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Solar Based Electric Vehicle Charging Station

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Abstract

We use the solar energy as a green energy for charging the E-vehicle. as we know that the cost of fuel is much more, so it is best to use solar energy as a green energy for the purpose of charging of E-vehicle. Our motto is to keeping the earth our safer place to live our next generation. Charging station is one of the main part of the electrical vehicle ecosystem. E-vehicle are charged from normal, medium and fast charging station located near the mall, workshop and hospital, etc. There is rapid growth in the development pollution and use of electrical vehicle. the E-vehicle are the future of transport. With the rising pollution and its certain effect on the environment there has been a paradigm shift toward electrical vehicle.

Keywords—component, formatting, style, styling, insert

Introduction

Electric charging infrastructure is an element that supplies electric energy through electric charging station for the recharging of electric vehicle including electric cars and plug in hybrid EV"s. Charging station is inevitable part of electric vehicle ecosystem. Electric vehicle are changed from normal, medium, and fast charging station located near to the malls workshop, hospitals etc. Fossil fuels are non-renewable they bring on finite resources that will became too expensive or too environmental damaging. Government is also encouraging the use of electrical vehicle to reduce petroleum import and environmental pollution .In case of India, it has one of the largest road networks across the world which is of over 5.5 million km as per recent reports and thus, the country needs nationwide network of charging station for electric vehicles as government is planning to sale only EV's by 2030. In 2017, Indian government pushed a major policy of selling at least 6-7 million EV's in India by 2020. But many experts in automobile industry criticized this plan and said that it might fail. This paper discusses and investigates the state-of-the-art techniques which are being developed for EV charging station. Comparing various techniques which are already proposed, a framework is presented for optimum design and deployment of EV charging station.

List of components

1. Solar panel
2. Charge controller
3. Battery
4. Arduino Nano
5. LCD display
6. Voltage sensor

1.solar panel

A solar cell panel, solar electric panel, photo-voltaic (PV) module or solar panel is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity. When sunlight heat on solar panel its energy absorbed into the semiconductor material then this energy used for battery charging.

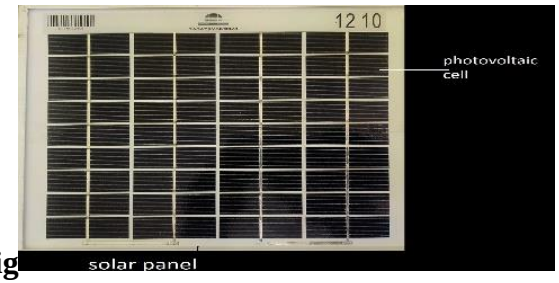


Fig no.1)Solar panel

2.charge controller

It use to control charging of the battery and for protection of the battery . it also use to protect the battery from discharging

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries to protect against electrical overload, overcharging, and may protect against overvoltage. This prevents conditions that reduce battery performance or lifespan and may pose a safety risk.

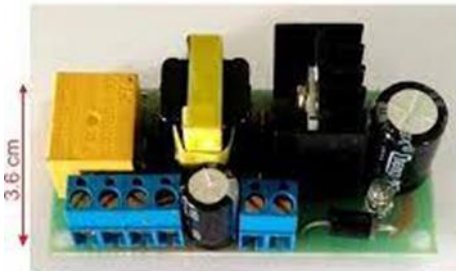


Fig no.2)Charge Controller

3.Battery

There are different types of battery available in the market are as follows

- Lead Acid
- Lithium ion
- Nickel Cadmium
- Sodium nickel chloride, etc

In this project we are using Lead Acid battery because for several years, lead-acid batteries have been used as a reliable energy supply for off-grid areas. They are typically deep-cycle and inexpensive. Lead-acid batteries are attributed to high power and discharge current but low energy. They take long to charge completely – up to 14 hours.

In this project we are using 3 batteries of 4 volt 2.5 ampere hour so total voltage is 12 volt and total ampere hour 10ampere hour.

Fi

Fig.no.3) Battery

4. Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano). It has more or less the same functionality of the Arduino Demeaned, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

Arduino Nano comes with a crystal oscillator of frequency 16 MHz It is used to produce a clock of precise frequency using constant voltage.

In this project the work of the Arduino nano is to control the LCD display and to give the status of the battery.

Fig.no.4)Arduino Nano

5.LCD Display

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly,[1] instead using a backlight or reflector to produce images in color or monochrome.[2] LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden.

In this project it is use to display the charging status of the station as well as customer added value for required charging for his vehicle.

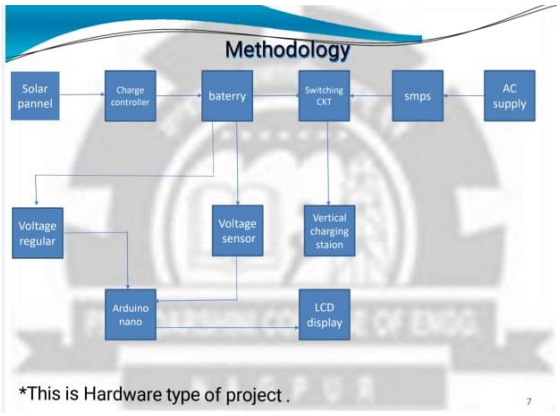
Fig.no.5)LCD display

6.Voltage sensor

A voltage sensor is a sensor used to calculate and monitor the amount of voltage in an object. Voltage sensors can determine the AC voltage or DC voltage level. The input of this sensor is the voltage, whereas the output is the switches, voltage signal, a current signal, or an audible signal. Sensors are devices that can sense or identify and react to certain types of electrical or optical signals. The implementation of a voltage sensor and current sensor techniques have become an excellent choice for the conventional current and voltage measurement method.

Fig no.6) Voltage sensor

Block diagram of solar based E-vehicle charging station

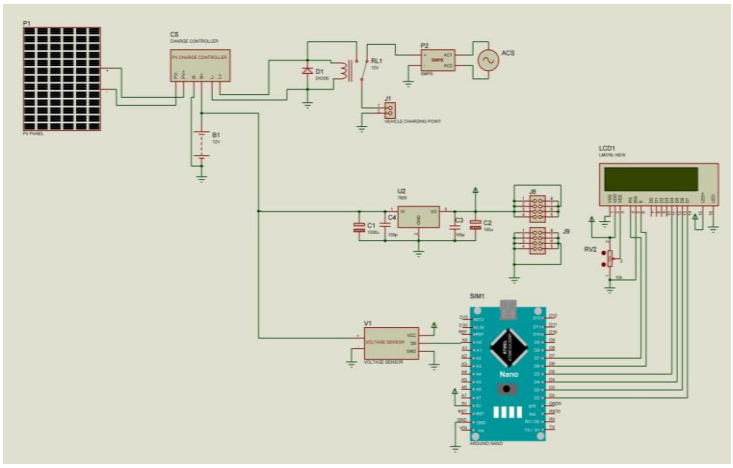


Working of solar based E-vehicle charging station

In this project we have the solar panel that includes the rooftop solar panel used for charging the batteries of an electric vehicle. solar panel used to collect the solar energy and convert it into electrical energy. After that there is a charge controller for protection of battery and control the charging of battery. Battery used to store the solar energy. We have two power source first is main power source is 1)solar power 2)grid power(backup power).voltage sensor is use to measure the battery voltage display in the LCD display with the help of Arduino Nano. Arduino Nano is the microcontroller
device and it control the LCD display and the status of battery. Voltage regulator is used to supply the 5v constant voltage to all hardware.

Whenever there is bad whether condition we can use the power from the main source. i.e. grid connection. Grid connection consist AC current but the E-vehicle required DC current then SMPS need to seat between the grid and battery to convert AC current to DC current. After all the connection the results is shown in the LCD display. After that the solar energy stored in the battery is used to charge the E-vehicle . instead of E-vehicle we used the battery charging status by giving the buzzer.

Circuit Diagram of the project



Result And Calculation :-
Solar panel:- 20 W
Battery :- 12V,2.5A
Battery power (P):- voltage *current
=12*2.5
=30w
Charging time of battery (Tbc)
=(battery power/solar power)
=(30/10)w
= 3hr.
Load =4.8 V
Total power available on solar charging system=30w
Total vehicle charged=(battery power/load)
=(30/12)
=2.5 vehicle

Table 1. Charging status of vehicle

Sr. No.	Time (min.)	Charging Voltage (vehicle) (vehicle voltage=11.96 V)
1	30	1.2 V
2	60	2.4 V
3	90	3.6 V
4	120	4.8 V

Reference:-

[1] Z. Liu, F. r. Wen, and G. Ledwich, "Optimal planning of electric-vehicle charging stations in distribution systems," IEEE Trans. Power Deliv., vol. 28, no. 1, pp. 102– 110, 2013.
[2] "Workplace EV Charging - Commercial EV Charging Stations." [Online]. Available: https://www.revisionenergy.com/at-work/workplace-ev-charging/. [Accessed: 25- Jan2020].
[3] A. Sharma, A. Kapoor, and S. Chakrabarti, "Impact of Plug-in Electric Vehicles on Power Distribution System of Major Cities of India: A Case Study," 2019.
[4] C. E. Thomas, "Fuel cell and battery electric vehicles compared," Int. J. Hydrogen Energy, vol. 34, no. 15, pp. 6005–6020, Aug. 2009. [5] M. A. Cosenza, S. Bobbi, F. Ardente, M. Cellura, and F. Di Persio, "Energy and environmental assessment of a traction lithium-ion battery pack for plug-in hybrid electric vehicles," J. Clean. Prod., vol. 215, pp. 634–649, Apr. 2019. [6] A. Singh et al., "Progress to date and future opportunities India's electric mobility transformation authors: niti aayog," 2019.