

Solar and Wind Hybrid Power Generation System for Street Light and Highway



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ABSTRACT

In this proposed system, we discuss the universal issues about energy management for renewable resource, Wind / Photovoltaic (PV) hybrid power system in order to improve energy efficiency with LED's as the light source and placing the wind turbine in addition to solar. The LED's are energy saving, high luminous efficiency and high useful life to the proposed system. And in the same way the position of the turbine plays a major role, we had overcome that design for effective power production. By placing the short armed two turbine in the horizontal path due to the too and fro motion of the vehicles air pressure is developed on the blades of the turbine. The pressure is developed from both the directions keeps the turbine in continuous motion of all the vehicles such as Trucks, Lorries and Buses, etc., Due to this, an uninterrupted power generation by solar at day time and whenever the vehicles crosses the path both at day and night the turbine rotates and energy is generated. This would put down the electricity bill and reduce the pollution rate to a certain limit.

Keywords : solar panel, AVR Controller, GSM Modem, RFID

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I. INTRODUCTION

Solar and wind energy is more effective and conventional form of renewable energy available at most it does not depends on any factor, solar energy begins when the day begin and wind is available with a too and fro motion of the vehicle at streets. Much research's are on going to overcome power crisis. The demand in country is hiking each and every day. But, the available power does not meet the requirement. Renewable energy resources must be utilized as much as possible to cut down the demand rate and it's non-polluting. At present, the issue is how to utilize and manage these resources. This paper is proposed to overcome and enhance the power management as said [2], at highways, by acquiring the available energy sources at highways. The proposed system has some advantages such as the energy generated can be utilized not only by street lights but also in traffic signal, and direction and distance indicators.

Working Of Wind Energy:

At Highways there is availability of wind by the motion of moving vehicles. When a free moving air particle is disturbed by forceful object succeeding in its path a pressure is developed at the body of the object and it is delivered to the surrounding near objects. By this phenomenon wind turbine is placed on the top of street light. The wind turbines are not placed in vertical path, but horizontally.

Fig.1, Top View of Wind Generating System As, show above in fig.1, this design will keep the blades in rotational motion since the vehicle are directed towards left and right direction and hence a forceful wind can be obtained when two vehicles crosses the blade evenly. The blades are connected to synchronous generator to maintain the rotational RPM (Rotation per minute) as constant and its performance characteristics.

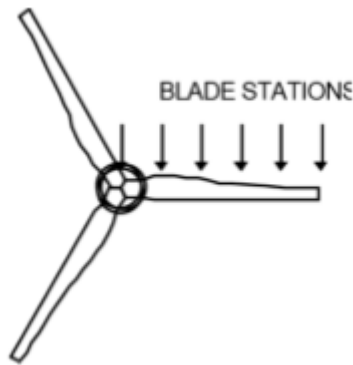


Fig.1, Top View of Wind Generating System

Working of Solar

The solar energy is an uninterrupted source available for the entire nation at least for a few hours. Solar power is available (9am to 6pm) during the day hours. Recently the researchers has made a record by utilizing 44.4% of the energy from solar with Gallium Arsenide [3], [8], [9], at highways there is none street lights placed in a shady area, but only in the middle. Though the solar panel is in middle there will no fluctuation in the power generated by panel it will remain as a default output.

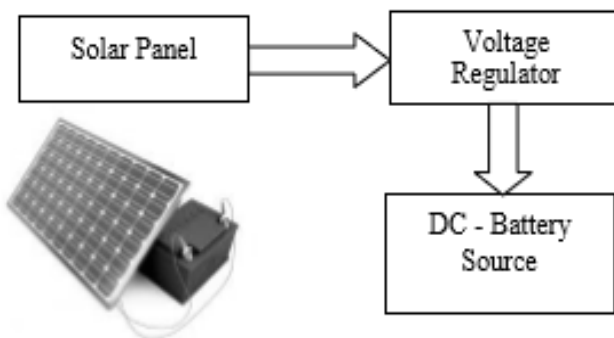


Fig 2. Working of solar system

II. LITERATURE SURVEY

A. Prabodh Bajpai et al. (2010):

In this paper Decentralized distributed generation technologies based on renewable energy recourses such as Solar Photovoltaic (SPV)/ Wind Turbine Generators (WTG) address the major issues concerned with conventional diesel generators to a large extent and are therefore considered as emerging alternate power solutions to stand alone applications. Three standalone WTG power systems using different energy storage technologies, i.e. WTG-Battery system, WTG-Fuel Cell (FC) system and WTG-FC-Battery system are optimized and compared in this paper. The analysis of such hybrid systems feeding a standalone load of 45.6 kWh/day energy consumption with a 2.3 kW peak power demand is carried out using Hybrid Optimization Model for Electrical Renewable (HOMER) software.

B. GM Shafiullah et al. (2010):

Current power systems create environmental impacts due to utilization of fossil fuels, especially coal, as carbon dioxide is emitted into the atmosphere. In contrast to fossil fuels, renewable energy offers alternative sources of energy which are in general pollution free, technologically effective and environmentally sustainable. There is an increased interest in renewable energy, particularly solar and wind energy, which provides electricity without giving rise to carbon dioxide emissions. This paper presents economic analysis of a renewable hybrid system for a subtropical climate and also investigated the impact of renewable energy sources to the existing and future smart power system. Initially total net present cost (NPC), cost of energy (COE) and the renewable fraction (RF) have been measured as performances metrics to compare the performances of different systems. For better optimization, the model has been refined with sensitivity analysis which explores performance variations due to wind speed, solar irradiation and diesel fuel prices.

C. Deepak Kumar Lal et al (2011):

A large proportion of the world's population lives in remote rural areas that are geographically isolated and sparsely populated. This paper proposed a hybrid power generation system suitable for remote area application. The concept of hybridizing renewable energy sources is that the base load is to be covered by largest and firmly available renewable sources and other intermittent sources should augment the base load to cover the peak load of an isolated mini electric grid system. The study is based on modelling, simulation and optimization of renewable energy system in rural area in Sundargarh district of Orissa state, India. The model has designed to provide an optimal system configuration based on hour-by-hour data for energy availability and demands. Various renewable/alternative energy sources, energy storage and their applicability in terms of cost and performance are discussed. The homer software is used to study and design the proposed hybrid alternative energy power system model. The Sensitivity analysis was carried out using Homer program. Based on simulation results, it has been found that renewable/alternative energy sources will replace the conventional energy sources and would be a feasible solution for distribution of electric power for standalone applications at remote and distant locations.

D. S. M. Hakimi et al. (2011):

In this paper, a novel intelligent method is applied to the problem of sizing in a hybrid power system such that the demand of residential area is met. This study is performed for Kahnouj area in south-east Iran. It is to mention that there are many similar regions around the world with this typical situation that can be expanded. The system consist of fuel cells, some wind units, some electrolyzers, a reformer, an anaerobic reactor, and some hydrogen tanks. The system is assumed to be stand-alone and uses the biomass as an available energy resource. System costs involve investments, replacement, and operation and maintenance as well as loss of load costs. Prices are all empirical and components are commercially available. In this study, we consider load growth and different types of load profile for their system. In this village, four types of loads exist such as residential, agricultural, industrial, and official loads.

As we know India required a large amount of energy and it is going to become difficult to fulfill those requirement through the fossil fuel like coal, wood etc. So the country should concentrate on generate clean and low price energy. India required motivating to take advantage of renewable energy sources like Solar, Wind, Hydropower, Fuel cells, Biomass etc. By this paper report we can easily say that the demand of energy may be fulfill by small scale through rooftop, Photovoltaic (PV), Concentrating solar power (CSP), or Wind, Geothermal and conventional Hydropower.

Radio frequency identification (RFID) is a technological tool used for the identification of objects and assets. RFID has attracted extensive interest in recent years because RFID technology has many benefits; for example, non line of sight, contactless, simultaneous collection of data, and high accuracy. RFID systems have been applied in several areas including personal identification, supply chain, food industries, library book tracking, and healthcare. Although RFID systems provide various advantages for several kinds of applications, they have implications for security and privacy concerns [1]–[3]. RFID tags are subject to clandestine (up to few feet) interception, allowing leakage of sensitive personal information [4].

In this paper, we proposed hybrid RFID with an adaptive priority transmission scheme to improve the security of an RFID system. In our model, the confidential information is transmitted using RFID since RFID provides high security to the street light at smart cities.

III. PROPOSED SYSTEM

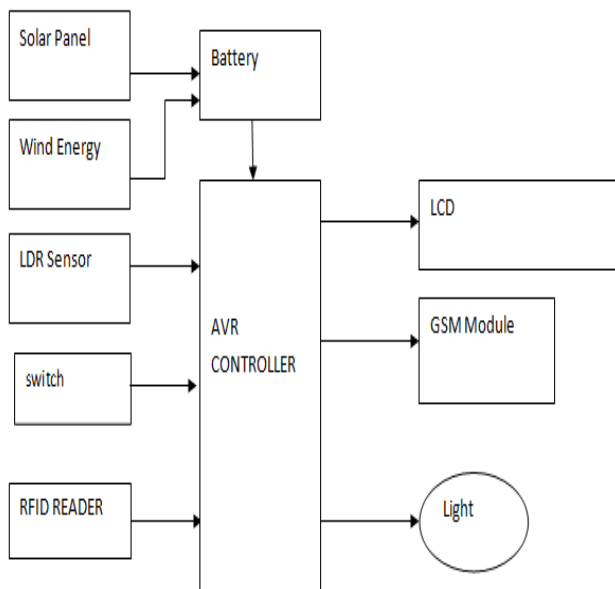


Fig. 3. Block Diagram

As shown in above block diagram we present an hybrid energy system with emergency switch for smart street light. Here input energy source is selected using LDR sensor. Also emergency switch is provided so that any outsider can inform directly to hospitals the particular location using GSM module in case of accidents.

LCD display:

In recent years the LCD is finding widespread use replacing LED's. This is due to the following reason: 1. The declining prices of LCD. 2. The ability to display numbers, characters, and graphics. This is in contrast to LEDs, which are limited to numbers and few characters. 3. In corporation of a refreshing controller into the LCD, thereby reliving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data. 4. Ease of programming for characters and graphics. Most of LCD's available in the market are based on controller HD44780. The LCD display can be interfaced either in 4-bit interface or 8-bit interface mode.

RFID:

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GSM:

GSM based street light monitoring & control system is an automated system designed to increase the efficiency and accuracy of an industry by automatically timed controlled switching of street lights. GSM based street light monitoring & control system consists of an AVR controller which on setting of time delays switches ON/OFF the street lights and sends the update through a phone to the specified phone number. This is smart way of managing street lighting systems. There are basically two modules which include the client side and the server side. The client side consists of the GSM modem which is further connected to the AVR.

IV. ADVANTAGES AND APPLICATION

Advantages:

- Expected power saving in various ways.
- 0% consumption say from 7am to 7pm.
- 97% saving at the time of dusk say from 7pm to 8pm.
- 55% consumption because of dimming technique used say from 11pm to 1am.
- 34% consumption because of dimming as well as staggering technique say from 1am to 2am.
- 55% consumption because of dimming technique used say from 2am TO 6pm
- 96% saving at the time of dusk say from 6am to 7am

Application:

- Also the problem of security is been solve using RFID card.
- Street lights
- Railways

- Bus
- Private apartment

V. CONCLUSION

From the above result we can find out that the hybrid model of solar and wind energy can full fill the load demand wind energy support solar energy to full fill load demand so through this system we can glow light on a street light. Hybrid design should be such that the component selection for electricity production must be economical. Economic viability should be in top priority over the technical feasibility exclusively for rural electrification in rural part of country like India as the end users have least pay capacity due to weaker economic status. A hybrid RFID improves the security of the RFID system.

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