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Improved Life Cycle by Using Solar Energy Technologies

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Abstract

Energy crisis is one of the biggest issues in this world with limited and continuously depleting conventional sources for energy and power generation such as oil, gas, fossil fuels etc. So we need have alternate energy sources to meet the continuously increasing power requirements of the globe. Solar energy as one of the renewable one is derived from natural processes that are replenished constantly. This precious resource is free, inexhaustible resource. According to the point that solar energy is the energy derived from the sun through the form of solar radiation, in this paper an attempt is made to explore the applications of active solar techniques including the use of photovoltaic and solar hot water Systems to harness the energy.

Keywords: *Renewable Resources, Active Solar System, Photovoltaic Systems, Solar Thermal Systems.*

1. Introduction

The Earth receives an incredible supply of solar energy. The sun, an average star, is a fusion reactor that has been burning over 4 billion years. It provides enough energy in one minute to supply the world's energy needs for one year. In fact, "The amount of solar radiation striking the earth over a three-day period is equivalent to the energy stored in all fossil energy sources." Continuing to use fossil fuels is polluting the atmosphere, and consequently, unwanted greenhouse emissions and climate change effects will come to dominate every part of the earth.
Concentrating Solar Power, CSP systems use lenses or mirrors combined with tracking systems to focus sunlight which is then used to generate electricity. The primary mechanisms for concentrating sunlight are the parabolic trough, the solar power tower and the parabolic dish. The high temperatures produced by CSP systems can also be used to provide heat and steam for a variety of applications. CSP technologies require direct sunlight to function and are of limited use in locations with significant cloud cover. Based on these statements, currently, active solar technologies are employed to convert solar energy into another more useful form of energy. This would normally be a conversion to heat or electrical energy. Solar energy is radiant light and heat from the sun harnessed using a range of ever evolving technologies. Such as solar heating, solar photo voltaic, solar thermal energy. It is an important source of solar energy and its technologies are broadly characterized as either passive solar or active solar depending on the way they capture and distribute solar energy or convert in to other solar power. The earth receives 174 pet watts of incoming solar radiation (insulation) at the upper atmosphere approx. 30% is reflected back to space while the rest is absorbed by clouds, oceans and land masses.

2. Growth of renewables

Recently increased national attention to climate change and energy independence has prompted a new focus on sources of low-carbon, renewable energy. Foremost among these is solar energy, which is defined as electricity and thermal

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harnessed from the heat and light of the sun, which is described in the next parts. There are a number of qualities that make solar power superior to other forms of energy. [3]

3. Solar power information

The power which is obtained by sun is known as solar power. It is a natural or renewable source of energy. It does not create environmental pollution because it does not require any type of fuels. Around 60% of world's electricity is produced by thermal power plants in which coal is the main source. According to the latest research it is noted that coal in India would last for about 20 years approximately. The other main source of generation of electricity is oil which is also present in limited amount. According to BP's statistical review of world energy is estimated that if we using the oil at present rate, it will be finished after about 40 years. These two sources such as coal and oil release harmful gases and other byproducts, many of which result in ozone layer depletion. But there is no question of any harmful gases and byproducts in case of solar energy. It causes zero pollution or we can say it is an environment friendly source of energy. Solar energy has some negative points also the main disadvantage of solar power is its high initial cost. It cannot be available during nights, cloudy and winter seasons. It is one of the oldest renewable energy source which is used for running many modern technologies by using solar panels. There are mainly two types of solar panel. The first one is Solar water heating collectors, which absorb the energy from the sun and transfer it to heat water. The second one photovoltaic cell which transform the solar radiation directly into electricity.

3.1 Producing Solar Thermal Energy

Everyday, we are listening about global warming, environmental pollution and wars over energy resources. Most of the governments are doing very little about it. The first use of solar power is for heating purposes. One of the popular device which is solar energy for heating water is called solar water heater. It consists of a flat plate collector which absorbed solar radiations and convert them into useful heat. This heat is further used for heating of water. A simple water tank is used to store hot water. A water pump is used for circulating cold water into flat plate collector by using this device we can raise the temperature of water up to 80 degree calcius. If we need water at higher temperature we use an external water heater. This is also known as auxiliary water heater. Solar water is used for heating of water in home, shops, swimming pools, hotels etc.

3.1.1 Flat-Plate Collectors

Flat-plate collectors are the most common solar collectors for use in solar water heating systems in solar space heating. A flat-plate collector consists basically of an insulated metal box with a glass or plastic cover, the glazing, and a dark-colored absorber plate. Solar radiation is absorbed by the absorber plate and transferred to a fluid that circulates through the collector in tubes (Figure 1). In an air-based collector the circulating fluid is air, whereas in a liquid-based collector, it is usually water, whose functions are systematically different in practice. Flat plate collectors are used for temperature below 105 degree calcius.

Figure1. Flat-plate collectors

3.1.2 Evacuated Tube Collectors:

Evacuated Tube Collector is made of double layer borosilicate glass tubes evacuated for providing insulation. The outer wall of the inner tube is coated with selective absorbing material. This helps absorption of solar radiation and transfers the heat to the water

whichthe first graph shows the unoptimised torque waveform. Ripples in every waveform are clearly visible which makes torque non linear and flows through the inner tube (Figure 2). Solar water heating is now a mature technology. Wide spread utilization of solar water heaters can reduce a significant portion of the conventional energy being used for heating water in homes, factories and other commercial and institutional establishments. Internationally the market for solar water heaters has expanded significantly during the last decade.

Figure2. Evacuated tube collectors

3.1.3 ICS or Batch Systems

ICS systems include as the feature one or more black tanks or tubes in an insulated, glazed box. Cold water first passes through the solar collector, which preheats the water. The water then continues on to the conventional backup water heater, providing a reliable source of hot water. These systems should be installed only in mild freeze climates because the outdoor pipes could freeze in severe, cold weather. Because the water storage is on the roof, these systems typically weigh over 800 pounds when filled with water.

3.2 Producing Solar Electricity

Photovoltaic is the direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, an electric current result can be used as electricity. The photoelectric effect was first noted by a French physicist, Edmund Bequerel, in 1839, who found that certain materials would produce small amounts of electric current when exposed to light. In 1905, Albert Einstein described the nature of light and the photoelectric effect on which photovoltaic technology is based, for which he later won a Nobel Prize in physics. The first photovoltaic module was built by Bell Laboratories in 1954. It was billed as a solar battery and was mostly just a curiosity as it was too expensive to gain widespread use. In the 1960s, the space industry began to make the first serious use of the technology to provide power aboard spacecraft. Through the space programs, the technology advanced, its reliability was established, and the cost began to decline. During the energy crisis in the 1970s, photovoltaic technology gained recognition as a source of power for non-space applications [1]. As PV generates electricity from light, PV produces no air pollution or hazardous waste. It doesn't require liquid or gaseous fuel to be transported or combusted [2]. Sunlight is free and abundant. Photovoltaic systems allow you to generate electricity and store it for use when needed. Photovoltaic contributes to our energy security, as a young technology, it creates jobs and strengthens the economy. It frees us from uncertainties and foreign oil dependence. It consists of multiple components, including the photovoltaic modules, mechanical and electrical connections and mountings and means of regulating and/or modifying the electrical output.

3.2.1 Solar Photovoltaic Technology

A photovoltaic cell or solar cell is semiconductor device. Which convert the energy of sun light into electricity. It is a Greek word where photo means lights and volt is related to electromotive force. It is made up of two semiconductor layer. One containing a positive charge and the other containing a negative charge. When sun rays fall on the top of semiconductor layer then these sun rays are absorbed by semiconductor material and generate the electron-hole pair due to separation of electrons and holes an electric field is produced by which current start flowing from p-type material to n-type material. The electric

current produced by photovoltaic cell is depends upon the intensity of solar radiation and the generated voltage depends upon the types of semiconductor material used. The voltage rating of one solar cell is approx. 0.39 volt and current rating varies from 30mA to 60mA. The solar plate have lower efficiency of around 25% but operating efficiency of a solar plate is very low about 15% because some part of solar energy reflected back to atmosphere and some part is absorbed by glass surface. It has very long life (thousand of years). The diagram for photovoltaic system is shown below

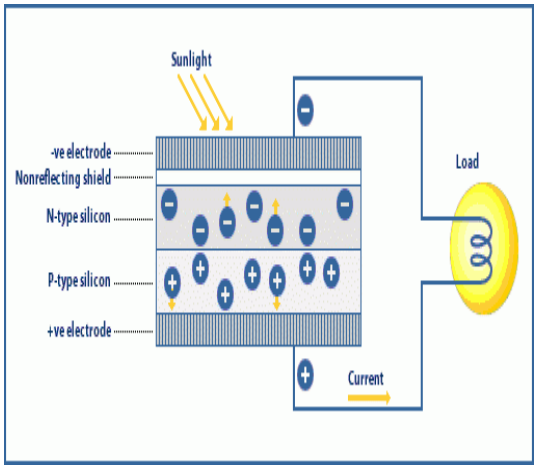

Figure3 photo voltaic system

3.2.2 Two Approaches for Using PV: Stand-Alone and Grid-Interface

• Stand-alone system

As its name suggests, this type of PV system is a separate electricity supply system. A stand-alone system is designed to operate independent of the national electric utility grid, and supply electricity to a single system. Usually a stand-alone system includes one or more batteries to store the electricity. So, PV systems were used only as stand–alone systems in remote areas where there was no other source of electricity. So, stand-alone systems are used for water pumping, highway lighting, weather stations, remote homes and other uses away from power lines [4]

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• Grid-interface system

Grid-connected or utility-intertie PV systems are designed to operate in parallel with and interconnected with the electric utility grid. The primary component is the inverter or Power Conditioning Unit, PCU. The inverter converts the DC power produced by the PV array into AC power consistent with the voltage and power quality required by the utility grid. The inverter automatically stops supplying power to the grid when the utility grid is not energized. A bi-directional interface is made between the PV system AC output circuits and the electric utility network, typically at an on-site distribution panel or service entrance. This allows the power produced by the PV system to either supply on-site electrical loads, or to back feed the grid when the PV system output is greater than the on-site load demand. During periods when the electrical demand is greater than the PV system output (night-time), the balance of power required is received from the electric utility This safety feature is required in all grid-connected PV systems, it also ensures that the PV system will not continue to operate and feed back onto the utility grid when the grid is down for service or repair. Either approach, stand-alone or grid interface, can be done partially; with PV's being used in conjunction with a generator in a stand-alone system, or with the central grid power serving as a primary power source in a grid-interface system. PV systems produce power intermittently because they work only when the sun is shining. This is not a problem for PV systems connected to the utility grid, because additional electricity you need is automatically delivered to you by your utility. Systems those are independent of the grid use battery banks to provide power when the sun is not out. This energy source is free, clean and highly reliable. PV systems are long-lasting and require little maintenance. The benefits of Photovoltaic far outweigh the initial cost the systems.

4. Conclusions

With fuel prices constantly rising and oil reserves on the verge of declining, renewable energy is what is being looked at, as never-ending energy source of the future. Solar energy is most sought today in developing countries.

Just the tiny fraction of the Sun's energy that hits the Earth, around a hundredth of a millionth of a percent, is enough to meet all our power needs many times over. In fact, every minute, enough energy arrives at the Earth to meet our demands for a whole year, if only we could harness it properly.

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