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RudnytskaT.H.

Kostayeva M.S.

Regional power network design

Вінницький національний технічний університет

Анотація
В даній роботі досліджено проектування електричної мережі, проведено розрахунок необхідних електричних параметрів і побудовано схему.
Ключові слова: електрична мережа, електропередача, трансформатор.

Abstract
This work studies power network design; it is also calculates the required electrical parameters and build a circuit.
Keywords: power network, electricity transmission, transformer.

The development of the economy and the requirements of scientific and technological progress dictate necessity to improve industrial power : creating an economically reliable power supply systems, systems with lower costs for design and construction.

When designing air lines it is recommended to focus on the development of the grid for the next five years. For air lines with voltage of 35-110 kV and above, this condition is mandatory.

Design of air power lines must be made in accordance with the building regulations.

Design development of Regional power network consists of a series of consistent and determined steps, implementation of which allows you to get the optimal design decisions. When designing the network should take into account the development of technologies which allow a more economically supply electricity to customers, while reducing the cost of its transmission. The route of transmission line should be the shortest possible, and it should be based on technical and economic comparison of possible options in order to get the most cost-effective design [1]. Any project begins with an analysis of the current situation at the facility, in order to form general direction of power network development, identify possible errors, which subsequently provides a reliable foundation for the formation of variations of design decisions.

The material of electric wires are defined by calculation of network, its parameters and specific conditions of electric power lines (inhabited or uninhabited terrain, presence of intersections of buildings, areas with ice and wind load)[2]. All this should be taken into account to get the network with minimized possibility of accidents, power interruption, etc.

To describe the branch of electricity network need to enter the following data:
- Number of units beginning and end of branches;
- Type branches (power line, transformer,);
- Switching apparatus;
- Type transformer;
- The name of the switching apparatus;
- The length of the transmission line;
- Coefficient of transformer;
- The state of the switching apparatus.

To properly implemention of this project it is necessary to solve several problems [3]. The first and one of the main - is the choice of economically viable schemes and the nominal voltage. Then necessary to calculate the load capacity. Knowing the value of active power load and power coefficient $\cos\varphi$, you can determine the value of reactive and full capacity.

The next task is the selection of the nominal voltage and calculation of power flow along the lines. Nominal voltage is chosen based on the preliminary allocation of capacity, length of the network in accordance with the formula Illarionov. Previos power flow determined without power losses for a given load capacities. Options of designed network or individual sections may have different nominal voltage.

Sections of ring network are performed on one voltage – the nominal voltage of areas where it was the largest.
Further it is necessary identify:
-Type of the wire;
-Sectional area of wires (sectional area of the wire is a major technical and economic indicator of the power system). There are standards of sectional area for each class of nominal voltage);
-Determine the voltage loss in normal and post-accident regime (seasonal and daily changing of load leads to systematic deviations in the voltage. When the load increases voltage decreases, and vice versa);
-The number and type of transformers.

Scheme plants must satisfy many requirements, the main ones are:

- The scheme should provide reliable power to consumers in normal, repair and post-emergency modes.
- The scheme should provide reliable transit capacity through the substation, in normal and post-emergency modes according to its value for the part of the network.
- The scheme should be simple, illustrative, economic.
- The scheme should allow gradual development with the transition from one stage to another without much work on reconstruction and interruptions in power supply.
- Number of switches that are triggered at the same time should be no more than two when line is damaged and no more than four when transformer is damaged.

Then compare all variants of the criteria of quality of electricity: the total length of lines, length of the route, the number of cell switches, voltage loss, the shortest path from the source to the point of consumption and choose the two most perspective network. Next to these two schemes calculate economic indicators and choose the most economically advantageous scheme. Further calculation of selected scheme is doing in special software package.

So thanks to calculations were modeled and determined the most convenient and cost-effective electricity network.

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Науковий керівник – Рудницька Тетяна Григорівна – викладач кафедри іноземних мов, Вінницький національний технічний університет, Вінниця.
Костяєва Марія Сергіївна – студентка групи 1Е-12б, факультет електроенергетики та електромеханіки, Вінницький національний технічний університет, Вінниця. margo65@mbox.vn.ua

Supervisor - Tatiana Rudnytska – teacher of English, the Foreigne Languages Department, Vinnytsia National Technical University, Vinnytsia.
Kostyayeva Maria S. - student group 1E-12b, Faculty of Electromechanics and Electricity, Vinnytsia National Technical University, Vinnytsia.