

## Wind turbines as an efficient way to generate electricity

Today, **wind turbines** account for an increasing share of total electricity production. **Renewable wind turbines** are forming a new sector of the economy that is developing rapidly, and **turbines** of this type are being installed in various countries around the world. Among the main advantages of **wind energy** are:

- Free operation of **wind generators**;
- Its ability to constantly recover;
- Compactness of **wind generators** that do not interfere with other activities in the same area;
- Independence from market fluctuations in fuel prices;
- Environmental safety during **wind turbine** operation;
- Potential that can compete with traditional methods of its extraction.

Currently, the issue of integrating wind energy into the general energy supply system is important, and the construction of new **wind turbines** is becoming an urgent need in terms of diversifying energy sources and improving environmental safety. At the same time, **small wind generators** capable of supplying energy to local power supply networks will play an important role in further development.

Experts believe that seasonal fluctuations and insufficient wind power should not affect the efficiency of **wind energy generators**. Secondary **wind turbine generators** used as multipliers help to maximize wind power. They are located at the ends of the rotor wings and rotate by the **wind energy** of the incoming air flow.

New forecasting techniques help to optimize the operation of the main **types of wind turbines**, which can, for example, predict how strong the wind energy will be over a long period of time, from five minutes to seventy-two days. A positive effect can also be given by expanding the area to accommodate more **turbines** that convert **wind energy** into electricity. Operation of a group of **wind turbines** with a total capacity of 350 MW provides for power fluctuations of not more than 10% per hour.

The availability of alternative energy sources, such as a wind farm, helps to solve energy supply problems, such as [charging points](#) for electric cars. You can also use small wind turbines at home.

## The principle of operation of a wind turbine

The operation of the **turbine** is based on the conversion of wind energy into mechanical rotation of the wind wheel. Thanks to the **wind towers**, the wheels are located at a significant height, where **wind energy** is the most optimal for the efficient operation of the **wind turbine**.

How is energy transferred to the generator?

**Wind energy** can be transmitted mechanically, pneumatically, aerodynamically or hydraulically.

There are different **types of wind turbines**. The aerodynamic method involves the use of **secondary wind turbines**. These auxiliary motors are mounted on the ends of the blades and function as multipliers.

There are two main **types of wind turbines** - vertical and horizontal. In the first of them, the axis of the **wind turbine** is located vertically. **Turbine** blades of this type have an arcuate shape. The advantage is that they make the best use of the potential that **wind energy** has, regardless of wind direction.

The **horizontal wind turbine** is attached to the top of the tower. The axis in this case is located horizontally. The **power of the wind turbine** depends on how many blades the rotor has. With a small number of them, the system will rotate faster. The optimal production of wind electricity will depend on the density of contact of the wind flow with the working plane of the blades. Depending on the location of the **wind turbine** relative to the support, **horizontal wind turbines** are divided into leeward and windward.

To make the most efficient use of **renewable wind energy**, a **telescopic mast** with an electromechanical device is used, thanks to which the user can raise the generator to the desired height, where optimal contact with the wind flow will be ensured. This primarily applies to **mini-wind turbines**, which can be installed for individual needs. In the near future, the installation of a makeshift **wind farm** with low capacity will be useful to those who plan to save on traditional sources of electricity. An alternative way to generate electricity should be of interest to frugal owners who plan to spend large amounts of energy on tasks such as maintaining the proper temperature in the [greenhouse](#).

### Factors that affect wind power

The distribution of **wind energy** between different regions and countries of the world is not uniform. The most profitable is the **construction of a wind turbine** on the coast and in the mountains. **Wind power** fluctuations during the year also have a significant effect on **wind turbine power**. When using a **small wind turbine**, it is always possible to compensate for the lack of power in the presence of other sources of electricity. The operation of a large number of **wind turbines** requires better forecasting of their efficiency.

**Wind energy** is considered to be derived from solar energy, because wind currents occur due to uneven heating of the earth's surface. But the accumulation of solar energy directly requires more costs than the commissioning of **wind turbines**, the principle of which is to use **renewable wind energy**. In addition, they occupy a much smaller area than solar panels of the same capacity.

**Wind power** increases if the height at which the **wind turbines** are placed is greater. Therefore, for the effective functioning of the system using **wind towers**, which make up the **wind farm**. The design of the **wind turbine** must be strong enough to withstand the pressure of the air flow and have all the necessary tools to transfer the **energy of wind turbines** from the **turbine** to the consumer.

**Wind turbines** are one of the most environmentally friendly methods of generating electricity, and the share of **wind electricity** in the world in the total amount of electricity produced is constantly growing. The user may not even mention that the usual [wall lamps](#) that illuminate his country house, work at the expense of wind turbines. For this purpose the house **mini-wind generator** will be useful.

### General possibilities of wind energy in the world

According to experts, **renewable wind energy** is considered a virtually inexhaustible source of electricity, which is obtained by installing and commissioning more **wind turbines** and the use of different types of wind turbines.

- What is the power of the available **wind energy** in the world?
- Its total potential is 1011 GW.

Due to this, **wind turbines** are quite capable of replacing other sources of electricity generation, which can be harmful to the environment. **Wind towers** fit very well into the environment and do not interfere with agricultural activities in the surrounding area.

**Renewable wind energy** is available in almost every corner of the globe. You can take advantage of it by installing small and **mini-wind turbines** to solve local problems. To catch the maximum wind force, a **telescopic mast** is used, with which the user has the opportunity to raise the **wind turbine** to the desired height. **Wind turbines** work more efficiently if they make optimal use of surface wind power.

Before you buy a **small wind turbine** for your own use, you should calculate the average annual **wind power** in your area. With a small wind force, the operation of a vertical **turbine** will be effective. But more powerful is a **horizontal wind turbine**, the design of which is quite complex. The convenience of installing a **mini-wind turbine** with a **telescopic mast** is that it has a mechanical height adjustment device. The operation of a **small wind turbine** allows you to use the potential of **wind electricity** for household needs, saving significantly on other energy sources.

The use of **wind turbines** on an industrial scale has its own specifics. In general, such components as:

- The ability of a **wind farm** to supply electricity to large industrial facilities;
- Stability of electricity capacity it generates;
- Integration into the general power supply network;
- Compact location.

The **efficiency of wind turbines** largely depends on the uniformity of the amount of **wind energy** they receive over a period of time. But the force of the wind is not always the same. The **power of the wind turbine** is regulated by changing the angle of attack of the wind on the turbine blade. The capacity of modern **wind turbines** is sufficient to provide electricity to [induction furnaces](#) that smelt and refine metal.

### New wind farm parks and prospects for wind energy

In 2012, the total power level of **turbines** of this type was 282.6 GW. The most powerful **wind farms** are built in Europe, Asia and North America. Leaders in the use of wind turbines to generate safe electricity are Germany, China and the United States. New **wind towers** are being actively built in developing countries, such as India and Brazil.

To predict the **efficiency of wind turbines**, it is desirable to take into account long-term observations of the dynamics of weather and climate change. Operation of **wind turbines** is considered economically justified if the average annual wind power in the area is not less than 5 m / s. The cost of **building a wind turbine** pays off quickly if the **turbines** are able to produce the projected amount of electricity.

What is the prospect of using **wind energy** in Ukraine?

Like other countries, Ukraine implements large-scale electricity generation programs, not least in terms of **wind energy** potential.

The operation of this type of turbines in the coastal area and in the mountains is considered to be the most economically justified. Due to global climate change, the economic potential of this energy source in southern and southeastern Ukraine is growing.

The role of a **small wind turbine**, which is installed using a telescopic mast, should not be underestimated in the household. If desired, the **mini-wind generator** can be made with your own hands, using a conventional [cooler](#), which is one of the parts of a personal computer.

### Secondary wind turbines: principle of application

One of the possible schemes for the transmission of wind energy through the rotor to the consumer is the use of **auxiliary wind turbine generators**, which are placed at the ends of the main rotor. These devices play the role of multipliers. **Wind turbines** use the force of the oncoming wind. It is much more intense than ordinary **wind energy**. This scheme increases the efficiency of the generator, but its complexity does not allow the widespread use of **secondary wind turbines** in practice.

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