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ELECTRICAL POWER - THE MISSING ELEMENT IN ELECTRICAL POWER QUALITY ASSESSMENT

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The subjects of the electricity market are distinguished in the production, transmission, distribution and consumption of Electrical Energy. The electrical energy is the real commodity that is supplied by suppliers, sold by traders and paid for by consumers and, like any goods, it has quantitative and qualitative characteristics. Without limitation of the focus on the physical quantity Electrical Energy, discussing the topic of product quality, the term Electrical Power Quality (EPQ) has gained wide public popularity, including in scientific forums and a huge number of publications. Electrical Power as a physical quantity obviously does not correspond to the product (goods) - Electrical Energy, but Electrical Power is more often used in the sense of Electrical Energy, i.e. The term Electrical Power Quality should be translated and understood in its broader sense as Electrical Energy Quality.

If we consider electrical energy as a commodity: "A commodity is ... a good, a product produced to satisfy certain needs, human needs ..., and which can be sold on the market. Goods can be intended for consumption, equipment, furnishing, or exploitation." (according to wikipedia.org), the specific characteristics of this goods can be distinguished:

- Electrical energy is a commodity, a product of continuous production (and transmission);
- Electrical energy is a commodity, subject to continuous dynamic consumption, which affects its characteristics;
- Electrical energy as an exchange commodity is strictly parameterized;
- Electrical energy as a commodity requires outgoing and incoming control of compliance with certain quality parameters using quality control methods.

The quality of electricity is a compromise between the consumer and the supplier. Production, transportation and delivery are practically at the moment of consumption. The measurement and assessment of the quality of the supplied energy must be carried out at the moment of consumption. As a presumption, for proper work of the network the generation, transmission and distribution systems must always meet the requirements for sufficient energy delivery capacity. Unlike other products, the quality of electricity depends on the mutual influence of the consumers themselves. The quality of the voltage varies from point to point depending on the instant consumption. As a result, the quality of electricity can be ensured simultaneously by producers, suppliers and consumers of electricity. Maintaining satisfactory quality is a joint responsibility of the producer, supplier and consumer.

The most popular standard guiding the trade relations for electricity supply in Europe is EN 50160 "Voltage characteristics of electricity supplied by public electricity networks". EN 50160 is a CENELEC product standard that defines, describes and specifies the main characteristics of the voltages that can be expected at the supply

terminals in European public low, medium or high voltage networks. It is not harmonised with the EU New Approach Directive. According to CENELEC's internal rules, the standard must be implemented as a national standard in all CENELEC member countries. In accordance with the general status of the standard, the specifications given in the main body of EN 50160 are not mandatory in themselves, but may become mandatory if they are specified in contracts between the participants (supplier-user), in local regulations and also in EDC rules for using the network. The presumption of EN 50160 as a standard for Electrical Power Quality is that if the voltage characteristics are in norms the Quality of the supplied commodity Electrical Energy is guaranteed.

As it was said: The quality of electricity is a compromise between the consumer and the supplier. That compromise is lightly discussed in Annex A of the standard. As Norms in EN 50160 are specified only the parameters of the supplied Voltage. It is seemingly only laid down in the Standard defining Power Quality measurement methods EN 61000-4-30 with the references to the Current. It is accepted that "In a power quality context, current measurements are useful as a supplement to voltage measurements, especially when trying to determine the causes of events such as voltage magnitude change, dip, interruption or unbalance". EN 61000-4-30 limits to measurements of current magnitude, harmonics and inter-harmonics and current unbalance. The relationship with the consumed (or delivered) power is not treated – e.g. phase angle. Active, reactive and apparent power, their peak values, etc. are parameters of the contracts for connection to the electricity distribution network. In most practical cases, these limits are violated, resulting in problems with the supply voltage, but they are not included in the compliance assessment when documenting the inspection. Moreover, the popular averaging intervals in EN 50160 (based on the EN 61000-4-30) are 10 min, than the intervals of averaging the consumption for billing in LV/MV electricity meters are 15 min what reflects on the values in the respective power registers read by the supplier.

The conclusions are:

- The Electical Power Quality (EPQ) is a wide discussion area with partial one-way regulations protecting the consumer;
- The EPQ dependence on consumer loads is not reflected in standards or in regulatory sanctions;
- Typically, power limits are covered in connection contracts with certain sanctions, but they cannot cover, for example, short-term overloads, because consumption is measured at 15-minute intervals.

Therefore:

- Reporting EPQ, a compliance with the limits of contracted permissible power should be recorded on averaging intervals corresponding to the supply contract;
- Measuring consumption, a provision should be made for recording short-term overloads.

References

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