International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 3 Issue 4, April - 2014

Power Generation using Advanced Solar Panel

Artee Kinolikar, Suchitra Garg, Sukrity Pundir[1]
Dept.Electrical.Eng.
K J College Of Engineering
Pune,India

Mohit Kumar Shakya[2]
Assistant Professor
Department of Electrical Engineering
K J Educational Insitutes, KJCOEMR, Pune

***Abstract*— This Paper is of power generation using advanced solar panel. In this project our aim is to overcome the disadvantages of current version of solar panels that are flat plate collectors by replacing it with appropriate dimensions of convex lenses. And then use this setup for generation of steam that is used for generation of electricity in thermal power plant.**

***Keywords*—Convex lens, Focal length, Solar energy, Renewable, Non renewable.**

List Of Nomenclature

CUF **:** Capacity Utilization Factor
PV : Photovoltaic Cell
W : Watt
Cd-Te :Copper Indium diselenide.
CIGS :Copper Indium diselenide and copper indium gallium diselenide.
% : Percentage

I. INTRODUCTION

At the upper atmosphere the earth receives 174 petawatts (PW) of incoming solar radiation. Out of total approximately 30% is reflected back to space while the rest is absorbed by clouds, oceans and land masses. As the Earth's land surface, oceans and atmosphere absorb solar radiation, and this raises their temperature, warm air containing evaporated water from the oceans rises causing the atmospheric circulation or convection. When the air is reached at a high altitude, where the temperature is low, water vapor condenses into clouds, which rain onto the Earth's surface, completing the water cycle. Sunlight absorbed by the oceans and land masses keeps the surface of the Earth at an average temperature of 14 °C. The total amount of solar energy absorbed by Earth's atmosphere, oceans and land masses is approximately 3,850,000 exajoules (EJ) per year. The amount of solar energy reaching the surface of the planet is so vast that in one year it is twice as much as will ever be obtained from all of the Earth's non-renewable resources of coal, oil, natural gas. Solar energy can be harnessed at different levels all around the world, mostly depending on distance from the equator.

Solar power is energy generated from the heat or light by the sun which can be used to produce heat, light, hot water, electricity, and cooling in a wide variety of applications. The burning of fossil fuels to provide electricity is a very dirty business that is determined to be the major cause of global climate change which will one day run out. This paper is about one solution that can help to alleviate the problem a completely renewable source of clean energy. The most powerful sources of energies on the Planet Earth come from the sun. Without the sun, none of the fossil fuels that power our society would exist as they are derived from the organic decomposition of ancient algea, plants, plankton, and animals including dinosaurs, which could not have existed, were it not for solar energy.

So, in this paper we are going to make use of total solar energy received from the sun which is heat and light energy and will generate steam thereby producing power required for various applications.

II. LITERATURE SURVEY

For this paper we have consider the data of Mumbai for 10 hours in the month of April provided by climatology department
We have consider the amount of sunlight coming to the earth's surface during particular time period
From 9am-12pm = 200W
From 12pm-3pm = 6400W
From 4pm-6pm = 1300W
From 6pm-7pm = 100W
So from the data provided we have considered 10hours in which we are getting total amount if sunlight is 8000W.

Existing system

We will see two existing systems because in this project we are obtaining power from sunlight. Solar power generation technologies can be broadly classified into two broad categories:

1) Solar thermal power plants
2) Solar photovoltaic technologies

A) Power Generation using solar thermal power plants

Thermal power plant is the one in which prime mover is steam driven. Solar thermal power plants produce power by converting the solar radiation into high temperature heat using mirrors and the reflectors. In this the collectors are referred to as the solar-field. The energy is used to heat a working fluid and then steam is produced when the water is heated more than the boiling point of the water. Then this steam is used to rotate a turbine or power an engine to drive a generator and to produce power at the output. In the design of thermal power stations, there is great variation due to the use

different fossil fuels. All solar thermal power plants are based on four basic essential systems which are collector, receiver, transport and the power conversion. Here, parabolic trough, Solar towers, Parabolic Dishes and Linear Fresnel Reflectors are the main technologies that are available today.
The performance of the solar thermal power plant is defined by the CUF.

Capacity utilization Factor is the ratio of the actual electricity output from the plant, to the maximum possible output during any year. The following factors are considered as the key factors:

1) Radiation at site
2) Losses in the PV system
3) Condition of the temperature and climate
4) Design parameters of plant
5) Efficiency of the inverter
6) Module degradation due to the aging

B) Power generation using Photovoltaic cell

The photovoltaic converters are the semiconductor devices that convert part of the incident solar radiation directly into electrical energy. Sunlight consists of the little particles of solar energy which are called photons. When the PV cell is exposed to the sunlight, at that time many of the photons are reflected pass right through or absorbed by the solar cell. When the enough photons are absorbed by the negative layer, electrons are freed from the negative semiconductor material. Due to manufacturing process of the positive layer, freed electrons naturally migrate to the positive layer creating a voltage differential, which is similar to the household battery. When these two layers are connected to an external load, the electrons flow through the circuit creating electricity. Most common PV cells are made from single crystal silicon but there are variations in cell material, design and methods of the manufacture. They are available as crystalline silicon, amorphous silicon cells such as Cadmium Telluride(Cd-Te), Copper Indium diselenide and copper indium gallium diselenide (CIGS). The amount of captured solar energy depends on the orientation of collector with respect to the angle of the sun. Under the optimum conditions, one can obtain fluxes as high as 2000 Watts per square meter.

III. BLOCK DIAGARM AND DESCRIPTION

When the solar rays gets incident on the concentrated assembly consisting of convex lens, the lens converges the entire sunlight to a single point and heats the water. As the sun gives us the light energy and heat energy, we will be using both to boil the water. Due to continuously heating, the water gets heated above its boiling point and the steam is generated which is passed to the steam generator with the help of the nozzle. Now the pressurizing assembly consisting of nozzle will create high pressure steam and pass it to targeted rotary assembly (Flywheel) and the output of targeted rotary assembly is given as an input to the alternator which thereby converts the mechanical energy to electrical energy and hence generating the power.

Now the left out stream will be getting collected in the steam collector whose output is connected to the input of stream carrier. The steam carrier will carry the steam up to the tank where the temperature of the stream will be reduced by 1℃. Now the stream will be converted to water again. This water will be given to the condensed water collector and the same process will be repeated again and again.

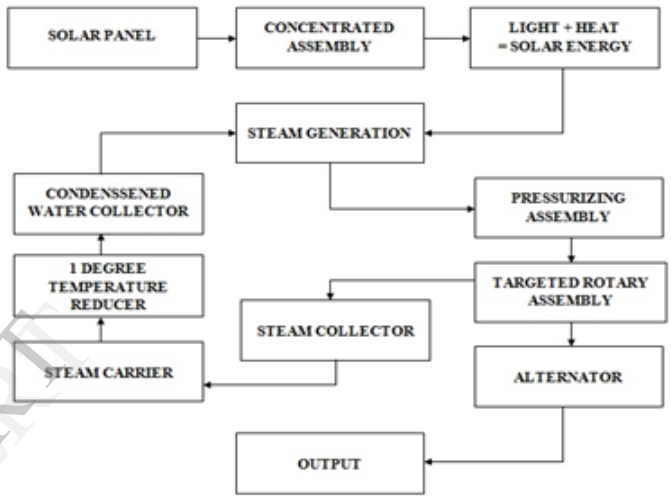

Fig. 1 Block Diagram of proposed system

IV. POWER GENERATION USING ADVANCED SOLAR PANEL

Out of total solar energy received on the earth 60% is Heat energy and 40% is Light energy. The current solar panels take 40% of Light energy from sun for heating purpose and the rest 60% Heat energy is wasted. Advanced solar panel is a new technology that uses convex lens instead of flat plate collector. As convex lens have the converging property, it will converge all the radiations received from the sun and will help in heating the water greater than its boiling point. With the help of black body, we will convert the light energy received from sun into heat energy that is total heat energy will be utilized to heat water.

We are going to utilize the total solar energy received from the sun that is without using any renewable sources for heating purpose, we are using total solar energy for heating water which produces steam and thereby produces Electricity. When these lenses are adjusted to a particular focal length to heat the water, large volume of steam is produced. Water heated, turns into steam and spins a steam turbine which drives the generator. The flywheel is connected to a generator that contains the rotor which has an electromagnet located within coils of copper wire called as stator. As the generator rotor spins, a flow of electrons is created within the stator.

This produces electricity that can be stepped up in voltage through the power station transformers, and sent from the station across transmission lines. The steam from the flywheel is condensed back to water, using cooling water from the tank, and pumped back to the boiler where it is reheated to continue the process.

A. Why Convex Lens?

The main property of the convex lens is convergence. Convex lens will converge the suns energy to a set focal point and will increase the temperature of the water. This will help in heating the water for generating the steam which will help in producing electricity required for various domestic and industrial applications.

Kids often take magnified glasses or hand lenses to burn paper by concentrating solar energy at a particular point known as focal point. Similar to this experiment would be the basic working principle of our project.

B. Advantanges of Solar Panel

1) Use of renewable energy resource.
2) Available in abundance.
3) Free source as it is from the sun.
4) Reduction in consumption of non renewable energy sources in thermal power plant.
5) This setup will require lesser space than that occupied by current solar panels.
6) Output efficiency obtained would be thrice of the existing system.
7) Human safety.
8) Electricity can also be transferred to the various regions.

V. ESTIMATED CALCULATIONS

Sun= Light energy + Heat energy
Light= 40% and Heat= 60%
In existing solar plants
Best claimed efficiency is 85%

Considering the literature survey again of Mumbai, the total amount of sunlight is given below-
From 9am-12pm= 200W
From 12pm-3pm=6400W
From 4pm-6pm=1300W
From 6pm-7pm=100W

Total energy is 8000W

So 85% of 8000W will give= 6800W

8000W light is converted to heat by structural design which is 98% of total available light.

Total energy is 18000W (heat and light)
Now from available light we will get 98% of 8000W
98% of 8000W= 7840W
For available heat we will get 90% of 10000W
90% OF 10000W=9800W
Total available power is 16840W

So we are getting 93.55%
By considering mechanical losses=5%
(This will be achieved by using gearbox and bearing and proper lubrication)
From total= 94%-5%= 89%
Now alternator is giving 71%
So from 71% of 89% will give 0.6319

Therefore total output power= 11374.2W
So, the total output is double of the existing solar system.

VI. RESULT

After performing many numbers of experiments on the model and by using various materials for testing, we are able to generate the power which is thrice times more efficient than that produced by the existing systems. This power obtained can be used for various domestic and industrial applications. The power obtained at the output can be used in medical applications as well and also the generated power can be transferred to the various regions.

VII. CONCLUSION

Comparison of different types of solar based systems has been presented. By making the use of convex lens and due to the advanced solar panel we are able to obtain sufficient amount of steam. Overall, in this system the output is thrice as of the output of existing systems. Moreover, the main source of input fuel is solar energy which is presented in abundant. Thus because of advanced design we are able to achieve the following:

1. Efficient use of solar energy.
2. Less dependency on renewable energy sources.
3. Larger power generation.
4. No wastage of water.
5. Advanced water purification system.
6. Effective utilization of space.
7. Cost efficient system.

REFERENCES

[1] Patent 2740/MUM/2013 by Mr. Adwait Parale, Protocontrol Instruments (INDIA) Private Limited, Bhosari, Pune, Maharashtra, India. named SYSTEMS AND METHODS FOR TRANSPORTATION OF LIQUID.
[2] India meteorological department, ministry of earth and science.
[3] Irena case study-2013
[4] Solar radiation resource assessment in India
[5] www.imdpune.gov.in
[6] Latest NCC Product / Data on Sale by government of India year2012