

## Electricity consumption accounting. Accounting devices. Ascoe

At the enterprises there is a settlement (or commercial) **account of the expense of the electric** power on which the enterprise settles with the energy supply organization according to the tariffs approved by the regional energy commission. In addition, enterprises often have meters to **control the consumption of electricity** within the enterprise. These devices are used for technical (control) accounting of **electricity consumption**. With the help of technical accounting at the enterprise, you can analyze the **consumption of electricity** within the enterprise, calculate the specific cost of electricity, make balances of **electricity consumption**, etc.

**Active and reactive [electricity meters](#)** are most often used to **account for electricity consumption**. Practice shows that if instead of an induction old meter, put a more accurate electronic, the latter, though expensive, but usually pays for itself quickly. After all, it is known that the regulation of commercial meters is carried out by energy supply organizations and they carry out this regulation, as a rule, although within the accuracy of the meter, but always in their favor. There are, of course, exceptions to this rule, but relatively rare. Here is an example of **saving money** with such a replacement. For example, by replacing an induction meter of class 1.0 with an electronic meter Delta 8010-01 of class 0.5, the company can save up to 0.2% on the difference in meter readings. Is it a lot? Let's make a simple calculation. If the average load passing through the meter is approximately 500 kW, and for the year the meter has charged **electricity consumption** of 4 million kWh, then 0.2% of this cost will be 8000 kWh. The meter, taking into account the cost of installation, will pay off in less than a quarter.

The number of settlement meters at the enterprise must be minimal and justified by the adopted power supply scheme. If the company has sub-subscribers, then each of them must have its own **meter**. As a rule, meters should be installed on the border of balance responsibility between the consumer and the energy supply organization. The boundary of division most often passes on the HV side of power step-down transformers. **Settlement meters** that take into account the consumption of electricity on the HV side are connected via measuring voltage transformers (TN) and current transformers (TS). The accuracy class of measuring transformers must correspond to the accuracy class of the calculated meters, and for the calculated meters it must be not worse than 0.5. Measuring devices are connected through vehicles with accuracy class 1, relay current protections - through vehicles with accuracy class 3.

When conducting an energy audit, it is necessary to pay attention to the conformity of the transformation coefficients of the vehicle to the connected load, taking into account the operation in emergency modes (for example, when the load fed from one transformer, after triggering AVR begins to feed from another transformer). Due to the reduction in production and the shutdown of individual electrical receivers, at many enterprises, the transformation factors of the vehicle have become inflated. A current transformer with an inflated transformation coefficient is considered to be one in which at 25% of the connected load the current in the secondary circuit of the vehicle is less than 10% of the nominal (ie less than 0.5 A, because the nominal current of the meter is 5A). With inflated transformation coefficients and low-load operation, the measurement error of electricity consumption increases, which causes additional financial costs.

In Fig. 1 shows different **connection diagrams** of active energy meters. Voltage transformers usually measure the voltages of all three phases. But sometimes schemes with connection of TN to two phases are applied also. The cross section of the wires or cables from the current transformers to the meters must be at least 2.5 mm<sup>2</sup> for copper and 4 mm<sup>2</sup> for aluminum.

When calculating electricity consumption, it is necessary to take into account the transformation coefficients of the vehicle and HP. Meter readings should be multiplied by the correction factor  $K_{\text{opr.}} = K_{\text{ts}} \cdot K_{\text{tn}}$ .

Twice a year in June and December on "regime days" each company during the day (every half hour or hour) records the readings of all calculated meters of active (and if any, reactive) energy. These data allow to obtain a picture of daily loads of the enterprise, which can be used in the analysis of the choice of the type of tariffs at which the enterprise pays for electricity.

## Automated systems of the control and the account of the electric power (ASKOE)

The desire of enterprises to make more effective control over electricity consumption, as well as to provide themselves with greater maneuverability in choosing the type of electricity tariffs, has led to the widespread introduction of ASKOE system and local data collection and processing equipment (LUZOD) in industrial enterprises.

ASKOE systems allow to solve the following tasks:

- Collection of information for its use in commercial settlements between market participants (including complex tariffs);
- Formation of statistical reporting;
- Operational control and analysis of modes of consumption of electric power and electric consumption both by separate consumers (shop, branch, installations, etc.), and the enterprise as a whole;
- Optimal load management of consumers;
- Timely detection of unauthorized connection to the power grid of the enterprise;
- Control of reliability of readings of electricity meters.

The technical means of ASKOE should include:

- accurate microprocessor electricity meters;
- certified devices for collecting information from meters and transmitting it to the upper levels of government (PZPD);
- communication channels;
- means of information processing (most often ordinary personal computers).

PZPD devices must ensure the simultaneous removal of all parameters.

It is better to put meters of class 0,25 or 0,55 on commercial accounting, on technical accounting - class 1,0. Almost all modern digital meters in their maximum configuration can take into account the tariffs of active and reactive energy and power in two directions, record the maximum load power at a given time interval, measure some parameters of electricity quality (current, voltage, power factor, voltage dips, etc.) and store the measured parameters in the memory for up to a year. Meters must have interfaces for data transmission. Information can be transmitted via telephone cables, radio or RF modems, as well as via a cell phone. If the old meters transmitted pulses and in case of rupture of the communication line, the meter readings were lost, the new meters transmit the finished data in kWh at the time when they are connected. Therefore, the new meters provide completely reliable information and are practically computers.

ASKOE allows not only to solve the problem of accounting for electricity consumption. On the basis of ASKOE it is possible to create the system which continuously controls specific expenses of the electric power, both on divisions of the enterprise, and on separate technological installations. In case of unplanned increases in specific consumption of electricity at individual facilities, using ASKOE, you can find out the reasons and take action. In other words, the company will introduce strict control of specific electricity costs, which will undoubtedly increase production discipline and save 6 - 12% of electricity. In addition, such a system will prevent unauthorized connection of electricity consumers to the grid.

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