# PORTABLE EV CHARGING STATION WITH EASY ESTABLISHMENT TO INCREASE THE CHARGING STATION

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## ABSTRACT

*Electric vehicles face two primary challenges in their adoption compared to conventional vehicles: limited traveling range and inadequate charging infrastructure. Addressing these challenges requires the provision of charging options at various locations. However, the high initial costs and infrastructure demands make it challenging to establish multiple charging stations. Introducing low-cost, compact EV charging stations can facilitate the widespread use of electric vehicles.*

*In this proposed system, a combination of current and voltage sensors is employed to monitor the power delivered for vehicle charging. These sensors transmit signals to a microcontroller, which calculates and displays the billing amount. Users can interact with the system through a keypad and display to set charging parameters or billing preferences. Once the predetermined threshold is reached, the microcontroller activates a cutoff device to terminate the power supply. Additionally, the microcontroller sends data and alerts to a webpage via a Wi-Fi module, while an audible signal is provided by a buzzer. A power supply ensures that all circuit elements receive the necessary power. The proposed system outputs 230V AC for EV charging and incorporates a power meter, ensuring compatibility with various vehicle chargers for universal charging capability.*

**Keyword:** - *Electric Vehicles, Charging Stations, Transportation, Automation,*

## 1. INTRODUCTION

As the cost of fuel for petroleum vehicles continues to rise, there is a growing need for alternative solutions. Electric vehicles emerge as the most promising alternative, offering a way to reduce reliance on petroleum products and mitigate pollution resulting from current transportation practices. Governments are actively promoting electric vehicles, but challenges remain in developing efficient charging mechanisms and billing systems.

The world is increasingly embracing electrified mobility as a means to curb emissions from nonrenewable fossil fuel-powered vehicles and alleviate the burden of expensive fuel. In response to this trend, this project aims to develop a cost-effective and portable charging system, providing an alternative to traditional EV charging stations. This system will empower small shop owners to establish charging stations, expanding the available charging facilities network. Moreover, by incorporating solar power, the system will lessen dependence on the conventional grid for AC supply, making EV charging more sustainable. Ultimately, this initiative will result in a proliferation of charging options along roadsides, facilitating long-distance travel with electric vehicles.

## 2. LITERATURE SURVEY

### 2.1 "Electric Vehicle Charging Station Challenges and Opportunities: A Future Perspective"[1

The paper explores challenges in deploying Electric Vehicle Charging Stations (EVCS) post the environmental crisis, emphasizing the importance alongside Electric Vehicles (EVs). It addresses grid overloading, load forecasting, charging time, and traffic management issues. It discusses charging station terminologies, technologies, lithium-ion battery charging, and Battery Management Systems (BMS). Government initiatives, such as tax

reductions and subsidies, aim to facilitate EV and EVCS deployment. Guidelines from the Ministry of Power and Ministry of Housing assist in setting up charging stations.

**2.2 Smart Charging Management System for Electric Vehicles: A Review[2]**

This paper provides an extensive overview of smart charging management systems designed for electric vehicles (EVs). It explores a range of approaches and technologies employed to efficiently manage charging stations, such as demand response strategies, load balancing techniques, and integration with renewable energy sources. The review identifies key challenges and outlines future research avenues in the realm of smart EV charging management, stressing the significance of grid integration, user behavior analysis, and interoperability standards. The benefits encompass insights into diverse smart charging strategies and their potential advantages for grid stability, energy efficiency, and user satisfaction. However, limitations may include gaps in coverage of the latest advancements and specific challenges encountered in real-world implementations.

**2.3 "Development of an IoT System with Smart Charging Current Control for Electric Vehicles"[3]**

This paper outlines the development and assessment of an Internet of Things (IoT) framework tailored for supervising and managing electric vehicles. Employing the Firebase platform, the IoT architecture synchronizes vehicle data with an online server, enabling remote access via the Internet. The study introduces a smart charging system capable of dynamically adjusting the electric vehicle's battery charging current in real-time, based on demand at the residence, monitored by a residential wireless sensor network (WSN). To access vehicle data, an Android mobile app was developed, communicating with wireless sensor nodes of an intra-vehicular wireless sensor network (IVWSN) established using the Bluetooth Low Energy (BLE) protocol. Additionally, a real-time notification system was integrated to alert users of specific events, such as low battery or full charge. Experimental results validate the essential functionalities of the proposed IoT system.

**2.4 "Battery Chargers in Electric Vehicles"[4]**

Battery chargers are crucial components facilitating energy transmission between electric vehicles and the grid. Efficient transmission significantly influences EV technology advancement. To compete with internal combustion engine vehicles, rapid charging is essential. This paper delves into current charger technologies (specifically cable chargers, not wireless) and aims to develop a Simulink model for chargers. Given the scarcity of simulation samples in the literature, expanding these examples is vital for fast-charging technology advancement.

**2.5 An Efficient Billing Method for Electric Vehicle Charging Stations[5]**

This paper proposes an efficient billing method for electric vehicle (EV) charging stations to address fair and transparent billing challenges. Leveraging advanced metering infrastructure and real-time data processing, the method accurately measures and bills EV charging sessions. The paper discusses implementation details and evaluates the billing method's performance through simulation and experimental results. Advantages include providing a practical solution for fair and transparent billing.

## 3. NEED OF PROJECT

For electric vehicles, traveling range and charging infrastructure are the two major issues affecting its adoption over conventional vehicles. To overcome the issue its important to provide charging options at multiple places. But due to high initial investment and infrastructure needs its difficult to provide multiple charging stations. Here low cost and compact EV charging station will help to establish EV utilization

## 4. Objectives of Project

In this project, a cost-effective and compact system will be designed which will work as a portable charging station to provide an alternative for conventional EV charging stations. The major design objectives of the project are as follows:

- Calculate & shows the power delivered and billing amount for charging.
- Comparable for any vehicle and also with any EV charger.
- Able to set the charging time or bill amount as required.
- Adjustable charging rate for EV charging station owners.
- Automatic cut off and alert after set parameters.
- IOT based monitoring and alert on charging cut off.

## 5. Block Diagram

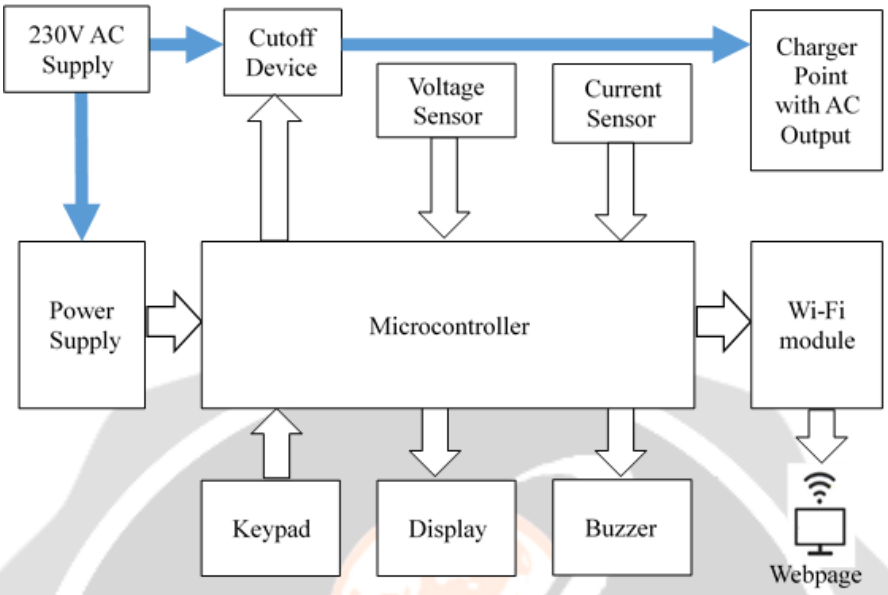


**Fig -1**: Block Diagram of System

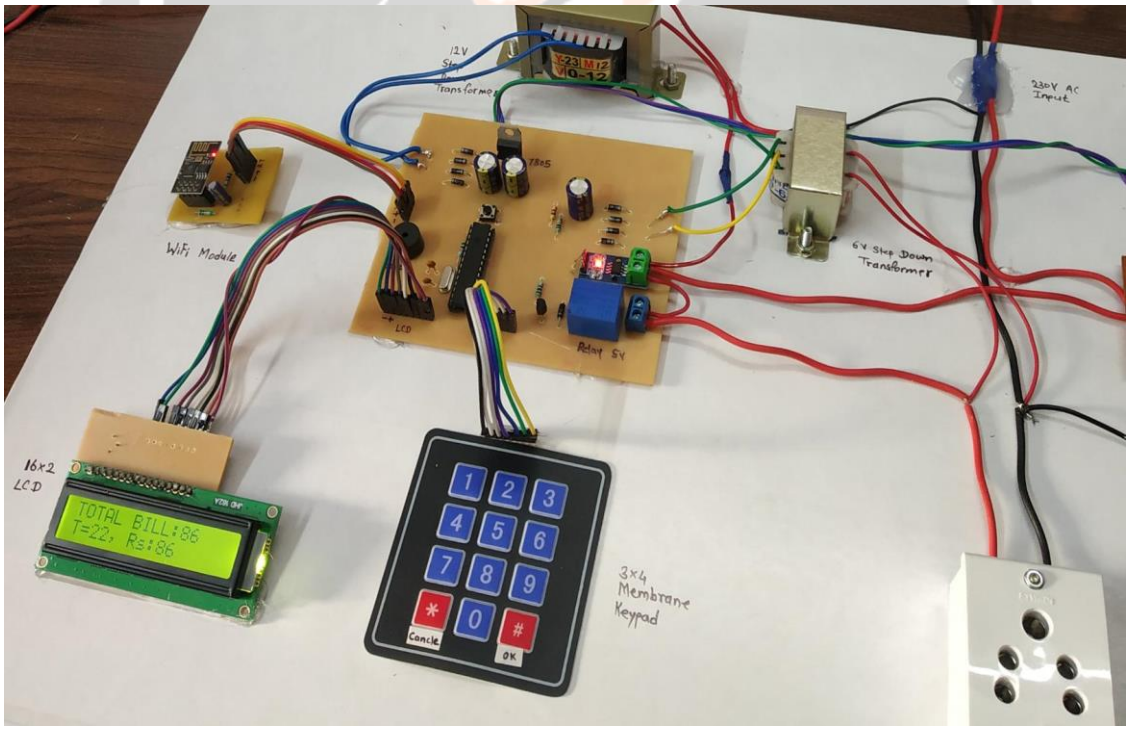


**Fig -2**: Hardware implementation of Prototype

## 6. RESULTS

This project presents, an cost effective and compact system which will work as an portable charging station to provide alternative for conventional EV charging stations.

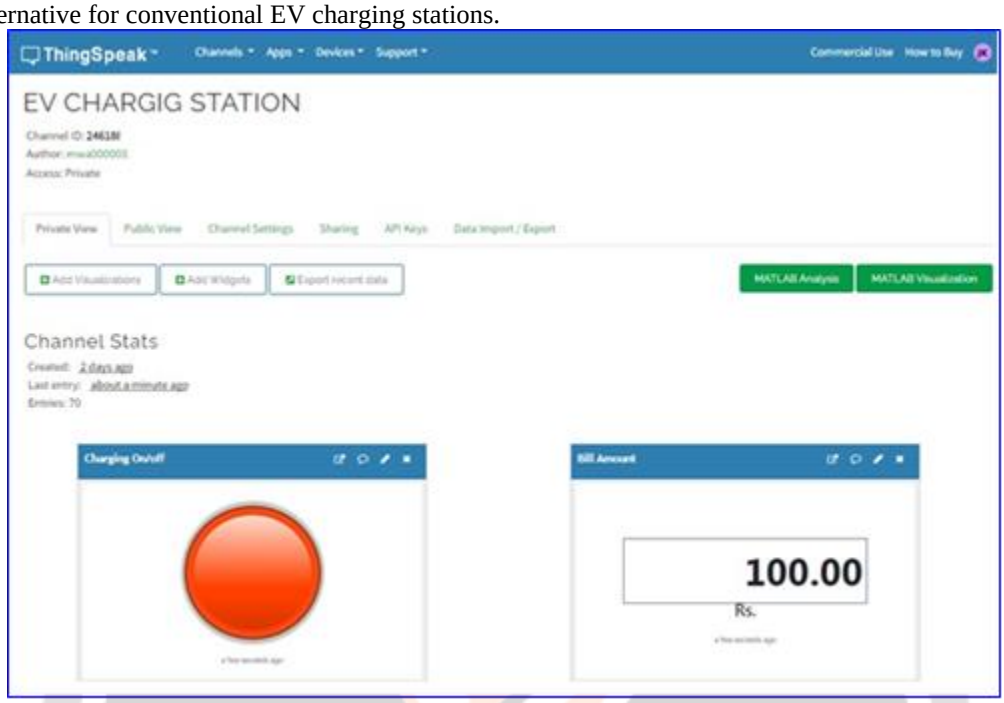


**Fig -3**: Screenshot of Webpage Result

The above image shows the webpage screenshot used to show the charging status and other information. Other outcomes of the project are:

- It must calculate & shows the power delivered and billing amount for charging.
- System must be compatible for any vehicle and also with any EV charger.
- System must be able to set the charging time or bill amount as required.
- It must has feature of adjustable charging rate for EV charging station owners.
- System must provide automatic cut off and alert after set parameters.
- It must provide IOT based monitoring and alert on charging cut off.

## 7. CONCLUSION

The electric vehicle revolution changed the transportation industry. It reduces the dependency on petroleum vehicles and also helps to minimize pollution. But due low availability of EV charging station infrastructure EV has the limited traveling range. So solve this issue, portable EV charging station is the best solution.

Proposed device will provide low cost setup as alternative to conventional EV charging stations. This will make EV charging stations affordable and help to increase the number of charging stations along roadside. This will ultimately result in long distance use of EVs. In this phase of project, we have studied all the ground situation and designed the system according. Though in future, system can be updated with dedicated webpage or android app to visualize the webpage data.

## 8. REFERENCES

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