Wind Energ. Sci. Discuss., referee comment RC1
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Comment on wes-2021-61

Anonymous Referee #1

Referee comment on "Results from a wake-steering experiment at a commercial wind plant: investigating the wind speed dependence of wake-steering performance" by Eric Simley et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2021-61-RC1, 2021

Useful paper, very well presented. I have only minor comments.

Fig 6: The target offsets are changed stepwise as the wind speed increases. As the shape is always the same, why not allow a continuous change in scaling factor with wind speed?

Line 196 says, "the most relevant feature for the two-turbine scenario investigated here is “yaw-added recovery,”" but there doesn't seem to be any further mention of this effect in the paper.

Line 202: "The FLORIS model is tuned ... by adjusting the turbulence intensity input" - What does this imply? If you use the measured turbulence intensity, does the model not fit so well?

Line 266: "it helps ensure that none of the turbines are unavailable or curtailed" - were there no flags available to indicate such turbine states?

Line 268: What are "the power curve filtering functions available in NREL’s OpenOA software"? Some indications would be useful to help reassure that no biases are introduced by any of the processing.

Line 286: "identifying the wind direction where the ratio between the mean power produced by SMV5 and SMV6 reaches a minimum" - presumably only with wake steering off, and making the (quite reasonable) assumption that the wake deflection at zero yaw is small.

Line 298 and other places: The term 'transfer function' usually applies in the frequency domain, but in this case I assume it's just a multiplier which is a function of one or more inputs. For clarity, it would be good to state this somewhere and specify what the inputs are.

Figure 14: linear regression - there is a slight but distinct curve - would it make sense to fit a quadratic?

Line 410: "blade element momentum theory predicts Pp = 3." This is only true if a skewed wake correctionis not used. It is recommended to use a skewed wake correction in blade element theory for better prediction of performance in yaw.

Line 411: "they are expected to agree in below-rated wind speeds" Above rated, equation (3) is definitely wrong, so is there a reason not to use equation (1)? The processing is only slightly less straightforward, effectively shifting the power curve to the right. The offset (alpha) can also be used in equation (1).

Line 446: "depends on the atmospheric boundary layer as well as the turbine's control system" It also depends on the rotor aerodynamics.

Line 582: Presumably the measured mean values in each bin are used. For clarity it might be worth spelling out precisely how this confidence interval is obtained for the long-term weighted results?

Line 606: "12–14-m/s wind speed bin—just below the turbines' rated wind speed" - That depends how you define rated wind speed. If you define it as the wind speed at which rated power is reached in steady wind, I would estimate the rated wind speed at around 11.5 m/s from visual inspection of the (turbulent) power curve. The higher the turbulence, the higher the wind speed at which the 10-minute average power "reaches" rated (inverted commas because in theory it never quite reaches rated power if there's any turbulence.)

Line 608: "wake loss reduction from wake steering increases to 9.8% for the wind directions analyzed" - Perhaps it's obvious, but taken over all wind directions, the improvement would be smaller - but, equally obviously, if wake steering were applied to the whole farm, not just one turbine, there would be more to gain.

Line 615 "almost no impact on power production from yaw misalignment was detected" - This is expected because the turbine is actually above the 'steady' rated wind speed - see Line 606 comment.