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Overview of Traffic Wind Turbines

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Abstract

This paper gives an overview of a vertical-axis wind turbine. The behavior of the Vertical Axis Wind Turbine(VAWT), its present technological state, new founding through modeling work, and the future direction of VAWTs was reviewed. It was observed that VAWT plays a vital role in the present energy crisis. One can foresee that human beings will be dwelling in a world with wind turbines and solar panels due to the present energy crisis with non-renewable energy.VAWTs are advantageous on a cost basis or materials basis over horizontal axis wind turbines(HAWTs). VAWTs do not generate enough electricity due to some challenges. Wind energy has been identified as a promising renewable option. Many nations in the world have identified and they have formulated policies to ensure that wind power has a growing role in energy resources.

Keywords: *Highway, Renewable Energy, Wind Turbine, Energy Harvesting, VAWT.*

INTRODUCTION

The wind is the horizontal movement of air from an area of high pressure to an area of low pressure. There are two types of winds- local and global winds. Both local and global winds are caused by differences in air pressure due to unequal heating of the earth's surface and the air above it.

A Wind turbine is a device that converts the kinetic energy of wind into electrical energy. Wind turbines produce electric

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power by using the power of the wind to drive an electric generator. The generator generates electricity and moves from the tower to an available transformer and switches from output voltage (usually about 700V) to nationwide grid (33000V) for personal use (about 240V). Wind power is an attractive and alternative power source for both large-scale and small-scale and distributed power generation applications.[2]In general, a wind turbine is classified into two types:

1. Horizontal-Axis Wind Turbines (HWAT)
2. Vertical-Axis Wind Turbines (VAWT)

Horizontal-Axis Wind Turbines (HWAT)

HAWT - HAWTs are the most common wind machine designs in use today. HAWTs utilize aerodynamic blades (i.e. airfoils) fitted to a rotor, which can be positioned either upwind or downwind. HAWTs are typically either two- or three-bladed and operate at high blade tip speeds. Machines with upwind rotors require a yaw, or tail vane, to help them orient into the wind while downwind rotors have blades that are coned allowing the turbine to orient on its own. One drawback identified with downwind rotors, however, is that they have been known to 'walk' around when trying to line up with winds during low-speed conditions, diminishing low wind-speed energy production.Horizontal-axis wind turbines are much more widely used, even if it requires a mechanism for orienting the blades. This type of aero generator is characterized by a higher aerodynamic yield than the vertical one. Moreover, it starts autonomously and has low elements at the ground level.

Vertical-Axis Wind Turbines (VAWT)

VAWT - A vertical-axis wind turbine (VAWT) is a type of wind turbine where the main rotor shaft is set transverse to the wind while the main components are located at the base of the turbine. This arrangement allows the generator and gearbox to be located close to the ground, facilitating service and repair.A vertical-axis wind turbine has its axis perpendicular to the wind streamlines and vertical to the ground. A more general term that includes this option is a "transverse axis wind turbine" or "cross-flow wind turbine".

Growth of Wind Energy inthe World and India

There is rapid growth in wind power development globally. This utilization of the wind for electricity generation is expanding quickly, due to large

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technological improvements, industry maturation, and increasing concerns with greenhouse emissions associated with fossil fuel burning. European countries have also widely harnessed this energy source. Germany, Denmark, and Spain are notable users of wind power. Denmark is pushing to generate 40% of its electricity through wind turbines. The UK has the largest wind energy resource and it is set for large expansion to bring down the price of wind energy.[2]As per official Government data from the Ministry of Power, almost 8 crores of rural homes in India have no electricity connection. In Bihar and Jharkhand, Wind power has emerged as the biggest renewable energy source in the world. So far wind turbines with a total combined capacity of 25000 MW have been installed in the world, Germany being the highest in the world and India standing 4th biggest wind power producer in the world. The government of India has estimated the potential of 45000 MW of wind power throughout the country. So far about 3500 MW capacity has been installed in India. All this power is obtained through big wind turbines from 250 KW to 1250 KW capacity. Wind energy is available without any cost and it does not emit any greenhouse gases. This makes it a great source of energy production for any developing state. The field of wind energy has tremendous scope for innovation, translating to real-world applications and tremendous economic opportunity.As the wind is an intermittent and site-specific resource of energy and therefore, an extensive Wind Resource Assessment is essential for the selection of potential sites.

Table-1

Sr. No.	State	Wind Potential at 100 m (GW)	Wind Potential at 120 m (GW)
1	Gujarat	84.43	142.56
2	Rajasthan	18.77	127.75
3	Maharashtra	45.39	98.21
4	Tamil Nadu	33.79	68.75
5	Madhya Pradesh	10.48	15.40
6	Karnataka	55.85	124.15
7	Andhra Pradesh	44.22	74.90
	Total 7 windy states	292.97	651.72
8	Others	9.28	43.78
	Total	**302.25**	**695.50**

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The Government, through the National Institute of Wind Energy (NIWE), has installed over 900 wind-monitoring stations all over the country and issued wind potential maps at 50m, 80m, 100m, and 120m above ground level. The recent assessment indicates a gross wind power potential of 302 GW in the country at 100 meters and 695.50 GW at 120 meters above ground level. Most of this potential exists in seven windy States as given below (Table 1):-

AIM AND OBJECTIVES

India is currently undergoing the worst electricity shortage in more than six years. The science behind these ongoing power cuts is increased demand and decreased supply. The rising mercury could lead to serious health complications, deaths, water storage and more.

The main aim of this study is to:-

- Giving a solution for the scarcity of electricity is becoming a major problem in the country.
- The objective of the study is to use natural resources for the generation of electricity; the same electricity will be used for the lighting of street lights.
- Analyzing the traffic speed and traffic flow of vehicles moving from a particular location for a particular period.
- To design and erect a Vertical Axis Wind Turbine for the generation of electricity from the wind which is generated from the moving vehicles on highways and expressways

Method of Implementation

By doing the surveyof the highway in Kharghar city and researching the traffic flow the necessary data will be collected.

- Traffic flow and scarcity of electricity.
- Processing of survey data.
- Collection of data, statically analysis and design/modeling.
- Problem identification for the scarcity of electricity.

After its assessment, an efficient design will be selected. The design can also be implemented in high-altitude regions for energy generation.

- List out the possible solutions.
- Evaluate the options.
- Select an option or opinion.
- Document the agreement.
- Agreement from authorities on contingencies, monitoring, and evaluation.

The assessment of the scarcity of electricity will be done by doing a survey of most of the roads and highways in Kharghar city and researching the

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flow/speed of vehicles. After the assessment, the solution for the scarcity of electricity will be expected to save high uses of electricity in street or highway lighting during the night. This study will generate awareness among the city's people about using natural sources as renewable energy.

RESULTS AND DISCUSSION

In the Modern generation Electricity is one of the essence and necessities;

- For the daily life application.
- For industrial purposes.
- For the communities and society.
- For transportation purposes.
- For the economy of the country.
- For on-coming future development.

Designing and installation of vertical axis turbines will help to generate efficient energy solutions. This energy can be harvested using a vertical-axis wind turbine (VAWT) placed on side of the highway. The generated energy can be used for lighting the highway and roadside lamps which minimizes the normal consumption of electricity. VAWT harvest wind energy from vehicle moments and convert it into electrical energy.The kinetic energy available for conversion mainly depends on the wind speed approaching the turbine. Wind turbines may also reduce the amount of electricity generation from fossil fuels, which results in lower total air pollution and carbon dioxide emissions. Turbine wind power can also help achieve energy self-sufficiency and sustainable development.

CONCLUDING REMARK

The main objective of this project is to tackle theglobal energy crisis and promote sustainable living.

- It will aware of energy generation among the people of the city.
- It could provide alternatives for nuclear power plants and coal power plants.
- It will save electricity costs and creates micro energy generation methods.
- It will minimize air pollution and health risks due to coal power plants.
- It will also help to preserve our environment& saves energy used to generate electricity using conventional methods.
- It wills aware people of energy generation & energy consumption.
- It will build a safe and modern community.

Implementation of the above-mentioned systems will give a great solution tothe scarcity of electricity.

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