# Submission of Supplemental Projects for Inclusion in the Local Plan

# APS Transmission Zone M-3 Process Misoperation Relay Project

**Need Number:** APS-2020-001

**Process State:** Submission of Supplemental Project for Inclusion in the Local Plan 10/8/2021

**Previously Presented:**

Need Meeting 4/17/2020

Solution Meeting 2/17/2021

**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

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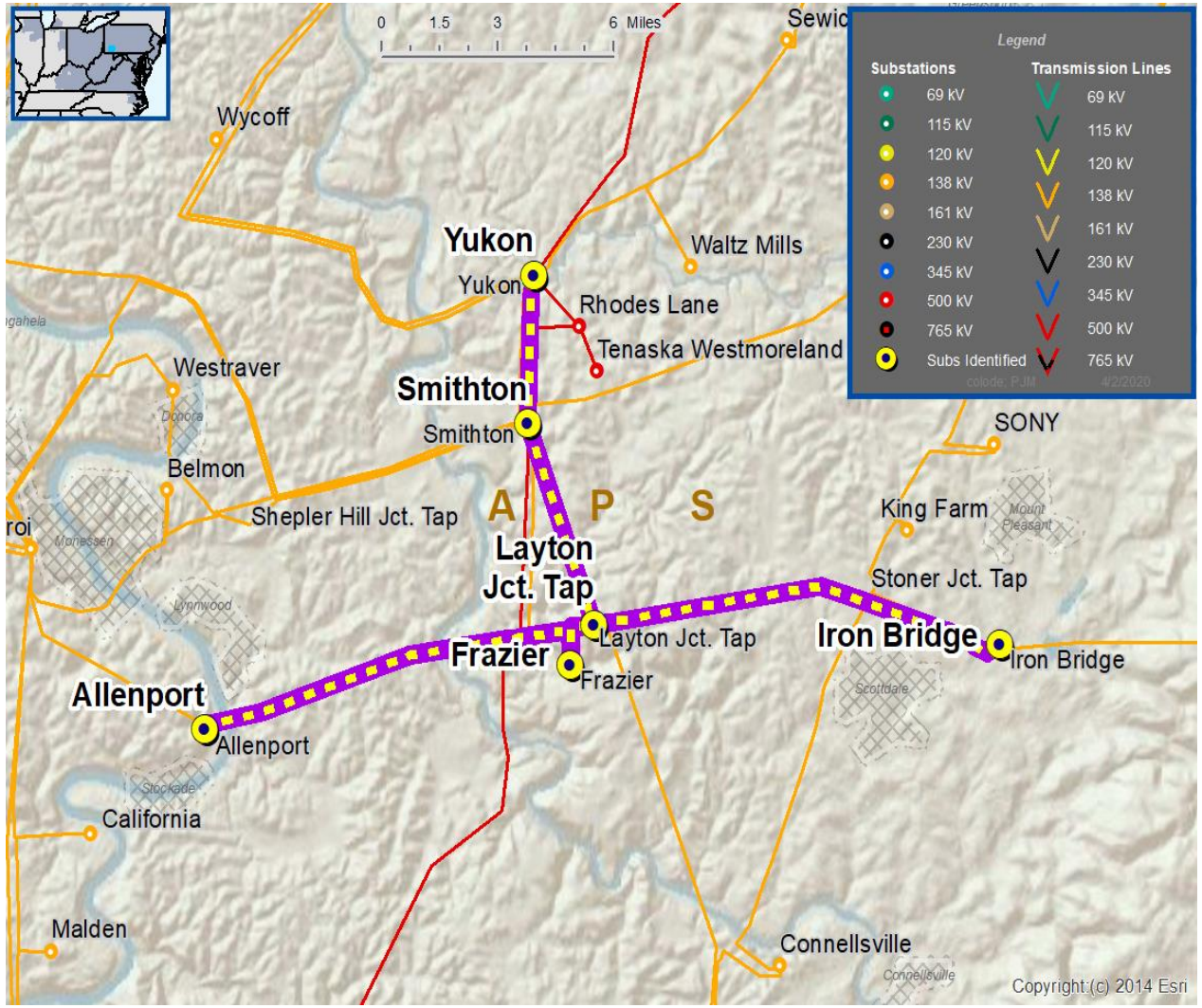


# APS Transmission Zone M-3 Process Misoperation Relay Project

**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cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.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.

| Need # | Transmission Line / Substation Locations | Existing Line Rating (SN / SE) | Existing Conductor Rating (SN / SE) | Limiting Terminal Equipment |
|---|---|---|---|---|
| APS-2020-001 | Allenport – Frazier 138 kV Line | 225/295 | 294/360 | Substation Conductor, Line Trap |
| | Frazier – Layton Junction 138 kV Line | 292/359 | 292/359 | N/A |
| | Yukon – Smithton Tap 138 kV Line | 285/287 | 285/351 | Line Relaying, Line Trap |
| | Smithton Tap – Layton Junction 138 kV Line | 236/299 | 236/299 | N/A |
| | Iron Bridge – Layton Junction 138 kV Line | 225/287 | 268/333 | Line Relaying, Substation Conductor, Line Trap, CTs |

# APS Transmission Zone M-3 Process Misoperation Relay Project

**Selected Solution:**

| Need Number | Transmission Line / Substation Locations | Supplemental Project ID | New MVA Line Rating (SN / SE) | Scope of Work | Estimated Cost ($ M) | Target ISD |
|---|---|---|---|---|---|---|
| APS-2020-001 | Allenport – Frazier 138 kV Line | s2549 | 294/360 | • Allenport 138 kV Substation – Replace line disconnect switches, CCVT, line Trap, line tuner, coax, replace substation conductor, install AMETEK Smart-Gap in line tuner | $3.8 M | 4/2/21 |
| | Frazier – Layton Junction 138 kV Line | | 292/359 | - | | |
| | Yukon – Smithton Tap 138 kV Line | | 285/351 | • Yukon 138 kV Substation – Replace line disconnect switches, CCVT, line trap, line tuner, coaxial cable, install AMETEK Smart-Gap in line tuner | | |
| | Smithton Tap – Layton Junction 138 kV Line | | 236/299 | - | | |
| | Iron Bridge – Layton Junction 138 kV Line | | 268/333 | • Iron Bridge 138 kV Substation – Replace line disconnect switch, CCVT, line trap, line tuner, coaxial cable, substation conductor, install AMETEK Smart-Gap in line tuner | | |

**Model:** 2020 RTEP model for 2025 Summer (50/50)

# APS Transmission Zone M-3 Process Misoperation Relay Project

**Need Number:** APS-2019-015 and APS-2020-009

**Process State:** Submission of Supplemental Project for Inclusion in the Local Plan 10/8/2021

**Previously Presented:**

Needs Meeting(s) –12/18/2019 and 05/22/2020
Solutions Meeting 03/19/2021

**Project Driver:**

*Equipment Material Condition, Performance and Risk*
*Operational Flexibility and Efficiency*

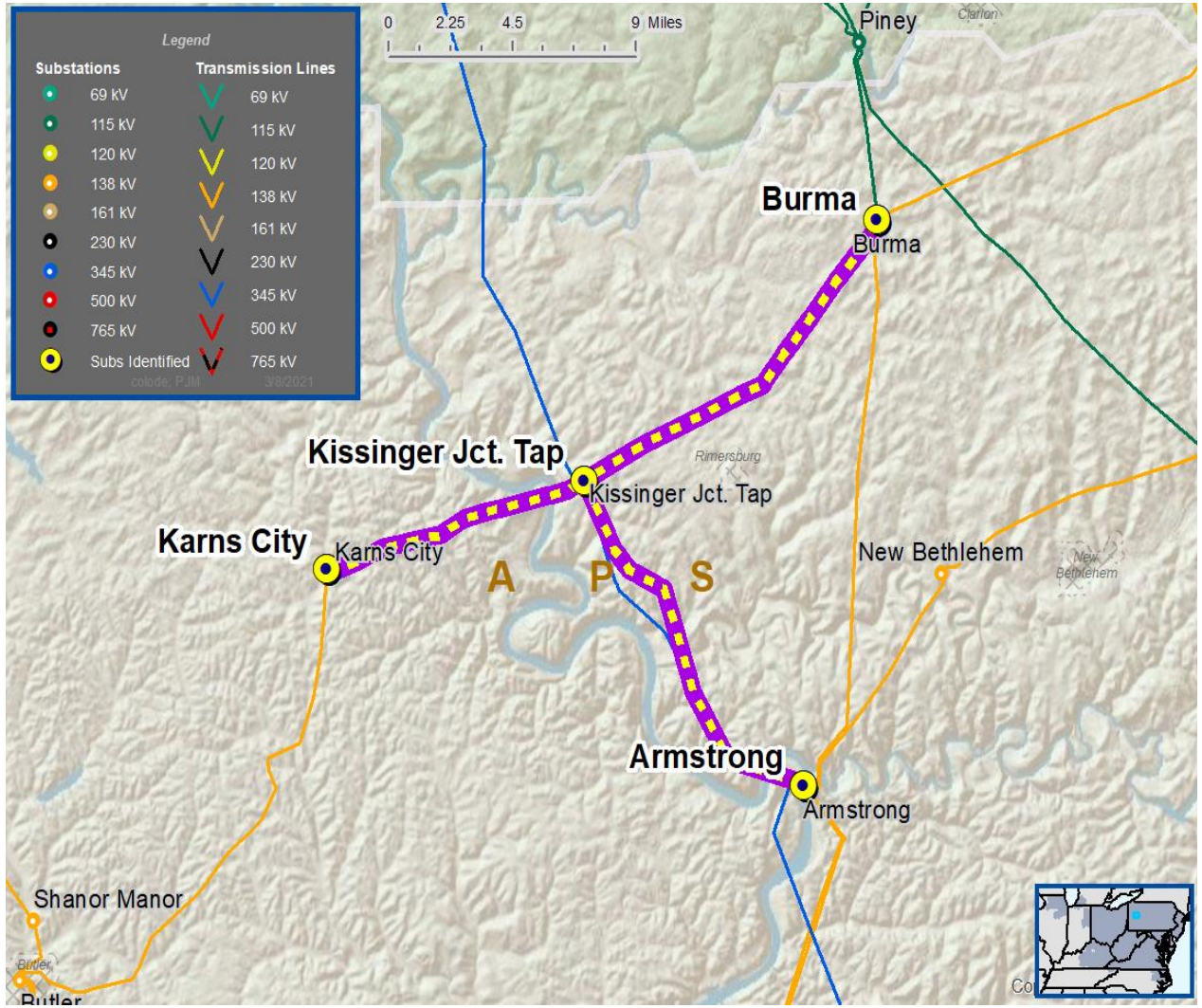
**Specific Assumption Reference:**

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.)
- Bus Protection schemes



# APS Transmission Zone M-3 Process Misoperation Relay Project

**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.

| Need Number | Transmission Line / Substation Locations | Existing Line Rating (SN / SE) | Existing Conductor Rating (SN / SE) | Limiting Terminal Equipment |
|---|---|---|---|---|
| APS-2019-015 | Karns City – Butler 138 kV Line | 141/179 | 160/192 | Substation Conductor |
| APS-2020-009 | Karns City – Kissinger 138 kV Line | 221/268 | 221/268 | Line Relaying (existing rating 306 MVA (WE) conductor rating 317 MVA (WE) |
| | Armstrong – Kissinger 138 kV Line | 221/268 | 221/268 | N/A |
| | Burma – Kissinger 138 kV Line | 293/332 | 308/376 | Substation Conductor, Line Relaying, Line Trap, Circuit Breaker |

# APS Transmission Zone M-3 Process Misoperation Relay Project

**Proposed Solution:**

| Need Number | Transmission Line / Substation Locations | Supplemental Project ID | New MVA Line Rating (SN / SE) | Scope of Work | Estimated Cost ($ M) | Target ISD |
|---|---|---|---|---|---|---|
| APS-2019-015 | Karns City – Butler 138 kV Line | s2550 | 160/192 | • At Karns City 138 kV Substation – Replace breaker, disconnect switches, line trap, line tuner, coax, CVT, and substation conductor. Install MCOV surge arrestors and AMETEK Smart-Gap in line tuner<br>• At Butler 138 kV Substation – Replace breaker, disconnect switches, line trap, line tuner, coax, CVT, and substation conductor. Install MCOV surge arrestors and AMETEK Smart-Gap in line tuner | $1.9 | 10/15/2022 |
| APS-2020-009 | Karns City – Kissinger Jct 138 kV Line | s2551 | 221/268 | • At Karns City 138 kV Substation – Replace breaker, line trap, line tuner, coax, and CVT. Install MCOV surge arrestors and AMETEK Smart-Gap in line tuner | $1.8 | 06/01/2023 |
| | Armstrong – Kissinger Jct 138 kV Line | | 221/268 | • At Armstrong 138 kV Substation – Install AMETEK Smart-Gap in line tuner | | |
| | Burma – Kissinger Jct 138 kV Line | | 308/376 | • At Burma 138 kV Substation – Replace breaker, disconnect switches, line trap, CVT, and substation conductor. Install MCOV surge arrestors and AMETEK Smart-Gap in line tuner | | |

**Model:** 2020 RTEP model for 2025 Summer (50/50)

# APS Transmission Zone M-3 Process

**Need Number:** APS-2020-007

**Process State:** Submission of Supplemental Project for Inclusion in the Local Plan 10/8/2021

**Previously Presented:**

Need Meeting – 05/22/2020

Solutions Meeting – 03/19/2021

**Project Driver:**

*Operational Flexibility and Efficiency*

**Specific Assumption Reference:**

System Performance Projects

- Load at risk in planning and operational scenarios

Add/Expand Bus Configuration

- Reduce the amount of exposed potential local load loss during contingency conditions
- Eliminate simultaneous outages to multiple networked elements

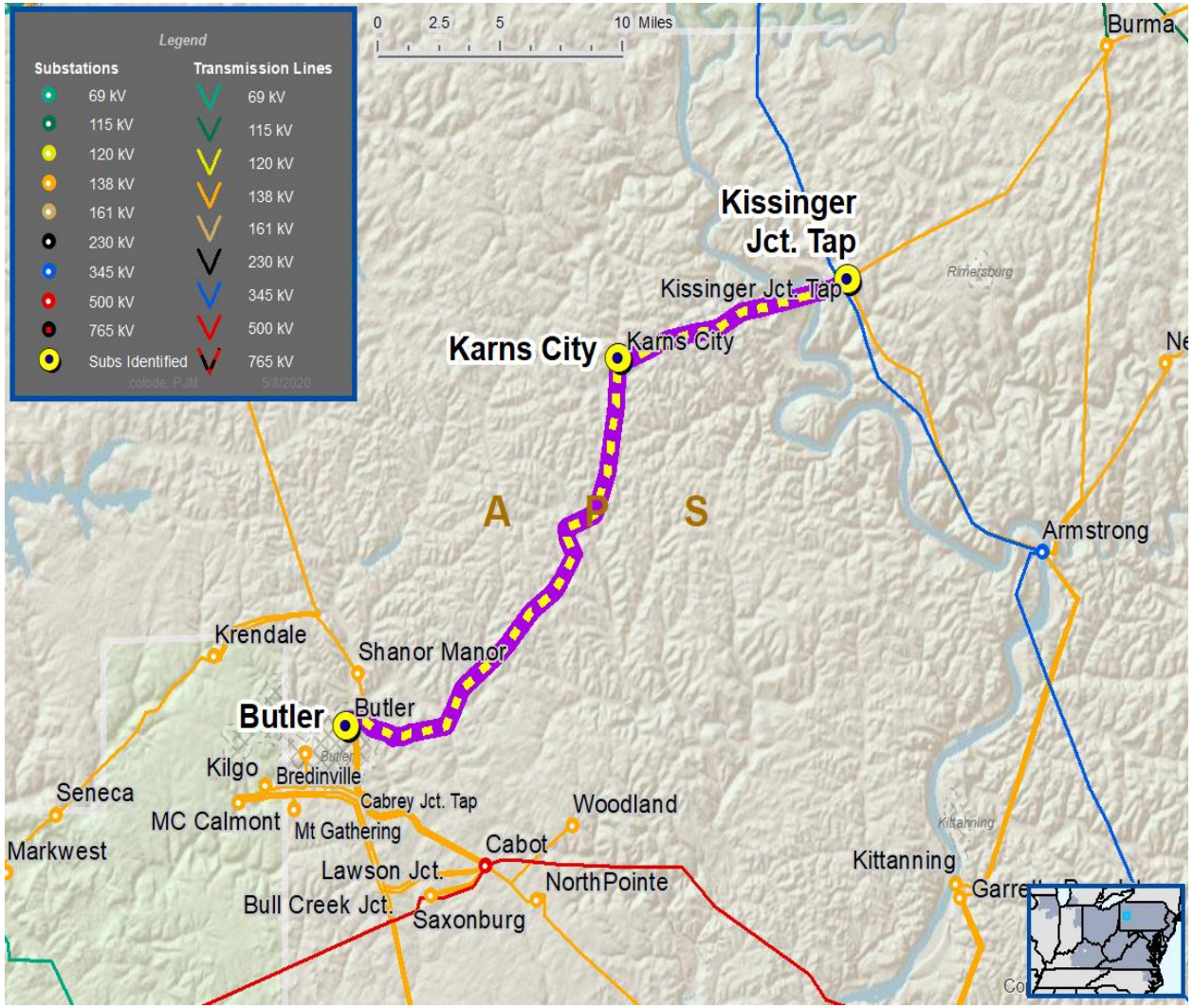
**Problem Statement:**

Loss of the Karns City #1 or #2 138-25 kV transformer results in significant voltage drop on the 25 kV system. Karns City substation consists of:

- Two distribution transformers connected to transmission with switches
- Two networked 138 kV transmission lines

Transmission lines are limited by terminal equipment.

- Karns City – Butler 138 kV existing line rating is 141 / 179 MVA (SN/SE). The existing transmission line conductor rating is 160 /192 MVA (SN/SE). (substation conductor) Refer to APS-2019-015.
- Karns City – Kissinger Junction 138 kV existing line rating is the existing transmission line conductor rating of 221 / 268 MVA (SN/SE). The winter emergency line rating is limited to 306 MVA from 317 MVA. (line relaying) Refer to APS-2020-009.



# APS Transmission Zone M-3 Process

**Need Number:** APS-2020-007

**Process State:** Submission of Supplemental Project for Inclusion in the Local Plan 10/8/2021

**Selected Solution:**

At Karns City 138 kV Substation:

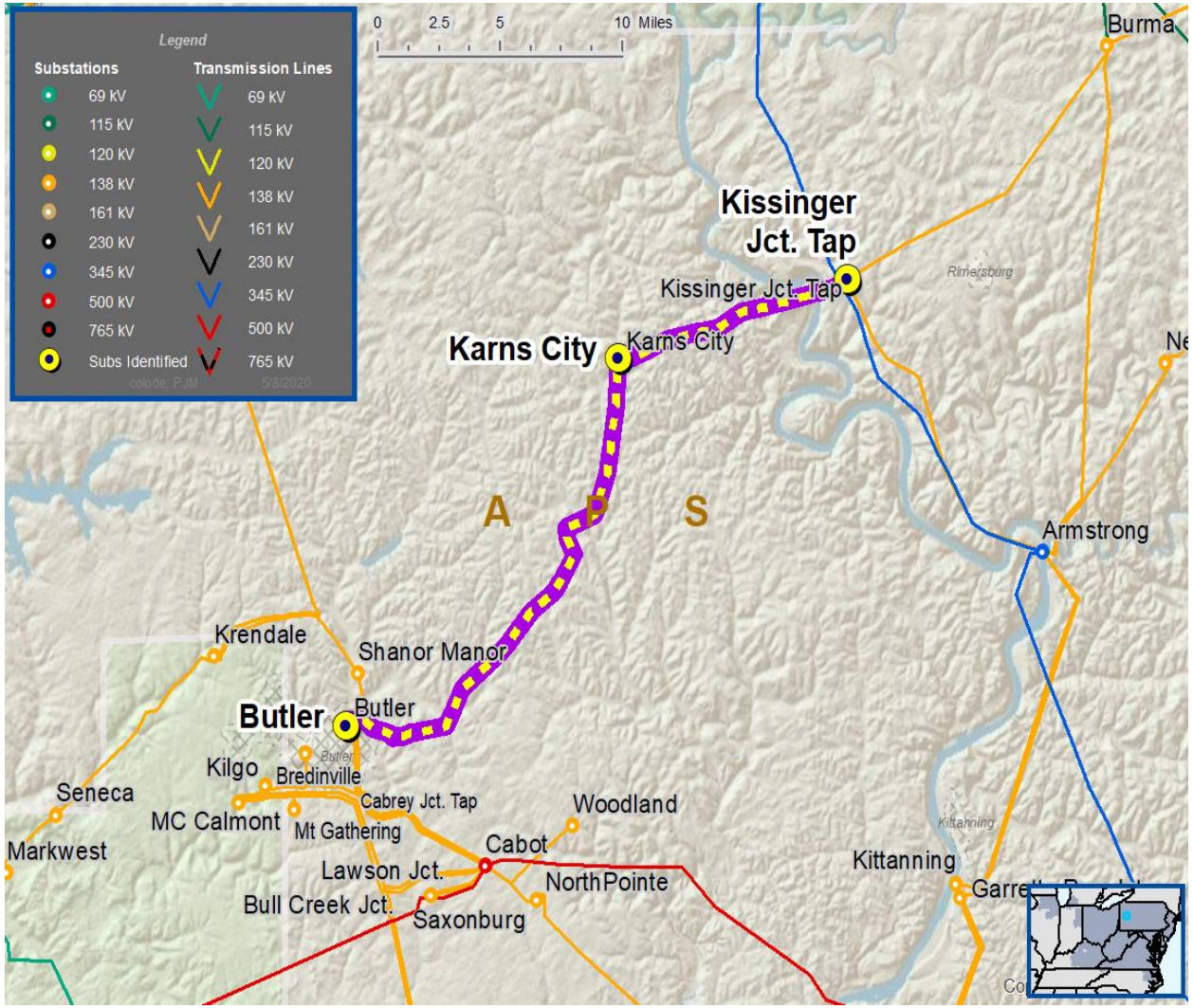
- Install a 138 kV bus tiebreaker disconnect switches.
- Install 138 kV CVT's and support structure.
- Replace/add 25 kV VT's.
- Upgrade relaying and protection.

**Estimated Project Cost:** $1.3M

**Projected In-Service:** 11/19/2022

**Supplemental Project ID:** s2542

**Model**: 2020 RTEP model for 2025 Summer (50/50)



# APS Transmission Zone M-3 Process
# Sand Fork, Weston, Vens Run 138 kV

**Need Number:** APS-2021-001

**Process State:** Submission of Supplemental Project for Inclusion in the Local Plan 10/8/2021

**Previously Presented:**

Need Meeting --2/17/2021

Solution Meeting -- Solution Meeting 4/16/2021

**Project Driver:**

*Equipment Material Condition, Performance and Risk*
*Operational Flexibility and Efficiency*

**Specific Assumption Reference:**

*Global Factors*

- System reliability and performance

*Add/Expand Bus Configuration*

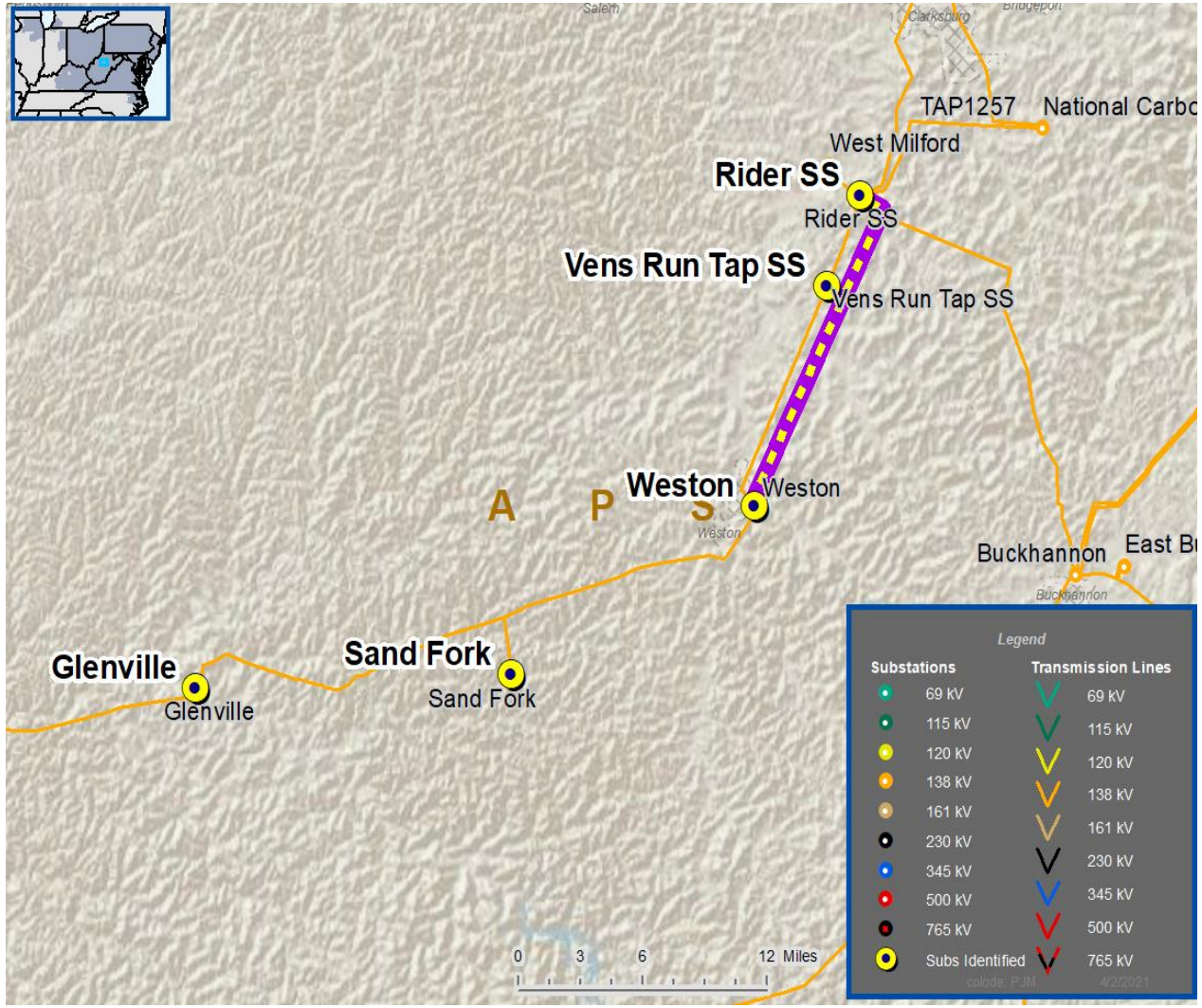
- Capability to perform substation maintenance

*Permanent Reactive Device Installations*

- Non-BES transmission systems facilities evaluation identifies the need for a permanent reactive device

**Problem Statement:**

Due to the load addition at Vens Run (s2293), a maintenance outage of the Rider to Vens Run 138 kV line followed by the loss of the Weston 138 kV capacitor results in low voltage at Weston, Vens Run, and Sand Fork 138 kV substations (0.89 p.u.).



# APS Transmission Zone M-3 Process
# Sand Fork, Weston, Vens Run 138 kV

**Need Number:** APS-2021-001

**Process State:** Submission of Supplemental Project for Inclusion in the Local Plan 10/8/2021

**Selected Solution:**

At Glenville SS:

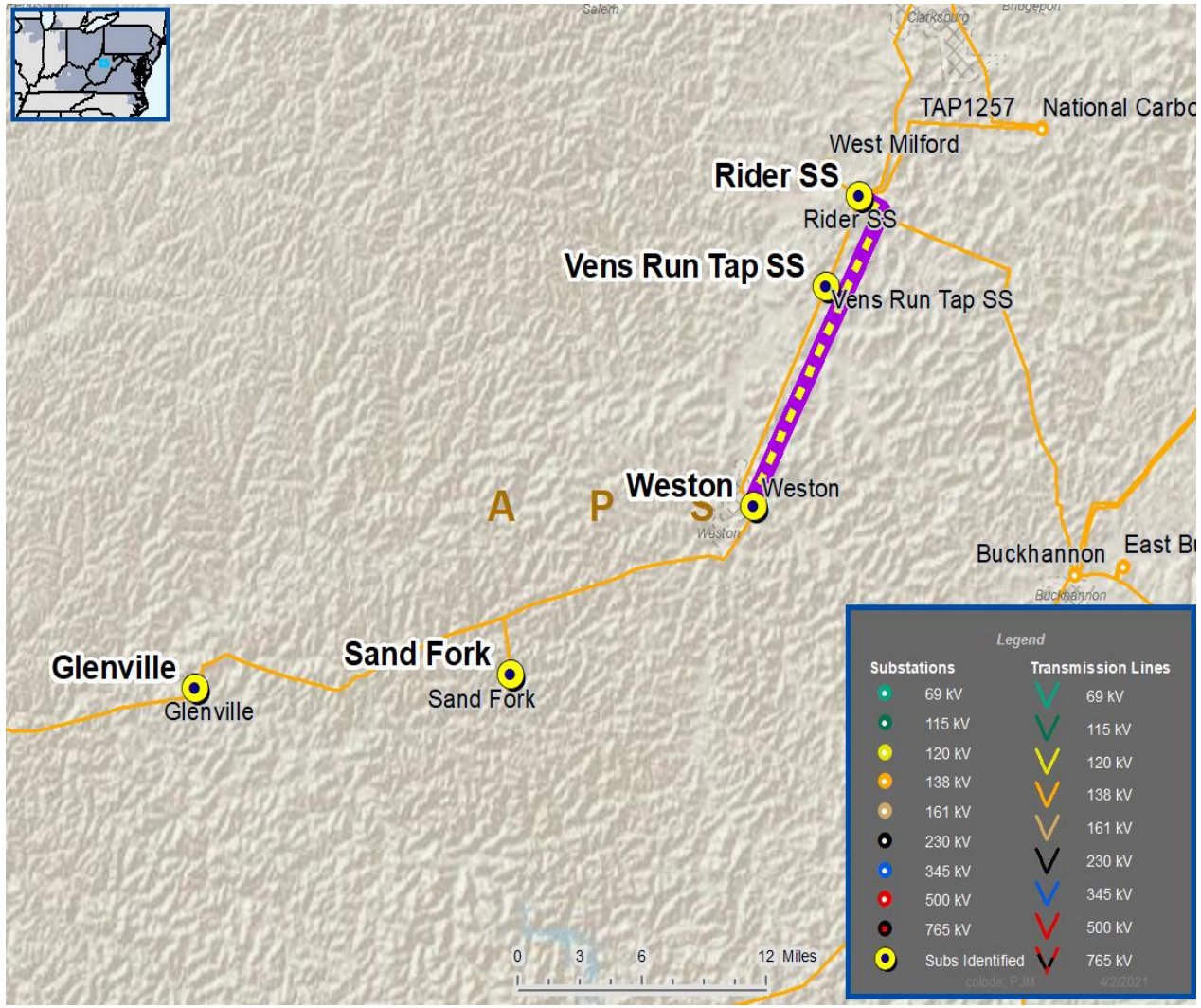
- Extend the 138 kV bus
- Install 26.4 MVAR 138 kV Capacitor
- Install 138 kV Capacitor switcher

**Estimated Project Cost:** $1.3M

**Projected In-Service:** 6/01/2021

**Supplemental Project ID:** s2543

**Model**: 2020 RTEP model for 2025 Summer (50/50)



# APS Transmission Zone M-3 Process
# Gore Substation

**Need Number:** APS-2021-002

**Process State:** Submission of Supplemental Project for Inclusion in the Local Plan 10/8/2021

**Previously Presented:**

Need Meeting – 2/17/2021

Solution Meeting – 4/16/2021

**Project Driver:**

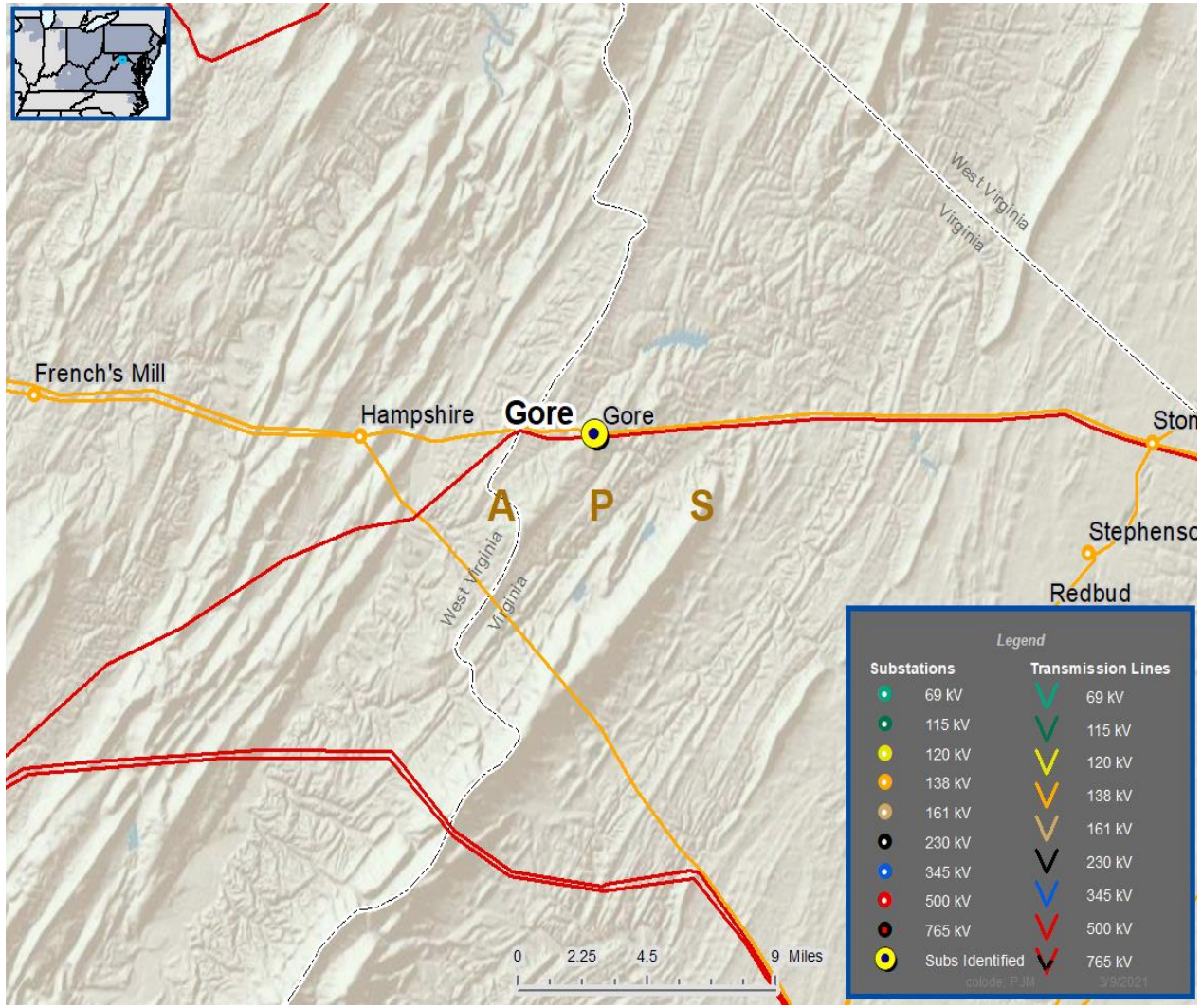
*Customer Service*

**Specific Assumption Reference:**

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

**Problem Statement:**

Existing Wholesale Customer Connection – Gore substation expansion to accommodate existing wholesale customer station upgrades.



# APS Transmission Zone M-3 Process
# Gore Substation

**Need Number:** APS-2021-002

**Process State:** Submission of Supplemental Project for Inclusion in the Local Plan 10/8/2021

**Selected Solution:**

At Gore:

- Install 138 kV breaker on the Stonewall terminal
- Remove existing Stonewall 138 kV line switch
- Adjust relaying

At Stonewall

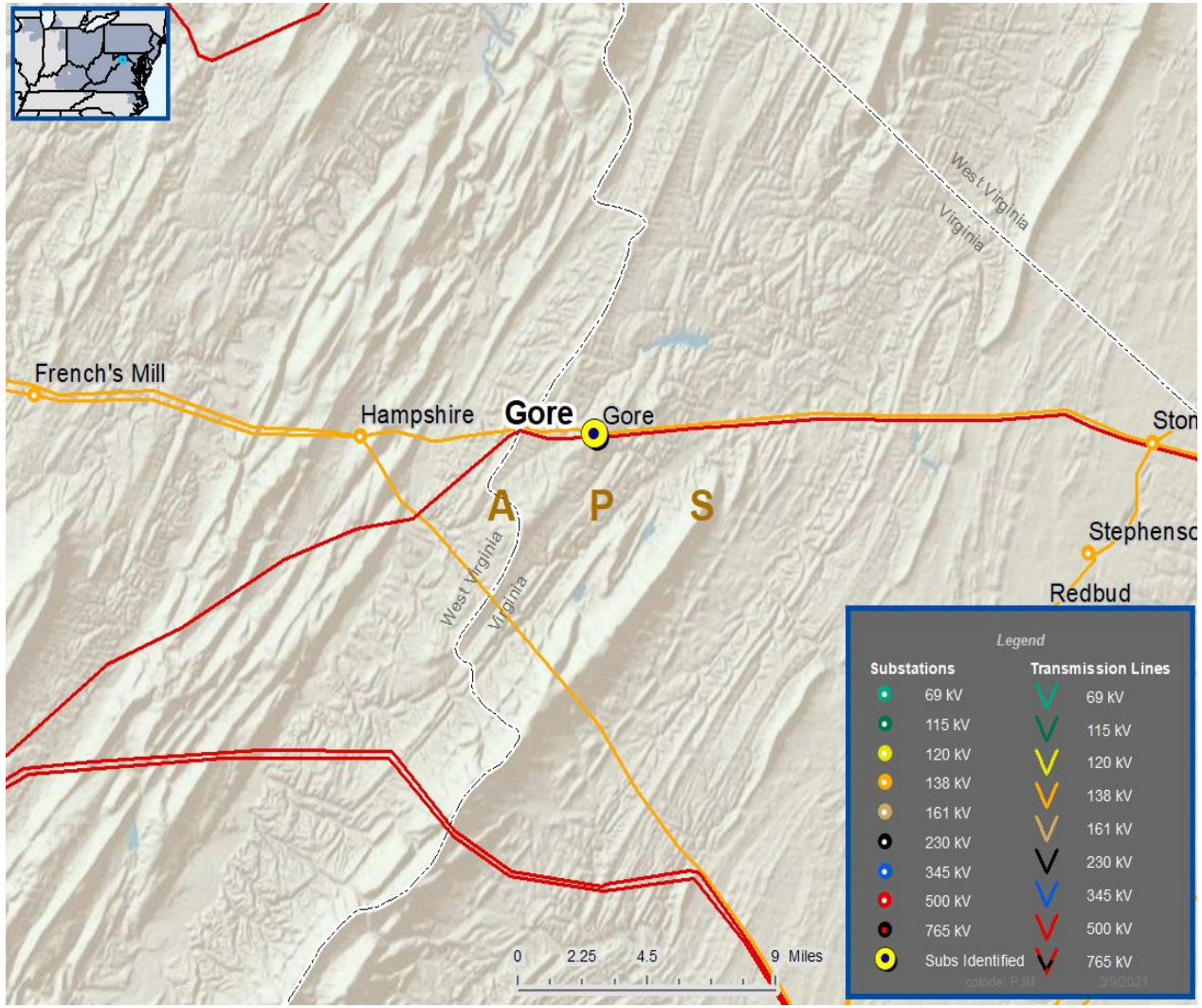
- Adjust relaying

**Estimated Project Cost:** $0.0M (Reimbursable)

**Projected In-Service:** 5/01/2021

**Supplemental Project ID:** s2544

**Model**: 2020 RTEP model for 2025 Summer (50/50)



# Revision History

10/08/2021 – V1 – Local plan posted on pjm.com (S2549, S2550, S2551, s2542, s2543 & S2544)