

Transmission Expansion Advisory Committee FirstEnergy Supplemental Projects

January 9, 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 Numbers: APS-2024-001 through -004

Process Stage: Need Meeting 01/09/2024

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

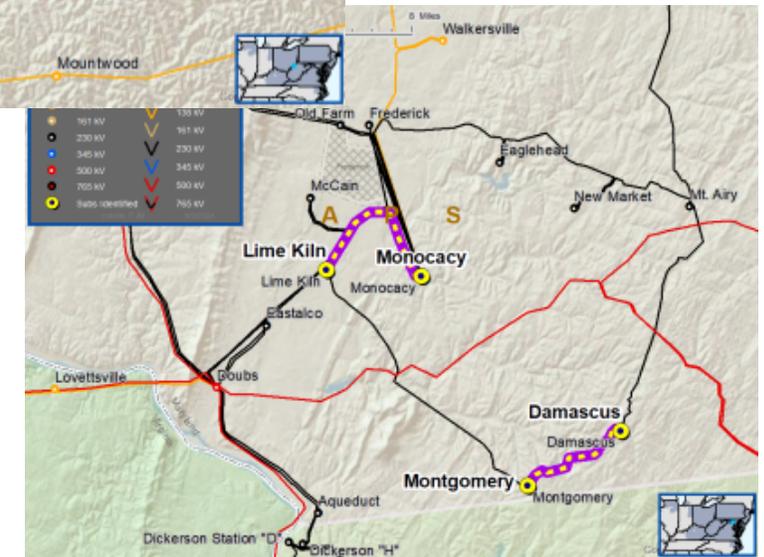
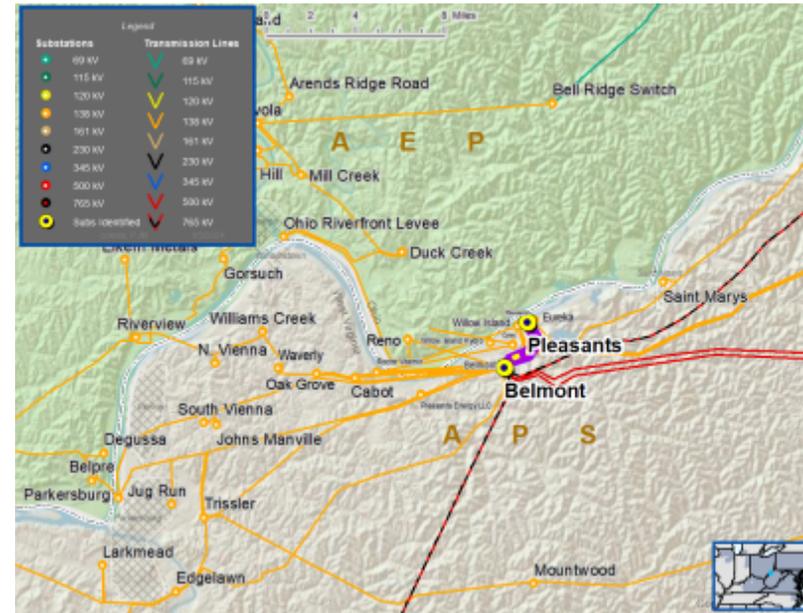
Upgrade Relay Schemes

- 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cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.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 Zone M-3 Process Misoperation Relay Projects

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE / WN / WE)	Existing Conductor Rating (SN / SE / WN / WE)
APS-2024-001	Damascus – Montgomery 230 kV	478 / 523 / 542 / 571	617 / 754 / 699 / 894
APS-2024-002	Lime Kiln – Monocacy 230 kV	548 / 688 / 699 / 804	617 / 754 / 699 / 894
APS-2024-003	Belmont – Pleasants Unit 1 500 kV	1986 / 2492 / 2611 / 2991	3573 / 4379 / 4050 / 5194
APS-2024-004	Belmont – Pleasants Unit 2 500 kV	1986 / 2492 / 2611 / 2991	3573 / 4379 / 4050 / 5194

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 Numbers: APS-2023-034

Process Stage: Solution Meeting 01/09/2024

Previously Presented: Need Meeting 09/05/2023

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

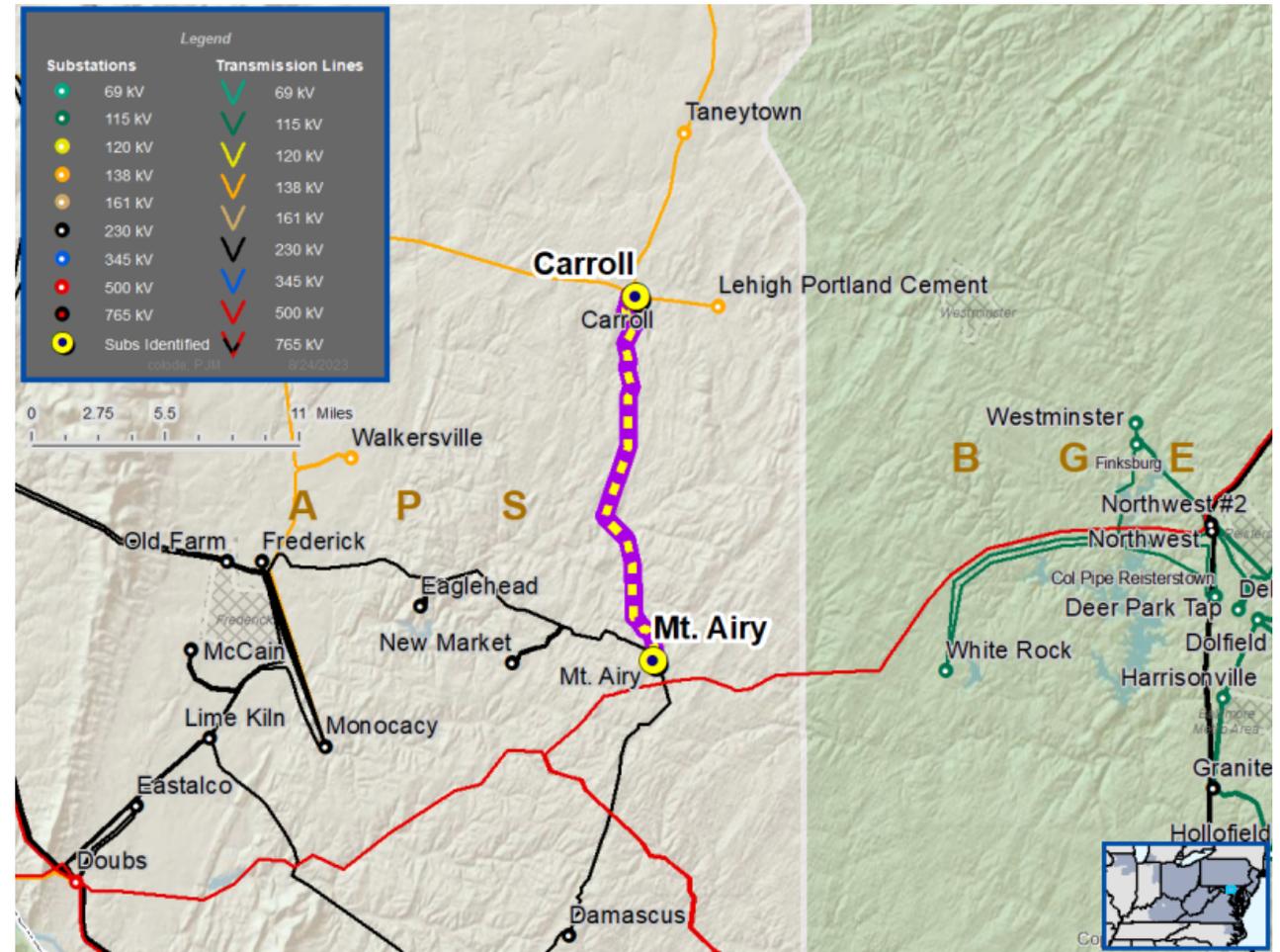
Upgrade Relay Schemes

- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
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Problem Statement:

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APS Transmission Zone 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)
APS-2023-034	Carroll – Mount Airy 230 kV	251/343	617/754

Need Numbers: APS-2023-063

Process Stage: Solution Meeting 01/09/2024

Previously Presented: Need Meeting 10/31/2023

Project Driver:

- Performance and Risk
- Operational Flexibility and Efficiency

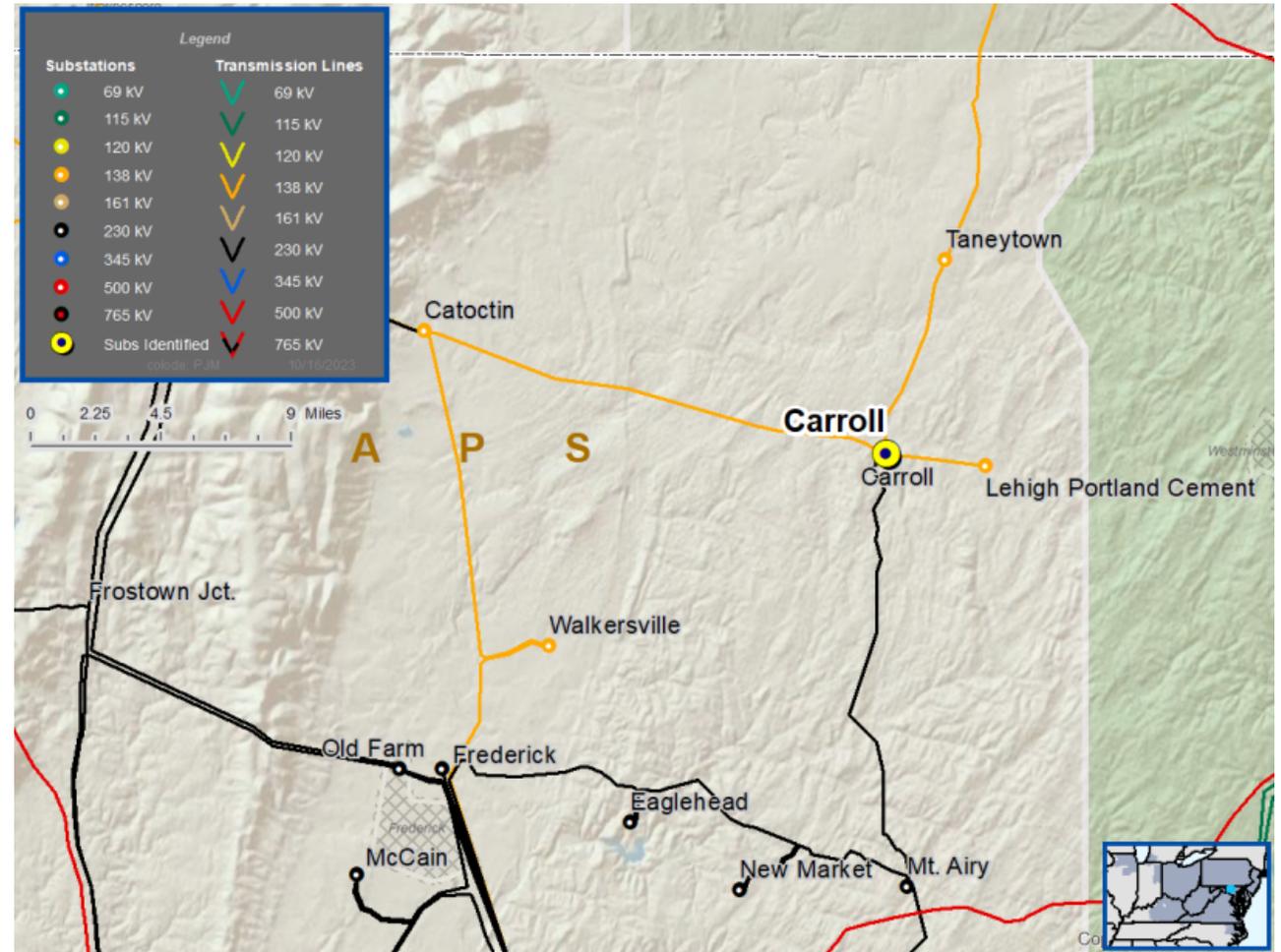
Specific Assumption Reference:

System Performance Projects Global Factors

- System Reliability and Performance
- Substation/line equipment limits
- Upgrade Relay Schemes

Problem Statement:

- The 230/138 kV No. 4 Transformer at Carroll was manufactured over 50 years ago and is approaching end of life.
 - The dielectric is below the acceptable norm of 50 kV.
- The transformer exhibits multiple maintenance issues including:
 - Elevated methane and ethane gas levels compared with IEEE Standards
 - Equipment degradation and obsolete replacement parts.
- Existing TR Ratings:
 - 251/343 MVA (SN/SE)



Need Number: APS-2023-034 and APS-2023-063

Process Stage: Solution Meeting 01/09/2024

Proposed Solution:

- At Carroll Substation:
 - Replace 200 MVA 230/138 kV Transformer No. 4 with a new 224 MVA 230/138 kV transformer
 - Replace limiting transformer conductor
 - Replace line tuner and coax, wave trap, circuit breaker, disconnect switch, and relaying
- At Mt. Airy Substation :
 - Replace line tuner and coax, wave trap, circuit breaker, disconnect switch, and relaying

Anticipated Transformer Circuit and Transmission Line Ratings:

- 230/138 kV Transformer No. 4 and Carroll – Mount Airy 230 kV Line :
 - Before Proposed Solution: 251 / 343 / 302 / 370 MVA (SN / SE / WN / WE)
 - After Proposed Solution: 281 / 384 / 338 / 414 MVA (SN / SE / WN / WE)

Alternatives Considered:

- Maintain transformer in existing condition with elevated risk of failure.
- Maintain line and vintage relay schemes in existing condition with elevated risk of misoperation.

Estimated Project Cost: \$8.6M

Projected In-Service: 12/31/2026

Project Status: Engineering

Model: 2023 RTEP model for 2028 Summer (50/50)

Carroll 138 kV



Carroll 230 kV



Mt. Airy 230 kV

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

Need Numbers: APS-2023-056

Process Stage: Solution Meeting 01/09/2024

Previously Presented: Need Meeting 10/31/2023

Project Driver:

Equipment Material Condition, Performance and Risk

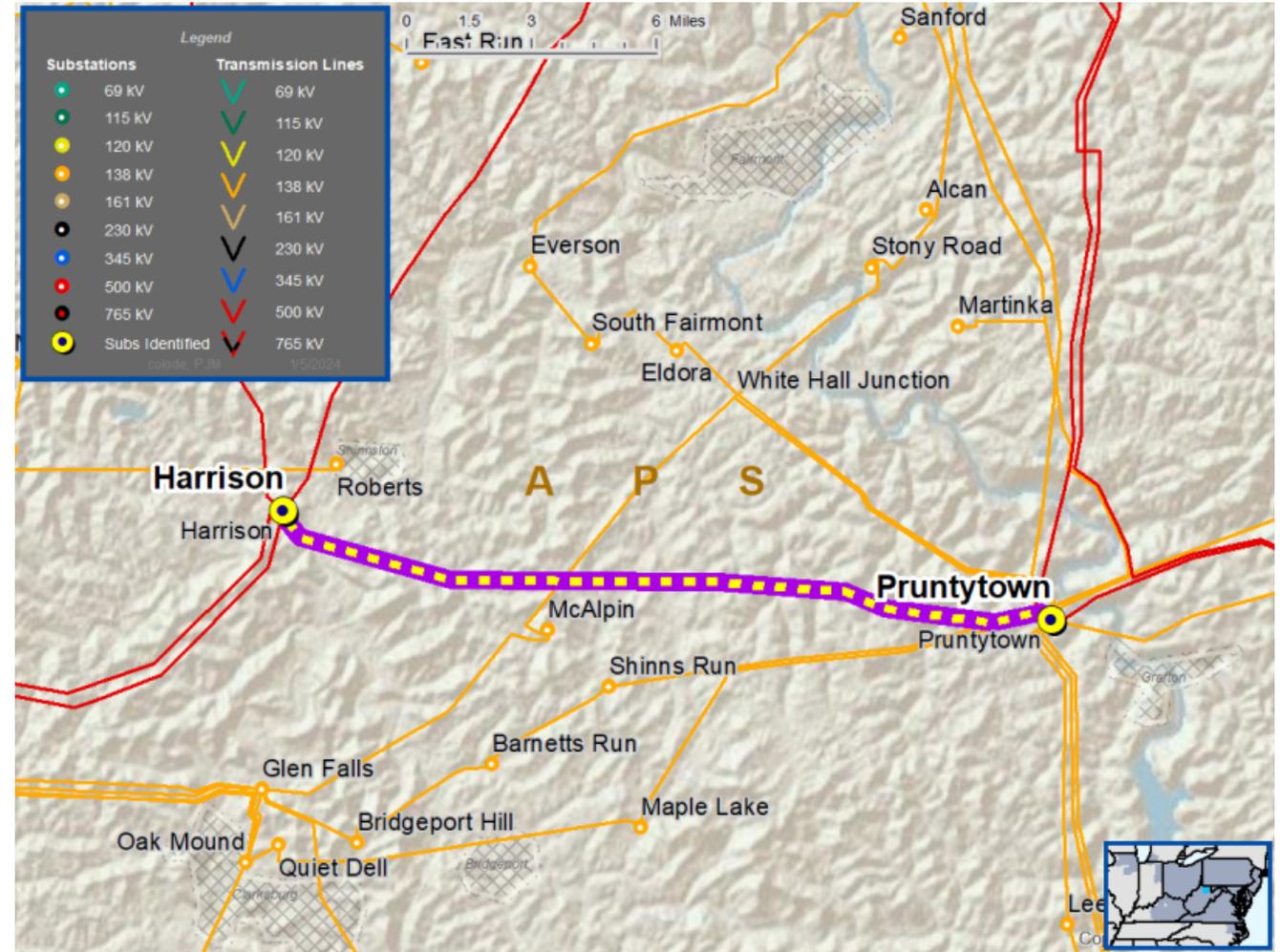
Specific Assumption Reference:

- 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.
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APS Transmission Zone M-3 Process Harrison – Pruntytown 500 kV Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)
APS-2023-056	Harrison – Pruntytown 500 kV	3464 / 3464	3573 / 4379

Need Number: APS-2023-056

Process Stage: Solution Meeting 01/09/2024

Proposed Solution:

- Replace wave trap, line metering and relaying at Harrison Substation
- Replace wave trap, line metering and relaying at Pruntytown Substation

Transmission Line Ratings:

Harrison – Pruntytown 500 kV Line:

- Before Proposed Solution: 3464 / 3464 / 3464 / 3464 MVA (SN / SE / WN / WE)
- After Proposed Solution: 3573 / 4379 / 4050 / 5194 MVA (SN / SE / WN / WE)

Alternatives Considered:

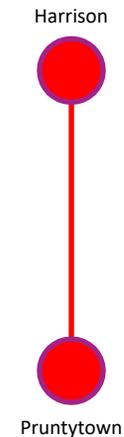
- Maintain line and vintage relay schemes in existing condition with elevated risk of misoperation

Estimated Project Cost: \$0.86M

Projected In-Service: 11/29/2024

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	

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

12/29/2023– V1 – Original version posted to pjm.com

1/5/2023 – V2 – Added Maps for all projects