Market Efficiency Update

Transmission Expansion Advisory Committee
November 9, 2017
Addendum 2016-2017 Long Term Proposal
Window 1A
• Addendum 2016-2017 Long Term Proposal Window 1A
  – Opened on September 14, 2017
  – Closed on September 28, 2017.
  – Solicited proposals to address the Tanners Creek - Dearborn 345 kV thermal constraint, which is a Reliability Pricing Model (RPM) constraint.

• Target facility Tanners Creek - Dearborn 345 kV was the next limiting element in the 2020/2021 RPM Base Residual Auction CETL study for the DEOK LDA*

• 3 Market Efficiency Proposals
  • 1 Greenfield proposed by Northeast Transmission Development, cost of $12.7M
  • 2 Upgrades proposed by AEP, costs of $0.6M respectively $4.9M
    (see Appendix B for full project descriptions)

*After RTEP baseline upgrade b2831 (Upgrade the Tanner Creek - Miami Fort 345 kV circuit) is constructed
Market Efficiency RPM Analysis Completed (LDA DEOK)

- Base Case Update
  - with the portion of the reliability project 2017_1-6A to be recommended in the Reliability Window 1 (see Appendix A)
- Determined CETL impact of proposed projects
- For each proposal, updated the CETL limits in the 2020/2021 RPM Base Residual Auction model and performed simulations for multiple study years
- Determined the RPM and Energy benefits and calculated the B/C Ratios

<table>
<thead>
<tr>
<th>CETL Analysis</th>
<th>Proposer</th>
<th>Project In-Service Year</th>
<th>Project Cost ($M)</th>
<th>B/C Ratio</th>
<th>DEOK LDA Price Separation?*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>201617_1-1A</td>
<td>NTD</td>
<td>2021</td>
<td>$12.70</td>
<td>8.88</td>
<td>No</td>
</tr>
<tr>
<td>201617_1-2A</td>
<td>AEP</td>
<td>2021</td>
<td>$0.60</td>
<td>151.61</td>
<td>No</td>
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<tr>
<td>201617_1-2B</td>
<td>AEP</td>
<td>2021</td>
<td>$4.90</td>
<td>18.6</td>
<td>No</td>
</tr>
</tbody>
</table>

• Results based on 2020/2021 RPM Base Residual Auction model. Future BRA models may yield different results.
Market Efficiency Recommendation

• Upgrade 201617_1A-2A, proposed by AEP, has the highest B/C ratio and lowest cost:
  • Upgrade terminal equipment at Tanners Creek 345kV station. Upgrade 345kV Bus and Risers at Tanners Creek for the Dearborn circuit.
  • Cost $0.6 million

• Additional Projects provide no incremental benefit

• PJM anticipates that the Market Efficiency baseline solution 201617_1A-2A, proposed by AEP, will be presented to the PJM Board in December and recommended for inclusion in the RTEP.
2016-2017 Long Term Window
PPL Group Evaluation
Proposals Received (6 proposals)

• Reconductor Susquehanna – Harwood 230 kV line:
  – 2A: PPL, $13.13M
  – 2B: PPL, $13.01M

• 500/230 kV Transformer At/Near Siegfried:
  – 2C: PPL, $18.32M
  – 10A: NextEra, $33.8M
  – 18G: NTD, $32.9M

• New Harwood – Trexler Run 230 kV line:
  – 18Q: NTD, $33.7M

Note: Cost/Constructability analysis in progress
Project ID: 201617_1-2A

Proposed by: PPL

Proposed Solution:
Reconductor the Susquehanna - Harwood and Susquehanna-Sugarloaf-Harwood 230 kV DCT lines and replace a limited number of structures as necessary to accommodate the heavier conductor.

kV Level: 230 kV
In-Service Cost ($M): $13.13
In-Service Date: 2021
Target Zone: PPL

ME Constraints:
SUSQUEHANNA - HARWOOD 230 kV

Notes:
• This is an upgrade.
• Due to different conductor size, 2A has higher ratings than 2B
### Proposed Solution:
Reconductor the Susquehanna - Harwood and Susquehanna-Sugarloaf-Harwood 230 kV DCT lines and replace a limited number of structures as necessary to accommodate the heavier conductor.

<table>
<thead>
<tr>
<th>kv Level: 230 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service Cost ($M): $13.01</td>
</tr>
<tr>
<td>In-Service Date: 2021</td>
</tr>
<tr>
<td>Target Zone: PPL</td>
</tr>
</tbody>
</table>

### ME Constraints:
SUSQUEHANNA - HARWOOD 230 kV

### Notes:
- This is an upgrade.
- Due to different conductor size, 2B has lower ratings than 2A
Project ID: 201617_1-2C

Proposed by: PPL

Proposed Solution:
Tap the Susquehanna - Wescosville 500 kV line at Siegfried. Expand Siegfried to include a 500/230 kV substation.

kV Level: 230/500 kV
In-Service Cost ($M): $18.32
In-Service Date: 2021
Target Zone: PPL

ME Constraints:
SUSQUEHANNA - HARWOOD 230 kV

Notes:
• This is an upgrade of Siegfried station
Project ID: 201617_1-10A

Proposed by: Nextera

Proposed Solution: Greenfield
Tap the Susquehanna - Wescosville 500 kV line near Siegfried and build a new 500/230 kV substation (Spring Hill). Tie Spring Hill 230 kV into the existing Siegfried 230 kV substation.

- kV Level: 230/500 kV
- In-Service Cost ($M): $33.8
- In-Service Date: 2021
- Target Zone: PPL

ME Constraints:
SUSQUEHANNA - HARWOOD 230 kV

Notes:
• This is a greenfield project
Project ID: 201617_1-18G

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield
Tap the Susquehanna - Wescosville 500 kV line near Siegfried and build a new 500/230 kV substation (Fells Creek). Tie the Fells Creek 230 kV into the existing Siegfried 230 kV substation.

kV Level: 230/500 kV
In-Service Cost ($M): $32.9
In-Service Date: 2021
Target Zone: PPL

ME Constraints:
SUSQUEHANNA - HARWOOD 230 kV

Notes:
• This is a greenfield project
Project ID: 201617_1-18Q

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield  
Tap the Catawissa - Frackville 230 kV line and build a new 230 kV switchyard (Trexler Run). Build a new Harwood - Trexler Run 230 kV line.

kV Level: 230 kV  
In-Service Cost ($M): $33.7  
In-Service Date: 2021  
Target Zone: PPL

ME Constraints:  
SUSQUEHANNA - HARWOOD 230 kV

Notes:  
• This is a greenfield project
PPL Evaluation Highlights

• Base Case Mid-Cycle Update includes monitoring of PPL Wescosville supplemental project (s0864).

• s0864 supplemental project changes operations around Wescosville transformer:
  – New Wescosville 230/138 kV transformer is projected to be operated as normally closed
  – Removes the current Wescosville 230/69 kV #2 transformer (currently operated as normally open)

• The new configuration creates a new flow path
  – from Wescosville 500 kV bus, down through Wescosville 500/138 kV transformer, back up through Wescosville 138/230 kV transformer, toward Hosensack 230 kV bus.

• The new configuration changes congestion pattern
  – Susquehanna – Harwood congestion driver is significantly diminished
  – New congestion around Wescosville 500/138 kV transformer
• Base case configuration assumed operational procedure (WESC OP)
  – Open Wescosville 230/138 kV transformer when Breinigsville – Wescosville 500 kV line in outage

• Sensitivity Scenarios around the Wescosville transformer
  – Wescosville 230/138 kV operated as normally open (WESC OPEN)
  – Wescosville 230/138 kV operated as normally closed without operational procedure (WESC CLOSED noOP)
## Different Wescosville 230/138 kV Operating Schemes

<table>
<thead>
<tr>
<th>Proposal Description</th>
<th>Company</th>
<th>Proposal Id</th>
<th>Proposal Cost* ($ million)</th>
<th>Base WESC OP</th>
<th>Sensitivity Wesc OPEN</th>
<th>Sensitivity WESC CLOSED noOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>New 500/230 kV Siegfried Transformer</td>
<td>NextEra</td>
<td>201617_1-10A</td>
<td>$33.80</td>
<td>Wescosville 230/138 kV closed</td>
<td>0.49</td>
<td>15.70</td>
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<tr>
<td></td>
<td>NTD</td>
<td>201617_1-18G</td>
<td>$32.90</td>
<td>Assumes WESC Operational Procedure active</td>
<td>0.75</td>
<td>16.60</td>
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<tr>
<td></td>
<td>PPL</td>
<td>201617_1-2C</td>
<td>$18.32</td>
<td>(open Wescosville 230/138 kV flo BREI-WESC)</td>
<td>0.83</td>
<td>28.67</td>
</tr>
<tr>
<td>New Harwood - Trexler Run 230 kV line Reconductor</td>
<td>NTD</td>
<td>201617_1-18Q</td>
<td>$33.70</td>
<td>Wescosville 230/138 kV open</td>
<td>2.70</td>
<td>2.60</td>
</tr>
<tr>
<td>Susquehanna - Harwood 230 kV</td>
<td>PPL</td>
<td>201617_1-2A</td>
<td>$13.13</td>
<td></td>
<td>1.74</td>
<td>4.22</td>
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<tr>
<td></td>
<td>PPL</td>
<td>201617_1-2B</td>
<td>$13.01</td>
<td></td>
<td>0.73</td>
<td>5.14</td>
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</table>

* Cost/Constructability analysis in progress
PPL Group Next Steps

• Challenges
  – Operating mode after PPL supplemental project Wescosville 230/138 kV is in service
  – FSA resources impact

• Further analysis is required
  – Finalize cost/constructability analysis
  – Additional sensitivity analysis
    • FSA
    • Gas - (+/- 20%)
    • Load - (+/- 2%)
BGE Group Preliminary Results
BGE Group Analysis

- Completed the preliminary base runs for 46 proposals received from 9 entities.
- Projects modeled using the submitted assumptions
- B/C ratios computed using the submitted in-service cost of components
- Descriptions of submitted proposals included in Appendix D
- Results presented on the following slides:
  - Projects grouped by proposer
  - Congestion results are based on averages of simulated years 2021 and 2024 ($ million)
  - Congestion driver is Conastone-Graceton-Bagley 230 kV
## BGE (5 proposals)

<table>
<thead>
<tr>
<th>Proposal</th>
<th>5A</th>
<th>5B</th>
<th>5C</th>
<th>5D</th>
<th>5E</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$ 5.97</td>
<td>$ 14.20</td>
<td>$ 20.30</td>
<td>$ 20.40</td>
<td>$ 25.40</td>
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<td>In-service Year</td>
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<td>2021</td>
<td>2021</td>
<td>2021</td>
<td>2021</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>6.83</td>
<td>5.15</td>
<td>4.91</td>
<td>5.84</td>
<td>5.39</td>
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<td>Fully Solves Target Congestion</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Creates Other BGE Congestion</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

### Map

- **5A**: Graceton - Conastone - Bagley - Raphael Rd
- **5B**: Graceton - Conastone - Bagley - Raphael Rd
- **5C**: Conastone - Graceton - Bagley - Raphael Rd
- **5D**: Conastone - Graceton - Bagley - Raphael Rd
- **5E**: Conastone - Graceton - Bagley - Raphael Rd

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*PJM TEAC 11/9/2017*
<table>
<thead>
<tr>
<th>Proposal</th>
<th>6F</th>
<th>6G</th>
<th>6L</th>
<th>6M</th>
</tr>
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<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$49.20</td>
<td>$56.00</td>
<td>$41.70</td>
<td>$65.49</td>
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<tr>
<td>In-service Year</td>
<td>2021</td>
<td>2021</td>
<td>2021</td>
<td>2021</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>3.58</td>
<td>2.99</td>
<td>4.22</td>
<td>2.43</td>
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<tr>
<td>Fully Solves Target Congestion</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Creates Other BGE Congestion</td>
<td>No</td>
<td>No</td>
<td>No</td>
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</table>

Map
<table>
<thead>
<tr>
<th>Proposal</th>
<th>7H</th>
<th>7I</th>
<th>7J</th>
<th>7K</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$35.60</td>
<td>$59.80</td>
<td>$68.10</td>
<td>$191.40</td>
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<tr>
<td>In-service Year</td>
<td>2021</td>
<td>2021</td>
<td>2022</td>
<td>2022</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>4.86</td>
<td>2.94</td>
<td>2.40</td>
<td>0.93</td>
</tr>
<tr>
<td>Fully Solves Target Congestion</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Creates Other BGE Congestion</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Map**

- Map of Proposal 7H
- Map of Proposal 7I
- Map of Proposal 7J
- Map of Proposal 7K

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**PECO (4 proposals)**
<table>
<thead>
<tr>
<th>Proposal</th>
<th>10C</th>
<th>10D</th>
<th>10E</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$ 44.40</td>
<td>$ 93.50</td>
<td>$ 105.70</td>
</tr>
<tr>
<td>In-service Year</td>
<td>2021</td>
<td>2021</td>
<td>2021</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>2.02</td>
<td>0.80</td>
<td>0.74</td>
</tr>
<tr>
<td>Fully Solves Target Congestion</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Creates Other BGE Congestion</td>
<td>No</td>
<td>No</td>
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</table>

Map
## TRANSOURCE (7 proposals)

<table>
<thead>
<tr>
<th>Proposal</th>
<th>13A</th>
<th>13B</th>
<th>13C</th>
<th>13D</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$ 457.80</td>
<td>$ 107.49</td>
<td>$ 169.27</td>
<td>$ 182.99</td>
</tr>
<tr>
<td>In-service Year</td>
<td>2024</td>
<td>2022</td>
<td>2022</td>
<td>2022</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>0.46</td>
<td>1.82</td>
<td>1.00</td>
<td>0.92</td>
</tr>
<tr>
<td>Fully Solves Target Congestion</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Creates Other BGE Congestion</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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</tbody>
</table>

**Map**

![Map of Proposal 13A](image1)
![Map of Proposal 13B](image2)
![Map of Proposal 13C](image3)
![Map of Proposal 13D](image4)
<table>
<thead>
<tr>
<th>Proposal</th>
<th>13E</th>
<th>13F</th>
<th>13G*</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$ 179.22</td>
<td>$ 483.21</td>
<td>$ 192.07</td>
</tr>
<tr>
<td>In-service Year</td>
<td>2022</td>
<td>2024</td>
<td>2022</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>1.11</td>
<td>0.49</td>
<td>N/A</td>
</tr>
<tr>
<td>Fully Solves Target Congestion</td>
<td>No</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>Creates Other BGE Congestion</td>
<td>No</td>
<td>No</td>
<td>N/A</td>
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</tbody>
</table>

* 13G Analysis in progress. Results to be posted when completed.

Map
### ATC (1 proposal)

<table>
<thead>
<tr>
<th>Proposal</th>
<th>14A</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$114.80</td>
</tr>
<tr>
<td>In-service Year</td>
<td>2023</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>1.12</td>
</tr>
<tr>
<td>Fully Solves Target Congestion</td>
<td>Yes</td>
</tr>
<tr>
<td>Creates Other BGE Congestion</td>
<td>No</td>
</tr>
</tbody>
</table>

- **Map**

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**In-Service cost ($M)**: $114.80

**In-service Year**: 2023

**B/C Ratio**: 1.12

**Fully Solves Target Congestion**: Yes

**Creates Other BGE Congestion**: No

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**Map**

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### Joint PPL-ATXI EAST (2 proposals)

<table>
<thead>
<tr>
<th>Proposal</th>
<th>15A</th>
<th>15B</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$138.50</td>
<td>$178.30</td>
</tr>
<tr>
<td>In-service Year</td>
<td>2022</td>
<td>2022</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>3.06</td>
<td>0.92</td>
</tr>
<tr>
<td>Fully Solves Target Congestion</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Creates Other BGE Congestion</td>
<td>Yes</td>
<td>Yes</td>
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**Map**

![Map of Joint PPL-ATXI EAST proposals](#)
### PSEG (5 proposals)

<table>
<thead>
<tr>
<th>Proposal</th>
<th>16A</th>
<th>16B</th>
<th>16C</th>
<th>16D</th>
<th>16E</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$70.50</td>
<td>$92.20</td>
<td>$87.20</td>
<td>$105.10</td>
<td>$109.30</td>
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<tr>
<td>In-service Year</td>
<td>2021</td>
<td>2021</td>
<td>2021</td>
<td>2021</td>
<td>2021</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>1.73</td>
<td>1.26</td>
<td>1.06</td>
<td>1.10</td>
<td>1.28</td>
</tr>
<tr>
<td>Fully Solves Target Congestion</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Creates Other BGE Congestion</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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</tr>
</tbody>
</table>

#### Map

![Map](image1.png)  ![Map](image2.png)  ![Map](image3.png)  ![Map](image4.png)  ![Map](image5.png)
# Northeast Transmission Development (6 proposals)

<table>
<thead>
<tr>
<th>Proposal</th>
<th>18A</th>
<th>18B</th>
<th>18C</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$126.20</td>
<td>$132.80</td>
<td>$149.90</td>
</tr>
<tr>
<td>In-service Year</td>
<td>2021</td>
<td>2021</td>
<td>2021</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>2.52</td>
<td>2.04</td>
<td>0.96</td>
</tr>
<tr>
<td>Fully Solves Target Congestion</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Creates Other BGE Congestion</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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## Map

![Map of Proposal 18A](image1)

![Map of Proposal 18B](image2)

![Map of Proposal 18C](image3)
## Northeast Transmission Development (continue)

<table>
<thead>
<tr>
<th>Proposal</th>
<th>18D</th>
<th>18E</th>
<th>18F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In-Service cost ($M)</td>
<td>In-service Year</td>
<td>B/C Ratio</td>
</tr>
<tr>
<td></td>
<td>$ 166.00</td>
<td>2021</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>$ 152.90</td>
<td>2021</td>
<td>1.10</td>
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<td></td>
<td>$ 95.30</td>
<td>2021</td>
<td>1.94</td>
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<td></td>
<td>Fully Solves Target Congestion</td>
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<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Creates Other BGE Congestion</td>
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</tr>
</tbody>
</table>

### Map

[Maps showing transmission projects]
## ITC (9 proposals)

<table>
<thead>
<tr>
<th>Proposal</th>
<th>20A</th>
<th>20B</th>
<th>20C</th>
<th>20D</th>
<th>20E</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Service cost ($M)</td>
<td>$ 73.60</td>
<td>$ 63.00</td>
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### Map

1. ![Map 1](image1.png)
2. ![Map 2](image2.png)
3. ![Map 3](image3.png)
4. ![Map 4](image4.png)
### ITC (continue)

<table>
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<th>Proposal</th>
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<tr>
<td>Creates Other BGE Congestion</td>
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**Map**

![Map of proposals](image1.png) ![Map of proposals](image2.png) ![Map of proposals](image3.png)
BGE Group Next Steps

• Narrow list of potential projects based on additional analysis

• Finalize Cost/Constructability analysis

• Run additional sensitivities on gas and load forecasts:
  – High/Low Gas Price Forecast (+/- 20%)
  – High/Low Load Forecast (+/- 2%)

• Perform reliability analysis
Appendix A
Portion of 2017_1-6A
(Preliminary Reliability Recommendation
DEOK Transmission Zone)
Preliminary Recommendation: (Portion of 2017_1-6A)
Install a new 345kV breaker “1422” so Pierce 345/138KV transformer #18 is now fed in a double breaker, double bus configuration.
Remove X-533 No. 2 to the first tower outside the station. Install a new first tower for X-533 No.2.
Install new 345KV breaker B and move the Buffington-Pierce 345kV feeder to the B-C junction. Install a new tower at the first tower outside the station for Buffington-Pierce 345kV line.
Replace breaker A and move the Pierce 345/138kV transformer #17 feed to the C-D junction.
Replace breaker 822 at Beckjord 138kV substation to increase the rating from Pierce to Beckjord 138kV to 603MVA.

Estimated Project Cost: $ 9.17 M

Required IS date: 6/1/2021

Project Status: Conceptual
Appendix B
Addendum Window 1A
Projects Received
Project ID: 201617_1A-1A

Proposed by: Northeast Transmission Development (NTD)

Proposed Solution: Greenfield.
New 345 kV switching station ("Twelvemile"). Build a 345 kV switching station ("Twelvemile") interconnecting the existing Silver Grove - Zimmer 345 kV transmission line and the Pierce - Buffington 345 kV transmission line.

kV Level: 345 kV
In-Service Cost ($M): $12.7, B/C Ratio = 8.88
In-Service Date: 6/1/2021
Target Zone: DEOK LDA
ME Constraints:
TANNERS CREEK - MIAMI FORT 345 kV

Notes:
• Same project was submitted as 2017_1-2E to the reliability window, PJM 2017 Proposal Window 1, to address reliability violations.
• This RPM project is not currently recommended.
Project ID: 201617_1A-2A

Proposed by: American Electric Power (AEP)

Proposed Solution: Upgrade
Upgrade terminal equipment at Tanners Creek 345kV station
Upgrade 345kV Bus and Risers at Tanners Creek for the Dearborn circuit.

kV Level: 345 kV
In-Service Cost ($M): $0.6, B/C Ratio = 151.61
In-Service Date: 6/1/2021
Target Zone: DEOK LDA
ME Constraints:
TANNERS CREEK - MIAMI FORT 345 kV

Notes:
• Very low cost
• Anticipate recommendation for Board approval in December 2017
• Designated Entity: AEP (the local TO)
Project ID: 201617_1A-2B

Proposed by: American Electric Power (AEP)

Proposed Solution: Upgrade
Establish Tanners Creek - Dearborn 345kV Circuit #2
Install two 345kV CB at Dearborn station for Tanners Creek Circuits #1 and #2 and one 345kV CB at Tanners Creek for Dearborn Circuit #2.

kV Level: 345 kV
In-Service Cost ($M): $4.9, B/C Ratio = 18.6
In-Service Date: 6/1/2021
Target Zone: DEOK LDA
ME Constraints:
TANNERS CREEK - MIAMI FORT 345 kV

Notes:
• Cost higher and B/C ratio lower than 201617_1A-2A proposal
• This RPM project is not currently recommended.
Appendix C – PPL Supplemental Project
Wescosville Transformer 230/138 kV
PPL Transmission Zone (presented at TEAC 04/09/2015)

- S0864 Supplemental Upgrade Scope Change:
- Old Scope:
  Rebuild approximately 10 miles of the Hosensack-Wescosville 230 kV line to 500 kV and upgrade Wescosville 500-138 kV Substation.
- New Scope:
  - Build approximately 6 miles 500 kV 2nd circuit on the existing Alburtis – Breinigsville.
  - Reconfigure the Wescosville 500 kV station to double breaker arrangement.
  - Install a new Wescosville 230/138 kV transformer.
- Estimated Project Cost: $ 58.4 M
- Projected IS Date: 12/31/2017

Note: New Projected IS Date is 3/1/2019
Appendix D – BGE Group
Proposed Projects
Project ID: 201617_1-5A

Proposed by: BGE

Proposed Solution:
Reconduct the Conastone to Graceton 230 kV lines.
Upgrade substation equipment at Conastone.

kV Level: 230 kV
In-Service Cost ($M): $5.97
In-Service Date: 2020
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON 230 kV

Notes:
**Project ID: 201617_1-5B**

**Proposed by:** BGE

**Proposed Solution:**
Add bundled conductors to the Graceton-Bagley-Raphael Road 230 kV double circuit lines.

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**ME Constraints:**
GRACETON - BAGLEY 230 kV

**Notes:**

---

PJM TEAC 11/9/2017
**Project ID: 201617_1-5C**

Proposed by: BGE

**Proposed Solution:**
Reconductor the Conastone to Graceton 230 kV lines. Upgrade substation equipment at Conastone. Add bundled conductors to the Graceton - Bagley-Raphael Road 230 kV double circuit lines.

- **kV Level:** 230 kV
- **In-Service Cost ($M):** $20.30
- **In-Service Date:** 2021
- **Target Zone:** BGE

**ME Constraints:**
CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**
Project ID: 201617_1-5D

Proposed by: BGE

Proposed Solution:
Reconductor the Conastone to Graceton 230 kV lines. Upgrade substation equipment at Conastone. Add bundled conductors to the Graceton-Bagley-Raphael Road 230kV double circuit lines. Upgrade substation equipment at Windy Edge substation.

kV Level: 115/230 kV
In-Service Cost ($M): $20.40
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:

PJM TEAC 11/9/2017
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<td>Reconductor the Conastone to Graceton 230kV lines. Upgrade substation equipment at Conastone. Add bundled conductors to the Graceton-Bagley-Raphael Road 230kV double circuit lines. Reconductor the Raphael Road to Northeast 230 kV double circuit lines. Upgrade substation equipment at Windy Edge substation.</td>
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**ME Constraints:**

CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**

PJM TEAC 11/9/2017
Project ID: 201617_1-6F

Proposed by: BGE PECO

Proposed Solution:
Tap the Peach Bottom-Conastone 500 kV line at Graceton. Expand Graceton to include a 500/230 kV substation. Add bundled conductors to the Graceton-Bagley-Raphael Road 230 kV double circuit lines. Reconductor the Raphael Road to Northeast 230 kV double circuit lines. Upgrade substation equipment at Windy Edge 115 kV substation.

kV Level: 115/230/500 kV
In-Service Cost ($M): $49.20
In-Service Date: 2021

Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:

PJM TEAC 11/9/2017
Proposed by: BGE PECO

Proposed Solution:
Tap the Peach Bottom-Conastone 500 kV line at Graceton. Expand Graceton to include a 500/230 kV substation. Add bundled conductors to the Graceton-Bagley-Raphael Road 230 kV double circuit lines. Reconductor the Raphael Road to Northeast 230 kV double circuit lines. Reconductor Graceton – Cooper 230 kV line. Upgrade substation equipment at Cooper 230kV and Windy Edge 115 kV substations.

kV Level: 115/230/500 kV
In-Service Cost ($M): $56.00
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
Project ID: 201617_1-6L

Proposed by: BGE PECO

Proposed Solution:
New Peach Bottom - Cooper 230 kV line with series reactor; resupply PB Tap. Reconduct the Conastone to Graceton 230 kV lines. Add bundled conductors to the Graceton – Bagley - Raphael Road 230 kV double circuit lines. Reconduct the Raphael Road to Northeast 230 kV double circuit lines. Reconduct Graceton - Cooper 230 kV line. Upgrade substation equipment at Peach Bottom 230 kV, Cooper 230 kV, Conastone 230 kV and Windy Edge 115 kV substations.

kV Level: 115/230 kV

In-Service Cost ($M): $41.70

In-Service Date: 2021

Target Zone: BGE PECO

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:

PJM TEAC 11/9/2017
Proposed by: BGE PECO

Proposed Solution:
Tap the Peach Bottom-Conastone 500 kV line at Graceton. Expand Graceton to include a 500/230 kV substation. New Peach Bottom - Cooper 230 kV line with series reactor; resupply PB Tap. Add bundled conductors to the Graceton – Bagley - Raphael Road 230 kV double circuit lines. Reconductor the Raphael Road to Northeast 230 kV double circuit lines. Reconductor Graceton - Cooper 230kV line. Upgrade substation equipment at Peach Bottom 230 kV, Cooper 230 kV, Conastone 230 kV and Windy Edge 115 kV substations.

kV Level: 115/230/500 kV

In-Service Cost ($M): $65.49

In-Service Date: 2021

Target Zone: BGE PECO

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
Project ID: 201617_1-7H

Proposed by: PECO

Proposed Solution:
New Peach Bottom - Cooper 230 kV line with series reactor. Add bundled conductors to the Graceton - Bagley - Raphael Road 230 kV double circuit lines. Reconductor the Raphael Road to Northeast 230 kV double circuit lines. Reconductor Graceton - Cooper 230 kV line. Upgrade substation equipment at Peach Bottom 230 kV, Cooper 230 kV and Windy Edge 115 kV substations.

kV Level: 115/230 kV

In-Service Cost ($M): $35.60

In-Service Date: 2021

Target Zone: BGE PECO

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

Notes:
PJM TEAC 11/9/2017
Proposed by: PECO

Proposed Solution:
New Peach Bottom - Cooper 230 kV line with series reactor. Add bundled conductors to the Graceton - Bagley - Raphael Road 230 kV double circuit lines. Reconduct the Raphael Road to Northeast 230 kV double circuit lines. Rebuild Graceton - Cooper 230 kV line. Upgrade substation equipment at Peach Bottom 230 kV, Cooper 230 kV and Windy Edge 115 kV substations.

kV Level: 115/230 kV

In-Service Cost ($M): $59.80

In-Service Date: 2021

Target Zone: BGE PECO

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

Notes:

PJM TEAC 11/9/2017
Project ID: 201617_1-7J

Proposed by: PECO

Proposed Solution:
New Peach Bottom - Graceton 230 kV line with series reactor.
Reconductor Graceton - Cooper 230 kV line; add reactor.
Reconductor Peach Bottom - Cooper section of 220-08 line.
Add bundled conductors to the Graceton - Bagley - Raphael Road 230 kV double circuit lines. Reconductor the Raphael Road to Northeast 230kV double circuit lines. Upgrade substation equipment at Peach Bottom 230 kV, Graceton 230kV, Cooper 230 kV and Windy Edge 115 kV substations.

kV Level: 115/230 kV

In-Service Cost ($M): $68.10

In-Service Date: 2022

Target Zone: BGE PECO

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

Notes:
Peach Bottom - Cooper line & Cooper substation should also be highlighted.
Project ID: 201617_1-7K

Proposed by: PECO

Proposed Solution:
Add two 500/230 kV transformers at Peach Bottom substation. New Peach Bottom - Graceton 230 kV double circuit line. Replace Graceton - Cooper 230 kV line and Peach Bottom - Cooper section of 220-08 line with underground cable. Add reactor to Graceton - Cooper 230 kV line. Add bundled conductors to the Graceton - Bagley - Raphael Road 230 kV double circuit lines. Reconduct the Raphael Road - Northeast 230 kV double circuit lines. Upgrade substation equipment at Peach Bottom 500/230 kV, Graceton 230 kV, Cooper 230 kV and Windy Edge 115 kV substations.

kV Level: 115/230/500 kV

In-Service Cost ($M): $191.40

In-Service Date: 2022

Target Zone: BGE PECO

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

Notes: Peach Bottom - Cooper line & Cooper substation should also be highlighted.
Project ID: 201617_1-10C

Proposed by: Nextera
Proposed Solution: Greenfield
Build a new 230 kV switchyard (Rowland) near Conowingo and a new Perryman – Roland 230 kV line. Loop the Conowingo - Colora and Conowingo - Nottingham 230 kV lines into the new switchyard.

kV Level: 230 kV
In-Service Cost ($M): $44.4
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
GRACETON - BAGLEY 230 kV

Notes:

PJM TEAC 11/9/2017
Proposed by: Nextera

Proposed Solution: Greenfield
Tap the Peach Bottom - Conastone 500 kV line at near Graceton and build a new 500/230 kV substation (Pylesville) tying into Graceton 230 kV. Build a new 230 kV switchyard (Rowland) near Conowingo and a new Perryman – Roland 230 kV line. Loop the Conowingo - Colora and Conowingo - Nottingham 230 kV lines into the new switchyard.

kV Level: 230 kV
In-Service Cost ($M): $93.5
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
**Project ID: 201617_1-10E**

**Proposed by:** Nextera

**Proposed Solution:** Greenfield

Tap the Peach Bottom - Conastone 500 kV line at near Graceton and build a new 500/230 kV substation (Pylesville) tying into Graceton 230 kV. Build a new 230 kV switchyard (Rowland) near Conowingo and a new Perryman – Roland 230kV line. Loop the Conowingo - Colora and Conowingo - Nottingham 230 kV lines into the new switchyard. Build a new 230 kV line from Pylesville 500/230 kV to Rowland 230kV.

**kV Level:** 230/500 kV

**In-Service Cost ($M):** $105.7

**In-Service Date:** 2021

**Target Zone:** BGE

**ME Constraints:**

CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**

PJM TEAC 11/9/2017
Proposed by: Transource

Proposed Solution: Greenfield Tap the Peach Bottom - Rock Springs 500 kV line. Build a new 500/230 kV substation (Baldwin Road). Build a new Baldwin Road - Raphael Road 230 kV line. Rebuild Raphael Road - Northeast 230 kV lines, Northeast - Riverside 230 kV lines and Five Forks - Windy Edge 115 kV DCT lines. Loop Crane - Windy Edge 115 kV lines into Northeast substation. Replace both 115/69 kV transformers at Face Rock.

kV Level: 115/230/500 kV

In-Service Cost ($M): $457.83

In-Service Date: 2024

Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
Project ID: 201617_1-13B

Proposed by: Transource

Proposed Solution: Greenfield

Build a new 230/115 kV substation (Dulaney Valley) along the Windy Edge - Texas line. Build a new Conastone - Dulaney Valley 230kV line. Loop Windy Edge - Texas 115 kV and Summerfield - Shawan Road 115 kV lines into Dulaney Valley substation. Reconductor Dulaney Valley - Summerfield 115 kV lines and a section of Windy Edge - Hazelwood 115 kV. Replace transformers at Face Rock and upgrade transformer replacement at Furnace Run.

kV Level: 115/230 kV

In-Service Cost ($M): $107.49

In-Service Date: 2022

Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
Project ID: 201617_1-13C

Proposed by: Transource

Proposed Solution: Greenfield

kV Level: 115/230 kV
In-Service Cost ($M): $169.27
In-Service Date: 2022
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:

PJM TEAC 11/9/2017
**Project ID: 201617_1-13D**

**Proposed by:** Transource

**Proposed Solution:** Greenfield


**kV Level:** 115/230 kV

**In-Service Cost ($M):** $183.00

**In-Service Date:** 2022

**Target Zone:** BGE

**ME Constraints:**

CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**

- Need to show Long Green Sub south of Glenarm on 138kV line.
- Add a Conastone to Long Green line and a Long Green to Raphael Rd line.
- Highlight Face Rock down to Windy Edge.
Proposed by: Transource
Proposed Solution: Greenfield

Tap the Conastone-Brighton 500 kV line and build a new 500/230 kV substation (Hereford). Build a new 230/115 kV substation along the Windy Edge-Texas 115 kV lines (Dulaney Valley). Build a new 230 kV line from Hereford to Dulaney Valley. Loop Conastone-Northwest 230 kV line into Herford and rebuild from Conastone to Herford. Loop Windy Edge - Texas 115 kV and Summerfield - Shawan Road 115 kV lines into Dulaney Valley substation. Reconduct Dulaney Valley - Summerfield 115 kV lines and a section of Windy Edge - Hazelwood 115 kV. Replace transformers at Face Rock and upgrade transformer replacement at Furnace Run.

kV Level: 115/230/500 kV
In-Service Cost (SM): $179.22
In-Service Date: 2022
Target Zone: BGE
ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
Project ID: 201617_1-13F

Projected by: Transource

Proposed Solution: Greenfield
Tap the Rock Springs - Keeney 500 kV line and build a new 500/230 kV substation (Love Run). Build a new 230 kV line from Love Run to Perryman. Rebuild Perryman-Raphael Road 230 kV lines, Raphael Road-Northeast 230 kV lines, Northeast-Riverside 230 kV lines and Five Forks-Windy Edge 115 kV lines. Loop the Crane - Windy Edge 115 kV lines into Northeast substation. Replace transformers at Face Rock. Substation work at Rock Springs 500 kV station.

- **kV Level:** 230/500 kV
- **In-Service Cost ($M):** $483.21
- **In-Service Date:** 2024
- **Target Zone:** BGE

**ME Constraints:**
- CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**

PJM TEAC 11/9/2017
**Project ID: 201617_1-13G**

**Proposed by:** Transource

**Proposed Solution:**
Reconductor Conastone - Graceton 230 kV lines. Reconductor Graceton - Bagley and Bagley - Raphael Road 230 kV lines. Rebuild Raphael Road - Northeast 230 kV lines and Five Forks - Windy Edge 115 kV lines. Replace transformers at Face Rock and upgrade transformer replacement at Furnace Run.

**kV Level:** 115/230 kV

**In-Service Cost ($M):** $192.07

**In-Service Date:** 2022

**Target Zone:** BGE

**ME Constraints:**
CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**
Proposed Solution: Greenfield
Build a new Furnace Run - Perryman 230 kV line. Add series reactors to both Conastone-Graceton 230 kV lines. Rebuild the Glenarm to Windy Edge 115 kV lines.

kV Level: 115/230 kV
In-Service Cost ($M): $114.80
In-Service Date: 2023
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

Notes:
Project ID: 201617_1-15A

Proposed by: ATXI East PPL

Proposed Solution: Greenfield

Build a new 230/115 kV Substation (Baldwin) north of Glenarm. Build a new Conastone - Baldwin 230 kV double circuit line and a new Baldwin - Raphael Road double circuit 230 kV line. Reconductor the Raphael Road to Northeast 230 kV lines. Loop the Glenarm - Colonial Pipe 115 kV lines into Baldwin. Rebuild the Baldwin to Windy Edge 115 kV lines.

kV Level: 115/230 kV

In-Service Cost ($M): $138.53

In-Service Date: 2022

Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
Proposed Solution: Greenfield
Build a new 230/115 kV Substation (Baldwin) north of Glenarm. Build a new Peach Bottom - Otter Point 230 kV double circuit line and a new Raphael Road - Baldwin 230 kV double circuit line. Loop the Glenarm - Colonial Pipe 115 kV lines into Baldwin. Rebuild the Baldwin to Windy Edge 115 kV lines. Reconductor the Otter Point to Raphael Road 230 kV lines and the Raphael Road to Northeast 230 kV lines.

kV Level: 115/230 kV
In-Service Cost ($M): $178.30
In-Service Date: 2022
Target Zone: BGE
ME Constraints: CONASTONE - GRACETON - BAGLEY 230 kV
Notes:
**Project ID: 201617_1-16A**

**Proposed by:** PSEG

**Proposed Solution:** Greenfield
Build a new Peach Bottom - Otter Point 230 kV line.
Reconductor / Rebuild Raphael Road - Northeast 230 kV lines. Reconductor / Rebuild Northeast to General Motors 115 kV lines.

**kV Level:** 115/230 kV

**In-Service Cost ($M):** $70.5

**In-Service Date:** 2021

**Target Zone:** BGE

**ME Constraints:**
CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**

PJM TEAC 11/9/2017
### Proposed Solution: Greenfield
Build a new Peach Bottom - Raphael Road 230 kV line. Reconductor / Rebuild Raphael Road - Northeast 230 kV lines. Reconductor / Rebuild Northeast to General Motors 115 kV lines.

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**Target Zone:** BGE

**ME Constraints:**
CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**
PJM TEAC 11/9/2017
### Proposed by: PSEG

#### Proposed Solution: Greenfield

Build a new Conastone - Raphael Road 230 kV line. Reconductor / Rebuild Raphael Road - Northeast 230 kV lines. Reconductor / Rebuild Northeast to General Motors 115 kV lines.

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### Notes:

PJM TEAC 11/9/2017
Proposed by: PSEG

Proposed Solution: Greenfield
Build a new Conastone - Northeast 230 kV line. Reconductor / Rebuild Northeast to General Motors 115 kV lines.

kV Level: 115/230 kV
In-Service Cost ($M): $105.1
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:

PJM TEAC 11/9/2017
**Project ID: 201617_1-16E**

**Proposed by:** PSEG  

**Proposed Solution:** Greenfield  
Build a new Peach Bottom - Northeast 230 kV line.  
Reconductor / Rebuild Northeast to General Motors 115 kV lines.

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<th>Target Zone: BGE</th>
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</thead>
</table>

**ME Constraints:**  
CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**
PJM TEAC 11/9/2017
### Project ID: 201617_1-18A

**Proposed by:** Northeast Transmission Development  
**Proposed Solution:** Greenfield  

- Tap the Peach Bottom - Delta Power Plant (York) 500 kV line and build a new 500/230 kV substation (Robinson Run). Build a new Robinson Run - Graceton 230 kV double circuit line.  
- Upgrade the Graceton - Bagley - Raphael Road double circuit 230 kV lines. Rebuild the Raphael Road - Northeast 230 kV double circuit lines. Upgrade the Rock Ridge to Windy Edge 115 kV lines. Tap the Raphael Road - Northeast 230 kV lines and build a new 230/115 kV substation (Pumpkin Run). Loop in the Crane - Windy Edge 115 kV lines.

**kV Level:** 115/230/500 kV  
**In-Service Cost ($M):** $126.2  
**In-Service Date:** 2021  
**Target Zone:** BGE  

**ME Constraints:**  
CONASTONE - GRACETON - BAGLEY 230 kV  
CONASTONE - PEACH BOTTOM 500 kV  

**Notes:** Need to show Robinson Run sub and a line from Robinson Run to Graceton. Only one highlight line Rock Ridge to Windy Edge and Graceton to Northeast. Need to show Pumpkin Run sub.
Project ID: 201617_1-18B

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield
Tap the Peach Bottom - Three Mile Island 500 kV line and build a new 500/230 kV substation (Bookers Run). Build a new Bookers Run - Graceton 230 kV double circuit line.
Upgrade the Graceton - Bagley - Raphael Road double circuit 230 kV lines. Rebuild the Raphael Road - Northeast 230 kV double circuit lines. Rebuild Five Forks - Rock Ridge 115 kV lines. Upgrade the Rock Ridge to Windy Edge 115 kV lines.

kV Level: 115/230/500 kV
In-Service Cost ($M): $132.8
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

Notes:
Project ID: 201617_1-18C

**Proposed by:** Northeast Transmission Development

**Proposed Solution:** Greenfield
Tap the Peach Bottom - Delta Power Plant (York) 500 kV line and build a new 500/230 kV substation (Robinson Run). Build a new Robinson Run - Otter Point 230kV double circuit line. Rebuild the Raphael Road - Northeast 230 kV double circuit lines.

**kV Level:** 230/500 kV

**In-Service Cost ($M):** $149.9

**In-Service Date:** 2021

**Target Zone:** BGE

**ME Constraints:**
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

**Notes:**

PJM TEAC 11/9/2017
Project ID: 201617_1-18D

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield
Tap the Peach Bottom - Rock Springs 500 kV line and build a new 500/230 kV substation (Slate). Build a new Slate - Otter Point 230 kV double circuit line. Rebuild the Raphael Road - Northeast 230 kV double circuit lines. Tap the Raphael Road - Northeast 230 kV lines and build a new 230/115 kV substation (Pumpkin Run). Loop in the Crane - Windy Edge 115 kV lines.

kV Level: 115/230/500 kV
In-Service Cost ($M): $166
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

Notes:
- Need to show Slate sub and Slate – Otter Point line
- Need to show Pumpkin Run sub
Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield
Tap the Peach Bottom - Rock Springs 500 kV line and build a new 500/230 kV substation (Slate). Build a new Slate - Otter Point 230kV double circuit line. Rebuild the Raphael Road - Northeast 230 kV double circuit lines. Upgrade the Rock Ridge to Windy Edge 115 kV lines.

kV Level: 115/230/500 kV
In-Service Cost ($M): $152.9
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

Notes:
Need to show Slate sub and Slate – Otter Point line
Project ID: 201617_1-18F

Proposed by: Northeast Transmission Development

Proposed Solution: Greenfield
Build a new 230/115 kV substation (Fitzhugh Run). Build a new Conastone - Fitzhugh Run 230 kV double circuit line. Loop Shawan Road - Summerfield 115 kV lines and Windy Edge - Texas 115 kV lines into Fitzhugh Run substation. Upgrade the Graceton - Bagley - Raphael Road 230 kV double circuit line.

kV Level: 115/230 kV
In-Service Cost ($M): $95.3
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV
CONASTONE - PEACH BOTTOM 500 kV

Notes:
Project ID: 201617_1-20A

Proposed by: ITC

Proposed Solution: Greenfield
Tap the Raphael Road - Otter Point 230 kV line and build a new 230 kV switchyard (Old Post). Build a new Peach Bottom - Old Post 230 kV line.

kV Level: 230 kV
In-Service Cost ($M): $73.60
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
Show Old Post sub and Peach Bottom to Old Post line
### Project ID: 201617_1-20B

**Proposed by:** ITC

**Proposed Solution:** Greenfield

Build a new Conastone - Raphael Road 230 kV line.

**kV Level:** 230 kV

**In-Service Cost ($M):** $63.00

**In-Service Date:** 2021

**Target Zone:** BGE

**ME Constraints:**

CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**

Show new Conastone to Raphael Road line.
**Project ID: 201617_1-20C**

**Proposed by:** ITC

**Proposed Solution:** Greenfield  
Build a new Conastone - Northeast 230 kV line.

**kV Level:** 230 kV  
**In-Service Cost ($M):** $135.78  
**In-Service Date:** 2021  
**Target Zone:** BGE

**ME Constraints:**  
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:

Show new Conastone to Northeast line
<table>
<thead>
<tr>
<th>Project ID: 201617_1-20D</th>
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</thead>
<tbody>
<tr>
<td>Proposed by: ITC</td>
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<tr>
<td>Proposed Solution:</td>
</tr>
<tr>
<td>Greenfield</td>
</tr>
<tr>
<td>Tap the Raphael Road - Otter Point 230 kV line and build a new 230 kV switchyard (Old Post). Build a new Conastone - Old Post 230 kV line.</td>
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<tr>
<td>kV Level: 230 kV</td>
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<tr>
<td>In-Service Cost ($M): $75.89</td>
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<td>Target Zone: BGE</td>
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</table>

**ME Constraints:**

CONASTONE - GRACETON - BAGLEY 230 kV

**Notes:**

Show Old Post sub and Conastone to Old Post line
<table>
<thead>
<tr>
<th>Project ID: 201617_1-20E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed by: ITC</td>
</tr>
<tr>
<td>Proposed Solution: Greenfield</td>
</tr>
<tr>
<td>Tap the Graceton - Bagley 230 kV line and build a new 230 kV switchyard (Fallston Road). Tap the Raphael Road - Otter Point 230 kV line and build a new 230 kV switchyard (Old Post). Build a new 230 kV switchyard (Pyle Road). Build a new Peach Bottom - Pyle Road 230 kV line, a new Pyle Road - Fallston Road 230 kV line and a new Pyle Road - Old Post 230 kV line.</td>
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<tr>
<td>kV Level: 230 kV</td>
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<tr>
<td>In-Service Cost ($M): $132.24</td>
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<tr>
<td>In-Service Date: 2021</td>
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<td>Target Zone: BGE</td>
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<tr>
<td>ME Constraints: CONASTONE - GRACETON - BAGLEY 230 kV</td>
</tr>
</tbody>
</table>

Notes:

- PJM TEAC 11/9/2017
Proposed by: ITC

Proposed Solution: Greenfield
Tap the Graceton - Bagley 230 kV line and build a new 230 kV switchyard (Fallston Road). Tap the Raphael Road - Otter Point 230 kV line and build a new 230 kV switchyard (Old Post). Build a new 230 kV switchyard (Pyle Road). Build a new Conastone - Pyle Road 230 kV line, a new Pyle Road – Fallston Road 230 kV line and a new Pyle Road – Old Post 230 kV line.

kV Level: 230 kV
In-Service Cost ($M): $125.99
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
Proposed by: ITC

Proposed Solution: Greenfield
Build a new Peach Bottom - Northeast 230 kV line.

kV Level: 230 kV
In-Service Cost ($M): $151.51
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
Show Peach Bottom to Northeast line; do not highlight Conastone
Project ID: 201617_1-20H

Proposed by: ITC

Proposed Solution: Greenfield

Tap the Raphael Road - Otter Point 230 kV line and build a new 230 kV switchyard (Old Post). Build a new Peach Bottom - Old Post 230 kV line. Install a transmission battery energy storage system at the Old Post 230 kV switchyard.

kV Level: 230 kV
In-Service Cost ($M): $107.46
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:

Show Old Post sub and Peach Bottom to Old Post line
Proposed by: ITC

Proposed Solution: Greenfield

Tap the Graceton - Bagley 230 kV line and build a new 230 kV switchyard (Fallston Road). Tap the Raphael Road - Otter Point 230 kV line and build a new 230 kV switchyard (Old Post). Build a new 230 kV switchyard (Pyle Road). Build a new Peach Bottom - Pyle Road 230 kV line, a new Pyle Road - Fallston Road 230 kV line and a new Pyle Road - Old Post 230 kV line. Install a transmission battery energy storage system at the Fallston Road 230 kV switchyard.

kV Level: 230 kV
In-Service Cost ($M): $165.74
In-Service Date: 2021
Target Zone: BGE

ME Constraints:
CONASTONE - GRACETON - BAGLEY 230 kV

Notes:
• Revision History
  – V1 – 11/XX/2017 – Original Version Posted to PJM.com
  – V2 – 11/09/2017 – Slide 8 – Added $M to all costs.
  – V2 – 11/09/2017 – Slide 17 – Added more details to column descriptions.
  – V2 – 11/09/2017 – Slide 26 – Updated with “project 13G analysis in progress”.