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Comment on wes-2021-111

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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-RC1>, 2021

Dear Authors,

Thank you for a well-written paper. You have collected a comprehensive dataset of wind measurements (62 sites) and production data (55 small wind turbines) and used it to evaluate three wind resource models (WIND Toolkit, ERA5, and MERRA-2) and three simulation tools (SAM, Wind Report, and MyWindTurbine.com). It is an ambitious analysis. The comprehensive evaluation is the strength but also the weakness of the paper. There are many uncertainties associated with energy yield assessment, wind measurements and small wind turbine performance (e.g. SAM and MyWT assumes 18% & 7% loss), but the manuscript can not detail all aspects. I would like to see a general discussion about the prediction error and whether it is within the expected uncertainty - does the simulation tools provide added value, or are wind measurements needed for proper energy yield assessments?

Wind Report and SAM make estimates by interpolating within coarsely resolved wind resource grids (2 and 5km). MyWT is fundamentally different in that it uses high-resolution micro-scale and obstacle flow models (<1m) to downscale the large-scale forcing found from the wind resource model (50km in GWA1). The paper hints that the poor performance of MyWT is due to the coarse resolution of the wind resource model. However, as the sheltering effect of nearby trees and buildings can be significant for small turbines (like the 8.9 kW turbine), they should be included in the analysis. MyWT requires the user to input the exact location and type of obstacles; these are not defaults. The paper does not mention if obstacles were included, but if not, it should be noted as the probable cause for the high wind speeds predictions.

The Global Wind Atlas 3 (GWA3) is another easy-to-use tool to estimate wind speed and the energy yield of wind turbines. The GWA3 is based on large-scale forcing from WRF simulations (3km) with global coverage down-scaled to 250m resolution. It would be interesting to compare GWA3 (3km) and GWA1 (50km) as this could indicate if the prediction error is caused by the resolution of the wind resource model or the lack of an obstacle model.