Voltage and current sources in microgrids

What is the control objective of a dc microgrid?
The control objective is guaranteeing voltage stabilityin the DC microgrid while delivering power to the loads and extracting energy efficiently from renewable sources. To verify grid voltage regulation among a number of devices via current sharing,we use Lyapunov-based Input-to-State Stability (ISS) analysis.

What is primary control in dc microgrid?
Primary control Power electronic convertersare essential components in DC microgrid that provides a controllable interface the sources and load. In a multi-level control system,the primary stage of control is the initial stage of control architecture and is in charge of voltage and current control.

How can a microgrid overcome voltage problems?
Overcoming this difficulty can be accomplished through the development and/or enhancement of voltage control techniques,including the hybridization of energy storage devices,artificial intelligence-assisted DC fault control,grid-forming techniques,and voltage ride-through capability. Deloading techniques are widely used for AC microgrids.

How to improve voltage restoration in a dc microgrid?
In order to accomplish accurate sharing of current and improve voltage restoration,a hybrid distributed and decentralized control strategyfor a DC microgrid was proposed by . Decentralized and distributed control strategies were implemented to accomplish enhanced voltage restoration along with precise power distribution respectively.

How does a dc microgrid work?
Power electronic converters (PEC) connect the DC microgrid to grid utility as depicted in Fig. 1. with several voltage levels and energy storage devices on the DC side that control demand variation,a DC microgrid can deliver power to DC and AC loads. Fig. 1. DC microgrid topology.

Can a direct current microgrid be controlled by a star topology?
Abstract: We present a general framework for the control of a direct current (DC) microgrid with star topology(a common DC bus) consisting of renewable sources of energy,loads,and storage devices connected via step-up and step-down DC/DC converters.

The operations of the grid-following units (current-controlled voltage source inverters) and grid-forming units (voltage-controlled voltage source inverters) in single-phase microgrids are also coordinated via the hierarchical control architecture. The microgrid hierarchical architecture is subdivided into three control

This paper presents the positive sequence, negative sequence and zero sequence voltage and current control

schemes in dq-frame for the Voltage Source Converter (VSC) based Distributed Generation ...

Microgrid technology is poised to transform the electricity industry. In the context of commercial/domestic buildings and data centers, where most loads are native direct current, DC microgrids are in fact a natural choice. Voltage stability and current/power-sharing between sources within a DC microgrid have been studied extensively in recent ...

The PMSG controls the voltage and frequency of AC power, and it also helps manage the power flow between renewable energy sources, microgrids, and DC buses. The control Eqs (6) and (7) allow the PMSG to continuously regulate both voltage and frequency in the DC microgrid system by comparing measured values to desired reference values and ...

The major problems of microgrids are stability, bidirectional power flow, modeling, less inertia, the effect of load perturbation, and uncertainties [3], [4].To address all the aforementioned issues, control strategies have been proposed; however, the control strategies have many limitations, including weak dynamic response, trade-off between voltage regulation ...

Direct current (DC) microgrid has recently gained potential interest since it supports easy integration of distributed generators (DGs) and energy storage devices (ESDs). However, most DGs and ESDs are integrated into the DC bus with the power electronic converter/inverter. Thus, controlling large-scale power electronic-based generators, loads, and ...

It belongs to any current-source structure. The voltage sensing across that capacitor is needed in order to keep it under control and regulation. The voltage sensor from the grid side is required as well. ... García Vera, Y.E. et al.: Energy management in Microgrids with renewable energy sources: a literature review. Appl. Sci. 9(18), 3854 ...

Therefore, accurate fault location at the proper time is crucial. In this paper, a method is proposed to determine the fault distance and section of single and multi-phase faults in alternative current microgrids using voltage and current data from the beginning node and nodes at the end of the microgrid.

Recent technological advances and increasing concerns about global warming have prompted engineers to seek clean energy sources. 1 The microgrid can tackle the current energy crisis by reducing transmission losses. ...

3 · A secondary controller based on cooperative control was proposed in, regulating bus voltage through a voltage observer while improving current-sharing accuracy with a current ...

Tmain parameters of the sources and control system is presented as follow: The system nominal voltage: 3-phase, 400 V (L-L), 50Hz. The data of cables, loads, transformers, are given in . DER capacities: 200 kVA;

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DC voltage: 800 V; Dissel generator capacity: 400 kVA; LCL filter parameters is 1.6 mH: 0.15 uF: 1.6 mH.

Voltage-Current droop strategy is achieved by linearly minimizing the output voltage while output is maximized. This operating characteristic has made the droop technique ...

Multiple Grid-Connected Microgrids with Distributed Generators Energy Sources Voltage Control in Radial Distribution Network Using ANFIS to Enhance Energy Management December 2023 DOI: 10.37391 ...

Microgrids (MGs) can be considered as the state-of-the-art of a present day power system as it was designed by early electrical pioneers. ... The VSC is a current-controlled voltage source designed to deliver a controlled amount of power (active and reactive) to the grid. In some literature, they are also referred as grid tied converters. The ...

The proposed technique achieves 100% accuracy in fault detection and classification, outperforming other data mining classifiers such as support vector machine (SVM), k-nearest neighbor (KNN), and ensemble classifiers. The article also discusses the modeling of HIF and the characteristics of HIF in the current and voltage output signals.

In this paper, a current-control strategy is proposed for voltage-source inverters in microgrids. The main objective of the proposed controller is to inject a clean sinusoidal current to the grid, even in the presence of nonlinear/unbalanced loads and/or grid-voltage distortions. The repetitive control technique is adopted because it can deal with a very large number of ...

We present a general framework for the control of a direct current (DC) microgrid with star topology (a common DC bus) consisting of renewable sources of energy, loads, and storage devices connected via step-up and step-down DC/DC converters. The control objective is guaranteeing voltage stability in the DC microgrid while delivering power to the loads and ...

A coordinated architecture of islanded ac microgrids with smooth switching droop control. The flexible power control of each renewable energy source and storage capacity of ESSs therein are obtained through the changes in the seamless modes: Xu et al 198: Decentralized: DC: A method for coordination of an autonomous low-voltage direct-current ...

Within the framework of DC microgrids, DC-DC converters often offer the choice to employ two distinct control modes: voltage control and current control. In voltage control mode, converters function as controlled voltage sources that guarantee the output voltage remains within a permissible range, while in the current control mode, the ...

Here, the reactive power (Q) is adjusted using a control coefficient "n" and a reference value (Q*), which determines the sensitivity to voltage fluctuations.E represents the current system voltage, while E* indicates

the desired voltage, typically aligned with the nominal or expected voltage [30, 31] gure 1 depicts the P/Q droop characteristic for the q-axis and d ...

In Ovalle et al. (2014), for permeable MGs of VSCs, a new control strategy is presented that uses VSCs with an LC filter as a current source. This proposed scheme works ...

Modern power networks are complex adaptive systems which have undergone extensive changes over the past two decades. Microgrids (MGs), a novel structure of distribution networks, have emerged as a suitable solution for the installation of distributed sources in the grid [1, 2].Today electrical systems are dominated by alterative current (AC), however, there is a ...

This framework, with layers including an internal voltage and current controller loop and DFTC strategies, aims to enhance MG performance and ensure stability in key ...

Current source converters (CSCs) and voltage source converters (VSCs) are two kinds of power semiconductor inverters that may be used to transform the alternating or direct current from clean ...

The increasing integration of renewable energy sources (RESs) into high-voltage direct current (HVDC) sending-end AC power systems has eroded voltage and frequency regulation capabilities, leading to operational challenges like overvoltage and over-frequency during block faults in the HVDC link . This study presents a steady-state voltage security ...