

Abstract Submitted  
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**Effect of wind turbines and atmospheric stability on turbulent boundary layers**<sup>1</sup> MARCO PLACIDI, PHILIP HANCOCK, PAUL HAYDEN, University of Surrey, ENVIRONMENTAL FLOW RESEARCH CENTRE TEAM — Wind power is becoming an ever-more significant contributor to the overall energy production across the globe as the net benefits of renewable energy and the advantage of economy of scale become clearer. In this climate, it is therefore important to gain a deeper understanding and more accurate predictability of the wind power availability. Simple but effective methods (e.g. Veers, Report SAND83-1909,1984) rely on information on the incoming turbulence correlations across the turbine's rotor (amongst other quantities). These correlations, however, vary greatly with (i) the presence of upstream turbines, and (ii) the atmospheric conditions. To investigate the effect of these on wind turbine performance, experiments were carried out in the EnFlo wind tunnel at Surrey in both neutrally and weakly thermally stratified boundary layers (with and without an overlying inversion). Both a single rotor in isolation and two aligned turbines were considered. The model turbines are 1:300 scaled replicas of a typical 5MW turbine for off-shore application. The presentation will cover the effect of atmospheric stability and the presence of upstream wind turbines on turbulence statistics and characteristic lengthscales.

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