

Subregional RTEP Committee – Western FirstEnergy Supplemental Projects

August 14, 2020

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-2020-Mutiple (See next slide)

Process Stage: Need Meeting – 08/14/2020

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cases the protection equipment cannot be repaired due to a lack of replacement parts and available expertise in the outdated technology.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.



Continued on next page...

...Continued from previous page

| ATSI-2020 | Transmission Line / Substation Locations | Existing Line/Terminal Equipment MVA Rating (SN / SE) | Existing Conductor/Transformer MVA Rating (SN / SE) | Limiting Terminal Equipment |
|-----------|---|--|--|---|
| -014 | Galion 138/69 kV Transformer #1 | 112 / 132 143 (WN) / 143 (WE) | 126 / 132 151 (WN) / 157 (WE) | Substation conductor and relay at 69 kV |
| -015 | Masury – Maysville 138 kV Line | 124 / 124 124 (WN) / 124 (WE) | 273 / 332 309 (WN) / 393 (WE) | Metering and substation conductor |
| -016 | Babb Substation 1. Valley Terminal Upgrade | 200 / 223 223 (WN) / 223 (WE) | 200 / 242 226 (WN) / 286 (WE) | Relay |
| -017 | Highland – Mahoningside 138 kV Line | 200 / 223 223 (WN) / 223 (WE) | 200 / 242 226 (WN) / 286 (WE) | Relay |
| -018 | Highland – GM Lordstown 138 kV Line 1. Highland-Tod 2. GM Lordstown-Tod | 1. 329 / 413 430 (WN) / 430 (WE) 2. 267 / 352 387 (WN) / 430 (WE) | 1. 376 / 465 430 (WN) / 520 (WE) 2. 430 / 494 430 (WN) / 520 (WE) | 1. Disconnect switch and relay 2. Substation conductor and relay |
| -019 | Dale – West Canton 138 kV Line (AEP) | 233 / 282 263 (WN) / 287 (WE) | 233 / 282 263 (WN) / 333 (WE) | Relay |
| -020 | Dale – South Akron 138 kV Line 1. Dale-Moore 138 kV section 2. Moore-South Akron 138 kV section | 1. 233 / 282 263 (WN) / 284 (WE) 2. 225 / 282 263 (WN) / 306 (WE) | 1. 233 / 282 263 (WN) / 333 (WE) 2. 233 / 282 263 (WN) / 333 (WE) | Substation conductor and relay |

Continued on next page...

...Continued from previous page

| ATSI-2020 | Transmission Line / Substation Locations | Existing Line/Terminal Equipment MVA Rating (SN / SE) | Existing Conductor/Transformer MVA Rating (SN / SE) | Limiting Terminal Equipment |
|-----------|---|---|---|--|
| -021 | Avery – Shinrock 138 kV Line | 233 / 282 263 (WN) / 287 (WE) | 233 / 282 263 (WN) / 333 (WE) | Relay |
| -022 | Central – Packard 138 kV Line | 157 / 196 198 (WN) / 210 (WE) | 157 / 196 198 (WN) / 255 (WE) | Relay |
| -023 | Wauseon – Delta 138 kV Line 1. Wauseon – Lear 2. Delta-Nature Fresh Farms | 1. 327 (WN) / 396 (WE) 2. 327 (WN) / 396 (WE) | 1. 327 (WN) / 420 (WE) 2. 327 (WN) / 420 (WE) | Substation conductor and relay |
| -024 | Eastlake – Lloyd Q13 138 kV Line 1. Eastlake – Marble | 278 / 287 287 (WN) / 287 (WE) | 278 / 339 315 (WN) / 401 (WE) | Relay |
| -025 | Cardington (Galion) 138 kV Line | 145 / 145 145 (WN) 145 (WE) | 233 / 282 263 (WN) 333 (WE) | Substation conductor and relay |
| -026 | Brookside – Longview East 138 kV Line | 153 / 192 180 (WN) 210 (WE) | 160 / 192 180 (WN) 228 (WE) | Substation conductor and relay |
| -027 | Hanna – West Ravenna No1 138 kV Line | 295 / 369 367 (WE) / 373 (WE) | 376 / 432 376 (WE) / 455 (WE) | Substation conductor, disconnect switch, line drop and relay |
| -034 | Masury – Maysville 138 kV Line | 124 / 124 124 (WN) / 124 (WE) | 273 / 332 309 (WN) / 393 (WE) | Metering, substation conductor, relays, and CTs |

Need Number: ATSI-2020-028
Process Stage: Need Meeting – 08/14/2020

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

Specific Assumption Reference(s)

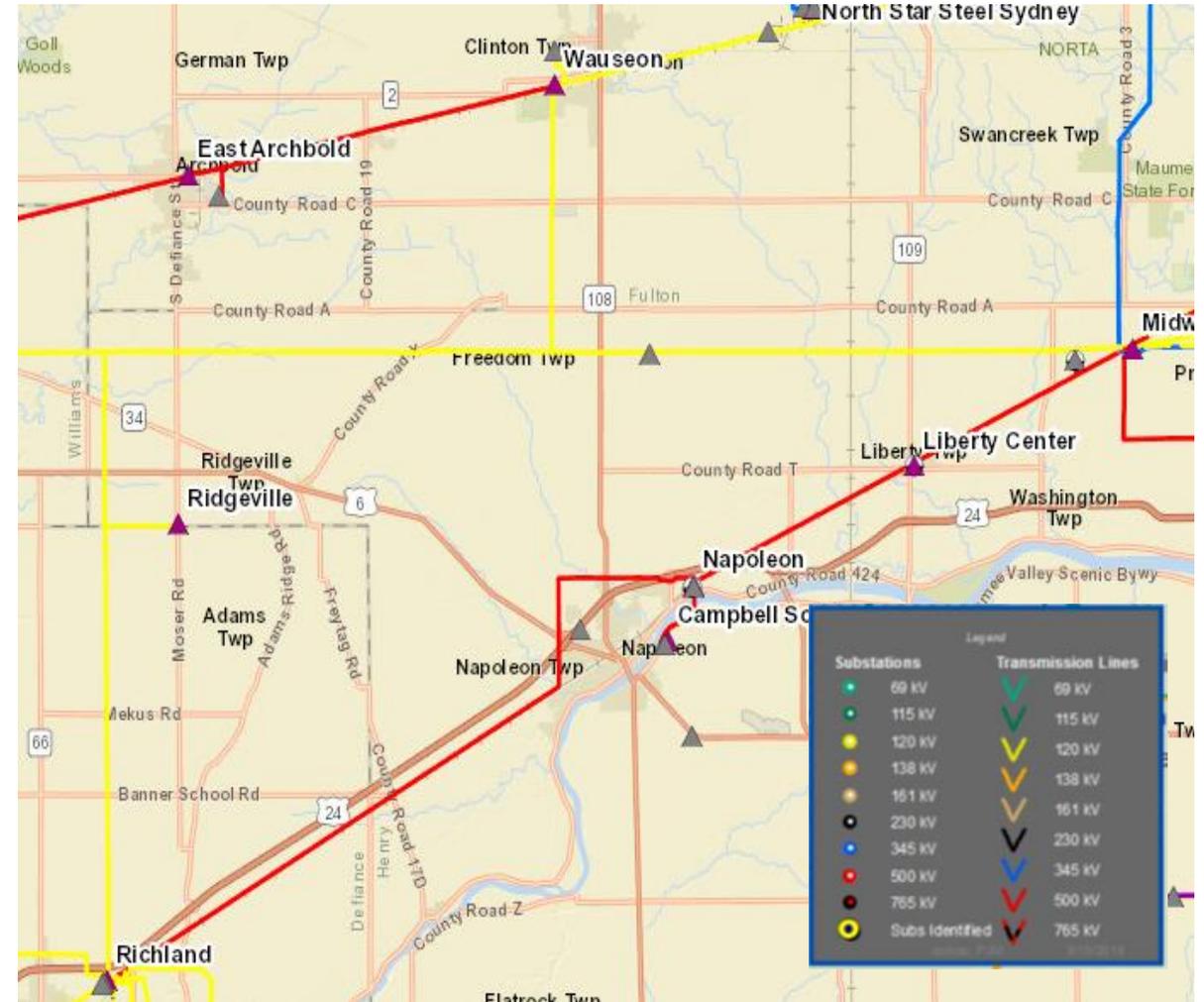
Line Condition Rebuild / Replacement

- 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:

Midway-Richland-Wauseon 138kV (~33.5 miles) Transmission Line:

- Existing 336.4 ACSR has a history of failure due to conductor vibration resulting in thermal overload and corrosion of steel core.
- Original porcelain insulators from 1948 construction are aged and exhibiting wear.
- Comprehensive aerial inspection was completed in 2020 and shows a rising negative trend in required maintenance with 160 structures that presently require repair for structure damage, static wire damage, broken insulators, and broken or overheated conductor.
- Growing trend in unscheduled interruptions on this line with five (5) equipment caused outages in the past 10 years.
- Condition of static wire is deteriorating which may be contributing to rise in lightning caused outages.



Need Number: ATSI-2020-029
Process Stage: Need Meeting – 08/14/2020

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

Specific Assumption Reference(s)

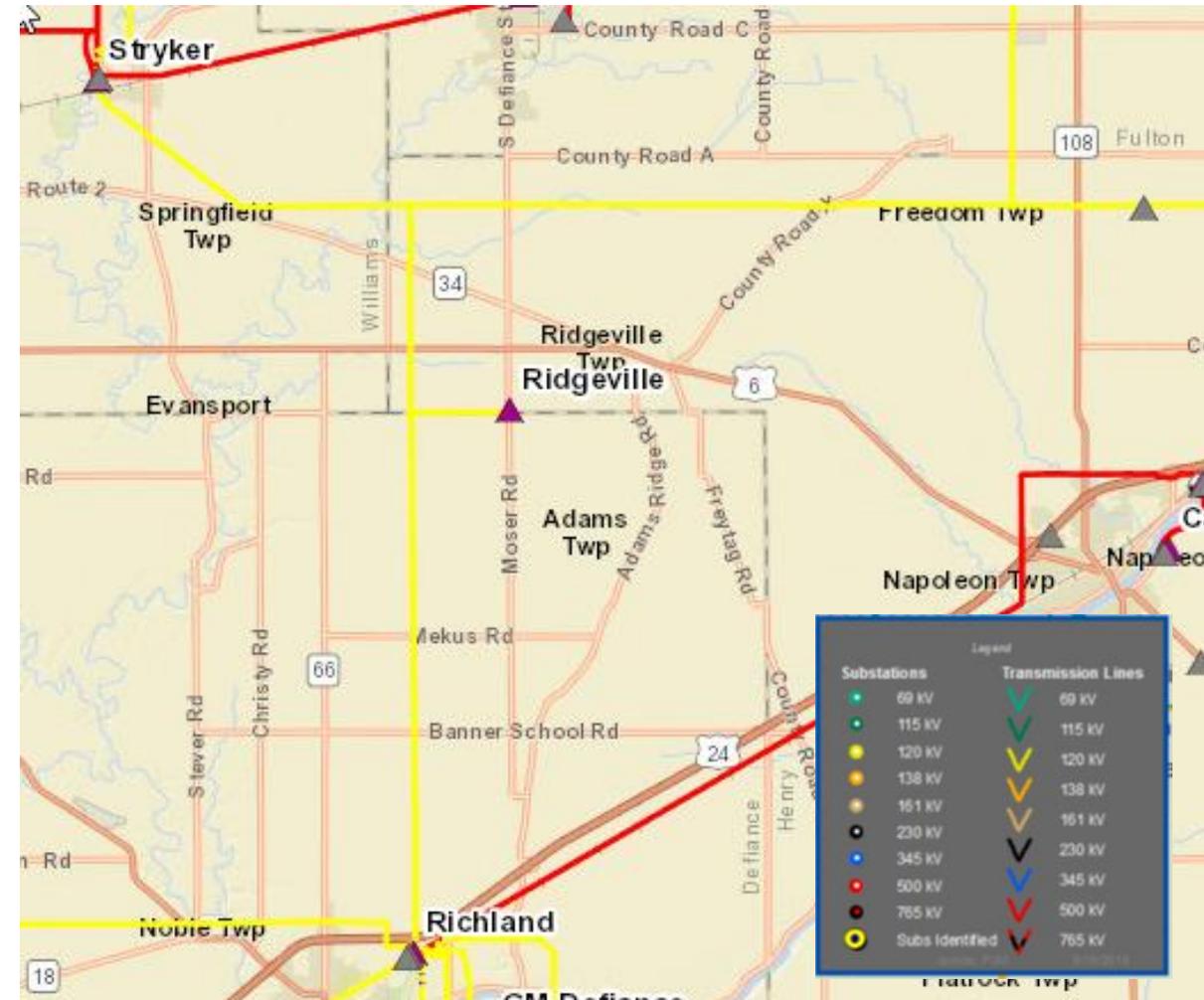
Line Condition Rebuild / Replacement

- 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:

Napoleon-Richland-Stryker 138kV (~32 miles) Transmission Line:

- Existing 336.4 ACSR has a history of failure due to conductor vibration resulting in thermal overload and corrosion of steel core.
- Existing line is constructed on double circuit lattice towers shared with the Midway-Richland-Wauseon 138kV line.
- Comprehensive aerial inspection was completed in 2020 and shows a rising negative trend in required maintenance with 130 structures that presently require repair for worn static wire, damaged attachment hardware, and broken or flashed insulators.
- Growing trend in unscheduled interruptions on this line with six (6) equipment caused outages in the past 10 years.



Need Number: ATSI-2020-030
Process Stage: Need Meeting – 08/14/2020

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

Specific Assumption Reference(s)

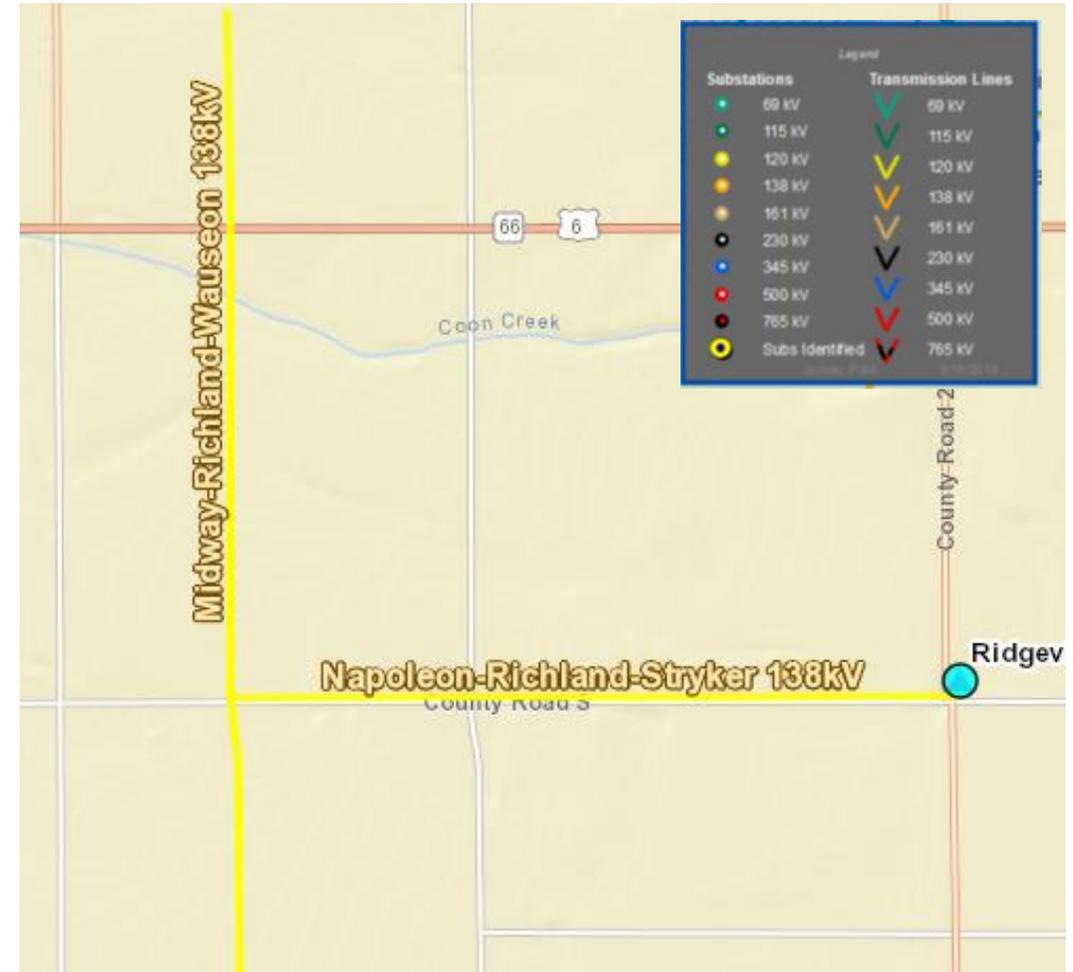
Line Condition Rebuild / Replacement

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

Problem Statement:

Napoleon-Richland-Stryker 138kV, Tap to Ridgeville (~1.5 miles):

- Tap was originally constructed in the 1970s. The average age of structures on this line are 50 years old. FirstEnergy has historically experienced an average age of reject for wood poles to be 48.7 years.
- 41 of 45 wood pole structures on this tap were bypassed during a previous project on the main line in 2015. Line survey in 2018 determined that all 41 structures failed. The primary reasons for reject were wood pole cracking and decay.
- Both the entrance and exit to Ridgeville substation share the same structures, increasing risk to reliability.



Need Number: ATSI-2020-031
Process Stage: Need Meeting – 08/14/2020

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

Specific Assumption Reference(s)

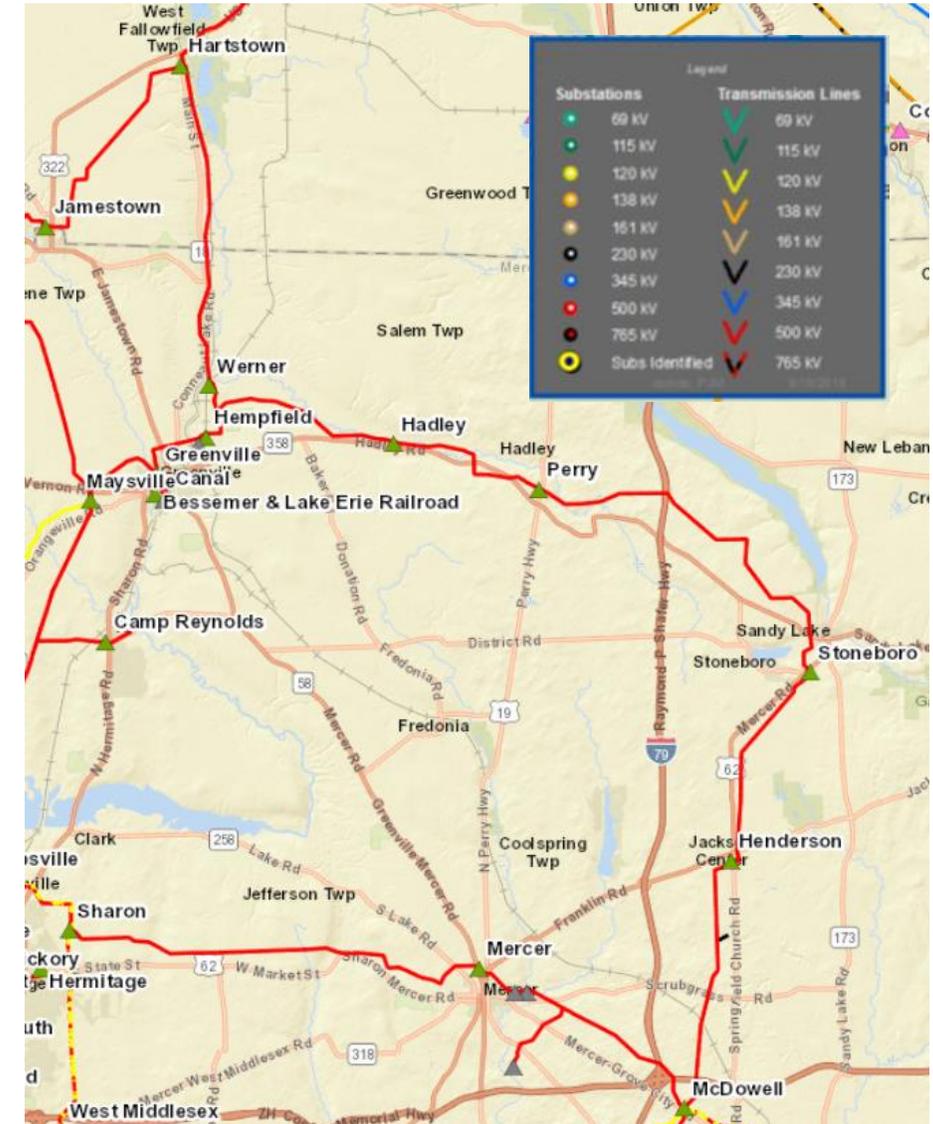
Line Condition Rebuild / Replacement

- 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:

Maysville-McDowell 69kV Line (~33 miles):

- Line was originally constructed in the 1960s. The average age of structures on this line are 54 years old. FirstEnergy has historically experienced an average age of reject for wood poles to be 48.7 years.
- Line survey in 2019 showed a structure reject rate of 86% (528 of 613). The primary reasons for reject were woodpecker holes, wood pole decay, and pole top extensions previously used to mitigate the issue of pole top rot, an indicator that the pole is deteriorating.
- Conductor condition is deteriorating with over 40 conductor splices in a 30 mile line section.
- Obsolete line switches (A-2092, A-2091, A-2143 N.O.) are no longer supported by the manufacturer
- Line has experienced eleven (11) outages in the past five years of which eight (8) are sustained.



Need Number: ATSI-2020-032
Process Stage: Need Meeting – 08/14/2020

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:

Dilworth-Maysville 69kV (~11.4 miles) Transmission Line:

- Line was originally constructed in 1947. The average age of structures on this line are 58 years old. FirstEnergy has historically experienced an average age of reject for wood poles to be 48.7 years.
- Line survey in 2019 showed a structure reject rate of 57% (166 of 293). The primary reasons for reject were wood pole deterioration, broken static wire, woodpecker holes, broken conductor strands.
- Existing 336.4 ACSR has a history of failure due to conductor vibration resulting in thermal overload and corrosion of steel core.
- Environmental conditions on ROW causes difficulties for routine maintenance, vegetation management, and outage restoration.
- Growing trend in unscheduled interruptions with 10 outages in the past two years with approximately 15,000 customers impacted in the area.
- Obsolete line switch (A-212 N.O.) is no longer supported by the manufacturer.



Need Number: ATSI-2020-033
Process Stage: Need Meeting – 08/14/2020

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

Specific Assumption Reference(s)

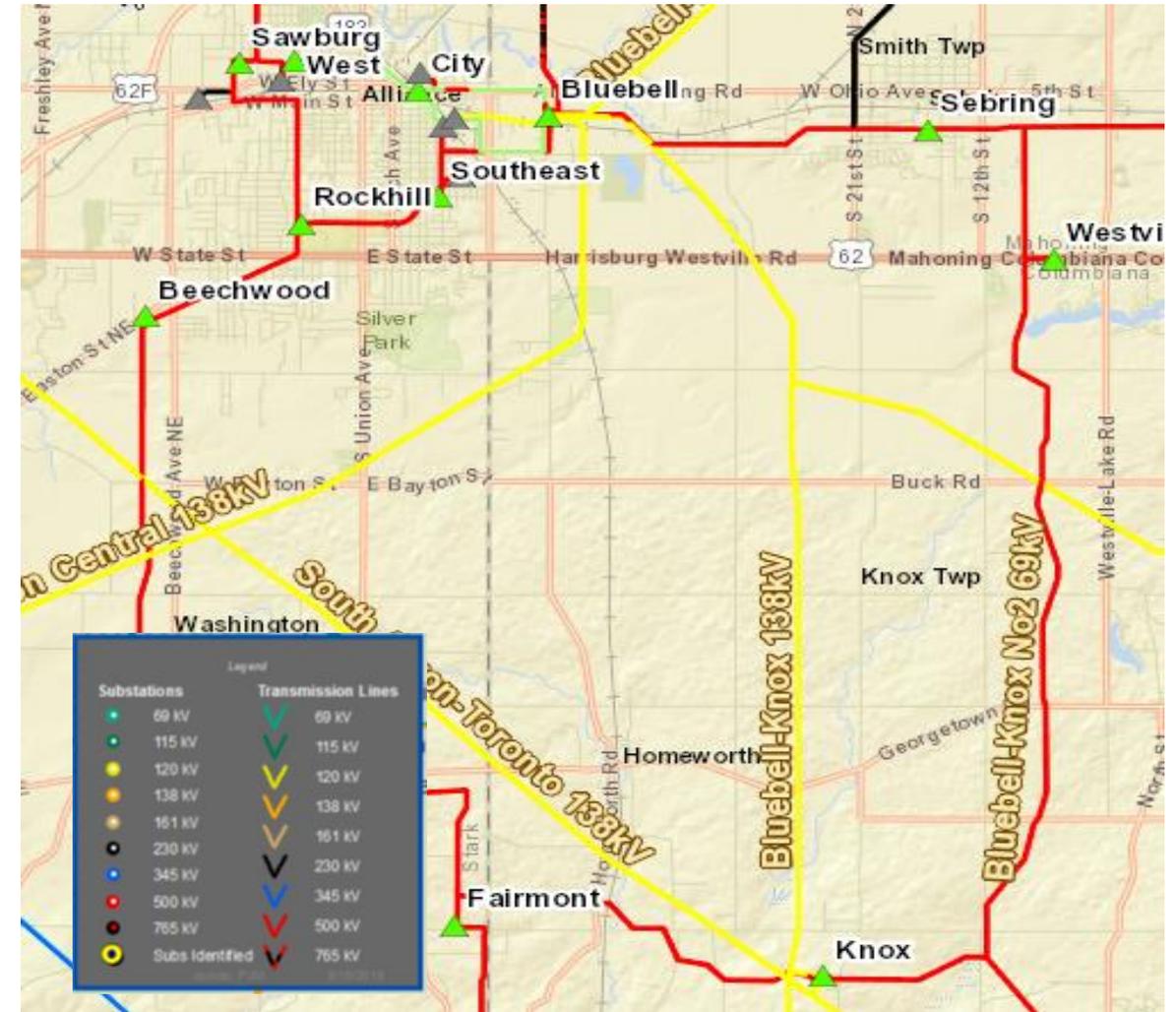
Line Condition Rebuild / Replacement

- 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:

Bluebell-Knox No1 69kV (~16 miles) Transmission Line:

- Original H-frame wood pole construction dating back to 1970s.
- Line survey in 2020 showed a structure reject rate of 92% (242 of 262). The primary reasons for reject were large woodpecker holes, wood pole decay, and pole top extensions previously used to mitigate the issue of pole top rot, an indicator that the pole is deteriorating.
- Obsolete line switches (A-6935 & A-6936) are no longer supported by the manufacturer.
- Growing trend in unscheduled interruptions with six (6) equipment caused outages in the past 5 years for cross-arm failures and pole failures; Outages have historically had a large impact on customers interrupted and customer minutes interrupted.



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

8/4/2020 – V1 – Original version posted to pjm.com

8/12/2020 – V2 – Updated assumption references for project ATSI-2020-028