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Energy Generation using Hybrid System of Horizontal Axis Wind Turbine and Solar Panel

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Abstract: *This paper discuss about the construction of a Horizontal axis wind turbine that will be combined with a solar panel to create direct current (DC) electricity that will be used to charge a battery. This system will meet the house's basic electrical needs. A variety of designs were examined in terms of wind turbine was selected based on literature. The major goals of this project are to decrease pollution and preserve the environment by reducing the use of fossil fuels, increasing windmill power output, and developing hybrid machines to create more electricity with zero emissions. In the pursuit of sustainable and renewable energy sources, the integration of multiple technologies has emerged as a promising solution. One such innovative approach is the hybrid system of vertical axis wind turbines (VAWT) and solar energy generation. Harnessing the power of wind and sunlight, this hybrid system offers a synergistic and efficient approach to energy production. By combining these two renewable sources, we can achieve a more reliable and consistent energy supply while minimizing the environmental impact*

Keywords: Renewable Energy, Generator, Inverter Circuit, Horizontal Axis Wind Turbine, Wind Energy, Solar Panel

I. INTRODUCTION

There are two ways of electricity generation either by conventional energy resources or by non-conventional energy resources. 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. And it also damages the nature. The nuclear waste is very harmful to human being also. The conventional energy resources are depleting day by day. Soon it will be completely vanishes 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. There are many non- conventional energy resources like geothermal, tidal, wind; solar etc. the tidal energy has drawbacks like it can only implemented on sea shores. While geothermal energy needs very lager step to extract heat from earth. Solar and wind are easily available in all condition. The non-conventional energy resources like solar, wind can be good alternative source. Solar energy has drawback that it could not produce electrical energy in rainy and cloudy season so we need to overcome this drawback we can use two energy resources so that any one of source fails other source will keep generating the electricity and in good weather condition we can use both sources combine. In these project used a HAWT instead of HAWT. Hence these projects are based on the combination of two energy source wind and solar.

Solar panels utilize photovoltaic cells to directly convert solar radiation into usable energy, providing a clean and abundant source of power. With advancements in solar panel efficiency and cost reduction, solar energy has become increasingly accessible and viable for widespread adoption. By integrating horizontal axis wind turbines and solar panels into a hybrid system, we can take advantage of their complementary characteristics. Wind power tends to be more prevalent during certain seasons or times of the day, while solar energy generation is maximized during daylight hours.

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II. LITERATURE SURVEY

For our project we are surveying some reports and references which are helping us to make it easy and simplest and they are as follows

S. Jain, and V. Agarwal, "An Integrated Hybrid Power Supply for Distributed Generation Applications Fed by Nonconventional Energy Sources," in these chapter a review of the literature is suggested about the modern techniques use in a hybrid power generation, its control and monitoring. Also introduce to the equipment's for controlling the hybrid power generation [1].

A. O. Ciuca, I. B. Istrate, and M. Scripcariu, "Hybrid Power-Application for Tourism in Isolated Areas," in these chapter a review of the literature is suggested about the regulatory changes has brought increasing opportunities for distributed power generation at small scale for meeting the requirements of a single house, a community, a commercial activity in an efficient way close to the point of demand than main grid connected to a large centralized power plant [2].

Non-conventional energy sources by smt. C. K. Rai, in these chapter a review of the literature is taken about how the actual hybrid power plant is being constructed in large scale, as it is very easy to set up a hybrid power plant [3].

Ahmed et al., "Power Fluctuations Suppression Of Stand-Alone Hybrid Generation Combining Solar Photovoltaic/Wind Turbine And Fuel Cell Systems, Energy Conversion," in these chapter a review of the literature is taken about a hybrid system model that included fuel cell generation along with wind and solar power. The fuel cell system was used as a backup resource, where as the main energy sources were the solar and wind systems. Results demonstrate that the system is reliable and can supply high-quality power to the load, even in the absence of wind and sun [4].

Deshmukh and Deshmukh, "Modeling of hybrid Renewable Energy Systems", Renewable and Sustainable Energy Reviews, in this chapter a review of the literature is discussed about methods of modeling and designing hybrid renewable energy systems, and also issues involved in increasing the penetration of such systems [5].

Yang et al., "Weather data And probability analysis Of hybrid photovoltaic-wind power generation systems" in these chapter a review of the literature is taken about the development of a hybrid wind/solar system which are used to calculate optimized combinations of PV module, wind turbine design of a hybrid power generation system, with the objective of maximizing power, while minimizing cost [6, 7].

Tina et al., "Hybrid solar/wind power system probabilistic modeling for long-term performance assessment", in these chapter a review of the literature is taken about assessed the long-term performance of a hybrid wind/solar power system for both standalone and grid-dependent applications by using a probabilistic approach to model the uncertain nature of the load and resources [8].

III. METHOD OF DISEASE DETECTION

Solar energy is one of the major renewable energy sources that can consist of three major blocks namely solar panel, solar photovoltaic cell, and battery. The electrical energy generated using solar panel can be stored in battery or directly used for equipment. Solar panel works by allowing photons, or particles of light, to knock electron free from atoms, generating a flow of electricity. Solar panels actually comprises many, smaller units called photovoltaic cells. Many cells linked together make up a solar panel. Each photovoltaic cell is basically a sandwich made up of two slices of semi conducting material, usually silicon. To work photovoltaic cell need to establish an electric field. Much like a magnetic field, which occur due to the opposite poles, an electric field occurs when opposite charges are separated. To get this field, manufacturers dope silicon with other materials, giving each slice of the sandwich a positive or negative electrical charge. Specifically, they seed phosphorous into the top layer of charges silicon, which add extra electron, a negative charge, to that layer. Meanwhile, the bottom layer gets a dose of boron, which results in fewer electrons, or positive charges. This all adds up to an electric field at the junction between the silicon layers. Then, when photons sunlight knocks an electron free, the electric field will push that electron out of the silicon junction. A couple of other component of the cell turns this electron into usable power. Metal conductive plates on the side of the cell collect the electron and transfer them to wires

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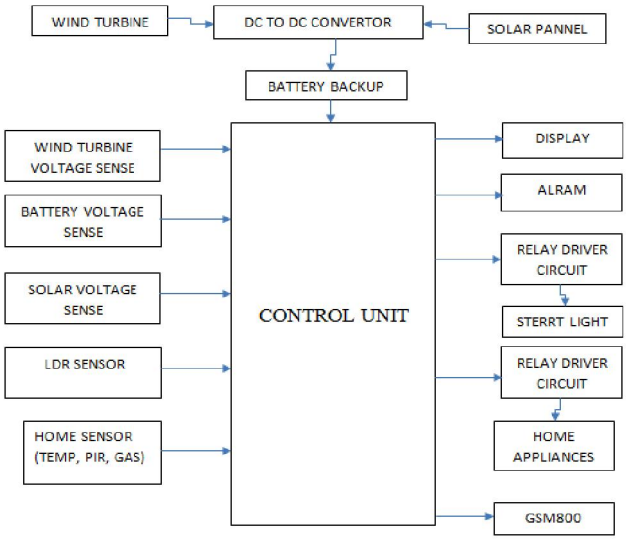

Fig. 1. Block Diagram

Wind energy is also one of the renewable energy source that can used for generating electrical energy with wind turbine coupled with generator. These system mainly consist of wind turbine, gear box and dc generator. Overall, when the wind is blowing, turbine are rotate, EMF is induced which will cause a current flow. When shaft is rotate mechanism is rotate because mechanism is fixed on shaft. This rotary motion is converted into maximum rpm of the gear box, the generator is directly connected to the gear box, which is directly converted into electrical energy or give the output.

3.1 PIC18f4520 Microcontroller

The PIC18F4520 is a 28/40/44-Pin, High-Performance, Enhanced Flash, USB Microcontrollers with nanoWatt Technology. The following are the features:-

- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
  - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
  - Compare is 16-bit, max. resolution 83.3 ns (TCY)
  - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
  - Multiple output modes
  - Selectable polarity
  - Programmable dead time
  - Auto-shutdown and auto-restart
- Enhanced USART module: LIN bus support

Fig. 2. PIC 18f4520

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3.2 LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

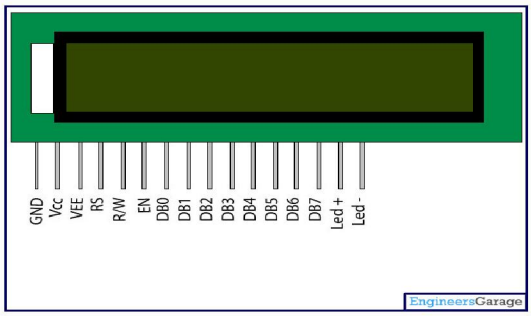

Fig. 3. LCD Display

3.3 Solar Panel

Photovoltaic solar panels absorb sunlight as a source of energy to generate electricity. A photovoltaic (PV) module is a packaged, connected assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.

Fig. 4.Solar Panel

3.4 Horizontal Axis Wind Turbine

Horizontal axis wind turbines are the most commonly used type of wind turbine. They can be defined as the turbine in which the shaft of the rotor is in the direction of the wind as shown in Fig. 6.4. The wind turbine could be single-bladed, double-bladed, or three-bladed. The blades are aerodynamically designed that rotate by the aerodynamic lift of the force. The pressure difference is created between the upward and lower faces of the turbine blades. The speed of air through the front side of the blade is high and a low-pressure area is created there. On the other hand, airspeed is low on the rear side and a high-pressure area is created there. The air from the high-pressure region moves the blades upward giving an aerodynamic lift.

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Fig. 5.Horizontal axis wind turbine

3.5 GSM SIM 800

The Sim800C GPRS/GSM Shield with Antenna provides you with a way to use the GSM phone network to receive data from a remote location and it is compatible with all boards which have the same form factor (and pinout) as a standard Arduino Board. This shield can also be applied to DIY phones for calling, receiving and sending messages, making GPS trackers or other applications like Smart home, etc.

Fig. 6.GSM SIM 800

IV. CONCLUSION

As mentioned in the paper this combination of solar and wind is better than each individually. This is the safe and free energy to save the planet. Because of the somewhat complementary nature of the seasonal profile, It will get higher efficiency than individual systems. Horizontal axis wind energy conversion system is practical and potentially very contributively to the production of clean renewable electricity from the wind even under less than ideal conditions. . It is hoped that they may be constructed used high strength, low- weight materials for deployment in more developed nations and settings or with very low tech local materials and local skills in less developed countries.

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