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Comment on wes-2021-74

Anonymous Referee #2

Referee comment on "Land-based wind turbines with flexible rail-transportable blades – Part 2: 3D finite element design optimization of the rotor blades" by Ernesto Camarena et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2021-74-RC2, 2021

This paper is part of an interesting piece of research that investigates both on a system level and a detailed blade structural design level. The paper is well written and offers a lot of information, but there also some aspects that can be elaborated on.

Especially the implications of high flexibility necessary for rail transport in the USA will trigger the potential reader. In this paper however a 'rail transport' constraint is missing, which is a pity since it could illustrate the consequence of the lower design strain for the Heavy-Tow carbon compared to the uniaxial glass or the industry-standard carbon fiber.

The reader could now conclude from Part 1 of this study (see wes-2021-29) that for each material a maximum strain of 3500 μstrain has been allowed. That would be low for uniaxial glass but high for the Heavy-tow carbon fiber.

The blade design is discussed in Ch. 4.3 only briefly. It would help the reader to learn more about the choices made regarding the components. To name some questions that could be answered:

- Has carbon fiber also been used for the LE and TE reinforcements?
- The TE panel is a sandwich with triax facings, has that also been used for he LE panels?

- Usually, the root section of a blade mainly consists of triax material, has that been used here too (Figures 14-16 do suggest something like that)?

Some notes on the ANSYS analysis. For the ANSYS model shell181 has been used. Shell elements like shell181 are suspected to give an incorrect estimate of the torsional stiffness and thereby of the shear stresses due to torsion (and maybe also shear forces). Would an inaccuracy of 30% in torsional (shear) stress lead to another ranking in blade designs?

The Tsai-Wu criterion is applied, but line 257 mentions 'that neglects any effects due to transverse normal stress'. What is mentioned here: all transverse normal stresses, i.e. all non-spanwise normal stresses, or only the normal stress perpendicular to the laminate plane?

For the Heavy-Tow carbon fiber most probably material data are used for pultruded profiles. If that is the case the spar cap will have discrete thickness steps (the pultrusion thickness), which will lead to a somewhat higher blade mass. At the thickness step a stress peak will occur which lowers the strength locally which again leads to an increase in blade mass. What consequences would this have?