Wind Effective Load Carrying Capability (ELCC) Analysis

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Effective Load Carrying Capability (ELCC)

- Methodology to determine the contribution that an individual generator or a fleet of generators makes to overall system resource adequacy
- Specifically, ELCC is a measure of the additional load that the system can supply with the particular generator(s) of interest, without change in reliability
- Consequently, the ELCC results are driven by the output of the generator(s) of interest during hours with potentially high reliability risk
The ELCC analysis was performed using GE-MARS, a resource adequacy software.

The Wind ELCC was calculated for the projected set of wind resources for year 2021.
- 12,540 MW of nameplate capacity approximately

Nine Wind ELCC values were calculated, one for each year in the period 2009 – 2017

The capacity model was from the 2017 Reserve Requirement Study
Wind ELCC Analysis – Input Load/Wind Shapes

• Each of the nine hourly load shapes was derived as follows,
  – Each of the 8,760 unrestricted hourly loads was divided by the peak unrestricted hourly load in the calendar year

• Each of the nine hourly wind shapes was derived as follows,
  – For each of the 8,760 hours, the total simultaneous wind output was calculated (only wind farms that were in-service for the entire duration of the calendar year were included)
  – The total simultaneous wind output for each hour was then divided by the total nameplate wind capacity in the calendar year
  – The per-unitized hourly values above were then multiplied by the projected nameplate wind capacity in 2021
Wind ELCC Analysis – Procedure

• Using each of the nine hourly load shapes (and without using the hourly wind shapes), iteratively modify the hourly peak load until the LOLE is 0.1 days/year
  – Each of these nine Base cases now meets the 1 day in 10 years criterion
• Add the corresponding wind hourly shape to each of the nine Base cases. The LOLE will now be less than 0.1 days/year.
• Increase the hourly peak load in each of the nine cases above until the LOLE is back at 0.1 days/year.
• The difference between this New hourly peak load and the hourly peak load from the Base case is the ELCC (in MW). The ELCC is commonly expressed as a percentage of the nameplate capacity.
The mean ELCC is 11.5%; the median ELCC is 10.2%
• **Reminder (from March Intermittent Resources Subcommittee meeting):** The capacity factor values based on wind output between 3pm and 6pm during the summer season in 2015 – 2017 are:
  – 7.9%, using the median
  – 16.7%, using the mean

• **Conclusion:** The Wind ELCC results shown in the previous slide (either 11.5% or 10.2%) are much closer to the value calculated using the median (7.9%) than to the value calculated using the mean (16.7%)