Transmission Expansion Advisory Committee Meeting

2011 Market Efficiency Analysis Results

August 4, 2011
• 2011 Market Efficiency Base Analysis completed
  – Updated congestion results in Appendix A

• 2010 project reviews completed
  – COMED Area
  – PPL, METED, and PENELEC Area
  – Dominion and AEP Areas
Market Efficiency Projects

COMED AREA
Market Efficiency Proposed Projects: COMED Zone

- **BCP Transmission Project** submitted by LS Power for new single 345 kV line from Byron to Cherry Valley to Pleasant Valley.

- **Expected ISD: 6/1/2016**

- **LS Power estimated project Costs: $112.5 million**

- **2011 Analysis Results:**
  - Benefit/Cost ratio = .75
  - .75 < 1.25 - Fail
**Market Efficiency Proposed Projects: COMED Zone**

- **Variation of BCP Transmission Project** submitted by LS Power for new single 345 kV line from Byron to Pleasant Valley.

- **Expected ISD:** 6/1/2016

- **LS Power estimated project Costs:** $115.4 million

- **2011 Analysis Results:**
  - Benefit/Cost ratio = .96
  - .96 < 1.25 - Fail
Market Efficiency Proposed Projects: COMED Zone

- Variation of BCP Transmission Project submitted by LS Power for new single 345 kV line from Cherry Valley to Pleasant Valley.

- Expected ISD: 6/1/2016

- LS Power estimated project Costs: $67.5 million

- 2011 Analysis Results:
  - Benefit/Cost ratio= 2.74
  - 2.74>1.25 - Pass
  - Creates congestion on Byron-Cherry Valley 345 KV ckt.
Variation of BCP Project Submitted by COMED for new single 345 KV line from Byron–Charter Grove-Wayne with 345/138 KV transformer at new Charter Grove station that ties into the W. De Kalb-Cherry Valley 138 KV ckt.

- Expected ISD: 6/1/2016
- Estimated Costs: $275 million
- 2011 Analysis Results:
  - Benefit/Cost ratio= .24
  - .24<1.25 - Fail
Market Efficiency Proposed Projects: COMED Zone

- Variation of COMED and BCP Transmission Project submitted by LS Power for new single 345 kV line from Byron - Wayne.

- Expected IS date: 6/1/2016

- LS Power estimated project Costs: $175 million

- 2011 Analysis Results:
  - Benefit/Cost ratio= .41
  - $.41<1.25 - Fail
## COMED Area Proposed Projects

<table>
<thead>
<tr>
<th>COMED Area Proposed Projects</th>
<th>Company Proposing Project</th>
<th>Expected ISD*</th>
<th>Estimated Cost* ($ millions)</th>
<th>Benefit/Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byron-Cherry Valley-Pleasant Valley 345 kV</td>
<td>LS Power</td>
<td>6/1/2016</td>
<td>112.5</td>
<td>0.75</td>
</tr>
<tr>
<td>Byron-Pleasant Valley 345 kV</td>
<td>LS Power</td>
<td>6/1/2016</td>
<td>115.4</td>
<td>0.96</td>
</tr>
<tr>
<td>Cherry Valley - Pleasant Valley 345 kV</td>
<td>LS Power</td>
<td>6/1/2016</td>
<td>67.5</td>
<td>2.74</td>
</tr>
<tr>
<td>Byron - Charter Grove - Wayne 345 kV, Charter Grove 345/138 kV Tx</td>
<td>COMED</td>
<td>6/1/2016</td>
<td>275.0</td>
<td>0.24</td>
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<tr>
<td>Byron - Wayne 345 kV</td>
<td>LS Power</td>
<td>6/1/2016</td>
<td>175.0</td>
<td>0.41</td>
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</tbody>
</table>

*Expected ISD and Estimated Costs developed by company proposing project.*
Summary COMED Area Proposed Upgrades

• COMED Area proposed projects show less benefit in 2011 Market Efficiency Analysis
  – Lower overall congestion in 2011 vs. 2010 analysis
  – Decreased Load
  – Updated Base topology
  – Updated Fuel and Emission prices

• Next Steps
  – Independent Cost Review currently being conducted
  – Coordination with Light Load study
  – Coordination with Regional Planning Process Task Force (RPPTF) developments
Market Efficiency Projects

METED, PPL, PENELEC Area
Market Efficiency Proposed Projects: METED, PPL, and PENELEC Areas

- Liberty East Transmission Project submitted by LS Power:
  - New 500/230 KV TX at Hunterstown.
  - New Single or Double 230 KV circuit from Hunterstown-Conewago

- Expected ISD: 6/1/2016

- LS Power estimated project Costs.
  - $99.4 million single circuit
  - $134.1 million double circuit

- Results:
  - Single:
    - Benefit/Cost ratio= 1.09
    - 1.09 <1.25 - Fail
  - Double:
    - Benefit/Cost ratio= .74
    - .74 <1.25 - Fail

Map and route developed by LS Power for illustrative purposes only.
Market Efficiency Proposed Projects: METED, PPL, and PENELEC Areas

- Keystone-Shawville Project submitted by LS Power:
  - New 230 KV transmission line from Keystone to Shawville.
  - Expected ISD: 6/1/2016
- LS Power estimated project Costs.
  - $137.5 million
- Results:
  - Benefit/Cost ratio = 0.34
  - 0.34 < 1.25 - Fail
## METED, PPL, PENELEC Area Proposed Projects

<table>
<thead>
<tr>
<th>METED,PPL,PENELEC Area Proposed Projects</th>
<th>Company Proposing Project</th>
<th>Expected ISD*</th>
<th>Estimated Cost* ($ millions)</th>
<th>Benefit/Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liberty East Project Single - New Hunterstown 500 kV Tx, New single circuit Hunterstown-Conewago 230 kV line, New Conewago 230 kV substation connecting the Jackson - Three Mile Island 230 kV and West Shore - Brunner Island 230 kV transmission lines near their intersection in York County</td>
<td>LS Power</td>
<td>6/1/2016</td>
<td>99.4</td>
<td>1.09</td>
</tr>
<tr>
<td>Liberty East Project Double - Two new Hunterstown 500 kV Tx, New Double circuit Hunterstown-Conewago 230 kV line, New Conewago 230 kV substation connecting the Jackson - Three Mile Island 230 kV and West Shore - Brunner Island 230 kV transmission lines near their intersection in York County</td>
<td>LS Power</td>
<td>6/1/2016</td>
<td>134.1</td>
<td>0.74</td>
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<tr>
<td>Keystone - Shawville 230 kV</td>
<td>LS Power</td>
<td>6/1/2016</td>
<td>137.5</td>
<td>0.34</td>
</tr>
</tbody>
</table>

*Expected ISD and Estimated Costs developed by company proposing project.
Summary METED, PPL, PENELEC Area Proposed Upgrades

• Liberty East single and double configurations do not pass 1.25 Benefit/Cost threshold with 2011 Analysis
  – Lower overall congestion in 2011 vs. 2010 analysis
  – Decreased Load
  – Updated Base topology
  – Updated Fuel and Emission prices
  – Future new generation reduces benefit

• Next Steps
  – Independent Cost Review currently being conducted
  – Variations to be considered
Market Efficiency Projects

Dominion and AEP Area
Market Efficiency Proposed Projects: Dominion and AEP Areas

- Kanawha River to Bath County project submitted by LS Power:
  - New Single or Double 345 KV circuit from Kanawha River to Bath County
  - New 500/345 KV TX at Bath County (Two transformers for double circuit configuration)
- Expected ISD: 6/1/2017
- LS Power estimated project Costs.
  - $260.46 million single circuit
  - $387.17 million double circuit
- Results:
  - Single:
    - Benefit/Cost ratio = 3.38
    - 3.38 > 1.25 - Pass
  - Double:
    - Benefit/Cost ratio = 2.29
    - 2.29 > 1.25 - Pass
Dominion and AEP Area Proposed Upgrades

<table>
<thead>
<tr>
<th>Dominion and AEP Area Proposed Projects</th>
<th>Company Proposing Project</th>
<th>Expected ISD*</th>
<th>Estimated Cost* ($ millions)</th>
<th>Benefit/Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>New single circuit Kanawha River-Bath County 345 kV line, One new Bath County 500/345 kV Tx</td>
<td>LS Power</td>
<td>6/1/2017</td>
<td>260.46</td>
<td>3.38</td>
</tr>
<tr>
<td>New double circuit Kanawha River-Bath County 345 kV line, Two new Bath County 500/345 kV Tx</td>
<td>LS Power</td>
<td>6/1/2017</td>
<td>387.17</td>
<td>2.29</td>
</tr>
</tbody>
</table>

*Expected ISD and Estimated Costs developed by company proposing project.
Summary Dominion/AEP Area Proposed Upgrades

• Kanawha River to Bath County single and double circuit configurations continue to pass 1.25 Benefit/Cost Market Efficiency threshold
  – Single Circuit configuration shows highest benefit/cost ratio with current cost estimates.

• Next Steps
  – Independent Cost Review currently being conducted.
  – Sensitivity Analysis to be performed
    • Bath County operation
    • Sensitivity on key input assumptions
    • Reliability Review
  – Variations to be considered
Next Steps

- Review results of independent cost reviews
- Sensitivity Analysis for Kanawha River – Bath County project
- Analysis on new proposed projects and variations of existing projects.
Appendix A

2011 Market Efficiency Base Congestion Results

<table>
<thead>
<tr>
<th>Constraint Name</th>
<th>Area</th>
<th>Type</th>
<th>2011 As-Is System Topology</th>
<th>2014 As-Is System Topology</th>
<th>2015 System Topology without MAPP &amp; PATH</th>
<th>2020 As-Is System Topology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency (Hours)</td>
<td>Market Congestion ($Millions)</td>
<td>Frequency (Hours)</td>
<td>Market Congestion ($Millions)</td>
<td>Frequency (Hours)</td>
<td>Market Congestion ($Millions)</td>
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<tr>
<td>AP SOUTH</td>
<td>3211</td>
<td>$279.7</td>
<td>3118</td>
<td>$358.2</td>
<td>2465</td>
<td>$313.5</td>
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<tr>
<td>Cloverdale 500kV to Lexington 500kV</td>
<td>1045</td>
<td>$125.2</td>
<td>1151</td>
<td>$184.1</td>
<td>1214</td>
<td>$261.5</td>
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<tr>
<td>5004/5005</td>
<td>2434</td>
<td>$131.5</td>
<td>705</td>
<td>$43.8</td>
<td>2080</td>
<td>$303.1</td>
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<tr>
<td>Black Oak - Bedington Interface</td>
<td>148</td>
<td>$24.9</td>
<td>811</td>
<td>$163.7</td>
<td>988</td>
<td>$274.3</td>
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<tr>
<td>EASTERN</td>
<td>713</td>
<td>$61.2</td>
<td>1921</td>
<td>$250.5</td>
<td>54</td>
<td>$6.8</td>
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<tr>
<td>WESTERN</td>
<td>56</td>
<td>$3.8</td>
<td>183</td>
<td>$15.1</td>
<td>270</td>
<td>$10.25</td>
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<tr>
<td>Krendale 138kV to Seneca 138kV</td>
<td>73</td>
<td>$0.5</td>
<td>1915</td>
<td>$25.6</td>
<td>2031</td>
<td>$39.3</td>
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<tr>
<td>COOPER 230kV to Peach Bottom 230kV</td>
<td>1006</td>
<td>$15.1</td>
<td>984</td>
<td>$27.0</td>
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<tr>
<td>Altoona 230kV to Bear Rock 230kV</td>
<td>732</td>
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<td>$19.2</td>
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<tr>
<td>Lexington 500kV to Dooms 500kV</td>
<td>146</td>
<td>$21.0</td>
<td>76</td>
<td>$11.5</td>
<td>81</td>
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<td>CENTRAL</td>
<td>146</td>
<td>$2.4</td>
<td>182</td>
<td>$6.6</td>
<td>153</td>
<td>$10.5</td>
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<td>Mitchell 138kV to Erlama 138kV</td>
<td>1917</td>
<td>$10.9</td>
<td>1212</td>
<td>$12.7</td>
<td>1298</td>
<td>$26.5</td>
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<tr>
<td>Streator Cayuga Ridge Wind Farm 345kV to Wilton CTR 345 345kV</td>
<td>177</td>
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<td>2081</td>
<td>$7.5</td>
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<tr>
<td>Clover 230kV to Clover 500kV</td>
<td>148</td>
<td>$3.2</td>
<td>245</td>
<td>$9.1</td>
<td>343</td>
<td>$19.0</td>
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<td>Halfax (VA) 115kV to Mt Laurel 115kV</td>
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<td>32</td>
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<td>Juniata 230kV to Dauphin 230kV</td>
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<td>$4.3</td>
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<td>$0.5</td>
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<tr>
<td>Fredericksburg 230kV to Cranes Corner 230kV</td>
<td>12</td>
<td>$2.3</td>
<td>25</td>
<td>$4.4</td>
<td>39</td>
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<tr>
<td>Streator Cayuga Ridge Wind Farm 345kV to Pontiac Midpoint 345kV</td>
<td>58</td>
<td>$5.3</td>
<td>57</td>
<td>$7.1</td>
<td>73</td>
<td>$7.3</td>
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<tr>
<td>Bristers 500kV to Ox 500kV</td>
<td>144</td>
<td>$10.8</td>
<td>30</td>
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<td>37</td>
<td>$0.9</td>
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<tr>
<td>Tiltonsville 138kV to Windsor 138kV</td>
<td>454</td>
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<td>30</td>
<td>$4.0</td>
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<td>$0.9</td>
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<tr>
<td>Homer City Station 345kV to Homer City Station 230kV</td>
<td>659</td>
<td>$2.7</td>
<td>1269</td>
<td>$5.0</td>
<td>742</td>
<td>$4.7</td>
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<tr>
<td>Dune Acres - Michigan City</td>
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<td>$10.6</td>
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<td>Bayonne 138kV to Passaic Valley Sewage Commission 138kV</td>
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<td>$0.4</td>
<td>1066</td>
<td>$4.1</td>
<td>1847</td>
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<tr>
<td>Bedington 138kV to Harmony Junction Tap 138kV</td>
<td>600</td>
<td>$0.4</td>
<td>1066</td>
<td>$4.1</td>
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<td>$5.8</td>
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<tr>
<td>Altoona 230kV to Baystown 230kV</td>
<td>1414</td>
<td>$11.8</td>
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<tr>
<td>Meadow Brook 500kV to Meadow Brook 138kV</td>
<td>5</td>
<td>$11.1</td>
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<tr>
<td>Pleasant View 500kV to Pleasant View 230kV</td>
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<td>$10.4</td>
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<td>$10.4</td>
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<tr>
<td>Homer City Station 230kV to Shelocta 230kV</td>
<td>2149</td>
<td>$8.4</td>
<td>2149</td>
<td>$8.4</td>
<td>2149</td>
<td>$8.4</td>
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<td><strong>Grand Total</strong></td>
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<td><strong>$767.1</strong></td>
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**Note:** CONGESTION RESULTS DATA (>$5 Million For Any Study Year)