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MONITORING THE QUALITY OF ELECTRIC POWER IN POWER GRIDS

For the effective utilization of electric power, it is important to analyze the electric power consumed and to set up a system for controlling its quality. The results of the operation of such a system considerably influence the investment programs of companies and enterprises. The parameters of the electric power which it is advisable to monitor for the best results in controlling the quality are determined for each enterprise. To do this, investigations need to be carried out to determine the locations where measuring instruments need to be placed to measure the quality, and for the continuous monitoring and analysis of the results obtained during the monitoring. At present, the monitoring of electric power quality at enterprises is of a short-term periodic nature. For the continuous monitoring of the quality control of electric power, prolonged tests of some of its characteristics are required. This primarily relates to the parameters of surges and dips in the voltage. Measurement data characterizing these dynamic processes and their statistical processing must be stored for a year. It is therefore necessary to carry out constant monitoring of the quality, using an automated data-measuring system for monitoring electric power quality. Such a system enables measurement data to be obtained for determining that the electric power meets the compulsory requirements and makes clear the sources and reasons for any degradation in quality. The system contains the following: measuring voltage transformers, measuring current transformers, measuring computational systems, i.e., instruments for measuring the quality of the electric power, software-hardware systems for monitoring the quality of the electric power, communication lines between the measuring transformers and the instruments for measuring the electric power quality, modems, Ethernet apparatus and networks, concentrators, data servers, data acquisition stations, and working stations with standard system and applied software. The system for monitoring the quality of electric power enables one, with continuous monitoring, to reveal problem sections and equipment in the mining industry. After processing and analyzing the measurement data, one can determine the reasons for any deterioration in the quality of the electric power, and then make recommendations for appropriate power services to eliminate any deficiencies. To reduce the deviation of the harmonic components, we recommend the introduction of active higher-harmonic filters instead of the passive filter-compensating devices used at the present time [1].

The sources of interference are on the side of consumers and in electric systems that is why the responsibility for the assurance of electric power quality (EPQ) can be determined on the basis of the results of continuous monitoring of EPQ. The control of the electric systems should be directed to the interaction of electric power industry subjects where the required reliability indices of power supply and EPQ indices are provided. Such approach supposes the

transition to the customer-oriented system of power supply, i.e. the assurance of service quality including the reliability of power supply, the providing of customers with information [2]. Consumers are active members of the technological process of output, transfer and distribution of power and their interest in the process is in the system of technical and economical factors of the control of electric systems. The monitoring system should serve as the foundation of the assurance of EPQ. The monitoring allows making the statistical database of the previous measurements. The forecasting of the processes in electric systems, the determination of the expected levels of the reliability of power supply and EPQ to decrease the risk of losses of a supplier and/ or a customer can be made using the database.

The directions of the development of information and technological monitoring system are:

1. The development of software complexes for the accumulation and processing of statistical information on the quality and reliability of power supply which can allow solving the problems connected with the ensuring of contractual requirements and informing of customers.
2. The development of the guidance and regulatory requirements devoted to the determination of the causes of EPQ deterioration and location of the places in electric system with lower quality.
3. The development of the methods of evaluation of additional power losses and risks of the emergence of technical and technological damages that appear during operation of equipment and work of power consumers producing distortions.

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