Power curve measurement with a nacelle mounted lidar

Power curve measurement with a nacelle mounted lidar

Nacelle-based lidars are an attractive alternative to conventional mast base reference wind instrumentation where the erection of a mast is expensive, for example offshore. In this paper, the use of this new technology for the specific application of wind turbine power performance measurement is tested. A pulsed lidar prototype, measuring horizontally, was installed on the nacelle of a multi-megawatt wind turbine. A met mast with a top-mounted cup anemometer standing at two rotor diameters in front of the turbine was used as a reference. After a data-filtering step, the comparison of the 10 min mean wind speed measured by the lidar to that measured by the cup anemometer showed a deviation of about 1.4% on average. The power curve measured with the lidar was very similar to that measured with the cup anemometer although the lidar power curve was slightly distorted because of the deviation in wind speed measurements. A lower scatter in the power curve was observed for the lidar than for the mast. Since the lidar follows the turbine nacelle as it yaws, it always measures upwind. The wind measured by the lidar therefore shows a higher correlation with the turbine power fluctuations than the wind measured by the mast. Finally, the lidar is never in the wake of the turbine under test contrary to the cup anemometer; therefore, the wind sector usable for power curve measurement was larger than the sector for which the cup anemometer was not disturbed by any obstacle. The power curve obtained with the lidar for the wind sector in which the mast is in the wake of the turbine under test compared well with the power curve obtained on the standard sector. Copyright © 2013 John Wiley & Sons, Ltd.

General information
Publication status: Published
Contributors: Wagner, R., Friis Pedersen, T., Courtney, M., Antoniou, I., Davoust, S., Rivera, R.
Pages: 1441–1453
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Wind Energy
Volume: 17
Issue number: 9
ISSN (Print): 1095-4244
Ratings:
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 3.42 SJR 1.209 SNIP 3.688
Web of Science (2014): Impact factor 3.069
Web of Science (2014): Indexed yes
Original language: English
Keywords: Wind speed measurement, Wind sector
DOIs: 10.1002/we.1643

Research output: Contribution to journal › Journal article – Annual report year: 2013 › Research › peer-review