Definition of reactive power for nonsinusoidal systems

Can power behavior be represented under non-sinusoidal conditions?
This paper can be considered a small contribution to the research concerning the representation of power behavior in electric systems under non-sinusoidal conditions. Its main aim is defining power parameters under non-sinusoidal conditions by adopting instantaneous power waveforms for the definition of apparent power and reactive power.

How do we define power parameters under non-sinusoidal conditions?
It is focused on the conventional approach of defining power parameters under non-sinusoidal conditions by adopting instantaneous power waveformsfor the definition of apparent power and reactive power,in addition to the well-known definition of active power (average value of the instantaneous power).

What is a reactive power?
Each of the basic reactive powers is identified as the amplitude of an oscillation of instantaneous power. The separation of Q/sub F/in Q/sub 1/,the reactive power at the system frequency,and in Q/sub H/,the reactive power at harmonic frequencies,is recommended as an effective mean for monitoring filter efficacy and power-factor compensation.

What is apparent power under nonsinusoidal conditions?
By analogy to the sinusoidal conditions (8),the apparent power Sunder nonsinusoidal conditions is still usually defined as the product of the rms values of current and voltage,including all the harmonic components(16)S=VI=?i=1n(Vi)2×?k=1n(Ik)2.

What is a nonactive power component?
Many nonactive power component definitions have been proposed in the literature, even if their physical interpretation poses some problems. The conventional technique for measuring the apparent power Soperates by calculating the product of the root-mean-square (rms) of the voltage and current.

What are the different types of active power?
total active power PUF power unbalance factor P1 fundamental active power (IEEE) Q reactive power QC capacitive reactive power (Kunsters and Moore) QCR capacitive reactive power rest (Kunsters and Moore) QL inductive reactive power (Kunsters and Moore) QLR

Shepherd W. and Zakikhani P. Suggested definition of reactive power for nonsinusoidal systems Proc. IEE 119 9 1361-1362 1972. ... Suggested definition of reactive power for nonsinusoidal systems. $19.99. Add to cart. Buy this article Checkout ...

Reactive power definition for three-phase systems with nonsinusoidal and unbalanced voltages and currents

Definition of reactive power for nonsinusoidal systems

Three-phase three-wire systems. For three-phase systems with non-sinusoidal voltages and currents, two reactive power definitions stand out: the Currents" Physical Component ...

In this paper, an elaborate study on the evaluation of reactive power is presented for non-linear single-phase electrical systems. The study covers prominent power theories proposed over the last century and compares the definitions of reactive power with the standard accepted definition today and the elemental power measured across the reactive elements in the circuit. The ...

Abstract: Two methods for extending the definition of reactive power beyond the sinusoidal steady state are presented. Reactive power concepts are created that can be useful in the state-space analysis of nonlinear or nonperiodic systems. All definitions and results are given purely in the time domain without using Fourier analysis or other orthogonal function expansions.< >

The apparent power and power factor definitions in nonsinusoidal situations are critically examined, and new power transfer quality factors are suggested. The use and relevance of the quality factors are illustrated in quantitative examples related to power factor compensation and power transfer quality improvement.

Shepherd W. and Zakikhani P. Suggested definition of reactive power for nonsinusoidal systems IEE Proc. B 119 9 1361-1362 1972. Google Scholar. 12. ... On the definition of reactive power under non-sinusoidal conditions IEEE Trans. on Power Apparatus and Systems PAS-99 5 ...

This paper presents a new method of non-active power compensation in power systems under non-sinusoidal conditions. The basic idea of the compensation procedure stems from the condition for the minimum rms value of line currents. The application of optimization procedure, observing the above criterion, results in the required compensator. Three different ...

As with the classical definition of reactive power in sinusoidal systems, this single signed component of reactive power provides a measure that obeys conservation and can be used to indicate where the port reactive power flows in the circuit. ...

Existing definitions for power terms in alternating current systems work well for single-phase and three-phase systems where both voltages and currents are sinusoidal with respect to time. This paper clarifies and proposes definitions for power terms that are practical and effective when voltage and/or currents are distorted and/or unbalanced. It also suggests definitions for ...

The paper presents the generalized theory of electric power, which makes it possible to estimate the operation of complex electric circuits. Use has been made of the correlation analysis and new definitions have been found for various kinds of power occurring in such systems. It has been shown that both the active and the reactive power depend on the voltage-current correlation of ...

Definition of reactive power for nonsinusoidal systems

In control of power distribution in the power system, the reactive power is applied. ... the presentation of different definitions for nonsinusoidal currents and voltages in the circuits most often containing linear elements can be found. But which definition gives the right results is not described. ... and the capacitor current derivative ...

This paper discusses the strong and weak points of the time-domain and frequency-domain approaches to the energy transmission investigations in nonsinusoidal systems. The comprehension of possibilities relevant to these approaches is fundamental for the metrological tasks in nonsinusoidal systems formulation. It was shown, that despite a more complex ...

Reactive Power. Definition: The power which flows back and forth that means it moves in both the directions in the circuit or reacts upon itself, is called Reactive Power.The reactive power is measured in kilo volt-ampere reactive (kVAR) or MVAR. Apparent Power. Definition: The product of root mean square (RMS) value of voltage and current is known as ...

Non-linear loads are widely used in power systems nowadays. This application leads to affect the power grid negatively by producing harmful harmonics in the form of non-sinusoidal waveforms. Hence, the definitions of reactive power in non-sinusoidal have been proposed by various researchers who each of them claims that his proposed definition is ...

Four reactive power meters, operating on different principles, were tested under nonsinusoidal conditions. Different definitions of the reactive power are discussed. Because the definition and meaning of the nonsinusoidal reactive power are still being actively debated, the readings of the tested meters were compared with four nonsinusoidal reactive powers and the ...

2007. In this chapter the meaning of "real" and "reactive" power is explored for sinusoidal systems. Initially, single phase (so-called two-wire) circuits are discussed to gain an understanding of the energy flow within a circuit configuration that ...

The authors consider the effect of harmonics on reactive power measurements, and present a novel method for calculating active, reactive apparent, and residual power in nonsinusoidal conditions. The method considers common and uncommon harmonic components of voltage and current waveforms. It properly defines all power components at different ...

The instantaneous power, which is a physical quantity, is simply the product of the instantaneous voltage and instantaneous current. Note that the voltage and current variables of the current source are shown in the so-called generator arrow system, while the voltage and current variables of the R-L-u e load follow the "motor arrow system." Hence, if the value of the ...

7.1 Reactive Power IEEE Definition. The reactive power is well-defined in the IEEE Standard Dictionary

Definition of reactive power for nonsinusoidal systems

100-1996 under the energy "magner" as: ... L.S. Czarnecki, Physical Reasons of Currents RMS Value Increase in Power Systems with Nonsinusoidal Voltage, IEEE Trans. Power Delivery, vol. 8, pp. 437-447, Jan. 1993.

2.3 Reactive power definition proposed by Fryze The reactive power definition proposed by Fryze is based on the division of the current into two terms; the active current term and the reactive current term (Fryze, 1932, as cited in Svensson 1999): i i i=+a r (21) Considering that these terms are orthogonal, the following property applies: 0 1 0 T

A time-domain approach to current and voltage decomposition and power terms definition under periodic, non-sinusoidal conditions is presented, relying on conservative quantities which offer a basis for distributed reactive and harmonic compensation under non- sinusoid conditions. The paper presents a time-domain approach to current and voltage decomposition and power ...

In this context, the qualification and quantification of reactive power is the most controversial. Thus, this paper aims to contribute to studies in nonsinusoidal systems with focus on power definitions with a special attention to reactive ...

Suggested definition of reactive power for nonsinusoidal systems. Authors: E. Micu, W. Shepherd, and P. Zakikhani Authors Info & Affiliations. Publication: Proceedings of the Institution of Electrical Engineers. Volume 120, Issue 7.

The classical definitions for the energetical determining factors in power systems are reviewed and a new model for the apparent power is suggested. -- Based on the volt-ampere characteristic of the nonlinear load, an equivalent circuit, containing linear elements, can be determined. In this way, load-flow and harmonic compensation studies can be simplified.

Kusters NL, Moore WJM, (1980) On the definition of reactive power under nonsinusoidal conditions. IEEE Transactions on Power Applications, PAS-99:1845-1854. Article Google Scholar Page C, (1980) Reactive power in non-sinusoidal systems. IEEE Transactions on Instrumentation and Measurement, IM-29:420-423

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