Application Background of DC Microgrid

Are DC microgrids planning operation and control?
A detailed review of the planning, operation, and control of DC microgrids is missing in the existing literature. Thus, this article documents developments in the planning, operation, and control of DC microgrids covered in research in the past 15 years. DC microgrid planning, operation, and control challenges and opportunities are discussed.

What is a dc microgrid?
DC microgrids often incorporate fossil fuels such as gas or diesel to smooth out the variability of renewable energy sources [53, 54]. Poor management can reduce DC microgrid efficiency. DC microgrids benefit from several energy storage systems, but they complicate control. The supercapacitor and battery can store energy for later use.

What is a hybrid DC/AC microgrid?
The best qualities of DC and AC microgrids are combinedin a hybrid DC/AC microgrid. To increase overall efficiency,this type of topology connects DC and AC loads to separate but complementary DC and AC grids. Another benefit is that electric vehicle charging stations can be hardwired into the DC bus.

What are the key research areas in DC microgrids?
Power-sharing and energy management operation,control,and planning issues are summarized for both grid-connected and islanded DC microgrids. Also,key research areas in DC microgrid planning,operation,and controlare identified to adopt cutting-edge technologies.

Do DC microgrids need coordination?
The optimal planning of DC microgrids has an impact on operation and control algorithms; thus,coordination among them is required. A detailed review of the planning,operation,and control of DC microgrids is missing in the existing literature.

How to ensure the safe operation of DC microgrids?
In order to ensure the secure and safe operation of DC microgrids,different control techniques,such as centralized,decentralized,distributed,multilevel,and hierarchical control,are presented. The optimal planning of DC microgrids has an impact on operation and control algorithms; thus,coordination among them is required.

Deep learning applications in microgrids are studied by many researchers for accurate fault classification and distance calculation for effective monitoring and protection coordination of DC microgrids [52,53,54,55]. To cope with the intermittent nature of wind and solar power in the microgrid, power estimation is required for efficient energy management.

DC Microgrid (MG) with DC distribution system is an attractive technology over the last decade due to its

inherent compatibility with renewable energy sources (RESs), DC loads, and storage devices.

DC microgrids have attracted significant attention over the last decade in both academia and industry. DC microgrids have demonstrated superiority over AC microgrids with respect to reliability, efficiency, control simplicity, integration of renewable energy sources, and connection of dc loads. Despite these numerous advantages, designing and implementing an ...

This paper is concerned with the design of an autonomous hybrid alternating current/direct current (AC/DC) microgrid for a community system, located on an island without the possibility of grid connection. It is comprised of photovoltaic (PV) arrays and a diesel generator, AC loads, and battery energy storage devices for ensuring uninterruptible power supply during ...

In 2004, Tokyo University of Technology, Osaka University, and other institutions introduced the concept of a DC MG distribution system and built a series of 10 kW DC distribution system prototypes; in 2006, Osaka University of Japan proposed a bipolar structure of a DC microgrid system, a 6.6-kV distribution network, through a step down and rectifier using ...

Abstract: Microgrids are an emerging technology that maximizes the use of renewable energy sources (RES). Unlike AC microgrids, a DC microgrids do not need to consider the reactive power, frequency, etc. In addition, most RESs and energy storage system (ESS) have DC nature, which can be linked to the DC microgrid without energy conversion process, thereby reducing ...

Hybrid MGs may combine both AC and DC loads, allowing customers to customize their power usage with their own needs. Power electronic converters decouple the AC and DC components of an MG [95], [96], [97]. DG units in AC-DC hybrid MGs can be tied directly to the DC and/or AC networks without the need for synchronization [98]. However, this ...

Thanks to the contribution from the University of Genova, we will discover more on how the research is supporting this market trend, from simulations at labs to on-field applications. Common DC bus implementations, protection based on ...

This review emphasizes the role and performance of versatile DC-DC converters in AC/DC and Hybrid microgrid applications, especially when solar (photo voltaic) PV is the major source. Here, the various converter topologies are compared with regard to voltage gain, component count, voltage stress, and soft switching. This study suggests the suitability ...

Solar photovoltaic (PV) connection with the grid becomes more prevalent in distributed generation, and the DC grid contributes a significantly to the distributing system. The current study focuses on combining rooftop solar with the DC microgrid. A high-gain DC-DC converter for photovoltaic systems (HGBC-PVS) is proposed in this article to link two lower ...

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Recently direct current (DC) microgrids have drawn more consideration because of the expanding use of direct current (DC) energy sources, energy storages, and loads in power systems. Design and analysis of a standalone solar photovoltaic (PV) system with DC microgrid has been proposed to supply power for both DC and alternating current (AC) loads. The ...

Nowadays, DC microgrids are increasingly popular because of their various applications such as electric vehicles (EVs) [], uninterruptible power supplies (UPS) [], and so on.DC microgrids consist of various renewable ...

This paper covers the application of a Dual-Active-Bridge DC-DC Converter in Vehicle-to-Grid (V2G) technology for DC Microgrids to achieve soft-switching in the whole operating range independently of the electric vehicle"s battery state of charge while also ensuring stability of the Microgrid voltage port regardless of load or generation ...

This research discusses about the design and execution of a direct current (DC) microgrid system that leverages Internet of Things (IoT) technology. The microgrid combines various green ...

A microgrid is a small-scale electricity network connecting consumers to an electricity supply. A microgrid might have a number of connected distributed energy resources such as solar arrays, wind ...

Recently, direct current (DC) microgrids have gained more attention over alternating current (AC) microgrids due to the increasing use of DC power sources, energy storage systems and DC loads. However, efficient management of these microgrids and their seamless integration within smart and energy efficient buildings are required. This paper ...

Managing natural resources and air pollution has been challenging for humans for quite a long time. A severe manifestation of natural resource mismanagement has been in the form of CO2 emissions from smoke bellowing thermal power plants (TPPs). Besides evoking global warming, the TPPs also foster limited coal reserve reduction with the increasing ...

2.1.2 DC microgrids. In this type of microgrid, the bus voltage is DC, leading to its designation as a DC microgrid (Kumar et al., 2017) residential and commercial applications, such as computers, battery chargers, and highly efficient lighting systems, DC power is required.

DC microgrids have high efficiency, better reliability and compatibility and simple controlling strategy [1, 2].The use of DC microgrid for direct feeding of DC loads eliminates the utilization of inverters in power grids that prevent approximately 7%-15% of power loss of intact system [1].Dc microgrids are robust, resilient and having very simple control design with higher ...

More importantly, given that a large proportion of the decentralised renewable energy comes from direct current (DC) sources, for example, rooftop solar photovoltaics systems, microgrids in DC form also ...

Application Background of DC Microgrid

Figure 1 illustrates the basic design of a DC Microgrid structure. It consists of several micro sources, energy storage system, energy transfer system, and load control system. The DC microgrid can be run in island mode control otherwise in grid mode control [10].Furthermore, the DC microgrid is a dynamic multi-target control system that deals with ...

(a) DC microgrid connection and measurement (b) DC microgrid control diagram (c) DC microgrid equivalent scheme Fig. 3 DC microgrid under current -driven power sharing II. PRINCIPLES OF CURRENT-DRIVEN POWER SHARING In this section, principles of the current -driven power sharing are explained using a DC microgrid model, as shown in Fig.3(a ...

On the other hand, DC-MGs could offer various merits compared to AC-MGs: more efficient supply of DC loads, loss reduction via decreasing the multiple converters used for DC loads, facilitate various DC-DERs integration such as fuel cells (FC) and photovoltaic systems (PV) to the common node with simplified interfaces, and decreasing the need for ...

DC Microgrid (MG) with DC distribution system is an attractive technology over the last decade due to its inherent compatibility with renewable energy sources (RESs), DC loads, and storage devices. The worldwide growing concern on global warming and reduction of fossil fuel has raised the need for clean and eco-friendly RESs for electricity generation through the ...

Microgrids often include technologies like solar PV (which outputs DC power) or microturbines (high frequency AC power) that require power electronic interfaces like DC/AC ...

The hybrid microgrid, as the name suggests, is the combination of two microgrids--AC and DC. The AC microgrid is widely configured and utilized due to minimal alterations required in the existing infrastructure and utility grids, whereas DC microgrid is gaining popularity due to its own advantages, such as--no reactive power requirement or ...

[1] Aminu M. A. and Solomon K. 2016 A Review of Control Strategies In DC Microgrid Advances in Research journal 7 1-9 Article no.AIR.25722 Google Scholar [2] Ma W J, Wang J, Lu X et al 2016 Optimal Operation Mode Selection for a DC Microgrid IEEE Transactions on Smart Grid 1-9 Google Scholar [3] Ma J, He F and Zhao Z 2015 Line loss optimization ...

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