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DOI <https://doi.org/10.30525/978-9934-26-388-0-9>

**STUDY OF THE KEY INTERRELATIONSHIPS AND DYNAMICS
OF THE IMPACT OF GLOBAL TRENDS ON THE SPEED
AND DIRECTIONS OF DEVELOPMENT OF RENEWABLE
ENERGY SOURCES IN THE WORLD
AND IN UKRAINE IN PARTICULAR**

**ДОСЛІДЖЕННЯ КЛЮЧОВИХ ВЗАЄМОЗВ'ЯЗКІВ
ТА ДИНАМІКИ ВПЛИВУ ГЛОБАЛЬНИХ ТЕНДЕНЦІЙ
НА ШВИДКІСТЬ ТА НАПРЯМИ РОЗВИТКУ
ВІДНОВЛЮВАЛЬНИХ ДЖЕРЕЛ ЕНЕРГІЇ
В СВІТІ ТА В УКРАЇНІ ЗОКРЕМА**

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The problem is the need to ensure sustainable energy development and reduce dependence on traditional sources.

The study identifies promising opportunities and strategic challenges that arise in connection with global changes in the field of renewable energy sources, in particular, taking into account the Ukrainian context.

The main goal is to identify and analyze the relationships between global trends and the development of renewable energy sources, as well as to formulate recommendations for effective implementation in Ukraine.

Energy is a fundamental and strategically important basis for the full-fledged balanced development of modern civilization. The energy sector of the economy contributes to the increase of the greatest value for humanity – the increase of individual freedom. Today, democratic civilized states have chosen the path of development of their economy based on the development of renewable energy, that is, energy based on the use of renewable sources and resources.

HPP. In many countries, hydropower plants form the basis of the energy industry and bear almost the entire main load. So, according to various sources, Norway receives 98% of electricity from water, 95% – Brazil, 80% – Spain, 69.7% – Iceland. The production of electricity from solid biofuel provided 6.4% of the total global production of renewable electricity in 2022. The leader of such production is the USA – 45.6 TWh, which is 6.1% of the generation of renewable energy in the country. In 2022, the amount of electricity produced from biogas in developed European countries equaled 79.5%. Only Germany produced 33.9 TWh. The second largest producer is the USA with a 2022 figure of 13.1 TWh. Italy is followed by 8.2 TWh, and Great Britain – 7.2 TWh.. In addition to these main sources of renewable electricity, geothermal energy (USA, New Zealand, Turkey, Italy, Iceland), solar thermal energy (USA, Spain, Australia), renewable municipal waste is also used in the world (Netherlands, Luxembourg, Belgium), tidal energy (France, Canada and Great Britain) [1].

In 2021, the highest level of renewable electricity production was provided by hydroelectric power plants and hydroelectric power plants – 6,048.2 MW, solar power plants – 4,925 MW, and wind power plants – 1,170 MW. According to the Ukrainian Renewable Energy Association, since 2010, 12.3 billion dollars have been invested in the renewable electricity production industry in Ukraine. USA. 2020 and 2021 were the record-breaking years for investments: 2.4 and 4.1 billion dollars were involved in the construction of new facilities, respectively.

In 2021, 1.4 billion dollars were invested in new RES facilities. In the energy complex of Ukraine, hydroelectric power plants occupy the third place after thermal and nuclear power plants. Today, 60% of the potential of hydropower is used mainly at the expense of the Dnieper Cascade and other large hydropower plants. The six most powerful hydroelectric power plants in Ukraine are: Dniprovskaya HPP (1,569 MW), Kremenchuk HPP (686.4 MW), Kanivskaya HPP (444 MW), Kyiv HPP (408.4 MW), Middle Dniro HPP (352 MW), Kakhov HPP (351 MW). Ukraine has a significant potential for using the resources of small rivers, which is almost 28% of the total hydro potential of all rivers of Ukraine. The most powerful in Ukraine are five small hydroelectric power stations: Kasperivskaya HPP (7.5 MW), Ladyzhynskaya HPP (7.5 MW), Hayvoronskaya HPP (7.1 MW), Hlybochanska HPP (6.13 MW), Oskolskaya HPP (3 .68 MW) [2].

Solar energy. Solar energy is developing rapidly in Ukraine. Ukraine ranks seventh among European countries in terms of the rate of development of solar energy. The share of SES in the total generation of Ukraine in 2021 was about 20%. The most powerful solar power plants of Ukraine: Pokrovsky Solar Power Plant (240 MW), Nikopol Solar Power Plant (200 MW), Yavoriv-1 Solar Power Plant (72 MW), Kamianets-Podilskyi Solar Power Plant (63.8 MW), Tokmak Solar SPP Energy (50 MW). Solar power plants in private households began to be implemented at a rapid pace in Ukraine. If at the end of 2017, only about 3 thousand families switched to solar panels, then by the end of 2021 – almost 30 thousand families. Together, they generate 900 million kWh. electricity. The amount of investments in domestic SPPs is 600 million euros. Dnipropetrovsk Oblast – 4,184, Ternopil Oblast – 2,512, and Kyiv Oblast – 2,350 are the leaders in terms of the number of SES installed by households.

Wind energy. Thanks to its natural and climatic features, Ukraine has a significant potential for the use of wind energy, which the Carpathians, the coasts of the Azov and Black seas have. Today, the largest producer of wind energy in Ukraine is Wind Power, a subsidiary of DTEK. Its Botievskaya wind farm, located in the Zaporizhzhia region, is the largest in Ukraine. On the second and third places are "Wind Park Novoazovskyi" and "Wind Park Ochakivskyi", which consists of the Dmitrivskaya and Tuzlivskaya wind farms.

Bioenergy. Also, one of the most promising directions in Ukrainian renewable energy is the production of solid biofuel. The most powerful thermal power plant in Ukraine, which operates on solid biofuel and provides electric and thermal energy to one of the districts of the Kyiv region, belongs to Biogazenergo LLC. The development of renewable energy in the world is facilitated by the introduction of "green" tariffs and "green" electricity auctions in many countries and in Ukraine [3].

The USA, China, Germany, Japan and India remain the world leaders in implementing "green" tariffs. Renewable energy facilities in Ukraine received the right to use the "green" tariff in 2009. As of January 1, 2021, the installed capacity of RES facilities in Ukraine operating under the "green" tariff is 8.5 GW. Today, there are about 148 planned and already implemented projects in the world to replace the use of fossil fuels and fully transition to renewable energy. The countries of the European Union stimulate the transition to the widespread use of RES, impose restrictions and additional fees on traditional types of generation, and introduce environmental taxes. Like European countries, Ukraine is gradually switching to renewable energy sources. In particular, in the Energy Strategy of Ukraine for the period until 2035 "Security, energy efficiency, competitiveness" it is predicted that the share of renewable energy will grow to the level of 12% by 2025 and at least 25% by 2035.

Conclusions. Today, renewable energy is one of the most promising areas of development of the global energy system. In the countries of the world and in Ukraine, there is a positive trend towards more intensive use of renewable energy sources. However, the main problems on the way to the complete transition of countries to RES remain the high capital intensity of projects, the imperfection of the legislative framework, and the lack of necessary financing. Therefore, it is necessary to improve legislation, develop measures to improve the investment climate in countries, and promote the implementation of effective investment projects in renewable energy.

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POWER DISTRIBUTION OF AN INDUCTION MACHINE IN MOTOR AND GENERATOR MODES OF OPERATION

РОЗПОДІЛ ПОТУЖНОСТЕЙ АСИНХРОННОЇ МАШИНИ У ДВИГУННОМУ ТА ГЕНЕРАТОРНОМУ РЕЖИМАХ РОБОТИ

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При побудові асинхронного генератора на базі асинхронного двигуна загальнопромислового призначення постає питання допустимої по тепловому навантаженню потужності, що може виробляти асинхронна машина у генераторному режимі роботи [1].