First Energy (Penelec)
Local Plan Submission for the 2020 RTEP
**Need Number:** PN-2019-037

**Process State:** Submission of Supplemental Project for inclusion in the Local Plan 3/20/2020

**Previously Presented:**
- Need Meeting 10/21/2019
- Solutions Meeting 11/18/2019

**Project Driver:**

*Equipment Material Condition, Performance and Risk*

*Operational Flexibility and Efficiency*

**Specific Assumption Reference:**

- System Performance Projects 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

Continued on next slide…
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many cases the protection equipment cannot be repaired due to a lack of replacement part and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>037</td>
<td>Seward – Tower 51 115 kV Line</td>
<td>147/185</td>
<td>201/244</td>
<td>Circuit Breaker, Line Relaying, Line Trap, Substation Conductor</td>
</tr>
</tbody>
</table>
### Selected Solution:

|--------------|-----------------------------------------|-------------------------|-------------------------------|--------------------------------------------------------------------------------|----------------------|-------------|
|              | Seward – Tower 51 115 kV Line           | s2176, s2176.1, s2176.2 | 201/244                      | • Seward 115 kV Substation – Replace circuit breaker, line relaying, line trap, and substation conductor (s2176.1)  
• Tower 51 115 kV Substation – Replace circuit breaker, line relaying, line trap, and substation conductor (s2176.2) | $1.4M                | 6/1/2020                 |

No topology changes, no bubble diagram required.

**Model:** 2019 RTEP model for 2024 Summer (50/50)
Need Number: PN-2020-003

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 09/22/2020

Previously Presented:
Solution Meeting 06/02/2020
Need Meeting 04/14/2020

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:
Add/Expand Bus Configuration
- Eliminate simultaneous outages to multiple networked elements

Problem Statement:
The Shelocta 230 kV bus is a three terminal line consisting of two 230 kV lines and a 230/115 kV transformer.
An N-1 outage results in the loss of all three networked elements.
Need Number: PN-2020-003

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 09/22/2020

Selected Solution:
Shelocta 230 kV Substation:
- Construct three breaker ring bus (s2279.1)
Keystone 230 kV Substation:
- Replace line trap (s2279.2)
Homer City 230 kV Substation:
- Replace line trap (s2279.3)

Transmission Line Ratings:
Keystone – Shelocta 230 kV Line:
- Before Proposed Solution: 809 / 923 MVA (SN/SE)
- After Proposed Solution: 809 / 980 MVA (SN/SE)
Homer City – Shelocta 230 kV Line:
- Before Proposed Solution: 809 / 923 MVA (SN/SE)
- After Proposed Solution: 809 / 980 MVA (SN/SE)

Estimated Cost: $6.7M
Projected In-Service: 6/1/2022
Supplemental Project ID: s2279.1, s2279.2, s2279.3
Model: 2020 RTEP model for 2025 Summer (50/50)
Need Number: PN-2020-001

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

Previously Presented:
Need Meeting 05/12/2020
Solution Meeting 07/07/2020

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:
Substation Condition Rebuild/Replacement

Problem Statement:
Hooversville #3 230/115 kV Transformer
- Transformer has increased failure probability due to:
  - Transformer is 43 years old.
  - Type “U” bushings
  - High level heating gases and moisture
  - Obsolete parts
  - Nitrogen and oil leaks

Transformer circuit rating is the existing transformer rating of 245/306 MVA (SN/SE).
Need Number: PN-2020-001

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

Selected Solution:
*Replace Hooversville #3 230/115 kV Transformer*
  - Replace the #3 230/115 kV transformer and associated equipment with a 180/240/300 MVA transformer

Transformer Rating:
Hooversville #3 230/115 kV Transformer
  - Before Proposed Solution: 245 / 306 MVA (SN/SE)
  - After Proposed Solution (anticipated): 375 / 438 MVA (SN/SE)

Estimated Project Cost: $4.2M

Projected In-Service: 12/10/2021

Supplemental Project ID: s2304

Model: 2020 Series 2025 Summer RTEP 50/50
Need Number: PN-2020-002

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

Previously Presented:
Need Meeting 5/12/2020
Solution Meeting 07/07/2020

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:
Substation Condition Rebuild/Replacement

Problem Statement:
Erie West #1 345/115 kV Transformer
- Transformer has increased failure probability due to:
  - Transformer is 47 years old.
  - High level heating gases and moisture
  - HV bushings have significant deterioration
  - Obsolete parts
  - Nitrogen and oil leaks

Transformer circuit rating is the existing transformer rating of 266/333 MVA (SN/SE).
Need Number: PN-2020-002

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

Selected Solution:

Replace Erie West #1 345/115 kV Transformer
- Replace the #1 345/115 kV transformer and associated equipment with a 168/224 MVA transformer

Transformer Rating:
Erie West #1 345/115 kV Transformer
- Before Proposed Solution: 266 / 333 MVA (SN/SE)
- After Proposed Solution (anticipated): 280 / 341 MVA (SN/SE)

Estimated Project Cost: $3.3M

Projected IS Date: 12/31/2021

Supplemental Project ID: s2305

Model: 2020 Series 2025 Summer RTEP 50/50
Need Number: PN-2020-007

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

Previously Presented:
Need Meeting 05/12/2020
Solution Meeting 07/07/2020

Project Driver:
Equipment Material Condition, Performance and Risk

Specific Assumption Reference:
Substation Condition Rebuild/Replacement
System Performance Projects Global Factors

Problem Statement:
Altoona #1 230-46 kV Transformer
- Transformer has increased failure probability due to:
  - Transformer is 55 years old
  - Poor oil quality in LTC
  - Nitrogen leaks in tank
  - Bushing H3 oil leaks

Transformer circuit rating is 89/97 MVA (SN/SE) and the existing transformer rating is 90/97 MVA (SN/SE).
(substation conductor)
Need Number: PN-2020-007

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

Selected Solution:

Replace Altoona #1 230-46 kV Transformer
• Replace the #1 230-46 kV transformer and associated equipment with a 60/80/100 MVA transformer

Transformer Rating:

Altoona #1 230-46 kV Transformer
• Before Proposed Solution: 89 / 97 MVA (SN/SE)
• After Proposed Solution (anticipated): 120 / 129 MVA (SN/SE)

Estimated Project Cost: $3.5M

Projected IS Date: 06/01/2022

Supplemental Project ID: s2306

Model: 2020 Series 2025 Summer RTEP 50/50
Need Number: PN-2020-008

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

Previously Presented:
Need Meeting 05/12/2020
Solution Meeting 07/07/2020

Project Driver:
*Equipment Material Condition, Performance and Risk*

Specific Assumption Reference:
Substation Condition Rebuild/Replacement
System Performance Projects Global Factors

Problem Statement:
Altoona #2 230-46 kV Transformer
- Transformer has increased failure probability due to:
  - Transformer is 47 years old
  - Nitrogen leak in tank
  - LTC oil leak
  - Pump flanges are leaking
  - SCADA alarms are not functional

Transformer circuit rating is 89/97 MVA (SN/SE) and the existing transformer rating is 91/97 MVA (SN/SE).
(substation conductor)
Need Number: PN-2020-008

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

Selected Solution:

Replace Altoona #2 Transformer 230-46 kV Unit
• Replace the #2 230-46 kV transformer and associated equipment with a 60/80/100 MVA transformer

Transformer Rating:
Altoona #2 230-46 kV Transformer
• Before Proposed Solution: 89 / 97 MVA (SN/SE)
• After Proposed Solution (anticipated): 120 / 129 MVA (SN/SE)

Estimated Project Cost: $3.6M

Projected IS Date: 12/31/2022

Supplemental Project ID: s2307

Model: 2020 Series 2025 Summer RTEP 50/50
Need Number: PN-2020-010

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan
10/16/2020

Previously Presented:
Need Meeting 5/21/2020
Solution Meeting 07/16/2020

Project Driver:

Equipment Material Condition, Performance and Risk

Operational Flexibility and Efficiency

Specific Assumption Reference:
System Performance Projects 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

Continued on slide 10&11...
**Need Number:** PN-2020-012

**Process Stage:** Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

**Previously Presented:**
- Need Meeting 5/21/2020
- Solution Meeting 07/16/2020

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

**Specific Assumption Reference:**
- System Performance Projects 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

**Continued on slide 10&11...**
Need Number: PN-2020-015, and APS-2020-008

Process Stage: Submission of Supplemental Project for inclusion in the Local Plan 10/16/2020

Previously Presented:
Need Meeting 5/21/2020
Solution Meeting 07/16/2020

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

Specific Assumption Reference:
System Performance Projects 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

Continued on slide 10&11…
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 part and available expertise in the outdated technology.
- Transmission line ratings are limited by terminal equipment.

<table>
<thead>
<tr>
<th>Need Number</th>
<th>Transmission Line / Substation Locations</th>
<th>Existing Line Rating (SN / SE)</th>
<th>Existing Conductor Rating (SN / SE)</th>
<th>Limiting Terminal Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN-2020-010</td>
<td>Hooversville – Tower 51 115 kV Line</td>
<td>137 / 172</td>
<td>178 / 214</td>
<td>Disconnect Switches, CTs, Substation Conductor, Line Trap, Line Relaying</td>
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<tr>
<td>PN-2020-012</td>
<td>Morgan Street – Franklin Tap 115 kV Line</td>
<td>221 / 239</td>
<td>232 / 282</td>
<td>Substation Conductor, Line Relaying, Line Trap</td>
</tr>
<tr>
<td>PN-2020-012</td>
<td>Franklin Tap – Air Products 115 kV Line</td>
<td>202 / 245</td>
<td>202 / 245</td>
<td>N/A</td>
</tr>
<tr>
<td>PN-2020-015 APS-2020-008</td>
<td>Blairsville East – Social Hall 138 kV Line</td>
<td>225 / 287</td>
<td>243 / 294</td>
<td>Substation Conductor, CTs, Line Relaying, Line Trap</td>
</tr>
</tbody>
</table>
### Selected Solution:

<table>
<thead>
<tr>
<th>Need Number</th>
<th>Transmission Line / Substation Locations</th>
<th>Supplemental Project ID</th>
<th>New MVA Line Rating (SN / SE)</th>
<th>Scope of Work</th>
<th>Estimated Cost ($ M)</th>
<th>Target ISD</th>
</tr>
</thead>
</table>
| PN-2020-010 | Hooversville – Tower 51 115 kV Line     | s2312                   | 178 / 214                      | • Hooversville 115 kV Substation – Replace line trap, line relaying, and substation conductor  
• Tower 51 115 kV Substation – Replace line trap line relaying, substation conductor, disconnect switches, circuit breaker, and CTs | $1.1M | 03/31/2022 |
|             |                                         |                         |                                |               |                      |            |
| PN-2020-012 | Morgan Street – Franklin Tap 115 kV Line | s2313                   | 232 / 282                      | • Morgan Street 115 kV Substation – Replace line trap, line relaying, substation conductor, breaker and bus disconnect switches, and circuit breaker | $2.5M | 05/27/2022 |
|             | Franklin Tap – Air Products 115 kV Line  |                         | 202 / 245                      | N/A |                      |            |
|             | Air Products – Geneva 115 kV Line        |                         | 202 / 245                      | • Geneva 115 kV Substation – Replace line trap, line relaying, breaker and bus disconnect switches, and circuit breakers | $0.8M | 06/01/2021 |
| PN-2020-015 APS-2020-008 | Blairsville East – Social Hall 138 kV Line | s2314.1 | 243 / 294                      | • Blairsville East 138 kV Substation – Replace line trap and line relaying  
• Social Hall 138 kV Substation – Replace line trap, line relaying, substation conductor, circuit breaker, and CTs | $0.8M | 06/01/2021 |
|             |                                         | s2314.2                   |                                |               |                      |            |

**Model:** 2020 RTEP model for 2025 Summer (50/50)
Questions?
Revision History

9/22/2020 – V2 – Added local plan for S2279
10/16/2020 – V3 – Added local plan for S2304, S2305, S2306, S2307, S2312, S2313 and S2314