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**ЗЕЛЕНА ЕНЕРГЕТИКА ЄВРОПЕЙСЬКОГО СОЮЗУ:
РИЗИКИ ТА МОЖЛИВОСТІ ДЛЯ УКРАЇНИ¹**
(науково-дослідна стаття)

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Проаналізовано стан та мотиви розвитку зеленої енергетики Європейського Союзу. З’ясовано рівень та темпи вдосконалення сфери відновлювальної енергетики в Україні. Описано критичні наслідки російської агресії для українського енергетичного сектору. Визначено перспективи та ризики для України, сформовані європейськи-

¹ Фінансується Європейським Союзом. Проте висловлені погляди та думки належать лише авторам і не обов’язково відображають погляди Європейського Союзу чи Європейського виконавчого агентства з питань освіти та культури. Ні Європейський Союз, ні грантодавець не можуть нести за них відповідальність. Номер проекту: 101047462 – EUSTS – ERASMUS-JMO-2021-HEI-TCH-RSCH.

ми трендами та проблемами в сфері енергетики. Розглянуто роль залучення України до Європейського зеленого курсу, програм “Горизонт 2020”, “EU4Energy” та “INOGATE”. Наголошено на негативному впливі енергетичної залежності Європи від Москви та окреслено шлях подолання такого виклику. Виокремлено основні компоненти плану REPowerEU та Стратегії зовнішньої енергетичної взаємодії ЄС 2022 року, де зазначено, що короткостроковою ціллю Організації є нівелювання впливу В. Путіна, яким він користується завдяки наявності значних енергетичних ресурсів. Проаналізовано прогнозовані зміни в енергетичному ландшафті, зумовлені переходом ЄС та України на відновлювальні джерела енергії. Зроблено висновок про неоднозначність впливу процесів зеленої енергетики та “зеленої” політики ЄС для України, яку потрібно регулювати спільно з Європейським Союзом.

Ключові слова: *Європейський Союз, зелена енергетика, Європейський зелений курс, відновлювальні джерела енергії.*

**EUROPEAN UNION GREEN ENERGY:
RISKS AND OPPORTUNITIES FOR UKRAINE²
(Research Article)**

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The article analyzes the state and motives for the development of green energy in the European Union. The level and pace of improvement in the field of renewable energy in Ukraine has been found out. The critical consequences of Russian aggression for the Ukrainian energy sector have been described. Prospects and risks for Ukraine, shaped by European trends and problems in the field of energy, have been identified. The role of Ukraine’s involvement in the European Green Deal, Horizon 2020, EU4Energy and INOGATE programs has been considered. The negative impact of Europe’s energy dependence on the Russian Federation has been emphasized and the way to overcome such a challenge has been outlined. The main components of the REPowerEU plan and the 2022 EU Strategy for an EU external energy engagement, where it is

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stated that the EU's short-term goal is to neutralize Putin's influence, which he uses due to the presence of significant energy resources, have been highlighted. The predicted changes in the energy landscape caused by the transition of the EU and Ukraine to renewable energy sources have been analyzed. A conclusion about the ambiguity of the impact of green energy processes and EU "green" policy for Ukraine, which needs to be regulated together with the European Union, has been made.

Key words: *European Union, green energy, European Green Deal, renewable energy sources.*

Relevance of the topic. Nowadays green energy development is one of the most popular energy trends, which involves the use of renewable energy sources. Following this trend, the world community is also moving in the direction of preserving our planet, fighting the climate crisis. This interrelationship of processes is certainly confirmed by statistical calculations: the energy sector is responsible for approximately $\frac{3}{4}$ of greenhouse gas emissions.

As of now, there is a sufficiently developed international legal framework for the regulation and extensive reduction of greenhouse gas emissions. These include, in particular, the Kyoto Protocol, which was replaced by the 2015 Paris Climate Agreement, the 2019 European Green Deal, energy charters and strategies. Among all obligations and potential mechanisms, an important role is given to the development of green energy.

The European Union is considered to be the leader in the production of green energy, which has ambitious goals in this regard. Taking into account the fact of Ukraine's active integration into the European space, in particular, Ukraine's acquisition of the status of a candidate for EU accession, the issue of the development of EU green energy, as well as the risks and opportunities it poses for Ukraine, becomes relevant for research. The context of modern events, in particular the waging of a full-scale war by the Russian Federation against Ukraine, once again confirms the thesis that energy is important both as an internal resource and as a geopolitical lever. Since the renewable energy of the EU is now considered an alternative to the import of Russian energy carriers, this makes the consideration of the impact of green energy of the EU member states on international processes and the security situation in Ukraine even more relevant.

The purpose of the article is to identify and analyze the risks and prospects that the development of green energy in the European Union creates for Ukraine.

Objectives: 1. To analyze resource availability in the field of renewable energy of EU member states and Ukraine. 2. To outline the risks provoked by the challenges in the European "clean" energy market. 3. To analyze the opportunities that the development of EU green energy opens up for Ukraine.

The level of the problem research. The identification of opportunities and threats that Ukraine

faces in connection with the development of green energy in the European Union is of particular interest to Ukrainian analysts, including N. Bobytskyi (2022), O. Moroz (2022), V. Nedashkivskyi (2022), S. Shukaev and O. Sulema (2020). Foreign researchers also focus their attention on the transformation of EU energy policy, the energy transition of the Union's member states, and the interrelationship of these processes with the development of the energy market of Ukraine [Lanoszka, Rogers & Triglavcanin 2022; Jonushka, Klimanskis, Coyala & Lyutvinskas 2016; Osička & Černoch 2022; Eichner & Pethig 2019; Cengiz & Kutlu 2021; Hainsch, K. Löffler, T. Burandt, H. Auer, P. Crespo del Granado, P. Pisciella & S. Zwickl-Bernhard 2021]. However, in the scientific field, there is a lack of comprehensive research on the impact of EU green energy on Ukraine, in particular on its energy security, economy and the European space integration.

Main trends of EU energy policy. The European Union's energy policy went through several key stages on its way of development and transformation, at each of which new challenges arose to be overcome. The formation of the dependence of European states on the supply of energy resources and, ultimately, the awareness of the negative consequences of the use of traditional energy sources gave an important impetus to the development of renewable energy by European countries [Kopiika, Makovskyi, Myronova 2021].

The European Union's course on green energy is determined by strategic, environmental and domestic political considerations. In a strategic context, a significant advantage of renewable energy sources is their availability, which opens up significant prospects for energy self-sufficiency, which contributes to strengthening the energy security of the European Union. Environmental considerations regarding green energy are focused on the aspect of improving the environmental situation on the continent, and in the world in general. Here, the role of "unconventional" energy is to reduce anthropogenic pressure on the environment. Among domestic political motives, the popularity of environmental topics in the media space, which worries Europeans, should be singled out. Accordingly, the implementation of such a policy is aimed at maintaining the support and trust of citizens. In addition, the formation of the environmental agenda is actualized by the institutionalization of the special role of environmental protection organizations and the activation

of “green” parties within the EU, which promote the idea of greening the energy sector [Копііка, Makovskyi, Myronova 2021].

The European Union is actively moving towards a zero-carbon future. Europe has already exceeded its 2020 renewable energy targets, according to official statistics. On average, EU member states get 22 % of their energy from renewable sources, which is two percentage points higher than the 2009 target. Among the member states of the Union, Sweden has the highest share of renewable energy sources (60 %). The country also topped the 2021 Energy Transition Index, which measures how well a country is doing in the energy transition, taking into account current conditions and the country’s readiness to adopt renewable energy sources. Apart from Sweden, the EU countries with the largest share of renewable energy sources include Finland (44 %), Latvia (42 %), Austria (36.5 %) and Portugal (34 %). Within the Union, Malta (10.7 %) and Luxembourg (11.7 %) have the smallest share of “unconventional” energy sources [Broom 2022].

The development of green energy in Ukraine.

The successful attraction of about 10 billion euros of investments in green energy, which lasted for several years in Ukraine, helped the state to reach the leading positions of individual ratings. Therefore, according to the pace of development of renewable energy in 2019, Ukraine entered the top 10 countries in the world, and in 2020 – among the top 5 countries of Europe according to the pace of development of solar energy. At the beginning of 2022, the total capacity of Ukrainian renewable energy facilities was 9.656 MW [Nedashkivskyi 2022].

According to the Energy Transition Index, Ukraine took 91st place among 115 countries (2021), scoring 45.5 points out of 100 according to the criterion of readiness for the transition to green energy. This indicates the importance of solving the problematic moments of such a transition for Ukraine [Fostering 2021].

Ukraine intends to dynamically move in the direction of clean, safe and sustainable energy. However, on February 24, 2022, the Russian Federation launched a full-scale war against Ukraine, which made adjustments to the plans for the development of green energy in the country. First of all, due to the military actions of the Russian side, some wind and solar power plants and bioelectric power plants were damaged or destroyed, and some of them are located in the occupied territories without the possibility of their exploitation by the Ukrainian side. However, the Ukrainian authorities do not abandon their course on the energy transition and are looking for various options for its implementation.

One of the most ambitious programs of the European Union, for which the development of green energy is of great importance, is the European Green

Deal (EGD), approved in 2019 and aimed at transforming Europe into a climate-neutral continent by 2050. This program provides many opportunities and prospects for Ukraine, but at the same time it causes certain risks and threats.

If we evaluate the prospects in the field of renewable energy, then Ukraine can get significant benefits from the production of hydrogen, its transportation and storage. Within the framework of the European Green Course, it is possible to create an effective mechanism of international cooperation, which will enable Ukraine to attract significant amounts of “green” financing. The idea of a climate-neutral Europe forms the conceptual and value basis of foreign policy cooperation between Ukraine and the European Union, in particular through the deepening of the process of association with the Union, interaction within the framework of the Eastern Partnership, the implementation of energy strategies, the Energy Community, the Memorandum of Understanding on cooperation in the field of energy between the EU and Ukraine. Completion of the so-called “homework” of the EEC accelerates Ukraine’s implementation of internal reforms and the approximation of Ukrainian legislation to the requirements of EU legislation, which is a positive step on the way to European integration [European Green Deal 2020].

However, the challenge is the fact that Ukraine can be allocated only technical assistance in the adaptation of legislation or loans from financial institutions of the EU or investment banks of individual member states. Therefore, Ukrainian manufacturers will not have all the financial opportunities that their European partners and competitors will have [Bobitskyi 2020]. In addition, the EU’s strong emphasis on environmental protection may mean strict control by the EU over the fulfillment of Ukraine’s obligations regarding the implementation of projects in the energy sector.

The integration of the Ukrainian energy system into the single EU electricity grid also opens up new opportunities for investment in Ukraine’s green energy sector. Joining the European power grid system means the prospect of generating electricity in Ukraine and selling it in Europe, where prices are high enough. Therefore, additional benefits received from the sale of energy resources can be directed to the development of renewable energy.

During the International Conference on the Reconstruction of Ukraine in Lugano, which took place in July 2022, Ukraine presented a plan for the post-war reconstruction of the country, according to which investments in the amount of \$130 billion should be allocated to projects in the energy sector. In particular, it

is planned to triple the capacity of renewable energy by 2032, which will allow Ukraine to develop innovative energy projects and become a reliable supplier of clean energy to Europe [Moroz 2022].

The impact of Russian invasion of Ukraine on the global energy landscape. The EU High Representative Josep Borrell notes in his blog that Europe is currently facing a “double challenge”, in particular, “a major geopolitical crisis” has started due to Russia’s war against Ukraine, and there is also a serious environmental threat [Josep Borrell Fontelles]. A comprehensive response to such threats is the REPowerEU plan, which consists of three components: diversification of supplies from Russia in favor of more reliable suppliers; increasing energy efficiency; increasing investments in the field of renewable energy (investment of about 300 billion euros in the implementation of the European “green course”) [Press and Information Team of the Delegation to Ukraine 2022].

Josep Borrell claims that Russia is using Europe’s dependence on energy imports as a “political weapon” and admits that continued purchases of energy from Russia are effectively “funding the Kremlin’s ability to wage war against Ukraine” [Josep Borrell Fontelles 2022]. Therefore, the European politician defines the EU’s short-term goal as depriving Putin of the resources and leverage he receives from the presence of significant fossil fuel resources. This goal is also followed in the EU’s 2022 External Energy Strategy, which states that, as of now, the transition to green energy is the only way to simultaneously provide the world with sustainable, secure and affordable energy. The Strategy also emphasizes the importance of supporting Ukraine and other countries affected by Russian aggression [Joint Communication 2022].

The war and the uncertainty regarding the purchase of Russian natural gas will have an important influence on the development of the energy transition in Europe. One of the main political goals of European states will be to reduce energy vulnerability and accelerate decarbonization. Also, it is expected that the EU will pay more attention to energy problems, since overcoming the crisis requires coordination and mobilization of resources that individual member states or private actors cannot provide independently [Osička, Černoch 2022].

It is important to consider that in connection with the transition to green energy there will be changes in the global energy landscape and the balance of power. Fossil fuel trade is expected to decline, as it will be replaced on the market by more relevant products – renewable energy products. Regarding the change in the configuration of forces, the capacities for energy production from

“unconventional” sources are distributed more evenly than it was in the case of gas and oil resources.

In this context, Ukraine will potentially receive opportunities to increase the export of energy produced from renewable sources in connection with the growth in demand for it. Taking into account various estimates and forecasts, it can be stated that in the next 4 years the world market for hydrogen production will reach 200 billion dollars. Ukraine can act in this market as the main exporter of green hydrogen to EU countries. Germany has chosen Ukraine as a partner that will produce and export hydrogen, which will amount to about 10–15 billion dollars in revenue per year [Press and information team of the Delegation to Ukraine 2022].

Importantly, the Ministry of Energy of Ukraine and some Ukrainian energy companies have joined the European Clean Hydrogen Alliance, which is part of the EU’s efforts to accelerate the decarbonization of industry. Ukraine was the first non-EU member of the alliance. Such integration will contribute to the development of cooperation in the field of hydrogen energy and to put the issue of its development on the agenda [Riepin 2019].

Renewable energy prospects and challenges for Ukraine. Participation in various grants financed by EU funds and programs is an opportunity for Ukraine. For example, Ukraine took an active part in the “Horizon 2020” program, which provided funds for innovation and research – in the field of renewable energy, this concerned the development of fuel from renewable sources, etc. Therefore, Ukraine signed 21 grants in the energy sector, the total amount of which was 2.5 million euros [Shukaev, Sulema 2020].

In this regard, one of the most powerful programs is the “EU4Energy” Program, which reflects the EU’s support for the countries-addresses of the Eastern Partnership for the improvement of energy supply, energy security, energy efficiency and the use of renewable sources. In 2021, a new phase of the program began – “Transition of Eastern Partnership countries to clean energy: the second phase of EU4Energy”, which will contribute to the development of an effective regulatory and legislative framework in the energy sector to support the transition of the region to clean energy and the liberalization of the energy market. The main focus will be on the implementation of digitalization and changes in the pricing policy, which could compensate for the costs incurred from the energy transition; citizens receiving benefits from investing in sustainable energy; strengthening of regional energy cooperation; promoting gender equality in the energy sector [Transition... 2021].

It is also promising for Ukraine to participate in the “INOGATE” program, which is one of the long-term technical assistance programs in the field of energy,

financed by the EU. The goals of the Program are the convergence of the energy markets of the states according to the principle of the EU internal energy market; strengthening energy security; support for sustainable energy development; attraction of investments in energy projects [In brief n.d.].

Despite the positive aspects of the impact of the EU's green energy policy on Ukraine, a recent challenge for Europe, including Ukraine, was the European Parliament's support for the European Commission's proposal to expand the concept of "green energy". Among the proposals, natural gas and nuclear energy should be classified as "green" sources of energy. The new classification will take effect from 2023, unless the decision is blocked by member states' veto. Despite putting forward criteria for nuclear and gas projects, the decision to change the taxonomy has received criticism from academics and environmental activists due to its potential risks [Nedashkivskyi 2022].

If we consider the significance of the changes in the EU's "green taxonomy" for Ukraine, it opens up new opportunities for development and profit-making, since the largest nuclear power plant in Europe is located on the territory of Ukraine, despite its temporary occupation. However, there are certain threats. In particular, according to Kostiantyn Krynytskyi, a representative of the NGO "Ekodiya", "such a decision by European institutions is regrettable" [Nedashkivskyi 2022] not only from the point of view of environmental damage, but also in the context of the Russian-Ukrainian war. There are fears that classifying gas and nuclear energy as "green" energy will contribute to the further financing of Russia's military actions. Because Russia lobbied for changes to the EU taxonomy long before the full-scale invasion, and according to estimates, this could bring it an additional 4 billion euros annually from gas exports to the European Union and, by 2030, approximately 500 billion euros from increased orders for the construction of new nuclear power plants. Here, the obvious threat to Ukraine and Europe is obtaining additional finances for Russia's war, as well as a threat to their energy security and a possible strengthening of the dependence of European countries on the import of energy carriers from Russia [Nedashkivskyi 2022].

Conclusions. Summing up, it is worth noting that the development of the European Union's green energy and the transformation of the Union's policy in this area opens up many opportunities for Ukraine, including investment attraction, financing, development of international energy cooperation, profit from the export of green energy, etc. At the same time, Ukraine's transition to renewable energy and adherence to European standards brings Ukraine closer to EU integration.

However, modern processes in the field of renewable energy in the European Union also provoke the emergence of challenges for Ukraine, which, to a greater extent, concern national energy security, which is actualized due to Russian aggression and Russian "dominance" on the European energy market. Therefore, it remains necessary for Ukraine to overcome the energy threats caused by the current instability of the international environment through joint efforts with the European community, and continue to develop its potential in the field of renewable energy for the sake of current and future generations.

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