

Wind Energ. Sci. Discuss., referee comment RC2
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Comment on wes-2021-144

Anonymous Referee #2

Referee comment on "Prognostics-based adaptive control strategy for lifetime control of wind turbines" by Edwin Kipchirchir et al., Wind Energ. Sci. Discuss.,
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The submitted paper proposes a new approach to include an optimized life time consumption calculation as an integrated part of a control strategy to mitigate the loads on rotor blades and tower.

After a very detailed description of standard fatigue calculation methods, the integrated control approach is presented, which is based on a Robust Disturbance Accommodating Controller (RDAC), published in previous papers by the authors. As a reference turbine, the NREL 1.5 MW model has been chosen, the simulation tool is FAST.

Linearization around several operating points above rated wind speed is proposed, for each of these points the controller is optimized, with switching mechanisms foreseen to allow a realistic operation under changing wind conditions.

The results of the controller implementation are presented for an average wind speed of 18 m/s and demonstrate that for both the blades and the tower the accumulated fatigue damage can be reduced simultaneously, claiming to have no negative effects on the power performance.

While the overall approach of this paper shows impressively the potential of improved controller schemes taking into account life time consumption, some details need to be clarified.

In the description of the NREL turbine models it is mentioned that the number of degrees of freedom is reduced, here the author should be more specific and explain their decision.

It is not clear what type of wind model is used and why the analysis is limited to just 18 m/s average wind speed. Showing the impact of more relevant lower wind speeds around rated and demonstrating the switching mechanism would be interesting.

It is pretty obvious that directly related load components as flap-wise for the blade and fore-aft for the tower correlate in their behavior. Also taking into account the edgewise loads and the related tower movements would complete the picture.

The very high dynamics of the torque/speed signal need to be explained.

The baseline control strategy for the comparisons needs to be described in more detail – is it RDAC with or without IPC?

To compensate for some more additional results, the introduction can be shortened by referring to standard literature instead of explaining in detail the basics of fatigue calculation.

Some spelling errors should be eliminated, e.g. guarantee instead of guaranty etc.