Microgrid power quality monitoring

Can Microgrid technology enhance power quality?
Microgrid technology has emerged as a promising option to integrate distributed generation and facilitate the widespread use of grid-connected renewable energy. High power quality (PQ) is crucialfor achieving energy efficiency and proper operation of equipment in microgrids. Ensuring appropriate PQ in microgrids is challenging.

How can microgrids be managed effectively?
Specifically,an effective management of microgrids requires managing a large number of electrical variablesrelated to the power generated by the microgrid's power supplies,the power consumed by the loads and the aspects of power quality.

What are the power quality issues in microgrids?
Three different power quality issues are evaluated: the voltage drop,the harmonic distortion,and the phase unbalance. A formulation for an energy management algorithm for microgrids is proposed under the form of a mixed-integer linear optimization including harmonic load flows.

Can microgrids cope with PQ disturbances?
The local production and storage systems allow some microgrids to ensure the supply of electricity for their loads in case of a frequency or voltage outage on the traditional grid. However,studies have shown that PQ disturbances can be difficult to tacklein small-scale microgrids,due to the lower stiffness of the distributed power generation.

Can low-cost high-precision smart meters be used in microgrids?
In summary,the utilization of low-cost high-precision smart meters in microgridspresents a cost-effective and accurate solution for energy consumption and power quality monitoring,complemented by versatile connectivity features.

What is a microgrid?
A microgrid [14]can be characterized as a limited-scale electrical networkthat can work freely or in relation to the higher-power lattice,utilizing nearby age sources (for example,environmentally friendly power frameworks) and energy stockpiling frameworks.

The need for small-scale renewable energy generation is predicted to increase. Distributed energy production, in general, can be more profitable due to the cost of distribution and use of energy storage, especially from the microgrid. However, the utility and consumers face difficulties maintaining demand imbalance, frequent load-shedding, and a drop in power ...

The progress of traditional microgrids (MGs) has been followed with versatile objectives such as resolving the

problem of growing power system efficiency, beneficial exploitation of the unconventional renewable energy resources (RESs) with minimum environmental impact, optimal management of power fluctuation along with other power quality ...

Monitoring power quality (PQ) in microgrids is gaining increasing attention in recent years due to the popularity of microgrids and PQ disturbances caused by renewable energies. Many techniques based on artificial neural networks (ANNs) are proposed for monitoring the PQ with no need to pre-set thresholds. However, the necessity of retraining the ...

o Energy monitoring systems offer valuable data on grid conditions, voltage levels, power quality, ... allowing operators to monitor and manage the microgrid"s perfor-mance, detect anomalies ...

It has the potential to improve power quality, boosts energy security for critical loads, and maximize overall system efficiency [9], ... Web of Science, and ACM Digital Library. The searching keywords are "microgrid", "microgrids", "micro-grid", "nano-grid" and "nanogrid". ... Monitoring of energy flow and important ...

This study proposes an innovative approach to enhance the performance of photovoltaic-unified power quality conditioner (PV-UPQC) system by replacing traditional synchronous reference frame control with a sophisticated gated recurrent unit (GRU) network controller. This innovative framework achieves a reduction in system expenditure and intricacy ...

Nowadays, the electric power distribution system is undergoing a transformation. The new face of the electrical grid of the future is composed of digital technologies, renewable sources and intelligent grids of distributed ...

A low-cost wireless power quality monitoring system based on Narrowband Internet of Things (NB-IoT) technology is implemented and enables various micro-grid functions via a remote server. For small to medium-sized renewable energy dependent microgrids, large imbalances between generated and consumed electricity exist. These fluctuations coupled ...

A new approach to detect and classify the PQ disturbances accurately in multimicrogrids based on electromagnetic sensing and portability-enhanced ANN and the high accuracy of simulation and experimental results validate the effectiveness and efficiency of this portable and non-invasive approach. Monitoring power quality (PQ) in microgrids is gaining increasing attention ...

Thus, monitoring the overall quality of the power in distribution networks has become a significant concern. An appropriate measure and analysis of electromagnetic disturbances in networks show both the microgrid contribution ...

The determination process of the Power Quality Monitoring Index (PQMI) for the microgrid is a complex calculation that considers numerous power quality-related factors like voltage and frequency deviations, power

factor, total harmonic distortion (THD), etc. Hence,...

The Smart Grid (SG) and microgrid (MG) power quality (PQ) problems are discussed in this chapter. Section 17.1.1 describes about the SGs, Sect. 17.1.2 explains the PQ challenges in SGs, Sect. 17.1.3 illustrates the PQ challenges in both AC and DC MGs. The flow of this chapter is as shown in the Fig. 17.1a

The active power filtering feature of the IC helps to retain the power quality of the microgrid as per IEEE 519 standards by providing reactive power support and reducing the harmonic levels to ...

The various power quality monitoring and its control techniques are discussed in [1, 2]. The monitoring and analysis of several power quality parameters using various transform techniques are presented in [3, 4]. In pursuit of grid power quality enhancement, the adoption of passive or active filters presents a viable solution, wherein active ...

With the penetration of renewable energy, the power quality (PQ) becomes the important issue for operation stability of power system. The efficient monitoring mechanism for different multiple PQ disturbances is the fundamental infrastructure for modernization of power system. However, the diverse PQ signals result in numerous analysis techniques and make the integration of PQ ...

A microgrid is equipped with variants of distributed energy resources offering a challenging situation to power engineers to maintain the power quality during its operation. So, monitoring and maintaining power quality is a critical issue for healthy operation of microgrid system upto consumer satisfaction. The main objective of this paper is to propose a decision ...

This article discusses the importance of power quality (PQ) measurements in today"s electric infrastructure and reviews areas of application for PQ monitoring. It will cover the IEC standard for power quality and its parameters. Finally, it summarizes the key differences between Class A and Class S power quality meters. Part 2 will illustrate recommended ...

The widespread popularity of renewable and sustainable sources of energy such as solar and wind calls for the integration of renewable energy sources into electrical power grids for sustainable development. Microgrids minimize power quality issues in the main grid by linking with an active filter and furnishing reactive power compensation, harmonic mitigation, and load ...

Her current research area includes Power system protection, Power quality, Wide area measurement systems and application of soft computing techniques in power system protection. She is a senior member of IEEE, Life Member of Indian Society for Technical Education and Member of Institution of Engineer"s India.She has published numerous papers in various ...

This paper outlines the process of monitoring energy and power quality data in a microgrid using advanced smart meters with IoT capabilities. The proposed framework is validated through a real case study.

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As can be seen from Figure 1, when the microgrid is connected to the grid, the power quality problems such as three-phase unbalance or harmonic caused by three-phase unbalance load or non-linear load in the distribution network will be transmitted to the microgrid through the common connection point, thus causing microgrid power quality problems.At the ...

An autonomous power generation and distribution system is the main emphasis of a smart micro grid in this age, and internet of things (IoT) is utilized in various applications, ...

Microgrid monitoring has gained popularity in recent years, owing to their popularity and the power quality disturbances (PQD) caused by renewable energies. Many artificial intelligence-based PQD monitoring strategies have been proposed by researchers. This paper presents a novel method for detecting, classifying and monitoring the power quality disturbances in solar integrated ...

Power Quality in Smart Grid/Microgrid. ... He has conducted research, training & consultancy in the field of Power Quality, Condition Monitoring, Smart Grid, Data Centre Energy Efficiency and Green ICT at various international conferences and workshops. He is a Senior Member (2004) of IEEE PES, IAS, PELS, Member of Malaysian National Committee ...

To realize the real-time power quality monitoring, the power quality information of microgrid, such as voltage, frequency and phase angle in each home, needs to be collected in real- time. Furthermore, the unreliable sensing results and data collection in a microgrid make the real-time data collection more difficult. To address these challenges ...