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RENEWABLE ENERGY AS A TOOL FOR REBUILDING UKRAINE'S DESTROYED ENERGY INFRASTRUCTURE

The article examines the role of renewable energy as one of the key tools for restoring the critically important infrastructure of Ukraine, destroyed as a result of armed aggression. The relevance of the development of renewable energy sources (hereinafter – RES) in modern conditions, when the restoration of the energy system should take place not only taking into account the urgent need for reconstruction, but also in accordance with the principles of sustainable development and ensuring the energy independence of the state, is substantiated. The article analyzes the current state of legal regulation in the field of renewable energy, and identifies problematic aspects of the functioning of legislative and economic mechanisms for supporting RES in the conditions of martial law. A key problematic aspect is the lack of a coherent state strategy for post-war reconstruction for the effective integration of RES, taking into account the standards of the European Union. The author focuses on the significant scale of destruction of energy infrastructure facilities, their impact on the socio-economic development of territories and the possibilities of integrating RES into the reconstruction process.

The author analyzes the potential of various forms of renewable energy sources, namely: solar, wind, bioenergy in providing decentralized electricity generation for communities, which allows minimizing the risks of energy dependence and increasing the sustainability of critical infrastructure. Legal and economic incentives for RES development, including investment mechanisms, grant programs and international support opportunities, are considered separately.

The article outlines the main challenges of the development of renewable energy during martial law and post-war recovery, including: insufficient investments, difficulties with equipment logistics, legal conflicts and threats to energy security. Directions for improving the regulatory framework capable of promoting the integration of RES into state recovery programs are proposed. It was concluded that renewable energy can and should become a strategic factor not only for liquidation

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Key words: *renewable energy, renewable energy sources, administrative and legal regulation, administrative law, energy infrastructure, energy security, restoration of destroyed energy infrastructure, post-war reconstruction of energy infrastructure.*

Гуржій Т. О. Відновлювана енергетика як інструмент відновлення зруйнованої енергетичної інфраструктури України

У статті досліджено роль відновлюваної енергетики як одного з ключових інструментів відновлення критично важливої інфраструктури України, зруйнованої внаслідок збройної агресії. Обґрунтовано актуальність розвитку відновлюваних джерел енергії (далі – ВДЕ) у сучасних умовах, коли відновлення енергосистеми має відбуватися не лише з урахуванням термінової потреби у відбудові, а й відповідно до принципів сталого розвитку та забезпечення енергетичної незалежності держави. У статті проаналізовано сучасний стан правового регулювання у сфері відновлюваної енергетики, та визначено проблемні аспекти функціонування законодавчих і економічних механізмів підтримки ВДЕ в умовах воєнного стану. Ключовим проблемним аспектом є відсутність узгодженої державної стратегії післявоєнної відбудови з ефективної інтеграції ВДЕ з урахуванням стандартів Європейського Союзу. Автор акцентує увагу на значних масштабах руйнування об'єктів енергетичної інфраструктури, їхньому впливі на соціально-економічний розвиток територій та можливостям інтеграції ВДЕ в процес відбудови.

Автор аналізує потенціал різних форм відновлюваних джерел енергії, а саме: сонячної, вітрової, біоенергетики у забезпеченні децентралізованої генерації електроенергії для громад, що дозволяє мінімізувати ризики енергетичної залежності та підвищити стійкість критичної інфраструктури. Окремо розглянуто правові та економічні стимули для розвитку ВДЕ, включно з інвестиційними механізмами, грантовими програмами та можливостями міжнародної підтримки.

У статті окреслено основні виклики розвитку відновлюваної енергетики у період воєнного стану та післявоєнного відновлення, серед яких: недостатність інвестицій, складності з логістикою обладнання, правові колізії та загрози енергетичній безпеці. Запропоновано напрями вдосконалення нормативно-правової бази, що здатні сприяти інтеграції ВДЕ у державні програми відновлення. Зроблено висновок, що відновлювана енергетика може і повинна стати стратегічним чинником не лише для ліквідації наслідків руйнувань, але й для побудови нової, більш стійкої та незалежної енергосистеми України.

Ключові слова: *відновлювана енергетика, відновлювані джерела енергії, адміністративне-правове регулювання, адміністративне право, енергетична інфраструктура, енергетична безпека, відновлення зруйнованої енергетичної інфраструктури, післявоєнна відбудова енергетичної інфраструктури.*

Introduction. Today, Ukraine faces unprecedented challenges in the field of energy as a result of large-scale armed aggression on the part of Russia, which caused significant destruction of the energy infrastructure. In such conditions, renewable energy is considered not only as an additional source of energy, but also as a strategic tool for ensuring a decentralized and reliable energy supply.

Legal regulation of renewable energy in Ukraine is carried out on the basis of the Law of Ukraine «On Alternative Energy Sources» №555-IV of 2003 [1], which defines the basic principles of the development of this industry. An important element is the addition to this Law regarding the regulation, restoration and stimulation of the «green» transformation of the energy system of Ukraine. Terminology and creation of prerequisites for stimulating the development of RES and ensuring their integration into the energy system have been introduced [2]. At the same time, the scale of destruction of Ukraine's infrastructure requires adaptation of legislative mechanisms, simplification of permit procedures and expansion of opportunities for local communities in the conditions of war and post-war recovery.

Official reports of the State Energy Efficiency Agency for 2022–2024 demonstrate the preservation of positive dynamics of RES development, despite military actions. Attention is focused on the importance of solar and wind energy development, which can ensure the autonomy of communities and critical facilities such as: hospitals, educational institutions, water supply systems. In the report on the implementation of measures for the first half of 2025, provided for in the Annual Work Plan of the National Commission for State Regulation in the Energy and Utilities Sectors for 2025, an audit was carried out regarding the compliance of the information entered in the register of guarantees of origin by users of the register of guarantees of origin, to ensure the functioning of the register of guarantees of origin and creation of accounts, termination/restoration of access to the accounts of the register of guarantees of origin of electric energy, produced from renewable energy sources. The functioning of the register of guarantees of the origin of electric energy produced from renewable sources demonstrates the gradual formation of a transparent and reliable accounting system for «green» of electricity in Ukraine. In the first half of 2025, guarantees of origin were issued: for December 2024 – 899 225; for January 2025 – 892 945; for February 2025 – 1,159,316; for March 2025 – 1,130,022; for April 2025 – 1,481,015; for May 2025 – 1,553,740. A number of resolutions of the NCRECP «On the creation of accounts in the register of guarantees of the origin of electric energy produced from renewable energy sources» were adopted. As a result, in the first half of 2025, 46 new accounts were created in the register of guarantees of origin of electric energy produced from renewable energy sources, and their total number reached 1113 [3].

The adoption of the relevant resolutions of the NCRECP created regulatory and legal prerequisites for the development of renewable energy and the effective functioning of the register of guarantees of the origin of electric energy produced from renewable energy sources.

Therefore, the study of legal approaches to the integration of renewable energy into the process of infrastructure restoration as a component of the state policy of post-war reconstruction, which ensures energy security, economic efficiency and compliance with environmental standards, is relevant.

Setting the task. The purpose of the article is to study the main aspects of the process of renovation of the energy system through the energy transition to sources of renewable energy and to identify possible tools for the restoration of the destroyed energy infrastructure of Ukraine.

Research results. In Ukraine, one of the key ways to guarantee energy security is to ensure the development of renewable energy. Renewable energy generation plays an important role as it reduces dependence on fossil fuels, reducing greenhouse gas emissions and conserving natural resources for future generations. In the conditions of martial law and post-war recovery, RES can become a key element in the energy system of Ukraine.

Renewable energy sources play a key role in the fight against climate change, as they are a reliable and long-term source of energy that can be produced from alternative energy sources such as solar, wind, water or biomass. Facilities for decentralized electricity generation using RES have significant potential to enhance the energy security and resilience of critical infrastructure of the State.

A full-fledged energy transition based on the widespread use of RES has significant potential to solve the problems associated with the restoration of Ukraine's destroyed energy infrastructure. This process involves the modernization and transformation of energy systems, increasing energy efficiency and implementing innovative technologies in order to minimize the negative impact on the environment. The main goal of the energy transition is to ensure a sustainable energy future by reducing carbon emissions and increasing the share of energy from renewable sources. According to Art. 3 and 5 of the Law of Ukraine «On Alternative Energy Sources», the state policy in the field of alternative energy sources is aimed at: ensuring energy security at the expense of energy produced from alternative sources and attracting investments and support in the field of alternative energy sources to promote the sustainable development of renewable energy [1]. State regulation in this area is carried out by approving and introducing norms and rules for the production, transportation, supply, storage and consumption of energy produced from alternative sources, as well as confirming the origin of electric energy produced from renewable energy sources, which formulates the legal prerequisites for the integration of RES into the infrastructure of Ukraine.

In particular, Art. 16[1] of the Law of Ukraine «On the Regulation of Urban Planning Activities» provides for the implementation of a strategic environmental assessment for the approval of a comprehensive plan for the spatial development of the territory of the territorial community. This requirement is a key tool for sustainable development and coordination of infrastructure projects, in particular renewable energy facilities such as solar and wind plants, biogas complexes, energy storage systems. Conducting a strategic environmental assessment will ensure balanced and standardized use of territories for communities, businesses and investors, taking into account national and European requirements of «green» energy [4].

In this regard, we consider it necessary that, when developing and approving comprehensive spatial development plans for the territories of territorial communities, the prospects for the development of the infrastructure of renewable energy sources were taken into account, ensuring their alignment with the requirements of the strategic environmental assessment.

According to Art. 6 of the Law of Ukraine «"On Road Traffic»" defines that the competence of city councils and their executive bodies in the field of road traffic includes: determination of ways to stimulate the use of electric buses, electric wheeled vehicles and other ecological modes of transport [5]. From the analysis of this norm, it can be concluded that local self-government bodies are empowered to provide transport infrastructure, in particular, to create conditions for the spread of electric mobility and reduce harmful emissions.

Despite the presence of numerous normative legal acts in the field of renewable energy, legal regulation in Ukraine must constantly take into account changes in the political and economic life of the country. In other words, the legislation should be regularly updated and effectively respond to the current needs of the participants of this energy sector.

The state is taking the necessary legislative initiatives to create legal mechanisms for the integration of RES into the transformation of the energy sector and recognizes the importance of stimulating energy-efficient and «green» technologies that contribute to the reduction of greenhouse gas emissions through the use of RES. Responsibility is assigned to state authorities for the implementation of stimulation of the development of renewable energy, namely: the Ministry of Energy of Ukraine, the Ministry of Development of Communities and Territories of Ukraine and the State Agency for Energy Efficiency and Energy Saving of Ukraine. Within 2021-2023, provision was made for the removal of administrative barriers and the introduction of state support programs aimed at the development of charging infrastructure for electric vehicles, as well as the creation of a legislative framework for increasing the number of electric vehicles and the corresponding charging infrastructure [6]. The results of a joint study by the Representation of the Foundation named after. Heinrich Böll and the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine established that in the event of the implementation of a target policy for the development of renewable energy, under the condition of the Revolutionary scenario, Ukraine's «energy transition has the potential of transitioning the energy sector by 2050 to provide 91% of final energy consumption through the use of renewable sources [7, p. 7].

Russia's military aggression against Ukraine has caused significant destruction of Ukraine's critical infrastructure, including power plants, bridges, railway stations and transport hubs. The restoration of these facilities requires state support and is one of the priorities of post-war reconstruction. Despite significant losses in both full and partial energy infrastructure, Ukraine continues to attract international investment to rehabilitate affected energy facilities. Therefore, post-war reconstruction is a priority for Ukraine and should be consistent with the direction of transformation in which the European Union and the member states of the European Union are moving.

A 2023 report by the Ministry of Energy of Ukraine stated that the total volume of Component 3 Loan №8462-IIA is US$2.5 million. Funds are earmarked to finance consultancy services, in particular by individual consultants and consultancy companies. Although the Procurement Plan of Component 3 of the Second Electricity Transmission Project did not change in 2022 after the start of Russia's military aggression, the terms of reference of the consultation works were revised taking into account the new conditions. In 2023, two tasks were added to the Procurement Plan: an

expert on the preparation and implementation of energy rehabilitation projects and an analyst on energy infrastructure restoration, aimed at restoring facilities damaged during military attacks by the aggressor country [8].

In June 2024, the Platform of Action for Green Recovery in Ukraine was presented. This platform aims at the green recovery of Ukraine, integrating economic and environmental expertise into the recovery process, focusing on the necessary framework conditions in regulations and finance to promote green recovery [9].

In addition, the National Renewable Energy Action Plan for the period until 2030 and the plan of measures for its implementation, approved by the order of the Cabinet of Ministers of Ukraine dated August 13, 2024 № 761-r, define a comprehensive approach to the integration of RES into the energy system and infrastructure. The document aims to meet the requirements of Directive (EU) 2023/2413 on the promotion of renewable energy and the approval of development plans for the relevant zones, as well as zones for the development of network infrastructure and energy storage installations. [10].

In particular, the Plan envisages the following key goals for the implementation of energy efficiency in infrastructure:

- extension until January 1, 2026 of the period of preferential connection of energy storage installations to electrical networks (p. 18 of the Plan);
- implementation of a coordinated identification of zones for renewable energy development for the installation of renewable energy facilities and associated separate infrastructure zones for energy storage networks and installations (para. 21 of the Plan);
- development of action plans for the creation of separate infrastructure zones for the development of energy storage networks and installations (p. 23 of the Plan);
- development of the concept of state policy in the field of infrastructure development of charging stations for electric vehicles and a plan of measures for its implementation (p. 32 of the Plan) [10].

Thus, the National Renewable Energy Action Plan for the period until 2030 establishes the regulatory and organizational principles of state support for the development of network infrastructure, energy storage systems and charging stations for electric vehicles, ensuring the integration of national energy policy into the European legal space.

In addition, it is advisable to conduct research on new projects and potential ideas that can be implemented for the development of Ukraine's infrastructure in the field of renewable energy. This will allow not only the rehabilitation of destroyed sites, but also the introduction of modern, efficient and environmentally sound technologies.

For the quick and sustainable restoration of energy supply in Ukraine, which suffered significant damage as a result of Russia's invasion, it is possible to use it with the help of renewable energy sources. Taking into account the destruction of the energy infrastructure due to the missile attacks of the aggressor country in recent years, it is necessary to increase the share of energy from renewable sources, which will contribute to stable energy supply, restoration of the economy and industry of Ukraine.

Renewable energy development also promotes international cooperation. European countries exchange experiences, technologies and resources, strengthening global relations and accelerating the energy transition. Investing in renewable energy technologies opens wide prospects for the country's economic recovery. This will strengthen energy security, provide the basis for sustainable economic growth, and make a significant contribution to the fight against climate change and the implementation of global decarbonization goals.

Energy storage technologies play a key role in the transition to RES, but the high cost of energy storage system installations significantly complicates the implementation of RES. In this connection, there is an objective need for legal regulation of mechanisms for State support for such installations, through incentive tariffs and tax incentives. Such measures will contribute to the attraction of international investments, as well as ensure the development of renewable energy.

The reconstruction of Ukraine's energy infrastructure should take into account the strategic goals of the European Union and economic and environmental needs. Among the key criteria for the restoration of Ukraine: ensuring energy independence, creating an infrastructure more resistant to military attacks through decentralization, stimulating international investment and reducing emissions to achieve climate neutrality.

Conclusions. Renewable energy should become one of the key elements of the reconstruction of the destroyed infrastructure of Ukraine. Promoting the development of RES at the community level, ensuring the stability of tariff policy and attracting international investments are key steps for the formation of a sustainable, independent and ecological energy system of Ukraine.

The legal framework already lays down the necessary preconditions, but requires improvement in accordance with the conditions of the war and post-war periods. At this stage, planning for the post-war reconstruction of Ukraine should focus on key goals and defining a framework for reconstruction. The implementation of a number of reforms as part of the post-war reconstruction of the country is a necessary step towards full membership in the European Union.

In addition, financial and investment risks remain significant. Although the state allocates funds for the restoration and development of RES, large-scale needs exceed available resources, and the instability of the economic and political situation increases uncertainty for business and international partners.

Summarizing, Ukraine's biggest challenges in the field of RES today are related to the destruction of infrastructure, limited network and storage capabilities, the need to adapt legislation and the lack of funding for the large-scale development of «green» energy. Addressing these challenges is critical to ensuring the country's energy independence and sustainable recovery.

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