

# Designing and Implementation of Hybrid Energy System



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## **Abstract**

Because nonrenewable energy sources are depleting extremely fast. Pakistan is in grave danger in the next couple of decades, so if we don't take our mind towards renewable energy sources like sun, then there may not be any electricity in Pakistan to lamp our houses. The aim of this project is to provide a solution for the energy crisis that is not only cost effective, but also easy to implement. The project focuses on maximizing the solar power generation through auto-positioning of the panel and implementing the technique of Maximum Power Point Tracking for the charge controller. This project provides a way to keep electricity usage to minimum and utilize the solar energy as much as possible, and in case of extreme conditions of weather a battery plan is also available.

## **Dedication**

First of all we are very thankful to ALLAH ALMIGHTY who has given us enough courage to complete this project.

Dedicated to

Our loving Parents

&

Mr. Muhammad Salik

Who enlightened our minds with Knowledge, tried  
To include the spirit of hard work and dedicational us  
So that we could have a BRIGHT FUTURE in terms  
Of being good human and turn out to be competent  
Engineers; with the power to take challenges.

## Acknowledgements

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# Chapter 1

## Introduction

### 1.1: Introduction to Solar Energy

Solar energy is quite simply the energy produced directly by the sun and collected elsewhere, normally the Earth. The sun creates its energy through a thermonuclear process that converts about 650,000,000 tons of hydrogen to helium every second. The process creates heat and electromagnetic radiation. [1] The heat remains in the sun and is instrumental in maintaining the thermonuclear reaction. The electromagnetic radiation (including visible light, infra-red light, and ultra-violet radiation) streams out into space in all directions.

Only a very small fraction of the total radiation produced reaches the Earth. The radiation that does reach the Earth is the indirect source of nearly every type of energy used today. The exceptions are geothermal energy, and nuclear fission and fusion. Even fossil fuels owe their origins to the sun; they were once living plants and animals whose life was dependent upon the sun.

Much of the world's required energy can be supplied directly by solar power. More still can be provided indirectly. The practicality of doing so will be examined, as well as the benefits and drawbacks. In addition, the uses solar energy is currently applied to will be noted.

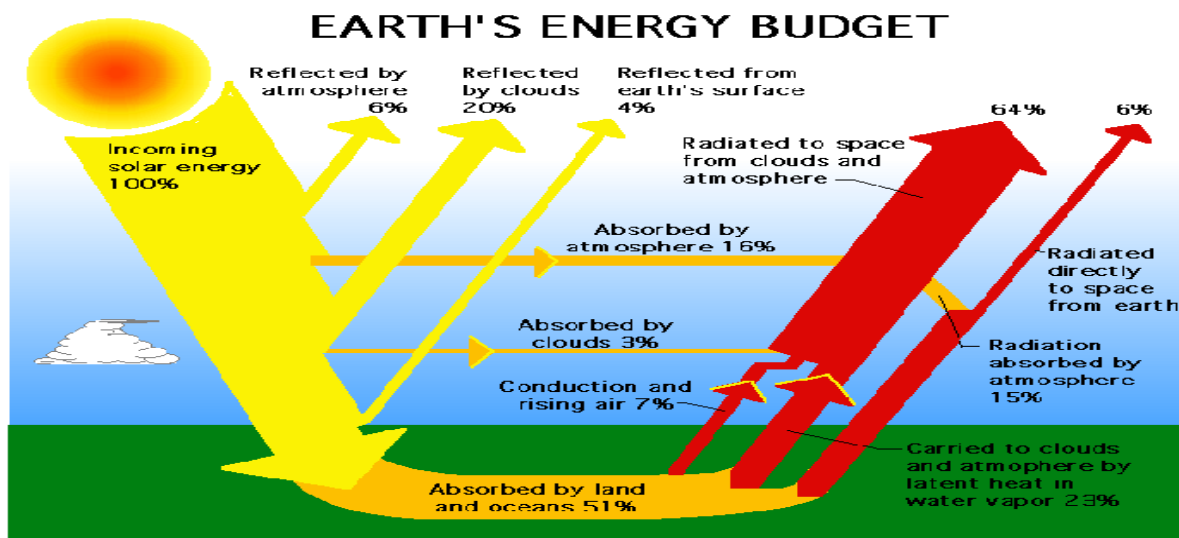


Figure: 1.1

## 1.2: How Solar Energy is used

An easy method to collect the sun's energy is photovoltaic conversion, this consists of the transformation of solar energy to electric energy using solar cells. Solar cells are manufactured from pure silicon with some impurities of other chemical elements, and they are each able to generate from 2 to 4 Amps, at a voltage of 0.46 to 0.48 V, using solar radiation as the source. [2] They capture both direct and diffuse radiation; this means that energy can be generated even on cloudy days. The cells are mounted in series to form PV modules in order to reach a suitable voltage for electrical applications; the PV modules collect the solar energy transforming it directly in electric energy as direct current, which, in isolated applications, it is necessary to store in batteries in order that it may be used during periods of the day in which there is no sunlight. [3]



Figure 1.2: Solar Panel

## 1.3: Scope of Solar Energy in Pakistan

The Pakistani power industry is presently facing huge crises in finding viable sources of energy as well as power generation and transmission. Fossil fuels are depleting at an alarming rate. Simultaneously, our high-voltage transmission system causes large amounts of pollution and is most likely not prepared for the ever-increasing demands of the 21<sup>st</sup> century. The Pakistani power grid must be re-thought and re-developed. These dilemmas have accordingly resulted in an increased urgency to prefer alternative sources of energy. The development and increased implementation of solar power systems can serve to enhance the

world's energy options as we progress. Solar power systems harness the unlimited and certain radiant energy of the sun. [4]

### 1.4: Solar Plants All over the world

These include the 354 megawatt (MW) Solar Energy Generating Systems power installation in the USA, Solnova Solar Power Station (Spain, 150 MW) and Andasol solar power station (Spain, 150 MW). The 370 MW Ivanpah Solar Power Facility, located in California's Mojave Desert, is the world's largest solar thermal power plant project currently under construction. The Solana Generating Station is a 280 MW solar power plant which is under construction about 70 miles (110 km) southwest of Phoenix, Arizona. There are plans to build many other large solar thermal plants. [5]

The solar thermal power industry was growing, planned with about 1.17 gigawatts (GW) of concentrating solar power (CSP) plants online as of 2011. 582 megawatts of them are located in Spain, and the United States has 507 MW of capacity. About 17 GW of CSP projects are under development worldwide, and the United States leads with about 8 GW. Spain ranks second with 4.46 GW in development, followed by China with 2.5 GW.

### 1.5 Basic Idea

Electricity is becoming the most important part of human life and with the increase in Load shedding In Pakistan people are looking for others means to produce electricity. We are giving the easiest way to Produce Electricity using this project.

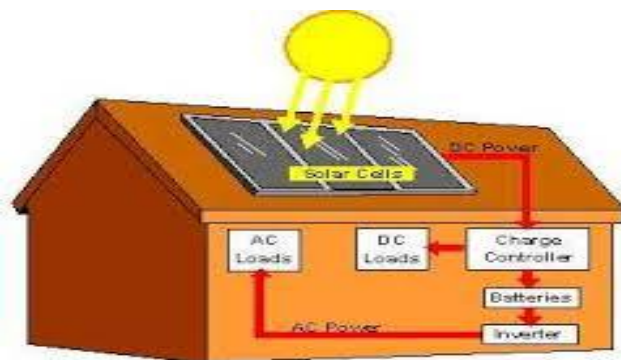


Figure 1.3:Solar System in House