UCAP and CIR Determinations of Intermittent Resources

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2/11/16
Initial Capacity Interconnection Rights (CIRs)

- For synchronous generators CIRs are typically set based on the generator nameplate.
- CIRs are set for new wind resources using a capacity factor of 13%
  - Wind resources can request a capacity factor other than 13% if they provide an analysis accompanied by sufficient information.
- CIRs are set for new solar resources using a capacity factor of 38%
  - Solar resources can request a capacity factor other than 38% if they provide an analysis accompanied by sufficient information.
- The 13% and 38% class averages are documented in Appendix B of Manual 21.
Wind and Solar Class Averages

• PJM will publish new class averages based on various types of wind and solar units. These class averages will be posted on pjm.com rather than in Manual 21. The new class averages will first be used in the 2017/18 DY.

• Wind  (Currently have about 6,000 MW ICAP/900 MW UCAP)
  – Mountaintop
  – Ground Level

  OR
  A general equation relating altitude and wind speed to wind output

• Solar  (Currently have about 350 MW ICAP/150 MW CAP)
  – Fixed Panel
  – Tracking Panel

• Note that class average values are applied only to new resources or to existing resources that have not yet accumulated three years of operating data.
Retention of CIRs

• CIRs for synchronous generators are retained by performing the summer capacity verification test.
  – The CIRs will be retained if any one of the tests in the past three summers meets or exceeds the CIR level.
  – If not, the CIRs are reduced to the highest test value of the past three summers.

• CIRs for wind and solar resources are retained by calculating the three-year average summer capacity factor for the hours ending 1500-1800 on all summer days (June 1 through August 31)
  – The CIRs will be retained if the capacity factor in any one of the past three summers meets or exceeds the capacity factor that set the CIRs
  – If not, the CIRs are reduced commensurate with the highest capacity factor of the past three summers
Summer Capacity Verification Tests

- **Steam Units: Nuclear, Fossil Steam, Combined Cycle**
  - Tests (2 hours in duration) must be corrected for local plant median ambient conditions based on the past 15 years of PJM peaks
- **Combustion Turbines**
  - Tests (1 hour in duration) must be corrected for local plant median ambient conditions based on the past 15 years of PJM peaks
- **All other units: Hydro, Diesel, Pumped Storage, Fuel Cell**
  - Tests (1 hour in duration) need not be corrected for ambient conditions
• Wind and Solar resources use the 3 year average summer peak capacity factor to set and retain CIRs and to set annual capability (UCAP) to be used in RPM. The summer peak capacity factor is based on output for HE 1500-1800 for all days in June, July and August (total hours = 92 days * 4 hours/day = 368 hours). The UCAP value is equal to the average of the summer peak capacity factors in each of the last three summers.

• It is assumed that the average 368 peak hour capacity factor over any single summer is similar to the median capacity factor during the 368 peak summer hours.
Wind Capacity Factors Peak Summer Hours (2008-2015)
Solar Capacity Factors Peak Summer Hours (2008-2015)
Average vs. Mean Comparisons

Hours in which load exceeded the 50/50 W/N peak (2011-2013 because 2014 and 2015 had no qualifying hours):

<table>
<thead>
<tr>
<th>Unit type</th>
<th>Average CF</th>
<th>Median CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td>48.3%</td>
<td>51.3%</td>
</tr>
<tr>
<td>Wind</td>
<td>7.8%</td>
<td>4.6%</td>
</tr>
</tbody>
</table>

These wind results are consistent with what PJM LOLE analyses have indicated.

Should the procedure be modified to use the median output, rather than the mean output, over the summer peak hours?
Run of River Hydro and Landfill Gas

In CP, run of river hydro and landfill resources are excluded from the must offer requirement.

Manual 18, Section 5.3.1 states:

**Intermittent Resources** are generation capacity resources with output that can vary as a function of its energy source, such as wind, solar, landfill gas, run of river hydroelectric power and other renewable resources. An acceptable method for determining the quantity of unforced capacity MWs that may offer as Capacity Performance for an intermittent resource is based on calculating the average of the hourly output (MWh) of the intermittent resource during the expected performance hours in the summer and winter. The expected performance hours in the summer are hours ending 15:00 through 20:00 EPT in the months of June, July, and August. The expected performance hours in the winter are hours ending 6:00 through 9:00 EPT and 18:00 through 21:00 EPT in the months of January and February. Notwithstanding the above, PJM may review and accept alternative proposed methods for determining the quantity of unforced capacity MWs that may be offered as Capacity Performance for an Intermittent resource.
Run of River Hydro and Landfill Gas

• Run of river hydro and landfill gas resources may experience fuel limitations under peak summer conditions. Stricter CP penalties will incent these resources to offer UCAP amounts they can produce under peak summer conditions. This may result in a different ICAP rating for the same unit in GADS vs. RPM. This could result in a disconnect in EFORd calculations (because the bottom half of the unit is always more reliable than the top half when the unit experiences any partial outages).

• As intermittent resources under CP, should run of river hydro and landfill gas units compute their UCAP values based on the intermittent resource rules?

• This change would address the disconnect that will arise in EFORd calculations if RPM and GADS ICAP values are different.
Next Steps

• Use median (rather than mean) result in computation of wind and solar summer peak capacity factors
• Compute multiple class average capacity factors for wind and solar to recognize different unit characteristics within these categories.
• Further investigate the following potential changes:
  – Apply intermittent rules to run of river and landfill gas units under CP.
  – Require all generators (of similar technologies) behind a single revenue meter to test simultaneously for the purposes of the capacity verification test
  – Require all generators with a common renewable fuel source to test simultaneously for purposes of the capacity verification test
• Determine effective date of any changes.