

Response to Reviewer 1

Andrew P. J. Stanley, Christopher Bay, Rafael Mudafort, and Paul Fleming

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First, thank you for all the efforts involved in reviewing our manuscript. We realize the amount of effort necessary to review and provide thoughtful feedback for our paper, and are very grateful for that. We have structured this response to be clear and easy to follow. Each of the reviewer comments will be shown in blue, immediately followed by our response in black. Please note that if the comments refer to specific pages, sections, or line numbers, they refer to the original submission. These references may be different in the revised manuscript.

Page 3 line 75: you refer to "the square root of the sum-of-squares" method with no citation. If it is the same as (Crespo et al., 1996), then I would suggest moving that citation to the end of the sentence. If it is from something else, then a citation should be added.

The appropriate citation was added for this wake combination method.

Page 5 line 106: the bounds of 0° to $+30^\circ$ are considered for yaw optimization with no mention of negative yaw angles. Some explanation should be given as to why negative yaw angles are not considered in this article.

This explanation will be included in the revised manuscript.

Page 5 lines 107 & 113: The word "greedy" is used to describe the Boolean method. This is confusing to me because the word "greedy" has been traditionally used to mean "business-as-usual" in wind plant optimization. I would consider sticking to that convention and use a different word here to describe the Boolean method.

We have removed the greedy description from the explanation of the Boolean optimization in the updated manuscript.

Page 6 line 135 & figure 2 title: you mention "we optimized turbine rows...", which seems contradictory to the figure title "Turbines in-line". I think what you are trying to say on line 135 is "we optimized an individual row of turbines varying from 10 – 50...". Please consider changing this sentence to avoid confusion.

We have reworded this explanation. The text in the updated manuscript reads:

" To determine this, we optimized an individual row of turbines using the Boolean optimization method with several different setups. We varied the number of turbines between 10 and 50, with spacings of 3, 5,

and 8 rotor diameters between turbines. We repeated each Boolean optimization with different Boolean yaw angles from 5–30 degrees at 5-degree increments”

Page 8 paragraph starting at line 165: It is probably worth mentioning here how often a re-optimization of yaw angles needs to occur for a production wind plant during operation. This would further make the case for a need to have a computationally efficient algorithm as the optimization time would really start to add up with re-optimizations for the continuous method when compared to the Boolean method.

Great idea, this will be included in the revised manuscript.

Page 9 lines 196 & 197: you refer to a wind plant arranged in a grid and contrast this against an in-line arrangement. To me a grid is several sets of in-line turbines, so they don't really contrast one another. Something needs to be done to clear this up. I do agree that an in-line arrangement does contrast a random arrangement. Also “in line” here should be changed to “in-line”.

The following has been added to the revised manuscript to clear up this issue:

“Similar to the previous section, grids of wind turbines are simply several sets of in-line wind turbines. However, the spacing between wind turbines varies depending on the wind direction. Also, it is possible to have wake interaction between the rows of turbines depending on the wind direction. ”

Section 4.2: It was surprising to me that the $285^\circ/345^\circ$ and $300^\circ/330^\circ$ pairs of wind directions do not give identical results as the pairs are mirrors of one another about 315° for a regular square grid arrangement. Perhaps this is because only 0° to 30° optimized yaw angles are considered. Some mention should be made about this in this section as to why the results are not identical. Additionally, if it is because of only optimizing positive yaw angles, then it should be reiterated here why negative yaw angles were not considered in this article.

Yes, the angles you mention do not exactly mirror because only positive yaw angles were considered. This will be mentioned in the updated manuscript, along with a reiteration of why we did not consider negative yaw angles in this paper.

Page 14 line 253: Here it is stated that seven random wind plant layouts were generated. Why not more? Why not less? It should be mentioned why seven was chosen for the results presented in this section.

The following text has been added to the revised manuscript to address this comment:

“Seven layouts was the number of full optimizations that completed in an arbitrary amount of time we set to run the random yaw optimizations, and was deemed sufficient to demonstrate the performance of our Boolean optimization method.”

Page 15 figure 10: A thought I had after seeing this figure is that it would be great if a scatter plot was included in this paper showing “computational time ratio” vs. “optimized power ratio” from the two right plots in figure 10. This figure could show an aggregate of results from the scenarios across the article. I think that this scatter plot would greatly add to this paper by showing how much power improvement you

get at the cost of how much additional computational time, which is one of the main points that this article is trying to make.

Great suggestion! To the revised manuscript we have added a scatter plot with the aggregate results of all of the optimizations run for this paper, showing AEP ratio vs. the time ratio.

Again, overall, nice job!

Thank you!
