

Review Responses

September 2024

I would like to thank reviewer 3 for their comments on the paper. The comments on both the modelling, validation and the presentation of the results, has helped improve the paper, and improve myself as a researcher.

Reviewer 3

1. "I would recommend to implement at least: - the flow-curvature correction, which is well documented in the literature of VAWT (the Gaude's model in particular is of straightforward implementation, see Dyachuck and Goude, 2015, Energies);"

The 2DAC code has been modified to include the curvature correction described in (Dyachuck and Goude, 2015, Energies). This correction was found to produce a deviation in both power coefficient calculation and blade force results, this is now presented in Appendix 2.

2. "I would recommend to implement at least: a modeling of the drag induced by the struts, whose weight is expected to change significantly depending on the inclination of the blades (by referring to the wide literature on the topic, see for example the paper of Bianchini et al., 2017, Energy Conversion and Management)."

The correction for the parasitic drag on the rotor crossarm has now been modelled using the correction presented in (Bianchini et al., 2017, Energy Conversion and Management). Whilst the headline results have not changed significantly, the effect of including the strut drag has been seen to increase the optimum solidity and decrease the optimum tip speed ratio for both the un-tapered, and the optimised blades. The strut correction has the largest effect for lower rotor aspect ratios.

3. "With these added models the authors should repeat the validation performed in the previous paper they cite, and introduce in this paper a brand new section reporting these new validation results."

A new subsection concerning model validation has been included where the power coefficient and integrated blade forces for the X-Rotor upper and lower blades, as calculated using a blade resolved URANS simulation,

are compared the 2DAC model used in this study. In addition, the effect of the proposed curvature correction is presented in appendix 2.

4. "As a second main consideration, the authors propose to use as metric for the optimization the parameters Φ_C and Φ_T , which are dimensional quantities combining the power and thrust coefficients with the swept area. My impression is that these parameters are of doubtful relevance"

Φ_P and Φ_T are no longer presented or introduced, and the change in rotor area is presented separately to the change in rotor power coefficient. In order to understand the coupled effect, the normalised power and thrust are presented alongside the change in power coefficient.