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A critical review on potential and current status of wind energy in Vietnam

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ABSTRACT

With a coastline of more than 3000 km and its location in the monsoonal climate zone, Vietnam is expected to have good potential for wind energy development. During the last years, several preliminary studies on assessment of wind energy potential in Vietnam have been carried out. Policies for supporting wind energy projects are still under development and improvement. The goal of this paper is to give an overview on wind energy potential and the current application as well as development of wind energy in Vietnam. This paper also presents the current policies for wind energy development and identifies the major barriers need to be addressed for the future development of wind energy in Vietnam.

Contents

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1. Introduction

During the past years, topics of climate change, environmental protection, and sustainable development has been increasingly discussed both in academic and political spheres. Many countries, especially developing countries are making substantial efforts for mitigation of climate change impacts and minimization of negative impacts on the environment towards sustainable development through the optimization of energy use. In this realm, exploitation and application of renewable energy sources appears as one of the most important issues.

Likes the other developing countries in Southeast Asia, Vietnam is experiencing the high economic growth with the average gross domestic product (GDP) annual growth rate of 7.2% during the last decade. As a result, the country's energy demand has continuously increased at the rate of 15% per year. It is estimated that the energy use comparative to GDP growth in Vietnam is twice bigger than that of developed countries. The energy demand in the coming years is expected to keep increasing at a significant rate of 11–16% due to the rapid economic development, urbanization, industrialization, and population growth. It is predicted that Vietnam's energy demand would be more than triple by 2020. Such situation would raise a number of questions concerning the availability of energy resources and environmental degradation [1].

In order to meet the rapidly increasing energy demand, the Government of Vietnam has decided to increase its reliance on renewable energy sources. Following the Prime Minister's Decision No. 1855/QD-TTg dated 27 Dec 2007 approving the "National energy development strategy up to 2020, with a vision to 2050", the specific targets of increasing the renewable energy proportion have been set at 5% and 11% of the total primary energy consumption by 2020 and 2050, respectively [2]. Compared to the other Southeast Asian countries, Vietnam has a huge basin of renewable energy sources, including hydropower, wind, solar, biomass, geothermal, and wave and tide—all capable of supplying a large part of the country's energy requirements. Except hydropower which accounts for about 38% of the total installed capacity, however, contribution of all other renewable energy sources currently just accounts for about 2% of the total installed capacity [3].

Among renewable energy sources, wind energy represents one of the strongest growth opportunities in Vietnam. With a coastline of more than 3000 km and its location in the monsoonal climate zone, Vietnam is expected to have good potential for wind energy development. With the increasing shortage in power supply and energy across the country in the recent years, exploitation and application of wind energy in Vietnam have an important meaning in assuring national energy security, supplying adequate high-quality energy for socio-economic development, and developing energy sector in a quick, efficient and sustainable manner in association with environmental protection. However, as is the case in many other developing countries where development and application of wind energy are in the early stage, assessment of wind energy potential in Vietnam remains incomplete. In addition, policies for supporting wind energy projects are still under development and improvement. The objectives of this paper are to give an overview on wind energy potential and current application as well as development of wind energy in Vietnam on the basis of data collected from various sources. This paper also presents the current policies for wind energy development and identifies the major barriers and corresponding solutions for the future development of wind energy in Vietnam.

2. Studies on assessment of wind energy potential

A preliminary step in the development of a wind energy project in particular area is to evaluate its wind energy potential, which requires information on the wind speed of that area. Worldwide, a number of methods have been applied to estimate the wind speed including those rely on analysis of statistical data [4], artificial neural network models [5], prediction model that using the wind speed data of the neighboring stations to estimate the wind speed of the target station [6], sweeping microwave radar ("scatterometer") measurements by satellite [7], and atmospheric mesoscale model coupled with Geographic Information System (GIS) [8].

Located in the tropical region, the dominant influences on the synoptic-scale winds in Vietnam are the summer and winter monsoons, which are created by differences in temperature between the Asian land mass and the surrounding oceans—see breezes on a large scale. The southerly and westerly winds generally resulted by a counter-clockwise circulation around southern and eastern Asia induced by the summer monsoon. Whereas, the northerly and easterly winds mainly resulted by the opposite circulation induced by the winter monsoon. During the last years, several studies have been conducted for assessment of wind energy resource in Vietnam (Table 1). In 2000, the World Bank (WB) carried out a study to prepare Wind Resource Atlas for four Southeast Asian countries including Cambodia, Laos, Thailand and Vietnam for supporting the development of wind energy for the region [9]. Using the MesoMap simulation model, the study provided a rough estimate of wind energy potential at 65 m above ground level (AGL) in Vietnam. More than 39% of Vietnam's total land area was estimated to have annual average wind speeds of greater than 6 m/s (the wind speeds that suitable for operation of large wind turbines) at 65 m AGL. This developable land area was equivalent to a wind power capacity of 513,360 MW. However, this wind energy potential of Vietnam might be overestimated since there was probably large uncertainty on simulation modeling.

In 2007, an official study was conducted by Electricity of Vietnam (EVN) for assessing the wind resource for power generation [10]. The study carried out the measurements of wind speed at 60 m AGL for 10 sites located in different provinces of three regions of Vietnam. Based on the measurement results, the study identified the land area suitable for wind energy generation which was equivalent to a wind power capacity of 1785 MW as seen in Table 1. Among three regions, the central coast was evaluated to have the largest wind energy potential, followed by the south central coast. However, it should be noted that the estimated potential was not complete due to the scale of the study that just focused on limited number of sites. It is possible that many other sites with good wind potential have not been identified and evaluated.

More recently, with the support from WB, the Ministry of Industry and Trade (MOIT) conducted a study [11,12] for updating