

Wind Effective Load Carrying Capability (ELCC) Analysis

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- 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

- 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

- 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.

Calendar Year	Base 1in10 Hourly Peak Load (MW)	Projected Nameplate Wind Capacity 2021 (MW)	LOLE After Adding Wind (days /year)	New 1in10 Hourly Peak Load (MW)	ELCC (MW)	ELCC (% of Nameplate)
2009	167,418	12,540	0.058	168,752	1,334	10.6%
2010	163,518	12,540	0.065	164,727	1,209	9.6%
2011	165,898	12,540	0.079	166,911	1,013	8.1%
2012	164,134	12,540	0.066	165,351	1,217	9.7%
2013	164,598	12,540	0.065	165,880	1,282	10.2%
2014	164,534	12,540	0.027	167,578	3,044	24.3%
2015	162,678	12,540	0.061	163,738	1,060	8.5%
2016	165,128	12,540	0.060	166,668	1,540	12.3%
2017	163,368	12,540	0.065	164,698	1,330	10.6%

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%)