Dc bus voltage control for a distributed power system

How does DC bus voltage affect voltage-sensitive loads?
As a result, DC bus voltage suffers from rapid changes, oscillations, large excursions during load disturbances, and fluctuations in renewable energy output. These issues can greatly affect voltage-sensitive loads. This study proposes an integrated control method for the bus voltage of the DC microgrid to solve the abovementioned problems.

What happens if a DC bus voltage is greater than 2 volts?
When the oscillation amplitude of the bus voltage is detected to be greater than 2 V,the system activates the oscillation suppressor. Thereafter,the voltage compensator is activated at 2 s. The DC bus voltage with the conventional control method rapidly decreases to about 758 V,and the system inertia is insufficient.

What is DC bus voltage drift?
The DC bus voltage with the conventional control method rapidly decreases to about 758 V, and the system inertia is insufficient. Meanwhile, the busbar voltage drift is greater than 5%, which is beyond the safe operating range.

How fast does a DC bus voltage change?
The speed of the voltage change is fast, and the inertia of the system cannot be well represented. Under the integrated control strategy, the DC bus voltage change rate slows down significantly, the oscillation amplitude is reduced to about 2 V, and the bus voltage recovers to 800.5 V after the voltage compensator is operated.

What is the amplitude of a DC BUS oscillation?
After the method in is operated,the DC bus voltage is restored to 800.2 V. However,the amplitude of the oscillation is about 8 V. The speed of the voltage change is fast,and the inertia of the system cannot be well represented.

How does integrated control strategy affect DC bus voltage change rate?
Under the integrated control strategy,the DC bus voltage change rate slows down significantly,the oscillation amplitude is reduced to about 2 V,and the bus voltage recovers to 800.5 V after the voltage compensator is operated. Experimental waveforms comparing the method in with the proposed integrated control strategy

An outstanding issue is DC voltage control in MTDC systems. The easiest way to maintain stable operation is to assign the task of DC voltage regulation to one converter. ... A solution to this problem is a distributed slack bus. Active power regulating buses help the original slack bus (main slack bus) in keeping the DC voltage stable. There ...

Developing an energy management strategy (EMS) is an important requirement to satisfy the load power

demand for a proton-exchange membrane fuel cell (PEMFC) hybrid system under different working conditions. For this objective, this paper proposes an EMS to control the power distribution between the PEMFC, battery (BAT), and supercapacitor (SC) and regulate ...

Modular generation system, which consists of modular power conditioning converters, is an effective solution to integrate renewable energy sources with conventional utility grid to improve reliability and efficiency, especially for photovoltaic generation. A distributed control strategy based on improved dc bus signaling is proposed for a modular photovoltaic ...

An adaptive nonlinear droop control for accurate load current sharing and DC bus voltage compensation in a DC power system Article 30 November 2021. ... Karlsson, P.; Svensson, J.: DC bus voltage control for a distributed power system. IEEE Trans. Power Electron. 18(6), 1405-1412 (2003) Article Google Scholar

A brief review of the DC bus voltage control strategy and improved DC bus control method is presented in Section V, and the simulation results are presented in Section VI. ... DC bus voltage control for a distributed power system. IEEE Trans Power Electron (2003) D. Salomonsson et al. Protection of low-voltage DC microgrids. IEEE Trans Power ...

This study investigates the DC microgrid system and proposes an integrated bus voltage control method, which includes an IAVIC, a oscillation suppressor, and a voltage ...

It leads to DC-bus voltage stability with a slight transient response during the wind speed decrement and an accurate current tracking as depicted in Fig. 11 and 12, respectively. Download : Download high-res image (138KB) Download : Download full-size image; Fig. 11. DC-bus voltage under load change and the wind speed decrement during scenario II.

Second, for the first time, a simple and novel d-q current regulation technique, which employs flowchart decision logic, is used in the DC-Bus control system for both the PV power system and the ...

Instead, the dc bus voltage is measured at each source converter and all the source converters contribute to balance the total power consumed by the loads and the losses of the dc power ...

The traditional V-I droop control is commonly used to realize current sharing among distributed generators (DGs). Provided that the influence of line resistance cannot be neglected, there exists a trade-off between voltage deviation and current sharing accuracy when designing the droop coefficient. An adaptive nonlinear droop control in the DC power system ...

DC microgrids are well known as a proper solution to link different DC sources, such as photovoltaic panels and wind turbines, directly to DC loads. Along with their advantages, they suffer from an imbalance state of charge (SOC) in their energy storage units (ESUs), improper current-sharing between ESUs, and DC bus

voltage deviation. This study proposes a ...

Distributed control strategies are also proposed to deal with the aforementioned issues, which only require the local information or limited communication [17,18,19,20,21,22].A coordinated adaptive droop control was proposed for a DC microgrid to optimize its power distribution [].However, the global bus voltage regulation of the DC microgrid was not ...

State-of-charge (SoC) consistency and bus voltage regulation are two major control objectives of shipboard DC microgrids. To achieve these objectives, this paper presents a novel distributed model predictive control (DMPC) strategy with multiple cost functions. Firstly, based on the bus voltage derivative and SoC dynamic model, the voltage and SoC control equations in ...

Fig. 10. DC bus voltage (top) and ac side output power (bottom) for the sending (black) and receiving (grey) end converters at an output power step from zero to rated power when r = 0:01 pu, l = 0:0002 pu and thus = 0:02. - "DC bus voltage control for a distributed power system"

This paper presents dc-bus voltage control with a three-phase bidirectional inverter for dc distribution systems. The bidirectional inverter can fulfill both grid connection and rectification ...

, an improved version of distributed secondary control is discussed which performs all calculations at the local level by utilising DC bus voltage without knowing global information of the system for voltage restoration and power allocation. The major research outcome of this study is the limited requirement of information, which significantly ...

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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 suppress ...

The interaction among agents helped the co-simulation with a distributed control to maintain the DC bus stable in 180 Vdc and battery voltage oscillating within the state of charge (SoC) range, 99% and 97%, of 144 Vdc fed by a photovoltaic array under the coordination of the multi-agent system.

To control the DC bus voltage, more power than consumed by the loads must be supplied to the wind turbines and the excess power removed by pitch angle control. Pitch angle control is a ...

In addition, a new term "voltage-shifting factor" is defined in [20] to achieve a proportional power sharing and DC bus voltage deviation restoration. In [21], a feedback detection of the period event-triggered ... Moreover, the distributed multi-agent system (MAS) control structure is prevalent for a discrete communication method [23], [24 ...

In order to solve the shortcomings of current droop control approaches for distributed energy storage systems (DESSs) in islanded DC microgrids, this research provides an innovative state-of-charge (SOC) balancing control mechanism. Line resistance between the converter and the DC bus is assessed based on local information by means of synchronous ...

This paper proposes a design of a controlled voltage bus for a PV source to be used in a hybrid DC distribution system infrastructure. Load centers, boost converter, and distribution panels combine to link the solar collectors with multiple loads and Backup battery systems add to the complexity of a PV installation. The controlled voltage bus is constructed based on the design ...

his paper addresses voltage control of distributed DC power systems. Especially the dynamic properties of load source interactions are highlighted. They are interesting since the sources are considered weak for a distributed power system. This is illustrated with simulations where the power is fed from wind turbines only, and still constant power loads are controlled at the same ...

(DOI: 10.1109/TPEL.2003.818872) This paper addresses voltage control of distributed DC power systems. DC power systems have been discussed as a result of the introduction of renewable, small-scale power generation units. Also, telecommunication power systems featuring UPS properties might benefit from a broader introduction of DC power ...

grid using a distributed power source and an energy storage device, has been actively conducted [1-4]. A small microgrid can be classified as an AC microgrid system based on AC power and a DC microgrid system based on DC power. The additional power conversion step has the disadvantage of higher power loss than the power loss in the DC system ...

The resulting integrated strategy for DC bus voltage control can solve the problems of fast bus voltage changes, oscillations, and large deviations that occur when the system is disturbed by constant power loads. ... Z., Xing, K, et al.: Individual load impedance specification for a stable DC distributed power system. In: APEC "99. Fourteenth ...

In this paper, a power flow model is presented to include a DC voltage droop control or distributed DC slack bus in a Multi-terminal Voltage Source Converter High Voltage Direct Current (VSC MTDC) grid. The available VSC MTDC models are often based on the extension of existing point-to-point connections and use a single DC slack bus that adapts its active power injection to ...

same time as the DC bus voltage level. The wind power generators are modeled as permanent-magnet synchronous machines. The controller needed for the machines, including position estimation and field weakening, is discussed. To control the ...

DC bus voltage in islanded DC microgrids (MGs) is prone to power fluctuations of sources and loads. ... A VIC is proposed for PVAs in an islanded DC MG, which utilises active power control of the PVAs to improve dynamic performance of the DC MG. ... and represent the characteristic equations of their respective closed-loop control systems. Thus ...