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### An Empirical Study on Significant Role of Solar Energy Products in this Modern Era

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#### A B S T R A C T

Nowadays, solar energy has very significant in the fulfillment of power because of heavy need and lower production. It is the easiest way to produce power. The problem regarding solar system is unawareness of this method and heavy cost. In this paper, it is going to study about effectiveness of solar system and their usage in this advanced world.

### Introduction

It is the energy received by the earth from the sun. This energy is in the form of solar radiation, which makes the production of solar electricity possible. Electromagnetic energy (solar radiation) transmitted by the sun (approximately one billionth of which reaches the earth) that is the basis of all terrestrial life. It amounts to about 420 trillion kilowatt-hours, and is several thousand times greater than all the energy used by all the people. Solar energy is harnessed by capturing the sun's heat (through solar heaters) or light (through photovoltaic cells). It is estimated that one square kilometer (about 0.4 square miles) of land area receives some 4000 kilowatts

(4 megawatts) of solar energy every day enough for the requirements of a medium-sized town.

The following is a list of products which use solar panels to power their operation.

- Solar air conditioning
- Solar car
- Solar cell phone charger
- Solar powered compacting trash can
- Solar fan
- Solar keyboard
- Solar lamp
- Solar powered calculator
- Solar powered fountain
- Solar powered pump

- Solar powered radio
- Solar powered refrigerator
- Solar powered watch

### **Solar Cell Phone Chargers**

**Solar cell phone chargers** use solar panels to charge cell phone batteries. They are an alternative to conventional electrical cell phone chargers and in some cases can be plugged into an electrical outlet. There are also public solar chargers for mobile phones which can be installed permanently in public places such as streets, park and squares. The model which is according to European Commission proclaimed as the first in the world is the Strawberry Tree, public solar charger invented by Strawberry energy Company. This solar station won the first place at "EU Sustainable energy week (EUSEW) 2011" in the Consuming category.

Some models of cell phones have a built in solar charger and are commercially available for GSM cell phone models. Solar cell phone chargers come in different shapes and configurations including folding and rotating types. They also come in the form of straps, with solar cells on the outer surface and a nickel metal hydride battery within. They are capable to charge a mobile device fully within six hours of exposure to the Sun resulting in 40 minutes of talk time. Solar chargers are also available for other cell phone accessories, such as Bluetooth headsets and speaker phones.

### **Solar Fan**

It is a mechanical fan powered by solar panels. The solar panels are either mounted on the device or are installed independently. Solar fans mostly do not require secondary power sources other than solar power, as most of them are used for

cooling purposes during day time. Some types are also used for heating purposes. It runs the fastest when it is the hottest outside providing savings on air conditioning costs.

### **Applications**

Solar fans are mostly applied for residential cooling purposes and in some cases, for industrial applications<sup>5</sup>

#### **Solar-powered attic fan**

When airflow in the attic is low and when the sealing between the building and the attic is ruptured, solar-powered attic fans will provide airflow from the building into the attic. This action reduces the dampness in the building and saves energy. By installing a solar fan in the attic, the whole house is cooled as it creates a draft, draws in hot air and pushes it out. It provides good circulation of air when the cool outside air is being drawn into the house through windows.

#### **Solar-powered gable fan**

It is similar to the solar-powered attic fan, except that its installation is a little different. Attic fans are installed on the roof, whereas gable fans are installed in the gables, as the name suggests. They are typically smaller in size but are more powerful than the solar attic fans. They are mostly installed in places like garages or barns and other storage places where moisture is usually present. These types of fans are generally installed on intake grills to provide ventilation. Vents are usually installed high on the gable close to the ridge and are also coupled with soffit or roof vents for well-balanced intake and exhaust air avenues. The airflow depends upon the level of sunlight when there is

more sunlight, the airflow will be more resulting in enhanced cooling. It is also capable of lowering the air conditioning costs by cooling the attic.

### **Advantages**

A solar fan is more environmentally friendly.

Though initially the installation may be costlier, in the long term it would turn out to be cheaper because it does not use power from the utility grid and may provide savings up to 30 percent on air conditioning costs

Risk of electric accidents is eliminated as there are no electric cords attached to the solar fan.

Another great benefit of having a cordless appliance is that it has much more mobility compared to conventional fans.

### **Solar Street Lights**

It is raised light sources which are powered by photovoltaic panels generally mounted on the lighting structure. The photovoltaic panels charge a rechargeable battery, which powers a fluorescent or LED lamp during the night.

### **Features**

Most solar panels turn on and turn off automatically by sensing outdoor light using a light source. Solar streetlights are designed to work throughout the night. Many can stay lit for more than one night if the sun is not available for a couple of days. Older models included lamps that were not fluorescent or LED. Solar lights installed in windy regions are generally equipped with flat panels to better cope with the winds.

Latest designs use wireless technology and fuzzy control theory for battery management. The street lights using this technology can operate as a network with each light having the capability of performing on or off the network

### **Types**

Solar street lights are generally classified into two types.

#### **Standalone solar street lights**

Standalone solar street lights have photovoltaic panels mounted on the structure. Each street light has its own photovoltaic panels and is independent of the other lamps.

#### **Centrally operated solar street lights**

In this type, the photovoltaic panels for a group of street lights are mounted separately. All the street lights in a particular group are connected to this central power source.

### **Advantages**

Solar street lights are independent of the utility grid. Hence, the operation costs are minimized.

Solar street lights require much less maintenance compared to conventional street lights.

Since external wires are eliminated, risk of accidents is minimized.

This is a non polluting source of electricity

Separate parts of solar system can be easily carried to the remote areas

### **Disadvantages**

Initial investment is higher compared to conventional street lights.

Risk of theft is higher as equipment costs are comparatively higher.

Snow or dust, combined with moisture can accumulate on horizontal PV-panels and reduce or even stop energy production.

### **Solar Energy Powered School Traffic Light**

#### **Solar Panel Battery Enclosure on Traffic Light**

Most solar traffic lights use LED lamps as they are more reliable and have more advantages over other lighting devices like CFL lamps as they are more energy efficient, have a longer life span and turn on and turn off quickly. Solar traffic lights contain enclosures which house the batteries and the control panel circuitry. Existing solar panels can also be upgraded with an auxiliary power source using solar panels for use during power failures. The other parts in a solar traffic light include a charge controller to control the charging and discharging of the battery and a countdown timer which displays the amount of time left before the battery discharges fully.

#### **Solar traffic light as an auxiliary system**

Auxiliary solar traffic lights, in addition to the existing street lights, can be attached near the primary street lights. They are useful in regulating traffic when the primary system fails. The control system in the auxiliary traffic light monitors the primary system and when the primary system fails, it switches to the auxiliary

system. Switching from primary system to the auxiliary system and vice versa can also be achieved using a hand-held transmitter unit.

### **Solar traffic light during natural disasters**

Portable, Solar Powered, Traffic Light used when construction workers must narrow a 2way street to a single lane and must replace traffic controls for safety.

Solar traffic lights can also be used during periods following natural disasters, when the existing street lights may not function due to power outages and the traffic is uncontrollable. Street lights used in such scenarios are designed to be portable enough to be carried and operated by police and relief workers wherever traffic needs to be regulated.

### **Advantages**

Solar traffic lights are self sufficient as they do not require external power sources.

They are easy to set up and operate.

They require very little to no maintenance as they have no moving parts

### **Solar Air Conditioning**

It refers to any air conditioning (cooling) system that uses solar power. This can be done through passive solar, solar thermal energy conversion and photovoltaic conversion (sunlight to electricity). The U.S. Energy Independence and Security Act of 2007 created 2008 through 2012 funding for a new solar air conditioning research and development program, which should develop and demonstrate multiple new technology innovations and mass

production economies of scale. Solar air conditioning will play an increasing role in zero-energy and energy-plus buildings design.

### **Solar lamp**

A **solar lamp** is a portable light fixture composed of an LED lamp, a photovoltaic solar panel, and a rechargeable battery.

Solar panel on top of the lamp recharges the battery.

Outdoor lamps are used for lawn and garden decorations. Indoor solar lamps are also used for general illumination (i.e. for garages and the solar panel is detached of the LED lamp).

Solar garden lights are used for decoration, and come in a wide variety of designs. They are sometimes holiday-themed and may come in animal shapes. They are frequently used to mark footpaths or the areas around swimming pools.

Solar lamps recharge during the day. At dusk, they turn on (usually automatically, although some of them include a switch for on, off and automatic) and remain illuminated overnight, depending on how much sunlight they receive during the day. Discharging time is generally 8 to 10 hours.

Some solar lights do not provide as much light as a line-powered lighting system, but they are easily installed and maintained, and provide a cheaper alternative to wired lamps. In India, solar lamps, commonly called solar lanterns, using either LEDs or CFLs, are being used to replace kerosene lamps.

### **Conclusion**

Solar energy is vital to support life on earth, it helps to grow our food, light our days, influence weather patterns, provide heat, and can be used to generate solar electricity. Solar electricity relies upon man-made devices such as solar panels or solar cells in order to provide a source of clean, and low cost renewable energy.

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