Market Efficiency Update

Transmission Expansion Advisory Committee
February 07, 2019
2018/19 Long Term Window Update
2018-2019 24-Month Market Efficiency Cycle

• Long term proposal window: Nov 2\textsuperscript{nd} 2018 – March 1\textsuperscript{st} 2019

• Mid-cycle update of major assumptions: Jan 2019 – Apr 2019
  • Demand forecast, Fuel prices, Generation expansion, Network topology, etc.
  • Only updating the most significant changes, not full update

• Analysis of proposed solutions: May 2019 - Oct 2019
  • Independent consultant review of cost and ability to build
  • Review of analysis with TEAC: Jun 2019 - Nov 2019

• Determination of final projects: Dec 2019
  • Final review with TEAC and Board approval
  • Projects may be approved earlier if analysis and review complete
Market Efficiency Modeling Data – Load Forecast Update

• 2019 Load Forecast Update (see Appendix A for details)
  – update based on the 2019 PJM Load Forecast Report
  – includes updated Zonal Peak and Zonal Energy forecasts

• OVEC Integration in PJM
  – New OVEC zone, OVEC load forecast, OVEC hourly profile added to the PROMOD model
  – OVEC zone included in the PJM pool
  – OVEC generating units, OVEC buses assigned to the OVEC zone
  – OVEC synthetic hourly load profile consistent with the other PJM zones

• Updated PROMOD files to be posted by Friday, Feb 8th
2018/19 RTEP Window Submittal Process

• Items due at close of 120-day window
  – Completed RTEP Proposal Template
    • Include both an overall project cost and detailed cost of each component
    • Any cost cap or cost containment mechanisms
  – All analytical files needed for technical analysis & market efficiency simulation, e.g.
    • Include all PSS/E files, contingency files, one line diagrams, etc.
    • Include all PROMOD modeling files and event file changes
  – Include all results of simulations (PSSE and PROMOD)
  – Detailed substation and route diagrams. Show transmission topology and all breakers
  – All other documents as requested in the problem statement document

• Per PJM-MISO JOA, Interregional Proposals must
  – Address at least one identified issue in both regions
  – Be submitted to both PJM and MISO Regional Windows
2018/19 RTEP Window Submittal Process (cont.)

- Proposal Submittal Template
  - [https://www.pjm.com/planning/competitive-planning-process.aspx](https://www.pjm.com/planning/competitive-planning-process.aspx)

- Proposal Submittal Instructions

- Completing the Proposal Submittal Form
  - [https://videos.pjm.com/media/PJM+Competitive+Transmission+Project+Proposal+Template+Tutorial/1_o44u3xfj](https://videos.pjm.com/media/PJM+Competitive+Transmission+Project+Proposal+Template+Tutorial/1_o44u3xfj)

- Market Efficiency Proposal Submission Tutorial
  - see Appendix C for slides deck
    - [https://videos.pjm.com/media/1_rnse27px](https://videos.pjm.com/media/1_rnse27px)

- Window Related Questions
  - Window related questions should be posted to the PJM Planning Community
<table>
<thead>
<tr>
<th>Step</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Term Proposal Window</td>
<td>November 2\textsuperscript{nd} 2018 – March 1\textsuperscript{st} 2019</td>
</tr>
<tr>
<td>Base Case Mid-Cycle Update</td>
<td>March – May 2019</td>
</tr>
<tr>
<td>Analysis of Proposed Solutions</td>
<td>May – October 2019</td>
</tr>
<tr>
<td>Final TEAC Review and Board Approval</td>
<td>November – December 2019</td>
</tr>
</tbody>
</table>
Appendix A
Market Efficiency Load Forecast Update
(2019 PJM Load Forecast Report)
• PJM zonal peak and energy forecast from 2019 Load Forecast Report

2019 PJM Peak Load and Energy Forecast

<table>
<thead>
<tr>
<th>Load</th>
<th>2019</th>
<th>2023</th>
<th>2026</th>
<th>2029</th>
<th>2033</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak (MW)</td>
<td>151,358</td>
<td>152,854</td>
<td>154,494</td>
<td>156,689</td>
<td>158,900</td>
</tr>
<tr>
<td>Energy (GWh)</td>
<td>801,724</td>
<td>813,283</td>
<td>823,826</td>
<td>836,489</td>
<td>847,956</td>
</tr>
</tbody>
</table>

Notes:
1. Peak and energy values from PJM Load Forecast Report Table B-1 and Table E-1, respectively.
2. Model inputs are at the zonal level, to the extent zonal load shapes create different diversity - modeled PJM peak load may vary.

* Load Forecast PROMOD modeling file to be posted by Friday, Feb 8th
Peak and Energy Forecast Comparison 2019 vs. 2018

PJM RTO Peak Forecast

PJM RTO Energy Forecast

percent change from 2018 Liqpt

2018 Peak Forecast

2019 Peak Forecast

percent change from 2018 Liqpt

2018 Forecast Energy

2019 Forecast Energy
• Model zonal demand resources consistent with Table B-7 of the 2019 Load Forecast Report.

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2023</th>
<th>2026</th>
<th>2029</th>
<th>2033</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand Resource (MW)</td>
<td>8,154</td>
<td>9,198</td>
<td>9,315</td>
<td>9,433</td>
<td>9,593</td>
</tr>
</tbody>
</table>
Appendix B

Eligible Congestion Drivers
### Eligible Congestion Drivers

<table>
<thead>
<tr>
<th>FG#</th>
<th>Constraint</th>
<th>FROM AREA</th>
<th>TO AREA</th>
<th>2023 Simulated Year</th>
<th>2026 Simulated Year</th>
<th>2023 Simulated Year</th>
<th>2026 Simulated Year</th>
<th>Line is Conductor Limited?</th>
<th>Comment</th>
<th>Potential Upgrades</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME-1</td>
<td>Hunterstown to Lincoln 115 kV</td>
<td>METED</td>
<td>METED</td>
<td>$20.98</td>
<td>$24.03</td>
<td>1756</td>
<td>1732</td>
<td>yes</td>
<td>Internal Flowgate</td>
<td></td>
</tr>
<tr>
<td>ME-2</td>
<td>Monroe 1&amp;2 to Wayne 345 kV</td>
<td>MISOE</td>
<td>MISOE</td>
<td>$5.81</td>
<td>$6.23</td>
<td>184</td>
<td>227</td>
<td>miso</td>
<td>M2M</td>
<td></td>
</tr>
<tr>
<td>ME-3</td>
<td>He Hubbell to Sunman Weisburg 138 kV</td>
<td>MISOC</td>
<td>MISOC</td>
<td>$1.80</td>
<td>$1.91</td>
<td>76</td>
<td>69</td>
<td>miso</td>
<td>M2M</td>
<td></td>
</tr>
<tr>
<td>ME-4</td>
<td>E Frankfort (R) to Goodings (R) 345 kV</td>
<td>COMED</td>
<td>COMED</td>
<td>$0.38</td>
<td>$1.11</td>
<td>51</td>
<td>127</td>
<td>no</td>
<td>M2M</td>
<td></td>
</tr>
<tr>
<td>ME-5</td>
<td>Cumberland TR2 to Juniata Bus 1 230 kV</td>
<td>PLGRP</td>
<td>PLGRP</td>
<td>$4.11</td>
<td>$7.24</td>
<td>205</td>
<td>188</td>
<td>yes</td>
<td>Internal Flowgate</td>
<td></td>
</tr>
<tr>
<td>ME-6</td>
<td>Marblehead North Bus 1 138/161</td>
<td>MISOC</td>
<td>MISOC</td>
<td>$2.21</td>
<td>$1.79</td>
<td>321</td>
<td>229</td>
<td>miso</td>
<td>M2M</td>
<td></td>
</tr>
<tr>
<td>ME-7</td>
<td>Bosserman to Trail Creek 138 kV</td>
<td>AEP</td>
<td>MISOE</td>
<td>$3.99</td>
<td>$5.10</td>
<td>145</td>
<td>198</td>
<td>Yes</td>
<td>M2M</td>
<td>A PJM/MISO TMEP has been proposed for this facility</td>
</tr>
</tbody>
</table>
Appendix C
PJM Competitive Transmission
Market Efficiency Proposal Submission Tutorial
### Competitive Planning Process

The PJM competitive planning process implements FERC Order 1000. The process affords non-incumbent transmission developers an opportunity to participate in the regional planning and expansion of the PJM bulk electric system. By publishing a set of criteria violations and soliciting solutions from competing transmission developers, PJM and the FERC hope to encourage innovative, cost effective and timely solutions to the challenges of building and maintaining a highly reliable electric system.

PJM will announce in the Transmission Expansion Advisory Committee (TEAC) its intention to solicit competitive solutions to identified planning needs. The “windows” for submitting such solutions fit into three categories and follow the 18-month and 24-month planning cycles as described in Manual 14F. Clean | Clean | Clean | Clean | Clean.

#### Planning Cycles

<table>
<thead>
<tr>
<th>Planning Cycles</th>
<th>Standard Window Length (Years)</th>
<th>Required In-Service Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-Term - considers reliability criteria violations, economic constraints, system conditions and public policy requirements</td>
<td>120 days</td>
<td>&gt; 5</td>
</tr>
<tr>
<td>Short-Term - considers reliability criteria violations</td>
<td>60 days</td>
<td>3-5</td>
</tr>
<tr>
<td>Immediate Need Reliability - considers reliability criteria violations</td>
<td>Shortened</td>
<td>&lt; 3</td>
</tr>
</tbody>
</table>

While PJM endeavors to adhere to the standard length of the proposal windows, unique situations do arise. When adhering to the standard window length would be unnecessarily burdensome on the transmission developers, PJM may elect to modify the length of a proposal window. Any such changes will be made clear when the proposal window is announced.

### Proposal Submissions

#### Pre-qualification for designated entity status

is required in order to submit proposals.

#### Diagram requests should follow the FERC Form 715 request process.

### Instructions

- Proposal Submittal Template
- Proposal Submission Instructions

### Demonstration Videos

- Completing the Proposal Submittal Form
- Sending a Proposal to PJM
2018/19 RTEP Window Proposal Submittal Process

• Proposal Submittal Template

• Proposal Submittal Instructions

• Completing the Proposal Submittal Form
  – https://videos.pjm.com/media/PJM+Competitive+Transmission+Project+Proposal+Template+Tutorial/1_o44u3xfj

• Sending a Proposal to PJM
Items Due at Close of 120-Day Window

- Completed RTEP Proposal Template
  - Include both an overall project cost and detailed cost of each component
  - Any cost cap or cost containment mechanisms

- All analytical files needed for technical analysis & market efficiency simulation
  - Include all PSS/E files, contingency files, one line diagrams, etc.
  - Include all PROMOD modeling files and event file changes

- Include all results of simulations (PSSE and PROMOD)

- Detailed substation and route diagrams. Show transmission topology and all breakers

- All other documents as requested in the problem statement document
• Per PJM-MISO JOA, Interregional Proposals must
  – Address at least one identified issue in both regions
  – Be submitted to both PJM and MISO Regional Windows

• PJM and MISO will follow the effective JOA language when analyzing and recommending Interregional Proposals

• In the PJM Project Proposal Template
  – Check “Yes” for items 1.g., 1.q.i, and 1.q.ii on the Executive Summary tab
PJM Eligible Congestion Drivers

• Eligible congestion drivers are selected to focus proposals on significant issues
  – Identified coincident with the opening of market efficiency proposal window

• Only proposals which address one or more of PJM identified congestion drivers will be evaluated
  – see PJM Manual 14F, 8.2.1.1 Eligible Congestion Drivers

• If the proposal does not substantially address a PJM identified congestion driver, or is otherwise substantially deficient or is seriously flawed, it will be rejected and the proposer will be notified
On the “Overloaded Facilities” tab, table 2.a. the proposal should clearly identify the eligible congestion drivers addressed by the project.

The proposal should include in table 2.b any reliability criteria violations or shifted congestion that the proposed project causes or does not address.
PROMOD Files To Be Submitted (Recommended)

- PROMOD case(s) modeling the transmission enhancement (XML format)
  - Please indicate if cases should be added to the scenario in a specific order

- Event file updated with the project specific flowgates
  - It is recommended to provide the updated events added to the PJM posted event file (to allow for easy file comparison)

- Market Efficiency Analysis results:
  - N-1 contingency analysis used to identify new flowgates
  - B/C ratios from the base run
  - Congestion reports showing congestion decreases and shifted congestion

- Provide results from sensitivity simulations if available (see the next slide for sensitivity details)

- Reliability Analysis results
## 2018/19 Market Efficiency Sensitivities

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Sensitivity</td>
<td>Plus or Minus 2%</td>
</tr>
<tr>
<td>Gas Price Sensitivity</td>
<td>Plus or Minus 20% Henry Hub</td>
</tr>
<tr>
<td>No FSA Sensitivity</td>
<td>Remove all units with FSA or suspended ISA status</td>
</tr>
</tbody>
</table>

Note: PJM reserves right to add sensitivities as necessary.
• Revision History
  – V1 – 02/04/2019 – Original Version Posted to PJM.com
  – V2 – 02/07/2019 – slide 4, updated slide to match the data included in the PROMOD modeling files to be posted by Feb 8th
    - slide 6, added link to Market Efficiency Proposal Submission tutorial
    - slide 9, added note about posting the load forecast modeling files in February, rather than waiting for the mid-cycle update
    - slide 12, added Appendix B, Eligible Congestion Drivers
    - slide 14, added Appendix C, Market Efficiency Proposal Submission Tutorial