Effective Load Carrying Capability (ELCC) Review – Part II

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November 14, 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
Effective Load Carrying Capability (ELCC)

- Methodology to determine the Capacity Credit of a resource by means of estimating the contribution that an individual generator makes to overall system resource adequacy

- Originally, ELCC was defined as the measure of the additional load that the system can supply with the particular generator of interest, without a change in reliability
  - Consequently, the ELCC results are driven by the output of the generator of interest during hours with potentially high reliability risk
  - Such hours will vary based on the penetration level of solar and wind resources
ELCC Procedure – Option 1 – “Load Approach”

- Using historical or representative hourly load shape(s), develop a Resource Adequacy case (without including wind/solar) that meets the 1 day in 10 years Loss of Load Expectation (LOLE) criteria (this is the Base Case)
- Add historical or representative hourly system-wide wind/solar output shapes to the Base Case. The LOLE in this Modified Case will now be less than 0.1 days/year.
- Increase the peak load in the Modified Case (retaining the hourly load shape) until the LOLE is back at 0.1 days/year. This is the Final Case
- The difference between the peak loads in the Final Case and the Base Case is the ELCC
- The ELCC is then allocated to the individual wind/solar resources
The ELCC of the Resource added in Step 2 is the amount of Load added in Step 3 (Y MW).
It can be expressed as percent of the Resource’s nameplate (i.e., Y / X)
ELCC Procedure – Option 2 – “Generation Approach”

- Using historical or representative hourly load shape(s), develop a Resource Adequacy case (without including wind/solar) that meets the 1 day in 10 years Loss of Load Expectation (LOLE) criteria (this is the **Base Case**).

- Add historical or representative hourly system-wide wind/solar output shapes to the Base Case. The LOLE in this **Modified Case** will now be less than 0.1 days/year.

- Add 100% available generation to the **Base Case** until the LOLE is equal to the LOLE of the **Modified Case**. This is the **Final Case**.

- The amount of 100% available generation added to the **Base Case** is the ELCC.

- The ELCC is then allocated to the individual wind/solar resources.
ELCC Procedure – Option 2 – “Generation Approach”

1:

Base Case
0.1 days/year

2:

Resource
X MW
Nameplate

Base Case
0.1 days/year

= Modified Case
0.09 days/year

3:

100% Available Generation
Z MW

Base Case
0.1 days/year

= Final Case
0.09 days/year

The ELCC of the Resource added in Step 2 is the amount of 100% Available Generation added in Step 3 (Z MW). It can be expressed as percent of the Resource’s nameplate (i.e., Z / X)
A key difference between Option 1 and Option 2 is the resulting ELCC of a 100% available resource (i.e., a resource that produces at its ICAP the 8,760 hours of a year)

- Under Option 1, the resulting ELCC for such resource is ~93%
- Under Option 2, the resulting ELCC for such resource is 100%

Under current RPM rules a 100% available resource is valued at 100% (i.e., its UCAP is equal to its ICAP)

Therefore, Option 2 seems to be more consistent with current RPM rules.
MISO only performs ELCC for Wind resources (solar penetration is low)

MISO calculates an annual system-level ELCC by using 1) historical wind output data since 2005 and 2) current wind penetration level

- MISO estimates the annual system-level ELCC for each year since 2005 by assuming that the current wind penetration level existed in each of the historical years
- For 2019-2020, they calculated 14 annual system-level ELCC values (once for each year since 2005 and 2018)
- The MISO system-level ELCC is the average of the 14 values (currently 15.7%)
• MISO then allocates the system-level ELCC to individual resources as follows
  – For Existing resources, the system-wide capacity credit is calculated as the ELCC (in %) times the total existing nameplate.
    • This system-wide MW capacity credit is then allocated to individual units based on the average output of an individual wind unit during the top 8 daily peak hours in each year for which the unit was in-service
  – For New resources, the capacity credit corresponds to the system-wide ELCC (in %) times the nameplate of the new unit.
• CAISO performs ELCC for Wind and Solar resources
• CAISO estimates the monthly system-level ELCC under current wind and solar penetration levels
  – Solar ELCC range from 0% (Dec, Jan) to 45% (Jun)
  – Wind ELCC range from 8% (Oct, Nov) to 48% (Jun)
• CAISO then allocates the monthly system-level ELCC (in %) to individual resources by multiplying the monthly ELCC times the nameplate of the individual resource
  – Therefore, the allocation is not performed based on the actual performance of the individual resource
Sources

• MISO
  – Planning Year 2019-2020. Wind & Solar Capacity Credit

• CAISO
  – Qualifying Capacity Methodology Manual Adopted 2017
  – Deliverability Assessment Methodology