Constant power supply of DC microgrid

Are power converters a problem in a dc microgrid?
Power converters are essential parts of microgrids (MGs),but they cause several problems. One of the most serious concerns with a DC microgrid (DCMG) is the constant power load (CPL),which has an incremental negative impedance (INI). INI has a negative dampening effect on the power efficiency of a power system.

What is a dc microgrid?
A microgrid is an emerging technology that encompasses different distributed energy sources (DESs), storage units, power electronic converters, and electrical load. The most recent developments in power electronics have enabled DC microgrids to meet the required specifications at a reasonable cost and in a smooth approach.

What are the problems of dc microgrid?
Through a power electronic interface, it is also easy to effectively connect energy storage devices to the DC microgrid. The major problems of microgrids are stability, bidirectional power flow, modeling, less inertia, the effect of load perturbation, and uncertainties , .

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 to operate DGS in dc microgrid?
Operating the DGs in accordance with the load requirement needs suitable control techniques and power electronic converter selection. Distributed energy sources (DESs), storage units, and electrical loads are all linked to the bus in DC microgrid.

What is power flow analysis in dc microgrid?
Power flow analysis in DC microgrid Direct-current (DC) power flow analysis is a crucial technique for understanding DC microgrids. It consists of passive elements,active sources,and nonlinear loads. These loads,which are usually constant power loads (CPLs),bring in hyperbolic non-convexities into the power flow modelling .

In recent years, due to the wide utilization of direct current (DC) power sources, such as solar photovoltaic (PV), fuel cells, different DC loads, high-level integration of different energy storage systems such as batteries, supercapacitors, DC microgrids have been gaining more importance. Furthermore, unlike conventional AC systems, DC microgrids do not have ...

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 ...

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 ...

This paper proposes an adaptive active control approach for damping the low-frequency oscillations in a DC microgrid (DC-MG). The DC-MG is comprised of hybrid power sources (HPSs) formed by a ...

Keywords: DC microgrid; constant power load; bidirectional DC-DC converter; model predictive control; disturbance observer 1. Introduction Renewable energy sources (RESs) are becoming a key solution to face the increasing demand of electricity and the environmental impact caused using fossil fuels. Photovoltaic

In this paper, the stability of direct current (DC) microgrids with a constant power load (CPL) and a non-ideal source is investigated. The CPL"s negative impedance will destabilize the system ...

Abstract: With the constant growth in the number of DC loads, DC microgrids have gained great interest as energy supply systems. In this context, distributed control schemes based on ...

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 ...

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). ...

This paper proposes a learning-based finite control set model predictive control (FCS-MPC) to improve the performance of DC-DC buck converters interfaced with constant power loads in a DC microgrid (DC-MG). An approach based on deep reinforcement learning (DRL) is presented to address one of the ongoing challenges in FCS-MPC of the converters, ...

The multilevel boost converter (MBC) has been widely adopted in the dc microgrid systems due to its high voltage gain and simple structure. In recent years, the power electronic loads, which usually behave as constant power loads (CPLs), are penetrating in microgrids. The incremental negative impedance of CPLs degrades the stability of microgrid ...

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 ...

1. Introduction. Recent energy concerns include power systems reliability, availability and resilience, increase in energy consumed beyond of existing transmission capacity [1], [2].With increasing penetration of

distributed generation (DG), microgrids have come to coexist with traditional power system architectures [3].The DC microgrid test bed implemented ...

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 ...

This paper investigates stability of a DC microgrid with integrated constant power loads (CPLs). The investigation is based on an interconnected model of the DC microgrid with two subsystems. ... In recent years, DC microgrid has developed rapidly to meet the need of power supply from renewable generation to new types of DC loads, such as the ...

DC Microgrids (DCMGs) aggregate and integrate various distribution generation (DG) units through the use of power electronic converters (PECs) that are present on both the source side and the load side of the DCMGs. Tightly regulated PECs at the load side behave as constant power loads (CPLs) and may promote instability in the entire DCMG. Previous

It is widely known that constant power loads (CPLs) degrade the stability margin of operation as their nature of special negative incremental resistance, especially in DC microgrid, which is a low-inertia, highly power electronics-embedded, and tightly-regulated power system (Mingfei and Dylan Dah-Chuan, 2015). In general, there are two.

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 ...

Bus voltage control is a crucial issue in dc microgrids. Constant power loads (CPLs) exhibit negative incremental impedance characteristics and tend to affect the operation of the microgrid system. To this end, most of the existing methods concentrate on ensuring the steady-state performance of the system while the transient performance is often overlooked. ...

A microgrid is a smaller-scale energy system that is more adaptable and is part of the larger smart grid concept. The key advantages of microgrids are higher efficiency and flexibility, dependability, and more modularity [1], [2], [3].Microgrids are broadly divided into two categories: AC and DC microgrids, which can operate in both isolated and grid-connected ...

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 ...

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 ...

In order to improve the stability of direct current (DC) microgrid with constant power loads, a novel virtual inductive approach is proposed in this paper. It is known that the negative impedance characteristic of constant power loads will lead to DC bus voltage fluctuation, which will be more serious when they integrate into the DC microgrid though a large transmission line inductive. ...

DC power supply voltage: 280 V: C 0: Capacitance nominal value: ... A nonlinear disturbance observer-based virtual negative inductor stabilizing strategy for DC microgrid with constant power loads. Energies, 11 (11) (2018), p. 3174. CrossRef View in Scopus Google Scholar [36] Dragicevic T.

11182 IEEE TRANSACTIONS ON POWER ELECTRONICS, VOL. 35, NO. 10, OCTOBER 2020 Fig. 1. Typical dc microgrid with various types of sources and loads.