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**USING CONSUMER-REGULATORS TO EQUALIZATION OF ELECTRICAL  
ENERGY SYSTEM LOAD SCHEDULE**

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**АННОТАЦИЯ**

В статье рассмотрено, что сбалансированность графика работы электроэнергетической системы зависит от режима работы потребителей электроэнергии.

**Ключевые слова**

энергетические системы; электричество; график загрузки; потребители электроэнергии; режим.

**ABSTRACT**

The article considers that the balance of the work schedule of the electric power system depends on the mode of operation of electricity consumers.

**Key words**

energy systems; electricity; loading schedule; electricity consumers; mode.

It is known that due to a number of economic and environmental factors, electricity is becoming more and more expensive for mankind, which does not allow to have excess reserves as a condition of excess supply. Therefore, the task of optimizing the operation of electric networks and the electric power system is becoming increasingly important.

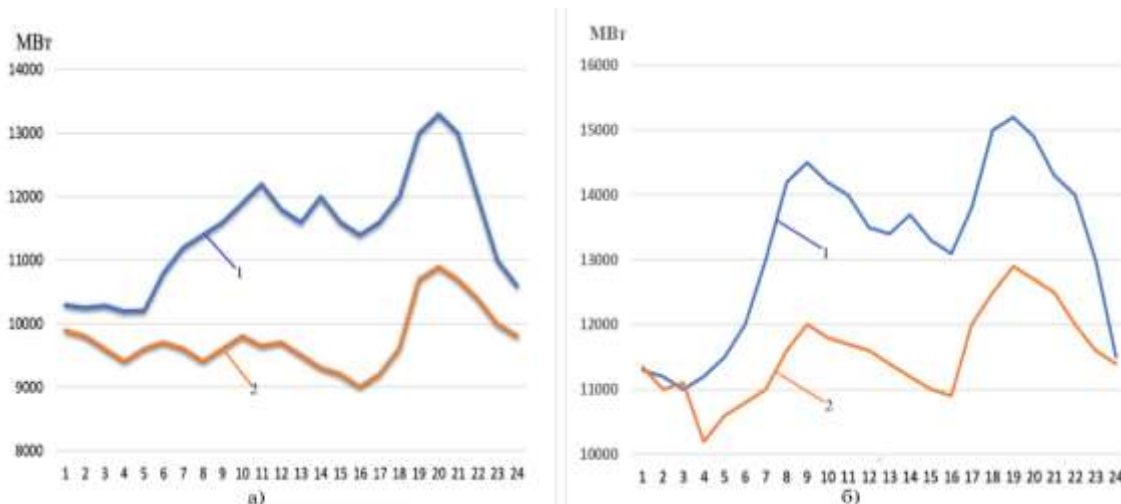
The economic efficiency of the electric power system is mainly determined by the nature of the system's load graph, its unevenness cannot be a random process by itself. It requires targeted measures with appropriate material and financial support. All participants must participate in this process: the state, the electric power system, consumers [1; #-5].

Under the modes of electricity consumption in any object is understood the nature of the change in time of the electrical load of this object, which can be presented in the form of appropriate graphs. When analyzing the impact of time-differentiated tariffs on electricity consumption modes in a single electric power

system, it is necessary to study the impact of these tariffs on changing the characteristics of its electric load or the configuration of load graphs.

V.V. made proposals for planning the electricity consumption to regulate the system of electricity tariffs and the schedule of the system's parameters, taking into account the interests of electricity consumers. Mikhailov proposed in the 70-80s of the last century [2; B.128].

As we know, the period of the main demand of consumers for electricity mainly corresponds to the morning and evening period of the day (Fig. 1).



**Figure 1. Energy system loading schedule (a-June, b-September) 1- working day, 2- weekend.**

In every electric power system, constant attention is paid to the analysis and planning of load schedules. Load curve indicators are used to compare the performance of daily load charts. They reflect the requirements for the mode of stations. Usually indicators are used in relative units. The following three indicators are considered the main indicators of the daily chart:

- uneven graph (ratio of the period of minimum loads in the night period to the period of maximum loads) is expressed as follows:

$$\alpha_H = \frac{P_{min}}{P_{max}}; \quad (1)$$

- load filling coefficient (ratio of the average daily load period to the maximum load period) is expressed as follows:

$$\gamma_3 = \frac{P_{ad}}{P_{max}}; \quad (2)$$

- the number of hours of the period of maximum loads is expressed as follows:

$$h = \frac{E_{year}}{P_{max}}; \quad (3)$$

where  $E_{year}$  is the annual amount of consumed electricity,



$P_{max}$  is the period of annual maximum loads of the energy system [2; B.18].

It is very effective to use consumer-regulators to balance the load schedule of the electric power system. The operation mode of the electricity consumer participating in the equalization of the electricity system's load schedule provides an opportunity to limit power consumption in the maximum hours in order to equalize the load schedule of the electric power system or power station and increase the electricity consumption in the minimum hours.

The possibility of operation of consumers, especially consumers that consume a large amount of electricity, in the consumer-regulator mode should be taken into account not only in the design of an industrial enterprise, but also at the design stage of technological units, taking into account the possibility of operation in a wide range of load schedule regulation [3; B-152].

In order to successfully and effectively implement the regulation of electricity consumption modes, it is necessary to know the technical, economic and energetic characteristics of technological processes. For this, the following is necessary:

- review of technological schemes of production by groups of main, auxiliary and general production workshops, technological devices, aggregates, to determine their technical, economic and energetic characteristics;
- to determine the possibilities of reducing the power of technological devices, aggregates, the depth and duration of these reductions;
- to determine the possibility of repeated restriction (reduction) of stools during the day;
- to determine the possibility of creating intermediate warehouses (cisterns) of semi-finished products, raw materials, which allow shutting down individual units of the technological process or the entire process for different periods;
- determination of the technological installation, the possibility of compulsory use of aggregates, the permissible level and duration of the compulsory regime;
- determination of technical, economic and energetic characteristics of technological devices and aggregates in mandatory mode;
- identification of consumers who may not work in the nighttime maximum load of the electric power system;
- to determine the possibility of seasonal regulation of nagruzka;
- determination of additional costs of the enterprise as a result of regulating the electricity consumption regime, including changes in the quantity and quality of products;
- to determine the possible options for compensating low production in this enterprise or other enterprises of this industry and the additional capital costs, the number of employees and wage funds necessary for this [3; B.144-145].



As mentioned above, the load graph of the electric power system is the sum of the load graphs of many consumers, so it can be smoothed only with the help of regulator consumers who are able to limit or transfer a part of the electric load from one hour of the day. Consumers regulated by load schedules can be conditionally divided into two groups: a group of consumers regulated by load schedules, which are part of the electric power system and perform the combined function of generation and consumption of electricity, and a mass group of consumers regulated by load schedules. The social issue should be taken into account when determining the consumers who regulate the pressure graphs. At present, while a lot of attention is being paid to improving the living conditions of the population in our country, one of the most important tasks of the society is to improve the working conditions to the maximum, to reduce the processes that require heavy labor, and to reduce the work in night shifts.

For the development of the economy and industry, a number of industrial enterprises, sectors and technological processes need to work around the clock. Therefore, when choosing consumers who regulate load schedules, it is necessary to pay attention to consumers who require a lot of electricity, who have a small number of service personnel and who work continuously around the clock with modern automated technologies using robotics.

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