# Wireless Solar EV Charging Station

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**Abstract -** The industry is rapidly transforming from an IC engine vehicle to an electric vehicle. The demand for an electric vehicle is increasing, these lead to an increase in charging station as well. In this project, a wireless charging system is used to charge the vehicle wirelessly via inductive coupling. We just simply need to park the car on the charging spot. The transmission of electrical energy from source to load from a distance without any conducting wire or cables is called Wireless Power Transmission. The system checks if the person has sufficient balance and then deduct the charging charges *and* update the balance. The Internet of Things describes the network of physical objects that uses sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems.

***Keywords*: *Electrical energy, IOT, Android app***

## 1. INTRODUCTION

Energy in the form of electricity plays a very important role in the life of a normal man. Electricity is one of the greatest wonders of science. Next to man, it is the most important and revolutionary creation in this world of ours. It has practically revolutionized the world .The gradual but excessive use of electricity has come to bring about stupendous changes in industry. With it our modern gigantic tools are worked. Computers as also calculators sum up totals and make other calculations with the utmost accuracy. Newspapers and books are printed in millions overnight. There is not a single phase of human life that is not indebted to electricity for its progress .The modern age has, therefore, been truly called the “age of electricity.”

We do many things with electricity now days. We warm our homes, we drive the machines in factories, and we run our trains and buses. Electricity has completely revolutionized the methods of travel and transport .It has enabled us to travel in aero planes and fly into cold atmosphere of the sky. We also have electric trains in our country.

The infrastructure element that provides the crucial link between an Electric Vehicle (EV) with a depleted battery and the electrical source that will recharge those batteries is the Electric Vehicle Supply Equipment or EVSE. This report provides a review of the current and emerging EVSE technologies and an assessment of the common codes and standards associated with EVSE. The report also evaluates the barriers and challenges of deploying an expanded

An electrical vehicle battery recharging system composed of a set of photovoltaic solar panels connected to the electrical power grid. Thus, the energy generated

by the solar panels is preferably used to recharge the electrical vehicle where the generated energy is injected into the power grid. In things where the generation of energy by the panels is but the demand of the electrical vehicle, the grid complements the specified energy.

An electrical vehicle battery recharging system composed of photovoltaic solar panel connected to the electrical power grid. With the help of Solar panel, energy will be stored into the battery. When vehicle is parked at the charging station, vehicle battery will be charged by charging station battery. After full charging the supply will be cutoff by the relay. Also using NODE MCU, Battery voltage will be continuously monitored on android application through Wi-Fi. LDC is used to display battery voltage and percentage of battery charge.

## 2. LITERATURE SURVEY

**Electric Vehicle Charging System using Wireless Power Transmission, IoT and Sensors, 2020 International Research Journal of Engineering and Technology (IRJET):** In this paper, a wireless charging system is used to charge the vehicle wirelessly via inductive coupling. The transmission of electrical energy from source to load from a distance without any conducting wire or cables is called Wireless Power Transmission. The concept of wireless power transfer was the greatest invention by Nikola Tesla. Also, an Internet of things based collection system is designed in which a person can use the RFID to pay the charging charges of that vehicle. The system checks if the person has sufficient balance and then deduct the charging charges and update the balance. The Internet of Things describes the network of physical objects that uses sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems. This system doesn't require any human interaction. The result of this project is we can charge our vehicles wirelessly via inductive coupling and pay our charging charges through RFID tags. Wireless power transmission might be one of the technologies that are one step towards the future. This project can open up new possibilities of wireless charging that can use in our daily lives.

**Wireless Mobile Charger Design Based on Inductive Coupling, 2019 International Journal of Trend in Scientific Research and Development (IJTSRD):** In this paper, authors have been proposed wireless charging system by using inductive coupling. There was a growing market to construct the wireless charging system in the various kinds of electronic devices. There were many kinds of methods in wireless charging system. Among them, inductive coupling method was the simplest method. The system used Arduino microcontroller to produce the required frequency for driving the induction coil because it gave more accurate frequency than other controllers. In this circuit, N channel mode MOSFET IRFZ44N was used for driving the inductive coil because of its accurate switching timing and ratings. An important issue associated with all wireless power systems was limiting the exposure of people and other living things to potentially injurious electromagnetic fields. Finally, the wireless charger for mobile phones became an important role of human life style because of its simple design and safety for humans. The most powerful output can be obtained at switching frequency of 100 kHz for the design shown in earlier sections.

**A Review Paper on Wireless charging of mobile phones, 2014 International Journal of Engineering Research & Technology (IJERT):** In this paper two methods for wireless charging of mobile phones are studied. Nowadays Mobile communication not only restricted for voice transmission but also used for various multimedia applications like transfer of text, images, videos, playing games etc. Continuous use of mobile phones needs charging of the batteries again and again. Imagine a system where your cellular phone battery is always charged, You don't have to worry if you forget the charger. In this paper two methods are studied first is

wireless charging of mobile phones using microwaves which eliminates the need of separate charger for mobiles .In this method the charging of mobile phones is done using microwaves when we talk on that particular mobile .The microwave frequency used is 2.45Ghz.The second method is charging of mobile phones using Bluetooth.

**Shared Solar-powered EV Charging Stations: Feasibility and Benefits, 2016 IEEE:** In this paper, we explored the benefits of integrating renewable solar energy with EV charging infrastructure placed at car-sharing service's parking lot. We formulated a Linear Programming approach that maximized both solar energy utilization and customer satisfaction. Comprehensive evaluation of our algorithm was performed using real-world EV charging traces. They demonstrated the feasibility of a grid-isolated solar-powered charging station and show that a PV system proportional to the size of a parking lot adequately apportions available solar energy generated to the EVs serviced.

**System design for a solar powered electric vehicle charging station for workplaces, 2018 Applied Energy:** This paper analyses the PV system design and EV charging in a holistic manner considering the above aspects. The new contributions of the work compared to earlier works are as follows: 1. Determination of the optimal orientation of PV panels for maximizing energy yield in Netherlands and comparing it with the use of tracking systems. 2. Possibility of oversizing the PV array power rating with respect to the power converter size based on metrological conditions of the location. 3. Dynamic charging of EV using Gaussian charging profile and EV prioritization, which is superior to constant power charging. 4. Determination of grid impact of two different types of workplace/commercial charging scenario considering 5 days/week and 7 days/week EV load by running round-the-year simulation. 5. Optimal sizing of local storage considering both meteorological data and smart charging of EV.

## 3. PROBLEM STATEMENT

It is clear that vehicle electrification is unavoidable due to environment and energy related issues. Wireless charging will provide many benefits compared to wire charging. In particular, when the roads are electrified with wireless charging capability, it will provide the foundation for mass market penetration for EV regardless of battery technology. With technology development, wireless charging of EV can be brought to fruition. Wireless charging system by using inductive coupling technique is safety and more efficiency than other methods of wireless power transfer. Wireless charging method can increase efficiency by changing the design of coil and the circuit design. Moreover, we can add to use solar energy via photovoltaic (PV) panels in this current project. Solar energy is one of the top-rank renewable energy resources which cannot be harmful to the natural environment. One of the problems in electric vehicle is range anxiety which is the fear that a vehicle has insufficient range to reach its destination and would thus strand the vehicle's occupants.

## 4. PROPOSED SYSTEM

We live in a world of technological advancement. New technologies emerge each and every day to make our life simpler. Despite all these, we still rely on the classical and conventional wire system to charge our everyday electronic gadgets. The conventional wire system creates a mess when it comes to charging several electric vehicles simultaneously. It also takes up a lot of electric sockets at the charging port.

## 5. ARCHITECTURE

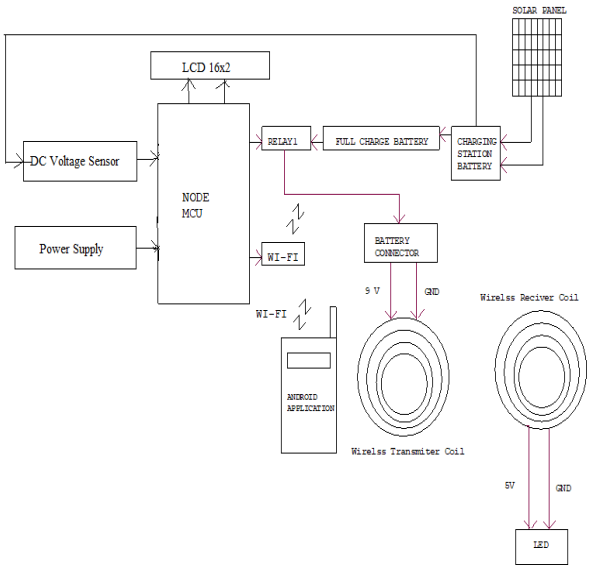
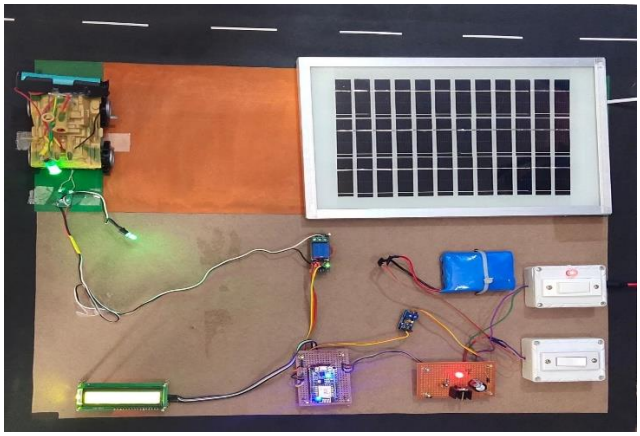



**Fig.1 Block Diagram**

In this project, we are going to develop a system using IoT based technology and renewable energy source i.e. solar energy. Whole system will be operated on 12 V supply using battery. Battery will be charged by solar panel. We will be using Node MCU microcontroller for interfacing Voltage sensor and to monitor voltage level.

Voltage sensor gives analog output to Arduino UNO. This controller converts Analog signal into digital form and provides it to LCD and Node MCU. Percentage of battery will be displayed on LCD 16X2. For wireless power transfer, we are using transmitter and receiver coil. The distance between these two coils is less than 5 mm so we get the voltage 5 volt. The transmitter coil requires 9 volt DC supply and at the end of receiver coil, we get the 5 volt supply.

We can have customized control from Android App to ON and OFF the relay for charging the battery with time. If the Relay is OFF then it will turn OFF the transmitter coil supply 9 Volt. If the relay is ON then it will turn ON the wireless transmitter coil supply 9 Volt. So it will save the battery power with the help of Android application and also will increase the battery life because timer function is available in Android application. It provides fully customized and dynamic setting to ON and OFF the relay for EV and mobile charger on time as per battery charging requirement.



## 6. SYSTEM REQUIREMENTS

- **User Interfaces**

  For user interface, either use can used android application or web application.

- **Hardware Interfaces**

  We will interface Node MCU controller with LCD 16x2, Battery, Solar panel, relay, DC Voltage Sensor, and Wireless coil. We will interface all components with Node MCU microcontroller. To provide 5V DC supply. We used transformer and rectifier circuit at the input side of project

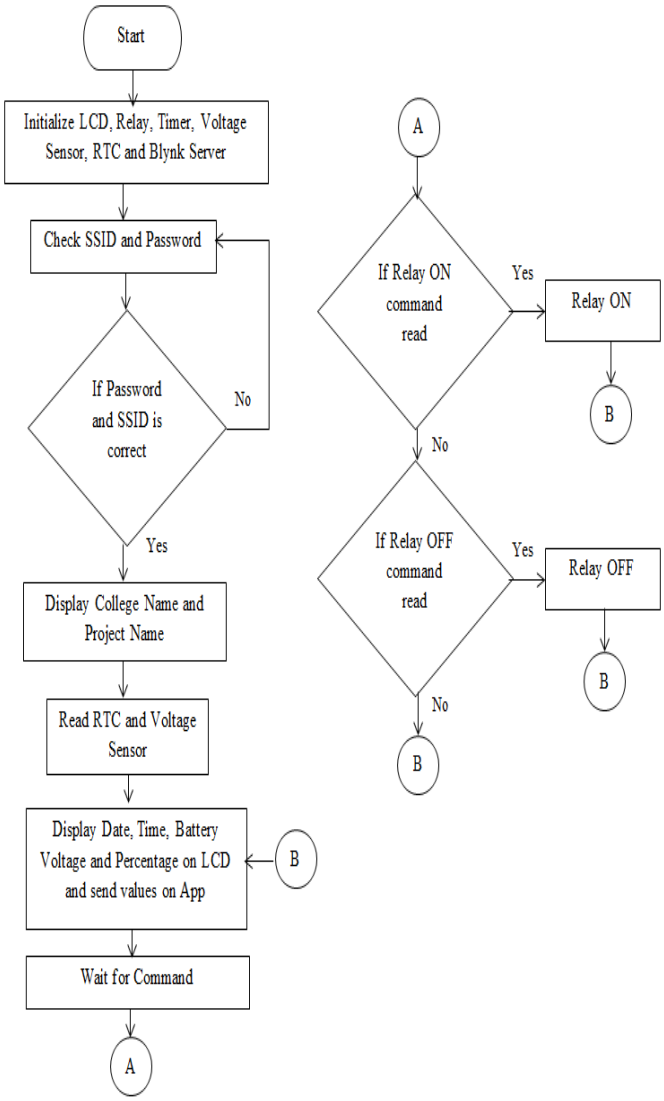
- **Software Interfaces**

  We have chosen windows 7 operating system for its best support and user friendliness. To implement the project we used Arduino IDE, Altium and OrCAD software.

- **Communication Interfaces**

  We are using simple software and hardware in this project communication between microcontroller and devices can be easily controlled by Android application connecting with Wi-Fi.

## 7. FLOWCHART




## CIRCUIT DIAGRAM

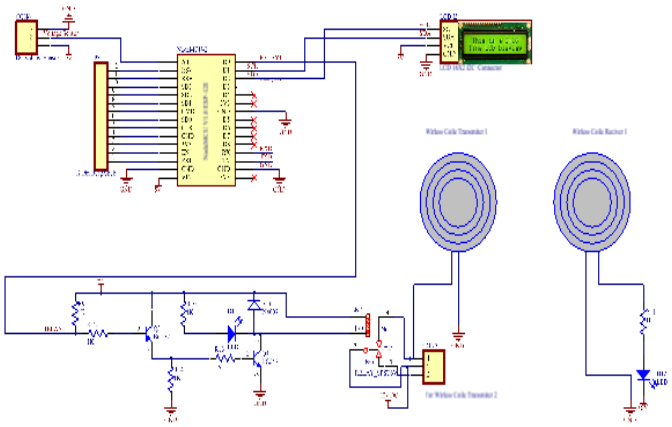
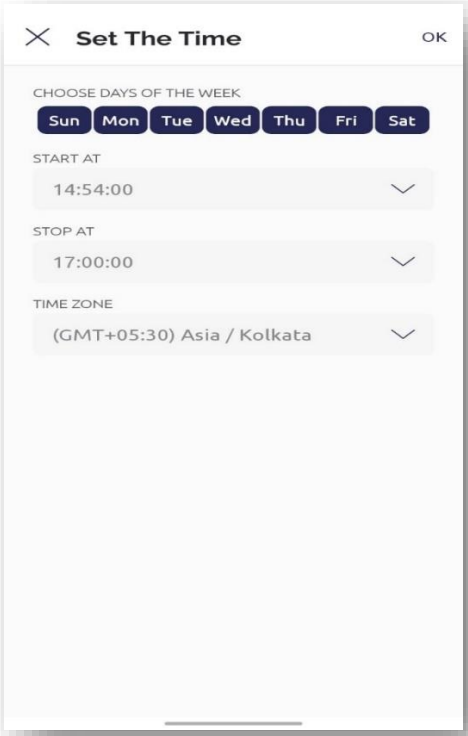
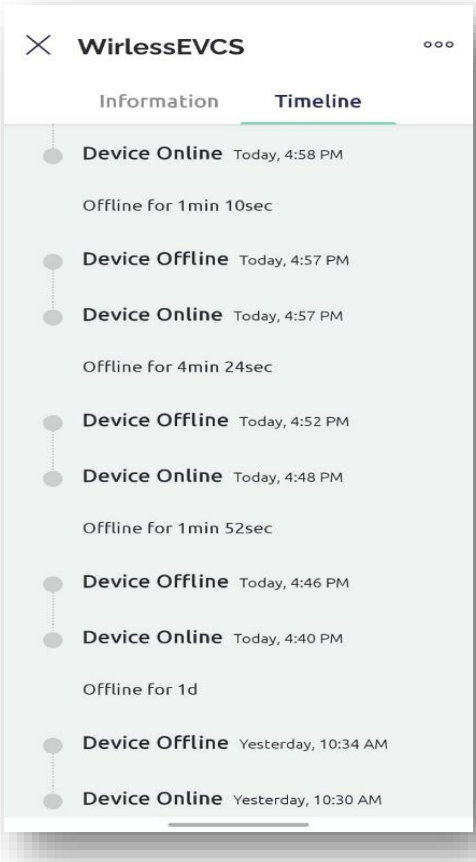


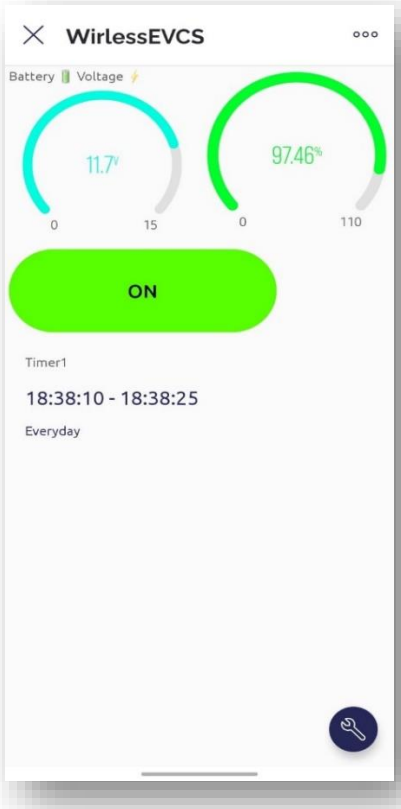
**Fig 2**: Interfacing of LCD, LCD 16X2, Relay, Dc voltage sensor, Solar panel with Node MCU

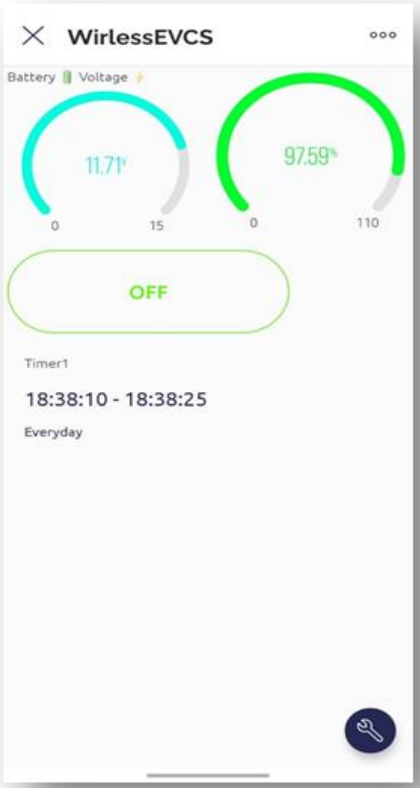
## 1. RESULTS AND EVALUATION

- **USER SIDE INTERFACE**




WirlessEVCS
Battery
Voltage
11.7
0
15
97.46
0
110
ON
Timer1
18:38:10 - 18:38:25
Everyday


WirlessEVCS
Battery
Voltage
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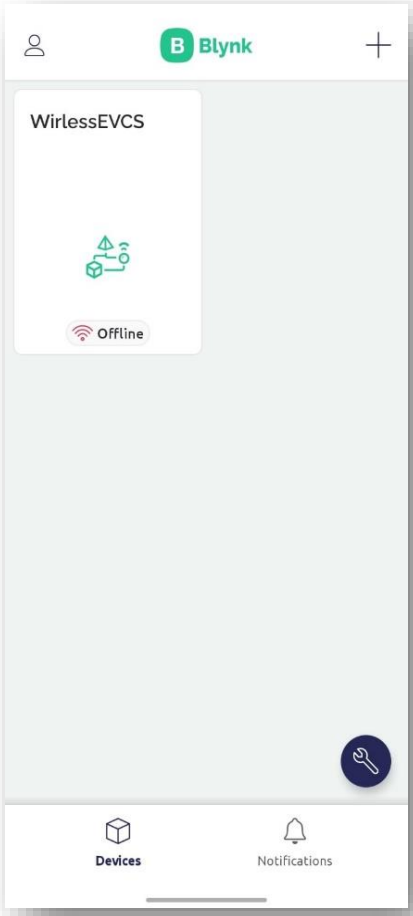
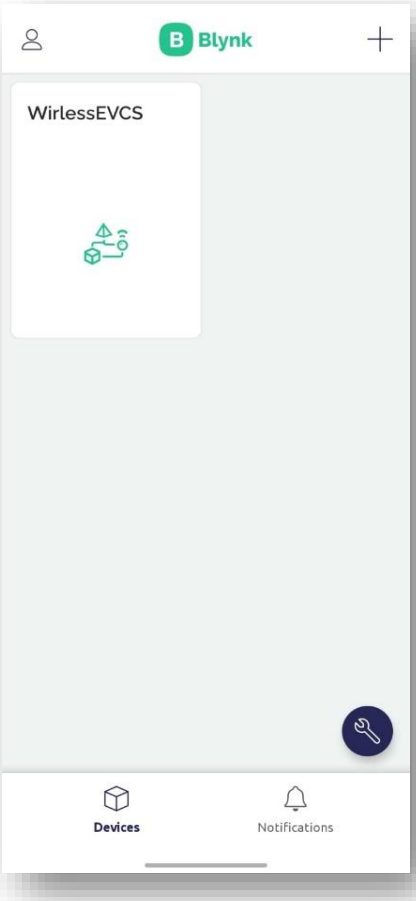
0
15
97.59
0
110
OFF
Timer1
18:38:10 - 18:38:25
Everyday


Blynk
WirlessEVCS
Offline
Devices
Notifications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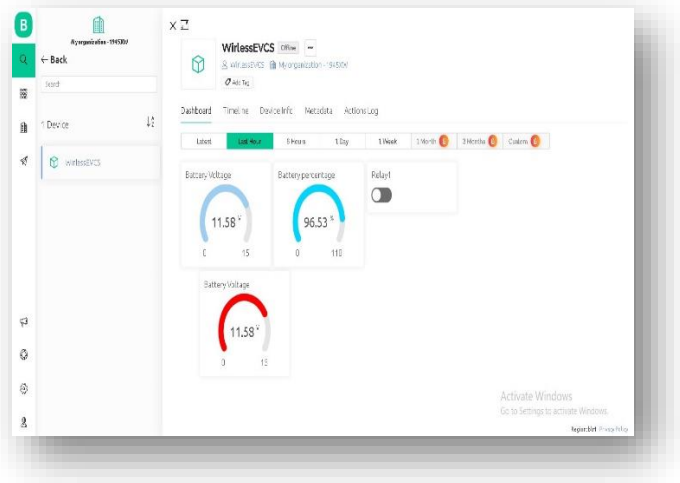
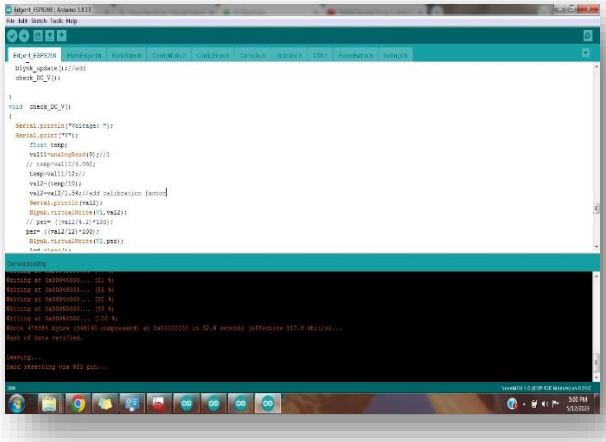



- **Embedded C Program in Arduino IDE**



## 2. CONCLUSIONS

We have successfully studied interfacing of LCD and Voltage sensor with Node MCU microcontroller. We have designed a prototype model for the implementation of EV charging station. The use of hardware and software along with the android app also will be studied. For mobile charging, the interfacing of relay through converter module is done which is very effective wireless mode of charging. Using Node MCU microcontroller having in-built Wi-Fi technology, a project has developed in Blynk app for monitoring and controlling charging of EV and mobile battery as well.

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