Dear Associate Editor,

Thank you for your comments. It is unfortunate to hear that one of the reviewers is unsatisfied with our changes.

We have clearly presented our results and showed that using Polynomial Chaos to compute the AEP is better than the rectangle rule, albeit the results are not as good as the reviewer expected. It is true that the convergence results for PC should be exponential and for the rectangle rule second-order, but these are theoretical results observed in the limit (usually demonstrated in toy problems with analytic solutions and using an impractical number of model evaluations). The computation of the AEP is a challenging problem especially because of the highly oscillatory and non-smooth responses; thus, for the practical number of samples considered, we do not observe the theoretical convergence of the methods. Instead, we focus on the practical aspect of performing wind farm layout optimization, and for this, we have shown that PC is better as it can compute the AEP to a given accuracy with fewer samples than the rectangle rule and also find better optimal layouts. We believe this is a valuable and useful insight to practitioners.

The reviewer brings up a good point about using Fourier series. Due to the oscillatory response of the power with respect to wind direction, it could be beneficial to compute the AEP by a Fourier approximation which is expected to converge exponentially (similarly to PC's theoretical convergence rate). In our paper, we hope to motivate moving beyond the use of the rectangle rule to compute the AEP. We have shown why the Polynomial Chaos could be a good method to replace the rectangle rule not just to compute the AEP but for the optimization problem in general. We have not said it is the best method for computing the AEP, especially as custom integration methods could be built to approximate the AEP. Methods making use of Fourier series would be an option. We believe other researchers should investigate these different integration methods. In the paper, we can say more about other methods to compute the AEP if that would be helpful. And be clearer saying that PC is an approach and not necessarily the best approach to compute the AEP.

Yes, the improved performance of PC-R comes because it is a smoother approximation to the power response. It is likely that the benefits from using Fourier series would also be because it smooths out the response. We had mentioned the smoothing behavior of PC in the paper before the reviewer comment, following the reviewer comment we made this point clearer by reiterating it in Figure 9's caption as well to make sure it is not overlooked.

The benefits of PC-R come from smoothing the response, not the input distribution. In fact, we observed the benefits of PC-R over the rectangle rule for smooth input distributions as well. We had initially performed the study on a smoothed wind distribution and also on a uniform distribution for the wind direction, and for both PC-R performed better. We went with the non-smooth wind direction distribution as it was the most realistic. We took great care in not treating the methods differently and in not making one method look better or worse.

In conclusion, we have clearly illustrated the application of modern UQ methods for the computation of the AEP and for the larger wind farm optimization problem. We have shown that Polynomial Chaos is better than the methods commonly used. As this is one of the first applications of UQ to the wind farm optimization problem, we do expect there would be many ways including those in the reviewer's comments to improve the work presented here. And, we believe looking at different methods to improve our work should be pursued in new papers, instead of significantly changing the work we have presented.

Thank you for your feedback, and we look forward to hearing your thoughts.

Regards,
Santiago