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# Wind energy is an inexhaustible wealth

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**ABSTRACT:**The article discusses the use of wind energy, its prospects and priorities for future generation of wind energy and its use, thereby achieving energy efficiency.

**Basic expressions:**electricity, power plant, wind flow, control, turbulence, Beaufort scale kinetic energy, electric current, wind turbine, air passage, time period, wind speed, low frequency oscillations, radio noise, wind energy resources, wind power equipment.

## I.INTRODUCTION

The wind energy on earth is inexhaustible. For centuries, people have been trying to turn wind energy into their own interests by building wind farms that perform different functions: mills, water and oil pumps, power plants. The practice and experience of many countries show that the use of wind energy is very beneficial, because, firstly, the cost of wind is zero, and secondly, electricity is obtained from wind energy, combustion products are dangerous to people not by burning carbon fuel effect. Due to the constant emissions of industrial gases into the atmosphere and other factors, the temperature contrast of the earth's surface increases. This is one of the main factors leading to an increase in wind activity in many regions of our planet and, accordingly, the urgency of building wind power plants as an alternative energy source.

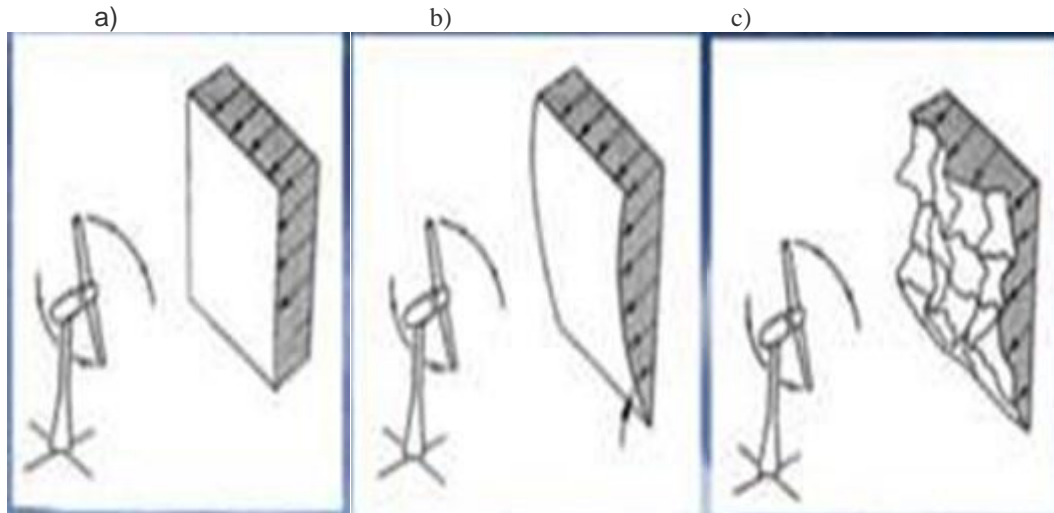
Rotating Wind Power Station (WPP) It converts the kinetic energy of a wind current into electrical energy.WPP consists of a wind mechanical device (rotary or propeller), an electric generator, automatic control devices to control the wind turbine and generator, devices for their installation and maintenance.

A wind power plant is a set of technical means for converting the kinetic energy of a wind current into the mechanical energy of a generator rotor rotation. A wind turbine consists of one or more wind power stations, a battery or backup device, and systems for automatic control and regulation of the operating modes of the installation. In remote areas that are not adequately supplied with electricity, there is no other economically viable alternative, such as building wind farms.

Wind has kinetic energy, which is converted into mechanical energy by a wind mechanical device, and then by an electric generator. Wind speed is measured in kilometers per hour (km / h) or meters per second (m / s):  $1 \text{ km / h} \approx 0.28 \text{ m / s}$   $1 \text{ m / s} \approx 3.6 \text{ km / h}$ . Wind energy is proportional to the cube of wind speed. Wind energy  $\propto \frac{1}{2} \rho A t S^3$   $\rho$  - air density,  $A$  - air passage,  $t$  - time period,  $S$  - wind speed.

The force (P) is proportional to the wind energy ("swept surface") passing through the surface per unit time. Wind power  $\propto \frac{1}{2} \rho A S^3$

Wind is characterized by the following indicators: average monthly and average annual velocities according to magnitude and external character gradations on the Beaufort scale; emergency maximum speed is a very important indicator of the stability of the operation of a wind power plant; wind / wind direction - "wind gust", frequency of change of wind directions and force (Fig. 1); turbulence - the internal structure of the air flow, which creates velocity gradients not only in the horizontal but also in the vertical plane; gustiness - a change in wind speed per unit time; atmospheric pressure, temperature, and wind flow density depending on humidity. wind can be a single-phase as well as a two-phase and multi-phase medium containing liquid droplets and solid particles of different sizes, moving at different speeds within the stream.



**Wind models**

a) averaging over time and space, b) variation of wind speed over altitude, c) turbulent wind model a) b) c)  
 Worldwide wind power capacity has increased by 120 GW. Wind power plants generated about 200 billion kWh, which is about 1.3 percent of global electricity. More than 400,000 people are employed in the wind energy industry worldwide. The global market for wind power equipment grew by 36.5 billion euros, or \$ 46.8 billion. 61% of installed wind farms are located in Europe, 20% in North America and 17% in Asia. In 2009, wind power plants in China accounted for 1.3 percent of the country’s total electricity. Since 2006, the PRC has had a law on renewable energy sources. By 2020, wind power capacity will reach 80-100 GW. Environmental aspects of wind energy:

- Waste emissions
- Impact on climate
- Ventilation of cities
- Noise
- Low frequency oscillations
- Radio noise

Wind turbines generate two types of noise:

- mechanical noise (noise of mechanical and electrical parts)
- aerodynamic noise (noise from the interaction of wind current with the mounting blades)

Source of noise	Noise level, dB
The pain threshold of human hearing	120
250 m jet engine turbine noise	105
Jekhammer noise 7 m	95
Truck noise at a speed of 48 km / h at a distance of 100 km	65
Against the background of noise in the office	60
Noise from a passenger car at 64 km / h	55



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Noise from a wind turbine at a height of 350 m	35-45
Against the background of noise in the village at night	20-40

Wind energy, like any other economic sector, must have three mandatory parts that ensure its operation: wind energy resources, wind energy equipment, and advanced wind infrastructure. The source of wind energy for the wind energy industry is almost limitless. The country has a developed centralized power grid and many free zones not occupied by economic entities. Therefore, the placement of wind power plants (WPP) and wind power plants (WPP) is conditioned only by the authorized placement of wind power equipment in appropriate locations. Opportunities to purchase foreign wind technology are very limited due to the lack of a clear choice of equipment for wind turbines and wind power plants that is suitable for the climatic conditions, as well as the sharp opposition of administrative officials in the official energy sector.

The lack of infrastructure for the design, implementation and operation of wind technology and, accordingly, practical experience and qualified personnel can be overcome only through active cooperation with representatives of the developed wind energy infrastructure abroad.

The project capacity in Zarafshan district of Navoi region has increased by 1.5 GW, which will help Uzbekistan achieve its goal of generating up to 3 GW of electricity by 2030 from wind farms. The 500-megawatt HPP in Zarafshan is scheduled to be commissioned by the end of 2024. With this capacity, SES will be able to generate enough electricity to supply 500,000 homes. It will also help prevent the release of up to 1.1 million tons of carbon dioxide into the atmosphere per year.

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