APPLICATION OF GRAPH THEORY IN QUESTION ENERGY SAVING SOLUTIONS

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Currently, most industrial equipment and technologies used in Ukraine are outdated and consume more energy compared with modern analogues. This leads to inefficient use of energy. Ukraine meets its needs for natural energy resources by domestic production by about 45%. In most countries the energy self-sufficiency is the same or even lower. Thus Ukraine - one of the countries where the level of energy consumption is extremely high. Its share in world energy consumption 1.9 %, while the population is less than 1 % of the population. In terms of energy production inefficiencies due to two main reasons: the unbalanced structure of energy consumption and inefficient use of energy in all sectors of the economy.

The purpose of research - the issue of energy saving in the grid, which will be the optimization of the structure of the electrical network in the power supply system - namely, minimizing the distance the electric power network system using graph theory.

Materials and methods of research. The application of graph theory to optimize the structure of the electricity network. Intuitively, graph theory can be represented as a geometric configuration which consists of points (vertices) connected by lines (edges).

Determination of the graph is so common that the term could describe a lot of events and objects of everyday life. We can say that graph theory is, in fact, the language of modern discrete mathematics.

Consider using graph theory to solve the optimization of the electrical network. Numbered top 1, 2, ..., 10 symbolize the place of electricity consumption (consumers), and the top 11 is a transformer substation.

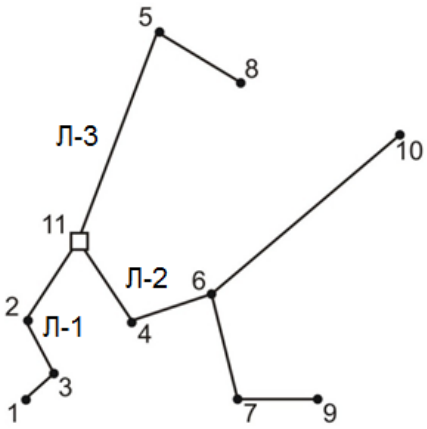

Fig. 1. Scheme mains:

● – places electricity consumption (consumer); □ – transformer substation

Results. Us solve a given power supply circuit to see how many are loss of electricity to its optimization.

Calculating the power grid generally accepted method got that power is 8,093.676 kVA substation, with total power loss ΔS = 681,810 kVA, representing 8.424% of the power consumption.

Us solve a given power supply design scheme, shown in Fig. 1 using graph theory.

Calculating the shortest start of construction of the electrical network. To build the electric network algorithm Kraskala use. It builds the shortest line length, adding to it in one area, while the happening of the branch, which connects the two sections of the circuit formed by the shortest growing branches network. Construction begins with the assembly of the new structure of the electrical network with n sections (each consisting of one consumer), and then perform the operation combining the two sections (the shortest branches) until there is only one network - electrical network shortest length.

After building design scheme of power supply into a single network with the least length of lines, we proceed to determine where the transformer substation.

As a result of calculation got top center of Earl v_6, because at that point the lowest value of the consideration. Thus, the substation should be placed within the area of consumption, said top v_6.

The total length of the network is 35.53 kilometers.

Having power and knowing the circuit point placement transformer substation can determine the loss of electricity.

The power plants will be 8032.990 kVA, while the total power loss -Δs = 576,537 kVA, representing 7.177% of the power consumption.

Conclusions

To address the issue of energy conservation applied graph theory to rationalize the structure of power at a constant composition, location and installed capacity of consumers. Based on the theoretical and practical search of the shortest skeleton graph to reduce electricity losses in the electrical system has been reduced length of transmission lines at 6.99 km, ie 16.44 %. Thus, the power loss in the system decreased by 105.273 kVA (at 15.44 %), which resulted in an increase in energy-saving systems.