Hybrid Power Generation and Storage System for the Application of EV Using IoT and Big Data

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Abstract:
In recent years, the installation of renewable energy facilities has grown rapidly due to the movement to reduce greenhouse gas emissions and preserve fossil fuels. Hence, the use of Electric vehicles (EV) are becoming more prevalent, making it necessary to improve and expand charging infrastructure. Hybrid renewable energy source (HRES) is needed for EV charging stations because the stored energy in an EV battery is insufficient for long distance travel. In this work, the concept of EV charging stations that are capable of being integrated with renewable energy sources (RES) and energy storage devices is proposed. Since the output from fuel cell and Photovoltaic (PV) system are intermittent due to environmental conditions, DC-DC converter is required to enhance voltage. Hence, Boost and improved Cuk converter is employed to improve voltage attained from fuel cell and PV system respectively. A single phase voltage source inverter (1 VSI) assists in the conversion of the DC link voltage to AC voltage, which is subsequently delivered to the EV battery for further usage. The AC power is then supplied to the grid. Internet of Things (IoT) is employed for remote monitoring and control purposes by sending vital data to cloud, in which the parameters such as DC link voltage and State of Charge (SOC) of battery is monitored. The MATLAB Simulink software is used to run all of the components and produce the appropriate results. It is clear from these results that the new approach is 97% more efficient than the traditional approaches.

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Contents

EVs are an appealing option compared to traditional transportation due to their lower carbon footprint and increased economic benefits. The primary source of energy in EVs is replaceable battery cells. Battery concerns, including as scarcity and high prices, are limiting EV adoption [1]. As a result, increasing the life of EV batteries is critical. In the event of an unexpected driving scenario, battery might discharge and charge at high current [2]. Because of the growing high load power and opposite high power of brake regenerating, the battery's lifespan has been lowered. Supercapacitor (SCs) are unable to function on their own because of their low energy density. Due to their increased power density, SCs can tolerate the extreme power fluctuations that EVs experience [3].

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