



The Scaled Wind Farm Facility

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In the past some wind turbines, which are equipped with intensive measurement systems, have been made available to a couple of institutes for research purposes. Nevertheless, generally an exact knowledge of the wind turbine controller is lacking. Furthermore, the measurements of wind conditions around the turbines are expensive and in general only up to hub height. The reaction of individual wind turbines on unsteady winds is well understood but an adequate knowledge for many turbines within a wind farm is not available. One reason for this is that for monetary reasons the number of meteorological masts does not scale with the number of turbines in a wind farm. Therefore many conclusions have been made solely on the base of the turbines SCADA data. However, while this allows for some insights in the internal wind farm flow it gives no information on the flow between the turbines, making it difficult to perform a proper research on wind farm aerodynamics and wind park control.

ECN has overcome this problem by building the scaled wind farm facility. This scaled farm consists of ten wind turbines, ten met masts, which are measuring all three wind velocity components at hub height and 4 met masts, which are measuring all three wind velocity components at the bottom, the top and one rotor diameter above the rotor as well as at hub height. The turbines have 10kW rated power, a rotor diameter of 7.6m and a hub height of 7.5m. ECN has full access to the controller software of the permanent magnet, direct drive, pitch controlled wind turbines. The large number of met masts within the wind farm permits to measure at the same time single, double, triple and quadruple wakes while simultaneously measuring the external conditions with three neighboring 108m meteorological masts. This unique research facility shall give further insights in the field of wind farm aerodynamics, wake interaction and wind

farm control.