

Design and Development of Hybrid Charging Topology

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Abstract: The proposed hybrid charging topology aims to address key inefficiencies in existing Multi-Power Source (MPS) systems by integrating intelligent control mechanisms with multiple energy sources, including grid, solar, and storage battery. A Microcontroller Unit (MCU) forms the core of the system, orchestrating seamless transitions between energy sources based on availability and demand. The system optimizes solar energy utilization by dynamically adjusting charging parameters to match battery voltage, thereby maximizing the efficiency of photovoltaic panels. Furthermore, it incorporates multiple charging levels to ensure optimal battery health and longevity. Additionally, the system features an output power system equipped to utilize surplus solar energy for powering small DC loads, enhancing overall energy utilization. Through rigorous testing in diverse environmental conditions, the proposed hybrid charging topology demonstrates reliability and efficiency, offering promising avenues for sustainable energy utilization and advancing power electronics technology.

Keywords: Hybrid charging, Renewable energy, Intelligent control, Energy optimization, Sustainable technology

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