

УДК 811.111: 620. 92

O. Poznyak, A. Mileiko

## **Wind Energy**

Belarusian National Technical University, Minsk, Belarus

Wind is the movement of air from an area of high pressure to an area of low pressure. In fact, wind exists because the sun unevenly heats the surface of the Earth. As hot air rises, cooler air moves in to fill the void. As long as the sun shines, the wind will blow. And as long as the wind blows, people will harness it to power their lives.

Ancient mariners used sails to capture the wind and explore the world. Farmers once used windmills to grind their grains and pump water. Today, more and more people are using wind turbines to wring electricity from the breeze. Over the past decade, wind turbine use has increased at more than 25 percent a year. Still, it only provides a small fraction of the world's energy.

Most wind energy comes from turbines that can be as tall as a 20-story building and have three 200-foot-long (60-meter-long) blades. These contraptions look like giant airplane propellers on a stick. The wind spins the blades, which turn a shaft connected to a generator that produces electricity. Other turbines work the same way, but the turbine is on a vertical axis and the blades look like a giant egg beater.

The biggest wind turbines generate enough electricity to supply about 600 U.S. homes. Wind farms have tens and sometimes hundreds of these turbines lined up together in particularly windy spots, like along a ridge. Smaller turbines erected in a backyard can produce enough electricity for a single home or small business [1].

Wind is a clean source of renewable energy that produces no air or water pollution. And since the wind is free, operational costs are nearly zero once a turbine is erected. Mass

production and technology advances are making turbines cheaper, and many governments offer tax incentives to spur wind-energy development [1].

Some people think wind turbines are ugly and complain about the noise the machines make. The slowly rotating blades can also kill birds and bats, but not nearly as many as cars, power lines, and high-rise buildings do. The wind is also variable: If it's not blowing, there's no electricity generated.

Nevertheless, the wind energy industry is booming. Globally, generation more than quadrupled between 2000 and 2006. At the end of last year, global capacity was more than 70,000 megawatts. In the energy-hungry United States, a single megawatt is enough electricity to power about 250 homes. Germany has the most installed wind energy capacity, followed by Spain, the United States, India, and Denmark. Development is also fast growing in France and China.

Industry experts predict that if this pace of growth continues, by 2050 the answer to one third of the world's electricity needs will be found blowing in the wind.

Belarus has no indigenous energy resources (FER). Only 15% of its energy resources cover the needs of the country, the remaining 85% is imported - mainly from Russia. In recent years there has been a constant rise in prices of fuel and imported electricity. This growth will occur and continue until the world price. In this connection, Belarus is extremely important to include in the fuel and energy balance of secondary energy resources and renewable energy sources, one of which is a breeze.

Wind power, like any other economic sector, must have three necessary components, ensuring its functioning:

1. wind energy resources
2. wind energy equipment
3. developed wind power infrastructure.

1 For wind energy resource of wind Belarus is almost unlimited. The country has developed a centralized power grid and a large amount of vacant space not occupied by business

entities. Therefore, the placement of wind turbines (wind power) and wind power stations (WPS) is due only to the suitability of wind power technology for this area.

2. The possibility of acquiring a foreign wind farms is very limited due to lack of choice is the equipment for wind turbines and wind farm, which corresponds to the climatic conditions of Belarus, as well as a powerful anti-responsible administrators of official power.

3. Lack of infrastructure for the design, implementation and operation of wind farms and, consequently, experience and skills can only be overcome in the course of active cooperation with the developed wind-power infrastructure abroad.

For the initial phase of wind energy development in Belarus in 1840 identified areas for construction of single wind turbine and wind farm with a capacity of more than 200 billion kWh (Part Identified in Belarus, a site for wind power - is, basically, the ridge of hills in height from 20 to 80 m with a background wind speed 5 m / s or more, which may be raised from 5 to 20 wind turbines [2].

Most efficiently provided by the use of modern turbines in areas of zones with an average annual background rates of not less than 4,5 m / s on a hilly terrain. These regions are: elevated areas mostly north and north-west of Belarus, the central zone of the Minsk region including adjacent to the west of the district, Vitebsk elevation.

Based on the wind potential only in the Minsk region, there are 1,076 construction sites for placement on each of 3 to 10 wind turbines of the continental home of up to 1000 kW.

#### References:

1. Mode of access:

<http://environment.nationalgeographic.com/environment/global-warming/wind-power-profile/>. – Date of access: 15.04.2016.

2. Mode of access:

[http://www.tycoon.by/english/page/up\\_page\\_2](http://www.tycoon.by/english/page/up_page_2). – Date of access: 15.04.2016.