POWER GENERATION FROM RENEWABLE ENERGY ON HIGHWAYS AND MONITORING USING IOT

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Abstract - In today's world electricity is one of the foremost thing for our day to day life. As we all are obvious of the fact that non renewable sources of energy are depleting at a lightning fast rate. So it's time for us to shift the focus from conventional to non-conventional sources of energy to produce electricity. Dual Power Generation system is basically an integration of solar plant and a wind energy plant. It will help in providing the uninterrupted power supply. Wind pressure from moving vehicles rotate blades of windmill to generate electricity. Wind turbulence at the highways directly depend upon size and speed of the automobile along with the traffic frequency. In other hand we generate power from another free energy source i.e., solar power generation. In our approach we place solar panels on dividers so that, it will generate power from sun light during day time and from vehicle headlights during night time. We monitor the energy produced by both the energy sources using sensor network and upload the data into cloud using IOT .

Key Words: Wind Energy, Solar Energy, Highways, IOT

1.INTRODUCTION

In a day to day life, the demand for the electricity is much higher than the production of electrical energy. Now a day's electrical energy is generated by the conventional energy resources like coal, diesel, and nuclear etc. The main drawback of these sources is that it produces waste like ash in coal power plant, nuclear waste in nuclear power plant and taking care of this wastage is very costly. The nuclear waste is very harmful to human being also. The conventional energy resources are depleting day by day. Soon it will vanish from the earth, so we have to find another way to generate electricity. The new source should be reliable, pollution free and economical. The non-conventional energy resources should be good alternative energy resources for the conventional energy resources.On highways, vehicle moves faster than the usual. Moving vehicles on the highway create wind turbulence. When a vehicle moves on highway, it disturbs the wind present over that highway. Vehicle creates low wind pressure field and big vertex behind it while moving. The wind disturbed by the vehicle intend to cover that space created by the moving vehicle and creates huge wind turbulence at highways. The direction of the wind turbulence is always moving along the vehicle to the centre of low pressure field.

Turbulence presents at the highways along with normal breeze creates a strong wind effect near the highways. This wind effect can be easily felt by any one on the highway side. Wind turbulence at the highways directly depends upon size and speed of the automobile along with the traffic frequency. For highway side application, wind turbine should have capability to utilize moderate wind speed. . All these parameters can be obtained by the combination of two VAWT turbines- Savonius and H type Darrieus Turbine. In other hand we generate power from another free energy source i.e., solar power generation. In our approach we place solar panels on dividers so that solar panel will generate power from sun light during day time and produce energy from vehicle headlights during night time. We cannot assure 100% accuracy during night time but we can assure at least 30-40%. Along with solar system we are using solar tracking system to improvise the efficiency. We monitor the energy produced by both the energy sources using sensor network and upload the data into cloud using IoT technology. This data will be used for future analysis. We use thingspeak cloud for data storage.We also implement automatic

street light controller to make efficient usage of generated power. If there is any movement on road, then only street lights will be turned on, remaining time it will be in off condition.This stored energy which can be further used for street lighting, toll gates, etc.

2. LITERATURE SURVEY

[1] *Innovative Hybrid Power Generation on Highway* Authors: *Ms.Sulochana B Belavi ,Ms.Savita B Dasangali Ms. Akshata B Nandaganv ,Ms.Gayatri T Gharabude*

A single turbine can easily provide the average daily electricity needs of households. The safety and comfort of the city are also ensured. The turbine can be installed in parks, near seashores, rooftops, households but the roads are the ideal locations for the device. The big vehicles like buses can provide a lot of wind energy. The speeding the turbine is designed vertically with long blades. It covers less area on the ground and is easy to handle. It can easily be assembled and disassembled which makes it durable. Solar panels are fixed at the top of the turbine to generate extra electricity. The device is capable of producing vehicles on the highway can provide enough wind for these turbines to work all day and night without stopping. Hybrid energy system is the combination of two energy sources for giving power to the load.

[2] *Hybrid Power Generation Using Smart Highway* Authors: *Payal S. Burande , Jagannath A. Shinde , Shubham R. Talmale*

In today's technology driven world electricity is one of the foremost things for our day to day life activities. As we all are oblivious of the fact that renewable sources of energy are depleting at a lightning fast rate. So it's time for us to shift the focus from conventional to non-conventional sources of energy to produce electricity. The output of the electricity produced by non-conventional sources is less than their counterparts. Renewable sources do not have any detrimental effect on the environment. Solar-wind hybrid system is basically an integration of solar plant and a wind energy plant. It will help in providing the uninterrupted power supply. As during bad weather conditions, the production can be shifted from one plant to another with the help of a microcontroller. Wind pressure from moving vehicles rotate blades of windmill and then utilizes to generate electricity.

[3] *Power Generation by Hybrid VAWT System for Highway Applications* Authors*: Menaka. , Mohan. , Muthu Vijay. , Ranjith.*

The rapid growth of renewable energy generation is increasing to meet the demand for electricity. In this paper, the generation of electricity is achieved by using vertical axis wind turbine using the force created by moving vehicles. For that purpose, wind turbines are placed at the center of the highway for the generation and utilization. There are two types of the axis is available in wind turbines, horizontal and vertical axis. The horizontal axis is commonly used but it is not applicable for highway applications. There are some types of turbines are available in the vertical axis. In this paper, two types of turbine blade model are made as a hybrid in VAWT (Vertical Axis Wind Turbine) which increases the efficiency in wind energy utilization. Due to this hybrid model, drag and lift are increased and rotate automatically even with low wind speed. The power generated by this VAWT can be utilized for highway applications, and then the excess power will be injected into the grid or local area.

3. PROPOSED SYSTEM

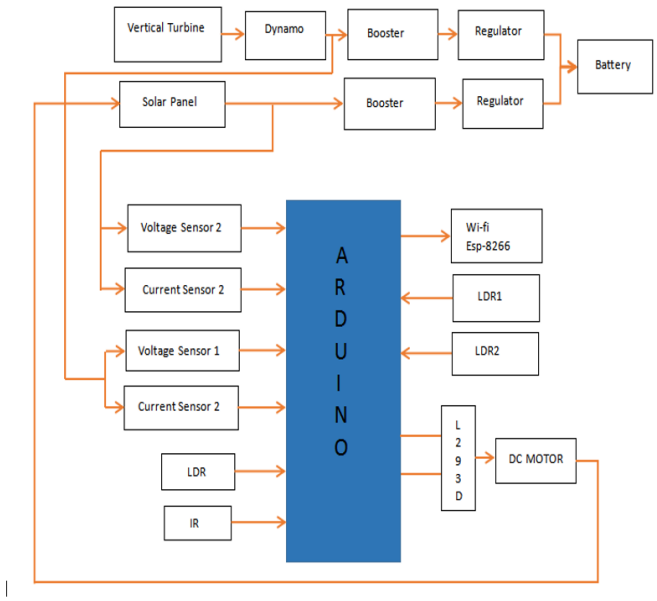

Figure1: Block Diagram of Two Way Power Generation and Monitoring on Highways using IOT.

When a vehicle moves on highway, it disturbs the wind present over the highway and creates huge wind turbulence. This wind turbulence rotate the blades of the windmill to generate

electricity. The turbulence directly depends upon size and speed of the automobile along with the traffic frequency. For highway side application, wind turbine should have capability to utilize moderate wind speed. These parameters can be obtained by using VAWT turbines.

Solar panels are placed on dividers so that it will generate power from sun light during day time and from vehicle's headlight during night time. We can assure around 30-40% of accuracy during night time. Solar Tracking system improvises the efficiency. LDR's are used to track the maximum sunlight. If the light on the LDR1 is maximum, the solar plate moves clockwise. Similarly when the light on the LDR2 is maximum,the solar plate moves anticlockwise. If the light on both the sensors are equal ,the solar plate will not rotate in any direction. DC motor is used to move the solar panel in the direction of sun.

Arduino receives the signal from the voltage and current sensors, then upload the obtained data to the cloud using wifi module. It also controls the rotation of DC Motor.

The power generated by the solar panels and wind turbine are monitored using sensor network and the data is uploaded into the cloud using IOT. This data can be used for future analysis. The electrical energy produced by the system should be either completely utilized or stored. Automatic street light controller is implemented to make efficient usage of generated power. The stored energy can be further used for the purpose of street lighting, toll gates etc. Complete utilization of the energy produced by the system is not possible at all times. So,the energy can be stored in the batteries when it is not utilized. Dual power generation systems is an integration of solar plant and a wind energy plant. During winter the system will provide maximum output from the wind turbine, whereas during summer, the solar panels would produce their peak output. This system often yields greater economic and environmental returns than wind, solar, geothermal or trigeneration stand alone systems by themselves.

ADVANTAGES

As this system uses two energy sources, it produces maximum power. This model is reliable, pollution free and economical. To make use of Huge wind Turbulence which is wasted near Highways. Solar tracking system is used to increase the efficiency. During night we also use vehicle's headlight to generate power. Automatic street light controller is implemented to make the efficient usage of generated power. The energy stored in the batteries can be further used for the purpose of street lighting, toll gates etc.

DISADVANTAGES

This system is subjective to climatic variations. The efficiency is comparatively lower to non renewable resources.

APPLICATION

It is mainly applicable on highways where vehicle moves faster and create wind turbulence. Wind pressure from moving vehicles rotate blades of windmill and then it is utilized to generate electricity.

It can also be implemented on the rooftop of the houses .As these systems make use of the renewable energy and will have low maintenance cost .The generated power can be stored in the batterybank and can be used for any household activities.

CONCLUSIONS

Dual power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide electricity to remote places where government is unable to reach. Cost reduction can be done by increasing the production of the equipment. People should motivate to use the non conventional energy resources. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy resources. Wind is a cost effective, green, renewable energy resource for power generation. Highway side application of wind turbine with improved efficiency can help us to reduce a gap between demand and supply of power. An efficient hybrid wind turbine is designed to use in road side application for energy generation. This turbine is specially designed to

generate energy by utilization of natural wind and wind turbulence created by the moving vehicles on the highway. Winds from all the direction are utilized by this turbine. This turbine is self-starting, easy to installation, low in cost and suitable for both high and low wind speed. Turbines show 2.75 and 1.57 times better efficiency than the Savonius and Darrieus turbines respectively.

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