

SOLAR AND WIND ENERGY SUPPLY SOURCES FOR COMMUNICATION SYSTEMS

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Abstract. The stability and ecological cleanliness of energy sources are of crucial importance for the effective operation of communication systems. Today, in addition to traditional energy sources, renewable energy sources such as solar and wind energy are being considered as effective and ecologically clean alternatives for powering communication systems.

This paper discusses the importance of solar and wind energy in communication systems, as well as the integration of these energy sources with advanced technologies and innovations.

Keywords: Solar, wind, technological innovations, climate change.

A solar energy supply source converts the light energy from the sun into electrical energy. The energy produced by solar power sources not only provides energy to communication devices but also charges accumulator batteries. The charge and discharge processes of the accumulator are monitored with the help of a measurement control device. Communication devices that consume alternating current (AC) are connected through an inverter, while those consuming direct current (DC) are connected directly to accumulator batteries. Solar energy supply systems are divided into three main types: On-grid, Off-grid, and Hybrid. Currently, solar energy sources of the On-grid, Off-grid, and Hybrid types are widely used in the energy supply of communication systems in the Republic. The structure of the Off-grid type energy supply source is shown in Figure 1.



Figure 1. Structure of Off-grid solar energy supply source.

Here, DC→AC inverter converts direct current to alternating current; DC load (48 V) refers to communication devices with direct current load; AC load (220 V, 50 Hz) refers to communication devices with alternating current load. Based on observations, it can be stated that the use of solar energy sources is more effective during the months of April to September compared to the remaining months of the year.

Wind Energy Supply Source. Due to the geographic location of our country and the complex climatic processes occurring in the atmosphere, wind energy has a seasonal nature. The average comparative power of wind flow across the country is 84.0 W/m², ranging from 20.0 W/m² in Andijan province to 104.0 W/m² in Navoi province.

According to Uzbekistan's 2017-2021 energy program, the renewable energy resources have been identified, and the wind speed in stations designed for Uzbekistan's climatic conditions is estimated to generate 2.22 million tons per year, determining the wind energy potential. The structure of autonomous wind energy supply sources used in communication systems is shown in Figure 2.



Figure 2. Structure of wind energy supply source.

Wind energy sources can be used in both mixed and autonomous forms. The autonomous wind energy supply source shown in Figure 2 converts wind energy into electrical energy.

According to research results, the use of wind energy sources is more effective during the months of January, February, March, April, as well as October, November, and December, compared to other months. During these months, the use of wind energy sources for continuous power supply to communication devices requires 2-3 times more wind energy than in other months.

Conclusions:

The energy supply of communication systems is one of the most important and urgent issues. Today, solar and wind energy, as renewable sources, are widely used as alternatives to traditional energy sources. These energy sources play a significant role in ensuring ecological cleanliness, minimizing environmental harm, and creating a sustainable energy supply. The use of solar and wind energy not only helps ensure the reliable and continuous operation of communication systems but also contributes to reducing energy costs and combating climate change. Additionally, the development of these systems plays a vital role in addressing the global energy crisis.

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