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Institutional Analysis, Energy
Report

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COWI

Assistance to the Development of the **Mykolaiv** **Masterplan**

Institutional Analysis, Energy Report Final

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List of Abbreviations

AMCU	Antimonopoly Committee of Ukraine
CHP	Combined Heat and Power
CMU	Cabinet of Ministers of Ukraine
DAM	Day Ahead Market
DSO	Distribution System Operator
ENTSO-E	European Network of Transmission System Operators for Electricity
EU	European Union
FEC	Fuel Energy Complex
FIT	Feed-in-Tariff
IDM	Intra-Day Market
IPS	Integrated Power System
JSC	Joint Stock Company
LLC	Limited Liability Company
MCHPP	Mykolaiv Combined Heat and Power Plant, Private Joint Stock Company
MOE	Mykolaivoblenergo, Joint Stock Company
MOTE	Mykolaivoblteploenergo, Municipally Owned Heat Supply Company
NEURC	National Energy and Utilities Regulatory Commission
NPP	Nuclear Power Plant
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PSO	Public Service Obligation
PV	Photovoltaic
SAEE	State Agency on Energy Efficiency and Energy Saving of Ukraine
SOE	State Owned Enterprise
SPP	Solar Power Plant
SWOT	Strengths, Weaknesses, Opportunities, Threats
TPP	Thermal Power Plant
WPP	Wind Power Plant

Summary

The Institutional Analysis for the Mykolaiv Masterplan is aimed at determining a comprehensive strategy for improving the energy infrastructure of Mykolaiv in the context of institutional and legal analysis. It specifically involves the analysis of national legislation regulating the supply of electricity, heating, and renewable energy, identifying issues and providing recommendations for enhancing the effectiveness of legal regulation, harmonizing national legislation in the field of electricity supply, heating, and renewable energy with EU legislation, analysing the regulatory system and institutional issues in the supply of electricity, heating, and renewable energy, and the goal is to outline a path to ensure the city's energy security.

In addition, a SWOT analysis, based on sector -specific policy factors in the energy sector of Mykolaiv, reveals strengths and weaknesses, identifies opportunities arising from the implementation of sector policy, and highlights threats that hinder the policy's implementation.

To create conditions for sustainable development of the national economy and ensure access to reliable, sustainable, and modern sources of energy at the national level, several strategic documents have been adopted, including the Energy Strategy of Ukraine until 2050. This strategy aims to achieve maximum climate neutrality and comprehensive integration with EU markets.

The state's energy sector policy should focus on addressing priority tasks, including strengthening the institutional component, infrastructure modernization, protecting critical infrastructure, improving the technical condition of energy infrastructure, implementing the latest and environmentally safe technologies, utilizing scientific and technical developments, aligning regulatory acts, including European legislation, and more. Therefore, efforts are required to harmonize national legislation with local rules and responsibilities and provide detailed mechanisms at the operational level to implement strategic policies.

At the local level, it is necessary to develop a plan for transitioning to sustainable, green energy recovery of the energy sector. The groundwork needs to be laid for more decentralized electricity generation using renewable sources.

Institutional Analysis will establish priorities and help attract investments for energy system renewal and reconstruction projects in Mykolaiv with a focus on integration with the European community and consideration of the European Green Deal.

1 Introduction

This report has been developed within the framework of the project “Mykolaiv - Denmark partnership — Technical support unit” financed by the Danish Ministry of Foreign Affairs (MFA). The project, which has been entrusted COWI, is a framework contract, which, among others, includes assistance to the Mykolaiv City Administration (MCA) in developing the Mykolaiv Masterplan in close cooperation with an Italian company, One Works.

Box 1-1 COWI's contribution to Mykolaiv Masterplan

Mykolaiv Masterplan, which has been requested by the Mayor of Mykolaiv City, has a time horizon till 2050. It provides a compass for actions to be taken by the Mykolaiv City to ensure that it will develop into a thriving city attractive to its citizens and business community.

COWI and One Works assist Mykolaiv City Administration in developing the masterplan. In this work, COWI focuses on three sectors:

Water and wastewater

Energy, including power, district heating and renewable energy sources

Solid waste management.

Mykolaiv City Administration meets every week with COWI and One Works to ensure proper coordination.

COWI has established a project organization consisting of a project management team and three sector teams of professionals, each headed by a Discipline Leader. Three sectoral Focal Points are responsible for monitoring cross-cutting activities, ensuring coordination between the parties and maintaining consistency in the deliverables.

To enhance transparency in the development of the Mykolaiv Masterplan, given its significant public interest and exposure, COWI has established three sector-specific Sounding Boards inviting all potentially interested parties to take part in these.

The report addresses the existing legal and regulatory framework for energy production and consumption in Ukraine, focusing on Mykolaiv City and Oblast. It takes into consideration progress made in recent years, also after 24 February 2022, aimed at improving the legal and regulatory framework in Ukraine so that it comes closer to the energy chapter of the EU acquis. Strengths, weaknesses, opportunities and threats of existing framework is highlighted, thereby paving the way for reforms to overcome prevailing barriers for further development of the energy sector. Recommendations on which reforms to introduce in this regard are provided in the report.

The report consists of seven chapters, in addition to the current. They are:

- Chapter 2 focuses on the legal framework in the heat sector, foremost the district heating sector; it identifies obstacles on the way of improving the legal framework; and provides recommendations for its improvement.
- Chapter 3 focuses on the legal framework in the power sector; the effectiveness of the legislative framework to support the development of the electricity supply and the introduction of new technologies.
- Chapter 4 provides overview of the legal framework in the renewable energy sector, focusing on solar energy, wind energy and bioenergy. It provides assessment of

opportunities and obstacles for the integration of renewable energy into the urban energy supply system.

- Chapter 5 describes the current management structure and institutional framework in the energy sector as whole; It addresses the specific features of the management and regulation of the energy sphere in Mykolaiv, analyses the local authorities' powers in the heat supply sector and their legal capacity.
- Chapter 6 looks at the harmonisation of Ukrainian and EU energy legislation; Ukraine's national law approximation to Acquis remains a challenging task in the energy sphere and it is now an important priority to reform Ukrainian energy legislation to ensure that the energy markets of Ukraine are integrated with the European markets.
- Chapter 7 puts forward the key findings in terms of a SWOT analysis. The strengths and opportunities should be taken into consideration to realize the necessary rapid green transition of Ukraine's energy sector, supporting the country in its ambition to comply with EU accession criteria.

A number of appendices are attached to the report providing information on the Ukrainian legislation regulating energy sector, and, in particular electricity, district heating supply and renewable energy sectors. Additional information is provided on institutional issues in energy sector, legal status and capacity of Mykolaiv City utilities. There is a list of the key EU Directives and Regulations in the energy sphere and comparative analysis of energy policies, strategies, and standards in Ukraine and the EU.

2 Legislative framework in the district heating sector

The section identifies the district heating sector's key areas in the legal and regulatory framework which require reforms to enhance the sector's viability, to attract investment needed for the rehabilitation and modernisation of the infrastructure, to improve the financial performance, and introduce low -carbon technologies.

2.1 Legislative acts and regulations governing the heat supply

The legislation in the field of heat supply is divided into primary laws, secondary laws, subordinate normative-legal acts, and regulatory documents.

Primary and secondary laws are enacted at the national level and apply throughout the territory of Ukraine.

Subordinate normative-legal acts and regulatory documents are enacted at both the national and regional (oblast) levels and apply throughout the territory of Ukraine and the respective oblast.

At the local level, decisions are made concerning specific issues within the respective territory (settlement, city, etc.).

The general list of normative-legal acts related to the regulation of the energy sector, including the field of heat supply, is provided in Appendix A.

2.2 Identifying obstacles and opportunities for improving the legislative framework

The imperfect legislation and pricing system do not encourage the widespread implementation of energy efficiency measures. The lack of necessary investment funds for the modernization of the essential assets of the heat and housing sectors prevents the adoption of modern technologies in this field. As a result, the quality of energy supply to the population and industry is very low, leading to frequent disruptions in hot water supply for consumers. Building temperatures fall below acceptable standards, and in some cities, systemic crises even disrupt the functioning of the population's vital systems.

To a significant extent, the problems in the field of heat supply are due to the imperfections in the mechanisms of state regulation. Reforms in the electricity and natural gas sectors have not been accompanied by corresponding changes in the field of heat supply.

If the level of market prices for natural gas and electricity is a factor beyond the control of heat supply enterprises, the efficient use of these resources falls within the purview of these enterprises. Enhancing the energy efficiency of heat energy production and transportation should curb the growth of the respective tariffs. In turn, improving energy efficiency can only be achieved through a substantial boost in investment activity, which is subject to state regulation.

The procedure for the development, approval, coordination, and endorsement of investment programs is determined based on the technology of production (production of only thermal energy or simultaneous production of both thermal and electric energy) and the scope of activities in the field of heat supply. Heat supply enterprises, when planning investment activities, are guided by the following regulatory acts:

- Procedure for the formation of investment programs for licensees engaged in the production of electrical and thermal energy at heat and power plants and cogeneration facilities.
- Procedure for the development, approval, coordination, endorsement, and execution of investment programs for business entities in the field of heat supply, the licensing of which is carried out by the National Energy and Utilities Regulatory Commission (NEURC).
- Procedure for the development, coordination, and approval of investment programs for business entities in the field of heat supply, whose activities are licensed by the Council of Ministers of the Autonomous Republic of Crimea, regional, Kyiv, and Sevastopol city state administrations.

The content of these regulatory acts significantly contributes to the problems that currently exist in the field of state regulation of investment activities of heat supply enterprises.

The main problems include:

1. Imperfections in norms regarding the planning and implementation of investment activities.
2. Complexity in the development, justification, and approval of investment programs.
3. Stringent administrative control at the stages of coordination, approval, and implementation of investment programs.
4. A complicated mechanism for financing investment activities.

The imperfections in the planning process for investment activities primarily revolve around the short-term nature of this planning. All the mentioned procedures operate with terms such as "planning period," "investment program period," and "forecast period," which equate to a calendar year. For licensees under the NEURC, a development plan is included in the investment program, containing a component that outlines the implementation plan for activities and the use of funds for a five-year period. However, this is more of an optional nature. The investment program itself is only approved by the NEURC for one year.

At the same time, the possibility of medium-term planning for the development of heat supply systems is provided for in Article 6 of the Ukrainian Law "On Heat Supply," which declares periodic review, improvement, and techno-economic optimization of heat supply schemes approved by local executive authorities. Article 7 of this law identifies one of the main directions for the development of heat supply systems as planning heat supply, developing and implementing heat supply schemes for cities and other populated areas in Ukraine, with a duration of no less than 5-7 years based on the optimal combination of centralized and autonomous heat supply systems. The term "heat supply scheme" is defined in the "Methodological Recommendations for Developing Energy- and Eco-Efficient Heat Supply Schemes for Populated Areas in Ukraine."

Indirectly, the mandatory requirement to develop heat supply schemes is derived from the provisions of Article 26 of the Ukrainian Law "On Heat Supply," which stipulates that the design, construction, and reconstruction of objects in the field of heat supply are carried out based on heat supply schemes. However, in practice, this legislative requirement is not consistently enforced, as evidenced by the low number of approved and coordinated heat supply schemes.

Therefore, one way to boost investment activity could be to elevate the status of heat supply schemes, particularly by establishing requirements for their mandatory development and implementation.

Another problem with the existing state mechanism for regulating the of investment activities in the field of heat supply is the complexity of developing, justifying, and approving investment programs, which is attributed to the shortcomings of current regulatory acts on these matters.

An analysis of the legal framework in the field of heat supply, as well as the implementation and monitoring of developed programs in Ukraine, allows for several conclusions and proposals, which are summarized in a Table 2-1.

Table 2-1 Directions for the legal framework improvement

Direction for improvement	Meaning
Enhancing the interest and responsibility of the local self-government authority for the development and implementation of the district heating scheme.	<ul style="list-style-type: none"> ● Alignment of the city development plan with sustainable energy development planning (according to the Mayors' Agreement) ● Improvement of the procedure for granting subsidies (grants) from the regional development fund
Boosting investment activity.	<ul style="list-style-type: none"> ● Simplification of the justification of investment activities ● Introduction of medium- and long-term investment planning ● Introduction of financial planning for investment activities ● Abandonment of control over tariff structure, transition to control over the total cost ● Provision of direct and indirect (tax incentives, etc.) government support
Improving the methodological documents for the development of district heating schemes	<ul style="list-style-type: none"> ● Granting a mandatory status to the relevant regulatory act for use ● Detailed elaboration of specific norms and provisions
Enhancing regulatory and technical acts	<ul style="list-style-type: none"> ● Bringing existing regulatory and technical acts in line with the requirements of the Law of Ukraine on Standardization (departure from Soviet standards) ● Legislative definition of types of regulatory and technical acts that are mandatory for compliance by all economic entities in the field of heat supply ● Implementation and harmonization of regulatory acts with EU legislation

3 Legislative framework in the field of electricity supply

Legislative framework in the field of electricity supply has significantly improved after the Law on Electricity market came into force in July 2019. It aligns Ukraine's national legislation with the European Union's regulation embodied in the Third Energy Package on the European gas and electricity markets liberalizing country's national electricity market. However, electricity market in Ukraine is to a large extent regulated as the Public Service Obligation (PSO) and price caps are still in force.

The general list of regulatory acts related to the regulation of the energy sector (including the electricity supply sector) is provided in Appendix A.

3.1 Regulatory acts for the electricity sector and their effectiveness

The effectiveness of legislation in the field of electricity supply, in a broad sense, is the degree to which the interests of legal entities in the sector are satisfied in accordance with general legal principles and the rule of law (taking into account social needs). In a narrow sense, it is a coordinated system of quality laws in the electricity supply sector through which legal entities in the sector can satisfy their interests. Therefore, the effectiveness of laws depends on their quality and effectiveness.

However, the main problem with the effectiveness of laws in Ukraine is the non-compliance with laws, the absence of legal space, and the inefficiency of the judicial system (as a system for resolving social conflicts). The main reasons for these problems can be attributed to the low legal culture and the overall degradation of society.

The regulation of the development and implementation of new technologies in the electricity supply sector largely depends on the system of public administration, specifically the transition from a traditional management paradigm to an innovative type of public administration. This transition involves replacing a rigid bureaucratic component with an innovative one that fully adapts the activities of public authorities to the changing market environment in which they operate. The effectiveness of state and municipal governance depends on the use of a sufficient volume of innovative forms and methods of management, as traditional methods have become less effective.

The use of a particular innovative tool in practice depends on the available experience, human resources, and financial resources that will ensure the efficiency and effectiveness of governance in government bodies. The emergence and quality of innovation implementation in public administration is associated with a complex set of conditions and requires proper support: legal, personnel, scientific-methodological, informational, financial, and motivational. It's worth noting that financial conditions are not the decisive factor. The primary condition is motivation and demand for innovation.

Conducting innovative activities involves the interaction of all innovation institutions, government authorities, and direct participants in the innovation process. This, in turn, requires the formation of legislative, structural, and functional institutions involved in the creation and application of scientific knowledge and technologies. These institutions determine the legal, economic, organizational, and social conditions for ensuring the innovation process.

In other words, for the successful implementation of new technologies, it is necessary to develop relevant regulatory documents and standards, train professionals who can work with new equipment and technologies, and perform the necessary engineering work.

The current state of implementing cutting-edge technologies in the electricity supply sector is provided in [Appendix B](#).

3.2 Identification of necessary changes to ensure the stability and reliability of the city's power supply

The main problem today is the war and significant damage to Ukraine's energy system caused by the war.

In particular, due to massive missile attacks, over 47% of the energy infrastructure has suffered varying degrees of damage, including 44% of nuclear generation (including the occupied Chernobyl Nuclear Power Plant), 78% of thermal power plants, 66% of combined heat and power plants, 12% of hydropower plants, 75% of wind generation, and more than 20% of solar generation.

The primary concern today is ensuring the energy security of the country and the resilience and reliability of the country's electrical infrastructure and municipalities.

As a result of European reforms implemented from 2014 to 2022 aimed at the sustainability of Ukraine's energy, the following measures were taken:

- Diversification of energy supply, ensuring the import of necessary gas for the population and industry, nuclear fuel for nuclear power plants, partial coal, and oil products. Starting from March 16, 2022, Ukraine also imports electricity, which has become particularly important during the massive attacks on the energy system to ensure its stability.
- Unbundling and increased transparency in the financial and economic activities of energy companies, enabling numerous repairs on major gas pipelines and power grids, equipment replacement, and expansion of the energy system.
- Implementation of market-based pricing mechanisms, which encouraged new companies to enter the market and introduced energy-efficient measures for businesses and residential consumers.
- Ensuring the long-term stability of the energy system.
- One of the main tasks is to create conditions for attracting investors, despite the wartime threats. To achieve this, it is necessary to coordinate mechanisms for insuring against military risks with international partners and ensure proper legal protection of investments.

Local authorities can provide additional incentives for investors by establishing a "one-stop shop" for document submission related to land allocation, water use, and access to other information.

Energy network operators, in collaboration with governmental bodies, can significantly enhance their attractiveness to investors by preparing connection points to electric, gas, water supply, heating, and sewage networks in advance.

Creating conditions for the phased transition of the energy sector in line with the goals of the European Green Deal is vital. The extensive damage to thermal power plants should lead to the adoption of low-carbon technologies, moving away from coal-fired thermal generation.

Furthermore, to strengthen the country's electrical infrastructure and municipalities, various measures are proposed, as listed in the Table 3-1:

Table 3-1

<i>National level</i>	<i>Local level</i>
Establishing a mechanism for insurance against military risks (international model).	Development of infrastructure to ensure its minimal vulnerability and sufficient capacity to meet the needs of industry and private households.
Creating guarantees for investment protection.	Balancing supply and demand under various scenarios, including cases of new large-scale attacks.
Establishing a competitive environment with free access to the domestic market, exports, and minimal intervention in pricing.	Implementation of a risk management system.
Implementing a risk management system.	
Transitioning to "green energy" practices.	

4 Legislative framework in the field of renewable energy sources

Reconstruction of the energy sector in Ukraine should be based on the renewable energy sources (RES). In the wartime Ukrainian Government is continuing to align the existing legislation to support the producers of the energy from the RES by way of introducing certain amendments to the existing laws.

Before the war broke out in Ukraine, a series of regulatory documents and national strategies were adopted, outlining the future direction of renewable energy sources (RES) development in Ukraine for this and the coming decades. For instance, the Energy Strategy of Ukraine until 2035 (currently replaced by the Energy Strategy of Ukraine until 2050) allowed for the possibility of achieving a 25% share of RES in the total primary energy supply.

The Economic Strategy of Ukraine until 2030 also sets decarbonization, RES development, and the promotion of a circular economy as key pillars of the national economy. According to this strategy, the share of RES in total electricity generation was expected to increase to 25% by 2030. The strategy also emphasizes the need for increasing energy storage capacity, considering hydrogen production, and regulating localized RES generation.

The "Green Energy Transition of Ukraine" concept until 2050 aims to achieve a 70% share of RES in electricity generation by 2050, with a significant portion (up to 15%) coming from rooftop solar installations in households and businesses.

The National Strategy for Low-Carbon Development in Ukraine until 2050 and the Second National Determined Contribution to the Paris Agreement also underscore the essential role of renewable energy.

However, in the context of full-scale war with the Russian Federation, the priorities for further RES development have been outlined in the Ukraine Recovery Plan until 2032. It includes plans for building 5-7 GW of new solar and wind power plants to expand Ukraine's export capacity, over 30 GW of RES facilities for renewable hydrogen production, 3.5 GW of hydropower plants and pumped storage hydroelectric plants. Additionally, the plan envisions the introduction of 1.5-2 GW of peak capacity, 0.7-1 GW of battery storage, and 15 GW of electrolysis capacity over the next 10 years. The estimated investment volume in the national program "Energy Independence and Green Course" is currently assessed at \$130 billion.

Regarding the further development of solar energy, given the current market conditions in Ukraine and in line with the goals set out in the RePowerEU Plan, the small-scale solar energy sector, particularly the installation of photovoltaic systems on building rooftops and in households, is expected to see active development.

An overview of laws and regulations governing the use of renewable resources is provided in [Appendix C](#).

4.1 Vision for necessary changes in municipal energy and climate planning for cities in Ukraine

The methodology for municipal energy and climate planning in Ukrainian cities, which has evolved over the past 12 years (MEP, SEDAP), quickly becomes outdated and almost futile, especially in times of war and post-war conditions. Therefore, it is necessary to synchronize planning with the EU, adhere to its plans and goals:

Transition to the construction of zero-energy consumption buildings only, with a prohibition on new construction of buildings that do not meet these standards.

Prohibition of the use of gas boilers in new construction and a gradual transition to renewable heating, cooling, and hot water supply for cities and buildings.

Mandatory use of rooftop solar power stations for new buildings of all types.

Alternative energy in Mykolaiv Region:

Mykolaiv region, like the entire southern Ukraine, has significant potential and all the opportunities for the rapid development of alternative energy. Thanks to decentralization in local communities, not only financial resources but also all the levers for new decisions regarding energy supply sources have become available.

Development of Renewable energy in Mykolaiv Region:

Since the beginning of 2020, work has accelerated in Mykolaiv region to put into operation new facilities for electricity generation from renewable sources (wind and solar energy).

As of May 1, 2020, wind power stations with a total capacity of 131.7 MW have been constructed, including 9.6 MW (3 wind turbines as part of the "Olvia WPP-2" construction in Ivanivka village of Ochakiv district, constructed by LLC "Wind Park 'Prychornomorsky'") built from January to April 2020.

Amid war in May 2023 phase I of Tiligul WPP of 114 MW capacity was launched. It is located in Mykolaiv region and can provide zero-carbon electricity to 200 000 households a year.

During January to April 2020, the operating wind power stations in the region generated 134.664 million kWh of electricity. As of May 1, 2020, in the region, there have been constructed solar power stations with a total capacity of 624.780 MW, including 19 solar power stations with a total capacity of 163.439 MW built during January to April 2020.

In 2020, solar power stations were constructed in the following locations: Arbuzytsky district - 1; Berezneghuvatsky district - 2; Vitovsky district - 1; Voznesensky district - 2; Yelanetsky district - 2; Mykolaivsky district - 5; Novoodesky district - 1; Snihurivsky district - 2; Mykolaiv city - 1. The operating solar power stations generated 56.006 million kWh of electricity during January to April 2020.

Experts consider that the regional situation in the field of alternative energy is closer to critical. There have been cases where politicians in business installed solar panels on fertile black soils in

several southern districts of the region. In other instances, there are hidden extensive "energy" lands that are not indicated in the catalogs of investment attractiveness of the region.

However, there is great potential for the solar energy use in Ukraine. Particularly noteworthy is the position of the scientists from Lviv Polytechnic University which is briefly referred to in [Appendix D](#) to this report.

4.2 Recommendations for Improving the legislative framework to promote renewable energy development

Ukraine has the political and economic prerequisites, as well as dynamic potential for the development of alternative energy.

The overall state of the regulatory framework indicates that the state, at the very least, has declared the necessity of developing alternative energy.

To enhance the economic efficiency of alternative energy production, it is necessary to improve the existing regulatory framework that governs the establishment of a "green" tariff.

There is significant potential for attracting foreign investments for the development of alternative energy. However, Ukraine's imperfect judicial system deprives potential foreign investors of proper legal protection for their investments within Ukraine. Therefore, the issue of providing guarantees for the protection of foreign investments in alternative energy must be addressed at the legislative level, accompanied by a genuine reform of the judicial system.

Developing alternative energy to the level defined in Ukraine's Energy Strategy by 2050 will increase our country's energy and economic independence, reduce dependence on traditional energy resource imports, lower greenhouse gas emissions into the atmosphere, contribute to environmental preservation, and reduce the energy intensity of the domestic gross product.

To prevent environmental damage, it is necessary to establish a legislative mechanism for conducting mandatory state expertise before constructing facilities that produce alternative energy. This expertise should analyze the interaction of renewable energy sources with the environment.

In addition to the legal framework, the state should implement stimulation programs that create demand for energy efficiency, especially in the commercial, industrial, and residential sectors.

The government should create an attractive environment for investments in energy efficiency. For example, in the residential construction sector, programs for financing with preferential interest rates, fixed terms, and partial debt forgiveness can be organized, depending on the level of energy efficiency of the building (energy-efficient energy production, equipment, technological cooling + heating, heat recovery, automation). In addition to these investment incentives, the government can promote the implementation of a certified energy management system (in accordance with ISO 50001), provide tax benefits, and implement programs that increase demand for energy efficiency and energy-efficient services, among other measures.

5 Regulatory framework and governance

This chapter takes a look at the current management structure and institutional framework in the energy sector as whole. It addresses the specific features of the management and regulation of the energy sphere in Mykolaiv, analyses the local authorities' powers in the heat supply sector and their legal capacity.

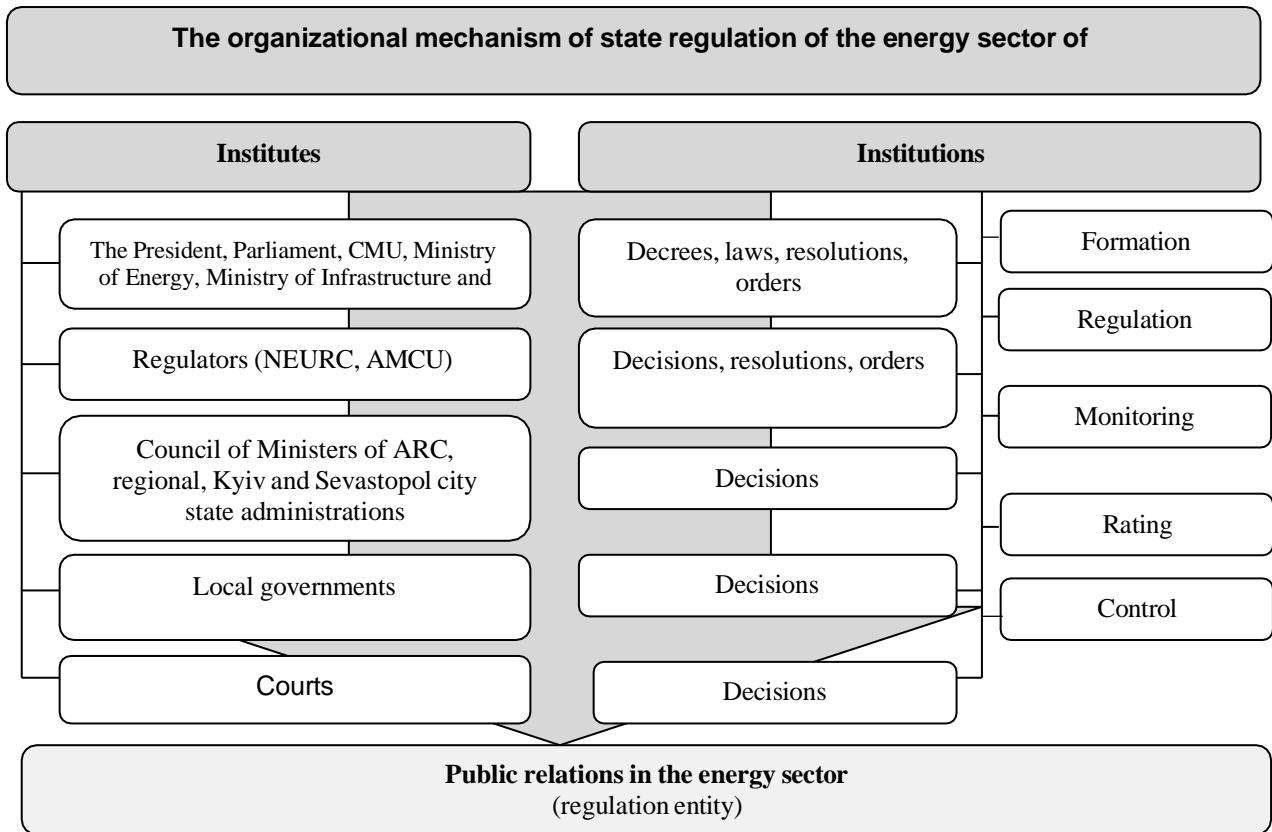
5.1 Analysis of the current management structure and regulatory mechanisms in energy sphere

Key governance and regulatory entities in Ukraine's energy sector include the Cabinet of Ministers of Ukraine (CMU), the Ministry of Energy (Ministry of Energy), the Ministry of Community and Territory Development and Infrastructure (Ministry of Infrastructure), and the National Energy and Utilities Regulatory Commission (NEURC).

The CMU is the highest executive authority responsible for making collective decisions and overseeing state policies in the energy sector and the electric power industry. The Ministry of Energy is responsible for formulating and implementing state policies in the energy sector. The Ministry of Infrastructure is responsible for shaping and executing state policies in the district heating and housing and communal services sectors.

The Ministry of Energy is also responsible for monitoring the implementation of Ukraine's Energy Strategy until 2050, measuring economic incentives, monitoring and reporting energy demand and forecast indicators, and determining the strategy and methodology for building energy generation facilities. The Ministry of Energy closely collaborates with the State Inspectorate for Energy Supervision and the CMU in implementing state policies in the electricity and thermal energy supply sector and during the safety monitoring of electricity supply, including technical aspects of the activities of Oblenergo (which are distribution system operators and suppliers) in the electric power industry. Figure 5-1.

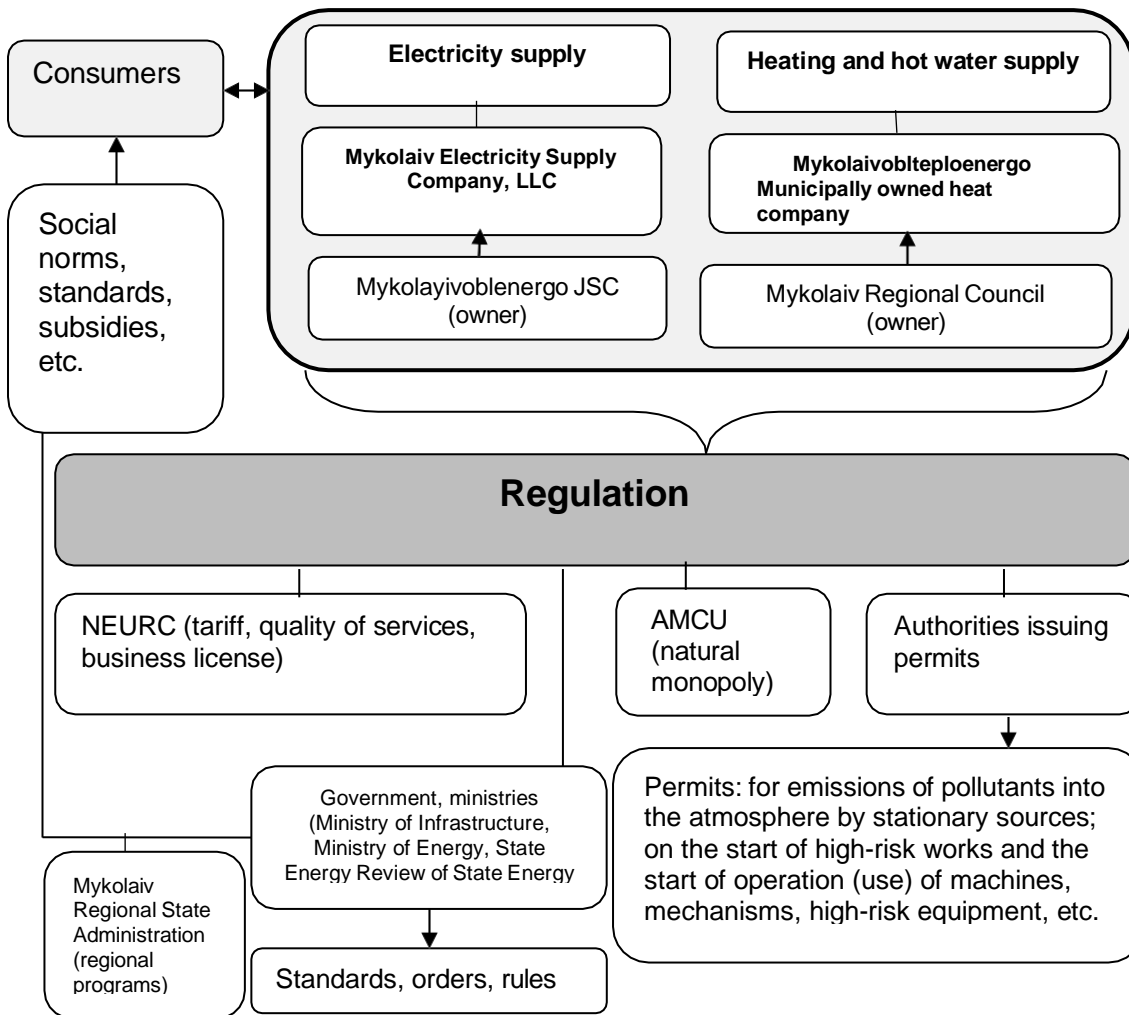
Figure 5-1 State regulatory structure of Ukraine's energy sphere



The management of property of enterprises in the energy sector is the responsibility of their owners. In particular, "Mykolaiv Electricity Supply Company", LLC belongs to "Mykolaivoblenergo" JSC," whose shares are owned by the following entities: "Ukrainian Distribution Networks" PJSC (70%), "RIVNEOBLENERGO" PJSC (10%), "CHERNIVTSIOBLENERGO" PJSC (8%), and "ZHYTOMYROBLENERGO" PJSC (5%). Shareholders determine the general principles of enterprise management, approve financial plans, make strategic decisions, and appoint executives.

The municipally owned heat company "Mykolaivoblteploenergo" is publicly owned by the Mykolaiv Regional Council, which defines the general principles of enterprise management, approves financial plans, makes strategic decisions, and appoints executives. Characteristics of the management and regulation of the energy sphere in Mykolaiv are presented on Figure 5-2.

Figure 5-2 Characteristics of the management and regulation of the energy sphere in Mykolaiv



Appendix E provides overview of the Institutional analysis in the energy sphere of Ukraine. The legal status and legal capacity of Mykolaiv Electricity Supply Company, LLC and Mykolaivoblteploenergo, municipally owned heat supply company are provided in Appendix G.

Mykolaiv municipality needs technical and financial assistance to transform both utilities into a modernized, efficient public energy utility that operate under European standards and are attractive to investors. Information as to the heat supply scheme for Mykolaiv is presented in Appendix F.

5.2 Recommendations for the improvement of regulatory base and energy management in energy sector

All recommendations in today's conditions are to be considered in the context of external support for Ukraine. In particular, on September 25, 2023, the United States and Ukraine signed a memorandum, under which the United States may provide \$522 million to strengthen Ukraine's energy sector, subject to the availability of funds and the Ukrainian government's fulfillment of a series of requirements. This assistance program, as emphasized in the document, is aimed at improving the resilience of Ukraine's energy system, including the restoration of critical

infrastructure, the introduction of distributed generation, energy sector reform, and supporting Ukraine's post-war transition to a low-carbon, competitive, and EU-integrated energy economy:

- By October 30, 2023, approve a new statute and establish the Supervisory Board of the Ukrainian gas transmission system operator. These measures are also provided for in the International Monetary Fund program for Ukraine.
- Begin the procedures for conducting a competition to elect members of the Supervisory Board of "Energoatom", the State Enterprise National Nuclear Energy generating Company by November 30, 2023, and establish PJSC "Energoatom" by the end of the year.
- The NEURC by April 1, 2024, establishes the procedure, scope, degree, and periodicity of reporting on wholesale energy commodity trading related to REMIT legislation.

Starting from September 26, 2023, access to funding for infrastructure projects is available within the European Investment Fund, providing the opportunity to propose such funding independently, without consultations with EU countries.

Recommendations for improving the institutional framework and governance in the energy sector are summarized in Table 5-1 Recommendations for improving the regulatory base and governance in the energy sector.

Table 5-1 Recommendations for improving the regulatory base and governance in the energy sector

National level	Local level
<ul style="list-style-type: none"> • Strengthen cooperation with the EU in the development of hydrogen, biomethane, and other climate-neutral technologies, taking into account all necessary certification criteria for producers and the origin of end products. • Adapt and keep regulatory acts on energy efficiency up to date within the framework of the review of EU directives on energy efficiency, especially when developing the regulatory framework for the implementation of the law on high-efficiency cogeneration. • Systematize a strategic approach to green post-war reconstruction, including making changes to key strategic documents in Ukraine and approving the National Energy and Climate Plan, which will also consider the latest trends in EU legislation changes 	<p>Ways in which municipalities can influence the development of centralized district heating in a city:</p> <ul style="list-style-type: none"> • Urban planning can impact specific heat loads. High specific heat loads are an important factor for the economics of centralized district heating. • Urban planning can promote the development of centralized district heating in areas with high specific heat loads and individual heating systems in areas with low specific heat loads • Management of the municipal building and facility fund to facilitate connections to centralized district heating systems and payment for heating services. • Defining strategic goals for the municipal-owned centralized district heating company related to heating quality and costs. • Providing local guarantees for municipal-owned enterprises to finance the reconstruction and development of centralized district heating (the centralized district heating company may not have

access to commercial loans without municipal guarantees).

- Supporting the management of the centralized district heating company by providing operational independence, regularly monitoring management efficiency, and encouraging collaboration with other centralized district heating companies and equipment producers

Analysis of international experience indicates the need for a more active role of local authorities in the modernization of local heating systems.

In the review by the Secretariat of the Energy Charter on cogeneration and centralized district heating, the main instruments of influence by local self-government bodies on the development of centralized district heating are formulated. Methods which are used by municipalities to exert influence on the development of centralized district heating are presented in the Table 5-3.

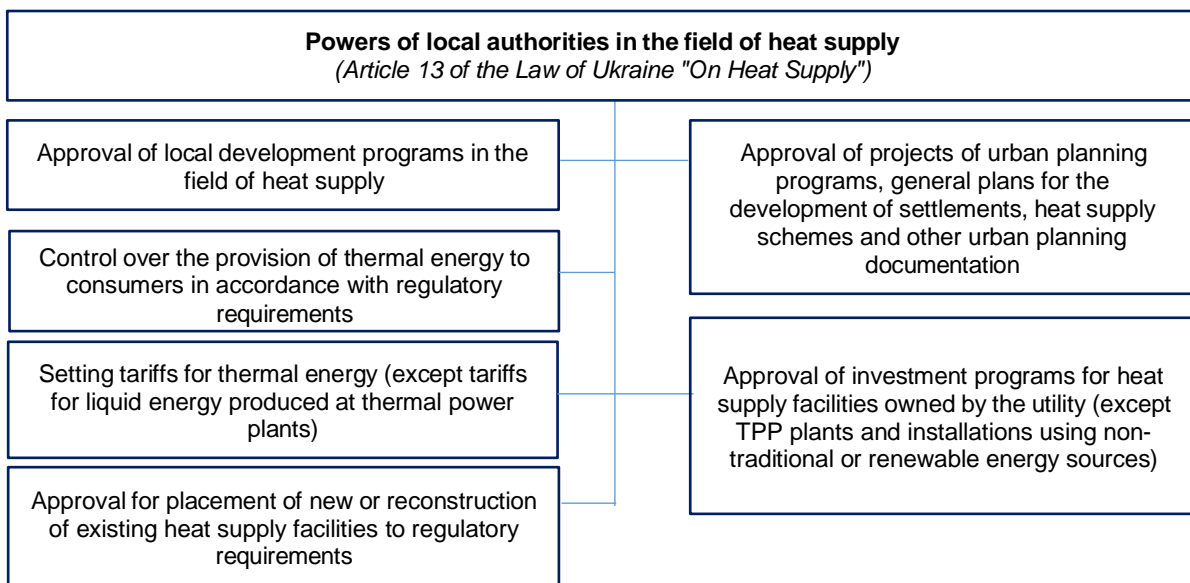
Figure 5-3 Tools of influence used by local self-governing authorities for the development of centralized district heating systems.

Methods used by municipalities to influence the development of centralized district heating:	
	Urban planning influences the specific heat load. High specific heat loads are essential for the economics of centralized district heating.
	Urban planning can contribute to the development of centralized district heating in specific areas with high specific heat loads and individual heating modes in areas with low specific heat loads.
	Management of the property and construction fund belonging to the municipality for connection to the centralized district heating system and payment for heating services.
	Defining strategic goals for the municipality-owned centralized district heating enterprise regarding the quality and heating expenses.
	Providing local guarantees for financing the reconstruction and development of centralized district heating. The centralized district heating enterprise may not have access to commercial loans without municipal guarantees.
	Offering support to the management of the centralized district heating enterprise by providing operational independence, conducting regular oversight of management efficiency, and encouraging cooperation with other centralized district heating enterprises and equipment manufacturers.

In Ukraine, the powers of local authorities in the field of district heating are defined by Article 13 of the Law of Ukraine "On District Heating." In other words, local authorities are practically deprived of the authority to regulate the development of combined heat and power plants (CHP) and facilities operating on renewable energy sources, which are a priority for the development of centralized district heating in developed countries.

Figure 5-3. In other words, local authorities are practically deprived of the authority to regulate the development of combined heat and power plants (CHP) and facilities operating on renewable energy sources, which are a priority for the development of centralized district heating in developed countries.

Figure 5-3 Powers of local authorities in the field of heat supply



6 Harmonization with the EU energy legislation

This chapter considers the harmonisation of Ukrainian and EU energy legislation; Ukraine's national law approximation to Acquis remains a challenging task in the energy sphere and it is now an important priority to reform Ukrainian energy legislation to ensure that the energy markets of Ukraine are integrated with the European markets.

6.1 Analysis of the level of harmonization of the Ukrainian legislative framework with the EU requirements and standards in energy sector

Ukraine has made progress in aligning its legislation with the requirements of the Association Agreement and the Third Energy Package of the EU in the field of electricity. This was achieved by adopting the framework law "On the Electricity Market" and the main regulatory acts for its implementation. According to the assessment of the Energy Community, a total of 49% of all obligations in this area have been fulfilled.

The list of EU energy legislation acts is provided in [Appendix H](#).

A comparative analysis of policies, strategies, and standards in the energy sector in Ukraine and the EU is provided in [Appendix I](#).

At the same time, during the process of implementing EU legislation in Ukraine, difficulties arise that are closely related to the fact that Ukraine is not a member state of the EU, the legal nature of EU legislation, and the enforcement of implemented norms.

In Ukraine, there is a system of technical regulation for district heating, the main features of which were formulated during the Soviet era. This system includes mandatory state standards, building and sanitary norms, technical conditions, and so on, which are associated with central economic planning.

In the European Union, over 40% of primary energy resources are consumed in buildings, two-thirds of which are residential buildings, and one-third are non-residential buildings and structures. The EU's strategic focus on decarbonizing the economy has led to the integration of technical policies in district heating as part of energy conservation and improving energy efficiency policies. The system of normative and technical regulation and managing the energy saving and energy effectiveness problems in the EU (including the heat supply issues) is provided in [Appendix J](#).

EU legislation is dynamic in all areas, and the Association Agreement with the EU does not provide a mechanism for implementing the latest revisions of documents and involving Ukraine in discussions on the most current issues in a given field. Therefore, Ukraine does not have a corresponding level of legislation implementation in one or another area.

Ukraine ensures the adoption of fundamental laws, as well as secondary legislative acts aimed at implementing European legal norms into the Ukrainian legal system in the field of the fuel and energy complex. The status of Ukraine's legislative adaptation and cooperation with the EU is presented in [Appendix K](#).

Effective implementation of EU secondary legislation is significantly influenced by the supervisory role of the European Commission and the review process of the European Court of Justice. Ukraine, however, is outside the scope of European mechanisms that operate exclusively for EU member states, including oversight of compliance with European norms.

6.2 Proposals for measures for further harmonization with the EU

The mission of Ukraine's Energy Strategy until 2050 is to create conditions for the sustainable development of the national economy by ensuring access to reliable, resilient, and modern energy sources.

By 2050, the energy sector should strive to achieve maximum proximity to climate neutrality. This will entail the presence of clean energy, addressing energy poverty, the development of an innovative and decentralized energy system, the full functioning of national energy markets, and their integration into international ones. The key principles of Ukraine's Energy Strategy are economic feasibility, environmental friendliness, accessibility, social justice, and market orientation.

The Energy Strategy will be based on the target indicators of economic development in line with the National Economic Strategy for the period up to 2030. It will also align with international commitments undertaken by Ukraine, primarily within the framework of the Association Agreement with the EU and the Paris Climate Agreement.

The objectives of Ukraine's Energy Strategy 2050 include:

- Achieving the highest level of climate neutrality.
- Maximizing the reduction of coal usage in the energy sector.
- Renewing and modernizing energy infrastructure.
- Enhancing resource efficiency in the energy sector.
- Comprehensive integration with the European Union markets and effective functioning of domestic markets.
- Ensuring the energy sector's self-sufficiency with economic feasibility in mind.
- Developing alternative energy sources, new products, and innovative solutions in the energy sector.

Measures for further harmonization of legislation in the electricity and heat supply sectors are provided in Table 6-1.

Table 6-1 Measures for the further harmonisation of Ukraine's heat supply and power sector legislation with the EU-norms and standards

In the electricity sector:

- Harmonization of Ukrainian legislation with the rules and standards in the field of electricity in the EU involves:
- Implementation of joint auctions for the allocation of cross-border capacity.
- Integration of the balancing market and ancillary services market, the day-ahead market, and the intraday market.

- Implementation of monitoring and oversight of the market in accordance with REMIT (EU Regulation No. 1227/2011 on Wholesale Energy Market Integrity and Transparency).
- Work on improving the forward market, including the introduction of standardized contracts and other measures

In the heat supply sector:

According to an analytical report on the implementation of EU law by Ukraine within the framework of the 24th Ukraine- EU Summit, the European Commission positively noted Ukraine's progress in harmonizing its legislation with European standards in the areas of energy efficiency, commercial heat metering, eco-design, energy labeling, and the establishment of a legislative framework for the development of the biomethane sector. Ukraine's legislation has been largely aligned with EU requirements in the fields of eco-design and energy labeling.

Currently, to ensure consumer access to energy-efficient equipment and technology, work needs to be done in the realm of technical regulation, including the development and implementation of new regulations.

7 SWOT analysis and key findings

This chapter provides key findings of the analysis carried out in this report in terms of a SWOT analysis.

SWOT analysis involves categorizing factors of sectoral policy into four categories: strengths (Strengths) and weaknesses (Weaknesses) of sectoral policy; opportunities (Opportunities) arising from the implementation of sectoral policy; and threats (Threats) that hinder the implementation of sectoral policy.

The strengths and opportunities should be taken into consideration to realize the necessary rapid green transition of Ukraine's energy sector, supporting the country in its ambition to comply with EU accession criteria.

Table 7-1 Key findings in terms of a SWOT analysis.

SWOT-analysis of the energy sector in Mykolaiv City	
STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Building a reliable foundation for a competitive economy Achieving energy self-sufficiency • Enhancing the security of the economy, energy, and the environment • Promoting internal reform. • Creating an energy-efficient society • Developing scientific potential • Generating job opportunities • Creating possibilities for the modernization of both the energy industry and the city's industry • Implementing incentive taxes • Advancing renewable energy sources • High potential for energy conservation 	<ul style="list-style-type: none"> • War • Political instability • Difficulties in implementation of EU standards in the energy sector • Aging energy infrastructure (outdated equipment and networks) • Rising energy resource costs • Underutilization of natural resources • Insufficient investment, particularly from the private sector • Complex economic transformations • Difficulties in achieving strategic energy goals in Ukraine • Absence of a city energy policy • Technological backwardness • Deterioration of energy supply systems • Lack of transparency and a high level of corruption • Lack of professionals of the energy sector • Institutional and regulatory issues • Lack of information within government bodies about the actual state of the fuel and energy complex • High energy consumption in public and residential buildings • High energy intensity of production • Absence of an established energy management system • The limitation of financial capabilities of budgets and the lack of financial resources for municipal enterprises to implement energy-efficient projects
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Restoration of the energy system (reconstruction with modernization) 	<ul style="list-style-type: none"> • External aggression (war)

- | | |
|---|--|
| <ul style="list-style-type: none"> • Integration with the EU and the development of green energy generation • Decentralization of the energy system, including the development of small-scale generation, increased use of gas turbine and gas piston units that can be rapidly deployed, the implementation of energy storage facilities for energy accumulation, and encouragement of Ukrainians to install solar panels along with individual energy storage systems. • Innovative modernization in accordance with global standards (microgrid and smart grid technologies). • Energy system reform • Strengthening global connectivity • Attracting foreign investments • Enhancing energy conservation and energy efficiency • Proper utilization of domestic resources • Diversification of energy resource imports and the creation of strategic reserves of fuel and energy resources | <ul style="list-style-type: none"> • Difficulty in ensuring the stability of energy resource transportation • Dependency on foreign energy resources • Offshoring of the economy • Ignoring decarbonization policies • Self-isolation due to non-compliance with EU regulations or inadequate implementation. |
|---|--|

The war has influenced greatly Ukraine's efforts to meet its obligations towards the EU acquis and created an acute need to gain independence from fossil fuels both in Mykolaiv and nationwide. On the other hand, it has revealed the strong interest in investments for creating new energy supply and production chains and strengthening the move towards greening the energy sector.

Appendix A General list of normative legal acts related to the regulation of the energy sector (including the city of Mykolaiv)

1. On Housing and Communal Services: Law of Ukraine No. 2189-VIII dated November 9, 2017. URL: <https://zakon.rada.gov.ua/laws/show/2189-19>
2. On state regulation in the field of communal services: Law of Ukraine No. 2479-VI dated July 9, 2010. URL: <http://zakon3.rada.gov.ua/laws/show/2479-17>
3. On access to public information: Law of Ukraine No. 2939-VI dated January 13, 2011. URL: <http://zakon5.rada.gov.ua/laws/show/2939-17>
4. On the peculiarities of access to information in the fields of electricity supply, natural gas, heat supply, centralized hot water supply, centralized drinking water supply and drainage: Law of Ukraine No. 887-VIII dated 10.12.2015. URL: <http://zakon3.rada.gov.ua/laws/show/887-19>
5. On commercial accounting of thermal energy and water supply: Law of Ukraine No. 2119-VIII dated 22.06.2017. URL: <http://zakon2.rada.gov.ua/laws/show/2119-19>
6. On metrology and metrological activities: Law of Ukraine No. 1314-VII dated 06.05. URL: <https://zakon.rada.gov.ua/laws/show/1314-18>
7. On licensing of economic activities: Law of Ukraine No. 222-VIII of March 2, 2015. URL: <https://zakon.rada.gov.ua/laws/show/222-19>
8. On the approval of the Rules for the provision of heat energy supply services and standard contracts for the provision of heat energy supply services: Resolution of the Cabinet of Ministers of Ukraine No. 830 dated 21.08. 2019 Database "Legislation of Ukraine". URL: <https://zakon.rada.gov.ua/laws/show/830-2019-%D0%BF>
9. On approval of the Procedure for recalculation of the amount of fees for the provision of services for centralized heating, the supply of cold and hot water and sanitation in case of failure to provide them or not in full, quality reduction: Resolution of the Cabinet of Ministers of Ukraine No. 151 of February 17, 2010. URL: <http://zakon5.rada.gov.ua/laws/show/151-2010-%D0%BF>
10. On ensuring a unified approach to the formation of tariffs for utilities: Resolution of the Cabinet of Ministers of Ukraine No. 869 of 01.06.2011. URL: <http://zakon3.rada.gov.ua/laws/show/869-2011-%D0%BF>
11. On the Unified State Automated Register of Persons Entitled to Benefits: Resolution of the Cabinet of Ministers of Ukraine of January 29, 2003 N 117. URL: <http://zakon2.rada.gov.ua/laws/show/117-2003-%D0%BF>
12. On Approval of the Rules for the Use of Thermal Energy: Resolution of the Cabinet of Ministers of Ukraine of October 3, 2007 №1198. URL: <http://zakon3.rada.gov.ua/laws/show/1198-2007-%D0%BF>

13. On strengthening social protection of the population in the face of rising prices and tariffs for utilities: Resolution of the Cabinet of Ministers of Ukraine of April 5, 2014 №83. URL: <http://zakon3.rada.gov.ua/laws/show/83-2014-%D0%BF>
14. On simplifying the procedure for granting subsidies to the population to reimburse the cost of housing and communal services, the purchase of liquefied gas, solid and liquid stove household fuel: Resolution of the Cabinet of Ministers of Ukraine of October 21, 1995 №848. URL: <http://zakon2.rada.gov.ua/laws/show/848-95-%D0%BF>
15. On the establishment of state social standards in the field of housing and communal services: Resolution of the Cabinet of Ministers of Ukraine of August 6, 2014 №409. URL: <http://zakon2.rada.gov.ua/laws/show/409-2014-%D0%BF>
16. On approving the procedures for crediting funds to current accounts with a special regime of use for settlements under investment programs, using these funds and monitoring their spending in the areas of heat supply, centralized water supply and sanitation: Resolution of the Cabinet of Ministers of Ukraine of October 9, 2013 №750. URL: <https://zakon.rada.gov.ua/laws/show/750-2013-п#Text>
17. On approval of the Rules for the technical operation of thermal installations and networks: Order of the Ministry of Fuel and Energy of Ukraine of 14.02.2007 No. 71. URL: <https://zakon.rada.gov.ua/laws/show/z0197-07#Text>
18. On approval of the Procedure for informing consumers about the intention to change prices/tariffs for utilities with the justification of such a need: Order of the Ministry of Regional Development of Ukraine of 05.06.2018. № 130. URL: <https://zakon.rada.gov.ua/laws/show/z0753-18>
19. On approval of the Methodology for the distribution between consumers of the volumes of utilities consumed in the building: Order of the Ministry of Regional Development of Ukraine of 22.11.2018 No. 315. URL: <https://zakon.rada.gov.ua/laws/show/z1502-18>
20. On approval of the Procedure for the formation of tariffs for thermal energy, its production, transportation and supply: Resolution of the NERCEP No. 1174 of 25.06.2019. URL: <https://zakon.rada.gov.ua/laws/show/v1174874-19#n6>
21. On approval of the Procedure for setting tariffs for thermal energy, its production, transportation, supply: NERCEP Resolution No. 528 dated 31.03.2016. URL: <http://zakon3.rada.gov.ua/laws/show/z0993-16>
22. On the establishment of tariffs for thermal energy, its production, transportation, supply, service for the supply of thermal energy to the REGIONAL COMMUNAL ENTERPRISE "NIKOLAEVOBLTEPLOENERGO": NERCEP Resolution No. 83 of 14.01.2020. URL: <https://zakon.rada.gov.ua/laws/show/v0083874-20#Text>
23. On verifying the Rules of the day-ahead market and the intraday market: NERCEP Resolution No. 308 of 14.03.2018. URL: <https://zakon.rada.gov.ua/laws/show/v0308874-18#Text>
24. On Approval of the Transmission System Code: NERCEP Resolution No. 309 of 14.03.2018. URL: <https://zakon.rada.gov.ua/laws/show/v0309874-18#Text>

25. On Approval of the Code of Distribution Systems: NERCEP Resolution No. 310 of 14.03.2018_ URL: <https://zakon.rada.gov.ua/laws/show/v0310874-18#Text>
26. On Approval of the Code of Commercial Accounting of Electric Energy: Resolution of the NERCEP of 14.03.2018 No. 311_ URL: <https://zakon.rada.gov.ua/laws/show/v0311874-18#Text>
27. On Approval of the Retail Electricity Market Rules: NERCEP Resolution No. 312 of 14.03.2018. URL: <https://zakon.rada.gov.ua/laws/show/v0312874-18#Text>
28. Licensing conditions for conducting economic activities for the supply of electricity to the consumer: Resolution of the NERCEP of 27.12.2017 No. 1469. URL: <https://zakon.rada.gov.ua/laws/show/v1469874-17#Text>
29. On the combined production of heat and electricity (cogeneration) and the use of waste energy potential: Law of Ukraine dated 05.04.2005 No. 2509-IV. URL: <https://zakon.rada.gov.ua/laws/show/2509-15#Text>
30. On the National Commission for State Regulation of Energy and Utilities: Law of Ukraine No. 1540-VIII of 22.09.2016. URL: <https://zakon.rada.gov.ua/laws/show/1540-19#Text>
31. On approval of the Energy Strategy of Ukraine for the period up to 2050: order of the Cabinet of Ministers of Ukraine dated April 21, 2023 No. 373-r. URL: <https://zakon.rada.gov.ua/laws/show/373-2023-%D1%80#Text>

Appendix B The status of implementation of some of the latest technologies in the field of power supply

The Energy Strategy of Ukraine (ESU) for the period until 2050, approved on April 21, 2023, provides for the restoration of the energy sector using the most modern technologies, strengthening the stability of the system and strengthening the energy security of Ukraine and the European continent as a whole. The key task of the strategy is to transform Ukraine into the energy hub of Europe, which will help the continent finally get rid of dependence on Russian fossil fuels thanks to the clean energy produced in Ukraine. The strategy determines the achievement of carbon neutrality in energy by 2050.

By 2050, Ukraine has the potential to increase the capacity of wind generation - up to 140 GW, solar - up to 94 GW, which will additionally require appropriate energy storage - up to 38 GW, nuclear generation - up to 30 GW, CHP and bioenergy capacities - up to 18 GW, hydro generation - up to 9 GW.

The Government of Ukraine continues work on legislation to make the energy market transparent and more self-regulating:

- Corporate governance reform in key state-owned energy companies continues.
- The law on the prevention of manipulation in the energy markets was adopted, which is an integral part of the obligations regarding the implementation of the REMIT Regulation.
- In April, Ukrainian gas storage facilities were certified according to the new EU rules, which gives us the opportunity to offer gas storage facilities.
- The law on the access of biomethane producers to the gas infrastructure was adopted. It is expected that 5 new methane plants with a potential volume of 70 million m³ will be launched this year.
- The electricity tariff for the population was increased. A very difficult, in wartime, but forced and necessary decision. At the same time, subsidies for the population have been preserved, and the financing of the communal services subsidy fund for vulnerable sections of the population has also been increased. This is the first stage of raising tariffs as part of the equalization of the tariff to the market price - and an important signal for business.
- Price restrictions on the electricity market were also revised and the electricity tariff was even increased.
- Soon a decision will be made to improve the efficiency of the renewable energy sector. This is the basic basis for the necessary reforms to change the rules within the country in accordance with European principles.

These and future reforms should create a reliable business basis for attracting private capital to the Ukrainian energy industry.

Electricity market

Ukraine has made progress in bringing the legislation closer to the requirements of the Association Agreement and the requirements of the EU's Third Energy Package in the field of electricity, having adopted the framework law "On the Electricity Market" and the main legal acts for its implementation. According to the estimates of the Energy Community, a total of 49% of all commitments in this area have been fulfilled.

The structural transformation of the electricity market has been carried out in accordance with the new EU law and regulations, all segments of the new electricity market model are up and running. On January 1, 2019, the retail market was launched through the unbundling of Oblenergo - the creation of distribution system operators and suppliers. From July 1, 2019 - the introduction of the wholesale market through the introduction of organized trade segments. To launch the wholesale electricity market, two new state-owned enterprises were created: "Market Operator" and "Guaranteed Buyer", which replaced SE "Energorynok". Since March 2022, the Ukrainian energy system has been synchronized with ENTSO-E.

However, the electricity market today still operates in a fairly regulated mode.

The functioning of the new market model is limited due to the significant use of non-competitive practices and regulatory and price restrictions in various market segments, insufficient transparency and imbalance of the market operation system. A significant level of cross-subsidization between industrial and household consumers remains, as well as a distorted pricing system caused by the application of special public obligations (PSO) for the supply of electricity to household consumers, price restrictions (price caps) on the DAM, IDM and the balancing market, low competition in organized market segments, a high level of concentration of generation and significant market power of the largest market participants. The priority task is to ensure the full functioning of the new competitive market model according to European rules, to improve the PSO mechanism and to phase out price restrictions and interventions in the pricing processes on the electricity market, to gradually abandon price restrictions on the DAM, IDM, balancing market, strengthening the role of market regulators -NEURC and the Antimonopoly Committee regarding monitoring and prevention of abuses in the wholesale and retail energy markets.

Energy efficiency

Energy efficiency is an integral component of the country's energy security, as well as its sustainable innovative development (especially today, the issue of reducing dependence on the import of traditional energy resources is acute).

In this context, energy efficiency is of strategic importance both for low-carbon development and reliable energy supply, and for the sovereignty and independence of the state.

The Law of Ukraine "On Energy Efficiency" (implementation of the European Union Directive 2012/27/EU "On Energy Efficiency") was adopted with the aim of regulating the issue of increasing the effective use of fuel and energy resources in Ukraine. In order to achieve the maximum effect for each direction of the energy efficiency system (buildings, industry and transportation/distribution 2 of energy), prerequisites for effective relations in the industry, regulatory instruments and support mechanisms must be created. However, this law potentially contains a number of shortcomings. A number of provisions of the law are declarative in nature, it is envisaged to adopt a large number (about 50) of subordinate legal acts: strategies, national action plans, municipal energy plans, reports on the energy efficiency potential of energy supply companies within a year, without which the law will remain a declaration of positive intentions. Responsibility for energy efficiency issues in general and energy efficiency is fairly abstractly distributed between the Ministry of Energy and the

Ministry of Development of Communities, Territories and Infrastructure of Ukraine, which will not contribute to the achievement of the goal of increasing energy efficiency. In addition, the implementation of the provisions of the law requires attracting funds, in particular, for the creation of an energy management system, implementation of energy plans of cities, energy audits, etc.

Cogeneration

Cogeneration is a technological process of producing two types of energy at the same time, in particular, electrical and thermal.

One of the priorities of the energy strategy of Ukraine is the use of waste heat and the conversion of boiler plants that produce only heat into cogeneration power plants.

In February 2023, the Law of Ukraine "On the combined production of heat and electricity (cogeneration) and the use of waste energy potential" was amended, which should create conditions for the development of highly efficient cogeneration in Ukraine in accordance with EU regulations (implementation of the requirements of Directive 2012/27/EU on energy efficiency).

Cogeneration is considered highly efficient if the efficiency of energy generation by the cogeneration plant compared to the reference values of the efficiency of separate production of thermal and electrical energy results in savings of primary energy at the level of:

- more than 10% (for installations with a capacity of more than 1 MW inclusive);
- more than 0% (for small cogeneration plants with a capacity of 50 kW to 1 MW and micro cogeneration plants with a capacity of up to 50 kW).

The development of highly efficient cogeneration makes it possible to increase the efficiency of fuel use, which, in turn, will contribute to a significant saving of fuel and energy resources on a national scale.

An exceptional advantage of highly efficient cogeneration is the possibility of decentralization of electric energy generation, which is critically necessary in the context of terrorist attacks in Russia.

At the same time, in order to stimulate the transition to highly efficient cogeneration, the law provides:

- replacing the qualification mechanism of cogeneration plants with the qualification of highly efficient cogeneration according to the requirements of the above-mentioned EU Directive;
- introduction of guarantees of the origin of electricity produced by highly efficient cogeneration plants.

The State Energy Efficiency Agency will carry out the qualification of highly efficient cogeneration and the issuance of guarantees of origin.

*In particular, in the EU, highly efficient cogeneration already provides 12% of electricity and 16% of thermal energy used in homes, industry and district heating. This helps to save energy in the equivalent of about 30 billion m³ per year, of which 15 billion m³ is a direct saving of natural gas.

Appendix C List of laws and regulations governing the use of the RES

Laws

On Alternative Fuels: Law of Ukraine No 1391-XIV dated 14.01.2000. URL:
<https://zakon.rada.gov.ua/laws/show/1391-14#Text>

On Alternative Energy Sources: Law of Ukraine No № 555-IV dated 20.02.2003. URL:
<https://zakon.rada.gov.ua/laws/show/555-15#Text>

On the Electric Energy Market: Law of Ukraine No 2019-VIII dated 13.04.2017. URL:
<https://zakon.rada.gov.ua/laws/show/2019-19>

On the combined production of heat and electricity (cogeneration) and the use of waste energy potential: Law of Ukraine No 2509-IV dated 05.04.2005. URL:
<https://zakon.rada.gov.ua/laws/show/2509-15#Text>

On Amendments to Certain Laws of Ukraine Regarding Promotion of Production and Use of Biological Fuels: Law of Ukraine No1391-VI dated 21.05.2009. URL:
<https://zakon.rada.gov.ua/laws/show/1391-17#Text>

On gas (methane) of coal deposits: Law of Ukraine No 1392-VI dated 21.05.2009. URL:
<https://zakon.rada.gov.ua/laws/show/1392-17#Text>

On Amendments to Certain Laws of Ukraine on Restoration and Green Transformation of the Energy System of Ukraine: Law of Ukraine No 3220-IX dated 30 June 2023. URL:
<https://zakon.rada.gov.ua/laws/show/3220-20#Text>

On amendments to some laws of Ukraine regarding the development of energy storage facilities: Law of Ukraine No 2046-IX dated 15 February 2022. URL:
<https://zakon.rada.gov.ua/laws/show/2046-20#Text>

Resolutions

Resolution of the CMU dated November 29, 2006 No. 1670 "On Approval of the Procedure for Qualification of a Cogeneration Plant". URL: <https://zakon.rada.gov.ua/laws/show/1670-2006-%D0%BF#Text>

Resolution of the CMU dated 05.10.04 No. 1307 "On the procedure for issuing a certificate of fuel belonging to an alternative". URL: <https://zakon.rada.gov.ua/laws/show/1307-2004-%D0%BF#Text>

Resolution of the CMU dated 07.24.13 No. 771 "On approval of the Procedure for issuing, using and terminating the validity of the guarantee of the origin of electric energy for economic entities producing electric energy from alternative energy sources". URL:
<https://zakon.rada.gov.ua/laws/show/771-2013-%D0%BF#Text>

Resolution of the NCRE dated 15.06.12 No. 749 "On approval of the Procedure for determining the specific weight of raw materials, materials, fixed assets, works and services of Ukrainian origin in

the cost of construction of electric power facilities that produce electric energy from the use of alternative energy sources". URL: <https://zakon.rada.gov.ua/laws/show/z1678-12#Text>

Resolution of the NEURC dated 10.12.2015 No. 2932 "On the approval of the Procedure for determining the level of use of Ukrainian-made equipment at electric power facilities, including at the commissioned construction stages of electric stations (start-up complexes) that produce electric energy from alternative energy sources (except blast furnace and coke gases, and with the use of hydropower - only micro-, mini- and small hydroelectric power plants), and the establishment of a corresponding surcharge to the "green" tariff". URL: <https://zakon.rada.gov.ua/laws/show/z0119-16#Text>

Decrees

Decree of the CMU dated 19.06.13 No. 429-r "On approval of plans of measures for the implementation of Directive 2001/77/EC and Directive 2003/30/EC". URL: <https://zakon.rada.gov.ua/laws/show/429-2013-%D1%80#Text>

Decree of the CMU dated 03.09.14 No. 791-r "On approval of the plan of measures for the implementation of Directive 2009/28/EU of the European Parliament and of the Council". URL: <https://zakon.rada.gov.ua/laws/show/791-2014-%D1%80#Text>

Decree of the CMU of October 14, 2022 No. 908 "On the National Renewable Energy Action Plan for the Period Until 2020"Concept of Smart Grid Implementation in Ukraine Until 2035». URL: <https://zakon.rada.gov.ua/laws/show/908-2022-%D1%80#Text>

Orders

Order of the State Committee for Energy Conservation dated 10.12.04 No. 183 "On approval of the Procedure for carrying out an examination to confirm the fuel belonging to an alternative". URL: <https://zakon.rada.gov.ua/laws/show/z1647-04#Text>

Order of the Ministry of Energy dated 07/21/2021 No. 155 "On approval of the Procedure for qualification of a cogeneration plant". URL: <https://zakon.rada.gov.ua/laws/show/z1218-21#Text>

Order of the Ministry of Housing and Rural Affairs of July 24, 2009 No. 223 "On approval of the Rules for connecting cogeneration plants to heat networks. URL: <https://zakon.rada.gov.ua/laws/show/z0778-09#Text>

Appendix D Position of the scientists of Lviv Polytechnic University regarding the solar energy potential in Ukraine

O. Wozniak and M. Yaniv¹ believe that:

1 In Ukraine, the most promising areas of solar energy use are:

1.1 Its direct transformation into low-potential thermal energy without prior concentration of the flow of solar radiation (for hot water supply of objects, communal household and technological heat supply, agricultural needs) with an efficiency of 45-60%, and in the case of using concentrators - 80-85%;

1.2 Its direct conversion into direct current electrical energy using photoconverters (photomodules) with an average efficiency of 10-15%, although there are promising developments with an efficiency of about 30%.

2 Optimally selected equipment reduces the annual use of energy for water heating by 50-60% and energy from the network by 50-70%. Between April and September, a properly installed system covers 95% of heat and energy costs.

¹ <https://ena.lpnu.ua:8443/server/api/core/bitstreams/c7efd0ad-530f-4cfe-a418-23c3d423c947/content>

Appendix E Institutional issues analysis in the energy sphere of Ukraine

Level	Main institutional problems
National & Regional	<p>The problem of forming the institute of an effective and transparent owner in the energy sector, which is also related to the issue of safety of critical infrastructure facilities. Most of the critical infrastructure companies in the energy sector belong to the state or domestic private owners (electricity supply), local self-government bodies (heat supply).</p> <p>The list of major SOEs operating in the energy sector of Ukraine includes Naftogaz (produces, transports and refines oil and natural gas) and its subsidiaries, Energoatom (operates nuclear power plants), Ukrhydroenergo (operates hydropower plants) and "Ukrenergo" (electricity transmission system operator). Improper management of state enterprises and communal heat supply enterprises and regulated pricing leads to significant losses in the energy sector;</p> <p>At the same time, a significant share of private electricity supply companies is under the direct or indirect corporate control of non-residents. The structure of ownership in the electric power industry is quite opaque, as evidenced by the high share of nominal owners from such jurisdictions as: Cyprus, the Netherlands, Latvia, as well as the presence of shareholders from Switzerland and Austria, China. That is, from countries that are usually used to cover up the actual beneficial owners. Oligarchic business groups, in particular Dmytro Firtash, Rinat Akhmetov, Kostiantyn Hrygoryshyn, VS Energy, Ihor Kolomoisky and a number of former deputies of "Opposition block For life" de facto control critical assets in the field of energy supply of Ukraine. Corruption and private interests blocked and block the process of reforming the energy sector, which had a negative impact on the energy security of Ukraine</p>
	The declarative nature of laws that are not intended to be implemented; non-compliance with laws, etc.
	Underdevelopment of the judicial system and its inefficiency (deformation of the principle of the rule of law); lack of a simple, accessible and effective mechanism for resolving conflicts arising between subjects of relations in the energy sector
	Inefficient financial and economic policy of the state, which affects the availability of services, the financial and economic condition of enterprises in the energy sector, etc
	Ineffective administrative reform of the state, lack of legal succession in the state apparatus and "institutional memory". In particular, the issue of ineffective administrative reform lies in the violation of the principle of legality, which has long since become purely declarative, and the law itself is used as a means to solve personal or political issues that are not urgent for the industry and the state
	The formation of a distorted social ideology. In particular, when the state declares principles of violation or non-fulfillment of legislation, etc., which as a result affects public trust in the state, state bodies, state policy, the perception of reforms, etc.
	Institutional failure of authorities. In particular, the adoption of laws is not for the regulation of socially important issues, but for the lobbying of private interests, the interests of business groups. Ignoring and non-compliance with the established rules of the game in the energy sector by the state authorities themselves and lack of responsibility for such behavior
	Low level of social culture. Non-acceptance of reforms, citizens' ignorance of their rights and obligations, etc.
	Low activity or lack of citizenship, which strengthens the role of the state and business groups in the energy sector
	Non-transparency and politicization of tariff formation orders and procedures
	Orientation of state policy on protecting the interests of influential business structures, as well as state policy measures on quick profit, and not on long-term modernization of the sphere
	Absence of a systemic personnel policy of the state at the level of both state authorities (lack of transparency or lack of tenders for positions in state bodies and state companies, etc.) and energy sector enterprises
City Level	The limited legal capacity of energy supply enterprises is determined in matters of determining the purpose of activity, use of property, disposal of profits, approval of annual activity plans, production volumes, norms of specific consumption of fuel and energy resources, investment programs, etc.
	Local authorities are practically deprived of the authority to regulate the development of CHPs and capacities that work on renewable energy sources, which in developed countries is a priority for the development of centralized heat supply.

The main risk that remains today is war. The crisis state of the energy sector is connected with the dependence of the energy sector of Ukraine on russian energy resources, the destruction of energy facilities by russia,

Since all institutes and institutions cannot function in normal mode. This is a kind of verification of all institutions and institutions for effectiveness in guaranteeing security. The war is not fully controllable, but it reveals risk zones in the sphere of public administration, and is also an impetus for the search for new solutions of a political and practical nature, which will aim to protect the country and people from the destructive consequences of war. And most of these decisions will be laid in the process of rebuilding the country.

Appendix F Heat supply scheme of Mykolaiv

The heat supply scheme of the city of Mykolaiv was approved in 2019. However, on June 6, 2023, the Department of Energy Efficiency of the Mykolaiv City Council reported the absence of the originals of the "City Heat Supply Scheme". They were seized in 2019 as part of the initiated criminal proceedings. It takes a year and a half to develop the documents .

Legal grounds for developing heat supply schemes:

- According to the Law of Ukraine "On Heat Supply" (hereinafter referred to as the Act), one of the main directions of state policy, state management and management in the field of heat supply is the development and implementation of heat supply schemes for cities and other settlements of Ukraine.
- According to Article 7 of the Law, one of the main areas of development of heat supply systems is the planning of heat supply, development and implementation of heat supply schemes for cities and other settlements of Ukraine, the term of which is 10 years based on the optimal combination of centralized and autonomous heat supply systems.
- According to Art. 26 of the Law, the design, construction, and reconstruction of facilities in the field of heat supply are carried out on the basis of heat supply schemes, state building regulations and normative legal acts on construction works.
- The authority of the Ministry of Infrastructure includes approving the methodology for developing heat supply schemes for populated areas (order of the Ministry of Regions, methodology dated 02.10.2020 No. 235) and approving heat supply schemes for populated areas with more than 20,000 inhabitants and regional programs for the modernization of heat supply systems (Article 11 of the Law).
- The authority of the local self-government body includes the approval, taking into account the requirements of legislation in the field of heat supply, of projects of urban development programs, general plans for the development of settlements, schemes of heat supply and other urban planning documentation (Article 13 of the Law).

The heat supply scheme serves as a pre-project document, which substantiates the economic feasibility and economic necessity of designing and building new, expanding and modernizing existing heat energy sources and heat networks.

In order to make decisions on the heat supply of this or that settlement, certification of the current system is carried out, in particular:

1. survey of the city's boiler houses regarding their further effective operation;
2. examination of heating networks in order to identify emergency areas;
3. calculation of the heat balance regarding the compliance of the installed heat capacities with the heat load of consumers.

As a result of the generalization and analysis of the existing heat supply system, development prospects, as well as local conditions, priority urgent measures (for a period of up to 2 years) are developed regarding the optimal operation of boiler houses, heat networks and their possible modernization and reconstruction.

The heat supply scheme with the optimal option is approved by local self-government bodies after public discussion. The term of validity of the approved heat supply scheme must be at least 10 years.

Heat supply schemes would make it possible to:

1. Develop comprehensive measures to increase energy efficiency in the city's heat supply;
2. Transfer to the reserve or eliminate the most inefficient heat sources;
3. Determine districts or separate administrative buildings and residential buildings, which should be supplied with heat from decentralized sources;
4. Determine thermal power reserves in the city districts;
5. Optimize the temperature schedule for each heat source;
6. Transfer part of the boiler plants to work in peak mode, develop schemes for their joint work with basic sources.

Appendix G Legal status and legal capacity of Mykolaiv Electricity Supply Company, LLC and Mykolaivoblteploenergo, municipally owned heat supply company (MOTE)

Mykolaiv Electricity Supply Company, LLC (electricity supply)	Mykolaivoblteploenergo, municipally owned heat company (heat supply)
<ul style="list-style-type: none"> ● A limited liability company (LLC) forms its own statutory fund on the basis of shares determined by the charter. Accordingly, the legal responsibility of the members of the company for the results of economic activity is proportional to their contributions. The minimum size of the statutory fund at the time of company registration must be at least 100 minimum wages. The right to manage an LLC belongs to both the meeting of its members and its executive body headed by the director. ● Control over the results of the company's executive body is carried out by the audit commission 	<ul style="list-style-type: none"> ● A communal enterprise is formed by local self-government bodies on the basis of communal property that falls within the scope of its management. ● The property of a communal enterprise is attached to it by the rights of economic management or operational management (communal non-commercial enterprise). For its registration, a statutory fund is formed by the body that forms it. ● The minimum size of the statutory fund of a communal unitary enterprise is established by the relevant local council. ● The name of the utility enterprise contains the words "utility enterprise" and indicates the local self-government body under whose management this enterprise belongs. ● A communal unitary enterprise is liable for the results of its own activities, but is not liable for the obligations of the owner and the local self-government body under whose management it is a part.
<ul style="list-style-type: none"> ● The LLC operates in accordance with the Charter, which defines the scope of rules governing the legal status of the enterprise, relations related to internal management, relations with other organizations or citizens. ● According to the Charter, the founder of the LLC is Mykolayivoblenergo Joint Stock Company. ● The purpose of the activity is to make a profit and supply electricity... 	<ul style="list-style-type: none"> ● Communal enterprise acts in accordance with the Charter, which defines the scope of rules regulating the legal status of the enterprise, relations related to internal management, relations with other organizations or citizens. ● According to the Statute of the Communal enterprise, it is included in the sphere of management of the Mykolaiv Regional Council. ● The purpose of the activity is the guaranteed provision of the needs of the social sphere in heat supply services and the concentration of efforts and means to bring the heat energy complex out of a crisis state...

- Management of the operational activities of the LLC is carried out by the director, who is appointed by the General Meeting of the LLC.
 - Management of the current economic activities of the Communal enterprise is carried out by the manager, who is appointed and dismissed by the decision of the Mykolaiv Regional Council on the proposal of the chairman. The head resolves all issues of Communal enterprise activity, with the exception of those that fall within the competence of the Mykolaiv Regional Council.
 - A fixed-term contract is concluded with the head of the Communal enterprise.
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Appendix H Energy legislation, EU

Legislative document	Title
Regulations	<ul style="list-style-type: none"> ● Regulation (EC) No. 713/2009 of the European Parliament and the Council of July 13, 2009 establishing the Agency for the Cooperation of Energy Regulators (No longer in force, Date of end of validity: 03/07/2019; Repealed by Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators (recast)). URL: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32009R0713; https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32019R0942 ● Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009. URL: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=celex%3A32013R0347 ● Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonised transmission tariff structures for gas. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R0460 ● Commission Regulation (EU) 2017/459 of 16 March 2017 establishing a network code on capacity allocation mechanisms in gas transmission systems and repealing Regulation (EU) No 984/2013. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R0459 ● Commission Regulation (EU) 2015/703 of 30 April 2015 establishing a network code on interoperability and data exchange rules. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015R0703 ● Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005. URL: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32009R0715 ● Commission Regulation (EU) 2016/1447 of 26 August 2016 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected power park modules. URL: https://eur-lex.europa.eu/eli/reg/2016/1447/oj ● Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0631 ● Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2016.223.01.0010.01.ENG ● Commission Regulation (EU) No 838/2010 of 23 September 2010 on laying down guidelines relating to the inter-transmission system operator compensation mechanism and a common regulatory approach to transmission charging. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32010R0838

	<ul style="list-style-type: none"> ● Regulation (EU) No 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32011R1227 ● Regulation (Ec) No 714/2009 Of the European Parliament And of The Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003. (No longer in force; Repealed by Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast) URL: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32009R0714; https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32019R0943 ● Regulation (EU) № 1348/2014 of 17 December 2014 on data reporting implementing Article 8(2) and Article 8(6) of Regulation (EU) No 1227/2011 of the European Parliament and of the Council on wholesale energy market integrity and transparency. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014R1348 ● Regulation (EU) №2018/1999 of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.328.01.0001.01.ENG
Directives	<ul style="list-style-type: none"> ● Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012L0027 <ul style="list-style-type: none"> ● Directive 2009/73/Ec Of The European Parliament And Of The Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC. URL: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009L0073 ● 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 (No longer in force, Repealed by Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast)). URL: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32009L0072; https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32019L0944

Appendix I Comparative analysis of energy policies, strategies, and standards in Ukraine and EU

EU Legislation	National Legislation in Ukraine
<p>Association Agreement and Treaty on the Establishment of the Energy Community: Article V.1.338, Article V.1.341 UA, Annex XXVII</p> <p>The main tasks in the field of electricity are:</p> <ul style="list-style-type: none"> • Transition to a competitive model of the organization of the electricity market (which will replace the "single buyer" model). In particular, the development of competition in the wholesale and retail electricity markets by separating monopolistic activities (transmission, distribution) from competitive activities (production, supply and trading activities). • Integration of the unified energy system (UES) of Ukraine into the pan-European energy system ENTSO-E (European network of electricity transmission system operators), which provides for the synchronization of the work of the UES with ENTSO-E regarding the technical and regulatory regime of electricity transmission based on EU standards. In particular, integration into ENTSO-E requires the full implementation of a new model of the electricity market in accordance with the requirements of the Third Energy Package. • Ensuring transparency of market operation and reliability of electricity supply. <p>An important component of the new market should be the principles of fair competition; equal rights to sell and buy electricity; free choice of electricity supplier; non-discriminatory and transparent access to the transmission system and distribution systems; non-discriminatory participation in the electricity market; independent regulation; and non-discriminatory pricing and tariff formation that reflects economic costs.</p> <p>The main benefits of the introduction of European rules for the organization of the electricity market include:</p> <p>liquidation of artificial monopolies of producers and suppliers of electricity, ensuring free flows of electricity between Ukraine and the EU member states, which will allow to achieve fair prices for electricity for end consumers, attraction of investments in the sector due to greater transparency and predictability of the market for investors, which will ensure better reliability and quality of energy supply</p> <ul style="list-style-type: none"> • Directive 2009/72/EC on common rules of the internal electricity market and repealing Directive 2003/54/EC, Regulation (EC) 714/2009 on conditions of access to the cross-border electricity exchange network and repealing Regulation (EC) 1228/2003, Directive 2005 /89/EU on measures to ensure the security of investments in the electricity supply system and infrastructure, Regulation of the 	<p>Law of Ukraine "On the Electric Energy Market"</p> <p>In order to fulfill the obligations of Ukraine under the Energy Community Treaty and the Association Agreement between Ukraine, on the one hand, and the European Union, the European Atomic Energy Community and their member states, on the other hand, this Law is aimed at implementing acts of Energy Community legislation Communities in the field of energy, namely Directive 2009/72/EC on common rules for the internal electricity market and repealing Directive 2003/54/EC, Regulation (EC) 714/2009 on conditions for access to the cross-border electricity exchange network and repealing Regulation (EC) 1228/2003, Directive 2005/89/EU on measures to ensure the safety of investments in the electricity supply system and infrastructure, Regulation of the European Parliament and Council (EU) No. 1227/2011 of October 25, 2011 on integrity and transparency in the wholesale energy market and decisions Council of Ministers of the Energy Community. Also, the main normative legal acts for the implementation of the Law, including Transmission System Code, Commercial Electricity Accounting Code, Market Rules, Distribution Systems Code, Retail Electricity Market Rules, etc.</p> <p>Integration of the UES of Ukraine into the pan-European energy system ENTSO-E from March 2022</p>

European Parliament and the Council (EU) No. 1227/2011 of October 25, 2011 on integrity and transparency in the wholesale energy market

Directive 2009/73/EU "On common rules for the internal natural gas market" and EU Regulation 715/2009 "On conditions of access to natural gas transportation networks"

Law of Ukraine "On the Natural Gas Market"

The adoption of the law marked the fulfillment of the obligations to the Energy Community taken by Ukraine by signing the Treaty on the Establishment of the Energy Community and regarding the implementation of the provisions and requirements of the Third EU Energy Package (Directive 2009/73/EU "On Common Rules for the Internal Market of Natural Gas" and EU Regulation 715 /2009 "On conditions of access to natural gas transportation networks").

As of today, the procedure for reforming (unbundling) JSC "Naftogaz of Ukraine" has been completed. The independent operator of the gas transportation system - LLC "Operator GTS of Ukraine" was separated from JSC "Naftogaz of Ukraine" and transferred to the management of JSC "Main Gas Pipelines of Ukraine", which is subordinate to the Ministry of Finance of Ukraine.

Directive of the European Union 2012/27/EU "On energy efficiency"

The Law of Ukraine "On Energy Efficiency", as well as 28 technical regulations on eco-design requirements and 16 technical regulations on energy labeling of energy-consuming products. Thanks to this, consumers will have an assortment of energy-efficient products, and Ukrainian manufacturers will be able to compete on the EU market.

The State Energy Efficiency Agency plans to develop 17 technical regulations by the end of 2023.

In addition, the Agency has developed and approved by order of the Ministry of Energy 11 lists of national standards that are identical to harmonized European standards and compliance with which provides a presumption of compliance of energy-consuming equipment with the requirements of technical regulations on ecodesign and energy labeling.

Also, within the framework of European integration, the National Action Plan on Energy Efficiency until 2030, developed by the State Energy Efficiency Department from the Ministry of Energy, was adopted.

Alternative energy

Directive 2002/77/EC of the European Parliament and the Council of September 27, 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market;

Directive 2003/30/EC of May 8, 2003, aimed at encouraging the use of biofuels or other renewable fuels in the transport sector;

Directive 2003/54/EC of June 26, 2003 on common rules for the internal electricity market provides definitions that apply generally to the entire electricity sector;

Directive 2009/28/EC of April 23, 2009 on the promotion of the use of energy produced from renewable sources and the Energy Roadmap to 2050.

In the Ukrainian legislation, Directive 2009/28/EC was adopted for implementation by the order of the Cabinet of Ministers of Ukraine No. 791-r dated September 3, 2014, in which a plan of measures was developed to ensure the implementation of the points of the specified regulatory document. Thus, the main goals are information provision, preparation of reports on the use of alternative sources of electricity, possibilities of application between Ukraine and the member states of the Energy Community of statistical transfers of energy produced from renewable energy sources, development of sustainability criteria, etc.

- The main thesis of this Directive is the approved plan for a period of 10 years, the task regarding the share of 20% of energy produced from renewable sources in the total energy consumption of the Community from 2010 to 2020, as well as the

Директива 2009/28/ЄС від 23 квітня 2009 року про заохочення до використання енергії, виробленої з відновлюваних джерел та Дорожня карта з енергетики до 2050 року.

minimum share of 10% of biofuels in the total consumption intended for the transport sector gasoline and diesel fuel. An important condition is also a reasonable price that must be set for the listed types of electricity. The responsibility for stimulating and encouraging the implementation of the plan has been fully transferred to the participating states, which in turn can encourage local authorities to involve local and regional authorities in the development of national action plans in the field of renewable energy and raising awareness of the benefits of energy, extracted from renewable sources.

- Considering the Energy Roadmap until 2050, the EU foresees a significant increase in energy efficiency and energy saving, and the total electricity needs should decrease by 41% compared to 2005 figures. Also, the share of energy obtained from alternative and renewable sources should increase to 60-75% of total consumption. Member States officially notify the EU Commission of information on the proportion or amount of electricity, heating or cooling energy produced from renewable energy sources to monitor the implementation of the plan. It is worth noting that the average level is only 16.7%, and the planned level is 20%.
- In turn, Ukraine limited itself only to stimulating the production of energy from renewable sources, there are no clear goals or they are only of a recommendatory nature. The Law of Ukraine "On Alternative Sources of Electricity" defines the mechanisms of incentives and subsidies through the application of a "green" tariff. The most profitable is electric energy produced from the energy of solar radiation by land-based electric power facilities, the installed capacity of which does not exceed 10 MW. Taking into account the geographical features, the most promising areas of development are the acquisition and transformation of solar energy, as well as wind energy, in particular in the Black Sea region.

Appendix J The system of normative and technical regulation and managing the energy saving and energy effectiveness problems in the EU (including the heat supply issues)

Level	Description
<p>First level (Strategic)</p>	<p>Concepts and Strategies that define challenges, establish visions and goals of the most important areas of activity.</p> <p>In particular, the "EU Strategy on Heating and Cooling" dated February 16, 2016, which provides the basis for the integration of efficient heating and cooling into the EU energy policy, focuses actions on preventing energy leaks from buildings, maximizing the efficiency and sustainability of heating and cooling systems, supporting efficiency in industry and the use of advantages of integration of heating and cooling in the power supply system.</p> <p>The general vision of this Strategy is the decarbonization of buildings based on energy efficiency, the transition to renewable energy sources and synergy between heating, cooling and the power supply system due to efficient district heating. In particular, the Strategy recognizes the key role in strengthening energy security and decarbonization of buildings, which can be played by district heating based on the recovery of waste heat, cogeneration and the integration of renewable energy sources</p>
<p>Second level (supranational)</p>	<p>Resolutions, Directives, Decisions of the EU, specifying the adopted strategies and concepts, establish specific tasks, directions and methods of achieving the set goals.</p> <p>In particular, a number of EU Directives aimed at increasing energy efficiency and creating modern systems of centralized heat supply:</p> <p>Directive 2004/8/EC of the European Parliament and the Council of February 11, 2004 "On the promotion of cogeneration based on effective heat load in the internal energy market and which amends Directive 92/42/EEC". The purpose of this Directive is to increase the efficiency of energy use and improve continuous supply by creating a structure for the promotion and development of cogeneration with high efficiency on the basis of useful thermal load and primary energy savings in the internal energy market, taking into account specific social circumstances, as well as climatic and economic conditions.</p> <p>The directive defines the criteria for highly efficient cogeneration, the mechanism for guaranteeing the origin of energy produced in the process of cogeneration with high efficiency. The definition of highly efficient cogeneration is contained in Directive 2012/27/EU "On energy efficiency" of October 25, 2012: highly efficient cogeneration is cogeneration production that provides primary energy savings of at least 10% compared to reference values for separate production of heat and electricity energy Production in small-scale and micro-cogeneration facilities, which provides savings in primary energy, can also be classified as high-efficiency cogeneration. This Directive also establishes criteria for determining heat supply as efficient. The purpose of the Energy Efficiency Directive is to ensure a 20% increase in energy efficiency by 2020 and pave the way for further improvements in energy efficiency in the years to come.</p> <p>Directive 2010/31/EU of the European Parliament and the Council of May 19, 2010 "Regarding the energy efficiency of buildings" (indirectly related to heat supply).The directive establishes relevant requirements for the energy efficiency of buildings. The main goal of the Directive is to ensure the creation of a base at the national level for improving the energy efficiency of residential and public buildings with the establishment of a number of quantitative indicators of energy consumption and energy efficiency for: newly constructed buildings; existing buildings; engineering systems of buildings; building materials and structures. The directive stipulates that all new buildings must be buildings with almost zero energy consumption. Regarding new buildings, it is required that the technical, ecological and economic feasibility of alternative high-efficiency systems (provided they are available) be taken into account before construction begins: decentralized energy supply systems based on energy from renewable sources; cogeneration; city or central heating, in particular, if it is based in whole or in part on energy from renewable sources; heat pumps.</p> <p>The main goals and measures defined by this Directive are set for the period until 2020. That is, its revision should be expected in the future.</p> <p>The main provisions of the Directive "On Energy Efficiency of Buildings" are implemented in Ukrainian legislation in the form of the Laws of Ukraine "On Energy Efficiency of Buildings" and "On Energy Efficiency". The "Methodology for determining the energy efficiency of buildings" is completely harmonized with EU directive materials, but for the full</p>

	<p>implementation of EU Directives into national legislation, amendments to the "Rules for the technical operation of heating installations and networks" and to some other regulatory acts are necessary.</p> <p>Directives are usually binding on all EU member states and provide for regular reporting on the fulfillment of relevant requirements to the European Parliament and/or the Commission. This level also includes international standards that determine the methods of determining individual indicators and requirements for the quantitative values of individual indicators and characteristics</p>
Third level (national)	Legislative, normative and technical regulatory acts of individual EU member countries that do not contradict EU Directives, Resolutions and Decisions.

Appendix K Status of adapting Ukrainian legislation to EU level and cooperating with the EU

The Law of Ukraine "On the Natural Gas Market" entered into force on October 1, 2015. The adoption of the law marked the fulfillment of the obligations to the Energy Community taken by Ukraine by signing the Treaty on the Establishment of the Energy Community and regarding the implementation of the provisions and requirements of the Third EU Energy Package (Directives 2009/73/ EU "On Common Rules for the Internal Natural Gas Market" and EU Regulation 715/2009 "On Conditions of Access to Natural Gas Transportation Networks").

As of today, the procedure for reforming (unbundling) JSC "Naftogaz of Ukraine" has been completed. The independent operator of the gas transportation system - LLC "GTS Operator of Ukraine" was separated from NJSC "Naftogaz of Ukraine" and transferred to the management of JSC "Main Gas Pipelines of Ukraine", which is subordinate to the Ministry of Finance of Ukraine.

On September 22, 2016, the Verkhovna Rada of Ukraine adopted the Law of Ukraine "On the National Commission, which executes state regulation in the spheres of energy and communal services."

The Law of Ukraine "On the Electric Energy Market" No. 4493 was adopted by the Verkhovna Rada of Ukraine on 04/13/2022 in the second reading and as a whole.

On July 19, 2017, at a meeting of the Cabinet of Ministers of Ukraine, the Plan for organizing the preparation of draft acts necessary to ensure the implementation of the Law of Ukraine of April 13, 2017 No. 2019-VIII "On the Electric Energy Market" was approved, currently work continues on the development of more than 50 acts of secondary legislation in the field of electricity.

The Energy Strategy of Ukraine (ESU) for the period up to 2050 was approved on April 21, 2023.

The structural transformation of the electricity market has been carried out in accordance with the new EU law and regulations, all segments of the new electricity market model are up and running. On January 1, 2019, the retail market was launched through the unbundling of Oblenergo - the creation of distribution system operators and suppliers. From July 1, 2019 - the introduction of the wholesale market through the introduction of organized trade segments. To launch the wholesale electricity market, two new state-owned enterprises were created: "Market Operator" and "Guaranteed Buyer", which replaced SE "Energorynok". Since March 2022, the Ukrainian energy system has been synchronized with ENTSO-E.

The State Reserve Agency of Ukraine, as part of the Concept of reforming the state material reserve system, initiated the implementation of the requirements of Directive 2009/119/EC, which obliges the member states of the European Energy Community to create minimum reserves of crude oil and petroleum products in case of emergencies.

Together with specialists of the Energy Community, the State Reserve calculated the minimum volume of oil and petroleum products, and also developed a plan of measures for the work plan for the implementation of Directive 2009/119/EC.

Currently, measures are being taken to further reform the gas and electricity markets in accordance with the norms and rules of the Third EU Energy Package and to implement the provisions of the updated Memorandum of Understanding on the Strategic Energy Partnership between Ukraine and the European Union together with the European Atomic Energy Community. Ukraine takes an active part in the discussion of possible changes to the Treaty on the Establishment of the Energy Community.

To date, the following has already been adopted and implemented:

The plan of measures for the implementation of the 1st stage of the Energy Strategy of Ukraine (until 2020), which was approved by the order of the Cabinet of Ministers of Ukraine dated 06.06.2022 No. 497.

By Decision No. 1/2019 of the EU-Ukraine Association Council dated July 8, 2019 on amendments and additions to Annex XXVII to the Association Agreement between Ukraine, on the one hand, and the European Union, the European Atomic Energy Community and their member states, on the other hand, Annex XXVII has been updated. It contains a list of EU acts in the field of energy that must be implemented by Ukraine, taking into account the obligations of Ukraine within the framework of the Energy Community and the development of EU law in this area with the aim of integrating the energy market of Ukraine into the energy market of the European Union in the gas and electricity sectors. This integration is of strategic importance for Ukraine, both from the point of view of membership in the Energy Community, and from the point of view of other international obligations, as well as improving energy security.

In order to transition to a new model, a number of normative legal acts have been adopted and implemented, namely:

- Resolution of the Cabinet of Ministers of Ukraine dated 14.02.2022 No. 77 "Some Issues of the State Energy Supervision Inspection of Ukraine" with the aim of establishing the State Energy Supervision Inspection of Ukraine as a central executive authority that carries out state supervision (control) in the field of electricity and heat supply and approving the Regulation on the State the Energy Supervision Inspection of Ukraine. URL: <https://zakon.rada.gov.ua/laws/show/77-2018-%D0%BF#Text>
- Resolution of the Cabinet of Ministers of Ukraine dated 04/18/2022 No. 324 "On Approval of the Procedure for Provision of Temporary Support to Producers Carrying Out Combined Production of Electric and Thermal Energy at Thermal Power Plants", with the aim of ensuring reliable and uninterrupted centralized heat supply to the population, increasing the efficiency of combined production of electric and thermal energy by reconstruction of thermal power plants. URL: <https://zakon.rada.gov.ua/laws/show/324-2018-%D0%BF#Text>
- Resolution of the Cabinet of Ministers of Ukraine dated 04/18/2022 No. 325 "On the formation of the Commission for the preparation of a conclusion on the feasibility of providing temporary support to producers carrying out the combined production of electricity and thermal energy at thermal power plants" for the purpose of evaluating the performance of the producer carrying out the combined production of electricity and thermal energy at thermal power plants, requirements mandatory for providing temporary support. URL: <https://zakon.rada.gov.ua/laws/show/325-2018-%D0%BF#Text>
- Resolution of the Cabinet of Ministers of Ukraine dated 04.07.2021 No. 575 "On approval of the list of particularly important objects of the electric power industry, including the territories of the prohibited zone and the controlled zone of hydrotechnical structures, which are subject to protection by departmental military security". URL: <https://zakon.rada.gov.ua/laws/show/575-2018-%D0%BF#Text>
- Resolution of the Cabinet of Ministers of Ukraine dated 12.12.2021 No. 1055 "On approval of the Procedure for conducting a competition to determine a provider of universal services". URL: <https://zakon.rada.gov.ua/laws/show/1055-2018-%D0%BF#Text>

- Resolution of the Cabinet of Ministers of Ukraine dated 12.12.2018 No. 1056 "On approval of the Procedure for conducting a competition to determine the supplier of the "last hope". URL: <https://zakon.rada.gov.ua/laws/show/1056-2018-%D0%BF#Text>
- Decree of the Cabinet of Ministers of Ukraine dated December 12, 2018 No. 1023 "On the designation of the State Enterprise of Foreign Economic Activity "Ukrinterenergo" as a "last hope" supplier. URL: <https://zakon.rada.gov.ua/laws/show/1023-2018-%D1%80#Text>.

For the implementation of the Agreement on the conditions for the future unification of the energy systems of Ukraine and Moldova, a Plan of measures for the synchronization of the united energy system of Ukraine with the unification of the energy systems of the member states of the European Union was developed, which was approved by the order of the Cabinet of Ministers of Ukraine on December 27, 2018 No. 1097.

For the purpose of demarcation in the electric power sector of Ukraine, the corporatization of the state-owned companies SE "NEC "Ukrenergo" and NAEC "Energoatom" was carried out.

Significant progress was made in 2018 in the area of security of supply. In order to increase the safety of electricity supply, the order of the Ministry of Energy and Coal dated August 27, 2021 No. 448 "On approval of the Rules on the safety of electricity supply" was adopted.

Also, in order to create at the legislative level a mechanism for organizing and conducting electronic auctions for the sale of electric energy under bilateral contracts, the Government adopted Resolution No. 499 of 06.05.2022 "On approval of the Procedure for conducting electronic auctions for the sale of electric energy under bilateral contracts and the Procedure for selecting organizers of electronic auctions with sale of electric energy under bilateral contracts".

On April 25, 2022, the Verkhovna Rada of Ukraine adopted the Law of Ukraine "On Amendments to Certain Laws of Ukraine on Ensuring Competitive Conditions for the Production of Electricity from Alternative Energy Sources" No. 2712-VIII, which entered into force on May 22, 2019. The said Law envisages the introduction of a competitive model for stimulating the development of renewable energy by holding auctions for the distribution of support ("green" auctions).

At the meeting of the Government on 27.12.2021, the resolution of the Cabinet of Ministers of Ukraine "On the introduction of competitive conditions for the production of electricity from alternative energy sources" was adopted, which includes the Procedure for conducting auctions for the distribution of support quotas and the Procedure for the selection of operators of electronic platforms to ensure the conduct of auctions for the distribution of quotas support

In order to implement the Law of Ukraine "On the Energy Efficiency of Buildings" and to implement the provisions of Directive No. 2010/31/EC, Resolution No. 265 of the Cabinet of Ministers of Ukraine dated April 11, 2018 was adopted "On approval of the list of industrial and agricultural buildings, energy facilities, transport, communication and defense, warehouses, which are not subject to the minimum requirements for energy efficiency of buildings and which are not subject to certification of energy efficiency of buildings".

Pursuant to Article 9 of the Law of Ukraine "On the Energy Efficiency of Buildings" and in accordance with Article 17 of Directive No. 2010/31/EU, Resolution No. 605 of the Cabinet of Ministers of Ukraine dated July 26, 2018 "On Approval of the Procedure for Professional Certification of Persons Who Intend to Conduct energy efficiency certification activity and survey of engineering systems", which made it possible to attract specialists to carry out such activity.

The state of fulfillment of obligations regarding the approximation of legislation: Ukraine has made progress in the approximation of legislation to EU requirements in the field of electricity,

having adopted the framework law and the main normative legal acts for its implementation. However, some of the obligations regarding the approximation of legislation remain fully or partially unfulfilled. Despite the adoption of the Law of Ukraine "On the Electric Energy Market", the issue of the implementation of parallel markets, generating capacities and the problem of debt accumulation, detailed regulatory and technical infrastructure, in fact remained unsettled. The planned strategic transition to green energy and the extremely high price for it in the conditions of the post-war economic crisis will cause a burden on the state budget of Ukraine. Under such conditions, the operation of large power plants from renewable energy sources is characterized by sharply changing modes of operation as part of the United Energy System of Ukraine.

For example, the Law of Ukraine "On Energy Efficiency" provides for national and regional systems of energy management and energy efficiency, which are important for the energy security of the state, at the same time, without adequate funding and training of a sufficient number of energy efficiency specialists, it will acquire a purely declarative nature.

The full and effective implementation of the new electricity market model in accordance with European regulations, including certification of an independent operator of the transmission system, full opening of the market and reduction of non-competitive restrictions.