ASSESSMENT OF THE QUALITY OF ELECTRICAL ENERGY ACCORDING TO THE POWER OF CONSUMERS

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Abstract: *The article discusses the issues of voltage, non-sinusoidality and asymmetry in the presence of several consumers at the point of common connection of the electrical network and the influence of power receivers on voltage distortion, solving the problem, assessing the influence of consumers from the parameters of the equivalent circuit of the electrical network of the studied harmonic for negative sequence currents at the fundamental frequency.*

Key words: *power quality, common connection point, voltage deviation and fluctuation, power overrun.*

Electricity has its own characteristics that are different from other types of products. The process of production, transmission and consumption of electric energy is continuous in time, and quality indicators of electric energy depend not only on the producer and supplier of electric energy, but also on the consumers themselves. If the quality of any product does not meet the standards, the consumer has the right to demand compensation for the damage caused to him in the agreed form. As for electricity, the impact of consumers on its quality, the role of consumers in the deterioration of voltage quality and the damage caused by them complicates the procedure [1].

There can be several consumers at the common connection point of the electrical network. In this case, the quality indicators of electricity will be the same for them. In this case, the effect of each of the consumers on the voltage disturbance may be different. If the power quality indicators do not meet the requirements, it is important to correctly assess the impact of each consumer on the power quality indicator and identify the consumers that degrade the power quality indicator to an unacceptable level.

One of the important tasks of electric power is to regulate the quality of electricity according to the characteristics of the three-phase voltage system, such as non-sinusoidality and asymmetry.

Failure to comply with the requirements of the quality indicators of electric energy (EESK), shortening the service life of electrical equipment, failure, increasing wastage of electricity and the appearance of low-quality products, leads to great material damage due to improper operation of relay protection devices.

There are many approaches to the problem of assessing the effect of consumers on voltage disturbances at the common connection point. Some of them allow only a

qualitative assessment of the impact of consumers and determine the positive or negative nature of their impact on the quality of electricity. It allows to create a methodology of consumers that influence the quality of electricity to regulate the quality of electricity.

Voltage characteristics such as voltage distortion, nonsinusoidality, and nonsymmetry are understood to be used to describe the problem of assessing the impact of consumers on the quality of electricity. Voltage distortion is the voltage of n-harmonic constituents or reverse sequence (or zero sequence) voltage.

The method of assessing the impact on the quality of electricity by the power of consumers is given in the normative document used to analyze the causes of the deterioration of the quality indicators of electricity at the common connection point, and is carried out when determining the sources of disturbances with non-sinusoidal voltage and voltage asymmetry:

In this case, it is proposed to distinguish objects that are consumers of electricity, which affect the non-sinusoidal voltage at the common connection point. To identify such objects:

1) the value of a is determined in percentages by the ratio of the permissible Srux power of the object to the minimum short-circuit power Sqt.min at the common connection point.

$$a = \frac{S_{\text{рух}}}{S_{\text{қт.мин}}} \cdot 100\% \qquad (1)$$

Permissible values a_{pyx} of arux for a common connection point in electrical networks:

- 6 kV and above - a_{pyx} from 0.3%;
- 0.22/0.38 kV - a_{pyx} should not exceed 0.2%.

If a≤arux, the object in question belongs to the group of electric consumers with an electric current that does not affect the non-sinusoidal voltage at the common connection point.

If a>arux, it will be necessary to determine the total installed power of breaking the electric consumer with the nonlinear Sbuz, the volt-ampere characteristic, based on the constituents of the object's power.

2) the value of a1 is calculated in percentages as a ratio of the total installed power of the object's electrical consumers to the minimum short-circuit power Skt.min at the common connection point of Srux:

$$a = \frac{S_{\text{буз}}}{S_{\text{қт.мин}}} \cdot 100\% \qquad (2)$$

If a≤arux, then this object belongs to the group of objects that disturb the electric current, which does not affect the non-sinusoidal voltage in the electrical consumers belonging to it.[4]

If a>arux, this object belongs to the group of objects that generate non-sinusoidal voltage at the common connection point of the considered electric consumers.

This method of identifying consumers that violate the quality of voltage does not take into account the probability of significant high harmonics in the operation of even a small power nonlinear consumer when resonance occurs in the network outside the consumer.

Thus, when there are several consumers at the common connection point of the electrical network, the quality indicators of electricity are the same for all consumers, but the impact of each electricity consumer on voltage disturbances may be different. In this case, if the quality of electricity does not meet the requirements of GOST, it shows the need to strictly assess the impact of consumers and develop methods that identify electricity receivers that have a bad effect on the quality of electricity.

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