SOLAR POWER TRACKING PROTOTYPE

Project Advisor

Dr.Sajjad H.Shami

Co-Advisor

Mr.Jawad Ullah

Group Members

Faiza Zubair (091420-061)

Zunaira Nazir (091420-233)

Electrical Engineering Department

School of Engineering

University of Management and Technology

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Project Advisor: - Dr.Sajjad H.Shami

Advisor Signature: - _____

Co-Advisor:-Mr.Jawad Ullah

Advisor Signature:- _____

Group Members

Faiza Zubair (091420-061)

Zunaira Nazir (091420-233)

Abstract

The aim is to provide ample information concerning all forms and topics of solar energy and converting to electricity. Energy concerning systems will change drastically, due to lack of conventional fuels, the political uncertainties related to the supply of petroleum, a rising population and rapid technological advancement. Within this framework solar energy will play a prominent role. This report contains in the order introductory information on solar energy application, fundamental of solar electric system and the nature of solar resource and storing solar energy, basic battery, controller, inverter then load.

Dedication

This project is lovingly dedicated to our respective parents who have been our constant sources of inspiration .They have given us the drive and discipline to tackle any task with enthusiasm and determination without their love and support this project would not have been made possible.

Acknowledgements

First of all we are very thankful to ALLAH who gave us strength and courage to complete this project.

We have taken effort in this project .However ,it would not have been possible without the kind support and help of many individual and organization .we would like to extend our sincere thanks to all of them of University

We are highly indebted to faculty of University of Management and Technology for their guidance and constant supervision as well as providing necessary information regarding the project & also for their support in completing the project

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Introduction

Our main purposes are to save the energy and cost. We live in an energy starved country. There are widespread power outages across cities and towns in Pakistan. Even if abundant power was available, tariff will continue to increase at astronomical rates. Local production of electric power for residential, industrial, and rural applications using generators is expensive and polluting. UPS as a backup source is insufficient because the duration of power outage is very long. Due to depletion of natural resources worldwide research in alternative form of energy is enhanced .Also in Pakistan the federal government has enhanced alternative forms of energy production due to limited supply of oil and increasingly environmental pollution. Solar power is a pollution-free, noise-free, fuel-free, maintenance-free, and cost effective method to produce electric power for homes, shops, schools, offices, factories, and farms The Solar cell panel generate an electrical charge that is stored in battery and used to provide

1.1 Problem Statement

We are facing a high deficiency in electrical power energy. The task is to overcome this problem using modern technologies available. Solar energy would a best source available which can be used to overcome this problem

1.2 Scope of Work

The purpose of solar panels is to meet the growing demand for renewable energy resources. In the modern world, the demand for electricity has grown at alarming rates to meet the needs of society. Many other benefits to solar energy include the lack of pollution directly created by these systems and their inexpensive and practical nature in the long term. As the demand for solar panels grow, so will the need for ways to optimize their energy Collection. Tracking systems are designed to orient solar panels toward the sun.

By adding a Tracking system, the energy a solar panel can output could be increased by up to 50% during the summer months. This project is very practical and feasible as there are many types of solar tracker designs in industry today.

1.3 Software Used

The Proteus Design Suite is wholly unique in offering the ability to co-simulate both high and low-level micro-controller code in the context of a mixed-mode SPICE circuit simulation. With this Virtual System Modeling facility, you can transform your product design cycle, reaping huge rewards in terms of reduced time to market and lower costs of development.

If one person designs both the hardware and the software then that person benefits as the hardware design may be changed just as easily as the software design. In larger organizations where the two roles are separated, the software designers can begin work as soon as the schematic is completed; there is no need for them to wait until a physical prototype exists.

In short, Proteus VSM improves efficiency, quality and flexibility throughout the design process..

1.4 Major Components

1.4.1 Solar Panel

A solar panel is a packaged, connected assembly of photovoltaic cell .the solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity for commercial and residential application, each panel is rated by its DC output power under standard test condition, and typically solar panel used for residential application ranges from 100 to 450 watts

1.4.1.1 Area and efficiency

The area of the panel determine the efficiency of the solar panel means area is directly proportional to the area if the area is large than the efficiency will be automatically large but in our project we will increase the efficiency of the solar

panel via a tracking when the panel is exactly in front of the face of sun then it will capture maximum rays from the sun

1.4.1.2 Construction

Solar panel use light energy (photons) from the sun to generate electricity through ht e photovoltaic effect .the structural (load carrying) member of a module can either be the top layer or the back layer .the majority of the modules use wafer – based crystalline silicon cells or thin film cells based on cadmium telluride .the conducting wire that take the current off the panels may contain silver, copper or other non magnetic conductivity transition metals.

Electrical connection is made in series to achieve a desired output voltage and in parallel to provide a desired current capability.Seperate diode may be needed to avoid reverse current, in case of partial or total shading, and at night

1.4.2 Types of Solar Panels:

There are three main types of solar panel in commercial production, all with some advantages and disadvantages. All three are based on silicon semiconductors - the difference being the form that the silicon is in. Panels based on other chemistries are under development. Cadmium telluride and copper indium dieseline panels may well appear in production soon; and also research is being conducted on using the photosynthesis effect that plants use to convert sunlight to useful forms of energy

1.4.2.1 Monocrystalline solar panel:

These are made from thin wafers of silicon, sliced from large crystals that have been grown under carefully controlled conditions. Typically, the cells are a few inches across, and a number of cells are laid out in a grid to create a panel. Relative to the other types of cells, they have a high efficiency, meaning you will obtain more electricity from a given area of panel. This is useful if you only have a limited area for mounting your panels, or want to keep the installation small for aesthetic reasons.

However, growing large crystals of silicon is a difficult and very energy-intensive process, so the production costs for this type of panel have historically been very high. Production methods have improved though, and prices have fallen a great deal over the years. Figure 1 shows the monocrystalline solar panel.

Figure 1

1.4.2.2 Polycrystalline solar panel:

It is cheaper to produce silicon wafers in polycrystalline form, as the conditions for growth do not need to be as tightly controlled. In this form, a number of interlocking silicon crystals grows together.

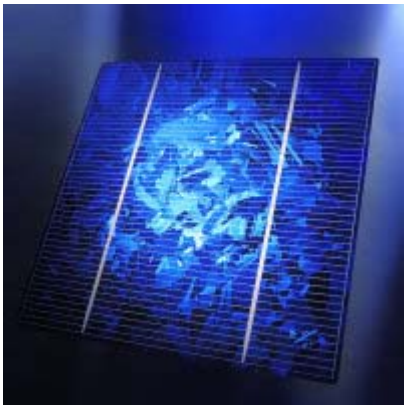

Figure 2

1.4.2.3 Amorphous Solar Panel:

The newest type of panel is based on amorphous silicon. Here, the silicon atoms are not ordered in a crystal lattice at all. The production methods are quite different - instead of growing crystals, the silicon is deposited in a very thin layer on to a backing substrate. Sometimes several layers of silicon, doped in slightly different ways to respond to different wavelengths of light, are laid on top of one another to improve the efficiency. The production methods are complex, but less energy intensive than crystalline panels, and prices should come down as panels are mass produced using this process.

One advantage of using very thin layers of silicon is that the panels can be made flexible. Panels are available that can be curved to the bend in a roof for example, or even attached to a flexible backing sheet so that they can be rolled up and put away when they are not needed! The disadvantage of amorphous panels is that they are not as efficient per unit area as monocrystalline panels - typically you would need nearly double the panel area for the same power output. At least one manufacturer now produces a hybrid panel, where a layer of amorphous silicon is deposited on top of single crystal wafers. This gives some of the advantages (high power, but still efficient at low light levels) - and some of the disadvantages (not flexible and relatively high price) of the different types of panels.

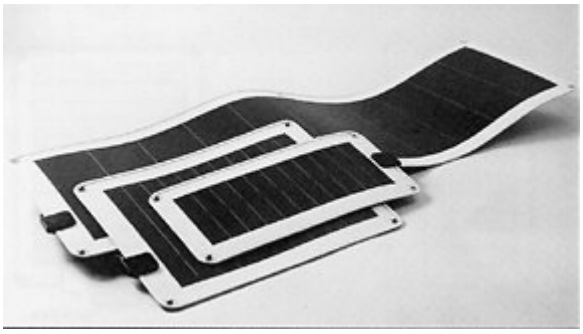

Figure 3

1.4.3 Industrial Use:

There are two main industry common solar panel types, Polycrystalline and Monocrystalline; both are PV (photovoltaic) solar modules however the structure

of the silicon used within each is different. Monocrystalline silicon is formed with a continuous crystal lattice structure making it highly purified and very efficient at converting solar energy into electrical energy.

The process of manufacturing silicon with a singular crystal structure makes it slightly more expensive than Polycrystalline silicon which is formed with many small crystals. Each silicon types has its own advantages and disadvantages; with Monocrystalline costing more but being more efficient and Polycrystalline being cheaper but less efficient. In our project we are using monocrystalline solar panel due to some advantages.

1.4.4 Advantages Of Monocrystalline Solar Panel:

Monocrystalline PV panels with their greater power output efficiency are seen as being better suited for long term investment as well as installations where space is limited and this post is focused on exploring the unique advantages

Determining what is an advantage or a benefit is a relativistic exercise and in this case the base of reference is the other type's solar panel technologies. With this caveat in mind, here are 8 good reasons why many people choose monocrystalline solar technology:

1.4.4.1 Longetivity:

Monocrystalline solar panels are first generation solar technology and have been around a long time, providing evidence of their durability and longevity. The technology, installation, performance issues are all understood. Several of the early modules installed in the 1970′s are still producing electricity today. Single crystal panels have even withstood the rigors of space travel!

According to solar engineers, even though this may be possible, there will be a slight drop off in efficiency of around 0.5% on average per year.

So although this type of solar panels can last a long time, there will come a time when the lower efficiency makes it economically desirable to replace the panels especially as the efficiency of newer panels continues to increase. Most

performance warranties go for 25 years, but as long as the PV panel is kept clean it will continue to produce electricity.

1.4.4.2 Efficiency:

Monocrystalline solar panels are able to convert the highest amount solar energy into electricity, thus if your goal is to generate the maximum possible electricity at your area, monocrystalline is an obvious choice.

They have become particularly common for urban settings, PV rooftop installations are costly and most installers want to make financial outlays back as quickly as possible.

1.4.4.3 Low installation costs:

Solar panels make up around 60% of the overall cost of an installation. With the world rapidly moving towards renewable energy sources and with new developments in transportation, etc., we envision a time in the not-too-distant future where the type of solar array used, specifically the ability to scale up, will also factor into house price values.

1.4.4.4 Embodied Energy:

Monocrystalline panels are amongst the greenest and cheapest to actually manufacture, some may argue thin film panels are less per panel, but they require more panels per install which somewhat negates this notion.

1.4.4.5 Recycling fees:

Solar panels products use cadmium telluride (CdTe). Cadmium is a heavy metal that accumulates in plant and animal tissues. Cadmium is a ‘probable carcinogen‘. While Cadmium doesn’t pose a threat while the solar panel is in service, disposing of the panels has to be done properly , which often comes at a large cost.Monocrystalline panels are not harmful or hazardous to the environment.

1.4.4.6 More Electricity:

Monocrystalline panels produce more electricity per m/2 than other panels which improves the owner's cash flow. They reduce the dependency on public utility companies and create truly renewable energy