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SOLAR POWER SYSTEM & ELECTRICAL SYSTEM- AN ANALYSIS

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ABSTRACT

Today about four-fifth of India's need for electricity are met by fossil fuels which may supply the necessities of power for another 100 -150 years.

1. *In India, the solar energy potential alone is numerous thousand times more than the aggregate power needs of the nation.*

2. *With over 300 sunny days in a year, India's geo-position allows to receive over 5000 trillion kWh of pure solar energy each year, with the potential to generate huge quantity of electricity through a high energy security and zero carbon process*

3. *Solar Photovoltaic (PV)] framework can be a down to earth and moderate answer for giving the expansive scale electrical burden in any business place. This will decrease the heap utilization from national matrix and additionally this type of Renewable Energy (RE) is absolutely environment neighborly. Trial study has been made in this paper which shows the investment funds of power utilization cost in an instructive grounds fundamentally.*

INTRODUCTION

In no time, the world energy utilisation is 10 terawatts (TW) every year, and by 2050, it is anticipated to be around 30 TW. The world will require around 20 TW of non-CO 2 energy to balance out CO2 in the climate by mid-century. The least difficult situation to balance out CO2 by mid-century is one in which photovoltaic (PV) and other renewable are utilised for power (10 TW), hydrogen for transportation (10 TW), and fossil fills for private and mechanical warming (10 TW) (Zweibel, 2005). Consequently, PV will assume a noteworthy part in meeting the world future energy necessity. The present is considered as the "tipping point" for PV (Kazmerski, 2006).

The most copious energy hotspot for the earth is the Sun. The sunlight is the source of all type of Energy like wind, fossil fuel, hydro and biomass. The surface of the earth receives solar energy at a rate of 120 pet watts, this implies that the sun powered energy got from the sun in one day can fulfill the entire world's interest for over 20 years. Renewable engergy originates from characteristic assets, for example, daylight, wind, downpour, tides and geothermal warmth. These assets are renewable and can be actually recharged. Along these lines, for all functional purposes, these assets can be thought to be unlimited.

Sun is the most requesting energy source because of reality that it is the most plentiful and best energy source on earth. Gotten from sun,solar energy is environment free as well as costless. Most recent innovation permits the outfitting of sun powered vitality through cells known as sun based cells or photovoltaic cells. Photovoltaic cells are set in direct sunlight, when the immediate daylight

strikes these cells synthetic response happens which produce electric streams.That's why solar energy is used. LED based lightning framework is utilized which got charge from lead batteries charged by solar boards. Solar System and LED lightning blend empowers its enthusiasm for representing powers to help road lights and schools in remote zones without setting up any outer foundation in a pitiful customary manner. Remain solitary solar street lightning arrangements are famous and normally worked with altered PV boards and outline. Frameworks are likewise utilized as a part of schools for lightning reason, web introducing hardware and portable PC charging. This framework incorporates photovoltaic cell, batteries and other availability types of gear. In this study, we review the leading edge of solar power energy over electrical energy in terms of economy, safety and future prospects of power generation method.

Main Components

Solar photovoltaic (PV)

Solar energy can be produced by two methods. One is Solar PV i.e. through photovoltaic cells and other is Solar Thermal i.e. by the virtue of concentrated power of sun. Solar Photo-voltaic (PV) is a strategy for creating electrical power by changing over solar radiation into direct current electricity utilizing semiconductors that show the photovoltaic impact. Photovoltaic power created utilizes solar boards composed of various solar cells having a photovoltaic material. The amount of power available from a solar cell depends on:

- Type and area of material
- Intensity of sunlight
- Wavelength of sunlight

Working principle: Sunlight possesses composed of minor energy pockets known as photons and those individual solar cell is laid out of positive and negative layer, in this manner, having the capacity to make an electric field (like the one in batteries). When photons are caught up in the cell their energy causes electrons to get free, and they move to the base of the cell, and way out through the interfacing wire which makes stream of electrons in this manner create power. The greater measure of the accessible sunlight the more noteworthy the stream of electrons and the more power gets delivered in the process. Several solar cells are connected together, encapsulated in a glass covered frame to form a module. A solar cell made from a mono-crystalline silicon wafer with its contact grid made from bus bars (the larger strips) and fingers (the smaller ones).

The photovoltaic (PV) cell's working requires 3 essential characteristics:

- Photons strike the solar board and are consumed by semiconducting materials, for example, silicon.
- Electrons (negatively charged) from their current sub-atomic/nuclear orbital are energized. The electron once energized can either scatter the energy, and come back to its orbital or go through the cell till it achieves an anode. Current begins coursing into the material to scratch off the potential and this power is caught. Due to the special composition of solar cells, the electrons are only allowed to move in a single direction.
- Variety of solar cells changes over solar to a fit to use measure of direct current (DC) electricity.

Essential requirements for solar energy generation are as follows:

(a) High solar radiation at the specific site

(b) Adequate land availability.

(c) Suitable terrain and good soil condition.

(d) Proper approach to site.

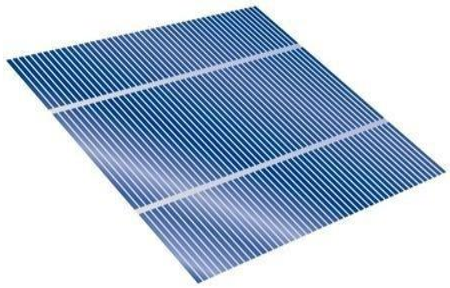
(e) Suitable power grid nearby.

Solar Board

Solar boards are intended to assimilate sun beams as a wellspring of energy for creating power and warming. It is likewise called photovoltaic as it changes over light energy straightforwardly into electrical energy. Solar board is comprised of solar cells. An expansive number of little solar cells spread over an extensive surface territory which can cooperate for arrangement of adequate energy to be utilized. Bigger the measure of light that falls on a cell, bigger is the measure of power produced. Two types of solar boards are utilized to accomplish power. The most widely recognized is the solar power cells. Diverse outline of solar boards which are expanding in notoriety are the solar water warming boards which can give all a player in homes boiling point water supply, heat swimming pools and for different purposes. Utilizing solar power boards some type of battery stockpiling is connected to the framework. This permits the capacity of power delivered during that time which is utilized around evening time (Fig . 1)

Figure 1: Solar Boards

LED Lights



The solar street lights are luminescence sources which are controlled by photovoltaic boards scaled on lightning structure or coordinated itself in the post. The PV boards are used to charge a rechargeable battery which controls a fluorescent or LED light amid night. LED lights are generally utilized for lightning hotspot for present day solar light. These lights furnish much higher lumens with lower energy utilization. LED lights surrender energy utilization to 50 percent lower than high weight sodium light (HPS) which is generally utilized as lightning source as a part of conventional road lights. The LEDs absence of warm up time likewise permits movement locators for extra pick up of effectiveness. LED lights are additionally utilized as a part of schools for lightning in classroom and examination lobby.

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Batteries

The most vital segment in the establishment of close planetary system are batteries. Batteries hold electricity from solar boards amid day time and convey this energy to the apparatus amid night. The life cycle of battery is vital to the lifetime of light and limit of battery will influence the reinforcement days of the lights. Two sorts of batteries are generally utilized which are Gel Cell Deep Cycle battery and Lead Acid Battery and some more. Amid charging time, electrical energy is changed over into substance vitality and put away as synthetic energy and amid releasing time the compound energy is changed over into electrical energy. The best possible determination of batteries for PV frameworks relies on the best information of their configuration highlights, operational necessities and execution qualities. Batteries are production by the blend of various consecutive and parallel procedures. Conduction of charging and releasing cycles on batteries are done essentially before conveying them to the business sector for dispersion to purchasers. Cells, dynamic component, electrolyte, matrix plate, separator, terminal posts, cell occasions and case are the imperative parts of batteries.

Charge controller

Charge controller is a fundamental piece of about all power frameworks that charge batteries. It is additionally imperative for sunlight based road lights and lightning framework. Switching on/off charging and lights is chosen for the most part by controllers. The capacity of charge controller is entirely straightforward; it hinders the opposite current and keeps battery from cheating. Some charge controllers additionally keep battery from over release, shield from electrical over-burden and show battery status and force stream. The PV boards works with pumping in pumping electric current to the battery.

Shaft

Street light contains its own photovoltaic board, which is autonomous from other road lights. Number of boards is introduced as a focal source source on a different area which supplies energy to number of road lights. Shaft Lock is intended for post scaled solar board confining framework which is a segment of Sun Lock group of sun oriented surrounding items. , 80 W and 85 W boards are some sorts of edges that are accessable. They are additionally possible for one.

OBJECTIVES OF STUDY

Main objective of our study is to review the solar power leading edge over the electrical energy as it is renewable energy resource and is environment friendly; another objective is to perform a comparative study on solar energy and electrical energy.

ASSUMPTIONS

This estimate depends on the accompanying assumptions:

- There are 300 sunny days in an year
- Electricity is available 24hrs in a day without any fluctuation in voltage
- Annual average consumption will remain same

PRESENT WORK

Present work consists of comparative cost analysis for electrical and solar lighting system for an Educational Campus having an area about 60 acres land.

(a) Total length of the road on which lighting is required: - 1200m

(b) Considered distance between two light poles:- 12m

(c) Total number of poles for given dimension of the road:- 200m

Sr No.	Cost	Electrical System	Solar System	Remarks
1.	Installation cost	Rs. 11,200	Rs. 11,100	50% subsidy is provided by government for the installation of solar panels therefore the net cost of solar lighting system will be 22,200/2
2.	Maintenance cost	Rs.3186	Rs. 9561	Average cost for 10 years with 10% increment every ye ar @ Rs. 2000/year for electrical and @ Rs. 6000/year for solar
3.	Running cost	Rs. 9855	NIL	730 units per year @ Rs.13.50 average for 10 years on increment of 10% every year. @ Rs. 8.50/year for electrical system
4.	Grand total cost	11200 + (3186 + 9855) x 10 = Rs.1,14,610 per pole ten years	11,100 + 9561 × 10 = Rs. 1,06,710 per pole for 10 years	Installation cost + Maintenance cost + running cost (for ten years)
5.	Total cost for 200 pole setups	1,14,610 × 200 =28.322,000	1,06,710 × 200 = 21342000	

Saving for ten years in case of solar panel is: 28,322,000-21,342,000 = Rs.6,980,000 Percentage saving in case of solar panel is: 24.64 % of the total cost for electrical system

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RESULTS AND DISCUSSION

The followingresults have shown that solar power is much more economical as compared to Electrical power if it is compared for a span of 10 years. There is a saving of 24.64% if we use solar panel instead of electrical system.

CONCLUSION

Solar Energy doesn't transmit carbon dioxide amid operation; the energy is pure and recyclable. The real material of photovoltaic board which is the most usually utilized today is silicon. Silicon is bounteous and ecologically sheltered. This research gives a brief outline to the individuals who are occupied with solar energy advancements and as a source of perspective for the individuals who need to put or work in this field. Solar power is infirm power and efforts are required to be made it firm power by developing appropriate storage facilities. The solar power can also make a viable source of energy by announcing the suitable policies incentives. The experimental study which has been done in this paper has shown that although the initial cost of solar panel installation is higher as compared to electrical power but if it is considered for long term, it emerges out to be the cheaper one and it is very beneficial for the society and environment.

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