

Can a poly-input DC-DC converter improve energy storage and electric vehicle applications?

This paper presents an innovative poly-input DC-DC converter (PIDC) designed to significantly enhance energy storage and electric vehicle (EV) applications.

How does a DC-DC converter work?

Power flow among the aforementioned energy sources and the EV occurs through a dc link associated with an interleaved bidirectional dc/dc converter. This topology presents low component count and high efficiency over a wide load range, consisting of an adequate choice for high-power, high-current levels.

Can solar power and fuel cells be integrated into dc/dc converters?

The integration of renewable energy sources, such as solar power and fuel cells, into DC-DC converters has been extensively studied. Solar power offers a sustainable and abundant energy source, while fuel cells provide high energy density and reliability 19.

Is there a bidirectional DC-DC converter for fuel cell electric vehicle driving?

Chiu H, Lin L (2006) A bidirectional DC-DC converter for fuel cell electric vehicle driving system. IEEE Trans Power Electron 21 (4):950-958

Can a multiport bidirectional converter be used for dc microgrid energy interconnection?

For dc microgrid energy interconnection, this article proposes a multiport bidirectional converter, leveraging three shared half-bridges. This converter achieves

How can design automation improve power converter performance?

Researchers are exploring accurate analysis methods, optimal design, and novel control strategies to improve the power converters' performance. These strategies can improve the converters' performance without any modifications to the traditional hardware. In addition, design automations are drawing more and more attention.

This paper presents a new control method for a bidirectional DC-DC LLC resonant topology converter. The proposed converter can be applied to power the conversion between an energy storage system and a DC bus in a DC microgrid or bidirectional power flow conversion between vehicle-to-grid (V2G) behavior and grid-to-vehicle (G2V) behavior. ...

This study is helpful in promoting the application of a bidirectional DC/DC converter in the HESS and provides an experimental, theoretical, and simulation basis for the research and ...

Emerging electric vehicle (EV) technology requires high-voltage energy storage systems, efficient electric

motors, electrified power trains, and power converters. If we consider forecasts for EV demand and driving applications, this article comprehensively reviewed power converter topologies, control schemes, output power, reliability, losses, switching ...

At present, in several European railway networks using traditional DC electrification systems, it is not possible to increase traffic nor to operate locomotives at their nominal power ratings. Trackside energy storage systems (TESSs) can be an alternative solution for the creation of new substations. A TESS limits contact line voltage drops and smooths the ...

To adapt to frequent charge and discharge and improve the accuracy in the DC microgrid with independent photovoltaics and distributed energy storage systems, an energy-coordinated control strategy based on increased droop control is proposed in this paper. The overall power supply quality of the DC microgrid is improved by optimizing the output priority of ...

The AC/DC hybrid microgrid has a large-scale and complex control process. It is of great significance and value to design a reasonable power coordination control strategy to maintain the power balance of the system. Based on hierarchical control, this paper designs a reasonable power coordination control strategy for AC/DC hybrid microgrid. For lower control, this paper ...

DC/DC converters are ubiquitous in renewable energies such as photovoltaic power systems. A novel and general approach is proposed that consists of three matching principles, which enables one to assign a best set of energy storage elements to a DC/DC converter to meet both desirable transients and small ripples, facilitating the design of a ...

A key solution that could reduce emissions from industrial heating processes is thermal energy storage (TES). From their market report, "Thermal Energy Storage 2024-2034: Technologies, Players, Markets and Forecasts," IDTechEx forecast that more than 40 GWh of thermal energy storage deployments will be made across industry in 2034.

This research paper introduces an avant-garde poly-input DC-DC converter (PIDC) meticulously engineered for cutting-edge energy storage and electric vehicle (EV) applications. The pioneering ...

To effectively solve the problem of stable control of DC bus voltage in the independent photovoltaic energy storage system under multi-source disturbances, a bidirectional DC-DC converter control scheme based on enhanced linear active disturbance rejection control (LADRC) is proposed.

Multiport converters are suitable for integrating various sources (including energy storage sources) and have a higher voltage ratio than buck-boost converters. 65, 66 One of the applications of DC-DC converters in DC microgrids, which includes energy storage systems, is to adjust the voltage of the supercapacitor and the power between the ...

Photovoltaic energy storage system meets the ever-growing demand for electricity, while ensuring the stability of power supply. Research of renewable energy-based microgrid system has become a hot topic, especially the study of Maximum Power Point Tracking (MPPT) and energy storage unit control strategies. This paper proposes an MPPT technique that combines gradient step ...

The proposed converter is dedicated to interface a DC-voltage network with a battery based energy storage device. The paper aims to define and test a suited control strategy able to ...

These standards are among numerous standards and guidelines from the ISA that support energy production, transmission, and storage efficiency and; Energy production that is efficient, sustainable ...

The RESs are generally distributed in nature and could be integrated and managed with the DC microgrids in large-scale. Integration of RESs as distributed generators involves the utilization of AC/DC or DC/DC power converters [7], [8]. The Ref. [9] considers load profiles and renewable energy sources to plan and optimize standalone DC microgrids for ...

Aiming at the DC microgrid with multiple photovoltaic and energy storage units, a new distributed hierarchical coordinated control strategy is proposed to improve the power supply reliability of the system. According to the operating state of the microgrid, the photovoltaic unit automatically and smoothly switches the working mode by controlling the voltage signal of the photovoltaic cell. ...

Hybrid electric vehicles (HEVs) and pure electric vehicles (EVs) rely on energy storage devices (ESDs) and power electronic converters, where efficient energy management is essential. In this context, this work addresses a possible EV configuration based on supercapacitors (SCs) and batteries to provide reliable and fast energy transfer. Power flow ...

DC-DC Converters make it possible to integrate storage systems into the drive line-up. So, for example, regenerative energy can be stored temporarily and then be used for the process as required. The stored energy can also be supplied to the drive line-up in the event of peak load requirements or power failures.

In this context, this work addresses a possible EV configuration based on supercapacitors (SCs) and batteries to provide reliable and fast energy transfer. Power flow ...

Aiming at the voltage fluctuation of DC microgrid bus caused by the power fluctuation of distributed power supply and switching of constant power load (CPL), this paper ...

In conclusion, DC coupling is an innovative technology that's revolutionizing the solar energy sector by streamlining the integration of solar and energy storage. By understanding its advantages, applications, and tools, we can better harness its potential and accelerate our transition to a cleaner, more sustainable future.

The DC-DC Series of the INGECON[®]; SUN STORAGE Power family is a bi-directional DC-to-DC converter designed to operate in combination with DC-to-AC solar PV inverters. Thus, it is intended to create DC-coupled solar-plus-storage systems. Besides, it features the same technology as Ingeteam's PV inverters, facilitating the supply of spare parts.

For dc microgrid energy interconnection, this article proposes a multiport bidirectional converter, leveraging three shared half-bridges. This converter achieves high voltage gain with fewer ...

A bidirectional DC-DC converter connects a battery pack and the DC link. The bus voltage of a single-phase system is usually less than 600 V while charging and discharging power does not exceed 10 kW. A buck-boost converter is the most common bidirectional DC-DC topology because it requires fewer components and is easy to control.

Direct-current (DC) microgrids have gained worldwide attention in recent decades due to their high system efficiency and simple control. In a self-sufficient energy system, voltage control is an important key to dealing with upcoming challenges of renewable energy integration into DC microgrids, and thus energy storage systems (ESSs) are often employed to ...

The energy transformation driven by the development of renewable energy sources has become a reality for all power grid users. Prosumer energy, primarily utilizing photovoltaic installations, is one of the fastest-growing market segments. The advancement of technology, a decrease in electrochemical energy storage prices, and changes in the legal ...

Hybrid energy storage system (HESS) is an attractive solution to compensate power balance issues caused by intermittent renewable generations and pulsed power load in DC microgrids. The purpose of HESS is to ensure optimal usage of heterogeneous storage systems with different characteristics. In this context, power allocation for different energy storage units is a major ...

Aiming at the voltage fluctuation of DC microgrid bus caused by the power fluctuation of distributed power supply and switching of constant power load (CPL), this paper proposes a model predictive control (MPC) strategy with nonlinear observer, which is applied to bidirectional DC-DC converter for energy storage. First, a small disturbance model of the ...

The medium-voltage DC distribution system DC AC DC DC 10 kV AC bus 10 kV AC bus AC DC DC load DC DC DC DC DC DC DC load DC AC DC AC 10 kV AC bus Â±10 kV DC bus Â±10 kV DC bus Â±375 V DC load AC load Jishan Station I Jishan Station II Tangjia Station Fig. 5 Topology of the three-terminal flexible DC distribution system demonstration ...

School of Automation, Guangdong University of Technology, Guangzhou, Guangdong, China; To

simultaneously solve the problems of the state-of-charge (SOC) equalization and accurate current distribution among distributed energy storage units (DESUs) with different capacities in isolated DC microgrids, a multi-storage DC microgrid energy ...

Energy storage systems (ESS) are an important component of the energy transition that is currently happening worldwide, including Russia: Over the last 10 years, the sector has grown 48-fold with an average annual increase rate of 47% (Kholkin, et al. 2019). According to various forecasts, by 2024-2025, the global market for energy storage ...

This paper presents an innovative poly-input DC-DC converter (PIDC) designed to significantly enhance energy storage and electric vehicle (EV) applications. By integrating ...

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