European Association for the Development of Renewable Energies, Environment and Power Quality (EA4EPQ)

International Conference on Renewable Energies and Power Quality (ICREPQ'10)
Granada (Spain), 23th to 25th March, 2010

Development and Implementation of a Voltage Real-Time Monitor System of Electrical Network with Remote Access

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Abstract

The Brazilian Electrical Energy Agency (ANEEL) promulgated in 2008 a standard to regulate the electric distribution in the country. A chapter of the standard is dedicated to Power Quality, area which was never regulated before. This chapter defines the procedures and computations of Power Quality indices, describes the electrical disturbances of interest, and defines the quality indices and reference values – some of them have not been defined yet.

In Brazil there use to be no regulations on PQ area. As the new standard includes phenomena never regulated before, some indices do not have well defined reference values (and procedures for final computation). So the standard foresees a period for a national campaign to collect and analyze the data and propose new quality indices and reference values. As a consequence, the standard manifests great interest on monitoring of phenomena such as harmonics, voltage unbalance, voltage fluctuation, voltage sags and swells, since the results of these indices will be used to determine the future reference values.

This paper discusses the development and implementation of a digital power quality meter to comply with the new standard which will regulate the Power Quality in Brazil. Its main objective has been to become a low cost device capable of monitoring the main Power Quality indices of the new standard, such as the steady state RMS voltage, harmonic distortion, voltage fluctuation, voltage unbalance, voltage sags and swells, as well as power supply interruptions in real-time. Through a cellular GPRS module, the meter can be remotely controlled and configured. In this way, it can exchange measurements and information data with a remote server, thus constituting a Power Quality monitoring system. The remote server at the utility company is responsible for the communication with all the meters through the Internet and GPRS networks. It configures and downloads the measured data from the devices remotely. After the meter's installation, no local work is necessary and the meters can be fully remotely controlled.

A market evaluation has permitted to observe that in Brazil it was found three types of equipment for power quality measurement. A low cost one, which does not satisfy the new standard. Two others, of medium and high cost, are likely to satisfy the new standard, but are too expensive for large scale utilization (these devices have cost above a thousand US dollars). The developed meter satisfies the main points of the new standard and it is cost effective (in the range of a few hundred US dollars) for large scale utilization.