Effective Load Carrying Capability (ELCC) Review – Part III

Patricio Rocha Garrido
Resource Adequacy Planning
Planning Committee
December 12, 2019
At the October PC meeting, PJM described the current methodology to calculate Capacity Credit for wind/solar resources and pointed out two key issues with such methodology:

- Too many hours without any reliability risk are included in the calculation
- Disregard for the potential reliability impact of “shifting the peak load” as the penetration of wind and solar resources increases
• At the November PC meeting, PJM described the Effective Load Carrying Capability (ELCC) methodology and
  – Outlined and compared two options in which the actual ELCC runs can be performed ("load approach" vs "generation approach")
  – Present how ELCC has been implemented at MISO and CAISO
Data Requirements/Considerations

• Analysis captures the relationship between loss-of-load risk and wind/solar output
  – Therefore, hourly load shapes and coincident wind/solar output shapes are required
  – Since such shapes are highly variable from year to year, the analysis should include as many annual shapes as possible

• In addition, since it is a reliability study, ELCC runs require inputs similar to those used in the Reserve Requirement Study
  – Load uncertainty, capacity availability uncertainty (based on performance metrics such as forced outage rates for resources other than wind/solar), etc.
• Analysis is forward-looking (e.g. what is the capacity credit of wind resources in future year X?) and as such it requires the expected level of penetration of wind/solar resources in a given future year

• The analysis is used to derive capacity credits and therefore it should focus on wind/solar resources that are or are expected to be **capacity** resources
For Wind, the system-wide Final ELCC value for Future Delivery Year (DY) X will be calculated as the average of 10 annual system-wide ELCC values (one for each DY in the period DY 2009 – DY 2018):

- Each of the annual system-wide ELCC values will be based on the total expected nameplate wind penetration for Future DY X and the performance of the wind resources (i.e., the hourly wind shape) that were in service in each of the corresponding historical delivery years.
- The expected nameplate wind penetration will only include wind capacity resources with RPM Resource Ids. (energy-only are excluded).
- The performance of wind resources (i.e., the hourly wind shape) for a historical year only includes wind capacity resources with RPM Resource Ids. (energy-only are excluded).
- In summary, the Final Wind ELCC for Future DY X is computed under the assumption that the average performance of the wind fleet during the last 10 DYs is a good indicator of the expected wind fleet’s performance in Future DY X.
Final Wind ELCC for Future DY X is the average of e1, e2, …., e10. This value represents the capacity value (in MW) of the expected Wind fleet for Future DY X.
For Solar, the system-wide Final ELCC value for Future Delivery Year X will be calculated as the average of 7 annual system-wide ELCC values (one for each DY in the period DY 2012 – DY 2018)

- Each of the annual system-wide ELCC values will be based on the total expected nameplate solar penetration for Future DY X and the performance of the solar resources (i.e., the hourly solar shape) that were in service in each of the corresponding historical delivery years
- The expected nameplate solar penetration will only include solar capacity resources with RPM Resource Ids. (energy-only are excluded)
- The performance of solar resources (i.e., the hourly solar shape) for a historical year only includes solar capacity resources with RPM Resource Ids. (energy-only are excluded)
- In summary, the Final Solar ELCC for Future DY X is computed under the assumption that the average performance of the solar fleet during the last 7 DYs is a good indicator of the expected solar fleet’s performance in Future DY X
### Preliminary Framework - Solar

<table>
<thead>
<tr>
<th>Delivery Year (DY)</th>
<th>Load (Hourly Shape)</th>
<th>Solar Performance (Hourly Shape)</th>
<th>Penetration Level</th>
<th>ELCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>2012</td>
<td>2012</td>
<td>Expected for DY X</td>
<td>e1</td>
</tr>
<tr>
<td>2013</td>
<td>2013</td>
<td>2013</td>
<td>Expected for DY X</td>
<td>e2</td>
</tr>
<tr>
<td>2014</td>
<td>2014</td>
<td>2014</td>
<td>Expected for DY X</td>
<td>e3</td>
</tr>
<tr>
<td>2015</td>
<td>2015</td>
<td>2015</td>
<td>Expected for DY X</td>
<td>e4</td>
</tr>
<tr>
<td>2016</td>
<td>2016</td>
<td>2016</td>
<td>Expected for DY X</td>
<td>e5</td>
</tr>
<tr>
<td>2017</td>
<td>2017</td>
<td>2017</td>
<td>Expected for DY X</td>
<td>e6</td>
</tr>
<tr>
<td>2018</td>
<td>2018</td>
<td>2018</td>
<td>Expected for DY X</td>
<td>e7</td>
</tr>
</tbody>
</table>

Final Solar ELCC for Future DY X is the average of e1, e2, …., e7. This value represents the capacity value (in MW) of the expected Solar fleet for Future DY X.