

Submission of Supplemental Projects for Inclusion in the Local Plan

ATSI Transmission Zone M-3 Process

Avon 345/138 kV #91 Transformer Replacement

Need Number: ATSI-2018-001

Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019

Previously Presented:

Need - 9/28/2018

Solution – 10/26/2018

Supplemental Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption Reference

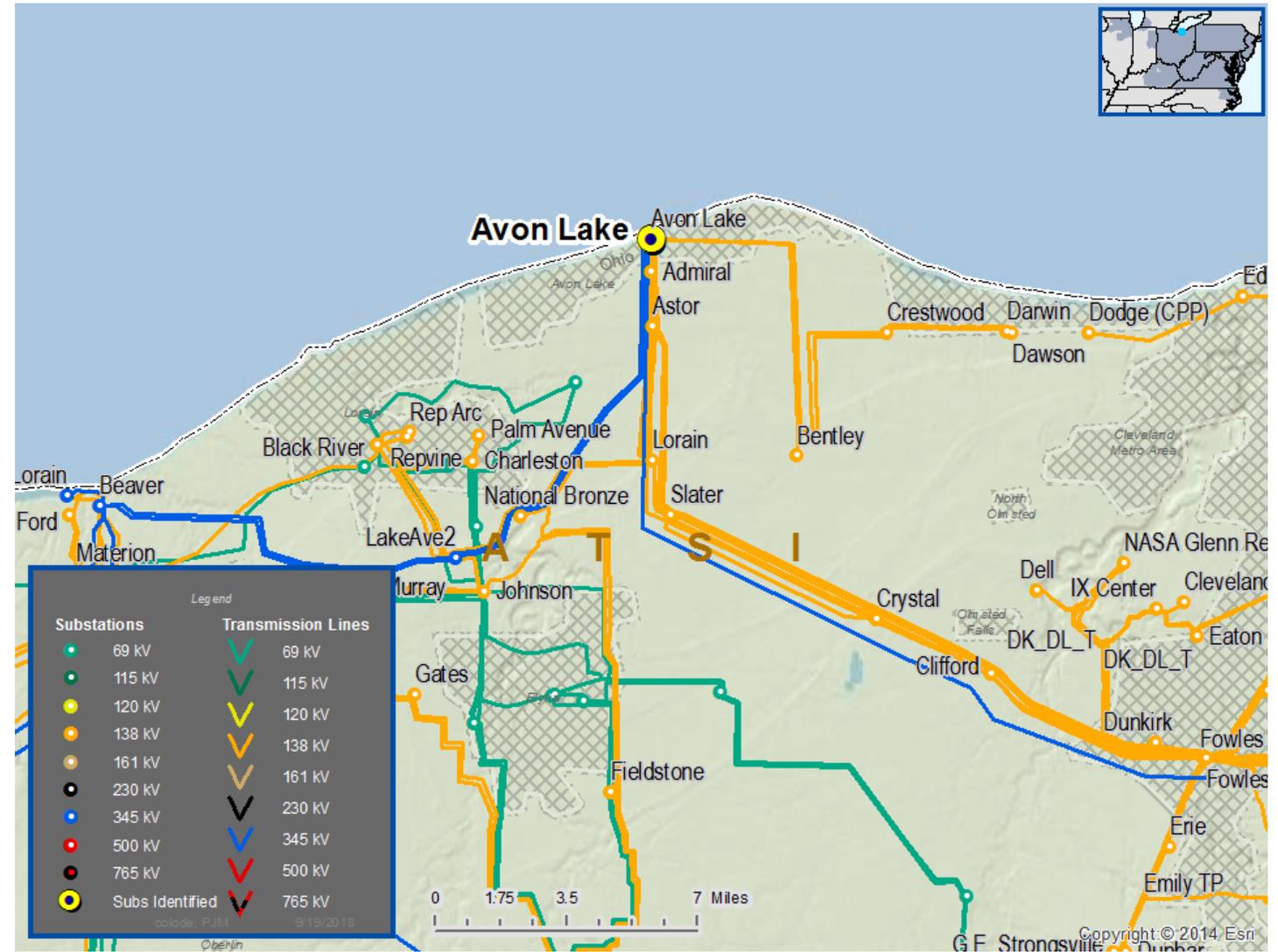
Substation Condition Rebuild / Replacement

- Power Transformers and Load Tap Changers (LTC)

Problem Statement

Avon 345 / 138 kV 448 MVA #91 Transformer

- Transformer is gassing at an increasing rate
- Oil condition is degraded
- Leaks – Not cost effective to repair
- Severe loading history
- Cooler condition is degraded



ATSI Transmission Zone M-3 Process

Avon 345/138 kV #91 Transformer Replacement

Need Number: ATSI-2018-001

Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019

Selected Solution:

Avon 345/138 kV #91 Transformer Replacement

- Replace existing Avon #91 345/138 kV transformer (448 MVA) with a new 345/138 kV transformer (560 MVA)

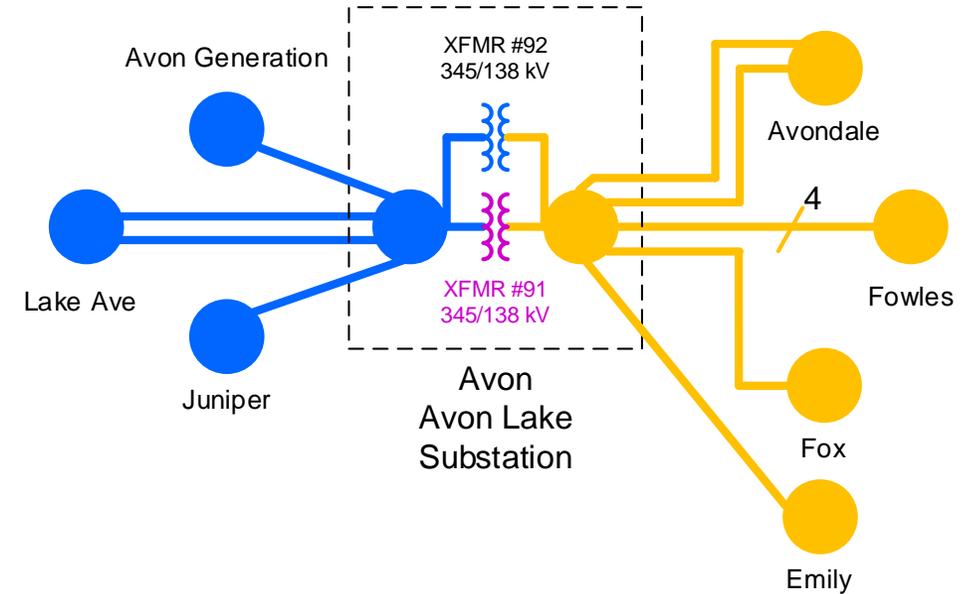
Avon Substation – Terminal equipment to be replaced include:

- Substation conductor

Estimated Project Cost: \$5.8 M

Projected In-Service: 12/31/2019

Supplemental Project ID: s1754



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Fox 345/138 kV #5 Transformer Replacement

Need Number: ATSI-2018-002

Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019

Previously Presented: Need - 9/28/2018
Solution – 10/26/2018

Supplemental Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Substation Condition Rebuild / Replacement

- Power Transformers and Load Tap Changers (LTC)
- Circuit Breaker and Other Fault Interrupting Devices

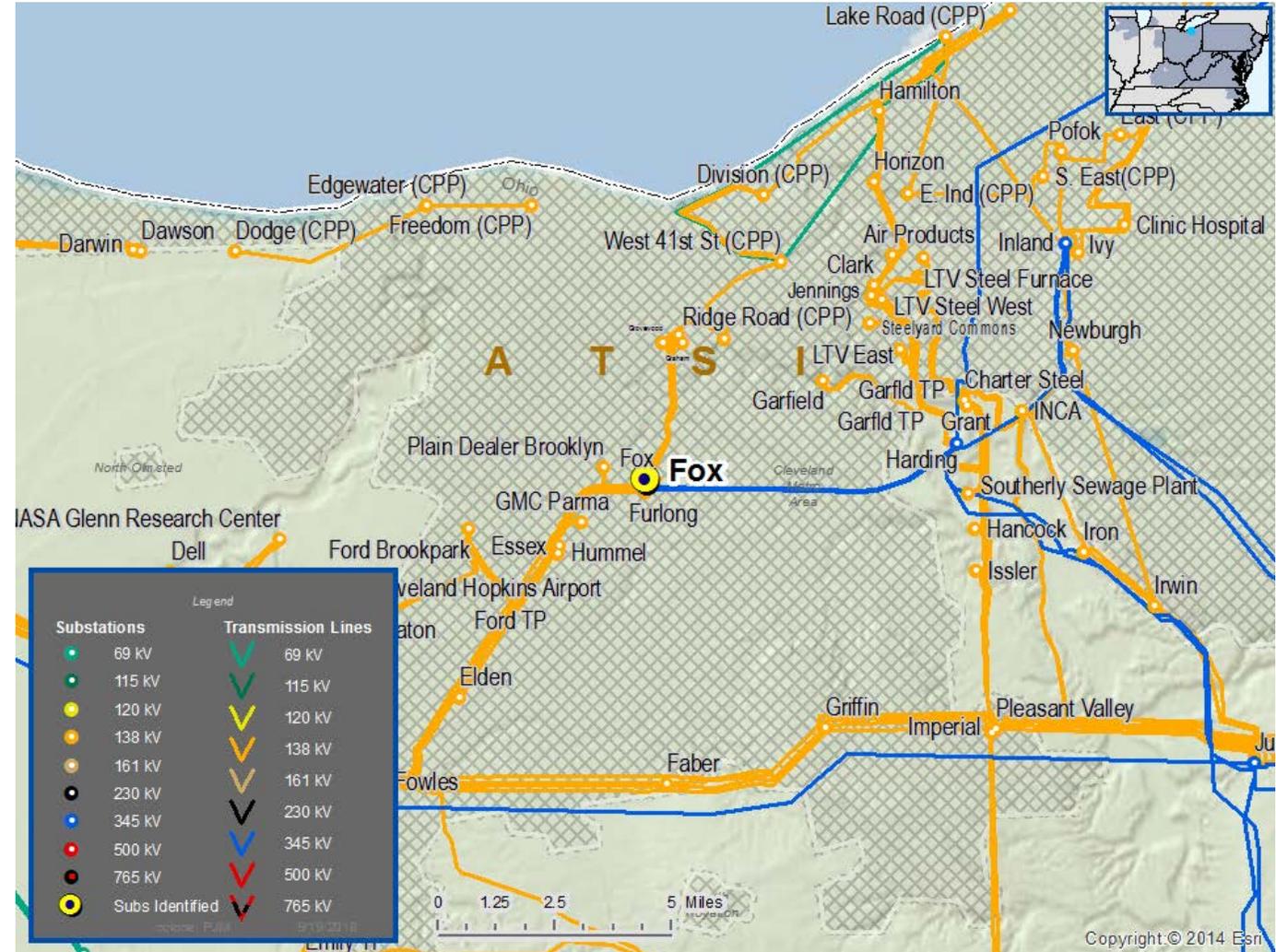
Problem Statement

Fox 345 / 138 kV 224 MVA #5 Transformer

- Oil Pump/cooler maintenance
- Aging/deteriorating bushings
- Increased failure risk

Fox 138 kV Circuit Breaker Q5

- Mechanism issues
- Aging/deteriorating bushings
- Spare part availability/vendor support limitations
- Negative impact on equipment health (transformer)



ATSI Transmission Zone M-3 Process

Fox 345/138 kV #5 Transformer Replacement

Need Number: ATSI-2018-002
Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019

Selected Solution:

Fox 345/138 kV #5 Transformer Replacement

- Replace existing Fox #5 345/138 kV transformer (224 MVA) with a new 345/138 kV transformer (280 MVA).

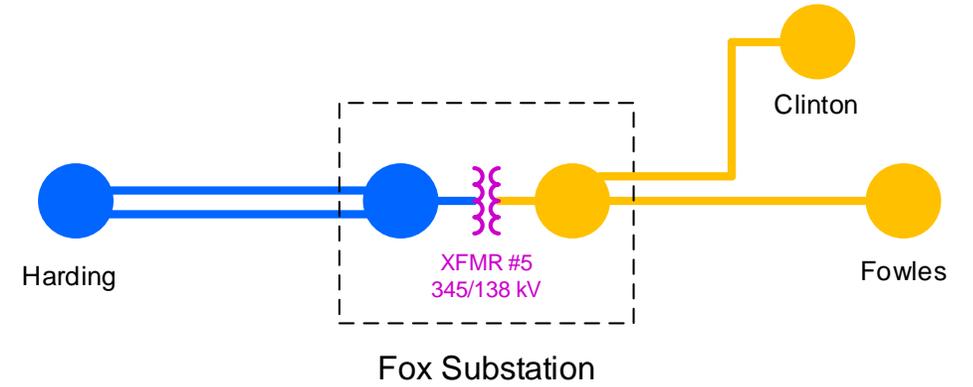
Fox Substation – Terminal equipment to be replaced includes:

- 138kV circuit breaker Q5, substation conductor, CCVT, and associated relaying.

Estimated Project Cost: \$6.3 M

Projected In-Service: 12/31/2019

Supplemental Project ID: s1755



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

New Castle 138/69 kV #7 Transformer Replacement

Need Number: ATSI-2018-003
Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Supplemental Project Driver:
 Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Substation Condition Rebuild / Replacement

- Power Transformers and Load Tap Changers (LTC)
- Circuit Breaker and Other Fault Interrupting Devices

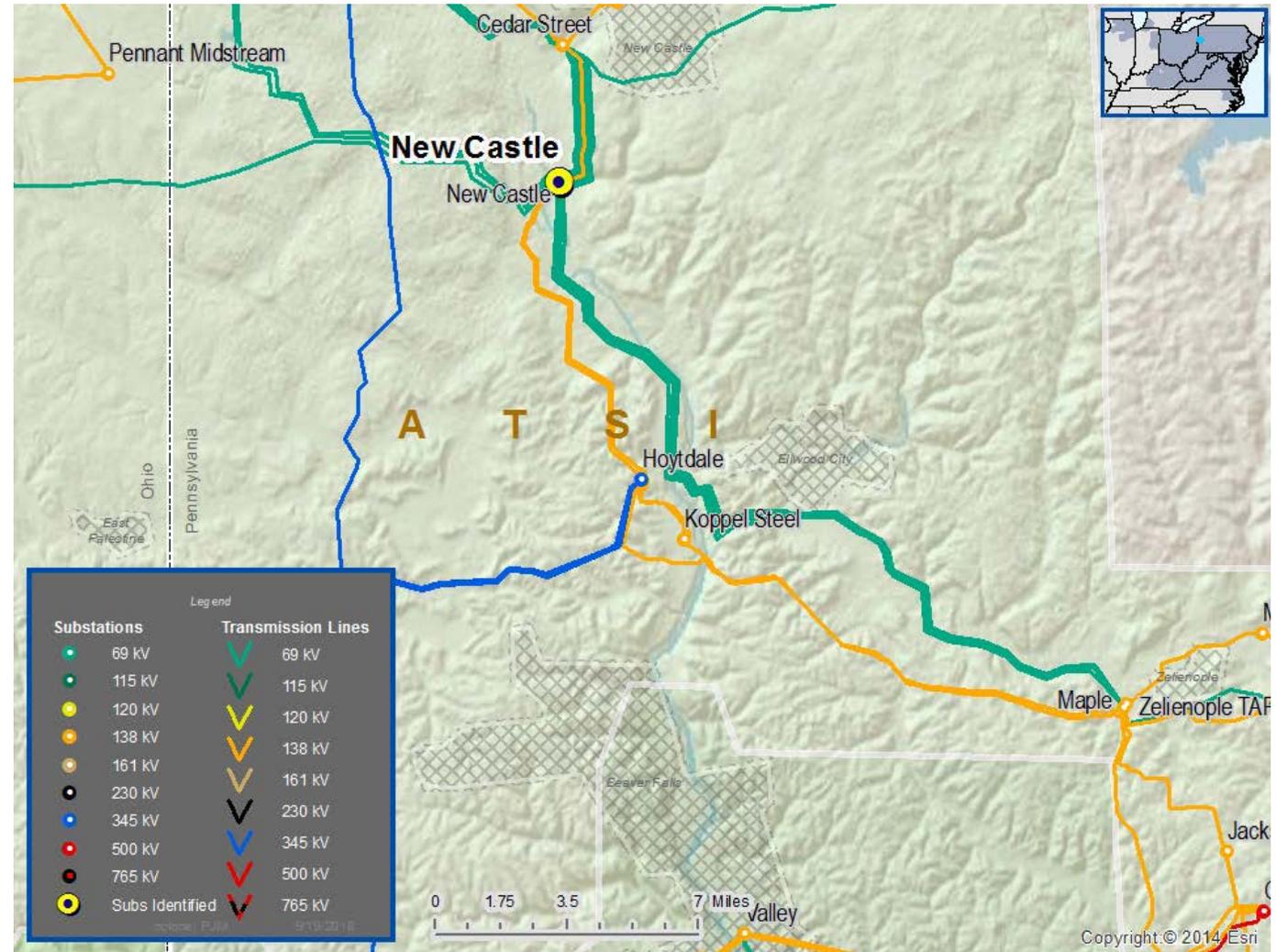
Problem Statement

New Castle 138 / 69 kV 75 MVA #7 Transformer

- Oil Leaks/moisture ingress
- Aging/deteriorating bushings
- Increased failure risk

New Castle 69 kV Circuit Breaker B32

- Mechanism issues
- Aging/deteriorating bushings
- Spare part availability/vendor support limitations
- New breaker will offer improved transformer protection



ATSI Transmission Zone M-3 Process

New Castle 138/69 kV #7 Transformer Replacement

Need Number: ATSI-2018-003

Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019

Selected Solution:

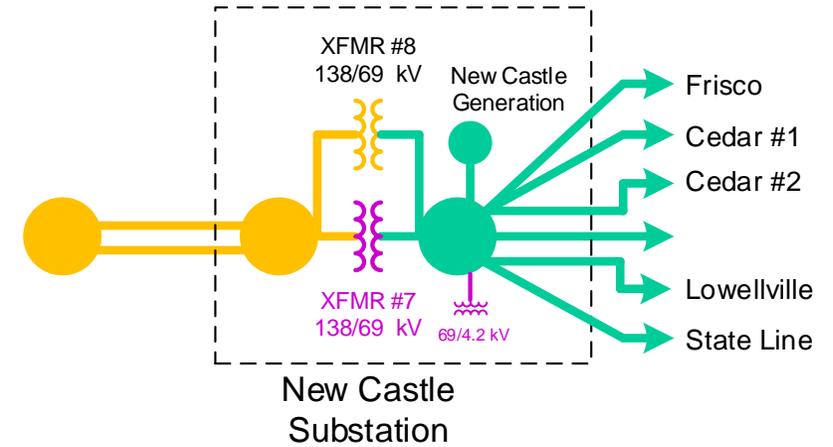
New Castle #7 138/69 kV Transformer Replacement

- Replace existing New Castle #7 138/69/4.2 kV transformer (125 MVA) with new 138/69 kV transformer (134 MVA).
- Replace existing 69 kV breaker (B32).
- Install new 69/4.2 kV transformer (15 MVA) and a 69 kV circuit breaker in existing 69 kV transformer position for generation station service.

Estimated Project Cost: \$3.9 M

Projected In-Service: 12/31/2020

Supplemental Project ID: s1756



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Beaver 345/138 kV #1 Transformer Replacement

Need Number: ATSI-2018-004
Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Supplemental Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Substation Condition Rebuild / Replacement

- Power Transformers and Load Tap Changers (LTC)

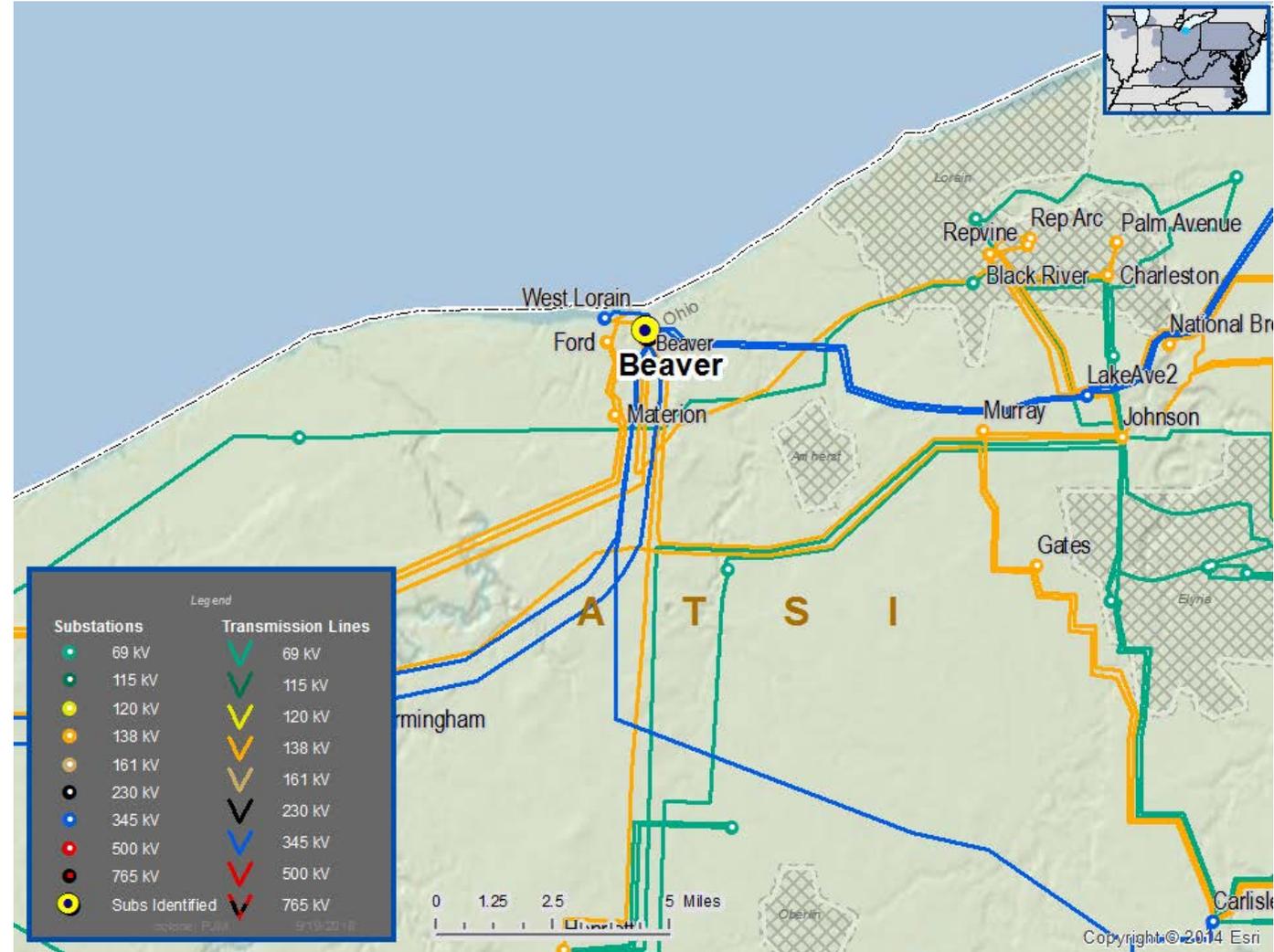
Problem Statement

Beaver 345 / 138 / 13.2 kV 392 MVA #1 Transformer

- Oil Pump issues and maintenance
- Increased failure probability
- Aging/deteriorating bushings

Beaver 345 / 138 / 13.2 kV 392 MVA #2 Transformer

- Oil Pump issues and maintenance
- Increased failure probability
- Aging/deteriorating bushings



ATSI Transmission Zone M-3 Process

Beaver 345/138 kV #1 Transformer Replacement

Need Number: ATSI-2018-004

Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019

Selected Solution:

Beaver #1 and Beaver #2 345/138 kV Transformer Replacement

- Replace existing Beaver #1 345/138/13.2 kV transformer (350 MVA) with new 345/138 kV transformer (448 MVA)
- Replace existing Beaver #2 345/138/13.2 kV transformer (350 MVA) with new 345/138 kV transformer (448 MVA)
- Install new 138/13.2 kV transformer (14MVA) and breaker for power to station service at Beaver
- Install new 138/13.2 kV transformer (14MVA) and breaker for power to station service at West Lorain Generation

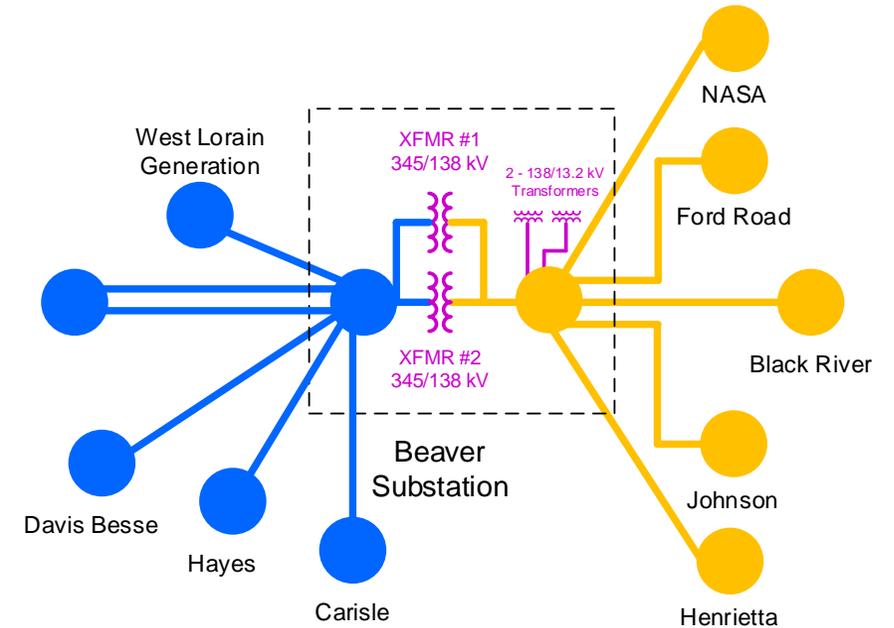
Beaver Substation – Terminal equipment to be replaced include:

- Replace disconnect switches, VT’s, CCVT’s, and associated relaying.

Estimated Project Cost: \$12.7 M

Projected In-Service: 12/31/2021

Supplemental Project ID: s1757



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Northfield and Juniper 138 kV Bus Upgrades

Need Number: ATSI-2018-005

Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019

Previously Presented: Need - 9/28/2018
Solution – 10/26/2018

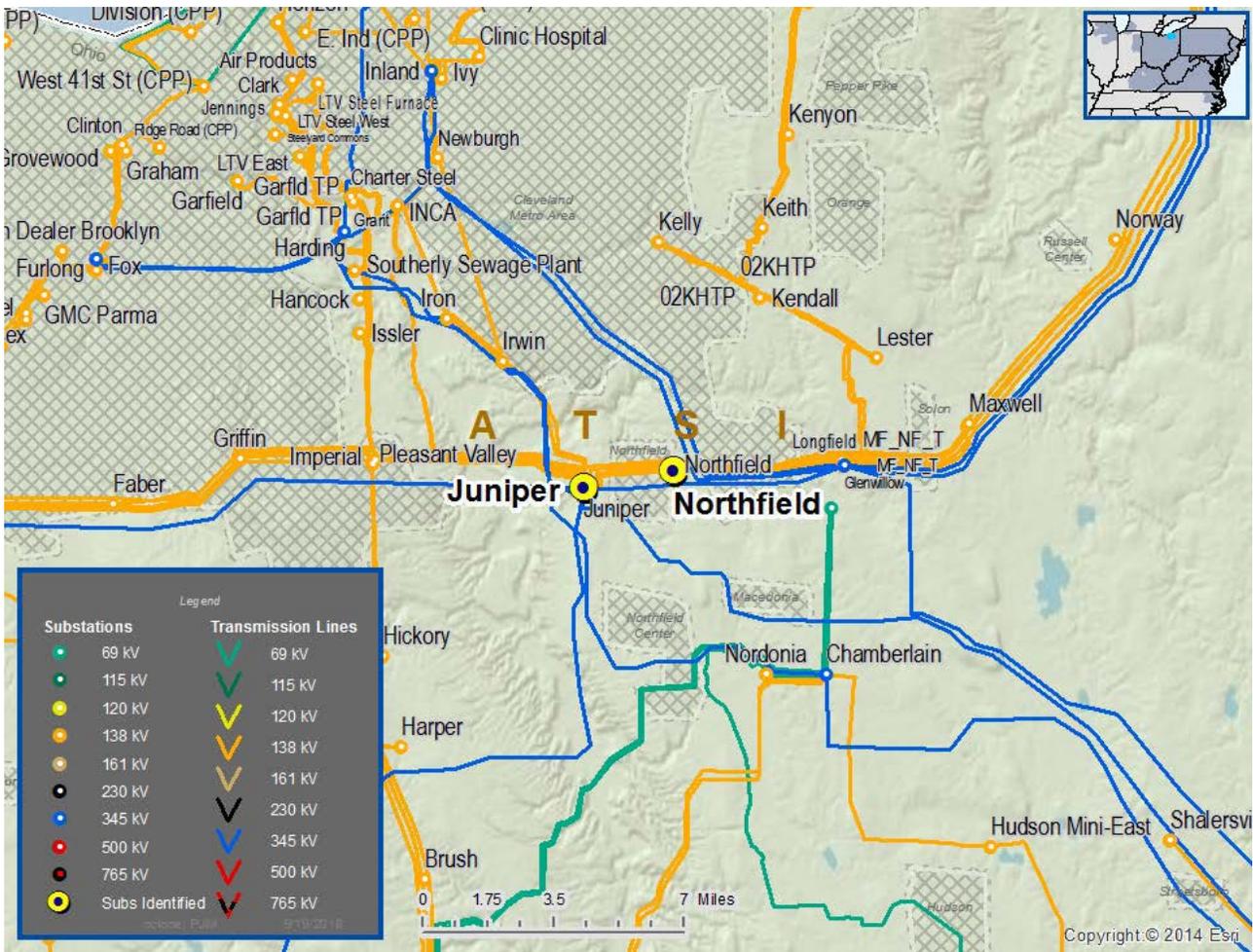
Supplemental Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

- Substation Condition Rebuild / Replacement
- Circuit Breaker and Other Fault Interrupting Devices
 - Disconnect Switches
 - Electromechanical and Solid-state Protective Relaying
 - Potential Transformers (PTs), Coupling Capacitor Voltage Transformers (CCVTs)
 - Line Arresters

Problem Statement

- Northfield 138 kV Bus 2 and Bus 4
- Deteriorated bushings and insulators, increased failure risks
 - Reliability issues, EM relaying mis-operations
- Juniper 138 kV Bus 1
- Deteriorated bushings and insulators, increased failure risks
 - Reliability issues, EM relaying mis-operations



ATSI Transmission Zone M-3 Process

Northfield and Juniper 138 kV Bus Upgrades

Need Number: ATSI-2018-005
Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019

Selected Solution:

Northfield and Juniper 138 kV Bus Upgrades
NORTHFIELD 138 kV Substation – Terminal equipment to be replaced include:

- Replace bus relaying, disconnect switches, VT’s, CCVT’s, breakers (B18, B20, B21), and arresters, for Northfield 138 kV Bus 2 and Bus 4.

JUNIPER 138 kV Substation – Terminal equipment to be replaced include:

- Replace bus relaying, disconnect switches, CCVT’s, breakers (B25 and B27), and arresters for Juniper Bus 1.

Estimated Project Cost: \$2.1M
Projected In-Service: 3/15/2020
Supplemental Project ID: s1758

Bubble Chart
Not Applicable

Substation upgrades only.

ATSI Transmission Zone M-3 Process

Frisco-Maple #1 and #2 69 kV Terminal Upgrades

Need Number: ATSI-2018-006
Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Supplemental Project Driver:
Operational Flexibility and Efficiency

Specific Assumption Reference

Add / Expand Bus Configuration

- Substation buses that adversely impact system performance
- Reduce amount of exposed potential local load loss during contingency conditions.

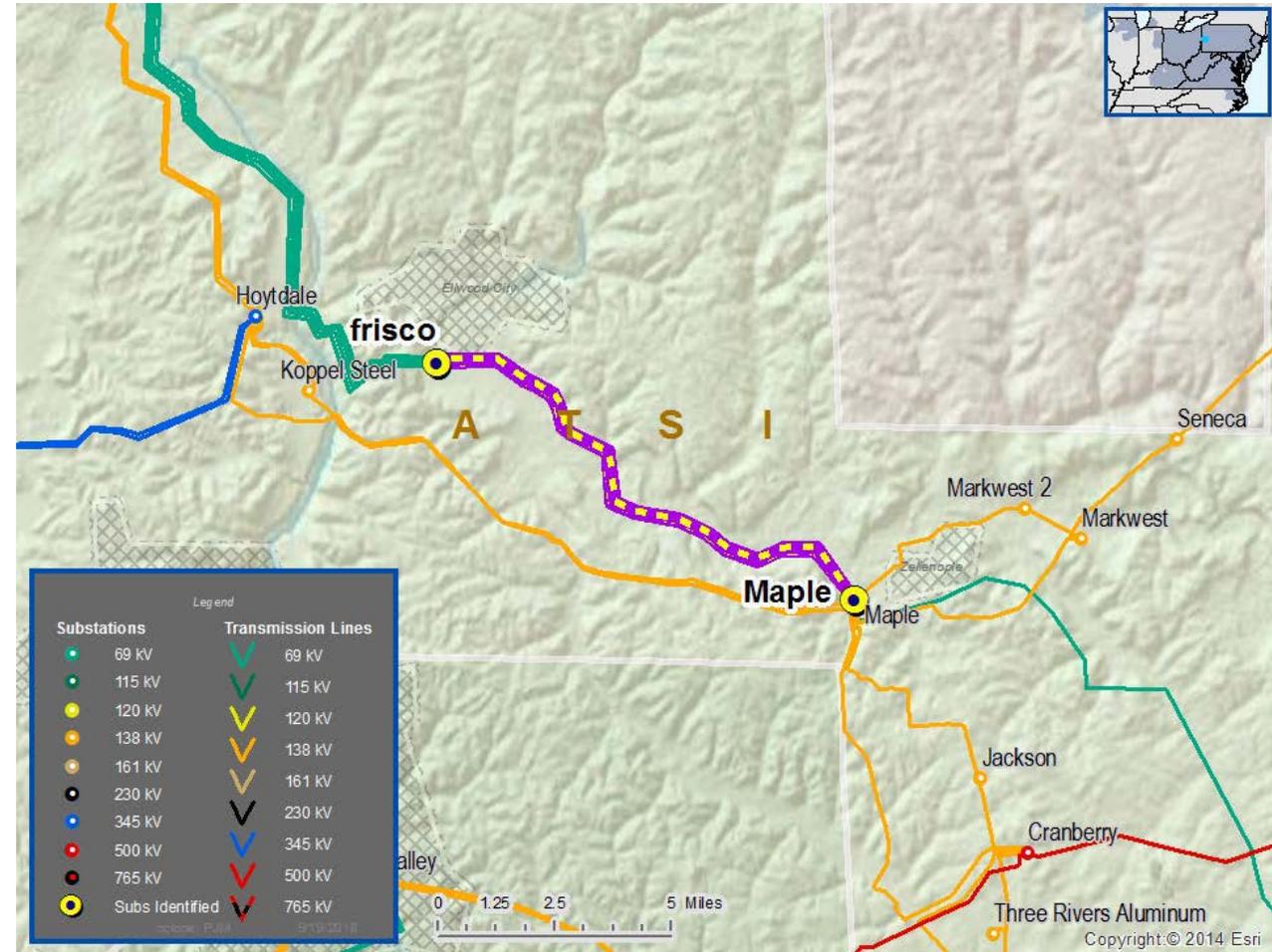
Reconductor / Rebuild Transmission Lines

- Mitigation of PJM issued PCLLRWs or post contingency switching limitations.

Problem Statement

Frisco-Maple # 1 and #2 69 kV line Terminal Equipment

- Mitigate PJM issued PCLLRWs / Pre-contingency switching orders, eight times, for thermal concerns on the 69 kV system under contingency conditions.
 - Loss of the New Castle-Hoytdale #1 and New Castle-Hoytdale #2 138 kV lines.
 - Results in potential thermal loading greater than 100% on the Frisco-Maple #1 69 kV line or potential thermal loading on the Frisco-Maple #2 69 kV line depending on system conditions.



ATSI Transmission Zone M-3 Process

Frisco-Maple #1 and #2 69 kV Terminal Upgrades

Need Number: ATSI-2018-006
Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019

Selected Solution:

Frisco-Maple #1 and #2 69 kV Line Upgrades

FRISCO Substation

- Install new relay panels on B4 breaker and line exit.
- Upgrade 336.4 ACSR substation conductor
- Replace disconnect switches

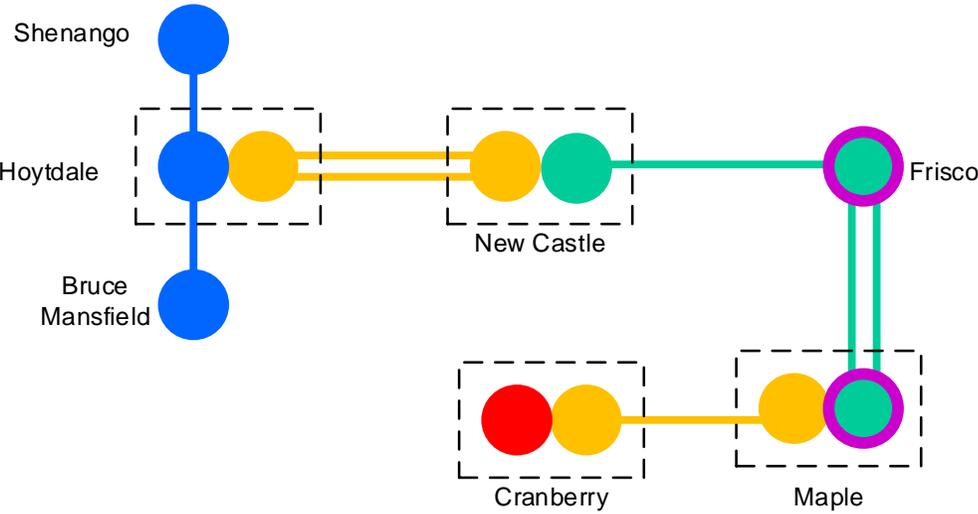
MAPLE Substation

- Install new relay panels on B118 breaker and line exit.
- Upgrade 336.4 ACSR substation conductor at Maple
- Replace disconnect switches
- Replace Breaker B118 (due to age and condition)
 - Existing Frisco-Maple #1 69 kV Line rating: 72 MVA SN / 72 MVA SE
 - New Frisco-Maple #1 69 kV Line rating: 80 MVA SN / 96 MVA SE
 - Existing Frisco-Maple #2 69 kV Line rating: 62 MVA SN / 62 MVA SE
 - New Frisco-Maple #1 69 kV Line rating: 80 MVA SN / 96 MVA SE

Estimated Project Cost: \$1.3M

Projected In-Service: 12/31/2019

Supplemental Project ID: s1759



Legend	
500 kV	—
345 kV	—
138 kV	—
69 kV	—
34.5 kV	—
23 kV	—
New	—

ATSI Transmission Zone M-3 Process

Ironville-Citgo 69 kV Line Rebuild

Need Number: ATSI-2018-010
Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan– 04/15/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Supplemental Project Driver:
Equipment Material Condition, Performance and Risk

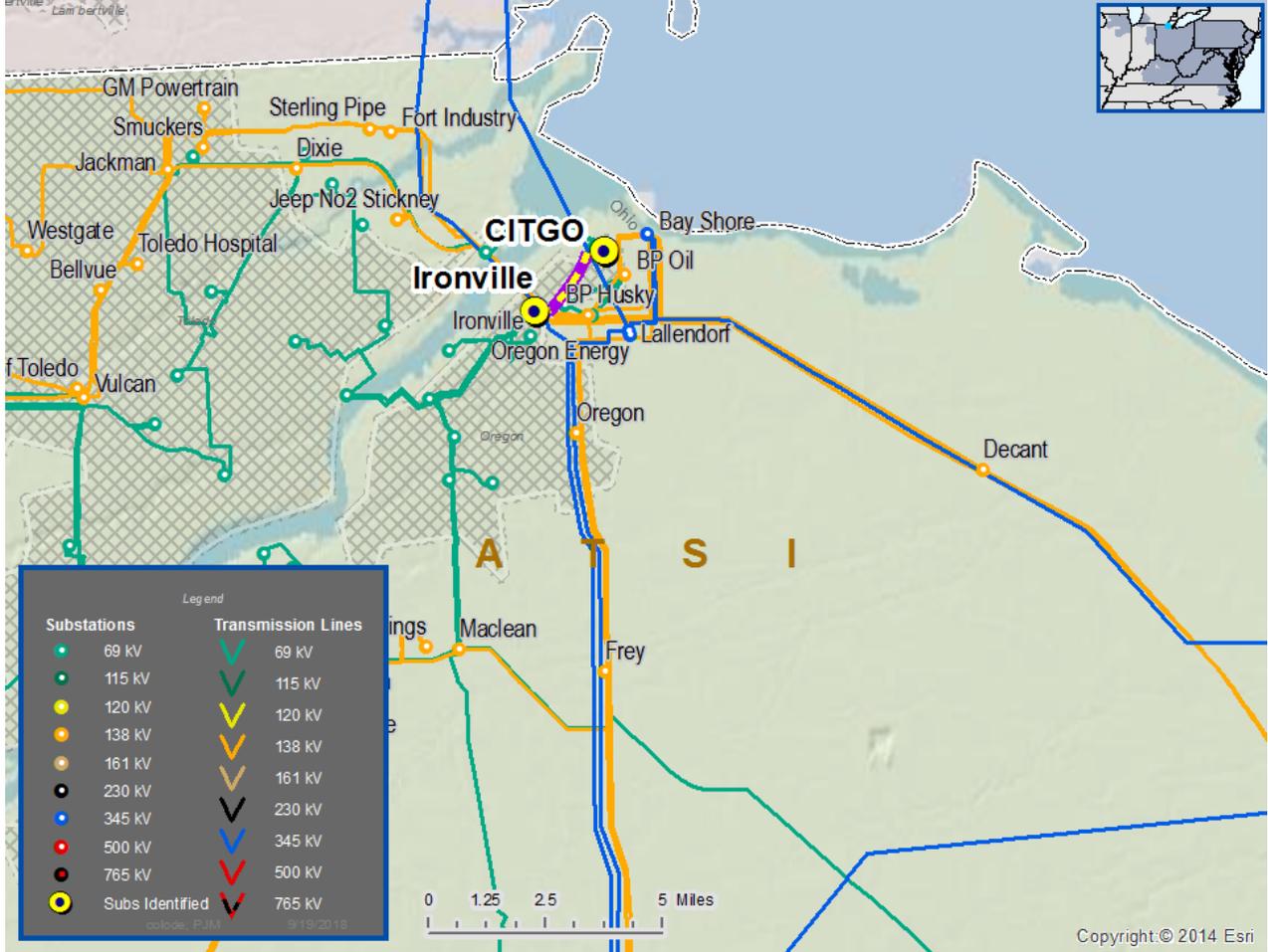
Specific Assumption Reference
 Line Condition Rebuild / Replacement
 Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Network Radial Transmission Line
 ▪ Radial lines that serve multiple delivery points.

Problem Statement
 Ironville-Citgo 69 kV Condition Assessment (Approximately 4 miles)

- Line Condition Rebuild / Replacement
- Identified obsolete and deteriorated equipment.
 - 60-68 year old construction; poor inspection results, 89 % rejection rate.
 - Approximately 2 repair records over the past 5 years.
 - Multiple transmission delivery points (3) impacted; back-up source to (4) transmission delivery points.



ATSI Transmission Zone M-3 Process

Ironville-Citgo 69 kV Line Rebuild

Need Number: ATSI-2018-010
Process Stage: Submission of Supplemental Projects for Inclusion in Local Plan–04/15/2019

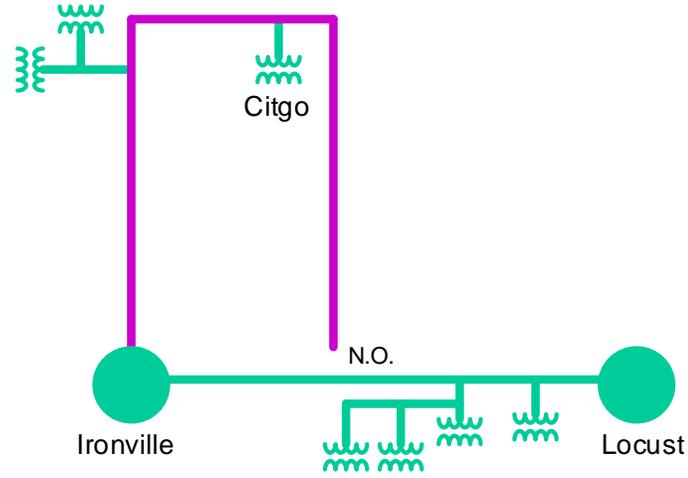
Selected Solution:

Ironville – Citgo 69 kV Line Rebuild

- Rebuild/reconductor existing radial Ironville – Citgo 69 kV Line with 477 ACSR and replace line switches A6648, A6791, A6792, A6793, and A6647.
- Existing conductor is 336 ACSR.

- Existing line rating: 79 MVA SN / 95 MVA SE
- New line rating: 100 MVA SN / 120 MVA SE

Estimated Project Cost: \$4.2M
Projected In-Service: 12/31/2020
Supplemental Project ID: s1760



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

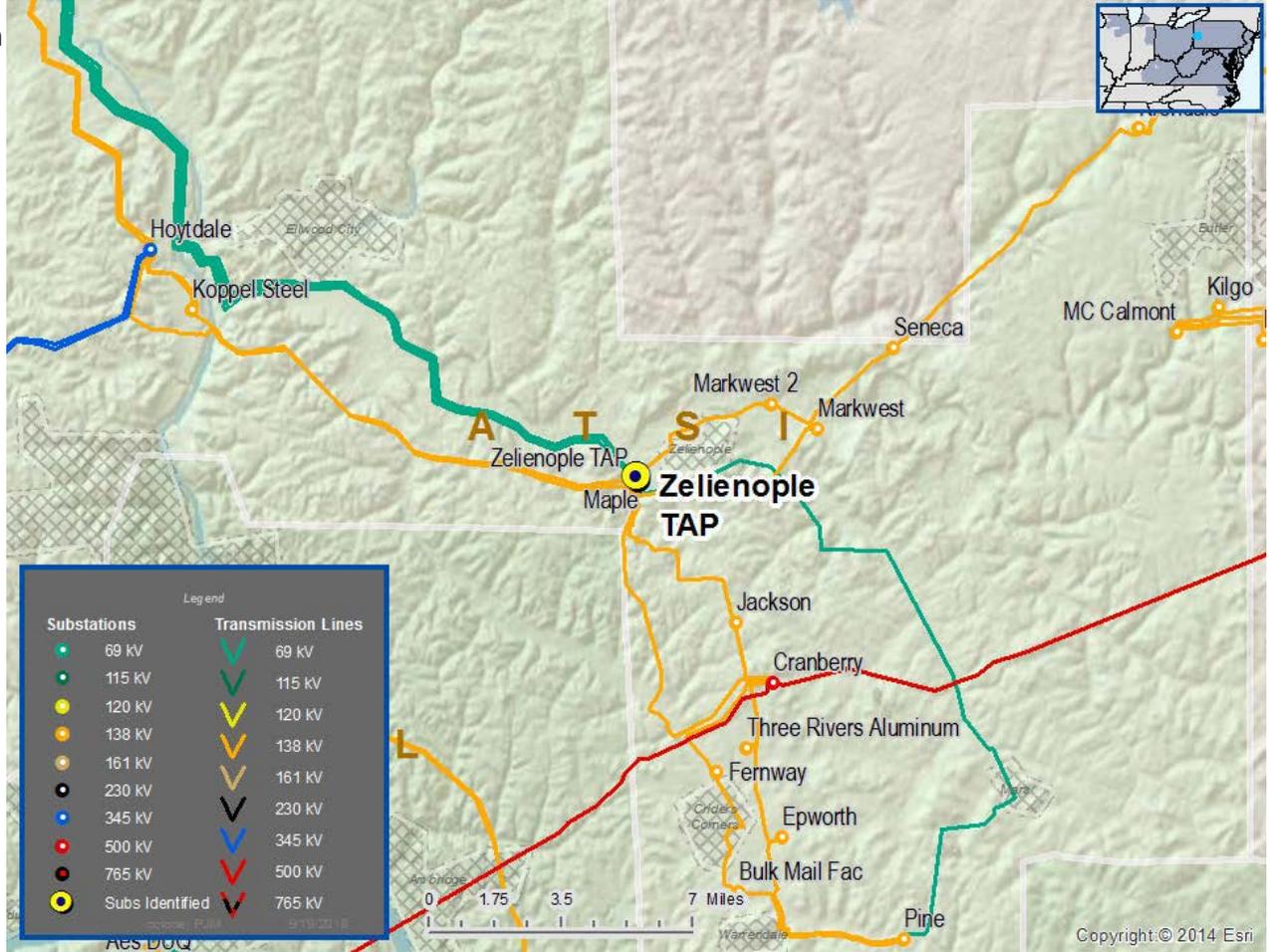
Zelienople Normally Open Switch Addition

Need Number: ATSI-2018-007
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan
 06/12/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Operational Flexibility and Efficiency

- Specific Assumption Reference**
 Add / Expand Bus Configuration
- Substation buses that adversely impact system performance
 - Reduce amount of exposed potential local load loss during contingency conditions.

- Problem Statement**
 Zelienople 69 kV Area Load At Risk
- Outage of the Zelienople circuit results in loss of 16.6 MW and 3,762 customers
 - Radial line exposure is 1.2 miles
 - Line has experienced 2 sustained outages in the past 5 years



ATSI Transmission Zone M-3 Process

Zelienople Normally Open Switch Addition

Need Number: ATSI-2018-007
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

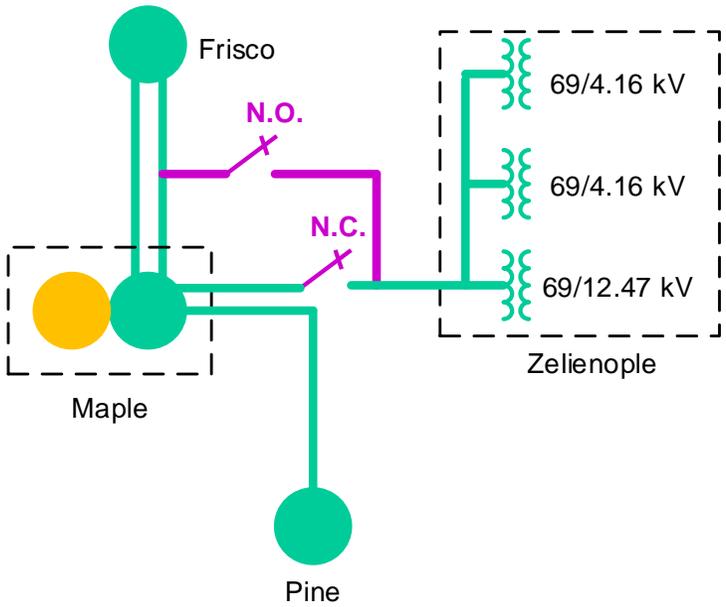
Proposed Solution:
 Zelienople Normally Open Switch Addition

- Install one normally closed SCADA controlled switch on the Maple-Zelienople 69 kV Line
- Install one normally open SCADA controlled switch to connect the Zelienople 69 kV load to the Maple-Frisco 69 kV Line under emergency or maintenance conditions.

Alternatives Considered:

- Maintain existing configuration
- Build a second 69kV line (1.2 miles) from Maple substation to Zelienople substation

Estimated Project Cost: \$0.6M
Projected IS Date: 12/31/2019
Status: Engineering
Supplemental Project ID: s1794



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

NLMK 138/69 kV Substation Rebuild Project

Need Number: ATSI-2018-008
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk
Operational Flexibility and Efficiency

Specific Assumption Reference

- Add / Expand Bus Configuration
- Substation buses that adversely impact system performance
 - Reduce amount of exposed potential local load loss during contingency conditions.

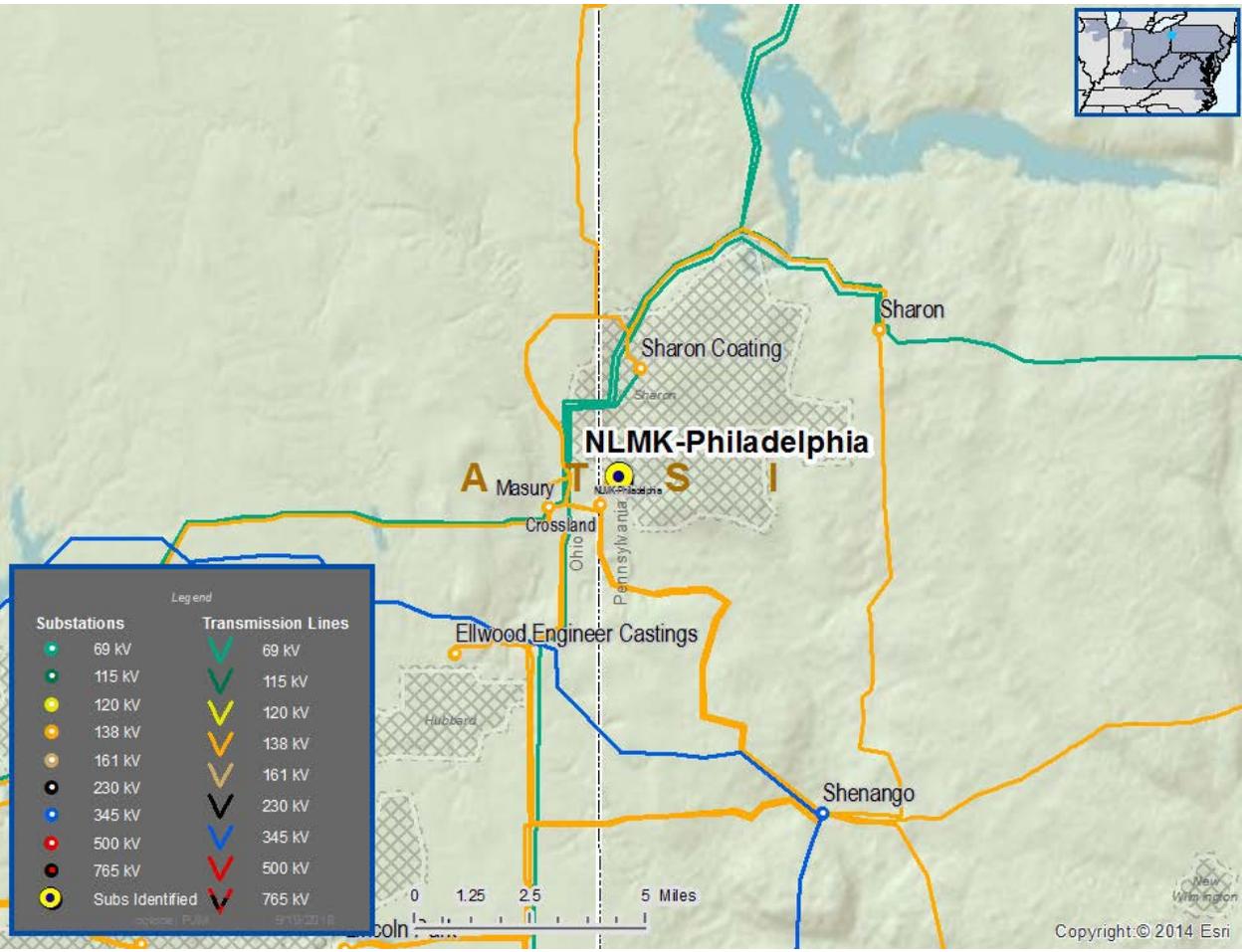
Substation Condition Rebuild / Replacement

- Power Transformers and Load Tap Changers (LTC)
- Circuit Breaker and Other Fault Interrupting Devices

Line Condition Rebuild / Replacement

Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

CONTINUED NEXT SLIDE...



ATSI Transmission Zone M-3 Process

NLMK 138/69 kV Substation Rebuild Project

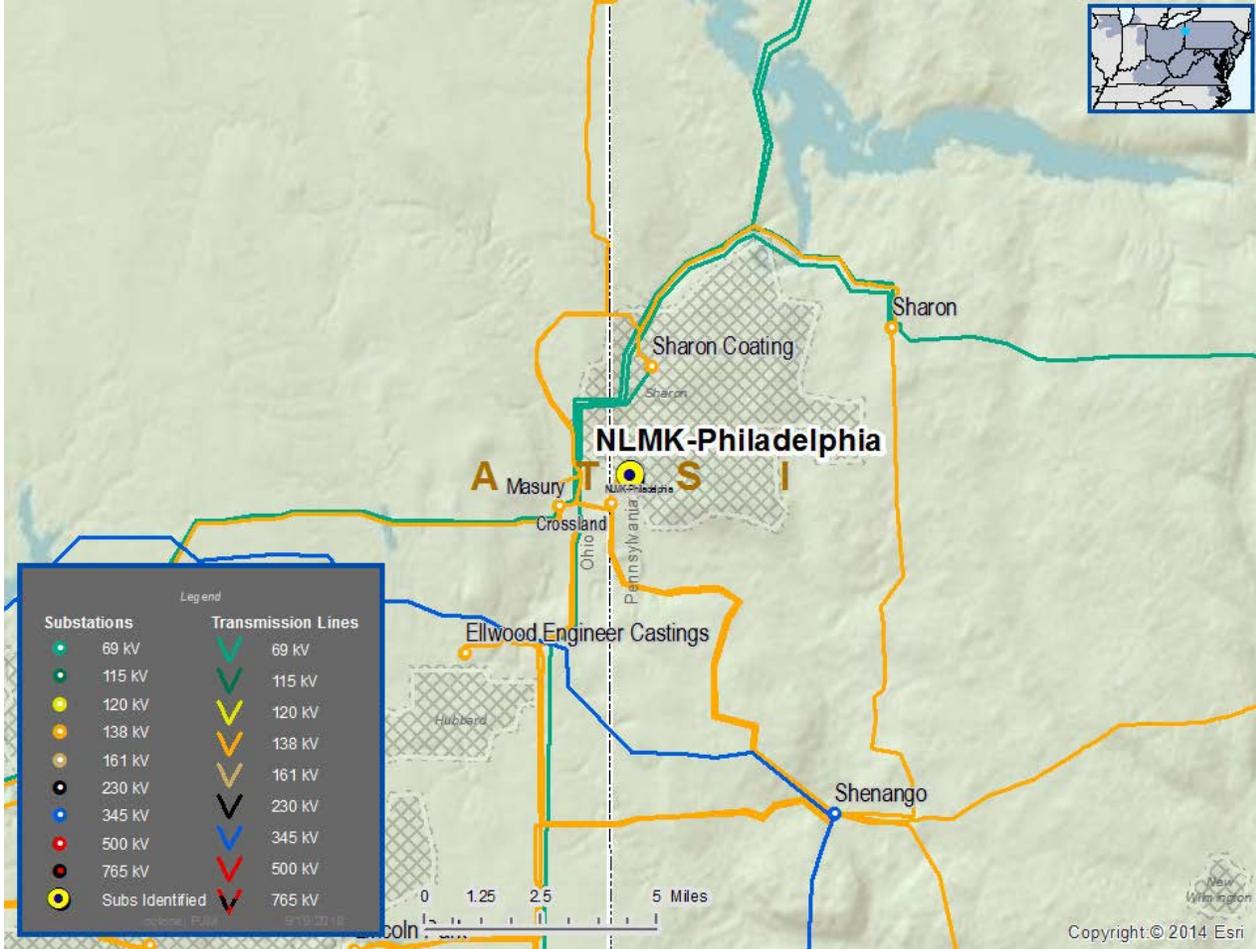
Need Number: ATSI-2018-008
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

CONTINUED FROM PREVIOUS SLIDE...

Problem Statement

NLMK 69 kV Load At Risk

- Reduce the amount of local load loss under contingency conditions.
 - Loss of Crossland-NLMK 138 kV line
 - Results in loss of approximately 58 MWs of load.
 - Or
 - Masury 69 kV bus fault
 - Results in potential local voltage collapse of the Masury 69 kV area
-
- Equipment Material Condition, Performance and Risk
 - NLMK 69 kV system cable trenches are deteriorated and in need of replacement
 - 69 kV breakers in need of replacement (bus-tie breaker has already failed)
 - NLMK 138/69 kV transformer # 6 and # 12 are aged (> 50 years) and not standard design.
 - Transformer #6 has elevated gas levels.
 - Existing 69 kV transmission line conductor around NLMK is corroded and deteriorated with multiple splice locations.
 - Need to upgrade to current standards



ATSI Transmission Zone M-3 Process

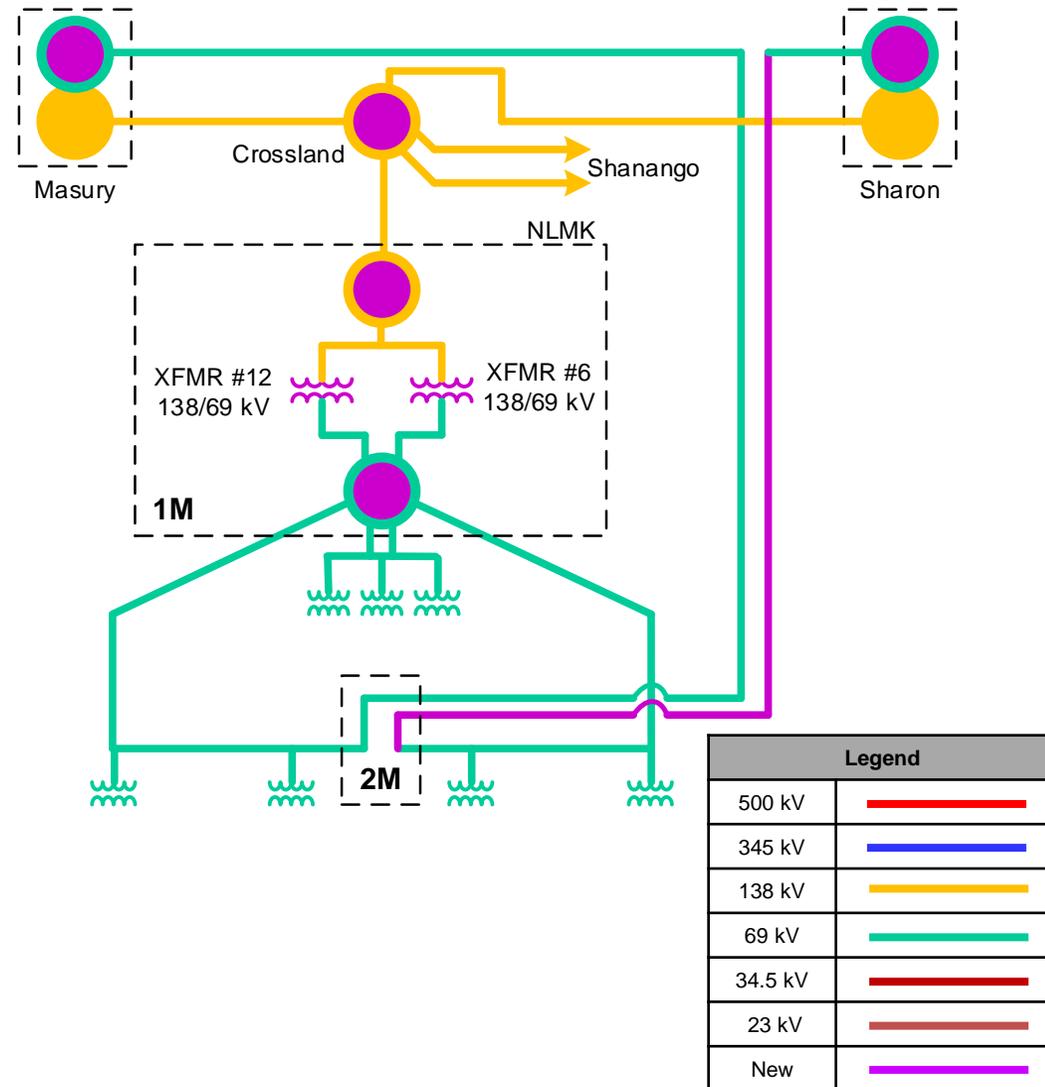
NLMK 138/69 kV Substation Rebuild Project

Need Number: ATSI-2018-008
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

Proposed Solution:

NLMK 138/69 kV Substation Rebuild Project

- Retire existing NLMK 1M and 2M substations and network the existing NLMK 69 kV system with the Masury-Sharon 69 kV line
- Install a loop structure at the Masury tap and rebuild the segment of line from the tap to the 2M substation as double circuit 336 ACSR (0.8 miles)
- Replace existing NLMK 138/69 kV 1M substation with new a 138/69 kV substation
 - 3-138 kV breakers in a straight bus configuration (1-Line and 2-transformer breakers)
 - 2-138/69 kV transformers (134 MVA)
 - Six (6) breaker 69 kV ring bus
 - New control building
- Re-configure existing 69 kV lines around NLMK
 - Masury-NLMK 69 kV Line: 57 MVA SN / 73 MVA SE
 - Sharon-NLMK 69 kV Line: 57 MVA SN / 73 MVA SE
- Install revenue metering
- Add a 138 kV breaker at Crossland for the Crossland-NLMK 138 kV Line
- Upgrade 69 kV relays at Masury and Sharon substations



ATSI Transmission Zone M-3 Process

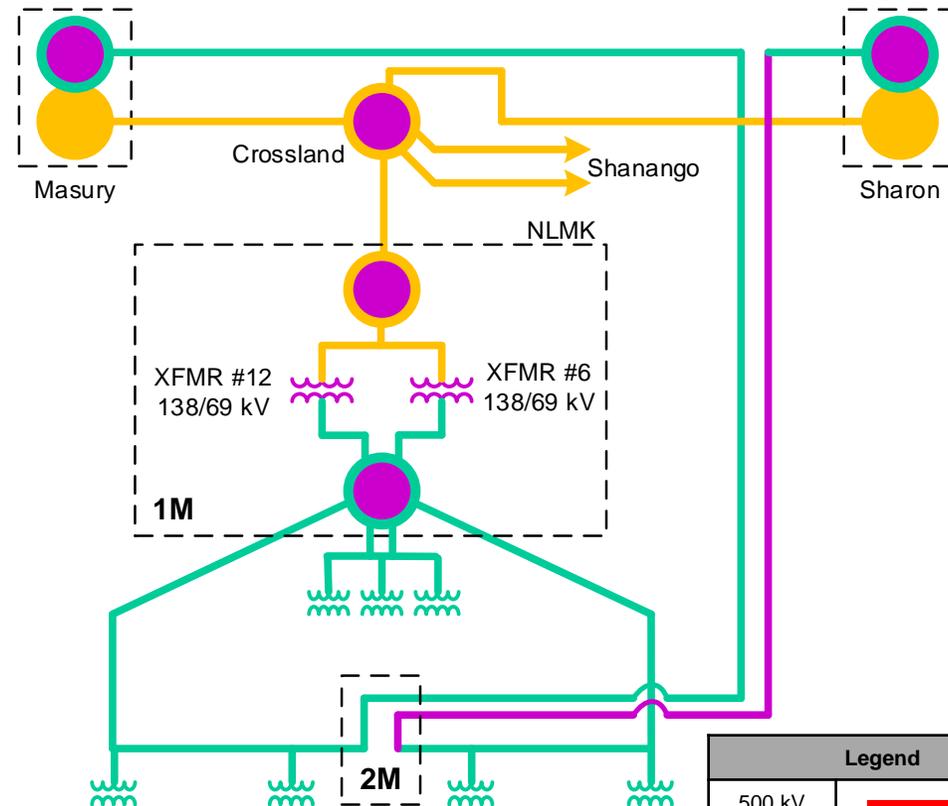
NLMK 138/69 kV Substation Rebuild Project

Need Number: ATSI-2018-008
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

Alternatives Considered:

Convert Masury 69 kV into breaker-and-a-half configuration and replace two (2) 138/69 kV transformers, seven (7) 69 kV breakers at NLMK 1M substation, and all substation control cable at NLMK 1M substation

Estimated Project Cost: \$30.0M
Projected IS Date: 12/31/2021
Status: Conceptual
Supplemental Project ID: s1795



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Abbe-Medina 69 kV Line Rebuild

Need Number: ATSI-2018-011
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan
 – 06/12/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Line Condition Rebuild / Replacement

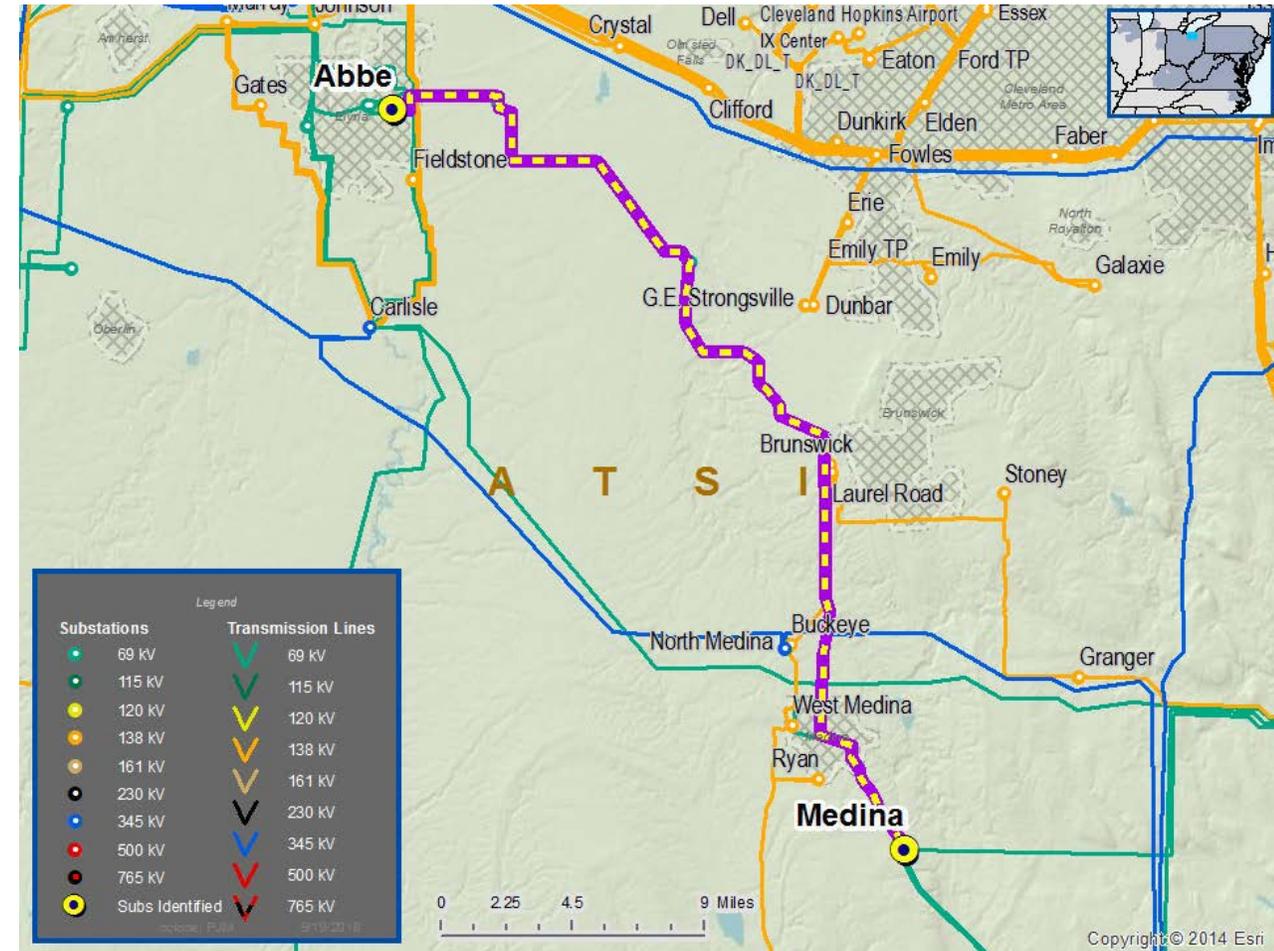
Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Problem Statement

Abbe-Medina 69 kV Condition Assessment (Approx. 30 miles)

- Identified obsolete and deteriorated equipment.
 - 62 year old construction; poor inspection results.
 - Negative outage history over past 5 years.
 - Approximately 17 repair records over the past 5 years; increasing trend .
- Multiple transmission delivery points (8) impacted.
- Need to upgrade to current standards



ATSI Transmission Zone M-3 Process

Abbe-Medina 69 kV Line Rebuild

Need Number: ATSI-2018-011

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

Proposed Solution:

Abbe-Medina 69 kV Line Rebuild

- Rebuild/reconductor the existing Abbe-Medina 69 kV line with 477 ACSR; existing conductor is mixed with 477 ACSR, 336 ACSR, 1/0 CU, and 3/0 ACSR conductors.

Abbe 69 kV Substation – Terminal equipment to be replaced includes:

- Substation conductor and disconnect switch

Columbia 69 kV Substation – Terminal equipment to be replaced includes:

- Substation conductor and disconnect switches

Medina 69 kV Substation – Terminal equipment to be replaced includes:

- Substation conductor and breaker B1 bypass and disconnect switch

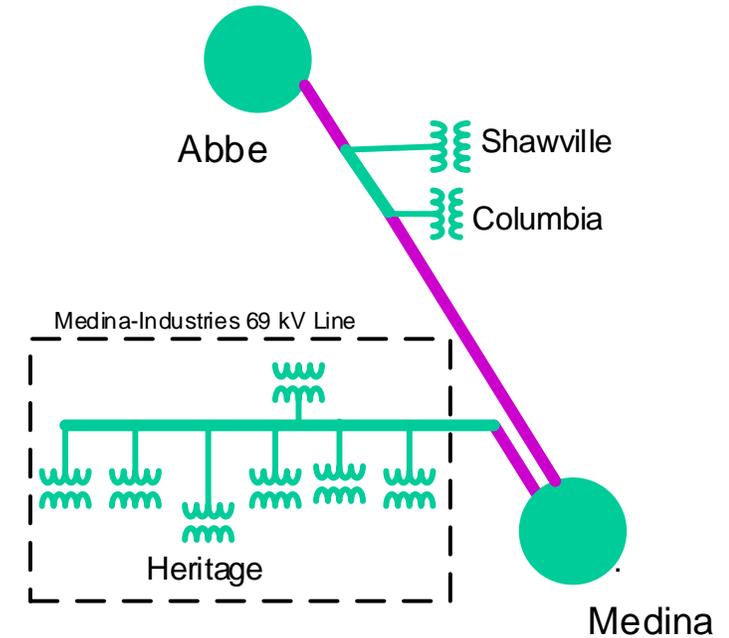
- Existing line rating: 45 MVA SN / 46 MVA SE
- New line rating: 100 MVA SN / 121 MVA SE

- Rebuild/reconductor approximately 1 mile existing Medina Industries 69 kV line using 477 ACSR; shared structure with Abbe-Medina 69 kV Line for ~1 mile; existing conductor is mixed 1/0 CU and 3/0 ACSR.
- Line portion from Shawville-Columbia (~ 7.5 miles) was rebuilt in 2014 and will not be included in this rebuild.

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$20.9 M
 Projected IS Date: 12/31/2019
 Status: Engineering
 Supplemental Project ID: s1796



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Hanville-Wellington-Steuben 69 kV Line Rebuild

Need Number: ATSI-2018-012
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk

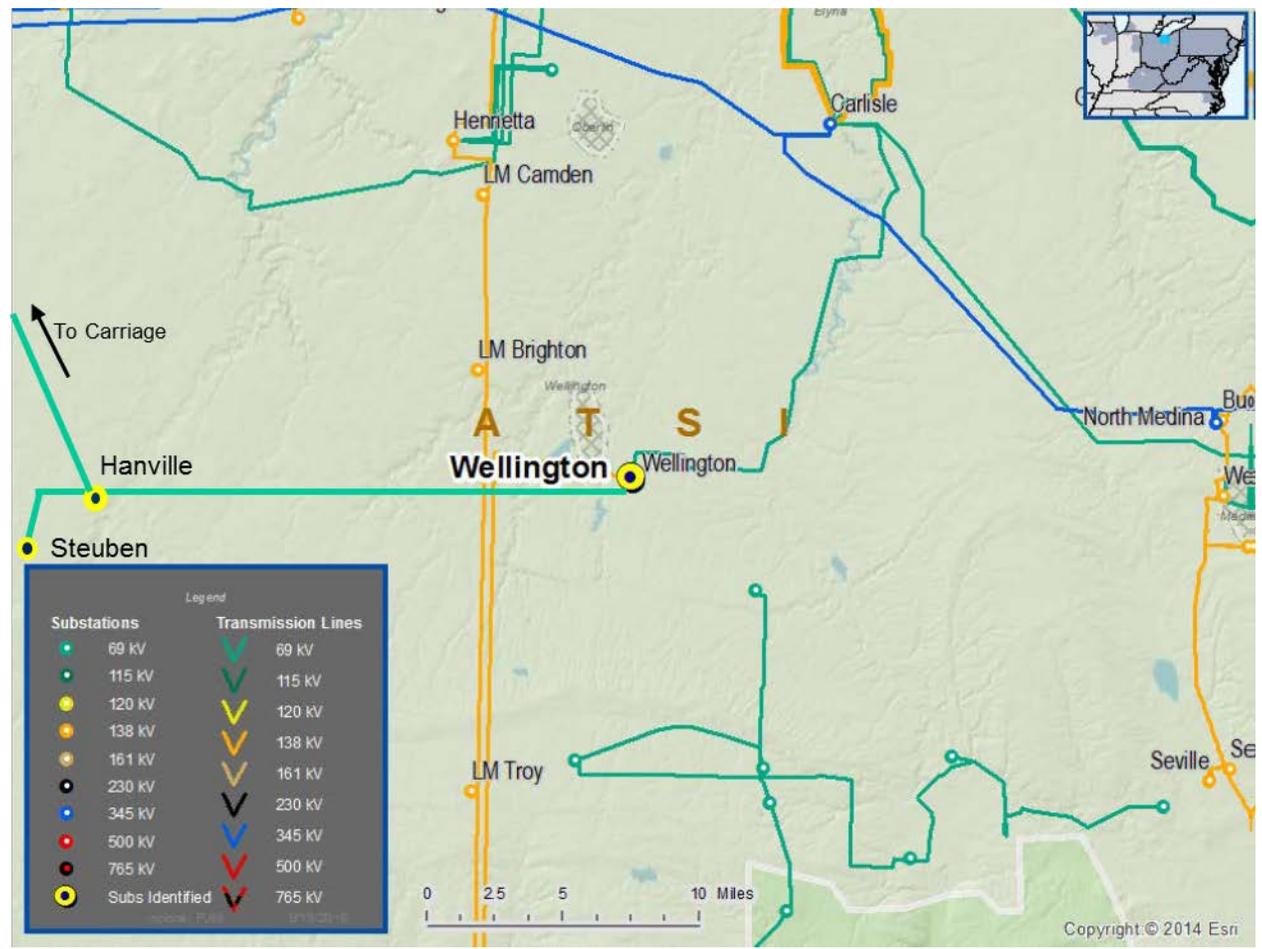
Specific Assumption Reference

Line Condition Rebuild / Replacement

Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

CONTINUED NEXT SLIDE...



Note: Added general location (not to scale) of the Wellington-Hanville-Steuben Line to PJM map

ATSI Transmission Zone M-3 Process

Hanville-Wellington-Steuben 69 kV Line Rebuild

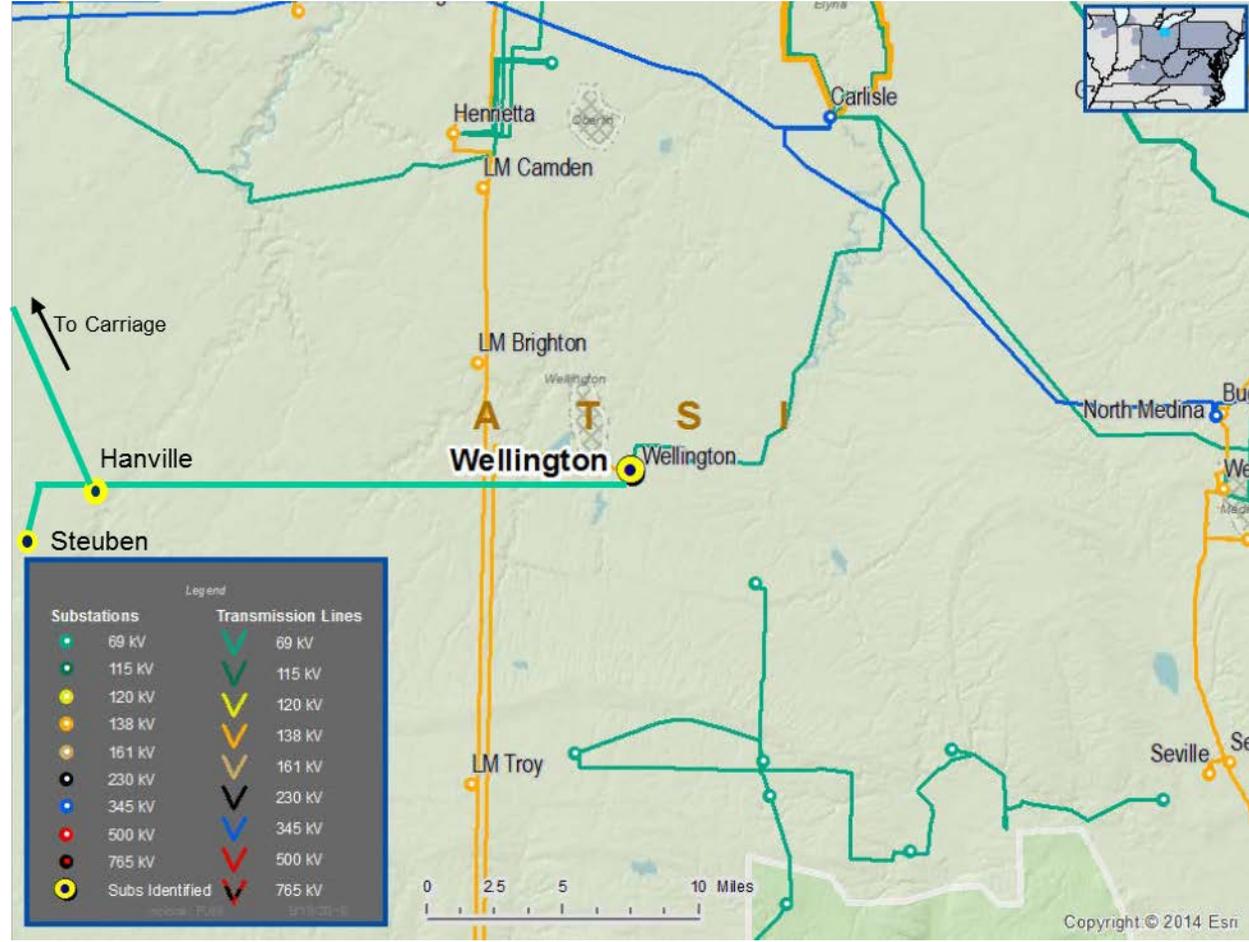
Need Number: ATSI-2018-012
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

CONTINUED FROM PREVIOUS SLIDE...

Problem Statement

Wellington-Hanville-Steuben 69 kV Condition Assessment (Approx. 33 miles)

- Identified obsolete and deteriorated equipment.
 - 50 to 56 year old construction; poor inspection results.
 - Negative outage history over past 5 years;
 - Previous radial line (now networked) with 5 distribution delivery points.
 - Approximately 13 repair records over the past 5 years; increasing trend.
- Multiple transmission delivery points (5) impacted.
- Need to upgrade to current standards



Note: Added general location (not to scale) of the Wellington-Hanville-Steuben Line to PJM map

ATSI Transmission Zone M-3 Process

Hanville-Wellington-Steuben 69 kV Line Rebuild

Need Number: ATSI-2018-012
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan
 – 06/12/2019

Proposed Solution:
 Hanville-Wellington-Steuben 69 kV Line Rebuild

- Rebuild/reconductor ~26 miles of the existing Hanville-Wellington 69 kV Line with 477 ACSR (existing conductor 336 ACSR and 3/0 ACSR)

Wellington 69 kV Substation – Terminal equipment to be replaced includes:

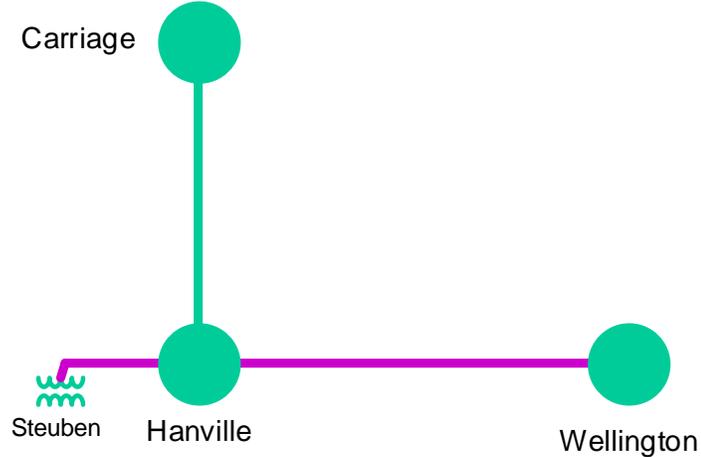
- Substation conductor and disconnect switches

- Existing line rating: 33 MVA SN / 33 MVA SE
- New line rating: 100 MVA SN / 121 MVA SE

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$27.8 M
Projected IS Date: 12/31/2021
Status: Engineering
Supplemental Project ID: s1797



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Ravenna-West Ravenna #1 69 kV Line Rehab

Need Number: ATSI-2018-013
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Line Condition Rebuild / Replacement

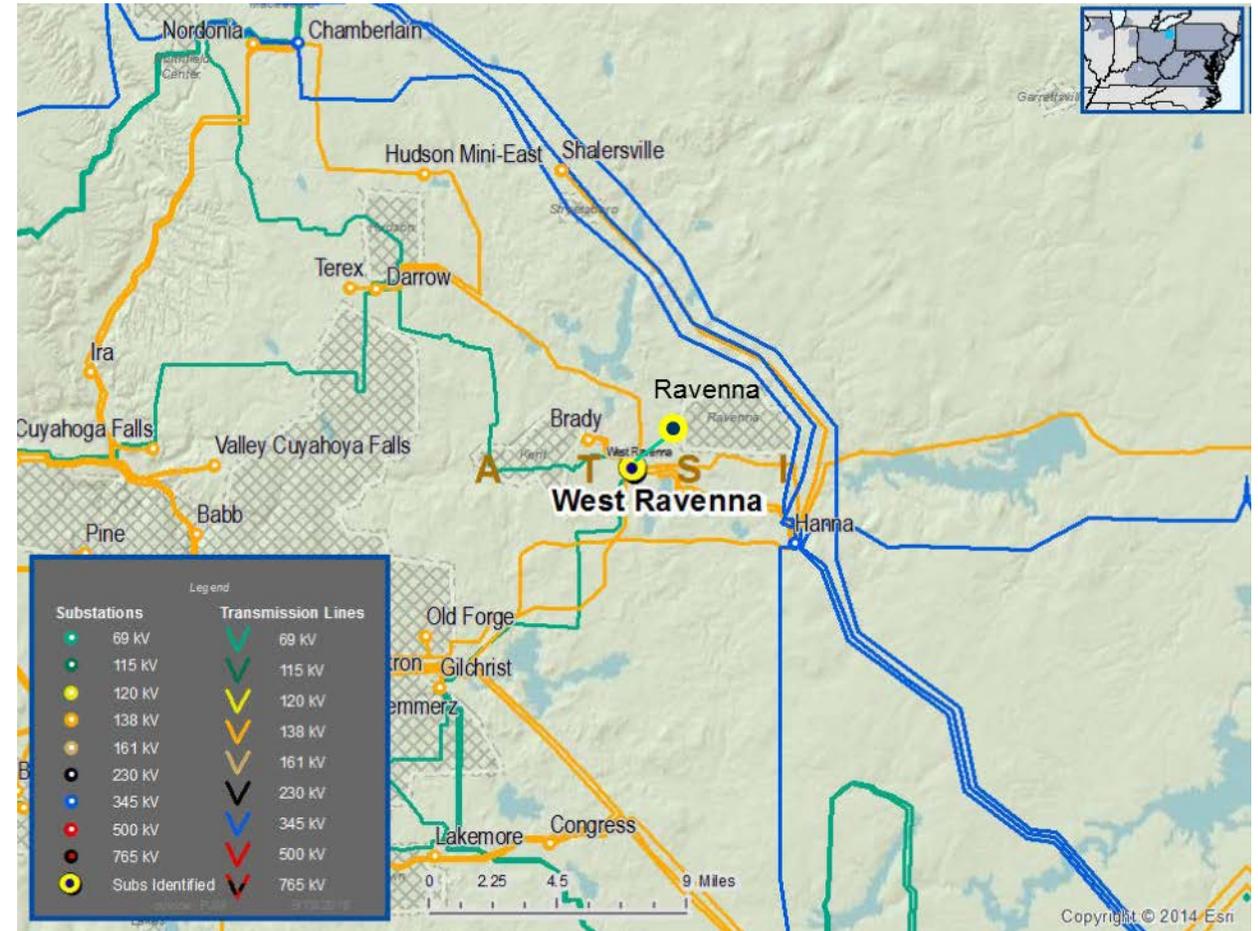
Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Problem Statement

Ravenna-West Ravenna #1 69 kV Condition Assessment (Approx. 4 miles)

- Identified obsolete and deteriorated equipment.
 - 50 year old construction; poor inspection results, 94 % rejection rate.
 - Negative outage history over past 5 years;
 - Approximately 21 repair records over the past 5 years; increasing trend.
- Need to upgrade to current standards



Note: Added general location of the Ravenna-West Ravenna line to PJM map

ATSI Transmission Zone M-3 Process

Ravenna-West Ravenna #1 69 kV Line Rehab

Need Number: ATSI-2018-013
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan
 – 06/12/2019

Proposed Solution:

Ravenna-West Ravenna #1 69 kV Line Rehab

- Rehab existing ~4.1 miles of the Ravenna-West Ravenna #1 69 kV Line (Existing 605 ACSR conductor not changing)

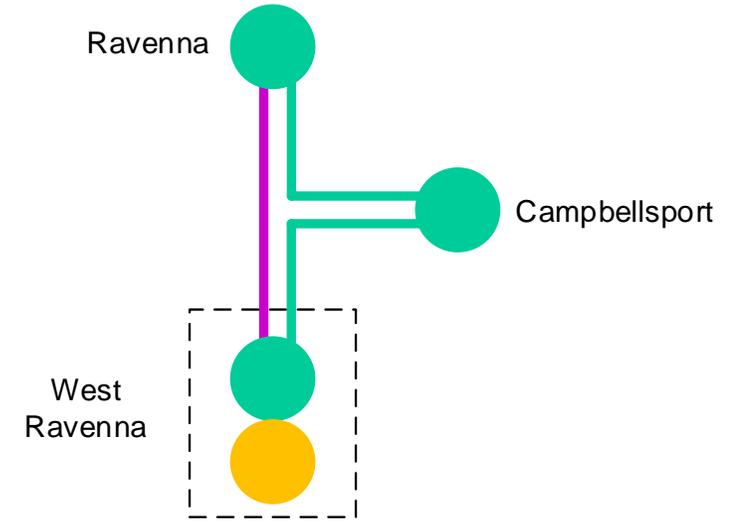
Ravenna 69 kV Substation – Terminal equipment to be replaced includes:

- Disconnect switches and transfer switches (due to condition)
- Existing line rating: 82 MVA SN / 103 MVA SE
- New line rating: 100 MVA SN /121 MVA SE

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$3.4 M
Projected IS Date: 12/31/2020
Status: Conceptual
Supplemental Project ID: s1798



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Bingham-Cardington (Schaff) 69 kV Line Rebuild

Need Number: ATSI-2018-014
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference
 Line Condition Rebuild / Replacement

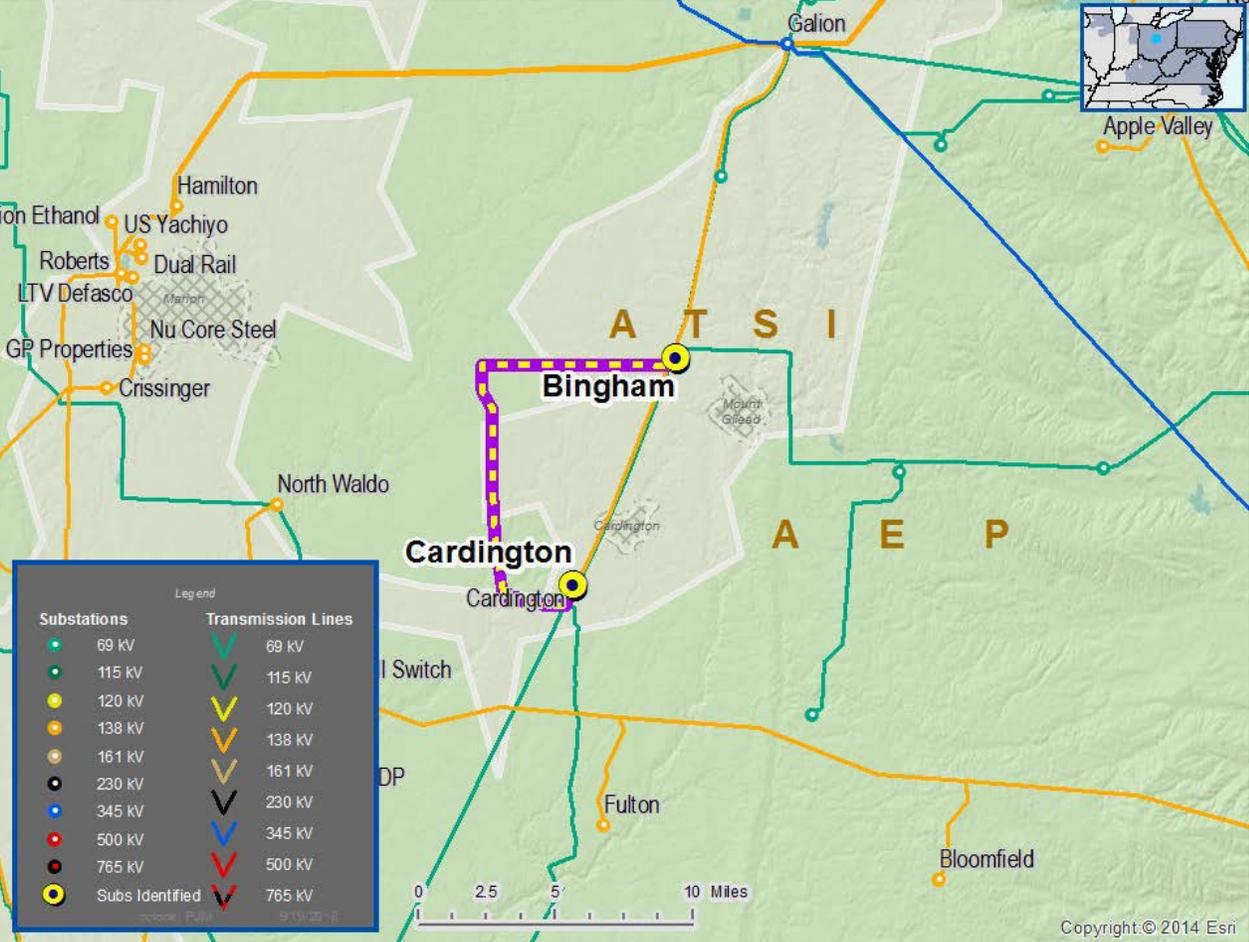
Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Problem Statement

Bingham-Cardington (Schaff) 69 kV Condition Assessment (Approx. 15 miles)

- Identified obsolete and deteriorated equipment.
 - 45-62 year old construction; poor inspection results, 92 % rejection rate.
 - Negative outage history over past 5 years;
 - Approximately 10 repair records over the past 5 years; increasing trend.
- Need to upgrade to current standards



ATSI Transmission Zone M-3 Process

Bingham-Cardington (Schaff) 69 kV Line Rebuild

Need Number: ATSI-2018-014
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan
 – 06/12/2019

Proposed Solution:

Bingham-Cardington (Schaff) 69 kV Line Rebuild

- Rebuild/reconductor ~15 miles of the existing Bingham-Cardington (Schaff) 69 kV Line with 477 ACSR (existing conductor 3/0 ACSR)

Schaff 69 kV Substation – Terminal equipment to be replaced includes:

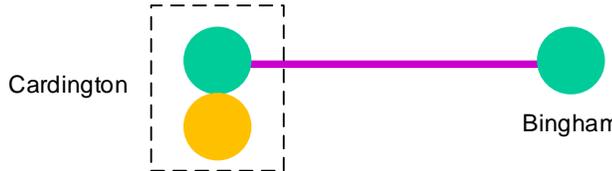
- Substation conductor and disconnect switch

- Existing line rating: 45 MVA SN / 54 MVA SE
- New line rating: 100 MVA SN / 121 MVA SE

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$13.3 M
Projected IS Date: 6/1/2020
Status: Engineering
Supplemental Project ID: s1799



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Bellevue-Carriage 69 kV Line Rebuild

Need Number: ATSI-2018-015
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019
Previously Presented: Need - 9/28/2018
Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Line Condition Rebuild / Replacement

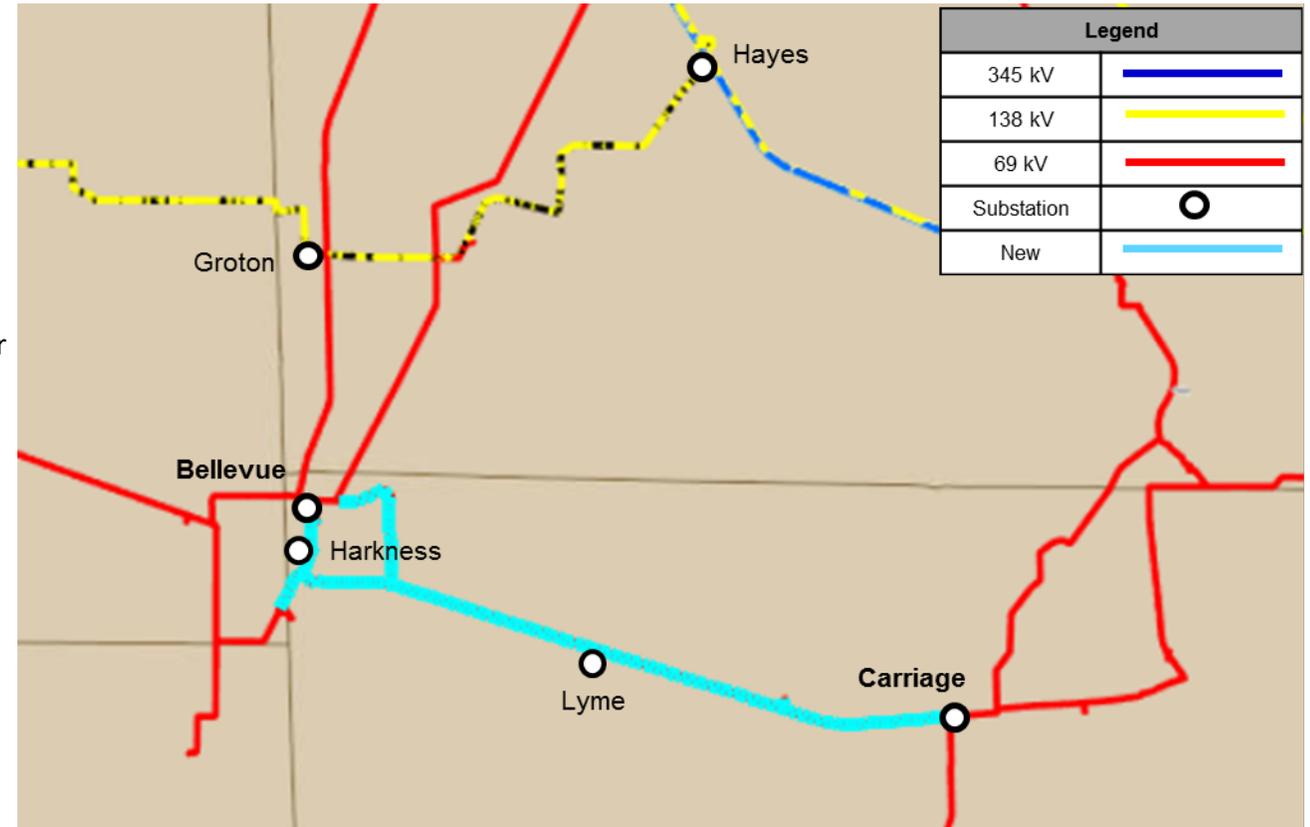
Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Problem Statement

Bellevue-Carriage 69 kV Condition Assessment (Approximately 13 miles)

- Identified obsolete and deteriorated equipment.
 - 48 year old construction; poor inspection results, 62 % rejection rate.
 - Negative outage history over past 5 years;
 - Approximately 9 repair records over the past 5 years; increasing trend.
 - Sections of older 3/0 CU conductor.
- Multiple transmission delivery points (7) impacted.
- Need to upgrade to current standards



ATSI Transmission Zone M-3 Process

Bellevue-Carriage 69 kV Line Rebuild

Need Number: ATSI-2018-015
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

Proposed Solution:

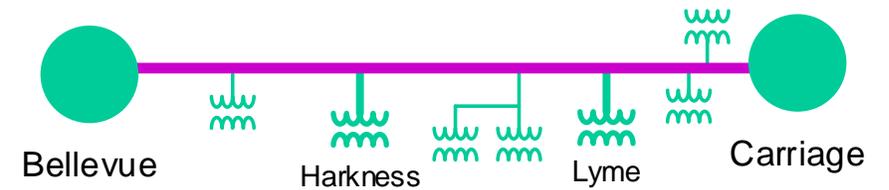
Bellevue-Carriage 69 kV Line Rebuild

- Rebuild/reconductor ~9.7 miles of the existing Bellevue-Carriage 69 kV Line with 336 ACSR (existing conductor 3/0 ACSR, 336 ACSR and 4/0 CU); replace existing line switches at Harkness (A50 & A51) and Lyme (A1 & A2) substations.
- Existing line rating: 45 MVA SN / 54 MVA SE
- New line rating: 76 MVA SN / 92 MVA SE

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$13.8 M
Projected IS Date: 6/1/2020
Status: Engineering
Supplemental Project ID: s1800



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Hanna-Newton Falls 138 kV Line Rebuild

Need Number: ATSI-2018-016
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Line Condition Rebuild / Replacement

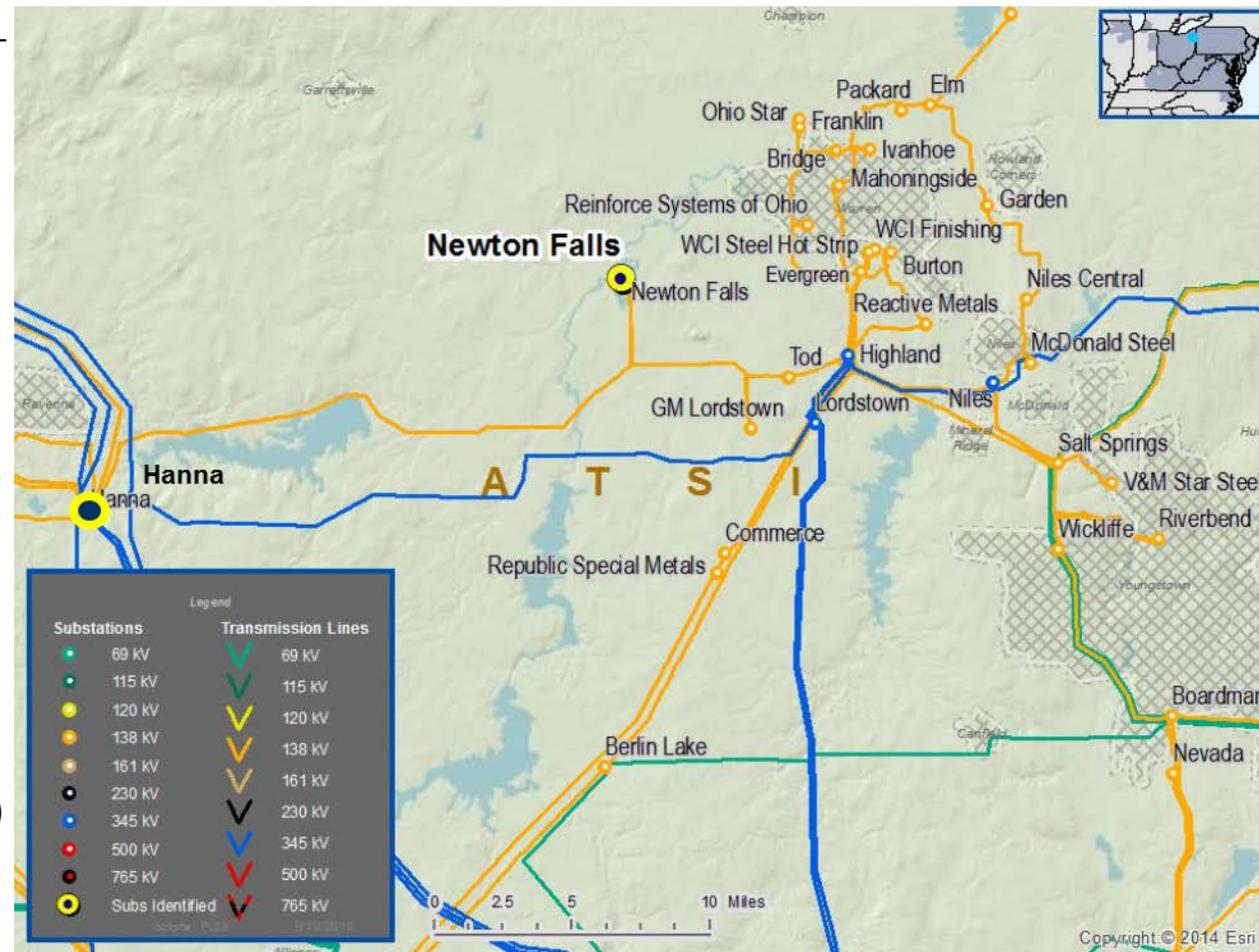
Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Problem Statement

Hanna-Newton Falls 138 kV Condition Assessment (Approximately 20 miles)

- Identified obsolete and deteriorated equipment.
 - 62 year old construction; poor inspection results, 87 % rejection rate.
 - Negative outage history over past 5 years;
 - Approximately 45 repair records over the past 5 years; increasing trend.
- Need to upgrade to current standards



ATSI Transmission Zone M-3 Process

Hanna-Newton Falls 138 kV Line Rebuild

Need Number: ATSI-2018-016

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan –
06/12/2019

Proposed Solution:

Hanna-Newton Falls 138 kV Line

- Rebuild/reconductor ~20 miles of the existing Hanna-Newton Falls 138 kV Line with 795 ACSR (existing conductor 477 ACSR and 605 ACSR)

Hanna 138 kV Substation – Terminal equipment to be replaced includes:

- Circuit breaker B4, CCVT's, disconnect switches, line relaying, and line metering

Newton Falls 138 kV Substation – Terminal equipment to be replaced includes:

- Substation conductor, disconnect switches, and line relaying

- Existing line rating: 169 MVA SN / 208 MVA SE

- New line rating: 275 MVA SN / 333 MVA SE

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$29.2 M

Projected IS Date: 6/1/2021

Status: Engineering

Supplemental Project ID: s1801



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Star-Seville (Rittman) 69 kV Line Rebuild

Need Number: ATSI-2018-017
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk
Operational Flexibility and Efficiency

Specific Assumption Reference

Line Condition Rebuild / Replacement

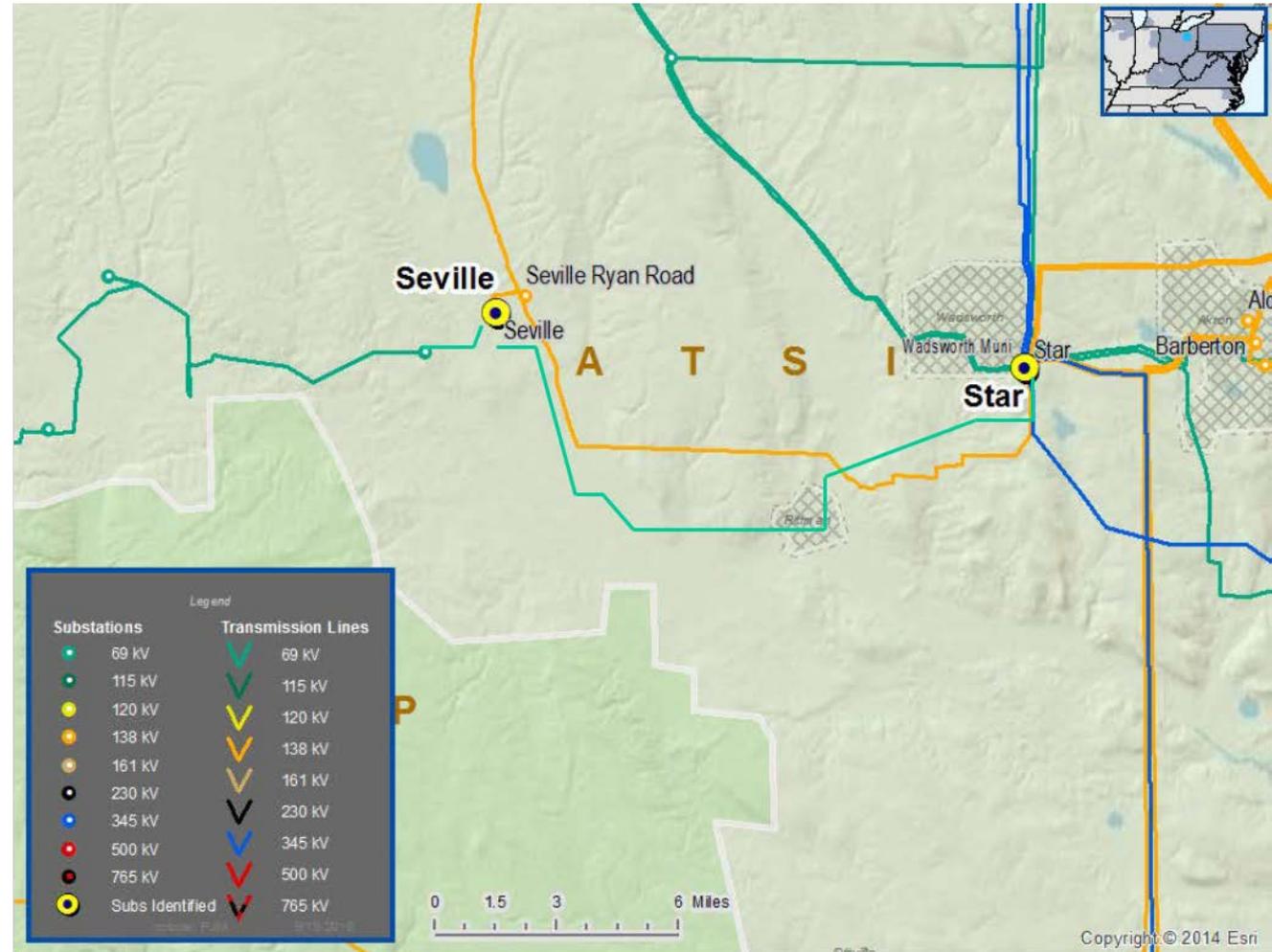
Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Network Radial Transmission Line

- Radial lines that serve multiple delivery points.

CONTINUED NEXT SLIDE...



NOTE: Added general location of the Star-Seville (Rittman) 69kV to PJM Map

ATSI Transmission Zone M-3 Process

Star-Seville (Rittman) 69 kV Line Rebuild

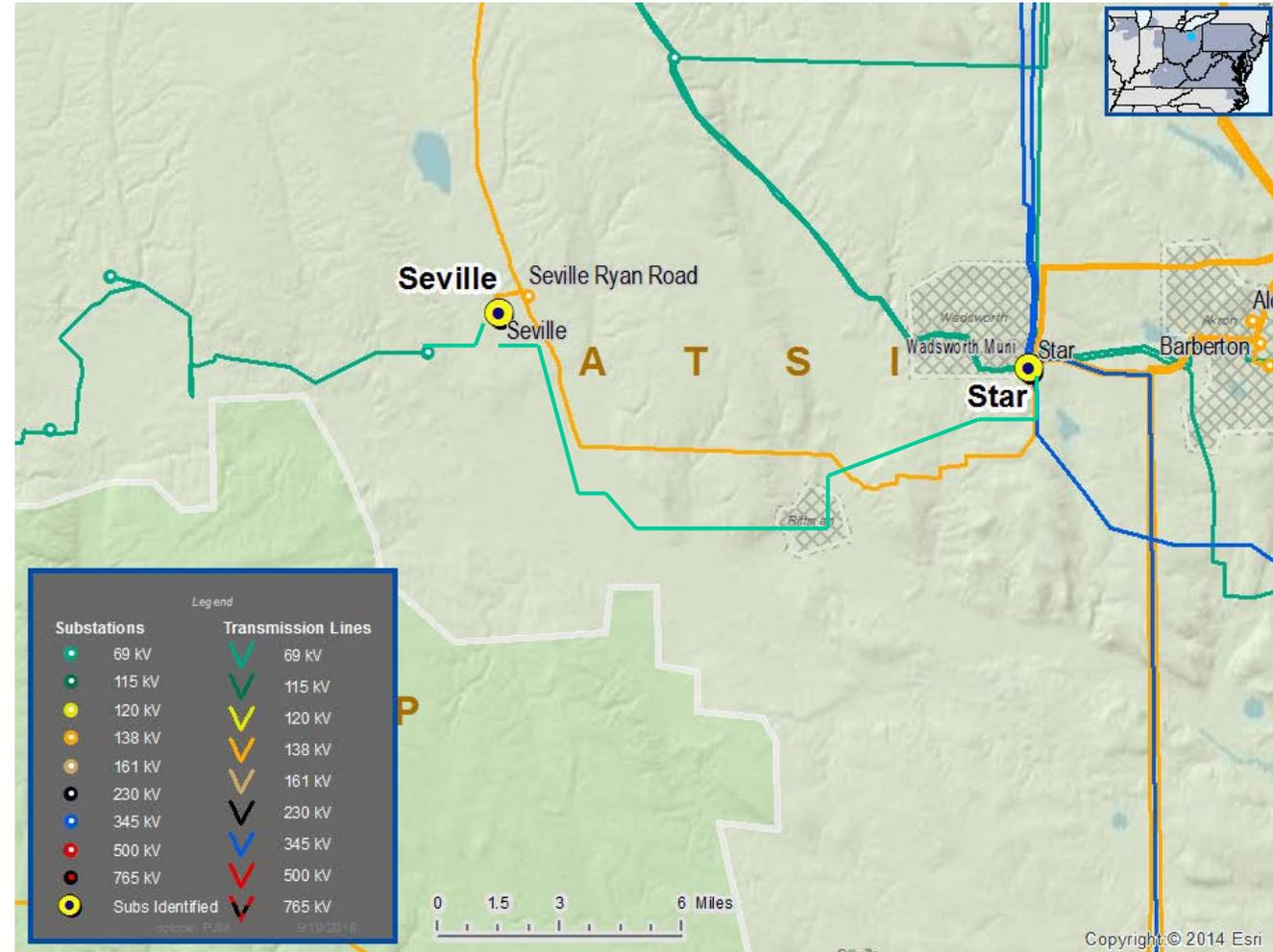
Need Number: ATSI-2018-017
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

CONTINUED FROM PREVIOUS SLIDE...

Problem Statement

Star-Seville (Rittman) 69 kV Condition Assessment (Approximately 18 miles)

- Identified obsolete and deteriorated equipment.
 - 56 year old construction; poor inspection results, 82 % rejection rate.
 - Negative outage history over past 5 years;
 - Approximately 30 repair records over the past 5 years; increasing trend.
- Multiple transmission delivery points (3) impacted.
- Radial 69 kV transmission line with approximately 30 MWs and approximately 7,700 customer at risk.



NOTE: Added general location of the Star-Seville (Rittman) 69kV to PJM Map

ATSI Transmission Zone M-3 Process

Star-Seville (Rittman) 69 kV Line Rebuild

Need Number: ATSI-2018-017

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

Proposed Solution:

Star-Seville (Rittman) 69 kV Line Rebuild

- Rebuild/reconductor approximately 18 miles of the existing Star-Seville (Rittman) 69 kV Line with 336 ACSR (existing conductor 1/0 CU and 3/0 ACSR)

Rittman 69 kV Substation – Terminal equipment to be replaced includes:

- Spark gap arresters, substation conductor, and disconnect switch

Star 69 kV Substation – Terminal equipment to be replaced includes:

- Substation conductor

- Existing line rating: 44 MVA SN / 45 MVA SE

- New line rating: 76 MVA SN / 92 MVA SE

Alternatives Considered:

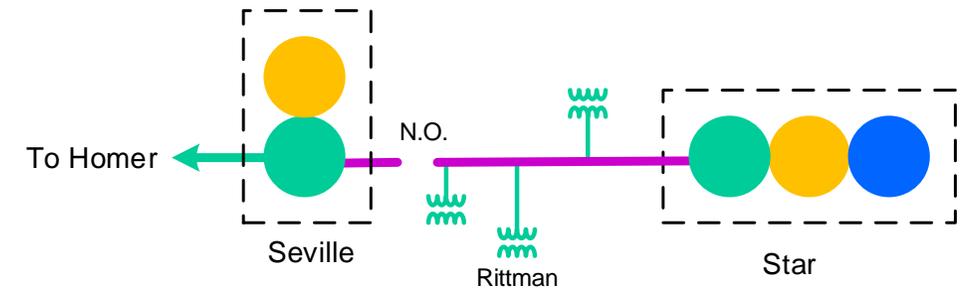
- Maintain existing condition and elevated risk of failure.

Estimated Project Cost: \$18.6 M

Projected IS Date: 12/31/2021

Status: Conceptual

Supplemental Project ID: s1802



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Carlisle-Wellington 69 kV Line Rebuild

Need Number: ATSI-2018-018
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019
Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Line Condition Rebuild / Replacement

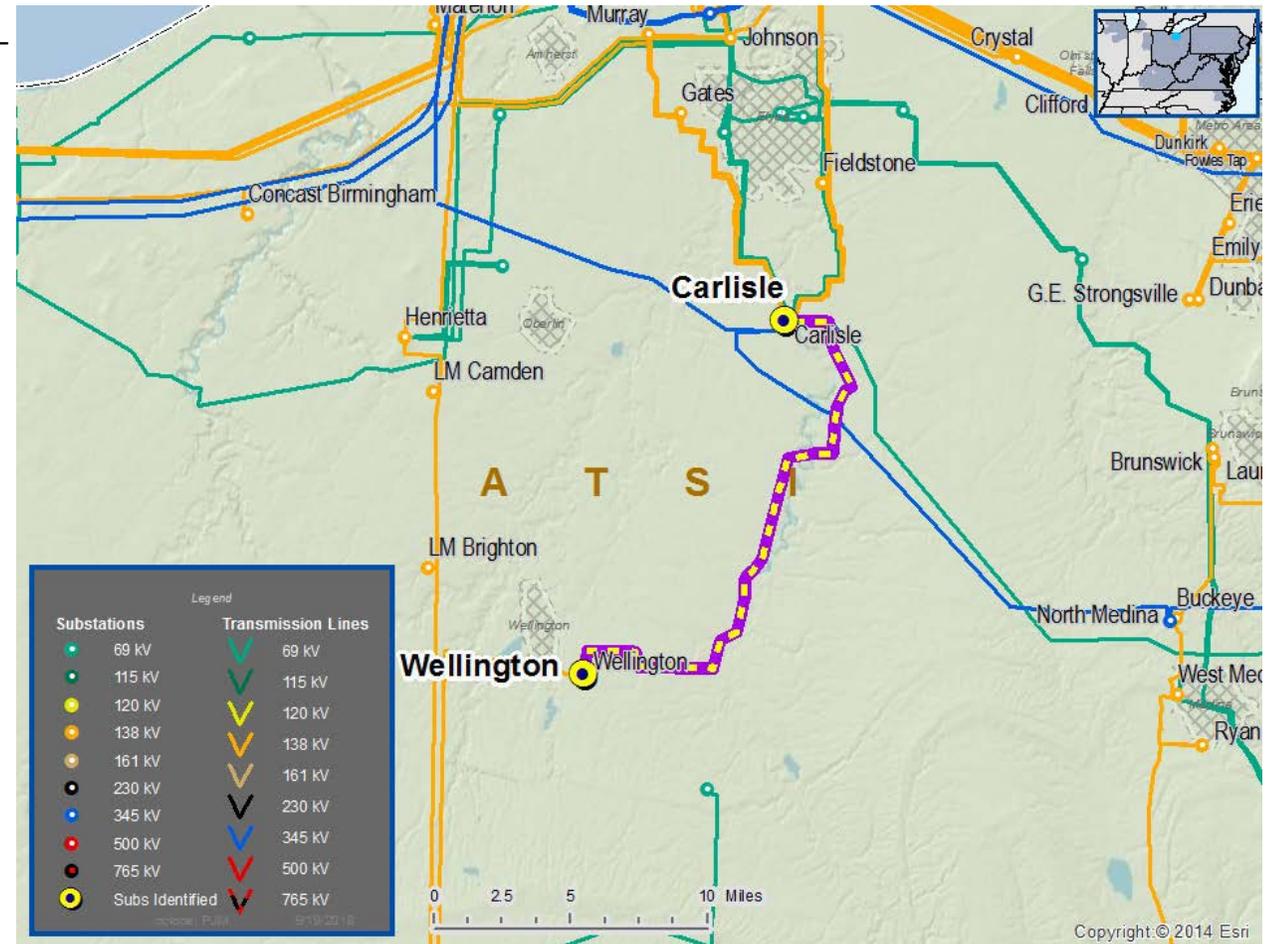
Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Problem Statement

Carlisle-Wellington 69 kV Condition Assessment (Approximately 29 miles)

- Identified obsolete and deteriorated equipment.
 - 50-75 year old construction; poor inspection results, 75 % rejection rate.
 - Negative outage history over past 5 years;
 - Approximately 29 repair records over the past 5 years; increasing trend.
- Multiple transmission delivery points (9) impacted.



ATSI Transmission Zone M-3 Process

Carlisle-Wellington 69 kV Line Rebuild

Need Number: ATSI-2018-018
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan
 – 06/12/2019

Proposed Solution:

Carlisle-Wellington 69 kV Line

- Rebuild/reconductor ~29 miles of the existing Carlisle-Wellington 69 kV Line with 477 ACSR (existing conductor 605 ACSR and 336 ACSR)
- Replace line switches A-37, A-48, A-49, A-50, and A-70

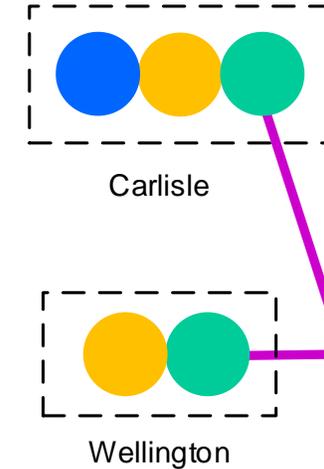
Wellington 69 kV Substation – Terminal equipment to be replaced includes:

- Circuit breaker B34 and relays and controls
- Existing line rating: 76 MVA SN / 92 MVA SE
- New line rating: 100 MVA SN / 121 MVA SE

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$27.9 M
Projected IS Date: 3/1/2022
Status: Conceptual
Supplemental Project ID: s1803



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Canal-Maysville 69 kV Line Rebuild

Need Number: ATSI-2018-019

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

Previously Presented: Need - 9/28/2018
Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Line Condition Rebuild / Replacement

Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

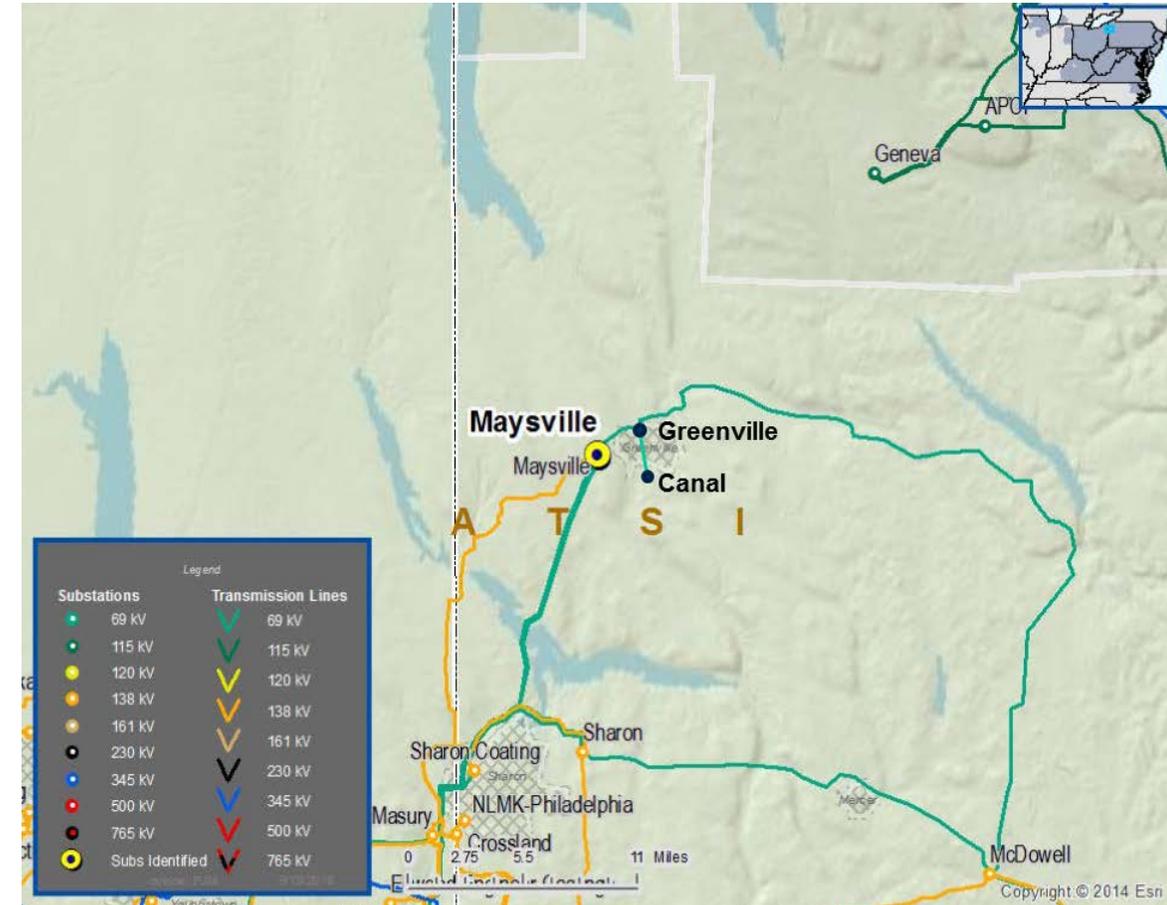
Network Radial Transmission Line

- Radial lines that serve multiple delivery points.

Problem Statement

Maysville-Canal (Greenville) 69 kV Condition Assessment (Approximately 1.5 miles)

- Identified obsolete and deteriorated equipment.
 - 61 year old construction; poor inspection results, 100 % rejection rate.
 - Approximately 4 repair records over the past 5 years.
- Radial 69 kV transmission line with 16 MWs and approximately 6,800 customer at risk.



NOTE: Added general location of the Maysville-Canal (Greenville) 69kV to PJM Map

ATSI Transmission Zone M-3 Process

Canal-Maysville 69 kV Line Rebuild

Need Number: ATSI-2018-019
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan
 – 06/12/2019

Proposed Solution:

Canal-Maysville 69 kV Line Rebuild

- Rebuild/reconductor ~1.5 miles of the existing Canal-Maysville 69 kV Line with 336 ACSR (existing conductor 336 ACSR and 3/0 ACSR)
- Replace line switches A-234 and A-235

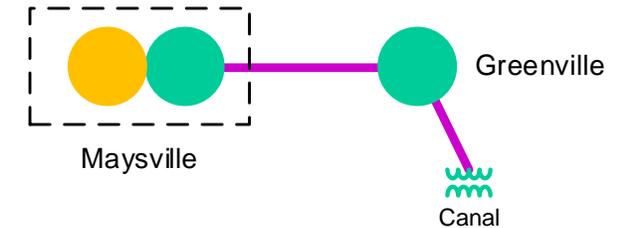
Greenville 69 kV Substation – Terminal equipment to be replaced includes:

- Substation conductor
- Existing line rating: 47 MVA SN / 56 MVA SE
- New line rating: 80 MVA SN / 96 MVA SE

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$1.7 M
Projected IS Date: 12/31/2019
Status: Engineering
Supplemental Project ID: s1804



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Midway – Napoleon 69 kV Line Rebuild

Need Number: ATSI-2018-020
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

Previously Presented: Need - 9/28/2018
 Solution – 10/26/2018

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference

Line Condition Rebuild / Replacement

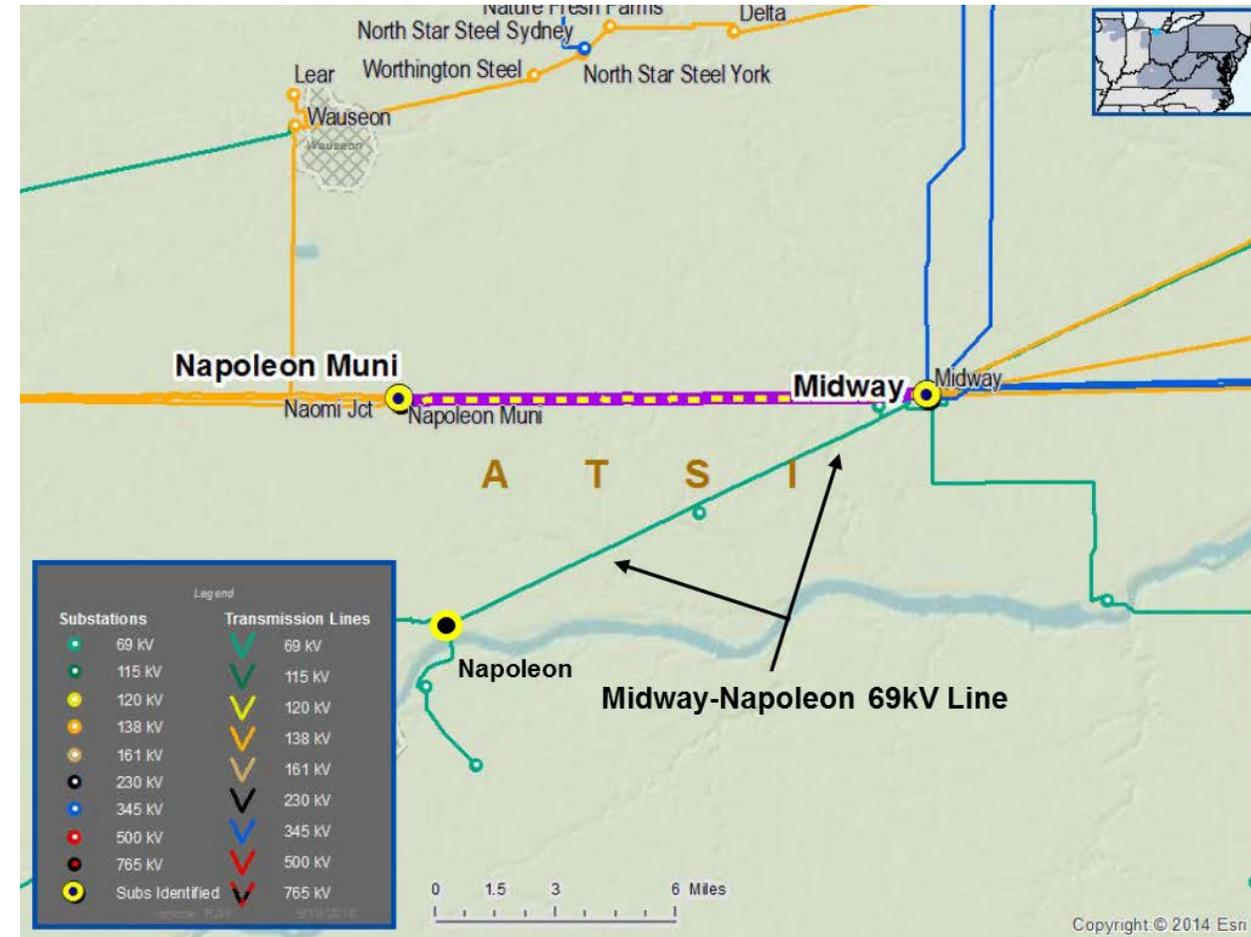
Assessment of existing transmission lines for equipment characteristics that are at, or beyond their existing service life, or contain components that are obsolete.

- Aged or deteriorated wood pole transmission line structures.
- Negatively impact customer outage frequency and/or durations.
- Demonstrate an increasing trend in maintenance findings and/or costs

Problem Statement

Midway-Napoleon 69 kV Condition Assessment (Approximately 11 miles)

- Identified obsolete and deteriorated equipment.
 - 42-52 year old construction; poor inspection results, 60 % rejection rate.
 - Approximately 8 repair records over the past 5 years; increasing trend.
 - 4/0 ACSR conductor



ATSI Transmission Zone M-3 Process

Midway – Napoleon 69 kV Line Rebuild

Need Number: ATSI-2018-020

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 06/12/2019

Proposed Solution:

Midway – Napoleon 69 kV Line Rebuild

- Rebuild/reconductor existing Midway – Napoleon 69 kV Line with 477 ACSR.
- Existing conductor is 4/0 ACSR.

Midway 69 kV Substation – Terminal equipment to be replaced includes:

- Replace 69kV breaker B6876, disconnect switches, line CVT, line trap, line tuner, and associated relaying.

Napoleon 69 kV Substation – Terminal equipment to be replaced includes:

- Disconnect switches, line CVT, line trap, line tuner, and associated relaying.

- Existing line rating: 53 MVA SN / 64 MVA SE
- New line rating: 100 MVA SN / 120 MVA SE

Alternatives Considered:

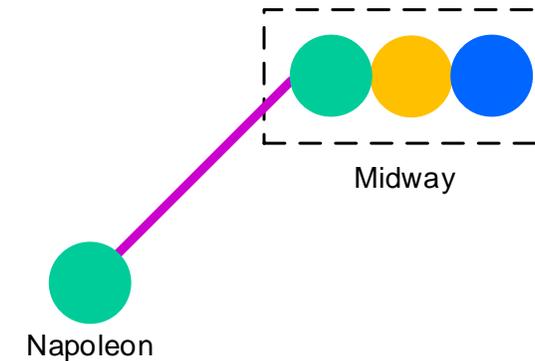
- Maintain existing condition and elevated risk of failure

Estimated Project Cost: \$19.6 M

Projected IS Date: 12/31/2019

Status: Engineering

Supplemental Project ID: s1805



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Need Number: ATSI-2018-022

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019

Previously Presented: Need - 11/29/2018
Solution – 11/29/2018

Project Driver(s):

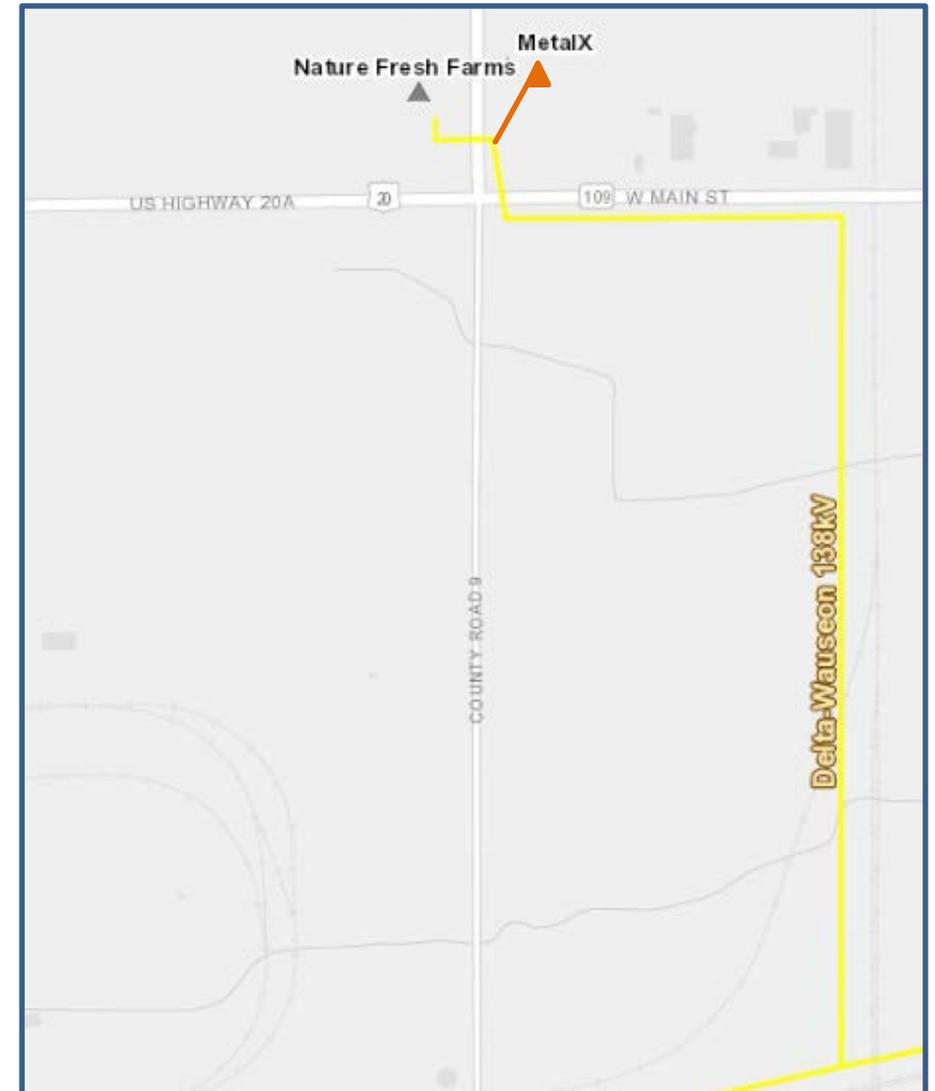
Customer Service - Emergent

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 - A customer requested 138 kV service for load of approximately 6 MVA near the Delta-Wauseon 138 kV line.



Need Number: ATSI-2018-022

Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019

Previously Presented: Need - 11/29/2018

Solution – 11/29/2018

Proposed Solution:

- Tap the Delta-Wauseon 138 kV line and extend a 138 kV line (approximately 0.1 miles) to the proposed customer site (Match existing line conductor).

Alternatives Considered:

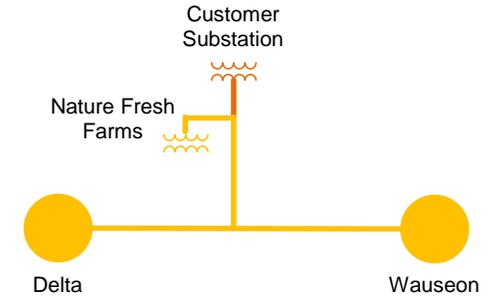
- None (obligation to serve)

Estimated Project Costs: \$0.5M

Projected IS Date: 02/11/2019

Status: Complete

Supplemental Project ID: s1848



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Need Number: ATSI-2019-001
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Considerations

- System reliability and performance
- Substation / Line equipment limits
- Reliability of Non-Bulk Electric System (Non-BES) facilities
- Load and risk in planning and operational scenarios
- Load and/or customers at risk on single transmission lines

Problem Statement

Black River-Shinrock 69 kV Line

The Black River-Shinrock 69 kV line is approximately 24 miles long and serves five (5) transmission customers. The transmission line conductor is the limiting element.

- A Black River-Shinrock 69 kV line outage (N-1) results in approximately 47 MW and 14,200 customers being interrupted.
- Over the past five years, the Black River-Shinrock 69 kV line has experienced approximately 17 outages (9 sustained , 8 momentary).

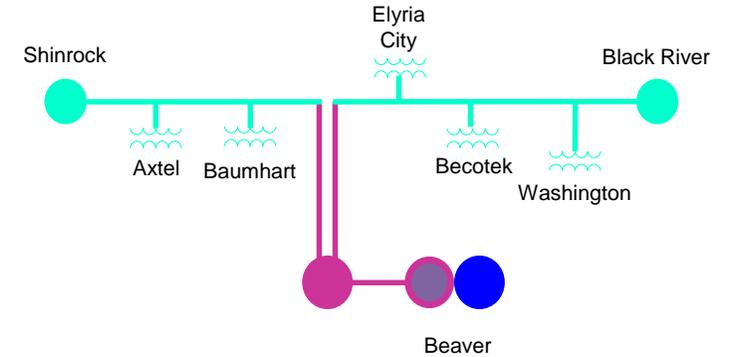


Need Number: ATSI-2019-001
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Proposed Solution:

Beaver Substation – New 138/69 kV Substation

- Build a new 138/69 kV substation near the existing Beaver 138 kV substation.
- Extend 138 kV line (Approximately 0.1 miles) from the Beaver 138 kV substation to the new site
- Install one (1) 138 / 69 kV 100/134 MVA transformer
- Build a three (3) breaker 69 kV ring bus and control house.
- Loop in/out the existing Black River-Shinrock 69 kV line with double circuit line extension (approximately 0.3 miles) to the new 69 kV ring bus.
- At Shinrock replace the existing Electromechanically Relays.
- Add auto-sectionalizing scheme at Axtel substation.
- The project will add new 138/69 kV source to the area.
 - Provide operational flexibility and increased reliability
 - Provide additional capacity on the Beaver-Black River 138 kV line



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	



ATSI Transmission Zone M-3 Process

Beaver Substation – New 138/69 kV Substation

Need Number: ATSI-2019-001
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution – 03/25/2019

Transmission Line Ratings:

- Black River – Shinrock 69 kV Line
 - Before Proposed Solution: 80 MVA SN / 96 MVA SE
- Black River – Beaver 69 kV Line
 - After Proposed Solution: 80 MVA SN / 96 MVA SE
- Shinrock – Beaver 69 kV Line
 - After Proposed Solution: 80 MVA SN / 96 MVA SE

Alternatives Considered:

- Install 69 kV ring bus or auto-sectionalizing scheme at Axtel substation.

Estimated Project Cost: \$7.4M

Projected IS Date: 12/31/2020

Status: Conceptual

Supplemental Project ID: s1945

Need Number: ATSI-2019-002
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Considerations

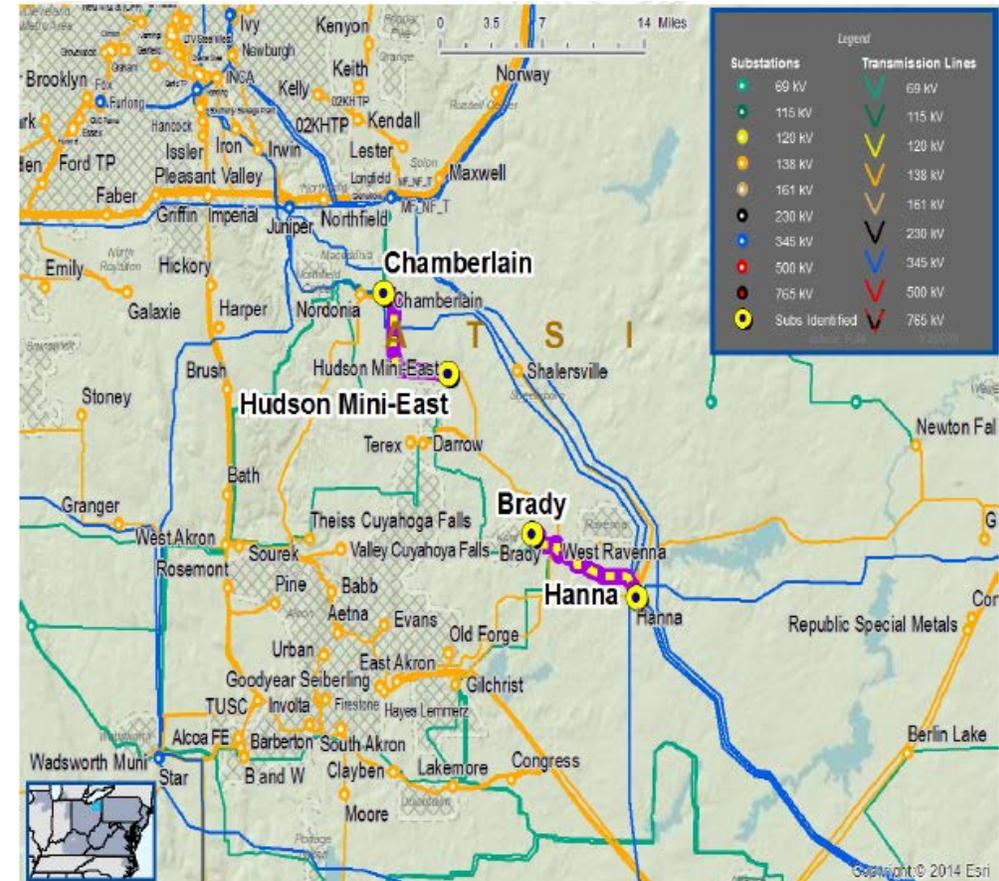
- System reliability and performance
- Substation / Line equipment limits
- Reliability of Non-Bulk Electric System (Non-BES) facilities
- Load and risk in planning and operational scenarios

Problem Statement

Brady 138 kV Area

PJM has issued PCLLRW to potentially drop 20 MW of load at Brady substation for the (N-1-1) outage of the Brady-Hanna 138 kV line and the Chamberlin-Hudson Muni 138kV line.

- Post-contingency voltage at Brady drops below 0.92 p.u. under this back-feed condition from Darrow 138 / 69 kV substation.
- The overall load at risk is approximately 61 MW, and the number of customers impacted is approximately 18,800.



Need Number: ATSI-2019-002
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Proposed Solution:

Brady 138 KV, 26.4 MVAR capacitor bank

- Install 138kV, 26.4 MVAR capacitor bank at Brady substation.
- Add one 138kV circuit breaker to convert Brady three (3) circuit breaker ring bus into four (4) circuit breaker ring bus.

Transmission Line Ratings:

- No Impact

Alternatives Considered:

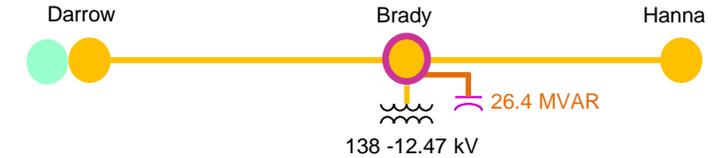
- Bring another 138 kV source into Brady substation.

Estimated Project Cost: \$1.4M

Projected IS Date: 12/31/2019

Status: Conceptual

Supplemental Project ID: s1946



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Need Number: ATSI-2019-003
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Considerations

- System reliability and performance
- Substation / Line equipment limits
- Reliability of Non-Bulk Electric System (Non-BES) facilities
- Load and risk in planning and operational scenarios
- Load and/or customers at risk on single transmission lines

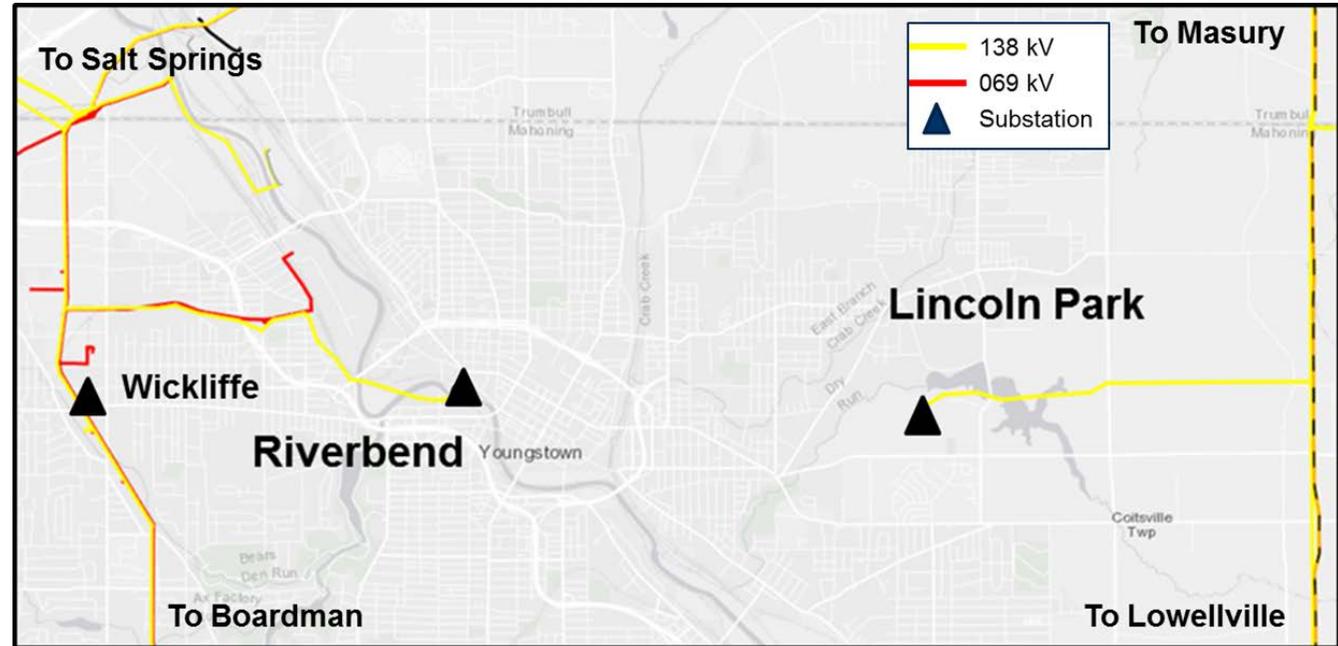
Problem Statement

Lincoln Park and Riverbend 138 kV Area

Lincoln Park 138 - 23 kV substation presently serves approximately 35 MW and 5,000 customers

- The loss of the Lincoln Park-Masury 138 kV line followed by the loss of the Lincoln Park-Lowellville 138 kV line (N-1-1) results in the loss of approximately 35 MW and 5,000 customers.

Continued on next slide...





ATSI Transmission Zone M-3 Process

Lincoln Park – Riverbend 138 kV Line

Need Number: ATSI-2019-003
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution – 03/25/2019

Problem Statement - Continued

Riverbend 138 - 23 kV substation presently serves approximately 40 MW and 9,100 customers. Additionally the Wickliffe 138 kV substation serves approximately 22 MW and 10,000 customers.

- The loss of the Boardman-Wickliffe 138 kV line followed by the loss of the Riverbend-Salt Springs 138 kV line (N-1-1) results in the loss of roughly 62 MW and 19,100 customers.

System Performance

- Over the past 5 years, the Lincoln Park-Masury 138 kV line has experienced 1 outage (0 sustained , 1 momentary).
- Over the past 5 years, the Lincoln Park-Lowellville 138 kV line has experienced 4 outages (3 sustained , 1 momentary).
- Over the past 5 years, the Boardman-Wickliffe 138 kV line has experienced 2 outages (2 sustained , 0 momentary).
- Over the past 5 years, the Riverbend-Salt Springs 138 kV line has experienced 1 outage (1 sustained , 0 momentary).



ATSI Transmission Zone M-3 Process

Lincoln Park – Riverbend 138 kV Line

Need Number: ATSI-2019-003
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Proposed Solution:

Lincoln Park – Riverbend 138 kV Line

- Build a new 138 kV line from Riverbend to Lincoln Park substation (roughly 5.7 miles)
- Convert the Riverbend substation into a 4-breaker ring bus configuration by installing two 138 kV breakers
- Expand the Lincoln Park 138 kV ring bus by installing one 138 kV breaker allowing for a new line terminal

Transmission Line Ratings:

- Lincoln Park – Riverbend 138 kV Line
 - After Proposed Solution: 275 MVA SN / 333 MVA SE

Alternatives Considered:

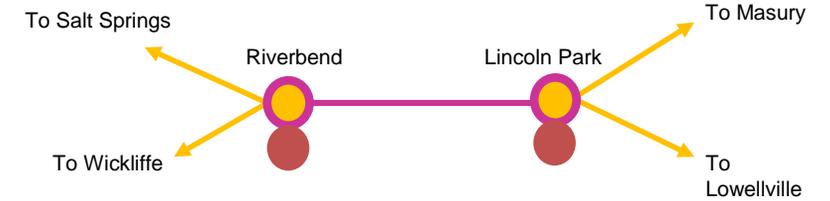
- Build a new Salt Springs-Riverbend #2 138 kV Line and a new Lincoln Park-Shenango 138 kV Line.

Estimated Project Cost: \$25.9M

Projected IS Date: 12/31/2022

Status: Conceptual

Supplemental Project ID: s1947



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Need Number: ATSI-2019-004
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Project Driver(s):
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Considerations

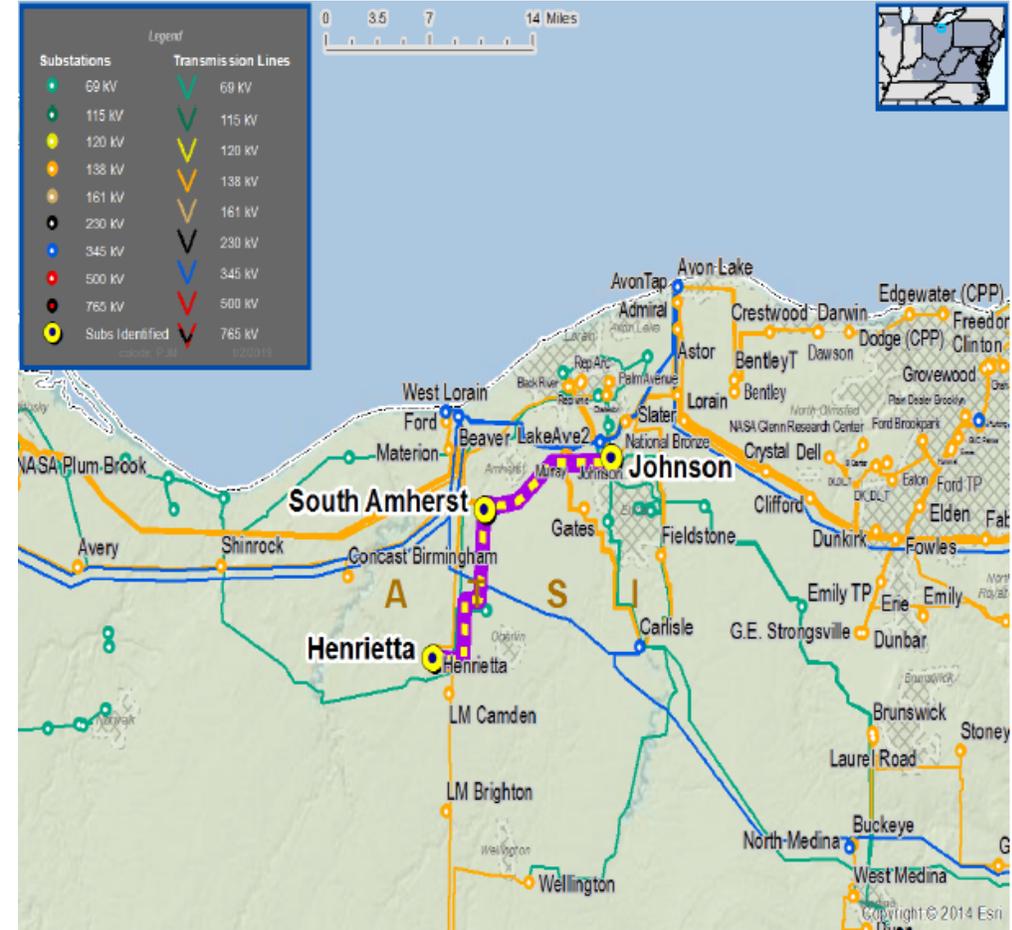
- System reliability and performance
- Substation / Line equipment limits
- Reliability of Non-Bulk Electric System (Non-BES) facilities
- Load and risk in planning and operational scenarios
- Load and/or customers at risk on single transmission lines

Problem Statement

Amherst 69 kV Area

The Amherst 69 kV substation is owned by Amherst Municipality with transmission service from a tapped 69 kV transmission line. The Henrietta-Johnson 69 kV line outage (N-1) results in approximately 39 MW & 9,195 customers at three transmission service points being interrupted.

- Over the past five years, the Henrietta-Johnson 69 kV line has experienced approximately 21 outages (13 sustained , 8 momentary).



ATSI Transmission Zone M-3 Process

Amherst (New) 69 kV Ring Bus

Need Number: ATSI-2019-004
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Proposed Solution:

Amherst (New) 69 kV Ring Bus

- Build new 69 kV three (3) circuit breaker, future four(4), ring bus adjacent to Amherst Muni substation.
- Rebuild the Amherst Muni / Nordson tap (Approximately 1 mile) as double circuit 69 kV line, match the main line conductor, and loop the Henrietta-Johnson 69 kV line in/out of the new Amherst 69 kV ring bus.
- Terminate Amherst Muni into the new ring bus switch station.

Transmission Line Ratings:

- Henrietta – Johnson (existing) 69 kV Line
 - Before Proposed Solution: 45 MVA SN / 54 MVA SE
- Henrietta – Amherst (New) 69 kV Line
 - After Proposed Solution: 80 MVA SN / 96 MVA SE
- Johnson – Amherst (New) 69 kV Line
 - After Proposed Solution: 80 MVA SN / 96 MVA SE

Alternatives Considered:

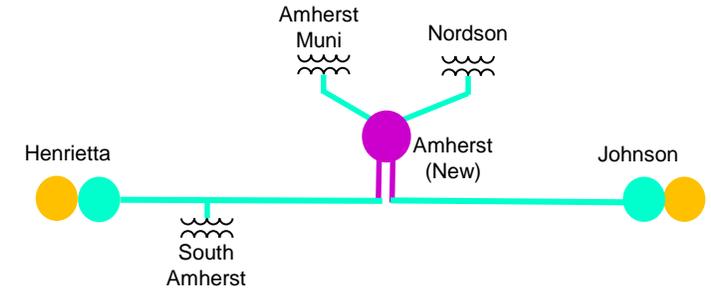
- Maintain existing configuration.

Estimated Project Cost: \$4.0M

Projected IS Date: 12/31/2020

Status: Conceptual

Supplemental Project ID: s1948



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Remove the Tangy – Delaware 138 kV Line

Need Number: ATSI-2019-005
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Project Driver(s):

Equipment Material Condition
Performance and Risk

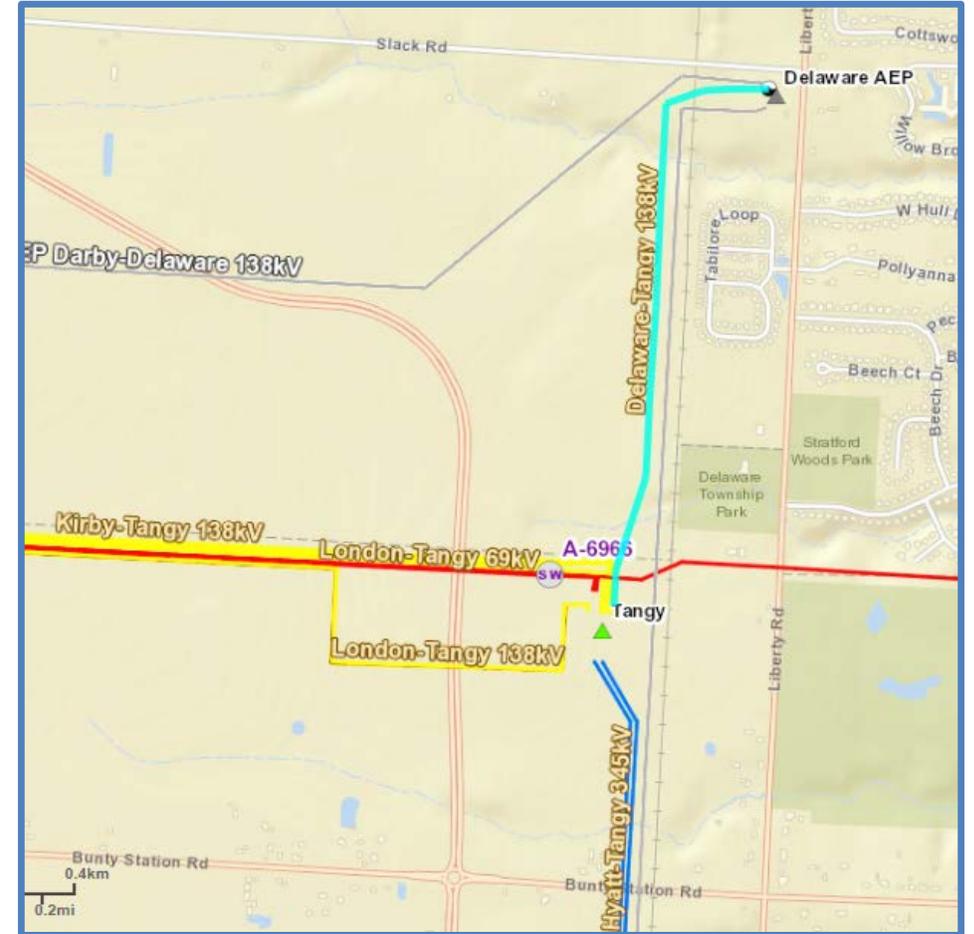
Specific Assumption Reference(s)

Global Considerations

- Level of criticality to system performance and operations
- Expected service life (at or beyond) or obsolescence

Problem Statement

The Delaware – Tangy 138 kV Line is an ~1.0 mile tie line between FirstEnergy and AEP.
 The line is operated normally open and has not been closed since 2014.
 Failing pilot wire relays and phone line communications are near or beyond their expected service life or obsolete.





ATSI Transmission Zone M-3 Process

Remove the Tangy – Delaware 138 kV Line

Need Number: ATSI-2019-005
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Proposed Solution:

- Remove the Tangy – Delaware 138 kV Line and poles.
- Remove Tangy's B50 relays associated with the Pilot wire scheme (CEY,NAA and CFPG).
- Keep all other relaying and equipment associated with Breaker B50.
- Breaker B50 will be used as the transfer breaker.

Alternatives Considered:

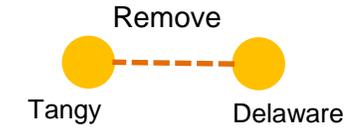
- Replace the obsolete relaying and phone line with fiber and 411L PR/L90 BU scheme with both using current differential over fiber.

Estimated Project Costs: \$0.6M

Projected IS Date: 06/30/2020

Status: Conceptual

Supplemental Project ID: s1949



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

ATSI Transmission Zone M-3 Process

Elm 138 kV Ring Bus and Line Build

Need Number: ATSI-2019-006
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):

Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Considerations

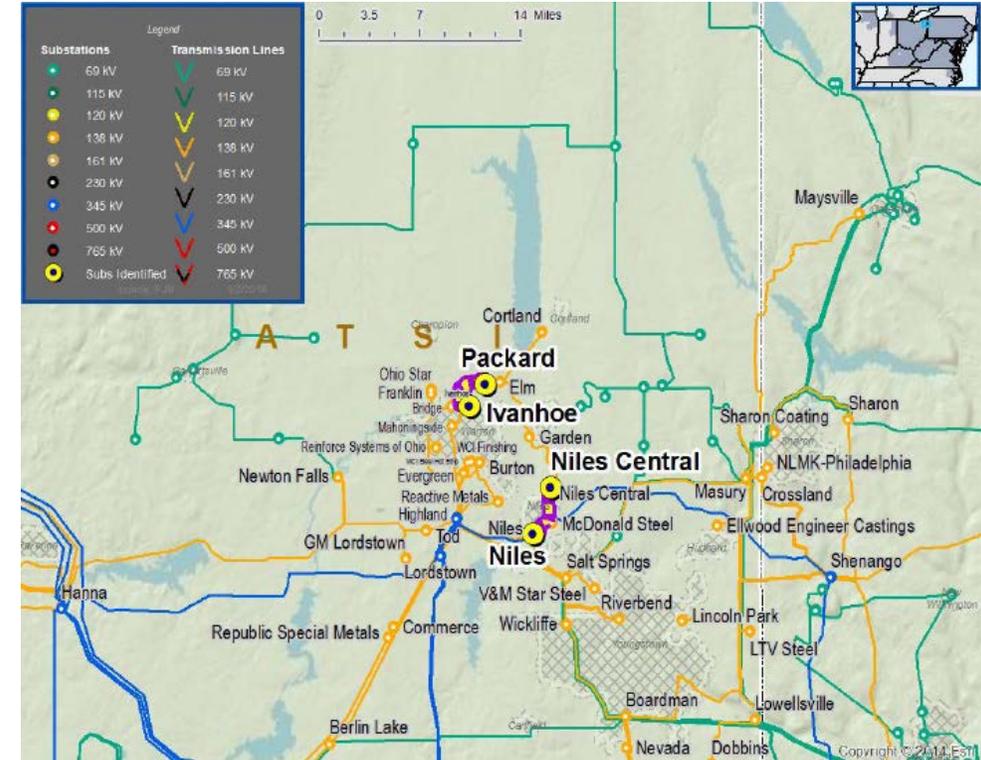
- System reliability and performance
- Substation / Line equipment limits
- Reliability of Non-Bulk Electric System (Non-BES) facilities
- Load and risk in planning and operational scenarios
- Load and/or customers at risk on single transmission lines

Problem Statement

Elm 138 kV Area

The contingency loss of the Ivanhoe-Packard 138 kV line followed by the loss of the Niles-Niles Central Muni 138 kV line results in the loss of approximately 137 MW and 28,600 customers at six (6) transmission service points.

- Over the past five years, the Ivanhoe-Packard 138 kV line has experienced approximately 2 outages (1 sustained , 1 momentary).
- Over the past five years, the Niles-Niles Central Muni 138 kV line has experienced approximately 4 outages (1 sustained , 3 momentary).



ATSI Transmission Zone M-3 Process

Elm 138 kV Ring Bus and Line Build

Need Number: ATSI-2019-006
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Proposed Solution:

Elm 138 kV Ring Bus and Line Build

- Convert Ivanhoe 138 kV substation to a six (6) breaker ring bus configuration by installing two (2) 138 kV breakers
- Convert Elm 138 kV substation to a five (5) breaker ring bus configuration (future 6) by installing four (4) 138 kV breakers
- Build approximately 3 miles of 138 kV line from Ivanhoe to Elm.

Transmission Line Ratings:

- Ivanhoe – Elm 138 kV Line
 - After Proposed Solution: 274 MVA SN / 333 MVA SE

Alternatives Considered:

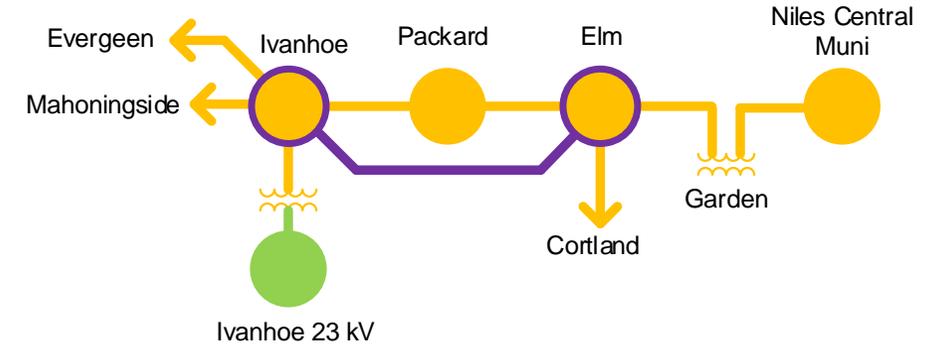
- Build new transmission line (approximately 3 miles) from Niles to Niles Central Muni and convert Niles Central Muni to a four (4) breaker ring bus configuration (space constraints at Niles)

Estimated Project Cost: \$12.1M

Projected IS Date: 6/1/2023

Status: Conceptual

Supplemental Project ID: s1950



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Need Number: ATSI-2019-007
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Project Driver(s):
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Considerations

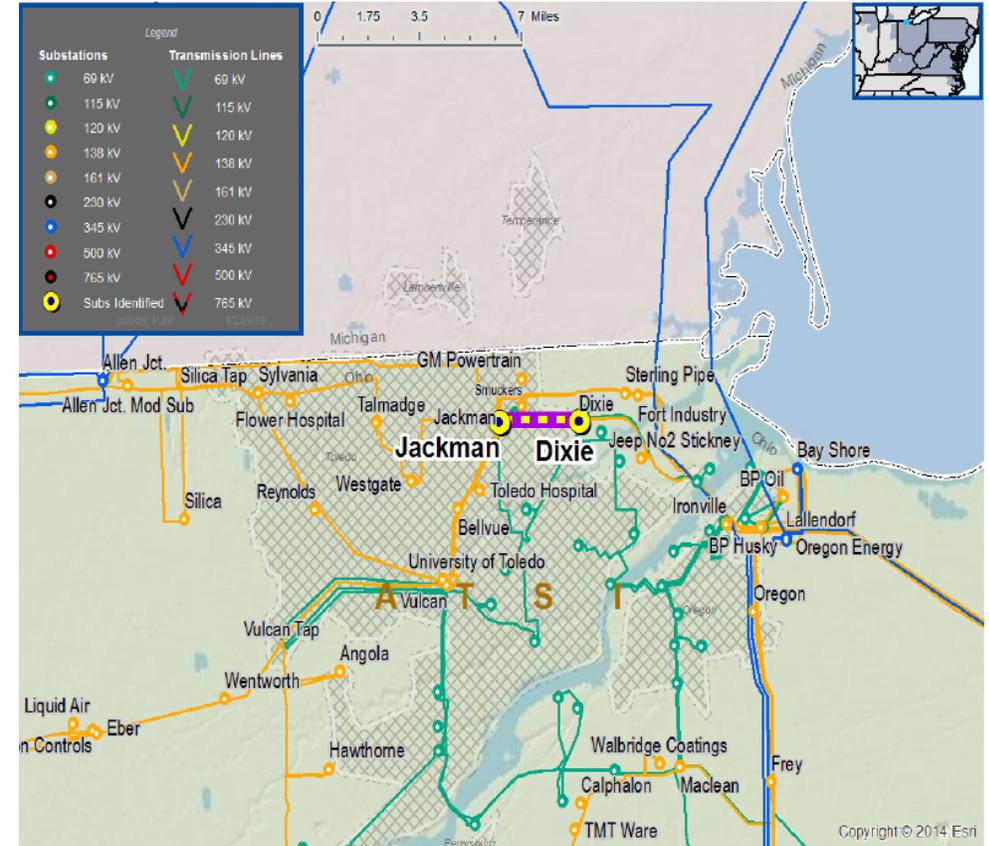
- System reliability and performance
- Substation / Line equipment limits
- Reliability of Non-Bulk Electric System (Non-BES) facilities
- Load and risk in planning and operational scenarios
- Load and/or customers at risk on single transmission lines

Problem Statement

Jackman 138 / 69 kV Area

The Jackman 69 kV substation is electrically isolated from the Jackman 138 kV substation; it is sourced from Dixie 69 kV substation. The contingency loss of the Dixie-Jackman 69 kV line or a stuck breaker at Dixie substation results in the loss of approximately 43 MW and 19,000 customers at three transmission service points.

- Over the past five years, the Dixie-Jackman 69 kV line has experienced approximately 1 outage (1 sustained , 0 momentary).



Need Number: ATSI-2019-007
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Proposed Solution:

Jackman 69 kV Ring Bus and Transformer

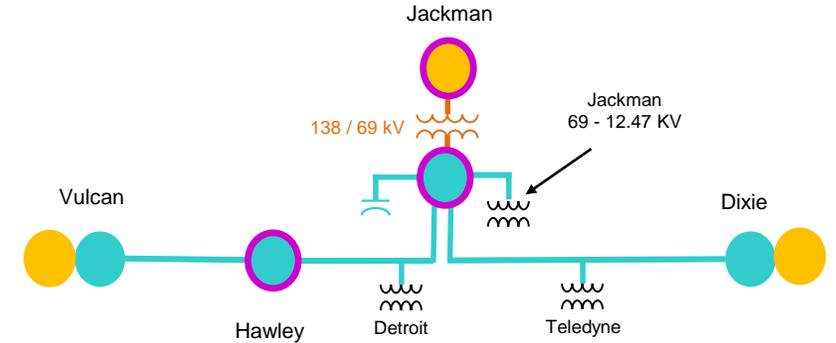
- Expand Jackman substation to a five (5) breaker 69 kV ring bus by adding 5 breakers.
 - Create positions for two transformers, a capacitor bank, and two line exits.
- Add a 138 kV high side breaker and install a 138 / 69 kV 134 MVA transformer.
- Close the normally open circuit switcher at Hawley substation to network the Jackman 69 kV system with the Vulcan sourced 69 kV system by replacing both 69 kV circuit switchers at Hawley substation with 69 kV circuit breakers.

Transmission Line Ratings:

- Jackman-Vulcan 69 kV Line
 - Before Proposed Solution: 96 MVA SN / 96 MVA SE
 - After Proposed Solution: 107 MVA SN / 132 MVA SE
- Jackman-Dixie 69 kV Line
 - Before Proposed Solution: 107 MVA SN / 138 MVA SE
 - After Proposed Solution: 107 MVA SN / 138 MVA SE

Alternatives Considered:

- Maintain existing condition and elevated risk of failure



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Estimated Project Cost: \$8.1M
Projected IS Date: 13/30/2023
Status: Conceptual
Supplemental Project ID: s1951

Need Number: ATSI-2019-008
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Project Driver(s):
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Considerations

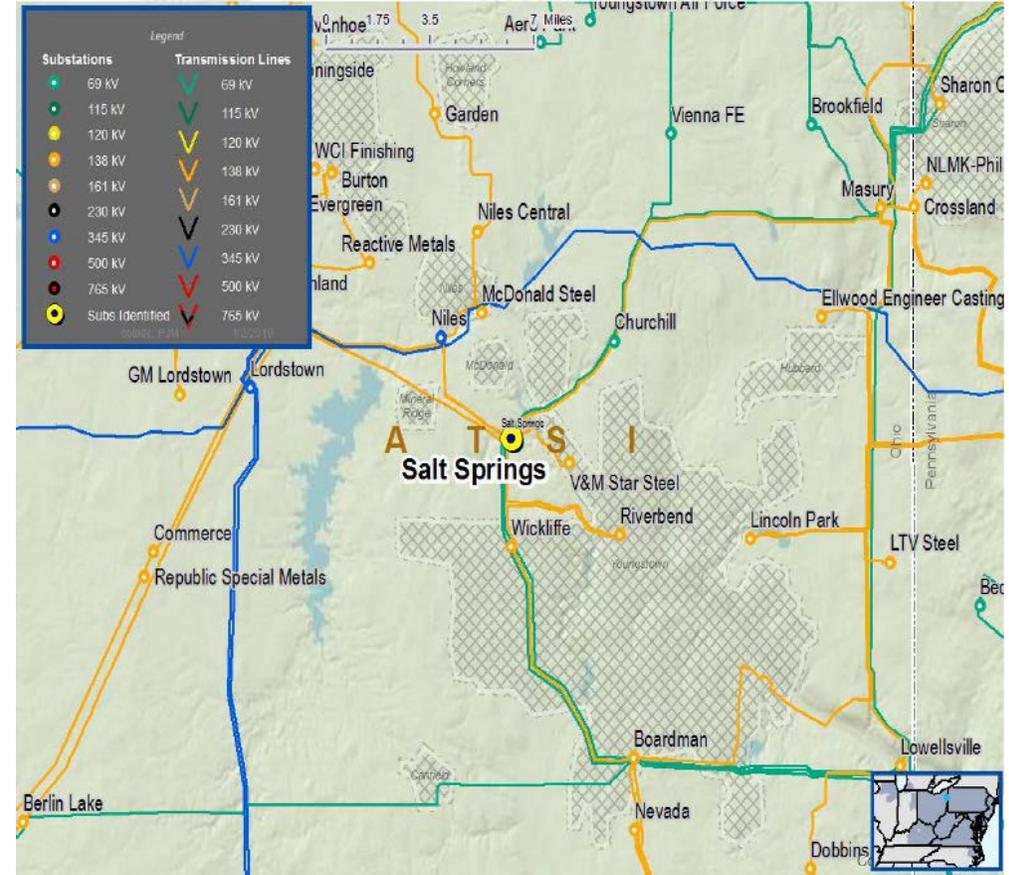
- System reliability and performance
- Substation / Line equipment limits
- Reliability of Non-Bulk Electric System (Non-BES) facilities
- Load and risk in planning and operational scenarios
- Load and/or customers at risk on single transmission lines

Problem Statement

Kimberly 69 kV Area

The Kimberly 69 kV substation is served from a 3.6 mile radial transmission line from Salt Springs 138 / 69 kV substation with 19 MW and 5,500 customers at risk.

Additionally, the contingency loss of the nearby Berlin Lake-Boardman 69 kV line results in the loss of approximately 46 MW and 12,500 customers at four (4) transmission service points.



Need Number: ATSI-2019-008
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Proposed Solution:

Weldon 69 kV Ring Bus and Line Build

- Construct a new four (4) breaker ring bus (Weldon Substation) outside the existing Canfield Steel substation.
- Network the new four (4) breaker ring bus by completing the following:
 - Loop the existing Canfield Steel radial 69 kV circuit into the new Weldon substation
 - Loop the existing Berlin Lake-Boardman 69 kV line into new Weldon substation by constructing roughly 0.6 miles 69 kV line adjacent to existing Canfield Steel 69 kV radial circuit
 - Build new Weldon-Kimberly 69 kV line (approximately 6.4 miles).
- Install new line exit switch and SCADA to the line exits at Kimberly.
- Install auto-sectionalizing scheme at Canfield substation.

Transmission Line Ratings:

Berlin Lake-Weldon 69 kV Line

- After Proposed Solution: 80 MVA SN / 96 MVA SE

Weldon-Boardman 69 kV Line

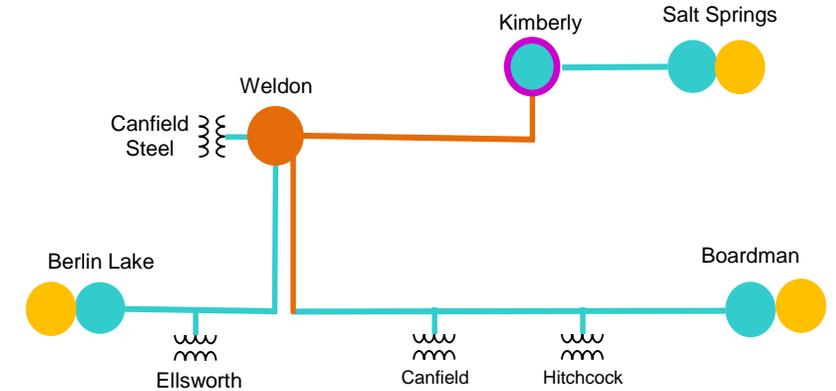
- After Proposed Solution: 80 MVA SN / 96 MVA SE

Weldon-Kimberly 69 kV Line

- After Proposed Solution: 111 MVA SN / 135 MVA SE

Alternatives Considered:

- Install ring bus at Canfield substation (Space constrained)
- Network Kimberly substation by building a new 69 kV line from Kimberly to Salt Springs substation



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Estimated Project Cost: \$17.4M

Projected IS Date: 6/1/2023

Status: Conceptual

Supplemental Project ID: s1952

Need Number: ATSI-2019-011
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Considerations

- System reliability and performance
- Substation / Line equipment limits

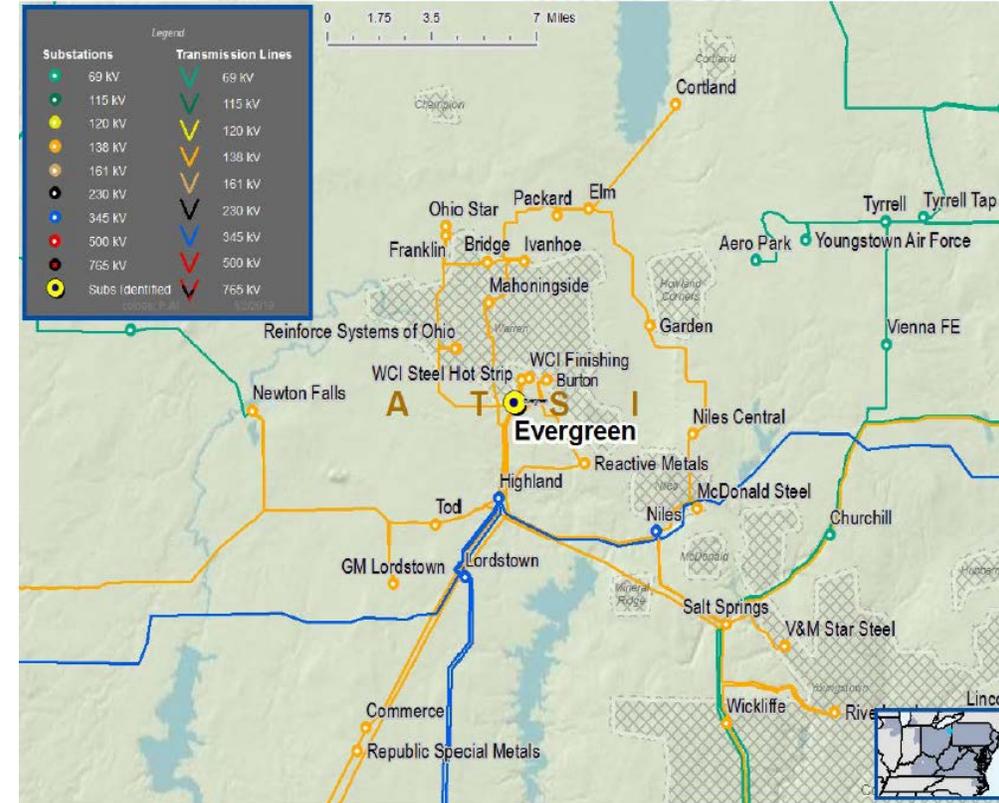
Upgrade Relay Schemes

- Bus protection schemes
- Relay schemes that have a history of mis-operation

Problem Statement

Evergreen Substation 138 kV Equipment and Protection

- BES bus protection is presently performed by a complex scheme that has a history of causing mis-operations at other substations. The scheme uses distributed electromechanical relays to exclude a bus fault rather than detecting the bus fault directly.





ATSI Transmission Zone M-3 Process

Evergreen 138 kV Relay Upgrades

Need Number: ATSI-2019-011
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution - 03/25/2019

Proposed Solution:

Evergreen 138 kV Relay Upgrades

- Replace bus protection scheme with dual differential protection.
- Replace bus PTs due to condition
- Replace 3 breakers (B23, B24, and B27 bus transfer) due to condition and insufficient lack of sufficient CTs for proper system to support standard, redundant bus protection.

Transmission Line Ratings:

- Evergreen-Ivanhoe 138 kV Line
 - Before Proposed Solution: 226 MVA WN / 249 MVA WE
 - After Proposed Solution: 226 MVA WN / 286 MVA WE
- Evergreen-Niles 138 kV Line
 - Before Proposed Solution: 224 MVA SN / 293 MVA SE
 - After Proposed Solution: 278 MVA SN / 339 MVA SE

Alternatives Considered:

- Maintain existing protection scheme with high risk for mis-operation.

Estimated Project Cost: \$1.3M

Projected IS Date: 3/1/2021

Status: Conceptual

Supplemental Project ID: s1954

**No diagram required.
All work is within the substation**

Need Number: ATSI-2019-012
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Considerations

- System reliability and performance
- Substation / Line equipment limits

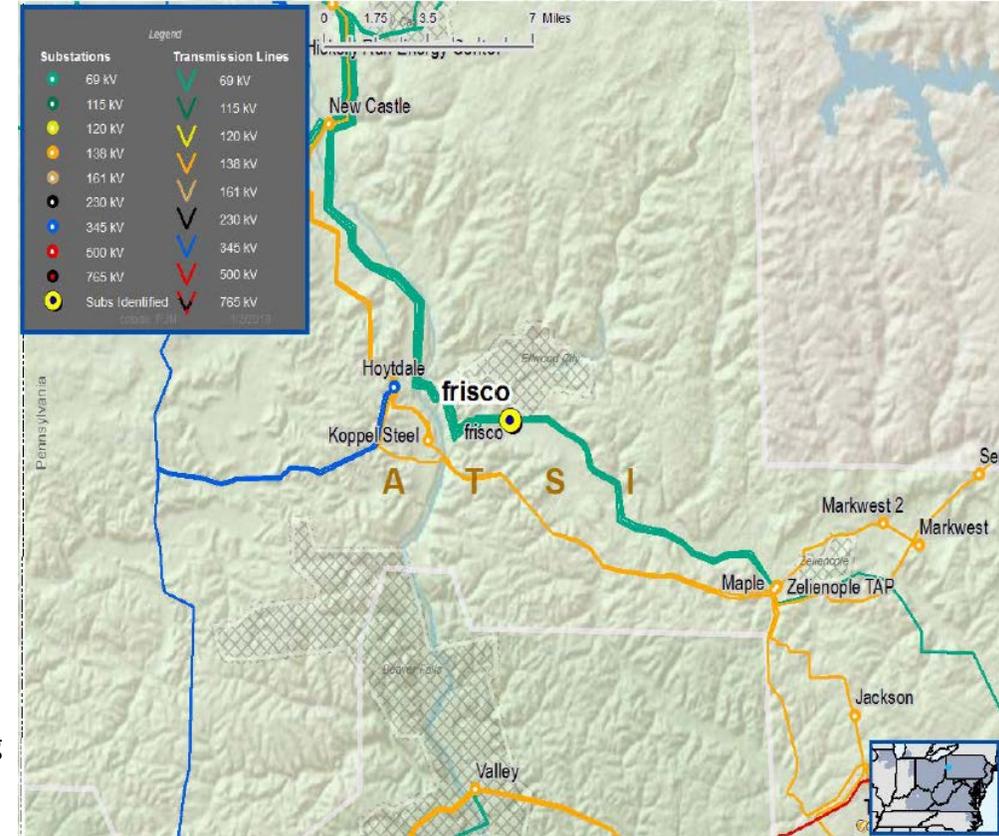
Upgrade Relay Schemes

- Protection system with single point of failure

Problem Statement

Frisco Substation 69 kV Protection

- Line protection at Frisco substation consists of a single relay protection scheme. A recent relay failure during a fault at a nearby substation led to delayed fault clearing and a larger number of customers affected than necessary. There is not backup relay schemes to reduce customer exposure to a similar single point of failure.





ATSI Transmission Zone M-3 Process

Frisco 69 V Relay Upgrades

Need Number: ATSI-2019-012
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution - 03/25/2019

Proposed Solution:

Frisco 69 V Relay Upgrades

- Replace bus protection with dual differential scheme.
- Upgrade relays and substation conductors on the Frisco-Maple 69 kV line exit.

Transmission Line Ratings:

- Frisco-Maple #1 69 kV Line (Frisco-Knox T)
 - Before Proposed Solution: 72 MVA SN / 72 MVA SE
 - After Proposed Solution: 80 MVA SN / 96 MVA SE

Alternatives Considered:

- Maintain existing protection scheme with high risk for mis-operation and single point of failure.

Estimated Project Cost: \$0.3M

Projected IS Date: 12/31/2020

Status: Conceptual

Supplemental Project ID: s1955

**No diagram required.
All work is within the substation**

Need Number: ATSI-2019-013
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution - 03/25/2019

Project Driver(s):

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

Specific Assumption Reference(s)

Global Considerations

- System reliability and performance
- Substation / Line equipment limits

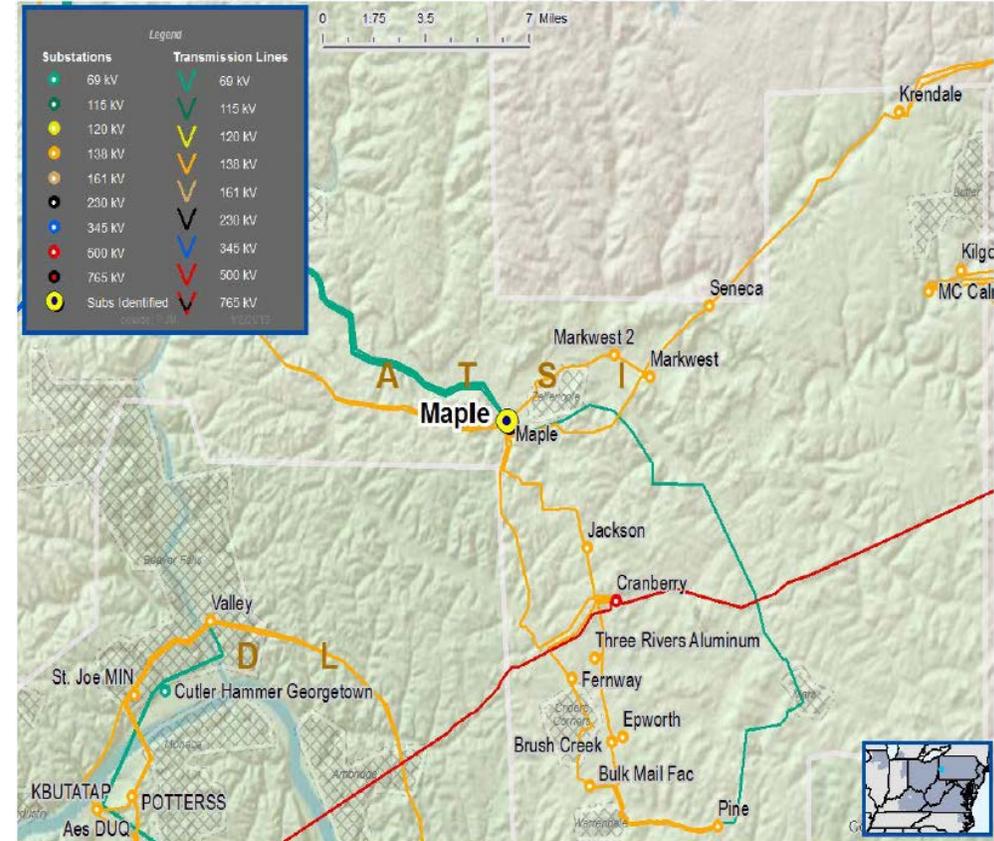
Upgrade Relay Schemes

- Protection system with single point of failure

Problem Statement

Maple Substation 69 kV Protection

- Line protection at Maple substation consists of a single relay protection scheme. A recent relay failure during a fault at a nearby substation led to delayed fault clearing and a larger number of customers affected than necessary. There is not backup relay schemes to reduce customer exposure to a similar single point of failure.





ATSI Transmission Zone M-3 Process

Maple 69 kV Relay Upgrades

Need Number: ATSI-2019-013
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution - 03/25/2019

Proposed Solution:

Maple 69 kV Relay Upgrades

- Replace bus protection scheme with dual differential protection.
- Replace two breakers (B118, and B134) due to condition and lack of sufficient CTs to support standard redundant bus protection.
- Upgrade the relays on the Maple-Frisco #2 69 kV line exit.

Transmission Line Ratings:

- Maple-Frisco #2 69 kV Line (Maple-Thompson T)
 - Before Proposed Solution: 62 MVA SN / 62 MVA SE
 - After Proposed Solution: 80 MVA SN / 96 MVA SE

Alternatives Considered:

- Maintain existing protection scheme with high risk for mis-operation and single point of failure.

Estimated Project Cost: \$0.95M

Projected IS Date: 12/31/2021

Status: Conceptual

Supplemental Project ID: s1956

**No diagram required.
All work is within the substation**

ATSI Transmission Zone M-3 Process

Fowles 138 kV Breaker and Substation Upgrades

Need Number: ATSI-2019-017
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk

Specific Assumption Reference(s)

Global Factors

- At or beyond expected service life or obsolete
- Failure risk, to the extent caused by asset design characteristics, or historical industry/company performance data, or application design error
- Show a high level of criticality to system performance and operations

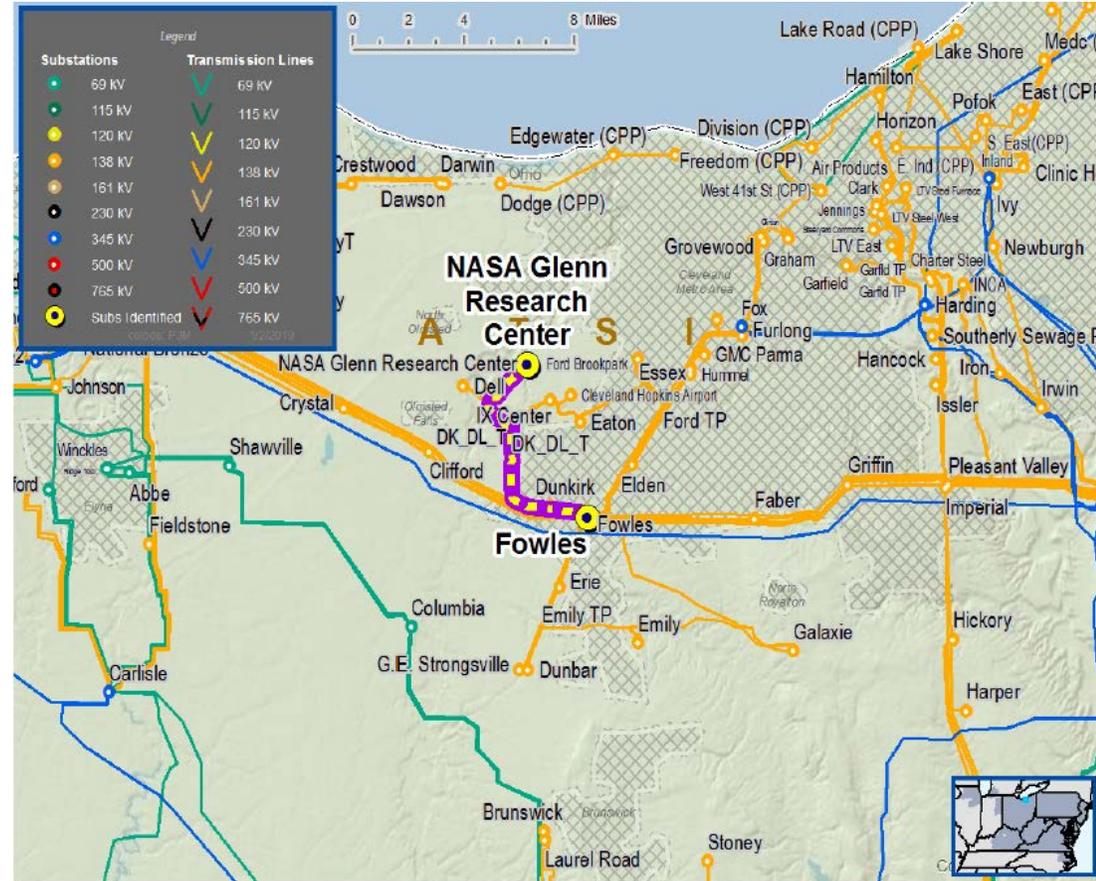
Substation Condition Rebuild / Replacement

- Circuit breakers and other fault interrupting devices
- Switches
- Relays
- CCVTs

Problem Statement

Fowles – NASA Q16 138 kV Terminal Equipment

- *One (1) 138 kV breaker at Fowles (Q16), associated switches, relays, and CCVTs are showing degrading performance, increasing maintenance, age (60 years), and obsolescence of equipment and spare parts.*





ATSI Transmission Zone M-3 Process

Fowles 138 kV Breaker and Substation Upgrades

Need Number: ATSI-2019-017
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution – 03/25/2019

Proposed Solution:

Fowles 138 kV Breaker and Substation Upgrades

- *Replace the 138 kV Q16 breaker at Fowles, associated switches, substation conductor, EM relays, and CCVTs.*

Transmission Line Ratings:

- Fowles-NASA Q16 138 kV Line (Fowles-Dunkirk Tap)
 - Before Proposed Solution: 153 MVA SN / 199 MVA SE
 - After Proposed Solution: 237 MVA SN / 287 MVA SE

Alternatives Considered:

- Maintain existing condition and risk of failure.

Estimated Project Cost: \$0.7M

Projected IS Date: 12/31/2019

Status: Conceptual

Supplemental Project ID: s1957

No diagram required.
All work is within the substation

ATSI Transmission Zone M-3 Process

West Akron 138 kV Breaker and Substation Upgrades

Need Number: ATSI-2019-019
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk

Specific Assumption Reference(s)

Global Factors

- At or beyond expected service life or obsolete
- Failure risk, to the extent caused by asset design characteristics, or historical
- industry/company performance data, or application design error
- Show a high level of criticality to system performance and operations

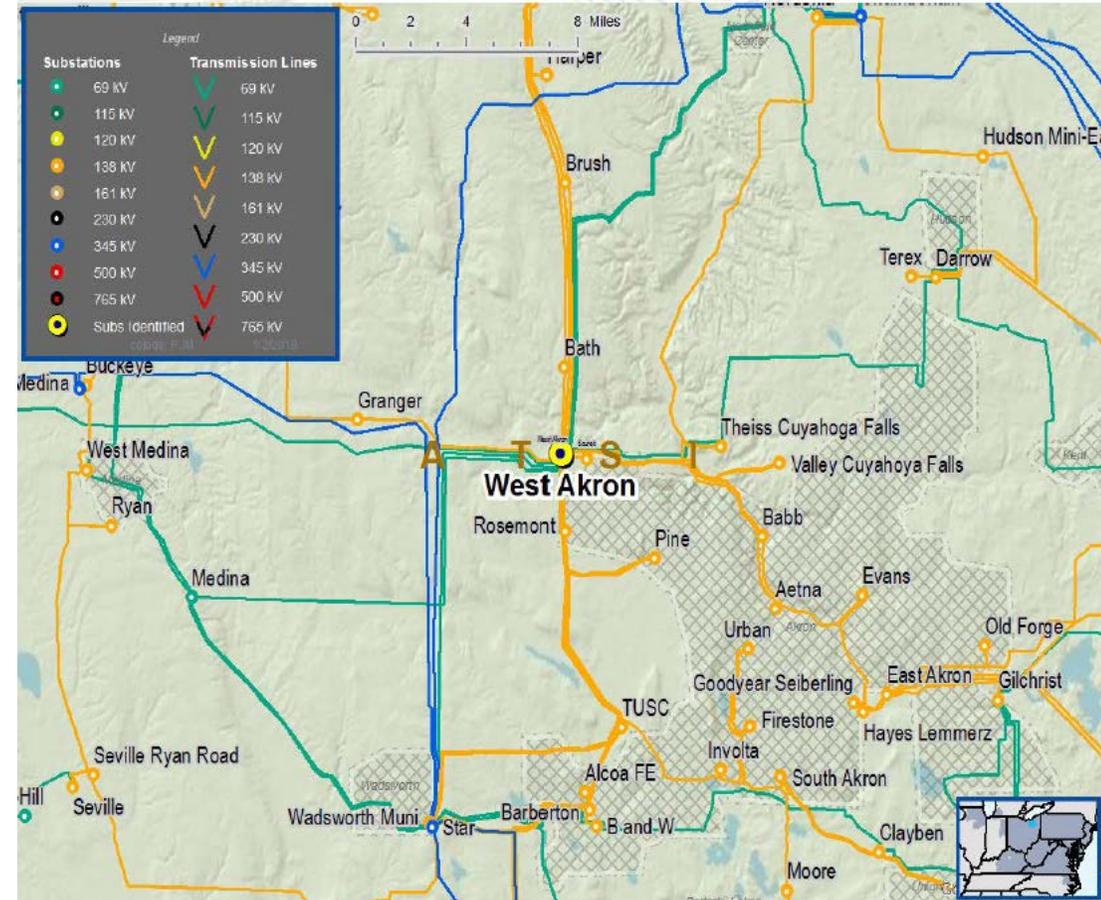
Substation Condition Rebuild / Replacement

- Circuit breakers and other fault interrupting devices
- Switches
- Current transformers (CTs), control cables, and cable trays
- Carrier sets and associated wave-traps
- Line Arresters, Risers and connections

Problem Statement

West Akron 138 kV Substation

One (1) 138 kV Oil Circuit Breaker (OCB) breaker (B1) at West Akron, lightning arresters and associated switches, and CCVTs are showing degrading performance, increasing maintenance, age (30 years), and obsolescence of equipment and spare parts.





ATSI Transmission Zone M-3 Process

West Akron 138 kV Breaker and Substation Upgrades

Need Number: ATSI-2019-019
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution – 03/25/2019

Proposed Solution:

West Akron 138 kV Breaker and Substation Upgrades

- Replace the 138 kV B1 Oil Circuit Breaker (OCB) breaker at West Akron, wave-trap, substation conductor, and associated switches, and CCVTs

Transmission Line Ratings:

- West Akron-Pleasant Valley 138 kV Line (West Akron-Bath Tap)
 - Before Proposed Solution: 196 MVA SN / 228 MVA SE
 - After Proposed Solution: 196 MVA SN / 242 MVA SE

Alternatives Considered:

- Maintain existing condition and risk of failure.

Estimated Project Cost: \$0.6M

Projected IS Date: 12/01/2019

Status: Conceptual

Supplemental Project ID: s1958

No diagram required.
All work is within the substation

Need Number: ATSI-2019-020
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk

Specific Assumption Reference(s)

Global Factors

- At or beyond expected service life or obsolete
- Show a high level of criticality to system performance and operations
- Impact customer outage frequency and/or duration

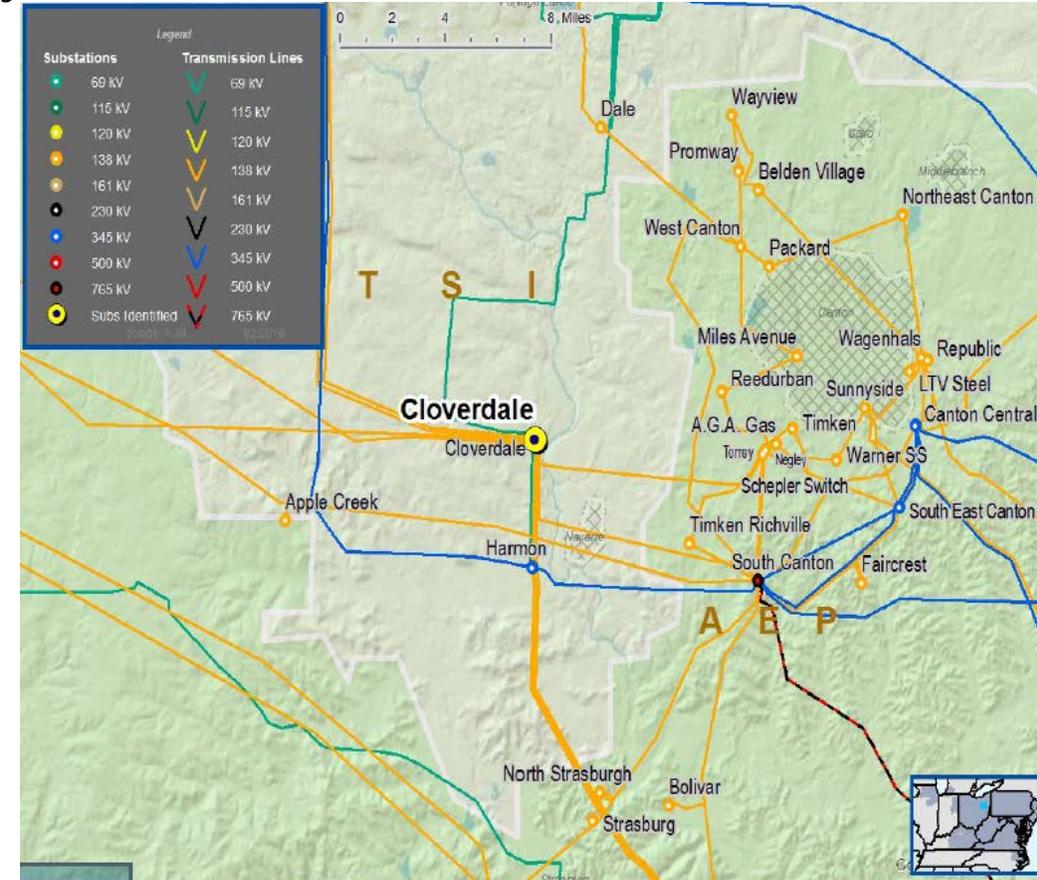
Upgrade Relay Schemes

- Relay schemes that have a history of mis-operation
- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades
- Bus protection schemes

Problem Statement

Cloverdale 69 kV Substation Assessment

The electromechanical relays and communication equipment at the 69 kV Cloverdale substation have been identified to be prone to mis-operation. The disconnect switches have operation difficulty and are greater than 40 years of age. The 69 kV Bus PTs are nearing end of life with increased risk of failure.





ATSI Transmission Zone M-3 Process

Cloverdale 69 kV Relay and Equipment Upgrades

Need Number: ATSI-2019-020
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution – 03/25/2019

Proposed Solution:

Cloverdale 69 kV Relay and Equipment Upgrades

- Replace the 69 kV line relays related to breakers B269 and B233, relays related to transfer bus breaker relays B275, 69 kV bus PTs, and associated CTs, disconnection switches, and communication equipment at the 69 kV Cloverdale substation.

Transmission Line Ratings:

- Cloverdale-Dale #2 69 kV Line (Cloverdale-Carmont Tap)
 - Before Proposed Solution: 139 MVA SN / 153 MVA SE
 - After Proposed Solution: 139 MVA SN / 169 MVA SE

Alternatives Considered:

- Maintain existing condition and risk of failure.

Estimated Project Cost: \$0.5M

Projected IS Date: 6/1/2020

Status: Conceptual

Supplemental Project ID: s1959

**No diagram required.
All work is within the substation**

Need Number: ATSI-2019-021
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk

Specific Assumption Reference(s)

Global Factors

- Level of criticality to system performance and operations
- Negative impact on equipment health and/or system reliability
- Customer outage frequency and/or durations
- Expected service life (at or beyond) or obsolescence

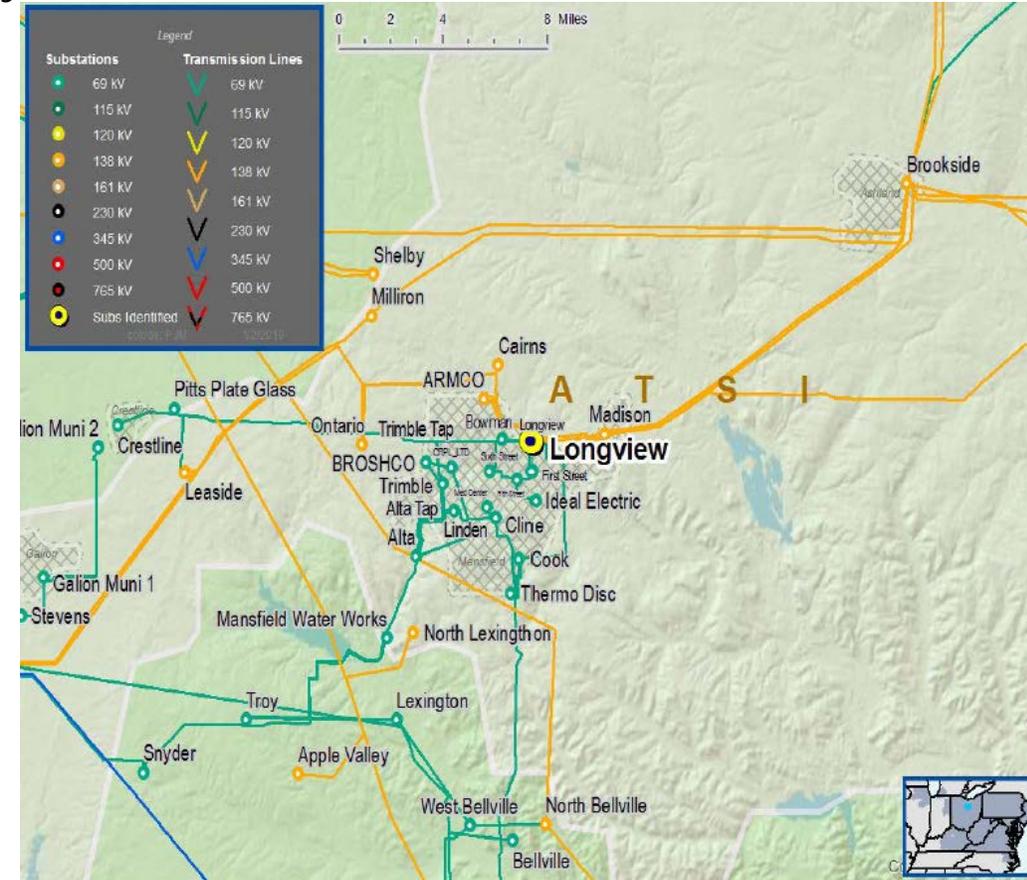
Upgrade Relay Schemes

- Relay schemes that have a history of mis-operation
- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades
- Bus protection schemes

Problem Statement

Longview 69 kV Substation Assessment

- *The electromechanical relays and communication equipment at the 69 kV Longview substation have been identified to be prone to mis-operation. The disconnect switches have operation difficulty and the 69 kV Bus PTs are nearing end of life with increased risk of failure.*





ATSI Transmission Zone M-3 Process

Longview 69 kV Relay Upgrades

Need Number: ATSI-2019-021
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution – 03/25/2019

Proposed Solution:

Longview 69 kV Relay Upgrades

- Replace line relays and bus transfer switches associated with breakers B228, B232, B215, B70, B4 and bus tie breaker B94.
Replace 69 kV bus PTs.
- Longview-Mohican 69 kV line being rebuilt under ATSI-2019-024

Transmission Line Ratings:

- Longview-Mohican 69 kV Line (Longview-Mifflin Muni Tap)
 - Before Proposed Solution: 36 MVA SN / 36 MVA SE
 - After Proposed Solution: 80 MVA SN / 96 MVA SE
 - *Final rating with ATSI-2019-021 and ATSI-2019-024 complete.*

Alternatives Considered:

- Maintain existing condition and risk of failure.

Estimated Project Cost: \$1.3M

Projected IS Date: 09/23/2019

Status: Conceptual

Supplemental Project ID: s1960

**No diagram required.
All work is within the substation**

Need Number: ATSI-2019-022
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk

Specific Assumption Reference(s)

Global Factors

- Level of criticality to system performance and operations
- Equipment installation times (long lead and/or extended)
- Environmental considerations
- Expected service life (at or beyond) or obsolescence

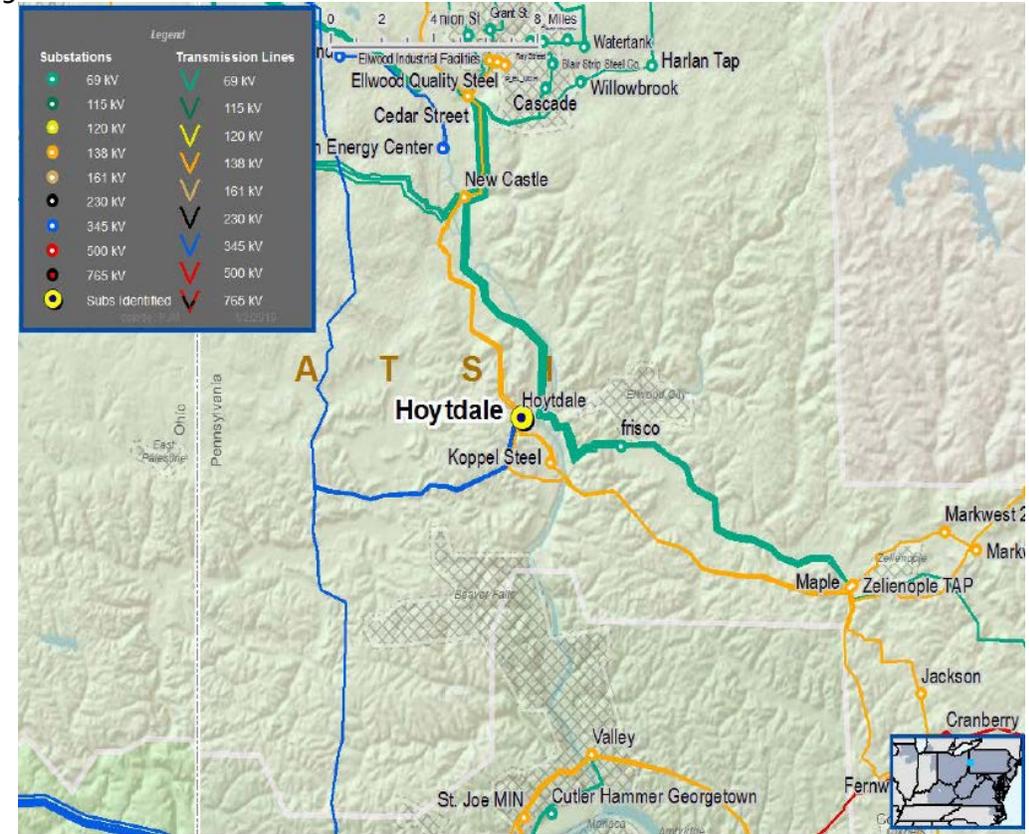
Substation Condition Rebuild / Replacement

- Power transformers and load tap changers (LTCs)

Problem Statement

Hoytdale Substation Transformer Assessment

- *The existing 345 / 138 kV Hoytdale transformer #1 is showing end of service life issues; including oil leaks, moisture ingress, problematic cooling controls, unreliable gauges / annunciators, failing pumps and relays that are prone to mis-operations.*





ATSI Transmission Zone M-3 Process

Hoytdale 345 / 138 kV Transformer #1

Need Number: ATSI-2019-022
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution – 03/25/2019

Proposed Solution:

Hoytdale 345 / 138 kV Transformer #1

- Replace the 345 / 138 kV Transformer #1 400 MVA transformer with a standard 448 MVA transformer.
- Replace existing relays, MOABs A-108 and A-36, and CCVTs

Transmission Line Ratings:

- Hoytdale 345 / 138 kV Transformer #1
 - Before Proposed Solution: 514 MVA SN / 533 MVA SE
 - After Proposed Solution: 533 MVA SN / 601 MVA SE

Alternatives Considered:

- Rebuild and reseal transformer, replacing pumps, bushings, gauges and cooling controls. Replace identified relays, CCVTs, and MOABs. Add on-line monitoring to transformer.
- Maintain existing condition and risk of failure.

Estimated Project Cost: \$4.8M

Projected IS Date: 6/1/2021

Status: Conceptual

Supplemental Project ID: s1961

**No diagram required.
All work is within the substation**

Need Number: ATSI-2019-023
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk

Specific Assumption Reference(s)

Global Factors

- Increasing negative trend in maintenance findings and/or costs
- Limited availability of spare parts, software obsolescence and/or compatibility, or vendor technical support
- Expected service life (at or beyond) or obsolescence

Substation Condition Rebuild / Replacement

- Circuit breakers and other fault interrupting devices
- Switches
- Risers and connections

Problem Statement

New Castle 138 kV and 69 kV Substation Assessment

- *One (1) 138 kV OCB breaker (B166) and five (5) 69 kV OCB breakers (B32, B86, B90, B96 and B106) at New Castle are showing end of life characteristics; including deteriorated bushings, mechanism, oil leaks, and age (> 30 years) with increasing maintenance and obsolescence of equipment and spare parts. Associated disconnect switches are also deteriorating with failures and operating difficulties.*

ATSI Transmission Zone M-3 Process New Castle 138 kV and 69 kV Breakers





ATSI Transmission Zone M-3 Process

New Castle 138 kV and 69 kV Breakers

Need Number: ATSI-2019-023
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution – 03/25/2019

Proposed Solution:

New Castle 138 kV and 69 kV Breakers

- Replace existing 138 kV oil circuit breaker B166, five (5) 69 kV oil circuit breakers (B32, B86, B90, B96, and B106), substation conductor, and associated disconnect switches at New Castle substation.
- Upgrade substation conductor at Lowellville substation on the New Castle-Lowellville 69 kV line.
- Upgrade disconnect switches at Frisco substation on the New Castle-Frisco 69 kV line.

Transmission Line Ratings:

- New Castle-Lowellville 69 kV Line (Lowellville-Bessemer Tap)
 - Before Proposed Solution: 88 MVA SN / 115 MVA SE
 - After Proposed Solution: 100 MVA SN / 121 MVA SE
- New Castle-Frisco 69 kV Line (Frisco-KoppleTap)
 - Before Proposed Solution: 82 MVA SN / 103 MVA SE
 - After Proposed Solution: 100 MVA SN / 121 MVA SE

Alternatives Considered:

- Maintain existing condition and risk of failure.

Estimated Project Cost: \$3.4M

Projected IS Date: 12/31/2020

Status: Conceptual

Supplemental Project ID: s1962

**No diagram required.
All work is within the substation**

Need Number: ATSI-2019-024
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk

Specific Assumption Reference(s)

Global Factors supporting Line Rebuild

- Negative impact on equipment health and/or system reliability
- Age/condition of wood pole structures and line hardware
- Increasing negative trend in maintenance findings and/or costs
- Limited availability of spare parts and/or vendor technical support
- Current design criteria, applicable codes, and industry best practices

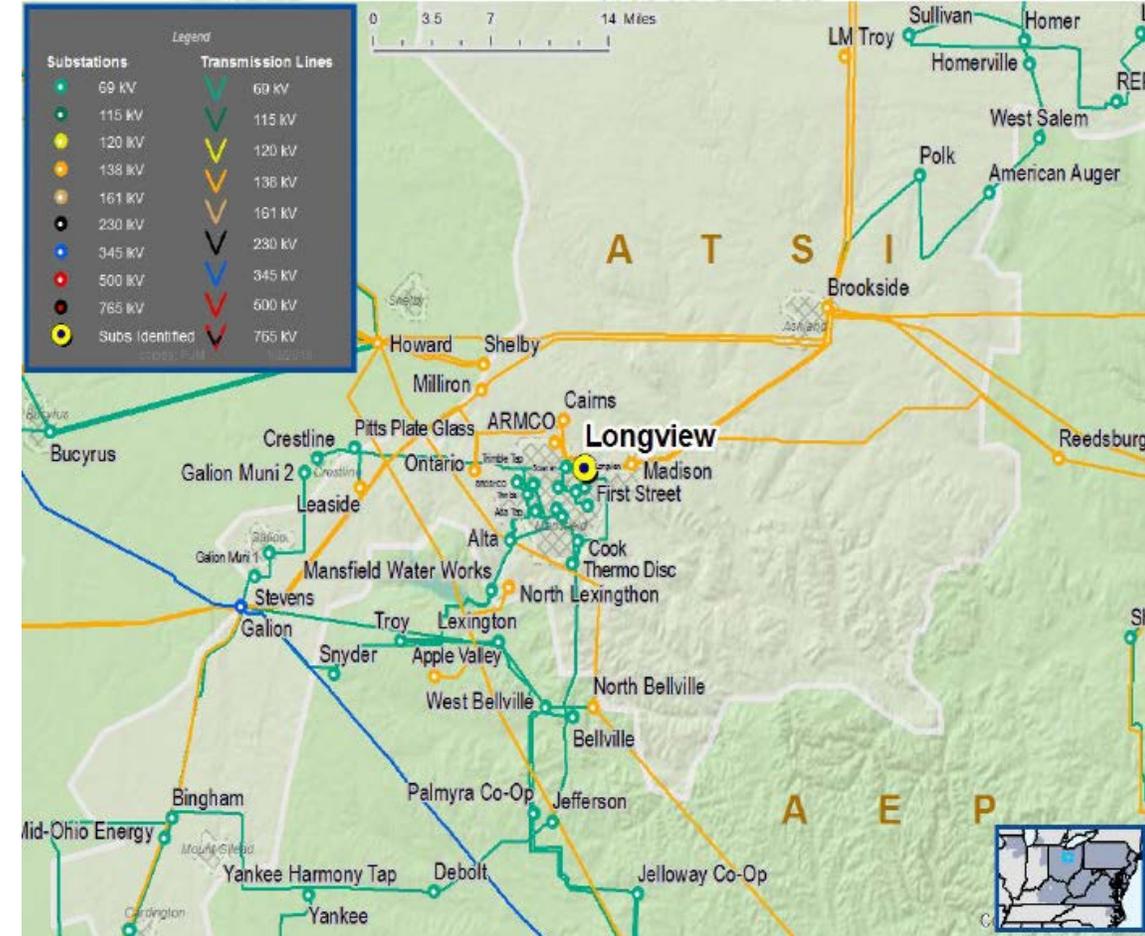
Problem Statement

Coulter-Longview 69 kV Line Assessment

- *The poles and associated hardware on this line have reached end of life with 90% of the poles greater than 60 years.*
- *Maintenance and repairs are trending upward in frequency and severity.*
- *Four Air Break switches are obsolete and no longer supported for parts.*
- *Conductor (1/0 and 2/0 Copper) dates to original construction*

System Performance

- Over the past 5 years, the Coulter-Longview 69 kV line has experienced 10 outages (6 sustained , 4 momentary).



Need Number: ATSI-2019-024
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Proposed Solution:

Longview-Mohican 69 kV Line (Longview-Coulter 69 kV Line Segment)

- Rebuild the Longview-Coulter 69 kV line segment (approximately 15.8 miles of the 22.1 line miles), replace four (4) line switches (A-10, A-19, A-23 and A-27) and add SCADA control.
- Terminal equipment at Longview substation to be upgraded under ATSI-2019-021; including:
 - Line relaying, substation conductor, and disconnect switches

Transmission Line Ratings:

- Longview-Mohican 69 kV Line
 - Before Proposed Solution: 36 MVA SN / 36 MVA SE
 - After Proposed Solution: 80 MVA SN / 96 MVA SE
 - Final rating with ATSI-2019-021 and ATSI-2019-024 complete.

Alternatives Considered:

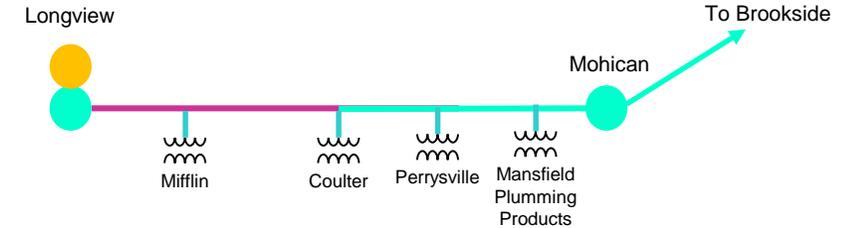
- Selective pole replacements and line rehab. This alternative was not selected due to 99% of the poles not meeting reliability evaluation for age and condition: Greater than 70 years old, top rot, woodpecker, failed hammer and sound tests, worn attachment hardware, rising maintenance costs.

Estimated Project Cost: \$22.2M

Projected IS Date: 12/31/2022

Status: Conceptual

Supplemental Project ID: s1963



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	

Need Number: ATSI-2019-025
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Project Driver(s):
Equipment Material, Condition, Performance and Risk

Specific Assumption Reference(s)

Global Factors supporting Line Rebuild

- Negative impact on equipment health and/or system reliability
- Age/condition of wood pole structures and line hardware
- Increasing negative trend in maintenance findings and/or costs
- Limited availability of spare parts and/or vendor technical support
- Current design criteria, applicable codes, and industry best practices

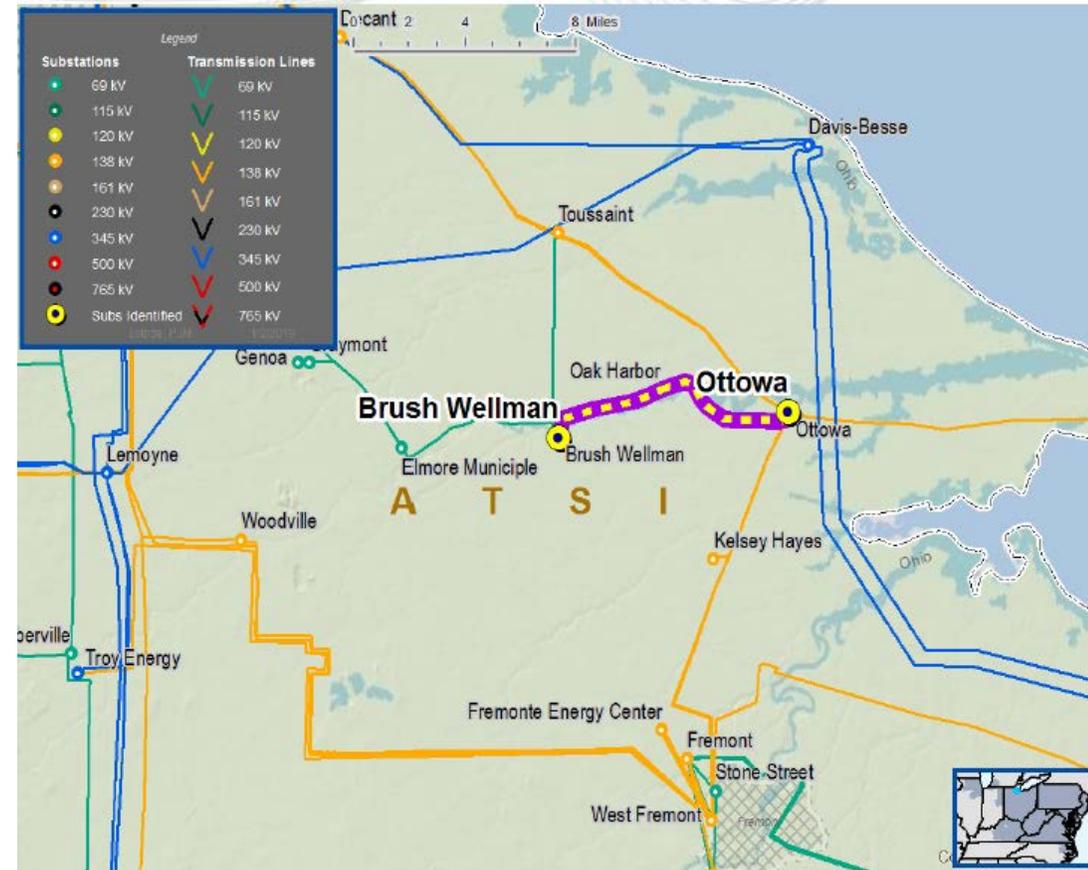
Problem Statement

Brush Wellman-Ottawa 69 kV Line Assessment

- *The poles and associated hardware on this line have reached end of life with 92% of the poles greater than 60 years.*
- *Maintenance and repairs are trending upward in frequency and severity.*
- *Four Air Break switches are obsolete and no longer supported for parts.*

System Performance

- Over the past 5 years, the Brush Wellman-Ottawa 69 line has experienced 4 outages (3 sustained , 1 momentary).



Need Number: ATSI-2019-025
 Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
 Previously Presented: Need - 01/14/2019
 Solution – 03/25/2019

Proposed Solution:

Brush Wellman-Ottawa 69 kV Line

- Rebuild the Brush Wellman-Ottawa 69 kV line (approximately 7.3 miles)
- Replace four line switches; A-7240, A-7228, A-7235 and A-7235 N.O
- Upgrade the terminal equipment at Brush Wellman substation including:
 - Substation conductors and relay communication equipment

Transmission Line Ratings:

- Brush Wellman-Ottawa 69 kV Line
 - Before Proposed Solution: 72 MVA SN / 72 MVA SE
 - After Proposed Solution: 80 MVA SN / 96 MVA SE

Alternatives Considered:

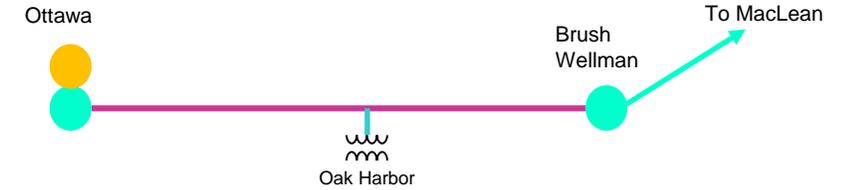
- Selective pole replacements (REHAB) and continue to maintain from present condition with risk of failure.

Estimated Project Cost: \$10.0M

Projected IS Date: 12/31/2022

Status: Conceptual

Supplemental Project ID: s1964



Legend	
500 kV	
345 kV	
138 kV	
69 kV	
34.5 kV	
23 kV	
New	



ATSI Transmission Zone M-3 Process

Relay Misoperation Upgrades (Multiple Locations)

Need Number: ATSI-2019-026 – ATSI-2019-049
Process Stage: Submission of Supplemental Project for Inclusion in the Local Plan – 10/11/2019
Previously Presented: Need - 01/14/2019
Solution – 03/25/2019

Project Driver(s):
Operational Flexibility and Efficiency
Infrastructure Resilience

Specific Assumption Reference(s)

Global Factors

- System reliability and performance
- Substation / line equipment limits

Upgrade Relay Schemes

- Relay schemes that have a history of mis-operation
- Obsolete and difficult to repair communication equipment (DTT, Blocking, etc.)
- Communication technology upgrades
- Bus protection schemes

Continued on next slide...

Map Not Shown
Multiple Locations



ATSI Transmission Zone M-3 Process

Relay Misoperation Upgrades (Multiple Locations)

Problem Statement

PJM Zone - ATSI

- 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.

ATSI-2019-	Transmission Line / Substation Locations	Existing Line Rating (SN / SE)	Existing Conductor Rating (SN / SE)	Limiting Terminal Equipment
026	Allen Junction-Vulcan 138 kV Line	290 / 325	290 / 346	Line Relay, Substation Conductor / Drops
027	Avery 138 / 69 kV Substation	153 / 153	177 / 177	Relay, Substation Conductor / Drops, Disconnect Switches
028	Bayshore-GM Powertrain 138 kV Line	278 / 342	278 / 343	Line Relay
029	Bayshore-Jeep 138 kV Line	297 / 326	297 / 365	Line Relay, Substation Conductor / Drops
030	Blue Jacket-Kirby 138 kV Line	218 / 269	278 / 339	External Company Equipment
031	Carlisle-Gates 138 kV Line	196 / 210	233 / 282	Line Relay, Wave-trap, Substation Conductor / Drops
032	Cedar Street-New Castle 138 kV Line	294 / 350	370 / 452	Line Relay, CT, Circuit Breaker, Substation Conductor / Drops, Disconnect Switches
033	East Akron-West Ravenna 138 kV Line	176 / 229	200 / 242	Substation Conductor / Drops
034	GM Defiance-Richland #1 138 kV Line	216 / 229	216 / 264	Line Relay
035	GM Defiance-Richland #2 138 kV Line	216 / 229	216 / 264	Line Relay

Continued on next slide...

Problem Statement – Continued from previous slide

ATSI-2019-	Transmission Line / Substation Locations	Existing MVA Line Rating (SN / SE)	Existing MVA Conductor Rating (SN / SE)	Limiting Terminal Equipment
036	Greenfield-New Departure 138 kV Line	153 / 199	200 / 242	Substation Conductor / Drops
037	Hanna-West Ravenna #1 138 kV Line	295 / 369	324 / 395	Substation Conductor / Drops
038	Hoytdale-Maple 138 kV Line	278 / 332	278 / 339	Wave-trap
039	Hyatt-Tangy 345 kV Line	971 / 971	1560 / 1900	External Company Equipment
040	Ivanhoe-Mahoningside 138 kV Line	196 / 222	200 / 242	Wave-trap
041	Ivanhoe-Packard 138 kV Line	196 / 210	200 / 242	Line Relay, Wave-trap
042	Jennings-LTV West Q-12 138 kV Line	43 / 43	256 / 262	Line Relay, CT, Circuit Breaker
043	Jennings-LTV West Q-14 138 kV Line	43 / 43	256 / 262	Line Relay, CT, Circuit Breaker
044	Kirby-Tangy 138 kV Line	265 / 273	278 / 339	Line Relay, Substation Conductor / Drops
045	Midway-Levis Park 138 kV Line	278 / 286	308 / 376	Line Relay, Substation Conductor / Drops
046	Midway-Napoleon 138 kV Line	161 / 179	161 / 194	Meter
047	Salt Springs-Riverbend 138 kV Line	223 / 223	278 / 339	Line Relay, CT, Substation Conductor / Drops
048	Star-Wadsworth Muni 138 kV Line	221 / 262	233 / 282	Substation Conductor / Drops
049	West Akron-Babb 138 kV Line	190 / 223	200 / 242	Line Relay, Wave-trap, Substation Conductor / Drops

Solution Statement

ATSI-2019-	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimate Costs (\$ M)	Target ISD
026	Allen Junction-Vulcan 138 kV Line	308 / 376 (Vulcan-Toledo U Tap)	Vulcan: replace 138 kV breaker B-13397, disconnect switches, relay panel, CCVTs, line tuner, and wave trap. Allen Junction: replace 138 kV breaker B-13377, disconnect switches, relay panel, CCVTs, line tuner, and wave trap	\$ 0.9 M	11/01/2019
027	Avery 138 / 69 kV Substation	177 / 177 (Transformer)	Avery: Replace Avery 138 / 69 kV transformer relaying, substation conductor and disconnect switches.	\$0.3 M	12/16/2019
028	Bayshore-GM Powertrain 138 kV Line	278 / 343	Replace Bayshore 238 kV Breaker, disconnect switches, wave trap, line tuner, CCVTs.	\$0.6 M	11/1/2019
029	Bayshore-Jeep 138 kV Line	279 / 365	Bayshore : Replace Jeep 138 kV Line relaying, replace CCVT, Wave Trap and Line Tuner.	\$0.6 M	12/31/2019
030	Blue Jacket-Kirby 138 kV Line	278 / 339 (Blue Jacket Upgrade)	Kirby: Replace Blue Jacket - Kirby 138kV Line relaying, CCVT, Line Tuner	\$0.4 M	12/1/2021
031	Carlisle-Gates 138 kV Line	233 / 282	Carlisle: Replace Carlisle-Gates 138 kV Line Relaying, Breaker B-67, disconnect switches, Wave Trap, Line Tuner, upgrade substation conductor. Gates: Replace Carlisle-Gates 138 kV Line Relaying, Breakers B-18 & B-22, disconnect switches, Wave Trap, Line Tuner, upgrade substation conductor	\$2.0 M	3/31/2020
032	Cedar Street-New Castle 138 kV Line	370 / 452	Cedar Street: Replace 138 kV Cedar Street – New castle Line relaying	\$0.2 M	4/1/2020
033	East Akron-West Ravenna 138 kV Line	200 / 242	East Akron: Replace 138 kV Line Relaying, Air Break Switch A-102, Disconnect switches, CCVT, metering, upgrade Substation conductor West Ravenna: Replace 138 kV Line Relaying, Air Break Switch A-39, Disconnect switches, CCVT, metering, upgrade Substation conductor	\$0.9 M	12/1/2021
034	GM Defiance-Richland #1 138 kV Line	216 / 264	GM Defiance: Replace GM Defiance-Richland #1 138 kV Line relaying, line conductor, disconnect switch, Remove Wave Trap and coupling capacitor Richland: Replace GM-Defiance-Richland #1 138 kV Line relaying, line conductor, Breaker B-13242, disconnect switch	\$0.6 M	2/15/2022
035	GM Defiance-Richland #2 138 kV Line	216 / 264	GM Defiance: Replace GM Defiance-Richland #2 138 kV Line relaying, GOAB switch 13277, Wavetrap, Line Tuner, PT's, CCVT, upgrade substation conductor Richland: Replace GM Defiance-Richland #2 138 kV line relaying, breaker B-13243, disconnect switch, CCVT, Wavetrap, Line Tuner, upgrade substation conductor	\$1.1 M	3/30/2022

Solution Statement – Continued from previous slide

ATSI-2019-	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimate Costs (\$ M)	Target ISD
036	Greenfield-New Departure 138 kV Line	200 / 242	Greenfield: Replace Greenfield-New Departure 138 kV Line Relaying, disconnect switches, substation conductor New Departure: Replace Greenfield-New Departure 138 kV Line Relaying, breakers B-17 & B-20, disconnect switches, substation conductor	\$0.8 M	6/1/2020
037	Hanna-West Ravenna #1 138 kV Line	324 / 395	Hanna: Replace Hanna-West Ravenna 138 kV Line Relaying, Breaker B-7, Disconnect switches West Ravenna: Replace Hanna-West Ravenna 138 kV Line Relaying, disconnect switches, tuner	\$0.7 M	4/1/2020
038	Hoytdale-Maple 138 kV Line	278 / 339	Maple: Replace Hoytdale-Maple 138 kV Line relaying, breaker B-22, disconnect switches, AB-switch, wave trap, tuner, CCVTs Hoytdale: Replace Hoytdale-Maple 138 kV Line relaying, breaker B-2, disconnect switches, AB-switch, CCVTs, Wavetrap, line tuner	\$1.1 M	12/31/2019
039	Hyatt-Tangy 345 kV Line	1560 / 1900 (Hyatt Upgrade)	Tangy: Replace Hyatt-Tangy 345 kV Line relaying, upgrade substation conductor	\$0.2 M	6/1/2020
040	Ivanhoe-Mahoningside 138 kV Line	200 / 242	Ivanhoe: Replace Ivanhoe-Mahoningside 138 kV line relaying, disconnect switches, Wave trap, line tuner, and CCVTs Mahoningside: Replace Ivanhoe-Mahoningside 138 kV Line relaying, breaker B-63, disconnect switch, CCVTs, Wave trap, line tuner	\$1.2 M	3/31/2021
041	Ivanhoe-Packard 138 kV Line	200 / 242	Ivanhoe: Replace Ivanhoe-Packard 138 kV line relaying, breaker B-9, disconnect switches, CCVTs, Wave trap, line tuner, upgrade substation conductor Packard: Replace Ivanhoe-Packard 138 kV line relaying, breaker B-10, Air break Switch, disconnect switches, CCVTs, Wave trap, line tuner, upgrade substation conductor	\$1.5 M	12/1/2021
042	Jennings-LTV West Q-12 138 kV Line	256 / 262	Jennings: Replace Jennings-LTV West Q-12 138 kV line relaying, disconnect switch	\$0.2 M	6/1/2020
043	Jennings-LTV West Q-14 138 kV Line	256 / 262	Jennings: Replace Jennings-LTV West Q-14 138 kV line relaying, breaker B-7, disconnect switches, CCVT's	\$0.5 M	12/1/2020
044	Kirby-Tangy 138 kV Line	278 / 339	Kirby: Replace Kirby-Tangy 138 kV line relaying Tangy: Replace Kirby-Tangy 1378 kV line relaying, disconnect switches, CCVTs	\$0.8 M	3/31/2021

Solution Statement – Continued from previous slide

ATSI-2019-	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimate Costs (\$ M)	Target ISD
045	Midway-Levis Park 138 kV Line	308 / 376	Midway: Replace Midway-Levis Park 138 kV line relaying, breaker 13300, CCVTs, wavetrap, line tuner, disconnect switches Levis Park: Replace Midway-Levis Park 138 kV line relaying, breaker 13336, CCVTs, wavetrap, line tuner, disconnect switches	\$1.0 M	12/31/2019
046	Midway-Napoleon 138 kV Line	161 / 194	Midway: Replace Midway-Napoleon 138 kV line relaying, breaker 13304, disconnect switch, CCVT's Wavetrap, line tuner Napoleon: Replace Midway-Napoleon 138 kV line relaying	\$0.8 M	6/1/2020
047	Salt Springs-Riverbend 138 kV Line	N/A	Cancelled Project – To be completed under ATSI-2019-003	N/A	N/A
048	Star-Wadsworth Muni 138 kV Line	N/A	Cancelled Project – To be completed under PJM Supplemental # s1695	N/A	N/A
049	West Akron-Babb 138 kV Line	200 / 242	West Akron: Replace West Akron-Babb 138 kV line relaying, breaker b-159, disconnect switches, ab switch, CCVTs, upgrade substation conductor Babb: Replace West Akron-Babb 138 kV line relaying, breaker, b-95, disconnect switch, AB switch, CCVTs, upgrade substation conductor	\$0.9 M	6/01/2021

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Estimated Project Cost: See Summary Tables

Project IS Date: See Summary Tables

Status: All projects are Conceptual

Supplemental Project ID: s1965-s1986

No Diagrams Required
All work is within the substation

Revision History

4/15/2019 – V1 – Local Plan posted to pjm.com for S1754 – S1760

6/12/2019 – V2 – Local Plan updated to include S1794-S1805

10/11/2019 – V3 – Local Plan updated to include S1848; S1945-S1952; S1954-S1986