Transmission Expansion Advisory Committee FirstEnergy Supplemental Projects

September 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

APS Transmission Zones M-3 Process
Bedington Substation

Need Number: APS-2023-028

Process State: Need Meeting – 09/05/2023

Supplemental Project Driver(s):

Performance and Risk, Operational Flexibility and Efficiency

Specific Assumption Reference:

System Performance Projects Global Factors

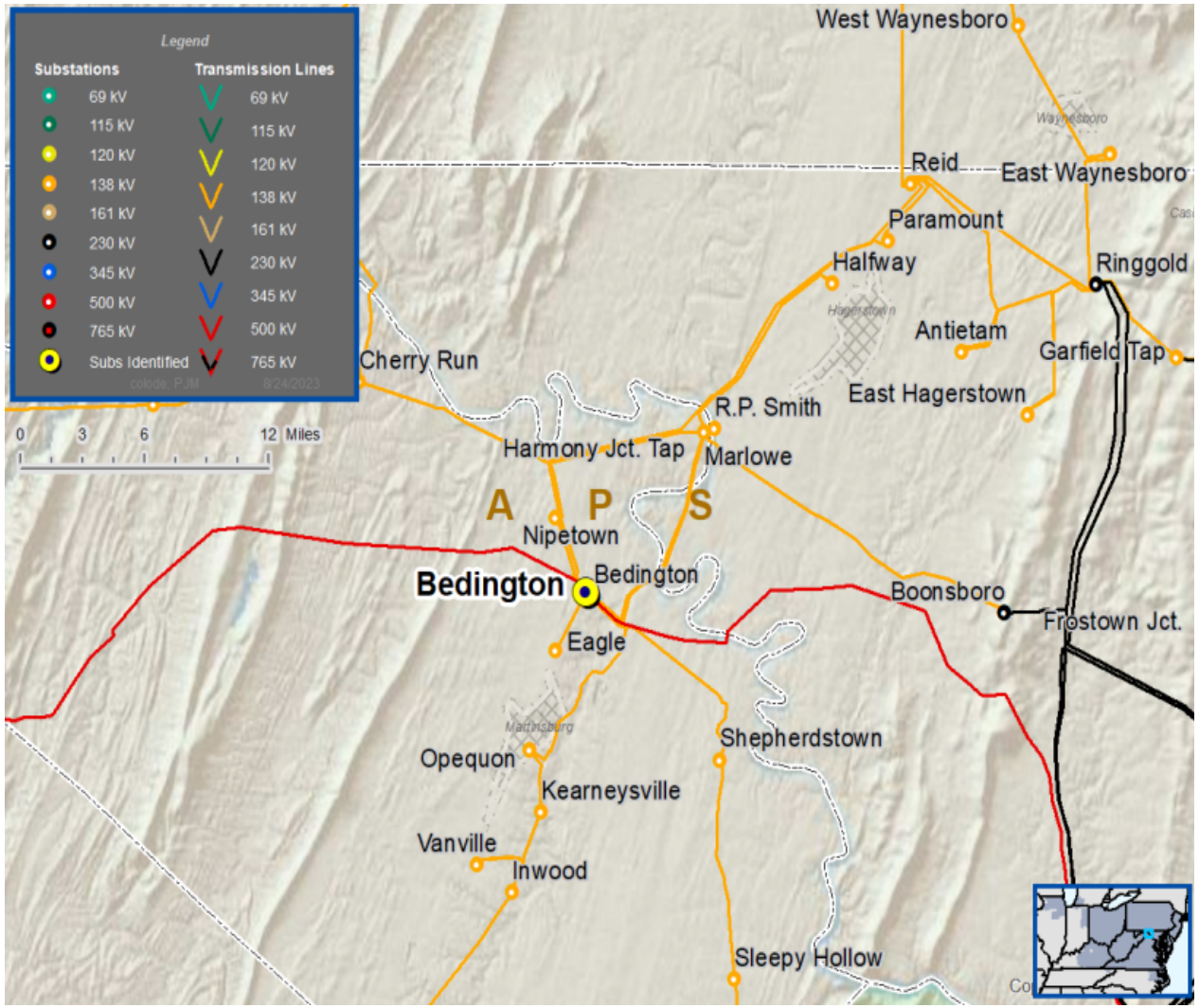
- System reliability and performance

Add/Replace Transformers

Past System Reliability/Performance

Problem Statement:

- The 500/138 kV No. 1 Transformer at Bedington was manufactured 47 years ago and is approaching end of life.
  - 500 kV and 138 kV protective devices are ~50 years old which produces reliability and safety concerns.
- The transformer exhibits multiple maintenance issues including:
  - Elevated methane and ethane gas levels compared with IEEE Standards
  - Equipment degradation and obsolete replacement parts
  - Oil leaks
- Existing TR Ratings:
  - 485 / 619 MVA (SN / SSTE)



APS Transmission Zone M-3 Process
Doubs – Lime Kiln 230 kV #231 Line New Customer

Need Number: APS-2023-031

Process Stage: Need Meeting – 09/05/2023

Supplemental Project Driver(s):
Customer Service

Specific Assumption Reference(s):

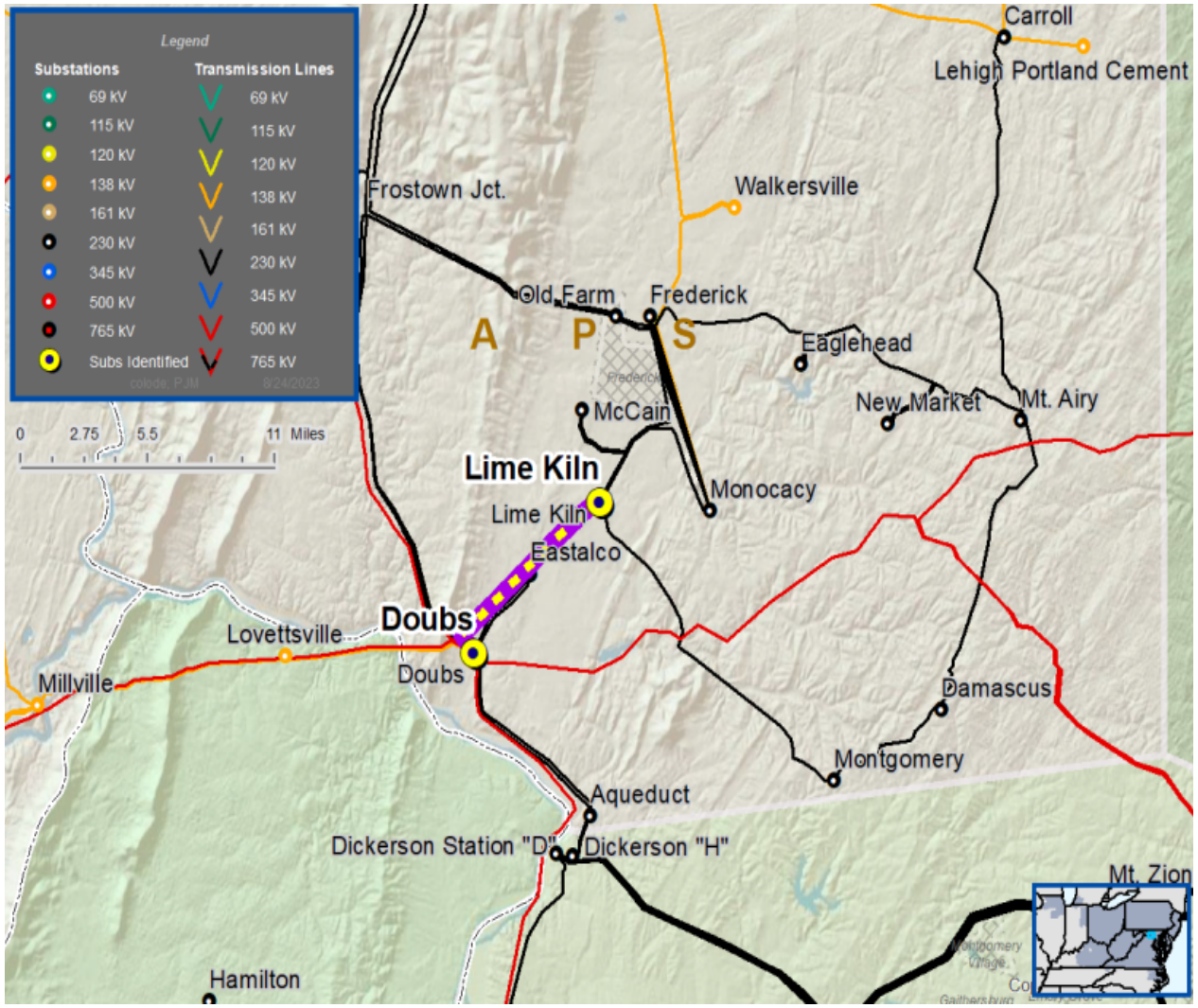
New customer connection request will be evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement

New Customer Connection – Customer requested 230 kV transmission service for approximately 360 MW of total load near the Doubs – Lime Kiln 230 kV 231 Line.

Requested In-Service Date:

December 31, 2025



APS Transmission Zones M-3 Process
Carroll – Mount Airy 230 kV Misoperation Relays

Need Numbers: APS-2023-034

Process State: Need Meeting – 09/05/2023

Supplemental Project Driver(s):

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

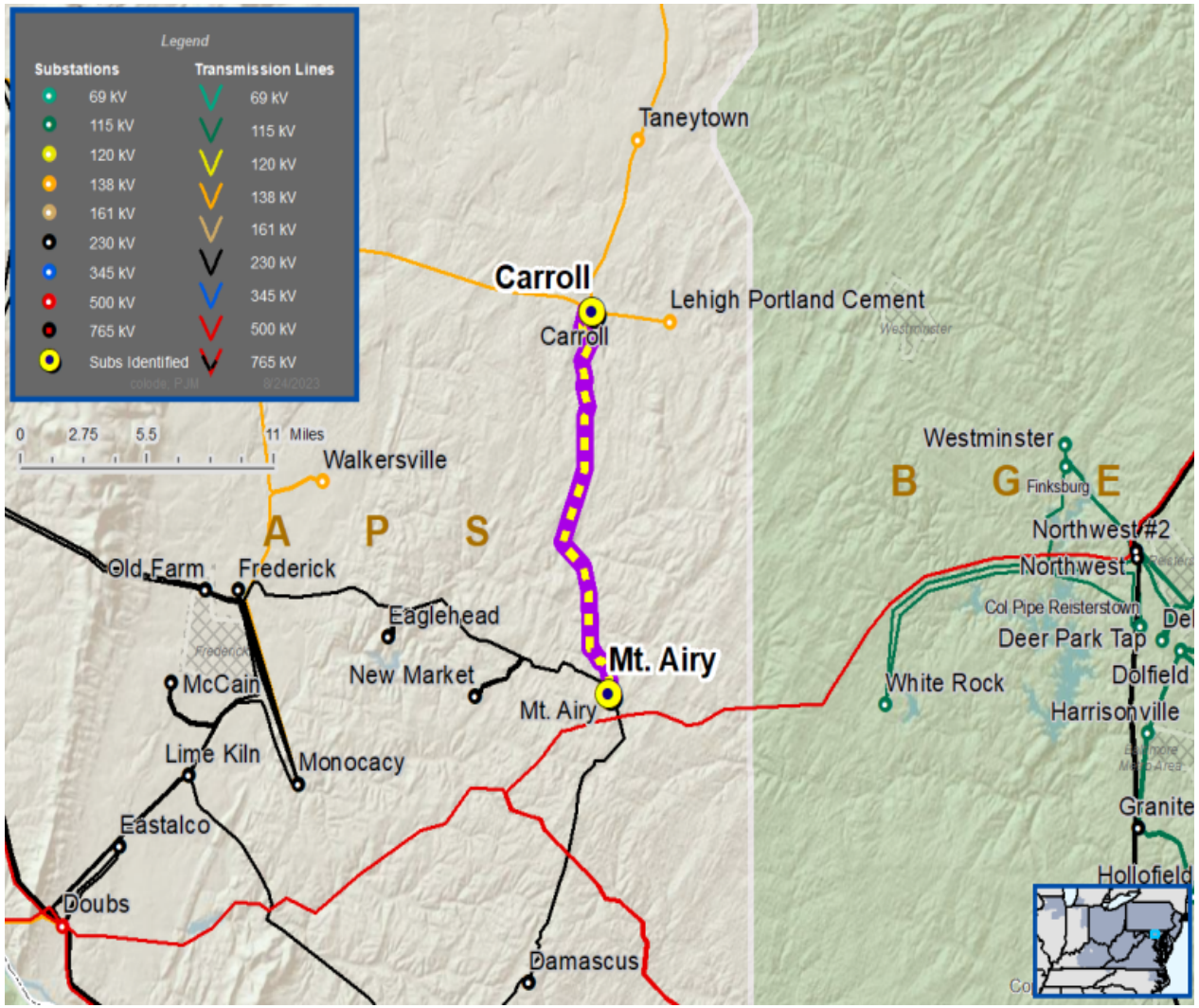
- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

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

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.



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APS Transmission Zones M-3 Process
Carroll – Mount Airy 230 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-034	Carroll – Mount Airy 230 kV	251/343	617/754	

APS Transmission Zones M-3 Process
Meadow Brook Substation

Need Numbers: APS-2023-037

Process State: Need Meeting 09/05/2023

Project Driver:

Performance and Risk, Operational Flexibility and Efficiency

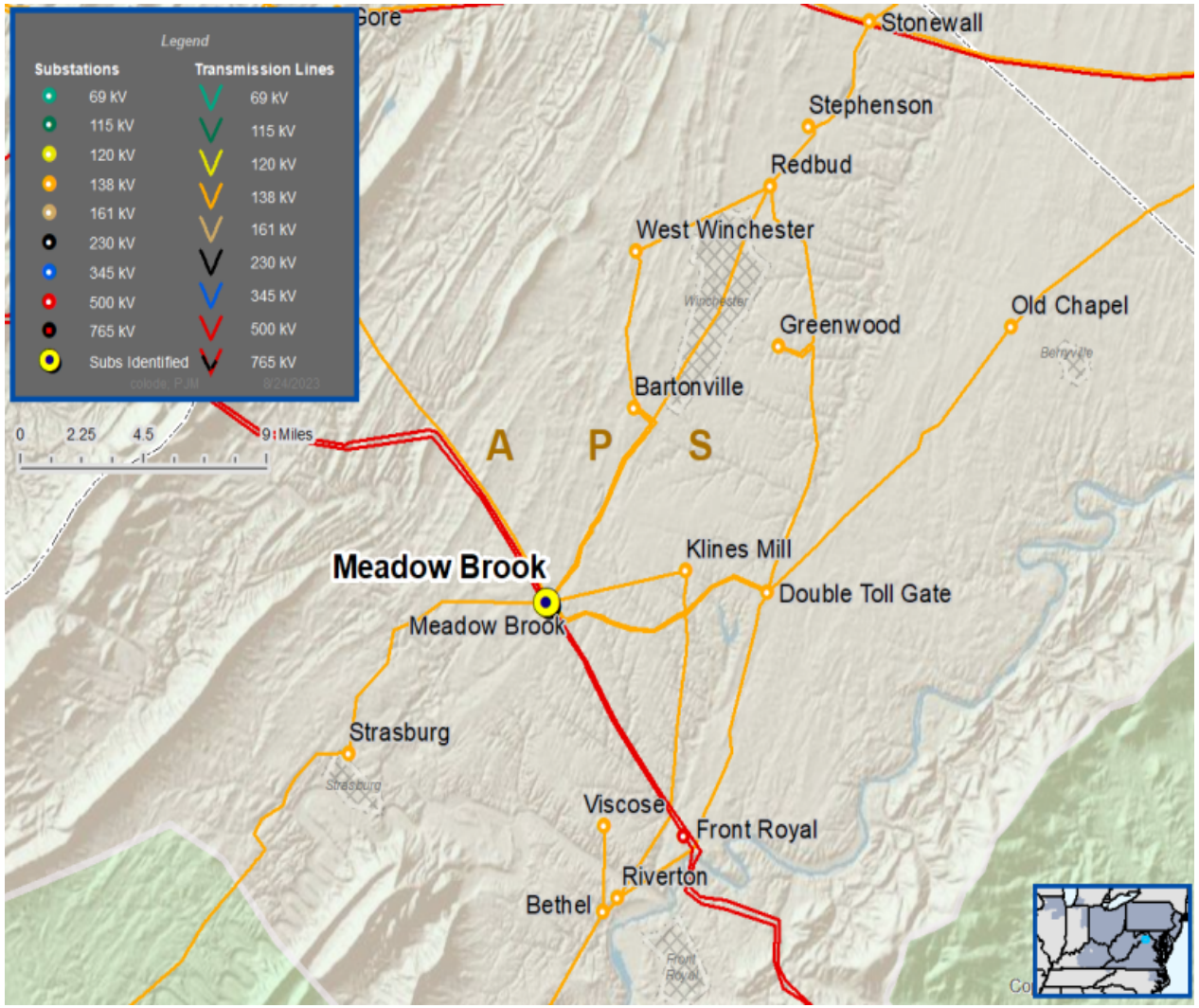
Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits
- Upgrade Relay Schemes

Problem Statement:

- The protective equipment on the Meadow Brook No. 1 500/138 kV and Meadow Brook No. 4 500/138 kV transformers are electro-mechanical and vintage.
  - The protective equipment cannot be easily repaired due to a lack of replacement parts and available expertise in the outdated technology.
- FirstEnergy has identified operational constraints when a single breaker is out of service for maintenance.
- The Meadow Brook No. 1 500/138 kV transformer is limited by terminal equipment:
  - Normal Ratings: 470/567/579/612 MVA (SN/SSTE/WN/WSTE)
  - Single Breaker Outage: 306/306/306/306 MVA (SN/SSTE/WN/WSTE)
- The Meadow Brook No. 4 500/138 kV transformer is limited by terminal equipment:
  - Normal Ratings: 461/567/539/553 MVA (SN/SSTE/WN/WSTE)
  - Single Breaker Outage: 306/306/306/306 MVA (SN/SSTE/WN/WSTE)



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 Transmission Zones M-3 Process
Damascus – Mount Airy 230 kV Misoperation Relays

Need Numbers: APS-2023-026

Process State: Solution Meeting 09/05/2023

Previously Presented: Need Meeting 07/11/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

System Performance Projects Global Factors

- System reliability and performance
- Substation/line equipment limits

System Condition Projects

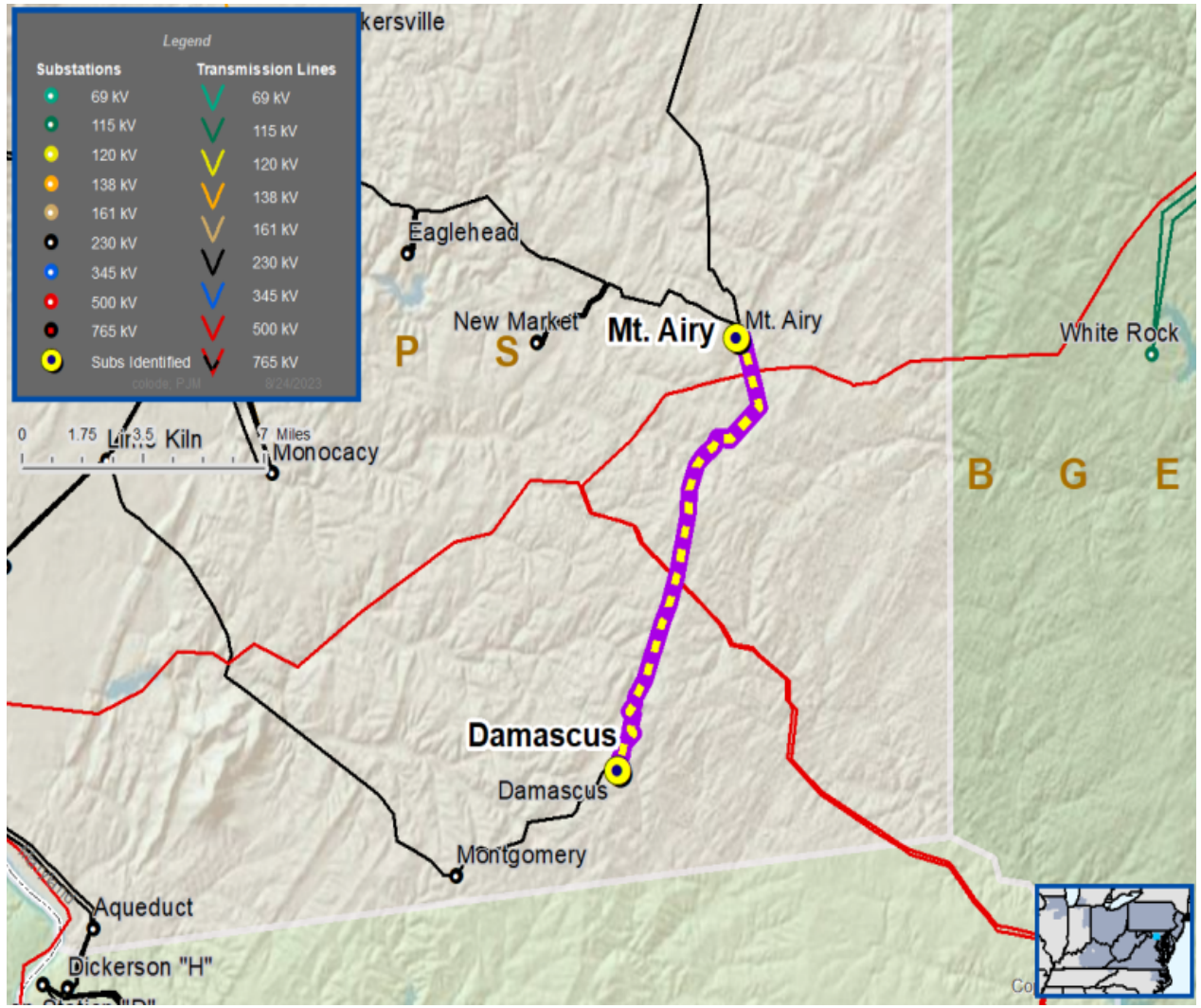
- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

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

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.



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APS Transmission Zones M-3 Process
Damascus – Mount Airy 230 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-026	Damascus – Mount Airy 230 kV	478/523	617/754	

APS Transmission Zones M-3 Process
Damascus – Mount Airy 230 kV Misoperation Relays

Need Numbers: APS-2023-026

Process Stage: Solution Meeting 09/05/2023

Proposed Solution:

- Replace circuit switcher and limiting substation conductor at Damascus
- Replace wave trap, disconnect switches, and limiting substation conductor at Mount Airy

Transmission Line Ratings:

- Damascus – Mount Airy 230 kV Line
  - Before Proposed Solution: 478 / 523 MVA (SN / SE)
  - After Proposed Solution: 617 / 754 MVA (SN / SE)

Alternatives Considered:

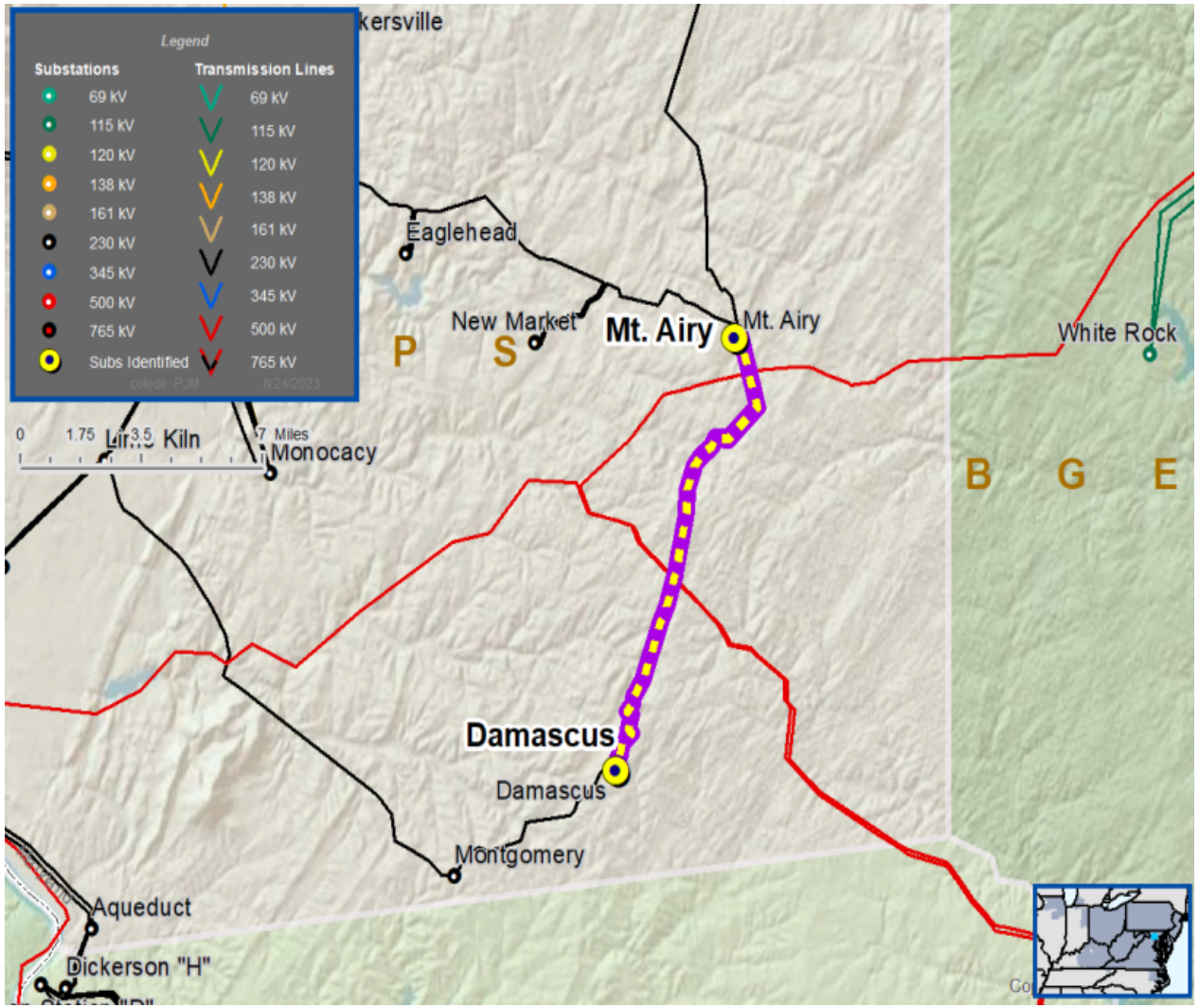
- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: $ 2.2 M

Projected In-Service: 12/22/2023

Project Status: Engineering

Model: 2022 RTEP model for 2027 Summer (50/50)



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

08/25/2023 - V1 – Original version posted to pjm.com
08/25/2023 – V2 – Updated final ratings for APS-2023-026