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Hybrid Power Generation System Assisted with Solar and Wind Turbine

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Abstract: ***In today's world electric-powered technology is one of the mainstays of our daily life. Since we are all ignoring the fact that renewable energy sources are dwindling at a rapid rate. So it is time to change the focus on conventional energy sources to conventional electricity generation. The output of electricity generated by non-standard sources is less than their counterparts. Renewable sources do not have a negative impact on the environment. The Solar-wind hybrid system basically consists of a solar plant and a wind power plant. It will help to provide uninterrupted power supply. The hybrid system can be used for both industrial and domestic applications. Horizontal-Axis Wind Turbines (HAWTs) are a type of wind turbine in which the main rotor shaft is set horizontally. Among the advantages of this arrangement is that the generators can be placed close to the ground and the solar module, making it a hybrid system. This energy can be used for a variety of purposes. Electricity generation will be done at an affordable cost. The project is responsible for generating electricity through two interconnected sources that lead to generating electricity at affordable cost without harming the natural balance.***

Keywords: Solar Energy, Wind Energy, PV Cell, Renewable Energy, Hybrid Power System, Electricity etc.

I. INTRODUCTION

The Hybrid energy system is a combination of two energy sources to power a load. In other words it can be described as a “energy system designed or designed to generate energy through two energy sources is called a hybrid energy system.” The Hybrid energy system has good reliability, efficiency, slow output, and low cost.

In this proposed system solar and wind power are used to generate energy. The sun and the wind are far more efficient than any other natural energy source. Both sources of energy are widely available. It requires low cost. There is no need to find a special place to install this program.

A. Solar Energy

Solar energy is the energy that is generated by the sun's rays. The sun's energy is concentrated in the earth's crust. Solar energy is free. It does not produce any gases which means it is not polluted. It is affordable. It has low maintenance costs. The only problem with the solar system is that it cannot produce energy in bad weather. But it is much more efficient than other energy sources. It only needs an initial investment. It is long lasting and has a low release.

B. Wind Energy

Wind energy is energy released from the air. Extraction using an air mill. These are renewable energy sources. Wind power requires less electricity generation costs. The cost of repairing it is also minimal in the wind energy system. Wind power is available for about 24 hours a day. It has a small discharge. The initial cost is also less than the system. The production of electricity from the wind depends on the speed of the flowing air.

In the proposed program we can use both sources to integrate. Another way is that we can use any source and save another source as unit configuration. This will lead to the generation going on. This will make the system more reliable. The main disadvantage of this program is that it requires high initial costs. Apart from being reliable, it has little relevance. The savings are minimal. The lifespan of this system is great. Efficiency is more. The great advantage of this system is that it provides continuous power supply. This hybrid system is designed to meet the energy requirement. With the use of a hybrid system, transmission costs are reduced in remote areas, as they can be established there to provide powe.

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II. PROBLEM STATEMENT

Renewable energy is gaining momentum as a source of energy as petrol prices fluctuate. At the level of education, it is therefore important that engineering and technical students have an understanding and awareness of technology related to renewable energy. One of the most popular renewable energy sources is solar energy. A lot of research is being done to develop alternatives to increase the efficiency of Photo Voltaic systems (solar panels). One such method is to use a solar panel tracking system.

A. Key Statement

1) Install sources such as horizontal axis wind turbines to increase power outages.
2) Also add a solar system to generate electricity.
3) Create a similar model that will be able to reflect system features and functionality as needed..

III. OBJECTIVES

1) Design a wind power system to generate electrical air flow.
2) Design a solar system that can absorb sunlight.
3) Reducing installation and operating costs that provide high reliability.
4) Combine the whole program to create a mixed power supply, which will help provide maximum power to any industry or area.

IV. SCOPE OF THE PROJECT

1) It is a design method for high efficiency turbine modification to bring high power to load, battery, in the case of an independent air system.
2) Save space.
3) It does not need oil.

V. BLOCK DIAGRAM

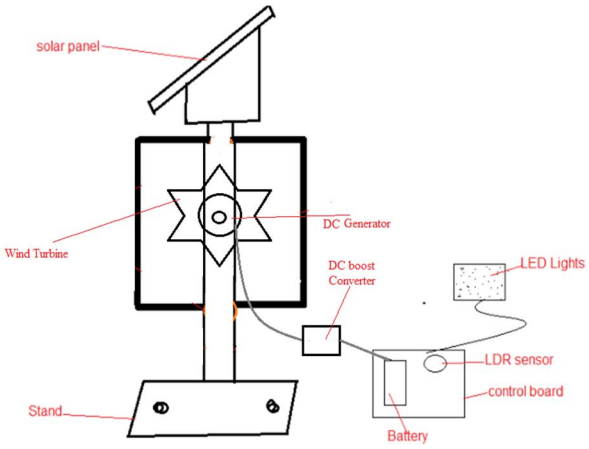

Figure 1. Block Diagram of system

VI. WORKING

1) Hybrid systems are basically a combination of solar panels and wind turbine, the output of which is used to charge batteries, this stored energy can then be transferred to local power stations.
2) In this system a wind turbine can be used to generate electricity where the wind is present and solar panels are used where the sun's rays are. Power can be generated by both phases at the same time as well.
3) Use of batteries to provide uninterrupted electricity supply. This program requires a high initial investment. But honesty, longevity and a little care make that worse. The wind turbine output power is DC converted to AC with the help of an inverter.
4) Now the amount of electricity needed can be generated depending on the environment, using two systems at the same time or using only one, depending on the conditions..

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VII. HYBRID WORKING PRINCIPLE

We are now more interested in the use of renewable energy sources as an alternative to generating electricity. Hybrid systems are basically a combination of solar panels and wind turbine, the output of which is used to charge batteries, this stored energy can then be transferred to local power stations. In this system a wind turbine can be used to generate electricity where air is available and solar energy panels are used where the sun's rays are. Power can be generated by both phases at the same time as well. Battery use to provide uninterrupted power supply. This program requires a high initial investment. But honesty, longevity and a little care make that worse. The wind turbine output power is DC converted to AC with the help of an inverter.

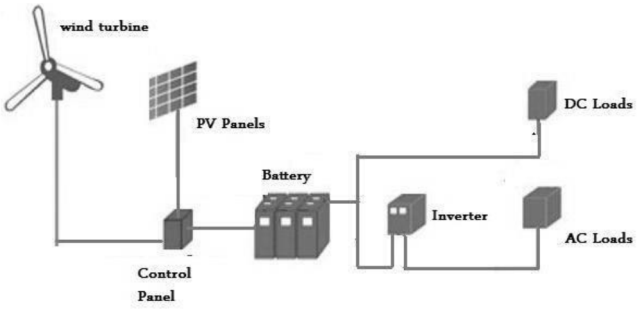

Figure 2. Hybrid Systems

Now the amount of electricity needed can be generated depending on the environment, using two systems at a time or using only one, depending on the conditions.

VIII. PROPOSED CALCULATIONS

Total energy generated by the system is the total energy generated by the solar PV panel and the power generated by the wind turbine. According to statistics, it can be represented by,

PT = NW * Pw + Ns * PS
There,
Total energy generated = PT
Power generated by wind turbines = PW
Energy produced by solar panels = PS
Wind turbine number = NW
Number of solar panels used = NS

A. Calculations for Wind Energy

The energy produced by wind power is provided by,
Energy = (air density * swept area * cubed velocity) / 2
PW = ½. ρ (AW) (V) 3
There,
P is the power in watts (W)
ρ air pressure per kilogram per cubic meter (kg / m^3) AW area of air per square meter (m^2) V wind speed per meter (m / s).

B. Calculations for Solar Energy

To determine the size of the PV modules, the required power consumption should be measured. Therefore, power is calculated as
PS = Ins (t) * AS * Eff (pv)
There,
Ins (t) = separation at t (kw / m2)
AS = one PV panel area (m2)
Effpv = full efficiency of PV panels and dc / dc converters.
The overall efficiency is provided by,
Eff (pv) = H * PR

There,
H = Annual rate of solar radiation on oblique panels.
PR = Performance rate, loss coefficient.

C. Cost

The total cost of a solar-wind energy system depends on the total number of wind turbines used and the total number of solar panels used. The total cost is therefore provided as follows

Total Cost = (Wind Turbine Number * Cost of One Wind Turbine) + (Solar Panel Number * Cost of One Solar Panel) + (Number of Batteries Used in Battery Bank * Cost of One Battery)

CT = (NW * CWT) + (NS * CSP) + (NB * CB)

There,
CT is the total cost per Rs
CWT is the cost of a single wind turbine
CSP costs one day panel per Rs
CB One Battery Cost Rs
NW is the amount of wind turbine used
NS is the number of solar panels used
NB is the number of batteries used in the Battery Bank.

IX. ADVANTAGES WITH HYBRID SYSTEM

1) During the rainy season and winter the amount of sunlight is insufficient as this season energy is complemented by the wind energy system.
2) Due to climate change when there is a lack of wind power beyond the power provided by solar panels.
3) Low operating costs and maintenance costs make you a savings.
4) Used in any place whether it is remote or crowded.
5) Efficient power generation
6) Solar and wind sites benefit the environment as they will reduce carbon and other harmful pollutants by about 90% in the area..

X. APPLICATIONS

1) Distributed electricity generation
2) Hospital, Hotels, Guest House etc.
3) Electricity installation in remote and rural areas.
4) Street lighting.
5) Transfer and contact Tower with multiple application

XI. RESULT AND DISCUSSION

This is a model of the solar-wind hybrid system, the system-developed power is transferred to the load as shown in the picture. The output voltage and power of the solar panel, wind turbine, batteries and load are measured more accurately and the final results are calculated. The amount of energy produced and used is measured.

Aerodynamically, it is a drag-type device, consisting of two or three scoops. If you look down at the rotor from the top, the two scoop machine will look like an "S" shape in the cross section. Due to the bend, the scoops face less drag when opposed to the wind than moving with the wind.

Differential suction causes the wind turbine to rotate Because they are gravity type tools, wind turbines emit much less wind energy than other lifting turbines of the same size. A large swept area of the air rotor may be close to the ground, if it has a small ladder without extended transmission, making the total power output inefficient due to the low wind speed found at high altitudes.

A. Solar-PV Wind Power hybrid power is Provided Below

PV Array Power = 20 watts
Air / generator engine = 3W
Electrical power of the system = 48V
Battery = 12V
Inverter Rate (VA) 25
The outgoing AC Wave makes a Sine-wave
Output AC Voltage (Vnom), +/- 10% = 230 V / AC Output Ac frequency, Hertz, +/- 0.5% = 50 Hz.

XII. CONCLUSION

Developing hybrid systems is one of the simplest and most efficient solutions for generating electricity compared to non-renewable energy resources. Not only is it expensive but it also does not cause environmental damage. Also, it can be used to generate electricity in hilly areas, where it is difficult to transfer electricity in normal ways. Depending on the need the setting can be determined. All the people in the world should be encouraged to use extraordinary resources to generate electricity so that they can be relatively reliable. Longevity, minimal care is one of your best places. It just needs a higher initial investment.

As we know the mixed system has additional production costs per unit but uses the resources available effectively. This Hybrid program is also capable of recovering from any accidental or unwanted situation. And the hybrid system is able to harness power in remote and rural areas. So it is clear that the Hybrid system is the best choice.

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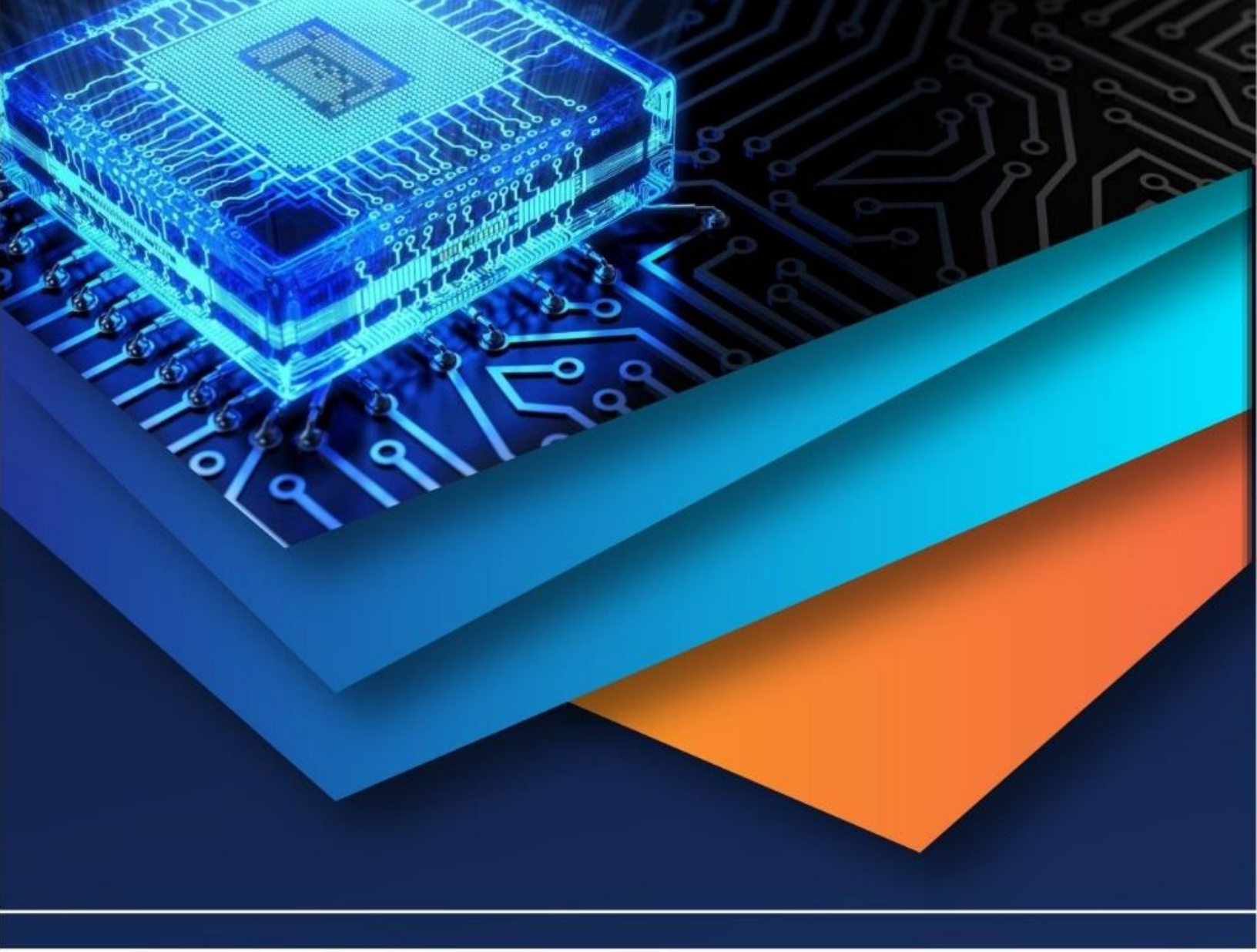

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