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A peer-to-peer blockchain based interconnected power system

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ABSTRACT

Utilities produce and supply products following local requirements and with the synchronizations which connect subscribers. Harmonics is a power efficiency/quality variable caused by electronic devices that domestic and industrial consumers use. The famous IEEE Standard 519 is maintained to calculate harmonic limits, which ensures power efficiency. In a standard power system, currents and voltages generate pure sine wave signals during regular operations. As harmonics influence the power system, they cause interference in the sine wave signals. So, the best practice method should be used to resolve the harmonics issue. One of the problem-solving techniques of harmonics is the measurement and reduction of harmonics detection, and it uses Fast Fourier Transform (FFT). Therefore, power output should assess in a peer-to-peer Blockchain scheme by measuring and minimizing harmonics detection. This paper uses a Shunt Active Power Filter (SHAPF). It describes the simulation analysis and reduction of harmonics detection in a peer-to-peer interconnected 3-phase power system with the help of an FFT algorithm. This research was carried out to assess the efficiency of the AC signal by collecting, processing, and evaluating power data. Using the shunt active filter, the proposed design outperformed the traditional methods for both six and twelve pulse rectifiers, achieving total harmonic distortion (THD) of only 1.42% and 0.92%, respectively.

1. Introduction

The interconnected Blockchain systems include many individual processing units connected to perform an operation verification (Wheeler et al., 2018a). Each Blockchain peer is considered the minimum power-consuming component for the interconnected 3-phase power system (Wheeler and Bowers, 2019). The traditional power system has been suffering power quality issues in the distribution network and consumer side. Harmonics is one of the critical issues causing power efficiency measurement and monitoring distortion—the sinusoidal waveform distortion of the current or voltage emanated from non-linear loads. Pure sine waveforms of currents and voltages are distorted, resulting in a non-sinusoidal waveform because of the electrical power system (Rohouma et al., 2020; Shafiq et al., 2020c). Non-linear loads, including the integration of Renewable Energy (RE) sources to the distribution power system, are the leading causes of harmonic voltages and currents (Hasan et al., 2021a; Akhtaruzzaman et al., 2020; Hasan et al., 2020). As the current flows through the designed system, impedances become harmonics, yielding the distortion of supply voltage (Ahasan Habib et al., 2020a; Shafiq et al., 2020; dos Santos Alonso et al., 2019). Reference (Bordini Braga et al., 2020) analyzed the voltage harmonic distortions for a wind power plant, excluding the external load system. The instability of harmonic analysis is studied in Kwon et al. (2016) for RE sources using a State-space model. The theoretical model was simulated only for a single-phase grid-connected system. Focusing this problem on peer-to-peer blockchain interconnected power systems is significant in quality power distribution, monitoring and energy trading. Fig. 1 shows the concept of the peer blockchain based interconnect power system for distributing, monitoring and energy trading.

Concerning the Fourier theorem, the non-sinusoidal periodic functions can be narrated as the summation of expressions eliminated by sinusoidal terms. Their frequencies are the multiple of the fundamental frequency and DC component. In this concern, the harmonic order n is referred to as the *nth* harmonic (Pereira

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