Transmission Expansion Advisory Committee
Market Efficiency Update

December 15, 2016
• 2016/17 Long-Term Window Update

• Recommended Congestion Drivers for 2016/17 Long-Term Window

• 2016 Acceleration Analysis Conclusions

• Next Steps
2016/17 Market Efficiency Timeline

Year 0

- Develop Assumptions (Y1, Y5)
- Market Efficiency Analysis (Y1, Y5)
  (Accelerations and Modifications)

Year 1

- Develop Assumptions (Y1, Y5, Y8, Y11, Y15)
- Market Efficiency Criteria Analysis (Y1, Y5, Y8, Y11, Y15)
- Market Efficiency Analysis (Y1, Y5, Y8, Y11, Y15)

12-month cycle

12-month cycle

24-month cycle

- Identify proposed solutions
- Update significant assumptions (Y0, Y4, Y7, Y10, Y14)
- Independent Consultant reviews of buildability
- Adjustments to solution options by PJM on analysis
- Develop Assumptions (Y1, Y5)

Final Review with TEAC and approval by Board
## 2016/17 Market Efficiency Cycle Timeline

<table>
<thead>
<tr>
<th>Item</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Term Proposal Window</td>
<td>Nov 1, 2016 – Feb 28, 2017</td>
</tr>
<tr>
<td>Analysis of Proposed Solutions</td>
<td>March 2017 - November 2017</td>
</tr>
<tr>
<td>Determination of Final Projects</td>
<td>December 2017</td>
</tr>
</tbody>
</table>
• Market Efficiency base cases were posted on 11/01/2016
  – PROMOD cases, and supporting documentation were posted on Market Efficiency Web page

• Proposal window opened on November 1, 2016

• Proposal window will close on February 28, 2017

• Market Efficiency Questions
  – Send to the RTEP e-mail distribution (rtep@pjm.com) with “Market Efficiency” in the subject line header
2016/17 Long-Term Window Posted Data

• Input Assumptions:

• PROMOD Data (requires CEII and ABB PROMOD License)
  • 2016/17 Base Cases
    • Market Efficiency Base Case
    • Case Descriptions
    • Procedure for Executing PROMOD Simulations
  • 2016 ARR Model
    • PROMOD Case: PJM ME Base ARR Mapping 20161118 (XML file)
    • Market Pnode to PROMOD Mapping (XLSX file)
  • Sample Data (ZIP file)
    • PROMOD Test Case
    • Test results

• Additional Files
  • Benefit / Cost Evaluation Tool
    • Market Efficiency Benefit/Cost Evaluation Spreadsheet and Example
2016/17 Long-Term Window Posted Docs

- **Problem Statement**

- **Recommended Congestion Drivers (requires CEII)**

- **2016 Base Congestion Results**
## 2016/17 Long-Term Window
### Recommended Congestion Drivers

**Facilities Recommended for Proposal**
*(updated On 11/09/2016)*

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>AREA</th>
<th>TYPE</th>
<th>Frequency (Hours)</th>
<th>Market Congestion ($ Millions)</th>
<th>Frequency (Hours)</th>
<th>Market Congestion ($ Millions)</th>
<th>Notes/Potential Upgrade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conastone to Graceton 230 kV</td>
<td>BGE</td>
<td>LINE</td>
<td>972</td>
<td>$58.3</td>
<td>1,044</td>
<td>$72.1</td>
<td></td>
</tr>
<tr>
<td>Graceton to Bagley 230 kV</td>
<td>BGE</td>
<td>LINE</td>
<td>1,265</td>
<td>$33.0</td>
<td>1,518</td>
<td>$49.6</td>
<td></td>
</tr>
<tr>
<td>Susquehanna to Harwood 230 kV</td>
<td>PPL</td>
<td>LINE</td>
<td>166</td>
<td>$4.0</td>
<td>201</td>
<td>$5.6</td>
<td></td>
</tr>
<tr>
<td>Bosserman to Olive 138 kV</td>
<td>AEP</td>
<td>LINE</td>
<td>17</td>
<td>$0.4</td>
<td>71</td>
<td>$2.0</td>
<td>Interregional Constraint</td>
</tr>
</tbody>
</table>
Acceleration Analysis
Acceleration Analysis

• Scope
  – Determine which reliability upgrades, if any, have an economic benefit if accelerated or modified.

• Study Years
  – 2017 and 2021 set of economic input assumptions used to study impacts of approved RTEP projects

• Process
  – Compare market congestion for near term vs. future topology
  – Estimate economic impact of accelerating planned upgrades
Acceleration Analysis Status

- Finalized PROMOD modeling work for 2017 and 2021 AS-IS cases
- Completed PROMOD runs
- Compared the board approved reliability upgrades with the congestion reductions between the AS-IS and the ME Base cases.
## Acceleration Analysis: 2017 Load, Generation and Economic Assumptions

### Congestion Decreases Associated With Approved Reliability Projects - 2017 Study Year

<table>
<thead>
<tr>
<th>Constraint Name</th>
<th>AREA</th>
<th>TYPE</th>
<th>Year 2017 Congestion ($ Millions)</th>
<th>Year 2017 Congestion ($ Millions)</th>
<th>Congestion Savings ($ Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milford to Steele 230 kV</td>
<td>DP&amp;L</td>
<td>LINE</td>
<td>$3.2</td>
<td>$0.0</td>
<td>$3.2</td>
</tr>
<tr>
<td>BAYWAY_Q to Doremus Pl 138 kV</td>
<td>PSE&amp;G</td>
<td>LINE</td>
<td>$1.4</td>
<td>$0.0</td>
<td>$1.4</td>
</tr>
<tr>
<td>ZION EC ;RP TO ZION STA ; R 345kV</td>
<td>CE</td>
<td>LINE</td>
<td>$2.1</td>
<td>$0.0</td>
<td>$2.1</td>
</tr>
<tr>
<td>Milford to Cool Springs 230 kV</td>
<td>DP&amp;L</td>
<td>LINE</td>
<td>$1.4</td>
<td>$0.2</td>
<td>$1.2</td>
</tr>
</tbody>
</table>

### Upgrade Responsible for Congestion Reduction

- **PJM RTEP B2633.1: New 230 kV transmission line between Salem and Silver Run.**
  - ISD: 2019

- **PJM RTEP B2436: PSEG Northern NJ 345 kV Project.**
  - ISD: 2018

- **MISO MTEP P8065: Reconfigure the Pleasant Prairie-Arcadian 345 kV and Zion-Libertyville: 345 kV transmission lines to loop into new station.**
  - ISD: 2020

- **PJM RTEP B2633.1: New 230 kV transmission line between Salem and Silver Run.**
  - ISD: 2019

**Note:** For a particular flowgate, the congestion savings for the 2017 study year are calculated as the difference in simulated congestion between the PROMOD case with AS-IS 2017 topology and the PROMOD case with the RTEP 2021 topology.
Acceleration Analysis: 2021 Load, Generation and Economic Assumptions

<table>
<thead>
<tr>
<th>Congestion Decreases Associated With Approved Reliability Projects - 2021 Study Year</th>
<th>2021 Study year</th>
<th>Upgrade Responsible for Congestion Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constraint Name</td>
<td>AREA</td>
<td>TYPE</td>
</tr>
<tr>
<td>Susquehanna to Harwood 230 kV</td>
<td>PPL</td>
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</tr>
<tr>
<td>Milford to Steele 230 kV</td>
<td>DP&amp;L</td>
<td>LINE</td>
</tr>
<tr>
<td>05GABLSS to Tidd 138 kV</td>
<td>AEP</td>
<td>LINE</td>
</tr>
<tr>
<td>East Towanda to East Sayre 115 kV</td>
<td>PENNELEC</td>
<td>LINE</td>
</tr>
<tr>
<td>McDowell to Shenango 138 kV</td>
<td>ATSI</td>
<td>LINE</td>
</tr>
<tr>
<td>Juniata to Cumberland 230 kV</td>
<td>PPL</td>
<td>LINE</td>
</tr>
<tr>
<td>BAYWAY_Q to Doremus Pl 138 kV</td>
<td>PSE&amp;G</td>
<td>LINE</td>
</tr>
<tr>
<td>ZION EC ;RP TO ZION STA ; R 345kV</td>
<td>CE</td>
<td>LINE</td>
</tr>
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Note: For a particular flowgate, the congestion savings for the 2021 study year are calculated as the difference in simulated congestion between the PROMOD case with AS-IS 2017 topology and the PROMOD case with the RTEP 2021 topology.
Acceleration Analysis: Results

- Reliability upgrades did not provide significant congestion benefits in the acceleration analysis.

- Moreover, reliability upgrades responsible for congestion reductions are unlikely to be accelerated.
  - ISD is in near future, or
  - project scope too large to accelerate.

- Update will be provided if any of facilities may be accelerated.
## Next Steps

### Milestone Schedule 2016 - 2017

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Schedule</th>
</tr>
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<tbody>
<tr>
<td>Proposal Window Closing</td>
<td>February 28, 2017</td>
</tr>
<tr>
<td>Base Case Update Significant Assumptions (mid cycle update)</td>
<td>March – April 2017</td>
</tr>
<tr>
<td>Project Analysis</td>
<td>March – November 2017</td>
</tr>
<tr>
<td>Final TEAC Review and Board Approval</td>
<td>December 2017</td>
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Questions?

Email: RTEP@pjm.com