

Wind Energ. Sci. Discuss., referee comment RC2
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Comment on wes-2021-111

Tom Acker (Referee)

Referee comment on "Validation of wind resource and energy production simulations for small wind turbines in the United States" by Lindsay M. Sheridan et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2021-111-RC2>, 2021

General Comments:

The paper reports on a well-reasoned and performed piece of work related to wind speed and wind energy assessment for small, distributed wind turbines. The approach taken, data used, and results presented are useful and needed, and the work represents a step forward. Identification of the source data is useful, especially for any that would like to use the wind simulation data from the sources listed. Typical proposed small wind turbine installations do not have good met tower or weather data from nearby sources, so the use of simulation data is very practical, and thus the some understanding of its ultimate accuracy in predicting AEP is critical.

Specific Comments:

The wind speed bias errors are only positive for the smallest wind speed bin plotted in Fig. 5 (0-5 m/s), yet the wind turbine capacity factors are almost all overpredicted (Fig. 7). This seems to imply that the wind speed spends most of its time in the lowest wind speed bin. However, most of the wind power curves shown in Fig. 2 show little production in this wind speed range. Would it be possible to add to Fig. 5 the percent of time that the wind speed was in each wind speed bin? That could help in interpreting the results. Moreover, if they possess sufficient time resolution in the wind turbine production data, it would be helpful if the authors provided an explanation for the overestimate of capacity factor... at which wind speeds (or wind speed bins) does the overestimate of energy occur?

The (simulated – actual) capacity factors for 55 turbines are presented in Fig. 7, split up by region of the country. Another interesting categorization would be by “surface roughness” or something similar that provides an indication of whether the area in the vicinity of the turbine is forest, fields, etc. It would also be nice to sort by complex terrain vs non-complex, and to provide some suggestion of how to distinguish between the two. Have the authors considered looking at the data in these ways?

Fig. 10 shows availability statistics for 9 turbines of varying ages. Why were only nine turbines used? Also, did the authors sort the availability by turbine age?

For the conclusions: Do the authors have any recommendation about how a person whose job is estimating small wind turbine AEP/capacity factor should account for interannual variability, given its significant influence on capacity factor?

Technical Corrections:

Page 6 Line 148: Should read “2.1 kW to 56 kW” NOT “8.9 kW to 56 kW”

I believe the Southwest WindPower Skystream is now owned by Xzeres. Perhaps some mention should be made of this when introducing the turbine?