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Interactive comment on "Brief communication: Wind speed independent actuator disk control for faster AEP calculations of wind farms using CFD" *by* Maarten Paul van der Laan et al.

Anonymous Referee #1

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The manuscript presents a velocity-independent actuator disk method to reduce computational costs for numerical simulations of wind farm flows. The annual energy production (AEP) of a rectangular 5*5 wind farm consisting of NREL-5MW turbines is computed including different wind speeds and directions. The results show that using the new method can reduce computational costs by a factor 2-3.

It is indeed useful to develop RANS simulations with lower computational costs, and I appreciate the authors' efforts to address this issue. However, I have some concerns regarding the methodology suggested in this paper. My main concern is associated with validity of the concept of a velocity-independent actuator disk. Any change in

the incoming velocity can affect wind flow distribution in different ways. In a turbulent boundary layer, any change in the incoming velocity at hub height affects the mean flow shear and size of large turbulent eddies, among other effects. The proposed technique is likely to capture effects of wind speed change on the thrust force. However, it seems that it does not account for changes in flow physics caused by a change in the incoming wind speed. Other more specific comments can be found below:

Page 1, line 20: Apart from the turbulence intensity, the integral length scale is also an important factor as it represents the size of largest turbulent structures in the flow.

Figure 1: Please clarify how the curve shown for a different scaling factor "s" is computed.

Page 3, line 6: How many simulations are performed to estimate Ct*-Uad? Please provide more information about this.

Page 5, line 32: The convergence error is used in this study as the AEP computed by the base case is already available. Please elaborate how this criterion can be used if one aims at using the new technique without a prior knowledge on the true value of AEP.

Minor editorial comments:

Page 1, line 13: I think "relative" should be replaced by "relatively".

Page 1, line 14: "be" is missed in "that can used".

Page 2, line 5: "is" should be removed in "This is strategy ..."

Page 5, line 5: "This an optimization ... " is grammatically incorrect.

Interactive comment on Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2019-27, 2019.