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Review of Future for Wind Turbine Systems

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Abstract: Wind power plant is measured as a machine that change kinetic energy of airstream into electrical power.Winds are caused by solar heating of atmosphere. Wind power is a main and major supply for power generation Wind energy has emerged as the leading renewable energy generation method,The conversion of wind energy into electrical power generation is very useful, important and economical In order to successfully use wind energy with traditional generation supplies it is necessary to have the facility to accurately predict the available output by wind mill . In this research work I have made model to analyse the output by windmill with respect to dissimilar parameters like blade length, Air Density, Swept Area and wind speed. A variety of turbines may be used within order to increase contributions to house power supply. This is performed at time of selling power to utility supplier. Power is supplied through electrical grid. These wind farms are considered as a beneficial source of energy. Here I have made relative analysis between power present in wind and power extracted from wind.In this case output in case of different blade length has been calculated and plotted using MATLAB tool. Simulation of power production in case of different wind speed. In this case there is comparative analysis of power production in case of different Air Density. A quantitative measure of wind energy which was available at different place is known as Wind Power Density. Energy of blowing wind is not used as conservation of collective needs that as much collective of air exits turbine as enters it. Law of Betz's provides achievable extraction of wind power by wind turbine because fifty nine percent of kinetic energy of air is flowing through turbine.

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Keywords: Wind Turbine

[I] INTRODUCTION

Winds are caused by solar heating of atmosphere. They can carry enormous quantity of energy. Before the development of electric power on large scale, windmills served many countries for their electric utilities. The conversion of wind energy into useful form of energy (mechanical and electrical energy). The operating cost of windmill is negligible. Wind power is non- steady and unreliable source. It makes necessary to store wind energy in form of batteries to use same energy during calm periods. and are used by many countries as part of a strategy to reduce their reliance on fossil fuels.

1.2 Resources

A quantitative measure of wind energy which was available at different place is known as Wind Power Density. It is calculation of mean annual power available per square meter of swept field of a turbine. It is tabulated for different heights above the ground. Calculation of density of wind power may comprise the effect of wind velocity & air density.

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Color-coded maps are usually developed for a particular area. In United state America results of such calculation has been considered within an index that was designed by National Renewable Energy Laboratory. This was also referred to as NREL CLASS. It is generally rated by class higher if WPD calculation is Larger Range of Classes is from Class 1 to Class 7 & Commercial wind farms are considered as Class Isolated points in Class 1 area could be practical to exploit.

1.3 Classification of Wind Turbines

Wind turbines are classified by the wind speed they are designed for, from class I to class IV, with A or B referring to the turbulence.

Class	Avg Wind Speed (m/s)	Turbulence
IA	10	18%
IB	10	16%
IIA	8.5	18%
IIB	8.5	16%
IIIA	7.5	18%
IIIB	7.5	16%
IVA	6	18%
IVB	6	16%

1.4 Efficiency

Not all the energy of blowing wind can be used, since conservation of mass requires that as much mass of air exits the turbine as enters it. Betz's law gives the maximal achievable extraction of wind power by a wind turbine as 59% of the total kinetic energy of the air flowing through the turbine.

There are some other losses also,which reduce the power delivered by a wind turbine. Commercial utility-connected turbines deliver 75% to 80% of the Betz limit of power extractable from the wind, at rated operating speed. Efficiency can decrease slightly over time due to wear. Study of wind turbines older than 10 years showed that half of the turbines had no decrease, while the other half saw a production decrease of 1.2% per year.

[II] LITERATURE REVIEW

At Starting people have harnessed the **energy** of the **wind**. **Wind energy** propel boats along the Nile stream as early as 5000 B.C. Near 200 B.C., simple windmills in China were pumping water, while vertical-axis windmills with cane reed sails were grinding grain in Persia and the Middle East.Wind power has been used as long as humans have place sails into the wind. For more than two millennia wind-powered machines have ground grain and pumped water. The power extracted from the wind was widely obtainable and not restricted to the banks of fast-flowing streams, or soon after, requiring sources of fuel. Wind-powered pumps weak thepolders of the Netherlands, and in dry areas such as the American mid-west or the Australian outback, wind pumps provided water for cattle Windmills first appeared in Europe during the Middle Ages. The first historical records of their use in England date to the 11th or 12th centuries and there are reports of German crusaders taking their windmill-making skills to Syria around 1190. By the 14th century, Dutch windmills were in use to use up areas of the Rhine delta. Complex wind mills were described by Venetian inventor Fausto Veranzio. In his book Machinae Novae (1595) he described vertical axis wind turbines with curved or V-shaped blades.

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In July 1887 James Blyth built a wind turbine which was a battery charging appliance to light his holiday home in Marykirk, Scotland which was found too costly in the UK but was more cost efficient in countries with widely spread populations Some months later American inventor Charles F. Brush built the primary automatically operated wind turbine for electrical energy GENERATION in Cleveland, Ohio..

Fig 1. Windfarm

First historical record of usage of windmill within England was from 11th to 12th centuries.

By 14th century Dutch windmills were used to drain reasons of Rhine delta.Advanced wind mills as described by Venetian inventor Fausto Veranzio.

In 1595 Machinae Novae described vertical axis wind turbines havingcurved V-shaped blades.

In July 1887 Ist electricity generating wind turbine was a battery charging machine. Scottish academic James Blyth installed it. Purpose was to light his home at Marykirk Scotland.

After few months American inventor Charles F. Brush made automatically operated wind turbine with help of local University professors.

Colleagues Jacob S. Gibbs & Brinsley Coleberd successfully got blueprints peer-reviewed. With objective of electricity production at Cleveland Ohio.

Blyth's turbine termed as uneconomical at United Kingdom. Electricity generation by wind turbines was cost effective where population was scattered widely.In 1887 F. Brush made automatically operated wind turbine within Cleveland. Its height was 60 feet & weight was 3.6 metric tons. This had powered a generator of 12 kilo watt.In 1990 there were about 2500 windmills for mechanical loads such as pumps & mills. This made production of power about 30 MEGA WATT within Denmark.

Huge machines were on 24 meter towers. This has four-bladed 23 meter diameter rotors.

In 1908 near about 72 wind-driven electric generators were operated within United States. These generators operated from 5 kilo watt to 25 kilo watt.

At time of First World War Makers of American windmill developed 1 Lac farm windmills every year to pump water.

In 1930 wind generators for electricity were common on farms most of time within USA where distribution systems had not yet been installed. During this time high-tensile steel was cheap. Generators were placed at top of steel lattice towers. These tower were prefabricated open.

In 1931 a modern horizontal-axis wind generators was within service at Yalta, USSR. This was a 100 kilo watt generator on a 30 meter or 98 feet tower. This was connected to local 6.3 kV distribution systems. .In 1951 first utility grid connected wind turbine within order to operate within UK was developed by John Brown & Company within Orkney Islands.Fossil fuel systems were removed any wind turbine systems that was bigger than super micro size. To make micro turbines of 22 kilo watt within 1970s anti-nuclear protests within Denmark spurred artisan mechanics.

After some time companies were developed within India & China.

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[III] DESIGN AND CONSTRUCTION

Wind turbines are developed in order to utilize wind energy that exists at a place. Aerodynamic modeling could be used to check:

1. Optimum control systems
2. Height of Tower
3. Number of blades
4. Shape of Blade

It is considered that Role of Wind turbines is to convert wind energy into electricity & to distribute. The Conventional x-axis turbines can be categorized into three components that are discussed as:

1. The rotor component nearly twenty percent of wind turbine price which consists of blades to manipulate wind energy to low speed rotational energy.
2. Generator component nearly about thirty four percent of wind turbine price comprises:
    1. The Electrical generator
    2. The Control electronics
    3. The Gearbox
    4. The Speed which is adjustable drive to convert low speed incoming rotation to high speed rotation suitable to generate electricity.
3. Structural support component about fifteen percent of wind turbine price include tower & rotor yaw technique.

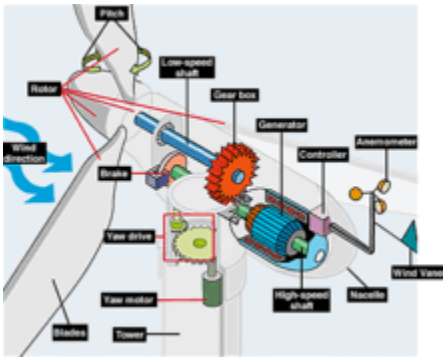

Fig 2. Components of a horizontal-axis wind turbine

A 1.5 MW wind turbine of a type frequently seen in the United States has a tower 80 meters (260 ft) high. The rotor assembly (blades and hub) weighs 22,000 kilograms (48,000 lb). The nacelle, which contains the generator component, weighs 52,000 kilograms (115,000 lb). The concrete base for the tower is constructed using 26,000 kilograms (58,000 lb) of reinforcing steel and contains 190 cubic meters (250 cu yd) of concrete. The base is 15 meters (50 ft) in diameter and 2.4 meters (8 ft) thick near the center. Among all renewable energy systems wind turbines have the highest effective intensity of power-harvesting surface because turbine blades not only harvest wind power, but also concentrate it.

Fig 3. Inside view of a wind turbine tower, showing the tendon cables.

[IV] TECHNOLOGY USED

MATLAB is a high-presentation language for practical computing. It integrates calculation, image, and encoding in an user-friendly environment where troubles and solutions are expressed in well-known precise information. Typical uses include: Math and calculation.

MATLAB (**mat**rix **lab**oratory) is a multi-model mathematical computing situation and fourth-generation programming language. Developed by

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MathWorks, MATLAB allows matrix manipulations, plotting of functions and data, completion of algorithms, formation of consumer interfaces, and interfacing with programs written in other languages, including C, C++, Java, Fortran and Python.

.[V] PROPOSED WORK

We will design build & test a wind turbine using simulator with following objective.

It would be a device that will be able to convert kinetic energy from wind into mechanical energy that would be suitable for various geographic locations. A Generator connected to turbine shaft will immediately convert mechanical energy into electrical energy. Research is derived from basic technologies, ranging from advanced materials to nanotechnology & micro replication. There are many ways these technologies could be involved to meet emerging needs of wind industry.

Wind Turbine simulation is made considering

a. Length of Blade
b. Shape of Tip
c. Pitch of Blade,
d. Shape of Airfoil
e. Twist in Blade
f. Height of turbine.

We will check Turbine performance within different situations. Watt produced Efficiency factor, Watts/Unit Cost will fluctuate according to Blade length, Tip shape , Blade pitch, Blade Twist, AirFoil Shape, Turbine Height.

[VI] SCOPE OF RESEARCH

Wind energy is famous energy source. It delivers power that does not make pollution. Wind energy is considered greener and cleaner as compared to traditional ways of electricity production like coal. Hidden cost of wind energy is nil. Wind Turbine is cost effective with new technical development. Wind Turbine is considered sustainable.Wind Turbine does not produce any pollution. Wind Turbine can be placed at various geographic locations. Today wind power is considered as most cost effective type of electricity production.

. Advantages of Wind Power

- **It's a clean fuel source.** Wind energy doesn't pollute the air like power plants that rely on combustion of fossil fuels, such as coal or natural gas.
- **Wind power is a household supply of energy.** The nation's wind supply is abundant: over the past 10 years, cumulative wind power capacity in the United States increased an average of 30% per year, outpacing the 28% growth rate in worldwide capacity.
- **It's sustainable**. Winds are caused by solar heating of atmosphere. They can carry enormous quantity of energy. Before the development of electric power on large scale, windmills served many countries for their electric utilities. The conversion of wind energy into useful form of energy .
- **Wind power is cost effective.** Depending upon the wind resource and project financing of the particular project it costing between four and six cents per kilowatt-hour,.
- **Wind power plant can be built on open farms.** This greatly benefits the economy in rural areas, where most of the best wind sites are found. Farmers and ranchers can continue to work the land because the wind turbines use only a fraction of the land. Wind power plant owners make rent payments to the farmer or rancher for the use of the land providing landowners with additional income.

[VII] CHALLENGES OF WIND POWER

- The cost of electricity generated byWind turbine system is higher in comparision with other conventional generation sources ..

- Wind resource development may not be the most profitable use of the land.
- Turbines may cause noise and aesthetic pollution.
- The turbine blades may damage local wildlife.

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