

УДК 620.92

## **ALTERNATIVE ENERGY SOURCES IN BELARUS: PROSPECTS AND CHALLENGES**

Vechorko A.Y., student  
Scientific supervisor – Brechko D.S., lecturer  
English language department №1  
Belarusian National University of Technology  
Minsk, Republic of Belarus

Annual energy consumption continues to increase globally, and Belarus exemplifies this trend. Currently, a significant challenge arises from reliance on fossil fuel combustion, which impacts the environment negatively. The adoption of alternative energy sources – wind, solar, biomass, and hydropower – offers a sustainable approach and may enhance efficiency and reduce costs over time. This article examines their utilization in Belarus and their significance.

Belarus possesses forest resources covering approximately 40% of its territory, providing a foundation for biomass utilization. These forests supply wood, emphasizing the role of lignocellulosic materials and peat in the energy sector. Numerous residential buildings and small-scale power facilities use wood and peat for heat and electricity generation. According to the results of 2024, the total installed biomass capacity in Belarus reached 77.2 MW. Biomass serves as the primary alternative energy source, constituting a significant share of the renewable energy supply.

Hydropower demonstrates significant potential for energy production. However, the use of river systems for electricity generation in Belarus is limited by the predominantly flat topography. As of January 1, 2025, organizations under the Ministry of Energy operate 24 hydroelectric power plants with a total installed capacity of 88.355 MW. As of 2024, the supply of electricity to the RUP-Oblenergo grid amounted to 14.7 million kWh; however, the construction of large-scale dams remains challenging due to geographical and infrastructural factors [1].

Wind energy development in Belarus is progressing, although the availability of sufficient wind resources remains suboptimal. As of January 1, 2025, organizations under the Ministry of Energy operate one wind power station with an installed capacity of 9 MW (comprising 6

wind turbines of 1.5 MW each). Nevertheless, wind variability limits operational consistency. The technical potential for wind energy is substantial, estimated at 300-400 billion kWh per year; though economic feasibility is undermined by insufficient wind speeds. As of 2024, the total installed wind power capacity reached 117.9 MW, representing an initial phase of development in this sector.

Solar energy, generated by photovoltaic panels that convert sunlight into electricity, is a renewable resource gaining increasing importance. By the end of 2024, the capacity of solar installations in Belarus reached 273 MW. Despite the environmental advantages of solar energy, its widespread use is hindered by high costs and reliance on weather conditions. Future innovations may allow Belarus to enhance the efficiency or lower the costs of solar panel technologies.

The government of Belarus actively supports the expansion of renewable energy. On September 18, 2019, the Decree on Renewable Energy Sources was enacted, establishing preferential tariffs for enterprises generating electricity from renewable resources. Additionally, the nuclear power plant in Ostrovets, operational since 2020, contributes to emission reductions compared to fossil fuel alternatives, despite not being classified as a renewable source [2].

Shifting to alternative energy demands considerable funding, with potential risks outweighing the advantages. The energy infrastructure requires upgrades, as many alternatives fall short of fossil fuels' efficiency due to environmental constraints.

This shift may reduce Belarus's energy import reliance and improve environmental conditions long term, representing an initial step toward sustainability. Future innovations may enhance this strategy. International cooperation could further accelerate the adoption of advanced renewable technologies.

## References

1. On Renewable Energy Sources: Decree № 357 of 18 September 2019 // President of the Republic of Belarus. – URL: <https://president.gov.by/ru/documents/ukaz-357-ot-18-sentjabrja-2019-g-22079> (date of access: 18.03.2025).
2. Renewable Energy Sources // BelEnergo. – URL: <https://www.energo.by/content/investoram/vozobnovlyaemaya-energetika/> (date of access: 18.03.2025).