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"EV Charging Station With On Grid Green Power And Wireless Charging Using RFID"

1)Mr. Vishal Narkhede, 2)Prof. Yogesh Sushir, 3) Miss. Aishwarya More
4) Mr. Shreyas Patil, 5) Mr. Onkar Patil, 6) Mr. Dipak Kharate
Department of Electrical Engineering, Padm. Dr. V. B. Kolte College of Engineering, Malkapur

Abstract- *In this paper we are introducing an updated version of charging of batteries through renewable energy grids. The major sources of this charging by solar panels and wind turbine. A voltage regulator is used to produce a constant voltage at the output side. Buck-Boost converter is used to convert the low voltage DC [LVDC] to high voltage DC[HVDC]. A rectifier circuit is used only at the output of wind turbine which rectify the harmonics produced. This power is stored in the battery. The output of this battery can be used for any type of electrical components. However, we are using a switching mechanism used at the battery side which makes sure that output from the batteries will be continuous. This project also presents wireless charging of electric vehicle [EV] mainly focusing on resonant technology. The main goal is to transmit power using wireless power charging with the maximum efficiency at a low cost. The power is transmitted through resonance coupling. This technology uses mutual inductance which is standard. The energy sources of this system are solar and wind energy. Use of Buck-Boost converter, voltage regulator with C smoothing. Finally transmitting coil coupled with battery at both the end of these coil.*

Keywords: *Solar Panels, Wind Turbine, Buck-Boost Converter, Resonance Coupling, Mutual Inductance.*

I. INTRODUCTION

As we move toward the next generation where each and every machine or some other things which makes human work easy will work only on electrical energy. If that is the case, then production of this energy and storage of these charges will be a major task for the humans. Though this project, we have come up with production of this energy by renewable energy. These two major renewable energies by renewable energy. These two major renewable energies is easily available in our nature. Even people living in urban area can easily find this out. Till now the major production of electrical charges were from thermal power plant, But the from 11.5% to 22.5% in last 15 years. These woods actually go for burning. By this way, we make sure that production of electrical energy ill increase day by day and also make sure that we are not harming the environment. According to World Health organization report, India ranks 13th out of 20th highest polluted countries in the world. The implementation of this project can help us to reduce the carbon dioxide emission by about 50%. Battery charging from renewable energy system is possible with the hybrid wind-solar energy. Sustainable development is development that meets the needs of the present without compromising the ability of future generation to meet their own needs. Moving towards energy sustainability will require changes not only in the way energy is produced. In this project, we have proposed the design and development of the battery by renewable energy grids. Recently we have got to know through media that the capital city of India and one of the most rapidly developing cities in the world that is New Delhi and other major capital cities across the whole country is covered with dense atmosphere and the reason behind is because of the air pollution caused by the people over there. As of total research papers, 41% to 43% of the total air pollution is caused due to vehicle emission i.e., by petrol and diesel engine. To overcome this situation, the Indian government has taken major decision and reform on placing EV's on the Indian road. Certainly, if the number of charging station would also increase across the country. The method of charging the EV would be an important criterion.

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Through our project, we have introduced the charging of EV.

II. LITERATURE REVIEW

- **Matjaz Rozman, Augustine Ikpehai (2019) et. al.** This paper presents a novel localization method for electric vehicles (EVs) charging through wireless power transmission (WPT). With the proposed technique, the wireless charging system can self determine the most efficient coil to transmit power at the EV's position based on the sensors activated by its wheels. To ensure optimal charging, our approach involves measurement of the transfer efficiency of individual transmission coil to determine the most efficient one to be used. This not only improves the charging performance but also minimizes energy losses by autonomously activating only the coils with the highest transfer efficiencies.
- **Jaime Garnica, Raul A. Chinga and Jenshan Lin (2020) et. al.** Wireless power has been a topic of interest from the early 20th century until today. This paper traces the history of wireless power transmission starting with Nikola Tesla, continuing on to experiments with beaming power using microwaves. Examining the difference between near-field and far-field techniques, this paper continues into modern times explaining why near-field technique is more suitable for consumer electronic devices and exploring the near-field transmission of power via the magnetic field. Examples of short-range and midrange wireless power systems are explored.
- **Shashank Prakash Naidu (2022) et. al.** In this paper we are introducing an updated version of charging of batteries through renewable energy grids. The major sources of this charging by solar panels and wind turbine. A voltage regulator is used to produce a constant voltage at the output side. Buck-Boost converter is used to convert the low voltage DC[LVDC] to high voltage DC[HVDC]. A rectifier circuit is used only at the output of wind turbine which rectify the harmonics produced. This power is stored in the battery. The output of this battery can be used for any type of electrical components. However, we are using a switching mechanism used at the battery side which makes sure that output from the batteries will be continuous.
- **Gautham Ram Chandra Mouli, Peter Van Duijsen, Francesca Grazian (2019) et. al.** If electric vehicles have to be truly sustainable, it is essential to charge them from sustainable sources of electricity, such as solar or wind energy. In this paper, the design of solar powered e-bike charging station that provides AC, DC and wireless charging of e-bikes is investigated. The charging station has integrated battery storage that enables for both grid-connected and on grid operation. The DC charging uses the DC power from the photovoltaic panels directly for charging the e-bike battery without the use of an AC charging adapter.
- **Seyed Ali Kashani, Alireza Soleimani, Ali Khosravi (2021) et. al.** Within the past decade, since impediments in nonrenewable fuel sources and the contamination they cause, utilizing green energies, such as those that are sun-oriented, in tandem with electric vehicles, is a developing slant. Coordinating electric vehicle (EV) charging stations with sun-powered boards (PV) reduces the burden of EV charging on the control framework. This paper presents a state-of-the-art literature review on remote control transmission frameworks for charging the batteries of electric vehicles utilizing sun-based boards as a source of power generation. The goal of this research is to advance knowledge in the wireless power transfer (WPT) framework and explore more about solar-powered electric vehicle charging stations.

III. HARDWARE IMPLEMENTATION

A. Solar Panel -20 watt each.

A solar panel is a device that converts sunlight into electricity by using photovoltaic (PV) cells. PV cells are made of materials that produce excited 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,

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or PV modules. Solar panels are usually arranged in groups called arrays or systems. A photovoltaic system consists of one or more solar panels, an inverter that converts DC electricity to alternating current (AC) electricity, and sometimes other components such as controllers, meters, and trackers. Most panels are in solar farms, which supply the electricity grid as can some rooftop solar.

Fig. A Solar Panel

Features of Solar Panel:

- Voltage : 12 Volts
- Current : 0.4167 Amp
- Power : 5 Watt
- Size : 29 cm x 18.5 cm x 1.7 cm

B. MPPT Solar Charge Controller

MPPT solar charge controller is the second generation of e-Smart MPPT controller, based on e-Smart series MPPT controller, we update the display with LCD, control method, connect way, internal structure etc. It features an efficient MPPT control algorithm to track the maximum power point of the PV array. Greatly improve the utilization of solar panel. Its intelligent LCD and upper PC display, mostly convenient for customers checking, records and parameter setting. It widely used in off-grid solar system, communication base station solar system, household solar systems, street light solar systems, field monitoring and other fields etc This reference design is a Maximum Power Point Tracking (MPPT) solar charge controller for 12-V and 24-V batteries, that can be used as a power optimizer in the future.

Fig. B. MPPT Solar Charge Controller

Features

- 98.3% efficiency in 12-V systems and 98.5% efficiency in 24-V systems
- Wide input voltage range: 15 V to 60 V
- Flexible design supports 12-V and 24-V battery voltages
- High-rated output current: 16 A
- Battery reverse polarity, over-charge and over discharge protections
- System over temperature and ambient light detection capabilities
- Small board form factor: 95 mm × 68.2 mm × 25 mm

C. DC-DC Converters

DC-DC Converters There are three basic types of dc-dc converter circuits, termed as buck, boost and buck boost. In all of these circuits, a power device is used as a switch. This device earlier used was a thyristor, which is turned on by a pulse fed at its gate. In all these circuits, the thyristor is connected in series with load to a dc supply, or a positive (forward) voltage is applied between anode and cathode terminals.

Fig. C. DC to DC Converter

The thyristor turns off, when the current decreases below the holding current, or a reverse (negative) voltage is applied between anode and cathode terminals. So, a thyristor is to be force-commutated, for which additional circuit is to be used, where another thyristor is often used. Later, GTO's came into the market, which can also be turned off by a negative current fed at its gate, unlike thyristors, requiring proper control circuit.

D. Buck Converters (dc-dc)

A buck converter (dc-dc) is shown in Fig. a. Only a switch is shown, for which a device as described earlier belonging

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to transistor family is used. Also a diode (termed as free wheeling) is used to allow the load current to flow through it, when the switch (i.e., a device) is turned off. The load is inductive (R-L) one. In some cases, a battery (or back emf) is connected in series with the load (inductive). Due to the load inductance, the load current must be allowed a path, which is provided by the diode; otherwise, i.e., in the absence of the above diode, the high induced emf of the inductance, as the load current tends to decrease, may cause damage to the switching device. If the switching device used is a thyristor, this circuit is called as a step-down chopper, as the output voltage is normally lower than the input voltage. Similarly, this dc-dc converter is termed as buck one, due to reason given later.

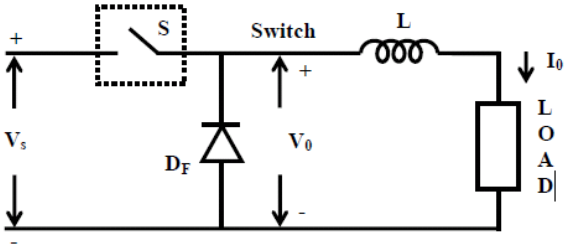

Fig. D. Buck Converter Line Diagram

E. Light Dependent Resistor (LDR)

Light Dependent Resistor (LDR) The light-dependent resistor is also known as a photo resistor or photocell. It is a light-controlled variable resistor. In photo resistor resistance decreases when light intensity increased and resistance increases with light intensity decreased. So that we can say that the resistance of the photo resistor is maximum at low light and minimum as light increases. LDR is mainly used for the detection of day and night. It can turn ON/OFF street light according to the change in light intensity or day/night time.

Fig. E. Light Dependent Resistor (LDR)

A Light Dependent Resistor (LDR) or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor materials having high resistance. There are many different symbols used to indicate a LDR, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling on it

F. Resistors

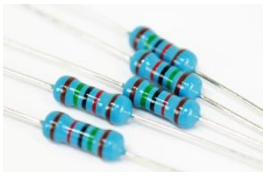

Fig. F. Resistors

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage.

G. EM18 RFID Module

EM18 is a RFID reader module which is used to read RFID tags of frequency 125 kHz. After reading tags, it transmits unique ID serially to the PC or microcontroller using UART communication or Wiegand format on respective pins. Radio-frequency identification (RFID) is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. This EM-18 RFID Reader is a Tiny, simple to use RFID reader module. With a built in antenna, the only holdup is the 2mm pin spacing.

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Fig. G. EM 18 RFID Module

Features:-

- Operating Voltage: 5V DC Supply
- Reading Distance: 6-10 cm.
- Read frequency: 125 kHz.
- EM4001 64 – bit RFID tag compatible.
- 9600bps ASCII output.
- Current : <50 mA
- Operating Frequency : 125 Khz
- Read Distance : 5 cm
- Compatible Tags : 125KHz EM4100 Tags

H. Lithium-Ion Batteries:-

A lithium-ion battery or Li-ion battery is a type of rechargeable battery. Lithium-ion batteries are commonly used for portable electronics and electric vehicles. In this battery, lithium ions move from the negative electrode through an electrolyte to the positive electrode during discharge, and back when charging. Li-ion batteries use an intercalated lithium compound as the material at the positive electrode and typically graphite at the negative electrode. The batteries have a high energy density, no memory effect and low self-discharge. Nominal, Maximum & Cut-off Voltage, these are the few Lithium-Ion batteries that I have been using for very long for many of my projects. Some of the batteries have a simple attached Battery Management System Circuit for over-voltage protection, balanced charging, short-circuit protection et

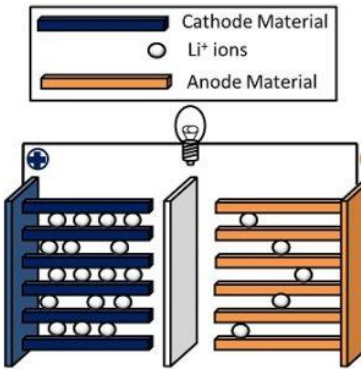
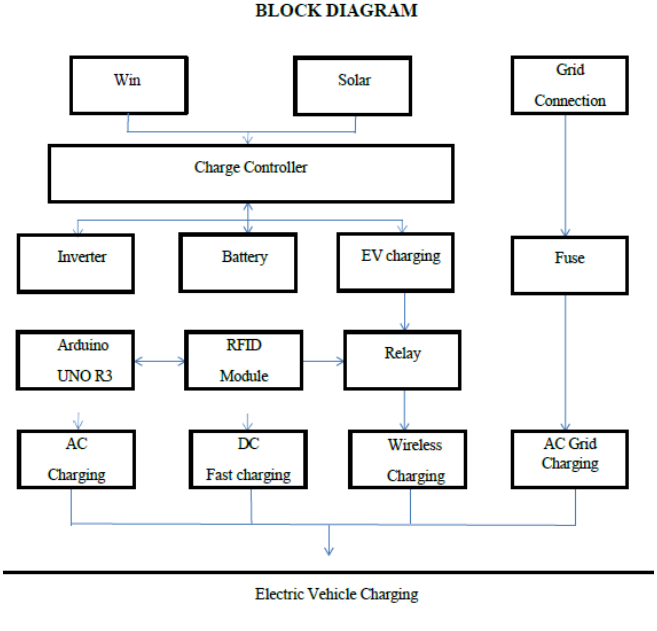


Fig. H. Li-Ion Battary

A lithium-ion (Li-ion) battery is an advanced battery technology that uses lithium ions as a key component of its electrochemistry. During a discharge cycle, lithium atoms in the anode are ionized and separated from their electrons. The lithium ions move from the anode and pass through the electrolyte until they reach the cathode, where they recombine with their electrons and electrically neutralize. The lithium ions are small enough to be able to move through a micro-permeable separator between the anode and cathode.

IV. BLOCK DIAGRAM



V. WORKING PRINCIPLE

The Smart EV Charging Station on Grid Green Power and Wireless Charging operates on various principles. In this the

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electricity is generated in solar plant and wind plant is given to the battery through the Invertors. Battery can store the generated electricity in solar and Wind. Battery connected to the charge controller and Charge controller play a crucial role that is system by regulating the flow energy. From charge controller the AC charging is provided to charge the E-Vehicle. The DC charging is provided from the Battery and the wireless charging is provided to the charging the E-Vehicle. Additional Grid charging is provided when the electricity is not generated through the solar plant and wind plant.

As the Vehicle comes at AC charging point it can charge itself by using connecting the pin. After that it comes at DC charging point it can also charge the Vehicle with the pin. But it comes at wireless charging point where Arduino and RFID module can installed. Here there is not visual/wired connection between the E-Vehicle and Charging point. So the permission granted vehicles are charged at the wireless charging point. Here the E-Vehicle owner which has not a REID card the RFID declined it which can show on display. The RFID card is given to customer who is a regular customer of the station and charge the vehicle Daily. With the help of Arduino we can set a limit of time to charge the E-Vehicle. Hence the electricity is not generated through the Solar and Wind then we can use the Grid Charging to charge the E-Vehicle for Emergency purpose. For number and many types of charging is provided at a station which can not disappoint the customer

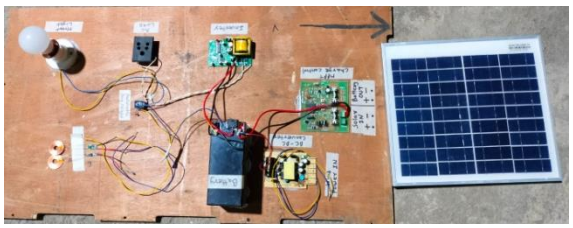
Overall the Charging the E-Vehicle through the Non-renewable source does not make any sense because we moving towards a Electric mobility. Due to use of E-Vehicle there is no pollution produced in the Nature.

Fabricating the E-Vehicle according to the following step

- The critical study of various research paper
- Gather all the information about the project
- Collect all the components
- Fabricate the all types of renewable energy sources
- Presenting the report and research paper

The EV charging station and wireless charging is designed for charge the vehicle without producing a pollution. The adoption of EV charging station a long distance is not covered at one attempt so that necessary point we have to install the Charging station.

- Solar and Wind Plant.
- Invertors & Charge Controller.
- Battery.
- Arduino & RFID Module.
- Frame support for Solar and Wind plant.
- Relays and some electronic and electrical components.



Prototype Model

4 Types of Charging -

- AC charging
- DC charging
- Wireless charging
- Grid charging.

A. Advantages

- Renewable energy source.
- One of the most significant advantages of solar-powered charging stations is that they use renewable energy from the sun to recharge EVs.
- Reduced carbon footprint.
- Reduce dependence on nonrenewable energy sources.
- Low-cost energy source.

B. Disadvantages

- Power outputs vary between charging stations, but DC fast chargers can deliver between 7 and 50 times more power than a regular AC charging station. While this high power is great for quickly topping up an EV, it also generates considerable heat and can put the battery under stress.

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- Wireless charging for electric vehicles offers several advantages, including convenience, enhanced safety, and environmental sustainability. However, challenges such as lower efficiency, higher implementation costs, and standardization issues need to be
- Power outputs vary between charging stations, but DC fast chargers can deliver between 7 and 50 times more power than a regular AC charging station. While this high power is great for quickly topping up an EV, it also generates considerable heat and can put the battery under stress.

VI. CONCLUSION

Increasing pollution and rapid depletion of fossil fuels has a paved a way to the entry of EV's in the market. But charging of E-Vehicle through conventional/Non renewable energy sources will can make the pollution. The development of the E-Vehicle represents a significant advancement in E-Vehicle is a new bridge between the E-Vehicle and Petrol and diesel Vehicles. The capable of fast charging with the help of Solar and Wind plant must adopted to short time require for charging of Vehicle. The Device now works with a limited connection but there are many types of charging and in a future we can increase the connections.

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