

Papkova N., Khomenko S.

## **Alternative Energy Potential of the Republic of Belarus**

Belarusian National Technical University  
Minsk, Belarus

For a country which seeks independence the problem of the security of energy supply should be a key question. Reducing conventional energy sources makes today's society use the energy resources much more carefully and efficiently, look for and use alternative energy sources more actively, control climate changes and environmental pollution, etc. Using the latest technologies and innovative approaches is vital for these areas; consequently energy is one of the priorities of science and technology development in most countries inside and outside the EU, including Belarus [1].

Figure 1 shows the structure of primary energy resources for the Republic of Belarus is shown [2].

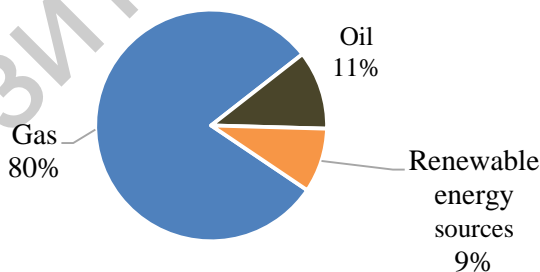


Figure 1 – The structure of primary energy resources for the Republic of Belarus

According to the Figure 1, 91% of all primary energy resources that are used by our power plants are not renewable. Belarus is poorly endowed with fossil fuel sources such as oil

and gas that together are considered to be the main fuel for Belarusian power plants. Therefore, Belarus has to import more than 80% of consumed energy resources, mainly from Russia [1]. Despite the decline in energy intensity of gross domestic product (GDP), energy demand is increasing every year. That is why it is highly relevant to use energy efficient technologies.

The main alternative energy sources in our country are run-of-the-river plants, biogas plants, wind and solar plants.

Hydroelectric engineering in Belarus is represented by 51 hydroelectric power stations in service with a total capacity of 34.6 MW. About 76% of all hydroelectric power stations capacity falls at 23 hydroelectric power stations, a total capacity of which is 26.3 MW [1]. All main and minor rivers in Belarus are used for power generation.

As stated in weather data, in the Republic of Belarus there are 250 overcast days, 85 partly cloudy days and only 30 clear days. The average annual solar energy input on the surface taking into account nights and cloudiness amounts to 243 kcal per 1 cm<sup>3</sup> per day equal to 2.8 kWh per m<sup>2</sup> a day and if we take into consideration energy efficiency rating of 12 % it amounts 0.3 kWh per m<sup>2</sup> a day [3]. Such figures are making solar plants not efficient in the country now. With new technologies efficiency output of solar panels can be increased.

At the moment on the territory of Belarus there are more than 50 wind turbines. They are installed in Grodno, Minsk, Vitebsk and Mogilev Regions. Experts say that windmills will be repaid within five years at an average annual rate of 6–8 m/s [4]. Average design wind speed map at a height of 100 m is shown in figure 2. The areas with the strongest winds are in dark blue colour, the light blue – for the worst conditions. Our wind farm potential is higher than in Germany [2].

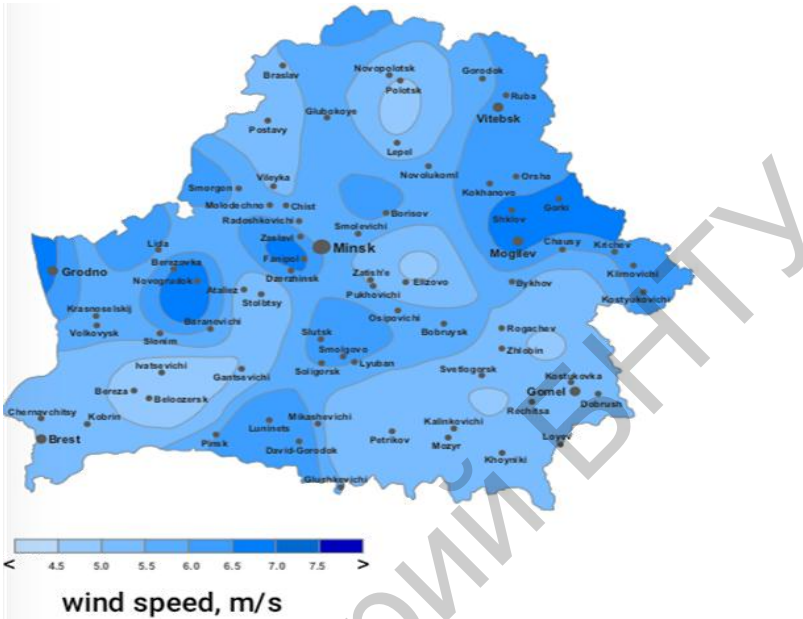


Figure 2 – Average design wind speed at a height of 100 m

Wind power is often criticized that it is not competitive with the conventional forms of energy and it has to be subsidized. However, Belarus has no gas and no significant water resources on its territory and that means that wind energy development is a great contribution to the future of our country. And let's not forget that wind energy is not only renewable but also clean.

According to the Levelised Cost of Electricity (LCOE) method that allows comparing power plants with different power generation and costing structures onshore and offshore wind farms are the cheapest and effective way to produce both electricity and heat [6].

In recent years, much work has been done on including local fuel and energy resources together with renewable energy

sources into the fuel balance. 840 areas for wind turbines placement have been determined on the territory of the Republic of Belarus. Among the inspected areas five of them were selected as priorities which are located in Grodno, Vitebsk and Minsk regions. According to the expert estimation, wind turbines with total capacity of 115 MW can be located in these areas. The unique weather conditions and geographical location of the Republic of Belarus can help our country to reach a high level of energy self-sufficiency.

#### References:

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