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On the wind energy resources of Sudan

Abdeen Mustafa Omer*

17 Juniper Court, Forest Road West, Nottingham NG7 4EU, Nottinghamshire, UK

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Abstract

The imminent exhaustion of fossil energy resources and the increasing demand for energy were the motives for those reasonable in Sudan to put into practice an energy policy based on rational use of energy; and on exploitation of new, and renewable energy sources. After 1980, as the supply of conventional energy has not been able to follow the tremendous increase of the production demand in rural areas of Sudan, a renewed interest for the application of wind energy has shown in many places. Therefore, the Sudanese government began to pay more attention to wind energy utilisation in rural areas. Because the wind energy resource in many rural areas is sufficient for attractive application of wind pumps, and as fuel is insufficient, the wind pumps will be spread on a rather large scale in the near future. Wind is a form of renewable energy, which is always in a non-steady state due to the wide temporal and spatial variations of wind velocity. A number of years worth of data concerning wind speed in Sudan have been compiled, evaluated and presented in this article. The need for the provision of new data stations in order to enable a complete and reliable assessment of the overall wind power potential of the country is identified and specific locations suggested. This paper presents the background and ideas of the development of the concept as well as the main results, and experience gained during ongoing project up to now. In Sudan, various designs of wind machines for water pumping have been developed and some designs are presently manufactured commercially. Results suggest that wind power would be more profitably used for local-and small-scale applications especially for remote rural areas. It is concluded that Sudan is blessed with abundant wind energy.

Keywords: Sudan; Wind energy resources; Wind power potential and assessment; Wind pumps application; Water pumping

*Tel.: +44 115 978717.
E-mail address: abdeenomer2@yahoo.co.uk.

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Contents

1. Introduction

New and renewable sources of energy can make an increasing contribution to the energy supply mix of Sudan in view of favourable renewable energy resource endowments, limitations and uncertainties of fossil fuel supplies, adverse balance of payments, and the increasing pressure on environment from conventional energy generation. Among the renewable energy technologies, the generation of mechanical and electrical power by wind machines has emerged as a techno-economical viable and cost-effective option.

The use of wind pumps declined dramatically from the 1920s due to the economic depression and the use of electric motors or petrol and diesel engines to drive water pumps. Soaring energy prices in the 1970s and growing interest in renewable energy sources led to their reconsideration, particularly in Sudan, although the take-up of the technology is still slow. This had led to the following developments:

- the attempts to disseminate wind pumps;
- adoption of modern engineering analysis and design methods; and
- a new generation of low cost modern wind pumps has evolved but it has as yet not reached the level of reliability of the old classical wind pumps.

The provision of pumped clean water is one of the best ways to improve health and increase the productive capacity of the population. Rural access to clean water is best