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HYBRID SOLAR & WIND SYSTEM

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ABSTRACT

Solar power and wind power generation had been used as a renewable energy since years ago. Residential that uses Hybrid power as their alternative power supply will bring benefits to them. The main objective of this project is to develop an automatic solar tracking system which will keep the solar panels aligned with the Sun in order to maximize in harvesting solar power along with a wind power generation setup as an alternative source. The solar tracking system tracks the maximum intensity of light. When the intensity of light is decreasing, this system automatically changes its direction to get maximum intensity of light. LDR light detector is used to trace the coordinate of the Sun. While to rotate the appropriate position of the panel, a DC geared motor is used. The system is controlled by two relays as a driver and a microcontroller as a main processor. This project is covered for a single axis and single source. It is designed for residential and agricultural usage. Finally, the project is able to track and follow the Sun intensity also winds power generation allows energy storage in order to get maximum power at the output regardless motor speed. Keywords: Hybrid system, solar energy, Wind energy, Sun tracking system, Microcontroller.

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I. INTRODUCTION

Nowadays the globe is progressing rapidly with a fast rate use of renewable energy sources. Energy is critical to the economic growth and social development of any country. Native (indigenous) energy resources need to be developed to the optimum level to minimize dependence on imported fuels subject to resolving economic, environmental and social constraints. The renewable energy system involves sources such as wind, solar, biomass etc. For power generation. The renewable energy sources are available in plenty; free of cost and it is pollution free. So it's a great time to switch over to the renewable energy sources and to restrict non renewable energy sources. As many are looking at sustainable energy solutions to pressure the earth for the future generations. Besides hydro power, wind and photovoltaic energy clasp the most potential to link up our energy demands. Alone wind energy is capable of supplying substantial amount of power but its presence is highly unpredictable as it can be here one moment and gone in next. In similar way solar energy is present for the whole day but the solar irradiation levels vary due to sun intensity and unpredictable shadows cast by trees, birds, clouds etc. The common inherent drawback of wind and photovoltaic systems are their intermittent natures that make them unreliable. However, by combining these two intermittent sources and by incorporating maximum power point tracking algorithms, the systems power transfer efficiency and reliability can be improved significantly. When a source is unavailable or insufficient in meeting the load demands, the other energy source can compensate for difference. In which Hybrid Solar and Wind energy system are using solar panels and wind turbine generators to generate electricity. The plan of combining these energy sources is to get continuous power during day and night also. This will achieve by Hybrid Solar and Wind Energy System.

II. METHODOLOGY

In this project we are using LDR. LDR are used as the main light sensors. Two DC gear motors are fixed to the structure that holds the solar panel. LDRs sense the amount of sunlight falling on them. Four LDRs are divided into top, bottom, left and right.

For east – west tracking, the analog values from two top LDRs and two bottom LDRs are compared and if the top set of LDRs receive more light, the vertical servo will move in that direction and If the bottom LDRs receive more light, the servo moves in that direction.

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For angular deflection of the solar panel, the analog values from two left LDRs and two right LDRs are compared. If the left set of LDRs receive more light than the right set, the horizontal servo will move in that direction and If the right set of LDRs receives more light, the servo moves in that direction.

The DC energy is generated from solar panel gets stored in batteries Similarly the energy is generated from windmill also gets stored in battery Further these batteries are connected to an inverter which converts dc supply into ac supply then this supply is fed through step up transformer toapplication.

III. MODELING AND ANALYSIS

In this project we have taken 2 servo motors one is for x direction and other is for y direction. Then we will decide the angle of panel at what angle we have to set arduino microcontroller so that it can operate at 12v.As if we directly connect arduino to 12v then there is a possibility that it will get damaged. That's why we have connected a switch through two diodes through a large capacitor. The reason for connecting capacitor is that if there is hysteresis or distortion available then it will filter them. After that we will take regulator IC we will give 12v to the regulator IC through a battery. Arduino kit, servo, LDR is operating at 5V. At a time when all the devices start consuming 5V then in regulator IC there will be a chances of loading from which the regulator IC output may drop. If regulator IC output is doped then the microcontroller will reset. In an arduino microcontroller we have interface 4 LDR sensor i.e. their output will be variable means they will not be constant. It will vary according to the light conditions. So we connect analog A0, A1, A2, and A3 to the LDR and in A4 and A5 we connect in servo motors. In servomotors there are three connections brown, red and yellow. LED is being placed to let us know that from solar panel power is generating or not. From that LED 11.7V is generating that will be get back to battery. If the generator is rotating clockwise or anticlockwise still electricity should be generated also we have connected 4 diode bridges to the generator and LED is also mounted on it. As we know that LED is a semiconductor device which operates at forward bias. And we have connected one LED to the bridge as well which generates 0.7V drop.

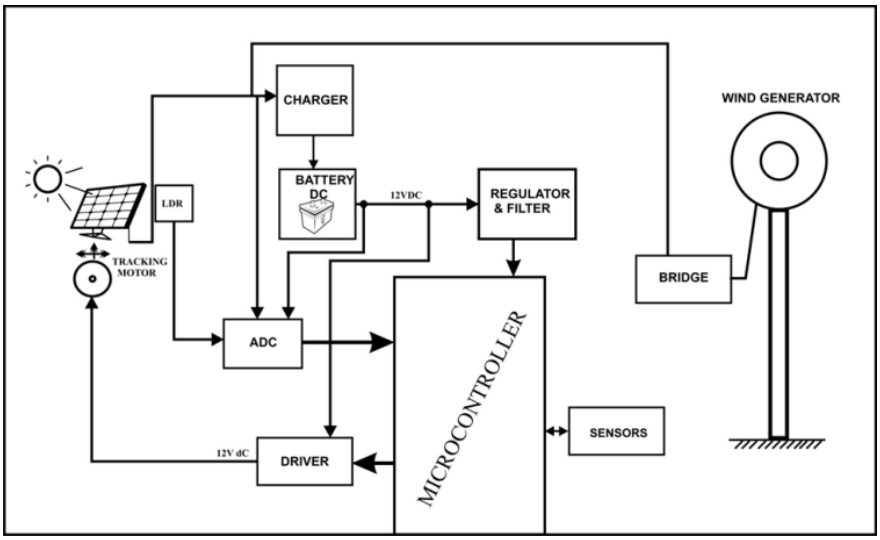

Figure 1: Block Diagram

IV. RESULTS AND DISCUSSION

OUTPUT POWER

1. Wind power generator = 36V 150mA at 700rpm

When blades of the wind turbine rotate with the speed of 700rpm then the in return rotation of generator axis generates the output of 36V voltage and 150mA current.

Total Power generated from wind generator = 5.4W

Total power (p) = V*I

V = 36V

I = 150mA

P = 36*150*10^-3 = 5.4W

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2. Solar power generation= 9V, 220mA (Mono-crystalline) When a solar panel of 9V and 220mA gets exposed to the sun rays generates output of 2W in one hour. Total Power generated from solar generation = 2W Total power (p) = V*I

V = 9V

I = 220mA

P = 9*220*10^-3 = 1.98W ~= 2W

3. Total Power generated from both sources i.e. solar and wind is as follow P = 5.4+2 = 7.4W
Now, from morning 9 am to 5 pm = 9 hours 4. Total power generated in a day = 7.4*9 = 66.6W

CONSUMPTION OF POWER

1. Battery used in project is of 12V, 2AH
Total current required to generate 7.4W power as output is given by

P = I*V

I = Total power/ Voltage supplied

= 7.4 /12 = 0.62A

2. Current required to charge the battery in 2 hours = 0.62 /2 =0.31A
3. Maximum load can be connected = 7.4W max output
4. Consumption of power by : -

- Arduion = 30mA
- Servo =30mA
- LDR = 30mA

Voltage of the solar panel is 9V.
Therefore, Total power consumed is

P = I*V

P = 90mA*9V

P = 0.81W

Now, from morning 9 am to 5 pm = 9 hours
5. Total Power Consumption in a day = 0.81W *9 = 7.29W
Hence, This Hybrid system is efficient to use as the amount of power generated is 66.6W which is much greater than the amount of power consumed i.e. 7.29W.

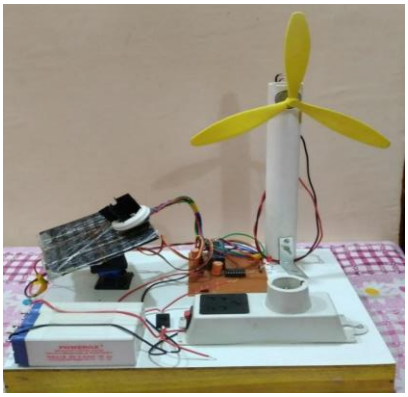

Fig 2: Hybrid system hardware setup

V. CONCLUSION

Using normal solar panel will generate the fixed amount of power. On other hand considering dual axis tracker, the solar panel moves in all direction. Therefore, it will track large amount of solar energy which means more amount of electrical energy is being produced also in addition with solar tracker an alternate energy source i.e. wind mill is also attached for increasing and efficient production of electricity. The Renewable energy (here considering solar and wind energy sources) is important in our life because the nonrenewable such as fossil fuel contribute significantly too many of the environmental problems we face today. In this study the solar and wind energy can be used to generate electricity. Photovoltaic cell systems and horizontal axis wind turbine with

generator system converts sunlight and wind directly into electricity. PV cell onsists of semiconducting material that absorbs the sunlight.

ACKNOWLEDGEMENTS

It is our immense pleasure to present project report on "HYBRID SOLAR AND WIND SYSTEM" and a matter of pride that we have successfully completed this project work. "Perseverance, inspiration and motivation have always played a key role in the success of any venture." At this level of understanding, it is often difficult to work under the wide spectrum of knowledge without proper guidance and advice. Hence, guide Mr. Prafull M. Tarwatkar, who over the period, has rendered his valuable guidance and without whose advice this project work would not been successful. We are extremely grateful to our respected Head of The Department Prof. Nitin K. Dhote for fostering and providing an excellent academic climate in institution which has made this endeavor possible. We feel fit occasion to open our heart to express our tender feelings and sense of gratitude to the principal Dr. Surendra V. Gole and the institution St. Vincent Pallotti College of Engineering and Technology, Nagpur which has provided us our most cherished goal in life to become Electrical Engineers. WE also express our gratitude to all individuals who have provided assistance directly in helping to achieve the best results. At last but not least, we would like to thank all the staff and faculty members of S.V.P.C.E.T., Nagpur for their direct or indirect support.

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