

Subregional RTEP Committee – Western FirstEnergy Supplemental Projects

November 18, 2022

Needs

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

Need Number: ATSI-2022-029
Process Stage: Need Meeting – 11/18/2022

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

Specific Assumption Reference(s)

Line Condition Rebuild / Replacement

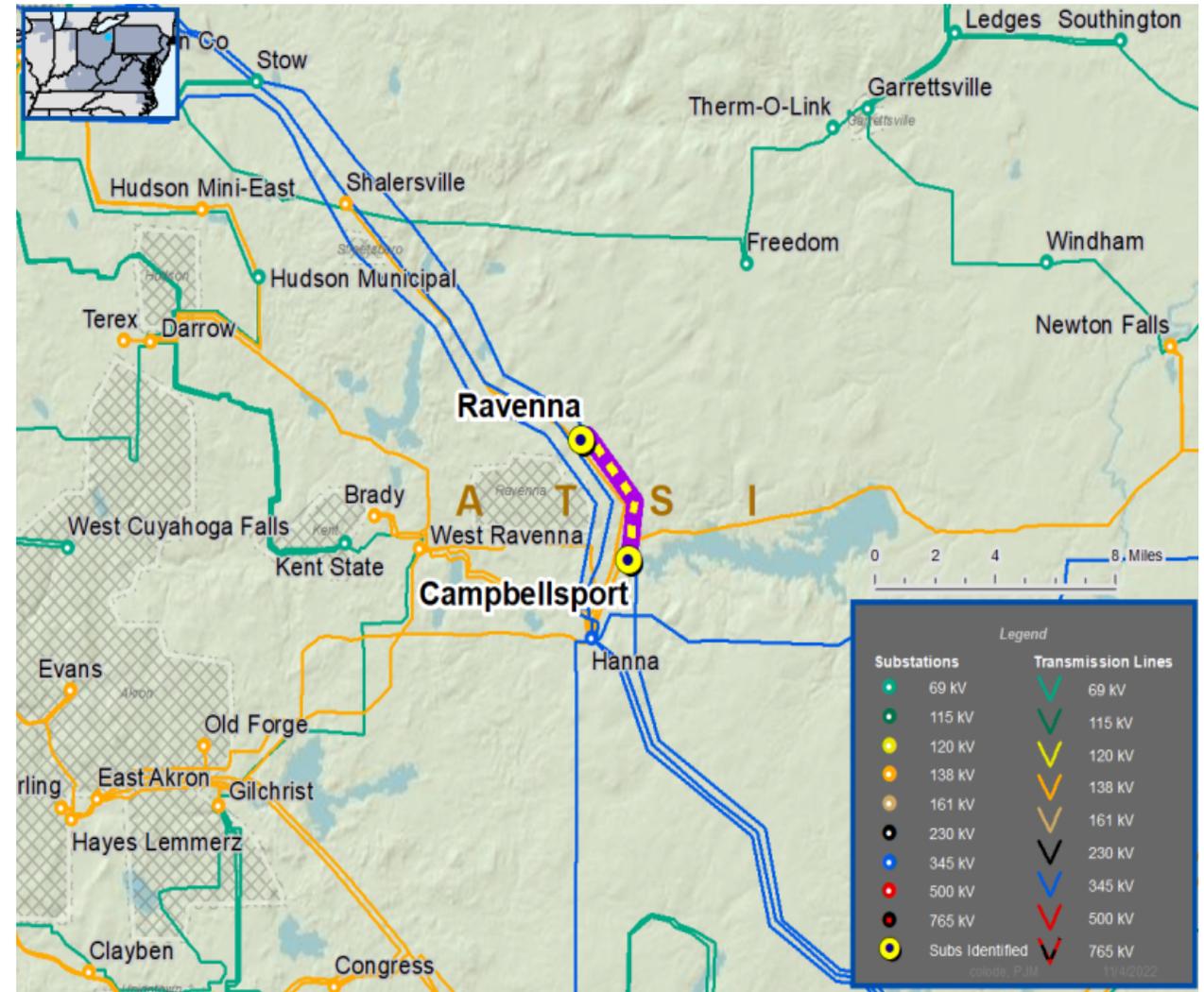
- Aged or deteriorated transmission line structures
- Negatively impact customer outage frequency and/or durations
- Demonstrate an increasing trend in maintenance findings and/or costs
- Transmission line ratings are limited by terminal equipment.

Problem Statement:

Campbellsport-Ravenna No.2 69 kV Transmission Line is approximately 4.4 miles in length. The line mileage includes approximately 0.2 miles on poles double circuited with Ravenna-West Ravenna No.1 69 kV Line and approximately 2 miles on poles double circuited with Campbellsport-Ravenna No.1 69 kV Line.

Recent inspection of 32 structures (approximately 1.6 miles) of the Campbellsport-Ravenna No.2 69 kV Transmission Line show a reject rate of 28% (9 of 32 structures). The reject rate includes woodpecker holes, sound test failure, and evidence of decay or splitting. All of these poles are greater than 40 years of age.

Disconnect switches and substation conductor at Ravenna Substation is limiting the transmission line rating.



Need Number: ATSI-2022-031
Process Stage: Need Meeting – 11/18/2022

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

Specific Assumption Reference(s):

Global Considerations

- System reliability and performance
- Load at risk in planning and operational scenarios

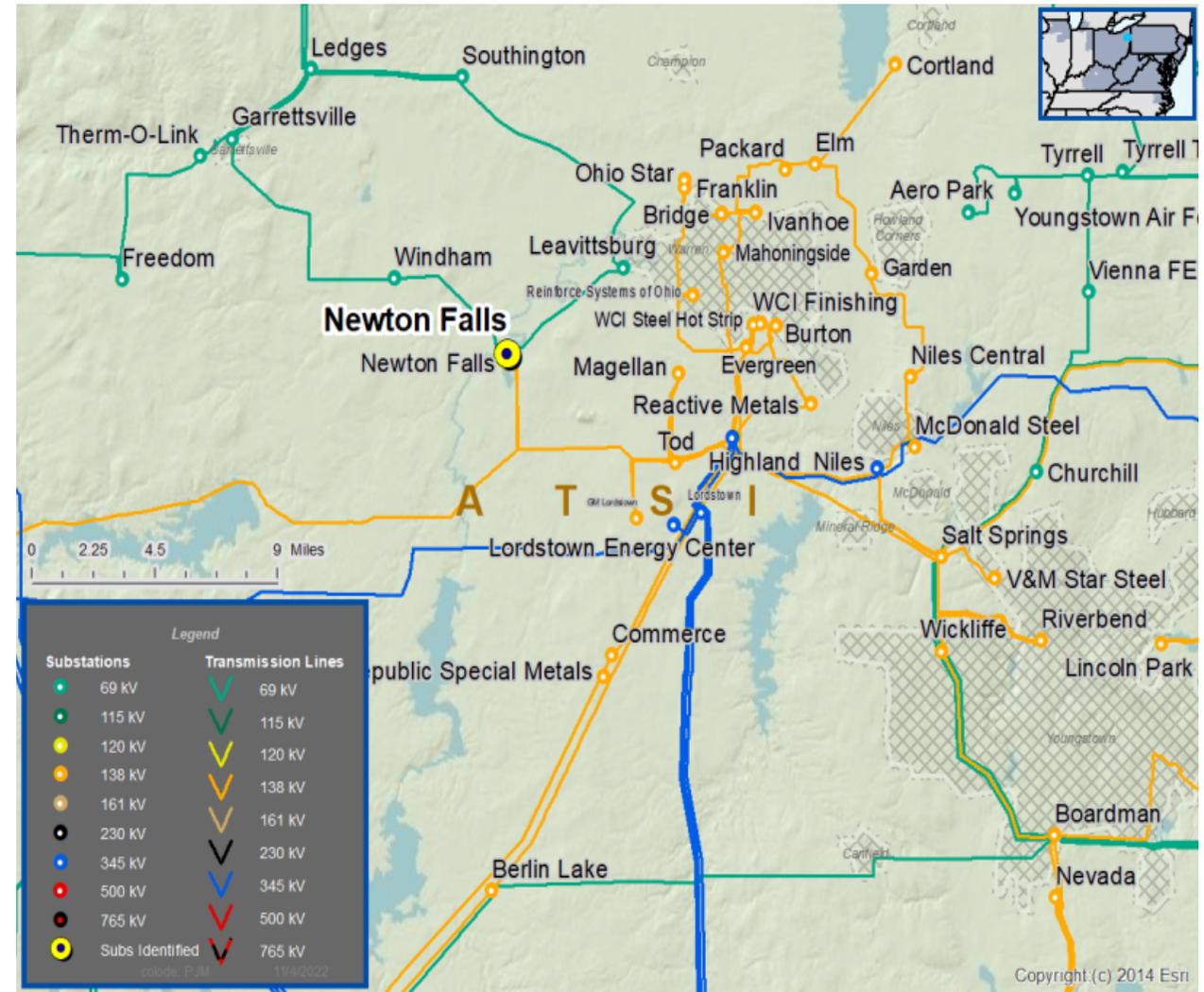
Add/Expand Bus Configuration

- Loss of substation bus adversely impacts transmission system performance
- Eliminate simultaneous outages to multiple networked elements under N-1 analysis
- Accommodate future transmission facilities
- Capability to perform system maintenance

Build New Transmission Line

Problem Statement:

- The Newton Falls 138/69 kV Substation is served via two 138 kV lines, loss of one of those 138 kV lines results in the isolation of the 138-69 kV transformer
- The majority of the Newton Falls 69 kV area is operated as normally radial out of the Newton Falls substation.
- An N-1-1 outage will result in the loss of the 69 kV and 23 kV system loads.
- An N-1 outage results in the outage of approximately 25,000 customers and 69 MW of load.
- Since 2018:
 - The Hanna-Newton Falls 138 kV Line has experienced one (1) sustained outage.
 - The GM Lordstown-Newton Falls 138 kV Line has experienced three (3) sustained outages.



Solutions

Stakeholders must submit any comments within 10 days of this meeting in order to provide time necessary to consider these comments prior to the next phase of the M-3 process

Need Number: ATSI-2022-014
Process Stage: Solution Meeting
Solutions Meeting: 11/18/2022
Process Stage: Need Meeting – 06/15/2022

Supplemental Project Driver(s):
*Equipment Material Condition, Performance, and Risk
 Infrastructure Resilience*

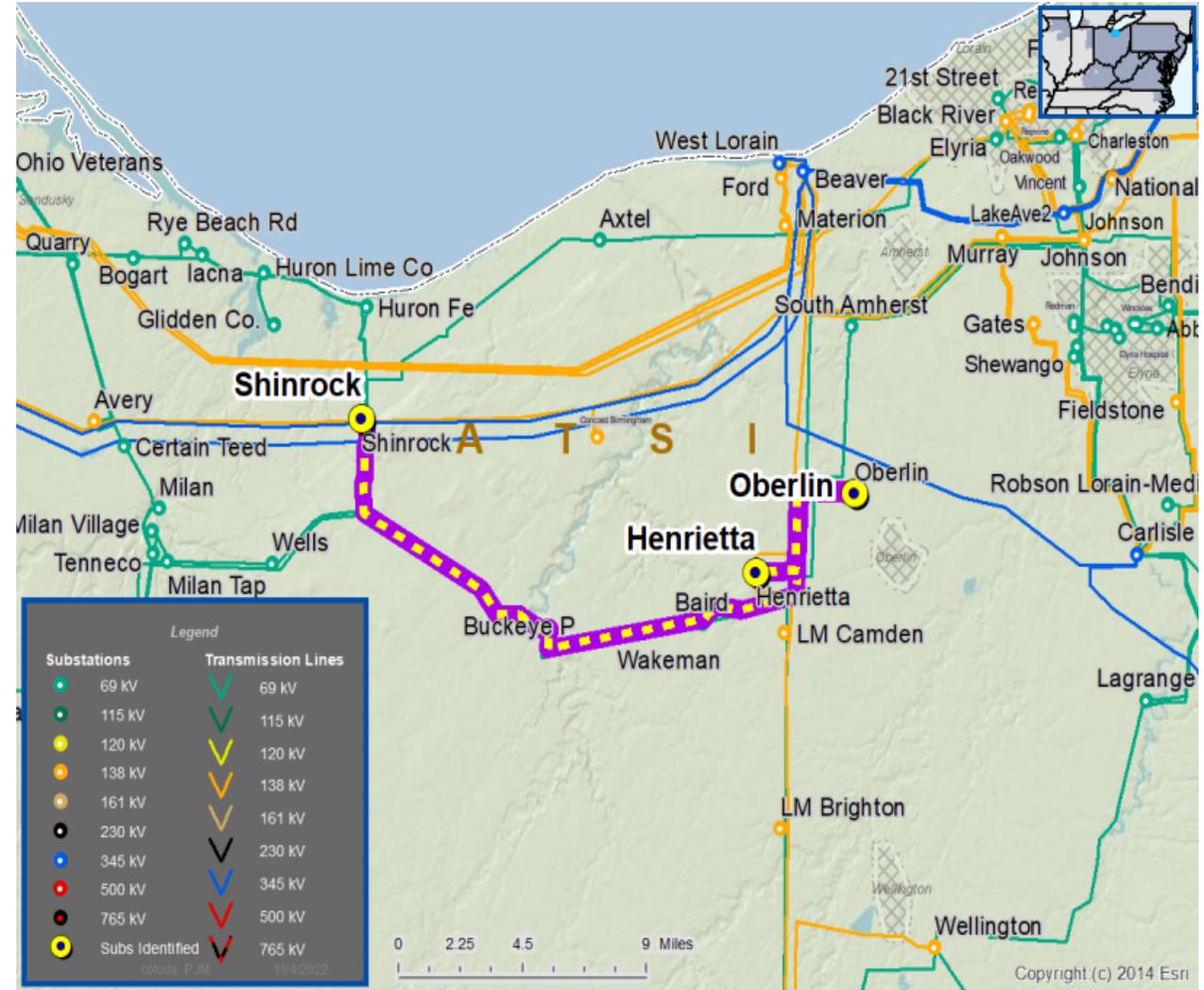
Specific Assumption Reference(s):

Global Factors

- System Reliability and Performance
- Increasing negative trend in maintenance findings
- Age/condition of transmission line conductor, hardware and structures
- Negatively impact customer outage frequency and/or duration

Problem Statement

- A common structure outage of the 69 kV line section (Shinrock-Oberlin & Henrietta-Oberlin 69 kV Line, approx. 1.6 miles) will result in a power outage of the Oberlin Muni substation impacting approximately 3,100 customers, 22 MW of load, and 19.2 MW of wholesale generation.
- A maintenance outage of the double circuit section of the 69 kV line (Shinrock-Oberlin & Henrietta-Oberlin 69 kV Line) will require an outage of the Oberlin Muni substation impacting approximately 3,100 customers, 22 MW of load, and 19.2 MW of wholesale generation.
- In 2021, the Oberlin Muni delivery point was outaged two times to address emergency repairs on the double circuit portion of the line (approx. 2-3 hours each outage).

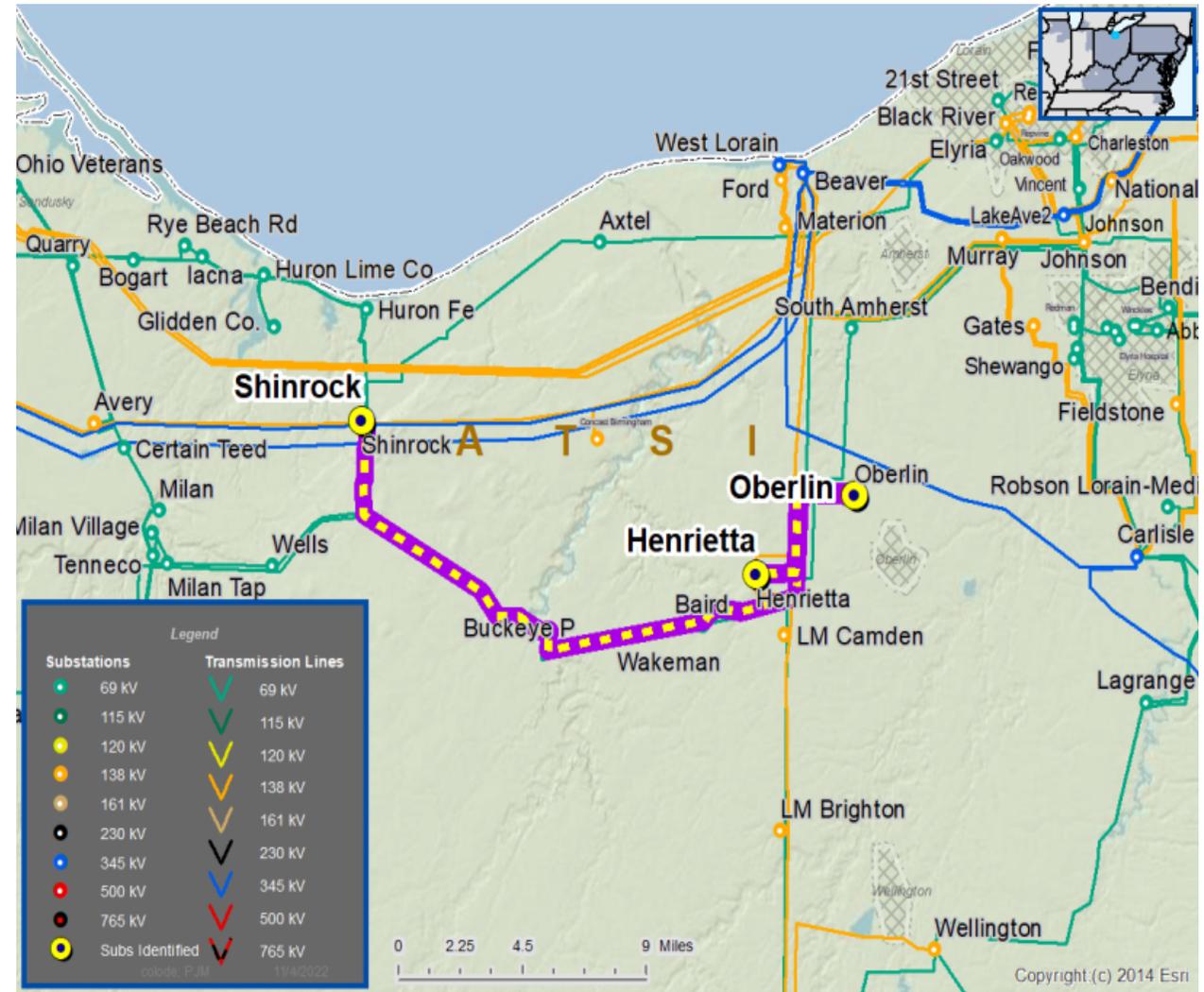


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Need Number: ATSI-2022-014
Process Stage: Solution Meeting
Solutions Meeting: 11/18/2022
Process Stage: Need Meeting – 06/15/2022

Problem Statement

- A ground and aerial CVI inspection conducted in 2021 identified:
 - 18 of the 27 common structures on the 69 kV line section (Shinrock-Oberlin & Henrietta-Oberlin 69 kV Line) have defects including rotten and /or cracked wood poles, cracked crossarms and crossarm braces, woodpecker damage and worn static wire attachments
 - The Shinrock-Oberlin-Henrietta 69 kV Line (approx. 26 miles, excluding the common structure portion of the line), has a 25% defect rate consisting of rotten poles, crossarms, and braces along with cracked insulators, and worn hardware.
- Since 2016:
 - The Shinrock-Oberlin 69 kV Line had four (4) momentary and nine (9) sustained outages.
 - The Henrietta-Oberlin 69 kV Line had two (2) momentary and four (4) sustained outages.



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ATSI Transmission Zone M-3 Process Shinrock-Oberlin 69 kV Line Solution-Phase 1

Need Number: ATSI-2022-014
Process Stage: Solution Meeting
Solutions Meeting: 11/18/2022
Process Stage: Need Meeting – 06/15/2022

Proposed Solution:

- Reroute and relocate the Shinrock-Oberlin Muni 69 kV line near structure 242 to the Oberlin Muni substation by building approximately 2.0 miles of new 69 kV line with 556 kcmil ACSR conductor in new ROW and on separate structures.
- Terminate new line and coordinate relay settings changes at Oberlin Muni substation.
- Revise relay settings at Shinrock substation.

Transmission Line Ratings:

- No change in rating

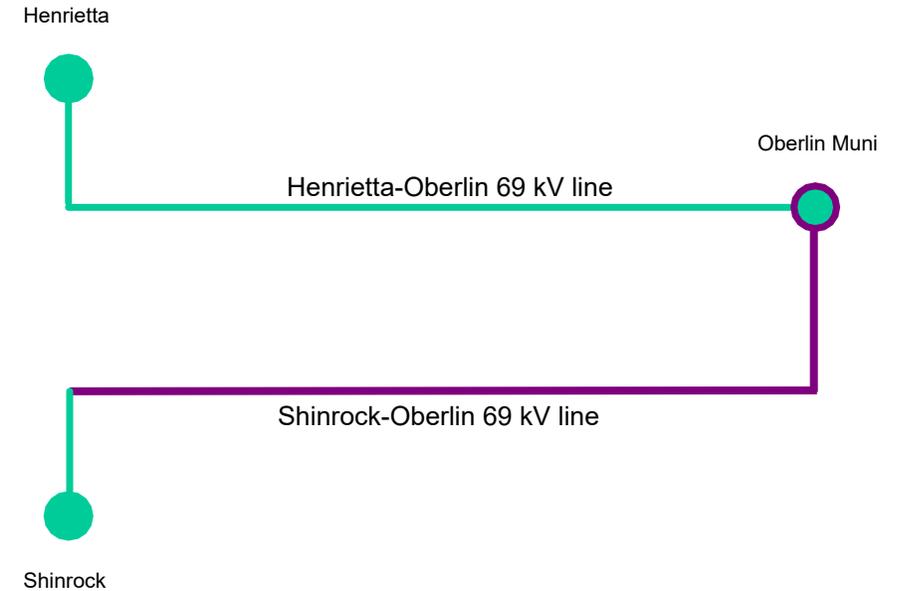
Alternatives Considered:

- Maintain existing condition and risk of failure.

Estimated Project Cost: \$7.3 M

Projected IS Date: 06/01/2024

Status: Engineering



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

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ATSI Transmission Zone M-3 Process Henrietta-Oberlin 69 kV Line Solution-Phase 2

Need Number: ATSI-2022-014
Process Stage: Solution Meeting
Solutions Meeting: 11/18/2022
Process Stage: Need Meeting – 06/15/2022

Proposed Solution:

- Rebuild the double circuit portion of Shinrock-Oberlin and Henrietta – Oberlin lines into a single circuit from Henrietta to Oberlin Muni using 556.6 kcmil ACSR conductor.
- Remove the Shinrock-Oberlin Muni portion of the double circuit.
- Coordinate relay setting changes at Oberlin Muni substation.
- Revise relay settings at Henrietta substation.

Transmission Line Ratings:

- Before Proposed Solution:
 - Henrietta-Oberlin: 76 MVA SN / 90 MVA SE, 87 MVA WN / 103 MVA WE
- After Proposed Solution:
 - Henrietta-Oberlin : 76 MVA SN / 90 MVA SE, 93 MVA WN / 103 MVA WE

Alternatives Considered:

- Maintain existing condition and risk of failure.

Estimated Project Cost: \$3.8 M

Projected IS Date: 12/31/2024

Status: Engineering



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

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Need Number: ATSI-2022-014
Process Stage: Solution Meeting
Solutions Meeting: 11/18/2022
Process Stage: Need Meeting – 06/15/2022

Proposed Solution:

- Rebuild/rehab wood structures on Shinrock-Oberlin Muni 69 kV Line from Shinrock to structure 201 including taps to Baird and Buckeye Pipeline and reconductor line with 556 kcmil ACSR conductor. Wood structures heading north at structure 201 were installed in 2019 and are not in need of replacement.
- Upgrade substation conductor at Wakeman to make TL the most limiting element.
- Upgrade switches A-74, A-73, A-14, A-16, A-65, and A-45.
- Revise relay settings at Shinrock and Oberlin Muni substations.

Transmission Line Ratings:

- Shinrock-Oberlin 69 kV Line
 - Before Proposed Solution:
 - Shinrock – Buckeye Tap: 76 MVA SN / 92 MVA SE, 87 MVA WN / 111 MVA WE
 - Buckeye Tap - Wakeman: 60 MVA SN / 62 MVA SE, 69 MVA WN / 69 MVA WE
 - Wakeman – LMREC Baird : 52 MVA SN / 53 MVA SE, 60 MVA WN / 60 MVA WE
 - LMREC Baird – Oberlin : 76 MVA SN / 90 MVA SE, 87 MVA WN / 103 MVA WE
 - After Proposed Solution:
 - Shinrock – Buckeye Tap: 111 MVA SN / 134 MVA SE, 125 MVA WN / 159 MVA WE
 - Buckeye T - Wakeman: 111 MVA SN / 134 MVA SE, 125 MVA WN / 159 MVA WE
 - Wakeman – LMREC Baird : 111 MVA SN / 134 MVA SE, 125 MVA WN / 159 MVA WE
 - LMREC Baird – Oberlin : 76 MVA SN / 90 MVA SE, 93 MVA WN / 103 MVA WE

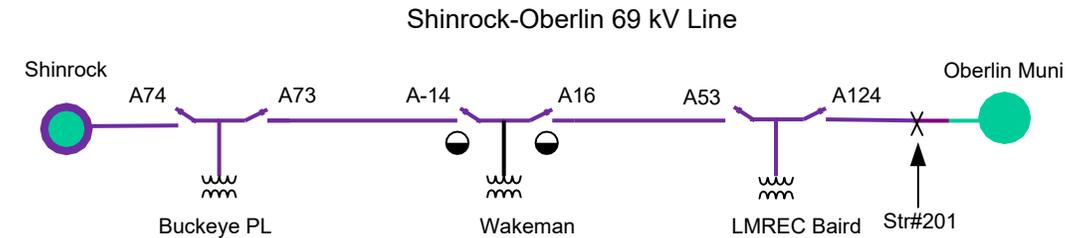
Alternatives Considered:

- Maintain existing condition and risk of failure.

Estimated Project Cost: \$35.8 M

Projected IS Date: 12/31/2027

Status: Conceptual



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

Need Number: ATSI-2022-Multiple (See next slide)

Process Stage: Solution Meeting – 11/18/2022

Previously Presented: Need Meeting - 07/22/2022

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption References:

Global Factors

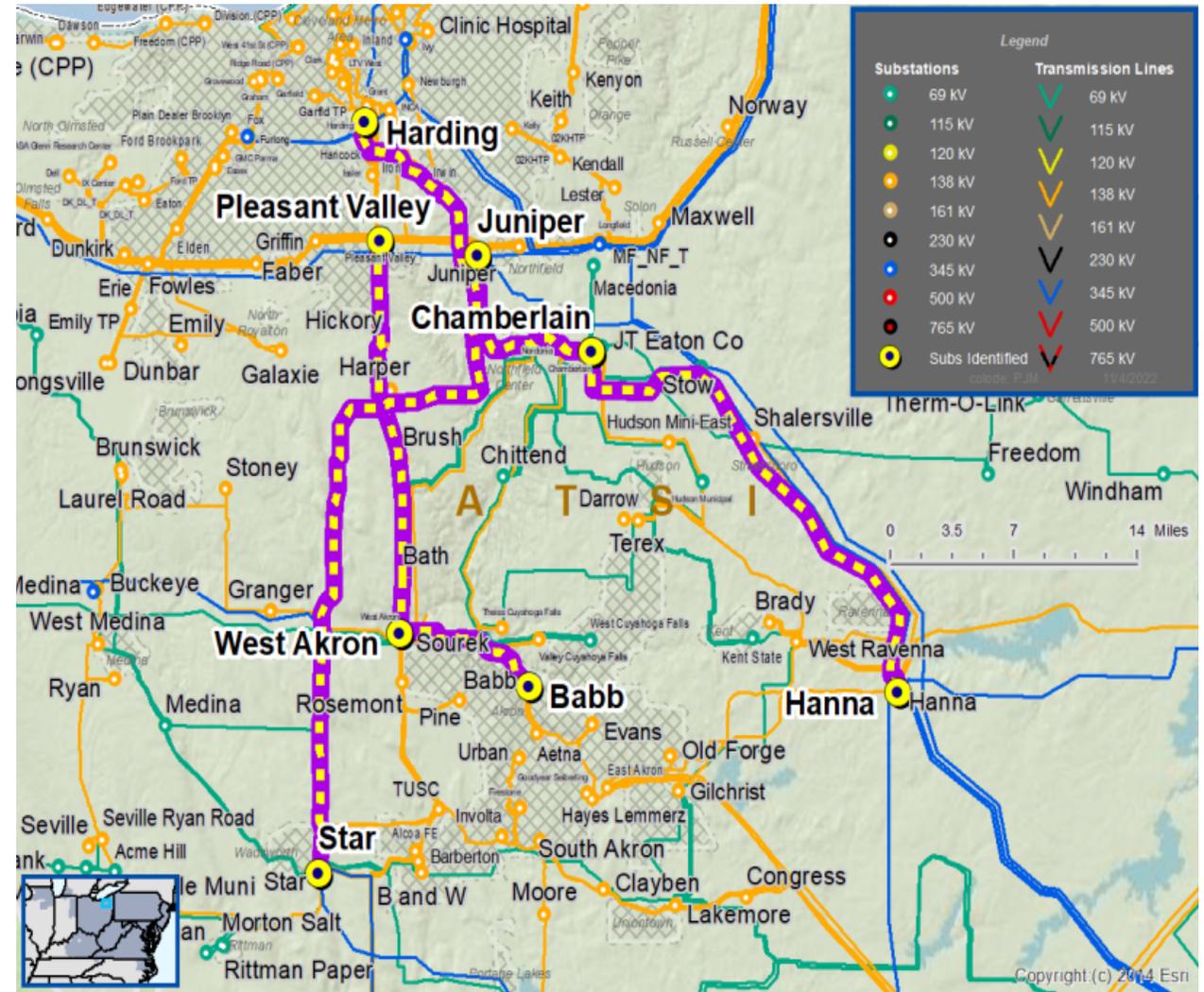
- System reliability and performance
- Substation / line equipment limits

Upgrade Relay Schemes

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

Problem Statement:

- Since 2018 there have been seven (7) reportable misoperations in ATSI as a result of a power line carrier communication (PLC) issues and several other PLC systems have concerning health issues based on alarm and maintenance records.
- Per NATF reporting, DCB schemes are by far the most common protection scheme to misoperate accounting for over 31% of all reported misoperations.
- During the period of 2014-Q1 2018, 2.4% of misoperations in ATSI were due to the DCB protection scheme. Another 12% of misoperations were due to communication failures, relay failures and unknowns in a DCB-PLC configuration.
- Transmission line ratings are limited by terminal equipment.



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ATSI-2022	Transmission Line / Substation Locations	Existing Line/Terminal Equipment MVA Rating (SN / SE)	Existing Conductor/Transformer MVA Rating (SN / SE)	Limiting Terminal Equipment
-016	Pleasant Valley-West Akron 138 kV Line (Pleasant Valley-Hickory section)	153 / 199 217 (WN) / 229 (WE)	237 / 287 267 (WN) / 339 (WE)	Wave trap, substation conductor at Pleasant Valley
-017	Chamberlin-Harding 345 kV Line	1555 / 1892 1766 (WN) / 2143 (WE)	1560/1900 1766 (WN) / 2251 (WE)	Substation conductor, Wave trap
-018	Chamberlin-Hanna 345 kV Line	1534 / 1878 1746 (WN) / 2143 (WE)	1542 / 1878 1746 (WN) / 2225 (WE)	Line Drop, substation conductor, Wave trap
-019	Juniper -Star 345 kV Line	1518 / 1849 1719 (WN) / 2143 (WE)	1518 / 1849 1719 (WN) / 2192 (WE)	Substation conductor, Wave trap
-021	Babb-West Akron 138 kV Line	190 / 209 217 (WN) / 223 (WE)	200 / 242 226 (WN) / 286 (WE)	Relay, substation conductor, wave trap

Proposed Solution:

ATSI-2022	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Scope of Work	Estimated Cost (\$)	Target ISD
-016	Pleasant Valley-West Akron 138 kV Line (Pleasant Valley-Hickory section)	153 (SN) / 199 (SE) 219 (WN)/ 247(WE)	Migrate line relay communication to the SONET network, remove existing carrier schemes, install associated relay and communication equipment and remove the line wavetrap (limiting element for winter ratings) at Pleasant Valley.	\$95k	12/11/2023
-017	Chamberlin-Harding 345 kV Line	1555 / 1892 1766 (WN) / 2160 (WE)	Migrate line relay communication to the SONET network, remove existing carrier schemes, install associated relay and communication equipment and remove the line wavetrap (limiting element for winter emergency rating)	\$150k	9/26/2023
-018	Chamberlin-Hanna 345 kV Line	1534 / 1878 1746 (WN) / 2160 (WE)	Migrate line relay communication to the SONET network, remove existing carrier schemes, install associated relay and communication equipment and remove the line wavetrap (limiting element for winter emergency rating)	\$315k	9/13/2023
-019	Juniper -Star 345 kV Line	1518 / 1849 1719 (WN) / 2160 (WE)	Migrate line relay communication to the SONET network, remove existing carrier schemes, install associated relay and communication equipment and remove the line wavetrap (limiting element for winter emergency rating)	\$365k	10/31/2023
-021	Babb-West Akron 138 kV Line	190 / 225 226 (WN) / 258 (WE)	Migrate line relay communication to the SONET network, remove existing carrier schemes, install associated relay and communication equipment and remove the line wavetrap (limiting element for summer emergency & winter ratings)	\$135k	12/30/2023

Alternatives Considered: Maintain existing condition

Project Status: Engineering

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

Need Number: ATSI-2022-025
Process Stage: Need Meeting – 09/16/2022

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

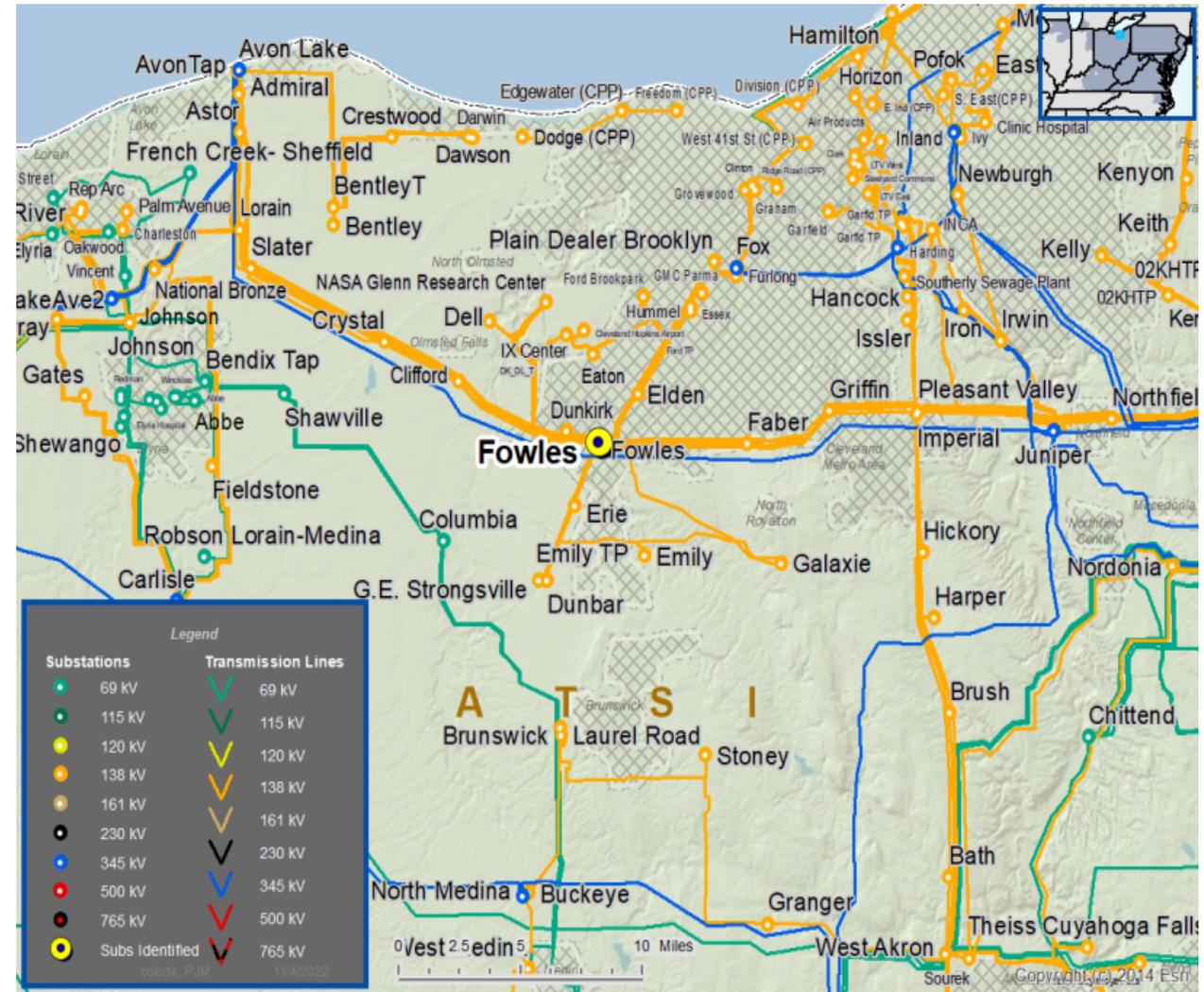
Specific Assumption Reference(s)

Global Factors

- System Reliability and Performance
- Load at risk in planning and operational scenarios
- Upgrade Relay Schemes – Protection Systems with single points of failure
- Substation/line Equipment Limits

Problem Statement

The existing Fowles Substation’s 138 kV No. 1 and No. 3 bus protection is a single scheme with no redundancy.



Need Number: ATSI-2022-025
Process Stage: Solution Meeting – 11/18/2022
Previously Presented: Need Meeting – 09/16/2022

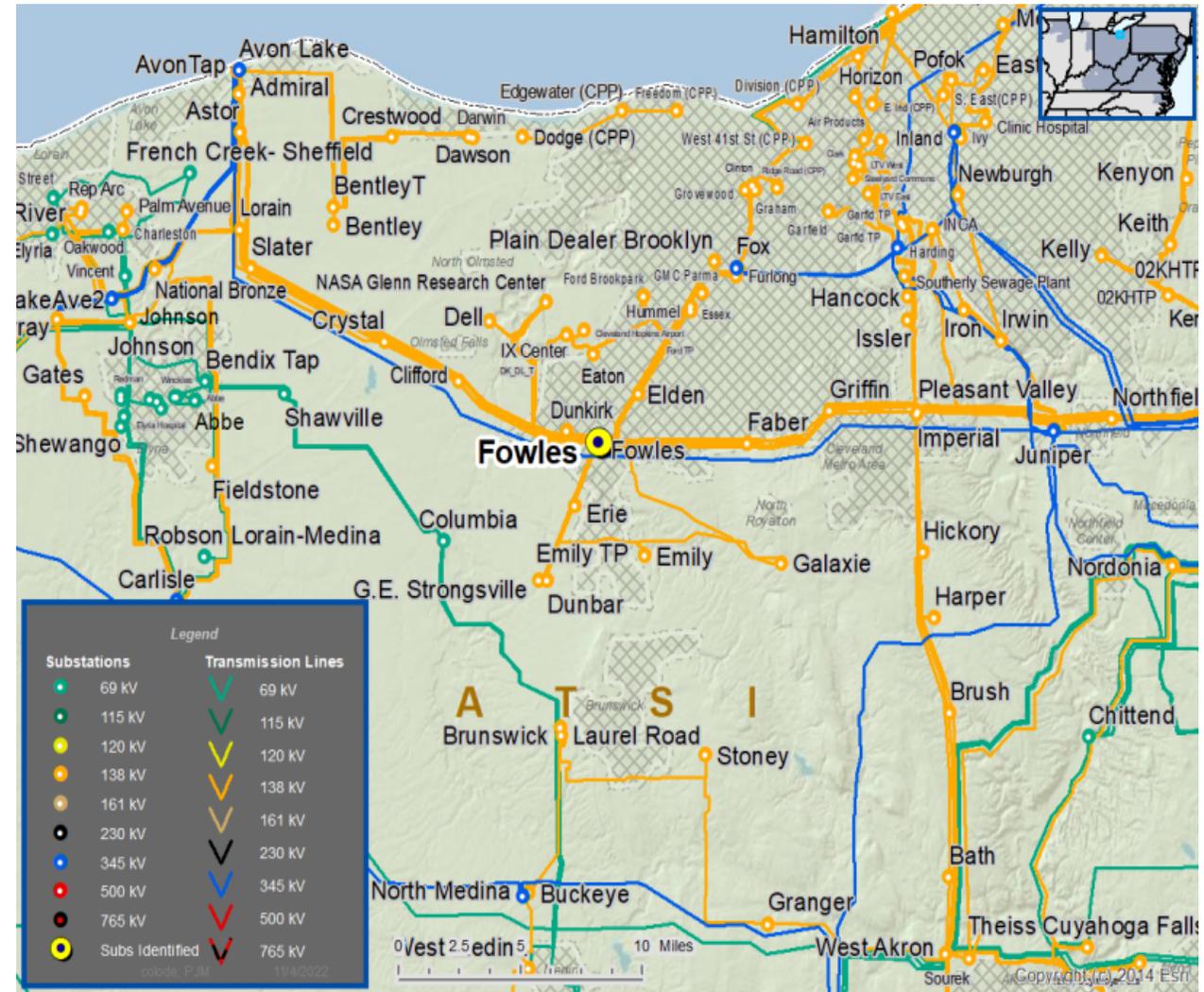
Proposed Solution:

Fowles 138 kV Substation

- Upgrade Fowles Substation’s 138kV No. 1 and No. 3 bus relaying with primary and backup protection scheme
- Replace (1) six-pole 138 kV switch (D304 & D305) with (2) 1200 A manually operated GOAB switches.
- Remove linear couplers for several 138 kV breakers and install slip-over CTs.
- Replace and install new relaying equipment for Bus No.1 and Bus No.2 with a dual 487B relay panel.
- Replace limiting substation conductors.

Transmission Line Ratings:

- Fowles – Pleasant Valley Q3 138 kV Line
 - Before project: 267 MVA SN / 332 MVA SE
 - After project: 273 MVA SN / 332 MVA SE
- Fowles – Fox Q13 138 kV Line
 - Before project: 265 MVA SN / 332 MVA SE
 - After project: 273 MVA SN / 332 MVA SE
- Avon – Fowles Q1 138 kV Line
 - Before project: 265 MVA SN / 332 MVA SE
 - After project: 273 MVA SN / 332 MVA SE
- Fox – Fowles Q12 138 kV Line
 - Before project: 265 MVA SN / 332 MVA SE
 - After project : 273 MVA SN / 332 MVA SE





ATSI Transmission Zone M-3 Process Fowles 138 kV Substation

Need Number: ATSI-2022-025
Process Stage: Solution Meeting – 11/18/2022
Previously Presented: Need Meeting – 09/16/2022

Proposed Solution:

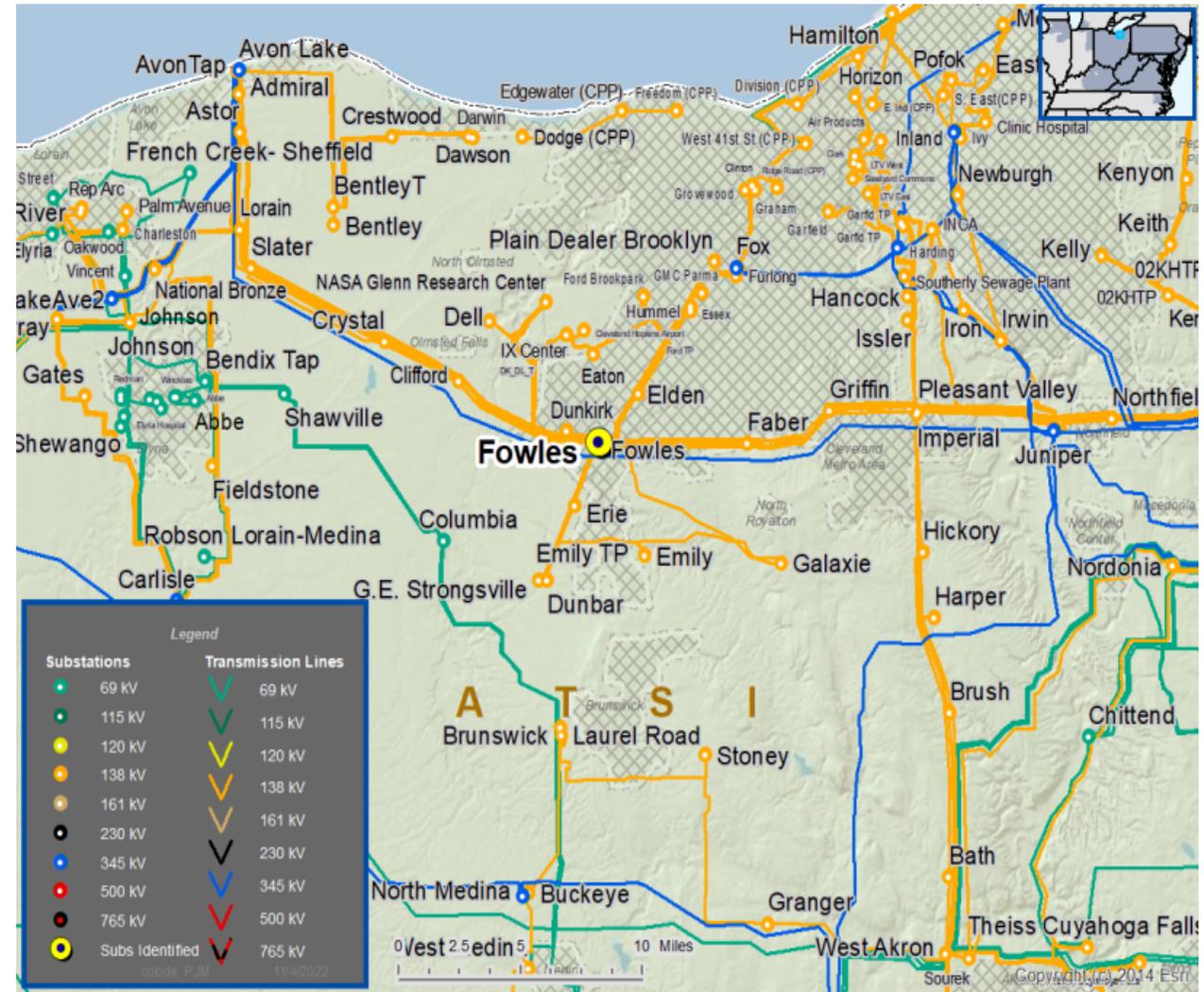
Alternatives Considered:

- Continue with existing non-redundant protection scheme

Estimated Project Cost: \$0.62M

Projected In-Service: 12/31/2023

Status: Engineering



Need Number: ATSI-2022-024
Process Stage: Solution Meeting –11/18/2022
Previously Presented: Need Meeting – 09/16/2022

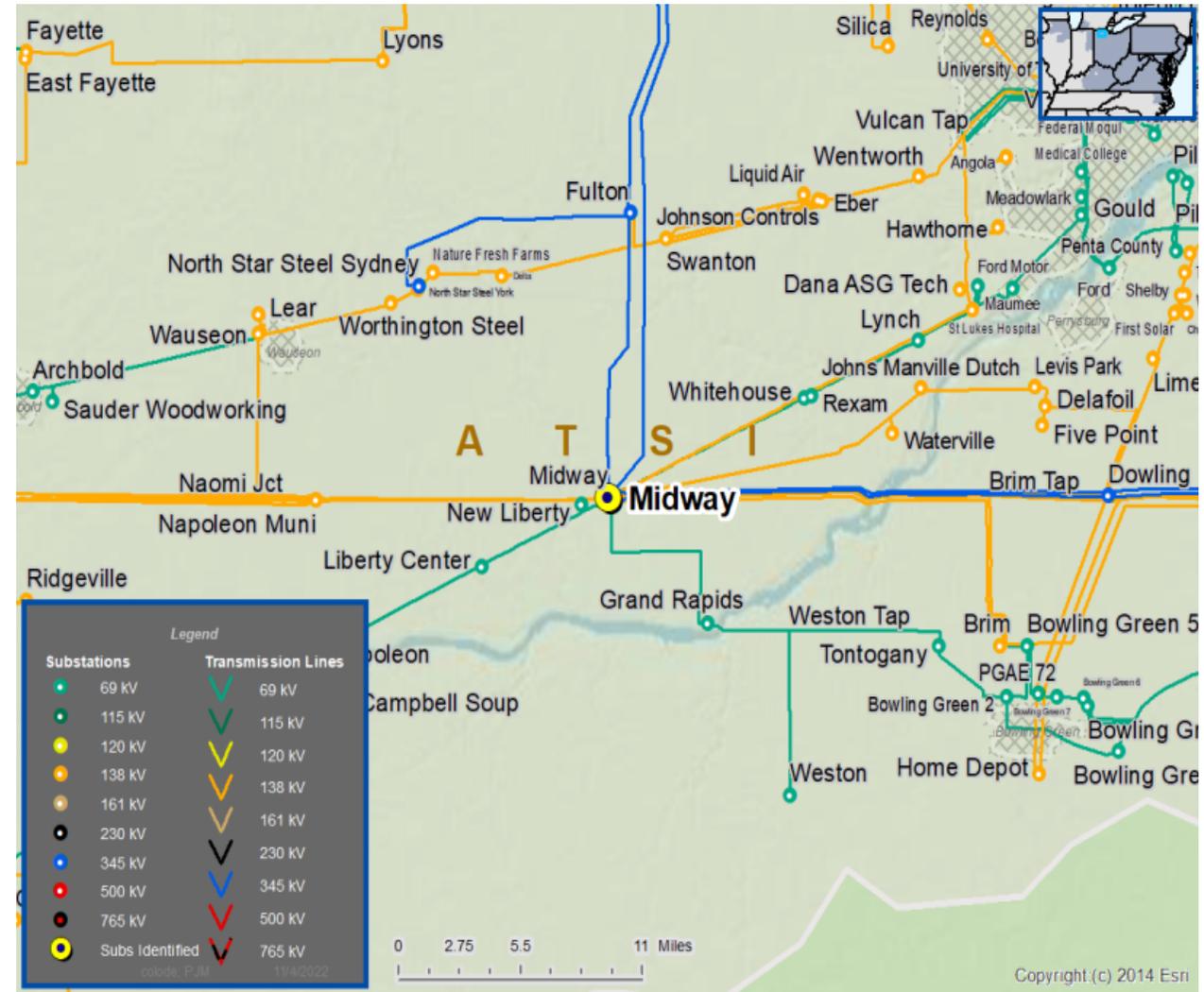
Supplemental Project Driver(s):
Operational Flexibility and Efficiency
Equipment Material Condition, Performance, and Risk
Infrastructure Resilience

Specific Assumption Reference(s)

- System Reliability and Performance
- Load at risk in planning and operational scenarios
- Upgrade Relay Schemes – Protection Systems with single points of failure
- Expected service life (at or beyond) or obsolescence

Problem Statement

- The existing Midway Substation’s 138 kV J and K bus protection is a single scheme with no redundancy.
- Oil Circuit Breakers ages and concerns:
 - B13301 is 40 years old.
 - B13303 is 54 years old with high dwell time.
 - B13305 is 50 years old with high dwell time.
 - B13308 is 47 years old.



Need Number: ATSI-2022-024
Process Stage: Solution Meeting – 11/18/2022
Previously Presented: Need Meeting – 09/16/2022

Proposed Solution:

Midway 138 kV Substation

- Replace breakers 13301, 13303 and 13308. Breaker 13305 is to be replaced under supplemental project s1698.
- Replace line and bus disconnect switches.
- For the Angola terminal line: replace wave trap and tuner, replace limiting terminal conductor, CVT, and revise relay settings on the Angola PR relay.
- Replace 138 kV VTs with CVTs for both J & K Bus.
- Replace J & K Bus relays with a dual 487B relay panels.

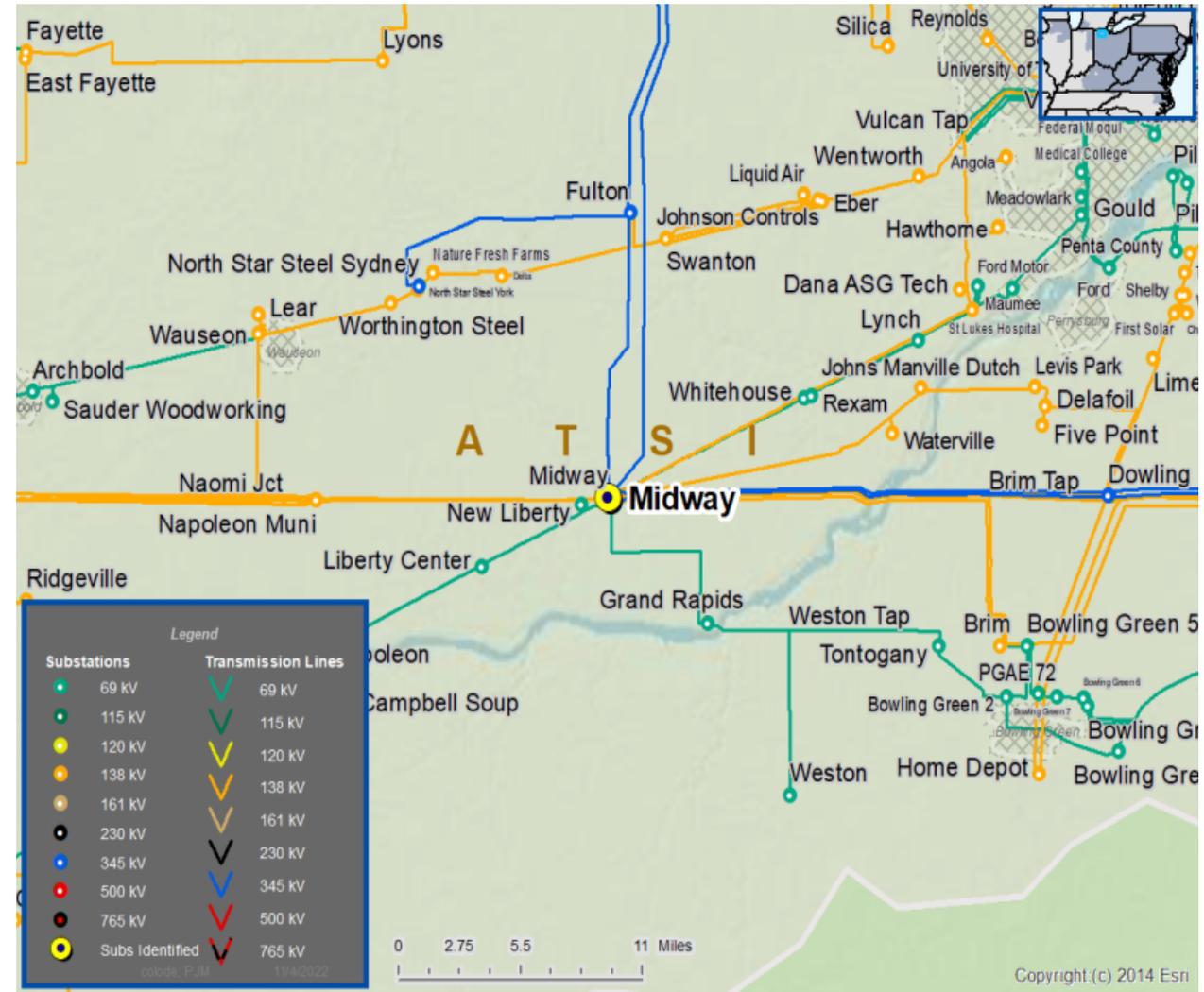
Line Ratings:

- Angola-Midway 138 kV Line
 - Before project: 288 MVA SN/346 MVA SE
 - After project: 288 MVA SN/353 MVA SE

Alternatives Considered:

- No alternatives considered for this project

Estimated Project Cost: \$1.8 M
Projected In-Service: 12/31/2023
Status: Engineering



Need Number: ATSI-2022-010
Process Stage: Solution Meeting – 11/18/2022
Previously Presented: Need Meeting – 05/19/2022

Supplemental Project Driver(s):
*Equipment Material Condition, Performance and Risk
 Infrastructure Resilience*

Specific Assumption Reference(s):

Global Factors

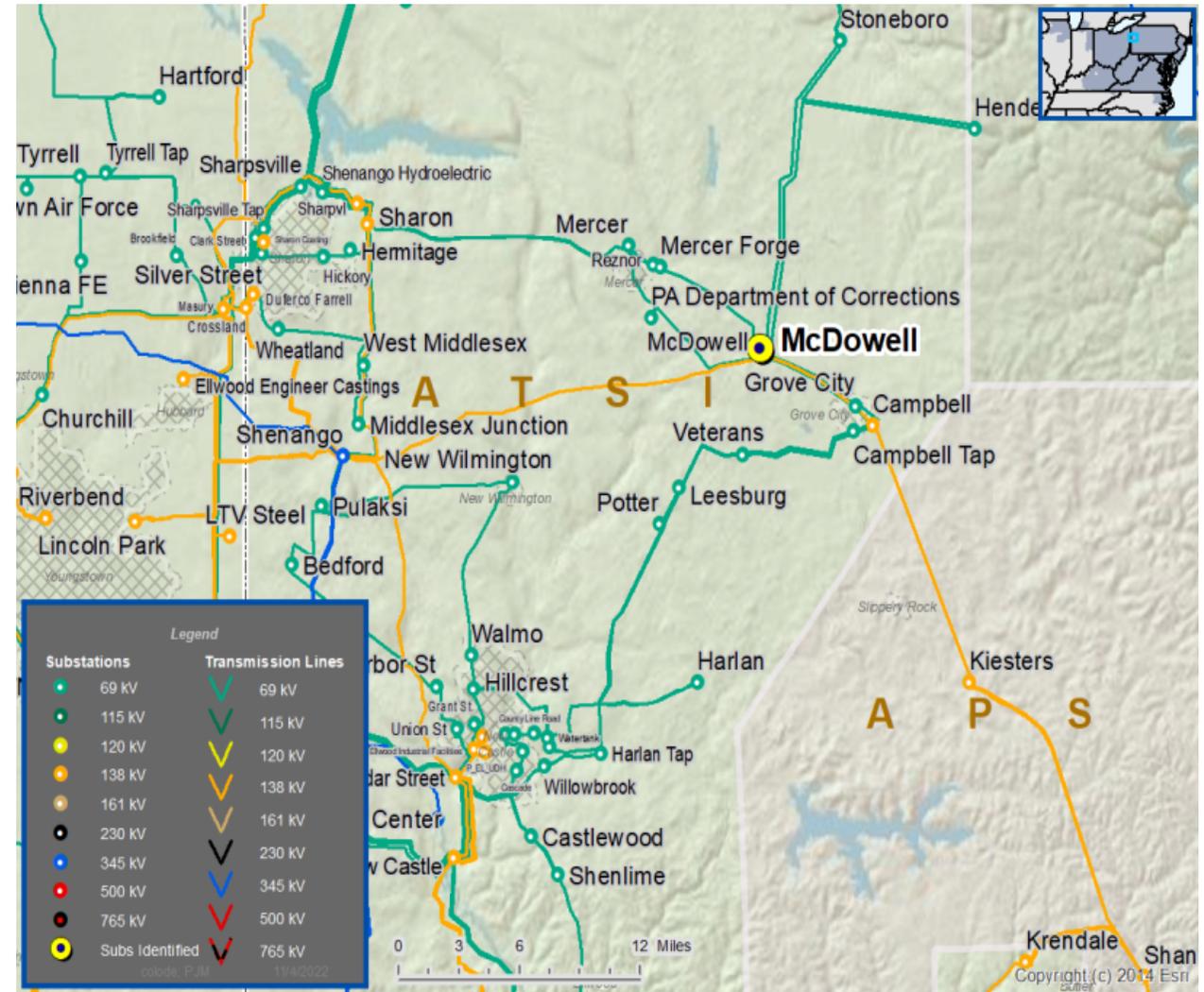
- System Reliability and Performance
- Increasing negative trend in maintenance findings and/or costs
- Expected service life (beyond) or obsolescence
- Costs for repair approach cost for replacement
- Substation/line Equipment Limits

Substation Condition Rebuild/Replacement

- Circuit breakers and other fault interrupting devices
- Switches and relays

Problem Statement

- Oil Circuit Breakers B-16 and B-30 and associated disconnect switches at McDowell are showing increasing maintenance concerns; compressor issues, valve issues, trip coil failure, pilot valve failure deteriorated operating mechanisms, timing issues, and increasing maintenance trends.
- Breaker B-16 is 44 years old; Breaker B-30 is 72 years old
- Similar breaker B-26 recently failed



Need Number: ATSI-2022-010
Process Stage: Solution Meeting – 11/18/2022
Previously Presented: Need Meeting – 05/19/2022

Proposed Solution:

McDowell Breakers Replacements

- Replace 69 kV breakers B-16 and B-30, and associated line and bus disconnect switches.
- Replace the Campbell and Campbell Tap relays with line relay panels and install SEL-421 primary/backup relays and SEL501 with LOR BF relays.
- Replace limiting substation conductors.

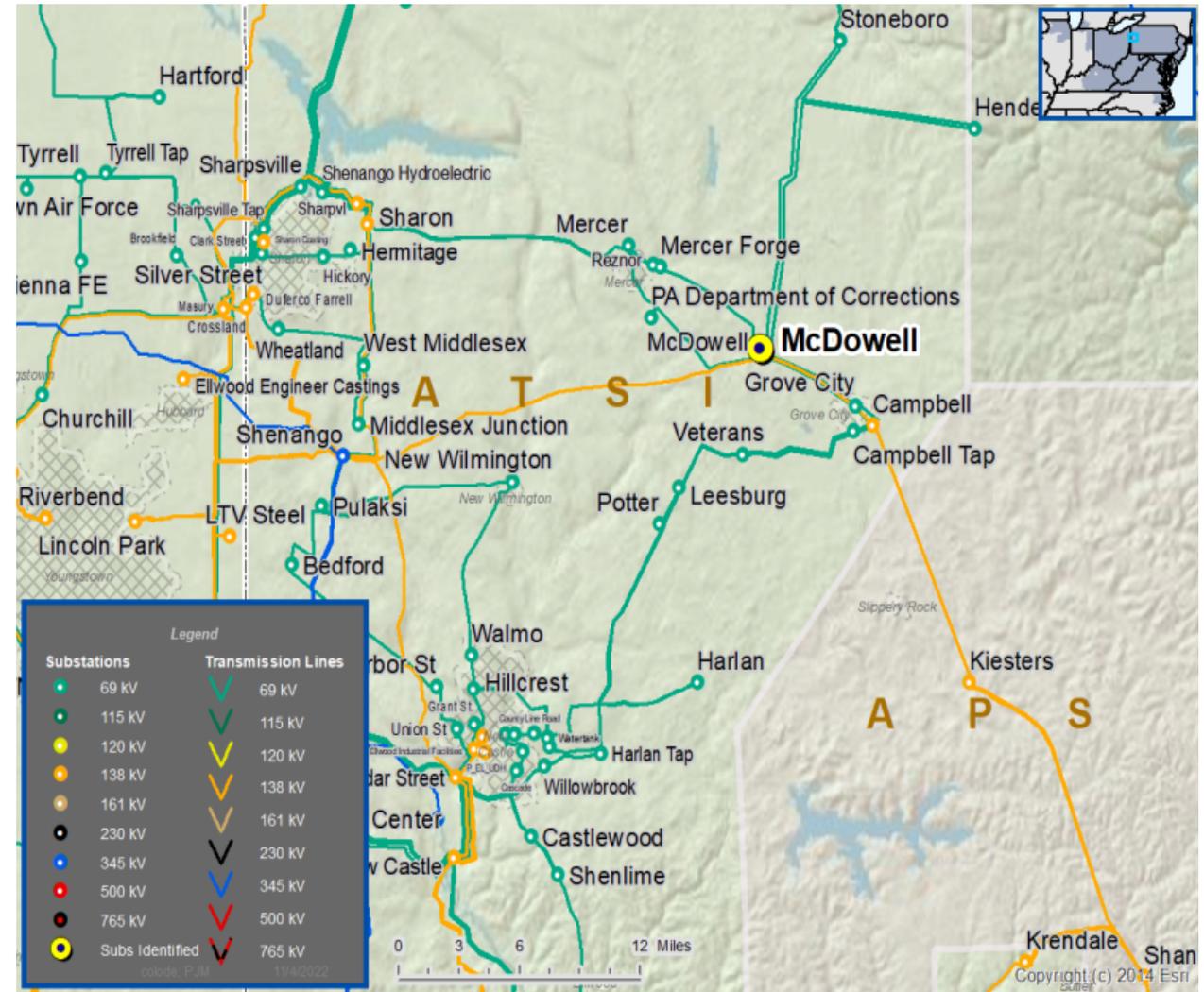
Transmission Line Ratings:

- Campbell T-McDowell Y-10 69 kV line section:
 - Before Proposed Solution: 48 MVA SN / 48 MVA SE / 48 MVA WN / 48 MVA WE
 - After Proposed Solution: 80 MVA SN / 96 MVA SE / 90 MVA WN / 114 MVA WE
- McDowell- G.E. TSD Grove City T 69 kV line section:
 - Before Proposed Solution: 72 MVA SN / 72 MVA SE / 72 MVA WN / 72 MVA WE
 - After Proposed Solution: 80 MVA SN / 96 MVA SE / 90 MVA WN / 114 MVA WE

Alternatives Considered:

No alternatives considered for this project

Estimated Project Cost: \$1.5 M
Projected In-Service: 12/30/2023
Project Status: Engineering
Model: 2022 Series 2027 Summer RTEP 50/50



Need Number: ATSI-2020-045
Process Stage: Solution Meeting – 11/18/2022
Previously Presented: Need Meeting – 11/20/2020

Supplemental Project Driver(s):
*Equipment Material Condition, Performance, and Risk
 Infrastructure Resilience*

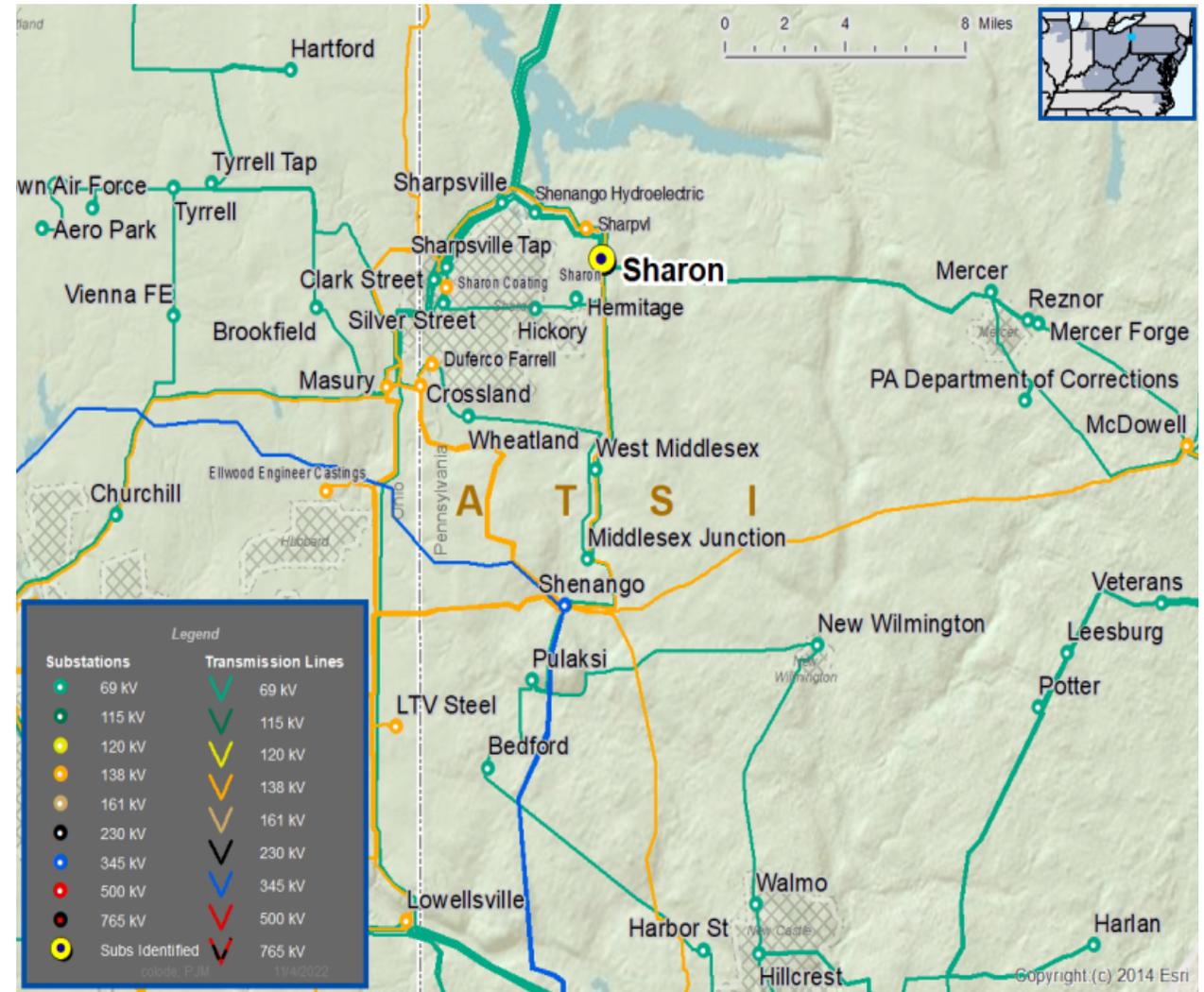
Specific Assumption Reference(s):

Global Factors

- Level of criticality to system performance and operations
- Customer outage frequency and/or durations
- Increasing negative trend in maintenance findings and/or costs
- Failure risk, to the extent caused by asset design characteristics, or historical industry/ company performance data, or application design error

Problem Statement

- The 69 kV lines at the Sharon 69 kV substation have a single set of relays providing protection.
- The Sharon 69 kV bus has a single bus protection scheme.
- There is no breaker failure presently installed on the Sharon 69 kV exposing this sub and its lines to risk of a larger outage if one of these schemes were to fail to operate.
- In June 2018, an uncleared fault on Y-300 line to McDowell led to a widespread outage of all the 69 kV lines from Sharon.



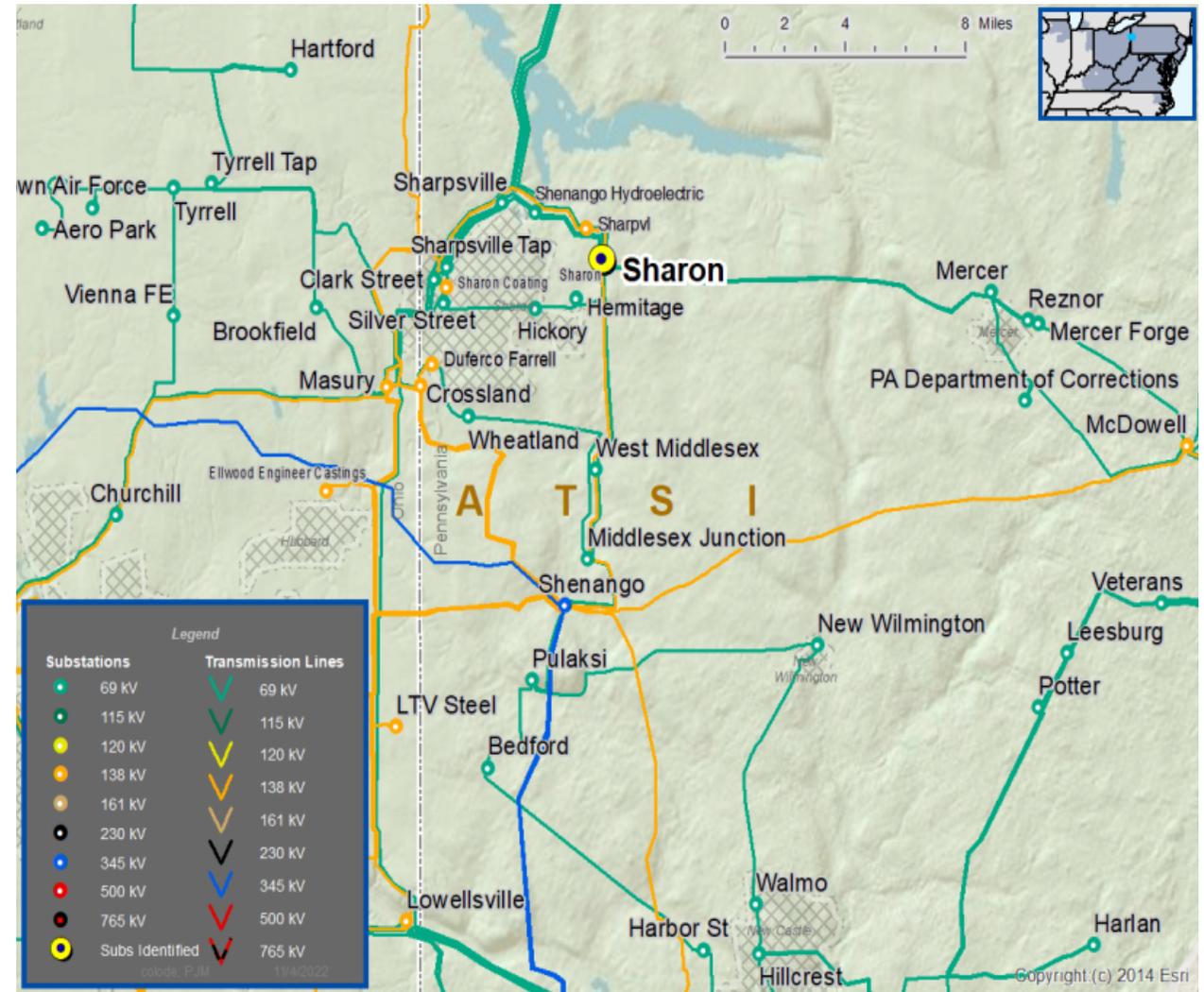
Need Number: ATSI-2020-045
Process Stage: Solutions Meeting – 11/18/2022
Previously Presented: Need Meeting – 11/20/2020

Proposed Solution:

- Replace relaying & controls at Sharon substation for the following lines:
 - Sharon – Maysville Y-299/Y-81 69 kV Line
 - Sharon – McDowell Y-300 69 kV Line
 - Sharon – Maysville Y-301 69 kV Line
 - Sharon – Masury Y-188/Y-303 69 kV Line
- Install a new 69 kV control building at Sharon substation
- Adjust relay settings at Masury, Maysville, & McDowell substations
- Install a new standard large RTU panel and a new standard HMI Panel

Transmission Line Ratings:

- Branch: Sharon T - Sharon Y81 69 kV
 - Before Proposed Solution: 72 MVA SN / 76 MVA SE / 76 MVA WN / 76 MVA WE
 - After Proposed Solution: 72 MVA SN / 91 MVA SE / 95 MVA WN / 123 MVA WE
- Branch: Mercer T – Sharon Y300 69 kV
 - Before Proposed Solution: 72 MVA SN / 72 MVA SE / 72 MVA WN / 72 MVA WE
 - After Proposed Solution: 80 MVA SN / 96 MVA SE / 90 MVA WN / 114 MVA WE
- Branch: McDowell – Dept of Corrections Y300 69 kV
 - Before Proposed Solution: 47 MVA SN / 48 MVA SE / 48 MVA WN / 48 MVA WE
 - After Proposed Solution: 47 MVA SN / 56 MVA SE / 53 MVA WN / 67 MVA WE



Need Number: ATSI-2020-045
Process Stage: Solutions Meeting – 11/18/2022
Previously Presented: Need Meeting – 11/20/2020

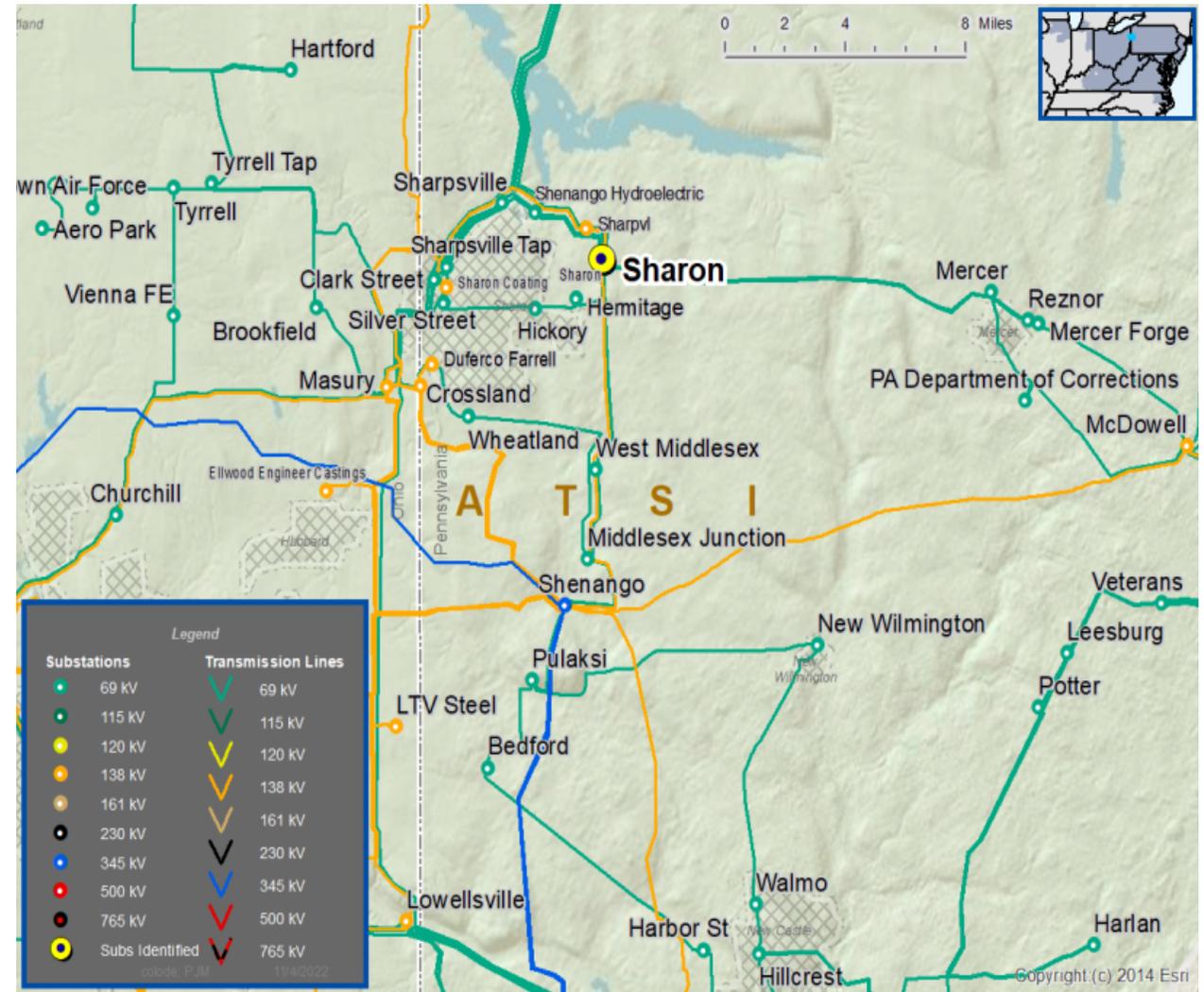
Transmission Line Ratings:

- Branch: Camp Reynolds – Sharon Y301 69 kV
 - Before Proposed Solution: 69 MVA SN / 72 MVA SE / 72 MVA WN / 72 MVA WE
 - After Proposed Solution: 69 MVA SN / 83 MVA SE / 78 MVA WN / 98 MVA WE
- Branch: West Middlesex T – Sharon Y303 69 kV
 - Before Proposed Solution: 100 MVA SN / 121 MVA SE / 113 MVA WN / 121 MVA WE
 - After Proposed Solution: 100 MVA SN / 121 MVA SE / 113 MVA WN / 143 MVA WE

Alternatives Considered:

- No alternatives were considered

Estimated Project Cost: \$20.8 M
Projected In-Service: 06/01/2025
Project Status: Engineering



Appendix

High Level M-3 Meeting Schedule

Assumptions	Activity	Timing
	Posting of TO Assumptions Meeting information	20 days before Assumptions Meeting
	Stakeholder comments	10 days after Assumptions Meeting
Needs	Activity	Timing
	TOs and Stakeholders Post Needs Meeting slides	10 days before Needs Meeting
	Stakeholder comments	10 days after Needs Meeting
Solutions	Activity	Timing
	TOs and Stakeholders Post Solutions Meeting slides	10 days before Solutions Meeting
	Stakeholder comments	10 days after Solutions Meeting
Submission of Supplemental Projects & Local Plan	Activity	Timing
	Do No Harm (DNH) analysis for selected solution	Prior to posting selected solution
	Post selected solution(s)	Following completion of DNH analysis
	Stakeholder comments	10 days prior to Local Plan Submission for integration into RTEP
	Local Plan submitted to PJM for integration into RTEP	Following review and consideration of comments received after posting of selected solutions

Revision History

11/8/2022 – V1 – Original version posted to pjm.com