Review of 2018 RTEP Assumptions

Transmission Expansion Advisory Committee
January 11, 2018
• Update of standard RTEP assumptions
• 2018 RTEP
  – TPL-001-4
• Modeling
  – MOD-032 (GOs and TOs)
    • Siemens PSS®MOD - Model On Demand (TOs)
    • PJM.com Planning Center Online Tool (Gen Model) – GOs
• RTEP Proposal Windows
• **Load Flow Modeling**
  - Power flow models for outside world load, capacity, and topology will be based on the following 2017 Series MMWG power flow cases
    - 2017 Series 2022SUM MMWG outside world for
      - 2018 Series 2023SUM RTEP, 2021SUM RTEP
    - 2017 Series 2022SLL MMWG outside world for
      - 2018 Series 2023LL RTEP
    - 2017 Series 2022WIN MMWG outside world for
      - 2018 Series 2023WIN RTEP
  - PJM reached out to neighbors to any updates to topology/corrections
  - PJM topology for all cases sourced from Model On Demand
    - Include all PJM Board approved upgrades through the December 2017 PJM Board of Manager approvals as well as all anticipated February 2018 PJM Board approvals
  - OVEC will be included as a part of PJM
Locational Deliverability Areas (LDAs)

- Includes the existing 27 LDAs
- Total of 27 LDAs
  - All 27 to be evaluated for the 2021/2022 delivery year RPM base residual auction planning parameters
  - Also to be evaluated for the 2021 and 2023 Summer RTEP case

<table>
<thead>
<tr>
<th>LDA</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMAAC</td>
<td>Global area - PJM 500, JCPL, PECO, PSEG, AE, DPL, RECO</td>
</tr>
<tr>
<td>SWMAAC</td>
<td>Global area - BGE and PEPCO</td>
</tr>
<tr>
<td>MAAC</td>
<td>Global area - PJM 500, Penelec, Meted, JCPL, PPL, PECO, PSEG, BGE, Pepco, AE, DPL, UGI, RECO</td>
</tr>
<tr>
<td>PPL</td>
<td>PPL &amp; UGI</td>
</tr>
<tr>
<td>PJM WEST</td>
<td>APS, AEP, Dayton, DUQ, Comed, ATSI, DEO&amp;K, EKPC, Cleveland, OVEC</td>
</tr>
<tr>
<td>WMAAC</td>
<td>PJM 500, Penelec, Meted, PPL, UGI</td>
</tr>
<tr>
<td>PENELEC</td>
<td>Pennsylvania Electric</td>
</tr>
<tr>
<td>METED</td>
<td>Metropolitan Edison</td>
</tr>
<tr>
<td>JCPL</td>
<td>Jersey Central Power and Light</td>
</tr>
<tr>
<td>PECO</td>
<td>PECO</td>
</tr>
<tr>
<td>PSEG</td>
<td>Public Service Electric and Gas</td>
</tr>
<tr>
<td>BGE</td>
<td>Baltimore Gas and Electric</td>
</tr>
<tr>
<td>PEPCO</td>
<td>Potomac Electric Power Company</td>
</tr>
<tr>
<td>AE</td>
<td>Atlantic City Electric</td>
</tr>
<tr>
<td>DPL</td>
<td>Delmarva Power and Light</td>
</tr>
<tr>
<td>DPLSOUTH</td>
<td>Southern Portion of DPL</td>
</tr>
<tr>
<td>PSNORTH</td>
<td>Northern Portion of PSEG</td>
</tr>
<tr>
<td>VAP</td>
<td>Dominion Virginia Power</td>
</tr>
<tr>
<td>APS</td>
<td>Allegheny Power</td>
</tr>
<tr>
<td>AEP</td>
<td>American Electric Power</td>
</tr>
<tr>
<td>DAYTON</td>
<td>Dayton Power and Light</td>
</tr>
<tr>
<td>DLCO</td>
<td>Duquesne Light Company</td>
</tr>
<tr>
<td>Comed</td>
<td>Commonwealth Edison</td>
</tr>
<tr>
<td>ATSI</td>
<td>American Transmission Systems, Incorporated</td>
</tr>
<tr>
<td>DEO&amp;K</td>
<td>Duke Energy Ohio and Kentucky</td>
</tr>
<tr>
<td>EKPC</td>
<td>Eastern Kentucky Power Cooperative</td>
</tr>
<tr>
<td>Cleveland</td>
<td>Cleveland Area</td>
</tr>
</tbody>
</table>
• Firm Commitments

  – Long term firm transmission service consistent with those coordinated between PJM and other Planning Coordinators during the 2017 Series MMWG development

• Outage Rates

  – Generation outage rates will be based on the most recent Reserve Requirement Study (RRS) performed by PJM

  – Generation outage rates for future PJM units will be estimated based on class average rates
Generator Deliverability: Generic EEFORds

- Generic EEFORd values developed for 2023 RTEP base case
  - To be posted with TEAC materials
- Capacity weighted by fuel type
  - Each unit within a given generator class is assigned the average EEFORd for that class

<table>
<thead>
<tr>
<th>GEN CLASS</th>
<th>MW</th>
<th>Avg EEFORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fossil Steam</td>
<td>73,006</td>
<td>9.74%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>34,074</td>
<td>2.16%</td>
</tr>
<tr>
<td>Combustion Turbine</td>
<td>27,414</td>
<td>9.45%</td>
</tr>
<tr>
<td>Combined Cycle</td>
<td>48,164</td>
<td>5.09%</td>
</tr>
<tr>
<td>Hydro</td>
<td>3,047</td>
<td>7.62%</td>
</tr>
<tr>
<td>Pumped Storage</td>
<td>5,597</td>
<td>3.35%</td>
</tr>
<tr>
<td>Diesel</td>
<td>1,056</td>
<td>13.17%</td>
</tr>
<tr>
<td>Wind*</td>
<td>1,891</td>
<td>0.00%</td>
</tr>
<tr>
<td>Solar*</td>
<td>634</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

* No change for wind and solar
• **Summer Peak Load**
  – Summer Peak Load will be modeled consistent with the 2018 PJM Load Forecast Report
  – The final load forecast released in December 2017
  – Include Demand Response (DR) and Energy Efficiency (EE) based on what cleared in the 2020/21 BRA

• **Winter Peak Load**
  – Winter Peak Load will be modeled consistent with the 2018 PJM Load Forecast Report

• **Light Load**
  – Modeled at 50% of the Peak Load forecast per M14B
    • Will continue to pursue a load adjustment through the Planning Committee
  – The Light Load Reliability Criteria case will be modeled consistent with the procedure defined in M14B

• **Load Management**, where applicable, will be modeled consistent with the 2018 Load Forecast Report
  – Used in LDA under study in load deliverability analysis
2018 RTEP Generation Assumptions

- All existing generation expected to be in service for the year being studied will be modeled.

- Future generation with a signed Interconnection Service Agreement, or that cleared in the 2020/21 BRA, will be modeled along with any associated network upgrades.
  - Generation with a signed ISA will contribute to and be allowed to back-off problems.

- Generation with an executed Facilities Study Agreement (FSA) will be modeled offline along with any associated network upgrades, which will be examined separately.
• Generation with an FSA will be modeled consistent with the procedures noted in Manual 14B
  – Exceptions to those procedures will be vetted with stakeholders at a future TEAC

• Generation with an executed FSA will be modeled offline but will be allowed to contribute to problems in the generation deliverability testing.
  – Generation with an executed FSA will not be allowed to back-off problems.

• Additional generation information (i.e. machine lists) will be posted to the TEAC page.
Queue Project NOT Included in 2018 Series RTEP Cases

• Queue projects with an FSA or ISA but are not included in 2018 Series RTEP cases
  – S58 (MTX) Collins “Rock Island Clean Line”
    • 1,600 MW total
    • 1200 non-firm and 400 firm
  – X3-028 (MTX)
    • 2000 non-firm and 1500 firm
  – Y3-092 (MTX)
    • 500 non-firm and 500 firm
Deactivation Notification Generation

• Generation that has officially notified PJM of deactivation will be modeled offline in RTEP base cases for all study years after the intended deactivation date

• RTEP baseline upgrades associated with generation deactivations will be modeled

• Retired units Capacity Interconnection Rights are maintained in RTEP base cases for 1 year after deactivation at which point they will be removed unless claimed by an interconnection queue project
• At a minimum, all PJM bulk electric system facilities, all tie lines to neighboring systems and all lower voltage facilities operated by PJM will be monitored.

• At a minimum, contingency analysis will include all bulk electric system facilities, all tie lines to neighboring systems and all lower voltage facilities operated by PJM.

• Thermal and voltage limits will be consistent with those used in operations.
• PJM/NYISO “ConEd” Wheel Cancellation
  – The ConEd wheel will not be modeled in the 2018 RTEP due to the cancellation of the corresponding transmission service in 2017.
  – Scheduled MW across the PJM/NYISO PARs will be set according to the procedures in Manual 14B that were approved in 2017.

• Linden VFT
  – Modeled at 330 MW

• HTP
  – Modeled at 0 MW
• As part of the 24-month RTEP cycle, a year 8 (2026) base case will be developed and evaluated as part of the 2018 RTEP

• The year 8 case will be based on the 2023 Summer case that will be developed as part of this year’s 2018 RTEP
  – The case will be updated to be consistent with the 2018 RTEP assumptions.

• Purpose: To identify and develop longer lead time transmission upgrades
FERC 1000 Process

• Similar to the 2017 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 2017 RTEP.
  – Advance notice and posting of potential violations
  – Advance notice of window openings
  – Window administration
• Request stakeholder suggestions for and input to 2018 alternative sensitivity studies and scenario analysis.

• PJM 2018 scenario and sensitivity discussion:
  – Light load scenario and sensitivity studies including a minimum load level study to support the development of light load test
  – Gas / Electric interface studies
Questions?
• V1 – 1/5/2018 – Original Slides Posted

• V2 – 1/9/2018 – Added slide 16 – Scenario and Sensitivity Analysis