Conversion of Solar Energy into Electric Energy

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Abstract: - Energy is used in our daily life in one or another way. Without energy our life is nothing. Energy sources can be broadly classified as conventional or non-conventional sources/ Non-Renewable or Renewable energy. Conventional sources of energy or non-renewable sources are going to be exhausted and become nil in coming future. Whereas the renewable sources of energy are abundant in quantity and will always present. The idea is to make changes in selecting the source of energy so, that we become eco-friendly and prevent ourself in going towards the dark & grim end of conventional sources of energy.

Keywords: - Renewable energy, solar photo voltaic modules, solar voltaic cells, rechargeable batteries

I. INTRODUCTION

Conventional sources or Non-Renewable of energy have fossilfuels coal, petrol, gases etc. which also result in pollution in one or another form. The level of pollution may differ but it exists. On the another hand Non-conventional sources of energy or renewable sources of energy are eco-friendly and pollution free solar energy, wind energy, fuel cells, bio-fuels are abundantly present in nature. Our sun is largest member of solar system. Its energy is largely easily available, 100% pollution free and eco-friendly.

II. METHODOLOGY

Our sun is a nuclear reactors. The nuclear fusion reaction is continuously and constantly taking place since, millions of years. the Reaction is

$4({}_1H^1) \longrightarrow {}_2He^4 + 26.7$ MeV

This energy is produced in the interior of the solar sphere at temp. of millions of degrees. The case temp. is 8.40X 106 K and further reduces to 5777 K at the outer surface of sun. The energy comes to the surface of earth in the form of radiation. The total solar radiation incident on a surface consists of beam solar radiation, diffuse solar radiation and solar radiation reflected from the ground and the surroundings. The radiation is absorbed and can be utilized for heating purposes which can be readily used for cooking, and heating water/ fluid. This heated fluid can be used for moving for turbine blades and utilized for electricity generation. One way is to direct convert radiation into electricity Now, comes the concept of solar photovoltaic cells. It converts sunlight into electricity directly without any intermediate conversion steps. A single cell generates electricity in the range of 6wh to 10wh So, cells are integrated joined in series to increase the capacity in order to meet the direct requirement of voltage. Suppose, the voltage given by cells is 0.5V and six cells are connected in series then total voltage is 0.5V + 0.5V +0.5V + 0.5V+ 0.5V +0.5V = 3V.

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A solar cell has a terminal voltage of 0.75 volt under operating conditions so, available voltage is 0.75X3V= 2.25V. The solar photovoltaic modules are rated in terms of peak power (WP) output. WP is specified by manufacture in standard test conditions (STC).

Solar input radiation = 1000 W/m2
Temperature = 25C
Wind speed = 1 m/s

P max = Im X Vm

Where,

Pmax= Maximum power under STC
Im = Maximum convergent under STC
Vm = Maximum voltage under STC
Isc = Maximum current a PV module can produce
Voc =Maximum voltage when terminals are left open or without any load

Normally, Im is equal to 90% to 95% of Isc of module

$FF = \frac{Im \times Vm}{Isc \times Voc} = \frac{Pm}{Isc \times Voc} =$

PM = Isc X Voc x FF

$n = FF = \frac{Pm}{Pin} = \frac{Iscx\ Voc \times FF}{P \times A}$

P_{in} = for STC is 1000 w/m2
n= Efficiency
FF = fill factor

If cells temperature in PV module is greater than 25^0C then there is loss of 1mv or 0.00 1v per degree centigrade. This is the practically voltage available. The factors which shout be kept in mind while designing a PV module.

1. The conversion efficiency (n):- Several cells are connected in series or parallel as per requirement into the form of modules. The light falls on cells and it converts a fraction of light falling into electricity. Similarly, module will also convert fraction of energy into electrical energy. So, the conversion efficiency of modules is always less than solar cells. All solar cells used in PV modules may not be perfectly identical, so there is different in electricity generation. Secondly, area of modules is large than the size of number of cells and there is spacing also between the cells, but generally in calculations the spacing basis is not neglected so there is difference in calculation of electricity generated on sumation of individual cell voltage to the volage generated by the module as a whole.
2. Change in Amount of input light (P_{in}) :- Sunlight intensity is not constant it change according to time like phase of morning to evening and finally displays at intent at a particular location so, solar cell slow down and finally steps functioning at night. So, electric supply is fluctuating.
3. Change in PV module area:- Increasing PV module area means increasing the number of solar voltaic cells in series and increasing in solar voltaic cells means more voltage generated under the similar intensity of radiation.
4. Effect of change in PV module temperature: - At standard conditions means 1000W/m^2 sunlight energy 25^0C is the PV cell temp. if this temperature increase then these is decrease of Imv are 0.001v for per degree rise of temperature.

$P\ (temp) = P_{(STC)} - T_C \times P_{(STC)} \times \Delta T$

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5. Change in Angle of light falling on PV module (Θ):- The modules produce maximum power when the sunlight is falling per to the surface of module i.e. Θ = 90 when angle is less than 90 then some light gets reelected and only less amount of sunlight is falling perpendicular to the surface of module i.e. Θ = 90 when angle is less than 90 than some light gets reflected and only less amount of sunlight is utilizing for power generation. These above factors give actual true and practical aspect of using photovoltaic modules for electricity generation. The calculations can easily be made on the basis of energy demand of any house hold or office than selecting the capacity of photovoltaic module. The solar energy is best option during day time but what about night? or any cloudy dark day when the intensity of sunlight is zero or almost zero. Then comes the best solution is rechargeable batteries. These batteries charge doing night time or a cloudy dark day. Battery is a combination of toward more units of electronically cells (voltaic cells) connected in series or parallel as per need. Now , days rechargeable or secondary batteries. requite popular in use when batteries are connected in series the voltage are added while current remains same and In parallel the batteries connected the current is added while voltage remains same. This combination is used when high current is required. Battery provides electricity. In day time solar energy provides electrical though photovoltaic modules which is used for lights, fan, laptops, computer etc and in charging of battery. The charged battery provides electricity when these is a cloudy day or at night when sunlight is not present.

III. CONCLUSION

Though many types of renewable sources are present but solar energy is abundantly present in all parts of India, so, focus can be given by all states. Whereas for other sources like with interest in the places are to be decided all places are not suitable for wind energy, but, solar energy is present every where so, lasily useable.

IV. RESULT & FUTURE SCOPE

Solar energy is easily available in all parts of India, we should shift our focus towards solar energy. Solar cookers solar gyser, solar pumps , solar panel calculaters, solar street lights etc. In this way we will use less non-renewable energy products and pollution level will go dwon. In the begining though initial cost of solar pannel and, running is more but when use will increase solar with the passage of time the installation and running cost will go down with more research work and improved design more reliable solar energy products and batteries with more power back up will be emerged. If we individually take responsibility by using at least one gadget of solar energy though it my be small like a calculator, a simple solar larten etc. This will be increase mass productuction and we will find that everywhere we have solar energy instruments which are eco- friendly.

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