

ENERGY SECURITY OF UKRAINE IN THE CONTEXT OF EUROINTEGRATION

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Abstract. *In the face of asymmetric effects in the global market, characterized by financial, investment, technological, production, and trade challenges, renewable energy emerges as a potential catalyst for transformative changes. Its primary goal is to rejuvenate economic activity and enhance energy security for nations. Energy security plays a critical role in this discourse, as reliance on non-renewable fossil fuels exposes countries to geopolitical vulnerabilities and environmental issues. In contrast, utilizing renewable energy sources such as solar, wind, hydro, and geothermal power provides a sustainable alternative, reducing dependence on finite resources and mitigating the adverse impacts of climate change. The authors explore the potential of renewable energy and demonstrate how transitioning to clean energy sources can enhance national energy security within the context of post-war economic recovery, while also minimizing the economic and environmental risks associated with a fuel-hydrocarbon model of public production. The adoption of renewable energy sources offers additional benefits beyond diversification and resilience. Renewable energy investments have a positive socio-economic impact by creating job opportunities and stimulating local economies. In addition, the utilization of renewable energy sources promotes technological innovation and fosters a culture of sustainability. By investing in R&D, countries can drive advancements in renewable energy technologies. These innovations can then be shared globally, accelerating the transition to a low-carbon future and fostering international cooperation. The promotion of renewable energy aligns with the SDGs. By integrating renewable energy strategies into national development plans, countries can contribute to multiple SDGs, including affordable and clean energy, climate action, sustainable cities and communities, and economic growth.*

DOI: 10.24263/EDSD-2023-5-9

Introduction. In the wake of a global crisis, nations are confronted with the task of revitalizing their economies while also addressing urgent challenges such as intensifying global competition, geopolitical uncertainties, energy security, and the imperative for sustainable development. One approach gaining prominence is the adoption of a green economy framework that aligns with the principles of the United Nations Sustainable Development Goals (SDGs). This approach emphasizes the integration of economic growth, social inclusion, and environmental sustainability to shape a more resilient and equitable future.

The green economy principles focus on fostering sustainable development by decoupling economic growth from environmental degradation. By shifting towards cleaner and more efficient production processes, countries can mitigate the negative impacts on natural resources and ecosystems, while simultaneously promoting economic prosperity. This transition involves adopting renewable energy sources, enhancing resource efficiency, promoting circular economy practices, and investing in green technologies and infrastructure. Additionally, the principles of the United Nations SDGs provide a comprehensive framework for countries to address a wide range of social, economic, and environmental challenges. These goals, encompassing areas such as poverty eradication, education, healthcare, gender equality, and climate action, offer a roadmap for nations to achieve

sustainable development holistically. By aligning their policies and actions with the SDGs, countries can contribute to the global agenda while addressing their unique development priorities.

The historic example of the Marshall Plan, officially known as the Program for the Reconstruction of Europe after World War II, serves as a remarkable precedent for international cooperation and effective utilization of financial resources. Spearheaded by the United States, this initiative successfully revitalized economies, promoted political stability, and fostered transatlantic alliances among nations. Drawing inspiration from this historic endeavor, countries today can leverage similar collaborative efforts and financial mechanisms to implement green economy principles and advance sustainable development goals.

Materials and Methods. In this study, a systematic approach was employed to analyze and compare various factors related to the subject matter. The research methodology incorporated elements of comparison, analysis, synthesis, and abstract-logical reasoning to ensure a comprehensive and rigorous investigation. To begin with, a systematic review of expert resources was conducted to gather relevant information and insights from existing studies and scholarly works. In addition, the use of a systematic approach, combined with comparison, analysis, synthesis, and abstract-logical reasoning, ensured a rigorous and comprehensive methodology for this study. Overall, these methods provided a solid foundation for collecting, analyzing, and interpreting data, ultimately leading to reliable and valid conclusions.

Results and Discussion. On June 23, 2022, the leaders of 27 EU member states decided to grant Ukraine the status of a candidate for EU membership. Further preparation for membership will involve the commitment to harmonize national policy with EU standards, to carry out a comprehensive transformation of socio-economic development. The country's status as a candidate for EU membership can contribute to the formation of an attractive business space for foreign investors through increased stability and the introduction of international regulatory standards. The specific impact of the status of a candidate EU member state on the management of changes in the state economic policy will depend on many factors, and this situation may change over time. At the level of international organizations, this requires the standardization of management decisions, in particular, the implementation of EU recommendations aimed at supporting Ukraine in the key direction of harmonization, standardization, unification, implementation in support of the development of political and regulatory measures to increase energy sovereignty, which will also contribute to its achievement of the Sustainable Development Goals (SDGs), declared by the UN General Assembly Resolution No. 70/1 of 09/25/2015, namely: universal access to affordable, reliable and modern energy supplies, including renewable energy sources (SDG 7) (UNDP, n/d). Additionally, the program for integration with the European Union, with a budget of up to \$1 billion, focuses on harmonizing Ukrainian legislation with European standards. This harmonization process will foster closer cooperation and interaction between Ukraine and the EU, promoting stronger ties and facilitating smoother integration efforts.

According to the reform course of the government of Ukraine, the development of renewable and low-carbon energy sources is foreseen in the coming years in order to achieve energy independence. To this end, in 2019-2021, Ukraine successfully separated the operators of the gas transportation network and the transmission system, which was confirmed by their certification, and makes changes to corporate governance approaches in state-owned companies in the energy sector. NEC Ukrenergo, as a Ukrainian transmission system operator (TSO), has taken measures to prepare our power system for synchronization with ENTSO-E since 2017, when the Agreement on the

conditions of future unification was signed. Since then, testing of power units of Ukrainian NPPs, TPPs, CHPs and HPPs has been carried out, a mathematical model of the energy systems of Ukraine and Moldova has been created, on the basis of which the ENTSO-E OSP Consortium has conducted a study of the static and dynamic stability of the energy systems of Ukraine and Moldova when working with the network of continental Europe. As a result, Ukraine joined the ENTSO-E continental Europe unified energy system a year earlier than planned, thereby fully synchronizing with the ENTSO-E continental European energy network (Cabinet of Ministers of Ukraine, 2022).

Ukraine has yet to enact the necessary legislation to align with the Governance Regulation mandated by the Energy Community, as well as its domestic energy and climate plan. As a signatory to Annex I of the United Nations Framework Convention on Climate Change, Ukraine has established a comprehensive legal framework for the development of a national greenhouse gas inventory system. It diligently conducts annual greenhouse gas inventory assessments, formulates policy initiatives, biennially reports on its progress and future projections to the UNFCCC, and maintains a rigorous system for quality assurance and quality control (European Commission, 2023).

One of the key mechanisms introduced in the program is the Carbon Border Adjustment Mechanism (CBAM). This mechanism will set tariffs on goods imported into the EU, the production of which is associated with carbon emissions. The Council decided to progressively strengthen CBAM rules over a period of 10 years between 2026 and 2035. The European Green Deal (EGD) package of initiatives was adopted by the EU at the end of 2019. The goal of the strategy was to transform the economy into a low-carbon, sustainable, and therefore more suitable for future generations. According to the plans of the EEC developers, the EU member states should achieve climate neutrality by 2050.

Ukraine became one of the first countries to support the EWC. The Ukrainian authorities argued for the strategy of “early joining” the agreement with the possibilities of influencing the processes of minimizing potential threats with the help of joint projects on decarbonization and climate protection. However, with the beginning of full-scale Russian aggression, the situation in the country changed. The founding document of the European Commission on EWC states that “climate change and biodiversity loss are global in nature and are not limited by national borders, so the European Union can use its influence, experience and financial resources to mobilize its neighbors and partners”. Thus, the EU called on other countries to join the EWC on the way to sustainable development (UA Energy, 2023).

RePowerEU envisions the annual production and import of at least 20 million tons of hydrogen derived from renewable energy sources. However, it is anticipated that EU member states may only fulfill half of this target through their own hydrogen production capacities. Nevertheless, direct exportation is not the sole promising avenue for harnessing Ukraine’s hydrogen potential. Valuable prospects include the advancement of “green” hydrogen-based metallurgy and, potentially, the manufacture of ammonia and fertilizers using “green” hydrogen as a feedstock. The establishment of a “hydrogen cluster” in the Zaporizhia and Dnipro regions is a viable possibility. This geographic region boasts optimal access to essential resources such as water, iron ore deposits, and a promising renewable energy potential, facilitating the development of hydrogen production and its application in “green” direct reduced iron (DRI) and steel production. Additionally, hydrogen can serve as a means of storing surplus electricity generated from renewable sources when production surpasses demand. Nonetheless, the cost-effectiveness of this hydrogen utilization is not expected until at least 2030, owing to the inherent inefficiencies in the process.

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In autumn 2020, the Ukrainian authorities presented “Vectors of Ukraine’s economic development until 2030”. However, according to the assessment of environmental experts, this strategy did not consider the economic model of Ukraine in the context of the integration of environmental and climate aspects into all spheres of the economy, climate neutrality and circular economy. At the same time, a sociological survey of public opinion conducted by the Resource-Analytical Center “Society and Environment” at the beginning of 2023 showed that reconstruction on ecological grounds is not among the top priorities of Ukrainians.

The survey showed that 95% of Ukrainians believe that the restoration of nature is important in the post-war reconstruction of Ukraine. At the same time, only about 26% are ready to pay for the environmental friendliness of basic services, such as access to high-quality drinking water, public transport, and proper waste management. And about 54% of respondents said that they would not participate in government programs to improve the energy efficiency of buildings if this would lead to an increase in the cost of utility services (UA Energy, 2023).

The goal of the reconstruction of Ukraine should not be a return to the pre-war state, but a full-fledged development and integration into the European community on the basis of sustainable development and taking into account what is also a requirement of the Copenhagen criteria for joining the EU. The need to speed up the implementation of European environmental legislation is caused by the need to comply with international obligations, as well as changes in the status of Ukraine as a candidate country for joining the EU. The need to speed up the implementation of European environmental legislation is caused by the need to comply with international obligations, as well as changes in the status of Ukraine as a candidate country for joining the EU. The too slow process of implementation of European directives in the “green” sphere in Ukraine was noted in the February 2023 report compiled by the expert group of the European Commission. Analysis of Ukrainian legislation shows that the country is showing significant progress in the implementation of energy reforms, but is still at the initial level of preparation in the field of environment and climate change. The report summarizes that Ukraine has done a lot to build its environmental regulatory framework and relatively little to reform its regulatory framework and align with climate law. But European experts noted that the gaps in the level of legislative coordination have grown with the expansion and deepening of the EU acquis (EU law) in these areas. The European Commission recommends solving problems with the ability to adopt the relevant EU acquis, taking into account the provisions of the European Green Course in all policy areas and effective implementation and enforcement of legislation.

The war with Russia made the problem of energy dependence of European states on the import of traditional energy resources even more acute. The reaction to this aggravation was the renewed “green” program RePowerEU, which raises the main goals of the Green Deal and Fit for 55 to an even higher level. The central goal of the program is to replace gas imports from Russia. Potential instruments for ensuring the EU’s demand for gas in the event of a refusal to import gas from Russia until 2030.

The Parliament of Ukraine has registered draft law No. 6004 dated 04.01.2023 “On integrated prevention and control of industrial pollution”, which should introduce Directive 2010/75/EC on industrial emissions into Ukrainian legislation. This draft law is important within the framework of the European Union as a signal to international partners and investors that the same environmental regulations apply in Ukraine as in the EU. Therefore, it will be possible to create factories here or invest in the restoration of Ukrainian industry in accordance with EU policies. And for Ukraine, this draft law will be a guarantee that investments will be environmentally sustainable without harming people’s health” (Verhkovna Rada, 2023). After all, this will contribute to the creation of a new permit system for industry in the form of an IT system, which will combine separate permits for emissions into water, air, soil, noise pollution, which will help calculate the cumulative impact on the environment, as well as the introduction of European emission standards for all types of industry in accordance with the indicators of the best available technologies (BAT – best available techniques), will contribute to the modernization of production and its growth.

Also, we cannot ignore the Draft Plan for the Recovery of Ukraine, which was prepared by the National Council for the Recovery of Ukraine from the Consequences of the War for the materials of the “Energy Security” working group, in particular with emphasis on such blocks as (Fig. 1) (Cabinet of Ministers of Ukraine, 2022).

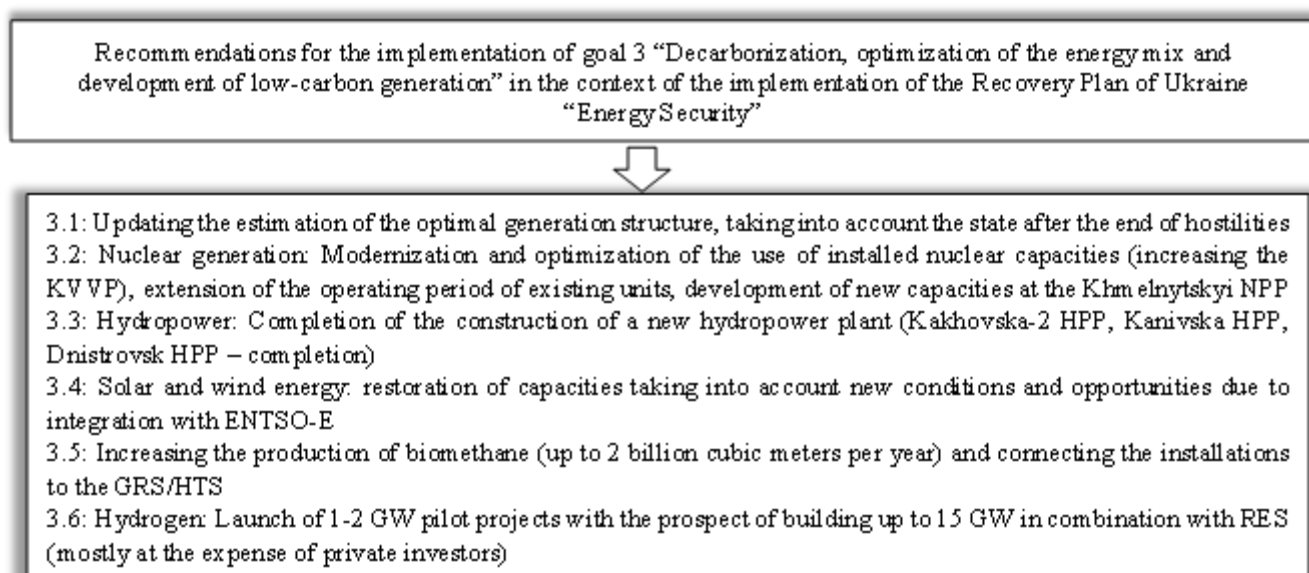


Fig. 1. Recommendations regarding the implementation of goal 3 “Decarbonization, optimization of the energy mix and development of low-carbon generation” in the context of the implementation of the Recovery Plan of Ukraine “Energy Security”

The estimated €750 billion Marshall Plan for Ukraine will serve as a foundation for rapid and sustainable economic development in Ukraine and throughout Europe in the 21st century. To ensure the success of this plan, it is crucial to promote structural changes in the economy, foster integration with the European Union, and address challenges in key strategic sectors (United4Ukraine, 2022). By diversifying the implementation channels, the Marshall Plan for Ukraine aims to create a comprehensive framework for economic development and facilitate the country’s integration into the European community. Presented in Lugano, the new Marshall Plan encompasses a comprehensive

set of strategic areas that will drive the economic and social development of Ukraine. With the plan consisting of 15 national programs spanning various sectors, each program includes a range of key projects scheduled for implementation as early as 2022 (ICPS, 2023). By strategically addressing defense and security needs and actively pursuing integration with the EU, the new Marshall Plan sets the stage for Ukraine's advancement in crucial areas, ensuring a more secure and prosperous future.

The program dedicated to the environment and sustainable development, with a budget of approximately \$20 billion, encompasses several notable projects. These include the restoration of salt mines in the village of Solotvino in Zakarpattia, the reduction of the Chornobyl nuclear power plant exclusion zone from 30 km to 15 km, the establishment of 142 waste processing complexes, the creation of ten natural parks, the construction of 15 eco-friendly houses, and the establishment of ten centers for wildlife rehabilitation. The energy security program, allocated a budget of around \$130 billion, focuses on various initiatives. These include the construction of hydroelectric power plants (HPP) and nuclear power plants (NGP), the development of renewable energy-based power plants with a capacity of 5-10 GW, the completion of additional units at the Khmelnytskyi NPP, the modernization of existing nuclear power plants, and the construction of infrastructure for the production of 'green' hydrogen.

Based on the OECD research, here are some recommendations on the measures to be taken for the development of the green economy in Ukraine (OECD, 2022):

1. Strengthen data collection and analysis: continue conducting comprehensive studies and analyses, similar to the ones carried out by the OECD, to provide robust evidence on energy subsidies. This will enhance transparency and provide a solid analytical basis for future policy reforms.

2. Raise awareness and build a case for reform: utilize the available reports and data to raise awareness among policymakers, stakeholders, and the general public about the negative impacts of fossil fuel subsidies. Highlight the economic, environmental, and social costs associated with such subsidies, and emphasize the potential benefits of subsidy reforms.

3. Establish a clear roadmap for subsidy reform: develop a well-defined plan and timeline for phasing out fossil-fuel subsidies. This roadmap should include specific targets, policy measures, and implementation strategies to gradually reduce and eventually eliminate subsidies. Ensure that the roadmap aligns with the country's energy transition goals and commitments to international agreements.

4. Promote alternative energy sources and energy efficiency: invest in renewable energy technologies and energy-efficient practices to reduce dependence on fossil fuels. Encourage the development and deployment of clean energy solutions, such as solar, wind, and hydroelectric power, and incentivize energy-efficient practices in industries, buildings, and transportation sectors.

5. Enhance coordination and cooperation: foster collaboration among Eastern Europe and Caucasus countries, regional organizations, and international partners to share experiences, best practices, and lessons learned in subsidy reform. Exchange knowledge on successful subsidy phase-out strategies and explore opportunities for joint initiatives and projects.

6. Strengthen institutional capacity: provide technical assistance and capacity-building support to relevant governmental agencies responsible for subsidy reform. Enhance their ability to design and implement effective policy measures, monitor progress, and evaluate the impact of subsidy reforms.

7. Monitor and evaluate progress: establish a robust monitoring and evaluation framework to track the progress of subsidy reform efforts. Regularly assess the effectiveness and efficiency of

policy measures, identify challenges and barriers, and make necessary adjustments to ensure successful implementation.

8. Promote international cooperation and peer learning: engage with international organizations, such as the OECD, and participate in regional and global forums focused on subsidy reform and energy transition. Learn from the experiences of countries that have successfully phased out fossil-fuel subsidies and seek opportunities for collaboration and knowledge-sharing.

By implementing these measures, Ukraine can gradually reduce its reliance on fossil fuel subsidies, promote sustainable energy practices, and contribute to global efforts in mitigating climate change and achieving sustainable development goals.

Addressing the public finance implications of the net-zero transition (OECD, 2023). It is essential to recognize the potential magnitude of these implications, especially when considering the indirect effects that carbon pricing can have on other sources of public revenue, such as fossil fuel taxes. In light of this, governments should undertake the following measures:

(i) Implement prudent fiscal planning to ensure a resilient net-zero transition. This requires a comprehensive assessment of both the direct and indirect effects of policy instruments on emissions. While policies may directly impact tax rates, they also have implications for tax bases. It is important to note that most indirect effects tend to exert downward pressure on public revenues.

(ii) Conduct a thorough analysis of the implications of national policy mixes on public finance, taking into account that non-price-based policies generally require increased government expenditure. Additionally, the national economic structure plays a pivotal role in determining fiscal outcomes. Therefore, a careful examination of the fiscal consequences of different policy combinations is imperative.

(iii) Develop plans to gradually implement alternative tax instruments, such as distance-based fuel charges, to mitigate the risk of tax base erosion. This risk becomes particularly significant for the country's fiscal balances, especially concerning excise duties on fossil fuels in the transport sector. As the transition to a net-zero economy gains momentum, these excise duties are expected to decline.

Maintaining investment flows amidst rising costs of capital (OECD, 2023). To address the challenges posed by the escalating costs of capital in the net-zero transition, it is crucial to ensure the continuity of investment flows and safeguard the economic viability of low-carbon projects. The government should take the following actions:

(i) Uphold the ambition and rigor of core climate policies to send a clear and compelling message to investors and financial institutions regarding the future significance of low-carbon assets. By maintaining strong climate policies, governments can instill confidence and provide long-term certainty for investments in low-carbon initiatives.

(ii) Continue providing fiscal support for low-carbon investments whenever possible, while exercising caution when phasing out subsidies for clean technologies. It is important to strike a balance between nurturing the growth of the low-carbon sector and managing the gradual reduction of subsidies in a manner that does not impede progress.

(iii) Implement policies aimed at reducing investor risk, such as promoting the inclusion of risk insurance or guarantees in financing arrangements for renewable energy projects. The government can also bolster governance structures by ensuring high-quality and predictable regulatory frameworks. Additionally, streamlining the permitting process for renewable energy projects can help alleviate barriers and facilitate timely project implementation.

(iv) Support the development of market products and measurement methodologies that enable investors to align their portfolios more effectively with climate objectives. However, it is essential to design these approaches carefully to avoid unintentionally diverting investment away from developing countries. Measures should be taken to ensure a balanced distribution of investment opportunities.

In addition to government actions, central banks can consider implementing 'green' monetary policies to safeguard low-carbon investments in the face of challenging investment conditions. This may involve offering preferential refinancing rates for low-carbon technologies or adopting green quantitative easing strategies, such as purchasing green bonds exclusively, to maintain low-interest rates specifically for climate-friendly sectors.

By adopting these measures, Ukraine could proactively address the public finance implications associated with the net-zero transition. Through careful fiscal planning, analysis of policy mixes, and the introduction of alternative tax instruments, they can ensure a resilient and sustainable pathway to a net-zero future. It is crucial to anticipate the challenges that arise from changes in revenue streams and fiscal balances and to take proactive steps to manage them effectively. The government and central bank can foster an environment conducive to sustainable investment flows, despite the rising costs of capital. Sustaining investor confidence, providing targeted fiscal support, mitigating risks, and promoting innovative financial instruments will contribute to the successful realization of the net-zero transition and the achievement of climate objectives.

Conclusions. In conclusion, the transition towards renewable energy sources is a vital step towards a more sustainable and resilient future. By diversifying energy portfolios, stimulating economic growth, fostering technological innovation, and promoting environmental stewardship, nations can lead the way in addressing global challenges and creating a better world for future generations. Moreover, aligning the development of renewable energy with the Sustainable Development Goals (SDGs) established by the United Nations offers a comprehensive framework to address global challenges, including eradicating poverty, implementing climate change measures, and ensuring access to clean energy resources. By integrating renewable energy strategies into national economic recovery plans, countries can simultaneously foster economic growth, promote social justice, and uphold environmental sustainability. The convergence of the Marshall Plan, the importance of green energy, and the potential of renewable energy is realized through a series of measures designed to support small and medium-sized enterprises, enhance infrastructure development, strengthen energy efficiency, modernize the healthcare system, and improve the quality of education. These elements are reflected in the plan for national economic recovery. In summary, the Marshall Plan for Ukraine stands as an essential strategic document and a valuable experience in formulating effective strategies to achieve economic growth, enhance national security, improve citizens' quality of life, and uphold democratic and legal values.

We believe that the development and formation of proposals for the doctrinal model of the Energy Security Strategy project in the context of European integration for the medium-term perspective until 2030, which should be based on a holistic integrative model of the system of principles of the rule of law and sectoral legal frameworks, one of the components of which should be vector of further cooperation with international partners. Proposals for key stakeholders within the framework of the doctrinal project of the Energy Security Strategy in the context of European integration for the medium-term perspective until 2030 are presented in Fig. 2.

Proposals for key stakeholders within the framework of the doctrinal project of the Energy Security Strategy in the context of European integration for the medium-term perspective until 2030



(1) FOR THE GOVERNMENT OF UKRAINE, which should formulate the government's priorities, taking into account the opportunities and threats of the EEC; to invite the European side to start a dialogue on the development of a Road Map for Ukraine within the framework of the EWC; to support the further European integration of Ukraine in the spheres of EEC, which are a priority for Ukraine; to formulate the climate policy of Ukraine; to support the integration of Ukrainian manufacturers into EU industrial production chains, in particular to ensure the signing of the ACCA as soon as possible; use and promote new opportunities for financing and attracting green investments, continue digitization; inform business about the role of the carbon footprint in future exports to the EU.

(2) FOR THE SUPREME COUNCIL OF UKRAINE, which, first of all, should ensure the process of full implementation of the requirements of European legislation related to the EWC, in particular through the strengthening of control mechanisms for compliance of draft laws with the requirements of European legislation and consideration of climate change issues at all stages of law-making.

(3) FOR BUSINESS, which must take into account the goals of the EWC in the process of strategic planning of its development and use the financial instruments of the EWC; to look for opportunities for integration into new industrial production processes on the EU market; take into account that access to the EU markets in the future will depend significantly on the compliance of goods and services with the climate and environmental requirements of the EU.

(4) FOR CIVIL SOCIETY, which, first of all, should contribute to better informing all interested parties about the opportunities and challenges of the EWC, as well as continue the process of monitoring the implementation of European integration reforms in Ukraine.

(5) FOR THE EUROPEAN SIDE, which should consider Ukraine as a necessary partner in the implementation of the EUC, develop together with the Government of Ukraine a road map for Ukraine based on the example of the Roadmap for the Balkan countries provided for by the EUC; promote Ukraine's integration into new "green" production processes in the EU by initiating an industrial dialogue; strengthen control over the sustainability of goods and services imported into the EU from Ukraine, in particular wood, agricultural products, etc.; support investments from the EU aimed at the production of "green" goods, decarbonization of the economy; continue to provide assistance to Ukraine in the approximation of legislation in the field of environmental and climate protection, agriculture, energy, and transport;

to form flagship initiatives for the integration of Ukraine into the EU environmental sphere, in particular, to start a dialogue on the elimination of barriers in the implementation of the bird and habitat directives and the integration of Ukraine into the NATURA 2000 network.

Fig. 2 Proposals for key stakeholders within the framework of the doctrinal project of the Energy Security Strategy in the context of European integration for the medium-term perspective until 2030 (Dixigroup, 2020)

For each of the outlined directions, it is necessary to define strategic goals, the implementation of which will be directed by the efforts of the main manager of financial resources in the country, as well as quantitative and qualitative indicators that will testify to their achievement, which will contribute to the formation of the Strategy-2030, which will form the basis for sustainable and inclusive development international cooperation and the national economy in general, improving the well-being of Ukrainian citizens. During the development of new strategic documents, attention should be paid to the main aspects of the real picture of cooperation with international financial institutions in the field of energy security, while respecting national interests. It is advisable to continue making efforts to increase the effectiveness of joint programs. First of all, it is about drawing up domestic norms and rules and harmonizing them with European ones (taking into account the chosen development vector) in order to more effectively avoid risks and manage them, monitor the processes of preparation, implementation and evaluation of the effectiveness of such proposals.

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