WESD

Interactive
comment

Interactive comment on "Polynomial chaos to efficiently compute the annual energy production in wind farm layout optimization" *by* Andrés Santiago Padrón et al.

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Received and published: 10 March 2018

RC1 - Question 1: "What if the wind speed does not nicely follow a (single) Weibull distribution? Is there a specific added complexity that might render the method less efficient than the rectangle method?"

No, the method would not be less efficient than the rectangle method. Where, by efficient, we mean the number of simulations required to accurately compute the AEP or a statistic of interest. However, there is an added complexity by not having a single Weibull distribution. The added complexity is that we cannot consider the uncertain variables of the wind speed and wind direction to be independent, which is often the

case as they are usually correlated. This added complexity introduces some upfront costs of dealing with the correlated variables, but it would not significantly affect the number of simulations required to accurately compute the AEP. There are different approaches to use polynomial chaos when the input variables are correlated (we cannot fit a single Weibull distribution to the wind speed): 1. Perform a variable transformation to uncorrelate the variables. 2. Construct polynomials that are orthogonal to the multivariate distribution instead of orthogonal polynomials for each dimension. 3. Find subsets of the wind direction where you can fit a single Weibull distribution, and then combine the subsets with what is known as multi-element polynomial chaos.

RC1 - Question 2: "Do you think complex constraints, e.g. water depth, wake-induced loads, shipping routes (for support vessels), could be more efficiently handled with the new method?"

Yes, If the constraints are formulated probabilistically. If the constraints are deterministic, then there would be no difference.

Interactive comment on Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2017-56, 2018.