Wind Energ. Sci. Discuss.,
https://doi.org/10.5194/wes-2019-28-AC1, 2019

WIND ENERGY SCIENCE DISCUSSIONS

Interactive comment on "Optimal relationship between power and design driving loads for wind turbine rotors using 1D models" *by* Kenneth Loenbaek et al.

Kenneth Loenbaek et al.

kenneth.loenbaek@suzlon.com

Received and published: 14 November 2019

Thank you for taking the time to read our paper. Your comments are appreciated and we believe that they have made the manuscript better.

The following is the author's answer to the minor comments. The *italic* text is the referee question/comment the following text is the author's answer/comment. The **(bold)** is the page - (p. #) and line number (l. #) in the document: DIFF_Optimal_power_capture_for_wind_turbines_with_design_driving_loads.pdf attached to this comment where the change has been highlighted.

1.) There are several grammar errors here and there. I suggest a second reading using good grammar corrector.
We have been though the paper a couple of times and the grammar should be better now.

2.) The introduction needs some revision to include more related works.
It is not clear to the authors if the referee has a specific part of the literature that he/she thought was missing?! As pointed out by another referee the work by Bottasso et al., 2010 (Multi-disciplinary constrained optimization of wind turbines) is a seminal work when talking about MDAO for wind turbine design. It is therefore added to the list of MDAO references. (**p. 2, l. 30**)
We also added the work by Buck and Garvey (2015a) discussing "thrust clipping" to the introduction. Their work was mentioned later in the paper, but it was thought that an earlier introduction would be better. (**p. 2, l. 50**)

3.) The authors assumed that the change in CT does not lead to a proportional change in CP. Can the authors elaborate more on this assumption.
It is an assumption that is a direct consequence of using 1D-momentum theory. It is best seen in equation (3) **(p. 4, l. 106)** where the classical equations for $C_T = 4a(1-a)$ and $C_P = 4a(1-a)^2$ is combined to an expression for the relationship between C_P as a function of C_T.

4.) The self-weight of the turbine is not taken into account in this study, the authors need to make this point clear in the manuscript including its impact on the general assumption used in the theory sections.
Indeed, the self-weight is not part of the optimization presented in this paper. This was mentioned in section 4.5 (Limitation of the study and possible improvements) **(p. 28, l. 415-419)**. But this is at the end of the article and as also pointed out by others the

limitations of the study should have been mentioned in the introduction to make it clear for the reader which level of detail the study deals with. To accommodate this we have added a further discussion about the limitation of the study to the introduction, where the self-weight is also mentioned. **(p. 3, l. 82-87)**

5.) The 1D-aerodynamic-momentum theory is considered as a first-order theory, the authors need to discuss broadly the benefit/shortcoming of using this theory instead for example using the Blade Element Momentum theory in the rotor design.
Related to the previous comment, we have now added a further discussion about the limitations of the study to the introduction. **(p. 3, l. 66-87)** This should clarify the intent of the paper as a tool for rotor analysis in the initial stage.
Furthermore, Blade Element Momentum theory is thought to be an extension of the 1D-aerodynamic-momentum theory where losses are taken into account and the load can be varied radially as discussed in section 4.5 **(p. 28, l. 420-426)**. The authors are currently working on generalizing the method for radial load variations.

Please also note the supplement to this comment:
https://www.wind-energ-sci-discuss.net/wes-2019-28/wes-2019-28-AC1-supplement.zip

---

Interactive comment on Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2019-28, 2019.