Transmission Expansion Advisory Committee
FirstEnergy Supplemental Projects

August 8, 2019

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

APS/Penelec Transmission Zone M-3 Process
Multiple Misoperation Relay Projects

Need Number: PN-2019-026, PN-2019-034, APS-2019-010, and APS-2019-011

Process Stage: Solutions Meeting 8/8/2019

Previously Presented:

Need Meeting 7/11/2019

Project Driver:

Equipment Material Condition, Performance and Risk

Operational Flexibility and Efficiency

Specific Assumption Reference:

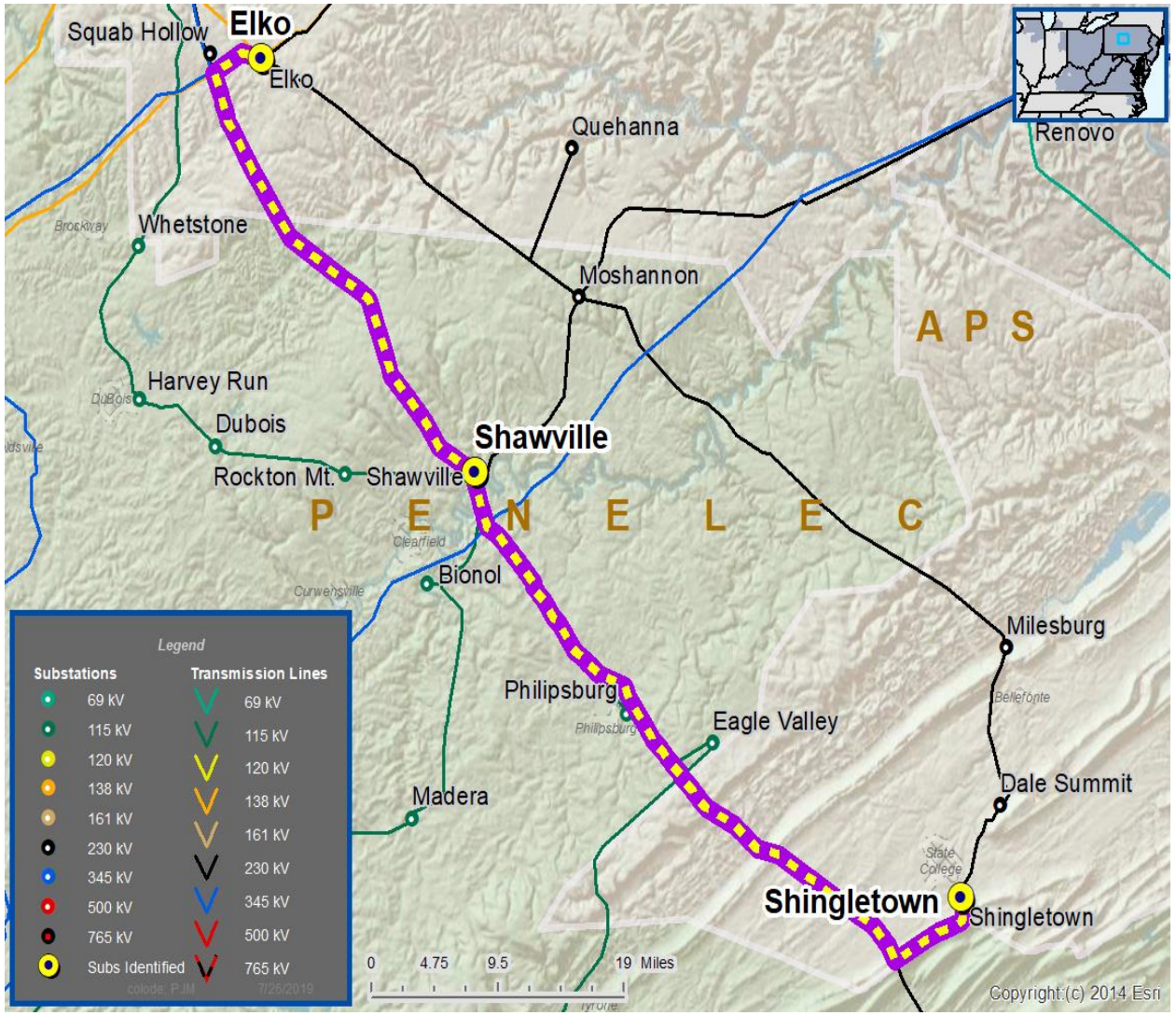
System Performance Projects Global Factors

- 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

Continued on next slide…



APS/Penelec Transmission Zone M-3 Process
Multiple Misoperation Relay Projects

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many cases the protection equipment cannot be repaired due to a lack of replacement part and available expertise in the outdated technology.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)	Limiting Terminal Equipment
PN-2019-026 APS-2019-011	Shawville – Shingletown 230 kV Line	489/554	546/666	Line Relaying, Line Trap, Substation Conductor
PN-2019-034 APS-2019-010	Elko – Shawville 230 kV Line	489/554	546/666	Line Relaying, Line Trap, Substation Conductor

APS/Penelec Transmission Zone M-3 Process
Multiple Misoperation Relay Projects

Need Number: PN-2019-026, PN-2019-034, APS-2019-010, and APS-2019-011

Process Stage: Solutions Meeting 8/8/2019

Proposed Solution:

Need Number	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimated Costs ($ M)	Projected In-Service
PN-2019-026 APS-2019-011	Shawville – Shingletown 230 kV Line	546/666	• Shawville 230 kV Substation – Replace line trap and substation conductor • Shingletown 230 kV Substation – Replace line relaying, line trap, and substation conductor	$0.9M	12/1/2020
PN-2019-034 APS-2019-010	Elko – Shawville 230 kV Line	546/666	• Elko 230 kV Substation – Replace line relaying, line trap, and substation conductor • Shawville 230 kV Substation – Replace line relaying and line trap	$1.3M	6/15/2020

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

No topology changes, no bubble diagram required.

Project Status: All projects are in the Conceptual phase.

Model: 2018 Series 2023 Summer RTEP 50/50

Penelec Transmission Zone M-3 Process
Homer City North 345/230-23 kV Transformer Replacement

Need Number: PN-2019-032

Process State: Solutions Meeting 8/8/2019

Previously Presented:

Need Meeting 7/11/2019

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

Substation Condition Rebuild/Replacement

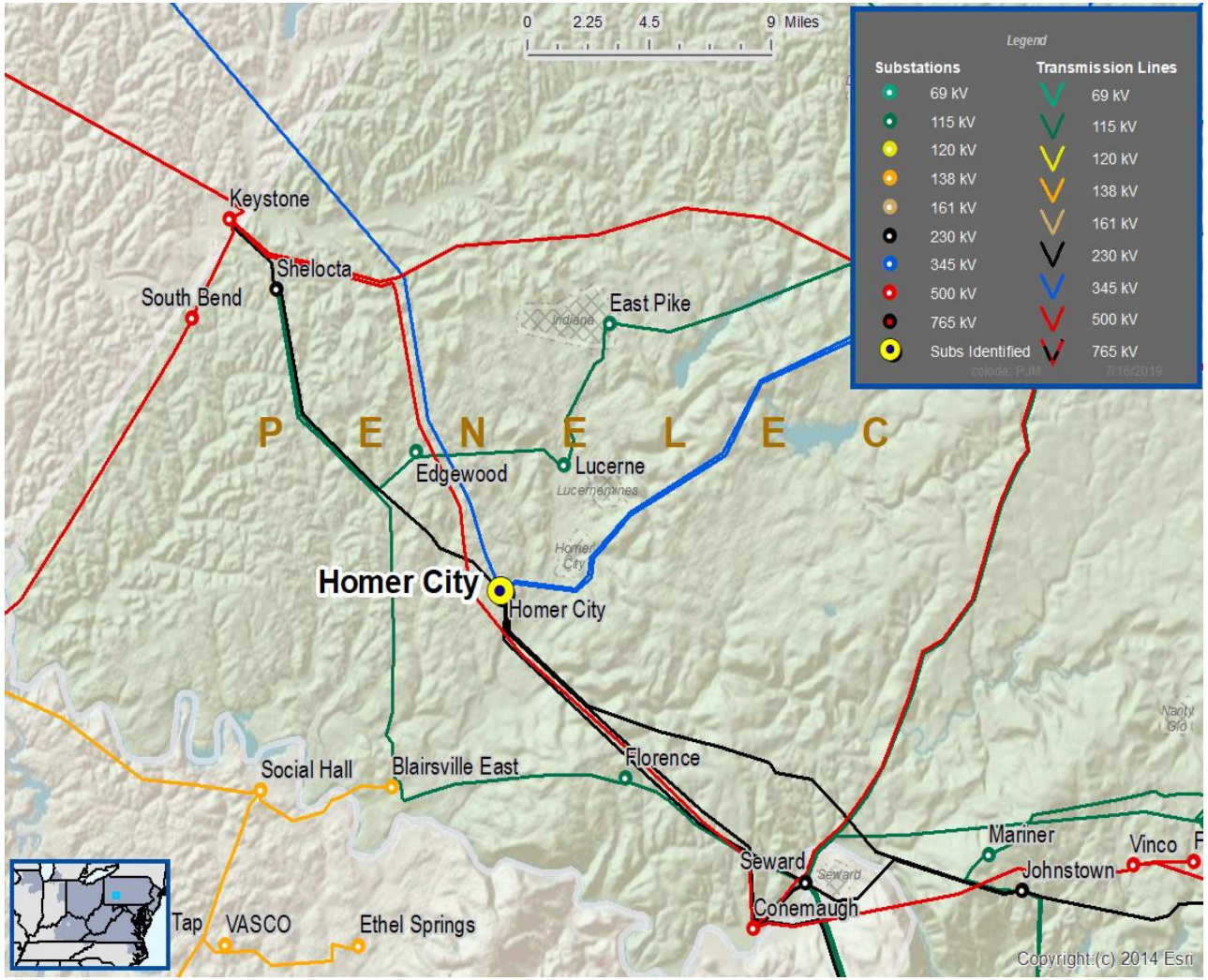
- Power transformers and load tap changers (LTCs)
- Station system protection and controls

Problem Statement:

Homer City North 345/230-23 kV Transformer

- Transformer has increased failure probability due to:
  - Type “U” bushings
  - High level heating gases and moisture
  - Deteriorated control cabinet components
  - Obsolete parts
  - Leaks
- Transformer is 51 years old.

Transformer circuit rating is the existing transformer rating of 653/697 MVA (SN/SE).



Homer City North 345/230-23 kV Transformer Replacement

Need Number: PN-2019-032

Process Stage: Solutions Meeting 8/8/2019

Proposed Solution:

Replace Homer City North 345/230-23 kV Transformer

- Replace the North 345/230-23 kV transformer and associated equipment with 345/230-23 kV 336/448/560 MVA transformer

Estimated Cost: $6.6M

Transformer Rating:

Homer City North 345/230-23 kV Transformer

- Before Proposed Solution: 653/817 MVA (SN/SE)
- After Proposed Solution: 691/854 MVA (SN/SE)

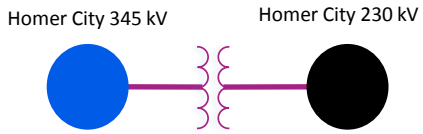
Alternatives Considered:

1. Maintain existing condition and elevated risk of failure

Projected In-Service: 12/31/2021

Project Status: Conceptual

Model: 2018 Series 2023 Summer RTEP 50/50



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

Penelec Transmission Zone M-3 Process
Armstrong – Homer City 345 kV Line Rebuild

Need Number: PN-2019-033

Process State: Solutions Meeting 8/8/2019

Previously Presented:

Need Meeting 7/11/2019

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

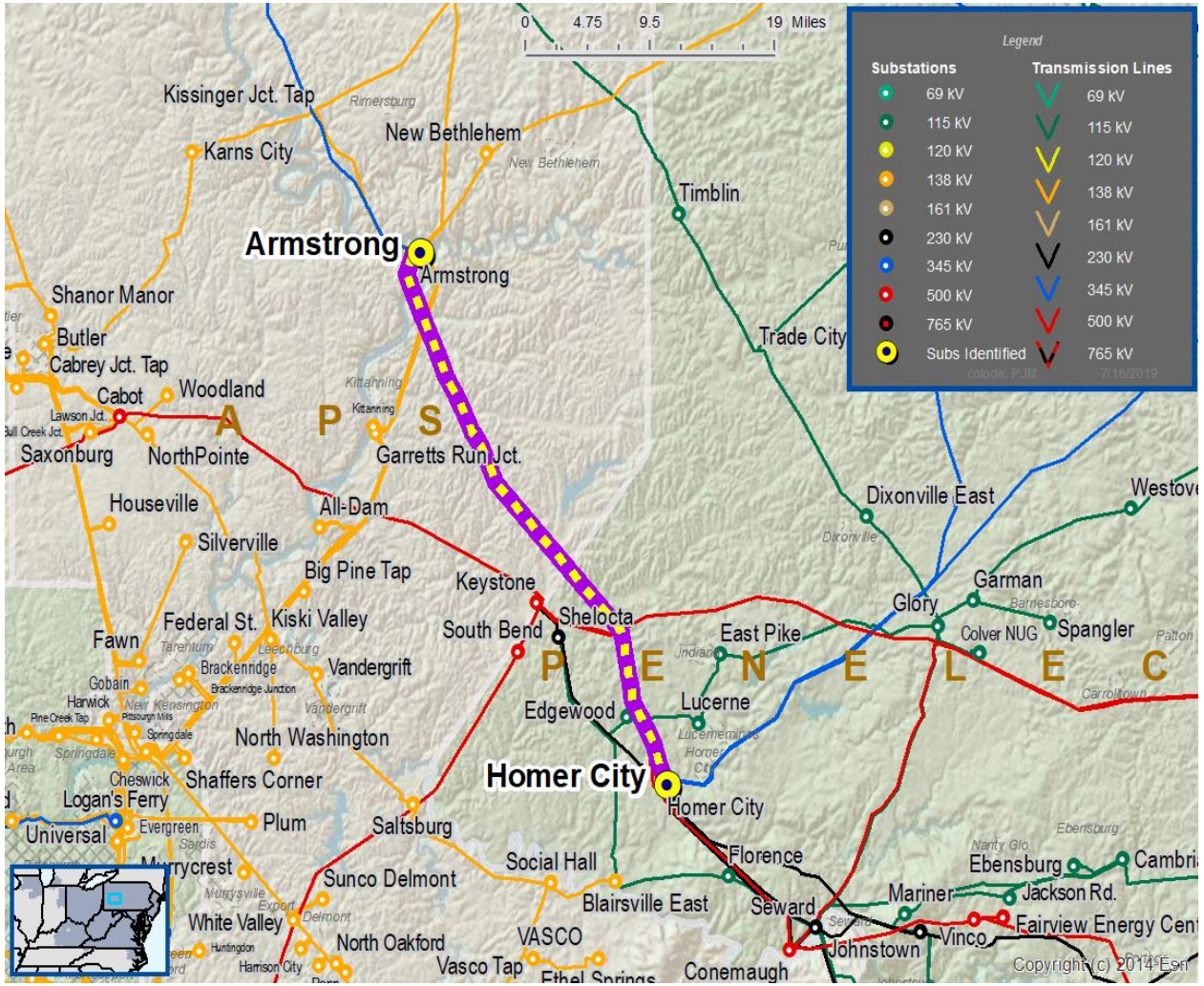
Line Condition Rebuild/Replacement

- Age/condition of wood pole transmission line structures

Problem Statement:

The Armstrong – Homer City 345 kV line is exhibiting deterioration resulting in increased maintenance. The structures are approaching end of life. The line was originally constructed in 1967.

- Total line distance is approximately 34.5 miles
- 167 out of 204 structures failed inspection (82% failure rate)
- Failure reasons include age, woodpecker damage, top rot, bayonet top, and weatherization.



Penelec Transmission Zone M-3 Process
Armstrong – Homer City 345 kV Line Rebuild

Need Number: PN-2019-033

Process Stage: Solutions Meeting 8/8/2019

Proposed Solution:

Armstrong – Homer City 345 kV Line Rebuild

- Rebuild and reconductor approximately 33.0 miles of wood pole construction

Estimated Cost: $138M

Transmission Line Rating:

Armstrong – Homer City 345 kV Line

- Before Proposed Solution: 1269/1566 MVA (SN/SE)
- After Proposed Solution: 1269/1566 MVA (SN/SE)

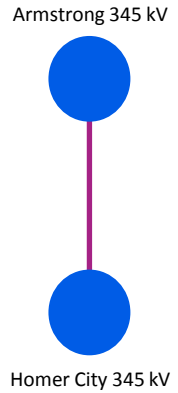
Alternatives Considered:

1. Maintain existing condition with elevated risk of failure

Projected In-Service: 12/31/2023

Project Status: Conceptual

Model: 2018 Series 2023 Summer RTEP 50/50



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500 kV	
345 kV	
230 kV	
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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

7/29/2019 – V1 – Original version posted to pjm.com