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METHODS FOR REDUCING LOSSES IN POWER LINES

Currently, methods for reducing losses in power lines can be:

- raising the voltage in power transmission lines up to 1100 kV (current decrease);
- improvement of energy infrastructure;
- using of wires with a low resistivity value.

The simplest and most cost-effective way to reduce losses is to improve the energy infrastructure by building power plants in large cities. For densely populated and small countries, this method is the easiest, because location of the power plant in the center of regional centers will reduce the cost of electrical losses due to the potential proximity of consumers. In this case, the only expensive high voltage power lines will go to remote settlements. If the country has low-power plants or electricity is purchased from other countries, then it should be taken into account that the losses in the 1100 kV line, although the lowest, are 1 %, that is 6 - 7 kW per km of power lines. With a conditional length of the power line 600 km, the losses will be 4,200 kWh. In Ukraine, for the Zaporizhzhia region, this loss will amount to 466.42 UAH per hour. For comparison, in Austria, on the territory of which only two hydroelectric power plants are located, the losses will amount to 619 euro per hour, or 10,733 UAH per hour at the euro exchange rate as of

02/10/2022. A decrease in the cost of installing the electric highways can be achieved by underground styling of power lines.

Among modern methods for reducing losses, there is the possibility of using materials with a low value of specific resistivity. The most acceptable materials in this case are copper or aluminum. When using copper wire, the losses are 60 % less than aluminum, but its cost is about 50 $/m, and besides, they are heavier, which requires an increase in the density of the support and will further increase the cost of installing electric lines. Therefore, at present, the most preferred is the use of aluminum cable, the cost of which is 20 $/m and it is also lighter than copper. Currently, high-temperature superconducting materials are being developed. However, their cost exceeds 100 $/m and can't be acceptable in the current conditions.

Thus, the use of various methods to reduce losses in power transmission lines is appropriate in the conditions of their operation on the territory of Ukraine.