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ODERN PROBLEMS OF ELECTRICITY THEFT IN THE ERA OF THE MINING BOOM

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Today, problems with the theft of electricity are still one of the main issues in the electric power industry. According to estimate[1], the theft of electricity is estimated at \$96 billion annually. Electricity losses caused by theft are classified as non-technical losses.

The theft of electricity means a crime in the form of theft, which is punishable by law. The theft of electricity consists in the illegal receipt of resources in order to avoid paying for them. Upon establishing the fact of theft by a consumer of energy resources, the violator is held liable depending on the damage caused.

Recently, according to Cambridge University, Kazakhstan ranks second (after the United States) as one of the most popular places for mining cryptocurrencies. In October 2021, the increased load on Kazakhstan's power systems led to emergency shutdowns at three power plants in the northeast of the country.

Illegal mining of cryptocurrencies can provoke emergency situations in the power grid complex, affect its development and modernization, and also increase electricity costs for certain categories of consumers. At the same time, illegal miners resort to increasingly sophisticated methods of concealing activities.

A mining farm requires a lot of energy. For example, one of the largest mining farms in Kazakhstan could consume as much energy as the city of Karaganda if it worked at full capacity. The recent sharp increase in the number of miners in Kazakhstan, who use electricity both openly and underground, apparently became the main cause of the energy crisis in the country.

At the end of November 2021, it became known that constant power outages began in Kazakhstan due to cryptominers. The mining of cryptocurrencies leads to an overload of power systems.

According to the Financial Times, the demand for electricity in Kazakhstan by the end of November 2021 increased by about 8% compared to January. This is

a sharp increase in energy consumption compared to the annual growth of 1-2%, which is usually observed in the country.

Methods of combating theft of electricity

The increase in energy tariffs is one of the striking features of the deepening economic crisis. In the context of this, the theft of electricity and issues related to its detection are of paramount importance.

The methods of detecting theft of electricity with the help of ASKUE and the fight against them, based on the systematic control of each accounting point via the Internet, are the most advanced and effective today [1].

The measures taken against the theft of electricity are inextricably linked with the determination of the fact of theft of electricity and its suppression. Considering all the variety of ways that dishonest consumers use to steal electricity, the methods of detecting theft of electricity can be divided into analytical and practical. Analytical (indirect) methods include the following:

1. Systematic reconciliation of the readings of common meters by directions, groups of consumers and loads with the total of individual consumers;

2. Identification of almost identical low readings from month to month, it is possible that the consumer steals electricity, having deliberately determined for himself the amount that he will pay;

3. When using the technology of remote collection of automated system for monitoring and accounting of electricity (ASKUE) readings, it is necessary to identify inconsistencies in the quantitative characteristics of the load to external factors. For example, there is no electricity consumption by the metering device, and the owner's plot is intensively illuminated.

4. Identification of inconsistencies between the load being tested with current-removing tongs or a multimeter to external factors. For example, a large load is fixed with current-removing tongs, and the meter readings do not change [2].

Practical methods include:

1. Checking the connection diagram of metering devices;

2. Load monitoring on general house lines and public lines — unauthorized connection of dishonest consumers to them with a corresponding sharp increase in load is possible;

3. Visual inspection of metering devices and lines suitable to them to exclude bypass power supply lines, mutual replacement of phase wire with zero and mechanical braking or stopping of metering devices;

4. During visual inspection of the consumer's premises, pay attention to the presence of dimensional electrical equipment, transformers, folding rods with hooks for throwing on overhead lines, additional grounding lines, as well as the condition of sockets (when the ground is connected to the zero wiring through the outlet, one of the holes is larger than the other) [3]

Effective fight against theft of electricity is based on two main components: systematic control and timely detection of thefts. Let's consider the simplest ways to combat theft [4].

1. Regular bypass of the route, allowing for visual monitoring of connections and meter readings. However, the involvement of crawlers is fraught with a human factor — an employee may not notice an additional bypass line or mistakenly underestimate the readings of electricity consumption when removing. These risks can be eliminated with the help of remote meter reading collection systems.

2. Sealing of counters with conventional or magnetic seals. Unfortunately, practice shows that this technique can be smashed to smithereens in the same way as the counter itself. The owner breaks the meter with all its seals, consumes electricity in unlimited quantities until the arrival of the inspector, after which he claims that everything was fine with the meter until the last moment. When monitoring the power directly at the input with the data archive, such manipulations with the meter become useless.

3. Control of the meter connection scheme for compliance with the "phase-zero" at the input, as well as the search for powerful transformers and other devices that make the meter count "in the other direction". However, with the possibility of instantaneous accounting of power consumption, coupled with its active and reactive components, direct control becomes unnecessary.

These measures will help to identify and prove the theft of electricity in general [5]. When stealing electricity by mining methods, load testing methods are used.

Today, the issue of theft of electricity is taking into account more attention. Energy companies are using new ASKUE technologies to solve this issue. Also, the growth of mining farms forces energy companies and the leadership of the countries to quickly respond to problems of electricity shortages.

List of used literature

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