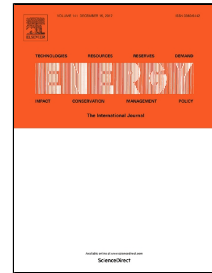


# Accepted Manuscript

The Effects of Blade Pitch Angle on the Performance of Small-scale Wind Turbine in Urban Environments

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PII: S0360-5442(18)30114-2  
DOI: 10.1016/j.energy.2018.01.096  
Reference: EGY 12208  
To appear in: *Energy*  
Received Date: 05 September 2017  
Revised Date: 05 January 2018  
Accepted Date: 19 January 2018

Please cite this article as: P.A. Costa Rocha, J.W. Carneiro de Araujo, R.J. Pontes Lima, M.E. Vieira da Silva, D. Albiero, C.F. de Andrade, F.O.M. Carneiro, The Effects of Blade Pitch Angle on the Performance of Small-scale Wind Turbine in Urban Environments, *Energy* (2018), doi: 10.1016/j.energy.2018.01.096

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# 1 The Effects of Blade Pitch Angle on the Performance of Small- 2 scale Wind Turbine in Urban Environments

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## 9 Abstract

10 Due to the growing importance of wind power as a clean and renewable energy  
11 source, the use of small-scale wind turbines in urban environments has increased  
12 lately. The blade pitch control is an effective method to improve the aerodynamic  
13 response of a wind turbine, usually applied to large-scale wind turbines. This study  
14 presents the effects of varied blade pitch on the aerodynamic performance of a  
15 small-size wind turbine. The blades were sketched out according to the Blade  
16 Element Moment (BEM) theory, applying the aerodynamic profile NREL-S809 and  
17 designed for a tip speed ratio of eight. To analyze the influence of the blade pitch  
18 angle on the energy conversion, a comparative study was carried out varying the  
19 pitch angle to five different values. Using the analysis of variance (ANOVA), it was  
20 possible to demonstrate that blade pitch control could be an effective method also  
21 for small-sized wind turbines. A performance chart from the results of blade pitch  
22 experiments shows that the power coefficient varies significantly when the angle  
23 changes. As conclusion, it is highlighted that an enhanced behavior could be  
24 attained by the use of a pitch angle controller resulting in a better recovery of the  
25 energy available in the wind.

26 Keywords: Small-scale wind turbine, Pitch angle control, Urban environment,  
27 Blade Element Momentum Theory, ANOVA.

28

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