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Wind farm feasibility study and site selection in Adrar, Algeria

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Abstract

Wind resources present a promising option to be integrated with the conventional energy sources to match the increased demand of electricity. This paper aims to investigate the possibility to set up a wind farm of 10 MW in Adrar, a region located in the south of the country. Using the wasp software, the wind resources of the zone of interest was performed, it indicates that wind speed reach 8.44 m/s at a height of 80 meters. Then, two sites Kaberten(75 north of Adrar) and Zaouia (80 Km south of Adrar) were selected. The wind farm study show that Aouia present the better performance, it can be expected to achieve from this site a production of 40 GW and a full load hours about 4044 h.

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1. Introduction

Wind energy becomes today a promising option to complement the conventional energy source, especially in region where the existing power plants are not sufficient to match the increasing electricity demand. This success is principally due the rapid growth of the wind technology which led the wind power to be more competitive by reducing the cost of electricity produced. This prompted the Algerian government to adopt a new energy policy by promoting and to supporting the development of this clean energy. An important result of this policy is the government intention to construct a wind farm in the south west desert of Algeria.

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The choice of this region was justified by the existing of vast inhabited areas which are required for a large scale development of the wind energy, and also the fact that the first wind map of Algeria show that this region is one of the windiest in country, [1,2].

Within this context, some micro-climate studies have been established, [4,5, 6]. A first study done to identify a suitable site in Adrar region has been by Sebaa Ben Miloud F et al in 2010, [7]. The authors did not consider the wind speed data inferior to 3 m/s and it is well known that this class of wind speed influences greatly the performance of the wind farm production.

In the present study, WAsP software is used to evaluate the wind resource of the Adrar region. It is a program, developed by the Riso National Laboratory of Denmark for climate forecast and power productions from wind turbines and farms[8].

In order to ensure the economic success of the future wind farm project in this region, a more accurate wind farm study on Adrar is needed. To answer this need, we perform this work by introducing some losses to evaluate and to determine the most suitable site for the project.

So, the net AEP (net output energy production) is calculated after deducting all the losses that occur during the production and transportation as wake loss, availability and transmission lines losses.

2. Wind assessment

2.1. Adrar location

The Algerian wind map, related to measured data at 10 m above ground level, established by Kasbadji-Merzouk, in 2006 [2] shows that a maximum of mean wind speed is reached in a South – West (Adrar region) of a country with a value of 6.5 m/s, (see Fig 1).

In fact, Adrar is situated in the middle of the Algerian Sahara. The area of the Adrar district is about 427 968 km². The inhabitant is concentrated at the main city of Adrar and population density has been estimated in January 2011 to 1.01 inh/km².

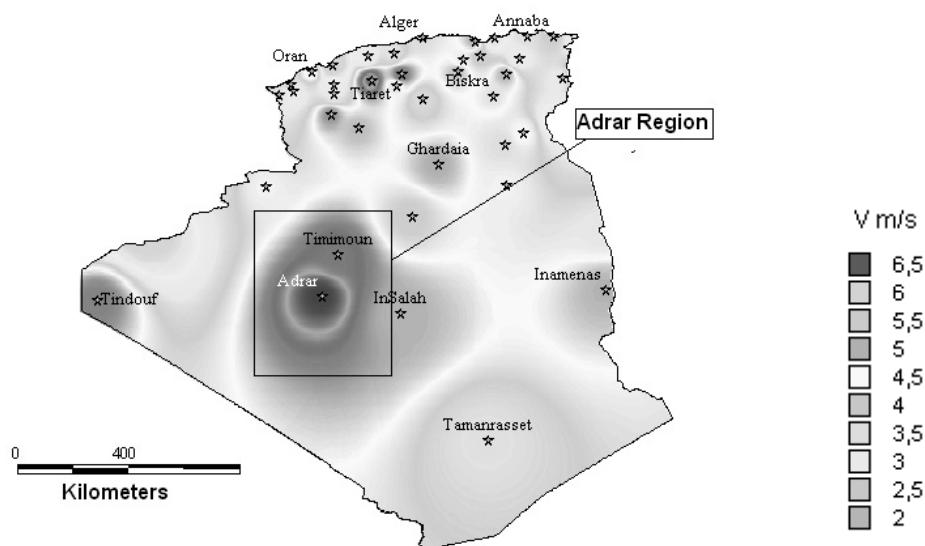


Figure 1 : Yearly mean wind speed map of Algeria, [2]

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