SOLAR WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM WITH IOT INTEGRATION

M. SRINU¹, P. NAGA RAJU², J. RAJESWARI³, P. DHANA SATYANARAYANA⁴, N. VAMSΙ⁵, K. MAHESH BABU⁶, A. MANIKANTA⁷

¹² Assistant Professors, Department of Electrical and Electronics Engineering
³⁴⁵.⁶.⁷ U.G Students, Department of Electrical and Electronics Engineering
D.N.R College of Engineering and Technology, Bhimavaram, Andhra Pradesh, India

Abstract: This paper describes the design of solar powered for charging of electric vehicle describes design of solar powered for charging of electric vehicle that solves the key downside of fuel and pollution. Electric vehicles have now hit the road worldwide and are slowly growing in numbers. Apart from environmental benefits electric vehicles have also proven helpful in reducing cost of travel by replacing fuel by electricity which is way cheaper. Well, here we develop an EV charging system that solves with a unique innovative solution. This EV charging of vehicles without any wires, No need of stop for charging, vehicle charges while moving, Solar power for keeping the charging system going, No external power supply needed. The system makes use of a solar panel, battery, transformer, regulator circuitry, copper coils, AC to DC converter, ESP8266 IOT Module, motors to develop the system. The system demonstrates how electric vehicles can be charged while moving on the road, eliminating the need to stop for charging. Thus, the system demonstrates a solar powered wireless charging system for electric vehicles that can be integrated in the road. IOT integration is a smart way to charge electric vehicles wirelessly using solar power. It combines solar panels to generate electricity and wireless technology to transfer that power to the vehicles. With IOT integration, you can monitor and control the charging process efficiently. It's an innovative solution for sustainable and convenient electric vehicle charging.

Keywords: Solar Panel, Battery Bank, dc to ac converter, transformer, Copper Coils, Esp8266 IOT Module, ac to dc converter, voltagessensor, L298N, Motor12v.

I. Introduction:
Electric vehicles have now hit the road worldwide and are slowly growing in numbers. Apart from environmental benefits electric vehicles have also proven helpful in reducing cost of travel by replacing fuel by electricity which is way cheaper. The system makes use of a solar panel, battery, transformer, Copper Coils, Esp8266 IOT Module, ac to dc converter, voltage sensor, Motor 12v.

IOT Module to develop the system. The system demonstrates how electric vehicles can be charged while moving on road, eliminating the need to stop for charging. The solar panel is used to power the battery through a charge controller. The battery is charged and stores dc power. The DC power now needs to be converted to AC for transmission. For this purpose, we here use a transformer. The power is converted to AC using transformer and the regulated using regulator circuitry. This power is now used to power the copper coils that are used for wireless energy transmission. A copper coil is also mounted underneath the electric vehicle. When the vehicle is driven over the coils energy is transmitted from the transmitter coil to ev coil. Please note the energy is still DC current that is induced into this coil. Now we convert this to DC again so that it can be used to charge the EV battery. We use AC to DC conversion circuitry to convert it back to DC current. Now we also measure the input voltage using ESP8266 to display in blink mobile app. Thus the system demonstrates a solar powered charging system for electric vehicle that can be integrated in the road.

II. ELECTRIC VEHICLE:

An electric vehicle (EV) is a vehicle that uses one or more electric motors or traction motors for propulsion. An electric vehicle may be powered through a collector system by electricity from off-vehicle sources, or may be self-contained with a battery, solar panels, fuel cells or an electric generator to convert fuel to electricity[4]. EVs include, but are not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft and electric spacecraft. EVs first came into existence in the mid-19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Modern internal combustion engines have been the
dominant propulsion method for motor vehicles for almost 100 years, but electric power has remained commonplace in other vehicle types, such as trains and smaller vehicles of all types[5].

III. LITERATURE REVIEW:

**Nikola Tesla** was the first who invented Wireless Power Transmission [WPT] technology in 1890. He wanted to create the supply system without use of the wire thus he invented inductive and capacitive coupling system for WPT. He invented coil known as Tesla Coil.

**Erhuvwu Ayisire** has given the idea related charging system for Electrical vehicle [EV] [2]. N. Uthaya Banu, U. Arunkumar, A. Gokula Kannan, M. K. Hari Prasad and A. B. Shathish Sharma has given the knowledge about the battery charging by using solar energy and it also analyzed primary and secondary side in detail [1]. The most difficult and important part while designing wireless charging system that is designing part of the coil. This paper gives knowledge about the Wireless Charging in Electrical Vehicle by using Solar Energy.

IV. BLOCK DIAGRAM:

![Transmitter side Block diagram](image1)

![Receiver side Block diagram](image2)

V. HARDWARE OVERVIEW

1. SOLAR PANEL 12V

![Solar panel 12v](image3)

Solar panels are classified according to their rated power output in Watts. This rating is the amount of power the solar panel would be expected to produce in 1 peak sun hour. Different geographical locations receive different quantities of average peak sun hours per day. In Australia, the figures range from as low as 3 in Tasmania to over 6 in areas of QLD, NT and WA. As an example, in areas of the Hunter Valley in NSW, the yearly average is around 5.6. The monthly figures for this area range from below 4.0 in June to above 6.5 in December. This means that an 80W solar panel would ideally produce around 320W per day in June and...
around 520W per day in December, but based on the average figure of 5.6, it would produce a yearly average of around 450W per day without taking losses into account.

Solar panels can be wired in series or in parallel to increase voltage or current respectively. The rated terminal voltage of a 12 Volt solar panel is usually around 17.0 Volts, but through the use of a regulator, this voltage is reduced to around 13 to 15 Volts as required for battery charging.

Solar panel output is affected by the cell operating temperature. Panels are rated at a nominal temperature of 25 degrees Celsius. The output of a typical solar panel can be expected to vary by 2.5% for every 5 degrees variation in temperature. As the temperature increases, the output decreases. With this in mind, it is worth noting that, if the panels are very cool due to cloud cover, and the sun bursts through the cloud, it is possible to exceed the rated output of the panel. Keep this in mind when sizing your solar regulator.

2. NODEMCU ESP8266

![NodeMCU ESP8266 controller](image)

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The NodeMCU ESP8266 development board comes with the ESP-12E module containing the ESP8266 chip having Ten silica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi Bluetooth and Deep Sleep Operating features make it ideal for IoT project.

3. Copper coils:

![Copper coils (30 turns)](image)

A circle, a series of circles, or a spiral made by coiling. 2 : a long thin piece of material that is wound into circles.

4. DC Motor:

![DC motor 12v](image)

Geared motors can be defined as rotations of the shaft per minute and is termed as RPM. The gear assembly helps to increasing the torque and reducing the speed. Using the correct combination of gear in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduces the speed of the vehicle expression of DC motor which already had its insight details are here. A geared DC motor has a gear assembly attached to the motor. The motor is counted in terms of but increase its torque is known as gear reduction.
5. Battery:

![Battery]

A power bank's built-in battery charges through an external power supply, such as a wall socket, then stores the energy in chemical form. When needed, the battery sends electrical energy to the connected device via the output port. The process consists of three parts: energy absorbing, storing and releasing. It works similarly to a cell phone battery, although a power bank can be more complex and have more functions depending on its design.

VI. METHODOLOGY:
1. Gathering & processing all information related to the system by studying various journals, research papers, books, articles etc
2. Collecting all hardwares
3. Software Designing
4. Assembly of all parts
5. Trial on manufactured machine
6. Interpretation of results

VII. HARDWARE OUTPUT:

![Hardware kit]

The system makes use of a solar panel, battery, transformer, regulator circuitry, copper coils, AC to DC converter, NODEMCU ESP8266 controller and MOBILE APPLICATION to develop the system. The system demonstrates how electric vehicles can be charged while moving on the road, eliminating the need to stop for charging[15]. The solar panel is used to power the battery through a charge controller. The battery is charged and stores dc power. The DC power now needs to be converted to AC for transmission. For this purpose, we here use a transformer.

The power is converted to AC using a transformer and regulated using regulator circuitry. This power is now used to power the copper coils that are used for wireless energy transmission. A copper coil is also mounted underneath the electric vehicle. When the vehicle is driven over the coils energy is transmitted from the transmitter coil to ev coil. Please note the energy is still DC current that is induced into this coil[16].
Now we convert this to DC again so that it can be used to charge the EV battery. We use AC to DC conversion circuitry to convert it back to DC current. Now we also measure the input voltage using a NODEMCU ESP8266 microcontroller and display this on an BLYNK Mobile application[17]. Thus, the system demonstrates a solar powered wireless charging system for electric vehicles that can be integrated in the road.

VIII. IOT Overview:

With IOT integration, you can monitor and control the charging process efficiently. It's an innovative solution for sustainable and convenient electric vehicle charging. Nodemcu Esp8266 Is Used For IOT Controlling. It controls the vehicle motion, charge monitoring, controlling and voltage sensing, voltage measuring. The whole controlling is controlled with blynk android application.

IX. ADVANTAGES:

1. 80% reduced operating cost than equivalent gas-powered vehicles.
2. Lower maintenance costs than gas powered vehicles.
3. Pollution free. Zero recharging time and unlimited range (when operating on an electric road)
4. Light weight vehicles.
5. A number of devices can be charged at a time
6. Electrically safe
7. Low maintenance cost
8. Charging is convenient

X. REFERENCE:

[5] Li Fei-Fei, et al. Research on technological innovation network of new energy vehicles in China from the