

# ENSURING ENERGY EFFICIENCY OF SETTLEMENTS IN UKRAINE AND EU COUNTRIES: LEGAL, ECONOMIC AND MANAGERIAL ASPECTS

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**Abstract.** The study examines energy and energy-related environmental policies in the international context and their impact on the economy and businesses in the context of energy efficiency. The focus is on Ukraine's integration into the European energy market and the legislative features of energy policy. The purpose of the article is to determine the content and features of the administrative and legal regime for the use of solar energy facilities in Ukraine in the light of ensuring the requirements for the viability of human settlements. The tasks of the article were to determine the EU energy efficiency policy, its economic and regulatory justification, which can be adapted to the needs of meeting the energy needs of Ukraine in the crisis conditions of war, and to determine the strategy for the development of energy efficiency of settlements in post-war conditions. The study used general scientific and special methods, the main of which were: abstract-logical, deductive, inductive, historical, modelling and forecasting, methods of system structural, system and functional analysis, economic-statistical (grouping, comparison, etc.). As a result, the authors conclude that the reason for this is its clear advantages over traditional sources, which are difficult to refute. In some countries, the government is implementing complex public programmes with huge financial investments for gradual replacement, but so far the results remain insignificant. Ensuring an adequate level of energy efficiency in Ukraine requires the activation of processes of harmonization of the current national legislation with the standards of the EU energy and climate policy, which is connected with: amendments to the Tax Code of Ukraine in order to create conditions for attracting investors to the market of energy services; further processes of decentralization of the energy system and the spread of alternative, independently separated energy subsystems and energy resource traders; formation of artificial raw materials as sources of thermal energy.

**Keywords:** energy policy, sustainable development, EU energy goals, energy consumption, legal regulation, economic system, Ukraine.

**JEL Classification:** Q40, Q01, P50

## 1. Introduction

Ensuring Ukraine's energy independence and restoring the country's energy system under martial law and in the post-war period is a pressing issue that requires intensified scientific research. Ukraine has significant resource potential in the energy sector, which was confirmed even in the context of the Russian-Ukrainian war. Obviously, Russia's military aggression against the developed world, as well as against Ukraine, has put on the agenda

the search for alternative energy sources on national territory to reduce or eliminate dependence on external resources.

The introduction of new technologies, the use of which makes it possible to solve the energy problems of the modern world, including the problems of energy resources supply in Ukraine, requires the development and implementation of an appropriate regulatory framework for their application, which justifies the relevance of this scientific publication.

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The purpose of the article is to establish the content and specific features of the administrative and legal regime for the use of solar energy facilities in Ukraine in the light of ensuring the requirements for the viability of settlements.

The objectives of the article are to define the EU energy efficiency policy, its economic and regulatory justification, which can be adapted to the needs of meeting Ukraine's energy needs in the crisis conditions of war, and to determine the strategy for the development of energy efficiency of settlements in the post-war environment.

## 2. Brief Literature Review

The development in the content of the administrative and state regime for the use of solar energy for electricity generation was due to the findings of such scientists as: S. D. Bilotsky (Bilotsky, 2021), O. O. Kravchuk (Kravchuk, 2017), V. B. Krikun (Krikun, 2021), A. Borysenko, Y. Volko, O. Pushkina, M. Potip, Y. Leheza (2022) and others. These studies examine the problems of energy efficiency in human settlements and put forward a number of proposals for optimising solutions with due regard to the public interest of society.

Many authors emphasise the contribution of energy policy to the energy transition (Patala, Juntunen, Lundan & Ritvala, 2021), corporate and regional energy efficiency (Fowlie, Greenstone & Wolfram 2018), and to reducing CO<sub>2</sub> emissions from consumption (Baloch & Danish 2022) in different countries and regions. This is why this paper considers energy policy as a driving force for achieving energy goals, and therefore the integration of energy markets is a key part of the EU's energy and economic strategy. Previous studies have demonstrated the positive impact of sustainable energy consumption on energy intensity (Degtiareva & Pudychева 2020).

On the other hand, the current energy transition can be described by the 5 Ds, namely decentralisation, digitalisation, decarbonisation, democratisation and decreasing consumption (Idries, Krogstie, Rajasekharan, 2022). The factor model showed a positive impact of sustainable energy consumption on energy intensity (Degtiareva & Pudychева, 2020). In this context, decentralised energy systems are the trend of future energy development and a core part of the sustainable energy nexus environment-economy-society (Wu T., Xu D.-L., Yang J.-B., 2021). However, this also means that in the future, energy generation will be spread across an infinite number of smaller producers throughout the country, and that the system of generators and grids will have to be significantly expanded to include storage and IT systems. As a result, the EU's energy system is under pressure from two opposing trends – integration and

decentralisation. In addition, the war in Europe has exposed other serious challenges: energy dependence on Russian fossil fuels, the fragility of European energy markets and the heterogeneity of the member states (Hercegova, 2022).

## 3. Materials and Methods

The study uses general scientific and special methods, the main of which are: abstract-logical, deductive, inductive, historical, modelling and forecasting, methods of system-structural, system-functional analysis, economic and statistical (grouping, comparison, etc.). The use of system analysis methods allowed structuring the constituent elements of the regulatory framework of public administration in the field of energy efficiency of settlements in Ukraine and the European Union.

Energy and the environment were and remain fundamental factors in the construction of the European Union project. Deep interaction and cooperation between the founding members crystallised around sustainable development and energy considerations. EU energy and environmental policies have evolved primarily to respond to current challenges in the respective areas and to prevent possible future challenges.

## 4. Results and Discussions

### 4.1. Energy Policy and Evolution of Energy Efficiency Standards in the EU

Throughout its history, European energy and environmental policy has adapted and responded to contemporary challenges. The catastrophic consequences of the Second World War and the constant threat of confrontation between East and West meant that Franco-German reconciliation became a top priority. The decision to unite the coal and steel industries of six European countries, enacted by the Treaty of Paris in 1951, was the first step towards European integration. The Treaties of Rome in 1957 strengthened the foundations of this integration, as well as the notion of a common future for the six European member states. To provide a common policy with a precise set of rules and instruments based on exclusive supranational powers conferred on a central institution (Tagliapietra, 2014, pp. 12-16):

- The High Authority in the case of European Coal and Steel Community (ECSC).
- The Supply Agency in the case of European Atomic Energy Community (EAEC).

Together with the European Economic Community, the foundations of the current EU were laid. After the initial impetus, the role of energy in EU development

weakened over time – the Single European Act and the Treaties did not give the EU clear powers between 1986 and 2001. This changed after the signing of the Lisbon Treaty, also known as the Lisbon Treaty, which updated the rules of the European Union, establishing more centralised leadership and foreign policy, a due process for countries wishing to leave the Union, and a simplified process for adopting new policies. The Treaty was signed on December 13, 2007 in Lisbon, Portugal, and amended two previous treaties that laid the foundation for the European Union.

Using the "ambient strategy", the EU has created extensive legislation on energy-related issues, especially in terms of competitiveness and environmental instruments. In particular, since the 1990s, the EU has adopted a series of directives aimed at liberalising electricity and gas markets in order to open national markets to competition and create a single EU energy market.

The process started with the adoption of:

- Directive 96/92/EC concerning common rules for the internal market in electricity;
- Directive 98/30/EC concerning common rules for the internal market in natural gas.
- The first and second legislative packages were aimed at developing market access, in particular, Directive 2003/54/EC and Directive 2003/55/EC introduced free choice of electricity and gas suppliers.

In the first decade of the XXI century, the EU faced major challenges in the field of energy and environment, most of which still play a crucial role in EU policy. In the energy context, these include: increasing import dependence, limited diversification and slow progress in energy efficiency, high and volatile energy prices, growing global energy demand, security risks affecting producer and transit countries, and the need for greater transparency, further integration and interconnection of markets.

The tendency to combine energy and environmental issues in EU policy is driven by the growing threats of climate change, in particular those related to traditional energy production and consumption; the need for decarbonisation and sustainable development; and the challenges posed by the increasing share of renewable energy.

Various measures aimed at achieving an integrated energy market, security of energy supply and a sustainable energy sector have become the basis of EU energy policy since the beginning of the new millennium. In general, three main energy and climate goals have been identified, which are formulated around the main objectives for 2020 (Figure 1).

The Third Energy Package was adopted in 2009 with the aim of further liberalising and integrating Europe's energy markets. The package pursues the general objective of completing the European Union's Internal Energy Market (IEM) and contains provisions on a number of aspects relating to the supply of electricity and gas, in particular in the following areas unbundling of energy suppliers from network operators; strengthening of the independence of regulators; creation of the Agency for the Cooperation of Energy Regulators (ACER); strengthening of cross-border cooperation between transmission system operators and creation of European Networks for Transmission System Operators (ENTSO-E and ENTSO-G); open and fair retail markets and consumer protection, switching, termination fees, billing of electricity and gas consumption, right to information on energy consumption, quick and inexpensive resolution of disputes.

In terms of consumer protection, the Third Energy Package obliges EU member states to define the concept of vulnerable consumers at the national level and to take measures to protect such consumers and overcome energy poverty.

The Third Energy Package consists of the following legal instruments (Treaty on Principles Governing):

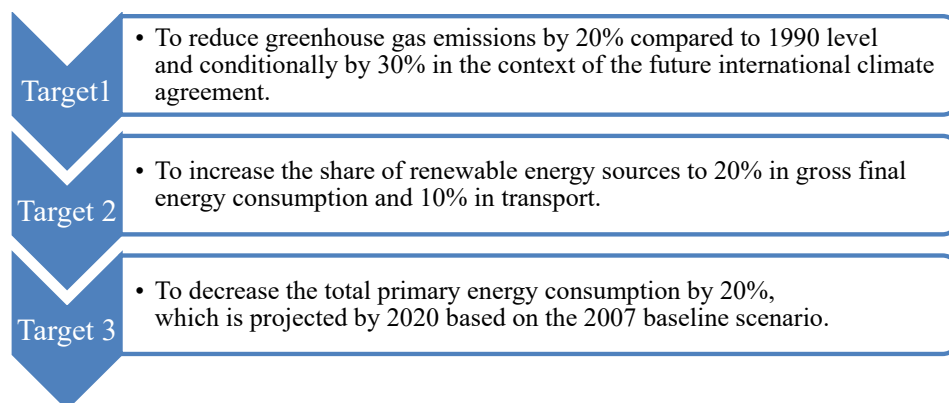


Figure 1. Three main EU goals for 2020 in the field of energy and environment<sup>1</sup>

<sup>1</sup> Available at: [https://ec.europa.eu/clima/eu-action/climate-strategies-targets/2020-climate-energy-package\\_en](https://ec.europa.eu/clima/eu-action/climate-strategies-targets/2020-climate-energy-package_en)

- Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC;
- Regulation (EC) No. 714/2009 of the European Parliament and of the Council of July 13, 2009 on conditions for access to the network for cross-border exchanges in electricity;
- Directive 2009/73/EC of the European Parliament and of the Council of July 13, 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC;
- Regulation (EC) No. 715/2009 of the European Parliament and of the Council of July 13, 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005;
- Regulation (EC) No. 713/2009 of the European Parliament and of the Council of July 13, 2009 establishing an Agency for the Cooperation of Energy Regulators.

The 2020 Climate and Energy Package consisted of the allocation of greenhouse gas emission reductions in the pan-European carbon market (Decision 406/2009/EC) based on Directive 2009/29/EC on the EU Emissions Trading System (ETS) and with individual targets for each Member State in sectors outside the EU ETS. In addition, the Renewable Energy Directive (RED) (2009/28/EC) and the Energy Efficiency Directive (EED) (2012/27/EU) require Member States to set indicative national targets to achieve the EU-wide objectives. The package was complemented by the Carbon Capture and Storage Directive (2009/31/EC) and the Biofuels and Fuels Quality Directive (2009/30/EC), as well as the Emission Standards Regulation (EC) No. 443/2009.

The 2020 Climate and Energy Package relied on strong EU-wide instruments, including the EU ETS, the internal energy market and harmonized EU-wide energy efficiency policies and measures (eco-design, building codes and energy performance certification for buildings, CO<sub>2</sub> standards for light-duty vehicles).

In November 2018, the European Commission presented a long-term vision for a climate-neutral EU economy by 2050. The communication "A Clean Planet for all" (EC, 2018) includes an analysis of scenarios with a baseline and eight alternative decarbonisation pathways (six with 80% greenhouse gas emissions reduction and two with 100% greenhouse gas emissions reduction, keeping global temperature rise to 1.5 degrees Celsius or less). All scenarios rely on several pillars (Figure 2).

Thus, the EU is currently addressing pressing energy issues and energy-related environmental challenges such as climate change, resource depletion and sustainable development. The Russian invasion of Ukraine and the subsequent energy blackmail have on the one hand become an additional energy challenge for European policy makers, but on the other hand they have strengthened the trend towards green energy production and more efficient energy consumption in Europe.

The Clean Energy for All Europeans Package (CEP), adopted in 2019, aims to decarbonise the EU's energy system in line with the objectives of the European Green Deal. The package consists of eight pieces of legislation:

- Electricity Market Directive 2019/944/EU and Electricity Market Regulation 2019/943/EU, ACER Regulation 2019/942/EU;
- Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-

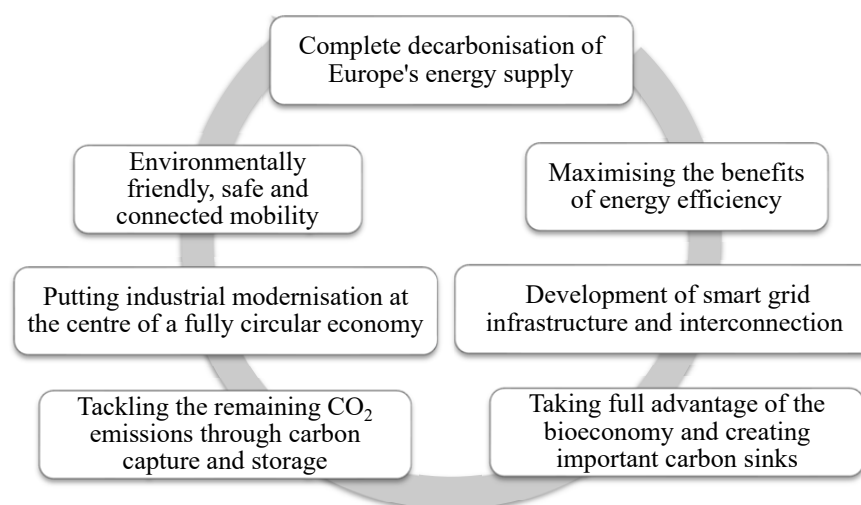


Figure 2. Road to a climate-neutral economy: strategic priorities

Source: (European Commission)

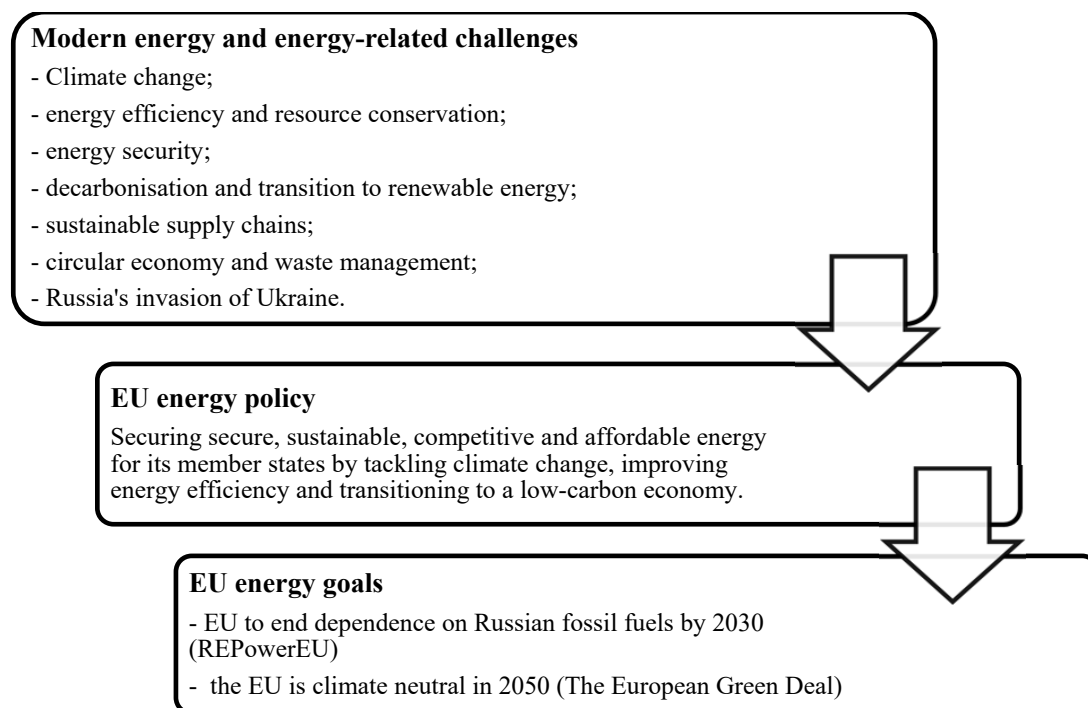


Figure 3. The interrelation of current energy challenges and EU energy policy

preparedness in the electricity sector and repealing Directive 2005/89/EC;

- RED 2018/2001/EU (RED II);
- EED 2018/2002/EU (EED II);
- Energy Performance of Buildings Directive 2018/844/EU (EPBD);
- Regulation 2018/1999/EU on the Governance of the Energy Union.

Prior to the CEP, EU-wide headline targets for 2030 were to reduce greenhouse gas emissions by 40% compared to 1990 level, increase the share of renewable energy and promote energy efficiency, while increasing interconnectivity and tackling emissions from cars, vans and trucks. The CEP increased the Energy Union's ambition for renewable energy and energy efficiency measures to meet the overall 2030 emissions reduction target.

**Energy efficiency comes first.** The revised EED II sets a target of 32.5% energy efficiency by 2030 (compared to 2007 projections), and the new Directive aims to maximise the energy saving potential of smarter and greener buildings and accelerate the refurbishment of existing buildings.

**More renewables.** The EU-wide target of at least 32% renewable energy by 2030 (as opposed to national targets in the RED I) is enshrined in the RED II, which includes specific provisions to ensure that public support, if provided, is cost-effective, promotes self-consumption and the creation of renewable energy communities, and promotes the use of renewable energy in the heating and cooling and transport sectors.

**Governance of the Energy Union.** A new governance regulation requiring each EU member state to develop National Energy and Climate Plans (NECPs) for 2021-30, which set out national ambitions (national voluntary targets) and policies to achieve European goals. In the first round, member states shared their draft NECPs with the European Commission, which reviewed them and provided recommendations for each country. In spring 2020, most EU countries submitted revised final plans to the European Commission.

**More rights for consumers** to produce, store or sell their own energy, including greater transparency of bills and choices.

**A smarter and more efficient electricity market** to improve security of supply, while promoting the integration of renewables and improved cross-border cooperation, as well as a pan-European adequacy needs assessment and common rules for capacity markets (new electricity regulation, amendments to the electricity directive, risk preparedness and regulation setting out a strengthened role for the Agency for the Cooperation of Energy Regulators (ACER)).

#### 4.2. Organisational and Legal Regulation of Energy Efficiency Assurance in Ukraine

Ukraine has a firm intention to integrate into the European economic and energy space. As an EU candidate country, Ukraine is implementing EU initiatives to strengthen energy security, promoting the development of adequate infrastructure, market

integration and regulatory alignment with key elements of the EU *acquis*, promoting energy efficiency and the use of renewable energy sources, and striving for a high level of nuclear safety.

Already in 2011, Ukraine acquired the status of a Contracting Party in the Energy Community of Southeast Europe in accordance with the Law of Ukraine "On Ratification of the Protocol on Accession of Ukraine to the Treaty establishing the Energy Community" ("On Ratification of the Protocol on Accession of Ukraine to the Treaty establishing the Energy Community", 2010).

Further European energy cooperation was developed within the framework of the Third Energy Package, which was adopted by the EU Council and ratified by the European Parliament in 2009. The implementation of the Third Energy Package in Ukraine had several goals: ensuring the country's energy security, improving the quality of services for the population, and, finally, integration into the ENTSO-G and ENTSO-E European gas transmission systems. To this end, the Law of Ukraine "On the Natural Gas Market" was adopted in 2015, and the Law of Ukraine "On Electricity Market" in 2017.

The framework legislation should ensure the demonopolisation and liberalisation of the energy market in the country. From a practical perspective, the electricity market has been officially operating in Ukraine since 2019, the same year the Government of Ukraine approved the unbundling model for Naftogaz of Ukraine, i.e., the model of separation of monopolistic competitive activities, which is a prerequisite for the creation of a natural gas market in accordance with Directive 2009/73/EC.

One of the first legislative acts to address the issue of legal regulation of energy saving facilities was the Law of Ukraine "On Energy-Saving" of July 1, 1994, No. 74/94-VR ("On Energy-Saving", 1994), which became invalid on October 21, 2021 with the adoption of the Law of Ukraine "On Energy Efficiency" ("On Energy Efficiency", 2021) and a number of other legislative acts, in particular the Law of Ukraine "On Energy Efficiency of Buildings" ("On Ratification of the Protocol on Accession of Ukraine to the Treaty establishing the Energy Community", 2010).

According to the Law of Ukraine "On Energy-Saving" of July 1, 1994, No. 74/94-VR, it was established that the purpose of its implementation is to regulate the use of energy resources in order to achieve energy stability, including through the introduction and use of renewable and alternative sources. According to the Law of Ukraine No. 74/94-VR of July 1, 1994, a number of categories were introduced as subjects of legal regulation which were not previously used in the current legislation, in particular, it was established that energy saving is an activity (organisational, scientific, practical, informational)

which is functionally aimed at achieving the goal of rational use of primary and secondary energy in the spheres of economic activity and other spheres of the economic sector of Ukraine, which requires the use of organisational, technical, economic and legal methods and means of influence. Thus, from that moment on, the issue of establishing and regulating relations with the use of energy resources in Ukraine, including through the use of solar energy sources, became relevant. Subsequently, a number of legislative acts on energy law were adopted, in particular, the Law of Ukraine "On Electricity" dated October 16, 1997 No. 575/97-VR ("On Electricity", 1997), which became invalid on April 13, 2017 No. 2019-VIII with the adoption Law of Ukraine "On Electricity Market" ("On Electricity Market", 2017).

According to the Law of Ukraine "On Electricity" No. 575/97-VR of October 16, 1997, it was established that the unified energy system of Ukraine includes, in addition to traditional energy sources, their alternative types, in particular, electric energy produced from solar radiation energy and/or wind energy. In accordance with the provisions of the Law of Ukraine "On Electricity" No. 575/97-VR of October 16, 1997, it has been established that it is permissible for private households to produce electricity from solar radiation using the permissible power of no more than 30 kW, which is purchased from energy suppliers at the regulated tariff in the territory of the corresponding licensed activity, at the so-called "green" tariff in the amount exceeding the monthly consumption of electricity by such a business entity.

In accordance with the provisions of Article 15 of the Law of Ukraine "On Electricity" dated October 16, 1997 No. 575/97-VR, the admissibility of using a generating plant in a household, which can be used to generate electricity from solar radiation without obtaining a special license, was established. At the same time, the distribution of such electricity was recorded in accordance with the methodology approved by the act of the National Commission for State Regulation of Energy and Utilities ("On approval of the Regulations of the National Commission for State Regulation in the Energy and Utilities Sectors", 2015). In accordance with Article 3(3)(7) of the Law of Ukraine "On the National Energy and Utilities Regulatory Commission" dated September 22, 2016 No. 1540-VIII, such a state body solves the task of promoting the implementation of energy efficiency measures, increasing the share of energy production from renewable sources energy sources and environmental protection ("On the National Energy and Utilities Regulatory Commission", 2016; Leheza, Surilova, 2019; Barvinenko, Mishyna, Qaracayev, 2023). The legality of the origin and further use of electricity generated using solar radiation

must comply with the provisions of the Procedure for Issuance, Use and Termination of the Guarantee of Origin of Electricity to Business Entities Generating Electricity from Alternative Energy Sources ("On Approval of the Procedure for Issuance, Use and Termination of the Guarantee of Origin of Electricity for Business Entities Generating Electricity from Alternative Energy Sources", 2013).

In addition to the above-mentioned legislative acts, the sphere of energy law of Ukraine includes such legislative acts as the Law of Ukraine of January 14, 2000 No. 1391-XIV "On Alternative Types of Liquid and Gas Fuel" ("On Alternative Types of Liquid and Gas Fuel", 2000) and the Law of Ukraine dated February 20, 2003 No. 555-IV "On Alternative Energy Sources" ("On Alternative Energy Sources", 2003).

According to Article 1 of the Law of Ukraine No. 555-IV of February 20, 2003, alternative types are defined as "renewable energy sources, which include solar, wind, geothermal, hydrothermal, aerothermal, wave and tidal energy, hydropower, energy biomass, gas from organic waste gas from sewage treatment plants, biogas, as well as secondary energy resources, which include blast furnace and coke oven gases, gas (methane) from coal deposits, gas (methane) from coal deposits generated during degassing of coal deposits, waste energy from energy carriers used in technological processes".

Thus, Ukraine has a certain regulatory framework for the use of electricity generated from solar radiation as an alternative non-traditional energy resource.

Solar radiation is a unique natural resource that differs in its administrative and legal regime from the use of other so-called "traditional" resources, despite its relative inexhaustibility and relative accessibility to everyone and everywhere in the world.

That is why the use of solar radiation should be regulated not only at the level of the domestic legal system, but also at the level of international legal acts.

First of all, the use of solar radiation must comply with the provisions of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty); Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of July 11, 1984 (Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1984), and other international legal regulations.

It should be emphasised that the use of solar radiation for the production of electrical energy for one's own needs does not require a physical or legal entity to obtain a special licence. Another peculiarity of the administrative and legal regime for the use of electrical energy obtained from solar radiation is that the level of efficiency of such activity depends not only on the quality of the equipment used in a

household or other type of economy, but also on the natural conditions of its location.

The State Agency on Energy Efficiency and Energy Saving of Ukraine and the Ministry of Energy of Ukraine are the public authorities in charge of using solar radiation for electricity generation. The functional content of the activities of such public authorities is to implement and develop programmes at the state, regional and local levels in the field of alternative energy sources.

The content of activities related to the use of solar radiation for the production of electrical energy also includes issues of tax incentives for the production of energy using alternative sources. In Ukraine, the processes of installation of equipment for production of electric energy, which are carried out even under war conditions, continue and are quite successful. However, it should be emphasised that most of Ukraine's alternative energy facilities are located in Zaporizhzhia Oblast and the Autonomous Republic of Crimea, and are currently unavailable for proper operation in the war zone, including the Tokmak and Okhotnykovo solar power plants, which are capable of producing around 100,000 MWh of electricity per year under normal conditions.

Therefore, the energy efficiency reform in Ukraine is primarily aimed at the residential sector. As part of the reforms, the Law of Ukraine "On Energy Efficiency of Buildings" will be adopted, and the Energy Efficiency Fund will be established – a state institution that will provide support for the thermal renovation of multi-family residential buildings. It should be noted that the renovation of buildings, which together are a large consumer of energy and producer of carbon dioxide in the EU, is also one of the priorities of the Fourth Energy Package on the way to greater energy efficiency and climate protection.

Among the organisational and economic measures to stimulate the production (extraction) and consumption of alternative types of fuels, the legislator also highlights the provision of tax benefits to legal entities and individuals established by the relevant laws of Ukraine to stimulate the development and introduction of new technologies, equipment and materials in the process of production (extraction) of alternative types of energy resources. In detailing the list of alternative types of energy resources, it is necessary to highlight alcohols (bioethanol, biobutanol), flammable liquids obtained during the processing of solid fuels, fuel obtained from oil and gas condensate of oil, gas and gas condensate fields of non-industrial importance and exhausted fields, from heavy grades of oil and natural bitumen, etc.

However, special favourable taxation conditions (primarily excise tax) are established only for bioethanol (Article 229(229.1) of the Tax Code of

Ukraine). In authors' opinion, the introduction of tax incentives for other types of alternative fuels will allow Ukraine to more effectively implement a balanced energy and innovation policy in the period of overcoming the economic crisis.

Without undermining the progressive nature of the standards analysed, it should be noted that in order to be able to apply the preferential rate to the profit received, companies must be included in the State Register of Enterprises and Organisations engaged in the development, implementation and use of energy efficiency measures and projects. This Register includes enterprises, institutions and organisations that are part of sectoral energy efficiency programmes and have received an expert opinion from an authorised body on the compliance of energy efficiency measures and energy efficiency projects that have already been implemented or are under development and implementation with energy efficiency criteria and are included in sectoral energy efficiency programmes. In addition, when a taxpayer implements energy-efficient measures and energy-efficient projects, such a taxpayer is obliged to keep separate records of profit/loss received from the implementation of these measures and projects.

Suggesting ways to improve such provisions, the authors consider it expedient to establish a zero rate of taxation of the profit of enterprises obtained from the implementation of energy-efficient measures and projects, as well as the profit of enterprises obtained from the sale in the customs territory of Ukraine of self-produced goods that increase the level of energy efficiency of the national economy, in the case of directing such profit to increase the volume of implementation of energy-efficient technologies, reduce their costs, as well as to repay loans used to finance the above-mentioned purposes.

This decision will free business entities from the unproductive work of maintaining additional tax records and will also free up financial resources to be used in the innovative field of energy efficiency. In case of violation of the requirements for the targeted use of tax-exempt funds, it is advisable to oblige the taxpayer to increase the tax liability for this tax based on the results of the tax period in which such

violation occurs, and also to pay a penalty calculated in accordance with the provisions of Article 30(30.8) of the Tax Code of Ukraine, namely: controlling authorities monitor the correctness of granting and accounting for tax benefits, as well as their intended use, the availability of legislative definition of the areas of use (in respect of conditional tax benefits) and timely return of funds not paid to the budget as a result of granting the benefit, if it is granted on a repayable basis. Tax concessions not used for the intended purpose or returned late will be returned to the respective budget with a penalty of 120% of the annual accounting rate of the National Bank of Ukraine (Tax Code of Ukraine, 2010).

The new energy strategy of Ukraine for the period up to 2050 was approved by the Cabinet of Ministers of Ukraine in 2023. In many respects, it is based on European guidelines for the development of the energy sector, takes into account the consequences of a full-scale war, strengthens the role of energy security and focuses on the stability of the energy system, primarily through the decentralisation of power generation throughout the country.

Thus, it can be argued that Ukraine's energy sector has recently been undergoing reforms and significant transformations to rebuild an old, worn-out infrastructure with low performance, high losses and significant oligarchic influence. Ongoing reforms are expected to significantly change the structure of the domestic energy sector and the rules of the game in the energy market.

#### 4.3. Impact of Energy Policy on Business and the Economy

The EU has consistently implemented its energy and environmental policies, which have a significant impact on business and the economy. Most of the EU's 2020 energy targets were achieved by 2020. In contrast, Ukraine's policies do not have a significant impact on the achievement of the EU's 2020 energy targets (Table 1).

The progress in reducing greenhouse gas emissions is more related to the deindustrialisation of the Ukrainian economy than to effective policy implementation. Despite a number of legislative

Table 1

#### Comparative analysis of Ukraine's and the EU's achievements in achieving the EU's energy goals by 2020

2020 EU energy goal	Targeted value	EU achievements	Ukrainian achievements
- 20% reduction in greenhouse gas emissions (from 1990 levels)	20%	32%	62% (2019)
- 20% of EU energy from renewable sources	20%	22.1%	9,19%
20% improvement in energy efficiency			
PEC	1 312 Mtoe	1 236 Mtoe	86 363 Ktoe
FEC	959 Mtoe	907 Mtoe	47 773 Ktoe

Source: based on data from Eurostat and the State Statistics Service of Ukraine



initiatives, the share of renewable energy sources in the energy balance is still far from the target of 20%, but it is growing very positively and relatively rapidly. The biggest challenge for Ukraine's economy is energy efficiency, as shown in the table with an almost half gap between primary and final energy consumption.

The most visible and significant results of energy and environmental policy implementation are observed in the manufacturing sector. The amount of energy associated with manufacturing illustrates its importance in terms of energy demand. Energy-intensive processing, where energy demand is one of the main cost drivers, together with production, dominate industrial energy consumption. Their share in total energy consumption is a combination of energy intensity, industrial scale and the ability to influence energy efficiency through policies affecting the processing industry (Figure 4).

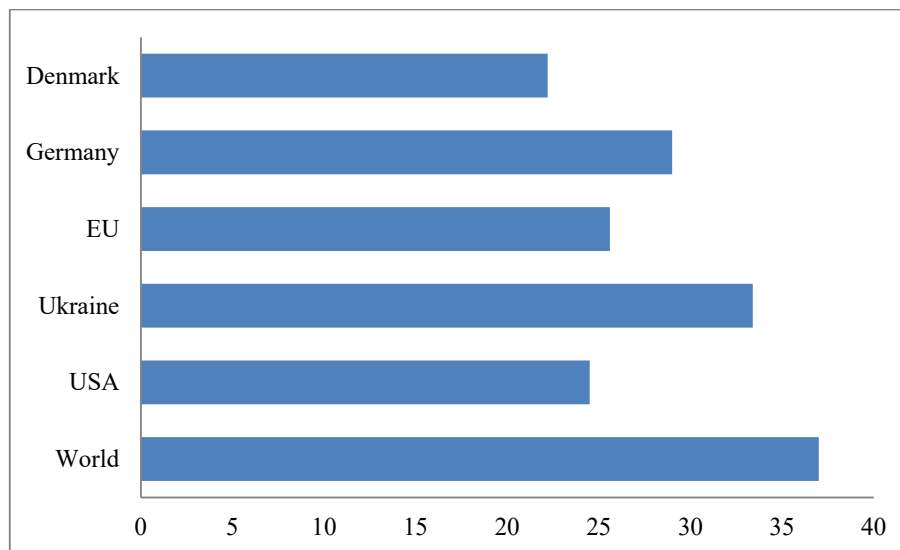
Stricter regulations and eco-standards, as well as the potential for competitive economic advantage and proactive green behaviour, are driving companies to move towards greener manufacturing solutions, e.g., reducing CO<sub>2</sub> emissions indirectly through electricity consumption and directly through the use of fossil fuels. Finally, energy challenges are driving the adoption of advanced operational and business technologies in the quest for energy efficiency. Manufacturers are seeking to minimise energy consumption not only to reduce costs, but also to meet environmental and regulatory requirements. The result is more energy efficient and sustainable manufacturing practices in the modern industrial landscape.

## 5. Conclusions

Unfortunately, modern energy consumption is largely based on the use of non-renewable fossil fuels such as coal, oil and gas. As a result, an energy problem is emerging: the rapid depletion of non-renewable fuels at the growing rate of consumption. One way to solve this problem is to use alternative energy sources. However, despite the recognition of the urgent need for alternative energy, the practical implementation of these sources is slow.

The effectiveness of the development of alternative energy sources depends primarily on the efficiency of the regulatory framework, the main goal of which should be to create favourable conditions for the domestic renewable energy market.

The main regulatory acts governing legal relations in the field of alternative energy in Ukraine are the Law of Ukraine "On Alternative Energy Sources", adopted by the Verkhovna Rada of Ukraine on February 20, 2003, as amended on April 13, 2017. The main principles of state policy in accordance with this Law in the field of alternative energy are: increasing the volume of production and consumption of energy produced from alternative sources with the aim of economical consumption of traditional fuel and energy resources and reducing Ukraine's dependence on their import by restructuring production and rational energy consumption according to the increase in the share of energy produced from alternative sources; attracting domestic and foreign investment and supporting entrepreneurship in the field of alternative energy sources, including through the development and implementation of



**Figure 4. Share of energy consumption of processing enterprises in total energy consumption in selected countries and regions, %**

Source: authors' own calculations based on data from Eurostat (2021), IEA (2022), State Statistics Service of Ukraine (2020)

national and local programmes for the development of alternative energy. On 29 December 2016, the National Energy and Utilities Regulatory Commission adopted the Resolution "On Establishment of 'green' tariffs for electricity for business entities and a surcharge to the 'green' tariffs for compliance with the level of use of Ukrainian-made equipment". This resolution approved feed-in tariffs for electricity produced by business entities at electricity facilities using alternative energy sources and a surcharge to feed-in tariffs for compliance with the level of use of Ukrainian-made equipment. On December 20, 2018, the Verkhovna Rada of Ukraine adopted the Resolution "On Adopting as a Basis the Draft Law of Ukraine on Amendments to Certain Laws of Ukraine on Ensuring Competitive Conditions for Electricity Generation from Alternative Energy Sources".

The Law of Ukraine "On Amendments to Certain Laws of Ukraine on Establishing a Green Tariff", adopted in September 2008, is aimed at attracting investment in environmentally friendly energy sources. Under this tariff, the state buys electricity generated by power plants using alternative energy sources.

In April 2009, the green tariff was improved at the legislative level. In particular, the green tariff was extended until 1 January 2030, and the tariff was pegged to the hard currency at 0.113 EUR per kWh.

Alternative energy continues to spread. The reason is its obvious advantages over traditional sources, which are difficult to refute. In some countries, governments are implementing comprehensive state programmes with huge financial investments to gradually replace them, but so far the results have been marginal.

Ensuring an adequate level of energy efficiency in Ukraine requires the activation of processes of harmonization of the current national legislation with the standards of the EU energy and climate policy, which is connected with: amendments to the Tax Code of Ukraine in order to create conditions for attracting investors to the market of energy services; further processes of decentralization of the energy system and the spread of alternative, independently separated energy subsystems and energy resource traders; formation of artificial raw materials as sources of thermal energy.

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