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DEVLOPMENT OF VERTICLE AXIS WIND TURBINE FOR APPLICATION ON HIGHWAYS

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ABSTRACT

The objective of the project is to build a wind turbine that can capture wind energy from moving vehicles. Despite being the renewable energy source with the fastest pace of expansion, wind energy is limited by the unpredictable wind conditions that roads can provide. A result of the amount of traffic, wind speed will be high enough for the turbine. This model allows for the use of waste power. There must be a thorough understanding of wind patterns in order to determine the average wind speed induced by approaching autos. The design will take into account smooth traffic flow from both sides of the road because the wind turbines will be placed on the medians. The existing lighting in the can be upgraded with these wind turbines to medians based on the gathered data. Additionally, the assembly will have a solar panel mounted on top of it, which will increase efficiency due to the variable nature of the wind source. The turbine should be able to provide limitless power on a global scale to streetlights and other public facilities.

Keywords: : Highway Wind Turbine, Wind Energy, Vertical axis Turbine, ENLIL Turbine.

I. INTRODUCTION

Over the past 25 years, both the utilisation of new renewable energy sources and old renewable energy sources have expanded. Hybrid renewable energy systems were created to utilise since conventional renewable energy sources were inadequate to meet the energy demand. A hybrid energy system, sometimes called hybrid power, typically combines the use of two or more renewable energy sources.

To enhance system efficiency and the balance of the energy supply. A vertical axis wind turbine that generates electricity is called ENLIL. In order to capture more solar energy, it also has solar panels. It is made to take in energy from modern cities, like the wind that moving automobiles produce. The best locations to install the gadget are near to beaches, on rooftops, or on houses. Buses and other large vehicles will offer lots of wind power. The Generator's goal was to convert the obtained mechanical energy into electrical energy. A permanent magnet synchronous generator is what is intended. Magnet synchronous generators are utilised because of their high efficiency and longer lifespan when compared to other generators. If there is enough wind produced by driving automobiles on roads, these turbines can run nonstop day and night.

II. LITERATURE SURVEY

The idea of putting wind turbines next to a highway is not brand-new. The energy from roads has been recycled by many persons and institutions. The most impressive idea is that shown in the YouTube video "Highway Helical Wind Turbine Project (Next Generation Highway's Potential For Wind Power)". A group of mechanical engineering students from YCET Kollam in Kerala demonstrate a road wind turbine prototype in the film. is a video still of a computer-animated model of the proposed highway wind turbine created by Indian mechanical engineering students. The design developed by the students Nabeel B, Firoz khan T S, Krishnaraj V, Kannan Raj, Arun S, Shaiju mon T K, and Akhil Ganesh is depicted in Figure 5 as a working prototype. Project For Highway Helical Wind Turbines With Potential For Next-Generation Highways, 2012. In order to evaluate the project's potential, a number of VAWT efforts were examined in order to gather the available research.

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In the 1980s, FloWind Corporation built full-Darrieus wind turbines using research from Sandia National Laboratories. A peak of 100 million kWh was produced in 1987 thanks to the development of 17- and 19-meter turbines with matching kW ratings of 142 and 250. The manner the blades were manufactured led to fatigue failure in these early Darrieus turbines. The joints in the extruded aluminium blades broke down, putting FloWind into bankruptcy (Gipe, 2013). VAWT Full-Darrieus

In a 2006 study, Eriksson et al. examined four various wind turbine designs. The first was the VAWT 850, a 500kW VAWT made in the UK. A modified 850 with a modified tower arrangement served as the second aircraft. The third design was the 500kW Sandia Darrieus turbine, which was built in the 1980s. Siemens HAWT with a 600kW rating that had the data scaled down to 500kW by Froude scaling was the finalised design. The table below displays the comparison that was made. They concluded that the second H-rotor might rival a HAWT and suggested improving it by using a three-bladed design and lighter support arms.

III. OBJECTIVE

The advised course of action is to construct a hybrid vertical axis renewable energy system. generating electricity with solar and wind energy, and using the wind that is created by moving vehicles to power the turbines both during the day and at night. The main objective is to produce power using hybrid renewable energy sources.

Anywhere there is wind, it can produce electricity by employing an ENLIL turbine. Nations like Norway and Denmark have long relied on renewable energy sources for the majority of their energy needs.

Because of the sudden increase in energy demand, the Indian government has recently allowed the development of offshore wind plants for generating electricity.

IV. EXISTING SYSTEM

Usual renewable electricity production techniques include solar, wind, and hybrid energy. Although hybrid energy combines the strength of the sun and the wind, it cannot be used everywhere. because the plant's massive overall size will provide a maintenance problem. The disadvantages of current methods include high maintenance and repair costs, shipping challenges, larger blade diameters, and need for high initial torque..

V. PROPOSED SOLUTION

The generator in this suggested solution only requires a little amount of torque to start due to its small size and use of a permanent magnet synchronous machine. The seashore, buildings, and other frequently windy locations are all suitable places to keep this turbine. By utilising the wind generated by moving cars, the suggested turbine is mounted on highways.

VI. DESIGN CHALLENGES

The cost of turbines is rising in line with the price of commodities and energy. Every car on the road offers a variable and uncontrolled source of wind energy. The design of the wind turbine must take into account power storage and an effective distribution system. The amount of space and operational noise are additional essential design considerations. The location of the wind turbines should not be altered in any way. Wind turbines are frequently used in remote places. Consequently, there is an additional challenge of transporting the created power to the desired location.

VII. PROPOSED DESIGN

Our team is suggesting building a vertical axis wind turbine to capture the wind produced by moving cars and convert it into electricity. The locations of these wind turbines will be close to heavily used roadways. The Savonius Model is the one we are utilising for our wind turbine.

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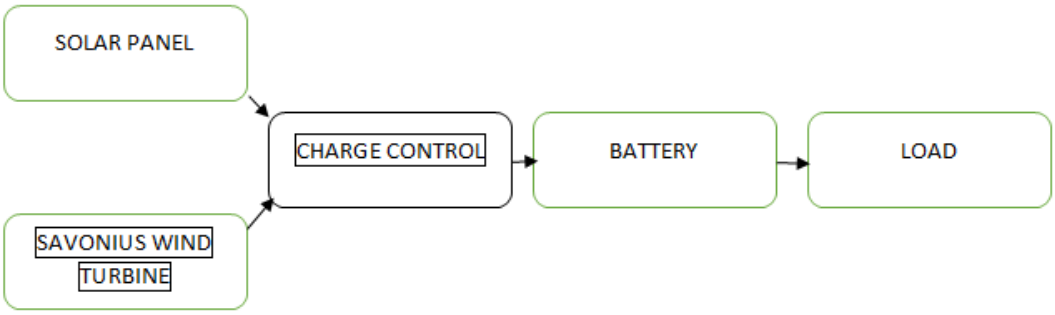
VIII. BLOCK DIAGRAM



IX. DETAILS OF COMPONENT

- **SOLAR PANEL:** Photovoltaic cells, or photovoltaic panels, are what gather solar radiation and transform it into electrical energy for charge control. In this project we are using 18 volt generation capacity photovoltaic cell of manufacturer named "LUXMi SOLAR" .
- **SAVONIUS WIND TURBINE:** A vertical axis wind turbine is a Savonius wind turbine. through which wind energy is transformed into electrical energy. This sort of wind turbine is unique in that it does not require a constant flow of wind to operate. It can function in strong wind conditions.
- **CHARGE CONTROL:** The voltage and current to be given to the load or batteries are regulated by a charge control device. Additionally, it stops the batteries from being overcharged.
- **4 POLE PERMANENT MAGNET GENERATOR:** an electrical generator that uses four magnetic poles to generate electricity. The generator typically consists of a rotor with four permanent magnets mounted on it and a stator with coils of wire that are used to generate an electric current. A small 4-pole permanent magnet generator can be used for various applications, such as in wind turbines, hydroelectric turbines, and small-scale power systems. The size of the generator will depend on the specific application and the amount of power that is needed. The advantages of a permanent magnet generator include its high efficiency, low maintenance requirements, and the fact that it does not require a separate power source to generate a magnetic field. However, one disadvantage is that the output voltage of a permanent magnet generator is fixed, which can limit its use in certain applications.
- **BATTERY:** Batteries are frequently used to store electrical charge and deliver it as needed for a load. There are many different types of batteries, including lithium ion, nickel cadmium, lead acid, and others. Lithium-ion batteries are a type of rechargeable battery that use lithium ions as the primary component of their electrolyte. They have become one of the most popular types of batteries used in modern electronics, including laptops, cell phones, and electric vehicles.

X. APPLICATIONS

- To produce the most energy, vertical axis turbines might be put along the roadway.
- To achieve the best results, you can arrange them along the seashore.
- The telephone tower needs energy, which can be provided by installing a turbine inside the tower because there is enough wind energy there.
- Additionally, a wifi modem can be installed inside the turbine assembly so that it can function as a wifi source.

XI. CONCLUSION

In conclusion, a lot of data is obtained regarding the wind patterns induced by vehicles on both sides of the road. The information acquired is used to design a wind turbine that will be mounted on the medians of highways. A set of turbines along a long stretch of highway have the potential to create a sizable amount of electricity, even though one turbine might not produce enough for streetlights, other public amenities, or even to make money by selling the power back to the grid. This architectural design aspires to be sustainable and environmentally friendly. A wind turbine that employs created wind has several applications. The turbine may theoretically be powered by any moving machine, like a ride in an amusement park.

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