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## Article

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## Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEPP)

**Reference:** Shakharova, Aliya/Alamanova, Chinara et. al. (2023). Towards the implementation of the environmental and economic doctrine of energy sector development : an environmental and economic assessment of public-private partnerships in decarbonization. In: International Journal of Energy Economics and Policy 13 (4), S. 423 - 432.  
<https://www.econjournals.com/index.php/ijeep/article/download/14358/7411/33958>.  
doi:10.32479/ijeep.14358.

This Version is available at:  
<http://hdl.handle.net/11159/631230>

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# Towards the Implementation of the Environmental and Economic Doctrine of Energy Sector Development: An Environmental and Economic Assessment of Public-private Partnerships in Decarbonization<sup>#,†</sup>

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Received: 15 March 2023

Accepted: 07 June 2023

DOI: <https://doi.org/10.32479/ijeeep.14358>

## ABSTRACT

The disruption of the energy system at the global and local levels requires an intensification of public policy in this area to respond quickly to changes. Strategic planning and public policy changes are needed to ensure the sustainability of the energy sector. In the short term, , improving energy security should be a priority for many countries. Natural gas will be essential in balancing electricity on the road to decarbonization. The transition to renewable energy sources can achieve natural gas self-sufficiency. The article analyzes the directions of energy security and normative and legal regulation in the energy sector. It is established that the main direction of transition to decarbonization in an unstable external environment is public-private partnership mechanisms. The introduction of this mechanism provides benefits for all interested parties. In order to choose the most effective form of public-private partnership, a flowchart of analysis and evaluation of environmental and economic efficiency was developed. This flowchart applies to decarbonization projects and considers regional features of the energy sector and differences in readiness for the transition to the decarbonization of different countries. Limitations of the model application are the imperfect regulatory framework and the high instability of the external environment. The main objective is to simplify the procedures for attracting investment in the energy sector and reduce the time for project preparation and submission, which will help to implement the most effective projects in the short term and make the transition to decarbonization in the long term.

**Keywords:** Energy Strategy, Pollution, Project, Efficiency, Model

**JEL Classifications:** Q42, Q47, Q51, Q53, Q54, Q57

# Research of Chinara Alamanova, Sofia Kafka and Ilona Tuts was performed within the framework of the international research project of the scientific and technical organization Teadmus OÜ ([teadmus.org](http://teadmus.org)) "Public-Private Partnerships in Decarbonizing Energy: An Enviro-Economic Analysis".

† Research of Oleksandra Olshanska was funded by the Ministry of Education and Science of Ukraine within the researcher project "Private-state partnerships in the field of nature management as a basis for the implementation of the ecological and economic security doctrine of the development of Ukraine" (16.04.76 DB).

## 1. INTRODUCTION

The security environment in the world is complex and volatile. Armed conflicts in Ukraine and the Middle East and competition for influence over global financial and energy flows has exacerbated global military and political turmoil. The need for an environmental and economic security doctrine for developing the energy sector has arisen in this context.

Each country must pragmatically approach sustainable development, considering its goals, national interests and economic opportunities.

The basic principles of state energy policy are competitiveness, sustainability and energy security, which should form a reliable basis for European governments to plan for the future. In the changing external environment, energy security issues related to developing unconventional and renewable energy sources (RES) and their distribution on the market, intensifying energy efficiency and conservation policies, and response to the adverse effects of policies affecting climate change are of particular relevance.

All countries should encourage investment in alternative energy sources to reduce dependence on imported natural gas and petroleum products. It would bring our world closer to the UN-declared decarbonization, which means a transition to zero emissions into the atmosphere.

The article aims to analyze and assess the environmental and economic opportunities of public-private partnerships in the context of decarbonization.

Based on the goal set in the article, the following tasks are solved:

- The analysis of the regulatory and legal framework to ensure energy security;
- Defined principles and conditions for ensuring decarbonization;
- Analyzed conditions and prospects of public-private partnership in the conditions of decarbonization;
- Assessment of benefits and threats to stakeholders within the framework of public-private partnership was carried out;
- Defined forms and directions of public-private partnership;
- The flow chart of ecological-economic assessment of public-private partnership was developed;
- The analysis of possibilities of application of the proposed flow chart in conditions of the changing external environment has been carried out.

The main task of the transition to decarbonization should be forming strategic priorities for the energy sector at the state level, considering specific directions of development and orientation towards international cooperation on decarbonization to attract foreign investors.

The research object is principles, methods and mechanisms of private-state partnership implementation under decarbonization and energy security provision conditions.

The research subject is corporate and economic relations between economic entities, society and stakeholders to ensure the decarbonization transition.

## 2. LITERATURE REVIEW

Ensuring energy security is one of the most critical priorities of each state. Each country defines energy security policy goals and implementation mechanisms, considering the peculiarities of organizing socially important activities and governance models. Administrative activity in this sphere requires considering different aspects of national life. These are resources, technology, economy, ecology, organizational administration, management, society, innovations, politics, geopolitics, security and other aspects, and ideological aspects of energy supply to meet the state's, society's and economy's crucial needs and functions. In addition, the energy security activities of an individual country can change significantly over time, depending on the dynamics of socio-economic and scientific and technological development, as well as the transformation of the functioning of the energy market.

Malynovska et al. (2022), Olshanska (2011), Prokopenko et al. (2018), Prokopenko et al. (2014), and Sala et al. (2023) considered national and regional peculiarities of the state energy policy implementation. At the same time, the considered features of the state strategy need to improve and consider the variability of the external environment.

Sotnyk et al. (2021) focus on forming the energy sector development strategy in a transformational and threatening environment. At the same time, the strategy should consider the limited resources, risks and instability in current conditions, as well as the innovative potential of production (Matskul et al., 2021; Salnikova, et al., 2019; Zolkover et al., 2020). Asemota and Olokoyo (2022) investigated the issue of financing renewable energy sources in the industry. The authors conclude that the use of external debt to finance renewable energy, as well as the use of energy from combustible waste and alternative nuclear sources, significantly and positively determines the development of the industrial sector. Petrenko (2021) emphasized the need for state support for the development of decarbonization projects. To achieve the targets of renewable energy potential at the national level, various forms of state support for the development of alternative energy sources are used. Its role is gradually decreasing as the maturity of alternative energy is achieved.

Andriienko and Truntsev (2022), Sobko and Smereka (2021), Shulga (2019) describe the regulatory and legal support of the energy sector, including the European level. These works indicate the complexity of the problem of legislative regulation in the energy sector and the need for its modernization.

The energy policy of Ukraine is based on the Laws of Ukraine, by-laws, resolutions of the Verkhovna Rada of Ukraine, orders of the Cabinet of Ministers of Ukraine, decisions of the National Security Council of Ukraine, codes, orders of the Ministry of Energy and Coal Industry, as well as Decrees of the President of Ukraine. All legislative and regulatory acts can be divided into groups: general,

on transboundary transfer and environmental policy, on climate change, energy regulation, subsoil use, the transformation of the coal industry, social protection, economic issues of the energy sector, investment and regional policy, on ensuring military and energy security, on local self-government, regarding planning and environmental regulation, environmental monitoring and public health, ecological safety and environmental protection. The existence of more than 250 documents regulating the state's energy policy does not allow for effective and rapid implementation of innovation and response to changes in the external environment.

The legal and regulatory framework for the fuel and energy sector in the Republic of Kazakhstan is also characterized by many legislative initiatives (Taitoryna and Beysenbayeva, 2022). Thus, in the Republic of Kazakhstan, all regulatory legal acts can be divided into groups according to their scope: electricity, coal industry, nuclear industry, oil industry, gas industry and oil and gas chemistry.

Thus, the main task of improving countries' energy security is to focus state policy on optimizing legislation in the energy sector to achieve efficiency in implementing innovations and adapting to changes in the external environment.

The strategic conceptual framework for the development and implementation of the national energy policy of Ukraine in modern conditions should consider the basis of the Concept of the green energy transition until 2050 (Heletukha, 2020). At the same time, the strategic guidelines must be consistent with international standards in the energy field. Dudin et al. (2017) an analysis of the views of foreign authors on the assessment of the energy policy of European countries in the context of further diversification and security of fuel supply, liberalization of the energy market, and development of renewable energy.

The strategic goal of the EU's new energy policy is to achieve a 50% reduction in greenhouse gas emissions by 2050 compared to 1990. Developed countries must reduce these emissions by 60-80%. This strategy forms the basis of the European Commission's position paper "Limiting Climate Change to 2°C - Policy Options" for the EU and the world until 2020.

Clear objectives and concrete proposal measures are at the heart of European energy policy. In this regard, Nekrasenko et al. (2015) identified the need to consider a carbon tax as a tool for implementing Ukraine's energy strategy.

Omirtay et al. (2020) note that the main guidelines for taking into account the concept of the energy transition by 2050 in the Republic of Kazakhstan as one of the main elements of global energy security are the practical introduction of renewable energy sources and ensuring a tripartite balance of energy - economy - environment. At the same time, the main focus is on regulating the pricing policy in the energy sector. In the Republic of Kyrgyzstan, unlike Ukraine and the Republic of Kazakhstan, the focus is on hydropower development (Sulaimanova et al., 2020). It is because the Republic of Kyrgyzstan, on the one hand, has significant water potential; on the other hand, the country's population has

problems with drinking water. Therefore, the primary efforts in the energy sector are aimed at developing small hydropower to achieve energy security.

### 3. METHODOLOGY

The hypothesis of this study is to formulate proposals for developing an energy strategy with the involvement of the private sector to ensure the country's security in the energy sector in the example of Ukraine and agree on the possibility of application in other countries.

In order to present the mechanisms of energy strategy formation systematically, the article analyzes the regulatory framework of the energy policy of Ukraine. This approach allowed to analyze the evolution and ramification of regulatory policy in the energy sector and identify areas that constrain the development in this area. Also, many legislative and regulatory acts need to provide economic security in the energy sphere.

During the study, dialectical cognitive methods were used, mainly the principles of systematicity. On this basis, the concepts of energy security and directions of private partnership in the energy sector were defined.

Given the research object's peculiarities, the study's directions are based on an interdisciplinary approach. Due to this, the work considered the historical basis for forming the energy policy of the state of Ukraine and the European Union and determining the direction of interaction at the international level. Thus, the methods of comparison and consistency were used.

In order to analyze the possibilities of public-private partnership in the energy sphere, the methods and directions of private sector participation in the development and implementation of energy-saving programs were analyzed. For this purpose, the methods of logical construction and systematization were used.

Using the analytical method in the work, the search, selection and generalization of data on the analysis and selection of energy projects for implementation in an unstable environment were conducted.

Based on the analyzed data, the work built a model for selecting public-private partnership projects. The proposed flowchart allowed to determine the primary and priority areas of formation of the doctrine of energy sector security. To achieve this goal, modeling, comparison and generalization methods were used.

The main advantage of the proposed model, which distinguishes it from similar models, is the integrity and completeness of the data presented and the ability to account for the variability of the external environment.

The study's main limitations were an imperfect regulatory framework and the inability to account for all factors of instability.



## 4. RESULTS

With the adoption of the UN Decarbonization Declaration, the content of which is set out in the Kyoto Protocol to the United Nations Framework Convention on Climate Change (2006), the call to combat climate change has intensified: companies are under unprecedented pressure to develop and effectively implement effective “zero-emissions” strategies. Investors are keenly aware of the link between management style and financial performance. The signal to managers is unmistakable: climate change risk ultimately trumps financial risk alone as a business threat. Stakeholders concerned about climate change have agreed that organizations that harm the environment can cause irreparable damage to their reputations.

It necessitated adopting an integrated approach to policy formulation and implementation for the energy sector, taking into account, in particular, the goals of sustainable development, greening and decarbonization of the national economy (Cheng et al., 2021). This document declares increasing the efficiency of the united energy system of Ukraine, ensuring the security of electricity and gas supply for consumers, integrating energy markets into the European market, the transparent work of independent regulators, and synchronization with the ENTSO-E technology.

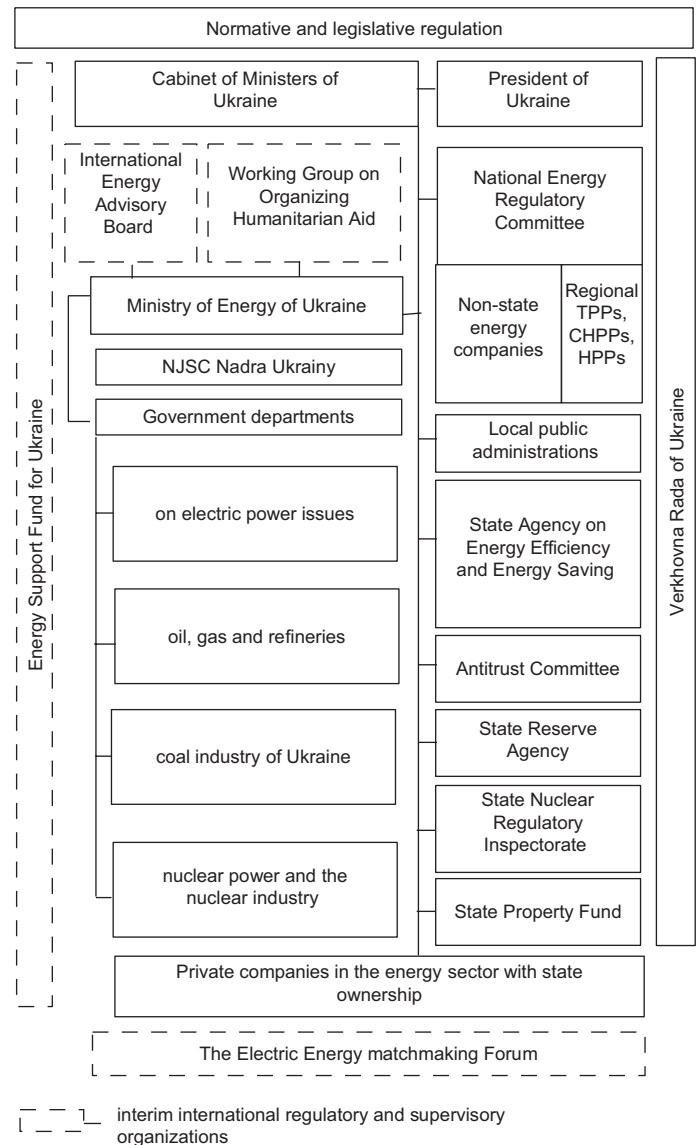
One area of implementing this approach can be the development of public-private partnership mechanisms. At the same time, the Law of Ukraine was adopted in 2012 as part of the transition to a green economy and energy security. In this regard, on 01.07.2022, the National Investment Council submitted a draft law on amendments to some legislative acts of Ukraine to improve the mechanism for attracting private investment using the mechanism of public-private partnership (Yefimenko, 2022).

The main task of the public-private partnership reform, formulated by the National Investment Council, is to simplify the existing procedures as much as possible, thereby reducing the time to prepare projects by almost half. After the reform, it will be reduced by 2-3 times. According to the current legislation, only the preparatory phase of project implementation takes at least two years. According to the current legislation, collecting the same number of documents for both projects is necessary to construct a power plant and reconstruct one of the units. Under modern conditions these terms cannot be provided.

According to the project developed by the National Investment Council, the transition is possible from the existing model in the energy sphere, which is aimed at a single buyer, to the market model of supplying energy needs. Under martial law, it is possible to involve other international supervisors and partners in solving energy problems in the state. Thus, the general interaction scheme in the energy sphere is presented in Figure 1.

According to Figure 1, public-private partnerships in the energy sector can be implemented at the national level and by engaging international organizations and funds.

**Figure 1:** Organizational structure of the regulatory authorities of the energy sector of Ukraine (developed by authors)



At the current stage of development Ukraine’s Ministry of Energy has been negotiating with international partners to assist Ukraine’s energy sector, which has come under relentless attack from its enemies.

The Ministry of Energy created a working group to organize humanitarian aid in the energy sector. It collects requests from Ukrainian energy companies about their needs, works through them, and passes them on to partners willing to provide appropriate assistance. The distribution of supplied materials and equipment was carried out mainly in the areas most affected by Russian aggression.

In April 2022, at the initiative of the European Commissioner for Energy Kadri Simson, the Energy Community established the Ukrainian Energy Support Fund. States, companies and organizations offer the fund. The fund’s primary mission is to support energy companies in the timely restoration of energy infrastructure damaged or destroyed by Russian bombings. The

fund purchases equipment that international partners cannot provide as humanitarian aid. USAID carries out the purchase of the relevant equipment according to international standards of transparency.

Under the auspices of the Ministry of Energy of Ukraine and the Ministry of Foreign Affairs of Ukraine and with the support of the European Commission and EISMEA, Enterprise Europe Network, in cooperation with the EU clusters, is also looking for partners in the field of electricity through the Power Connection Forum platform. The forum aims to identify energy equipment manufacturers and distributors that can contribute and provide all possible recommendations further to support Ukrainian citizens and businesses in the coming months.

The listed public institutions carry out activities in the FEC in cooperation with other authorities of Ukraine: the Ministry of Economic Development and Trade, the Ministry of Ecology and Natural Resources, the Ministry of State Service of Ukraine for Emergency Situations, the Ministry of Social Policy, the Antimonopoly Committee, the State Property Fund of Ukraine, the State Reserve of Ukraine, law enforcement agencies, local authorities, public authorities and local self-government bodies. Therefore, we understand public-private partnership in nature management as an integral system of organizational and economic forms, economic methods and tools for designing partnerships between the state (especially municipalities) and corporate structures to use and reproduce natural nature. Attracting investment helps to ensure long-term coordinated corporate environmental management in the company's environmental, social and economic interests through a balanced and responsible distribution of management, control, risks and results between partners and strategic platforms. Thus, the public-private partnership is considered a mechanism whose overall function is the harmonization of environmental and economic interests of economic entities and the resolution of the resulting contradictions, taking into account modern principles of decentralization of natural resource management; taking into account of current trends in the capitalization of natural resources.

The model of ecological and economic development within the framework of ensuring energy security should be based on the principles:

1. Public administration and social development functions remain paramount, particularly national security. In situations of common threats and a changing security environment, applying adaptive management that combines problem understanding, solution concept and adaptive assessment framework is advisable. This principle is outlined in Redko et al. (2022), which states that energy management should be seen as both a process and a method. It is a flexible and adaptive decision-making process designed partly to reduce uncertainty. At the same time, scientists emphasize that evaluation as an integral part of adaptive management is critical. Evaluation should be carried out continuously while implementing the relevant policy or program and should provide the information needed to select and determine the means for further development.

2. Equally important is the formation of national systems for threat analysis and protection of critical infrastructure (mainly energy). It is facilitated by the Joint Intelligence Committee, which should lead and coordinate the efforts of all intelligence agencies, combine intelligence information from different sources and provide this information to all actors in the 16 security, national and defense sectors that concern them.

Summarizing the experience of developed countries in the use of models of public-private partnership, we can state that the form of implementation of interaction depends on the form of participation and the status of the property, the object of the contract, the distribution of risks, and the duration of cooperation. It is important to note that public-private partnership is an alternative to the privatization of natural resources and public domain of the state, as it combines assets of the public and private sectors, in particular: social and environmental responsibility, public issues of social responsibility on the environment, business environment management standards; accountability and priority; entrepreneurial approaches to the formation of financial resources and the use of innovative technologies in factor management. Also, these issues are considered in Dudek et al. (2023), Kovalko et al. (2018), Samsin et al. (2021).

Generally, three stakeholders benefit from public-private partnerships: the state, business, and the international community (Table 1).

Characteristic of the energy sector, socio-environmental infrastructure and natural resources are mainly national or regional services, which often need help organizing the decarbonization transition. At the same time, underfunding regional development budgets must provide an adequate financial and economic basis for the ecosystem management of natural capital.

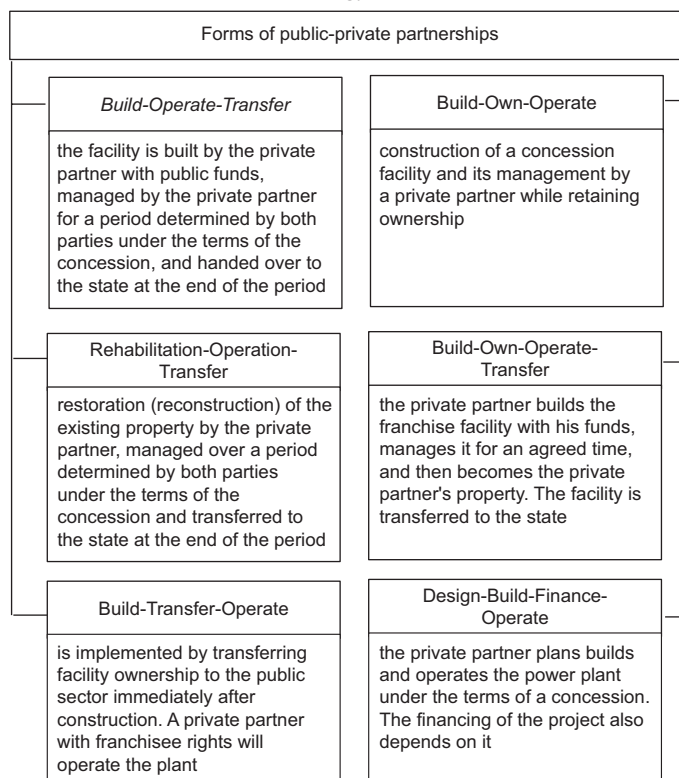
Strategic directions of balanced and innovative nature management in a changing environment should include the rational use, reproduction and conservation of natural resources, improvement of environmental quality and development of environmental infrastructure. At the same time, it is necessary to identify the main mechanisms and forms of public-private partnerships that environmental management units can implement. Some of them need clarification, coordination, cooperation and interaction between the state, the private sector and the public sector under conditions of instability (Table 1). This approach represents the central platform of cluster policy, forming a cluster-enterprise form of management in the energy sector.

At the same time, the forms of public-private partnership will differ depending on the sphere of application (economy, unification of public and private property, energy development of the state, ensuring more significant employment of the population). In the energy sphere, to provide decarbonization mechanisms, the primary forms of public-private partnership can be an export-oriented partnership and innovation-oriented partnership (Figure 2).

**Table 1: Benefits of public-private partnerships**

Governmental sector	Private sector
<p>Time savings. Traditionally, this form of the state was an installment plan for constructing new infrastructure. However, it should be taken into account that in addition to the speed of construction, the PPP format increases the costs of the state over time. With the help of public-private partnership projects, it is possible to start building more facilities, attracting corporate resources and paying for maintenance over the next 20 years</p> <p>The participation of private funds in the construction of social infrastructure by public-private partnerships attracts operators of social services to the market. Thus, the quality of services is improved</p> <p>All construction risks are transferred to private investors, and the state controls only the final quality</p>	<p>A national partnership means a faster approval process and less risk for companies. Investors receive a guaranteed return during the term of the public-private partnership agreement, which is a significant advantage to any commercial project. In doing so, the government will compensate for the demand risk in the project and allow for a realization that covers the costs</p> <p>Attractive location, a good, easily accessible place to do business and an almost ready clientele</p> <p>Security of state funding also ensures an easy project launch and better opportunities to raise outside funds. After all, cooperation with the state guarantees the financial integrity of the borrower</p>
Public sector	
<p>The energy structure was renewed, allowing for the implementation of energy-saving projects</p> <p>Public-private partnership projects allow the possibility of involving representatives of public and nongovernmental organizations in the implementation of projects</p>	

**Figure 2:** Forms of implementation of public-private partnerships in the energy sector



conclude energy service contracts and strategically manage the development of alternative energy. The following franchising models are distinguished in international practice, depending on the volume of equity rights granting and legal ownership of franchise facilities.

As for the effectiveness of the PPP mechanism, the figures for Ukraine, unfortunately, leave much to be desired. Compared to the countries mentioned above, Ukraine ranks last regarding the efficiency of PPP projects (21%). It is confirmed by the official data of the Ministry of Economic Development, according to which, as of July 1, 2018, out of 192 contracts concluded within the PPP framework, the majority (113 contracts) still needed to be implemented.

European countries have had a positive experience using the franchise model in the housing and utilities sector. In France, for example, the heating company of Paris supplies heat to 1/3 of the population of Paris. The system has a capacity of 4,000 MW, and the length of the heat network is 450 km. At the same time, the company uses renewable energy sources (geothermal and biomass) to produce heat.

In Romania, Apa Nova Bucuresti modernized Bucharest's water supply system. Thanks to the concession agreement, water quality has improved, the length of the water supply network has increased, the emergency response time has been reduced, and water losses have been reduced by almost 50%.

The mechanism of public-private partnerships in the form of concessions in the energy sector is widespread in international practice. In particular, in Gujarat (Western India), there is a 25-year concession contract with a private company Madhav Solar (Vadovara Rooftop), for the design and construction of 5 MW photovoltaic panels (mostly private buildings). The company will manage the panels and sell electricity to citizens in the future.

Vietnam has much experience implementing public-private partnership projects in the electricity sector (projects Nghi Son 2;

These statistics show that a legal and regulatory framework is a fundamental factor in the PPP relationship but needs to be more decisive. The effectiveness of the implementation of a PPP project depends directly on many other factors, namely: the interest of the private partner in the implementation of the PPP project, the availability of guarantees of the partner's financial obligations under the project framework, the guarantee of mutual respect in favor of the public and private sectors.

Cooperation on the franchise model is most common. With the help of PPP projects, reconstruct various energy facilities, develop energy infrastructure, introduce energy efficiency measures,

Song Hau 2; Vung Ang 2). The most common form of cooperation is the Build-Own-Operate agreement. Most documents are already standard, thanks to the established procedures for applying the PPG mechanism, significantly facilitating project implementation and implementation procedures.

According to Ukraine, the application of public-private partnership mechanisms for decarbonization is at the stage of development and generalization. At the same time, in the current conditions of martial law, it is necessary to pursue a policy of attracting investors more intensively in the energy sector of Ukraine.

In decarbonization, Ukraine is at an early stage. It is necessary to be able to demonstrate progress in order to reap the benefits of decarbonization initiatives. Customers, investors, lenders and shareholders expect transparent and reliable data to support profit claims.

The era of climate protection has begun: stakeholders want to see a strategy for achieving “zero” emissions and see results that can be verified. An organization’s willingness to adopt an effective strategy depends on the nature of the business and the progress the organization has made toward zero emissions. Central to this work is the ability to report on the results of pollution reduction. These technologies contribute to global change and underpin a platform that serves two primary purposes: tracking and reporting.

In order to conduct an environmental and economic assessment of the feasibility of implementing energy projects to enable the transition to decarbonization, we highlighted the environmental and economic outcomes of implementation (Table 2).

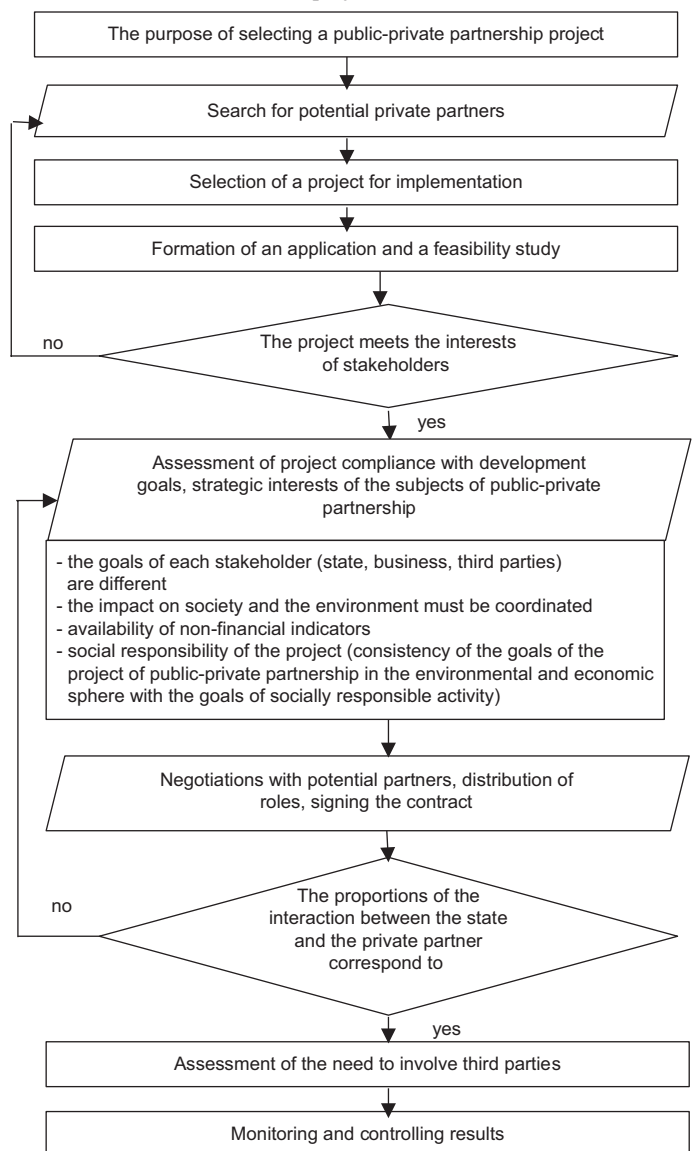
Assessment of the effectiveness of public-private partnership projects should consider the relationship of environmental, economic and social results, as well as the direction of changes in these indicators, depending on changes in the external environment. In order to take into account the risks and their correlation with the most probable result, we have developed an approach for selecting the most effective public-private partnership project (Figure 3).

Management of public-private partnership projects in the energy sector is proposed to be an open, dynamic system. This system requires constant control and monitoring of compliance with the requirements of the external environment and the possibility of implementation under current legislation. Since the adoption of the project model parameters can be considered as established standard values. Changes in these values may occur in the long term and depend on regulatory and legal framework changes. However, it should also be considered that the forms of implementation and directions of projects may differ depending on the territorial affiliation. Small hydropower projects are being implemented in Kazakhstan. The main obstacles to investing in renewable energy are relatively high financing costs and the need for unified tariffs for electricity supplied from renewable energy sources. The volume and duration of renewable energy tariffs are estimated separately for each project based on feasibility studies and production costs. Up to 35 MW of wind, solar, biomass,

**Table 2: Convenience of implementing decarbonization energy projects**

Environmental benefits	Economic benefits
Deceleration of the climate configuration	Creation of profitable export markets
Reducing CO <sub>2</sub> emissions	Upgrading the energy system
Reducing the pressure on the water system, the atmosphere and the subsoil system	Development of the state commodity producer
	Reduction of energy resource consumption
Social benefits	
Change in lifestyle	
Reducing energy costs	
Lean use of energy resources	

**Figure 3: Flowchart of the analysis of public-private partnership projects**



hydropower, and geothermal energy are subject to the tariff, and transport companies must buy electricity from renewable energy producers. Ukraine has more favorable conditions for the transition to renewable energy sources. Thus, according to the World Economic Forum (ETI) in 2021 (ETI, 2021), Ukraine



scored 2.4 points higher than Kazakhstan regarding its readiness to introduce clean energy sources.

Ukraine's regions also vary in the way energy efficiency is implemented. The metallurgical industry accounts for most of the electricity consumption. Considering that the metallurgical complex is concentrated in Lugansk, Donetsk, Dnepropetrovsk, Kyiv, Ivano-Frankivsk, Mykolaiv, Kharkiv, Chernivtsi, Lviv, Zhytomyr regions, it is necessary to focus on the implementation of renewable energy in the long term. The population consumes a minor part of the consumption of electricity. The direction of renewable energy applications may differ depending on the population density in different regions (Population, 2022). For example, in the Ivano-Frankivsk region, more individual heating is used because of the high population density and high electricity costs. In Kyiv and Sumy regions, centralized heating prevails. Therefore, short-term renewable energy projects should be applied to these regions.

## 5. DISCUSSION AND CONCLUSION

The energy industry faces significant challenges. Energy development over the next one or two years requires specific and detailed planning, for which financial support must be sought. An energy strategy must be based on some basic assumptions, such as industrial structure, population, and consumption. These characteristics in modern conditions are not subject to forecasting.

Aderemi et al. (2022) have established the nature of the relationship in the long term, the direction of causality, and the stochastic dynamics of the interaction between clean energy supply and industrial development. It is concluded that the production of electricity from hydropower plants did not lead to industrial development. At the same time, the use of a particular type of renewable energy will have a certain efficiency for each country. Setiartiti (2018) predicted the impact of different development alternatives on future energy consumption and carbon emissions as an indicator of clean energy. The transportation sector is the largest energy consumer with over 60% of the total energy demand and also the largest source of carbon emissions. Suggestions in terms of future energy saving are made and possible steps for policy makers to develop a sustainable clean energy region are suggested.

Considering the possibility of switching to renewable energy sources, this solution is complex and requires detailed elaboration. Otherwise, we can focus in the short term on gas production. It is a relatively common solution that can be rapidly launched into creation. In addition to nuclear generation, the basis for the development of the energy system of Ukraine should be the generation of natural gas, which can compensate for future unstable renewable energy sources.

However, in this case, the main issue will be the possibility of financing such capital-intensive projects. The first phase will be based on donor funds under the Ukrainian Support and Renewal Program. However, most next-generation projects, especially renewable energy projects, must attract private investment. In order to attract them, it is necessary to reduce historical debt and

ensure that these projects continue to pay for themselves. Another way out of the situation could be the purchase of power plants at a fixed price. In this case, compulsory insurance is needed, which potential investors will not facilitate because of historic debt.

At the same time, some parts of the industry are willing to pay European prices for electricity if there are guarantees that they will not be disconnected. Therefore, offering similar conditions to new private power generation projects is fair. It guarantees that electricity consumers are not separated from the grid purchased by new equipment manufacturers under direct contracts and that these manufacturers have the right to export these electronic products freely.

These conditions go some way to protecting the economics of next-generation projects. The state should also speed up and simplify permitting procedures for new energy projects.

In addition, for new large projects in long-term power generation (50 MW or more), investors must provide ready construction sites, including connections, all permits, and power purchase agreements.

The state's task is to create the necessary framework conditions, market rules, and incentives for private investment. However, private investors may require additional guarantees. A possible step to establish interaction with a potential investor in the short term could be a gradual increase in energy tariffs for industry and households. Kovaliuk et al. (2020) analyzed the impact of environmental conservation measures on the population's welfare. The work proves not only the environmental effects of such projects but also the economic ones.

If such projects are not implemented, the energy market will become unbalanced and require further support from the state budget. This cheap electricity and gas will stimulate market development and new generation construction but will not contribute to energy saving and efficiency measures. In this case, the government will be forced to implement reforms, or the energy crisis will continue. Of course, price increases must be accompanied by increased subsidies for vulnerable categories of people.

At the same time, energy reform projects must be coordinated with reforms in other areas. For example, projects should apply the results of digitalization. The reforming of this sphere has been analyzed, and implementation options in all areas of economic and political development have been proposed by Megits et al. (2022), Oneshko and Pashchuk (2021), and Bulkot (2021). Dykan et al. (2021) analyzed the effectiveness of digitalization projects and proved their effectiveness.

SUERF experts believe that decarbonization poses at least two risks regarding regulation and taxation: firstly, it will discourage investment and impede growth by worsening stagnation, which would worsen the economies of European countries. Higher energy prices drive up European production costs, requiring a permanent adjustment of import taxes and export subsidies to protect the industry. At the industry level, energy-intensive

industries (steel, chemical, and cement) may be subject to high European environmental and carbon taxes and, therefore, risk being displaced to areas with low energy consumption. In this case, inflation could increase significantly.

At the same time, the revision of the budgetary tax base would allow additional state credits for investments in energy efficiency projects, possibly in the form of an exemption from the basic standard of 3% for investments in such activities. It would be possible by investing an additional 1% of the gross domestic product in energy efficiency projects related to investments and the additional amount to be allocated to repay the historical debt.

It should be noted that national influence on the fiscal sphere within the European Union is akin to the practice of economic regulation by national governments. It is not a question of direct regulation (public procurement, sale of state assets) but of indirect influence (regulation of the deficit, historical debt, expenditures and budget revenues). Considering the option of creating credit for investment opportunities, it should be noted that, given the historically low borrowing costs, it is advisable to maintain public investment rather than increase current spending. In the UK, for example, the established level of net public investment has risen from 2% to 3% of the gross domestic product, while debt service accounts for less than 6% of government spending. With negative yields on most European zone bonds, governments can lend money almost for free, boosting profits from any public investment.

Studies have shown that achieving specific goals can be limited by the power of social capital or by micro- and macro-environment conditions and factors: firms maintain a certain level of profitability to achieve specific goals - attracting investors, ensuring the stability of workers' wages, supporting and creating jobs. Thus, Hrosul et al. (2021) and Khan et al. (2021) assess the impact of the state environmental policy on the profitability of business activities. It is also necessary to pay attention to the social security of businesses in implementing projects. It consists of paying taxes, creating new products and investing in the development of the industrial and social spheres. At the same time, the state and specially created public organizations are obliged to implement programs to improve the environmental situation on the enterprise's territory and create new employment opportunities. In the case of insufficient budgetary funds, the solution of these problems requires the combined efforts of various stakeholders to solve problems using the possibilities of public-private partnerships.

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