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SOLAR ELECTRICAL VEHICLE CHARGING SYSTEM FOR NON-STOP EV CHARGING

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***Abstract*—** Electric vehicles are becoming more popular because they reduce pollution and fuel consumption. However, one major problem in existing EVs is the charging time and limited battery backup. To overcome this issue, this project proposes a Solar Electrical Vehicle Charging System for Non-Stop EV Charging.

The proposed system uses solar energy as the primary power source to charge electric vehicles continuously. Solar panels collect sunlight and convert it into electrical energy, which is stored in a battery and supplied to the EV charging unit. The system is designed to provide uninterrupted charging support and improve the efficiency of electric vehicle usage.

This project helps reduce dependence on fossil fuels and supports clean energy transportation. The system is eco-friendly, cost-effective, and suitable for future smart transportation applications. The hardware model includes solar panels, charge controller, battery storage unit, inverter, and EV charging circuit. Experimental results show that the system can provide stable and continuous charging under different environmental conditions.

Index Terms— Electric Vehicle, Solar Energy, Non-Stop Charging, Renewable Energy, EV Charging System, Battery Storage.

I. INTRODUCTION

Electric vehicles are widely used today because they reduce environmental pollution and fuel expenses. But EV users still face problems such as charging delays, limited charging stations, and power interruptions. These issues reduce the convenience of electric transportation.

Solar energy is one of the best renewable energy sources available naturally. By using solar energy for EV charging, electricity consumption from the grid can be reduced. This project introduces a Solar Electrical Vehicle Charging System for Non-Stop EV Charging, which allows continuous charging support using solar power.

The system collects solar energy through photovoltaic panels and stores it in a rechargeable battery. The stored energy is then used to charge electric vehicles whenever required. This method supports green energy technology and reduces dependency on conventional power sources.

The proposed model is economical, reliable, and environmentally friendly. It can be implemented in homes, parking areas, highways, and public charging stations.

II. PROBLEM STATEMENT

The increasing usage of electric vehicles has created a high demand for efficient and reliable charging systems. Most existing EV charging stations depend completely on conventional grid electricity, which increases power consumption and operational cost. During power cuts or peak load conditions, continuous charging of electric vehicles becomes difficult.

At the same time, electricity generated from fossil fuels contributes to environmental pollution and global warming. The limited availability of renewable energy-based charging systems is another major challenge in modern transportation infrastructure.

In many rural and remote areas, uninterrupted power supply is not available, making EV charging inconvenient for users. Therefore, there is a need for an eco-friendly and cost-effective charging solution that can provide continuous charging support without depending fully on conventional electricity sources.

The proposed "Solar Electrical Vehicle Charging System for Non- Stop EV Charging" aims to overcome these problems by using solar energy with battery backup to ensure uninterrupted, sustainable, and efficient EV charging.

III. OBJECTIVES

The main objective of the proposed Solar Electrical Vehicle Charging System for Non-Stop EV Charging is to develop an efficient and eco- friendly charging solution for electric vehicles using renewable solar energy. The system is designed to provide continuous charging support while reducing dependency on conventional electricity sources.

The specific objectives of the project are as follows:

1. To design and develop a solar-powered electric vehicle charging system.
2. To provide uninterrupted EV charging using battery backup support during low sunlight conditions.
3. To reduce electricity consumption from conventional power grids by utilizing renewable solar energy.
4. To promote environmentally friendly and sustainable transportation systems.
5. To improve charging efficiency and energy management in EV charging applications.
6. To minimize energy wastage and reduce operational charging costs.
7. To encourage the adoption of green energy technologies for future smart city applications.

IV. SYSTEM ARCHITECTURE

The proposed system consists of:

1. Solar Panel
2. Charge Controller
3. Rechargeable Battery
4. Inverter Circuit
5. EV Charging Unit
6. Monitoring System

The solar panel converts sunlight into electrical energy. The charge controller regulates voltage and protects the battery from overcharging. The battery stores energy and supplies power continuously to the EV charging system. The inverter converts DC power into AC power whenever required.

The proposed system works based on the principle of electromagnetic induction. Electrical energy generated by the solar panel is supplied to the transmitter circuit. The transmitter coil produces a changing magnetic field, which induces voltage in the receiver coil placed beneath the vehicle.

The induced voltage can be expressed as:

$$V = M * di/dt$$

where:

V = induced voltage

M = mutual inductance

di/dt = rate of change of current

The received AC power is converted into DC using a rectifier circuit and supplied to the EV battery or motor system.

V. WORKING PRINCIPLE

The working process of the system is simple and efficient. During daytime, the solar panel absorbs sunlight and generates DC electricity. The generated power is stored in the battery through the charge controller.

Whenever an electric vehicle is connected, the stored energy is supplied to the charging unit. Even during low sunlight conditions, the battery backup ensures uninterrupted charging. Thus, the system provides non-stop EV charging support.

The transmitting and receiving coils, also known as primary and secondary coils, are fundamental components of electromagnetic devices such as transformers, inductors, and wireless power transfer systems. The working principle of these coils is based on electromagnetic induction When flows through the primary coil, it generates a changing magnetic field around it. This changing magnetic field induces a voltage in the secondary coil according to Faraday's law of electromagnetic induction. The induced voltage is directly proportional to the rate of change of the magnetic field and the number of turns in the secondary coil. The primary coil acts as the transmitter, converting electrical energy into a magnetic field. The alternating curent in the primary coil causes the magnetic field to expand and colapse, resulting in a fluctuating magnetic field.

The secondary coil acts as the receiver, converting the changing magnetic field back into electrical energy. As the magnetic field from the primary coil fluctuates, it cuts through the turns of the secondary coil, inducing a voltage across its terminals. This induced voltage can be used to power devices or perform other electrical work To optimize the energy transfer between the coils, they are often designed with a high number of turns to increase the magnetic coupling. This coupling is a measure of how much of the magnetic field generated by the primary coil intersects with the secondary coil. In wireless power transfer systems, such as inductive charging pads, the transmitting and receiving coils are typically designed to have resonant freguencies that match each other. This resonance allows for efficient energy transfer over a short distance, as the coils can exchange energy at a specific frequency with minimal losses

MODEL IMAGE :

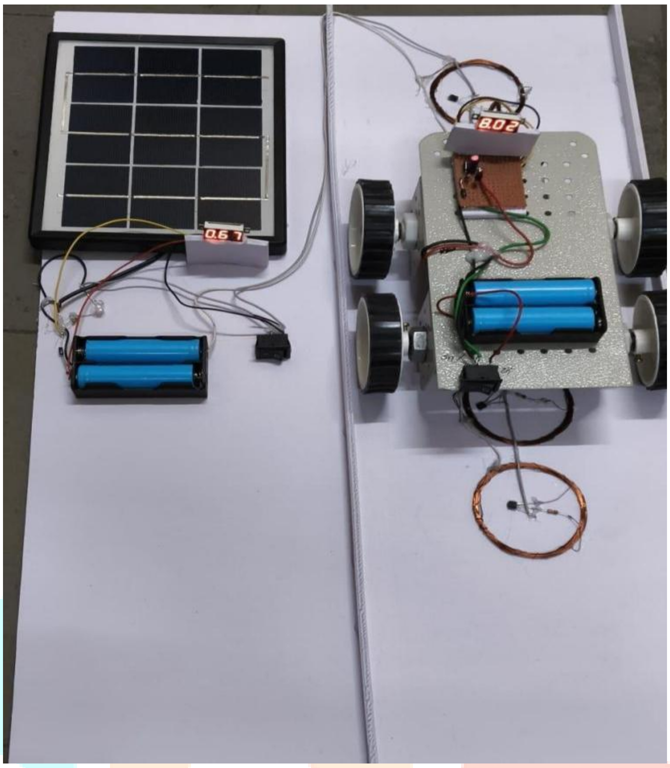

Fig : 1

VI. HARDWARE COMPONENTS

S.N	Component	Specification and Role
1	Solar Panel	Generates electrical energy
2	Charge Controller	Controls charging voltage
3	Battery	Stores solar energy
4	Inverter	Converts DC to AC
5	EV Charging Unit	Charges electric vehicle
6	Motor Driver Module	Regulates DC power delivery to drive motor
7	Connecting Wires	Power transmission
8	Switches	System control

SPTECH Silicon NPN Power Transistor

High Current Capability High Power Dissipation

High Collector-Emitter Breakdown Voltage: V(BR)CEO= 230V(Min)

Complement to Type 2SA1943

APPLICATIONS:

Power amplifier applications ·Recommend for 100W high fidelity audio frequency amplifier output stage application

BLOCK DIAGRAM:

- Eco-friendly and pollution-free system.
- Low maintenance cost.

- Suitable for future smart cities.

- *APPLICATIONS*

- Electric vehicle charging stations
- Residential EV charging systems
- Smart highways
- Shopping mall parking areas
- Industrial and commercial EV charging units

- *RESULT*

The developed prototype successfully demonstrated continuous EV charging using solar energy. The battery backup maintained uninterrupted power supply during low sunlight conditions. The system operated efficiently and provided stable charging output**.** The proposed Solar Electrical Vehicle Charging System for Non-Stop EV Charging was successfully developed and tested. The system efficiently converted solar energy into electrical energy and supplied power to the electric vehicle charging unit. During the testing process, the battery backup system provided continuous charging support even during low sunlight conditions. The charging output remained stable and reliable throughout the operation.

The experimental results showed that the proposed system reduced dependency on conventional electricity and improved energy efficiency. The system also minimized power wastage and supported eco-friendly transportation.

Hence, the proposed model proved to be economical, reliable, and suitable for future renewable energy-based EV charging applications.

VII. ADVANTAGES

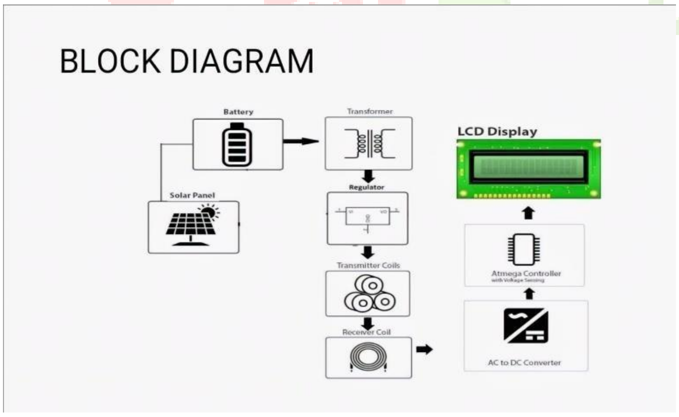

Fig : 2

- *CONCLUSION*

The Solar Electrical Vehicle Charging System for Non-Stop EV Charging is an effective solution for future electric transportation. The project reduces dependency on conventional electricity and promotes renewable energy utilization. Continuous charging support improves EV performance and user convenience.

This system can play an important role in developing sustainable and eco-friendly transportation infrastructure in the future. This paper presented the design and implementation of a Solar Electrical Vehicle Charging System for efficient and continuous EV charging using renewable energy. The proposed system successfully utilized solar power as the primary energy source to charge electric vehicles while reducing dependence on conventional electricity.

The project also highlights the importance of clean and sustainable energy solutions in the growing electric vehicle industry. By using solar energy for EV charging, environmental pollution and electricity consumption from the grid can be reduced significantly.

- Uses renewable solar energy.
- Reduces electricity cost.
- Provides continuous charging support.

In future, the system can be enhanced with smart monitoring, fast- charging technology, wireless charging methods, and IoT-based energy management systems for large-scale applications in smart cities and public charging infrastructure.

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