

Wind tunnel testing of 5-bladed H-rotor wind turbine with the integration of the omni-direction-guide-vane




AIP Conf. Proc. 1440, pp. 507-512; doi:<http://dx.doi.org/10.1063/1.4704256> (6 pages)


THE 4TH INTERNATIONAL MEETING OF ADVANCES IN THERMOFLUIDS (IMAT 2011)

Date: 3–4 October 2011

Location: Melaka, Malaysia

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A novel omni-direction-guide-vane (ODGV) that surrounds a vertical axis wind turbine (VAWT) is designed to improve the wind turbine performance by increasing the oncoming wind speed and guiding the wind-stream through optimum flow angles before impinging onto the turbine blades. Wind tunnel testing was performed to measure the performance of a 5-bladed H-rotor wind turbine with Wortmann FX63-137 airfoil blades, with and without the integration of the ODGV. The test was conducted using a scaled model turbine which was constructed to simulate the VAWT enclosed by the ODGV on a building. The diameter and height of the ODGV are 2 times larger than the VAWT's. Torque, rotational speed and power measurements were performed by using torque transducer with hysteresis brake applied to the rotor shaft. The VAWT shows an improvement on its self-starting behavior where the cut-in speed reduced to 4 m/s with the ODGV (7.35 m/s without the ODGV). Since the VAWT is able to self-start at lower wind speed, the working hour of the wind turbine would increase. At the wind speed of 6 m/s and free-running condition (only rotor inertia and bearing friction were applied), the ODGV helps to increase the rotor RPM by 182%. At the same wind speed (6 m/s), the ODGV helps to increase the power output by 3.48 times at peak torque. With this innovative design, the size of VAWT can be reduced for a given power output and should generate interest in the market, even for regions with weaker winds.

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1551-7616 (online)**ISBN:**

978-0-7354-1032-9

Publisher

American Institute of Physics



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