Changes in response to the final corrections requested by the Editor-in-Chief

Editor-in-Chief: *Thanks for the revision. I think the paper still misses some essential discussion. In most of the optimizations, even those with an even directional wind distribution, the turbines do not end up in the corners of the domain. This is to be expected, especially because cable length is not minimized. If you look at the paper by Rethore et al (2013) Wind Energy 10.1002/we.1667 you see a clear tendency of the turbines to go for the corners. Why do you not observe that and compare to their work? Wouldn't you expect to see turbines in the corners or have I (and Rethore) misunderstood something? Has it to do with a discretization of the angular distribution?*

Response: This is an interesting point. Looking at the work of Rethore et al (2013), there is indeed a case, i.e. the Stags Holt / Coldham case (in which line costs appear not to dominate) and with turbines ending up at all corners of the domain. However, this seems not to be consistently present in all reported optimization results in literature. Some papers show similar results (see, e.g. Feng & Shen 2015), while others do not always end up with turbines at the corners (e.g., Du Pont and Cagan, 2012) – all considering a number of cases with a uniformly 360°wind rose. Currently, we don't know whether this is possibly dependent on number of turbines and size and shape of the wind-farm domain, or whether turbines should always end up at the corners (in view of the complexity of the problem, we're not sure that this can be just concluded on intuition only). At the same time, it may also be possible that turbines not ending at the corners depends on convergence of the optimization method, the existence of many local optimums, so that in the global optimum, turbines are indeed always at the corners – given the non-convex nature of the problem, establishing this rigourously may not even be possible, and we did not find any studies in which this issue is explicitly resolved. In any case, we agree that this warrants some discussion in our manuscript. On page 20, last paragraph of §3.4, we extended the discussion as follows:

"The optimal layout itself is shown in Figure 9. In contrast to the layout found for the dominant wind direction, now turbines are spread out much more evenly throughout the domain. Moreover, a number of turbines, i.e. seven, are located on the domain boundary. We remark here, that for similar optimization cases in literature, turbines sometimes end up at the domain corners (see, e.g., Rethore et al 2013, or Feng & Shen 2015), but this is not the case for all studies (e.g., Du Pont & Cagan 2012). Currently, we are not sure whether this is possibly related to domain shape, size, and number of turbines, or whether this is related to the existence of local optimums, or convergence of the optimization method. Using a hybrid method that combines a global method with a gradient-based approach, as proposed by Rethore et al 2013, and exploring a large number of optimization starting points, may be required for studying this in more detail. This is an interesting topic for further research."

Finally, we reiterate that the scope of our current manuscript is on combining LES with the Jensen model for layout optimization with focus on the formulation of an approach that is computationally feasible (given the large costs of LES). It is not our intention to make an extensive comparison of optimization methods, and any kind of method can be straightforwardly used in the approach instead of the CE method (this is also explicitly discussed in the paper). Providing strong results on the precise properties of optimal layouts is a study in itself. Given the non-convex nature of the problem, it may be interesting to, e.g., look at the optimums of convex subproblems that arise when solving the optimization with an SQP approach, compare various global+gradient-based combinations for a large number of starting points, etc., but this is out of the scope of our current work. Therefore, given the additional discussion provided above, we hope that the manuscript can now be accepted in its current form.

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[1] Du Pont, B. L. and Cagan, J.: An extended pattern search approach to wind farm layout optimization, Journal of Mechanical Design, 134, 081002, 2012.

[2] Feng, J. and Shen, W. Z.: Solving the wind farm layout optimization problem using random search algorithm, Renewable Energy, 78, 182–192, 2015.

[3] Réthoré, P.-E., Fuglsang, P., Larsen, G. C., Buhl, T., Larsen, T. J., and Madsen, H. A.: TOPFARM: Multi-fidelity optimization of wind farms, Wind Energy, 17, 1797–1816, 2014.