ELECTRIC POWER GENERATION USING SOLAR AND WIND

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ABSTRACT

The aim of this work is ***electric power generation using solar and wind energy****. This work is expected to help to understand the basics of solar-wind hybrid power generation. A small part of the daily electricity consumption with an efficient utilization of solar and wind power. Here we made a hybrid system where the solar power is stored in a battery and the combination of battery output and wind power output fed to the load. Because of the availability of wind is throughout the day & night whereas solar power is only available in daylight and for a limited time, here we are not storing the wind power. The output of the work is to create electric energy using free energy sources like solar and wind energy. The purpose of this work is to generate electrical power by implementing hybrid combination of solar and wind energy. The output already got either using wind or solar energy now this work is the combination of these both energy sources. When it is manufactured in a large scale, cost of this integrated natural resources power generation system is affordable.*

KEYWORDS*: Hybrid systems, Wind energy, Solar Energy (Renewable Energy)*

1. INTRODUCTION

Energy is vital for the progress of a nation and it has to be conserved in a most efficient manner. Not only the technologies should be developed to produce energy in a most environment-friendly manner from all varieties of fuels but also enough importance should be given to conserve the energy resources in the most efficient way. It is obvious that the known resources of fossil fuels in the world are fast depleting. The importance of renewable energy sources was recognized in the early 18th century. During the past three decades, a significant effort has gone into the development, trial and induction of a variety of renewable energy technologies for the use in different sectors. Energy consumption has been growing rapidly in developing countries like India where, about 15 percent of the world's population live. Much researches are ongoing 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 by acquiring the available energy sources.

1.1 Objective of project

The purpose of the work is to reduce global warming. Build an energy saving smart lighting system with integrated sensors and controllers. Design a smart lighting system with modular approach design, which makes the system scalability and expandability. Design a smart lighting system which compatibility and scalability with other commercial product and automation system, which might include more than lighting system. The vital role of work is to make available of electric energy in small villages. This work enhances the use of renewable energy sources. The advantage of this work is only one-time investment of valuable money.

1.2 HISTORICAL BACKGROUND

Generally, power produced from various ways, in thermal power plant, the power produced by using steam. In India, 80% of power produced from thermal power plants. But the problem of thermal power plant is to create the pollution in environment and the cost of the coal material is high. In nuclear power plant, the power produced by using uranium, plutonium. In India, very less % of power produced from nuclear power plants. It does not create the environmental pollution but the cost of the coal materials is so high compare than thermal power plants. But the main disadvantage of nuclear power plant is, it creates very big problem when any components failure.

In order to avoid that, we enter the renewable energy systems. It does not create the environmental pollution. It does not require the coal materials and capital cost. Only natural sources (wind, tidal, solar) are required. There are many types of renewable energy sources are available such as solar, wind, tidal etc.

The thermal power stations are causing pollution which severely affects mankind and nature. These power stations result in causing many diseases. Also, natural resources like coal, oil, radio-active materials etc will get extinct in near future. The other existing power generating systems like Hydro-Electricity power generating plant cannot afford much power as it is season based, although it causes less pollution. Therefore, it is of great urgency to go for non-conventional energy resources.

2 SOLAR PV ENERGY

The power from the sun intercepted by the earth is approximately 1.8 x 1010 MW, which is thousands of times more than the present rate of energy consumption on earth. Solar energy could supply all the present and future energy needs of the world on a continuous basis, which is one of the most promising nonconventional energy sources and it is an environmentally clean source of energy that is available over almost all parts of the world [1]. The sun provides the basis for life on earth and sufficient energy to meet all our needs. Photovoltaic is a technology to convert sunlight directly into electrical energy. It has many advantages like, no noise and wear due to absence of moving parts, environmentally benign operation, and suitable source for remote applications. Photovoltaic systems are prominently suitable for remote places where there is no grid power supply. Also, space programmers have proved the technical feasibility of photovoltaic system, because of its high performance and reliability. Photovoltaic generation is gaining an increased importance as renewable energy source due to its innate advantages like absence of fuel costs, fuel supply problem and system reliability with little or no maintenance. Performance and reliability of photovoltaic systems have been demonstrated in a large variety of small and medium scale standalone application as well as MW grid connected power stations. The main obstacle for using multi MW scale photovoltaic system is the very high initial cost of the module. The solar photovoltaic systems may be operated in several modes such as standalone system with or without storage battery, hybrid and grid connected in accordance with their several applications. The ultimate objective of the solar photovoltaic system design procedure is to obtain the size of photovoltaic array and the battery bank, which can deliver power to load without failure. The performance of the system exclusively depends upon the solar resource at the site, system configuration and load parameters. The input energy for solar photovoltaic systems is the incident solar radiation, which depends on the location, time of the day, day of the year as well as solar energy receiving angle and other relevant environment conditions). The solar photovoltaic (SPV) array output also depends on the solar cell operating temperature, which is affected by the ambient air temperature. These parameters continue to change hourly, daily, monthly and yearly.

3 WIND ENERGY

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Wind energy is an important part of solution for world energy demand and pollution problems. With an average wind speed of 7.1m/sec, annual wind energy production is estimated as almost 60 million kWh, enough to supply 20,000 households with clean electricity. In other words, the wind turbine avoids discharging to the environment 50,000 tonnes of CO2, 200 tonnes of SO2 and 2,500 tonnes of ash as a consequence of operating thermal power plants, in order to produce same amount of energy. Wind has emerged as the most suitable candidate as a renewable energy source in the immediate future. Technology for wind electricity generation has nearly matured. Wind energy output depends on wind velocity and swept area. However, the output varies with the climatic conditions. In India, wind velocity depends on the monsoon circulations namely, the strong south-west summer monsoon commencing from June and the north-east winter monsoon commencing from October. Extensive wind resource assessment comprising wind monitoring and wind mapping include complex terrain projects that were taken up in 1985 covering all the states and union territories of India. The projected conservative estimate of the potential is about 60,000 MW.

4 HYBRID ENERGY

Hybrid renewable energy source is becoming popular because it is composed of two or more energy sources. This combination of two energy sources is an efficient way of generating energy. Hybrid energy systems are used in remote areas for power generation. The use of hybrid power generations came forward due to the high prices of oil. The use of hybrid energy systems can optimize the power supply especially in rural areas. However, it is still considered expensive and difficult to combine two or three energy sources together, but it is a onetime expense. This one-time expense can be of many uses to people living in remote areas Use of hybrid energy Hybrid energy sources can be used to generate electricity which can power many applications like TV, water pumps, grinders, irons and other machinery. Hybrid energy can also be used for supplying electricity to schools and churches which are located in remote areas. It can help the users to run electrical appliances as well as outdoor and indoor lights. These power systems can supply direct current and alternate current accordingly. The hybrid energy is useful only if we do not overlook the important considerations before deploying this energy. The input and output parameters should be compatible to each other. Also analyze the variations in the two very different energy sources like wind energy and solar power. The reduced range of power supply and the variation in the energy capabilities of both power plants should be monitored using charge controller. It is imperative to use power inverters to transform electric current into usable form like alternate current.

5 SYSTEM MODEL

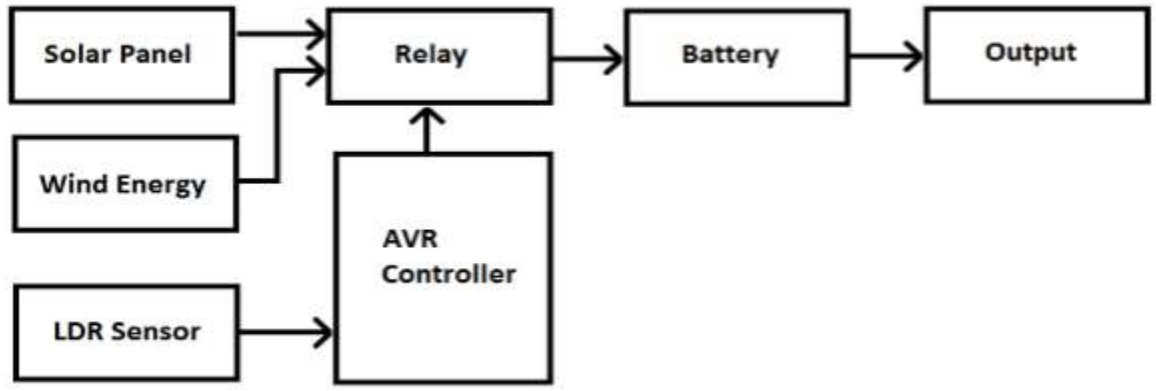

Figure 1. Block Diagram of Electric power generation using solar and wind

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6 METHODOLOGY

The overall of hybrid system is shown in figure 6.1 and its major building blocks are as follows:

6.1 OVERALL HYBRID SYSTEM

1. Microcontroller. 2. Solar panel with the solar tracking. 3. Wind mill. 4. Battery & inverter.

Fig6.1 overall hybrid system

6.2 WIND SECTION:

Generally, the wind mills are not located at all the places. It has some criteria to locate the wind mills. The wind generators are move the direction depends upon which direction has a high air velocity it changes and rotates fast. The wind tail is constructed to change the directions depends upon the wind velocity. Wind generators are two blade systems. It has synchronous generator type model. A mechanical braking system was used to stop the rotation of wind systems. The output power of the wind section is not a constant one, varying depends upon the climate changes. So, we cannot predict exact power generation from the wind systems. Figure 6.2 is showing the view of wind section.

Fig 6.2 wind section

6.3 SOLAR SECTION:

In our area situation, the solar system is the optimal system among others systems. Because our area located in the equilateral region .so among the renewable system solar is the best and optimal system for us. Solar energy is claimed to be one of the most important alternatives for viable sustainable energy in the future. Given the clean nature of solar and its wide spread availability, solar is an attractive alternative energy source. The technology for solar is already advanced and continues to develop. There is an unlimited resource base available for solar energy. The amount of energy that the Sun emits is astronomical. In just a single second the Sun radiates more energy than people have used since the beginning of time. One of the major problems with solar energy is the difficulty of meeting supply with demand over long term periods. The availability of solar energy varies as a result of factors, such as time of day, local weather conditions, geographical position, season, and other environmental characteristics. Over time, there will be a change in weather conditions which will affect solar radiation availability. It may increase for some areas, but it may also decrease for others. The view of solar section is shown in the figure 6.3.

Fig6.3 solar section

7 CONCLUSIONS

The utilization of renewable resources is greatly demanding in the world. The world facing the problem of global scarcity of electricity and pollution can be easily overcome with renewable energies. The presented paper is based on the different researches on the utilization of the natural resources like solar and wind. The combination of solar and wind hybrid system is also presented in the paper. Overall the aim of the research study to utilized the presented literature for developing the proposed research work.

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