WIND ENERGY SCIENCE DISCUSSIONS

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Interactive comment

Interactive comment on "Multi-element ducts for ducted wind turbines: A numerical study" *by* Vinit V. Dighe et al.

Anonymous Referee #1

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The authors performed the optimization of the design of a multi-element diffuser for the improvement of the performance of small size HAWTs. For the purpose, both inviscid and viscous numerical approaches were adopted, which employed an Actuator Disk (AD) methodology for the modelling of the wind-rotor interaction. The robustness of the approach was ensured by validation on available experimental data. Final result of the study is the configuration of the diffuser flaps, in terms of radial gap and deflection angle, which maximizes the overall power coefficient.

The reviewer believes that the topic and the activity are very interesting and worthy of investigation. The paper is clearly coherent with a broader research project, developed by the authors in previous works. It is well presented and the results are clear.

Some specific considerations:

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Discussion paper

- In the introduction, the presentation of ducted HAWTs technology is not very clear especially as far as their working principle is concerned.

- The numerical approach seems not to be fully adequate for the analysis. Is seems that the authors have used a steady approach for all tested configurations, although this is surely not suitable for high deflection angles because of the intrinsic unsteadiness of the stall phenomenon. The reviewer recommends to verify the validity of the adopted approach by re-analyzing a few selected configurations, especially at high deflection angles, with an unsteady CFD approach.

- The authors state that "The differences between results obtained using the panel and RANS methods are smaller than 5% for $\theta \leq 60°$". Upon examination of Figures 7,8 ,10, 11, however, the discrepancy between the two methods seems to be much higher.

- The reviewer believes that some of the results' comments require a slight revision. In particular, the physical explanation regarding the role of the diffuser radial gap in increasing flow resistance to separation needs to be revised, since it's effect is more related to the re-energization of the flow itself.

- Some errors are present in the paper:

page 1, line 14: Capital "V" is required after the dot

page 2, line 2: "Th" instead of "The"

page 5, line 2: Basing on described DWT theory, it should be "$\tau > 0$" and not "$\tau > 1$", for an improvement of the power coefficient with respect to the OWT case.

page 10, line 12: "th" instead of "the"

Based on the aforementioned comments, the reviewer does recommend the publication of this paper after the suggested modifications have been applied.

Interactive comment on Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2019-21, 2019.