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Analysis Condition of Icing Problem in the Electrical Transmission Lines of High Voltage under the Conditions of Navoi Region

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ABSTRACT: The problem of de-icing wires in power lines is quite acute around the world, especially in regions with high humidity and low temperatures, as high humidity, winds, sudden changes in air temperature contribute to intensive ice formation on wires of overhead lines with corresponding undesirable consequences in the form of cliffs wires, cables, destruction of reinforcement, insulators and even supports of overhead lines. This leads to significant economic losses. Therefore, throughout the world by a number of companies and organizations actively conducting research and development of methods for de-icing of power lines.

KEYWORDS: overhead power lines; icing and frost deposits; anti-icing wires; stationary system of melting ice.

I.INTRODUCTION

At present, power transmission over long distances due to the relatively small cost of overhead power lines are widely used (OPL). One of the main elements of overhead power lines are wires. When operating overhead power lines there is a problem of icing wires. A significant number of overhead power lines in the Zarafshan region are exposed in the winter season and in the autumn-winter and spring-winter seasons sticking of sleet onto the wires and the formation of icy frost deposits. Sudden changes in air temperature contribute to the formation of ice on the wires of overhead lines [1].

Ice deposits on wires and cables of high-voltage lines occur when the air temperature is about -5 ° C and wind speed is 5 ... 10 m / s. The presence of ice causes additional mechanical loads on all elements of overhead lines. As a result of a significant increase in the mass of the wires and the dynamic and static loads acting on them, dangerous and undesirable phenomena occur, especially in strong winds. These include the break of conductive wires and ground wire under the weight of snow and ice, the proximity of the wires and their strong swinging (the so-called “dance”), the deterioration of the protective properties of insulators, the destruction of supports are unacceptable. Such accidents bring significant economic damage, it takes several days to eliminate them and huge amounts of money are spent. As a result, grid companies and consumers incur large losses, and the restoration of dangling wires is a costly and time-consuming process.

II.RESULTS AND DISCUSSIONS

Deicing wire transmission lines is a serious problem, relevant to many countries with areas with high humidity and low temperatures. Therefore, a number of companies and organizations all over the world are actively conducting research and development of methods and devices for ice control on power lines.

When operating overhead power lines in a number of northern and mountainous regions, the problem of icing wires and other structures in the winter period. Ice deposition poses a great danger to stable power supply and normal operation of overhead power lines. Recent years have seen significant changes in the dynamics and geography of ice formation on high-voltage power transmission lines. Let us describe one of the possible physical mechanisms for the formation of ice, which originates due to the contact of two air masses - cold and warm, high humidity. Under conditions of relatively mild winter with a sharp drop in ambient air temperature from positive to negative, water drops settle on the wires and an avalanche-like process of formation of a thick ice crust, reaching a thickness of several tens of millimeters and multiply weighting wire begins (Figure 1) [1].

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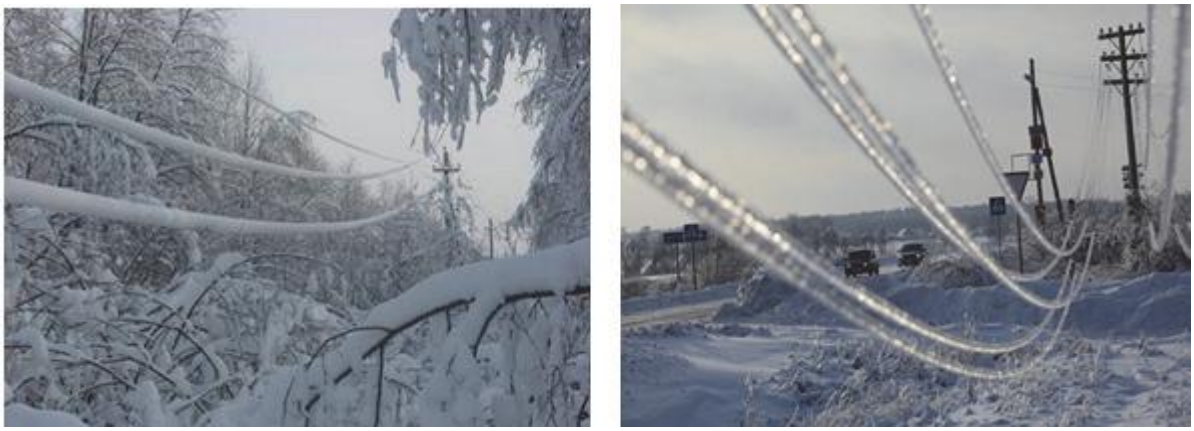

Figure 1. Ice deposits on the wires of overhead power line

At the same time, the thickness of dense ice on the wires can reach 60-70 mm (Figure 2), significantly weighing the wires. The weight of icing and frost deposits in some cases can reach more than 4 kg per linear meter of wire.

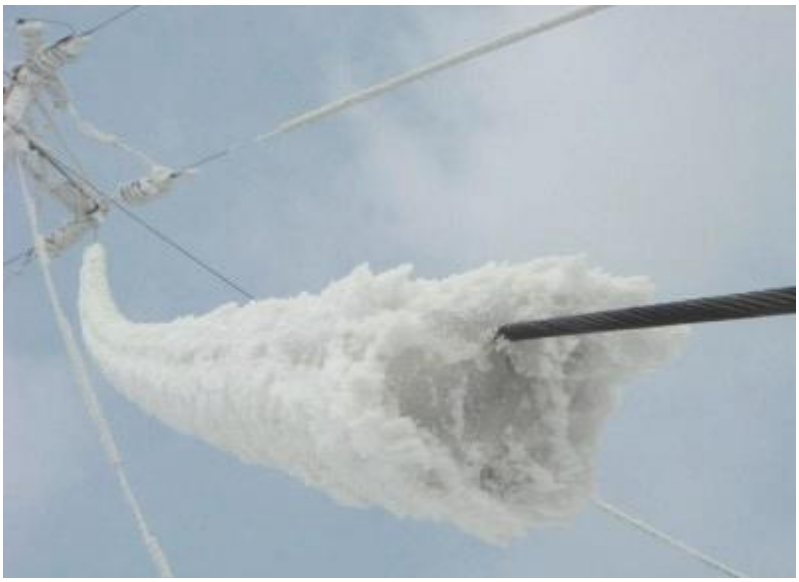

Figure 2. Characteristics of typical wire power lines icing

With significant icy deposits, wire breaks, cables, destruction of reinforcement, insulators and even supports of overhead lines are possible (Figure 3).

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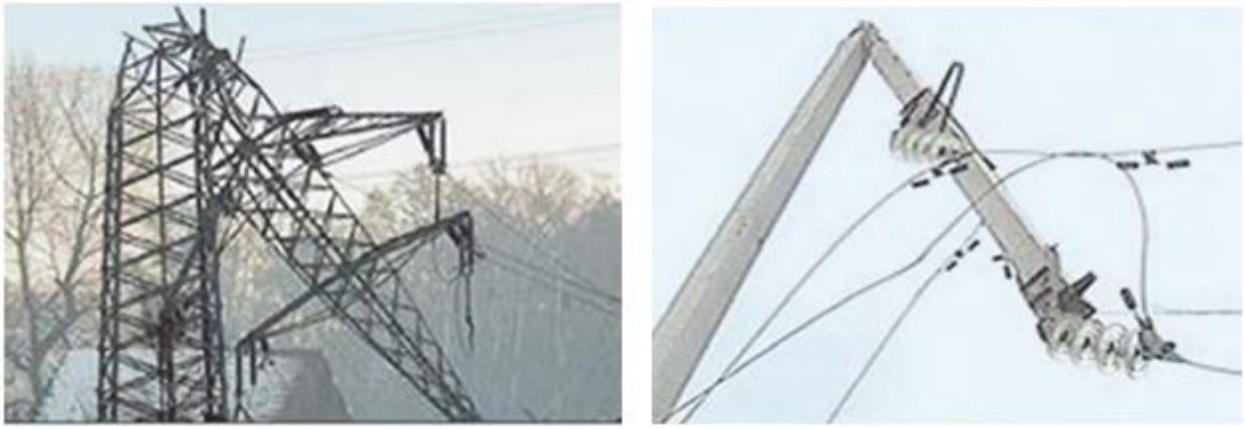

Figure 3. Ice - a disaster for power lines

Glaze can be deposited on the phase wires rather unevenly. Arrows sag wires with ice and without ice may differ by several meters. Irregular deposition of ice on the phase wires, leading to different values of the sag, as well as non-simultaneous discharge of ice when it thaws, causing the “jump” of individual wires, can lead to overlap of air insulation. Ice is one of the reasons for the "dancing" of wires, which can lead to their clashing [2].

III.CONCLUSION

Despite the long-term efforts of power engineers, ice accidents in the electrical networks of many power systems continue to cause the most serious consequences and periodically disrupt the power supply of the country's regions. In most cases, the fight against ice is carried out primitively, by covering the wires from wet snow and ice. Installing the supports at short intervals and even primitive ice control require a lot of labor and material resources [3]. As a result, power companies and consumers incur large losses, and the restoration of broken wires is an expensive and laborious process. Energy companies consider the icing of power lines as one of the most serious disasters. Many northern countries face the same problems, as well as Russia, China and Japan. Therefore, a number of companies and organizations all over the world are actively researching and developing methods and devices for combating the icing of power lines. Methods to combat the formations on the wires and cables of overhead power lines are to prevent icing, reduce the size of deposits and remove icy deposits.

Modern methods of active struggle against glaciation are:

- Mechanical;
- electrothermal;
- physical and chemical;
- Electromechanical.

Mechanical methods are used most often, are the use of special devices that provide the wires with ice churning [2, 3].

Electrothermal methods of removing ice consist in heating the wires with an electric current that prevents the formation of ice — preventive heating or melting it [4].

Physico-chemical methods consist in applying special substances onto the wires of solutions, which freeze at temperatures significantly lower than water.

Electromechanical methods of removing ice from wires of power lines form a class of new methods and devices for dealing with icing on power lines. It is proposed to remove the ice not by using thermal effects from the current flowing through the wires, but by using electromechanical effects on the ice.

Summarizing what has been stated in the sources used about the level of technology and methods of anti-icing of power lines, it can be concluded that there is still no effective remedy against this phenomenon. Each of the currently used methods has drawbacks and the problem of removing ice is relevant, and the development of devices for removing ice from power transmission lines built on the basis of energy-efficient methods is an important task. All of these

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methods require the constant active participation of personnel, energy or chemical reagents, and sometimes unsafe for the environment.

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