Answers to referee no.1

We are glad to have your support and time in reading our manuscript and writing your comments. Your remarks have been of great value to the betterment of the manuscript. We hope to fulfill the requirements.

2.1 Variation of T.I. over the computational domain.
The authors give the adopted value of TI without further critical discussion. As turbulence is subject to dissipation, plots should be shown of how turbulence varies over the computational domain (e.g. by plotting TI on a line through the AC, from inlet to outlet).
Ans: A plot along the center line will be presented, I is calculated using sqrt((2/3)k) / magU.

Steps taken: This is addressed in line 265, Fig. 11.

2.2 Turbulence intensity is not a free parameter.
In sect. 5.3, turbulence is increased from 1 % to 5 %, 'until the results become optimal'. This is wrong, of course. Apart from the fact that the adopted values are low for the ABL, turbulence is a variable describing a physical state, and cannot be treated as a free parameter. Also, turbulence along a line in the wind direction going through different VAWTs, will vary in a nonmonotonic way. The authors should show how their TI varies along this line. And, again, TI should not be treated as a fit parameter.
Ans: Data from Araya and Dabiri is used to calculate I. The data contains the average wind speed and standard deviation every minutes from a reference mast. The values of I for different speed bins are presented as well as a Python script which extracts the values of I from the file.

Steps taken: This is addressed in line 215 and Appendix A.

3. Solidity.
While it is understandable that the ACM performs less well a high solidity, the discussion of this issue in the paper is not always clear. On p. 3, sect. 1, the issue is first mentioned. Rather than stating that will be discussed 'later', refer to the appropriate sections. The performance of the ACM as a function of solidity should be discussed more carefully. On p. 3, sect. 1, the high solidity of the VAWT in the paper by Araya et al is mentioned but, nevertheless, there is an extensive comparison with that work. Should the reader conclude that σ = 0.3 is still acceptable? If so, at which solidities do results cease to be acceptable? The effect of solidity is presented in figure 8, but only chord lengths are given. The solidity should be given explicitly, and the results should be discussed more carefully, including the ability of the ACM to generate a result at high TSR and high solidity (lower panels of fig. 8).
Ans: Examples from the literature using AC codes or double multiple-stream tube are listed to explain the highest solidity vales encountered in these models. A validation case against a Windspire turbine is presented, the polars were obtained by using an Xfoil code and details concerning the certainty of these polars are explained according to experimental data. Experimental data was very limited when it comes to Reynolds numbers. The power coefficient curve from the AC follows a very good trend according to the experimental Cp plot, although it overestimates the Cp. Therefore the AC model can still deliver

good trends for high solidity rotors but it is not known whether it predicts the right angles of attack (this causes problems in another validation study later on).

Steps taken: Answer is in line 105.

4. Stall.
In sect. 5.3, the discussion of stall and the 'heuristic correction' needs to be improved. The statement is made (p. 16) that the AoA exceeds the static stall angle and this is remedied by squeezing the values of α so that they no longer exceed the static stall angle. I am not convinced that this is justified: at low TSR, the blades will experience stall. Why does this physical phenomenon need to be removed from the model? Also, what occurs is dynamic stall rather than static stall. Why then is the focus here on static stall?
The heuristic correction was removed entirely. No dynamic stall model is included because it can cause conflict with the AC model. Although neglecting flow curvature and dynamic stall in the validation case against experimental data from the Windspire turbine still shows a good trend of the power coefficient curve; the fact that the turbine is stalled according to results of the AC model will cause wrong results in the Antelope Valley wind farm of 18 turbines.
It is explained that the unblocked turbines have ironically lower power coefficients than the blocked turbines. Since a blocked turbine sees lower relative velocities and lower angles of attack, these angles will be lower than the unblocked turbines (which are stalled) and thus no stall will be present, thus leading to higher lift forces and thus higher Cps ironically. Data from a rows of turbines in the 18-turbine farm is presented to clear this shortcoming. It is emphasized that this is only due to the fact that the AC model can't predict accurately the angles of attack for this particular turbine
Another case study of a low-solidity turbine is shown: Cps, wake and an 18-turbine farm. It is shown that, since the model predicts well the angles of attack for this low-solidity turbine, the blocked turbines in this case always have lower Cps.

Steps taken: Answer is in line 150 and Section 3.3.

5. Paired VAWTs.
Paired counter-rotating VAWT pairs in close proximity are modelled in sect. 5.3. Were modifications to the model required to handle this case?
Ans: the heuristic correction was removed.

6. Figure.
Fig. 13 should have ticks and values for the normalised spatial coordinates, to facilitate the interpretation of the subsequent figures.
Ans: The figure showing the layouts will be corrected.

Steps taken: Fig. 6 and 7 shown the corrected figures.