Subregional RTEP Committee – Western
FirstEnergy Supplemental Projects

July 21, 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 Zone M-3 Process

Need Number: APS-2023-022

Process State: Need Meeting 07/21/2023

Project Diver:

Operational Flexibility and Efficiency

Specific Assumption Reference:

- System reliability and performance
- Load at risk in planning and operational scenarios
- Add/Expand Bus Configuration
- Upgrade Relay Schemes

Problem Statement:

- The Stoney Spring Junction (Harrison City - Hempfield – Luxor) 138 kV Line is a three terminal line that provides direct service or a network path to over 25,000 customers.
- The multi-terminal line creates difficulties for protective relaying.
- The tap stations on the line lack switches and SCADA.
- Terminals stations are equipped with antiquated relaying schemes and equipment that limits the use of the full capacity of the transmission line conductor.
- There is ~25 MW of load served directly from the line. Additionally, the line has 25 miles of exposure.

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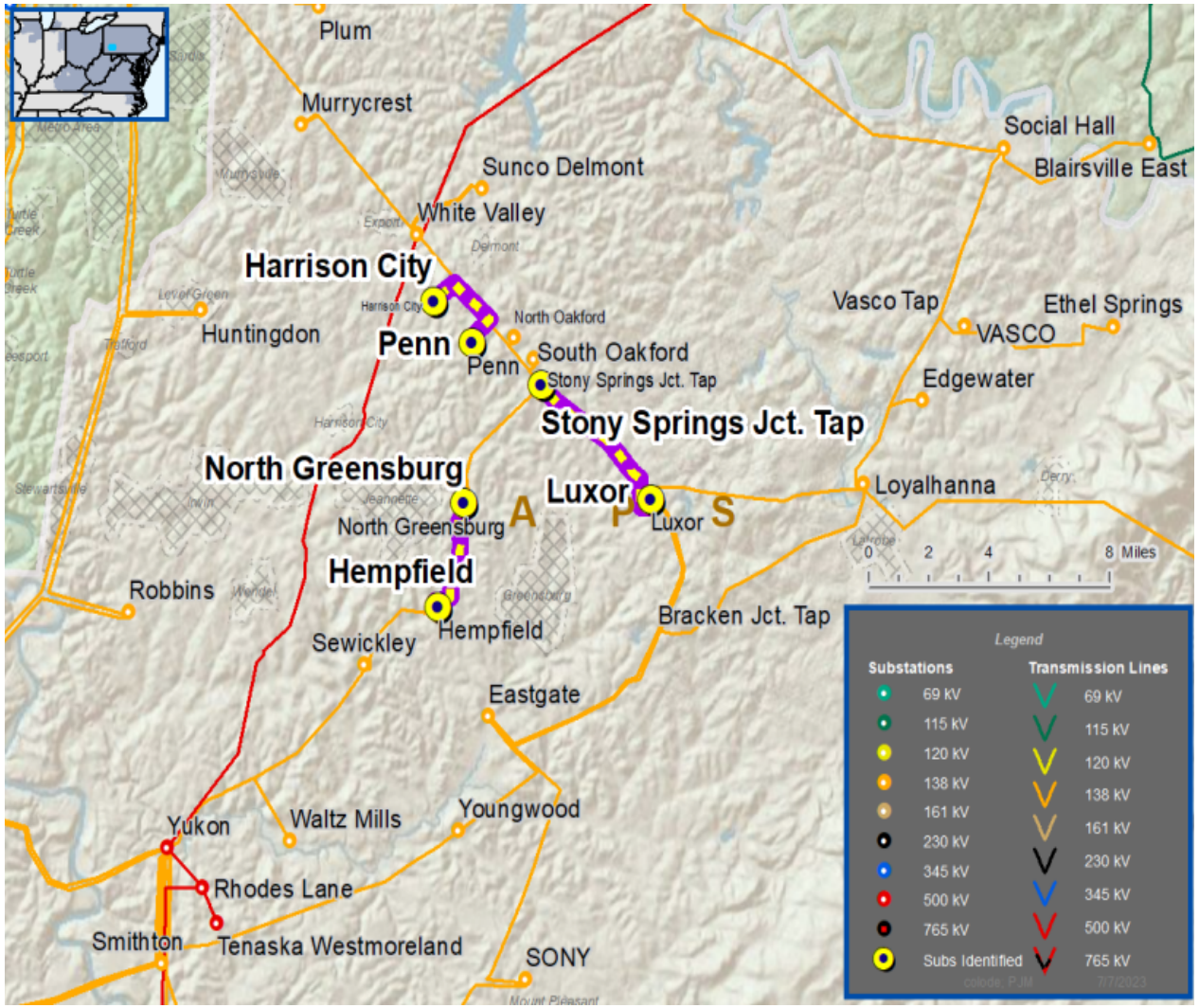


Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-022	Harrison City – Penn 138 kV	242/297	308/376	
	North Greensburg – Hempfield 138 kV	225/295	308/376	
	Stony Springs Junction – Luxor 138 kV	225/295	296/302	

Need Numbers: APS-2023-023, APS-2023-024 & APS-2023-025

Process Stage: Need Meeting 07/21/2023

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

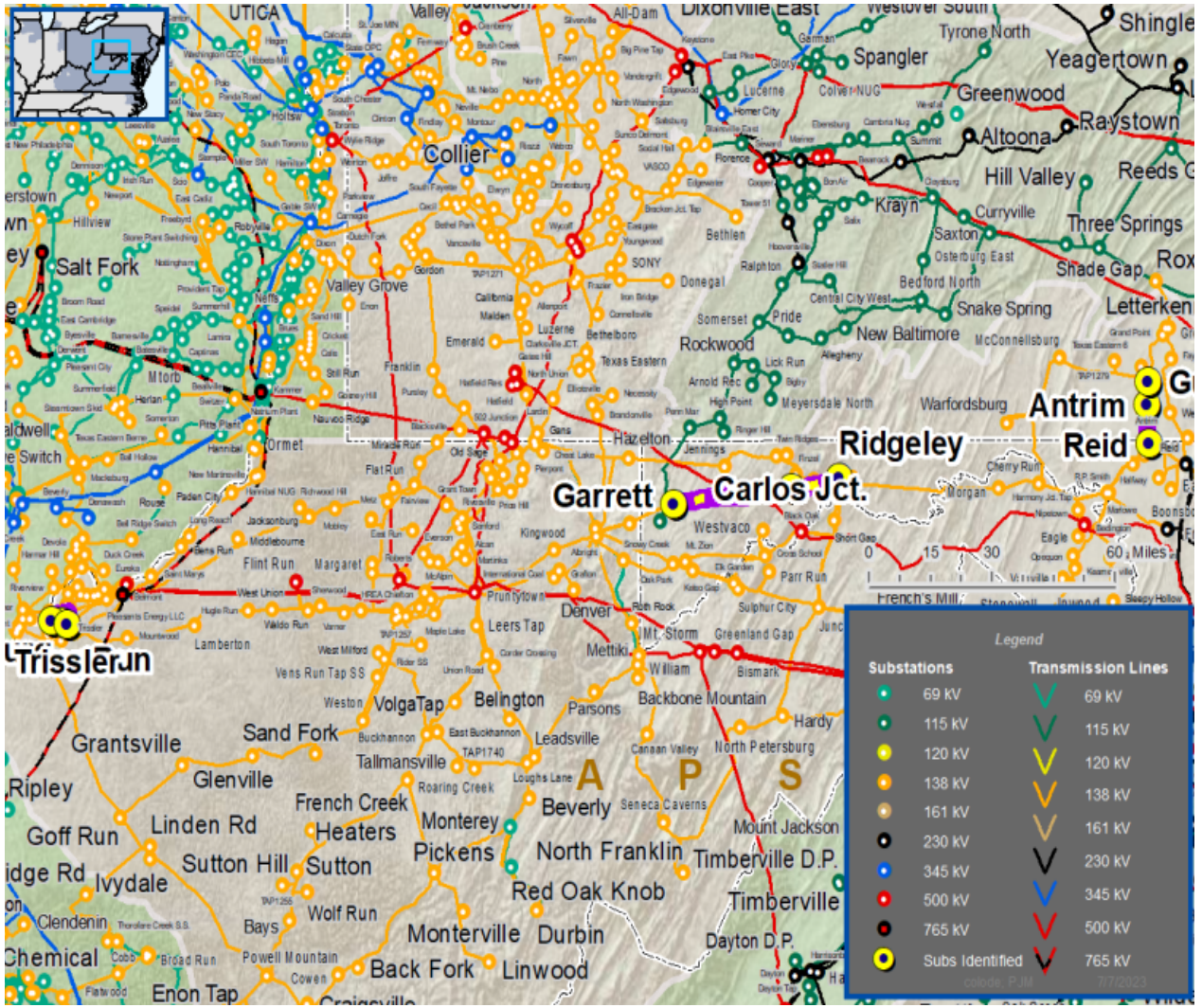
- Substation Condition Rebuild/Replacement

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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Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-023	Parkersburg – Jug Run 138 kV Line	225/295	308/376	
	Jug Run – Trissler 138 kV Line	292/314	308/376	
APS-2023-024	Guilford – Antrim 138 kV Line	292/314	308/376	
	Antrim – Reid 138 kV Line	292/314	308/376	
APS-2023-025	Garrett – Carlos Junction 138 kV Line	164/206	221/268	
	Carlos Junction – Ridgeley 138 kV Line	141/182	221/268	

APS Transmission Zone M-3 Process

Need Number: APS-2023-027

Process Stage: Need Meeting 7/21/2023

Project Driver(s):

- *Equipment Material Condition*
- *Performance and Risk*

Specific Assumption Reference(s)

- Substation Condition Rebuild/Replacement
- Substation/line equipment limits

Problem Statement

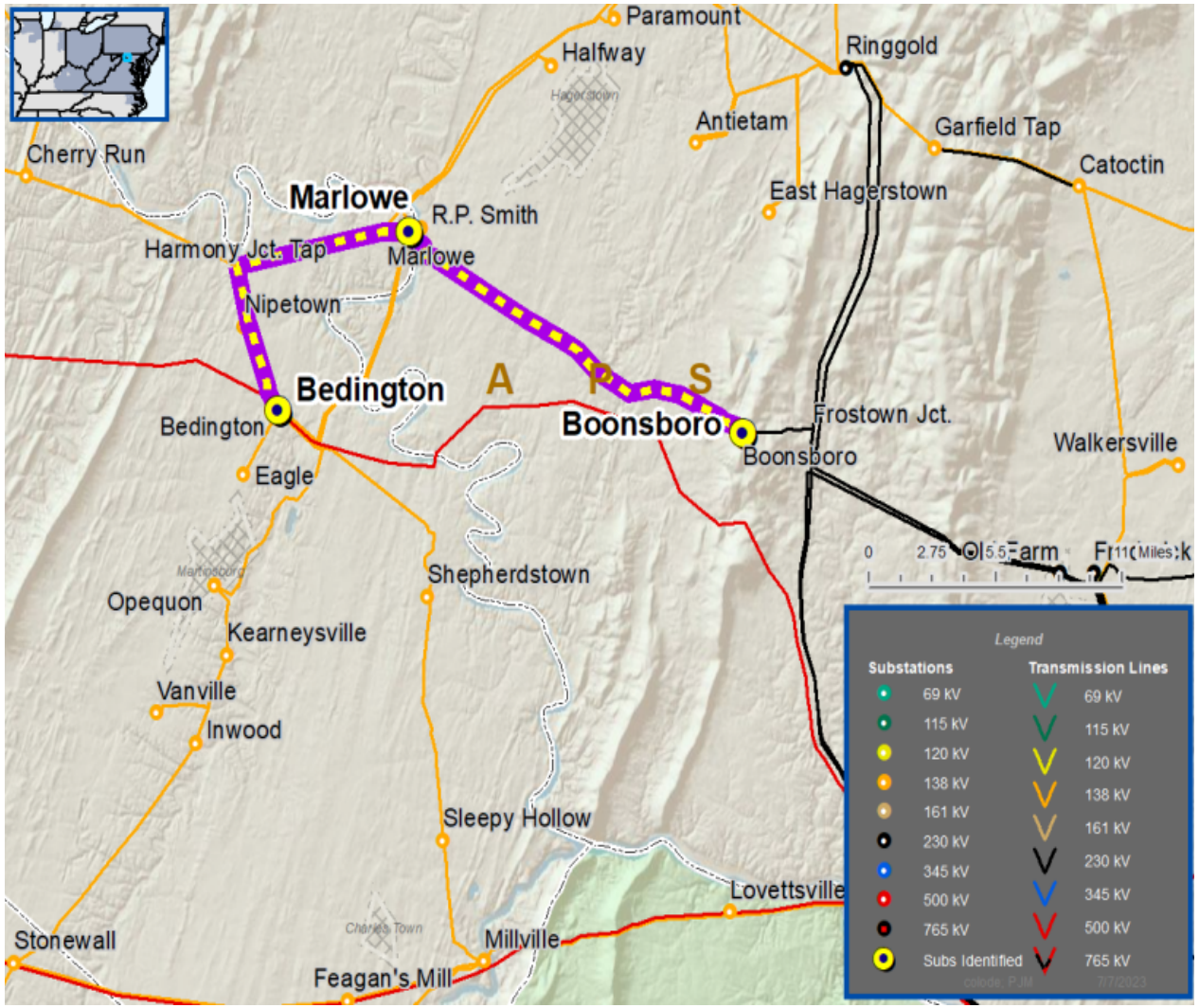
- Existing switches are beyond reliable operation.
    - Severe alignment issues result in improper closures, requiring a hammer to manually close, resulting in a safety issues
    - Switch mounting insulators often break during this process creating a potential for system faults.

The Boonsboro – Marlowe 138 kV line is limited by Substation conductor

- Existing line rating:
    - 300/358/349/410 MVA (SN/SE/WN/WE)

The Bedington – Marlowe 138 kV line is limited by Substation conductor

- Existing line rating:
    - 265/349/349/410 MVA (SN/SE/WN/WE)



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 Zone M-3 Process
Stoner Junction 138 kV Misoperation Relays

Need Numbers: APS-2023-011

Previously Presented: Need Meeting 04/21/2023, Solution Meeting 05/19/2023

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

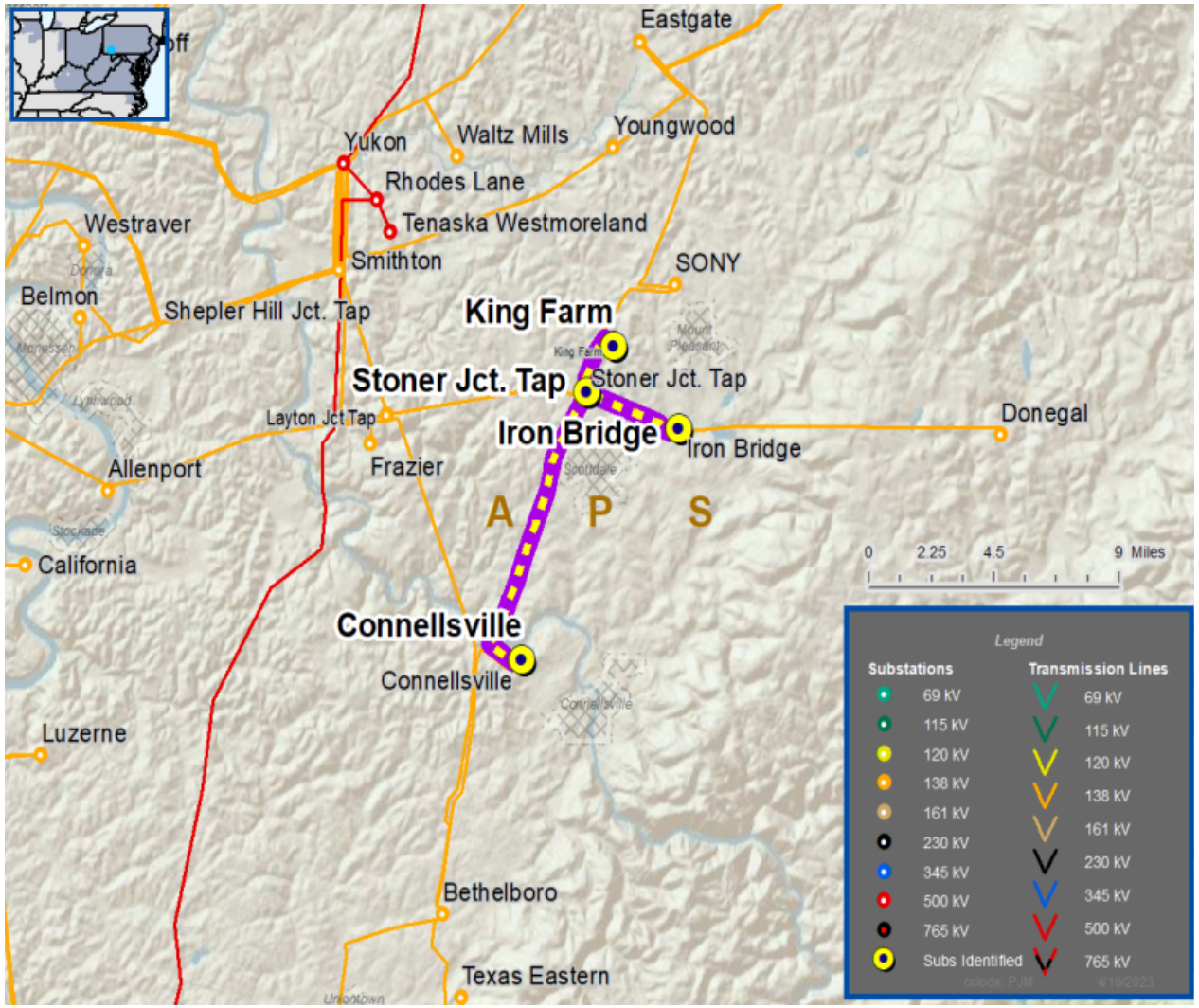
- Substation Condition Rebuild/Replacement

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 Zone M-3 Process
Stoner Junction 138 kV Line

Need Number: APS-2023-006

Previously Presented: Need Meeting 04/21/2023

Process Stage: Solution Meeting 07/21/2023

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

Line Condition Rebuild/Replacement

- Age/condition of wood pole transmission line structures
- System characteristics including lightning and grounding performance, galloping overlap, insulation coordination, structural capacity needs, clearance margins, and future needs (e.g., fiber path)

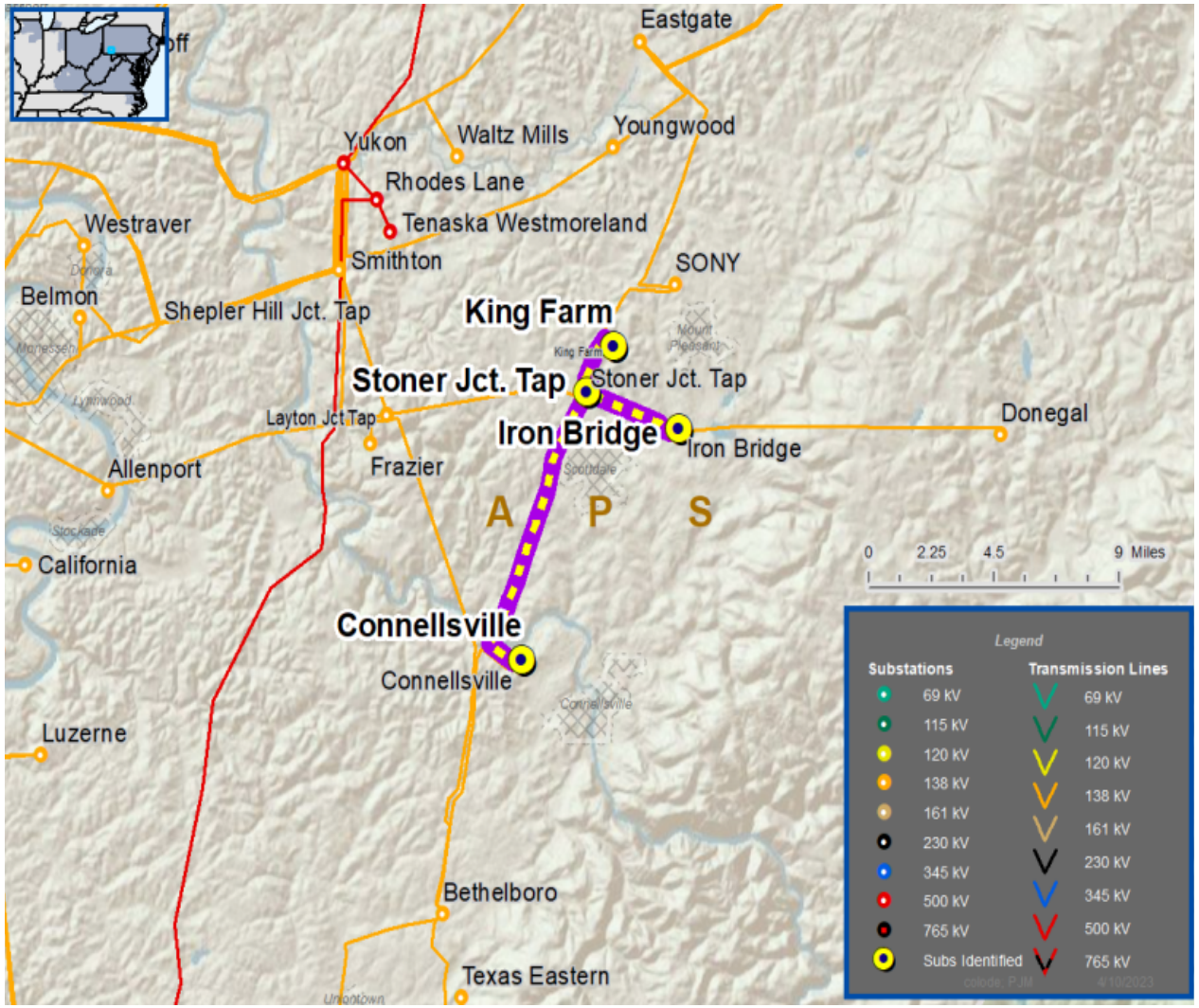
System Performance Projects Global Factors

- Substation/line equipment limits

Problem Statement:

The Connellsville – Iron Bridge – King Farm (Stoner Junction) 138 kV line is exhibiting deterioration and has significant outage history

- Approximately 15 miles of this line is on wood structures nearing end of life. They are recommended for rebuild.
- 78% of structures (89 of 114) did not meet one or more assessment criteria.
- The 4.3-mile balance of line is on lattice towers where 15 of 21 had correctable defects.
- The original conductor is 336.4 26/7 ACSR with original and maintenance splices and should be considered for replacement.
- There are 31 recent maintenance conditions, primarily due to wood pole conditions or rusted hardware. Conditions are expected to deteriorate as equipment approaches end of life.



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APS Transmission Zone M-3 Process
Stoner Junction 138 kV Line

Need #	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
APS-2023-006 & APS-2023-011	Connellsville – Stoner Junction 138 kV	160 / 192	160 / 192	
	Stoner Junction – King Farm 138 kV	293 / 343	308 / 376	
	Stoner Junction – Iron Bridge 138 kV	210 / 250	221 / 268	

APS Transmission Zone M-3 Process
Stoner Junction 138 kV Misoperation Relays

Need Number: APS-2023-011

Previously Presented: Solution Meeting 05/19/2023

Proposed Solution:

- Replace limiting substation conductor, wave trap, and relaying at Connellsville 138 kV substation
- Replace limiting substation conductor, wave trap, circuit breaker, and relaying at King Farm 138 kV substation
- Replace limiting substation conductor, wave trap, circuit breaker, and relaying at Iron Bridge 138 kV substation

Need #	Transmission Line	Existing Line Rating (SN / SE)	Post Project Line Rating (SN / SE)
APS-2023-011	Connellsville – Stoner Junction 138 kV	160 / 192	160 / 192
	Stoner Junction – King Farm 138 kV	293 / 343	308 / 376
	Stoner Junction – Iron Bridge 138 kV	210 / 250	221 / 268

Alternatives Considered:

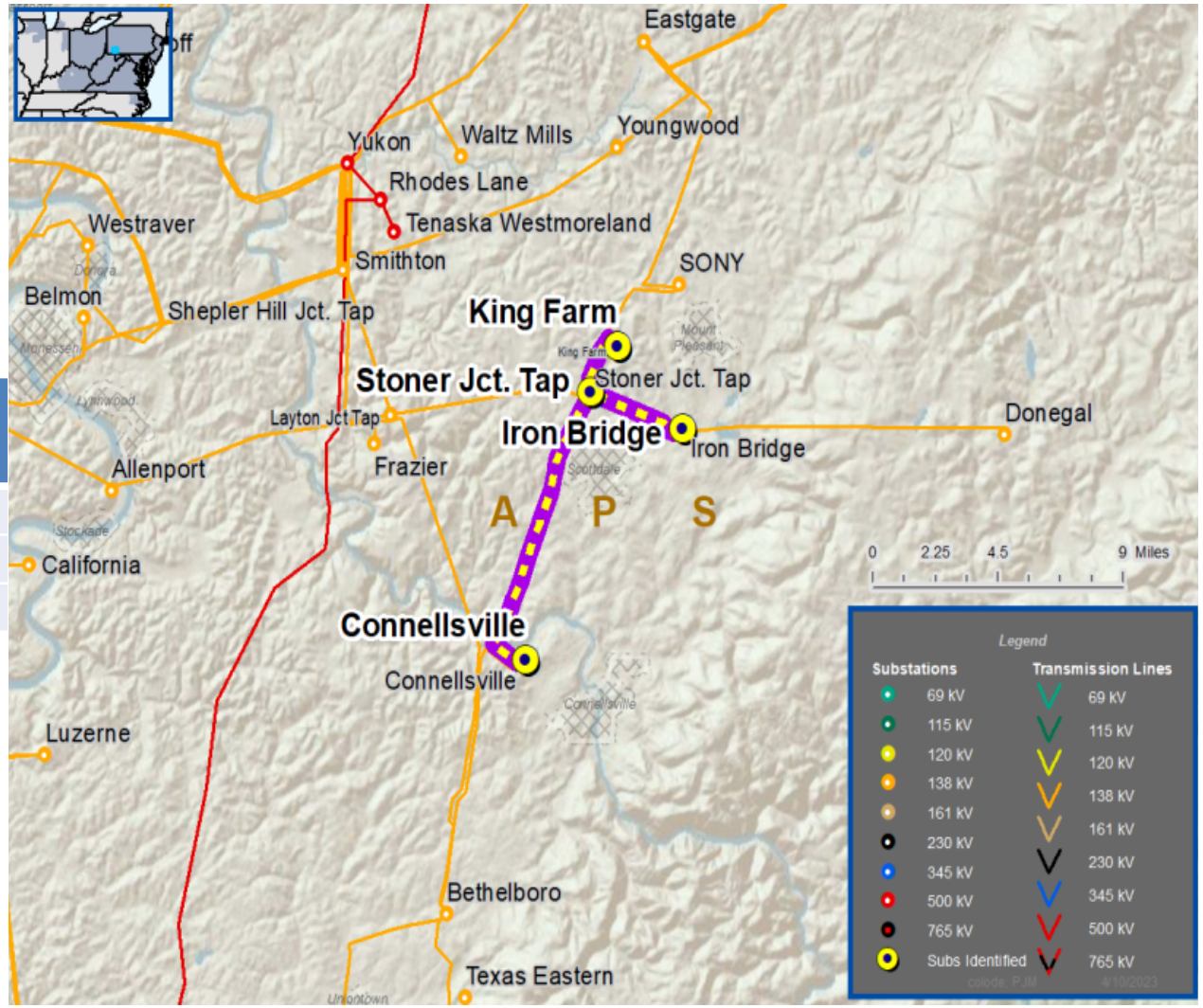
- Maintain line and vintage relay schemes in existing condition

Estimated Project Cost: $ 1.9 M

Projected In-Service: 12/15/2023

Project Status: Engineering

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



APS Transmission Zone M-3 Process
Stoner Junction 138 kV Line

Need Number: APS-2023-006

Process Stage: Solution Meeting 07/21/2023

Proposed Solution:

- Rebuild/rehab the Connellsville – Stoner Junction 138 kV Line. Replace existing transmission line conductor with larger size.
- Rebuild/rehab the Stoner Junction – King Farm 138 kV Line.
- Rebuild/rehab the Stoner Junction – Iron Bridge 138 kV Line. Replace existing transmission line conductor with larger size.

Need #	Transmission Line	Existing Line Rating (SN / SE)	Post Project Line Rating (SN / SE)
APS-2023-006	Connellsville – Stoner Junction 138 kV	160 / 192	308 / 376
	Stoner Junction – King Farm 138 kV	308 / 376	308 / 376
	Stoner Junction – Iron Bridge 138 kV	221 / 268	308 / 376

Alternatives Considered:

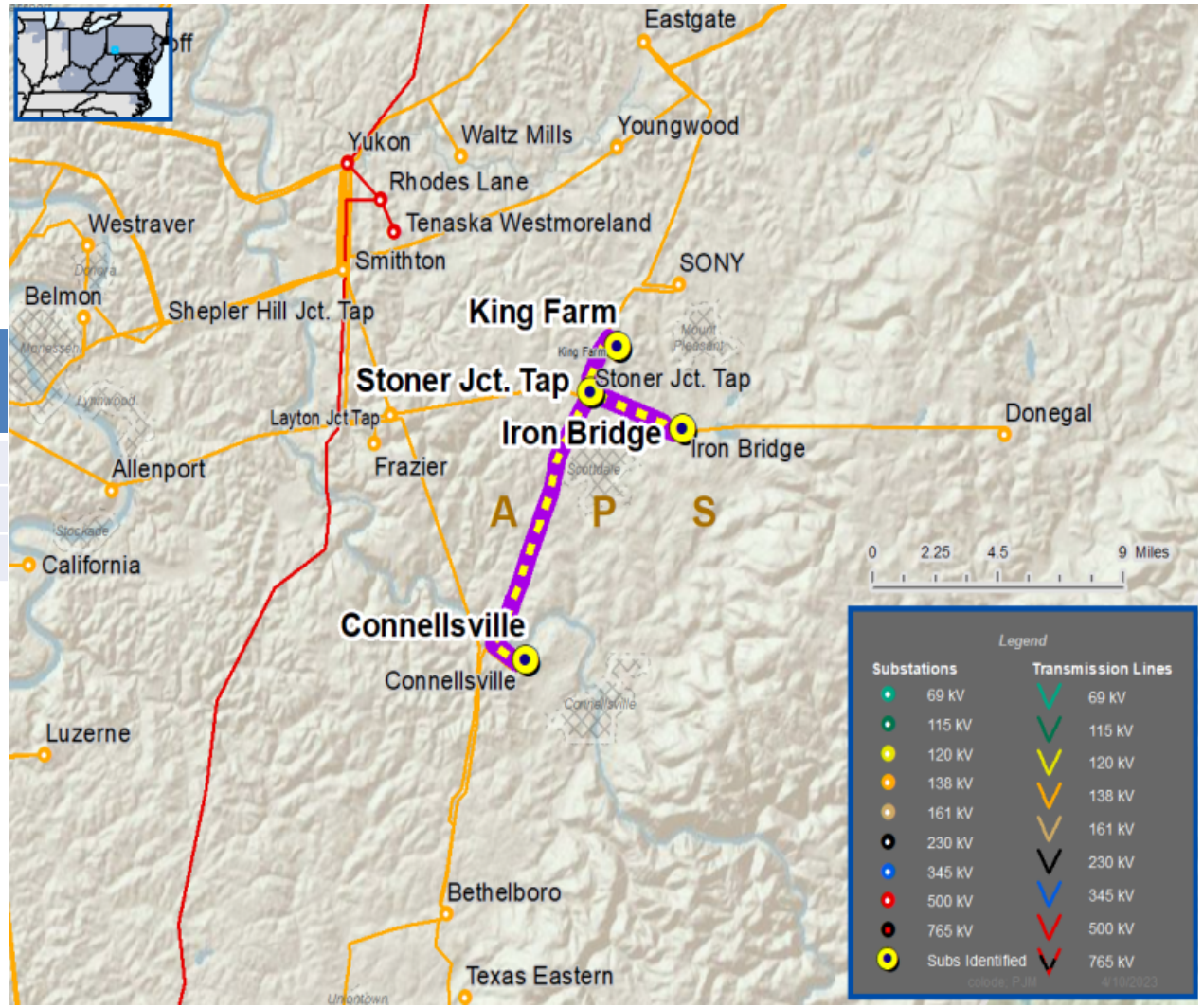
- Maintain line in existing condition

Estimated Project Cost: $ 31.5 M

Projected In-Service: 12/31/2025

Project Status: Engineering

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



APS Transmission Zone M-3 Process
Penn-North Oakford 138 kV New Customer

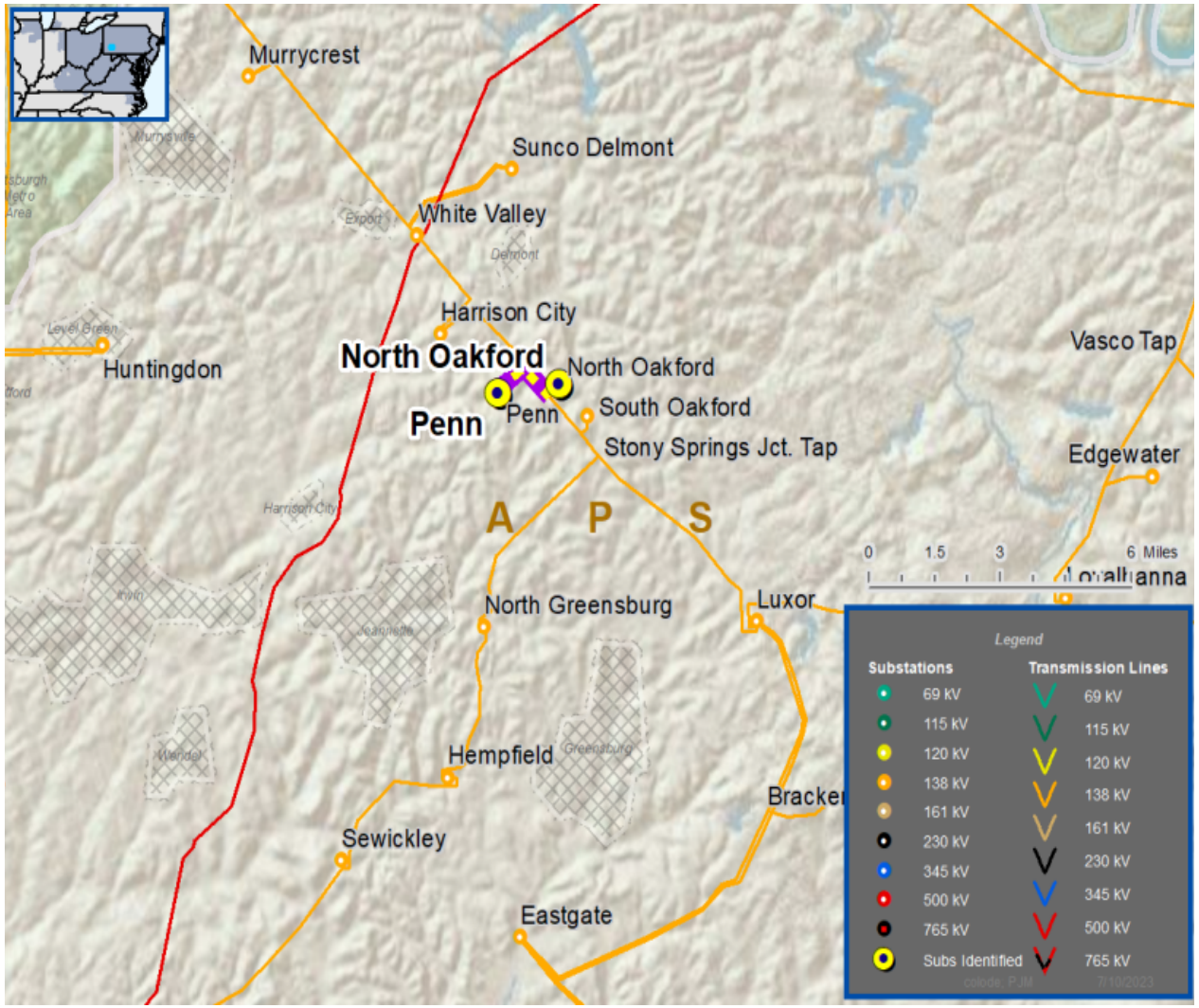
Need Number: APS-2023-008
Process Stage: Solution Meeting – 7/21/2023
Previously Presented: Need Meeting – 4/21/2023

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 - has requested a new 138 kV delivery point near the Penn-North Oakford 138 kV line. The anticipated load of the new customer connection is 100 MVA.

Requested in-service date is 12/31/2024.



APS Transmission Zone M-3 Process
Penn-North Oakford 138 kV New Customer

Need Number: APS-2023-008
Process Stage: Solution Meeting – 7/21/2023

Proposed Solution:

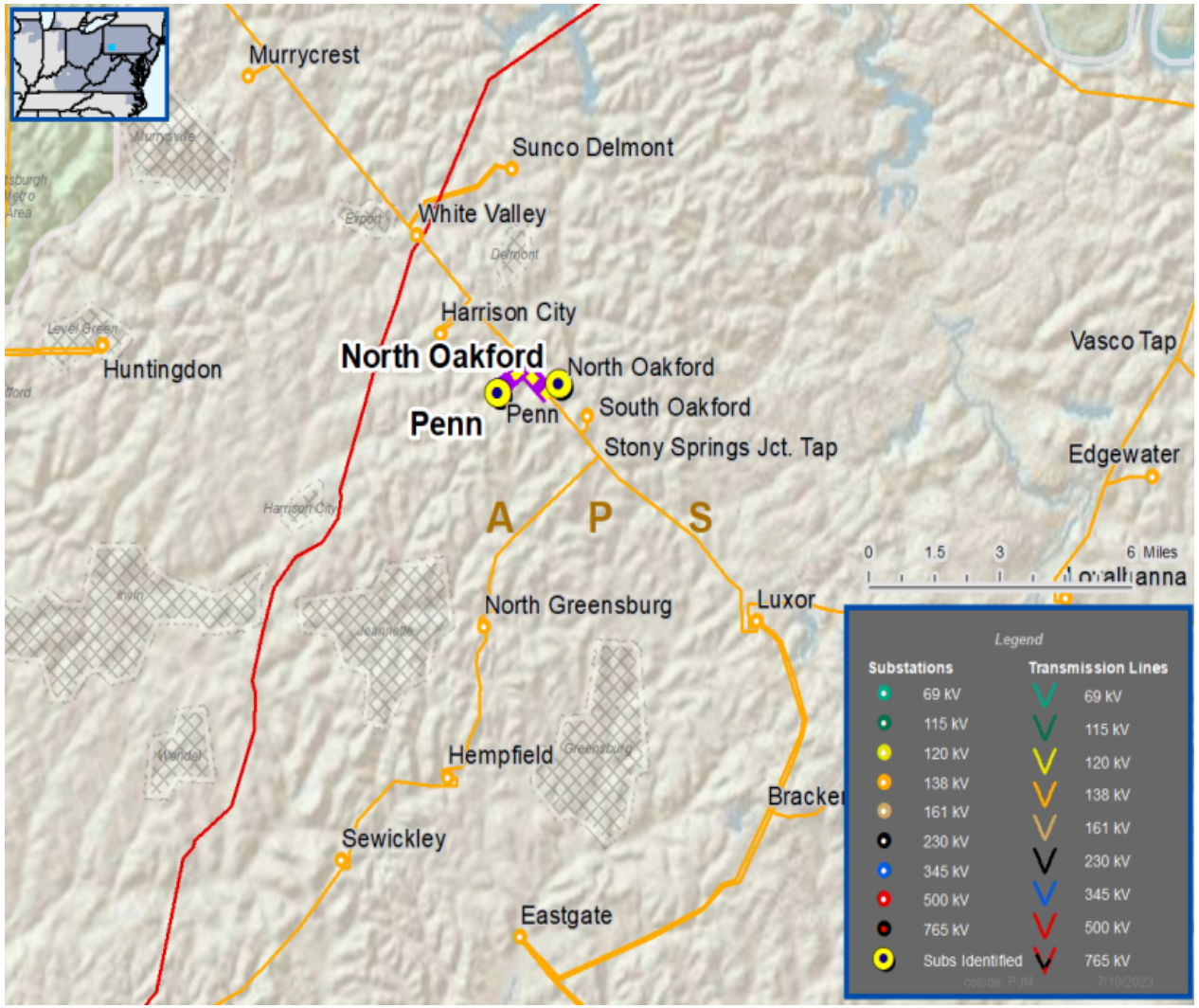
138 kV Transmission Line Tap

- Install three SCADA controlled transmission line switches
- Construct approximately 0.75 miles of transmission line using 1590 ACSR 45/7 from tap point to customer substation
- Install one 138 kV revenue metering package at customer substation

Alternatives Considered:

- No other feasible alternatives to provide service

Estimated Project Cost: $5.4m
Projected In-Service: 12/31/2024
Status: Engineering



PE Transmission Zone M-3 Process
Greenwood-Redbud 138 kV New Customer

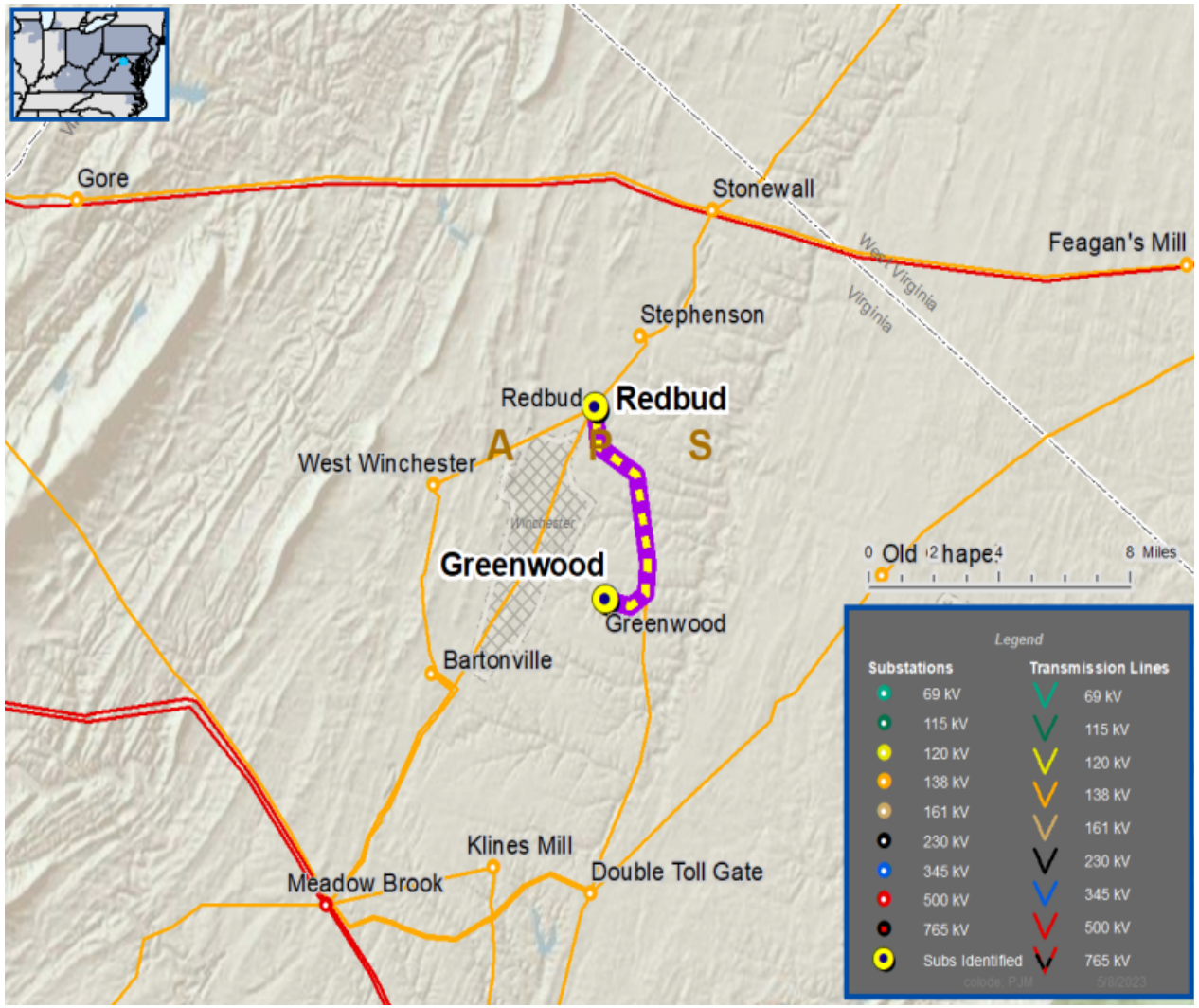
Need Number: APS-2023-013
Process Stage: Solution Meeting – 07/21/2023
Previously Presented: Need Meeting – 05/19/2023

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 - has requested a new 138 kV delivery point near the Greenwood-Redbud 138 kV line. The anticipated load of the new customer connection is 35 MVA.

Requested in-service date is 05/3/2024.



PE Transmission Zone M-3 Process
Greenwood-Redbud 138 kV New Customer

Need Number: APS-2023-013

Process Stage: Solution Meeting – 07/21/2023

Proposed Solutions:

138 kV Transmission Line Tap

- Install a three-switch tap along the Greenwood – Redbud 138 kV Line with three 1200 A SCADA load break switches
- Install 138 kV line extension from the three-switch tap to the Customer's substation
- Install 138 kV revenue metering in Customer's substation
- Modify line relay settings in Greenwood and Redbud substations

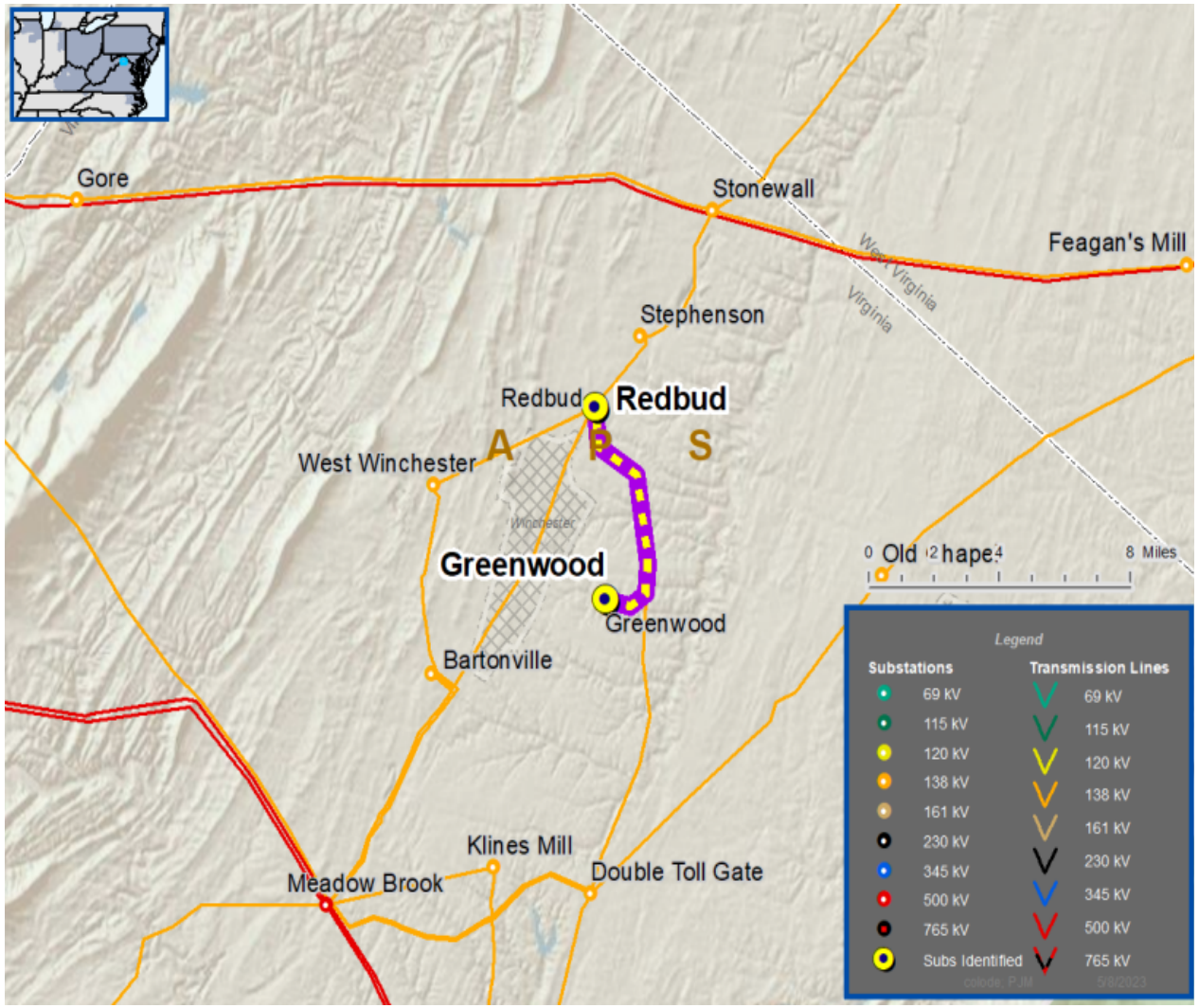
Alternatives Considered:

- No other feasible transmission solutions

Estimated Project Cost: $1.6M

Projected In-Service: 05/3/2024

Status: Project Initiation



PE Transmission Zone M-3 Process
Page-Riverton 138 kV New Customer

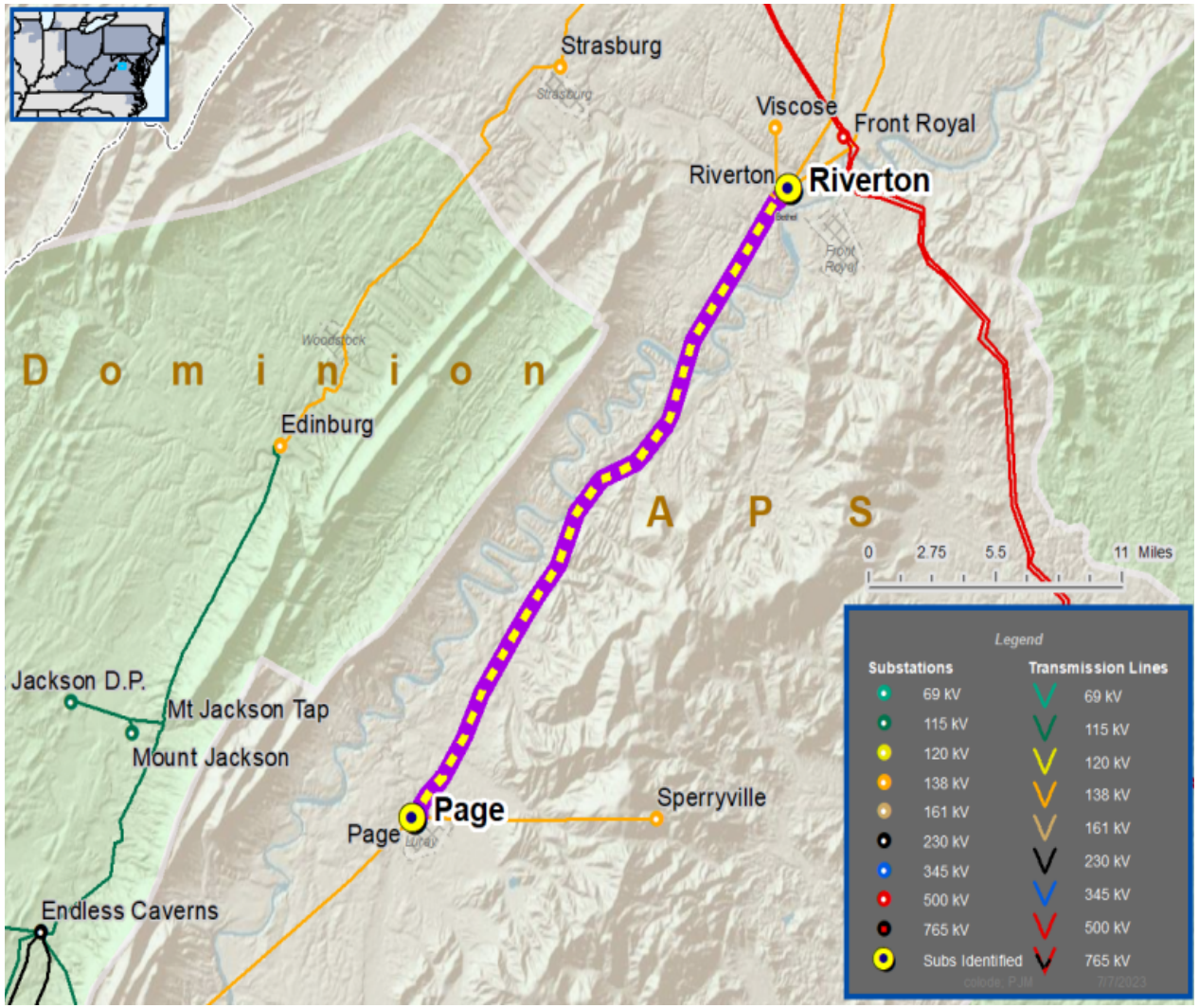
Need Number: APS-2023-014
Process Stage: Solution Meeting – 07/21/2023
Previously Presented: Need Meeting – 05/19/2023

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 - has requested a new 138 kV delivery point near the Page-Riverton 138 kV line. The anticipated load of the new customer connection is 35 MVA.

Requested in-service date is 05/30/2025.



PE Transmission Zone M-3 Process
Page-Riverton 138 kV New Customer

Need Number: APS-2023-014

Process Stage: Solution Meeting – 07/21/2023

Proposed Solution:

138 kV Transmission Line Tap

- Install a new 4-breaker ring bus named Catlett Mountain near 85 Russ Johnson Rd, Front Royal, VA 22630
- Cut the Page – Riverton RLU 138 kV Line near pole RLU-154 and extend 0.3-mile line in and out of the new Catlett Mountain substation
- Protection/terminal end relay settings review required
- Install revenue metering in Customer's facilities

Line Ratings:

Catlett Mountain – Page 138 kV Line

After project completion 160 MVA SN/ 192 MVA SE

Catlett Mountain – Riverton 238 kV Line

After project completion 153 MVA SN/ 153 MVA SE

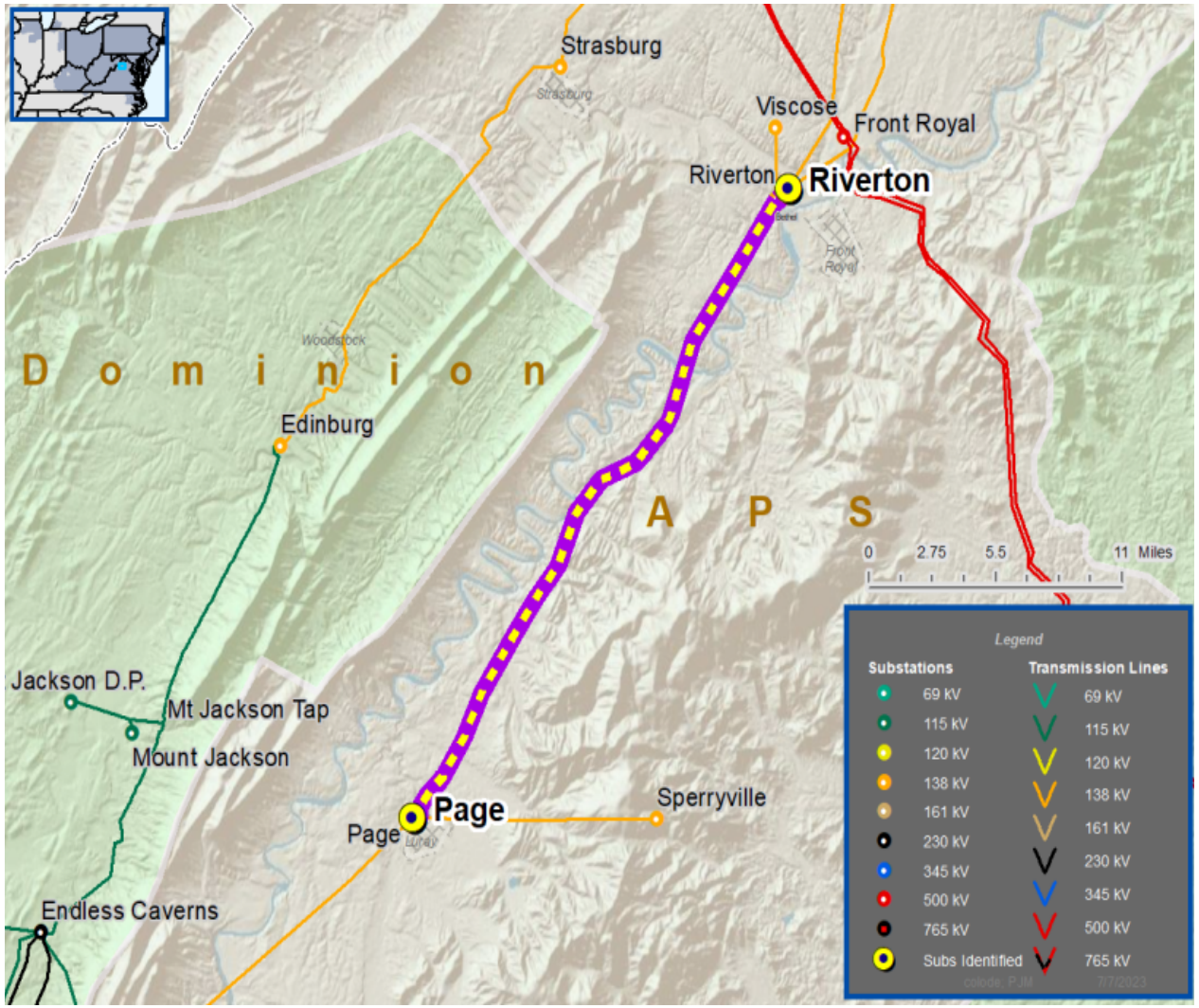
Alternatives Considered:

- No other feasible transmission alternatives

Estimated Project Cost: $16M

Projected In-Service: 05/30/2025

Status: Project Initiation



APS Transmission Zone M-3 Process
Messick Road – Morgan 138 kV New Customer

Need Number: APS-2023-015

Process Stage: Solution Meeting 07/21/2023

Previously Presented: Need Meeting 05/19/2023

Project Driver(s):

Customer Service

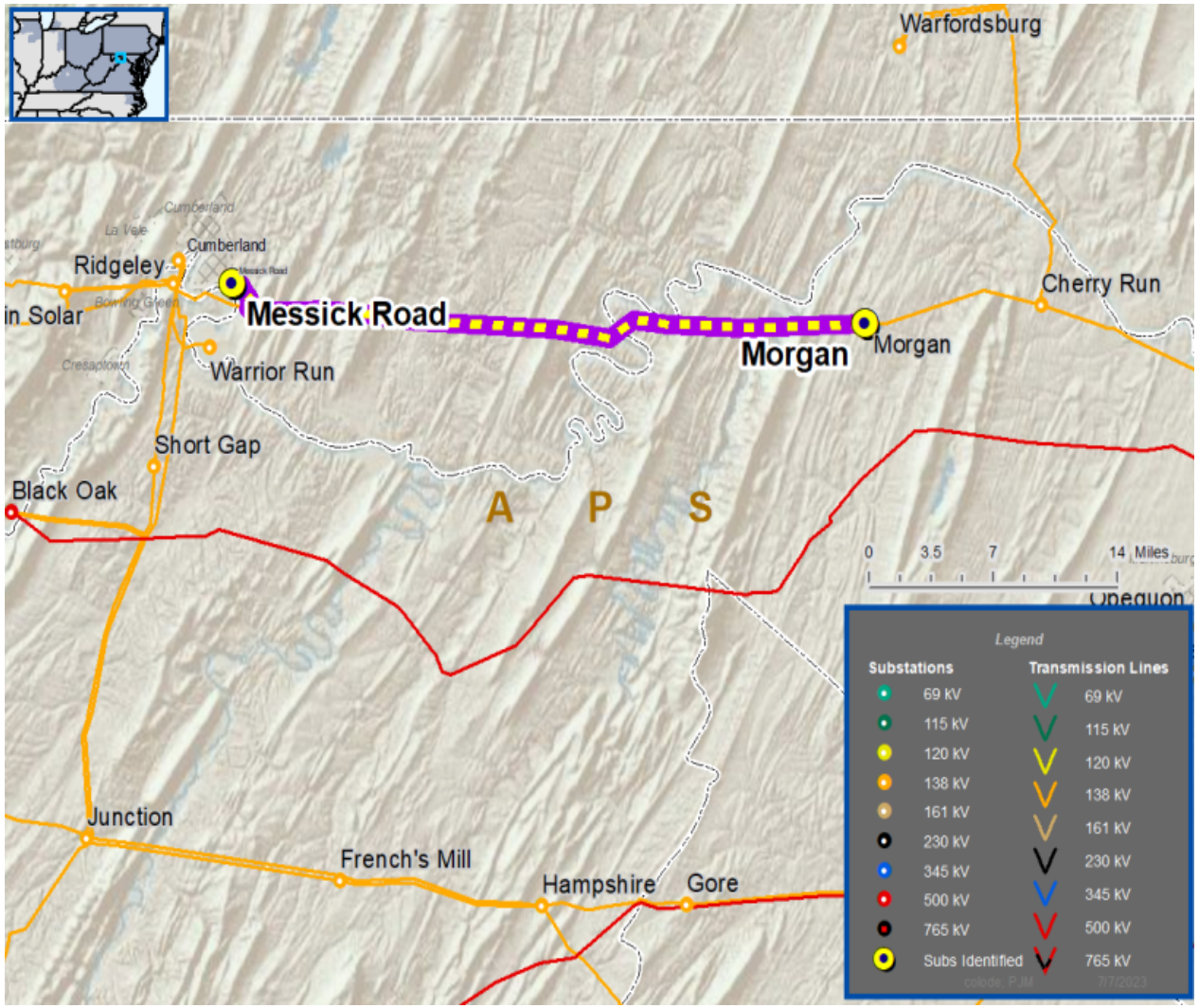
Specific Assumption Reference(s):

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

Problem Statement:

A customer has requested a new 138 kV delivery point near the Messick Road – Morgan 138 kV line. The anticipated load of the new customer connection is 5 MW.

Requested in-service date is 12/31/2024.



APS Transmission Zone M-3 Process
Messick Road – Morgan 138 kV New Customer

Need Number: APS-2023-015
Process Stage: Solution Meeting – 07/21/2023

Proposed Solutions:

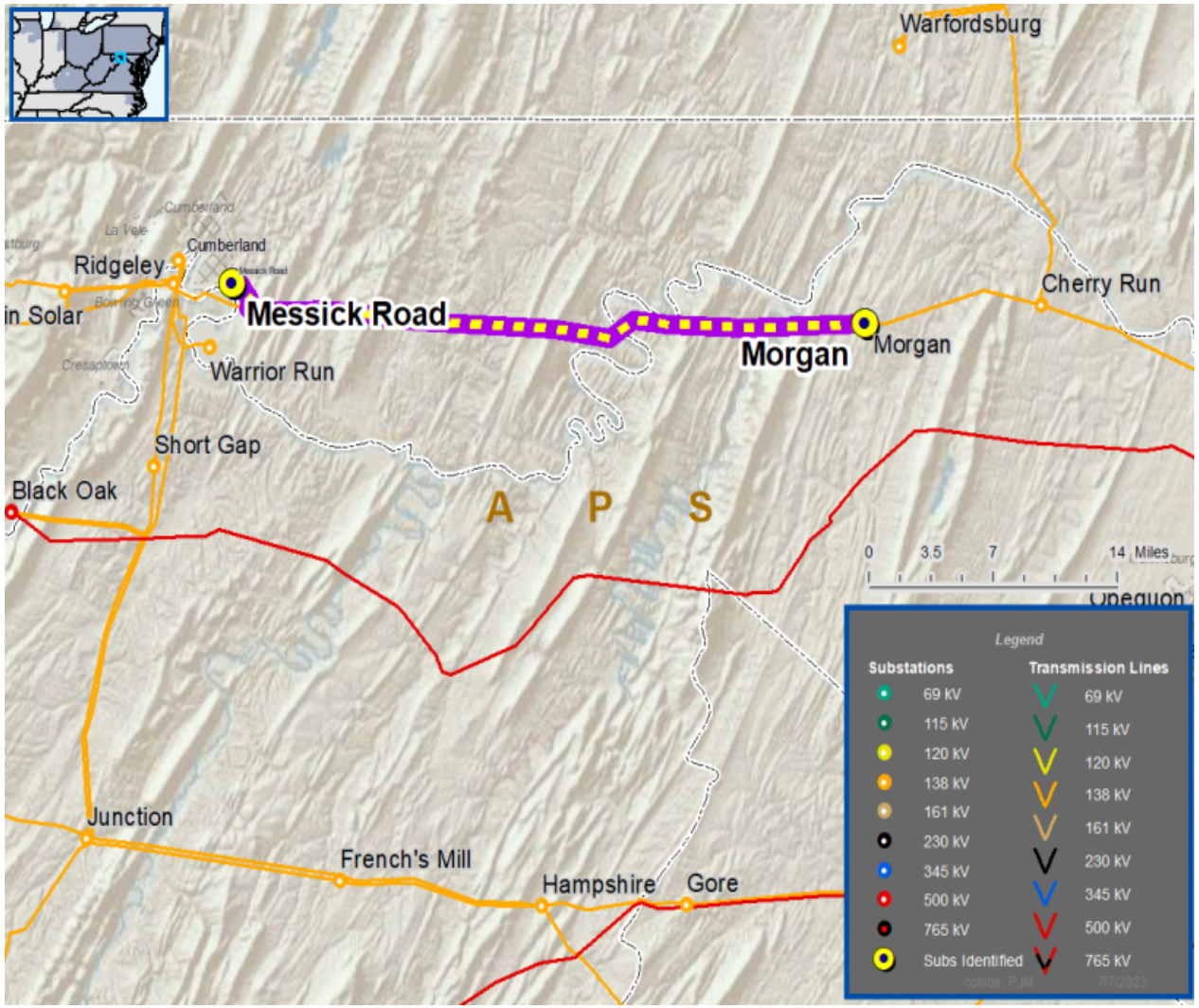
138 kV Transmission Line Tap

- Install three-way tap using three 2000 A SCADA switches
- Construct 0.1 miles of 556 ACSR 26/7 from tap location to new substation

Alternatives Considered:

- No other feasible transmission solutions

Estimated Project Cost: $1.8M
Projected In-Service: 12/31/2024
Status: Project Initiation



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/xx/2023– V1 – Original version posted to pjm.com