Transmission Expansion Advisory Committee FirstEnergy Supplemental Projects

April 30, 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

Penelec Transmission Zone M-3 Process
Forest – Glade 230 kV FG Line

Need Numbers: PN-2024-014

Process Stage: Need Meeting – 04/30/2024

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Global Factors

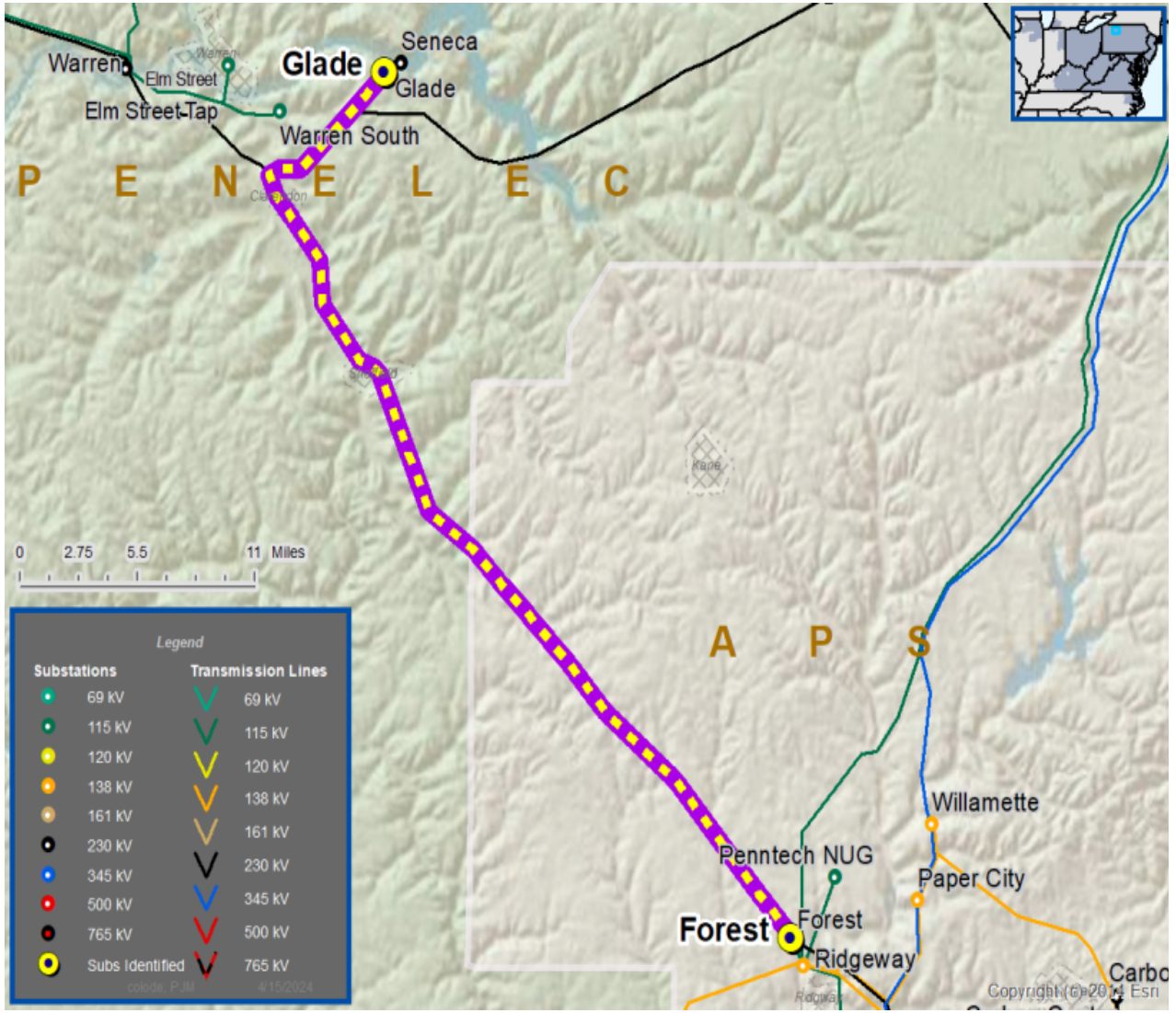
- Past system reliability/performance
- Substation/Line equipment limits

Line Condition Rebuild/Replacement

- Age/condition of wood pole transmission line structures

Problem Statement:

- The Forest – Glade 230 kV FG Line was constructed approximately 65 years ago and is approaching end of life. The line is approximately 36 miles long with 306 wood pole transmission line structures.
- Per recent inspections, the line is exhibiting deterioration. Inspection findings include cracked/deteriorated wood poles and components and sound test failure.
  - 54 structures require replacement.
  - 37 active repair conditions on structures for broken insulators and/or cracked/deteriorated wood pole components.
- Structures from structure 289 to Glade Substation (approximately two miles) were rebuilt in 2009.
- Since 2020, the line has had one unscheduled outage due to a pole failure.
- The line is currently limited by terminal equipment.
- Existing Ratings:
  - 541 / 659 / 612 / 781 MVA (SN/SE/WN/WE)



Penelec Transmission Zone M-3 Process
Elko (APS) and Shawville (Penelec) Substations

Need Number: APS-2024-037, PN-2024-015

Process Stage: Need Meeting – 04/30/2024

Project Driver:

System Performance and Operational Flexibility

Specific Assumption Reference:

System Performance Global Factors

- System reliability and performance
- Substation and line equipment limits
- Add/Expand Bus Configuration

Problem Statement:

- The existing 230 kV and 138 kV yards at Elko Substation are configured as straight buses. Elko Substation contains four 230 kV lines, three 138 kV lines, a 138 kV capacitor, and one 230/138 kV transformer. There are multiple common mode contingencies that cause outages on multiple 230 kV or 138 kV elements including a complete loss of the 230 kV or 138 kV bus at Elko Substation.
- Transmission lines served from Elko Substation are limited by terminal equipment.

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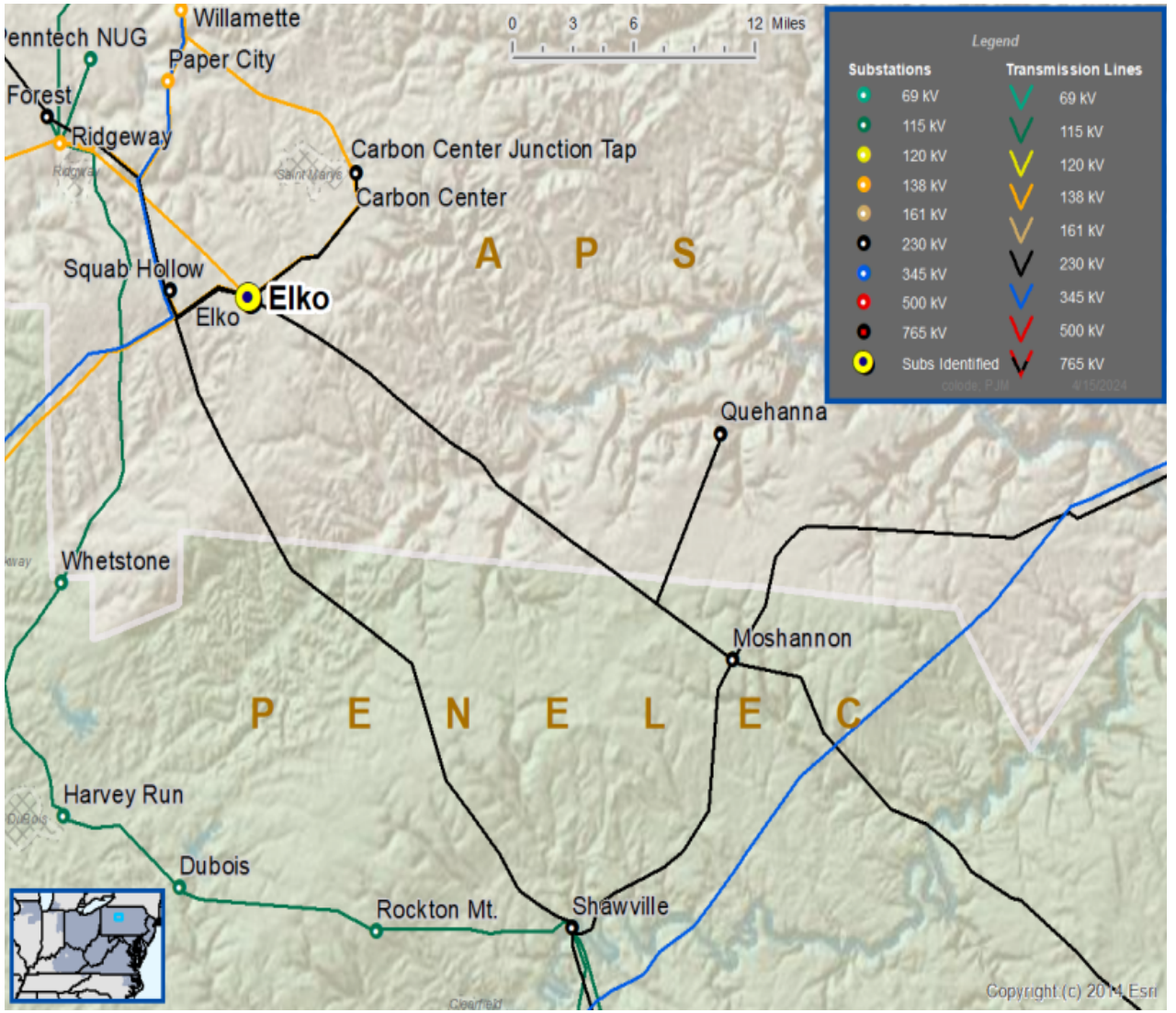


Penelec Transmission Zone M-3 Process
Elko (APS) and Shawville (Penelec) Substations

Transmission Line	Existing Line Rating MVA (SN / SE / WN / WE)	Existing Conductor Rating MVA (SN / SE / WN / WE)
Elko – Shawville 230 kV Line	442 / 582 / 619 / 725	546 / 666 / 619 / 790
Elko – Carbon Center 230 kV Line	442 / 442 / 442 / 442	617 / 754 / 699 /894
Elko – Squab Hollow 230 kV Line	512 / 612 / 619 / 700	546 / 666 / 619 / 790
Elko – Quehanna 230 kV Line	548 / 688 / 699 / 804	617 / 754 / 699 / 894
Elko – Squab Hollow 138 kV Line	294 / 350 / 349 / 401	309 / 376 / 349 / 445

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

Penelec Transmission Zone M-3 Process
Shawville Bank 1A Transformer

Need Numbers: PN-2023-030

Process Stage: Solution Meeting – 04/30/2024

Previously Presented: Need Meeting – 12/05/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

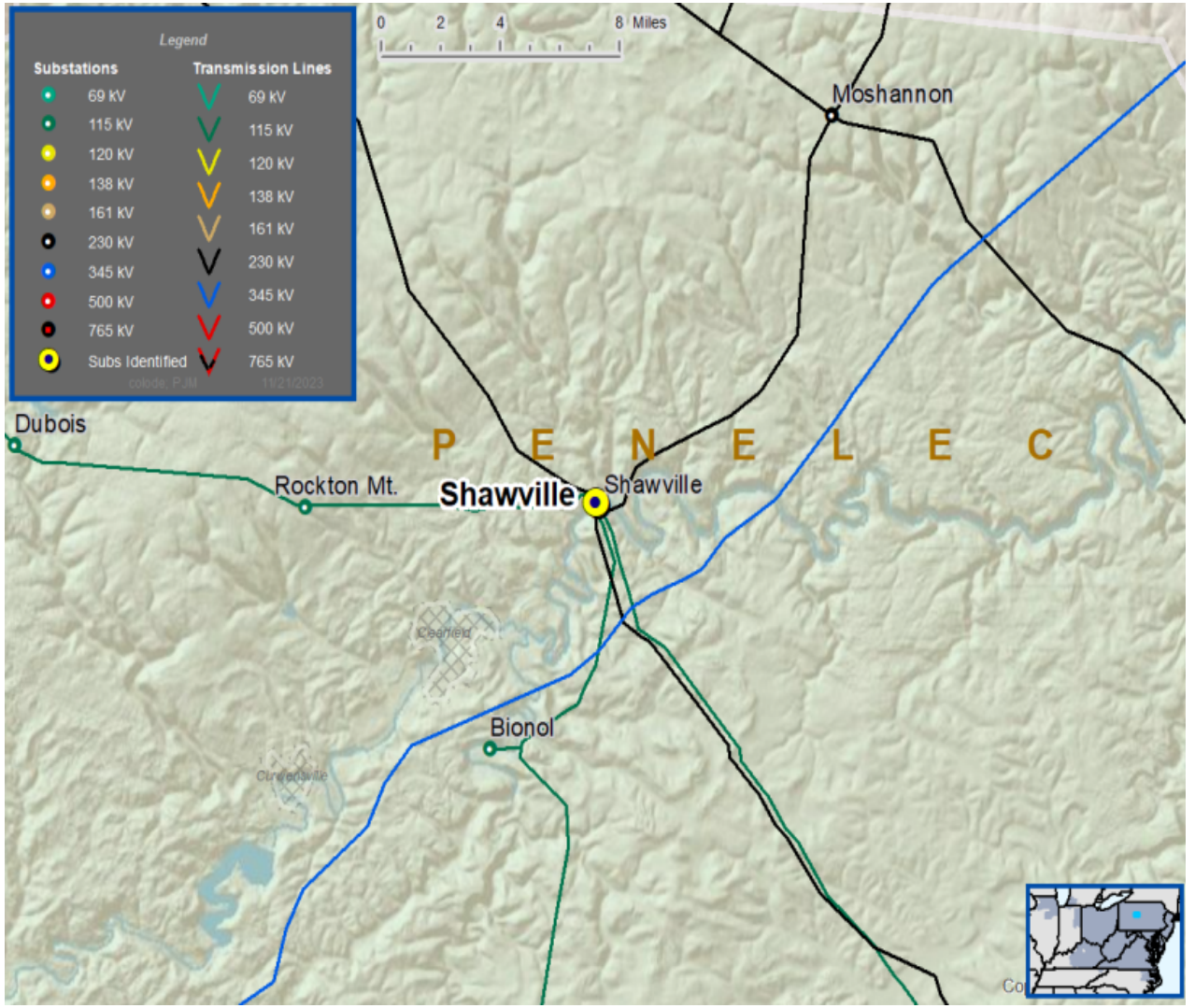
- System reliability and performance

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The Shawville 1A 230/115-17 kV Transformer is approximately 69 years old and serves as both a GSU and transmission transformer.
- The transformer has exhibited maintenance issues and has been requiring more frequent nitrogen additions due to leaks.
- Existing transformer ratings:
  - 141/186 MVA SN/SLTE
  - 181/222 MVA WN/WLTE



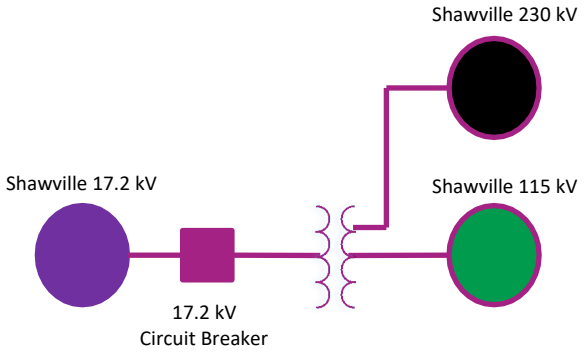
Penelec Transmission Zone M-3 Process
Shawville Bank 1A Transformer

Need Numbers: PN-2023-030

Process Stage: Solution Meeting – 04/30/2024

Proposed Solution:

- Replace the existing Shawville 1A Transformer with a three-winding, 230/115-17.2 kV, 180/240/300 MVA Transformer.
- Install a 17.2 kV circuit breaker.
- Replace disconnect switches, bus conductor, insulators, surge arresters, and the 230 kV breaker.



Ratings Upon Project Completion:

230 kV Winding:

- 222 / 222 MVA (SN/SLTE)
- 222 / 222 / 229 MVA (WN/WLTE)

115 kV Winding:

- 147 / 191 MVA (SN/SLTE)
- 211 / 237 MVA (WN/WLTE)

17.2 kV Winding:

- 119 / 119 MVA (SN/SLTE)
- 119 / 119 MVA (WN/WLTE)

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

Penelec Transmission Zone M-3 Process
Shawville Bank 1A Transformer

Need Numbers: PN-2023-030

Process Stage: Solution Meeting – 04/30/2024

Alternatives Considered:

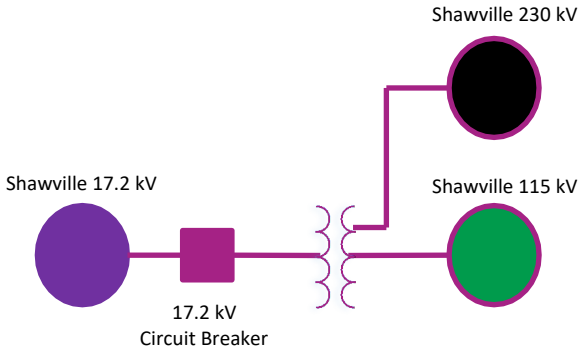
1. Replace the existing 1A Unit with FE standard 230/115 kV, 180/240/300 MVA Transformer and replace the plant's 1B GSU transformer with a larger unit.
2. Install a new FE Standard 230/115 kV, 180/240/300 MVA transformer and transfer ownership of the Transformer 1A to the Plant. Disconnect the 230 kV winding from Transformer 1A and connect the 115 kV winding in parallel with Transformer 1B.

Estimated Project Cost: $8.80M

Projected In-Service: 12/31/2025

Project Status: Engineering

Model: 2023 Series 2028 RTEP Summer 50/50



Legend	
500 kV	
345 kV	
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138 kV	
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23 kV	
17.2 kV	
New	

Penelec Transmission Zone M-3 Process
Homer City South 345/230 kV Transformer

Need Number: PN-2024-007

Process Stage: Solution Meeting – 04/30/2024

Previously Presented: Need Meeting – 02/06/2024

Project Driver:

Operational Flexibility and Efficiency

Equipment Material Condition, Performance, and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Failure risk, age and condition, obsolescence, operational or design limitations

System Performance

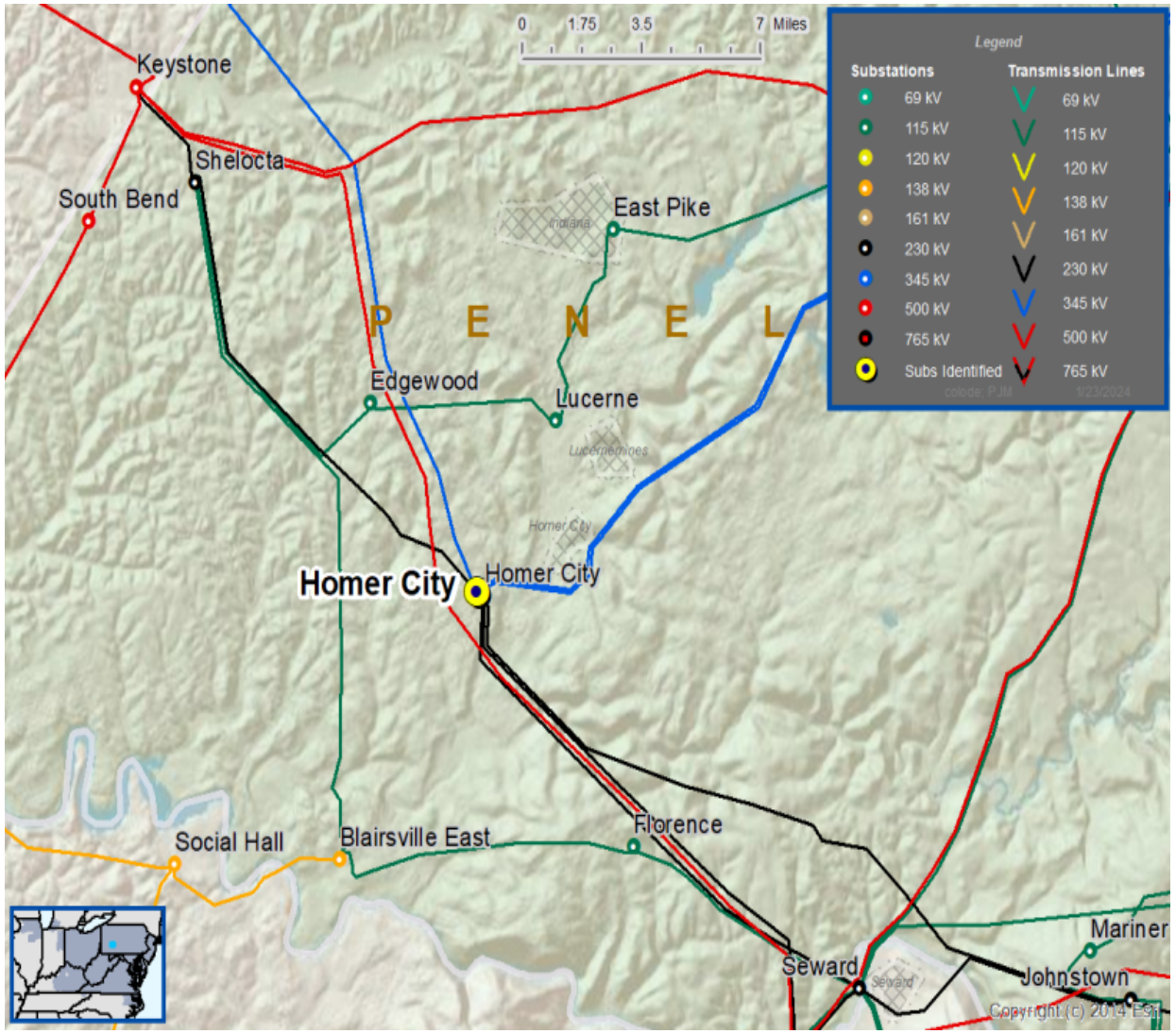
- Add / Replace Transformers

Problem Statement:

The Homer City 345/230-23 kV South Bank Transformer is 48 years old and is approaching its end of life. Transformer parts are obsolete, as the original equipment manufacturer (OEM) has discontinued support for troubleshooting and maintenance. Oil samples in recent years have indicated that the transformer is leaking. Moisture concentration has increased due to aging paper breakdown.

Transformer protection relaying is composed of obsolete, electromechanical equipment that is over 40 years old.

Existing transformer ratings: 649 / 836 / 793 / 984 MVA (SN/SLTE/WN/WLTE)



Penelec Transmission Zone M-3 Process
Homer City South 345/230 kV Transformer

Need Number: PN-2024-007

Process Stage: Solution Meeting – 04/30/2024

Proposed Solution:

Replace Homer City South 345/230-23kV Transformer

- Replace the South 345/230-23kV Transformer and associated equipment with:
  - One 345/230kV Transformer with three single-phase units
- Replace 345 kV circuit switcher, disconnects, circuit breaker, and substation conductor

Transformer Ratings:

- Before Proposed Solution: 649/836/793/984 MVA (SN/SLTE/WN/WLTE)
- After Proposed Solution: 913/1147/1201/1376 MVA (SN/SLTE/WN/WLTE)

Alternatives Considered:

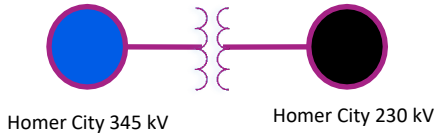
- Replace transformer with a 345/230 kV transformer and install a 230-23 kV transformer to provide station power to generation facility.
  - Not considered because Homer City generation has retired

Estimated Project Cost: $8.8M

Projected In-Service: 06/01/2027

Project Status: Engineering

Model: 2023 Series 2028 RTEP 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