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MAIN ISSUES OF FUNCTIONING OF THE ELECTRICITY MARKET

Due to the development of market relations in the industry of electric energy supply, electric energy is considered to be the product which should comply with certain quality and market demands. The Law of Ukraine “On electric energy market” as in force on 17.10.2020 defines clearly the legislative, economic, and organizational grounds of the energy supply market, regulate the relations in terms of production, transmission, distribution, purchase and sell, supply of electric energy to provide reliable and safe electric energy supply for consumers taking into consideration the consumers’ interests, development of competitive relations, minimization of costs for electric energy supply, and minimization of negative environmental impact. Article 18 “Quality of electric energy supply” of the Law of Ukraine “On electric energy market” makes it clear that:

1. The Regulator (the National Committee performing state regulation in the spheres of power generation and communal services) defines a list of quality coefficients for electric energy supply, characterizing the level of energy supply reliability (continuity), commercial reliability of the services as for electric power transmission, distribution, and compensation as well as electric energy quality, and approves their values;

2. The Regulator defines the procedure of compensations, if the electric energy supply does not meet the quality coefficients, and the amount of compensations;

3. The quality coefficients of electric energy supply, procedure, and amount of compensations for being not in compliance with them are subject to public disclosure in accordance with the procedure identified by the Regulator.

As is known, the electric energy quality is the complex of certain properties of electric energy according to the specified standards determining the degree of its suitability for its proper use.

According to the information from the official site of the National Committee regulating the activities in the spheres of power generation and communal services (<http://www.nerc.gov.ua/>): “Currently, the relations between the electric energy producers or suppliers and consumers, taking place during the electric energy purchase and sell in the electric energy market, are regulated by the “Rules of retail electric energy market (RREEM) approved by the National Committee regulating the activities in the spheres of power generation and communal services (NCRPGCS) of 14.03.2018 No. 312.

According to point 5.1.2 of RREEM, an operator of the distribution system is obliged to follow the quality coefficients of electric energy supply, which characterize the level of reliability (continuity) of electric energy supply, commercial quality of the services concerning the electric energy distribution (transmission) as well as the quality of electric energy coefficient, which list and values are approved by the Regulator.

According to the provisions of point 11.4.6 of chapter 11.4 of division XI “Code of distribution systems” approved by the Order of the NCRPGCS of 14.03.2018 No. 310, parameters of the electric energy quality coefficients within the points of consumers’ connections and in terms of standard operating mode should meet the parameters determined in DSTU EN

50160:2014 “Characteristics of electric energy supply voltage in general-purpose electric networks” (DSTU EN 50160:2014)”.

Thus, the State Standard of Ukraine DSTU EN 50160:2014 “Characteristics of electric power supply voltage in general-purpose electric networks” is the current effective document in Ukraine; the Standard is developed by the Institute of Electrodynamics of the National Academy of Sciences of Ukraine.

As is known, electromagnetic compatibility (EMC) of technical means considers the processes occurring in electrical complexes and systems in terms of generating electromagnetic interference, their impact on electrical equipment, the degree of protection and correction of adverse effects. The emergence of new devices for conversion technology, the modernization of an increasing number of industrial electrical installations, in particular, the use of adjustable electric drive, lead to a decrease in the quality of electricity in the supply networks of enterprises. This necessitates the strengthening of electromagnetic compatibility requirements for industrial plants. Standardization of electricity quality indicators in such conditions is one of the main issues of this problem [1].

Electricity quality indicators (EQI), regulated by state standards, are the starting point in almost all areas related to electrical installations. This applies to the design of new facilities, and commissioning, research of electrical equipment, the decision to upgrade and others.

The international normative basis for the assessment of electromagnetic compatibility of electrical installations is the well-known European standard EN 50160: “Characteristics of voltage supplied by general purpose distribution systems” (1994), as well as the standard of the International Electrotechnical Commission (IEC) 1000-2 - 4: “Electromagnetic compatibility. EMC levels at industrial facilities for low-frequency conduction interference.

Nowadays, the demand for electricity is much higher than the potential of electric networks; at the same time, consumers require much cheaper high-quality electric energy. That is why provision of high quality of electric energy is a topical problem and one of the main tasks of electric energy. Inappropriate electric energy quality is the main reason of interruptions in terms of power supply for consumers. Quality of electric energy is the degree of correspondence of electric energy characteristics at a specific point of electric system to a set of control parameters.

Broadly defined, electric energy quality is a set of its properties determining the influence on electric equipment, devices, and facilities. Quality of electric energy is connected with reliability since the standard mode of electric power supply is the one in terms of which consumers are provided with the electric energy of normalized quality, in the required amount, and without any interruptions. Due to the fact that the quality coefficients of electric energy may differ from the standard ones regulated by DSTU EN 50160:2014, some enterprises may face following negative consequences: disconnection and downtime of the equipment due to accidents and switching in the external networks; direct losses due to underproduction of end products; indirect losses due to possible operations to repair mechanical equipment as well as its maintenance expenses; decreasing reliability of electric energy supply systems; reducing production efficiency and increasing specific energy-output ratio of the end product unit; and reducing service life of electric equipment.

References

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