

Solar wireless Electric Vehicle Charging System

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ABSTRACT

A genuine impact on the climate has been brought about by the overuse of gasoline products in the modern world, which has increased environmental repercussions. A replacement solution is required for the consumption of such non-sustainable assets. Therefore, everyone should look for renewable alternatives. As a result, wherever we travel, combining several layouts into one can help us increase the amount of energy we can generate using solar panels on boards.. A small scale prototype model was made by our team to attest the working of smart inductive charging process. Solar thermal energy conversion: Solar radiation. (photons) interacts with a material in PV cells. Solar photovoltaic(PV) Conversion Photons falling on a semiconductor P-N junction cause a potential difference to be generated across the junction (photovoltaic effect). This can drive current into an external circuit and deliver energy to it works on the principle that when light falls on the solar cell, electron-hole pairs are create in the n-type emitter and in the p-type base. On the electric vehicle, there will be the use of coils which are experimentally made for the flow of charges that are needed to provide charge to a moving electric vehicle (EV).The detailed strategy is presented in this report.

keywords: *wireless energy transfer; batteries; electric vehicles; converters; monocrystalline scilion panel; transformer; induction coil.*

Introduction:-

This The sun is a star made up of hydrogen and helium gas and it radiates an enormous amount of energy every second . Electrical line distortion or a lack of energy generation, which occurs in rural regions or during

disasters or natural calamities, is the most major liability or disadvantage of communication lines. To the practical application of photovoltaic cells in address these issues, we require a renewable energy source that can operate 24 hours a day, seven days a week. A photovoltaic cell is an electrical device that convert the energy of light directly into electricity by photovoltaic effect Photovoltaics is the field of technology and research related the practical application of photovoltaic cells in producing electricity from light ,though it is often used specially to the generation of electricity from sunlight [2].firstly ,the use of renewable energy soucres such as solarenergy is accessible to a wider audience because of the falling cost of the PV panels. Industrial sites and office buildings harbor a great potential for photovoltaic panels with their large surface on flat roofs. Examples include warehouses industrial buildings, universities, factories, This potential is largely unexploited today. Secondly EVs provide a clean, energy efficient and noise-free Means for commuting when compared when compared with gasoline vehicles. The current forecast is that in the Netherlands will be 200,000ev in 2020[1].This paper examines the possibility of creating electric vehicles charging infrastructure using PV panels .The system is designed for use in workplaces to charges electric cars of the employees as they are parked During the day. The motive is to maximize the use of energy for EV charging with minimal energy exchange with the grid.[1].

ROOFTOP SOLAR: -

A high Benefits power source. Present day solar PV technology a low carbon Energy solution ,is well suited for much of Asian and the pacific. With the large areas of the religion endowed with bountiful solar radiation, many countries in the religion have the ideal conditions for Utilization of the solar energy. Most solar PV system tend tobe one of

Two types.1 type is utility scale install

The second type is the distributed system

I. A vehicle that uses one or more electric motors or traction motors for propulsion is referred to as an electric vehicle (EV). An electric vehicle may be self-contained with a battery, solar panels, fuel cells, or an electric generator to convert gasoline to energy [4], or it may be fueled through a collector system by electricity from off-vehicle sources. Road and rail vehicles, surface and underwater watercraft, electric airplanes, and electric spacecraft are all examples of EVs. EVs first came into being in the middle of the 19th century, when electric motors were among the main forms of motor vehicle propulsion. These vehicles offered a level of comfort and convenience of use that was unattainable with gasoline-powered vehicles at the time. For almost a century, modern internal combustion engines have dominated the propulsion of motor vehicles, but electric power has remained prevalent in other vehicle types, such as railways and smaller vehicles of all kinds.

BLOCK DIAGRAM OF WIRELESS

TRANSMISSION OF EV SYSTEM

II. BLOCK DIAGRAM CONSISTS OF ARDUINO CONTROLLER, LCD DISPLAY, LED BATTERY, POWER SUPPLY ETC. PRIMARY COIL IS FIXED AT SOLAR PANEL WHICH IS USED WHILE FORMATION OF SOLAR ROAD. SECONDARY COIL IS FIXED AT THE BASE OF CAR MOVING ON ROAD. WHOLE SETUP WORKS ON THE BASIS OF WIRELESS POWER TRANSMISSION (WPT) CONCEPT. LED WILL GLOW WHEN ENERGY IS TRANSFERRED FROM PRIMARY COIL TO SECONDARY COIL. FIG[1]SHOWS THEBLOCKDIAGRAM[2]

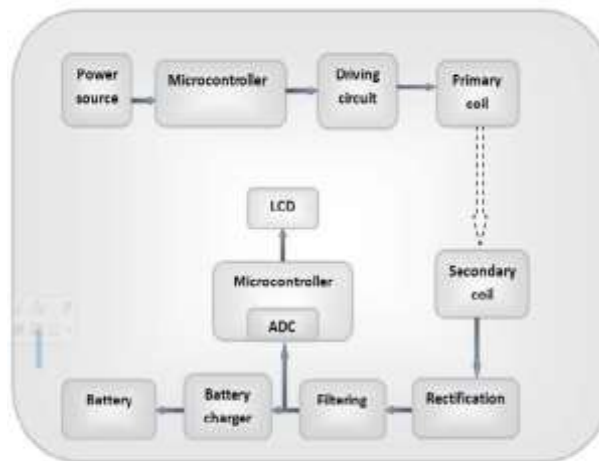


Fig. 1. Block diagram of WPT system.

System-Structure:-

In the above-given block diagram the process of the charge flowing from the solar panel unit to the electric vehicle module are as follows:

- The solar panel is adjusted to an angle in which it can receive as much as the power it can and then once it is placed at a suitable angle the indicator shows it is charging.
- Then the charge is passed through the controller and then the charges are transferred to the storage battery. As shown in fig 2
- The charges are then passed through a converter which converts the DC to AC and then when the car is moved along the road the charges that gets stored in the battery is then transmitted wirelessly to the transmitting coils and the receiving coils of the car receives the charges as a sources of electro-magnetic field and the car charges as it moves along the road.

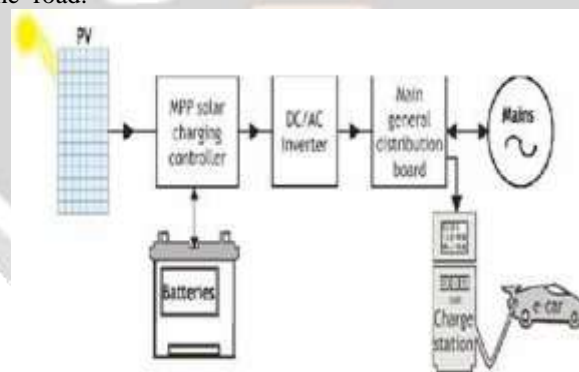


Fig:2: total transferring of energy

MAGNETIC COUPLERS:-

- In most WPT systems, transmitter (Tx) and receiver (Rx) pads exchange power through an air medium. In the literature, these pads are commonly referred to as magnetic couplers and play a significant role in the entire WPT operation [3]. Therefore, many researchers have proposed pad structures to improve system coupling coefficient k , pads' quality factor Q , misalignment tolerance, coil to coils efficiency, and reduction stray/fringe fields [3]. Magnetic couplers usually include Litz wires to reduce the skin effect losses.
- Magnetic couplers are used in wireless charging systems (WCSs) to ensure that there is no electrical connection between the transmitter and receiver. Safe, dependable, and convenient are some of its qualities [1]. Due to the cost and capacity restrictions on some devices, such as electric cars and automatic guided vehicles (AGV), quick charging, which is made possible by high output power, is always utilized to reduce charging time and enhance user experience.

- The WCS with a single power transfer channel that consists of a single transmitter and receiver, however, may not be able to meet the demand for high output power and has the issues of low reliability and malfunction when the fault occurs due to the power capacity and cost limitations of the available semiconductor devices. As a potential fix.
- ,primary units The WCS with multiple power transfer channels, made up of numerous transmitters and receivers, is used to boost output power and lessen voltage and current stress in order to solve the aforementioned issues.
- The use of inexpensive, low-power semiconductor devices that are simple to purchase is therefore possible. Currently, the design and optimization of the power converters and magnetic couplers are the primary areas of research for the WCS with multiple power transfer channels .
- . The magnetic coupler is also the focus of this paper's research. Two magnetic couplers that are frequently utilized for the WCS with multiple power transfer channels are identified by the literature review.

The HARDWARE COMPONENTS

- ATMEGA CONTROLLER
- SOLAR BATTERIES
- TRANSFORMER
- REGULATOR
- TRANSMITTER COIL
- RECIVER COIL
- LCD DISPLAY
- SOLAR PANELS
- AC to DC CONVETER

➤ ATMEGA Controller:-

- [chip microcontroller](#) created by [Atmel](#) in the [mega AVR](#) family (later [Microchip Technology](#) acquired Atmel in 2016). It has a [modified Harvard architecture 8-bit RISC](#) processor core. [6]
- **AT Mega Microcontrollers** belong to the **AVR family** of microcontrollers and is manufactured by **Atmel Corporation**. An AT Mega Microcontroller is an **8-bit microcontroller** with Reduced Instruction Set (RISC) based Harvard Architecture.[6]As in fig



Fig 3:-At mega controller

SOLAR BATTERIES :

There are four main types of battery technologies that pair with residential solar systems:

- Lithium ion battery

- Nickel cadmium battery
- Lead acid batteries
- are Lithium ion batteries are the new kids on the energy storage block. As the popularity of electric vehicles began to rise, EV manufacturers realized lithium's potential as an energy storage solution. They quickly became one of the most widely used solar battery banks. [7] Anode, cathode, separator, electrolyte, and two current collectors (positive and negative) make up a battery. Lithium is stored in the anode and cathode. Positively charged lithium ions are transported through the separator by the electrolyte from the anode to the cathode and vice versa. A charge is produced at the positive current collector by the movement of the lithium ions, which releases free electrons in the anode. The electrical current then travels from the positive current collector to the negative current collector after passing via a powered device (such as a computer or cell phone). The separator prevents electrons from moving freely inside the battery.



Fig 4: lithium ion battery

- Batteries made of nickel-cadmium (Ni-Cd) are highly resilient and perform better than many other electrochemical systems under challenging circumstances like overcharging, overdischarging, and long-term storage in a wide temperature range of 40 to +70 °C. Although new electrochemical systems have been developed, sealed Ni-Cd batteries are still frequently used in a variety of portable applications, such as high-power tools, or for emergency uses, where the cell is continuously fully charged with a small floating current and occasionally delivers its capacity, like emergency lighting units. Ni-Cd batteries are still often used in stationary batteries for emergency backup or starting power in many industrial sectors, as well as in many industrial applications like aircraft, train, and public transportation. This article discusses the electrochemistry, solid state chemistry, and battery design aspects of Ni-Cd sealed cell technology.



Fig 5: Nickel Cadmium

- **. Transformer:**
- Transformers are used to transfer power from one circuit to another without any physical contact between them and without changing the frequency or phase. There are various uses of transformer depending on the type. Some of the most common applications are mentioned below.

□ **Regulator:**

- A regulator is an important device when it comes to power electronics as it controls the power output. Need for a Regulator For a Power supply to produce a constant output voltage. The part of electronics that deal with the control and conversion of electric power can be termed as **Power Electronics**. A regulator is an important device when it comes to power electronics as it controls the power output.

□ **LCD Display:-**

- A wireless display is any type of display – i.e. flat panel LED, LCD, projector, video wall, etc. – that can be accessed wirelessly from a separate device – such as a laptop, tablet, or smart phone. The vast majority of the wireless display solutions available in the market operate over standard IP networks like WiFi. In other words, users join the WiFi network that the wireless display is attached to in order to connect.



Fig 6:lcd display

□ **AC to DC Converter:**

- In all fields of [electrical engineering](#), **power conversion** is the process of converting [electric energy](#) from one form to another. A **power converter** is an electrical or [electro- mechanical](#) device for converting electrical energy[8]. From fig6 A power converter can convert [alternating current](#) (AC) into [direct current](#) (DC) and vice versa; change the [voltage](#) or [frequency](#) of the current or do some combination of these.[8]

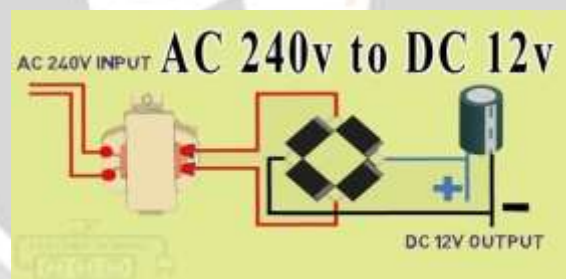


Fig 7: Ac to Dc converter

□ **Transmitter coils and receiver coils :**

- Here wireless transmission of power is achieved by mutual induction of magnetic field between transmitter and receiver coil. When the main AC supply applied to the transmitter coil, it creates AC magnetic field that passes through receiver coil and this magnetic field moves electrons in receiver coil causes AC power output. Wirelessly transferred power simplifies the charging of these devices and brings more convenience to the everyday lives of our customers. Dedicated controllers are required for wireless charging application control. [9]

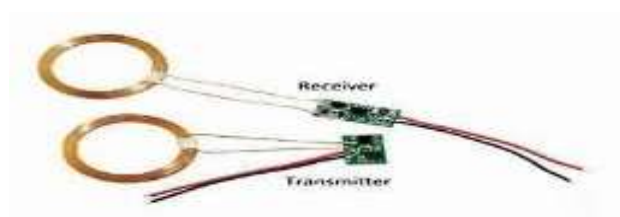


Fig 8: Receiver and transmitter

□ SOLAR PANELS:-

- A battery of an electronic device will be charged wirelessly. The solar panel converts the sun light into electrical energy. Power from a solar panel is sent through a transmitter circuit and received by a receiver circuit wirelessly based on Faraday's law of induction.
- A solar panel is a device that converts sunlight into electricity by using photovoltaic (PV) cells. PV cells are made of materials that generate electrons when exposed to light. The electrons flow through a circuit and produce direct current (DC) electricity, which can be used to power various devices or be stored in batteries. Solar panels are also known as solar cell panels, solar electric panels, or PV modules.
- Solar panels are usually arranged in groups called arrays or systems.
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Fig 9:-solar panels

WORKING PRINCIPLE:-

- One solar freeway is a series of drive-on solar energy panels that have been physically designed. The goal is to replace present fossil fuel asphalt roads, parking garages, and pathways with solar road panels that collect energy for consumption by houses and buildings, also with capacity to store surplus power in or alongside the solar roadways throughout the future [2]. . As a result, renewable energy eliminates necessity conventional fossil fuels for electricity generation, reducing carbon emissions and improving the quality of life.[2] the wireless charging stage is considered as an intermediate stage that provides galvanic isolation through the large air gap separation. This section will focus on the isolated DC-DC wireless charging stage to investigate the applications of different power electronics topologies in high-power wireless charging systems.[3]. The two port transmission line is modified by connecting a solar PV generator at the load point bus 2. The solar PV generator injects active power and zero reactive power that is with a power factor of 1. The introduction of the solar PV generator at bus 2 alters the equations of the voltage profile and the voltage drop. These are altered to include solar PV power and results in equations[4].

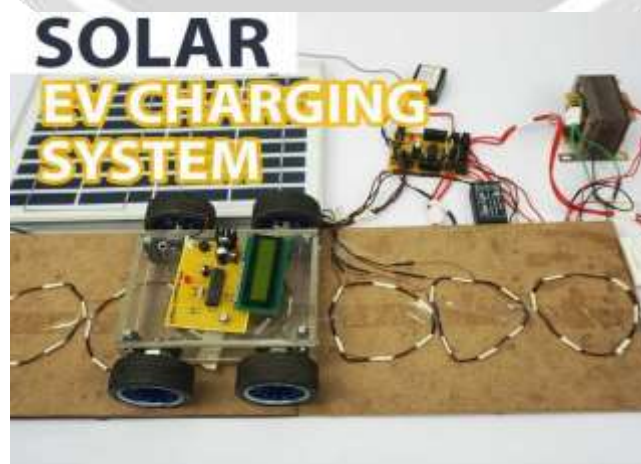


Fig 10: solar EV System

may The Solar Wireless Electric Vehicle Charging System (SWEVCS) is a revolutionary solution that enables EV owners to charge their vehicles wirelessly using solar energy. The SWEVCS utilizes several components to provide a seamless and efficient charging experience.

Here, we create an innovative, one-of-a-kind EV charging system that addresses both of these issues. The advantages of using this EV charging setup are as follows:

- Vehicles can be wirelessly charged without using wires.
- No need to stop because the vehicle charges while it is in motion.

Solar energy is used to maintain the charging system.No requirement for an external power source
Road coils built in to prevent deterioration

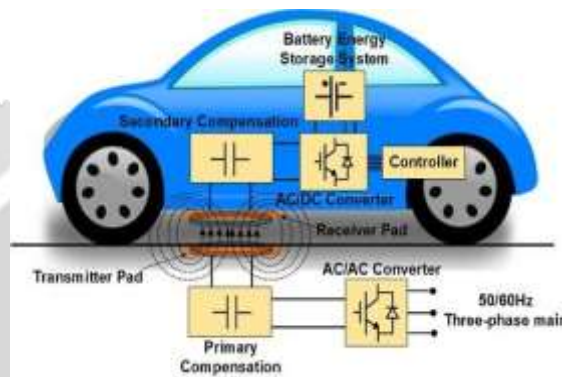


Figure 11:EV Internal Process

CONCLUSION:

- The report offered an inventive keen charging framework for future electric vehicles. It is an imaginative (on the grounds that it is an enlistment loop free) remote charging component that rehearses sun based boards. To minimize fossil fuel by-product, from public vehicle perspectives, it is alluring to track down a substitute wellspring of energy. Electric vehicles can be the method of lessening fossil fuel by-products without consuming petrol. To help the charging arrangement of electric vehicles all the more creatively, easy to use, and with no trouble, a remote charging framework can be an exceptionally viable arrangement

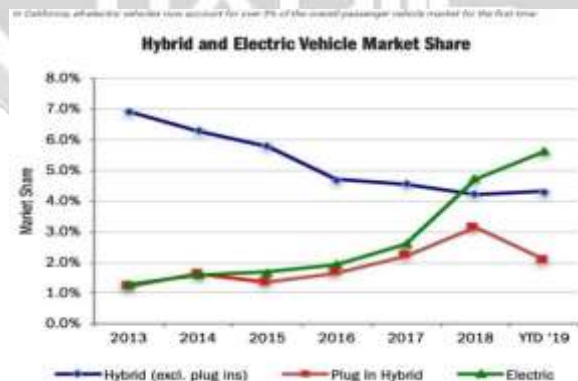


Fig11: Rise EV Market

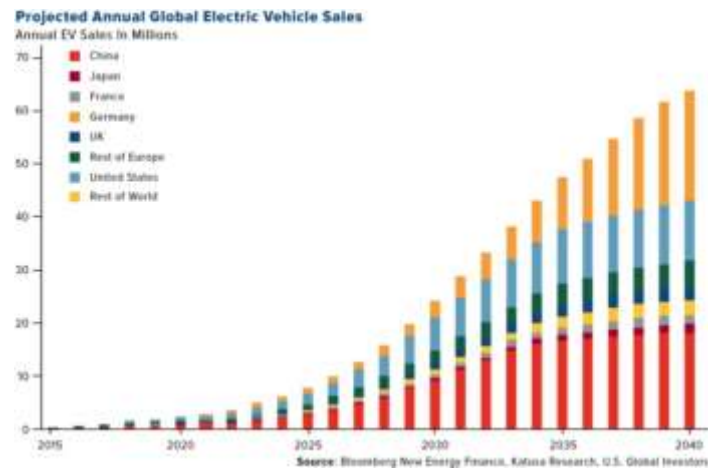


Fig 13: Rise of Sales of EV over countries

APPLICATIONS:-

- Commercialized four wheel drives in Automobiles.
- The Continual recharging of its batteries whileoperating an EV on roads and Highways
- Medical Devices and Food products whereElectrical shocks or Bacteria can be eliminated
- Solar charger, power banks

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