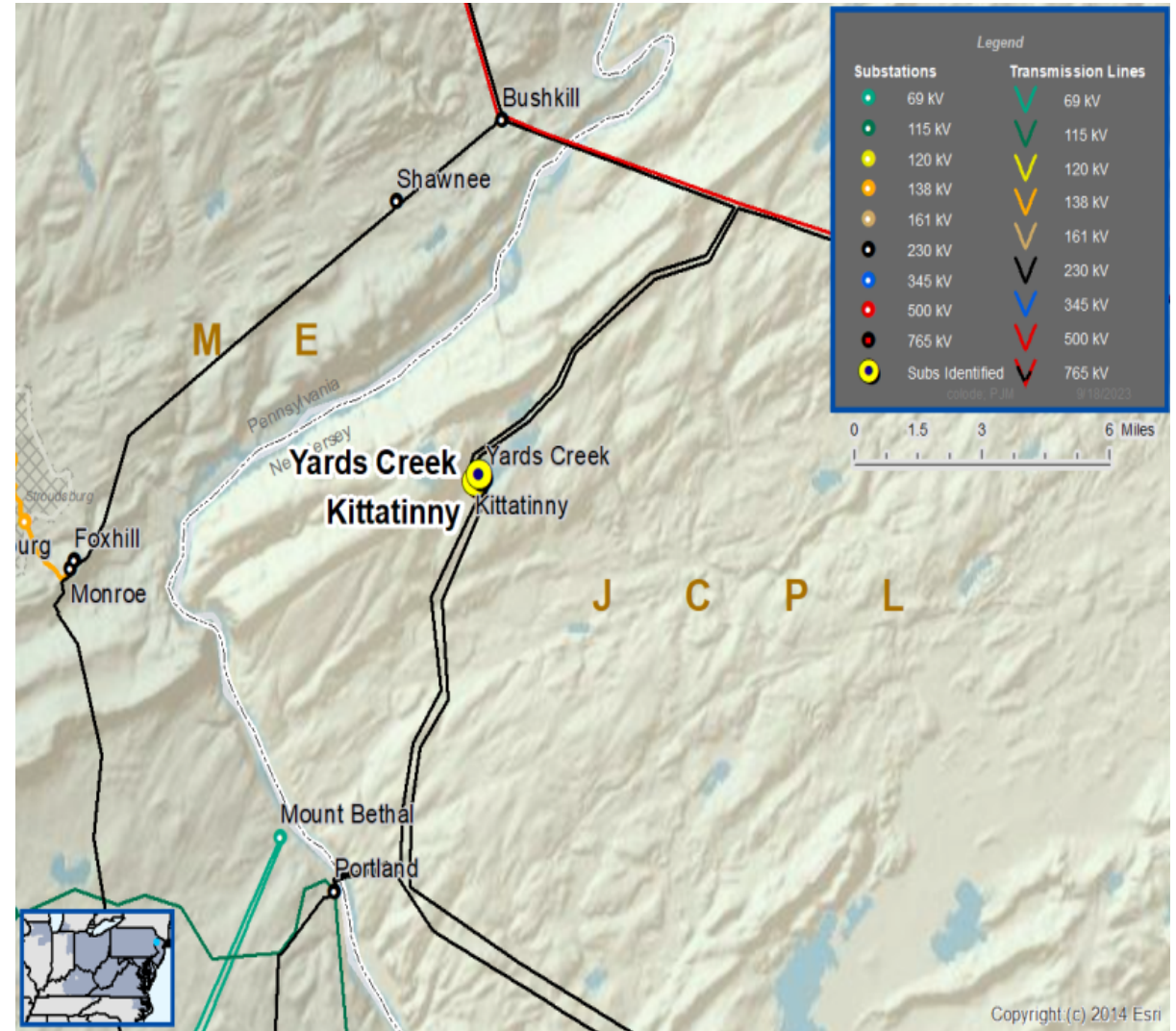
- System reliability and performance
- Substation / line equipment limits

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

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Need Number	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)
JCPL-2023-035	Kittatinny-Yards Creek 230 kV M1027 Line	648 / 648	709 / 850

Need Number: JCPL-2023-035

Process Stage: Solution Meeting 10/31/2023

Proposed Solution:

- Replace relaying, limiting substation conductor and line disconnect switches at Kittatinny substation

Transmission Line Ratings:

- Kittatinny-Yards Creek M1027 230 kV Line
 - Before Proposed Solution: 648 / 648 MVA (SN / SE)
 - After Proposed Solution: 709 / 850 MVA (SN / SE)

Alternatives Considered:

- Maintain line and vintage relay schemes in existing condition

Project Cost: \$ 1.3 M

Projected In-Service: 12/03/2022

Project Status: In Service

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

9/22/2023 - V1 – Original version posted to pjm.com