

Novel Power Quality Data Analysis and Reporting Framework for Wide-area system of registration and processing of power quality data

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Abstract— This paper presents a novel method for data analysis and visualization, including real-time visual monitoring and proposal for combined area PQ indices on the example of the developed and operational comprehensive system of registration, archiving and data processing for the wide-area monitoring of power quality in a separated part of real power grid with distributed renewable generation. Real case studies related to power quality disturbances are presented.

Index Terms—power quality, power distribution faults, power distribution reliability, power system restoration, power system transients, relational databases, distributed generation, location of disturbances, voltage dips, GIS, data visualization and analysis.

I. INTRODUCTION

NEW ideas related to power quality data visualization and analysis are presented in this paper. One of the most important problems in assessment of power quality problems is the huge amount of different indices, numbers and information, spread in time and related to different geographical points. Aggregation and averaging leads to loss of important information.

One of the objectives of received funding was building a distributed power quality observation system. Such a system, composed of PQ monitoring units is found at the nodes of the particular distribution network, permits the study of phenomena occurring within the system containing distributed generation units. The observation system is provided with stationary time-synchronized power quality recorders with GPS synchronization. The software system supports data transmission between analyzers and database.

It permits to conduct effective analysis of phenomena occurring in a distribution system [2]. The main requirement was observation of events in networks and power facilities regardless of their location [3]. In addition, there was a requirement for synchronous data capture for quality assessment throughout PQ multi-measurements. The analysis

of the assumptions and limitations within the context of technological and economic possibilities, led to GSM telecommunications systems, permitting the best coverage of sparsely industrialized and urbanized areas.

Basic diagram of developed and realized management and measuring system is shown in Figure 1 and the system schematic is shown in Figure 2.

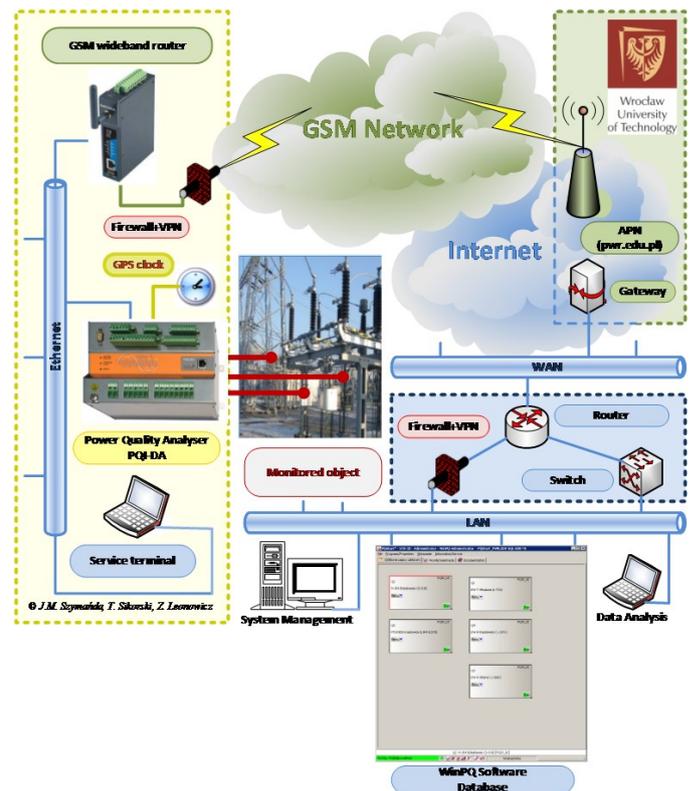


Fig. 1. Functional diagram of the wide-area PQ monitoring system [4, 5].

First contribution of the paper is the idea of plotting one power quality index for all nodes of the wide-area measuring system in form of radar plot, as shown in Figure 3. The second contribution is the idea of visualization of PQ data (similar to

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