Review of WES-2023-10

The study presents a tightly coupled, 3D optimization framework based on FEM analysis and CFD. The method has a lot of potential and if properly fine-tuned can be used to greatly improve the current state o the art when it come to wind turbine rotor design.

The work is very interesting, and this line of work has a lot of potential. Nevertheless, some of the details of this work raise some questions in my opinion. Firstly, the scope of this work is not clear: is it intended as an illustration and first showcasing of the coupled optimization method? If so important details regarding the method's details are missing throughout the paper, and it would be very hard for a third party to reproduce the results showcased with the information contained in the paper. On the other hand, if the objective is to discuss the results of the optimization discussed in the paper, various corners appear to have been cut: the blade is made of aluminum and no details regarding how the distribution along the blade of the various thickness panels is chosen is given. From an aerodynamic perspective, no mesh convergence & important details on model set-up are presented, and baseline results are not compared to other author's predictions for this testcase. Moreover, the single-point optimization, without accounting for extreme loads in other operating and parked conditions is questionable, and the authors also acknowledge this in the paper.

Title: "Aeroelastic Tailoring": What is the reasoning for including this term in the title? Perhaps consider elaborating on the concept of aeroelastic tailoring and what it means in the context of this study when discussing results in section 5.2.

Literature review: An interesting concept that I don't think was considered in the literature review is to use high-fidelity simulation to train a meta-model such as an Artificial Neural Networks (ANN) to perform design exploration, such as proposed by (Lorenzo Cozzi *et al* 2022 *J. Phys.: Conf. Ser.* **2265** 042050). The best candidate designs can then be simulated, and the ANN can be updated and the process repeated if needed.

Figure 1: This illustration is very detailed, but it is hard to read. My suggestion is to move it to an appendix and focus on a more streamlined and simple illustration here. Moreover, the differences between the loosely-couple and tightly-couple aero structural optimization loops should be investigated.

Section 3: No details regarding boundary conditions, problem formulation, turbulence model and numerical domain are given. Moreover, authors state that various meshes are tested, but no comparison between them is presented. The choice of L1 mesh makes sense to reduce core-hours but does it ensure high enough accuracy?

Section 3: It is not clear to me how the structural problem is formulated. Is it a static analysis? Is it possible to account for complex aeroelastic interactions with the methods (flutter, vortex-induced vibration, etc…)

L463: ". The discontinuities in the plots originate from minor inconsistencies in the location of leading and trailing edge points at consecutive airfoil sections because we extract these distributions directly from the deflected aerodynamic meshes of the coupled solution" – I think this needs to be explained better. Without further information I would not expect differences in local deformation to lead to discontinuities in twist as seen in Figures 5 and 6.

Figure 6: It is not clear to me what is being shown here. What is the difference between the "Rigid" and flexible cases? Is it the difference caused by the blade deflection or is it a different starting geometry?