

“IMPLEMENTATION OF SOLAR BASED SYSTEM FOR RURAL AREA DEVELOPMENT”

Ms. Shubhangi R. Mohije¹, Ms. Arti S. Bhongade², Ms. Vaishnavi D. Varma³,

Prof. Mangesh. J. Nemade⁴

^{1,2,3}UG Scholar, Electrical Engineering (E&P), DESCOET, Dhamangaon (Rly.), Maharashtra, India,

⁴Assistant Professor, Electrical Engineering (E&P), DESCOET, Dhamangaon (Rly.), Maharashtra, India,

Abstract - As the India is developing country. So we are helping to make our country developed with the aim of the paper is to build, 'Set it and forget it' type solar powered lighting system which is not solely easier to take care of however conjointly setting friendly. At identical time PV technology is that the strongest growing electricity generation technology, which also provides a solution to the global warming. Almost each portion of the tropical Asian nation is favorable for adopting this technology. The main objective of the study is to provide alternate lighting system by using solar energy. The proposed controller units provide optimum power efficiency along with longer system life span and reduce cost per KW hour in comparison with the existing solar power lighting system. The proposed system reveals significant improvement in the use of solar power lighting system in the rural area. It provides solution to the gap between the energy demand and energy availability. The study presents the analysis of star battery-powered home lighting system much and verifies the look of the system for reliable and optimum performance.

Key words: Battery, Cable, Charge Controller, DC Light, Solar panel.

1. INTRODUCTION

As part of an environmental approach, the world is moving towards the discovery of new clean (green) energy resources that are both renewable and have less negative impact on the environment. The solar energy is one among this green resource. Several techniques and systems had been developed to collect this energy on a higher scale by maximizing the concentration of the solar irradiance. One well-known sort of star huntsman is that the heliostat, a movable mirror that reflects the moving sun to a hard and fast location, however several different approaches are use still. In last 10 years, several of residential round the world used electrical scheme as a sub power at their homes. This is as a result of solar power is a vast energy resource, set to become progressively vital within the long term, for providing electricity and warmth energy to the user. Solar energy additionally has the potential to be the foremost energy offer within the future. Solar huntsman is an automatic solar array that really follows the sun to extend the facility. The sun's position within the sky varies each with instrumentality over any mounted position. Active

huntsman use motors and equipment trains to direct the tracker as commanded by a controller responding to the star direction. The star huntsman are often used for many application like star cells, solar day-lighting system and solar thermal arrays. The star huntsman is incredibly helpful for device that wants additional daylight for higher potency like cell. Many of the star panels had been positioned on a set surface like a roof. As sun could be a moving object, this approach is not the best method. One of the solutions is to actively track the sun employing a sun trailing device to manoeuvre the electrical device to follow the sun. With the sun continually facing the panel, the maximum energy can be absorbed, as the panel is operating at their greatest efficiency. The large scale star huntsman that usually used isn't appropriate for the residential use. The power generated from PV systems is extremely variable because it depends on the star irradiance and different environmental condition. The uncertainty in solar energy generation might cause needless increase within the spinning reserve and operational prices. This motivates the necessity for correct prediction of the generated solar energy at completely different time intervals to make sure the soundness of the grid by reconciliation the demand and provide, while keeping the costs low. Different approaches for prediction the facility generated from PV systems are projected. They are based on statistical methods such as liner regression and autoregressive moving average, and machine learning methods such as Neural Networks, nearest neighbour and Support Vector Regression (SVR). Most of the previous work centre on developing general prediction technique for all sorts of atmospheric condition. Solar powered lighting system is widely used for lighting in off grid areas. Despite the hustle to maintain, inefficiency of the present system is addressed.

Solar home lighting system area unit electrical phenomenon systems that offers price effective resolution to produce energy to remote off-grid areas. Solar energy sustains life on Earth for all plants, Animals and folks as a result of it provides an exciting resolution for all the societies to satisfy their wants for clean, abundant sources of energy in the future. The main supply of alternative energy is that the natural process at the core of the sun, where the energy comes from the conversion of hydrogen into helium. Solar energy is transmitted to the planet within the sort of magnetic force waves, which can also be represented by

photons. The Earth, therefore, is basically massive alternative energy collector receiving large quantities of alternative energy which may be seen in numerous forms like plant chemical process, and evaporation of the oceans ensuing as rain that forms rivers and provides hydropower energy. Globally SHS provide power to hundreds of thousands of households in remote locations where electrification by the grid is very costly or not possible. SHS usually operate at a rated voltage of 12V direct current which we get from the lead acid battery and provide power for low power DC appliances such as lights, radios and small TVs for about three to five hours a day. Furthermore SHS use appliances such as inverter in which we have used multivibrator IC and two MOSFETs, so by using inverter we can change 12/24V power to 240VAC power for larger appliances. A SHS typically includes one or more PV modules consisting of solar cells, a charge controller which distributes power and protects the batteries and appliances from damage and at least one battery to store energy for use when the sun is not shining because at night there is no sun so output voltage at the panel is zero. The study consists of energy source by means of solar energy. The photovoltaic panel converts solar energy directly into electrical energy. The electrical energy is given to charge controller. The charge controller regulates the power and provides overcharging protection and deep discharging protection to the battery. Regulated power is stored in the lead acid battery. The stored energy is in DC form which is further converted into AC by means of a medium power inverter. The order of reference in the running text should match with the list of references at the end of the paper.

2. Hardware Description

There are unit a spread of advantages to adopting a star home system. Besides households, star home systems might offer power for faculties, clinics, or little businesses. Having this bright supply of sunshine throughout the night may also deter wild animals that area unit dangerous or eat their crops. They replace fuel lamps and candles historically used for lighting. Having to buy fuel and/or candles may be a daily expense that may be eliminated with a SHS. Furthermore, fumes produced from traditional lighting methods are toxic and lead to chronic lung problems, especially when children are exposed. Generally, a family can use regarding three liters of fuel per month. Using these rheostat sources of sunshine for finding out or handicraft production will strain the eyes and cause long vision issues. Having a system can permit youngsters to check and little businesses to continue production later into the night. This will increase the population's ability to be independent, raises their incomes, and allows them to begin to lift themselves out of poverty.

The proposed system mainly consist of solar panel, battery, and the charge controller. As the demand of electricity increasing day by day so for and the generation of electricity is insufficient to satisfy the rapid growth of electricity

demand. So by using this PV technology we are going to make bright the houses of poor people for their development. The proposed work components are shown in Fig.1 below-



Fig. 1: Block Diagram of Proposed Work

The proposed system uses a solar panel because it is more efficient, so when light strikes the surface of the panel then we get 12V output which can be convert into 5V by transformer IC associated this 5V is fed as an input to the charge controller. The battery is charged employing a electrical device with a charge controller in between them. The charge controller is used to protect the battery from overcharging and deep discharging. Once the battery is charged, a DC load could be directly connected to the battery.

2.1 Solar Panel

Solar panels or a lot of technically electrical phenomenon (PV) panels are star home electrical system anctionative part. There is varied sorts of electrical device however in the main there are solely 3 sorts of electrical device i.e. mono-crystalline, polycrystalline and amorphous thin film type solar panel. Mono-crystalline cells are being sliced out from ingot of pure crystalline. They are black in colour and that they will absorb most daylight falling on the surface if set at correct angle. The efficiency of mono-crystalline cell is around 19-20%. Polycrystalline cells are being product of pure element cut offs. Unlike mono-crystalline their cells are not perfectly aligned in one direction and thus interconnection losses may occur which reduces its efficiency to 13-15%. Amorphous thin film efficiency is around 6-10%. The Panels are made of wafers or cells of semiconductor material that use sunlight (photons) and the photovoltaic effect to generate direct current electricity. The totally different cell technologies are wont to represent different energy conversion efficiencies and producing techniques that are employed in making an attempt to scale back the price of electrical phenomenon generated electricity.

The electrical phenomenon technology is continually evolving day by day within the direction of higher conversion potency and lower price. Each photovoltaic cell will generate a planned voltage and current below sure producing and physical constraints. A electrical device could be a series and parallel mixtures of identical cells to come up with the specified power output (current and voltage).

Panels are appointed an influence rating in watts that depends on the most power they will manufacture below ideal sun and temperature conditions. By knowing the rated power output {we can we will we are able to} verify what percentage panels are needed to fulfil the electrical load demands. Multiple panels combined together are called solar arrays. There is a directly quotient between electrical device price and output power. The electrical device is about five hundredth of the full initial instrumentality price of a SHS. The types of solar panels are shown in fig. 3.2 below-

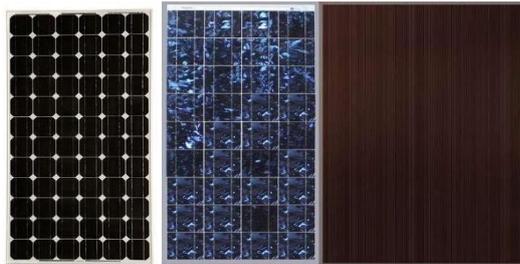


Fig. 2.1: Mono-Crystalline Silicon, Polycrystalline Silicon & Amorphous

2.2 Charge Controller

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries. It prevents overcharging and may prevent against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk. It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life. The terms "charge controller" or "charge regulator" may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery recharger. The primary function of a charge controller in a Solar Home System (SHS) is to maintain the battery at highest possible state of charge, when PV module charges the battery the charge controller protects the battery from overcharge and disconnects the load to prevent deep discharge. Ideally, charge controller directly controls the state of charge of the battery.

2.3 Battery Unit

Sun powered batteries produce power by a physical wonder transformation technique.

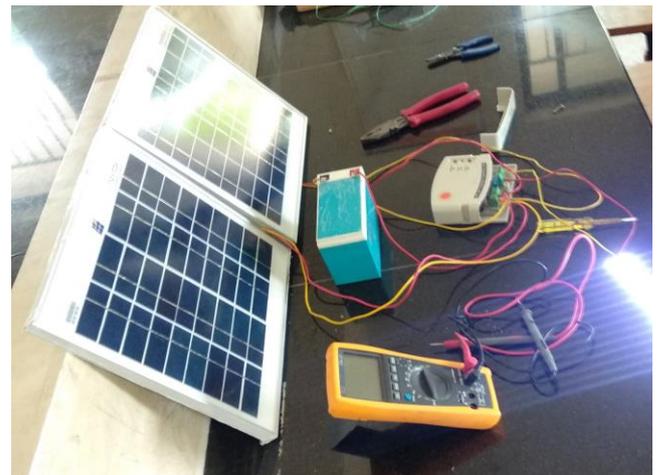
The supply of power might be a touchy conductive substance like a semiconductor precious stone to that polluting influences are extra.

At the point when the gem is stricken by lightweight, electrons are ousted from the surface of the precious stone and move toward the elective surface. There they're gathered as a flow of power.

Sunlight based batteries have frightfully long lifetimes and are utilized in the fundamental in ballistic case as a supply of power to work the instrumentality on board.

2.4 Loads

Burdens or load are electrical apparatuses that draw control from the battery. As we realize that most extreme home electrical machines are AC control and to utilize AC fuelled apparatuses in a SHS, a DC-AC control inverter will be required. The inverter itself goes about as a heap since it can draw control (remain by power utilization) and change productivity misfortunes are additionally happened in an inverter. For this situation all the AC apparatuses associate with the inverter can likewise get its capacity from the battery. In numerous SHS ventures, an inverter is excluded because of cost limitations and framework intricacy. So in those cases we incorporate DC apparatuses, for example, CFL and LED lights, little radios, and little DC fuelled TVs are associated specifically into the 12v DC SHS circuit. It is exceptionally financially savvy and effective to average low power prerequisites of DC apparatuses and it additionally lessen framework unpredictability.



3. CONCLUSIONS

From this Paper, it is concluded that the solar PV LEDs lighting system is better than other lighting sources because this system can be used as home appliance, residential and Commercial method with some switch devises, and with some controlling equipment.

The power performance of this method is nice as a result of it doesn't take a lot of power as compared to alternative lighting systems.

Home lighting is a basic need, and solar home systems can provide it with fewer immediate negative health impacts and fewer global environmental consequences than traditional energy sources. High initial capital costs are prohibitive to the rural poor, but donated systems often result in lower

overall energy costs to beneficiary households. Unfortunately and ironically, the poorest segments of rural populations must necessarily be excluded from economically sustainable SHS donation programs. Without ongoing subsidy, those who must frequently do without light without a SHS are almost certainly not in a position to save or raise the capital needed to maintain SHS into the indefinite future. If an income generating opportunity can result from the donated SHS, the additional income must be enough to both cover the system's own maintenance and to pay for other basic needs of the household that were previously going unmet, but additional income resulting from SHS is often modest. In these cases, improving livelihoods to enable households to better meet their food, water, and health care needs are likely more appropriate development activities than providing home lighting. The present work will kindly some hope in the minds of the readers & we hope that we are not going to be plunged in darkness after the fossils fuels are totally exhausted.

REFERENCES

- [1] Aaditya Jain, Mrs. Kusum Tharani, Himanshu Dhall, Nikhil Kumar Singh, Sarthi Bhatia, "Solar Home Lighting System with AC and DC Loads", IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE), Vol. 12, pp. 07-13, May-June 2017.
- [2] Alkos Baldauf, "A smart home demand-side management system considering solar photovoltaic generation", IEEE, 5th International Youth Conference on the Development in the Renewable Energy Technology (ICDRET), 2015.
- [3] A. B. Kanase-Patil, R. P. Saini, M. P. Sharma, "Integrated renewable energy systems for off grid rural electrification of remote area", Elsevier, Renewable Energy 35 (2010), pp. 1342-1349.
- [4] A. C. Brent and D. E. Rogers, "Renewable rural electrification: Sustainability assessment of mini-hybrid off-grid technological systems in the African context", Renewable Energy, vol. 35, no. 1, pp. 257-265, Jan. 2010.
- [5] A. S. Werulkar, P. S. Kulkarni, "Design of a solar charge controller with microcontroller based soft switching buck converter", IEEE, International Conference on Power Electronics, Drives and Energy Systems (PEDES), 2012.
- [6] Biswajit Biswas, Sujoy Mukherjee, "A Comparative Study of Low Cost Solar Based Lighting System and Fuel Based Lighting System for Remote off Grid Location in India", International Journal of Modern Engineering Research (IJMER), Vol. 3, Issue. 5, September 2013, pp. 2249- 6645.