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Prospective Use of Wind Energy

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Abstract

This article examines the prospects of using non-traditional energy sources and the large-scale reforms being implemented in this area. In particular, alternative energy sources such as wind energy, its origin, and prospects for use were considered.

Keywords: Wind, solar energy, air mass, energy deficit, wind energy, wind power plants.

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Humans used wind energy long before the use of water energy and steam engines. Wind energy is widely used in industry and agriculture in countries such as England, Germany, France, Denmark, Netherlands, USA, and others. Current work on using wind energy consists of creating separate powerful wind turbines and connecting their energy to existing power grids and using them as the main grid.

The circulation of air masses around the Earth's atmosphere has been assessed differently by experts. Annual theoretical wind reserves are 100 times greater than all Earth's energy reserves and amount to 3300×10^{12} kW·h. However, only 10-12% of this energy can be utilized. For example, in 1987, all wind turbines on Earth produced 10^{12} kWh of energy, which constituted only 0.3% of the annual reserves. Wind is the movement of air

mass as a result of pressure fluctuations caused by the intensity of sunlight.

Wind is a moving stream of air. The unique natural and climatic conditions of our country allow us to use wind and solar energy as alternative energy sources. Air movement causes uneven heating of the Earth's surface by the sun. Since the Earth's surface has different forms - terrestrial and aquatic space, it receives incoming heat in different volumes. During daylight hours, the air warms up faster above land than over seas and oceans. Heated air expands above the ground and rises to the sky, its place is taken by a heavier layer of cold air, and this movement creates wind. In the evening, the wind changes its direction because the air on the ground surface cools faster than on the water surface. Simultaneously, strong atmospheric winds sweep all around, causing the equatorial part to heat up somewhat more than the part located near the North and South Poles.

Today, wind energy is mainly used to generate electricity. As long as the Sun exists, the wind blows, and it is considered a renewable energy source. Of course, there are many non-traditional production methods that can replace fuel or electricity. However, it is important to choose among them those that do not harm the environment, are effective in use, and at the same time are financially acceptable. From this point of view, wind energy has several advantages. Wind is a renewable energy source.

Today, the production of this alternative energy capacity is quite popular in Western Europe. The reason is that while natural conditions are suitable for this, the demand for this type of energy is also increasing. Modern wind power plants operate optimally in areas with relatively low wind relief, with speeds ranging from 3-4 m/s to 25 m/s. Germany, possessing such territorial capabilities, is currently the world leader in wind energy utilization. According to the data, 9,000 MW of wind power plants have been built in this country in recent years, and this process is continuing at a rapid pace.

Currently, more than 60,000 people are employed in the industrial sectors of European countries related to the WES. The goals correspond to this. For example, by 2030, Germany plans to produce 50-60% of electricity using wind power plants. While other European Union members plan to install 180 thousand MW of wind power stations, China plans to build such stations with a capacity of 30-40 thousand MW in its national development program. In addition, there is information that Great Britain, Norway,

Canada, India, Japan, Spain, and New Zealand have developed government plans related to the targeted development of the wind energy sector in the near future. According to the International Energy Agency (IEA), by 2030, the need for wind energy on our planet will be 4800 gigawatts. This alternative energy has several advantages from an economic and environmental perspective. For example, the construction of wind power plants is cheaper and more convenient compared to other energy sources. The main part of the cost of generated energy consists of the initial costs for the construction of wind power plants. Additionally, since the base of the station tower is usually completely underground, the possibility of growing crops remains even on nearby lands. Simply put, the areas designated for such structures do not have a negative impact on agriculture. In addition, they do not require fuel. For example, a 1 MW wind power plant saves about 29 thousand tons of coal or 92 thousand barrels of oil over 20 years. Unlike other energy producers, wind power plants do not pollute the environment with harmful emissions. Most importantly, wind is infinite in nature. It has been established that the power of this natural phenomenon is 100 times greater than the water energy sources available in all the rivers of the Earth. All this strengthens confidence in the prospects of wind energy. There is another side to the issue, there are some problems related to the implementation of wind energy in practice. In particular, the instability of wind nature affects the uniform generation of energy at wind power plants. Taking this into account, it is possible to organize the use of solar panels at such power plants. This is how unconventional electricity is accumulated and uninterrupted power supply is ensured. Additionally, numerous and densely packed wind structures near cities can disrupt natural air exchange.

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