Design of an aeroelastically tailored 10 MW wind turbine rotor

This work presents an integrated multidisciplinary wind turbine optimization framework utilizing state-of-the-art aeroelastic and structural tools, capable of simultaneous design of the outer geometry and internal structure of the blade. The framework is utilized to design a 10 MW rotor constrained not to exceed the design loads of an existing reference wind turbine. The results show that through combined geometric tailoring of the internal structure and aerodynamic shape of the blade it is possible to achieve significant passive load alleviation that allows for a 9% longer blade with an increase in AEP of 8.7%, without increasing blade mass and without significant increases in ultimate and fatigue loads on the hub and tower.

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