

# Photovoltaic Cell Energy Augmentation by Fresnel Lens

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**Abstract:-** In today's world, there is desperate need of energy. So everyone is concentrating on renewable type of energy. Solar energy offers great deal with human being. That's why we are utilizing this solar power and storing it in different kinds of photovoltaic cell. But we can use this huge amount of energy stored in solar radiation for heating purpose. Fresnel lens is one of the major equipment used for concentrating solar rays on vessel, and using this heat energy the PV cell energy augmentation can be carried out.

## I. INTRODUCTION

The human kind is using so much of non-renewable that now a day he automatically get diverted his mind towards renewable energy, because of the green house gas effect. The mankind cannot live without electricity. So here comes the Solar Energy. Solar energy is broadly classified into two main categories that is active energy and passive energy. The photovoltaic cells comes under active solar energy. Means by using the solar energy, the electricity or some kind of power is generated. In the photovoltaic cell, it mainly concentrates on developing electricity by direct sunlight. Our aim is to enhance the solar cells by increasing the amount of input to the cell and increasing the efficiency of the photovoltaic cell.

## II. FRESNEL LENS

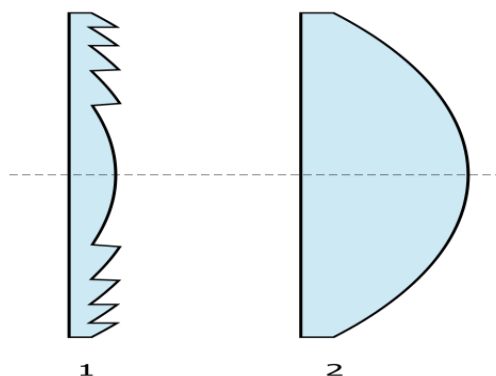


Fig 1:- Fresnel lens

Due to its flat nature, it can be replaced by dome shaped lenses and thus, Fresnel lenses can be easily mounted over roof-top solar panels.

## III. PHOTOVOLTAIC CELL

A photovoltaic system is also known as PV solar cell is a system used for converting solar energy into usable electricity. This electricity is stored in batteries and used thereafter. But now a days the efficiency of most advanced solar cells are as low as 20% only. Nearly 80% of solar energy gets reflected back into the atmosphere. For increasing this efficiency, author carried out the experiment based on the basic principles of the lens. Now a days, there are two types of solar cells viz. Grid type and off grid type. Most PV cells are grid connected, while off grid or also known as stand-alone type are used at small portion in the market.

The PV cells are having eco-friendly nature, means there is no any excess emission from these cells, so now a days this technology is most helpful for eliminating the problem of global warming. There are no any moving parts in this system so best suitable for any environment. In the grid type, the roof top solar cells can produce 95% of clean and renewable energy and they are having the lifetime of over 30 years. Whatever amount we invested in green energy, it get refunded to us within span of 0.7 to 2 years. So it is just like policy of our life, we just need to invest once, it is having dozens of benefits.

Now a days, we can see the improvements in the capacity of solar cells. It ranges from some kilowatts to tens of kilowatts for larger scale.

## IV. CONCENTRATOR PHOTOVOLTAIC'S (CPV)

It is same as PV cells but CPV system is used for large scale production. In this system, the mirrors are arranged in some specific pattern for reflecting sunlight. These mirrors are curved in nature so it can concentrate the sunlight over large area at single point. That single point is also known as Multi Junction (MJ) Point. Here, the heat energy is converted into electricity. For increasing efficiency of this plant, the coolers are provided for chilling purpose. In this way the CPV system works. But in this system, there is major drawback which is land space. This plant requires huge amount of land space for lying down the curved mirror.

**V. METHODOLOGY**

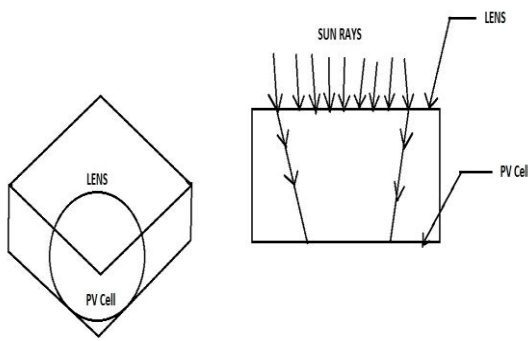


Fig 2:- Working principle

We are going to concentrate the solar radiation on to the PV cells to increase their efficiency. In CPV, it cannot be used in roof-top solar panels. For that, we are introducing the Fresnel lens to increase the efficiency of nominal PV cell.

**VI. EFFICIENCY**

According to the survey conducted in 2012, the solar panels available for consumers in the market are having efficiency as low as 17% only. While in commercial solar cell, it can vary in between 25% to 27%. It has been recorded that a group from the Fraunhofer Institute for Solar Energy Systems have created a cell that can reach 44.7% efficiency, which makes scientists' hopes of reaching the 50% efficiency threshold a lot more feasible.

For increasing this efficiency, what we have done is that, we just concentrated the solar rays over A4 size Fresnel lens over a solar cell, the cell get burnt initially, but it shows significant values to research. Then we put that solar cell into mineral oil, while mineral oil is act as coolant, then the cell didn't get damaged and we got some significant results. The results are as follows:

**VII. RESULTS**

After using Fresnel lens onto the single solar cell submerged in transparent mineral oil as coolant, the results are as follows:

*A. Normal sun light:*

Voltage (mill volts)	Current (amps)	Temperature of cell
234	1.24	39

*B. Normal sun light with coolant:*

Voltage (mill volts)	Current (amps)	Temperature of cell
276	1.51	29

*C. Fresnel lens with coolant:*

Voltage (mill volts)	Current (amps)	Temperature of cell
310	1.42	32

*D. Fresnel lens without using coolant:*

Voltage (mill volts)	Current (amps)	Temperature of cell
52	0.27	47

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