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A field test with a continuous wave wind lidar (ZephIR) installed in the rotating spinner of a wind turbine for unimpeded preview measurements of the upwind approaching wind conditions is described. The experimental setup with the wind lidar on the tip of the rotating spinner of a large 80 m rotor diameter, 59 m hub height 2.3MW wind turbine (Vestas NM80), located at Tjæreborg Enge in western Denmark is presented. Preview wind data at two selected upwind measurement distances, acquired during two measurement periods of different wind speed and atmospheric stability conditions, are analyzed. The lidar-measured speed, shear and direction of the wind field previewed in front of the turbine are compared with reference measurements from an adjacent met mast and also with the speed and direction measurements on top of the nacelle behind the rotor plane used by the wind turbine itself. Yaw alignment of the wind turbine based on the spinner lidar measurements is compared with wind direction measurements from both the nearby reference met mast and the turbine’s own yaw alignment wind vane. Furthermore, the ability to detect vertical wind shear and vertical direction veer in the inflow, through the analysis of the spinner lidar data, is investigated. Finally, the potential for enhancing turbine control and performance based on wind lidar preview measurements in combination with feed-forward enabled turbine controllers is discussed. Copyright © 2012 John Wiley & Sons, Ltd.

General information
State: Published
Organisations: Department of Wind Energy, Test and Measurements, ZephIR Lidar
Pages: 625–643
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Wind Energy
Volume: 16
ISSN (Print): 1095-4244
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.18 SJR 1.051 SNIP 1.834
Web of Science (2017): Impact factor 2.938
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.37 SJR 1.079 SNIP 2.316
Web of Science (2016): Impact factor 2.725
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 3.06 SJR 1.201 SNIP 2.165
Web of Science (2015): Impact factor 2.891
Web of Science (2015): Indexed yes
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
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.75 SJR 1.235 SNIP 2.486
Web of Science (2013): Impact factor 2.556
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.36 SJR 1.062 SNIP 2.297
Web of Science (2012): Impact factor 1.436
ISI indexed (2012): ISI indexed yes