APPLICATION OF GRAPH THEORY FOR THE CALCULATION OF POWER SUPPLY SYSTEMS. OPTIMAL LOCATION OF THE SUBSTATION INTO THE GRID

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A rationale for the application of graph theory to rationalize the structure of the system power supply voltage of the middle class. Performed theoretical and practical search for the center of the graph, and optimization implemented in the electrical substation location. The tasks of further research.

Power systems, graph theory, shortest skeleton graph, the network with the least amount of power lines.

Graph theory is an effective device formalization of modern engineering and scientific problems arising in the study of large and complex systems, and the language of graph theory developed enough and convenient. Currently, graph theory has been widely practical application. Graphs are used in the analysis and design of systems of electricity, water, gas, heat supply, transport networks and so forth. At the same time are of particular interest for solving optimization problems on graphs.

We can say that the word "Count" and "network" are related, and instead the notion of a graph often used the concept of the network. This is particularly true in cases where besides the main purely structural relations in the graph are given some quantitative characteristics of dots and lines forming a graph. Such a weighted graph is called a network.

The purpose of research - to carry out theoretical and practical search for the center of the graph, to carry out optimization in the electrical substation location and create problems for further research.

Materials and methods of research [14] based on the application of graph theory to rationalize the structure of the power supply system with constant composition, location and terms of installed capacity of consumers, based on the theoretical and practical shortest cores count was reduced length of transmission lines at 7 km (16.5%). It is shown that using this method, you can optimize the structure of how novoproektiruemyh electrical networks and, if necessary, the existing structural renovation.

As the object of study to choose a specific scheme of the electricity network, thus illustrating a weighted graph.

A more efficient algorithm for finding the shortest paths between all pairs of vertices is the algorithm of Floyd-Uorshalla. It is known that the application of the algorithm, Floyd Uorshalla less laborious and save almost 50% of the time compared to using Dijkstra's algorithm [5].

Floyd algorithm-Dijkstra Uorshalla and belong to the well-known algorithms, the description can be found in most textbooks on discrete mathematics, in particular [10].

The trees are in some sense the simplest class of graphs, and many of the trees in relation to the evidence and arguments are much easier. The trees stand out, along with its other properties so that their center is always true to its name - the center of the tree consists of a single vertex, or two adjacent vertices (one of the so-formulated theorems of graph theory). If the tree has a central peak, then it is called central. If the tree has two adjacent central peaks, it is called bitsentralnym.

For trees is not necessary in the examination of complex algorithms for finding the shortest paths between all pairs of vertices, and all algorithmization simplified because in the tree, each pair of vertices is connected by one and only one simple chain. A selection of some peaks immediately determines the shortest distance from the tree of the selected vertex to all other vertices.

The results of research. Returning to the problem, we need to determine the center of the graph constructed as a result of finding the minimum spanning tree with Kruskal's algorithm.

We have a weighted graph, in which the determination of the path represented by a sequence of edges, due to its weight (length) adopted a number equal to the sum of weights of the edges included in this way. If the path, the path length is determined by the sum of the lengths of its edges Thus, without introducing new notation, then by denote the length of a balanced way between the peaks. As before, we will put the top weighted according power consumption.

Thus, the optimal placement of the substation coordinate with the structural component of the graph. It should be noted on the rationality of practical calculations based on theoretical positions generated in this article.

Conclusions

The application of graph theory to rationalize the structure of the power supply system with constant composition, location and terms of installed capacity of consumers, based on the theoretical and practical search for the center of the graph layout optimization implemented in the electrical substation and identifies the coordinates of its location. Thus, using this method can be optimized as a structure novoproektiruemyh electrical networks and existing under the need for structural reconstruction.