Review of Brief Communication: On the influence of vertical velocity profiles on the combined power output of two model wind turbines in yaw by J. Schottler, et al.

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The article presents wind tunnel measurements of two aligned model wind turbines. The influence of two different inflow profiles on the power output is investigated, as function of the yaw misalignment angle of the upstream wind turbine.

You conclude that a negative wind shear moves the combined maximum power output from negative to positive yaw angles compared to a positive wind shear. I think there is a some information lacking to support this conclusion:

1. Where are the profiles from Figure 1 measured with respect to the wind turbine positions and how do they develop from the first to the second wind turbine and further downstream (without the wind turbines present in the tunnel). My concern is that if the wind profiles are far from equilibrium, it could influence the wake deflection significantly.

2. What is the turbulence intensity and/or how do the turbulence profiles look like that correspond to profile 1 and 2 from Figure 1?

It would strengthen the article if a model or simulation results could confirm your experimental results. I think that a simple actuator disk (AD) model with rotation based on airfoil data in a Reynolds-averaged Navier-Stokes (RANS) code should be able to model it. I could not resist to perform such simulations myself. In Figure 1, simulation results are shown for two different wind shears: a small wind shear of $\Delta U = 1$ m/s and a large wind shear of $\Delta U = 3.5$ m/s (taken over the rotor area). The yaw angle is positive for a counter clockwise rotation seen from above. The inflow profiles represents a neutral atmospheric surface layer with a low and a high roughness length (or a turbulence intensity of 5% and 20% at hub height) and a hub height wind speed of 8 m/s in both cases. I have used the NREL-5MW reference wind turbine. Unfortunately, I could not replicate a clear shift in total power as function of yaw. There are small asymmetries, but not as strong as you have presented in the article. In addition, the maximum power of the combined wind turbines lies around 0 deg for both shears, which means that there is no benefit in yawing the first wind turbine in an aligned configuration, at least in my simulations. I have also done RANS AD simulations where the second AD has a slight lateral offset of $\pm D/8$,

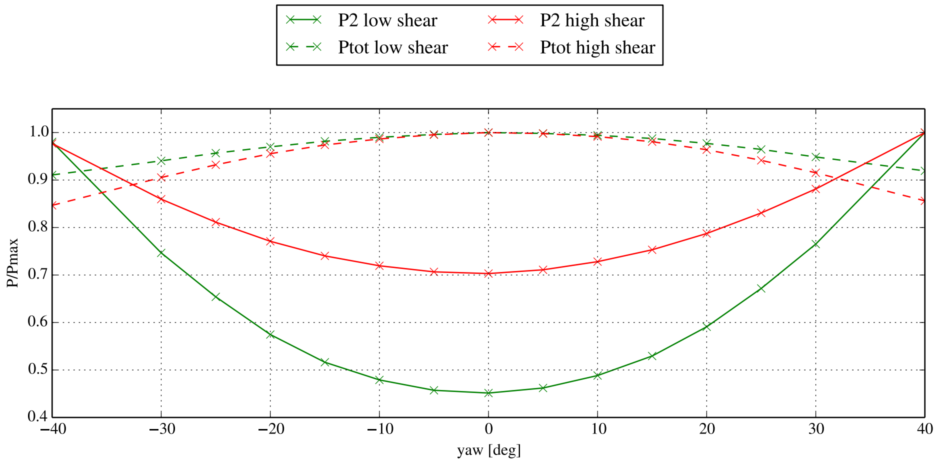

Figure 1: RANS AD simulation results of an aligned setup for a low and a high wind shear.

where D is the rotor diameter. This would correspond to a misaligned wind direction of $\pm \text{atan}(1/8) = \pm 7°$, with respect to the downstream wind turbine. The results are shown in Figure 2. Figure 2 indicates that your results could be generated by asymmetries in the experimental setup. Possibly your inflow profiles develop downstream, which could result in flow that is not perfectly aligned with the wind turbine pair (before yawing the first wind turbine).

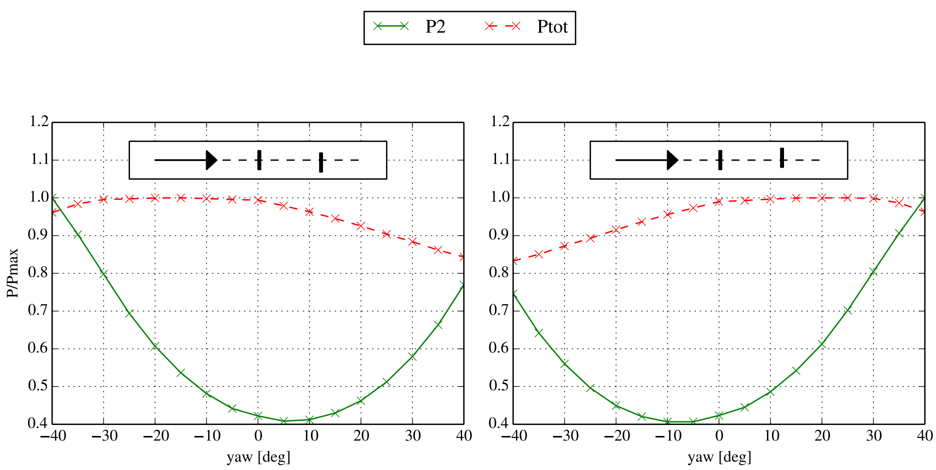

Figure 2: RANS AD simulation results of two wind turbines with a lateral offset of $\pm D/8$.

Other minor comments:

1. A few references include duplicated links.

2. Page 1, lines 12-14: I am not able to find a discussion on asymmetries of wake deflection in Gebraad et al. (2016).

3. I would call vertical velocity gradient simply wind shear.

4. How is your yaw angle defined?

5. Page 2, lines 14-16: I would add over the rotor area to be more precise: Using two inflows which feature a vertical velocity gradient in opposite direction over the rotor area allows an investigation of ....