High-quality supply of grid-connected inverters in the Democratic Republic of Congo

Can grid-connected PV inverters improve utility grid stability?
Grid-connected PV inverters have traditionally been thought as active power sources with an emphasis on maximizing power extraction from the PV modules. While maximizing power transfer remains a top priority, utility grid stability is now widely acknowledged to benefit from several auxiliary services that grid-connected PV inverters may offer.

Do power inverter topologies and control structures affect grid connected photovoltaic systems?
Consequently, the performance of the inverters connected to the grid depends largely on the control strategy applied. This paper gives an overview of power inverter topologies and control structures for grid connected photovoltaic systems.

Do adaptive grid-following inverter control schemes improve power quality?
Narendra BabuP. This paper addresses a comprehensive review on various adaptive grid-following inverter control schemes developed for enhancing the power quality in renewable energy generation systems (REGS).

How does a grid connected inverter work?
The grid-connected inverter must be controlled in such a way that not only it injects a current with low total harmonic distortion(THD),but also allows controlling the injected reactive power into the grid selecting a proper power factor according to the grid demands: active or reactive power.

Why are grid-connected inverters important?
As the interface of the distributed generation system,grid-connected inverters play an important role in energy conversionand maintenance of power quality of the power grid (Azab,2021; Saim et al.,2020).

Are large-scale grid-connected inverters affecting power grid performance?
With the continuous increase in the penetration of renewable energy,the integration of large-scale grid-connected inverters has created a complex coupling relationship with the power grid,presenting unprecedented challengesto system performance.

The installation of photovoltaic (PV) system for electrical power generation has gained a substantial interest in the power system for clean and green energy. However, having the intermittent characteristics of photovoltaic, ...

Renewable energy sources (RES) in microgrids and virtual power plants are considered to be the backbone of these power systems. The RESs have been shown recently to reduce the costs per kWh by 85% ...

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The power electronics devices generate harmonics at the load side and disturbing the supply current to deviate from the fundamental signal. Meanwhile, the high injection of renewable sources in the power system along with grid connected power electronics interfaces has raised high power quality (PQ) challenges [1]. In Contrast to the ...

As the Democratic Republic of the Congo attaches importance to clean energy, the local power company began to look for efficient inverters to improve the efficiency of its solar power generation system. First, they ...

In grid-connected photovoltaic systems, a key consideration in the design and operation of inverters is how to achieve high efficiency with power output for different power ...

Increasing the penetration of grid-connected inverters and integration of single-phase microgrids (MG) and unbalanced loads into three-phase MGs result in power quality issues such as voltage harmonics and unbalance at the point of common coupling (PCC) under nonideal grid conditions. The grid impedance also increases in a weak grid and influences the system"s stability. This ...

The Smart Grid (SG) is treated as the next level of modern power system which uses the bilateral flow of power and information. The ability of the smart grid for two-way communication amid the ...

Inverter provides specific parameters for grid synchronization when it should be minimize the Total Harmonics Distortions (THD). Power Quality (PQ) issues are based on experimental ...

The MG has the ability to operate locally during the interruption of the power flow of the main grid or even when the main grid is not available [24, 25].MGs can operate in the grid-connected mode, synchronized with the utility grid, or in the islanded mode, as an autonomous system [26, 27].When the mains grid is not available, they must operate independently and in ...

However, the power quality issues remain at the high penetration level of REGS connected to the grid [74]. On the grid side, several types of uncontrolled bridge rectifier circuits, motors, domestic and industrial loads that are connected to the distribution side raise the power quality issues in the system [75]. In order to rectify the above ...

An effective design method for grid-connected solar PV power plants for power supply reliability. ... Kinshasa city in Democratic Republic of the Congo with a huge (5425 MWh) energy deficit has been considered as a case study. In fact, the method employed in this study has considered weather data, site selection, hourly load power and energy ...

This paper introduces a virtual series impedance to increase the output impedance of the grid-connected

inverter only at the dominated lower harmonic frequencies, thus the injected grid current ...

The dynamic and steady-state performance of grid-connected inverters is typically closely related to the design of the phase-locked loop (PLL) and the current control loop. ...

The customer demands a reliable, low cost, prolix system and an enhanced power at the output. Because of that parallel operation of inverter that could fulfill the customer critical requirement is considered most essential [4] spite the enigma of phase difference between the parallel inverters and synchronized integration to grid, parallel operation of inverters proved to ...

This paper describes power quality improvement, which has attracted the attention of the electricity distribution companies and subscribers. The idea of improving power quality is considered as the universal concept for various types of the power system disturbances. These aforementioned disturbances include noise, low voltage, overvoltage and middle harmonics, in ...

Mining Code of the Democratic Republic of Congo Ministerial Decree #18/042 declaring cobalt, germanium and colombo-tantalite strategic mineral substances Law No. 14/011 (Electricity Sector) ENERGY AND EMISSIONS Avoided emissions from renewable elec. & heat CO 2 emission factor for elec. & heat generation LATEST POLICIES, PROGRAMMES AND ...

With the development of modern and innovative inverter topologies, efficiency, size, weight, and reliability have all increased dramatically. This paper provides a thorough ...

To improve the dynamic response of the inverter, the conventional proportional-integral controller and the modulation part are substituted by the finite-control step model predictive control (FCS-MPC) strategy. Compared to ...

The use of an adaptive Qxe-LMF filter in Ref. [13] resulted in improved power quality by detecting and compensating for harmonics in distorted currents using a PV inverter.This approach resulted in balanced grid currents with fast convergence and resilience to variations in solar irradiance and non-linear loads.

The penetration of distributed energy resources in electrical grids has been steadily increasing in an effort to reduce greenhouse gas emissions. Inverters, as interfaces between distributed energy resources and grids, have become critical assets in modern power systems. In recent years, the development and application of grid-forming inverters have ...

This paper addresses a comprehensive review on various adaptive grid-following inverter control schemes developed for enhancing the power quality in renewable energy ...

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To enhance the stability of grid-connected inverters with different grid impedance, a novel impedance-phased compensation control strategy is added to the current controller [19]. Alternatively, an external active damper, which is already a modularized part, can be connected in parallel at the PCC to damp out the resonance between the grid ...

In grid-connected photovoltaic systems, a key consideration in the design and operation of inverters is how to achieve high efficiency with power output for different power configurations. The requirements for inverter connection include: maximum power point, high efficiency, control power injected into the grid, and low total harmonic ...

if the microgrid can be connected to the main grid. With a high penetration rate of renewable energy, many technical problems in the ... coordinated control of power need to be solved in order to improve the power supply quality and reliability. Parallel operation of inverter-based distributed generation systems, in the two ... according to the ...

In summary, the main contribution of this investigation with respect to the state-of-the-art outcomes is made to improve power quality of the grid side and also to handle the ...

Unlike conventional control schemes for grid-connected converters, the proposed strategy is de- signed to be sequence-asymmetric for the purpose of unbalanced and harmonic local voltage ...

@misc{etde_968104, title = {Sensorless digital control of grid connected three phase converters for renewable sources} author = {Kulka, Arkadiusz} abstractNote = {Power electronic converters have become popular in the field of power transformation for renewable energy. Power electronics converters achieve high efficiency, and the price of their ...

The effectiveness of the 3 L active power filter has been assessed across various load conditions, and simulation and hardware results confirm its robustness for accurate reference tracking ...

Grid-connected inverters play an important role in the integration of renewable energy sources such as solar and wind. However, due to the unneglectable grid impedance value seen by the inverters at the point of common coupling (PCC), especially in the weaks and resistive low voltage distribution networks, there is an inherent strong coupling between active ...

The proposed model can be utilised for low and high-frequency harmonic emission of grid-connected inverters. A new analytical expression is introduced as an indicator of the maximum possible individual grid current harmonic in the case of harmonic injection of multiple external sources.

Improved grid quality (reactive power by phase displacement and harmonics control) has recently been

explored and implemented in inverters for new, larger, centralized grid-connected PV systems. 6. DC current Injection : The DC current injection into the electrical grid via PV inverters is related to the THD of the generated current waveforms.