

Solar Photovoltaic Charging Station for Electric Vehicles

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Abstract

Electrical Vehicle (EVs) has attracted much attention owing to their use of clean energy. Large progress in Lithium ion battery has propelled the development of EVs. However, the challenge is that growing number of EVs leads to huge demand in electric power, which will aggravate the power grid load. This leads to an exploration for alternative clean sources of energy to charge EVs. This project implements solar energy system to erect a charging for EV application. The charging station employs multi-port charging by providing a constant voltage DC bus. The charging controllers are operated based on the concept of power balance, and constant current/constant voltage charging. Performance of the charging Performance of the charging system is validated with simulation and experiment result.

Keywords: *- Electric vehicle, charging station topology, Path inference, Renewable energy*

INTRODUCTION

Electric Vehicles (EVs) have received considerable attention in recent times is an eco-friendly and cost effective alternative over conventional vehicle driven by internal combustion engine (ICEs). They have lower operating costs with respect to ICE vehicle and can be also charged with

locally produced renewable energy sources (RESs). However, there exist several challenges to large scale adoption of EVs. Although their operating costs are less, EVs are still more expensive to buy than ICE vehicle. In addition, access to charging station is limited and large capital investment is required for developing a

public charging infrastructure. In addition EVs consume comparatively high power from the grid during charging.

Electric vehicle charging technology continuous to advance several standard and guideline have become widely acceptable across the industry this section gives a brief overview of charging instruction technology standard and terminology.

An Electrical bike charging power management system is a charging power supply for electrical vehicle that process design of a model for a PV basic electrical vehicle that forecasted total power output and under particular condition In order to charge the batteries the batteries efficiency , and to ensure their long life we need a smart battery management of charging system. To realize such an EV charging system has come up with smart electrical vehicle battery charging solution for charging EV batteries.

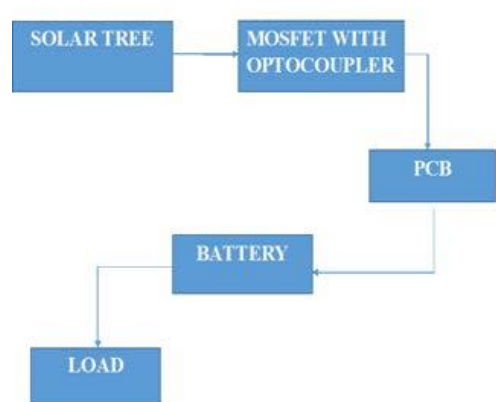
Electric vehicles (EVs) have been the significant proliferation since post one decade. This is calculating demand is primarily due to the gradual exhaustion of the fossil fuels that includes crude oil, coal, natural gas and heavy oils which is demanded by the growing population of

the developed and developing countries. It is conspicuous that the demand for PHEV is more. EVs do not have an internal combustion engine and therefore do not use conventional fuels like petroleum.

Firstly, the use of renewable energy sources such as solar energy is accessible to a wider audience because of the falling cost of PV panels. Reduced energy demand on the grid due to EV Charging as the charging power is locally generated in a GREEN manner through solar panels. The solar tree is a structure incorporating solar energy technology on a single pillar, like a tree trunk, which is not just restricted to one panel but a number of panels to produce electricity at the same time, with brighter sunlight, a tree would be better efficient for developing countries. They are an idle practical solution for developing countries where space constraint is a major problem for implementation of large scale renewable energy projects. PV generation system generally use a microcontroller based charge controller connected to a battery and the load. A charge controller is used to maintain the proper charging voltage on the batteries. As the input voltage from the solar array, the charge controller regulates the charge to the batteries preventing any overcharging. So a good, solid and reliable

PV charge controller is a key component of any PV battery charging system to achieve systems maximum efficiency. Whereas microcontroller based designs are able to provide more intelligent control and thus increases the efficiency of the system.

BLOCK DIAGRAM



Explanation of block diagram:

In this project enhanced n-channel MOSFET was chosen for both high side and low side and low side switches of the h-bridge. For the MOSFET to carry drain current I_d (on state) a channel between the drain and source must be created. This occurs when drain to source voltage exceeds the device threshold ($V_{gs} > V_{th}$). Once the channel is induced the MOSFET can operate in either triode region or the saturation region.

The gate to drain voltage determines whether the induced channel enters pinch-

off or remains in triode region. When used as a switching device only triode and cut-off region are utilized. The device will operate at cut-off when gate to source voltage V_{gs} is less than threshold voltage.

RELEVANCE

In This Proposed system Maximum power point tracker battery charger is proposed for extracting maximum power from a photovoltaic panel to charge the battery. The output power of the PV system continuously varies with change in irradiance and temperature. It is very important to improve the efficiency of charger. There are number of maximum power point tracking (MPPT) method available to operate the PV system at maximum power point. The Proposed system has perturbed & observe (P&O) MPPT algorithm for the design and implementation. When irradiance and temperature are constant or slowly varying, the P&O method track MPP steadily and calculate the operating point at which the battery is capable of production maximum power. In this method, the controller provides the PWM signal to adjust the voltage, adjustment is done by Buck converter and measure power, if the power increase, further adjustment in that direction are tried until power no longer increase.

OBJECTIVE

The environment benefits of charging stations that are generally run on solar power reduced depend on fossil fuels, every day running costs defiantly are for all intents and purpose lower in suitable way. The load on conventional grids also gets reduce in a major way. Apart from this, pretty large scale implementation will increase employment opportunities definitely owing to the need for trained people for installation, maintenance and operation of these stations, actually contrary to popular belief.

COMPONENT NEEDED

Table – 1: Component require

Sr. No	COMPONENT	Quantity
1	Solar panel	6
2	MOSFET	1
3	Battery	1
4	PCB Design	1

Considering the benefits and the availability of such a system, pretty many businesses literally are investing. In this concept, which is fairly significant? Tesla Motors, a subsidiary of Tesla, The important part is constructing. Solar-powered charging station is convenient location for its EV customer which is quite significant.

The project will further efforts to lowering our dependence on fossil fuels. If our charging station can charge more devices without having external power from the national grid, it will be able to reduce some of the demand for energy. Most of the people are aware of the efforts of using oil and natural gas as a form of energy. These techniques do create plenty of energy, however they are non-renewable and they results in damaged the ecosystem and earth atmosphere. The objective of this project is to charge the vehicles environmentally safe which will help to reduce the demand of power from other methods. Our objective for this project will generate power from solar energy.

Solar Panel

Solar panel and fairy electric vehicle are a match made in heaven – when you definitely install a solar energy system on for all intent all and purpose your home, you can use it to both and charge basically electric emission-free transportation in a basically big way. The cost of solar particularly is falling rapidly, and companies from Tesla to Nissan particularly are manufacturing kind of electric vehicle for generally your pretty daily use in a subtle way.

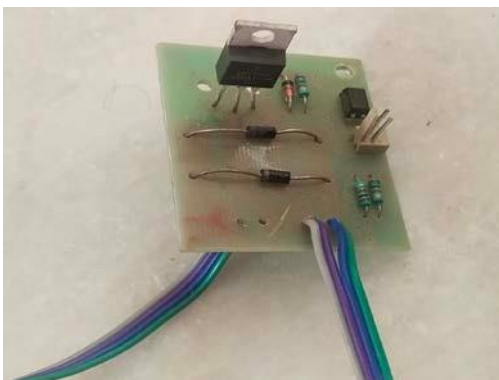
Now the ability to install a solar PV system large enough to power both your home and your cars actually is an option within reach, which is quite significant. But even with incentives and rebates available for both technologies, most homeowners still can't basically afford to basically install solar and for all intents and purposes buy and very electric vehicle at the same time.



Mosfet with Optocoupler

Here, we use this circuit as a gate drive.

This is ideal for use in power conversion applications where the microcontroller and user need to be isolated and protected from high voltage.



Battery

An Automotive battery is a rechargeable battery that used to start a motor vehicle. Its main purpose is to provide an electric current to electric – powered starting motor, which is turn start the chemically – powered internal combustion engine that actually propels the vehicle. Solar panel and fairy electric vehicle are a match made in heaven – when you definitely install a solar energy system on for all intent all and purpose your home, you can use it to both and charge basically electric emission-free transportation in a basically big way.

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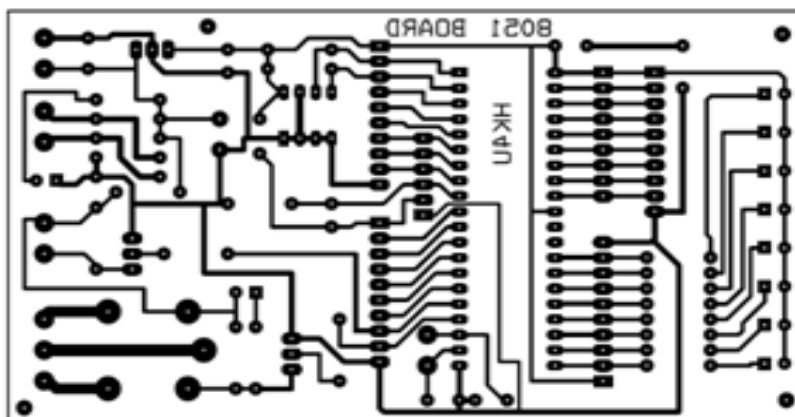
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CALCULATION OF BATTERY AND SOLAR PANEL

Table – 2: Component require

Battery Voltage	Battery A/h	Solar rating in Watt	Time to charge
12	24A/h	300W	Five Hours
24	24A/h	600W	Five Hours
36	24A/h	900W	Five Hours
48	24A/h	1200W	Five Hours
60	24A/h	1500W	Five Hours
12	7A/h	84W	Eight Hours

PCB Design



Printed circuit board (PCB) brings your electronics circuits to life in the physical form. Using Layout software, the PCB design process combines component placement and routing to define electrical connectivity on a manufacturing circuit board.

Diode

To ensure unidirectional flow of liquid we use mechanical valves in its path. By properly arranging these valves on a

system we get useful device such as pumps and locomotives. In the field of electronics too we have a valve called semiconductor diode (a counterpart of thermionic valve) for controlling the flow of electric current in one direction. But we use these diodes in circuits for limited purpose like converting AC to DC, by passing EMF etc. a diode allows Current to pass through it provided it is forward biased and biasing voltage is more than potential barrier (forward voltage drop) of the diode.

INTEGRATED CIRCUIT

Table – 3: Chart for Integrated Circuit

Scale of integration	Abbreviation	Number of Gates
Small	SSI	1 to 10
Medium	MSI	10 to 100
Large	LSI	100 to 1000
Very Large	VLSI	1000 to 10000
Super Large	SLSI	10000 to 1000000

LCD 16×2:

A 16×2 LCD mean it can display 16 character per line and there are 2 such lines. In this LCD each character is displayed in 5×7 pixel matrix. The 16×2 intelligent alphanumeric dot matrix display is capable of displaying 224 different character and symbol. This LCD has two register, namely, command and data.

Resistors:

It may electronics circuit application the resistance froms the basic part of the circuit. The reason for inserting the resistance is reduce current or to produce the desired voltage drop. These component which offer value of resistance are known as resistors. Resistor may have fixed value i.e., whose value cannot be changed and are known as fixed resistors. Such of those resistor whose value can be changed or varied are known as variable resistors.

Berg Strip:

1. No. of Pins : 40
2. Pin Spacing: 2.54 mm
3. Length of the Strip: 103mm
4. Pin height: 6mm
5. Square posts.
6. Stackable- End to End and side to side.
7. Can be manually broken for the legth needed.
8. Standoffs allow cleaning of solder contaminants.

Capacitor:

In this disk from, silver is fired on to both sides of the ceramic to form the conductor plates. The sheets are then baked and cut to the appropriate shape and size & attached by pressure contact and soldering. These have high capacitance per unit volume and are very economical. The disks are lacquered or encapsulated in plastic or phenolic milding.

MOSFET:

It is commonly used in Automotive electronics, particularly as switching devices in electronic control units, and as power converters in modern electric vehicles. The insulated-gate bipolar transistor, a hybrid MOS- bipolar transistor, is also used for a wide variety of application.

PCD Fuse:

The BK/PCD-5-R is a 5A subminiature radial leaded Fast-acting fuse is designed to carry rated current for four hours minimum. The PC- Tron series through-hole fuse is UL recognized for DC supplementary over-current protection to provide individual protection for component or internal circuit in equipment. Suitability for a specific application is dependent on time constant and capacitance values. It is the responsibility of the customer to evaluate the information provided for applicability to their particular application.

- Board washable.
- Idle for high voltage DC applications.
- 0.750 full straight lead.

YXC Crystal:

YXC is manufacture and supplier which mainly focus on frequency component. Professional in the crystal oscillator for 34

years. The shift turn trade into manufacturer. Upgrade from cheap bulky into experiences to own the R&D gargantuan team. We are constantly changing and expanding, but the goal is immutable present the best product to the world. Every step of the production crystal is clear and distinct. Not only the procedure of crystal can be checked from material to finished crystal, but also the finished testing of crystal can be verified.

CONCLUSION

This paper is presenting the solar charging station for sort of electric vehicles, which is generally used to avoid use of non-renewable source of energy to charge for all intents and purpose electric vehicle, which is fairly significant. This study develops a model that really combines the solar power station and EVs to mostly reduce pollutants emission from the power generation and transportation sector in a suitable way

RESULT

From the energy balance data generated using PV system, the monthly and annual energy supplied by the system to electric vehicle can tabulated. The no. of electric vehicle charged by the charging station depends on the vehicle's battery capacity

and the energy supplied to it by the charging station.

Electric cars are becoming immensely popular and coming years we expect nearly anyone who owns a solar energy system will install a solar charging station at its home. Solar charging station for home and commercial for will play a major role in powering electric vehicles with renewable energy.

FUTURE SCOPE

In future, the rate of charging station will increase. This confirms that an increase of EV charging station is very necessary within public parking, and highway, to ensure full coverage and increased appeal for the user. EV charging should be as simple as possible and should be built in parking facilities, near shops, sports and leisure facilities. When the electric vehicle will park in the parking, this parking is made with solar panel, with the help of this people will charge electric vehicle in rest position. An increase of charging station is not only necessary on the road but also private parking. With research of electric charging has no higher chance of bursting into flames as compared to daily vehicle. Charging stations are tested before production. Whether private

or public, AI parking will be important to increase the quality of EV charging station.

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