

Does negative impedance affect the stability of a dc microgrid?

Constant power loads (CPLs) often cause instability due to its negative impedance characteristics. In this study, the stability of a DC microgrid with CPLs under a distributed control that aims at current sharing and voltage recovery is analyzed. The effect of the negative impedance on the behavior of distributed controller is investigated.

Is a dc microgrid stable under decentralized control?

However, the DC microgrid with CPL tends to be unstable when traditional decentralized control or distributed control is implemented independently. Stability issues of the DC microgrid with CPL under decentralized control have been investigated.

What is a common CPL in a dc microgrid?

The resistance of the common bus is zero; hence, all loads are regarded as one common CPL. The cable is purely resistive. In low-voltage DC microgrid, the cable inductance can be neglected. For constant power loads, the power balance equation should be satisfied.

Are DC microgrids stable under droop control?

Stability issues of the DC microgrid with CPL under decentralized control have been investigated. In order to realize current sharing, the small-signal stability of a system with CPLs under droop control has been analyzed in Sandeep and Fernandes (2013), Su, Liu, Sun, Han, and Hou (2018) and Tahim, Pagano, Lenz, and Stramosk (2015).

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.

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.

The first challenge in regulated DC microgrids is constant power loads. The second challenge stems from the pulsed power load problem that commonly occurs in indoor microgrids. The pulsed loads in the microgrid limit ...

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DC-DC boost converter with constant power load in DC microgrid | Find, read and cite all ...

Therefore, this paper proposes a power control strategy for the DC microgrid converter system based on the extended simplex method, the algorithm can calculate the ...

The performance of DC shipboard power systems (SPSs) may degrade due to the negative impedance of constant power loads (CPLs) connected to DC microgrids (MGs). To control the DC SPS effectively ...

The optimization of a suitable controlling method is a priority in running any DC/DC boost converter effectively. However, a problem may arise as the occurring oscillations in the microgrid caused by the incremental negative resistance of the Constant Power Load (CPL) variation may lead to system instability. In order to tackle this intrinsic problem, three proposed ...

Despite its advantages over its AC counterparts, DC microgrids present a lot of challenges. One of these challenges is the instability issues caused by constant power loads (CPLs).

Constant power loads (CPLs) often cause instability due to its negative impedance characteristics. In this study, the stability of a DC microgrid with CPLs under a ...

System topology and control block diagram of the DC microgrid with a constant power load Table 2. System control parameters. Symbol Quantity Value K Droop coefficient 0.1 uref Reference voltage value 24 V ubus DC bus voltage - Figure 2 shows the DC microgrid control method in 2 main layers of control, the bottom layer control and the top ...

Hassan MA, Li EP, Li X, Li T, Duan C, Chi S (2019) Adaptive passivity-based control of DC-DC buck power converter with constant power load in DC microgrid systems. IEEE J Emerg Select Topics Power Electron 7(3):2029-2040.

In DC microgrids the impedance interaction takes place due to the cascaded connection of a Permanent Magnet Synchronous Generator -Voltage Source Converter and a Dual Active Bridge converter. This impedance interaction adversely degrades system stability and transient response, resulting in oscillations and voltage deviations and affecting power flow in ...

Abstract: This paper aims to present a robust passivity-based control (PBC) strategy to solve the instability problem caused by the constant power loads (CPLs) in dc ...

This paper presents an adaptive nonlinear control scheme to ensure the stability of a boost converter in a DC microgrid that supplies a constant power load (CPL) and a resistive load. The proposed controller comprises a passivity-based control (PBC) and a Nonlinear Disturbance Observer-Based Robust Control (NDOBRC).

accomplish the goals of DC microgrid power sharing and bus voltage control. When the CPL aggravated,

compared with the hierarchical control strategy based on PI control of not being ...

For hybrid AC/DC microgrid (HMG) under master-slave control strategy, DGs usually adopt constant power control (P control) in grid-connected mode and at least one DG adopts constant voltage control (V control) in islanding mode. However, when unplanned islanding happens, the voltage and current of the HMG will experience remarkable fluctuations, which ...

Virtual inertia control of PV systems for dynamic performance and damping enhancement of DC microgrids with constant power loads. Ali Hosseinipour, Ali Hosseinipour. Department of Electrical Engineering, Shahid ...

2.2 Analysis of DC microgrid problems with traditional control. Figure 2 shows the equivalent circuit of a DC microgrid studied in this work. It consists of power supply units, a DC transmission line, and a constant power load unit. The DC/DC converters of both power modules adopt droop control and additional virtual inertia control.

A comprehensive small-signal model is derived by analyzing the interface converters in each stage of a converter-based dc microgrid, and virtual-impedance-based stabilizers are proposed to enhance the damping of dc microgrids with CPLs and guarantee the stable operation. In this paper, a converter-based dc microgrid is studied. By considering the ...

In recent dc microgrids (dcMGs), the naval motors and hotel loads are constantly powered by point of load converters these are precisely regulated, which perform as constant power loads (CPL). One of the most important CPL's characteristics is the negative incremental impedance, it decreases effective damping of the system, which leads to instability of the whole system, and ...

In order to solve the system instability caused by a large number of constant power load access in the DC microgrid, an active damping control method based on the DC current feed forward of the ...

Hesam Pishbahar, Hassan Moradi CheshmehBeigi, Navid Piri Yengijeh, Shokoofeh Bagheri, Inertia emulation with incorporating the concept of virtual compounded DC machine and bidirectional DC-DC converter for DC microgrid in islanded mode, IET Renewable Power Generation, 10.1049/rpg2.12150, 15, 8, (1812-1825), (2021).

This paper proposes a novel stabilizing control method aimed at overcoming the instability challenges posed by the negative incremental resistance characteristics of a constant power load (CPL) within an autonomous microgrid (MG). The proposed stabilization technique integrates a power derivative-integral term with conventional droop control, strategically ...

One of these challenges is the instability issues caused by constant power loads (CPLs). CPLs deteriorate the system's performance due to their incremental negative ...

In this paper, a composite passivity-based control method based on a finite-time disturbance observer (FTDO) and a passivity-based control (PBC) is proposed to improve the stability of the Boost converters with constant power loads in DC Microgrids. The FTDO improves the robustness and rapidity of the system by accurately estimating system disturbances. The ...

CPLs deteriorate the system's performance due to their incremental negative impedance characteristics. In this paper, a DC microgrid composed of a PV/battery system feeding a pure CPL was ...

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 ...

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