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Research of Smart EV Charging Station Using Green Power

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Abstract: *Smart Electric Vehicle (EV) Charging Station powered exclusively by solar energy. By harnessing the abundant and renewable power of the sun, this charging station aims to reduce carbon emissions and promote sustainable transportation solutions. Advanced technologies such as smart grid integration and real-time monitoring enable efficient utilization of solar energy for electrical vehicles charging. Intelligent algorithms optimize charging schedules based on solar availability, ensuring reliable and eco-friendly charging experiences for electrical vehicles owners. This innovative approach not only supports the growth of the electrical vehicles market but also contributes to the global transition towards clean and renewable energy sources*

Keywords: electrical vehicle, charging, solar energy, etc

I. INTRODUCTION

With the increasing demand for electric vehicles (EVs), the need for electric vehicle charging stations is growing rapidly. However, the use of traditional electricity sources to power these stations results in significant environmental impact and contributes to the global carbon footprint. Therefore, the implementation of renewable energy sources, such as solar power, is becoming increasingly important. The combination of solar power and electric vehicle charging stations offers a sustainable solution that can significantly reduce carbon emissions and promote the use of renewable energy sources. The integration of a smart charging system allows for efficient management of the charging process, optimizing the use of solar energy and avoiding peak demand periods. This paper proposes a smart electric vehicle charging station that is powered by solar energy and includes a smart charging system. The paper is organized as follows: The first section provides an overview of the current status of electric vehicle charging stations and the use of solar power as a renewable energy source. The second section presents the proposed smart electric vehicle charging station and its components. The third section discusses the implementation of the proposed system. Finally,the conclusion summarizes the findings of this research paper and discusses the potential for future research.

II. CURRENT STATUS OF ELECTRIC VEHICLE CHARGING STATIONS AND SOLAR POWER

The increasing demand for electric vehicles has resulted in a significant increase in the number of electric vehicle charging stations globally. According to the International Energy Agency (IEA), the number of publicly accessible electric vehicle charging points reached over 1.3 million worldwide in 2020. However, the majority of these charging stations rely on traditional electricity sources, such as coal and natural gas, which contribute to greenhouse gas emissions. The implementation of renewable energy sources, such as solar power, can significantly reduce the environmental impact of electric vehicle charging stations. Solar power is a clean and renewable energy source that can be harnessed to provide electricity to charging stations. The use of solar power in electric vehicle charging stations not only reduces carbon emissions but also reduces the reliance on the traditional electricity grid, providing energy security

III. METHODOLOGY

A. Block Diagram • The grid-based photovoltaic charging system is an innovative future technology. The photovoltaic charging system is shown in the architecture, which was developed after various studies. • The above design shows that a DC-to-DC converter and a DC-to-AC converter both produce two stages. The dc bus is more important since it interfaces with additional dc power devices, as well as the PV array and energy storage batteries of electric cars. The

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fact that the DC bus is meant to connect the PV array, the ESU, the EV battery pack, and other dc powered devices emphasizes its importance.

• Standalone PV charging system: With an off-grid station, power is provided directly to the batteries of an electric car. Connection to the power grid An Energy Storage Device (ESD) unit is connected to the charging system to deliver electricity to the EV battery continuously during the night. • We'll build an Internet of Things project in which the ESP8266 will track its own battery level using the BlynkIoT Cloud. We can monitor sensor data, battery charging/discharging status, battery voltage, and battery % in order to quickly recharge it. This is a simple method that makes use of a voltage divider circuit and the analogue input on the NodeMCU ESP8266 board.

IV. BLOCK DIAGRAM

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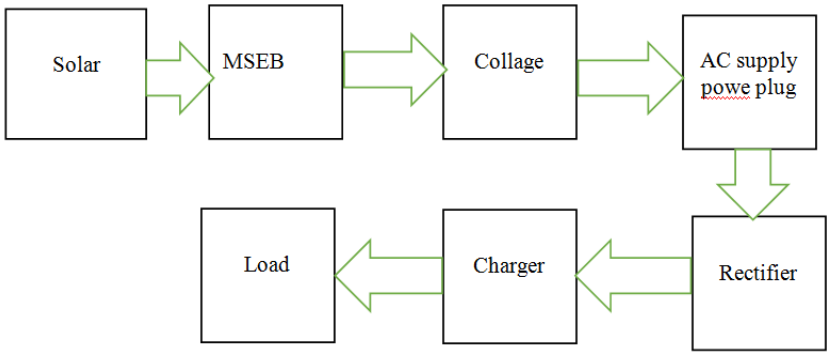

V. BENEFITS

a) Sustainable and Environmentally Friendly:The pro- posed system uses solar power, which is a renewable and clean energy source. It reduces the carbon footprint and contributes to mitigating the climate change effects.

b) Cost-effective:The use of solar power can reduce the operating costs of the EV charging station and increase the return on investment. The energy storage system can also reduce the peak demand charges and provide ancillary services to the electric grid. •

c) Efficient and Reliable :The smart control system can optimize the energy management and charging scheduling, and provide real-time monitoring and control of the chargingprocess. It ensures the efficient use of the available energy resources and the reliable operation of the system. •

d) Scalable and Flexible:The proposed system can accommodate different charging standards and protocols, and can be scaled up or down based on the demand and the availability of solar energy. It can also be integrated with other renewable energy sources and energy storage systems.

VI. DRAWBACKS

a) Initial Investment: The installation and setup of the EV charging station and the solar panels require a significant initial investment. The cost may vary depending on the size, capacity, and location of the system.

b) Weather Dependency: The efficiency and performance of the solar panels depend on the weather conditions, such as sunlight intensity, cloud cover, and temperature. The system may not generate enough energy during periods of low solar irradiance or extreme weather events.

c) Space Requirement: The installation of the solar panels requires a significant amount of space, which may not be available in some urban or densely populated areas. The charging station may also require additional space for parking and infrastructure.

d) Maintenance and Operation: The maintenance and operation of the EV charging station and the solar panels require specialized skills and knowledge. The system may also require periodic inspections and repairs to ensure the safety and reliability of the system.

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VII. CONCLUSION

This paper various aspects of EV charging, from technological advancements to infrastructure deployment strategies and future trends. It emphasizes the importance of sustainability, efficiency, and innovation in shaping the future of EV charging networks. Overall, the review paper serves as a valuable resource for understanding the current landscape and emerging trends in EV charging, laying the groundwork for continued growth and development in the electric vehicle industry.

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