

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

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:

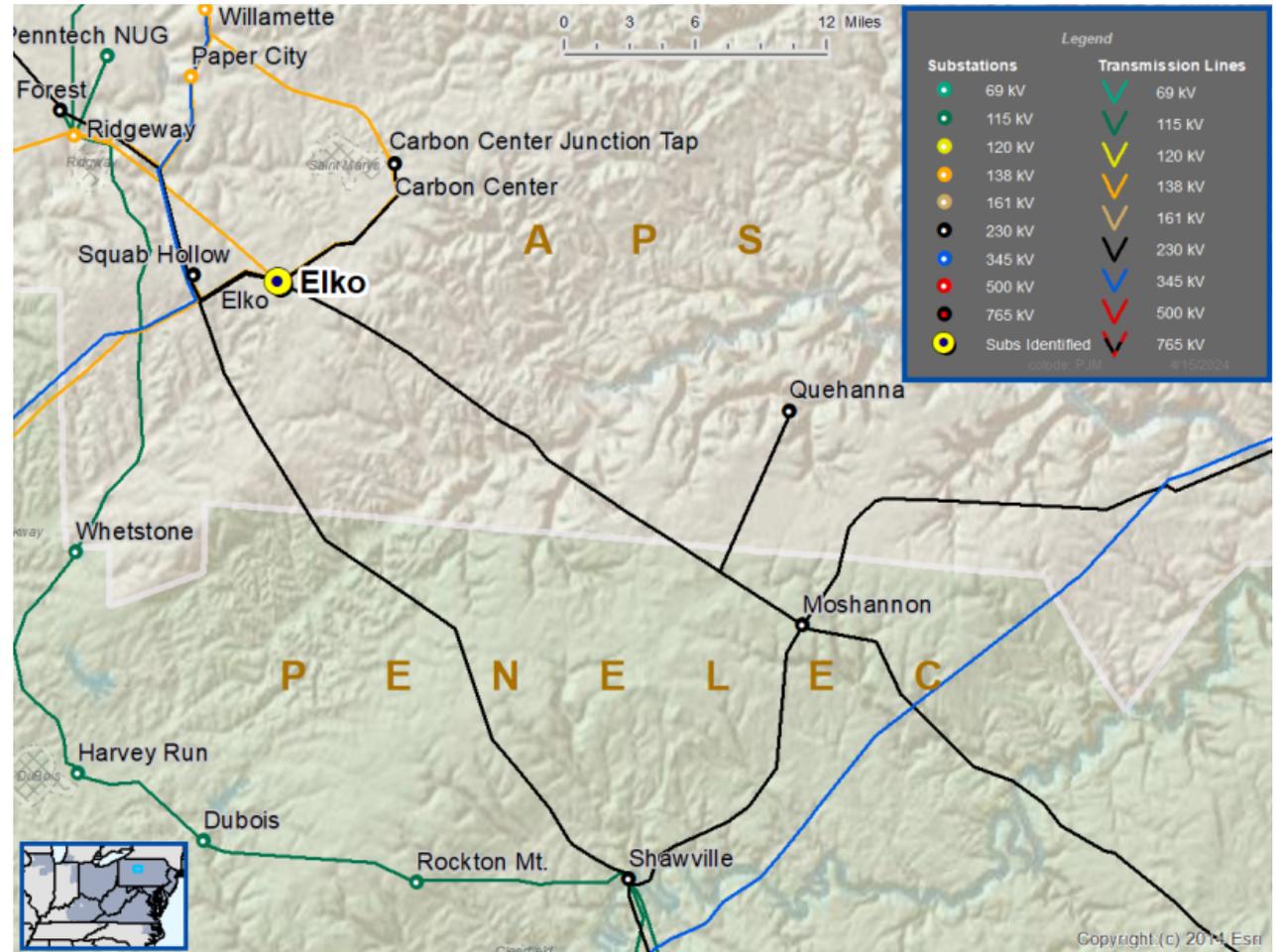
System Performance Global Factors

- 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 230/138 kV transformer, and a 138 kV capacitor. 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.

Continued on next slide...



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

Need Numbers: APS-2024-020 to APS-2024-022

Process Stage: Solution Meeting – 04/30/2024

Previously Presented: Need Meeting – 02/06/2024

Project Driver:

Operational Flexibility and Efficiency, Performance and Risk

Infrastructure Resilience

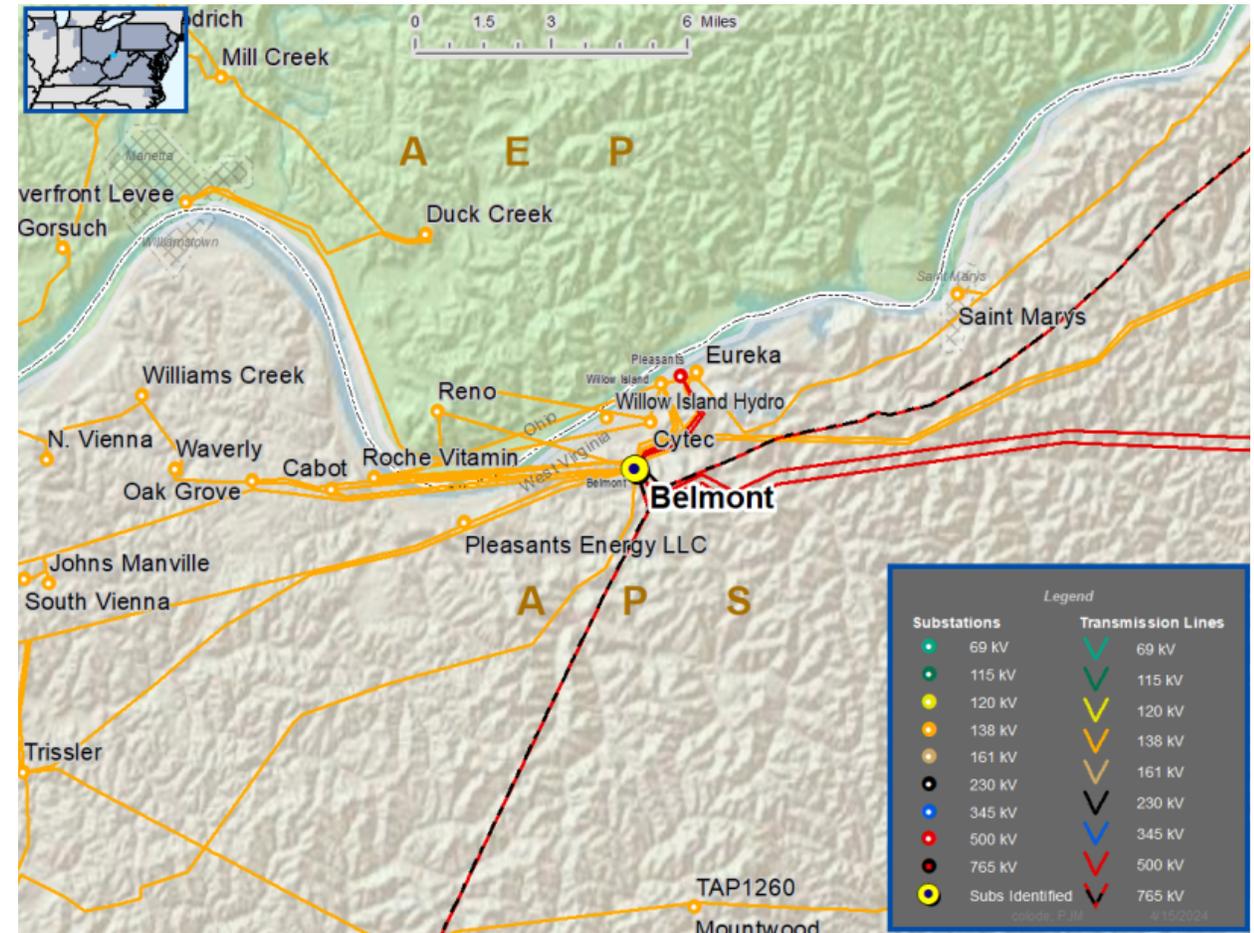
Specific Assumption Reference:

System Performance Projects Global Factors

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

Problem Statement:

- The 500/138 kV Transformers #1, 2 and 3 at Belmont were manufactured over 45 years ago and are approaching end of life.
- The transformers exhibit multiple maintenance issues including:
 - Elevated gas levels (such as Oxygen) compared with IEEE Standards.
 - They have history of low breakdown kV indicating polar contaminants.
 - Equipment degradation and obsolete replacement parts.
 - The jaws of the switches are heavily worn and need to be replaced.
- Existing TR #1 Branch Ratings: 459 / 567 / 540 / 615 MVA (SN / SLTE / WN / WLTE)
- Existing TR #2 Branch Ratings: 440 / 559 / 516 / 599 MVA (SN / SLTE / WN / WLTE)
- Existing TR #3 Branch Ratings: 371 / 420 / 441 / 545 MVA (SN / SLTE / WN / WLTE)





APS Transmission Zone M-3 Process Belmont 500/138 kV Transformers

Proposed Solution:

Need #	Transmission Line / Substation Locations	New MVA Line Rating (SN / SSTE / WN / WSTE)	Scope of Work	Estimated Cost (\$ M)	Target ISD
APS-2024-020	Belmont No. 1 500/138 kV Transformer	517 / 618 / 622 / 719	<ul style="list-style-type: none"> Replace 500/138 kV Transformer No. 1 with a new 500/138 kV transformer of the same size Replace circuit breaker, disconnect switches, conductor and relaying 	\$18.8 M	12/31/2029
APS-2024-021	Belmont No. 2 500/138 kV Transformer	440 / 559 / 516 / 599	<ul style="list-style-type: none"> Replace 500/138 kV Transformer No. 2 with a new 500/138 kV transformer of the same size Replace circuit breaker, disconnect switches and relaying 	\$18.8 M	12/15/2029
APS-2024-022	Belmont No. 3 500/138 kV Transformer	371 / 420 / 441 / 545	<ul style="list-style-type: none"> Replace 500/138 kV Transformer No. 3 with a new 500/138 kV transformer of the same size Replace circuit breaker, disconnect switches and relaying 	\$18.8 M	06/04/2027

Alternatives Considered: Maintain equipment in existing condition with elevated risk of failure.

Project Status: Engineering

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

Need Numbers: APS-2024-005, APS-2024-006

Process Stage: Solution Meeting – 04/30/2024

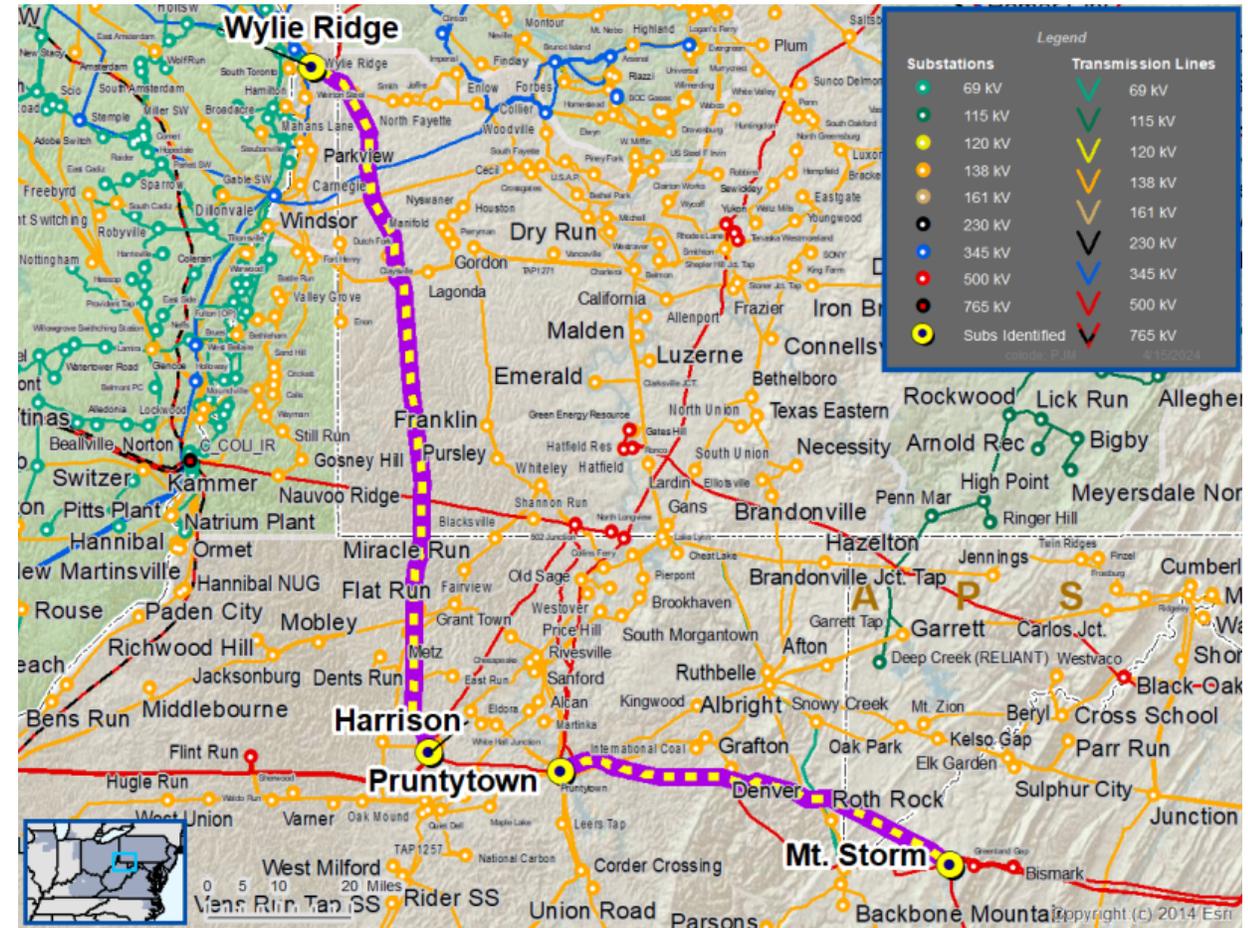
Previously Presented: Need Meeting – 01/09/2024

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.
- **Continued on next slide...**





APS Transmission Zone M-3 Process Misoperation Relays

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE / WN / WE)	Existing Conductor Rating (SN / SE / WN / WE)
APS-2024-005	Harrison – Wylie Ridge 500 kV	3464 / 3464 / 3464 / 3464	3573 / 4378 / 4050 / 5194
APS-2024-006	Mt Storm (Dom) – Pruntytown 500 kV	3204 / 3860 / 3944 / 4409	3573 / 4378 / 4050 / 5194



APS Transmission Zone M-3 Process Misoperation Relay Projects

Proposed Solution:

Need #	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE / WN / WE)	Scope of Work	Estimated Cost (\$ M)	Target ISD
APS-2024-005	Harrison – Wylie Ridge 500 kV	3573 / 4378 / 4050 / 5194	<ul style="list-style-type: none">At Harrison, replace line trap, metering and relayingAt Wylie Ridge, replace line trap and relaying	\$1.30 M	12/01/2026
APS-2024-006	Mt Storm (Dom) – Pruntytown 500 kV	3573 / 4378 / 4050 / 5022	<ul style="list-style-type: none">At Pruntytown, replace line trap, disconnect switches, substation conductor and relaying	\$0.41 M	06/01/2025

Alternatives Considered: Maintain equipment in existing condition with elevated risk of equipment misoperation.

Project Status: Engineering

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

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

04/19/2024– V1 – Original version posted to pjm.com