Response to Referee 1

We greatly appreciate the time taken by the referee to read our manuscript. We have taken into consideration and addressed all comments, questions, and suggestions from the reviewer, and we feel that the revised manuscript is now substantially stronger as a result. Changes made to the text at the request of the reviewer have been highlighted in red in the revised manuscript. In the following, reviewer comments are repeated in italics and our responses are provided in the bulleted sections of text.

Comments

1) *In section 3.1, the authors present that 7D rotor diameters were chosen as the spacing between the two turbines, but no justification or references were provided as to why this distance was chosen. Additionally, no reasoning is provided for the chosen wind speed of 7.5 m/s, and the details of the inflow turbulent intensity at hub height are missing. As all of these parameters (turbine spacing, inflow speed, turbulence intensity) would have a significant impact on wake recovery and hence resulting fatigue and power production of the downstream turbines, further clarification on the impact of these parameters on the methodology and results would be interesting to see.*

- We thank the reviewer for pointing out this opportunity for clarification. In revised paper we have clarified that the presented results are specific to the specified atmospheric conditions on P17L368 and P17L379. Further, on P8L189-192, we explain that we wanted to have optimal solutions that were inside the boundaries of allowable yaw offsets. When turbines are spaced tightly, we found that the optimal power was commonly associated with the largest allowable yaw offset of the front turbine, which was a less challenging optimization case. Ultimately, the primary novelty of this paper is the presentation of the applied framework for wake steering. This framework can be applied with different turbine spacings and atmospheric conditions in the future, as we now note on P19L402-403 in the conclusions.

2) *The numerical modeling section could also benefit with the inclusion of performance curves, such as power/rotational speed/pitch against wind speed and yaw angles. By comparing such curves against reference values from the turbine report, it can be confirmed that the turbine and implemented controller in the numerical set-up are operating correctly.*

- On P8L196-197 we now clarify that our analysis assumed constant rotational speed and pitch angles and that we did not have an integrated controller.

3) *The moments in the paper are evaluated by determining the aerodynamic forces along the actuator line elements according to the equation 25. The authors however do not go into further detail about the blade structure and whether the blade material properties and flexibility are accounted for in their simulations. Blade deformation and structural damping could significantly affect the amplitude of stress reversals and hence the resulting fatigue damage. Furthermore, no information is provided as to why only the blade flapwise bending moments are considered in this study, and the edgewise moments and tower loads are not considered.*

- We agree with the reviewer that adding these details will increase the clarity of the paper. We now clarify that the turbine blades are rigid and without a controller on P8L196-197. Because this study is a demonstration of a method, we simply chose the flapwise bending moment for the purpose of providing an illustrative example. We have correspondingly added a note on P9L234-235 that there are several methods available to quantify loading, although we just consider the flapwise bending moment here.

4) *Since both the high-fidelity and low-fidelity simulations are run for the short time durations of 1,200s and 400s, the measure of accuracy of the computed time averaged power production and DEL could suffer from the small sample sizes. Figures 4 and 5 show the output power and loads for all the simulations, however the range of uncertainty of these values is not addressed. The results could benefit from a supplementary figure showing the uncertainty on the computed power and loads, using a statistical tool such as bootstrapping. Additionally, since the flow-through time is reported to be 301 seconds for the turbine set-up, is the duration of 400 seconds of the low-fidelity model sufficient considering initial transients?*

- We agree with the reviewer that there is likely some uncertainty resulting from the finite-time simulations. Regarding the low-fidelity time duration, on P9L225-226, we have added that this cut-in time and the total low-fidelity model time were selected to avoid the effects of the initial transient period while keeping the time required of the low-fidelity simulation low. We have also added text on P9L221-223 explaining that we validated the time intervals used by comparing analysis results after 600-900 s to results after 900-1,200 s, finding a 2.6% relative difference between the computed powers and 4.2% relative difference between the computed DELs.

5) *While formulating the loading objective in line 225, page 9, it is not clear why a factor of '10' is subtracted from the loads.*

- We agree that this could have been clearer. We now clarify on P10L262-263 that this *ad hoc* approach was chosen to ensure that both power and loading were always negative.

6) *Table two summarizes the total power gain for different yaw angles, however it could be interesting to see an analysis on the power production by the individual turbines as well, as shown for loads in Figure 8.*

- We are grateful to the reviewer for providing this feedback and we have now adjusted Table 2 to reflect the front and back turbine power productions.