PJM Regional Transmission Expansion Planning (RTEP) Process

IPSAC
June 4, 2021
Planning Committee (PC)
• http://www.pjm.com/committees-and-groups/committees/pc.aspx

Transmission Expansion Advisory Committee (TEAC)
• http://www.pjm.com/committees-and-groups/committees/teac.aspx

Interregional Planning
• http://www.pjm.com/planning/interregional-planning.aspx

Services and Requests
• http://www.pjm.com/planning/services-requests.aspx

RTEP Development
• http://www.pjm.com/planning/rtep-development.aspx

Manual 14B
• http://www.pjm.com/-/media/documents/manuals/m14b.ashx
System Expansion Drivers

- Load Forecast, Demand Resources
- Public Policy
- Transmission Service
- Resilience
- Operational Performance
- Capacity Resources, RPM
- Aging Infrastructure
- Market Efficiency
- Interregional Coordination
- Reliability Criteria

RTEP Development
PJM’s 2-year Reliability

Cycle 1
- Yr -1
  - Develop assumptions
  - Reliability criteria analysis for years 5 - 15
  - Identify and evaluate solution options
  - Review with TEAC and approval by the PJM Board
- Yr 0
  - Develop assumptions and build Year 8 base case
  - Perform criteria analysis for years 8 - 15
  - Perform reliability and market efficiency analysis for Year 8 - 15
  - Identify proposed solutions
  - Re-tool for analysis years 7 - 15 including solution options
  - Independent consultant reviews of buildability
  - Adjustments to solution options by PJM based on analysis
- Yr +1
- Yr +2

Cycle 2

PJM’s 2-year Market Efficiency

Planning Cycles

Year 1
- Jan
- Feb
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep
- Oct
- Nov
- Dec
- Jan
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep
- Oct
- Nov
- Dec

12-month cycle
- Develop assumptions (Year 1)
  - Market Efficiency Analysis (Year 1 and Year 5)
  - Accelerations and Modifications
  - Identify and evaluate solution options
  - Final review with TEAC and approval by the PJM Board

24-month cycle
- Develop assumptions (Year 1, Year 5, Year 8, Year 11, Year 15)
  - Market Efficiency Criteria Analysis (Year 1, Year 5, Year 8, Year 11, Year 15)
  - Market Efficiency Analysis (Year 1, Year 5, Year 8, Year 11, Year 15)
  - Identify proposed solutions
  - Update significant assumptions (Year 0, Year 4, Year 7, Year 10, Year 14)
  - Independent consultant reviews of buildability
  - Adjustments to solution options by PJM based on analysis

12-month cycle
- Develop assumptions (Year 1, Year 5)
  - Market Efficiency Analysis (Year 1, Year 5 Accelerations and Modifications)
  - Identify and evaluate solution options
  - Accelarations and Modifications
  - Final review with TEAC and approval by the PJM Board
PJM 2021 RTEP Assumptions
• PJM annually presents the assumptions at the beginning of each year. See the link below for details of the presentation.

• https://www.pjm.com/-/media/committees-groups/committees/teac/2021/20210209/20210209-item-09a-2021-rtep-assumptions.ashx
• PJM/NYISO Interface
  – B & C cables will be modeled out of service consistent with NYISO modeling
• Linden VFT
  – Modeled at 330 MW
• HTP
  – Modeled at 0 MW

• Queue projects with an FSA or ISA but are not included in 2021 Series RTEP cases
  – Y3-092 (MTX)
    • 1000 MW Capacity Transmission Injection Rights
    • 500 MW Firm Transmission Withdrawal Rights and 500 MW Non-Firm Transmission Withdrawal Rights
As part of the 24-month RTEP cycle, a year 7 (2028) base case will be developed and evaluated as needed as part of the 2021 RTEP.

The year 7 case will be based on the 2026 Summer case that will be developed as part of this year’s 2021 RTEP.

Purpose: To identify and develop longer lead time transmission upgrades.
• Similar to the 2020 RTEP and per the PJM Operating Agreement, a proposal window will be conducted for all reliability needs that are not Immediate Need reliability upgrades or are otherwise ineligible to go through the window process.

• FERC 1000 implementation will be similar to the 2020 RTEP.
  – Advance notice and posting of potential violations
  – Advance notice of window openings
  – Window administration
Expected Timeline

• June/July 2021
  – Open competitive proposal window
  – Post modeling assumptions changes and corrections for and begin mid-year retool of 2021 RTEP baseline analysis
    • Accounts for major new modeling assumption changes and corrections not previously considered.
    • Basic assumptions such as planning criteria and ratings methodology that changed after February will not be considered until the 2022 RTEP.

• July/August 2021
  – Close competitive proposal window
  – Finalize mid-year retool

• August to October 2021: Evaluate proposals

• October to December 2021: Approve proposals
Generation Deactivation Notification Update  
(Between 11/1/2020 and 4/1/2021)
<table>
<thead>
<tr>
<th>Unit(s)</th>
<th>Fuel Type</th>
<th>Transmission Zone</th>
<th>Requested Deactivation Date</th>
<th>PJM Reliability Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martins Creek CT 4 (17.3 MW)</td>
<td>Natural Gas</td>
<td>PPL</td>
<td>5/31/2022</td>
<td>Reliability analysis complete. No violation identified</td>
</tr>
<tr>
<td>Dresden 2 (902.5 MW)</td>
<td>Nuclear</td>
<td>ComEd</td>
<td>11/8/2021</td>
<td>Reliability analysis complete. No violation identified</td>
</tr>
<tr>
<td>Dresden 3 (895.5 MW)</td>
<td>Nuclear</td>
<td>ComEd</td>
<td>11/29/2021</td>
<td>Reliability analysis complete. No violation identified</td>
</tr>
<tr>
<td>West Kingsport LF (45 MW)</td>
<td>Biomass</td>
<td>MetEd</td>
<td>5/31/2022</td>
<td>Reliability analysis Underway.</td>
</tr>
<tr>
<td>Unit Name</td>
<td>Fuel Type</td>
<td>Transmission Zone</td>
<td>Actual Deactivation Date</td>
<td>PJM Reliability Status</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------</td>
<td>-------------------</td>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Elmwood Park Power (69.2 MW)</td>
<td>Natural Gas</td>
<td>PSEG</td>
<td>3/12/2021</td>
<td>Reliability analysis complete; no impacts identified</td>
</tr>
<tr>
<td>Birchwood Plant (238 MW)</td>
<td>Coal</td>
<td>Dominion</td>
<td>3/1/2021</td>
<td>Reliability analysis complete; upgrades expected to be completed in future, but interim operating measures identified and unit can deactivate as scheduled</td>
</tr>
<tr>
<td>Beckjord Battery Unit 2 (0 MW)</td>
<td>Storage</td>
<td>DEOK</td>
<td>2/3/2021</td>
<td>Reliability analysis complete; no impacts identified</td>
</tr>
<tr>
<td>Countryside Landfill (5.8 MW)</td>
<td>Methane</td>
<td>ComEd</td>
<td>1/27/2021</td>
<td>Reliability analysis complete; no impacts identified</td>
</tr>
<tr>
<td>Spruance NUG 1 (116 MW)</td>
<td>Coal</td>
<td>Dominion</td>
<td>1/12/2021</td>
<td>Reliability analysis complete; no impacts identified</td>
</tr>
<tr>
<td>Possum Point 5 (770 MW)</td>
<td>Oil</td>
<td>Dominion</td>
<td>12/30/2020</td>
<td>Reliability analysis complete; no impacts identified</td>
</tr>
<tr>
<td>Unit(s)</td>
<td>Fuel Type</td>
<td>Transmission Zone</td>
<td>Withdrawn Deactivation Date</td>
<td>PJM Reliability Status</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------</td>
<td>-------------------</td>
<td>----------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sammis Diesel</td>
<td>Oil</td>
<td>ATSI</td>
<td>2/16/2021</td>
<td>Reliability analysis complete and upgrades expected to be completed in time for unit to deactivate as scheduled.</td>
</tr>
</tbody>
</table>

Generation Deactivation link: [https://www.pjm.com/planning/services-requests/gen-deactivations](https://www.pjm.com/planning/services-requests/gen-deactivations)
PJM Market Efficiency Update

Nicolae (Nick) Dumitriu
Sr. Lead Engineer, PJM Market Simulation
2020/2021 Long-Term Window
<table>
<thead>
<tr>
<th>12-month cycle</th>
<th>24-month cycle</th>
<th>12-month cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR 0 (2020)</strong></td>
<td><strong>YEAR 1 (2021)</strong></td>
<td><strong>YEAR 0 (2020)</strong></td>
</tr>
<tr>
<td>JAN</td>
<td>FEB</td>
<td>MAR</td>
</tr>
<tr>
<td>Develop assumptions – Year 1 &amp; 5</td>
<td>Market Efficiency Analysis – Year 1 &amp; 5</td>
<td>Develop Assumptions – Year 1 &amp; 5</td>
</tr>
<tr>
<td>Identify and evaluate solution options</td>
<td>Final review with TEAC and approval by the PJM Board</td>
<td>Identify and evaluate solution options</td>
</tr>
<tr>
<td><strong>24-month cycle</strong></td>
<td><strong>Mid-cycle update of significant assumptions – Year 0, 4, 7, 10 &amp; 14</strong></td>
<td><strong>24-month cycle</strong></td>
</tr>
<tr>
<td>Develop assumptions – Year 1, 5, 8, 11 &amp; 15</td>
<td>Market Efficiency Criteria Analysis – Year 1, 5, 8 &amp; 15</td>
<td>Develop Assumptions – Year 1 &amp; 5</td>
</tr>
<tr>
<td>Market Efficiency Analysis – Year 1, 5, 8, 11 &amp; 15</td>
<td>Identify proposed solutions</td>
<td>Market Efficiency Analysis – Year 1 &amp; 5</td>
</tr>
<tr>
<td>Analysis of market solutions and support of benefits of reliability solutions</td>
<td>Year 0, 4, 7, 10 &amp; 14</td>
<td>Identify and evaluate solution options</td>
</tr>
<tr>
<td>Independent consultant reviews constructability</td>
<td>Adjustments to solution options by PJM based on analysis</td>
<td>Final review with TEAC and approval by the PJM Board</td>
</tr>
<tr>
<td>Final review with TEAC and approval by the PJM Board</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Indicates accelerations and modifications
Market Efficiency Assumptions

• Market Efficiency Input Assumptions presented at TEAC meetings June through August
  – 20/21 Market Efficiency Analysis Assumptions whitepaper was shared with the PJM board for consideration at the September Board meeting and posted with the October TEAC materials

• Market Efficiency Training, available here completed October 20th

• Window process and registration presented at the Special TEAC – Market Efficiency on December 23rd, 2020
Long-Term Market Efficiency Window (120 days)
2020/21 Long-Term Window started January 11, 2021 and will close May 11, 2021

Problem statement and target congestion drivers are posted on the Competitive Planning Process page

- Updated Market Efficiency Economic Models posted on the Market Efficiency Secure Page
- Includes updated market efficiency base case files for all study years, PROMOD input files and benchmark test cases and results.
- To access the information, stakeholders required to have CEII confirmation (for both PJM and MISO) and PROMOD vendor (ABB) confirmation.
<table>
<thead>
<tr>
<th>FG#</th>
<th>Constraint</th>
<th>FROM AREA</th>
<th>TO AREA</th>
<th>2025 Simulated Year</th>
<th>2028 Simulated Year</th>
<th>2025 Simulated Year</th>
<th>2028 Simulated Year</th>
<th>Is Line Conductor Limited?</th>
<th>Conductor Ratings**</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME-1</td>
<td>Kammer North to Natrium 138 kV</td>
<td>AEP</td>
<td>AEP</td>
<td>$2.13</td>
<td>$5.89</td>
<td>71</td>
<td>157</td>
<td>Yes</td>
<td>SN/SE=221/268 MVA WN/WE=250/317 MVA</td>
<td>Internal Flowgate</td>
</tr>
<tr>
<td>ME-3</td>
<td>Junction to French's Mill 138 kV</td>
<td>APS</td>
<td>APS</td>
<td>$6.78</td>
<td>$9.49</td>
<td>215</td>
<td>233</td>
<td>No</td>
<td>SN/SE=463/578 MVA WN/WE=521/639 MVA</td>
<td>Internal Flowgate</td>
</tr>
<tr>
<td>ME-5</td>
<td>Charlottesville to Proffit Rd Del Pt 230 kV</td>
<td>DOM</td>
<td>DOM</td>
<td>$3.96</td>
<td>$5.34</td>
<td>125</td>
<td>122</td>
<td>Yes</td>
<td>SN/SE=221/268 MVA WN/WE=250/317 MVA</td>
<td>Internal Flowgate</td>
</tr>
<tr>
<td>ME-6</td>
<td>Plymouth Meeting to Whitpain 230 kV</td>
<td>PECO</td>
<td>PECO</td>
<td>$3.36</td>
<td>$3.48</td>
<td>117</td>
<td>95</td>
<td>No</td>
<td>SN/SE=221/268 MVA WN/WE=250/317 MVA</td>
<td>Internal Flowgate</td>
</tr>
<tr>
<td>ME-7</td>
<td>Cumberland to Juniata 230 kV***</td>
<td>PLGRP</td>
<td>PLGRP</td>
<td>$8.11</td>
<td>$6.11</td>
<td>204</td>
<td>185</td>
<td>Yes</td>
<td>SN/SE=221/268 MVA WN/WE=250/317 MVA</td>
<td>Internal Flowgate</td>
</tr>
</tbody>
</table>

Notes:
* ME-2, ME-4, ME-9, and ME-10 constraints no longer eligible congestion drivers (updates to the model reduced congestion below the eligibility threshold).
** Conductor ratings provided by TOs for congestion drivers that are limited by station equipment.
*** Cumberland – Juniata congestion driver may be impacted by DLR (Dynamic Link Rating) projects (Expected in-service date 06/01/2021).
2020/21 Long-Term Window Schedule (Year 2021)

**Jan. – April**
- Open long-term window
- Mid-cycle update

**May – Sept.**
Analysis of proposed solutions

**Oct. – Nov.**
TEAC Reviews: first and second reads

**June – Aug.**
Independent cost/constructability review

**Dec.**
PJM Board approval of selected solutions
Questions?