LIDAR Correlation to Extreme Flapwise Moment: Gust Impact Prediction Time and Feedforward Control - DTU Orbit (21/10/2019)

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A conventional wind turbine controller uses feedback parameters reacting to wind disturbances after they have already impacted the rotor. LIDARs are able to measure the wind speed before it reaches the wind turbine rotor. These anticipated values can be used in control systems designed to reduce turbine loads. This report is focused on gust prediction events, based on nacelle mounted LIDAR measurements, which lead to large blade flapwise moments. The prediction could be used as a mitigation system decreasing the loading and extending the turbine lifetime. The data obtained from the UniTTe project (www.unitte.dk) is used in this task. The measurements come from three different acquisition systems: a met mast, an Avent 5 beam LIDAR and a series of sensors installed on a SWT-2.3MW-93. The turbine is owned by Vattenfall and is placed in Nørrekeær Enge. The impact of wind gusts on the blade root bending moment will be studied. In this report, first the measurement data is synchronized and second a sub-set of cases are chosen based on the wind turbine status, mean wind direction and cause of the blade root bending moment peak. Then, the LIDAR measurements are compared to the met mast and wind turbine loads. Finally, a discussion of the prediction accuracy of the current LDIAR set-up and some aeroelastic simulations are performed.

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