

# Wind Power Potentiality Analysis With Respect To Wind Velocity In Bangladesh

Suman Chowdhury, Mohammad Mahbubur Rahman, Swapan Kumar Saha, Utpal Kanti Das, Chandan Kumar Sarkar

**Abstract:** This paper tries to investigate the wind power potentiality in Bangladesh based on wind velocity data. For this purpose wind velocity data are taken for various locations in Bangladesh. From the data analysis, it is seen that the maximum wind potentiality is existing in Chittagong from the aspect of wind velocity.

**Index Terms:** Wind velocity, wind power, power generation, power adaptability, wind power potentiality, maximum power and site selection.

## I. INTRODUCTION

The present study is a part of the overall research carried out to locate most prospective windy sites by analyzing statistically the wind characteristics of some coastal regions of Bangladesh. In this regard, primarily wind speed data of 11 coastal areas namely: Kuakata, Munshigonj, Khagrachari, Kishorgonj, Naogaon, Pakshey, Panchagarh, Rauzan, Sitakunda, Kutubdia (Cox's Bazar) and Teknaf (Cox's Bazar) have been chosen for investigation. Comparing with the local needs, it is observed that the wind speed of Sitakunda matches very well for installing wind pumping systems (WPS) for irrigation in that area [19,20] but there are sudden gusty wind speeds [21]. Early wind wheels just produced couple of kWh; new turbines now can produce millions of kWh a year with rated power up to 6 MW [15]. Today, statistics from highly developed countries show that standards of living can increase independently of energy consumption if energy efficiency measures are introduced. The global demand for electricity at 2000 was about 15,391TWh and at 2010, it was 20,037TWh. This demand was met mainly through fossil fuels and nuclear power.

Renewable energies other than big hydropower plants only had a 1.9 % share. This marks a slight decrease compared to 1999, which means that total demand increased faster than renewable energies were being developed [16-18]. Now the wind power potentiality in Bangladesh is growing up gradually. For detection of sites in respect of wind power potentiality, wind velocity data are manipulated for three different locations in Bangladesh for the year range of 2001 to 2004.

## II. WIND POWER POTENTIAL IN BANGLADESH

Low-income developing countries like Bangladesh are very much susceptible to the setbacks arising from the ongoing energy crisis. Natural gas lies at the heart of the country's energy usage, accounting for around 72% of the total commercial energy consumption and 81.72% of the total electricity generated [1, 2]. However, the waning gas resources suggest that the country will face deficit of 142 million cubic feet per day (mmcf) in 2011 and it will rise to 1714 mmcf by 2019 -20. Even if Bangladesh's GDP growth remains as low as 5.5 percent till 2025, the country will need to add 19,000 MW of additional power, causing the gas demand to spiral up to 4,567 mmcf by 2019 -20 [3]. Different government, semi government and nongovernment organizations (NGOs) have been working separately or jointly to disseminate renewable energy technologies (RET) throughout the country over a significant period, as has been reported in the recent literature [5, 6].

- Suman Chowdhury, Lecturer, Department of Electrical and Electronics Engineering, International University of Business Agriculture and Technology, Dhaka-1230, Bangladesh, PH: +8801756777414  
Email: [suman.kuet@gmail.com](mailto:suman.kuet@gmail.com)
- Mohammad Mahbubur Rahman, Assistant Prof., Department of Physics, International University of Business Agriculture and Technology, Dhaka-1230, Bangladesh Email: [dinar\\_eic@yahoo.com](mailto:dinar_eic@yahoo.com)
- Swapan Kumar Saha, Senior Lecturer, Department of Business Administration, International University of Business Agriculture and Technology, Dhaka-1230, Bangladesh, Email: [swapanau@yahoo.com.au](mailto:swapanau@yahoo.com.au)
- Utpal Kanti Das, Associate Prof., Department of Computer Sciences and Engineering, International University of Business Agriculture and Technology, Dhaka-1230, Bangladesh, Email: [ukd@iubat.edu](mailto:ukd@iubat.edu)
- Chandan Kumar Sarkar, Associate Prof., Department of Economics, International University of Business Agriculture and Technology, Dhaka-1230, Bangladesh, Email: [csarkar@iubat.edu](mailto:csarkar@iubat.edu)

Comparison of Monthly Average Peak Generation

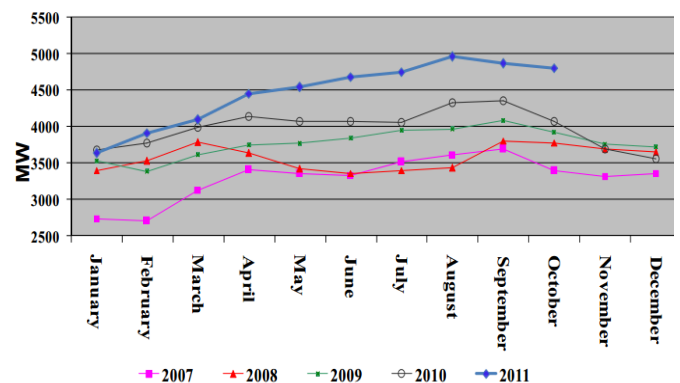


Fig. 1: Monthly average peak power generation data in Bangladesh for the year range of 2007 to 2011.

Electricity access rate and utilization of energy are the indicators economic growth of a country. Densely populated

Bangladesh has a population of almost 160 million people with electricity access rate of about 50%. Presently electricity demand growth is about 10%. At this moment power demand in Bangladesh is about 7500MW, whereas the generation ranges only 5000-6000MW. Demand is estimated to exceed 10,000 MW by 2015 [4]. From fig. 1, it is seen that the maximum peak power generation was 5000MW on August 2011 in Bangladesh.

### III. WIND POWER ADAPTABILITY ON POWER SYSTEM

Over the last decade, researchers have made significant effort to evaluate the impact of wind generation on the operations and cost of power grids. Grubb [7] addressed the integration of renewable energy into large power system. Hatzigiorgiou and Zervos [8] described more recent state and prospects of wind power in Europe. Strbac et al.[9] assessed the costs and benefits of wind generation on the U.K. electricity system based on assumed different levels of wind power capacity. Persaud et al.[10] studied the potential impact of significant wind power capacity on generator loading levels, system reserve availability and generator ramping requirements, and found that wind power generation did not significantly increase the ramping duty on the studied system. Holttinen [11] estimated the increase in hourly load-following reserve requirements based on real wind power production and synchronous hourly load data in the four Nordic countries. The result demonstrated an increasing effect on reserve requirements with increasing wind power penetration. Kirby and Hirst [12] discussed the economic efficiency and equity benefits of assessing charges on the basis of customer-specific costs, focusing on regulation and load following, and determined the extent to which individual customers and groups of customers contribute to the system's generation requirements for these two services. The long-term target of European Union is to increase the share of renewable energy resources to 22% [13]. The current policies imply the use of wind turbines with good grid compatibility and integrated measures for grid reinforcement [14].

### IV. DATA ANALYSIS FOR SITE SELECTION IN BANGLADESH

For determining the site potentiality in Bangladesh, wind velocity data are collected for taking the comparison in various locations of Bangladesh. From the data analysis, four different types of figures are obtained. From fig. 2, it is seen that the maximum average wind velocity lies in Chittagong for the year of 2001. Now from fig. 3, it is observed that the maximum average velocity (around 11.16 Km/h) also lies in Chittagong whereas in Cox's bazaar this velocity is around 8.04 Km/h for the year of 2002. Now fig. 4 indicates that the maximum average velocity is around 11.22 Km/h for the year of 2003 which is existing in Chittagong and fig. 5 shows that value is 10.96 Km/h for the same location for the year of 2004.

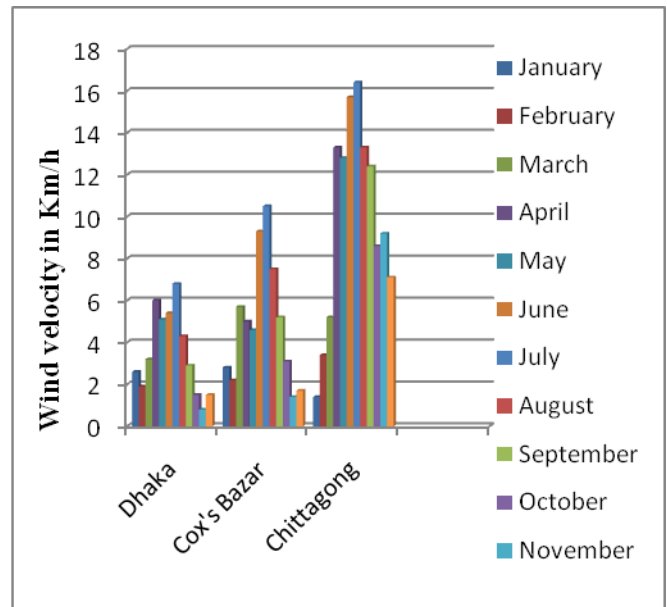


Fig. 2: Wind velocity data for the year of 2001.

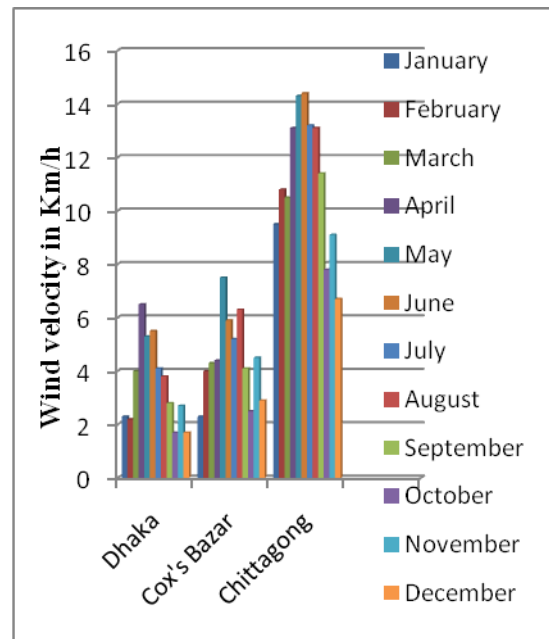


Fig. 3: Wind velocity data for the year of 2002.

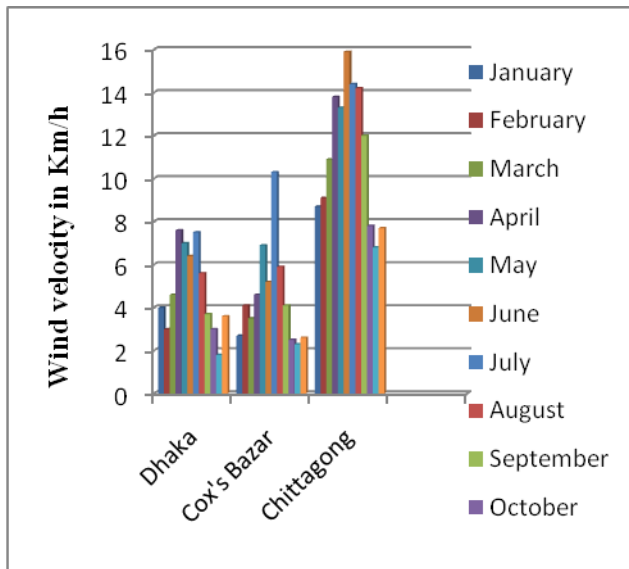


Fig. 4: Wind velocity data for the year of 2003.

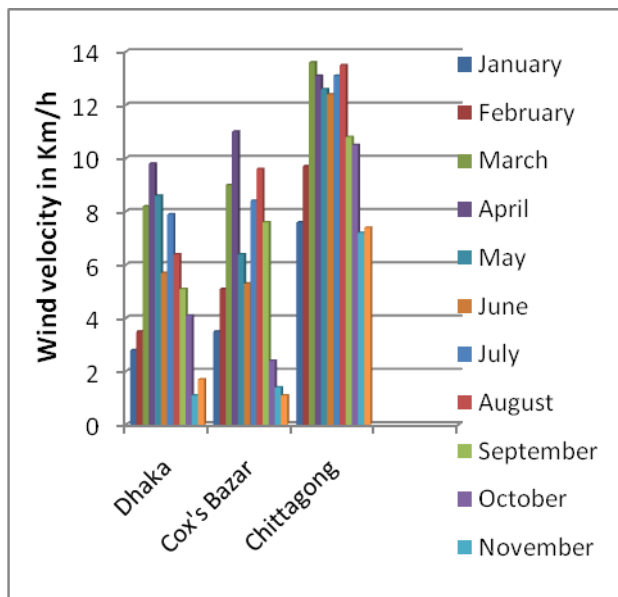


Fig. 5: Wind velocity data for the year of 2004.

## Conclusion

The maximum power with wind turbine is greatly affected by wind speed and its direction. So wind speed data analysis is taken for the evaluation of wind power potentiality in various locations of Bangladesh. From the analysis of four years data it is observed that the maximum average wind speed is 10.81 Km/h existing in Chittagong. Now a comparative study is needed for evaluation of wind power potentiality in various locations of Bangladesh taking consideration of wind speed and wind direction both.

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