Subregional RTEP Committee – Western
FirstEnergy Supplemental Projects

August 16, 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
Leroy Center - Mayfield Q2 138 kV Line

Need Number: ATSI-2021-015
Process Stage: Need Meeting – 08/16/2021

Supplemental Project Driver(s):
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
- Increase line loading limits
- Age/condition of transmission line conductors

Line Condition Rebuild/Replacement

- Transmission lines with loading at 80% or greater

Problem Statement

- The Leroy Center – Mayfield Q2 138 kV Line loads to 95% under contingency conditions in the 2020 RTEP Case.
- The Leroy Center – Mayfield Q2 138 kV Line has the potential to feed 7,017 customers and 20 MW at the Pawnee Substation, back up feed to LC-MF Q1 138 kV Line.
- The existing conductor is 4/0 CU and can cause protection issues due to not being able to handle the short circuit current for faults.

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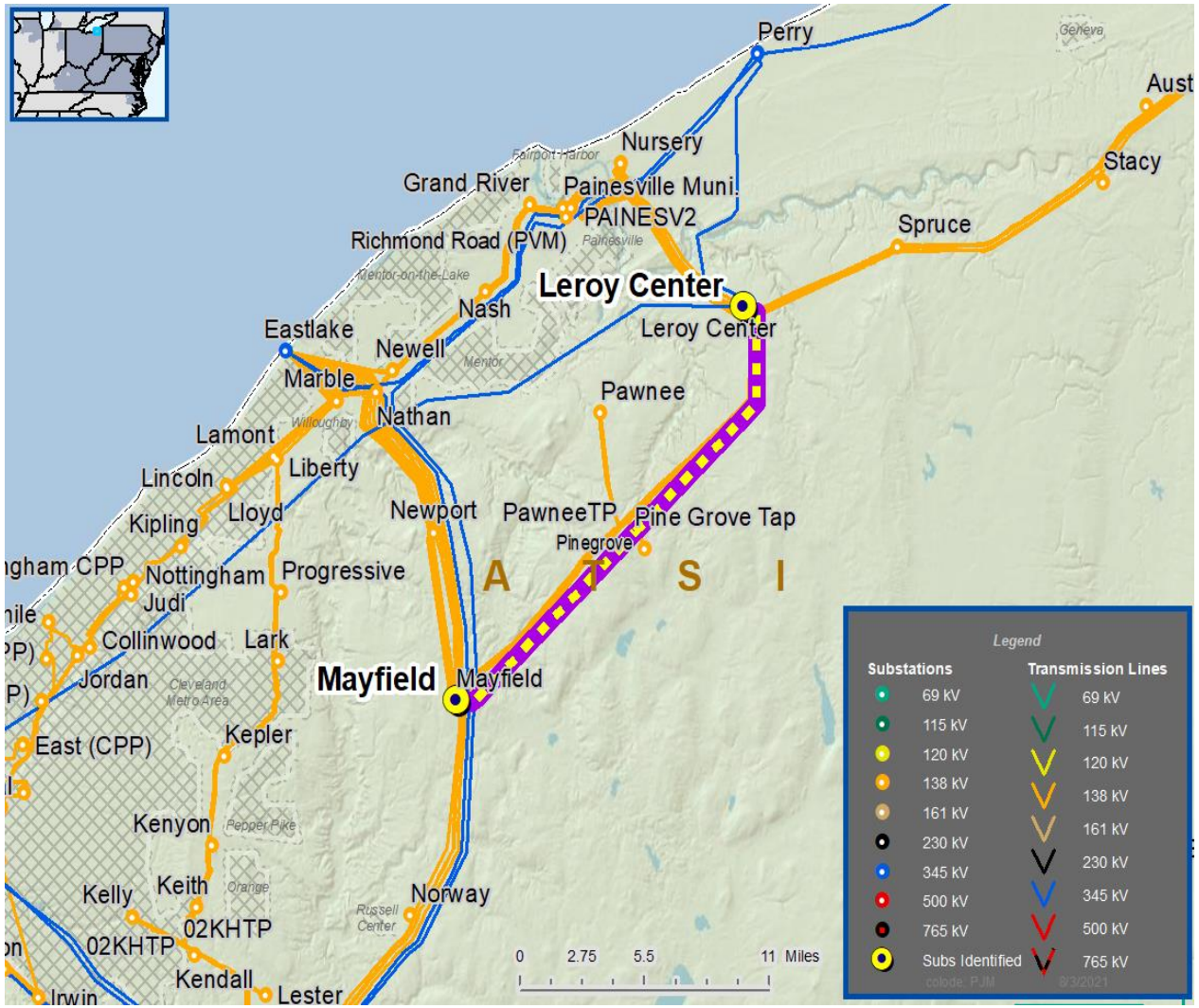
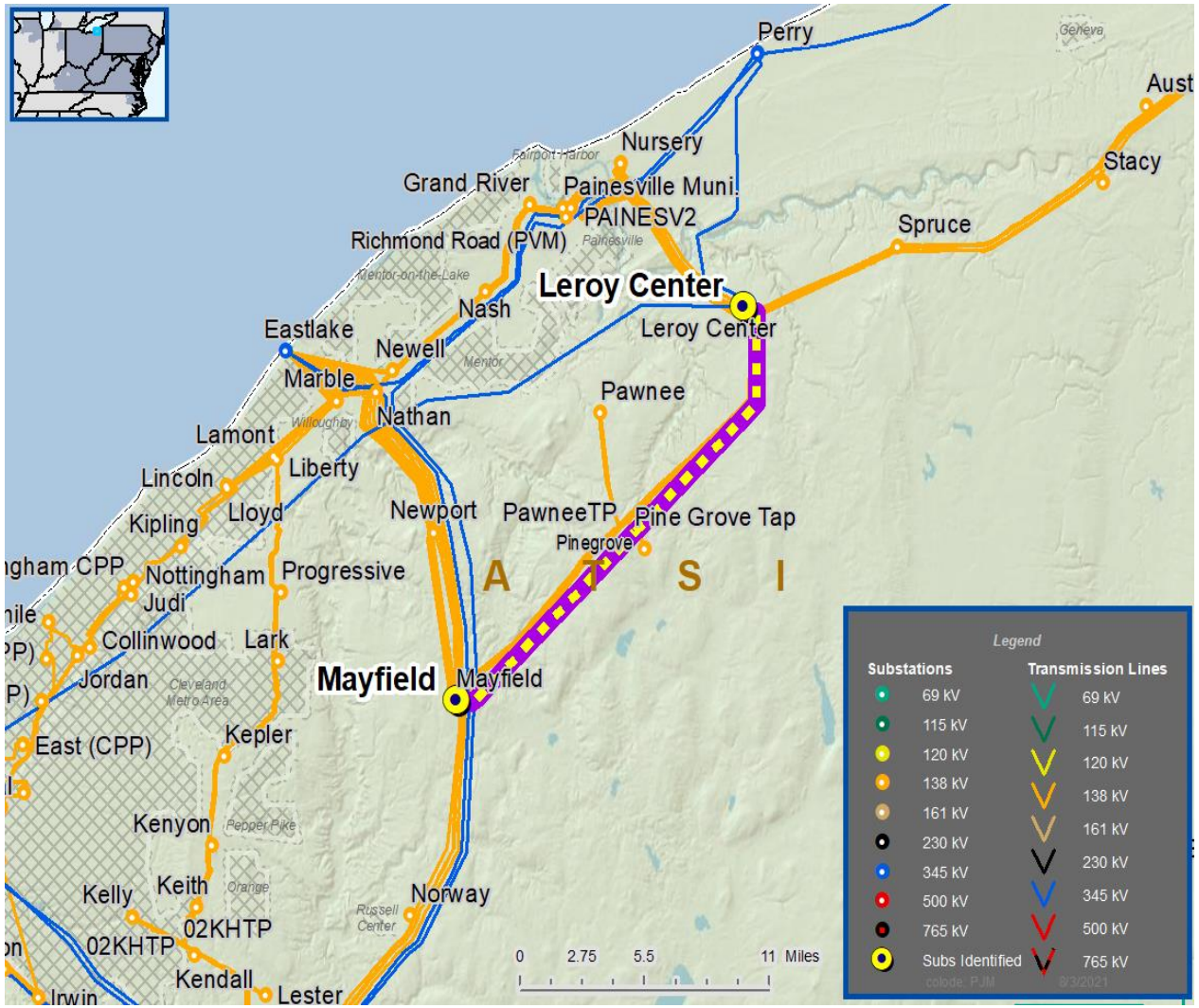


ATSI Transmission Zone M-3 Process
Leroy Center - Mayfield Q2 138 kV Line

Need Number: ATSI-2021-015
Process Stage: Need Meeting – 08/16/2021

Problem Statement Continued…

- Age/condition of transmission line conductors and hardware (mid 1940s).
- The Leroy Center – Mayfield Q2 138 kV Line has experienced one (1) sustained outage in the past five years.



ATSI Transmission Zone M-3 Process
Leroy Center - Mayfield Q3 138 kV Line

Need Number: ATSI-2021-016
Process Stage: Need Meeting – 08/16/2021

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

Specific Assumption Reference(s):
Global Factors

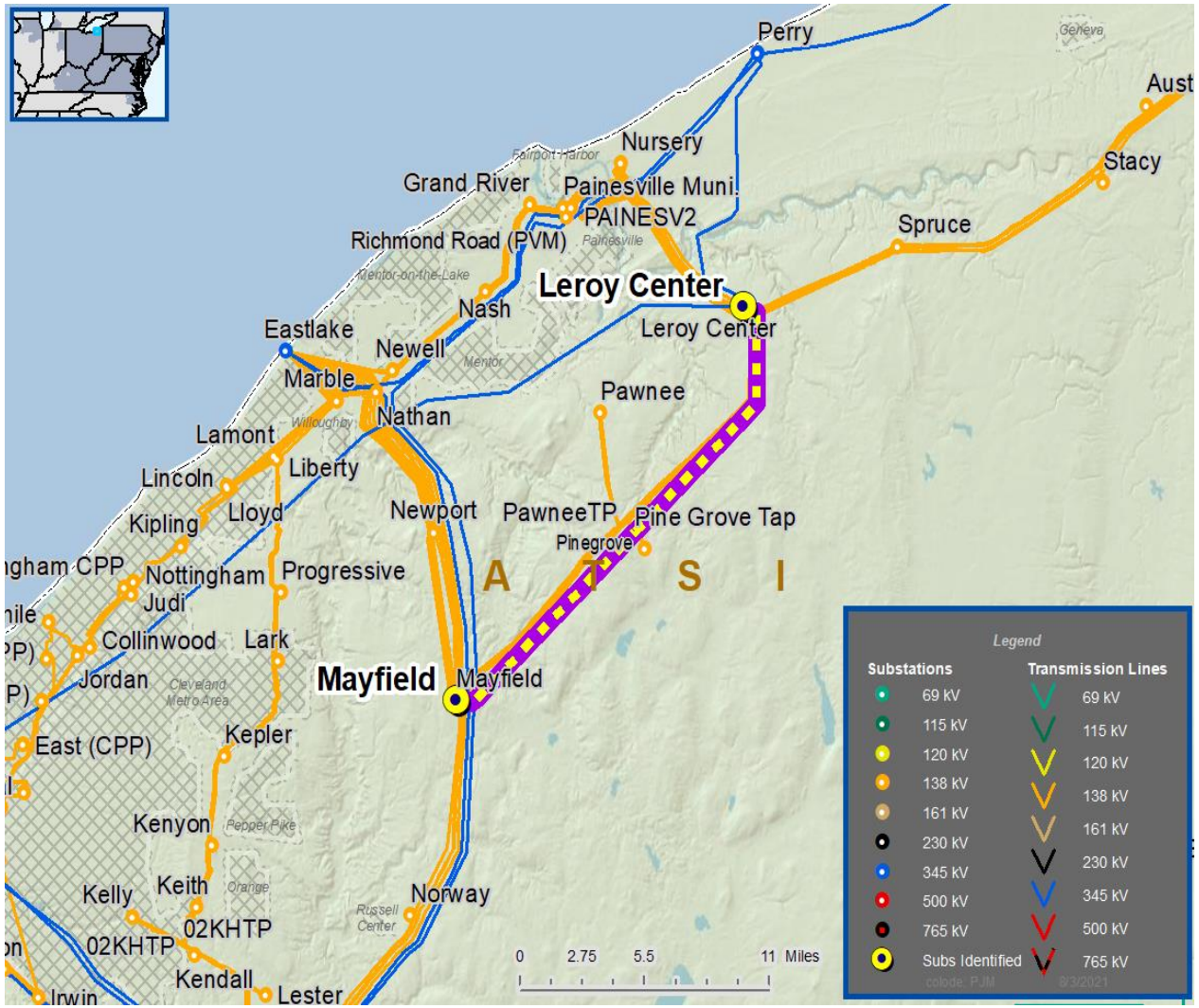
- System Reliability and Performance
- Load at risk in planning and operational scenarios
- Increase line loading limits
- Age/condition of transmission line conductors

Line Condition Rebuild/Replacement

- Transmission lines with loading at 80% or greater

Problem Statement

- The Leroy Center – Mayfield Q3 138 kV Line loads to 89% under contingency conditions in the latest RTEP Case.
- The Leroy Center – Mayfield Q3 138 kV Line feeds 4,938 customers and 21 MW at the Pinegrove Substation.
- The existing conductor is 4/0 CU and can cause protection issues due to not being able to handle the short circuit current for faults.
- Age/condition of transmission line conductors and hardware (mid 1940s).



ATSI Transmission Zone M-3 Process
Dowling – Lemoyne 138 kV Line - New Customer

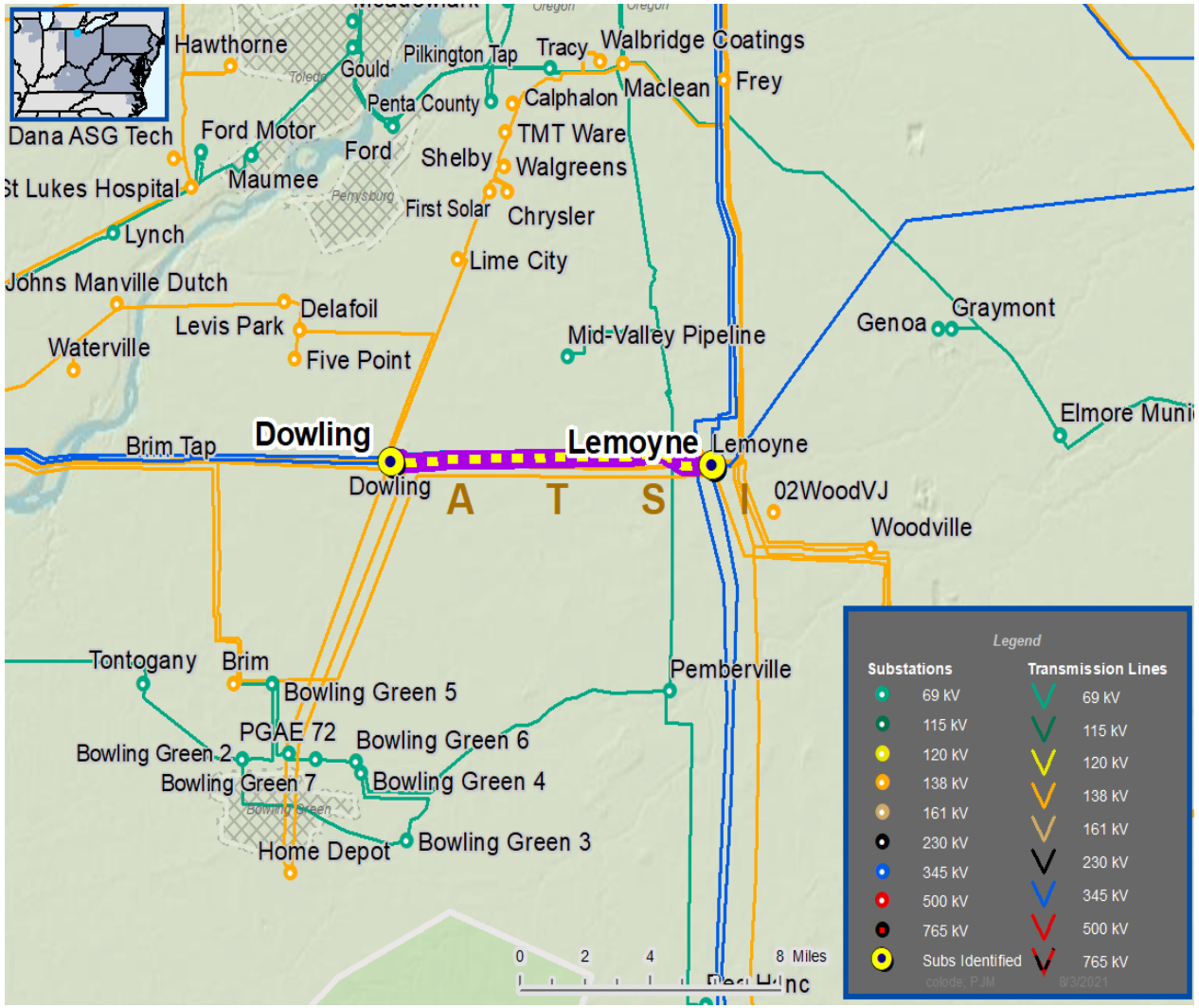
Need Number: ATSI-2021-020
Process Stage: Need Meeting – 08/16/2021

Supplemental Project Driver(s):
Customer Service

Specific Assumption Reference(s)
Customer connection request 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 transmission service for approximately 30 MVA of total load near the Dowling – Lemoyne 138 kV Line.

Requested In-Service Date: May 01, 2022



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 M-3 Process
West Akron Transfer Breaker B-22

Need Number: ATSI-2021-010
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 04/16/2021

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

Substation Condition Rebuild/Replacement

- Increasing negative trend in maintenance findings and/or costs.
- Expected service life (at or beyond) or obsolescence

Add/Expand Bus Configuration

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

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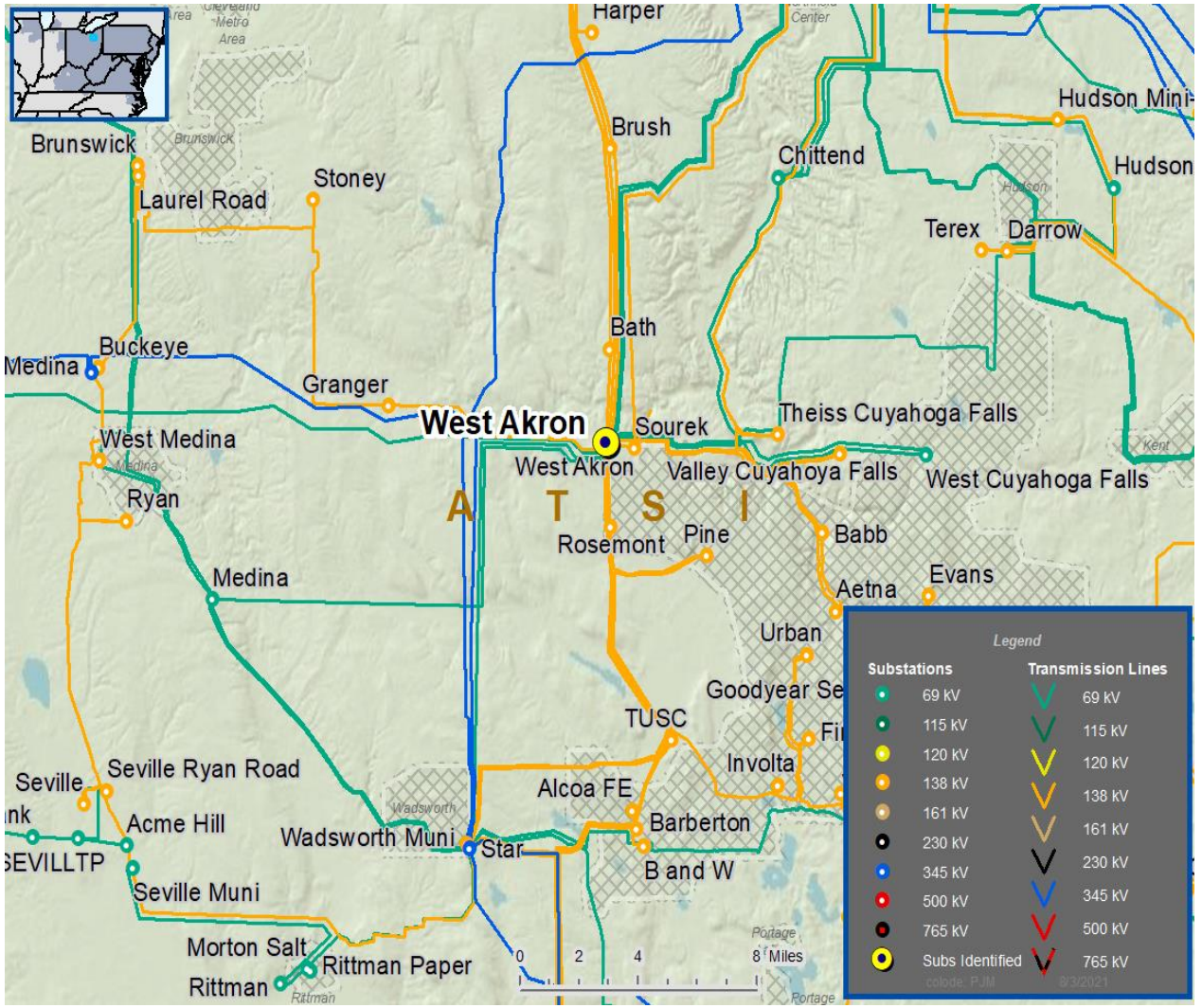
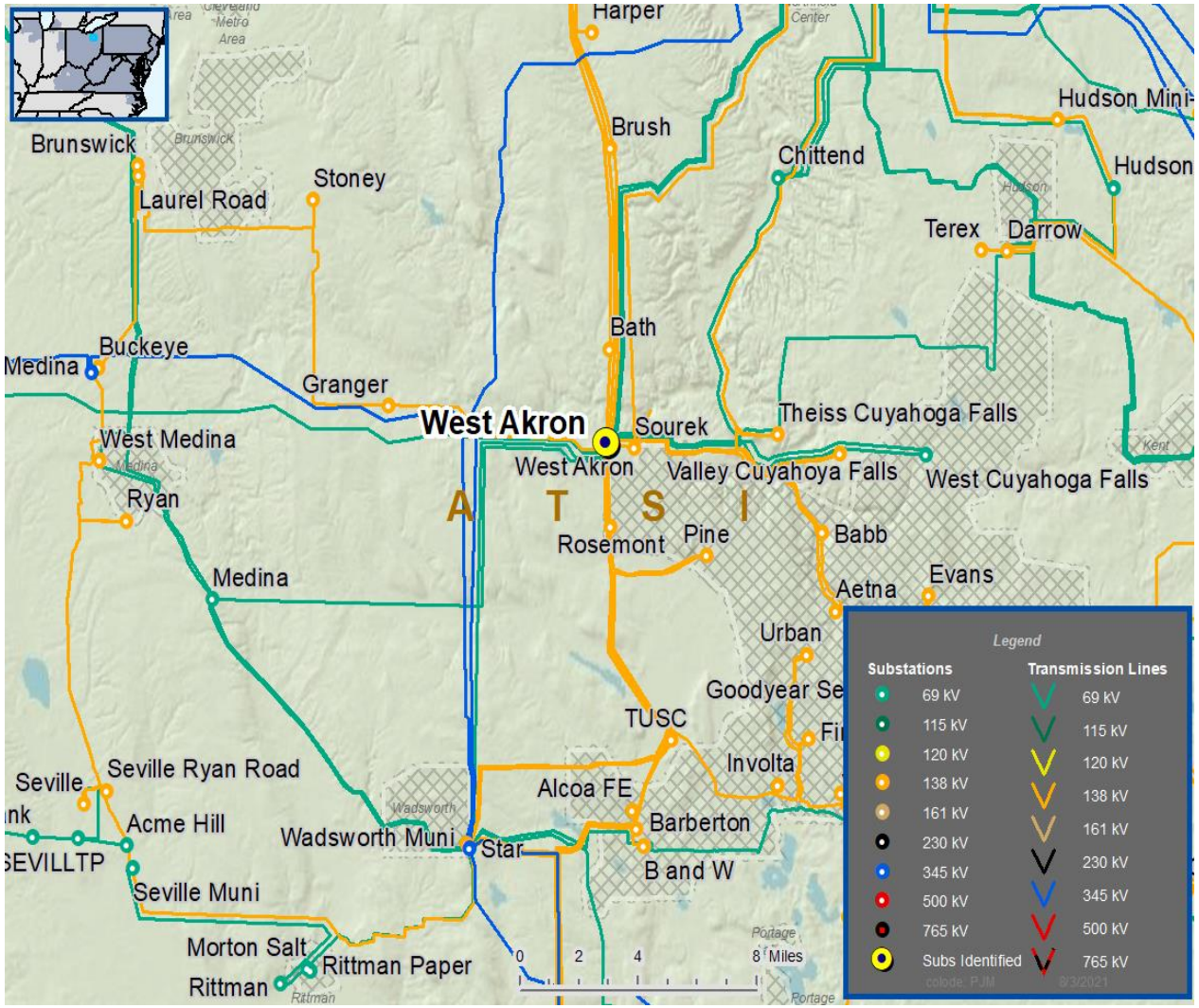


ATSI Transmission Zone M-3 Process
West Akron Transfer Breaker B-22

Need Number: ATSI-2021-010
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 04/16/2021

Problem Statement *continued…*

- West Akron 138 kV Breaker Transfer Breaker B-22 and associated disconnect switches
  - Oil Circuit Breaker (OCB) with increasing maintenance concerns; compressor issues, deteriorated operating mechanisms and increasing maintenance trends
  - Breaker B-22 is 40 years old



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ATSI Transmission Zone M-3 Process
West Akron Transfer Breaker B-22

Need Number: ATSI-2021-010
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 04/16/2021

Proposed Solution:

- Replace 138 kV bus tie circuit breaker B-22 and breaker leads
- Replace disconnect switch D-108 and D-109
- Install new SEL-501 breaker failure relying for 138 kV breaker B-22
- Replace transfer breaker line relaying for 138 kV breaker B-22

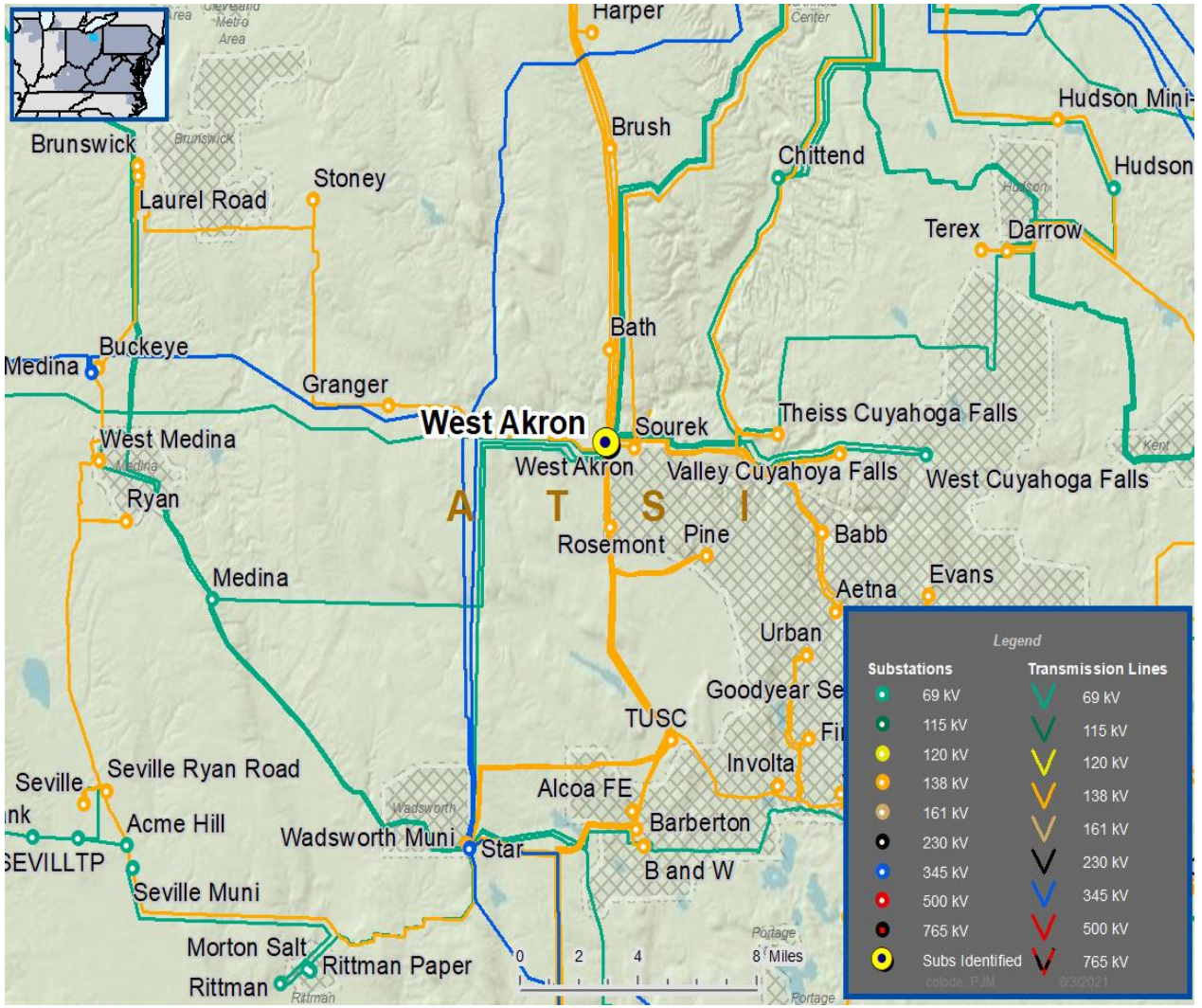
Transmission Line Ratings:

- Old 191MVA/SN 191MVA/SE
- New 221MVA/SN 262MVA/SE

Alternatives Considered:

- Maintain existing condition and risk of failure.

Estimated Project Cost: $0.7M
Projected IS Date: 02/25/2022
Status: Engineering



ATSI Transmission Zone M-3 Process
Cedar St – Frisco #1 69 kV Line - New Customer

Need Number: ATSI-2021-018

Process Stage: Solutions Meeting – 08/16/2021

Previously Presented: Need Meeting 07/16/2021

Supplemental Project Driver(s):

Customer Service

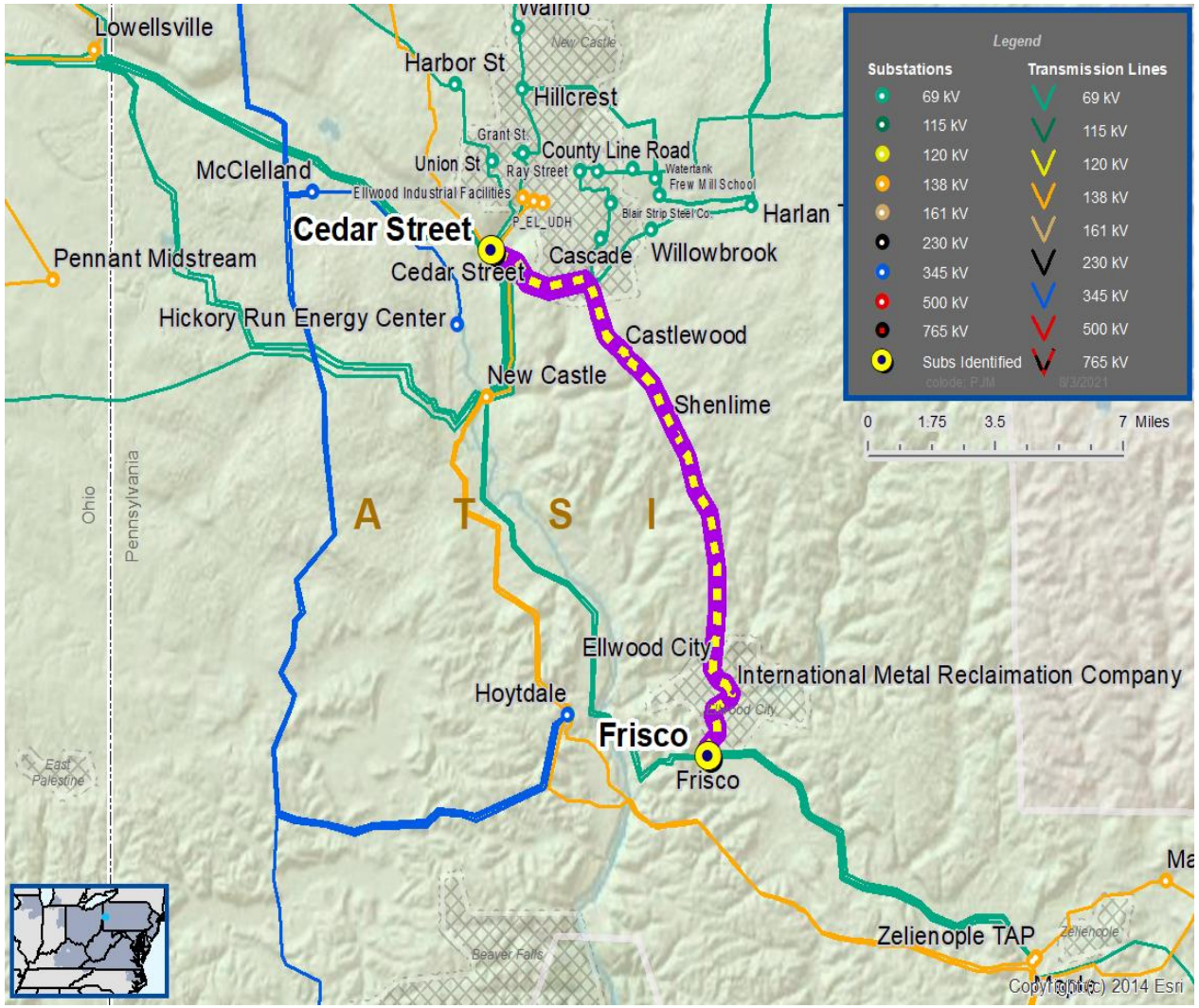
Specific Assumption Reference(s)

Customer connection request evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document.

Problem Statement

New Customer Connection – A customer requested 69 kV transmission service for approximately 4 MVA of total load near the Cedar St – Frisco #1 69 kV Line.

Requested In-Service Date: May 1, 2022



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ATSI Transmission Zone M-3 Process
Cedar St – Frisco #1 69 kV Line - New Customer

Need Number: ATSI-2021-018
Process Stage: Solutions Meeting – 08/16/2021
Previously Presented: Need Meeting 07/16/2021

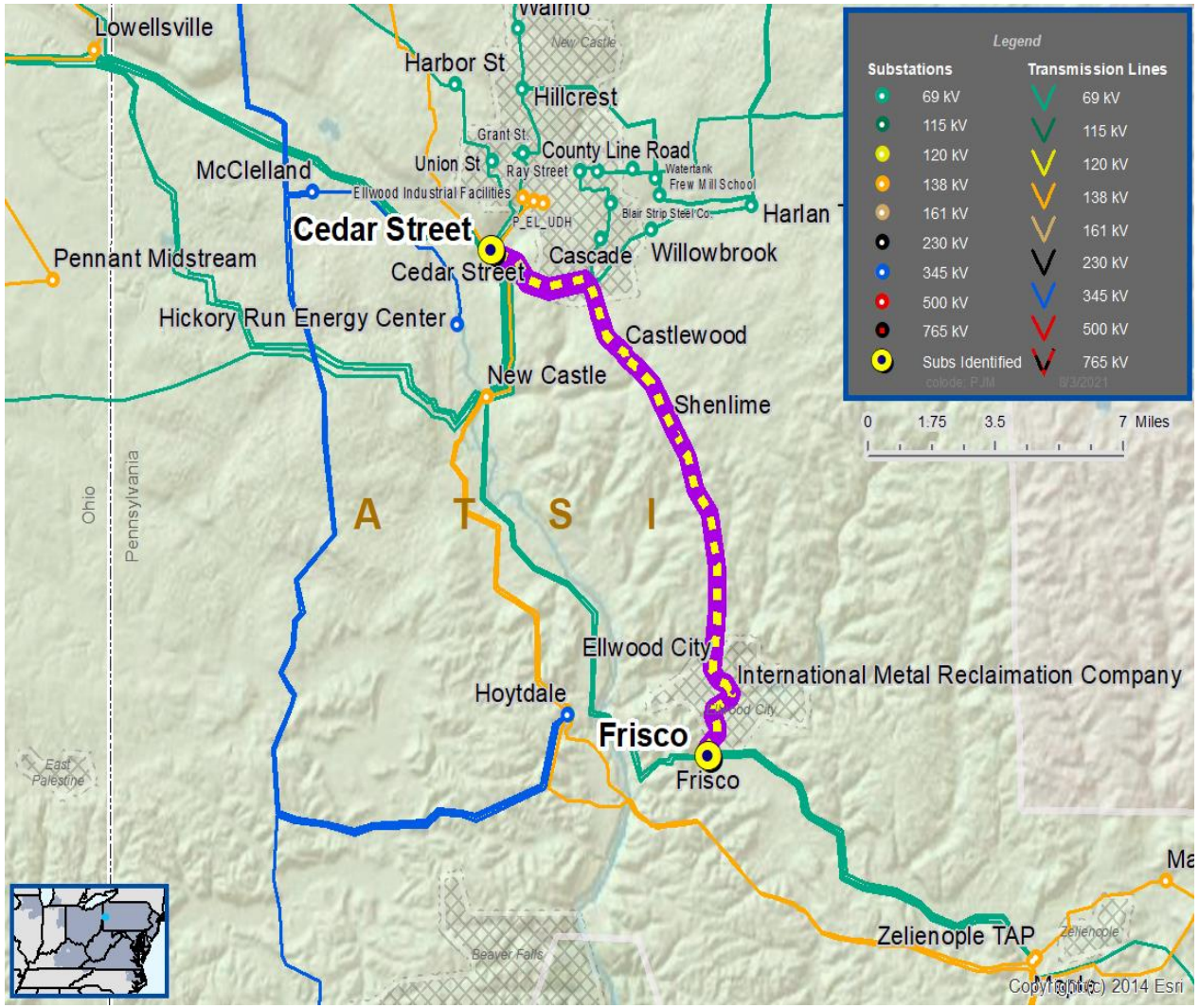
Proposed Solution:

- Tap the Cedar St – Frisco #1 69 kV Line between Cedar St and Inmetco
- Install two network 69 kV disconnect switches
- Install one 69 kV tap switch
- Construct ~1 span of 69 kV into new substation
- Adjust relaying at Cedar St and Frisco substations

Alternatives Considered:

- Tap the Cedar St – Frisco #2 69 kV Line

Estimated Project Cost: $1.4M
Projected In-Service: 05/01/2022
Project Status: Conceptual
Model: 2020 RTEP model for 2025 Summer (50/50)



ATSI Transmission Zone M-3 Process
London-Tangy 138 kV Line - New Customer

Need Number: ATSI-2021-017

Process Stage: Solution Meeting – 08/16/2021

Previously Presented: Need Meeting – 07/16/2021

Supplemental Project Driver(s):

Customer Service

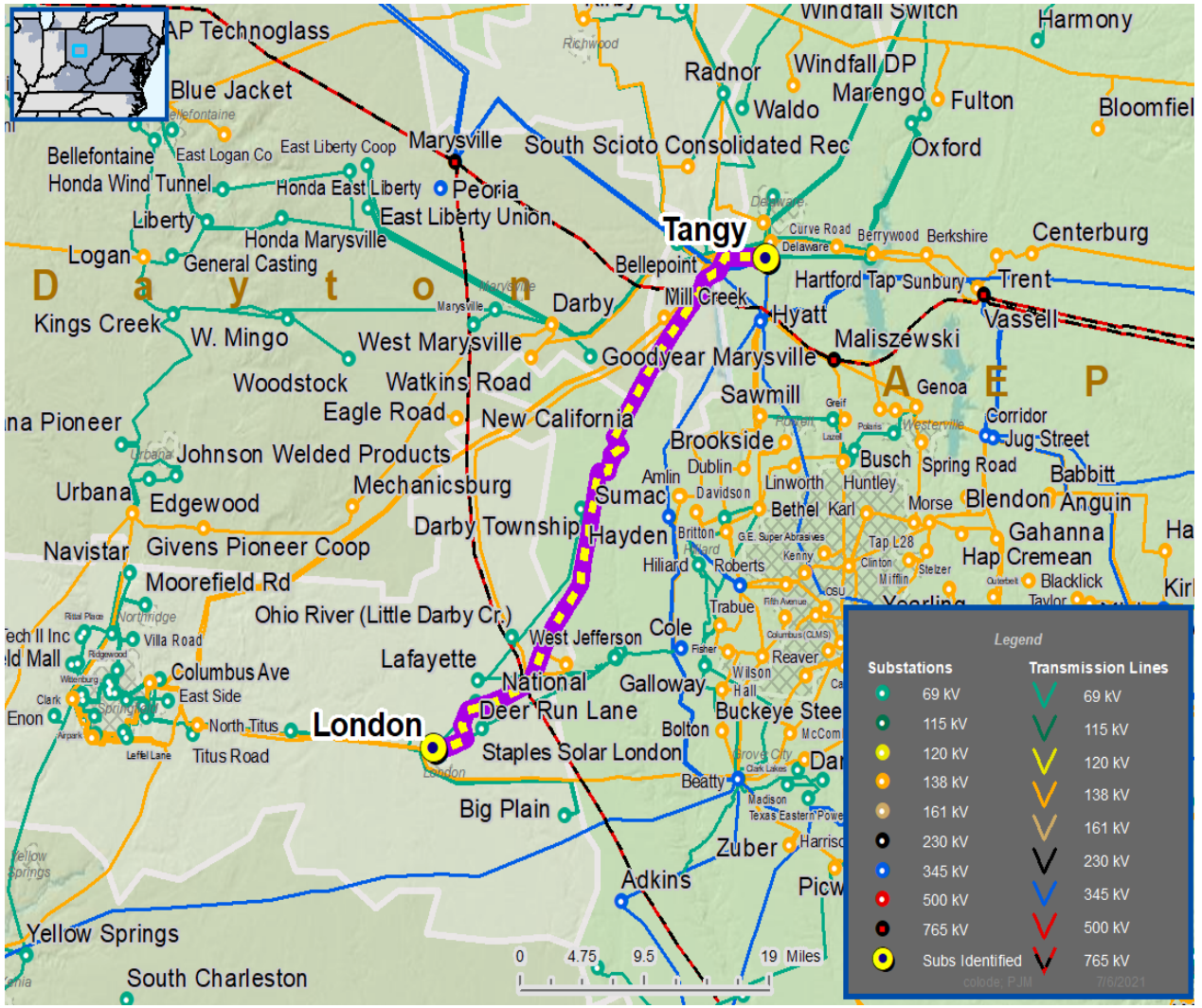
Specific Assumption Reference(s)

Customer connection request 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 transmission service for approximately 23 MVA of total load near the London-Tangy 138 kV Line.

Requested In-Service Date: April 30, 2022



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ATSI Transmission Zone M-3 Process
London-Tangy 138 kV Line - New Customer

Need Number: ATSI-2021-017
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 07/16/2021

Proposed Solution:

Mitchell Delivery Point 138 kV Transmission Line Tap

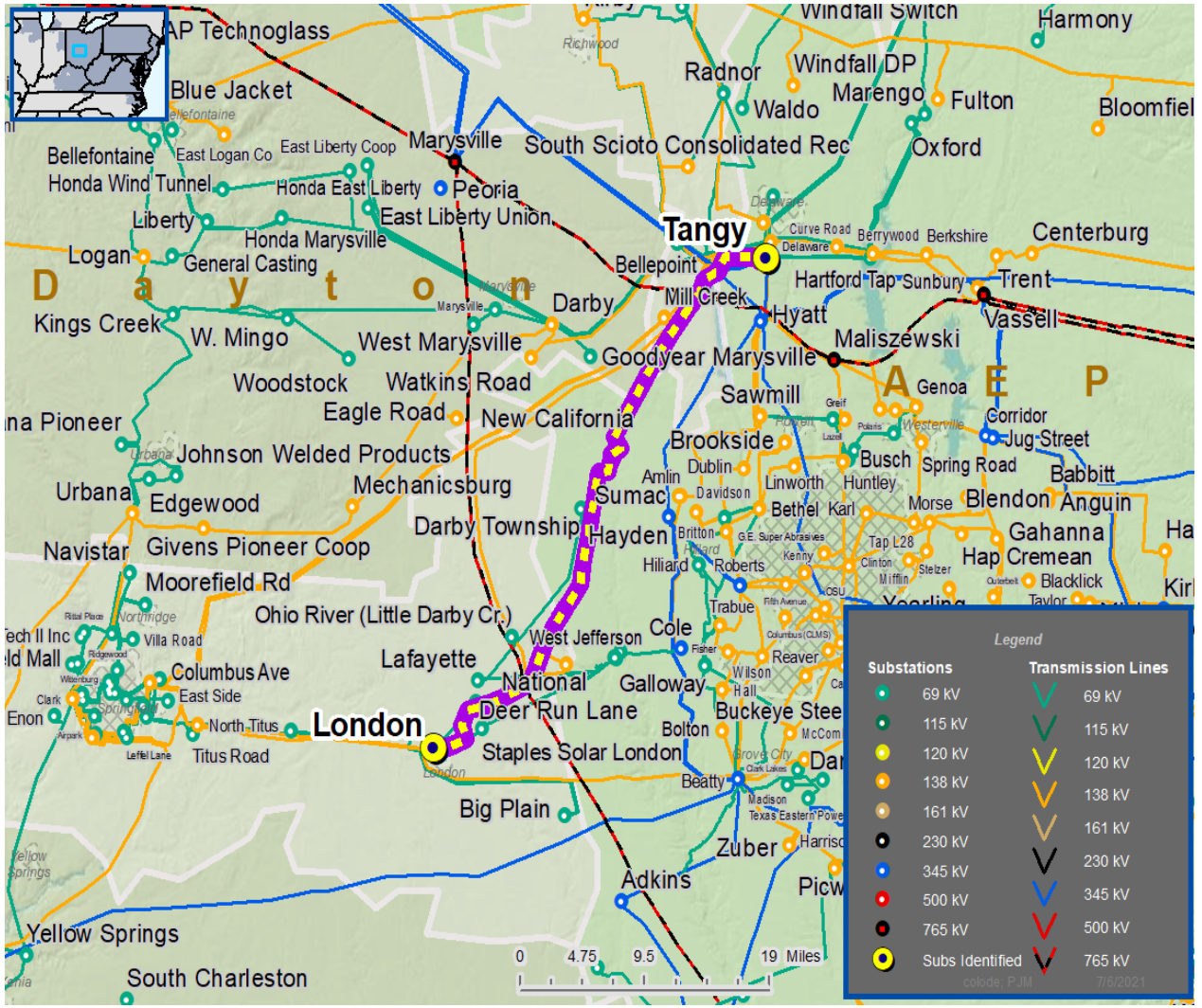
- Construct a 138 kV tap (approximately 1-2 spans) off the London-Tangy 138 kV Line. Tap location is approximately 15 miles from the Tangy Substation.
- Add two SCADA control switches at transmission line tap location and one tap switch
- Adjust relay settings at London and Tangy substations

Alternatives Considered:

- No alternatives considered for this project

Estimated Project Cost: $1.4 M

Projected In-Service: 4/30/2022
Status: Engineering
Model: 2020 Series 2025 Summer RTEP 50/50



ATSI Transmission Zone M-3 Process
GM Powertrain – Jackman 138 kV Line

Need Number: ATSI-2021-008
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 04/16/2021

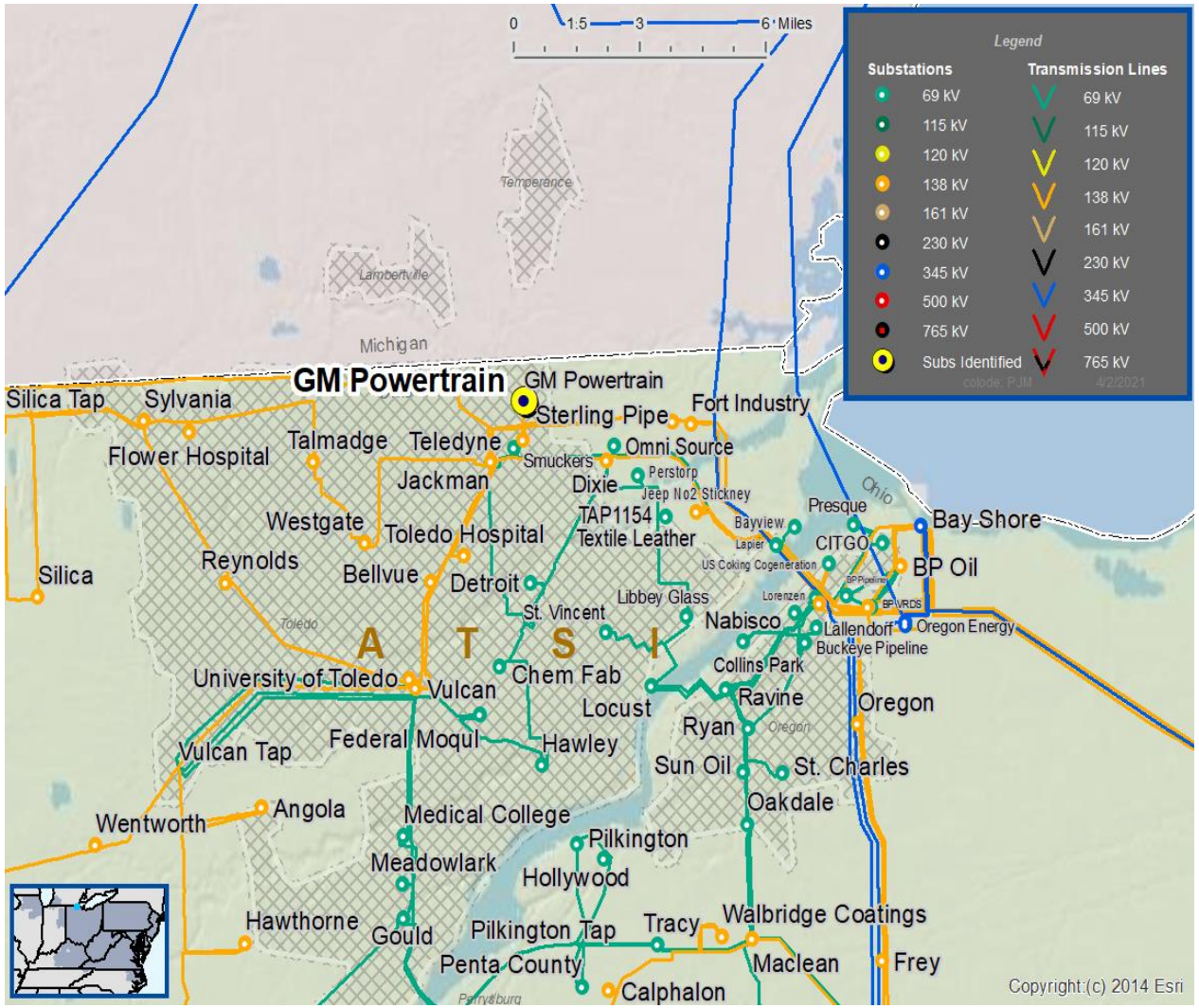
Supplemental Project Driver(s):
Equipment Material Condition, Performance, and Risk
Infrastructure Resilience

Specific Assumption Reference(s):
Global Factors

- 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
- Expected service life (at or beyond) or obsolescence

Substation Condition Rebuild/Replacement

- Circuit breakers and other fault interrupting devices
- Switches



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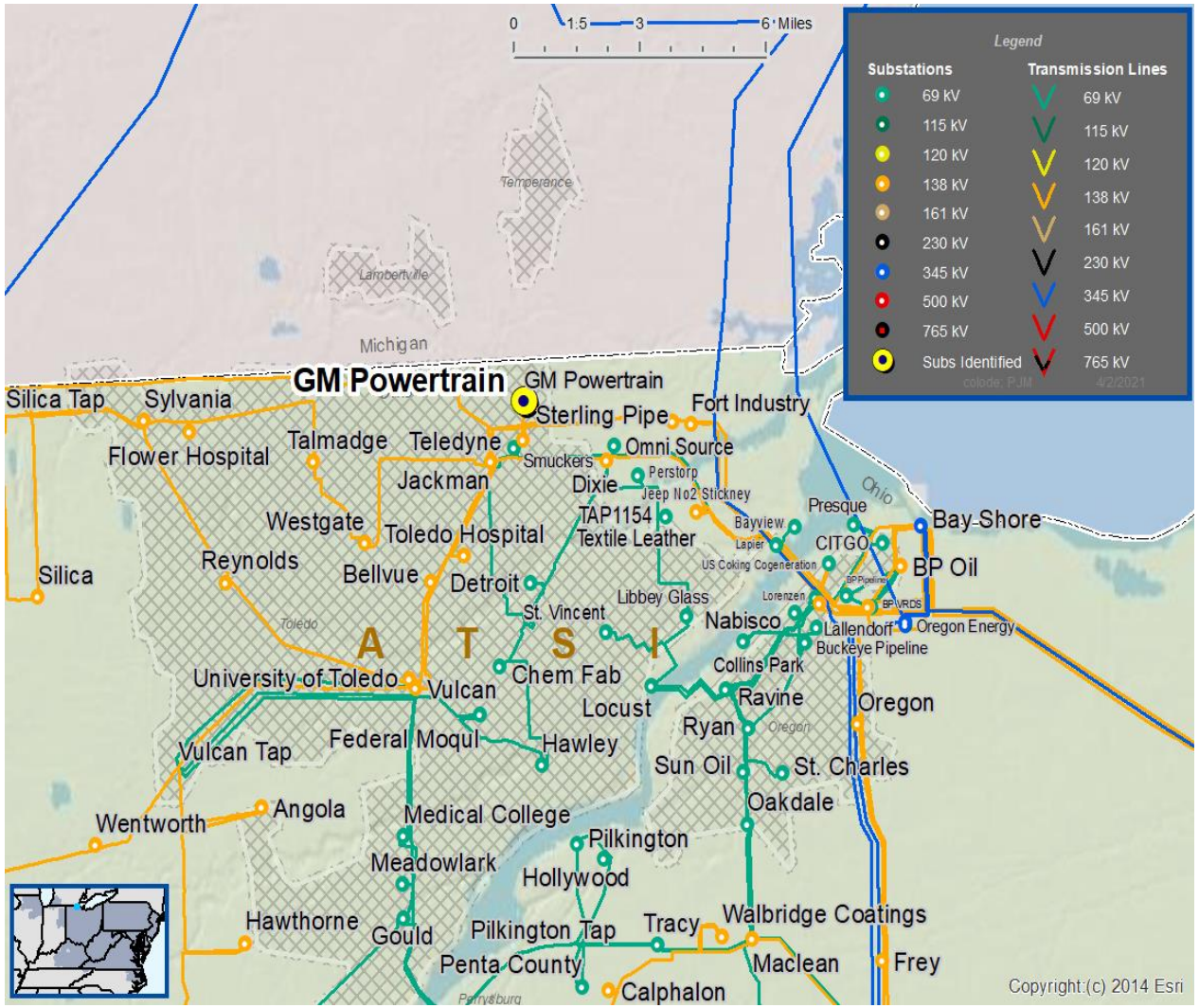
ATSI Transmission Zone M-3 Process
GM Powertrain – Jackman 138 kV Line

Need Number: ATSI-2021-008
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 04/16/2021

Problem Statement

- Breakers B-13295, B-13296, B-13297, and associated disconnect switches at GM Powertrain Substation
  - Increasing maintenance concerns; hydraulic fluid issues, deteriorated operating mechanisms and increasing maintenance trends.
  - Breaker B-13295 is 52 years old, Breaker B-13296 is 52 years old, Breaker B-13297 is 48 years old
  - Associated terminal equipment line arrestors and substation conductor
- Breaker B-13329 and associated disconnect switches at Jackman Substation
  - Increasing maintenance concerns; hydraulic pump issues, valve issues, deteriorated operating mechanisms and increasing maintenance trends
  - Breaker B-13329 is 48 years old



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ATSI Transmission Zone M-3 Process
GM Powertrain – Jackman 138 kV Line

Need Number: ATSI-2021-008
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 04/16/2021

Proposed Solution:

- Replace breakers B-13295, B-13296, B-13297 and associated disconnects at GM Powertrain Substation.
- Replace breaker B-13329 and associated disconnects at Jackman Substation.
- Replace limiting substation conductors to exceed associated line ratings.

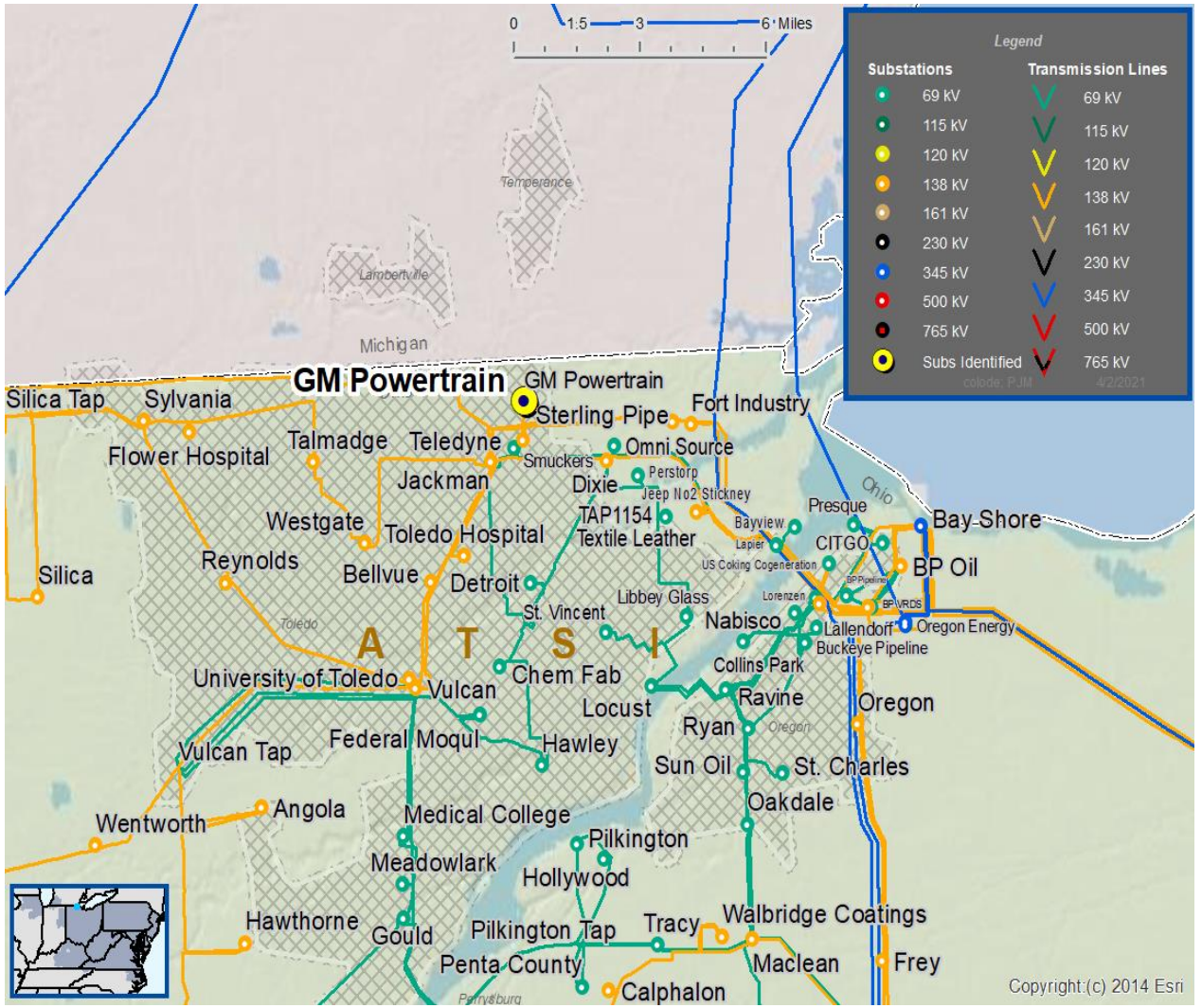
Transmission Line Ratings:

- GM Powertrain – Smuckers 138 kV Line
  - Before Proposed Solution: 327 MVA WN / 396 MVA WE
  - After Proposed Solution: 327 MVA WN / 420 MVA WE
- Bayshore - GM Powertrain 138 kV Line
  - Before Proposed Solution: 327 MVA WN / 396 MVA WE
  - After Proposed Solution: 327 MVA WN / 420 MVA WE

Alternatives Considered:

No alternatives considered for this project

Estimated Project Cost: $1.5M
Projected In-Service: 05/02/2022
Project Status: Engineering
Model: 2020 Series 2025 Summer RTEP 50/50



ATSI Transmission Zone M-3 Process
Eastlake 138 kV Substation

Need Number: ATSI-2021-011
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 04/16/2021

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

Specific Assumption Reference(s):
Global Factors

- 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
- Expected service life (at or beyond) or obsolescence

Substation Condition Rebuild/Replacement

- Circuit breakers and other fault interrupting devices
- Switches

Problem Statement

- Breakers B-19, B-35, B-22, B-25, B-24, B-28, B-27, and associated disconnect switches at Eastlake Substation:
  - Increasing maintenance concerns; compressor issues, valve issues, heater issues, deteriorated operating mechanisms, and increasing maintenance trends
  - Breaker B-19 is 50 years old; Breaker B-35 is 41 years old; Breakers B-22, B-25, B-24, and B-28 are 49 years old; and Breaker B-27 is 47 years old

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ATSI Transmission Zone M-3 Process
Eastlake 138 kV Substation

Need Number: ATSI-2021-011
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 04/16/2021

Proposed Solution:

Eastlake Breaker Replacements & Bus Upgrades

- Replace B-25, B-28, B-19, B-35, B-22, B-24, and B-27 with associated disconnect switches.
- Replace and install associated FE standard bus relaying panels, transmission line relying panels, capacitor bank panels, and BF relay panels.
- Replace limiting substation conductors to exceed associated line ratings.

Transmission Line Ratings:

- Eastlake – Nathan Q3 138 kV Line
  - Before Proposed Solution: 225 MVA SN / 295 MVA SE / 309 MVA WN / 367 MVA WE
  - After Proposed Solution: 273 MVA SN / 332 MVA SE / 309 MVA WN / 393 MVA WE
- Nathan – Mayfield Q3 138 kV Line
  - Before Proposed Solution: 265 MVA SN / 316 MVA SE / 309 MVA WN / 361 MVA WE
  - After Proposed Solution: 273 MVA SN / 332 MVA SE / 309 MVA WN / 393 MVA WE
- Nathan – Mayfield Q4 138 kV Line
  - Before Proposed Solution: 265 MVA SN / 316 MVA SE / 309 MVA WN / 361 MVA WE
  - After Proposed Solution: 273 MVA SN / 332 MVA SE / 309 MVA WN / 393 MVA WE

Alternatives Considered:

No alternatives considered for this project

Estimated Project Cost: $7.9M
Projected In-Service: 03/02/2023
Project Status: Execution
Model: 2020 Series 2025 Summer RTEP 50/50

ATSI Transmission Zone M-3 Process
Delta – Wauseon 138 kV Line - New Customer

Need Number: ATSI-2021-019
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 07/16/2021

Supplemental Project Driver(s):
Customer Service

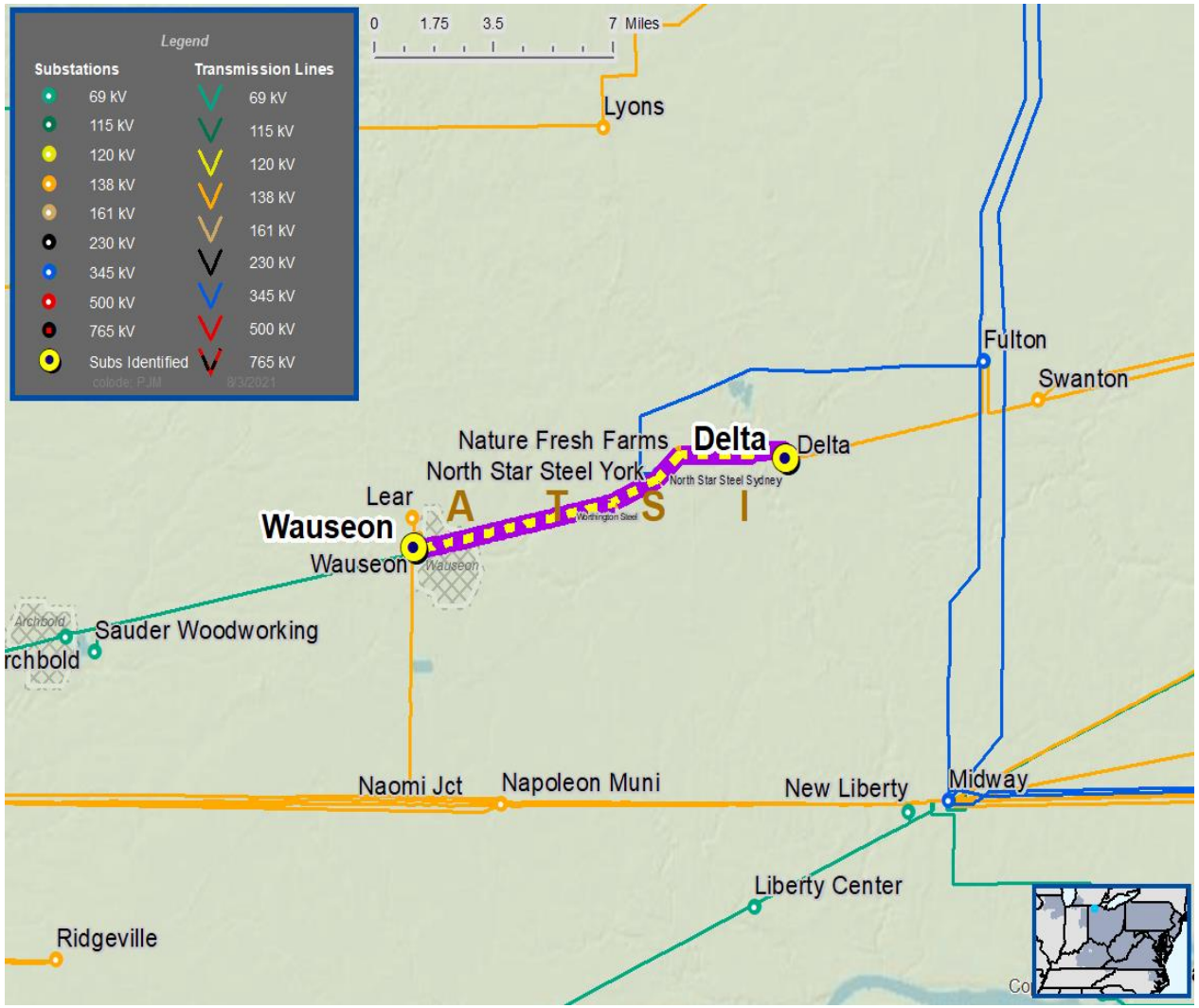
Specific Assumption Reference(s)

Customer connection request 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 transmission service for approximately 20 MVA of total load near the Delta – Wauseon 138 kV Line.

Requested In-Service Dates: 10 MVA by November 1, 2021
10 MVA increase by November 1, 2026



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ATSI Transmission Zone M-3 Process
Delta – Wauseon 138 kV Line - New Customer

Need Number: ATSI-2021-019
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 07/16/2021

Proposed Solution:

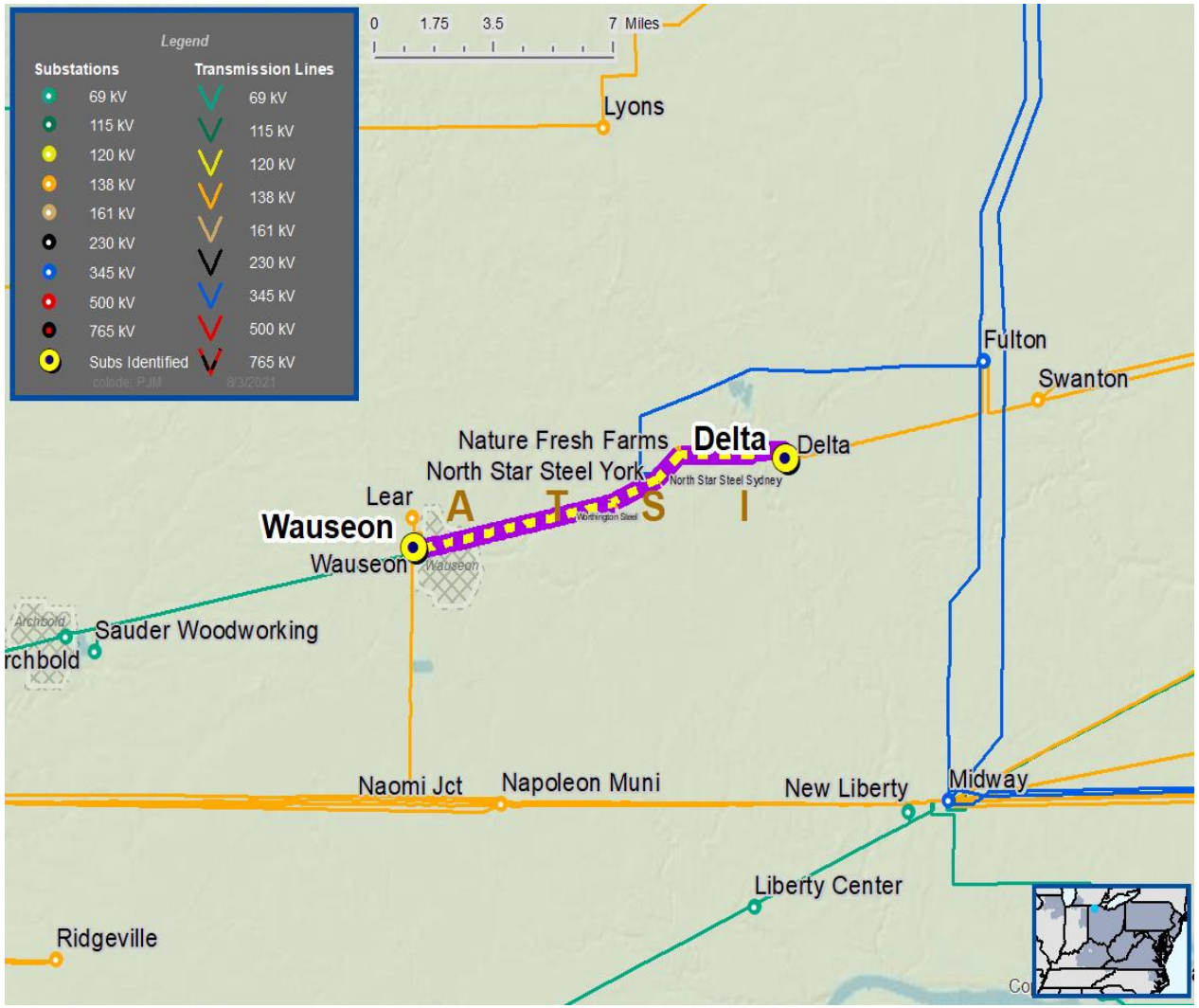
New 138 kV Customer

- Construct a 138 kV tap off the Delta – Wauseon 138 kV Line to the customer substation. The customer substation tap location is approximately a 0.9 mile extension from the existing structures to the new customer substation.
- Add MOAB and SCADA to two new switches on the Delta – Wauseon 138 kV Line.

Alternatives Considered:

- No alternatives considered for this project

Estimated Project Cost: $2.0M
Projected In-Service: 06/01/2022
Status: Engineering
Model: 2020 Series 2025 Summer RTEP 50/50



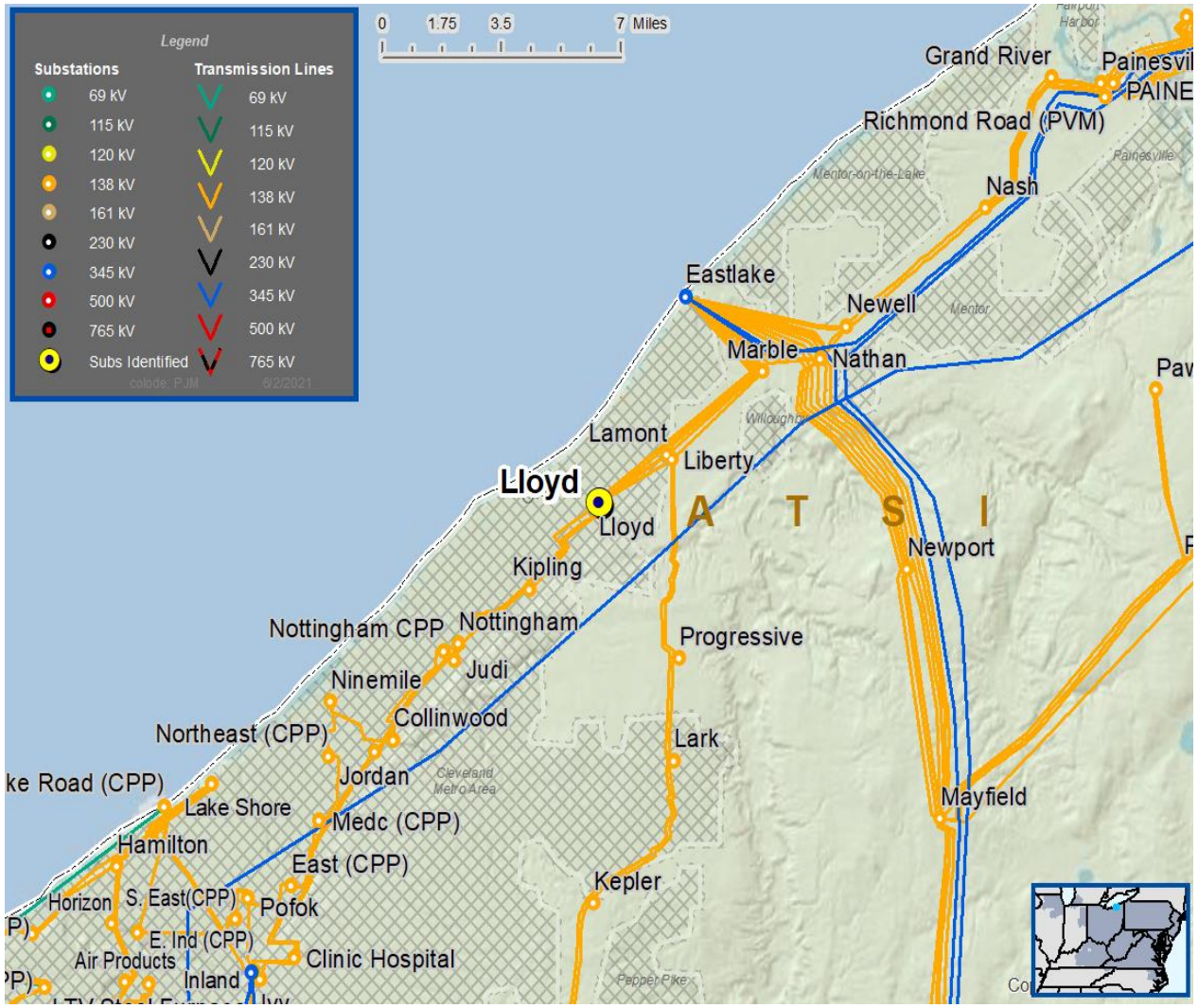
ATSI Transmission Zone M-3 Process
Lloyd Substation

Need Number: ATSI-2021-014
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 06/15/2021

Supplemental Project Driver(s):
Customer Service

Specific Assumption Reference(s)
Modification of existing customer connection request evaluated per FirstEnergy's "Requirements for Transmission Connected Facilities" document and "Transmission Planning Criteria" document

Problem Statement
- The B-phase of existing 138-36 kV Lloyd transformer #2 has failed.



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ATSI Transmission Zone M-3 Process
Lloyd Substation

Need Number: ATSI-2021-014
Process Stage: Solution Meeting – 08/16/2021
Previously Presented: Need Meeting – 06/15/2021

Proposed Solution:

Move Existing 138-36 kV Transformer

- Move the existing #3 transformer from Nathan Substation to the open bay position at Lloyd Substation in order to feed the distribution load. Retire the failed #2 Lloyd transformer in place.

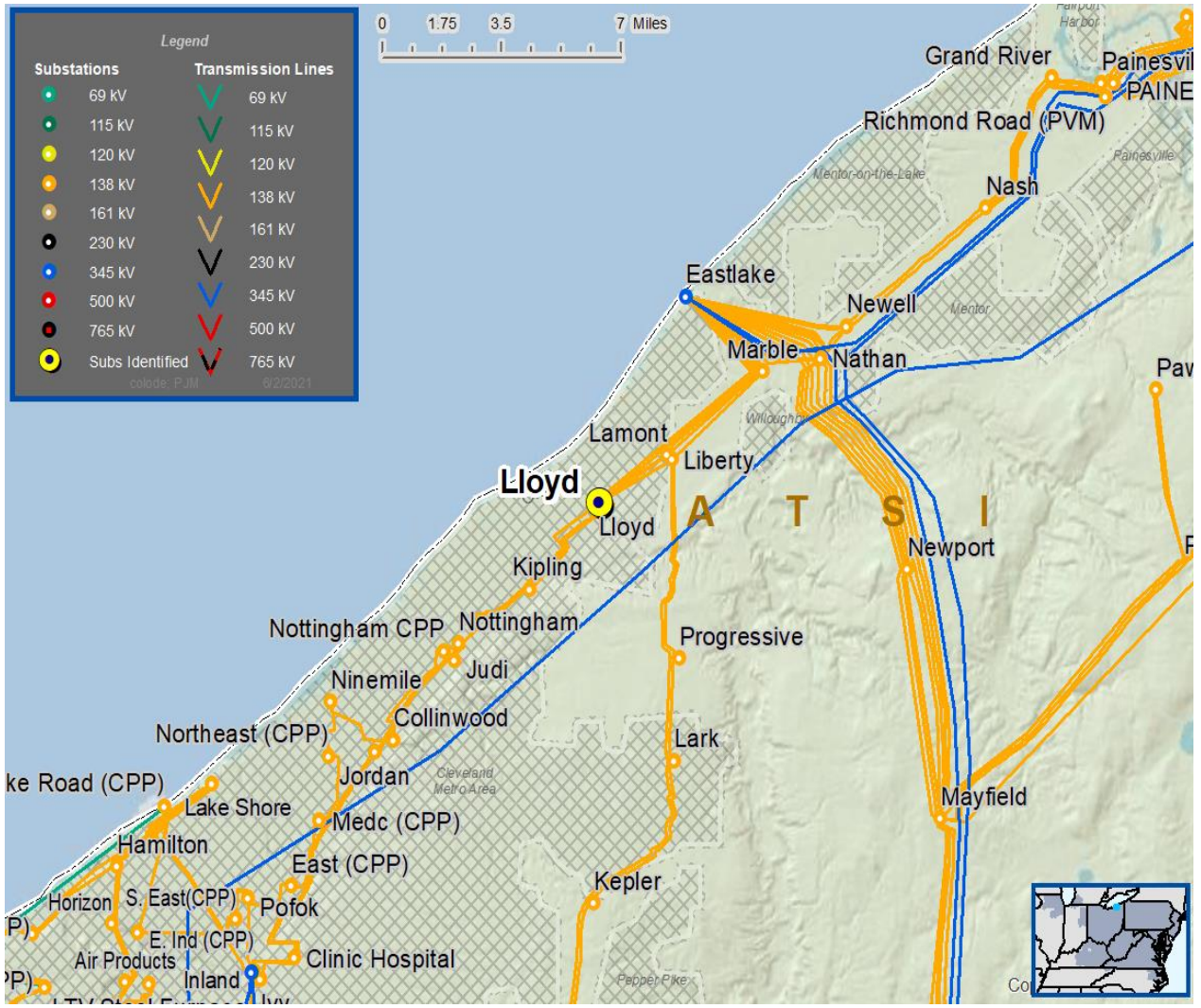
Transformer Ratings:

- **Failed #2 Lloyd Transformer**
  - 55 MVA SN / 66 MVA SE
- **Existing #3 Nathan Transformer**
  - 72 MVA SN / 81 MVA SE

Alternatives Considered:

- New transformer installation at Lloyd Substation

Estimated Project Cost: $0.0
Projected In-Service: 12/31/2021
Status: Engineering
Model: 2019 Series 2024 Summer RTEP 50/50



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 M-3 Process Relay Misoperation Solution

Need Number: ATSI-2019-073

Process Stage: Re-Present Solution Meeting – 08/16/2021

Previously Presented: Solution Meeting – 03/19/2020

Need Meeting – 11/22/2019

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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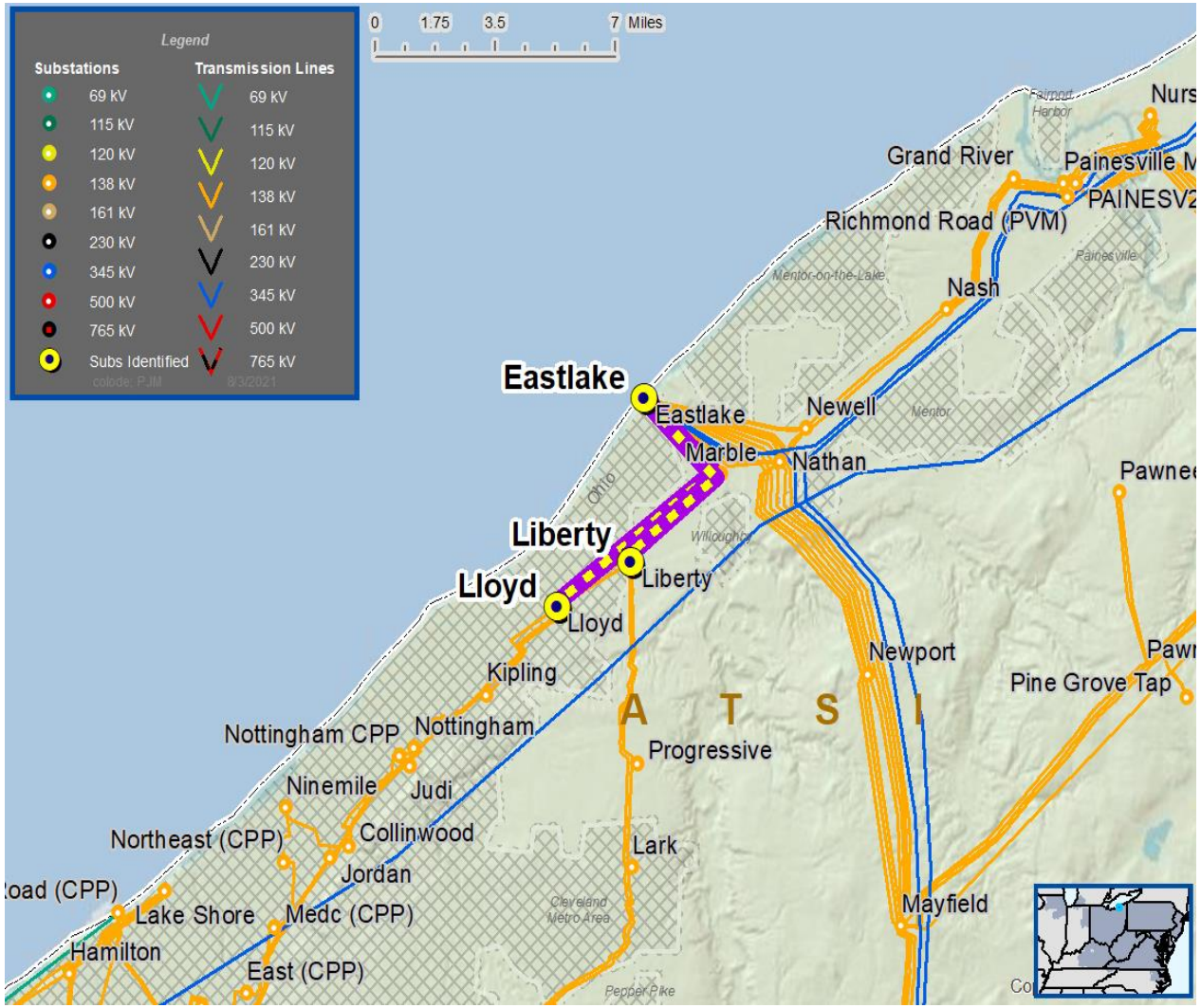

ATSI Transmission Zone M-3 Process
Relay Misoperation Solution

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ATSI-2019	Transmission Line / Substation Locations	Existing Line/Terminal Equipment MVA Rating (SN / SE)	Existing Conductor/Transformer MVA Rating (SN / SE)	Limiting Terminal Equipment
-073	Eastlake-Lloyd 138 kV Q12 Line 1. Eastlake – Liberty 2. Lamont – Lloyd	1. 273 / 287 2. 103 / 132	1. 273 / 332 2. 148 / 151	Substation Conductor, Relay, CTs @ Lloyd

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ATSI Transmission Zone M-3 Process
Relay Misoperation Solution

…Continued from previous page

ATSI-2019	Transmission Line / Substation Locations	New MVA Line Rating (SN / SE)	Proposed Solution	Estimated Costs ($ M)	Target ISD
-073 (s2228)	Eastlake-Lloyd 138 kV Q12 Line 1. Eastlake – Liberty 2. Lamont – Lloyd	1. 273 / 332 ~~2. 148 / 151~~ 2. 147 (WN) / 164 (WE)	At Eastlake replace the Q-12 circuit breaker, line disconnect switch, relaying, line terminal arresters, and line CVTs. ~~At Lloyd replace the substation conductor, and Eastlake-Lloyd Q-12 line relaying.~~ At Lloyd remove the Q12 line relaying due to Lloyd TR#2 moving to the Q11 bay position.	1.1	03/03/2023

Alternatives Considered:

- Maintain existing condition and elevated risk of failure

Projected In-Service: See table

Project Status: Engineering (All Projects)

Model: N/A

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

08/05/2021 – V1 – Original version posted to pjm.com