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An Analysis of Wind Energy Potential of Kampot Province, Southern Cambodia

W. Promsen^{1*}, S. Janjai¹, T. Tantalechon¹

¹*Department of Physics, Faculty of Science, Silpakorn University, Maung, Nakhon Pathom, Thailand, 73000*

Abstract

In order to analyze the wind energy potential, a wind measurement mast was established at Kampot province and the wind speed and its direction at the height of 50 m above the ground level were measured. A one year period of wind data from this measurement was analyzed using WAsP software. A microscale wind map was generated and used to estimate the installed capacity of wind turbines for a given scenario. It was found that the area of this study has relatively high wind energy potential, approximately annual electricity production of 55 GWh with an estimated installed capacity of wind turbines of 28.8 MW.

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1. Introduction

Nowadays, wind energy, an alternative clean renewable energy source, has been recognized as one of the fastest developing renewable energy source technology. Wind power generation has made a remarkable contribution to daily life across the globe and has grown rapidly in the past 20 years. Wind turbine technology has been successfully developed in many countries, such as Denmark, Germany and China. It is now considered as a mature, reliable and efficient technology. Normally, the energy from a wind turbine depends strongly on the wind speed correlated to topography and meteorological conditions.

Energy demand, environmental issues as well as an escalation in fossil fuel costs force many countries to explore and move towards environmentally friendly energy source. Not only the developed country, but also the developing country is interested in renewable energy, especially wind energy.

From the point of wind energy potential, an assessment of the site is essential as a primary employment prior to the wind power generation project. This refers to the characterization in terms of wind speed, direction and wind power. Many relevant works have been done for this purpose in different parts of the world. For example, Serrano et al. [1] characterized the wind speed and wind potential at Cucuta-Columbia by presenting the weibull parameters and also simulated the wind generation with 1.5 MW wind turbine at three different heights. Similar works had also been done as follow; Kose et al. [2] and Ucar and Balo [3] investigated the wind of certain areas in Turkey, Zhoua et al. [4] studied for the region of Pearl River Delta in China. Chang et al. [5] also presented an assessment of wind characteristics in Taiwan. Mathew et al. [6], Tsang et al. [7] and Shafiuzzaman et al. [8] investigated the wind regime in India, Taiwan and Bangladesh, respectively.

Cambodia is one among the developing countries that depend heavily on imported energy supplies. Therefore, renewable energy resources have gained great importance in Cambodia because they are domestic and clean. Wind is so far received more attention because Cambodia is located in a tropical zone influenced the most by both Northeasterly and Southwesterly monsoons. Thus, under the cooperative project between Thailand and the neighboring countries, the wind energy potentials in Cambodia were studied. According to this project, Kampot is one among the provinces that have relatively high wind speed. The aim of this paper is to further investigate about wind energy potential of this province by correlating the wind data gathered at the site and statistical analyzed data to support the evaluation of future wind energy project in the area.

2. Wind measurement mast

Kampot, located a few kilometers from the Gulf of Thailand, is a province in southern Cambodia. Kampot city is situated at the riverside near the coast with a population of 40,000. Kampot is up coming as a tourist destination. As the city's energy consumption is expected to increase significantly in the near future, new energy source is therefore necessary.

Wind energy is one of the choices; however, the wind energy-related activity for Kampot is limited, especially the measurement data. In order to acquire more information on the wind measurements, a 50 m-height wind mast was installed in Kampot province ($10^{\circ}36'N$, $104^{\circ}11'E$, elevation 13.5 m. asl.). The wind speed and wind direction were measured by anemometers (NRG #40) and wind vanes (NRG 200P), respectively, at the heights of 20, 40 and 50 m above the ground level. The solar cell was installed at 15 m above the ground level to supply energy for the data logger. Fig. 1 shows the pictorial views of the wind mast. The averaged data within a 10-minute interval were recorded for one year, during September 2007 to August 2008, by data logger (Nomad2) which was placed inside a nearby building.

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