

# Solar Electrical Vehicle with Battery Charging at Running Condition

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**Abstract:** *This Paper presents a study of solar-powered electric cars. Solar energy is one of the main sources of renewable energy that can be a viable alternative to fossil fuels. In bright sunlight, the sun's rays emit about 800-1,000 wattsof energy per square meter of the earth's surface. If solar energy is clean and free, why not use it to power our cars? Is a solar-powered car a good solution? Solar energy is a term used to use solar energy to power an electrical device or system. Solar panels for composed of a grid of solar cells. These cells collect the sun's energy and convert it into electricity. Today, solar cars use energy from the sun by converting it into electricity. This electricity burns the battery that powers the car's engine. A little sun instead of battery cars direct electricity directly to the electric motor. Today, solar cars can be categorized as "green cars" powered by renewable energy sources without carbon emissions..*

**Keywords:** Solar energy, solar powered electric vehicle (SPEVs), grid, solar cells, Green vehicle

## I. INTRODUCTION

In today's world, energy demand is increasing every day. Sooner or later it will be higher than in the current situation. That is why the world is now turning to sustainable energy and leaving energy from fossil fuels for their harmful effects on the environment. As solar energy is sustainable and less harmful to the environment, fuels are gradually being replaced. For optimal use of solar energy, we worked proactively on our project. Our solar-powered hybrid car uses solar panels and batteries instead of fossil fuels. That it can be considered a completely ecological car, which is in the current state of the world to cry. By taking these factors into account, we have made our solar car more efficient and more efficient for regular transport. Let us hope that the solar-powered electric car will be able to replace petrol cars and play a key role in creating a safe and clean environment.

The driving force to a shaft by an electrical motor that is pass solar power once some necessary conversion in electric vehicles rather than an inside combustion engine which is environmental pollution free is that the basic regulation of star high-powered electric vehicles. The electricity created by electrical phenomenon (PV) cells victimization daylight powers the electrical motor directly for driving of solar-powered vehicles (SPEVs). throughout sun shining the electricity is produced by PV cells otherwise, the vehicles use intense energy in its batteries. the most part of a solar automotive is its solar array, which collect the energy from the sun and converts it into usable electrical energy. The star cells collect some of the sun's energy and store it into the batteries of the solar car. Before that happens, power trackers converts the energy collected from the solar battery to the right system voltage, so the batteries and also the motor will use it. once the energy is keep within the batteries, it's obtainable to be used by the motor & motor controller to drive the car. The motor controller adjusts the number of energy that flows to the motor to correspond to the throttle. The motor uses that energy to drive the wheels.

## II. SOLAR VEHICLES

### 2.1 History of Solar Vehicles

In the late 1970's photovoltaic devices and electric vehicles were combined for the first time. Facing the pressure of the oil crisis, engineers and environmentalists started looking for an alternative source of energy and finally found solar as the best alternative. In order to create more coverage and examine interest in solar powered transportation, Hans Tholstrup organized a 1,865 mi (3,000 km) race across the Australian outback in 1987 ,better known as the World Solar Challenge

(WSC), in which competitors were invited from industry research groups and top universities around the globe. General Motors (GM) with their Sunray vehicle won the event by a large margin, achieving speeds over 40mh. In response to their success, GM came up with the US Department of Energy (DOE) to hold the GM Sunray in 1990. Approximately the same length as the WSC, Sunray is considered to be a more difficult race due to more varied terrain and climates as well as more challenging road surfaces and traffic blocking. USA conducted American Solar Challenge in 2001, then the North American Solar Challenge in 2005, which are now held every two years across different routes. A new record for the longest solar vehicle race, covering 2460 mi (3960 km) from Austin, Texas, USA to Calgary, Alberta, Canada was setup in the year 2005. Initially motivated by research, the building of solar vehicles is now referred to as —brain sport, developing dozens of new vehicles each year for the sole purpose of competition, not production. Solar vehicle competition enables engineers to research and develop new technologies. With the unique nature of the solar community and events, these technologies remain an available resource. Considerable improvements and attentive technologies of electric vehicles has been developed that can be applied to a broader range of automobiles to provide more efficient, effective and reasonable alternatives over combustion engine vehicle.

## 2.2 Why Need Solar Powered Vehicles?

The air pollution that warming the earth as a result of pollutants from the automobiles, which is about 23% of the total air pollution as shown in Fig.1. One of the great problems faced in urban areas throughout the world is the increase in vehicles due to an imbalance between the public transport and the increase in population which, finally results in a huge amount of air pollution.

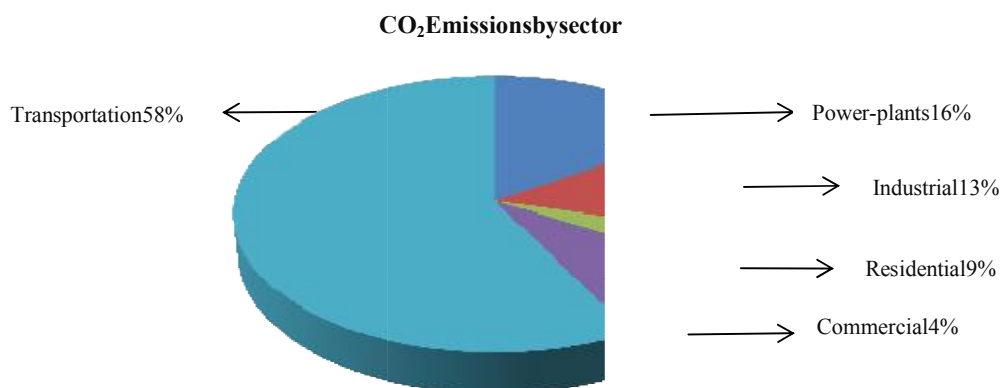


Fig.1. Different Sectors of CO<sub>2</sub> Emissions

With the increasing rate of population, the amount of vehicles is additionally increasing because of the imbalance between these 2 factors and eventually the pollution rate is also increased. Over the last two decades, several experiments are done to manage emission from IC engine. thus during this respect, this star steam-powered vehicle is also one in all the solutions attributable to waste matter free property.

## III. METHODOLOGY

When electricity is cut out we have a tendency to used alternative energy and convert at in to electric energy and used for charging purpose. A star charger employs solar energy to produce electricity to device or charger batteries. they're usually moveable. A series of solar cells are put in on the roof location of car and might be connected to electric battery bank to store energy for off-peak usage. Most portable chargers can get energy from the sun only. The generation of wattage by cold based mostly steam powerhouse and nuclear energy plants causes pollution, that is probably going to be more harmful in future thanks to massive generating capability on one aspect and it Became robust as a result of larger awareness of the individuals during this respect. The recent worse energy catastrophe has forced the planet to grow higher and substitute ways of power generation, that can be adopted simply due to its effectiveness and plenty of varied reasons.

This is the key element of any solar electrical phenomenon system, that takes the sun's energy and converts it into the electrical current. the method of changing lightweight (photons) to electricity (voltage) is named the solar photovoltaic (PV) effect. electrical phenomenon solar cells convert daylight directly into solar energy (electricity). They use skinny layers of semi-conducting material that's charged otherwise between the highest and bottom layers. The semi-conducting material may be cased between a sheet of glass and or a chemical compound resin. once exposed to daylight, electrons within the semi-conducting material absorb the photons, inflicting them to become extremely energized. These move between the highest and bottom surfaces of the semi-conducting material. This movement of electrons generates a current referred to as a right away current (DC).

The Charge Controller may be a change device that may connect and disconnect the charger to the battery and it'll take hold over charging and to prevent charging at the right voltage. this may defend the batteries from injury from over-charging and regulate the facility going from the solar panels to the batteries. A micro-controller within the circuit will scan the extent of the batteries and so bring to an end the supply of the solar panels to the batteries, once it sees the battery is at the absolutely charged state. If this wasn't in place, the solar panels would keep feeding the batteries energy and therefore the batteries would become hot and injury the inner components. The advantage to possess a micro-controller within the system is that it'll open a spread of options to feature to the system. as an example the micro-controller are going to be programmed to regulate and show the battery level of the system.

The team has hand-picked 2 deep cycle batteries to power the system. every battery could be a 12V and includes a 2200mA - hour Capacity. Batteries for PV system batteries usually need to discharge a smaller current for a extended amount of time, adore in the dead of night or throughout an influence outage, whereas being charged during the day. Deep cycle batteries are designed for the aim of discharging to a lower capacity, between 50% and 80%, than a traditional battery. the foremost ordinarily used deep-cycle batteries are lead-acid batteries and nickel-cadmium batteries, each of that have professionals and cons. The deepcycle batteries are ready to be simply charged and discharged persistently and might last for many years thanks to the thicker plate materials utilized. Batteries in PV systems can even be terribly dangerous thanks to the energy they store and also the acidic electrolytes they contain, so you'll want a well ventilated, nonmetal enclosure for them.

#### IV. BLOCK DIAGRAM

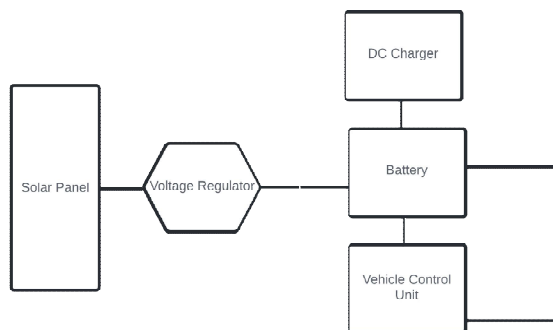


Fig 2. Block Diagram

#### V. WORKING OF SYSTEM

From the higher than diagram you'll be able to terribly simply get the thought that however your circuit goes to work. solar panel Charger will take the dc input from the solar panel and can regulate the voltage so as to charge the battery from it. solar panel charger circuit that we tend to are creating is created from electronic elements which are easily accessible in market yet as online.

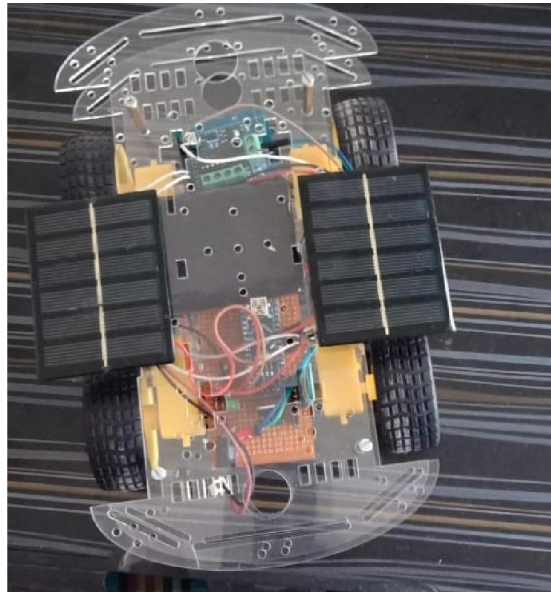


Fig.3.Hardware Component

Below are the components which you will need to complete the solar battery charger circuit:

- Solar panel
- Voltage Regulator
- Resistors of variable resistance
- Diode
- Schottky diode
- Battery (5v – 14V)
- LED lights

Additionally you can use the 5 V boost converter along to the battery we charge in order to charge our devices like mobile phone from the circuit or the charged battery

The solar panel which is being used has the output voltage and current near about 17 V and 0.3 A respectively. We use LM317T voltage regulator IC instead of the traditional 78XX voltage regulator family since the output voltage of the LM317T IC can be easily set to the desired voltage from 1.25 V to 37 V with the maximum current of 1.5 A

The Schottky diode plays a very vital role in the Solar Battery Charger as there would be a negative current flow to the solar panel when the battery is not being charged. Schottky diode of current rating up to 3A can to a pretty well.

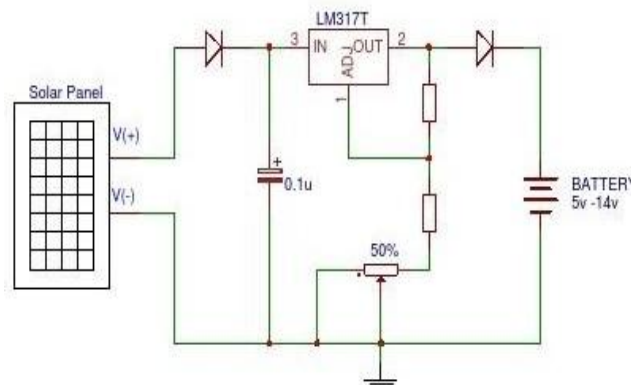


Fig.4.Circuit Diagram

## **VI. ADVANTAGES**

1. It boosts the battery's capacity.
2. It extends the battery's life lifetime.
3. It regulates the charging, discharging, and recharging of batteries and keeps them within their temperature ranges
4. It foresees battery possibilities in the near future.
5. Unlike regular vehicles, solar powered Vehicles are able to utilize their full power at any speed.
6. Solar powered Vehicles do not require any expense for running.
7. Solar Vehicles are quite.
8. Solar Vehicles require very low maintenance.
9. A solar Vehicle produces no harmful emissions.

## **V. DISADVANTAGES**

1. Solar Vehicles don't have speed or power that regular vehicles have.
2. Solar powered Vehicles can operate only for limited distance.
3. If there is no sunlight.
4. If it is dark out for many days, the car battery will not charge and this can be a problem. This is the main reason why people don't rely on solar vehicles.
5. Parts used in solar Vehicle are not produced in large quantity so they are expensive.

## **VII. CONCLUSION**

The objective of this study is to style and construct of more cost-effective} star high-powered vehicle. once performance study, it's obtained that storage system will run the solar vehicle regarding twelve km. the most speed of the solar vehicle has been found at twenty km/h. So, the solar powered vehicle is meant and created during this study will be used as a inexperienced vehicle in developing countries because of its less expensive and 0 pollution result nature.

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