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# SOLAR POWER BASED CHARGING STATION FOR ELECTRIC VEHICLES

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**ABSTRACT**
Highly requested nowadays, electric cars are emitting no talipipe emissions, greatly reducing smog and greenhouse gas emission. They utilize electricity for recharging their batteries as opposed to fossil fuels like petrol and diesel. More efficient than traditional vehicles, charging electric cars is less costly while considering electricity prices. The elevated demand necessitates reliable long-lasting charging systems or infrastructure. This article aims to present a sustainable and convenient charging solution for electric cars by harnessing renewable energy sources like solar power. Additionally, an electric vehicle charging spot is established using an Arduino microcomputer, wireless charging coil modules, a solar panel, and an ESP8266 Wi-Fi module.

**Keywords:**
Arduino, Electric Vehicles, Charging Stations, Solar Panel

## INTRODUCTION

As the world moved towards sustainable development, electrical cars (E-Cars) are gaining popularity as an environmentally friendly alternative to traditional petrol-powered cars. However, one of the major barricades to widespread E-Car adoption is the lack of adequate charging infrastructure. This is where a smart solar plus IoT wireless charging system for electrical cars steps in. This system is an innovative solution that uses renewable energy sources like solar power to wirelessly charge E-Cars, making them more accessible and convenient for consumers.

With the increasing popularity of electrical cars, there is a raised demand for a reliable and sustainable charging infrastructure. According to Bloomberg New Energy Finance, the number of electrical cars on the road is supposed to rise from 2 million in 2016 to 30 million by 2025. This stresses the importance of a powerful charging infrastructure to support this growth. The smart electrical car solar plus IoT wireless charging system is a fresh solution that can help in meeting this need. Utilizing renewable energy sources such as solar power, this system aims to provide a sustainable and convenient charging solution for E-Cars.

## LITERATURE SURVEY

A. Singh et al. [1] presented findings from the design of a solar-powered EV charging station for the Indian market. The analysis has been deliberated on the basis of the number of cars charged annually, the monthly variation in energy generation, the investment cost, and It can annually charge 414 vehicles with 30 kWh battery capacity.

This would contribute to a 7950 kg reduction in annual CO2 emissions. Maximum energy production occurs near the equator in March or January, and maximum energy production occurs near the Tropic of Cancer in May-June. When monocrystalline modules are used, the overall system generates more energy and saves money.

Ataur Rahman et al[2] developed created an on-board charging system with three different charging modes: slow charging for residential use, medium charging for office parking lots, and fast charging for charging stations on the road. With a maximum charging current of 50 A and an automatically activated quick evaporative thermal management system, the quick charging mode charges the battery in 1.5 to 2.0 hours. The quick charging system's performance has

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shown that the battery can be charged up to 85% of its rated capacity using constant current mode rather than constant voltage, which has reduced battery charging time by 16%. However, due to the fast redox reaction of the battery's electrochemistry, it may reduce battery life by about 5%.
Brenna et al. [3] provided an overview of existing and proposed EV charging technologies in terms of converter topologies, power levels, power flow directions, and charging control strategies. An overview of the main charging methods is also provided, with the goal of highlighting an effective and fast charging technique for lithium ion batteries in terms of extending cell cycle life while maintaining high charging efficiency. After presenting the most important aspects of charging technologies and strategies, the final section of this paper estimates the optimal size of charging systems using a genetic algorithm and values possible future trends in this field based on a sensitive analysis.
Syed Asad Abbas Rizvi et al[4] discussed many key issues such as forecasting, power quality, and the effect of charging and discharging EVs on the grid, as well as alluded to ambiguous issues to present guidelines to many research areas. According to research studies related to the development, the distribution system is the most impacted segment of the power system as a result of EV integration. Transmission line congestion can have an impact on both generation and transmission levels in extreme cases. The primary research topics in power quality are harmonic distortion and voltage imbalance. Some of the fringe issues are rising power losses and node voltage drops. Many researchers agreed that significant effects on power quality would be noticeable only at higher levels of EV integration penetration. The charging of EVs has the greatest impact on the power grid in terms of load capacity, power quality, grid economy, and environmental changes. EVs have a positive impact on the environment because they reduce CO2 emissions.
Chandra Mouli et al [5] investigated a solar-powered e-bike charging station that offers AC, DC, and wireless charging of e-bikes. The charging station includes integrated battery storage, allowing for grid-connected and offgrid operation. The e-bike can be charged wirelessly by inductive power transfer via the bike kickstand (receiver) and a specially designed tile (transmitter) at the charging station, providing maximum convenience to the user.
Gheorghe Badea et al [6] investigated the possibility of using solar autochthonous renewable resources to charge electric vehicle batteries with clean energy. A charging station for electric vehicles with photovoltaic panels and batteries as main components was designed, dimensioned, and operationally simulated. We simulated the operation of the photovoltaic system after optimising its configuration with improved Hybrid Optimisation by Genetic Algorithms (iHOGA) software version 2.4. The solar energy system must be designed in such a way that the charging station always has enough electricity to supply several electric vehicles 24 hours a day. The main findings concerned the system's energy, environmental, and economic performance after one year of operation.
T. S. Geetha et al. [7] proposed a novel capacity expansion framework for electric vehicle charging stations (EVCSs) based on short-term functional decisions and long-term planning in the presence of stochastic power demand. Energy is supplied to the microgrid by solar, wind, energy storage systems, and microgas turbines. An EVCS is a vehicle-to-grid (V-G) system that can send energy to a microgrid. Capacity expansion planning in a microgrid can increase the capacity of solar panels, storage systems, and wind turbines. The short-term and long-term expansion problems were solved by optimising resource hourly operation and using a five-year planning horizon, respectively. The effect of the availability of various resources, such as wind, solar, and V-G power, on system performance has been investigated. Finally, the proposed method was compared to three other algorithms, and the results show that it is superior.

## METHODOLOGY

The below Fig.1. illustrates the schematic diagram of Purposed System. A solar panel is making electricity to charging the EV's battery. IR sensor detect the EV accident, and dispatch a signal to the Arduino microcontroller as it nearing the power station. The microcontroller activate the relay module which on the power supply to the station's wireless charges coil module. That effect a magnetic field, causing a current in the EV's wireless charges coil module.
The charge is receive by the car's coil module, which soon charges the 3.7v rechargeable cell. Also, the system supervise the charge status of the EV and show the voltage and battery level on the station's LCD screen. Also, the ESP8266 Wi-Fi module sends the car's state to a Thingspeak account as 0 and 1, allowing users to monitor the charge operation from distant. If the EV's

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cell isn't completely filled, the system can fill it with sunlight energy. The sunlight into electricity, using it to charge the EV's battery.

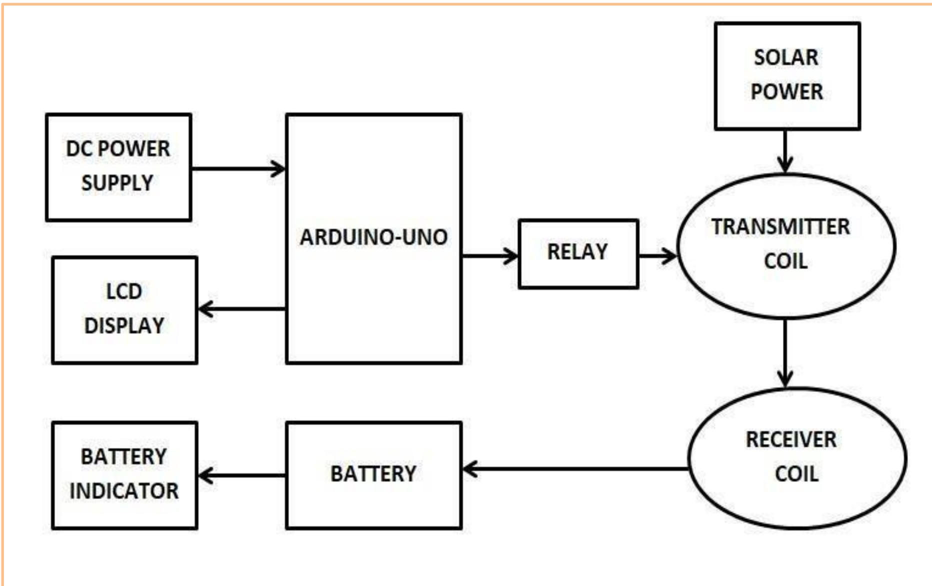


***Figure 1 Block diagram of Proposed System***

The following steps are take to develop a SPBCSEV-Solar Power Based Charging Station For Electric Vehicles
• Requirement Analysis: Identified the necessaries for a long pursue and effective EV charging forum, as well as the hardware and software components require.
• Hardware and Software Creating: Developed the scheme's hardware and software, including the Arduino microcontroller, wireless charging coil modules, the solar panel, and ESP8266 WiFi module.
• Building the system: Assembling the hardware components and constructing the software code.
• Testing: Testing conducted to guarantee the system's trustiness and functioning under a variety of conditions and eventualities.
• Deployment: Launched the system into production and monitored its functioning and user sentiments.3.1. Materials use for Proposed System
• Solar panel: A solar panel is a groupings of panels that capture day and convert it into electrical power. Normally, the panels are outfitted on a ceiling or a removed make nearby the charging spot.
• Battery: This element stores surplus solar panel power for usage during periods of low sunlight or high plea.
• DC Power Supply: This supplies power to the charging station when the solar panels are unable to produce enough energy.

- Arduino microcontroller: This microcontroller serves as the charging station's brain, controlling the flow of power to the vehicle.
- LCD Display: This shows the charging station's status, including the battery level, charging rate, and other information.
- Battery indicator: This shows the battery's current charge level.
- The group of IR sensing: It identify electric cars and start to charge!!!
- Relay: This regulates the power flow from the battery to the transmitter coil.

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- Transmitting coils: This wirelessly transfer powers to electric vehicle's receiving coil!
- Receiver coil: This coil wirelessly receives power from the transmitter coil and delivers it to the battery of an electric vehicle.
- ESP8266: This Wi-Fi module connects the charging station to the internet and allows it to communicate with other devices.
- Thing Speak IoT: This platform collects data from charging stations and provides analytics and visualization tools to help with charging process monitoring.

Overall, these systems enable electric trucks to be loaded using solar power and gives advanced supervising and control capacities via an IoT stage! Wireless charging eliminates the need for cables, providing more flexible charging options. The use of an Arduino microcontroller provides a platform that can be customized and expanded in the future.

## CONCLUSION

The use of solar panels to power electric vehicle charging stations has the potential to be an effective and environmentally friendly solution, but its feasibility and effectiveness will be determined by a variety of factors unique to each location and system. In the coming years, ongoing research and development will most likely improve the efficiency and viability of solar-powered electric vehicle charging stations.

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