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A STUDY ON VERTICAL WIND GENERATOR

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ABSTRACT

Electrical energy plays a vital role in our daily life, but the energy resources are limited and moreover costly to generate. So that government has taken initiative effort to fulfill the requirement of energy demand especially for agriculture purpose. Also, insists the peoples to utilize the renewable energy resources solar and wind. This system is likely to become wide spread in the future as alternative solution for the production of electrical energy without impacting ecosystem. There are varieties of hybrid energy systems are available but it requires frequent maintenance and high cost.

In the existing aero-profile blade has many critics like; un even surface resultant un even rotation, voltage and high cost etc., To overcome the drawback in the existing topology, it is required to introduce a new type of Vertical Wind Generator accompanied with solar system because, wind is available (24 x 7) and solar for 6-8 hours which is depends on the climate condition. In this system we introduced a new blade profile (semicircular blade profile) in place of aero-profile. We design and tested with 3 feet diameter swept area, the output of semicircular profile is resulted better than the aero profile system. Using vertical axis wind turbines at buildings seems favorable due frequent wind direction changes. This experiment measures temperature, atmospheric pressure, wind speed, wind direction, relative humidity, and evaporation.

Key Words: Vertical Wind Generator, Wind Energy, Solar Energy, Semi Circular Blade Profile

I INTRODUCTION

All over the world initiated to adopt the Renewable energy resources. Renewable energy is collected from the natural resources, like; sunlight, wind, rain, tides, waves, and geothermal heat. The impact of renewable energy has electricity generation, air and water heating/cooling, transportation, and rural (off-grid) energy services.

The energy scenario based on renewable contributed 19.2% to human's global energy consumption and 23.7% to their generation of electricity in 2014 and 2015, respectively. This energy consumption is divided as 8.9% coming from traditional biomass, 4.2% as heat energy (modern biomass, geothermal and solar heat), 3.9% hydro electricity and 2.2% is electricity from wind, solar, geothermal, and biomass.

Availability of energy resources depends on the geographical areas and other energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy efficiency is resulting in significant energy security, climate change mitigation, and economic benefits.

While many renewable energy projects are large-scale, renewable technologies are also suited to rural and remote areas and developing countries, where energy is often crucial in human development. As most of renewable provide electricity, renewable energy deployment is often applied in conjunction with further electrification, which has several benefits. In addition to that electrification with renewable energy is much more efficient therefore leads to a significant reduction in primary energy requirements, because most renewable don't have a steam cycle with high losses

II CLASSIFICATION OF RENEWABLE ENERGY SYSTEM

The various renewable energy sources are solar power, fuel cell generation, geo thermal power, wind power, tidal power and bio gas.

2.1. Wind Power

Airflows can be used to run wind turbines. Areas where winds are stronger and more constant, such as offshore and high altitude sites are preferred locations for wind farms.

2.2. Solar Energy

Solar energy, radiant light and heat from the sun, is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic's, concentrated solar power ,concentrator photovoltaic's ,solar architecture and artificial photosynthesis. Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy.

A photovoltaic system converts light into electrical direct current (DC) by taking advantage of the photoelectric effect. Solar PV continues to improve its cost-effectiveness, and has the most potential of any renewable technologies. Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Commercial concentrated solar power plants were first developed in the 1980.

III HYBRID MECHANISM

Two different energy systems installed at a location to ensure continuity of electrical supply is known as hybrid energy system. Thus hybrid energy system provides an edge over the stand alone and even grid interactive systems

for reliability of energy supply and lower capital cost. Hybrid renewable energy systems are pretty common for remote area power generation.

3.1. Design Scenario

At present various types of wind turbine is utilized in mountains as well as in coastal areas mostly horizontal type of wind turbine used in a specific height to generate the electrical power, but the main drawback due to installation, it can't installed over the roof top in urban and rural areas, because the vibration will affect the building. And also separate steel foundation is required in a specific height (60 to 70 feet) with high installation cost. Moreover the wind generator has to rotate in specific direction based on the wind flow direction. Sometimes it is found that, while frequent changes in wind direction it was not rotating just vibration alone because of aero profile design. So there is a requirement to identify any model or design which would rectify the above said issue, is most welcome for the future power generation. It is very costly so that, there is a requirement to overcome the existing model by introducing a vertical wind generator with a modified semi circular blade profile.

3.2. Blade Design

Designing of the blade profile is playing a vital role in power generation. Exisiting system of the blade design made up of aero profile model. In this design the main drawback the profile having different not uniform wind frictional force due to this the forces acting on the blade surface not uniform throughout the length causes need high wind velocity to rotate the generator. And if the wind direction is changed it is not rotating.

In the new design we rectified the above said issue with the help of a new blade profile (semicircular). The major advantage of this blade profile it will receive a uniform wind flow throughout the blade area which will helps to improve the efficiency of the generator at low wind velocity. In this model three blades were connected at an angle of 120^0 to each other by hub which will influence to free rotation to blade in all directions of wind flow. No need to identify the wind flow diction with the help of wind vane anemometer. It resulted that the better power generation at low height without any vibration so that it can be installed any roof top or agriculture field. The design of the blade is given below in Fig 1.

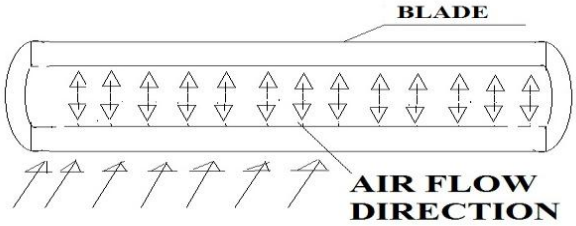

Fig. 1 Blade Design Semicircular

3.3. Hub Design

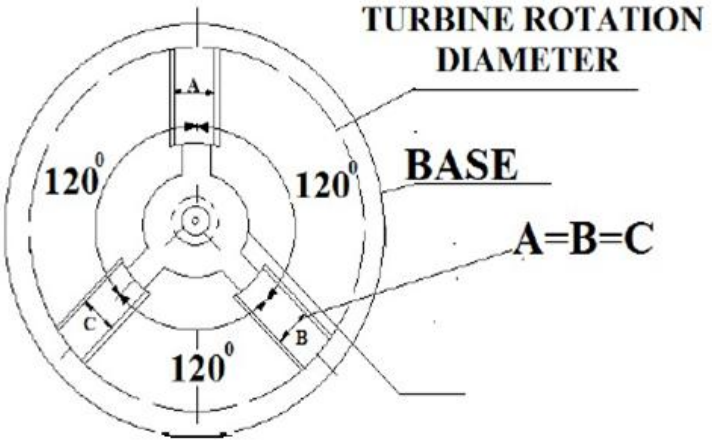

Fig. 2 Hub Design

3.4. Vertical Wind Generator

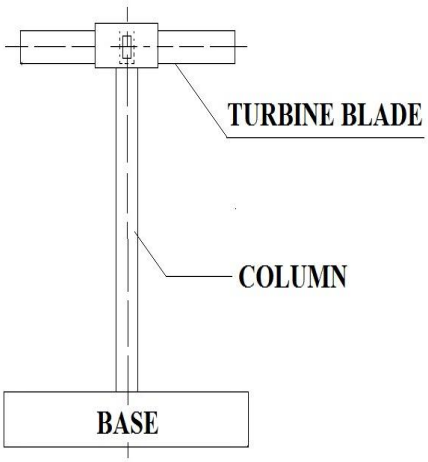

Fig. 3 Vertical Wind Generator

3.5. Hybrid System

The wind is readily available in the atmosphere throughout the day (365) but due to different climate condition it is required to use photovoltaic (hybrid system) because it will provide good output between 9 am -4 pm .Which the output of hybrid system can be produced more power which can restore in power bank and utilize for general purpose.

The following equipments are required to build a hybrid power generator.

Experimental design the lattice power – 4 feet solar panel: 20 W

Dynamo 24 V, Battery 24V, AC –DC- AC converter:

3.6. Blade Profile

The figure shown below is indicating that vertical wind turbine generator.

Fig. 3 Experimental set up of Vertical Wind Generator

IV RESULT AND DISCUSSION

The experimental study is based on the following parameters: wind speed, Wind generator height (constant), Humidity, Temperature, Wind velocity and all the parameters with respect to different days in this district (Nagapattinam). The table shown below:

Table.1 Observations of Hybrid electricity generation (March – April 2017)

Days	Time(Hrs.)	Average Temperature (°C)	Wind Average velocity(m/s)	Average Humidity (%)	Hybrid output (V)	
					Wind (V)	Solar (V)
Mon-Sun	9	28	2.0	58	14	10
Mon-Sun	10	33	2.5	62	20	16
Mon-Sun	11	33	2.2	62	18	17
Mon-Sun	12	32	2.0	60	16	16
Mon-Sun	1	30	2.2	55	15	18
Mon-Sun	2	28	2.0	58	15	11
Mon-Sun	3	33	2.5	62	20	17
Mon-Sun	4	33	2.2	62	19	18
Mon-Sun	9	27	1.9	60	14	10
Mon-Sun	10	32	2.4	58	20	16
Mon-Sun	11	32	2.3	61	18	17
Mon-Sun	12	33	2.1	60	16	16
Mon-Sun	1	31	1.9	55	15	18
Mon-Sun	2	29	2.1	58	15	11
Mon-Sun	3	30	2.4	62	20	17
Mon-Sun	4	31	2.2	62	19	18
Mon-Sun	9	28	2.1	60	14	10
Mon-Sun	10	33	2.4	62	20	16

Mon-Sun	11	33	2.1	62	18	17
Mon-Sun	12	32	1.9	60	16	16
Mon-Sun	1	30	1.8	55	15	18
Mon-Sun	2	28	2.1	58	15	11
Mon-Sun	3	33	2.5	62	20	17
Mon-Sun	4	33	2.2	62	19	18
Mon-Sun	9	28	2.0	58	14	10
Mon-Sun	10	33	2.5	62	20	16
Mon-Sun	11	33	2.2	62	18	17
Mon-Sun	12	32	2.0	60	16	16
Mon-Sun	1	30	2.0	55	15	18
Mon-Sun	2	28	2.0	58	15	11
Mon-Sun	3	33	2.5	62	20	17
Mon-Sun	4	33	2.2	62	19	18

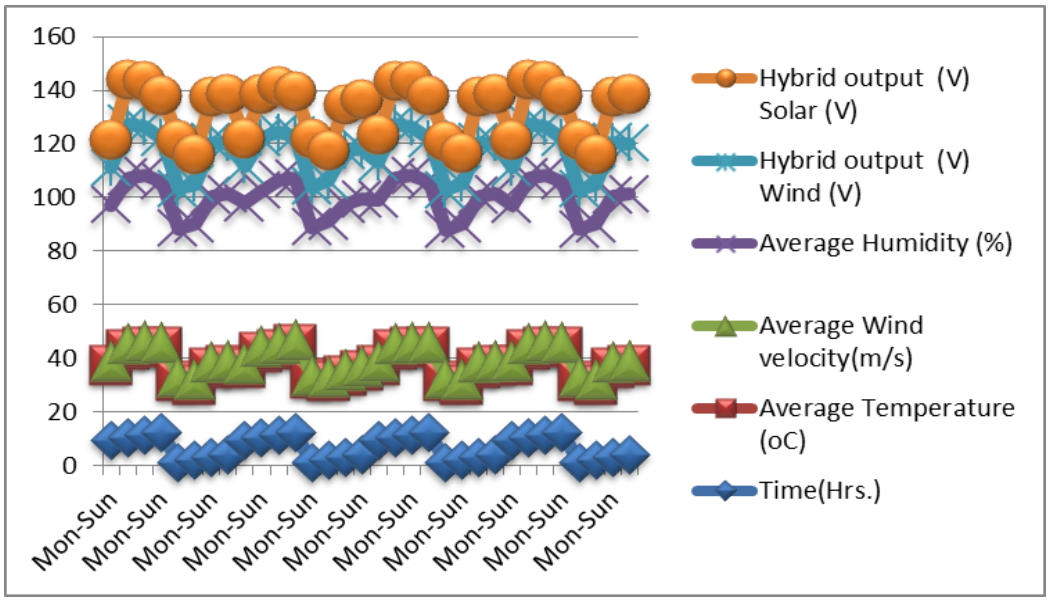

Fig.4 Cumulative Graph of the Hybrid out put

V CONCLUSION

The result of the experimental design of Semicircular blade profile provides better efficiency than the existing one and not effecting by environmental factors. The performance of the vertical wind turbine shows that better hybrid outputs as compared with the existing design. When the swept rotation is increased the efficiency of the hybrid system is also increased.

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