

Abstract Submitted
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Experimental study on the effect of turbulence properties on model wind turbine performance STEFANO GAMBUZZA, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — The effects of turbulence on wind turbine performance (thrust and power generation) are often assumed based on analytical considerations, and studies focusing on actual measurements or computations are scarce. For this reason, a measurement campaign was carried out to parametrically study the effect of characteristics such as turbulence intensity and integral scale on the thrust and power generated by a model-scale wind turbine. An active grid has been used to systematically vary the properties of the incoming turbulent flows, generating integral length scales ranging from one order of magnitude smaller to slightly larger than the turbine diameter. Likewise, it has been possible to vary the free-stream turbulence intensity in the range of 0.5% to more than 12%. The model is a speed-controlled wind turbine driven by the incoming flow, moving a permanent magnet DC generator used to actively control the turbine speed and to measure the torque generated by the turbine rotor. The forces on the turbine are measured with a load cell force balance. Rotor geometries with a NACA 63 series aerofoil and different diameters (150, 180 and 200 mm) are tested. Presented data will focus on the variation in power and thrust coefficients with the turbulence properties of the incoming flow.

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