Subregional RTEP Committee – Western
FirstEnergy Supplemental Projects

October 15, 2021

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

ATSI Transmission Zone M-3 Process
Maysville 69 kV Area

Need Number: ATSI-2021-005

Process Stage: Need Meeting – 10/15/2021

Supplemental Project Driver(s):

Operational Flexibility and Efficiency

Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)

Global Considerations

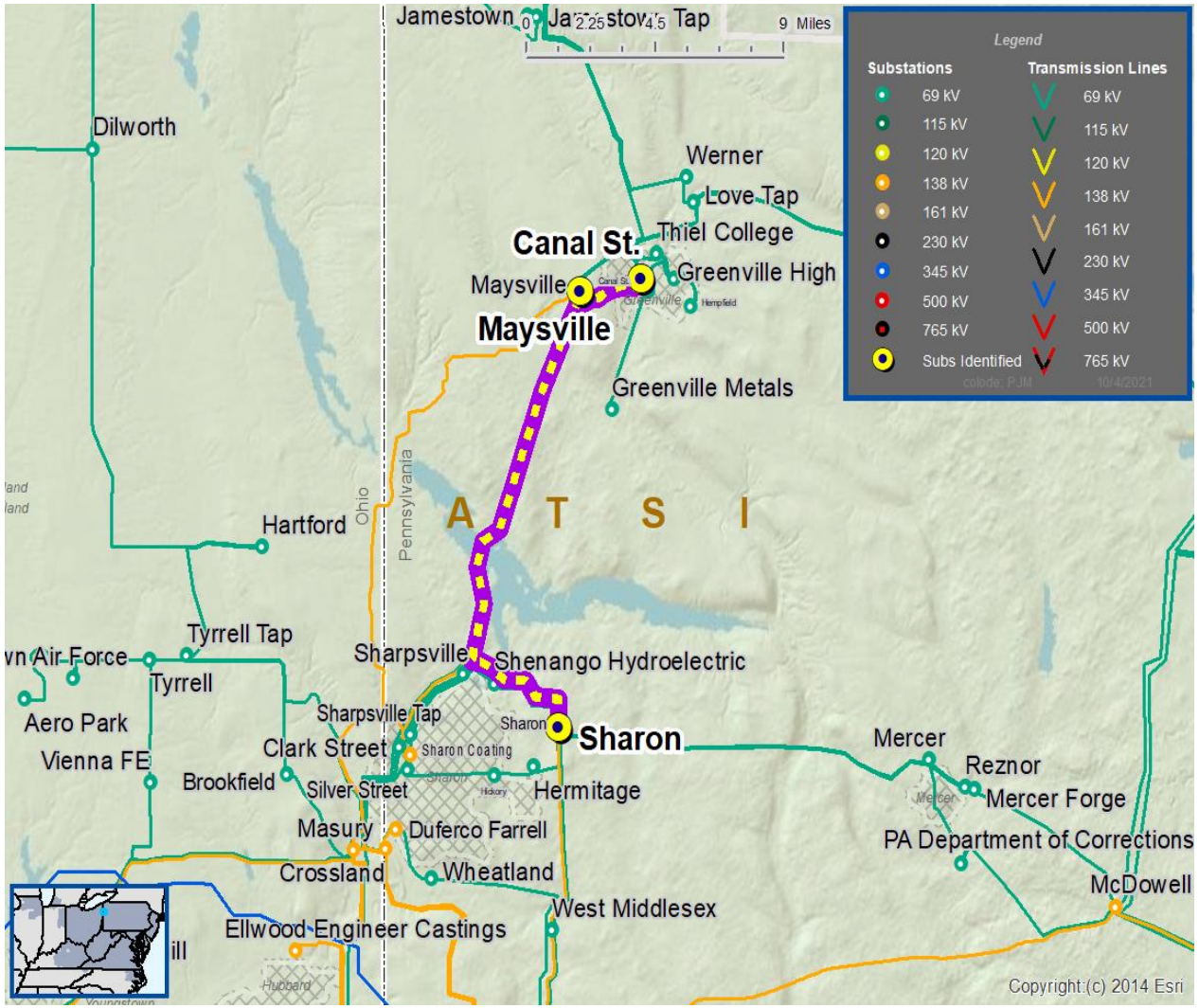
- System Reliability and Performance
- Substation/line equipment limits
- Reliability of Non-BES Facilities
- Load at risk in planning and operational scenarios.
- Load and/or customers at risk on single transmission lines

Network Radial Lines

- Load at risk and/or customers affected
- Proximity to other networked facilities

Build New Transmission Line

- Network radial lines



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ATSI Transmission Zone M-3 Process
Maysville 69 kV Area

Need Number: ATSI-2021-005

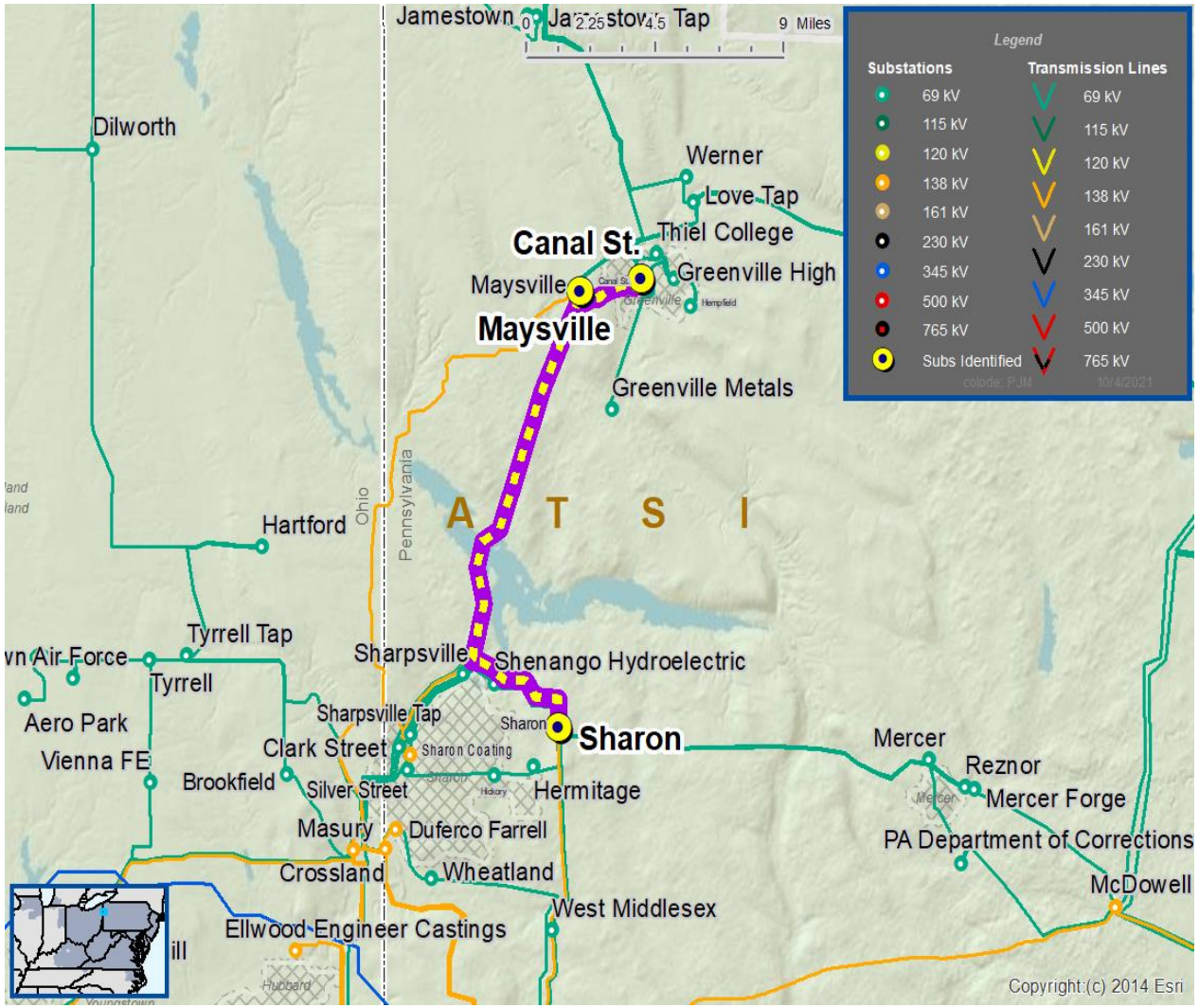
Process Stage: Need Meeting – 10/15/2021

Problem Statement

Canal (Maysville) 69 kV Line

- The Canal (Maysville) Y-79 69 kV Line serves approximately 14 MW and 6,500 customers on a 3.6 mile radial line
- A P1-2 contingency for the loss of the Canal (Maysville) Y-79 69 kV Line will outage approximately 14 MW and 6,500 customers
- The Canal (Maysville) Y-79 69 kV Line has experienced one sustained outage the past five (5) years
- The Maysville-Sharon Y-301 69 kV Line serves approximately 18 MW and 2,600 customers at two delivery points served on a 2.7 mile tap
- A P1-2 contingency for the loss of the Maysville-Sharon Y-301 69 kV Line will outage approximately 18 MW and 2,600 customers
- The Maysville-Sharon Y-301 69 kV Line has experienced three sustained outages in the past five (5) years

Model: 2020 Series 2025 Summer RTEP 50/50



ATSI Transmission Zone M-3 Process
Shenango 345/138 kV Transformers No. 1 and No. 2

Need Number: ATSI-2021-024

Process Stage: Need Meeting – 10/15/2021

Supplemental Project Driver(s):

Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s):

Global Considerations

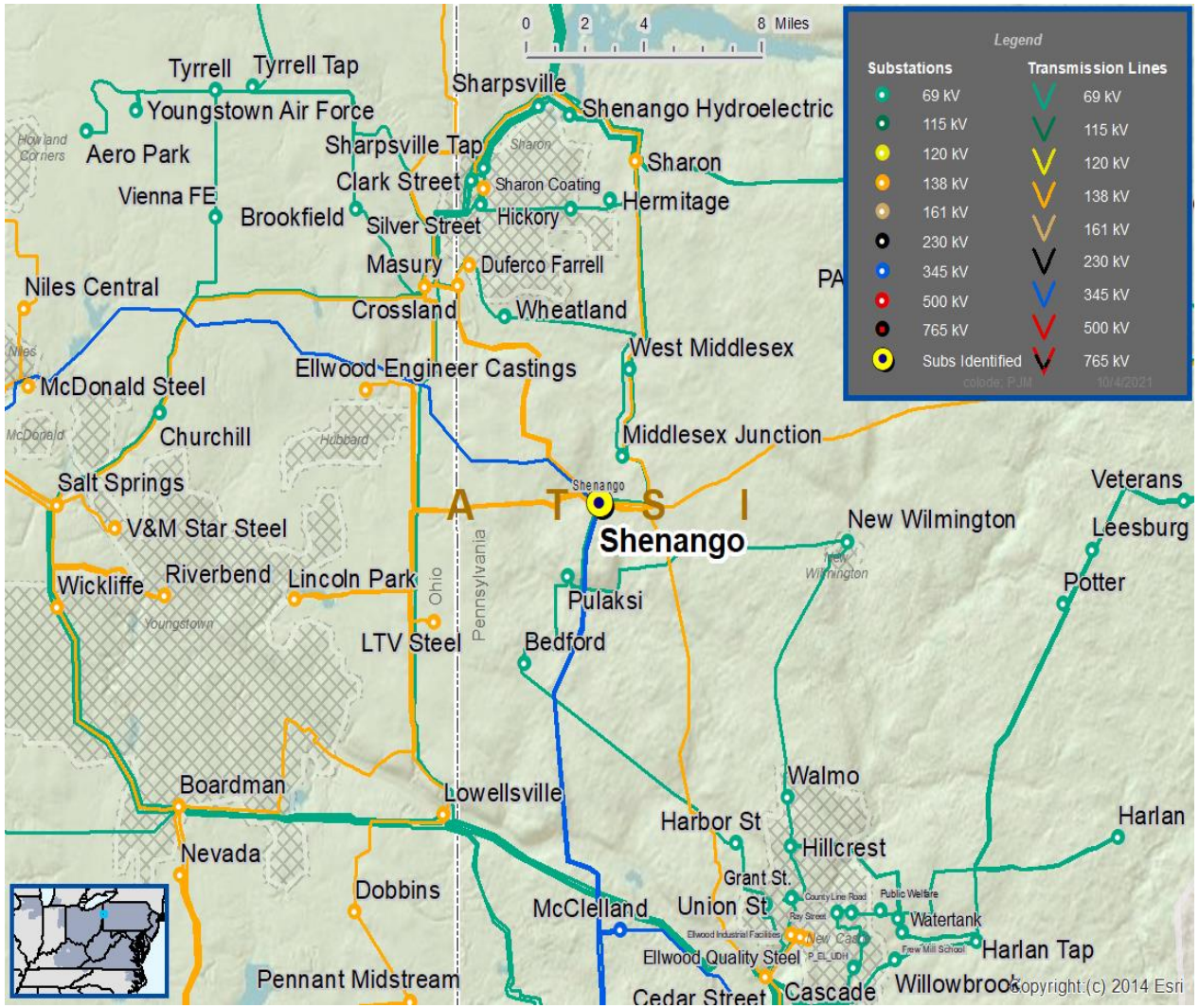
- System Reliability and Performance
- Substation/line Equipment Limits

System Condition Projects

- Substation Condition Rebuild/Replacement

Upgrade Relay Schemes

- Relay schemes that have a history of misoperation



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ATSI Transmission Zone M-3 Process
Shenango 345/138 kV Transformers No. 1 and No. 2

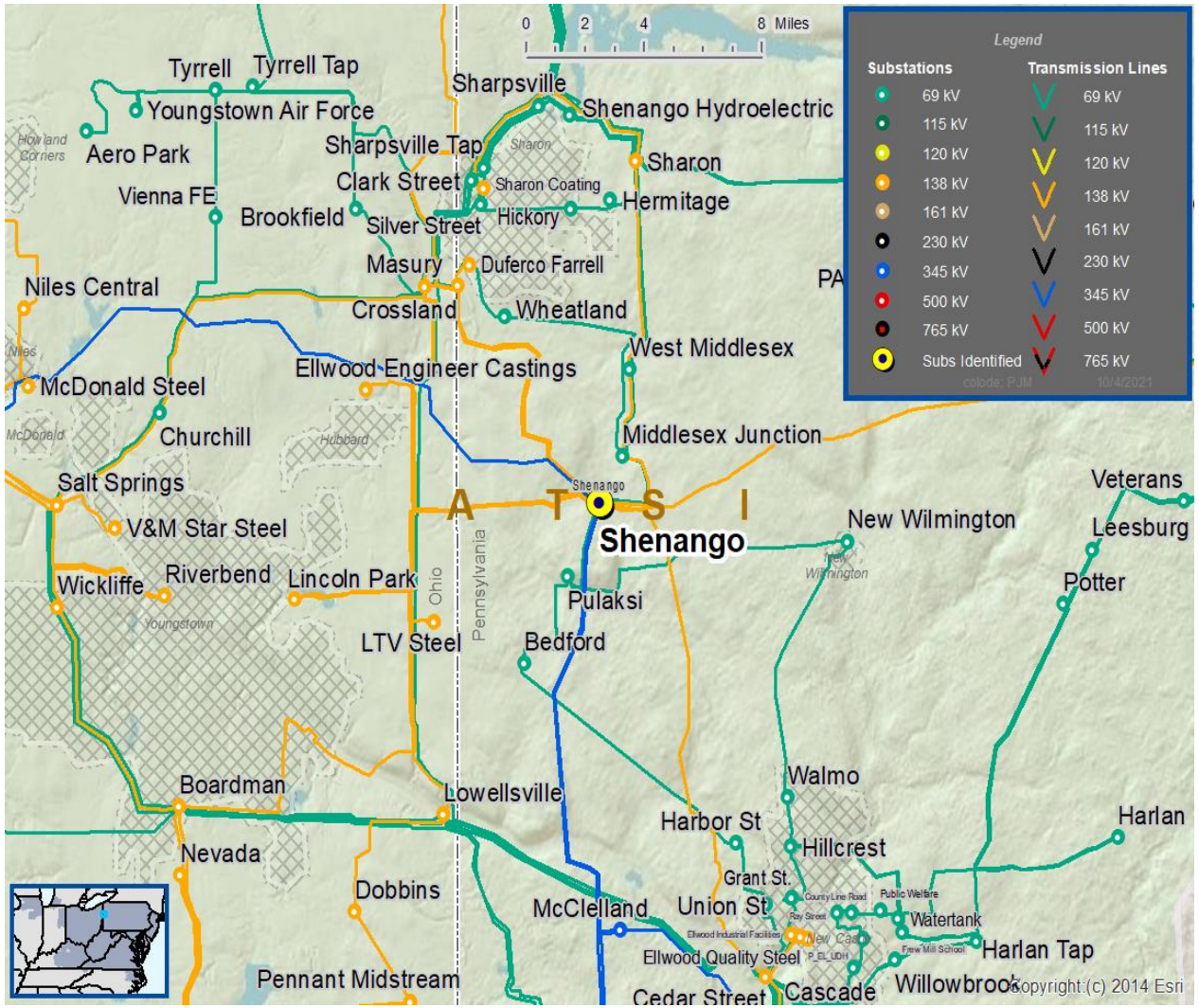
Need Number: ATSI-2021-024

Process Stage: Need Meeting – 10/15/2021

Problem Statement:

- The existing protection scheme on the Shenango 345/138 kV Transformers No. 1 and No. 2 is sensitive to neutral overcurrent inrush, which may cause unnecessary trips.
- Transformer circuit ratings are limited by disconnect switches, CT's, breakers, and substation conductor.

Model: 2020 Series RTEP Model for 2025 Summer



ATSI Transmission Zone M-3 Process
Relay Misoperation Projects

Need Number: ATSI-2021-025, ATSI-2021-026

Process Stage: Need Meeting - 10/15/2021

Project Driver:

Equipment Material Condition, Performance and Risk

Specific Assumption References:

Global Factors

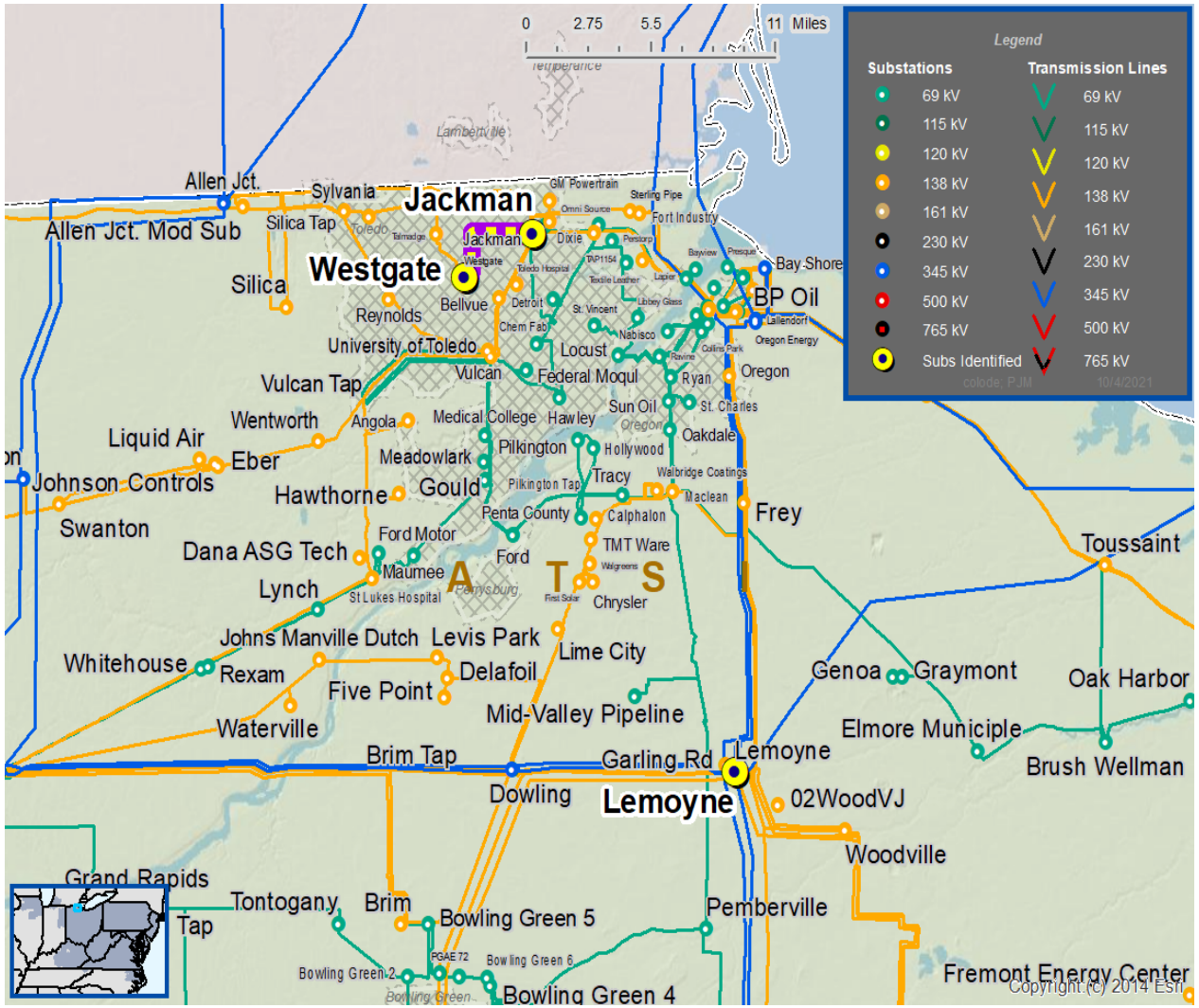
- System reliability and performance
- Substation / line equipment limits

Upgrade Relay Schemes

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

Problem Statement:

- FirstEnergy has identified protection schemes using a certain vintage of relays and communication equipment that have a history of misoperation.
- Proper operation of the protection scheme requires all the separate components perform adequately during a fault
- In many cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.



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ATSI Transmission Zone M-3 Process
Relay Misoperation Projects

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Need Number	Transmission Line / Substation Locations	Existing Line / Terminal Equipment MVA Rating (SN / SE)	Existing Conductor / Transformer MVA Rating (SN / SE)	Limiting Terminal Equipment
ATSI-2021-025	Jackman-Westgate 138 kV Line	278 / 343 327 (WN) / 396 (WE)	278 / 343 327 (WN) / 420 (WE)	Substation Conductor
ATSI-2021-026	Lemoyne-Troy 345 kV Line 1. Lemoyne terminal	1,146 / 1,208 1,309 (WN) /1,352 (WE)	1,542 / 1,878 1,746 (WN) / 2,225 (WE)	CTs, Circuit breaker B1, Substation Conductor, and disconnect switches

ATSI Transmission Zone M-3 Process
Medina/Seville Area

Need Number: ATSI-2021-021

Process Stage: Need Meeting – 10/15/2021

Supplemental Project Driver(s):

Operational Flexibility and Efficiency

Equipment Material Condition, Performance and Risk

Specific Assumption Reference(s)

Global Considerations

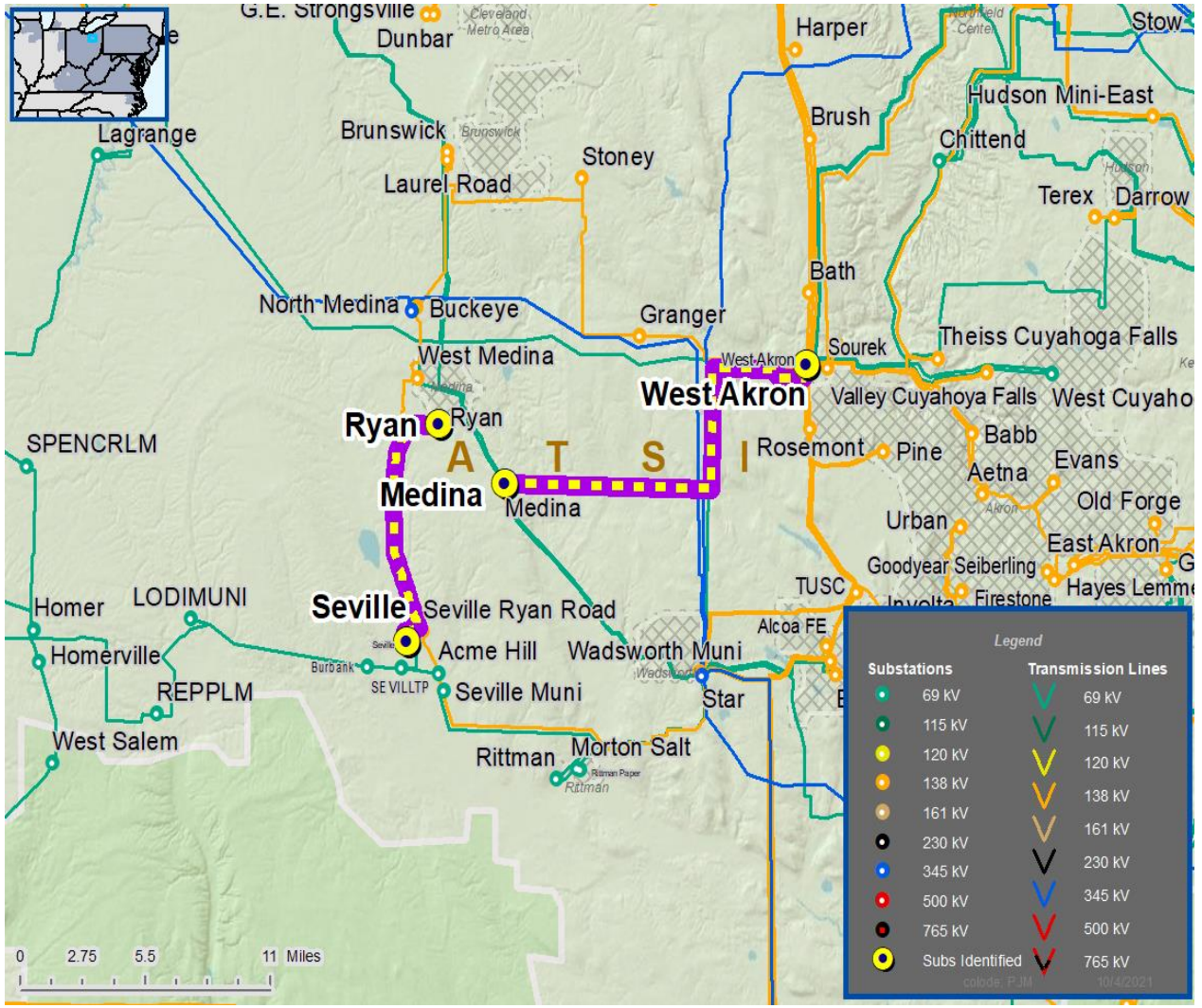
- System Reliability and Performance
- Substation/line equipment limits
- Reliability of Non-BES Facilities
- Load at risk in planning and operational scenarios.
- Load and/or customers at risk on single transmission lines

Add/Expand Bus Configuration

- Loss of substation bus adversely impacts transmission system performance
- Eliminate simultaneous outages to multiple networked elements under N-1 analysis

Network Radial line

- Network Radial Line



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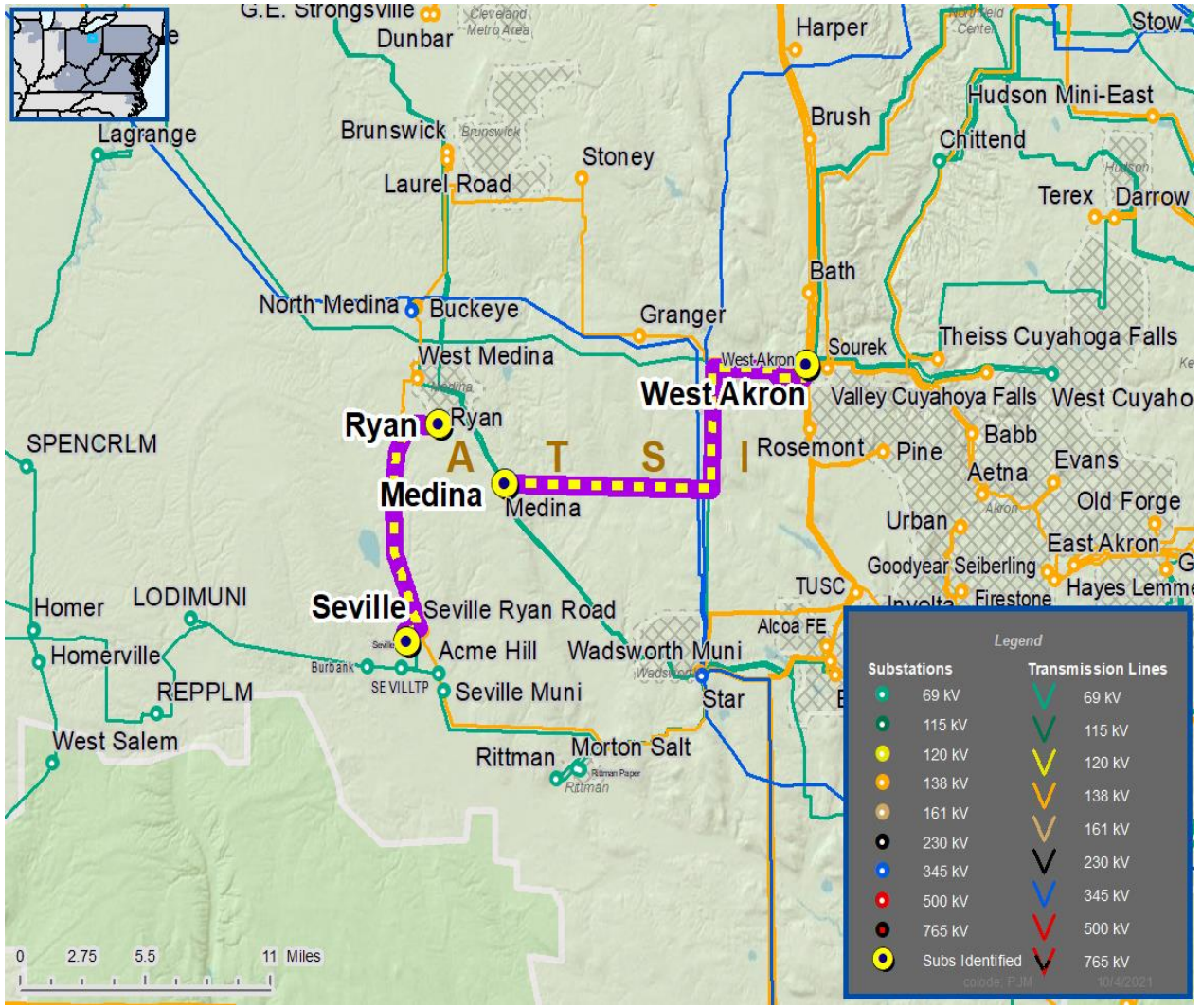
ATSI Transmission Zone M-3 Process
Medina/Seville Area

Need Number: ATSI-2021-021

Process Stage: Need Meeting – 10/15/2021

Problem Statement:

- At Medina Substation the 69 kV bus consists of a main and transfer bus. A fault on the bus or between the bus and the circuit breaker or failure of a relay to trip will result in an outage of the entire bus, interrupting four 69 kV lines, four distribution transformers and one 69 kV capacitor bank, resulting in loss of approximately 59 MW and 8,451 customers.
- An N-1-1 outage of the Medina-West Akron 69 kV Lin and the Medina-Star 69 kV Line causes low voltage (88% of nominal 69 kV voltage) and a total loss of load at the Medina 69 kV Substation and Medina Industries (Medina) 69 kV Line with loss of approximately 59 MW and 8,451 customers.
- An N-1-1 outage of the Ryan-Seville 138 kV Line and the North Medina-West Medina 138 kV Line results in a total load loss at Ryan Substation and West Medina Substation with loss of approximately 46 MW and 11,971 customers.
- The Medina Industries (Medina) 69 kV Line is a radial line
  - The line serves eight delivery points, approximately 27 MW of load and 1,057 customers.
  - Lack of operational flexibility during maintenance outages.
  - Customer complaints during outage on the radial line due to lack of alternate source to serve the customers.
  - High industrial customer growth area.



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ATSI Transmission Zone M-3 Process
Medina/Seville Area

Need Number: ATSI-2021-021

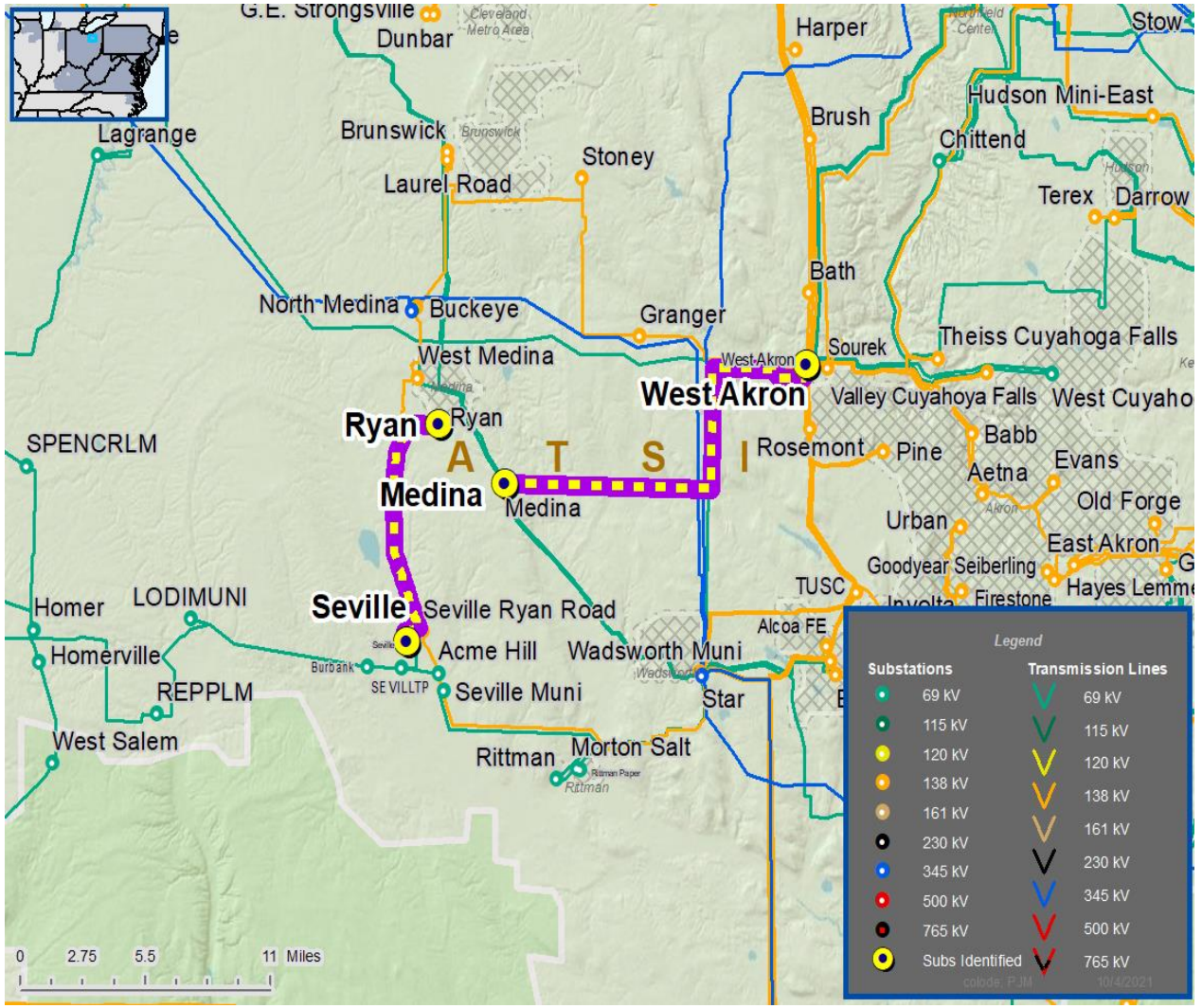
Process Stage: Need Meeting – 10/15/2021

Problem Statement

Past five-year outage history (2017-2021):

- Medina-Star 69 kV Line, one (1) momentary outage and two (2) sustained outages.
- Medina Industries (Medina) 69 kV Line, three (3) momentary and three (3) sustained outages.
- Medina-West Akron 69 kV Line, two (2) momentary and three (3) sustained outages.
- Abbe-Medina 69 kV Line, six (6) momentary outage and six (6) sustained outages.
- Ryan-Seville 138 kV Line, one (1) sustained outage.
- North Medina-West Medina 138 kV Line, one (1) sustained outage.
- Ryan-West Medina 138 kV Line, one (1) sustained outage.
- Seville-Star 138 kV Line, one (1) momentary outage and one (1) sustained outages.

Model: 2020 RTEP 2025 Case



Re-Present 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

ATSI Transmission Zone
Lincoln Park-Riverbend 138 kV Line

Need Number: ATSI-2019-003 (s1947)
Process Stage: Solution Meeting
Re-present Solution: 10/15/2021
Solutions Meeting: 03/25/2019
Needs Meeting: 01/14/2019

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.

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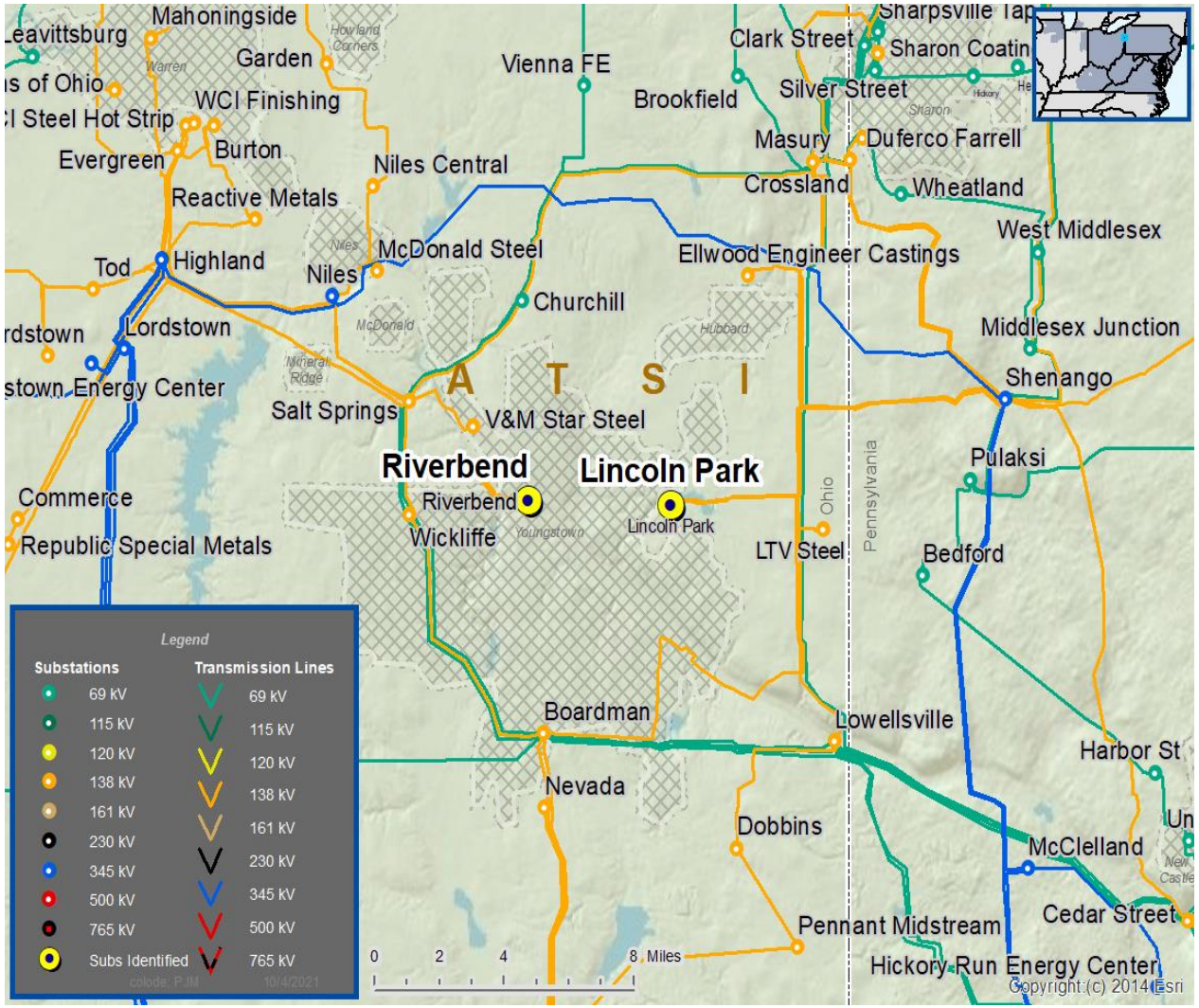


ATSI Transmission Zone
Lincoln Park-Riverbend 138 kV Line

Need Number: ATSI-2019-003 (s1947)
Process Stage: Solution Meeting
Re-present Solution: 10/15/2021
Solutions Meeting: 03/25/2019
Needs Meeting: 01/14/2019

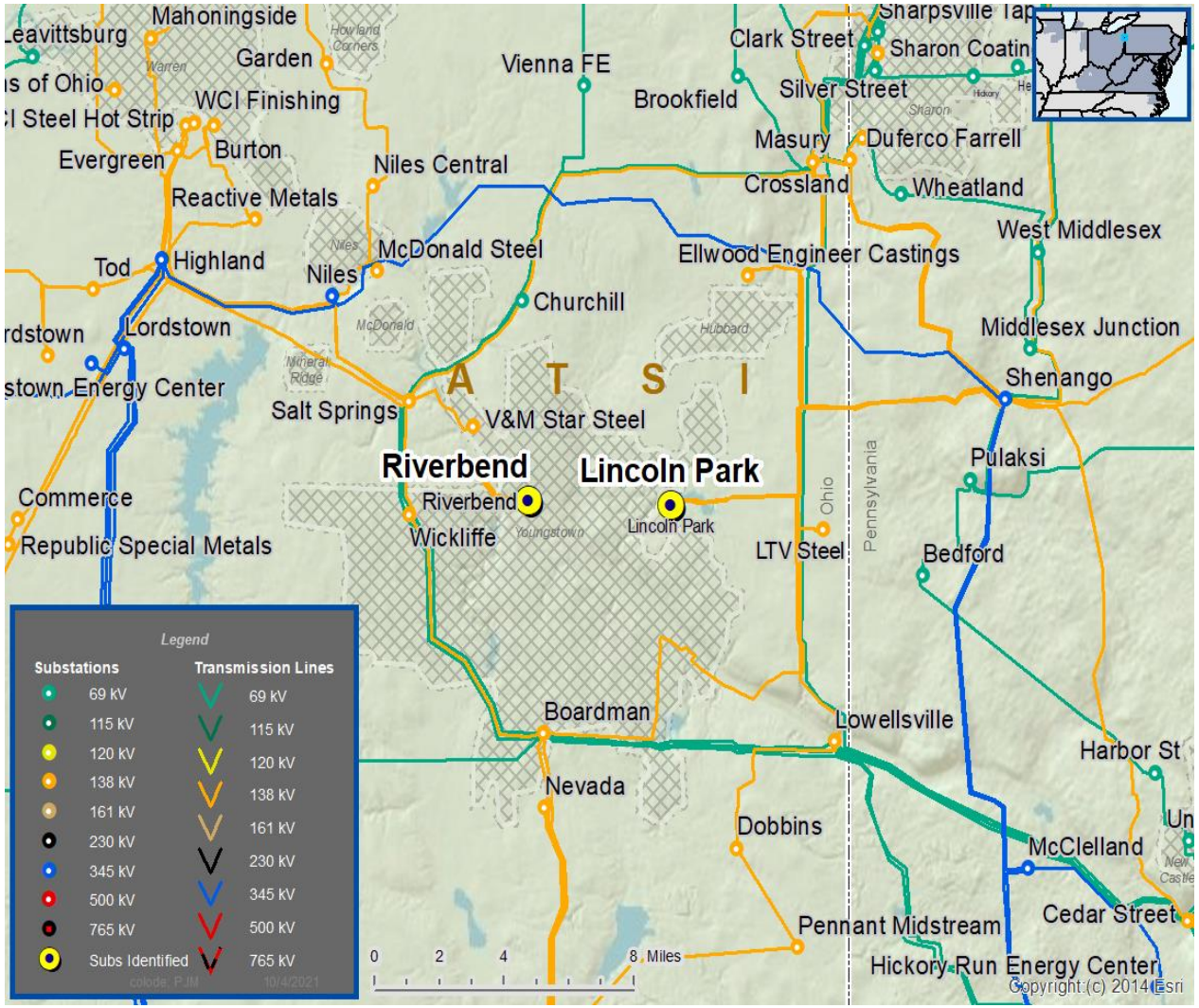
Problem Statement - Continued

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).



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ATSI Transmission Zone
Lincoln Park-Riverbend 138 kV Line

Need Number: ATSI-2019-003 (s1947)
Process Stage: Solution Meeting
Re-present Solution: 10/15/2021
Solutions Meeting: 03/25/2019
Needs Meeting: 01/14/2019

Proposed Solution:

Lincoln Park – Riverbend 138 kV Line

- Build a new 138 kV line from Riverbend Substation 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 Substation 138 kV ring bus by installing one 138 kV breaker allowing for a new line terminal
- Replace 138 kV breakers B-5 & B-7 at Lincoln Park Substation
- Replace 138 kV breaker B-11 at Riverbend Substation

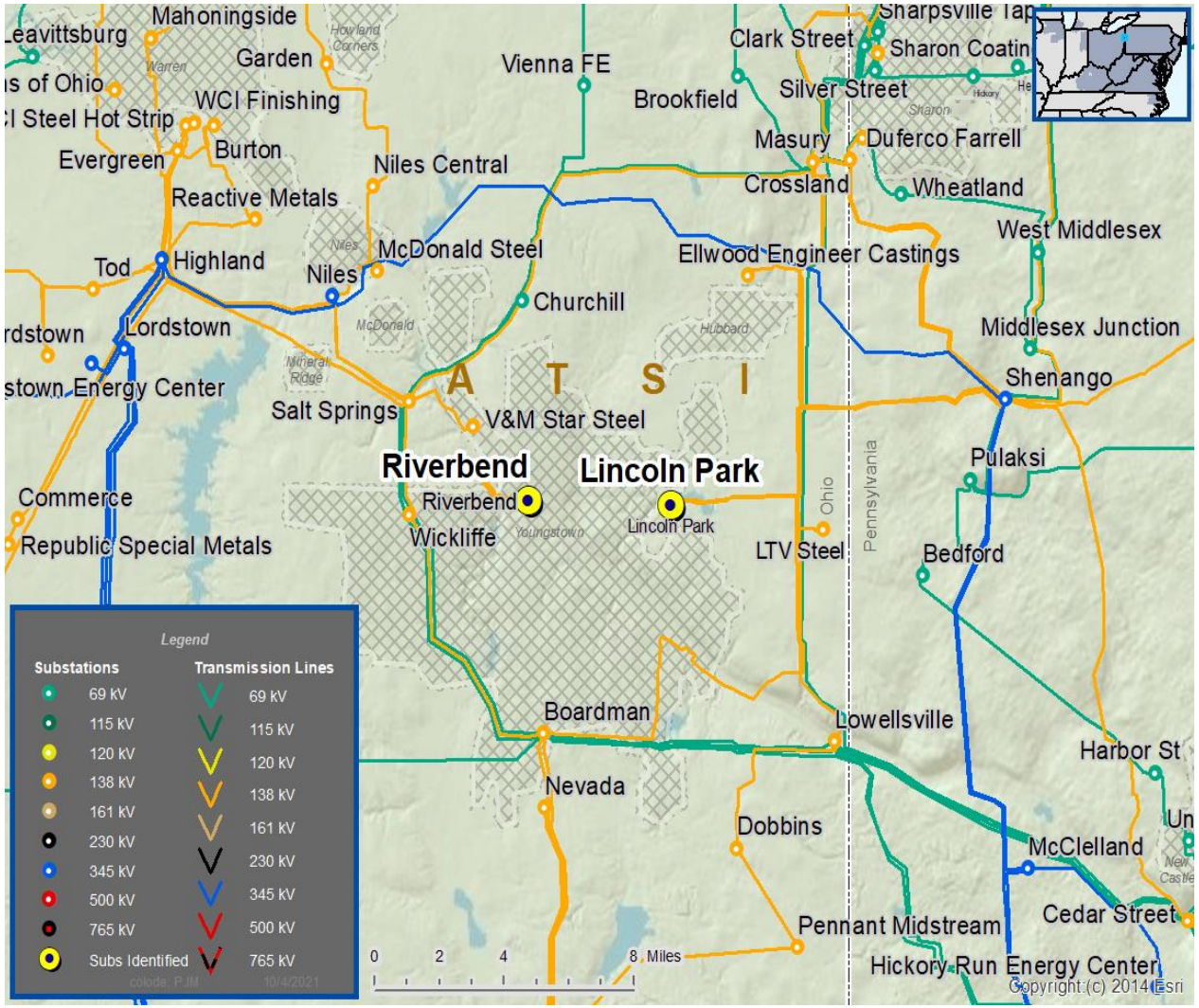
Transmission Line Ratings:

- 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~~ $30.5M
Projected IS Date: ~~12/31/2022~~ 12/31/2023
Status: ~~Conceptual~~ Engineering



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

10/05/2021 – V1 – Original version posted to pjm.com