

Submission of Supplemental Projects for Inclusion in the Local Plan

Need Number: APS-2019-009

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 2/19/2020

Previously Presented:

- Need Meeting 6/28/2019 (PN-2019-025)
- Need Meeting 7/24/2019 (APS-2019-009)
- Solutions Meeting 7/31/2019 (PN-2019-025)
- Solutions Meeting 12/18/2019 (APS-2019-009)

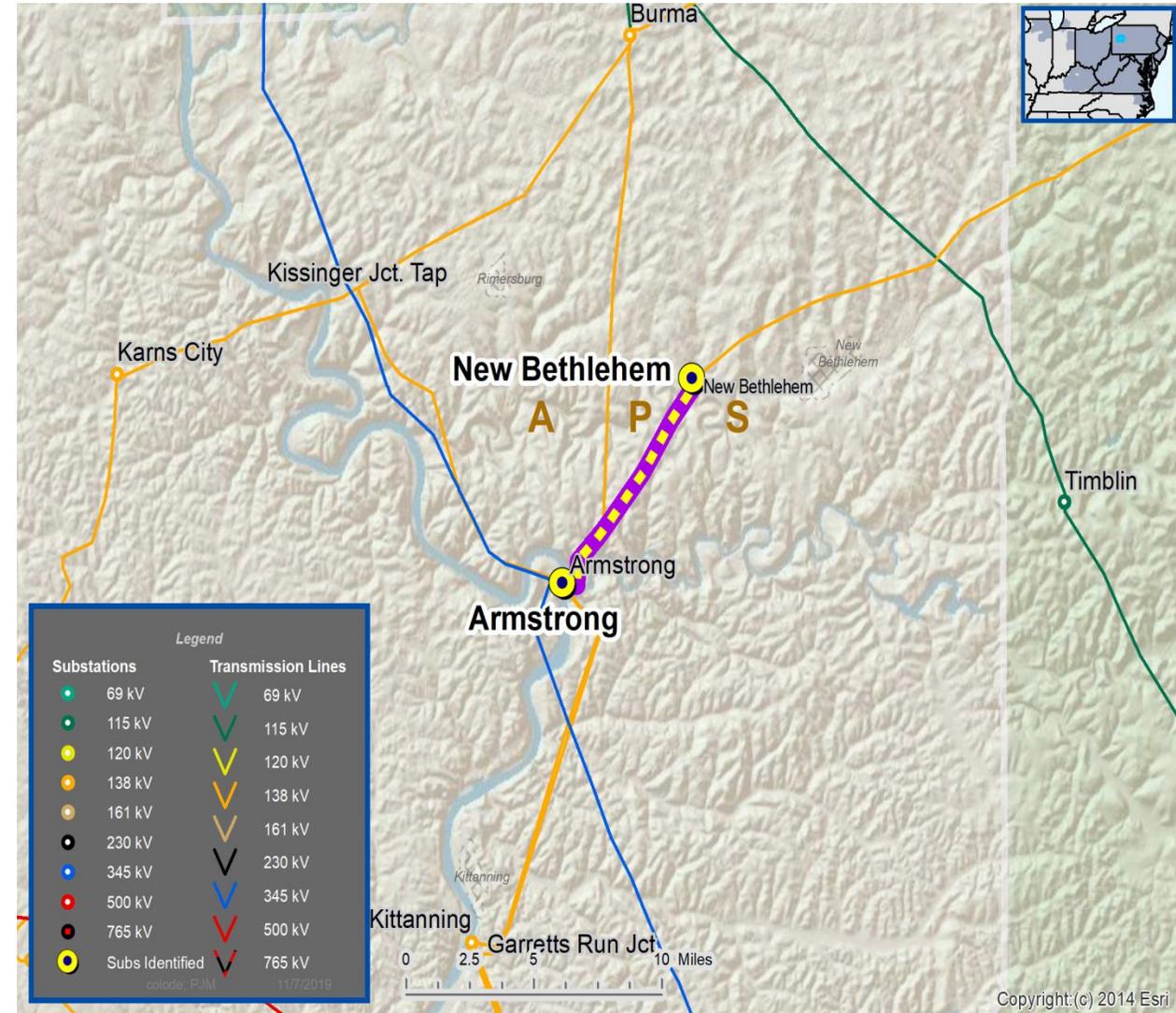
Project Driver:

*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





APS Transmission Zone M-3 Process Misoperation Relay Project

Need Number: APS-2019-009

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 2/19/2020

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many cases the protection equipment cannot be repaired due to a lack of replacement part and available expertise in the outdated technology.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-2019-009 PN-2019-025	Armstrong – New Bethlehem 138 kV Line New Bethlehem – Brookville 138 kV Line	293/332 295/342	308/376 308/376	Line Trap, Substation Conductor Line Trap, Substation Conductor, Circuit Breaker

APS Transmission Zone M-3 Process Misoperation Relay Project

Need Number: APS-2019-009

Process State: Submission of Supplemental Project for inclusion in the Local Plan 2/19/2020

Selected Solution:

Need Number	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Supplemental Project ID	Scope of Work	Estimated Costs (\$ M)	Target ISD
APS-2019-009 PN-2019-025	Armstrong – New Bethlehem 138 kV Line New Bethlehem – Brookville 138 kV Line	308/376 308/376	s2045.2 (APS) S2045.1 (PN)	<ul style="list-style-type: none"> Armstrong 138 kV Substation – Replace line trap and substation conductor 	\$0.4M	4/1/2020

Model: 2018 Series 2023 Summer RTEP 50/50

Need Number: PN-2019-026, PN-2019-034, APS-2019-010, and APS-2019-011
Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 2/19/2020

Previously Presented:

Need Meeting 07/11/2019
 Solution Meeting 08/08/2019

Project Driver:

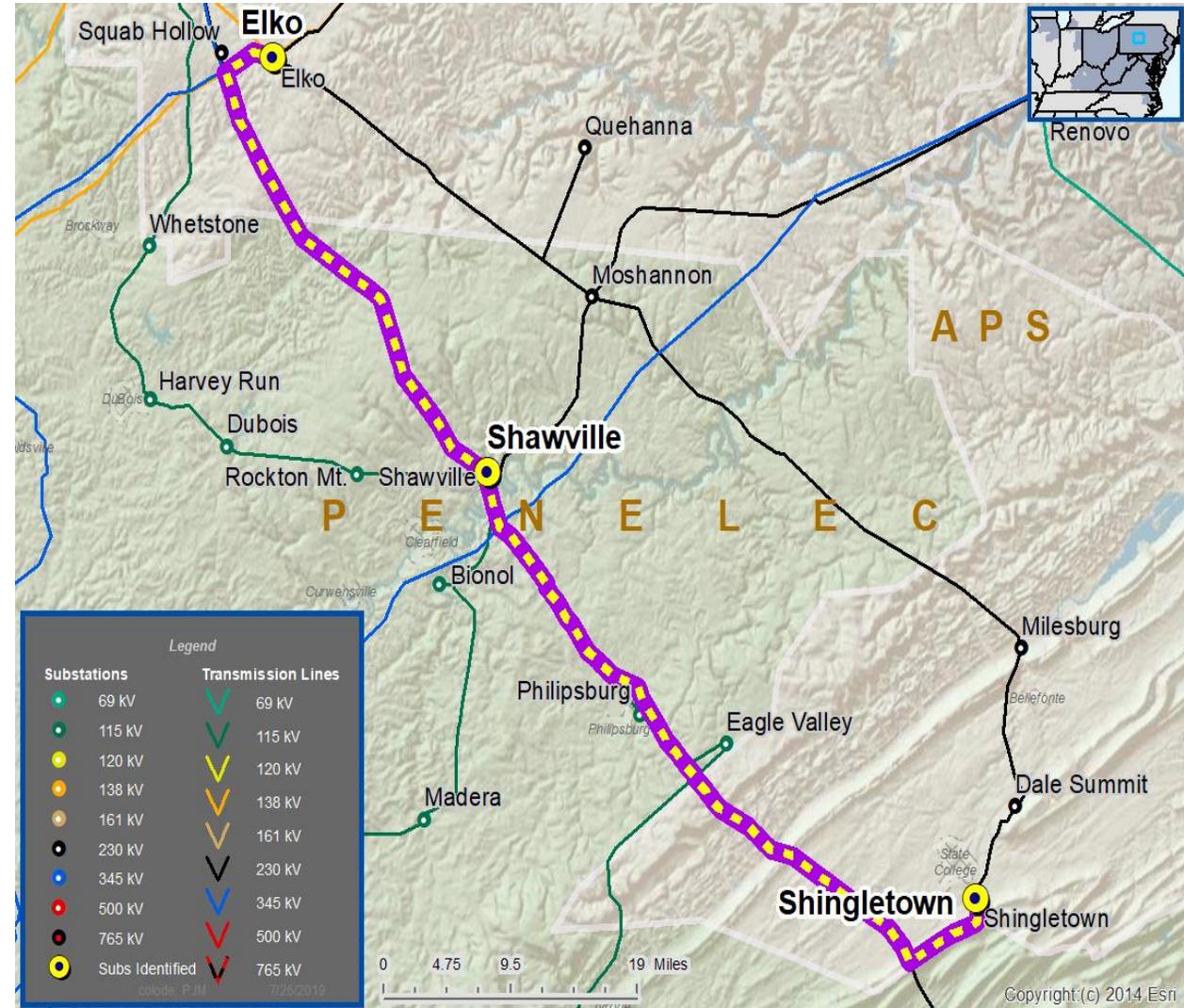
*Equipment Material Condition, Performance and Risk
 Operational Flexibility and Efficiency*

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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Penelec/APS Transmission Zone M-3 Process Multiple Misoperation Relay Projects

Need Number: PN-2019-026, PN-2019-034, APS-2019-010, and APS-2019-011

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 2/19/2020

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 part 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
PN-2019-026 APS-2019-011	Shawville – Shingletown 230 kV Line	489/554	546/666	Line Relaying, Line Trap, Substation Conductor
PN-2019-034 APS-2019-010	Elko – Shawville 230 kV Line	489/554	546/666	Line Relaying, Line Trap, Substation Conductor

Penelec/APS Transmission Zone M-3 Process Multiple Misoperation Relay Projects

Need Number: PN-2019-026, PN-2019-034, APS-2019-010, and APS-2019-011

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 2/19/2020

Selected Solution:

Need Number	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Supplemental Project ID	Scope of Work	Estimated Costs (\$ M)	Target ISD
PN-2019-026 APS-2019-011	Shawville – Shingletown 230 kV Line	546/666	s2051.1 (PN), s2051.2(APS)	<ul style="list-style-type: none"> Shawville 230 kV Substation – Replace line trap and substation conductor (s2051.1) Shingletown 230 kV Substation – Replace line relaying, line trap, and substation conductor (s2051.2) 	\$0.9M	12/1/2020
PN-2019-034 APS-2019-010	Elko – Shawville 230 kV Line	546/666	s2052.2 (PN), s2052.1 (APS)	<ul style="list-style-type: none"> Elko 230 kV Substation – Replace line relaying, line trap, and substation conductor (s2052.1) Shawville 230 kV Substation – Replace line relaying and line trap (s2052.2) 	\$1.3M	6/15/2020

No topology changes, no bubble diagram required.

Model: 2018 Series 2023 Summer RTEP 50/50

Need Number: APS-2019-014

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 05/22/2020

Previously Presented:

Need Meeting 12/18/2019
 Solution Meeting 3/19/2020

Project Driver:

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

Specific Assumption Reference:

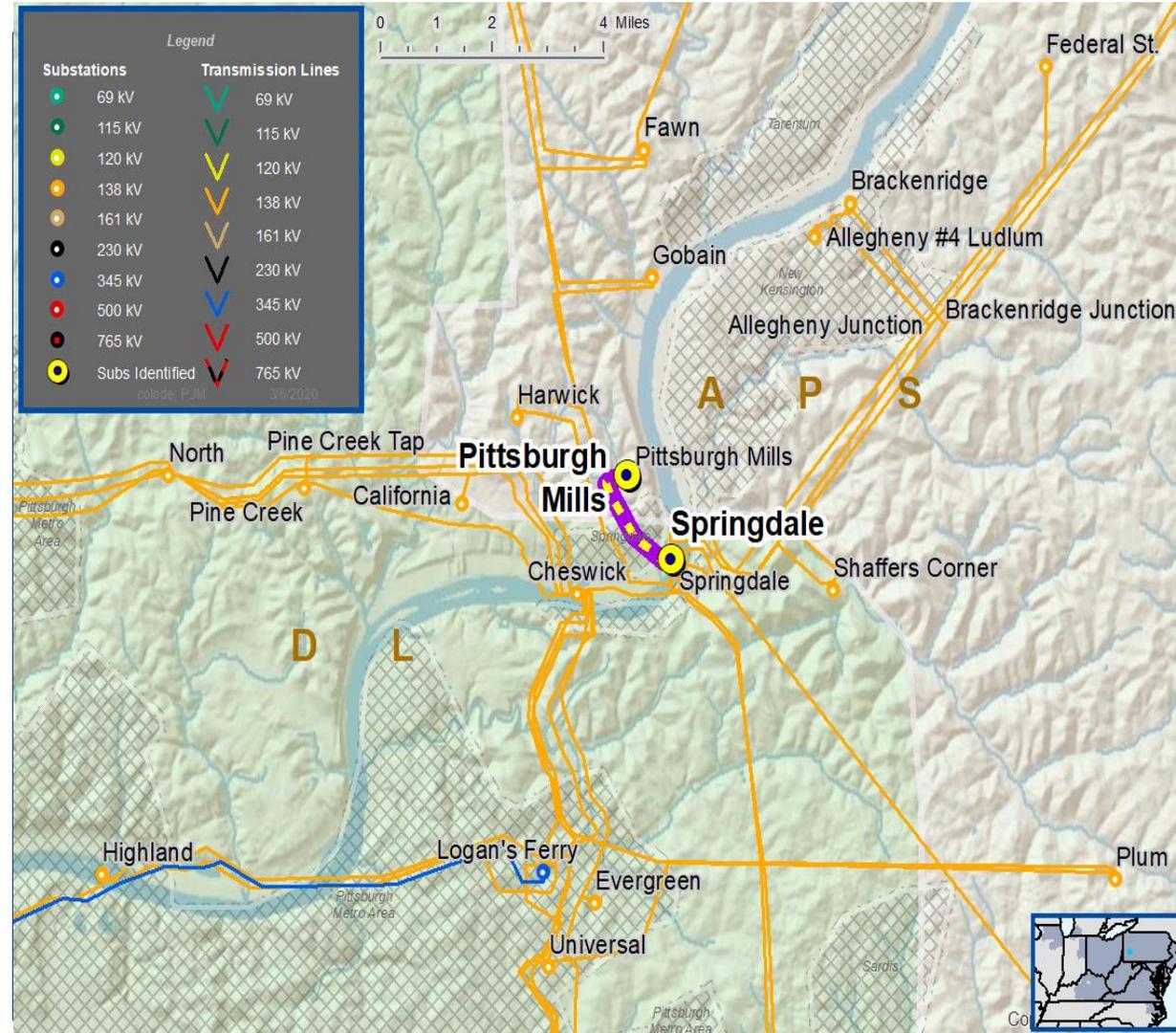
System Performance Projects Global Factors

- 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

Continued on next slide...



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-2019-014	Pittsburgh Mills – Springdale 138 kV Line	293/302	296/302	Line Trap

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 Costs (\$ M)	Target ISD
APS-2019-014	Pittsburgh Mills – Springdale 138 kV Line	s2205	296/302	<ul style="list-style-type: none"> • Pittsburgh Mills 138 kV Substation – Replace line trap and line relaying • Springdale 138 kV Substation – Replace line trap and line relaying 	\$0.8M	5/29/2020

No topology changes, no bubble diagram required.

Model: 2019 RTEP model for 2024 Summer (50/50)

Need Number: APS-2019-012

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/05/2020

Previously Presented:

Need Meeting 04/20/2020

Solution Meeting 05/22/2020

Project Driver:

Customer Service

Specific Assumption Reference:

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 – A customer requested 138 kV service, anticipated load is 27 MW, location is near the Buckhannon – Corder Crossing (Pruntytown) 138 kV line.

Requested in-service date is December 2020.

Geographic Map:
Include all facilities mentioned on slide, small locator map and a legend.

APS Transmission Zone M-3 Process Mon Power

Need Number: APS-2019-012

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/05/2020

Selected Solution:

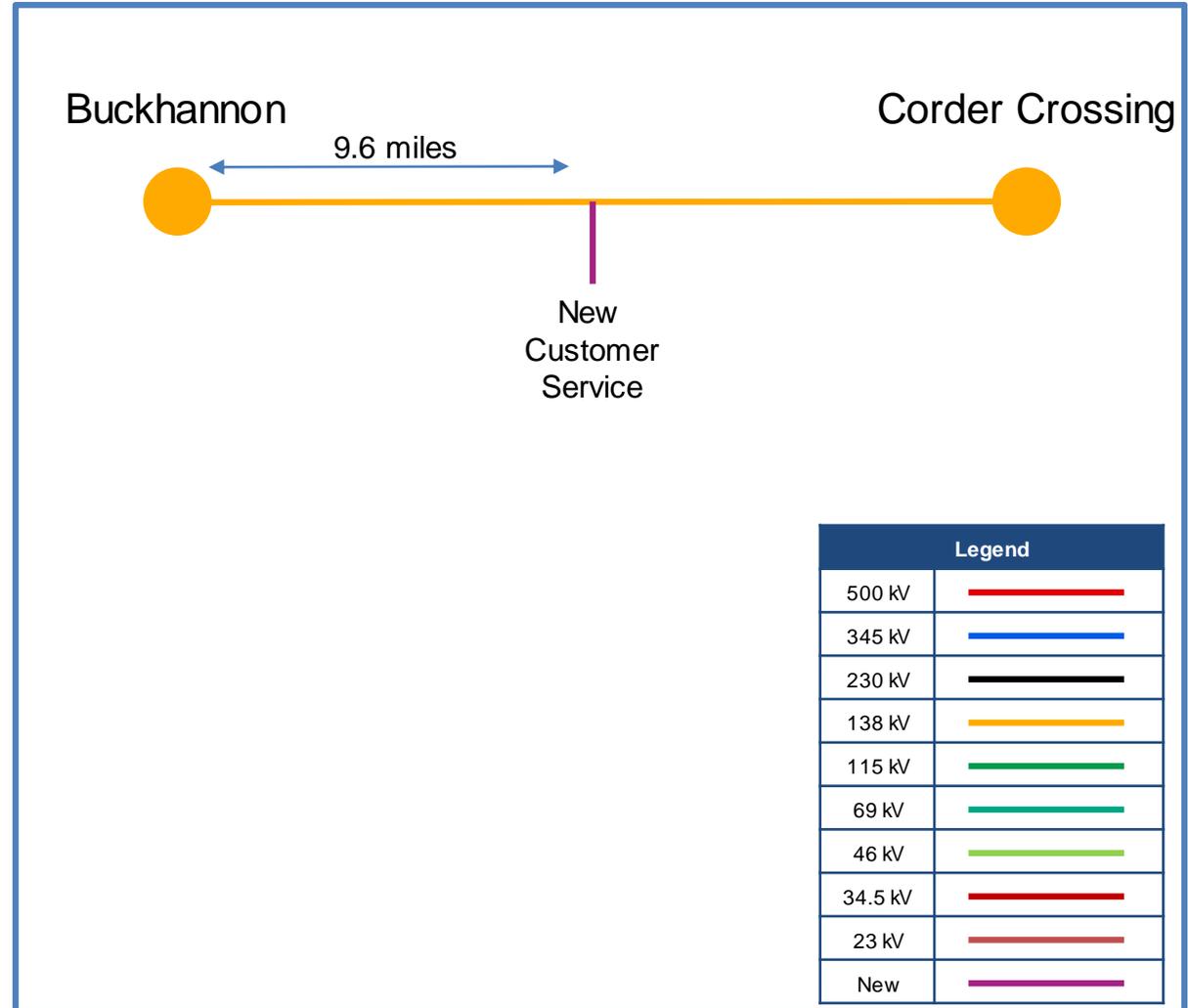
- Tap the Buckhannon-Corder Crossing 138 kV line approximately 9.6 miles from Buckhannon substation and build a 138 kV line one span toward the proposed customer substation
- Install two (2) 138 kV in-line switches on either side of the new customer tap connection
- Install one (1) 138 kV in-line switch on the line extension towards the customer substation

Estimated Cost: \$0.8M

Projected In-Service: 12/31/2020

Supplemental Project ID: s2288

Model: 2019 Series 2024 Summer RTEP 50/50



Need Number: APS-2020-002

Process State: Submission of Supplemental Project for inclusion in the Local Plan 10/05/2020

Previously Presented:

Need Meeting 04/20/2020

Solution Meeting 07/17/2020

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

Continued on next slide...

Geographic Map:
Include all facilities mentioned on slide, small locator map
and a legend.



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-2020-002	Roxbury – Greene 138 kV Line	164 / 206	221 / 268	Disconnect Switch, Substation Conductor
	Greene – Letterkenny 138 kV Line	221 / 268	221 / 268	N/A
	Letterkenny – Grand Point 138 kV Line	196 / 228	221 / 268	Line Trap

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-2020-002	Roxbury – Greene 138 kV Line	s2289	221 / 268	• Roxbury 138 kV Substation – Replace line relaying, disconnect switch, and substation conductor	\$0.5 M	4/29/2021
	Greene – Letterkenny 138 kV Line		221 / 268	-		
	Letterkenny – Grand Point 138 kV Line		221 / 268	• Grand Point 138 kV Substation – Replace line relaying and line trap		

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

Need Number: APS-2020-004, APS-2020-005, APS-2020-006, APS-2020-008, PN-2020-015

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/05/2020

Previously Presented:
Need Meeting 05/22/2020
Solution Meeting 07/17/2020

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

Continued on next slide...

Geographic Map:
Include all facilities mentioned on slide, small locator map
and a legend.



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-2020-004	Cabot – Lawson Junction 138 kV Line	287 / 287	297 / 365	Line Relaying, Line Trap
	McCalmont – Lawson Junction 138 kV Line	267 / 287	297 / 365	Substation Conductor, Line Relaying, Line Trap
	Fawn – Lawson Junction 138 kV Line	294 / 342	308 / 376	Substation Conductor, Line Trap
APS-2020-005	Charleroi – Union Junction 138 kV Line	274 / 302	296 / 302	Substation Conductor, Line Trap
	Mitchell – Union Junction 138 kV Line	295 / 342	308 / 376	Substation Conductor, Line Trap
	Peters – Union Junction 138 kV Line	294 / 342	308 / 376	Substation Conductor, Line Trap
APS-2020-006	Gordon – Lagonda 138 kV Line	293 / 343	309 / 376	Substation Conductor, Line Relaying, Line Trap
	Lagonda – Windsor 138 kV Line	261 / 311	297 / 365	Substation Conductor, Line Relaying, Line Trap
PN-2020-015 APS-2020-008	Blairsville East – Social Hall 138 kV Line	225 / 287	243 / 294	Substation Conductor, CTs, Line Relaying, Line Trap

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-2020-004	Cabot – Lawson Junction 138 kV Line	s2290	297/365	• Cabot 138 kV Substation – Replace line relaying, breaker, and line trap	\$2.5 M	5/19/2022
	McCalmont – Lawson Junction 138 kV Line		297/365	• McCalmont 138 kV Substation – Replace line relaying, breaker, substation conductors, and line trap		
	Fawn – Lawson Junction 138 kV Line		308/376	• Fawn 138 kV Substation – Replace line relaying, breaker, substation conductors, and line trap		
APS-2020-005	Charleroi – Union Junction 138 kV Line	s2291	296/302	• Charleroi 138 kV Substation – Replace line relaying, substation conductors, and line trap	\$1.6 M	5/28/2022
	Mitchell – Union Junction 138 kV Line		308/376	• Mitchell 138 kV Substation – Replace line relaying, substation conductors, and line trap		
	Peters – Union Junction 138 kV Line		308/376	• Peters 138 kV Substation – Replace line relaying, substation conductors, and line trap		
APS-2020-006	Gordon – Lagonda 138 kV Line	s2292	308/376	• Gordon 138 kV Substation – Replace line relaying, substation conductors, and line trap	\$1.4 M	6/1/2022
	Lagonda – Windsor 138 kV Line		297/365	• Windsor 138 kV Substation – Replace line relaying, breaker, substation conductors, and line trap		
PN-2020-015 APS-2020-008	Blairsville East – Social Hall 138 kV Line	s2314.2	243/294	• Social Hall 138 kV Substation – Replace line relaying, breaker, substation conductors, line trap, and current transformers	\$1.2 M	6/1/2021

Need Number: APS-2020-010

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/05/2020

Previously Presented:

Need Meeting 05/22/2020

Solution Meeting 07/17/2020

Project Driver:

Customer Service

Specific Assumption Reference:

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 – A customer requested 138 kV service, anticipated load is 10 MW, location is near the Rider – Weston 138 kV line.

Requested in-service date is December 2020.

Geographic Map:
Include all facilities mentioned on slide, small locator map and a legend.

APS Transmission Zone M-3 Process Mon Power

Need Number: APS-2020-010

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/05/2020

Selected Solution:

- Tap the Rider-Weston 138 kV line approximately 3.5 miles from Rider substation and build a 138 kV line one span toward the proposed customer substation
- Install two (2) 138 kV in-line switches on either side of the new customer tap connection
- Install one (1) 138 kV in-line switch on the line extension towards the customer substation

Estimated Cost: \$0.9M

Projected In-Service: 12/31/2020

Supplemental Project ID: s2293

Model: 2019 Series 2024 Summer RTEP 50/50



Need Number: APS-2020-011

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan 11/11/2020

Previously Presented:

Need Meeting 6/2/2020

Solutions Meeting 10/6/2020

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference:

Line Condition Rebuild/Replacement

- Age/condition of steel tower or steel pole transmission line structures
- Age/condition of transmission line conductors

System Performance Projects

- Substation/line equipment limits

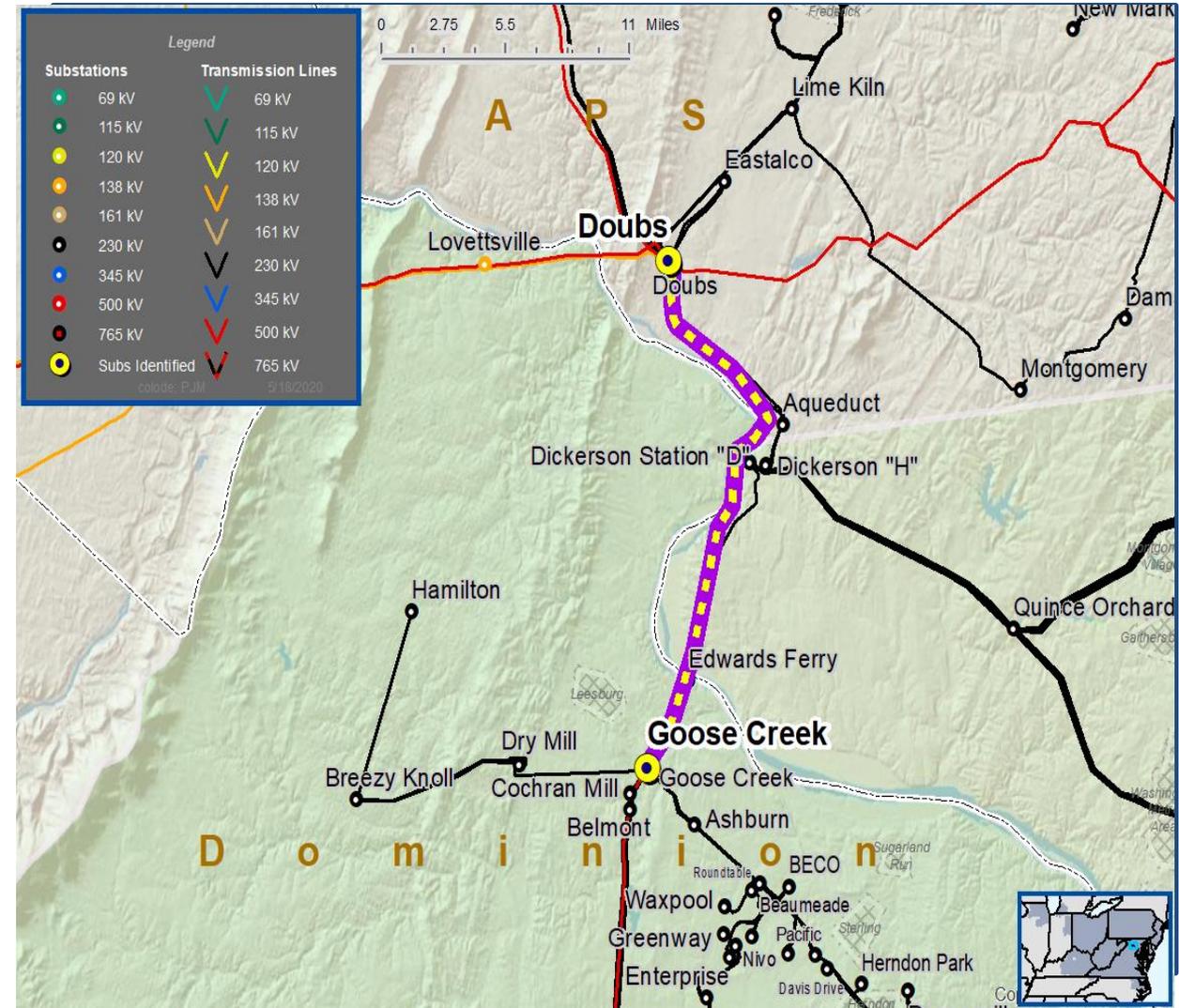
Problem Statement:

Doubs – Goose Creek 500 kV line is exhibiting deterioration.

- The transmission line was constructed in 1966.
- Total line distance is approximately 18 miles (FirstEnergy owns 15 miles).
- FirstEnergy owns 77 structures of the transmission line which consists of 69 COR-TEN steel lattice structures and eight galvanized steel structures.
- Independent assessment was conducted on a sample of 11 structures.
 - 10 of the 11 structures failed inspection (90% failure rate).
- Failure reasons include packout, corrosion, tension cracking, and structure foundation cracks/deterioration.

Transmission line ratings are limited by external ratings and terminal equipment

- Existing line rating: 2442/2442 MVA (SN/SE)
- Existing conductor rating: 3151/3894 MVA (SN/SE)



APS Transmission Zone M-3 Process

Doubs – Goose Creek 500 kV Line Rebuild

Need Number: APS-2020-011

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan 11/11/2020

Selected Solution:

Doubs – Goose Creek 500 kV Line Rebuild

- Rebuild and reconductor the FE portion of the Doubs – Goose Creek 500 kV line (approximately 14.8 miles of steel lattice tower construction) utilizing existing Right-of-Way.

Doubs 500 kV Substation – Equipment to be replaced includes:

- Breaker disconnect switches, line metering and relaying, substation conductor, and breakers

Transmission Line Rating:

Doubs – Goose Creek 500 kV Line

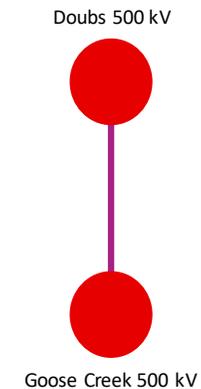
- Before Proposed Solution: 2442/2442 MVA (SN/SE)
- After Proposed Solution: 4330/4330 MVA (SN/SE)

Estimated Project Cost: \$60 M

Projected In-Service: 6/1/2025

Supplemental Project ID: s2386

Model: 2020 RTEP Model for 2025



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

Revision History

2/19/2020 – V1 – Local Plan posted to pjm.com for s2045.2, s2051.2, s2052.1

5/28/2020 – V2 – Local Plan posted to pjm.com for s2205

10/5/2020 – V3 – Local Plan posted to pjm.com for S2288, S2289, S2290, S2291, S2292, S2314.2, S2293

11/11/2020 – V4 – Local Plan posted to pjm.com for S2386