

Interactive comment on “Ducted Wind Turbine Optimization and Sensitivity to Rotor Position” by Nojan Bagheri-Sadeghi et al.

Anonymous Referee #2

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General comments:

The article "Ducted Wind Turbine Optimization and Sensitivity to Rotor Position" is clearly written and well structured.

It is easily read and understood, partly due to a very clear language and presentation mode, and partly because the paper presents new numerical DAWT results but without any new contributions to DAWT theory.

Another virtue of the article is the validation of the CFD actuator disk model by successful comparison against the HAWT open rotor ideal C_p (Betz limit). Subsequent application of the validated CFD actuator disk model on DAWTs, leading to optimized power performance above Betz for C_{p_total} . Such a "Betz-exceeding" result is not

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new, but it is still a result which until a few years ago might have been regarded as controversial, since it was speculated by some researchers whether Betz limit provided an upper limit for C_{p_total} for DAWTs. This has later been demonstrated not to be the case, and the present paper adds further evidence to this.

An interesting result of the paper is the aft position of the actuator disk for configurations that have been optimized for C_{p_total} . It seems to have a stall-suppressing impact for single-element diffuser profiles that are otherwise prone to suction side stall.

Specific/technical comments:

Page 1: Abstract: Good

Page 2: L15: Werle & Pretz arrived at similar optimum C_t value by introducing a shroud coefficient, C_s , in the 1D DAWT momentum analysis. Reference to this article should be considered. Hjort & Larsen did a $C_p + C_{p_total}$ optimization on multi-element DAWTs using a very similar actuator disk model. Reference to their paper (multilayered DAWT design) should be included.

Page 3: A clarification of available power (ideal, 100% rotor efficiency) and extracted power (with obtainable rotor efficiency of typically 80-90%) should be considered to clarify concepts.

Page 7: Identifying coupling between low thrust and inner diffuser separation - good.

Page 8: Benchmark comparison (model validation) with bare prop HAWT: Good !!

Page 11: Fig 12: Interesting reverse dependency of C_{pMax} (based on rotor and exit area resp.) on disk location. Before concluding, it would suit the article to elaborate on the possible pitfalls when trying to "extrapolate" AD CFD results to obtainable "real life" DAWT power extracted power. After all, DAWTs have a troubled history with many failures of meeting expectations when going "real life". Issues to consider: Swirl, Center body impact (nacelle), etc.

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