Winter Peak Study

PJM Planning Committee
Paul McGlynn
8/13/2015
• “Winter Peak Period”
  – December 1st – February 30th, Hours Ending 06:00 – 09:00 and 17:00-20:00

• Winter Peak Case
  – Ratings: 50F degree ratings applied
    • PJM Planning is currently looking at temperature data by PJM Zone and considering individual TO ratings guides
  – Topology- reflects the current system plus any future upgrades prior to the winter of the year under study
  – External world model reflects the same year MWWG winter model
  – Load: Winter load profile in each TO zone is provided by the respective TOs, PJM Winter 50/50 load forecast applied
Winter Peak Study Summary

• Base case dispatch
  – Pumped storage will be in generating mode
  – Generator fuel type will be considered in the initial base case dispatch
  – Queue generation and MTX projects with FSA are modeled along with their associated network upgrades
  – Average Capacity Factors (CF) by fuel type during the winter peak hours are used for the base case generating levels as shown in the following table (initial generator output = AVG CF* ICAP)
  – Maintain target PJM RTO area interchange that reflects all yearly long term firm (LTF) transmission service
    • Set MAAC to historical averages

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Solar</th>
<th>Wind</th>
<th>Water</th>
<th>Nuclear</th>
<th>Coal</th>
<th>Gas</th>
<th>Other Biomass</th>
<th>Distillate</th>
<th>Black Liquor</th>
<th>Kerosene</th>
<th>Residual Fuel Oil</th>
<th>Municipal Solid Waste</th>
<th>Wood Waste</th>
<th>Waste Coal</th>
<th>Petroleum Coke</th>
<th>other solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG CF (2008-2013)</td>
<td>0.05</td>
<td>0.33</td>
<td>0.38</td>
<td>0.98</td>
<td>0.51</td>
<td>0.73</td>
<td>0.46</td>
<td>0.25</td>
<td>1.11</td>
<td>0.01</td>
<td>0.74</td>
<td>0.02</td>
<td>0.79</td>
<td>0.66</td>
<td>0.75</td>
<td>0.75</td>
</tr>
</tbody>
</table>
1. Winter Generator Deliverability/Common Mode Outage test
   - The ramping limit for generators of all fuel types will be 100% including wind
     - Consider a lower ramping limit for solar
   - Contingencies: NERC Category A, B, C (except N-1-1)
   - Annual DR
2. Winter Load Deliverability test
   - Winter CETO
   - Annual DR
   - 27 LDAs
   - Contingencies: NERC Category A, B
3. N-1 thermal, voltage
   - Contingencies: NERC Category A, B, C (except N-1-1)
4. N-1-1 thermal and voltage
   • Overall Assumptions
     - Monitor all PJM BES and lower voltage BES and market monitored facilities
     - 34 Gas contingencies (TPL-001-4 Extreme Event) that results in 1000MW or more of generation loss including pipeline outage or temperature threshold contingencies will be evaluated in the tests above
Winter Peak Study Time line

- Target: approve a PJM Winter Reliability Criteria by the end of 2015
- Initial Generator deliverability study results – End of June
- Initial N-1 thermal and voltage results – July (see the July TEAC – Reliability Analysis Update)
- Initial Load Deliverability results – July (see the July TEAC – Reliability Analysis Update)
- N-1-1 results – August
- Post all final potential issues - End of the September
- Final review of the draft winter study procedure (Manual 14B) for stakeholder review/approve – October
Questions: RTEP@pjm.com