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Solar based electric vehicle charging station

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ABSTRACT

This project focuses on system electric vehicle charging station. We make use of solar power as it is totally green energy. Nowadays the petrol price has increased and fuels are costlier as they are high in demand, so it is good to go for solar power as green energy has no adverse effect on the environment. Electric energy can be created by solar energy or by using other options. Energy generated by solar and wind is green energy. Our proposed system is to design stations with independent grid-connected elements of solar power, EVSEs and external batteries. In our system, we provide smart billing in which card payment method can be used. Payment or charges totally depends on how much energy is used to charge a user's vehicle. Charging is fully automatic.

Keywords— *Batteries, Energy storage, Solar energy, Solar panel, Electric vehicle charging mechanism*

1. INTRODUCTION

One major trend in energy usage that is expected for future smart grids is the emergence of battery electrical vehicles as the future mode of transport. Over the past few years, Electric Vehicles (EV) have gained importance because of their appeal as a credible alternative to gas-powered vehicles. With EVs expected to be a major source of transportation in the future, there has been meaningful discussion around their adoption including those for policymakers. However, EVs requires charging station that enables them to "fuel up" its batteries similar to gasoline powered cars. While EVs are pollution free, the electricity used to charge their batteries may be drawn from traditional power plants, decreasing their appeal as an environment-friendly mode of transport.Many countries currently use coal, oil and natural gas for its energy. Fossil fuels are non-renewable; they bring on finite resources that will become too expensive or too environmentally damaging to retrieve. Solar energy is constantly replenished and will never run out. Solar energy is renewable energy and it is mostly called "clean energy" or "green power" because it doesn't pollute the air does not result in carbon emission. Recently, there is a move towards designing solar-powered EV charging stations that provide clean electricity. Our paper is all about the charging station design, working and uses with the disadvantages of the system .Every station is composed of a plug that becomes attached to a vehicle, supplying it with electric power to charge the vehicles. With the reduction in solar costs and improvement in solar efficiency building, solar-powered EV charging station presents a great opportunity to greenify our transportation need, making electric vehicles end-to-end environmentally positive. Charging stations are also called electric vehicle supply equipment and are provided in municipal parking locations by electric utility companies. Currently, the deficiencies of the electric vehicles are the cost of buying and operating the vehicle and also the limited distance capacity of one-time charging. Within the next few years, Electrified vehicles are destined to become an important component of the transport field. Therefore, the charging infrastructure should be developed at the same time. Among this substructure, Charging stations PV-assisted are attracting a substantial interest due to increased environmental consciousness, reduced cost and rise in efficiency of the photovoltaic module

2. PURPOSE

Solar energy is a technology that has been expanding in popularity as it is further developed. In this paper, we will be utilizing solar energy to provide the supply for an outdoor charging station for devices such as electric vehicles.

Solar energy continues to be researched and enhanced as an alternative source of energy. This paper will assist global research efforts in helping protect our environment. These methods do create more energy, however, they are non-renewable and can cause harm to

atmosphere and ecosystems.The objective of this project is to investigate the problem of providing an outdoor power source for charging devices in an environmentally friendly way to help decrease the demand for power from other methods.

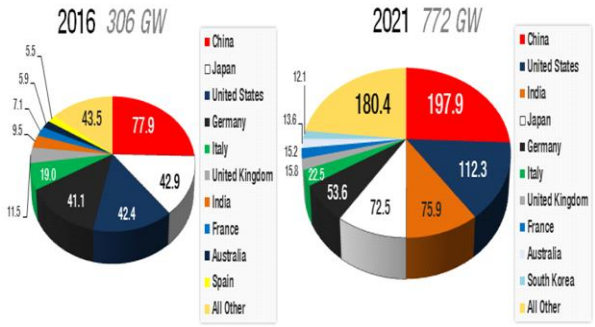

Fig. 1: Pie chart diagram of the use of solar energy as per country for the years 2016 to 2021

As above pie chart shoes green energy used by the country in GW(giga watt) in the year 2016 to 2021 which shoes the increase the use of green energy (solar energy).

Fig. 2: Design of solar-powered Electric Vehicle charging station

3. CHARGING ON PUBLIC NETWORKS

Due to electrical vehicle charging as the charging power is locally generated in a 'green' manner through solar panels. For improved efficiency, there is direct interfacing of EV on DC instead of AC interfacing. EV is inherently DC by nature. EV charging can be varied with time therefore dynamic charging of EV is possible. DC charging provides Vehicle-to-Grid (v2g) protocol.

A charging station is accessible to multiple electrical vehicles and has an additional current mechanism to disconnect the power when EV is not charging.Standard socket outlets are used to connect EV to the power grid. The safety regulations, earthing system and a circuit breaker are important to protect against an earth leakage protection and overload. Battery capacity and charging power affects the charging time.

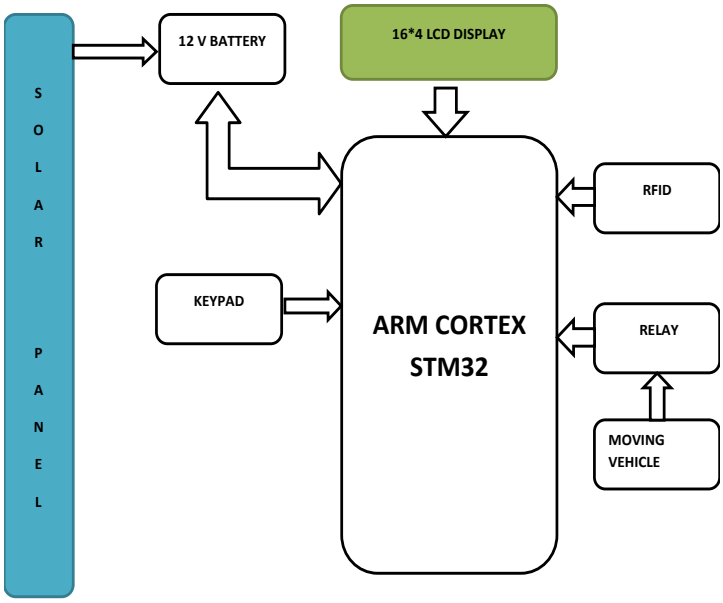

Fig. 3: Block diagram

Block diagram consisting of various blocks such as solar panel with the control unit, rechargeable battery, ADC, Microcontroller (ARM 32 bits Cortex STM32F103XB), RFID Reader, and LCD Display. The Solar panel 12v, 10watt is used. The output of which varies based on the intensity of incident light. The output of regulated supply stored in the battery. This battery produces an output of 12v, which can be used directly to charge the load. 9v fixed output can be obtained by regulating the voltage from the battery

using as a voltage regulator. The battery can be further to obtain 5v fixed output and 5v outputs used to power up the microcontroller. Most common LCDs connected to the microcontrollers are **16*2.** This means 16 characters per line by 2 lines5.

4. COMPONENT DESCRIPTION

4.1 Solar panel technology

A solar panel is a group of electrically connected photovoltaic cells made of most common semiconductor materials, such as silicon. When sunlight hits the cells, its energy is absorbed into the semiconductor material. This energy pushes another electron lose that is then forced to flow in a certain direction by an electric field created within the cells. This current is then drawn off of the panels. The amount of current a PV panel produces has a direct correlation with the intensity of light the panel is absorbing.

Multiple panels are electrically connected in either parallel to provide a desired current capability or/and in series to achieve the desired output voltage. A single solar panel produces only 0.5 volts. A typical 12-volt panel about 25 inches by 54 inches will contain 36 cells wired In series to produce about 17 volts peak output.

4.2 Microcontroller

The controller is switching devices that connect and disconnect the charger to the battery and it will take control over charging and to stop charging at the correct voltages. This will protect the batteries from damage from over charging and regulate the power going from the solar panels to the batteries. A microcontroller is used to read the level of the batteries and then cut off the source of the solar panels to the batteries, once it sees the battery is at the fully charged state. If the microcontroller is not in place, the solar panels would keep feeding the batteries energy and the batteries would become overheated and damage the internal components.

The advantage to having a microcontroller in the system is then it will open a variety of features to add to the system. For example, the microcontroller will be programmed to control and display the level of the battery of the system. It will ensure that there are enough power charge devices by displaying the 16*2 l LCD.

4.3 RFID

RFID is a technology that uses radio waves to transfer data between the reader and moveable item. RFID is fast, reliable and does not require physical contact between reader/scanner and tagged item. This RFID sensor used for card detection. RFID tags have a unique ID with a higher number of bits which has tag frequency: 125 kHz, read range: 10cm, consumption: 70mA. RFID uses an electromagnetic field to automatically identify tags attached to the object.

4.4 LCD (16*2)

Here we used 16*2 LCD displays LCD assembles with high degree precision. The LCD panel is made of glass. In our paper LCD used to display the charging status of the station as well as customer added value for required charging for his car.

4.5 Relay

The relay is an electrically operated mechanical switch that allows you to turn off or on a circuit using current or voltage much higher than a microcontroller could handle. There is no connection between the high power circuit and the low voltage circuit operated by the microcontroller. The relay protects each circuit from each other.

5. CONCLUSION

This paper is very usable and its need in future when petrol and diesel are finished. If we generate the electricity using solar and wind energy then it will be total green energy system.

Workplace charging of EV from solar energy provides a sustainable gateway for transportation in the feature. In this paper dynamic charging for solar energy powered EV charging station is investigated.

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