

POWER QUALITY MONITORING: STATE OF THE ART AND FUTURE TRENDS

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SUMMARY

There has been noticeable increase in the amount of power quality monitoring taking place in electric power systems in recent years. Monitoring of voltages and currents gives the network operator information about the performance of their network, both for the system as a whole and for individual locations and customers. There is also pressure from the customers and the regulatory agencies to provide information on the actual power quality level. Developments in enabling technology (monitoring equipment, communication technology, data storage and processing) have made it possible to monitor at a large scale and to record virtually any parameter of interest. The change in types of loads connected to the network and proliferation of nonconventional, power electronic interface connected, generators as well as envisaged further increase in nonconventional types of loads/storage (e.g., electric vehicles) puts additional pressure on network operators to monitor and document various aspects of network performance. While many network operators are installing monitoring equipment and while more and more manufacturers have monitors available, there is a lack of knowledge and agreement on a number of aspects of the monitoring process and in particular on processing the recorded data. The end users of the data, be it network operators or their customers, are increasingly asking for useful information rather than just large amounts of data to be provided by installed monitors and supporting software. In order to resolve some of the issues highlighted above and to suggest coherent and fit for purpose set of guidelines for power quality monitoring in future power network CIGRE/CIREC JWG C4.112 was established in January 2011 and completed its work in June 2014. The scope of the JWG was to address the application aspects of power-quality monitoring (PQM) focusing in particular on the following: i) Guidelines for choosing locations to install monitoring equipment and for the number of monitors needed to get a sufficiently-accurate picture of power quality; ii) Trade-off between costs of monitoring and amount of information provided, including the practical value of additional information gained by adding more monitors against the complexity of data extraction and classification; iii) Possibility and potential advantages of installing a power quality monitoring function in a large number of metering devices and/or protection relays; iv) Methods for reliable estimation of relevant power quality indices at non-monitored locations; v) What parameters should be recorded and at what sampling rate/resolution, including a discussion about appropriate data averaging windows and viability of inclusion of waveform data; v) How and where monitoring results should be stored, i.e., if data is to be transmitted to central location, should raw data or processed/compressed data be transmitted? The recommendations in this respect should not only cover existing practice but should also include possible future applications, including customer requests for past-performance at a certain site, and the need for future research and development in, for example, data capture and processing; vi) How to present the results of monitoring? It is neither possible, nor desirable, to have one way of reporting for all applications. Different methods of presenting the results of monitoring are required for different types of application and decision making. This recommendation should address the way of presenting statistical/probabilistic results over the whole or a large part of the service area, statistical/probabilistic results for individual customers over one or more years and results for individual events or over a short period of time. As one of the first tasks of the JWG, a questionnaire on power quality monitoring practices, was developed during 2011 and distributed during 2012 to a large number of transmission (TSO) and distribution system operators (DSO) from 43 countries on all continents. The key findings of the questionnaire, based on 114 responses received by January 2013 are used to acknowledge current industrial practice on PQ monitoring.

This key-note presentation will discuss the main results of the international survey on Power Quality monitoring, recommendations of the CIGRE/CIREC JWG C4.112 with respect to PQ monitoring in current and future networks and the key areas that JWG identified as potential future extension of the work in the area of PQ monitoring.

Key words: Power quality monitoring, international survey results, future PQ monitoring trends

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