

Wind Energy Resource Assessment for Electricity Generation In Maroua

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Abstract

In order to secure future energy and protect the environment, it is important to consider the possibilities of wind as a resource for electrical energy supply. The locality of Maroua in the Far North of Cameroon has been selected to carry out our study in which, an assessment of the wind energy resource has been made. Different kinds of data have been collected about wind, topography, and roughness. The Wind Atlas and the wind speed map have been determined and illustrated especially in the high wind resource areas using for this task, the WAsP software. The Annual Energy Production (AEP) of one hypothetical wind farm consisting of six 2.5 MW turbines has been estimated. The computed AEP is 16,330 MWh and this production could save the rejection of 3300 tons of CO₂ per year. On the other hand, we have carried out a CFD study of the flow around a naca0012 airfoil. For an optimal wind turbine performance, the maximum lift to drag ratio has been obtained for an angle of attack of 9°. We are expecting that with the African research collaborations, the involvement of public and private investors, this project could be more investigated and realized in the future.

Keywords: Resource assessment, wind energy, wind potential, CFD, airfoil.

1.0 INTRODUCTION

Promoting sustainable development and combating climate change have become integral aspects of energy planning, analysis and policy making in many countries. In Cameroon, development and environment issues are at the heart of the energy transition. The wind energy which confirmed its status as the number two source of renewable electricity production in 2012 (Observ'ER 2013) is now the most likely renewable energy source to back up the hydropower supply in halting the relentless increase in fossil fuel used to generate power (Furkan 2011). To obtain the initial feasibility of generating electricity from the wind power through a wind farm in Maroua, we have carried out wind climate characteristics and energy potential. Furthermore, we have provided a wind resource map useful for the selection of suitable areas for future wind farm. On the other hand, we have performed the analysis of the two dimensional subsonic flow over a NACA 0012 airfoil at various angles of attack and operating at a Reynolds number of 1×10^6 . The CFD package which has been used for the study is ANSYS-Fluent. This work highlighted that an angle of attack of 9° is required for good performances of the wind power plant on our site.

2.0 METHODS

2.1 Data

The one hour data of the wind speed and direction collected at 10 m above the ground level at the meteorological station of Maroua were used in this work.

this work will contribute in making wind power one of the future pillars for the electricity supply in the rural areas in the Far North of Cameroon and then consolidate our implication in the sustainable development.

We are expecting that with the African research collaborations, the involvement of public and private investors, this project could come true and hence solve the problem faced by the people living in rural areas.

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