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Solar-Wind Hybrid Energy Generation System

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Abstract: Energy is essential for the economic growth and social development of any country. The world facing the problem of power generation. The fossil energy sources are limited and needed to use properly. This power generated increases the greenhouse effect. The used of the combined solar and wind power system can be more benefits in order to make useful throughout year. In this presented research the review is carried out on the different types of solar and wind associated hybrid system for developing the proposed research study.

Keywords: Solar, Wind turbine, Arduino UNO, LCD, Inverter.

I. INTRODUCTION

We require electricity for operating most the appliances we use in our day to day life. So, it has become an indispensable part of our life. Now there are two ways to supply electricity first by using non-renewable sources of energy and second by renewable sources of energy. With increase in population and advancement of technology, consumption of electricity is additionally increasing exponentially. Simultaneously, we've to extend the assembly of electricity also so as to satisfy the stress of growing population. The biggest disadvantage with the usage of conventional resources is that their usage causes pollution thanks to the assembly of varied pollutants like ash just in case of a coal power plant, smoke just in case of diesel power station, material just in case of atomic power plant. Maintaining these pollutants is not an easy task and it also requires a lot of money. So, we have to find some other methods to produce electricity. The best possible way is by using non-conventional sources of energy. Out of all the possible options available in non-conventional sources of energy, solar and wind are the simplest methods. As tidal energy is often used only on the ocean shores, ocean thermal energy can utilize in the centre of the ocean and its setup is additionally very difficult. While solar and wind are available altogether the areas of the planet and fixing their power, station is additionally not a cumbersome task. The availability of solar power could be a major concern, because it is accessible for around eight hours during a day, on the opposite hand wind is accessible nearly for twenty-four hours. But we can do one thing to make up for that problem by integrating these two together. During foul weather one among them are often used while during normal weather both are often operated together. So, in this paper we will be describing a hybrid power system.

II. LITERATURE SURVEY

Ashish S. Ingole et al. (2015) Now a day's electricity is most needed facility for the human being. All the conventional energy resources are depleting day by day. So, we have to shift from conventional to non-conventional energy resources. In this the mixture of two energy resources is takes place i.e. wind and solar energy. This process reviles the sustainable energy resources without damaging the character. We can give power by using hybrid energy system. Basically, this technique involves the mixing of two energy system which will give continuous power. Solar panels are used for converting solar power and wind turbines are used for converting wind energy into electricity. This electrical power can utilize for various purpose. Generation of electricity are going to be takes place at affordable cost. This paper deals based on generation of electricity by using two sources combine which results in generate electricity with affordable cost without damaging the character balance.

J.Godson et al. (2013) Renewable energy sources i.e., energy generated from solar, wind, biomass, hydro power, geothermal and ocean resources are considered as a technological option for generating clean energy. But the energy generated from solar and wind is far but the assembly by fossil fuels, however, electricity generation by utilizing PV cells and turbine increased rapidly in recent years. This paper presents the Solar-Wind hybrid power grid that harnesses the renewable energies in Sun and Wind to get electricity. System control relies mainly on micro controller. It ensures the optimum utilization of resources and hence improve the efficiency as compared with their individual mode of generation. Also it increases the reliability and reduces the dependence on one single source. This hybrid solar-wind power generating system is suitable for industries and also domestic areas.

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Ali Diabat (2014) Among the wide range of problems facing our world today, there is global consensus that Greenhouse Gas (GHGs) emissions have the largest negative impact on our environment. GHGs include carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydro fluorocarbons and perfluorocarbons. These gases help maintain the temperature of the world at comfortable levels for organisms, and a decrease in their levels would end in a temperature that would be too low for us to survive. However, because GHGs allow sunlight to enter the atmosphere, but trap the heat radiated off the earth's surface, an increase in these emissions would result in an increase of the planet's temperature, or global warming, to levels that could be fatal to living organisms. Many scientists also believe that the increase in natural disasters is fueled by climate change, since atmospheric and oceanic patterns shift as the Earth's temperature increases.

Karim Mousa et al. (2014) Although solar and wind energy are two of the most viable renewable energy sources, little research has been done on operating both energy sources alongside one another in order to take advantage of their complementary characters. In this paper, we develop an optimal design for a hybrid solar-wind energy plant, where the variables that are optimized over include the amount of photovoltaic modules, the wind turbine height, the amount of wind turbines, and therefore the turbine rotor diameter, and therefore the goal is to attenuate costs. Simulation studies and sensitivity analysis reveal that the hybrid plant is in a position to take advantage of the complementary nature of the 2 energy sources, and deliver energy reliably throughout the year.

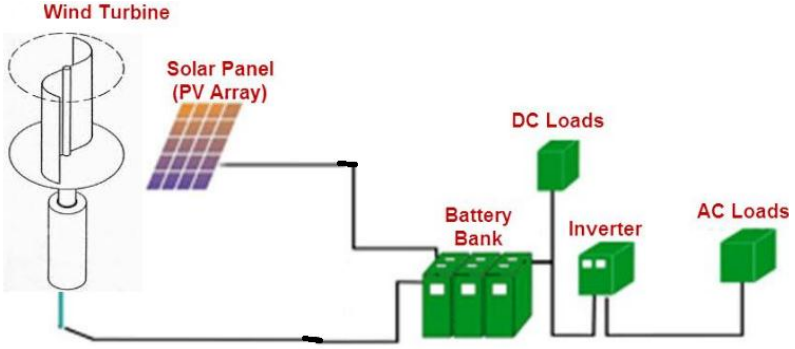
Medugu et al. (2014) A hybrid power system consisting of PV-arrays and wind turbines with energy storing devices (battery bank) and power electronic device was designed and constructed in this paper. The system is aimed at the production and utilization of the electrical energy coming from more than one source, provided that at least one of them is renewable. The integration of the hybrid is to electrify a residential house and its surrounding in order to reduce the need for fossil fuel leading to an increase in the sustainability of the power supply. This approach is techno-economically viable for rural electrification.

Yazhini.B et al. (2017) In this paper, it reviews some communication technologies available for grid integration of renewable energy resources. Since most renewable energy sources are intermittent in nature, it's a crucial task to integrate a big portion of renewable energy resources into the facility grid infrastructure mainly the electricity flow takes place in one direction from the centralized plants to consumers. When compared to large power plants, a renewable energy plant has less capacity. But as emerging resources renewable energy should be taken into account.

V. K. Gajbhiye et al. (2017) Energy is essential for the economic growth and social development of any country. The world facing the problem of power generation. The fossil energy sources are limited and needed to use properly. This power generated increases the greenhouse effect. The used of the combined solar and wind power system can be more benefits in order to make useful throughout year. In this presented research the review is carried out on the different types of solar and wind associated hybrid system for developing the proposed research study.

III. BLOCK DIAGRAM AND DESCRIPTION

Hybrid Systems Now we've become even more curious about usage of renewable energy sources as an alternate method of manufacturing electricity. Hybrid systems are basically an integration of solar panels and turbine, the output of this combination is employed to charge batteries, this stored energy can then be transmitted to local power stations. In this system turbine are often accustomed produce electricity when wind is out there and solar power panels are used when solar radiations are available. Power can be generated by both the sections at the same time also. The usage of batteries is to provide uninterrupted power supply. This system requires high initial investment. The power output of the turbine is AC which is converted to DC with the assistance of a rectifier. The Arduino controller is used in the system to control the switching between the converters with the help of a driver circuit.



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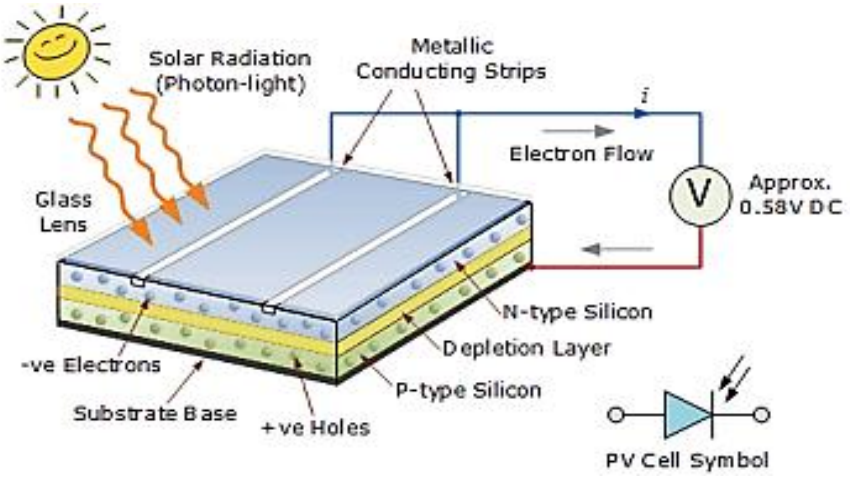
IV. HARDWARE REQUIREMENTS

For building prototype module we need following components.

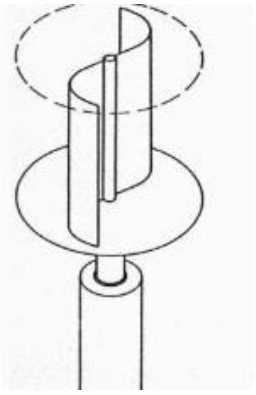
A. Solar Panel

Solar Panels A solar cell is used to convert solar energy into electric energy, it is also known as photovoltaic cell. It is a p-n junction diode which consist of two different layers of a semiconductor material called as n and p region, n region is thin while p region is lightly doped. The radiation falling on the surface of contact diode can undergo the n side. Most of the depletion region is contained in the p region which is lightly doped. The extent to that the n region may be penetrated is set by the wavelength of the falling radiation. Electron–hole pairs square measure generated within the n and p region, because of the difference in potential the electrons move to the n region and holes towards the p region. The current starts flowing when an external load is connected to the terminals of the n and p regions. To make a solar array multiple solar cells are connected serial and parallel combinations, they're connected in such how that the output obtained is additive in nature.



B. WIND TURBINE

Wind Turbine Wind is a renewable source of energy. This turbine is used to convert the kinetic energy of the wind into electric. The generator connected to the shaft of the blades converts the energy to electrical energy. The wind turbine is of two types depending upon the rotating axis of the blades, first is vertical axis wind turbine and horizontal axis wind turbine. The yield of the turbine depends on the speed of the wind. The power generated by the turbine is fluctuating. In order to get continuous provide of power initial the electricity is keep during a battery unit then it's transferred to the load.



C. BATTERY

Batteries The batteries are utilized in order to store the electricity that's produced from wind and solar power. The capability of battery might vary reckoning on the dimensions of turbine or solar energy plant. Battery ought to be having low maintenance and charge outflow ought to even be low. Considering of these parameters free discharge type is that the best choice available. Multiple batteries can be connected in series and parallel to increase or decrease the capacity of the battery, depending upon the output from the hybrid systems.

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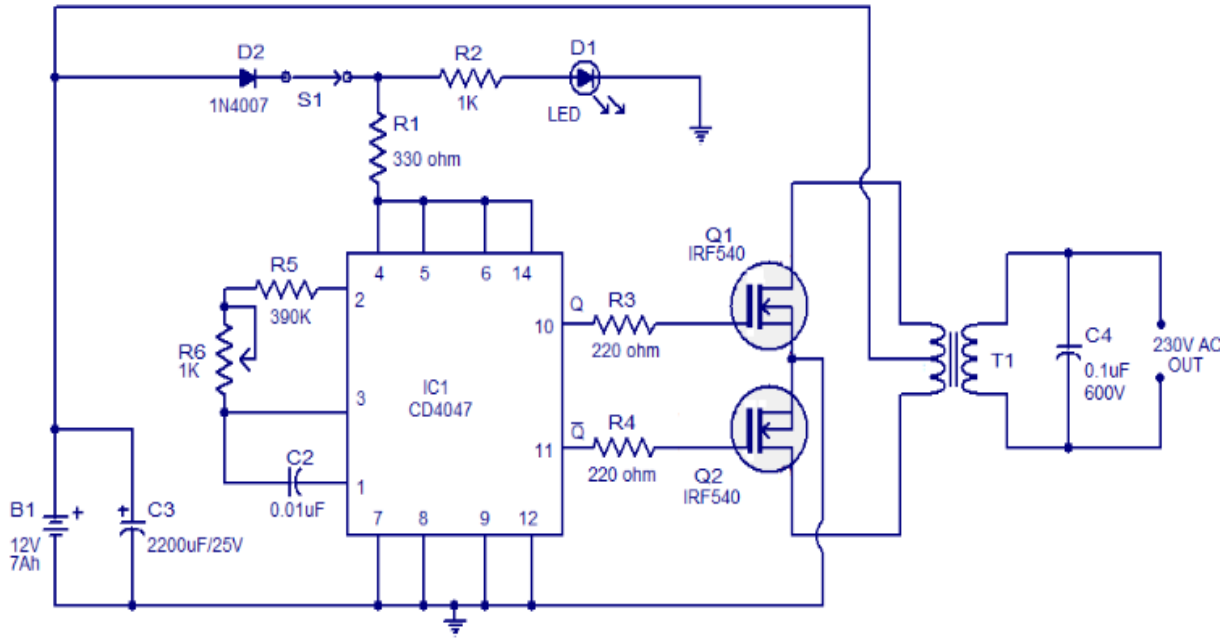
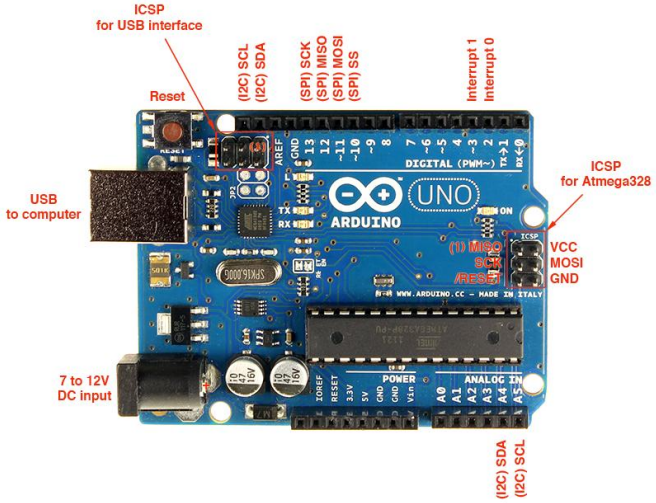
D. INVERTER

A power electrical converter, or inverter, is an electronic device or circuitry that changes Direct Current (DC) to Alternating Current (AC). The input voltage, output voltage and frequency, and overall power handling depend on the look of the particular device or electronic equipment. Inverter As we know that most of the electrical appliances require AC voltage, so first the DC output of the batteries will be converted into AC voltage with the help of an inverter and then it will be transferred to the loads. The inverter must be having over voltage protection, reverse polarity and short circuit protection.



E. ARDUINO:

Arduino/Genuine Uno is a microcontroller board based on the ATmega328P (datasheet). It has fourteen digital input/output pins (of that six are often used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. The Arduino/Genuine Uno board can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power will return either from AN AC-to-DC adapter (wall-wart) or battery. The adapter are often connected by plugging a a pair of.1mm centre-positive plug into the board's power jack. Leads from A battery are often inserted within the GND and input voltage pin headers of the power connecter. The board will operate AN external provide from six to twenty volts. If equipped but 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If mistreatment over 12V, the transformer could overheat and harm the board. The recommended range is 7 to 12 volts.



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V. CONCLUSION

Developing hybrid systems is one among the foremost convenient and effective answer for manufacturing electricity as compared to non-renewable energy resources. It is not only less costly but also it does not cause any harm to the environment. Another thing is that it are often accustomed generate electricity in hilly areas, where it's quite difficult to transmit electricity by conventional methods. Depending on the need its setup are often decided. All the people during this world should be motivated to use non-conventional resources to supply electricity so as to create them self-reliable to some extent. Long life, less maintenance are a number of its and purpose. It just requires some high initial investment.

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