

Accepted Manuscript

Small wind turbines: A numerical study for aerodynamic performance assessment under gust conditions

L. Menegozzo, A. Dal Monte, E. Benini, A. Benato



PII: S0960-1481(17)31289-2

DOI: [10.1016/j.renene.2017.12.086](https://doi.org/10.1016/j.renene.2017.12.086)

Reference: RENE 9583

To appear in: *Renewable Energy*

Received Date: 31 March 2017

Revised Date: 7 November 2017

Accepted Date: 24 December 2017

Please cite this article as: Menegozzo L, Dal Monte A, Benini E, Benato A, Small wind turbines: A numerical study for aerodynamic performance assessment under gust conditions, *Renewable Energy* (2018), doi: 10.1016/j.renene.2017.12.086.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Small Wind Turbines: a Numerical Study for Aerodynamic Performance Assessment under Gust Conditions

L. Menegozzo^a, A. Dal Monte^{a,*}, E. Benini^a, A. Benato^a

^a*Department of Industrial Engineering, University of Padua, Via Venezia 1, Padua, Italy*

Abstract

In the present work, a numerical study aimed to analyse the effect of an extreme loading event on a Horizontal Axis Wind Turbine (HAWT) is performed. A 3D unsteady CFD model of the NREL *Phase VI* small-sized wind turbine is validated against experimental data, with the incompressible solver of ANSYS Fluent and an unstructured moving mesh strategy. Then the Extreme Operating Gust (EOG) model from IEC 61400-2 is considered as the inlet condition. The results of the aerodynamic response and of the structural ultimate check, based on the IEC guidelines, are presented for both the operating and the parked turbine, in order to underline the benefit of the safety position in terms of lower stress transferred to the critical root section.

Keywords: Wind gust, Unsteady CFD, HAWT, NREL Phase VI, IEC 61400-2

1 Nomenclature

| | | | |
|-----------|----------------------|------------------|---------------------|
| A [-] | Section area | F_z [kN] | Axial load |
| c [m] | Chord length | $F_{z,max}$ [kN] | Maximum axial load |
| c_p [-] | Pressure coefficient | I [-] | Turbulent intensity |
| C [-] | Courant number | m [kg] | Mass |
| D [cm] | Root diameter | M [Nm] | Torque |

*Corresponding author

Email address: andrea.dalmonete@unipd.it (A. Dal Monte)

Download English Version:

<https://daneshyari.com/en/article/6764709>

Download Persian Version:

<https://daneshyari.com/article/6764709>

[Daneshyari.com](https://daneshyari.com)