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WIND ENERGY SCIENCE DISCUSSIONS

Interactive comment on "Comparison between upwind and downwind designs of a 10 MW wind turbine rotor" *by* Pietro Bortolotti et al.

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The paper presents a comparative study of different three bladed downwind wind turbines against their traditional upwind counterparts. The inner structure and the twist of the proposed rotor blades are optimized using and integrated optimization environment while the assessment of the designs is performed on the basis of COE, calculated using the INNWIND.EU cost model, which has been integrated into the optimization loop. An innovative element of the work is the design and assessment of a new active coning concept for loads control. The paper is well written and presents original and innovative work on the important field of the new design concepts for up-scaled wind turbines of reduced LCOE. A few points that the authors could consider/comment are the following: 1) As acknowledged by the authors, one critical parameter of the aerodynamic

analysis of downwind rotors is the modeling of the blade tower interference. The authors mention that the model used in the analysis of the downwind configuration differs from the one used in the analysis of upwind rotors. It would be nice to comment on the validity of this model. A short comment and a reference to some earlier development would be sufficient as the above model could be critical for the consistent prediction of the fatigue loads, especially in the wind speeds range where coning is not activated. 2) In the same direction, it is mentioned that nacelle anemometer wind speed measurements are inaccurate and therefore some rotor equivalent wind speed could be estimated (most probably based on loads measurements if I'm not mistaken). It would be nice to provide an estimate of the uncertainty of the wind measurement if such a method is applied (I guess/hope that this uncertainty decreases as higher frequencies of turbulence are filtered out). Has this uncertainty been taken into account in the control loop of the active cone or you have considered perfect wind speed measurements? 3) It is not perfectly understood how the radius of the blade was extended. Was that done by increasing the length of the blade or by increasing the radius of the hub keeping the same blade length? If the length of the blade is changed how the planform was scaled up? 4) Why the radius increase was fixed to 5%? Perhaps it would be preferable to leave the radius a free parameter in the optimization and find the optimum radius for every configuration. Perhaps in this way you could better exploit the mass reduction of the downwind coning concept by increasing as much as possible the energy yield. 5) It is not clear how would the coning system operate in the case of grid loss especially if this is combined with storm conditions. Analyzing parked operation at 30deg misalignment implies that the yaw system is not active. Would it be possible in this case to cone the blades? 6) It would be instructive for the reader to know which are the driving DLCs for the different loads. Some information is given in 3.4. Perhaps it would be nice to indicate the DLCs in plot 4b.

Minor comments and editorial 1) Page 2, line 3, add blade prebend 2) Page 5, line 10, you could add any deterministic asymmetry of the inflow and rotational sampling of turbulence 3) Page 7, line 3, replace "availably" by "available"

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