
Preliminary Legal Study

EUETH

EUROPE-UKRAINE
Energy Transition Hub

Roadmap for a climate-neutral,
sustainable Ukrainian energy sector
and its role in an integrated EU
energy market



Roadmap for a Climate-Neutral, Sustainable Ukrainian Energy Sector and its Role in an Integrated EU Energy Market

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Introduction

This publication is one of three preliminary studies – technical, financial and legal – comprised in the first stage of the Ukraine Energy Roadmap, a project funded by Breakthrough Energy and carried out by the Institute for Climate Protection, Energy and Mobility (IKEM) and its project partners. This project aims to describe the current state of Ukraine’s energy system and formulate medium and long-term scenarios for the best way to achieve prosperity and climate neutrality in line with its European ambitions.

The postwar reconstruction of Ukraine will rely on sustainable, low-carbon development, which will in turn require a substantial shift in the country’s legislative and regulatory frameworks. *This preliminary* legal study aims to elaborate legal recommendations for policymakers that will support a new energy system design based on the implementation of the EU energy acquis and eventually assure a just, stable, diversified, and green energy market. Ensuring a regulatory environment that stimulates investments, perhaps through frameworks that (temporarily) fall short of full EU membership, is another priority.

The conclusions and recommendations of the study are meant to propose building blocks for policymaking and legislation that should facilitate Ukraine’s preparedness for EU accession in the field of energy. A major focus is therefore legislation that supports the expansion of renewable energy, fosters innovation, and strengthens market mechanisms such as competitive pricing and a level playing field. The recommendations consider energy security, energy equity and environmental sustainability, and aim to facilitate quick catching up with or leapfrogging of European standards.

The study looks at the Ukrainian energy system across three periods: the present time until the hostilities cease, the first 24 months after the eventual end of the war, and the longer-term future beyond those first two years. The latter two are labelled Phase 1 and Phase 2 in the text.

The methodology of the study involves a multi-disciplinary approach that integrates insights and methods from a range of fields, including economics, comparative law and political science, as well as expert interviews. This approach ensures that the study is as comprehensive, rigorous, and relevant as possible to the needs of stakeholders in Ukraine’s postwar energy sector.

1. Ukrainian Energy Policy

The first section of this preliminary legal study gives a general impression of the legislative and regulatory foundations of Ukraine’s energy policy today. It starts by looking at the country’s international legal obligations and ambitions today and in the near and medium term and then describes & analyzes the Ukraine’s National Energy Climate Plan and its Energy Strategy until 2050.

1.1. International Legal Framework

The legal framework of international laws and obligations within which the Ukrainian energy sector operates consists largely of the global Paris Agreement and Energy Charter as well as a series of European legal instruments, namely the Association Agreement, the Deep and Comprehensive Free Trade Agreement (DCFTA), the Eastern Partnership (EaP), and the agreements and commitments under the Treaty Establishing the Energy Community. The latter are illustrated in Figure 1.



Figure 1: European legal obligations relevant to the development of Ukraine’s energy sector
Source: Own illustration.

1.1.1. The Paris Agreement

In the Paris Agreement, the parties – including Ukraine – agreed to keep the increase in global average temperature substantially below two degrees Celsius compared to the pre-industrial average, and agreed to aim to stabilize the temperature increase below 1.5 °C. Ukraine considers international treaties ratified by the Verkhovna Rada (Parliament of Ukraine) as a part of its national legislation.

Ukraine ratified the Paris Agreement on 14 July 2016¹ and the country's government subsequently approved a Concept of Implementation of the State Policy on Climate Change for the Period up to 2030. This was the first national strategic document in the sphere of climate change, which created a framework for drafting laws and other regulative acts related to climate change policy in all the sectors of the economy, including energy, industry, agriculture, transportation, water, forestry, housing, and communal services, land use, as well as healthcare, conservation, and restoration of ecosystems.²

In 2021, the Ukrainian government approved an Updated National Determined Contribution (NDCs are self-defined climate pledges under the Paris Agreement through which countries detail

what they will do to help meet the global goal to pursue 1.5 °C). Ukraine's aim was to reduce greenhouse-gas emissions by 35% by 2030 compared to 1990 levels. The government identified several key areas for action, including modernizing energy and industrial enterprises, developing renewable energy sources, implementing energy efficiency measures in all sectors of the economy, promoting thermal modernization of buildings, increasing the share of organic agriculture and resource-saving practices, electrifying and renewing transport, creating a hierarchy of waste management, and increasing forest cover and reforming forest fund management.³

Before the full-scale Russian invasion, Ukraine had also been working towards a more ambitious target scenario, which aimed to reduce carbon dioxide emissions by 65% at the national level by 2030 compared to 1990 levels and achieve climate neutrality by 2060. This scenario included targets for a range of greenhouse gases, including carbon dioxide, methane, and nitrous oxide.⁴ However, this goal is not in line with EU objectives goals will have to be adapted to the new obligations arising from Ukraine's EU candidate status.⁵

1.1.2. The Energy Charter

The Energy Charter Treaty provides a multilateral framework for energy cooperation under international law and is designed to promote energy security through the operation of more open and competitive energy markets, while respecting the principles

of sustainable development and sovereignty over energy resources. Ukraine is a signatory to the Energy Charter Treaty and has been a member since 1994, which means it has agreed to adhere to the principles and obligations outlined in the treaty.

1 Parliament of Ukraine, Про ратифікацію Паризької угоди.

2 Karras, Melnyk, and Zastup, "Stand Und Perspektiven Des Klimaschutzrechts in Der Ukraine: Zwischen Dem Krieg Und Dem Beitrittskandidatenstatus," 67.

3 Karras, Melnyk, and Zastup, 67.

4 UNEP, The Montreal Protocol on Substances that Deplete the Ozone Layer. Karras, Melnyk, and Zastup, "Stand Und Perspektiven Des Klimaschutzrechts in Der Ukraine: Zwischen Dem Krieg Und Dem Beitrittskandidatenstatus," 67.

5 Karras, Melnyk, and Zastup, "Stand Und Perspektiven Des Klimaschutzrechts in Der Ukraine: Zwischen Dem Krieg Und Dem Beitrittskandidatenstatus," 67.

The Treaty's provisions focus on four broad areas:

1. the protection of foreign investments, based on the extension of national treatment, or most-favored nation treatment (whichever is more favorable) and protection against key non-commercial risks;
2. non-discriminatory conditions for trade in energy materials, products and energy-related equipment based on WTO rules, and provisions to ensure reliable cross-border energy transit flows through pipelines, grids and other means of transportation;
3. the resolution of disputes between participating states, and - in the case of investments - between investors and host states;
4. the promotion of energy efficiency, and attempts to minimize the environmental impact of energy production and use.

Ukraine, as a founding member of the Energy Charter Process, reaffirmed its commitment to this treaty by signing the International Energy Charter in May

2015, underscoring its ongoing interest in the Energy Charter's evolution.⁶

1.1.3. Association Agreement and Deep & Comprehensive Free Trade Area

Ukraine's first environmental obligations towards the EU have their roots in the Partnership and Cooperation Agreement (PCA) signed between them in 1994.⁷ In this document, Ukraine committed to gradually aligning its legislation with that of the (then) European Community, with a focus on a range of areas including environmental protection and global climate change.⁸

In 2016, the PCA was upgraded to an EU Association Agreement, as a step towards eventual EU membership. It involves unprecedented access to many aspects of the European Single Market and presupposes the adoption of most EU law.⁹ The Association Agreement establishes strategic cooperation in environmental areas like air and water quality, waste and resource management,

industrial hazards, and nature protection, and helps direct the development and implementation of a climate change policy in Ukraine. It defines administrative competences and financial instruments, as well as timetables for implementing different measures.¹⁰ For instance, Ukraine had to create a procedure for environmental impact assessments within three years of the entry into force of the Association Agreement.

Other actions that Ukraine will need to take within the framework of an Associate Agreement include the adoption of a framework legal act to create the legal basis for achieving net-zero greenhouse gas emissions as well as protecting the natural environment and Ukrainian citizens from the adverse impacts of climate change.¹¹

6 Inna Shcherban, "Benefits of Ukraine's Participation in the Energy Charter Process - Energy Charter."

7 Council and Commission, Decision on the Conclusion of the Partnership and Cooperation Agreement between the European Communities and their Member States, of the one Part, and Ukraine, of the other Part.

8 Karras, Melnyk, and Zastup, "Stand Und Perspektiven Des Klimaschutzrechts in Der Ukraine: Zwischen Dem Krieg Und Dem Beitrittskandidatenstatus," 68.

9 Lorenzmeier, "Der Beitritt Der Ukraine Zur EU: Rechtliche Und Politische Fragestellungen," 392.

10 Karras, Melnyk, and Zastup, "Stand Und Perspektiven Des Klimaschutzrechts in Der Ukraine: Zwischen Dem Krieg Und Dem Beitrittskandidatenstatus," 69.

11 Kopytsia, "The Legal Regulation of Climate Change in Ukraine."

1.1.4. The Treaty Establishing the Energy Community

The Energy Community is an international organization that brings together the EU with EU candidate countries other than Turkey. Its members commit to implement relevant EU energy *acquis communautaire*, including developing adequate regulations and liberalizing their energy markets, and to promote energy efficiency and the use of renewable energy. Additionally, they pledge to comply with EU regulations in areas such as environmental protection and consumer rights in the energy sector.

The Energy Community *acquis* comprises legal acts linked to the fields of electricity, gas, renewable energy, energy efficiency, climate, environ-

ment, competition, statistics, infrastructure, and oil. One of the obligations of member states is to set out an integrated national energy and climate plan with major objectives, targets and contributions every ten years starting in 2019. The Treaty Establishing the Energy Community entered into force in July 2006.¹² Ukraine became a member in 2011 and it has been working on aligning with the energy *acquis* ever since. Figure 2 summarizes the five dimensions of the Energy Community, which should be taken into consideration when drafting Ukraine's national climate and energy plan, addressed in other sections of the study.

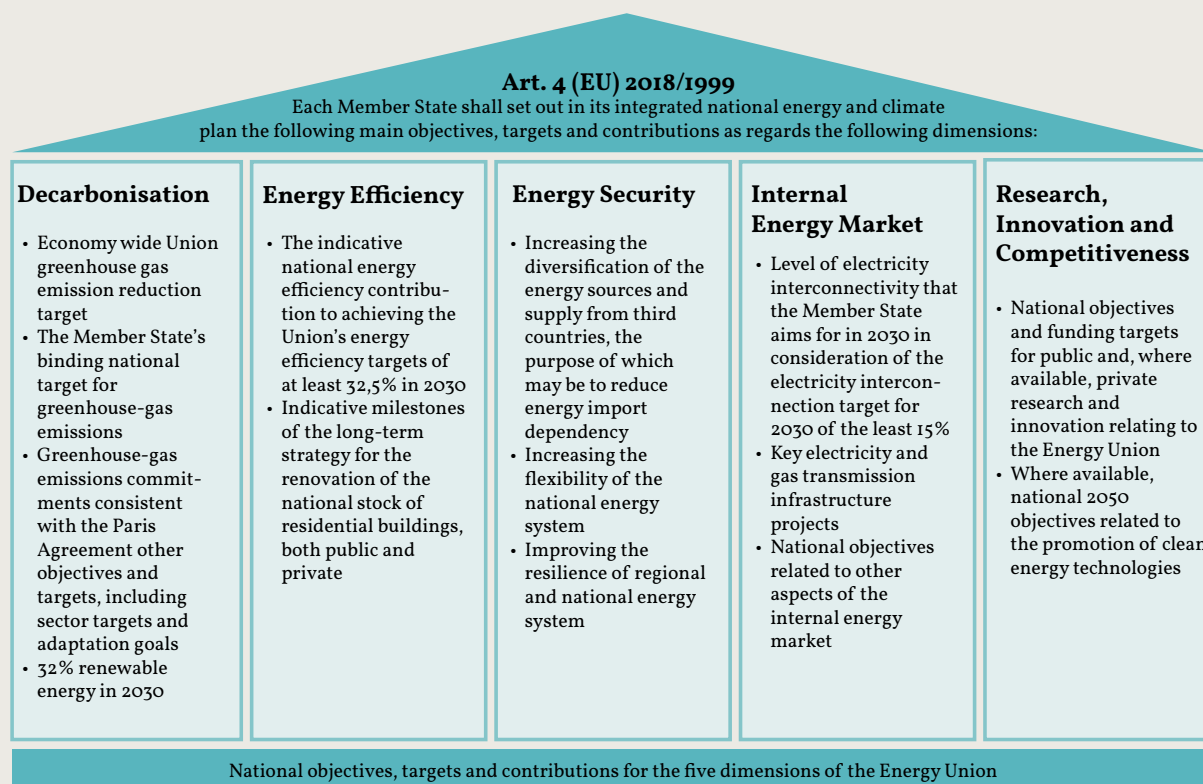


Figure 2: Summary of Art. 4 REG (EU) 2018/1999

Source: Own illustration.

12 Council of the European Union, Council Decision on the Conclusion by the European Community of the Energy Community Treaty.

1.2. Ukraine's National Energy Climate Plan (NECP)

The most important instrument for coordinating and implementing the EU's energy and climate change policies are the national energy and climate plans (NECPs). In these plans, countries set out how they plan to advance in the five dimensions of the Energy Union and achieve greenhouse gas reductions of up to -55% by 2030 compared with emission levels in 1990, and how the planned policies and measures could affect their competitiveness.

Ukraine is currently formulating an NECP with the support of a High-Level Advisory Group. This work, which is to be completed by mid-2024, is meant to help Ukraine achieve modern and highly efficient energy system resting on an advanced decentralized energy supply based largely on renewable energy sources.¹³ This study recommends that Ukraine's NECP includes at least the following measures:

- A modern and market design for energy and heating that is conducive to investment, including a revision of public service obligations and price caps in different market segments, and based on the European Commission's market design proposals.
- Proposals for debt restructuring along the entire value chain in the energy and heating sectors for consideration by national authorities and international donors.
- Measures that aim to provide targeted protection of vulnerable and energy-poor customers.
- A tariffication scheme incentivizing the upgrade of electricity and district-heating infrastructure, including the preparation of TEN-E-ready infrastructure projects as well as charging infrastructure for electromobility.
- An incentive package for flexibility solutions and large-scale demonstration projects.
- The full implementation of market-coupling projects in line with the Energy Community's electricity package, with a focus on neighboring states including Moldova.
- An ETS- and CBAM-ready carbon-pricing system for all ETS sectors based on a graduality, including principles for the usage of revenues.
- A package of legislation conducive to fuel switching and energy savings in large industrial consumers such as steel factories.
- The development of a package of support-schemes/auction rules and merchant (and cross-border) road-to-market-solutions for renewable energy, including wind, solar (agri-PV), biofuels, biogases, and hydrogen.
- Robust certification schemes for renewable energy and hydrogen.
- State-of-the-art permitting and grid-connection schemes.
- Governance and contractual models for energy communities, aggregation, decentralized energy production and peer-to-peer solutions.
- An EU-compliant disclosure scheme and taxonomy for financial institutions and large corporations.

13 Energy Community Secretariat, "High-Level Advisory Group on the Ukrainian NECP Launched in London amid Ukraine Recovery Conference."

It is important to note that, if these measures are elaborated and included in the design of the NECP, implementation will still require multiple packages of legislation, regulatory decisions, and contracts, accompanied by continued corporate governance reform of state-owned energy companies.

Overall, it is important that Ukraine's NECP supports a state-of-the-art decentralized energy system based on renewables, serving a modern and

highly efficient energy system in the future, is developed in alignment with Energy Strategy 2050 and 'Action Plan for Post-war Reconstruction and Development of Ukraine' and envision specific policy and legal measures within each economic sector should be developed considering the specific situation of Ukraine. Additionally, foreseeing some deviations/exceptions from provisions of the EU Governance Regulation might be necessary: e.g., less ambitious targets for 2030 GHG reductions, etc.

1.3. Energy Strategy of Ukraine 2050

Approved by the Cabinet of Ministers on 21 April 2023, the Energy Strategy of Ukraine 2050 represents a fundamental guideline for the transforma-

tion of Ukraine's energy sector of Ukraine in the coming decades.¹⁴ It defines six headline strategic goals quantified by specific indicators:

1. Self-sufficiency and consumption efficiency

- ensuring reliable and uninterrupted electricity coverage for households, commercial establishments and other consumers;
- improving the efficiency of energy use in all sectors; and
- reducing the energy intensity of GDP by 50 per cent through the implementation of an effective energy-use policy.

2. Comprehensive security of energy infrastructure facilities

- ensuring physical, engineering and cyber security for 100% of energy facilities.

3. Climate neutrality in the energy

- sector by 2050

4. 100% of electricity and heat generated from carbon-neutral sources

- development of renewable energy
- phasing out of coal
- implementing carbon capture & utilization and carbon capture & storage projects

5. Renewal and modernization of energy infrastructure according to international best practice

- comprehensive modernization
- increase of energy-infrastructure efficiency considering best available technologies, digitalization and other innovative solutions

14 Cabinet of Ministers of Ukraine, Про схвалення Енергетичної стратегії України на період до 2050 року.

6. Comprehensive integration with EU energy markets and efficient functioning of domestic energy markets

- legal, technical and economic synchronization with the EU, accompanied by expanded opportunities for exchange with neighboring countries and increased competition in the domestic market.
- more export orientation in the energy industry, including:
 - expansion of oil and gas production, and export to the EU,
 - integration of gas storage facilities into the EU grid,
 - production and export of hydrogen and alternative gases,
 - production and export of equipment and components for the energy sector,
 - nuclear-reactor design and manufacture, and
 - a full range of nuclear-power management, from nuclear-fuel production to radioactive waste management.

7. Reducing energy poverty, protecting vulnerable consumers, fostering gender-based and social inclusion

- identifying vulnerable consumers,
- ensuring economical energy consumption, and
- providing competitive market conditions
- establishing a robust objective research base dedicated to gathering knowledge, best practices, and innovative approaches.

The Energy Strategy of Ukraine until 2050 further envisions:

1. An increase of power generation capacity from 108 to 176 TWh per year and a shift from energy deficit to a net export of 9 TWh;
2. Development of carbon-neutral generation capacities, with 27% of energy consumption originating in renewable sources in 2030 (electricity: 25%; heating and cooling: 35%; and transport: 14%);
3. An affordable, reliable, and modern energy system demonstrated by the construction and installation of 1.4 GW of new high maneuvering capacities with a control range of at least 80% of installed capacity and a startup time not exceeding 15 minutes.

From the perspective of the authors of this study, the Strategy is as a commendable declarative document, encompassing well-defined objectives, visionary perspectives, and clear tasks that notably align with prevailing global trends within the energy sector. It is difficult to provide a comprehensive legal assessment, since the plan of measures for the implementation of the Strategy is still in the process of development.¹⁵

The ongoing hostilities continue to wreak havoc on Ukraine's society and infrastructure, which means that goals such as climate neutrality by 2050 may not ultimately be realistic. Moreover, it is not clear that adequate financing can be ensured for the

ambitious targets. Finally, some of the provisions of the Strategy clash with Ukraine's ambitions to join the EU – for instance, it foresees an increase in gas consumption, while the EU goal is a reduction of gas demand of at least 35% between 2019 and 2030. For all these reasons, the Energy Strategy of Ukraine 2050 is perhaps primarily useful as a guide for potential investors (that is, about which industries will be the most promising) rather than a proper green reconstruction plan. In the future, it may make sense for Ukraine to seek an interim framework before EU accession that would provide some flexibility in following EU regulations while still helping stimulate investment.

15 Cabinet of Ministers of Ukraine.

2. Ukraine's Energy Market Regulation in an EU Perspective

The reconstruction of the Ukrainian energy sector, its integration into the European internal energy market, and the energy security of the Ukrainian population depend not least on a functioning energy and electricity market design that should enable energy security and affordable energy prices. This section provides an analysis of the specificities of the electricity and gas markets of Ukraine, including EU and Ukrainian legal frameworks, to identify where there is a need for action. Special focus is given to a comparison of electricity market designs, with a view to identify how the Ukrainian model can be enhanced based on insights gained from the EU perspective.

2.1. European Energy Market

The EU's internal energy market aims to build a competitive, customer-centered, flexible, and non-discriminatory EU electricity market with harmonized regulation and market-based supply prices. This includes the development of trans-European networks for transporting electricity and gas as well as secure supplies of electricity, gas, and oil. Moreover, European energy policy clarifies the roles and responsibilities of market participants and regulators.¹⁶

In response to the challenges faced by the EU energy market in 2022, a period marked by high and volatile prices as well as significant apprehension regarding supply security, the EU initiated a structural reform of the electricity market with two primary objectives: safeguarding Europe's energy autonomy and achieving climate neutrality.

A proposal to amend the regulations governing electricity market design and enhance EU safeguards against manipulative activities in the wholesale energy market was presented by the Commission in March 2023.¹⁷ The proposal is designed to reduce the susceptibility of energy costs for European consumers and businesses to sudden fluctuations in short-term electricity prices. Achieving this involves a shift towards employing longer-term agreements, such as power-purchase agreements, while investment support is structured as mutually beneficial contracts for differences. In addition to enhancing consumer protection and expediting the integration of renewable energy sources into the energy landscape, this approach bolsters defenses against market manipulation, contributes to the stability and predictability of energy costs, and boosts the competitiveness of the EU industrial sector. At time of publication, the proposal was going through the EU's legislative procedure.¹⁸

16 "About ACER | www.Acer.Europa.Eu."

17 "Electricity Market Reform for Consumers and Annex."

18 "Staff Working Document on the Energy Storage - Underpinning a Decarbonised and Secure EU Energy System."

2.2. Overview of Ukraine’s Energy Market

There are five main institutions responsible for the regulation of the energy market in Ukraine. They are inventoried in Table 1.

Cabinet of Ministers (CMU)	Highest executive body, collective decision-making, supervising state policy
The Ministry of Energy (MoE)	Shapes and implements state policy, measures economic incentives, monitors and reports on energy demand and forecasts, defines strategy and methodology for constructing facilities for energy generation, has main responsibility for the working group on renewable energy sources
National Energy and Utilities Regulatory Commission (NEURC)	Semi-independent regulator for the energy sector which sets tariff policies and implements prices (Ukraine does not fully comply with EU energy legislation, which calls for regulatory independence); national representative in the International Renewable Energy Agency (IRENA)
State Agency on Energy Efficiency and Energy Saving (SAEE), under MoE	Central government body responsible for advancing and promoting energy efficiency and renewable energy developments and technologies
State Nuclear Regulatory Inspectorate	Regulatory responsibility for the operation of nuclear facilities, including uranium mining, radioactive waste storage and decommissioning at Chernobyl

Table 1: Key actors in Ukraine’s energy market regulation

The National Energy and Utilities Regulatory Commission (NEURC) is the central energy regulator, which monitors and analyzes markets in the energy and utilities sectors. It has the right to set temporary minimum and/or maximum price limits in the day-ahead market, the intraday market and the balancing market for each trading zone in accordance with a methodology it determines itself, and has done so since the start of the new market model – the prices are adjusted from time to time.

NEURC publishes reports on the monitoring of electricity markets for each quarter. These reports consist of sections that reflect information on the production, transmission, resale (trading activity) of electric energy, export-import operations, activities of the guaranteed buyer and market operator, the work of organized segments of the electric energy market, the market of bilateral contracts and the market of auxiliary services, wholesale electricity prices, electricity market liquidity, mergers and competition in the electricity market, and market-power indicators.

NEURC was given its role by the Cabinet of Ministers following legal changes in 2019. This is in contravention of the EU acquis, which demands that energy regulators be administratively and financially independent from other public bodies. This model was introduced because Ukraine’s Constitutional Court ruled that the regulator’s independent status was unconstitutional – this state of affairs can thus only be remedied through an amendment to the constitution.

To fully comply with EU legislation, the regulator needs to be independent, including financially, joint capacity allocation must be enabled, and the Regulation on Wholesale Energy Market Integrity and Transparency (REMIT) must be implemented. The regulatory basis for participation in the European inter-transmission system operator compensation (ITC) mechanism – another major part of relevant EU legislation – has been approved, implementing Regulation (EU) 838/2010.

2.3. State Aid Rules and Energy Sector Reconstruction

The development of a Ukrainian energy sector that is economically efficient, climate-neutral and integrated into the European internal energy market will require substantial state support in addition not only require investment from the private

sector, but also considerable state support. There are EU rules in place to ensure that such a development does not lead to socially harmful monopoly structures.

2.3.1. Status Quo of the State Aid Law in Ukraine

Legal review of state aid was introduced in Ukraine as far back as 2014, with the Law on Government Aid for Business Entities, which was adopted to implement Articles 267 et seq. of the Association Agreement with the EU, which themselves flow especially from the requirements of Articles 107 and 108 of the Treaty on the Functioning of the European Union (TFEU).¹⁹ Accordingly, state aid or aid granted from state resources in any form whatsoever that distorts or threatens to distort competition by favoring certain undertakings or the production of certain goods is prohibited.

As in Article 107 paragraphs 2 and 3 TFEU, however, Ukrainian state aid law also allows exceptions to the general prohibition of state aid. The review of state aid is the responsibility of the Antimo-

nopoly Committee of Ukraine (AMCU), although it is the Cabinet of Ministers of Ukraine that determines the criteria for assessing the exceptional admissibility of certain state aid measures.

Ukrainian state aid law is well aligned with the requirements of EU state aid law to the extent required by the Association Agreement, although the European Commission has stated that further steps will be necessary to ensure full compliance with the *acquis* in terms of both implementing legislation and the functioning of the AMCU.²⁰ The application of the State Aid Law has been suspended as long as martial is in force in Ukraine, and the following analysis relates to the time period after it is lifted.

2.3.2. State Aid Perspectives for a Ukrainian Energy Sector Integrated into the European Market

A multidimensional approach to subsidies will be required to ensure that the Ukrainian energy sector can service the population immediately after the war while also being bolstered and upgraded in a way that permits it to be integrated into the European internal energy market. Until Ukraine's accession to the EU, any state intervention through subsidies should be organized in a way that is largely in line with the EU *acquis*.

While the road from candidate to full member state of the EU is one that many other states have traveled, none have done so immediately after a war. The reconstruction of the Ukrainian energy

sector will have special requirements which will justify several state aid interventions. Exceptions for special circumstances are already provided for in Article 107 of the TFEU and in Articles 5 and 6 of the Law on Government Aid for Business Entities. Furthermore, the Ukrainian law on state aid will have to be further adapted to the *acquis* beyond the bare requirements of the Association Agreement, in particular regarding requirements for natural and legal monopolies, the provision of services of general economic interest, the promotion of energy infrastructures and the guidelines for state aid related to energy and climate protection.

19 European Commission, Commission Staff working document, Analytical Report following the Communication from the Commission to the European Parliament, the European Council and the Council Commission Opinion on Ukraine's application for membership of the European Union, 25.

20 Parliament of Ukraine, Про державну допомогу суб'єктам господарювання.

2.4. Ukraine's Electricity Market

A well-designed electricity market is essential for the post-war reconstruction of Ukraine's energy sector as well as for facilitating future integration into the EU. The market design should be established by a tailored legal framework that lays down price coordination and regulatory measures to address market failures, enhancing the security of the energy supply and facilitating affordable prices. The specific conditions significantly shape the

electricity market, affecting price discovery and influencing investment choices made by financial institutions and energy companies.

This section considers the status quo of Ukraine's electricity market before addressing the legal requirements of electricity market design from the perspectives of EU and Ukrainian legislation.

2.4.1. Status Quo

The current situation in the Ukrainian electricity market can be summarized as follows (see also Figure 3):

1. Despite the Russian invasion, all market segments – bilateral, day-ahead, intraday, balancing and ancillary-services markets – remain operational.
2. Ukraine's electricity sector is unbundled. It is comprised of separate generation, wholesale market, transmission system operation, distribution, and supply entities.
3. The retail market remains functional. All customers in the retail market are free to choose their supplier. Universal-service suppliers are obliged to supply electricity to households and other categories of customers entitled to universal service at regulated prices applied to households, which do not reflect costs.
4. Public service obligations (PSOs) were introduced to mitigate the negative effects of the new electricity market introduced in Ukraine on 1 July 2019, and to prevent an increase in prices for residential consumers. Despite the full-scale invasion, PSOs not only persisted but expanded in scope.
5. Transmission power losses are recovered by the transmission system operator using fixed-price schemes. However, the distribution system operators are still obliged to accept significant losses from the state-owned Energoatom at a fixed price in contravention of EU legislation.
6. On 1 June 2023, the unified electricity tariff for households was increased to UAH 2.64/kWh = €0.064/kWh (an increase of 83.33% from May 2023).
7. Ukrenergo covers its operating costs as part of the PSO for households. However, universal service suppliers are obliged to provide electricity to consumers whose supplier is in default status or has lost its license due to a Ministry Order.
8. The methodology for determining significant price fluctuations and setting price caps on the day-ahead, intraday, and balancing markets was approved by Resolution No. 1221 of 27 September 2022.

9. On 8 June 2023, the National Energy and Utilities Regulatory Commission (NEURC) approved the draft resolution “On establishing price limits on the day-ahead market, intraday market and balancing market”, which proposes a 35% increase in the maximum price limit and a cancellation of the minimum price limit.
10. The current model of price-cap setting in Ukraine does not correspond to the EU model. It does not comply with key principles of the new market model, namely transparency and competitiveness, which would allow the market to operate in a streamlined and regulated mode.
11. Setting price caps creates market distortions; leads to critical losses for energy companies; complicates market synchronization with the EU; and complicates trade in electricity when a deficit needs to be covered during certain hours.
12. The average remuneration to renewable-energy producers is 50% of the approved feed-in tariff amount. This significantly harms market principles and prevents producers from meeting financial obligations towards bank loans, resulting in a significant increase in non-performing loans within the industry.
13. Ukraine’s electricity market design already strongly resembles that of EU countries, thanks to the gradual introduction of the EU acquis through the country’s membership of the Energy Community.

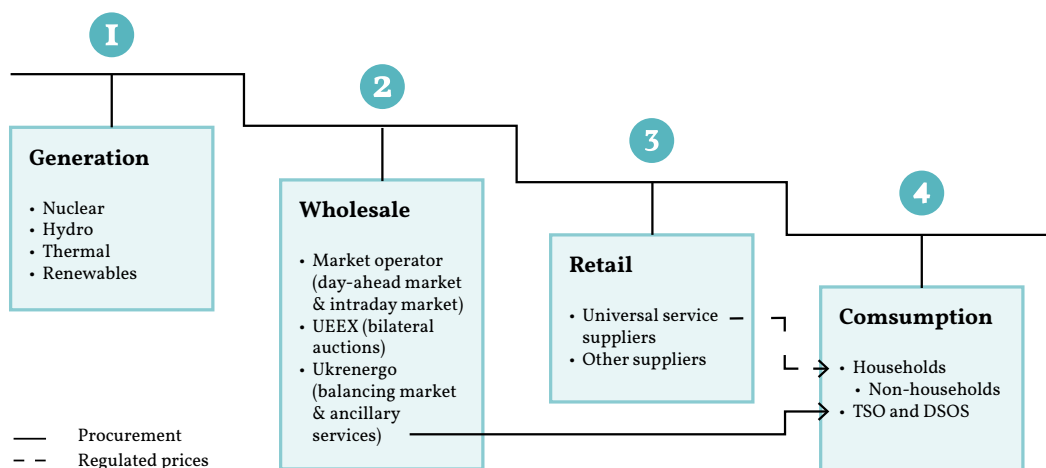


Figure 3: Ukraine’s current electricity market design
Source: Own illustration

Ukraine's electricity sector has undergone several stages of reforms. It was mostly unbundled and partially privatized in the 1990s, and state-owned assets were consolidated in 2004. Most thermal-generation plants have been partially or fully privatized, with the private company DTEK controlling the bulk of the market. Regional distribution and retail companies, or *oblenergosp*, were created, one in each administrative region, in 1995. As a part of electricity market reforms and to ensure retail-market competition, Ukraine enforced the unbundling of *oblenergosp* into distribution system operators (DSOs) and electricity-sup-

ply companies. There have been several rounds of privatization since 1995, and most DSOs and electricity-supply companies are now privately owned by domestic or foreign investors.

The state-owned national electricity company UkrEnergo owns and operates the United Energy System of Ukraine (UES), including transmission grids and interconnections with neighboring countries. UkrEnergo also provides technical and information support to the state-owned supplier of electric power Energorynok. The main participants in Ukraine's electricity market are shown in Figure 4.

<p>Ukrenergo</p> <ul style="list-style-type: none"> • only TSO in Ukraine, responsible for transmitting and dispatching electricity through high-voltage networks. • Under the new market model - operates the balancing and ancillary service markets, registers bilateral agreements, and serves as a commercial metering and settlements administrator. • Certified by NEURC under the independent system operator (ISO) unbundling model. 	<p>Centrenergo</p> <ul style="list-style-type: none"> • Thermal generating company, operating three thermal power plants. • State-owned and managed by the State Property Fund. 	<p>Energoatom</p> <ul style="list-style-type: none"> • State-owned company under the managements of the CMU • Operates four NPPs, generating about half of the country's electricity. 	<p>Ukrhydroenergo</p> <ul style="list-style-type: none"> • State-owned hydro power company managed by the Cabinet of Ministers of Ukraine. • Operates 10 plants generating around 6.7% of Ukraine's total electricity production.
<p>DTEK Group</p> <ul style="list-style-type: none"> • The largest vertically integrated private holding company • Involved in the production, supply and distribution of natural gas and electricity, and coal mining 	<p>Distribution system operators (DSOs)</p> <ul style="list-style-type: none"> • Responsible for distributing and dispatching electricity to final consumers. • 32 DSOs in Ukraine, eight of which are controlled by the State Property Fund. 	<p>Suppliers (under free prices)</p> <ul style="list-style-type: none"> • Economic entities purchasing electricity on the market and selling it to consumers at free (unregulated) prices. 	<p>Universal service suppliers</p> <ul style="list-style-type: none"> • Electricity suppliers with a legal obligation to supply residential and small, non-residential consumers at regulated prices. • 25 regional USSs, six of which are state-owned
<p>Ukrinternenergo (supplier of last resort)</p> <ul style="list-style-type: none"> • A state-owned supplier that provides services to consumers in exceptional circumstances (cancellation of their supplier). May supply electricity for no more than 90 days at regulated prices. 	<p>The Market Operator</p> <ul style="list-style-type: none"> • Shareholding company whose shares are 100% owned by state and which operates the DAM and IDM. 	<p>The Guaranteed Buyer</p> <ul style="list-style-type: none"> • A state-owned company responsible for ensuring public interest in increasing the share of electricity generation from renewable energy sources by buying electricity from producers eligible for green tariffs and selling it on the market. 	<p>Energy storage operators</p> <ul style="list-style-type: none"> • Introduced in 2022 to sell electricity released from energy storage facilities to provide ancillary and balancing services. As of March 2023, no energy storage operator licenses had been granted.

Figure 4: Key actors on the electricity market in Ukraine
Source: Own illustration.

2.4.1.1. Synchronization with ENTSO-E and electricity export

On 16 March 2022, Ukraine's national energy system was disconnected from the IPS/UPS wide-area synchronous transmission grid, which covers Russia and many other post-Soviet countries, and linked to the synchronous grid of continental Europe. Ukraine had already declared its intention to carry out this change by the end of 2023 in early 2021. In the event, the country disconnected from the Russian grid in February 2022 and completed an emergency synchronization with the European grid in early March 2022. Ukraine also joined the European Network of Transmission System Operators for Electricity (ENTSO-E).

Ukraine exported electricity to Europe after the synchronization for the first time on 30 March 2022. Export volumes have gradually increased since then, with 125 MW exported to Romania and Slovakia each in July 2022. At the end of July 2022, the volume was increased to 250 MW, and 210 MW

started being exported to Poland. Ukraine's TSO is currently allocating the capacity of interconnectors to EU countries at daily auctions. In the future, the period is planned to be extended (weekly, monthly, and quarterly). The export strengthens the energy security of both Ukraine and Europe, with Ukrainian electricity helping Europe reduce its dependence on Russian energy carriers and the carbon intensity of its electricity mix – 70% of Ukraine's electricity is generated in nuclear and renewable plants.

The following step should be a closer synchronization of European and Ukrainian energy markets. At the same time, the missile attacks against Ukraine's energy infrastructure in late 2022 forced it to cease exporting electricity from 11 October 2022 so as to stabilize its own energy system. Exports resumed in April 2023, but the situation remains fragile.²¹

2.4.1.2. Current challenges

The imposition of martial law in Ukraine resulted in the suspension of grid connections for electricity procedures, a decision made by the National Energy and Utilities Regulatory Commission (NEURC). The section of the Distribution Systems Code known as the Procedure for Joining the Distribution Systems was replaced by a Procedure for Temporary Grid Connection.²² All grid connections were labelled as "temporary", the distinction between standard and non-standard connections was inactivated, and it became possible to provide certificates from military administrations, the Armed Forces of Ukraine, or similar bodies to prioritize grid connections.

Due to the limitations of the new system and the lack of a detailed description of many procedures for connecting to power grids, confusion arose among state authorities at the onset of the war, leading to instances where power producers were denied con-

nection to the grid. The confusion mainly stemmed from Clause 3 of the Procedure for Temporary Grid Connection, which specified that priority should be given to connecting customer facilities used to meet the needs of enterprises under the Ministry of Strategic Industries and Ministry of Economy, as well as enterprises of the State Concern "Ukroboronprom" involved in mobilization tasks, and other enterprises, regardless of ownership, which perform mobilization tasks under agreements with the Armed Forces of Ukraine, other military formations of Ukraine, law enforcement agencies, and civilian forces of protection.²³

Efforts are being made to address these issues, and regular changes and additions are being made to the Procedure for Temporary Grid Connection. Notably, it has been further detailed, and the concept of non-standard connections introduced. These efforts aim to reduce the likelihood of deni-

²¹ Vasovic, "Ukraine Resumes Electricity Exports to Europe - Minister."

²² National Energy and Utilities Regulatory Commission, Про особливості тимчасового приєднання електроустановок до системи розподілу у період дії в Україні воєнного стану.

²³ National Energy and Utilities Regulatory Commission.

al of access by government authorities due to conflicting priorities, as mentioned above.

Another legal issue was the lack of clarity regarding what would happen after the termination of martial law. Notably it was not clear whether there would be a simplified procedure or whether a new

grid connection submission would be required under the Code of Distribution Systems. This created significant legal uncertainty for entities about the future procedures with which they would have to comply. This issue was successfully addressed on 6 July 2022 with an update to the Procedure for Temporary Grid Connection.²⁴

2.4.2. Current EU Law

This section outlines the legal foundations of the EU's energy market. It only takes into account legal acts that were in force at the time of publication, that is, the summer of 2023, although future relevant reform projects may also be referenced. The analysis focuses principally on regulations linked to the structure of the market and rules

which govern the behavior of market participants, ensuring that the free functioning of the market is not impaired by intervention. The main instruments are Directive 2019/944 concerning common rules for the internal market for electricity²⁵ and Regulation 2019/943 on the internal market for electricity.²⁶

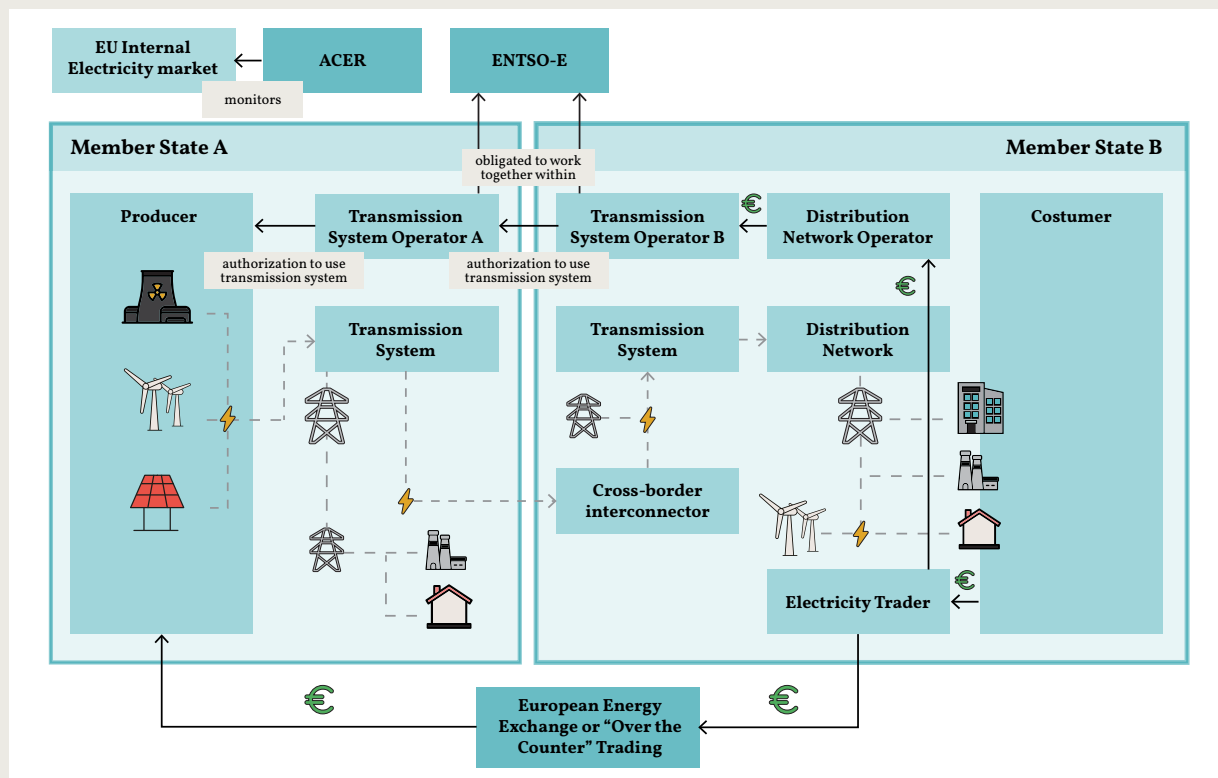


Figure 5: Design of the European internal electricity market, showing electricity and cash flows
Source: Own illustration.

24 National Energy and Utilities Regulatory Commission.

25 European Parliament and Council of the European Union, 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) (Text with EEA relevance).

26 European Parliament and Council of the European Union, Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast) (Text with EEA relevance).

2.4.2.1. EU Regulations on the Establishment and Structure of the Electricity Market

Formed in 1998, the European internal electricity market prohibits anti-competitive practices and creates a regulated right of grid access. Its main objective is to ensure that electricity markets in the Union are truly integrated, competitive, consumer-centered, flexible, fair, and transparent. This leads to affordable, transparent energy prices & costs for consumers and a high degree of security of supply, and enables a smooth transition towards a sustainable low-carbon energy system. The basic structure of the market is illustrated in

Figure 5. Under the principle of free competition, EU member states must ensure a level playing field where electricity undertakings are subject to transparent, proportionate, and non-discriminatory rules, fees and treatment, in particular with respect to balancing responsibility, access to wholesale markets, access to data, switching processes and billing regimes and, where applicable, licensing (Art. 3 para 4 of the Directive 2019/944). This includes the following:

- free access to the market;
- third-party access to transmission and distribution infrastructure (Art. 6 Directive);
- unbundling requirements for distribution and transmission system operators;
- strengthening and protection of consumers;
- free choice of supplier (Art. 4 Directive);
- freedom for all customers to purchase electricity from the supplier of their choice and to have more than one electricity supply contract at the same time, provided that the necessary connection points and metering points are available;
- market-based supply prices, i.e. suppliers themselves decide on the price at which they supply their customers with electricity (Art. 5);
- no state fixing of electricity prices except in the case of households affected by energy poverty; and
- independent regulatory authorities in the member states.

A major set of rules within the EU is established by the Regulation of the internal market for electricity (Regulation (EU) 2019/943, not to be con-

fused with the Directive (EU) 2019/944 mentioned above).²⁷ The most important goal of this Regulation, laid down in its Article 1, are:

the fundamental principles for well-functioning, integrated electricity markets which allow all resource providers and electricity customers non-discriminatory market access, empower consumers, ensure competitiveness on the global market as well as demand response, energy storage and energy efficiency, and facilitate aggregation of distributed demand and supply, and enable market and sectoral integration and market-based remuneration of electricity generated from renewable sources.

The Regulation refers to the climate and energy framework for 2030, increased efficiency, higher share of renewable energy sources, security of supply, flexibility, sustainability, decarbonization and innovation, cross-border exchanges in electricity, as well as a functioning and transparent

wholesale market, and security of electricity supply. Article 3 establishes principles regarding the operation of electricity markets and ensures that the internal market for electricity is built on free market mechanisms (see Table 2 for the details).

27 European Parliament and Council of the European Union.

Article section	Excerpt of the principles regarding the operation of electricity markets
(a), (b), (l)	Prices shall be formed on the basis of demand and supply, encouraged by market rules; market rules shall allow for the development of demonstration projects into sustainable, secure and low-carbon energy sources, technologies or systems which are to be realized and used to the benefit of society
(c)	Market rules shall facilitate the development of more flexible generation, sustainable low carbon generation, and more flexible demand
(e)	Aggregation of generation from multiple power-generating facilities or load from multiple demand response facilities shall enable the market participation of final customers and small enterprises
(f)	Market rules shall enable the decarbonization of the electricity system and provide incentives for energy efficiency
(g)	Market rules shall deliver appropriate investment incentives in particular for a decarbonized and sustainable electricity system, energy storage, energy efficiency and demand response to meet market needs, and [...] ensure security of supply
(h)	Barriers to cross-border electricity flows between bidding zones or member states and cross-border transactions on electricity markets and related services markets shall be progressively removed
(j)	Safe and sustainable generation, energy storage and demand response shall participate on equal footing in the market, under the requirements provided for in the Union law
(m)	Market rules shall enable the efficient dispatch of generation assets, energy storage and demand response
(o)	To allow market participants to be protected against price volatility risks on a market basis, long-term hedging products shall be tradable on exchanges in a transparent manner and long-term electricity supply contracts shall be negotiable over the counter, subject to compliance with Union competition law;
(p)	Market rules shall facilitate trade of products across the EU

Table 2: Summary of the principles regarding the operation of electricity markets according to Art. 3 REG (EU) 2019/943

In Article 5, the Regulation defines the legal term of “balance responsibility”, which specifies that all market participants are responsible for any imbalances they cause in the system and must strive to minimize them. Article 6 connects the technical aspects of the balancing market as well as integrated day-ahead, intraday and forward markets with economic market rules. Furthermore, it specifies that balancing markets have to be organized so that they accommodate the increasing share of variable generation through increased demand responsiveness and the advent of new technologies.

The main focus of the Regulation is on economic market topics. The aim is to ensure that power plants are deployed as effectively as possible while the grid is kept stable. The deployment of power plants depends on variable costs, as well as on the expected sales prices on the market and thus on demand. Every day, all power plant operators must inform transmission system operators of their planned energy production for the next day in a binding manner. The result is an allocation of the available power plant capacity in spatial, temporal and gradual terms for each quarter hour of the following day.²⁸

Based on the data reported to them, TSOs perform a load flow calculation. This enables them to see how the grid will perform at every point in time. If there

is risk of a bottleneck, power plants on one side of it can be instructed to curtail their feed-in, while plants on the other side must increase it, creating a load flow that counteracts the bottleneck.²⁹

Bidding zones are an important part of the EU’s electricity market. These are the largest geographical areas within which market participants can exchange energy without capacity allocation. Within a given bidding zone, there is a single price for electricity, and it can be traded without any extra cost for transportation. The power plant with the lowest variable costs therefore always dominate in the electricity mix. As above, if the grid is not as stable as needed to transport the power generated at a certain place to where it is needed, some power plants must be shut down and others need to start.

So-called capacity allocations ensure that electricity demand can be met in each bidding zone and that generation in one bidding zone can be transferred to another, if need be. This ensures that the power supply remains reliable and stable even if there are changes in power generation or demand. When an electricity system operator makes capacity allocations between bidding zones, transmission capacities are made available. Capacity allocations between bidding zones can be made in a variety of ways, for example by power lines, substations, or other transmission facilities.³⁰

2.4.2.2. European Network of Transmission System Operators for Electricity (ENTSO-E)

Article 28 of the Regulation of the internal market for electricity (Regulation (EU) 2019/944) states that transmission system operators must cooperate at Union level through the European Network of Transmission System Operators for Electricity (ENTSO-E), in order to promote the completion and functioning of the internal market for electricity and cross-zonal trade and to ensure the optimal management, coordinated operation and sound technical evolution of the European electricity transmission network. The target of ENTSO-E is to act with a view to establishing a

well-functioning and integrated internal market for electricity, thus contributing to efficient and sustainable achievement of the objectives set out in the European policy framework for climate and energy, and especially the expansion of renewable electricity and increases in energy efficiency, as well as maintenance of system security (Art. 28 (2) REG (EU) 2019/944).

The key activities of ENTSO-E are listed in Article 30 of the Regulation (EU) 2019/944. This includes the development of network codes, the adoption

28 Next Kraftwerke, “Dispatch & Redispatch.”

29 Bundesnetzagentur, “Bundesnetzagentur - Redispatch.”

30 Elia Group, “Capacity Allocation.”

and publishing of Union-wide network development plans, and provision of data and information within the Transparency Platform. On 28 July 2022, the transmission system operators of continental Europe agreed to increase trade capacity with Ukraine and Moldova to 250 MW. The technical preconditions for this commercial exchange were fulfilled in 2022. Ukraine's transmission system operator Ukrenergo became an observer member

of ENTSO-E on 26 April 2022 (see section 2.3.1.1 Synchronization with ENTSO-E and electricity export for more information).³¹ One of the EU's targets is the interlinking of energy infrastructure of European member states. Article 4 (d) (1) of Regulation (EU) 2018/1999 specifies an electricity interconnection target for 2030 of at least 15%. Figure 6 shows an overview of cross-border interconnectors in Europe and neighboring regions in 2021.

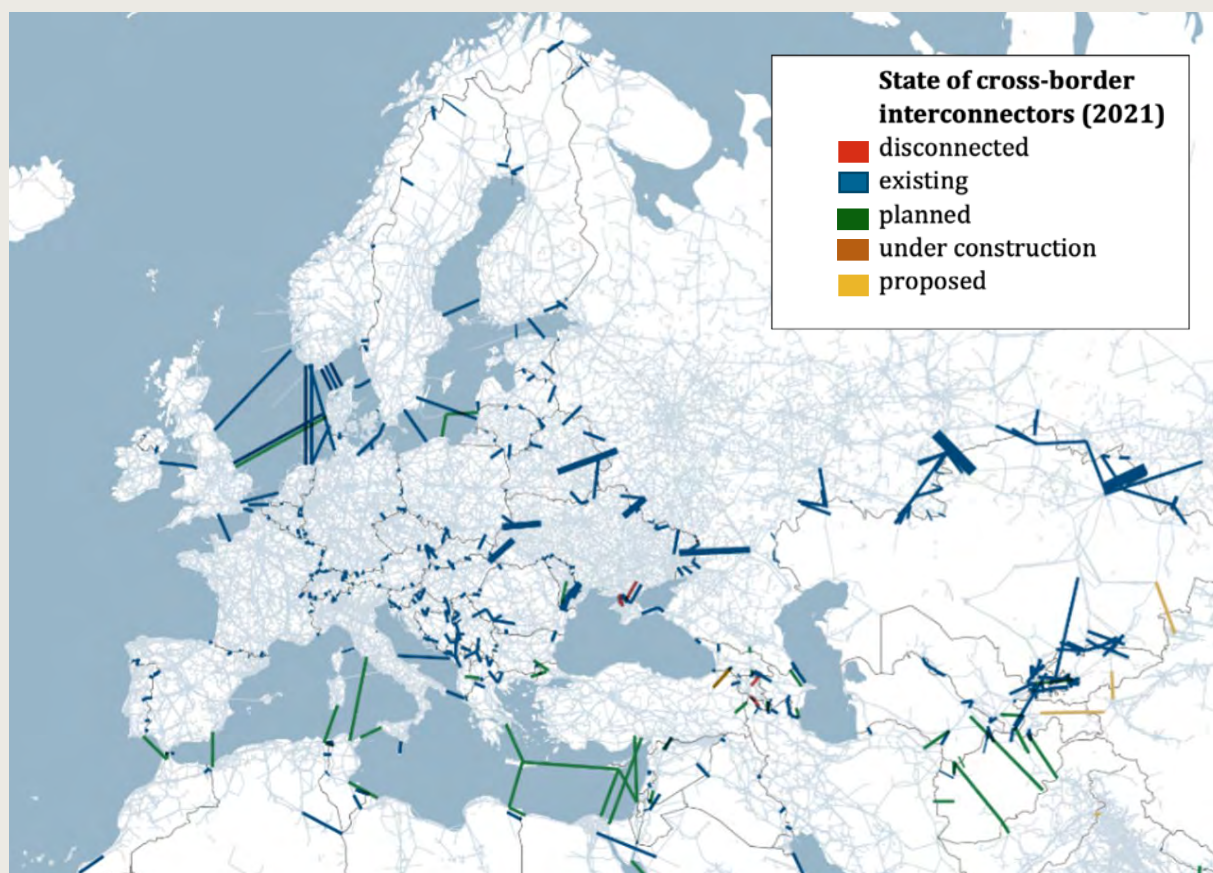


Figure 6: Cross-border interconnectors in Europe, North-Africa and West-Asia in 2021
Source: Westphal et al., "Geopolitik Des Stroms," 17.

2.4.2.3. EU Regulations of Market Conduct

The basic rules of market conduct revolve around competition law and prohibit cartels and market abuse (Articles 101 and 102 of the Treaty on the Functioning of the European Union). In addition, the Electricity Directive provides that final elec-

tricity customers have the right to choose an electricity supplier regardless of where the supplier is registered, as long as the supplier complies with the applicable trading and balancing rules (Article

³¹ ENTSO-E, "Transmission System Operators for Electricity of Continental Europe Agree to Increase the Trade Capacity with the Ukraine/Moldova Power System."

10). Suppliers in turn must provide transparent information on prices, tariffs and general terms and conditions.

Customers are free to buy and sell electricity services independently of their electricity supply contract. Member states must ensure that household

customers and micro-enterprises have access to at least one tool to compare suppliers' offers. Finally, the Regulation on Wholesale Energy Market Integrity and Transparency (REMIT) regulates energy market-specific obligations for market participants.³² A prime example is the prohibition on market manipulation and insider trading.

2.4.3. Current Ukrainian Law

The legal, economic, and organizational principles that govern the electricity energy market are defined by the Law of Ukraine "On the Electricity Market".³³ A new model of competition in the electricity market was introduced on 1 July 2019, replacing the single-buyer wholesale mar-

ket scheme that had been in place until then with trading in commercial segments. This section provides a description of the regulatory framework within which Ukraine's electricity markets operate, covering the wholesale electricity market, the retail market and public service obligations.

2.4.3.1. Wholesale Electricity Market of Ukraine

The wholesale electricity market in Ukraine was created in 1996 and was operated by the state-owned company Energorynok as a sole wholesale trader under a single-buyer model from 2000 to mid-2019 and acted as a settlement center for all payments until July 2019. To meet its Association Agreement commitment to implement the EU Third Energy Package, Ukraine successfully

switched from a single-buyer model to one with a more competitive power-market structure consisting of bilateral contracts, day-ahead, intraday, balancing, and ancillary-services markets in July 2019.

The fundamental legal basis for the wholesale electricity market comprises the following legal acts:

1. The Law of Ukraine "On the Electricity Market" (Electricity Market Law)³⁴
2. The Law of Ukraine "On the Commodity Exchange"³⁵
3. Resolution of the Cabinet of Ministers of Ukraine No. 499 "On Approval of the Procedure for Holding Electronic Auctions for the Sale of Electricity under Bilateral Contracts and the Procedure for Selecting Organizers of Electronic Auctions for the Sale of Electricity under Bilateral Contracts"³⁶
4. Order of the Ministry of Energy from 21 June 2019 No. 272 "On Establishment of the Auction Committee for the Sale of Electricity under Bilateral Contracts" (amended)³⁷
5. Regulations on the organization and conduct of electronic auctions for the purchase and sale

32 European Parliament and Council of the European Union, Regulation (EU) No 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency Text with EEA relevance.

33 Parliament of Ukraine, Про ринок електричної енергії.

34 Parliament of Ukraine.

35 Parliament of Ukraine, Про товарні біржі.

36 Cabinet of Ministers of Ukraine, "Про внесення змін до порядків, затверджених постановою Кабінету Міністрів України від 5 червня 2019 р. № 499," 499.

37 Ministry of Ecology and Natural Resources, "Про внесення змін до наказу Міністерства енергетики та вугільної промисловості України від 21.06.2019 М 272."

of electricity under bilateral contracts using the technology of bilateral continuous auction on the Ukrainian Energy Exchange, approved by the Protocol of the Auction Committee No. 34 dated 25 July 2022 (amended)³⁸

The Electricity Market Law, which liberalized the country's national electricity market, aligns Ukraine's national legislation with EU legislation, especially the Third Energy Package on the European gas and electricity markets. The REMIT Regulation (Regulation (EU) No. 1227/2011), adopted on 10 June 2023, also fosters the integrity and transparency of the wholesale energy markets for electricity and natural gas, and aims to prevent abuse by participants in the markets by establishing liability for market manipulation and for trading based on insider information.

Of course, reaching the intended goals of various types of regulation depends on the practical application of their mechanisms and principles. Efforts to establish more equitable mechanisms for setting price limits for electricity (price caps) in Ukraine continue, for instance. On 31 May 2023, the National Energy and Utilities Regulatory Commission (NEURC) canceled price caps in the electricity market, which can be considered a significant step towards the liberalization of the market and will enable sufficient electricity imports in the summer.

Regulation (EU) 2022/332 of 25 February 2022 established price caps in the day-ahead, intraday, and balancing market. The application of the Regulation in Ukraine was eventually amended, as market participants argued that the price caps

hindered their ability to import sufficient volumes of electricity to cover potential shortages during the summer. On 27 June 2023, NEURC approved a resolution to increase the price cap on the day-ahead and intraday markets from 4000 UAH/MWh to 5600 UAH/MWh (from 7 am to 7 pm) and 7200 (from 7 pm to 11 pm), and to lower the price floor from 2560 UAH/MWh (from 7 am to 11 pm) and from 1380 UAH/MWh (from midnight to 7 am) to a single value of 10 UAH/MWh. In the balancing market, the price cap changed from 120% to 125% of the day-ahead market price, while the price floor remained unchanged at 102% of the day-ahead market price.³⁹ New price caps were established in accordance with the Methodology for Determining Significant Price Volatility and Setting Price Caps on the day-ahead, intraday, and balancing markets.

This decision went some way towards further liberalization of the market, which is an indispensable condition for the full integration of the Ukrainian electricity market with the EU's. Convergence with European power markets and prices will also allow for imports from other contracting parties and member states and hence improve the security of electricity supply in Ukraine. However, price controls should include an automatic mechanism for adjustment based on a transparent methodology and be further liberalized in line with the free market.⁴⁰

38 Ministry of Energy of Ukraine, "Протокол № 34 Засідання Аукціонного Комітету з Продажу Електричної Енергії За Двосторонніми Договорами."

39 Energy Community Secretariat, "Secretariat Reviews the Decision on Setting Price Caps in the Electricity Market of Ukraine."

40 Energy Community Secretariat.

2.4.3.2. Retail Market

The retail market in Ukraine is regulated by the following legal acts:

- Electricity Market Law⁴¹
- Retail Market Rules⁴²
- Transmission Network Code⁴³
- Distribution Network Code⁴⁴
- Commercial Metering Code⁴⁵

The Electricity Market Law serves as a general legal framework, while the other rules and codes (developed and administered by the transmission system operator and approved by the National Energy and Utilities Regulatory Commission [NEURC]) provide detailed regulations on participants' rights and interactions.

Following the provisions of the Electricity Market Law, Ukraine's retail electricity market is essentially liberalized, with all customers free to choose their suppliers at unregulated prices. Meanwhile, universal service suppliers are obliged to supply electricity to households and other categories of customers entitled to universal service at regulated prices applied to households, which do not reflect costs.

A phase-out of regulated prices, combined with support for vulnerable households, would enable competition in this market segment and represent a better use of limited financial resources. It would also provide appropriate incentives to use electricity in an economically efficient way.

2.4.3.3. Public Service Obligations

To mitigate the negative effects of the new electricity market introduced in Ukraine on 1 July 2019, and to prevent an increase in prices for residential consumers, Ukraine introduced public service obligations (PSOs). These are regulatory measures or requirements to guarantee minimum levels of quality, service standards and consumer rights to achieve sector-specific objectives in the name of general economic interest.

In the energy sector, PSOs are justified by the fact that electricity and gas are essential goods, the supply of which must be continuous and non-discriminatory. Even after the full-scale Russian in-

vasion in 2022, the application of PSOs persisted and expanded in scope. For instance, PSOs were introduced in relation to electrical energy-export operations after the invasion began.⁴⁶

Furthermore, PSOs ensuring fixed electricity prices for residential consumers remain in effect.⁴⁷ It is evident that PSO mechanisms have an impact on the market and do not necessarily enhance market competition. However, they align with the objectives of state policy in the electricity market, especially during times of war.

41 Parliament of Ukraine, Про ринок електричної енергії.

42 National Energy and Utilities Regulatory Commission, Про затвердження Правил роздрібного ринку електричної енергії.

43 National Energy and Utilities Regulatory Commission, Про затвердження Кодексу системи передачі.

44 National Energy and Utilities Regulatory Commission, Про затвердження Кодексу систем розподілу.

45 National Energy and Utilities Regulatory Commission, Про затвердження Кодексу комерційного обліку електричної енергії.

46 Cabinet of Ministers of Ukraine, Про покладення спеціальних обов'язків на учасників ринку електричної енергії, що здійснюють операції з експорту електричної енергії, для забезпечення загальноосупільних інтересів у процесі функціонування ринку електричної енергії протягом дії воєнного стану.

47 Cabinet of Ministers of Ukraine, Про внесення змін до постанови Кабінету Міністрів України від 5 червня 2019.

2.5. Gas Market

This section provides an analysis of the legal status quo in Ukraine's gas market, followed by the EU regulatory framework and its application in Ukraine with regards to Ukraine's EU accession

readiness. The section also points out challenges Ukraine's gas market is currently facing and gives suggestions to address them.

2.5.1. Status Quo

Between 2014 and 2019, Ukraine implemented a number of reforms to bring its gas market in line with the EU's Third Energy Package. As with the electricity grid, the gas system was unbundled, separating the transmission from the supply. New rules were introduced to liberalize gas prices for households and industry and enable third parties to participate in transmission, storage and distribution. The state-owned company Naftogaz underwent its own liberal reforms to increase transparency. These reforms, which entered force in 2020, were, however, partly reversed after the 2022 Russian invasion, for reasons of national interest. The Secretariat of the Energy Community nevertheless remarked in its 2022 implementation report that this reversal was not efficient and could be revoked (i.e. the reforms could be implemented once more) without negative effects as long as the most vulnerable gas consumers remained protected.⁴⁸

that the existing regulation does require immediate change, or a non-payment crisis may arise in the markets. The regional gas companies have accumulated UAH 17 billion in debts to the gas transmission system operator alone, and the Naftogaz group has debts of about UAH 22 billion.⁴⁹

Another way in which Ukraine does not comply with EU regulations is in its lack of a single platform where all market participants trade standardized short-term products. This also means there is no local-price indicator for gas. Instead, trading is conducted on different platforms and the terms of supply vary significantly.

Private producers are facing a real problem with the sale of their gas, as industrial consumption has fallen by more than 50%, and gas exports are temporarily banned. Therefore, producers cannot sell gas and are forced to pump it into underground gas storage facilities, which already contain more than 1.3 billion cubic meters of gas.

The multibillion-dollar debts of the regional gas companies and the supplier of last resort show

2.5.2. Current EU Law

This section describes the current state of EU law as it applies to the gas market in Ukraine. It looks at the Third Energy Package, the Hydrogen and

Decarbonized Gas Market Package, and the issue of security of supply in a future beyond the war.

2.5.2.1. The Third Energy Package and Ukraine's EU Accession Readiness

The EU's Third Energy Package comprises the following legal acts with relevance to the gas market: 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 as well as the 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.

The Third Energy package made a significant contribution towards the creation of an internal market in

⁴⁸ Cahill and Palti-Guzman, "The Role of Gas in Ukraine's Energy Future."

⁴⁹ Макогон, "Які реформи потрібні ринку газу."

natural gas. It is complemented by other EU legislation affecting gas markets, notably Regulation (EU) 2017/1938 on security of gas supply. The latter and the abovementioned Regulation (EC) No 715/2009 were amended by the Regulation (EU) 2022/1032 of

the European Parliament and of the Council of 29 June 2022 with regard to gas storage. Today, Ukraine is already part of the internal market of the Energy Community, as well as – at least in economic terms – the European internal gas market.

2.5.2.2. The Hydrogen and Decarbonised Gas Market Package: a Goal for Ukraine's Transformation Phase

The Third Energy Package has had a positive effect on the competition and performance of EU's internal energy markets. However, the current regulatory EU-framework for gas, which has changed little over the past decade, focuses on fossil-based natural gas and does not fully anticipate the emergence of alternatives to methane gases (including natural gas and biomethane), such as hydrogen – the most notable amendment has been a targeted revision of the Gas Directive in 2019, which expanded its scope to cover pipelines between the EU and third countries. Further legal developments in the EU since the Third Energy Package have been introduced to remedy this. Both the Gas Directive and the Gas Regulation are also strongly focused on the functioning of networks for natural gas and have rather little to say about the potential creation of EU-wide hydrogen networks. A revision of the applicable gas-market regulatory framework is therefore much needed and currently discussed in the EU.

With its Fit-for-55 package of 15 July 2021, the European Commission adopted a number of legislative proposals that aim to make the EU's climate, energy, land use, transport and taxation policies fit for reducing net greenhouse-gas emissions by at least 55%

by 2030 compared to 1990 levels. Moreover, the Fit-for-55 package facilitates the implementation of the European Green Deal, which was presented by the Commission on 11 December 2019 with the goal of making Europe the first climate-neutral continent by 2050.

In parallel with these developments, the EU adopted a hydrogen strategy on 8 July 2020, and published a Hydrogen and Decarbonised Gas Market Package, which puts forward proposals to support the creation of optimized and dedicated infrastructure for hydrogen, as well as an efficient hydrogen market, on 15 December 2021.⁵⁰ This package comprises a review and revision of the above-mentioned Gas Directive 2009/73/EC and Gas Regulation (EC) No 715/2009, and was generally agreed to by EU energy ministers at the Energy Council on 28 March 2023.⁵¹ It aims to facilitate the integration of renewable and low-carbon gases into the existing gas network, to ensure a more integrated network planning between electricity, gas, and hydrogen networks, to promote consumer engagement, and to improve energy security and supply. These changes to the existing regulatory framework will increase stability, resilience, and EU's strategic autonomy.

⁵⁰ European Commission, Proposal for a directive of the Parliament and the Council on common rules for the internal markets in renewable and natural gases and in hydrogen.

⁵¹ European Commission, Proposal for a regulation of the European Parliament and of the Council on the internal markets for renewable and natural gases and for hydrogen (recast).

2.5.2.3. Security of Supply and Ukraine's Reconstruction

While the implementation of the hydrogen and decarbonized gas market package described above will be a challenge not only for Ukraine, but also for the EU, and is therefore a medium or longer-term goal for Ukraine, there are steps related to Ukraine's future gas sector that can be taken sooner. As mentioned above, June 2022 saw the passage of:

- Regulation (EU) 2022/1032 of the European Parliament and the Council, amending Regulation (EU) 2017/1938 of the European Parliament and of the Council concerning measures to safeguard the security of gas supply,⁵² and
- Regulation (EC) 715/2009 of the European Parliament and of the Council on conditions for access to natural gas transmission networks.⁵³

These regulations aim to address the very significant risks for security of supply and the EU's economy resulting from the dramatically changed geopolitical situation. To ensure that storage capacities in the Union, which are crucial for the security of supply, do not remain unused, a mandatory minimum level of gas in storage facilities was introduced. Furthermore, a mandatory certification of storage system operators excludes any potential influence over the critical storage infrastructure which could result in security of supply risks. Finally, the use of storage is incentivized, as storage users may be exempted from transmission tariffs at storage entry or exit points.

Another European legal act related to security of supply is Directive 2009/119/EC of 14 September 2009 (still in force), which imposes an obligation on EU member states to maintain minimum stocks of crude oil and/or petroleum products (90 days of average daily net imports or 61 days of average daily inland consumption, whichever is greater). The Directive also imposes strict requirements concerning the composition and location of the emergency oil stocks, so as to guarantee their availability and accessibility in case of need, among other provisions. If a member state is deemed not to be compliant with this Directive, the Commission can initiate an infringement procedure, ultimately leading to the Court of Justice of the European Union (Articles 258-259, Treaty on the Functioning of the European Union). This Directive was implemented in the Energy Community by Ministerial Council Decision 2012/03/MC-EnC of 18 October 2012.

Members of the International Energy Agency (IEA) are also obliged, pursuant to Article 2 of the International Energy Programme (IEP), to maintain oil reserves equal to 90 days of net imports of the previous year. (Ukraine is an associate member of the IEA.) IEA Members are obliged to submit information concerning their emergency measures to the IEA secretariat (Article 32 IEP) on a continuous basis and the IEA monitors member countries' compliance with the IEP.

52 European Parliament and Council of the European Union, Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage (Text with EEA relevance).

53 European Commission, Proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) 2017/1938 of the European Parliament and of the Council concerning measures to safeguard the security of gas supply and Regulation (EC) n°715/2009 of the European Parliament and of the Council on conditions for access to natural gas transmission networks.

2.5.3. Current Ukrainian Law

The gas market in Ukraine is currently subject to martial law and heavily regulated so as to preserve infrastructure assets, maintain control of domestic production, and guarantee the supply of gas to households. Despite severe limitations placed on Ukraine's transmission system operator, the country continues to fulfill its transit obligations, and efforts to diversify routes and suppliers have started to bear fruit. However, more actions are needed to facilitate liquid natural gas routes and ensure stable import in the future.

Implementation of the Storage Regulation (Regulation (EU) 2022/1032, see previous section) will require amendments to Ukraine's Gas Law and a certification procedure for the storage system operator. Ukraine will need to re-establish gas market reforms put in place before the war, with derogations limited to the most vulnerable customers, to embark on a long-term sustainable gas policy. As Ukraine ceases to be a transit country for fossil gas, the country should explore options for low-carbon gas production and its transport during the reconstruction period to prepare for the changing role in the future.⁵⁴

54 Energy Community Secretariat, "Ukraine, Annual Implementation Report, 1 November 2022," 6.

2.6. Recommendations for Ukraine's Energy Market Development

The recommendations for how Ukraine should proceed to align its energy market with EU legislation and its own best interest can be grouped into three topics: generation, trade, and transport.

Each of those can in turn be divided into near-term measures to be implemented during the first two years after the end of open hostilities (Phase 1) and the longer-term period after that (Phase 2).

2.6.1. Generation

The near-term priorities for Ukraine's energy markets linked to energy generation are as follows:

- A draft law on Amendments to Certain Laws of Ukraine (Concerning the Regulation of Ensuring the Security of Electricity and Natural Gas Supplies) has been drafted in the Parliament of Ukraine with the purpose of helping the country fulfill its obligations under the Association Agreement with the EU, in particular regarding the implementation of Directives (EC) 2009/72 and 2009/73.⁵⁵ The rapid adoption of this draft law would be highly beneficial, as it:
 - strengthens sanctions for violation of legislation regulating the functioning of electricity and natural gas markets, including increasing the fine for violating license conditions;
 - reinforces the institutional capacity of the Ministry of Energy to ensure the safety of electricity and natural gas supplies, in particular regarding the proper functioning and planning of the development of generating capacities and grid infrastructure;
- bolsters the functions of the State Inspectorate of Ukraine for Energy Supervision in terms of ensuring compliance by producers, transmission system operators, distribution system operators, and certain categories of consumers with the requirements of regulatory legal acts in the field of electric power. To meet EU accession requirements, the Third Energy Package regarding gas must be fully transposed.
- To ensure a gas policy that is sustainable in the long term, Ukraine will need to re-establish the gas market reforms which were suspended when the war began; derogations should be limited to the most vulnerable customers. Moreover, after the war, Ukraine will no longer provide transit for fossil gas, and should explore options for low-carbon gas production and transport as soon as possible.

55 Ministry of Energy of Ukraine, Про внесення змін до деяких законів України (щодо врегулювання питань забезпечення безпеки постачання електричної енергії та природного газу.

Longer-term measures in Ukraine's energy market to shore up energy generation should include:

2.6.2. Stability of the energy supply

Strategic reserves of energy resources must be managed effectively, which should include:

- the preservation of national interests,
- diversification of the supply of energy sources,
- efficient and cost-effective deployment of energy resources,
- coordination of the rates of consumption of exhaustible resources with the rates of development of renewable energy sources,
- increasing the share of renewable energy (8% at the beginning of 2022⁵⁶) in the energy mix,
- robust quality control to meet the requirements of national legislation and international standards.

2.6.3. Trade

To boost energy trade in Phase I after the end of hostilities, Ukraine should consider the following:

- The requirements of the Catalogue of Measures under the Association Agreement on the conditions for the future unification of the energy systems of Ukraine and continental Europe, as well as the measures to improve the dynamic stability of the energy unification should be adopted to facilitate permanent parallel operation with the ENTSO-E energy system of continental Europe.⁵⁷ An Agreement on Ukrenergo's membership in ENTSO-E as an observer was signed on 26 April 2022, opening the door to Ukrenergo's full membership in the European Energy Community.⁵⁸
- The scope of excise duty on energy products is currently narrower than the one required by the EU acquis, and the tax levels applied to excisable goods are below the minimum EU levels. As part of its tax obligations, Ukraine must implement Council Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity regarding the list of excisable goods to be sent to the EU's Directorate-General for Taxation and Customs Union.
- Ukraine should fully align its regulatory framework on the security of gas supply with the European gas acquis.⁵⁹
- The abovementioned Regulation (EU) 2017/1938 on security of gas supply ensures that Ukraine already has a well-established regulatory framework for the security of gas supply; however, the country's risk assessment and preventive & emergency action plans still need to be fully aligned with the European gas acquis.
- The transposition of the Storage Regulation (EU) 2022/1032 should be completed. This will require amendments to the Gas Law and a certification procedure for the storage system operator.
- Directive 2009/119/EC on oil stocks must be transposed to create the legal framework for emergency oil stocks.

56 LLC Ukrainian Energy Exchange, "Особливості вітчизняного виробництва електроенергії."

57 German Economic Team, "Ukraine's Electricity Grid Synchronisation with the EU."

58 ENTSO-E, "ENTSO-E Welcomes Ukrenergo as Observer Member."

59 Energy Community Secretariat, "Ukraine, Annual Implementation Report, 1 November 2022," 6.

Recommendations related to energy trade for Phase 2 include reform of the gas market:

Payment discipline should be improved and a balanced system of responsibility created for all gas market participants: suppliers, consumers, traders and operators of distribution and transmission grids. A single-payment system should be re-established for final gas consumers, covering the cost of gas supply and distribution services. Consumers should pay only to their suppliers, and suppliers should organize all the arrangements necessary for the supply of gas to consumers' metering units. The formation of a transparent and competitive gas market in Ukraine should continue, with an exchange as an important element.

2.6.4. Transport

The transport of energy in Ukraine can be facilitated by the following recommended reform, which is well suited for adoption in Phase 1:

The draft law on Projects of National Interest in the Energy Sector should be adopted in order to implement the requirements of Regulation (EU) No. 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure.⁶⁰ In its letter UA-MC/O/alo/31/23-II-2022 dated 23 November 2022, the Energy Community Secretariat supported this draft law as fully transposing the relevant provisions of the Regulation.

2.6.5. General recommendations

Several reforms for the longer term have a cross-cutting positive effect. To strengthen its energy market, Ukraine should:

I. Enhance the independence of the Regulator (energy regulation authorities)

Current Ukrainian legislation is not aligned with the EU acquis on energy regulatory authority. For instance, the European Commission's analytical report on Ukraine's alignment with the EU acquis points out the independence and reputation of the National Energy and Utilities Regulatory Commission of Ukraine (NEURC), the regulatory authority in the field of energy, have been negatively affected by a number of non-transparent appointments.⁶¹ Regulatory independence bolsters confidence and trust that regulatory decisions are made with integrity, and is crucial in ensuring that competitive energy markets work in the best long-run interests of consumers. To achieve this in Ukraine:

- National law should provide for regulatory independence from any public or private interests, with no legal provisions that conflict with each other. For this the constitutional status of the Regulator must be determined by amending the Constitution of Ukraine to enshrine a legal status of regulatory collegiate institutions, including provisions regarding their establishment, reporting, and subordination.
- Mandatory selection of the Regulator members on a competitive basis should be ensured.

⁶⁰ Draft law of Ukraine "On projects of national interest in the energy sector", Проект Закону України «Про проекти національного інтересу у сфері енергетики»

⁶¹ European Commission, Commission Staff working document, Analytical Report following the Communication from the Commission to the European Parliament, the European Council and the Council Commission Opinion on Ukraine's application for membership of the European Union.

- President and the Verkhovna Rada should be granted the authority to participate in the competitive selection process of NEURC members to maintain a balance of interests among different branches of government and centers of political influence in the selection process
- Regulators should consistently be given the power to issue final and binding decisions that are not subject to outside (ministerial) scrutiny or review (except for judicial review).

2. Foster a stable hydrogen and decarbonized gas market

The reform process of the currently applicable European gas-market regulatory framework is still ongoing in the EU. As soon as the proposals of the Hydrogen and Decarbonised Gas Market Package enter into force, Ukraine should proceed with the implementation of this package into domestic law. This process should aim to:

- **Prioritize the development and implementation of Ukraine's Hydrogen Strategy**

Taking into consideration that the production and transportation of hydrogen to the EU is meant to become an important part of Ukraine's energy sector, its development should continue, and a roadmap for preparing the gas-transport system for transporting a mixture of hydrogen and methane should become an important part of this state strategy. The gas transmission system operator should continue its work on assessing the possibility of transporting hydrogen mixtures and developing a detailed roadmap for the necessary modernization of the gas-transport system. Thus, Ukraine's Hydrogen Strategy should outline the development of a comprehensive UA H₂ Backbone Infrastructure Plan, which can outline a clear and phased strategy for preparing gas grids to be hydrogen-ready and provide the necessary direction and support for the industry and heating sector to transition to hydrogen.

- **Adopt the legal framework to support the optimization and modernization of the transmission systems**

Ukraine's gas-transport system was built to transport 145 billion cubic meters of gas per year, almost exclusively from Russia to the EU. In 2022, however, the transit amounted to only 20 billion cubic meters and is likely to stop completely as soon as the EU abandons Russian gas in the medium term. Most compressor stations can therefore be liquidated or mothballed, significantly reducing the cost of operating the gas-transport system and leading to a reduction in gas transportation tariffs for Ukrainian consumers.

3. Adapt state-aid regulations for renewable energy expansion

The design of subsidies should be aligned with EU state aid requirements, and circumstances which justify a given degree of state aid clearly defined. This must take into account the needs of postwar energy-sector rebuilding and comprise guidelines for the promotion of energy – generation and infrastructure construction – as well as climate protection. These efforts must always remain compliant with Ukraine's EU candidate status, with Article 107 of the Treaty on the Functioning of the European Union (TFEU) as guidance and with EU legal requirements for natural & legal monopolies and services of general economic interest addressed.

4. Establish a national energy agency

Establishing a national energy agency in Ukraine similar to those found in the EU – independent, objective, and transparent – will play a crucial role in facilitating the development of a market framework that supports market competition, particularly in the context of renewable energy and green certificates. An independent energy agency is less susceptible to political interference, ensuring that energy policies and regulations are developed and implemented objectively, which can create a stable and predictable investment environment. This can enhance investor confidence in the Ukrainian energy sector, attracting domestic and foreign investments needed for infrastructure development and capacity expansion. For instance, the Agency could serve as a) one-stop shop for permitting new renewable energy sources and facilitating the establishment of standards for the permit granting procedure; b) as the authority to oversee and coordinate the planning and adoption

of Renewable Energy Source (RES) potential area development plans. Additionally, a dedicated energy agency can make it easier to align Ukraine's energy policies and regulations with EU standards while facilitating cooperation and integration with European energy markets, potentially opening new export opportunities and enhancing energy security. Coordination with the relevant government bodies such as the Ministry of Energy of Ukraine will be crucial to the agency's success in shaping Ukraine's energy market.

5. Establish local markets for green energy

The establishment of local green markets modelled after the EU Energy Communities initiative can create a decentralized and resilient energy landscape that aligns with EU best practices and fosters local ownership and environmental responsibility. To ensure successful implementation, it is essential to establish a regulatory framework that supports community energy initiatives, incentivizes renewable energy adoption, and ensures fair compensation for energy producers.

6. Establish an environmental agency

The establishment of an environmental agency in Ukraine aligned with the EU model will ensure a higher level of compliance with EU and international environmental standards, and promote sustainable development practices, enabling better environmental monitoring, public awareness, and access to EU funding, and facilitating green reconstruction and recovery.

7. Elaborate a sustainability strategy, including circular-economy principles

A "Sustainability Strategy of Ukraine" should be drawn up and focus on at least the following key components:

- Clean energy transition – plans to transition to clean and renewable energy sources, reduce reliance on fossil fuels, and promote energy efficiency.
- Circular-economy concepts – promoting resource efficiency, reducing waste, and encouraging recycling and reuse.
- Sustainable transportation – including public transport, cycling infrastructure, and electric vehicle adoption.
- Water management – responsible water use, conservation, and protection of water resources.
- Sustainable agriculture and food security – promoting sustainable agricultural practices, food security, and food waste reduction.
- Green finance and investment – encouraging investment in sustainable projects and businesses, as well as the integration of environmental, social, and governance (ESG) factors in financial decision-making.
- Resilience, disaster preparedness and crisis response – envisioning strategies for resilience to climate change and other environmental challenges, including disaster preparedness and response.
- Biodiversity conservation and nature-based solutions should be integrated into urban planning and infrastructure development.
- Social equity and inclusion – addressing social disparities, promoting inclusivity, and ensuring that sustainability benefits all citizens.

8. Establish guarantees of origin for green hydrogen

They should also be included in a unified registry of guarantees of origin, including rules for combination with biomethane, electricity from renewable energy sources, and energy produced by highly efficient cogeneration.

9. Create a regulative framework for green financial mechanisms

Developing a green finance regulatory framework and creating options for subsidies to build up manufactures for renewable technologies, batteries and innovative energy technologies in Ukraine will ensure that these subsidies are targeted effectively and are in line with the country's energy and environmental goals. For more information, see the relevant sections of the preliminary financial study carried out in the framework of the Ukraine Energy Roadmap project.

10. Approve legislative-support quotas and auction schedules

Currently, the support-allocation mechanism for renewable-energy projects through auctions in Ukraine is blocked due to the absence of approved legislative-support quotas and auction schedules. To address this issue, the government should prioritize the swift approval of these quotas to provide a transparent framework for the allocation of support and develop and publish auction schedules. Additionally, it is important to ensure greater unity and coordination among designated government bodies responsible for renewable energy policy implementation to establish a consensus on economic approaches, support quota sizes, and strategic development priorities.

II. Establish an independent research platform to make the most of international best practice

Ukraine should study best practice and experience from other countries when developing a regulatory framework and consider establishing an independent research platform. Implementing international best practices can enhance Ukraine's competitiveness in the global energy market: by adopting efficient and effective regulatory mechanisms, the country can more easily attract foreign investment, technology transfers, and partnerships, ultimately leading to a more resilient and competitive energy sector. Establishing an independent research platform would ensure:

- Objectivity and transparency of research, which would foster transparency in decision-making processes related to energy-market regulation.
- Data integrity, as an independent platform can collect, verify, and maintain data and information in an unbiased manner.
- Efficient integration of best practices through systematic collection and analysis of best practices from other countries, and knowledge transfer where suitable.

3. Legal Framework for Energy Generation, Transport and Storage

This section analyses the legal underpinnings of how energy is produced, moved, and stored in Ukraine. It is divided into five thematic sections, each of which considers relevant European legal instruments and current Ukrainian law and provides recommendations for Ukraine's reconstruction and energy transition.

3.1. Renewable Energy Sources

The role of renewables is pivotal in aiding the post-war restoration of Ukraine's energy sector, ensuring energy security, and aligning with the country's EU accession and decarbonization goals. The extensive utilization of solar, wind, hydro,

and geothermal energy coupled with the phase-out of fossil fuels can potentially enable Ukraine to achieve 98% energy independence by the middle of the century.⁶²

3.1.1. Legal Status of Renewable Energy in Ukraine Today

Given Ukraine's international commitments in the field of energy and its plans to join the EU, a legislative and regulatory framework that reduces its dependence on fossil energy – especially by boosting renewable production – must be a top priority. Within the last couple of years, the country has adopted a number of regulations and strategies that point towards an ambitious renewable energy future.

The Energy Strategy of Ukraine until 2050 calls for renewable energy sources to reach a share of 36% in the total energy mix by 2032 and 50% by 2050. Moreover, the Economic Strategy of Ukraine until 2030 defines decarbonization, development of renewable energy sources and a circular economy in accordance with the European Green Deal, and energy efficiency as one of the benchmarks for the development of the national economy.⁶³ The importance of renewable energy is also underlined

by Ukraine's Nationally Determined Contributions under the Paris Agreement.

A significant milestone in Ukraine's regulatory landscape concerning renewable energy was achieved with the adoption of the Law on Amendments to Certain Laws of Ukraine on the Restoration and Green Transformation of the Energy System of Ukraine (the so-called "Green Transformation Law"), which aims to address a range of challenges which hinder the development and optimal operation of renewable energy sources.⁶⁴ Substantial efforts lie ahead in the form of enacting a considerable volume of secondary legislation to guarantee its successful implementation and operation, however.

The obstacles and opportunities linked to the legal status of renewable energy in Ukraine can be subdivided into seven categories.

62 United Nations Economic Commission for Europe (UNECE), "Rebuilding Ukraine with a Resilient Carbon-Neutral Energy System."

63 Cabinet of Ministers of Ukraine, Про затвердження Національної економічної стратегії на період до 2030 року.

64 Parliament of Ukraine, Про внесення змін до деяких законів України щодо відновлення та "зеленої" трансформації енергетичної системи України.

3.1.1.1. Ability of Renewable-Energy Producers to Join or Leave the Balancing Group of the Guaranteed Buyer

Until recently, one of the significant obstacles in the renewable-energy market of Ukraine was the absence of a clear legal mechanism for joining and leaving the balancing group of the Guaranteed Buyer by renewable-energy producers. Participation in this balancing group is of crucial importance, as it is one of the conditions for a feed-in tariff to be valid for renewable-energy producers. Any renewable-energy with the intention and desire to sell their electricity on the market on any other financial terms than the feed-in tariff was indirectly limited in their right to do so, as it would entail accepting the risk that leaving the balancing group of the Guaranteed Buyer would prevent them from returning at a later time.

This situation has been remedied by Ukraine's Green Transformation Law, which codifies the conditions in which renewable-energy producers can suspend or terminate contracts for participation in the balancing group and contracts for the purchase and sale of electric energy at the feed-in tariff. The Law also clarifies that these contracts can be reactivated without prejudice to the producer, and that the Guaranteed Buyer cannot refuse an application to rejoin. The secondary legislation implementing these mechanisms is not yet ready, however, and its completion should be accelerated.

3.1.1.2. Launch of "Green" Auctions in Ukraine

A new support scheme for renewable-energy producers that replaces the previous feed-in tariff scheme was introduced and implemented in Ukraine in 2019. This scheme gave renewable-energy producers the right to support through auctions. The essence of the auction system lies in the allocation of quotas and the determination, through auctions, of the electricity price that will be guaranteed (by the Guaranteed Buyer) for purchase from renewable-energy producers. The right to support wind projects over 5 MW and solar projects exceeding 1 MW is granted exclusively through auctions.⁶⁵

The responsibility for defining additional aspects of these auctions falls under the authority of the Cabinet of Ministers of Ukraine and the Ministry of Energy of Ukraine. This includes setting an annual support quota, scheduling auctions for the year, and establishing forecast indicators for annual support quotas for four years. The State Energy Efficiency Agency and Ukrenergo provide proposals regarding the size of the annual support quotas, taking into account Ukraine's international commitments for renewable-energy de-

velopment, the Energy Strategy of Ukraine until 2050, the assessment report on the adequacy of generating capacities, and the development plan of the transmission system, as well as the progress in implementing renewable-energy projects.⁶⁶

However, the implementation of the support-allocation mechanism through auctions has not yet taken place. Formally, it remains blocked due to the absence of approved legislative-support quotas and auction schedules. The problem lies in the lack of unity among designated government bodies regarding the approaches to implementing the renewable-energy policy. There is no consensus on the economic approach to determining the support quota sizes, nor is there a unified vision of strategic development priorities. Another obstacle to launching the auctions was the absence of an adequate market support mechanism for renewable-energy producers, such as contracts for differences.

Finally, the Green Transformation Law introduced contracts for differences, legislatively establishing state support through an auction support model. The model includes a 12-year support term

65 Parliament of Ukraine, Про внесення змін до деяких законів України щодо забезпечення конкурентних умов виробництва електричної енергії з альтернативних джерел енергії.

66 Parliament of Ukraine.

and grants the Cabinet of Ministers of Ukraine the authority to determine the share of the auction price, which is fixed in euros and cannot be less than 50%.⁶⁷ Under these circumstances, it is essential for the Cabinet of Ministers to promptly approve the annual support quotas and auction schedules and ensure the full operation of “green” auctions in Ukraine.

3.1.1.3. Market-Premium Mechanism

The Green Transformation Law introduced the market-premium mechanism as a new way to stimulate the production of renewable electricity. Under this mechanism, the Guaranteed Buyer pays the difference between the feed-in tariff or auction price and the estimated price for electricity to business entities that have been set a feed-in tariff and business entities that have been eligible for support based on the results of the auction. This model is also known as feed-in-premium or contracts for difference and is provided for, among other things, by Directive 2018/2021 of the European Parliament and of the Council of 11 December 2018, which Ukraine will have to adopt at some point.

Entities which decide to leave the balancing group of the Guaranteed Buyer are specifically entitled to enter into a contract for the provision of servic-

3.1.1.4. Issues with Payments to Renewable-Energy Producers

Legal restrictions on payments to renewable-energy producers for the produced electricity were imposed by the Ministry of Energy following the start of the full-scale Russian invasion in early 2022. For instance, Order No. 103 of 4 March 2022 completely suspended settlements, and Order No. 140 of 28 March 2022 introduced partial settlements (due to the lack of a proper system recording state body decisions during the initial phase of the full-scale invasion, it is impossible to provide references to the related legal acts.). The method of making payments to renewable-energy producers is currently regulated by Order No. 206 of 15 June 2022, which sets the average remuneration at 50% of the approved feed-in tariff amount.⁶⁸ The payments are carried out by the state-owned

Here, too, establishing an independent research platform could be constructive. By providing ongoing assessment and monitoring of the performance of the auction scheme, such an institution could help ensure the transparency and efficiency of Ukraine’s green energy auctions and continuously foster alignment with evolving industry standards and goals.

es under the market-premium mechanism. In this case, the agreement is concluded for the duration of the feed-in tariff, and the purchase of the service is carried out by the Guaranteed Buyer based on a contract for the provision of services under the market-premium mechanism. For entities that have recently received the right to support based on the results of the auction, the term of support is 12 years.

There is an urgent need to adopt secondary legislation to implement this concept as soon as possible. The National Energy and Utilities Regulatory Commission (NEURC) should approve a model contract for the provision of services under the market-premium mechanism. Additionally, it is crucial to develop procedures for paying for the services.

Guaranteed Buyer, which is mandated to transfer funds from its current account and revenue generated from the sale of electricity produced from alternative energy sources to cover payments for the purchased electricity to the producers of electric energy from alternative sources according to the contract (Para 1 of the Order).

The fact that electricity producers are not paid in full is a significant infringement of free-market principles. Restrictions on payments have also led to a series of knock-on effects, such as the inability of renewable-energy producers to meet their financial obligations linked to loan repayment, resulting in a significant increase in non-performing loans within the industry – in early May 2023,

67 Parliament of Ukraine, Проект Закону про внесення змін до деяких законів України щодо відновлення та зеленої трансформації енергетичної системи України.

68 Ministry of Energy of Ukraine, Про розрахунки з виробниками за «зеленим» тарифом.

this proportion was an alarming 51%.⁶⁹ Addressing these challenges requires careful and strategic solutions to maintain a fair and effective electricity market while protecting the interests of re-

newable-energy producers and ensuring overall financial stability. This is explored in more detail in this study in section 2 Ukraine's Energy Market Regulation in an EU Perspective .

3.1.1.5. Guarantees of Origin for Renewable Electricity

Until recently, the export of green energy was greatly hampered by the absence of guarantees of origin. The obligation to create a mechanism for issuing, using, and terminating guarantees of origin was enshrined in Directive 2018/2021 of the European Parliament and of the Council of 11 December 2018, which must also be implemented by Ukraine. The system of guarantees of origin can become a powerful incentive to boost the production as well as export of green energy from Ukraine. (This is also a crucial foundation for the production of green hydrogen as it enables the electricity certificates to ensure that only green energy is utilized in the production of hydrogen.)

Ukraine's Green Transformation Law responded to this requirement by creating guarantees of origin defined as 1 MWh of green electricity supplied to the grid or produced for own consumption. The ownership of these guarantees of origin can be transferred separately from the electricity and guarantees of origin can circulate separately from the volume of electricity within 12 months from the date of production of the volume of electricity for which they are issued. The guarantees would be generated automatically in the register.

Ukrainian law currently envisions that a separate register of guarantees of origin should be established and subsequently integrated into the regional Energy Community register. The body designated to establish this register and issue the guarantees is the National Energy and Utilities Regulatory Commission (NEURC). As with the above topics, there is urgent need for secondary

legislation to ensure the proper functioning of the introduced mechanisms. The procedure for issuing, circulating, and redeeming guarantees of origin must be separately approved by Ukraine's Cabinet of Ministers.

Additionally, to comply with EU energy legislation, NEURC should be made fully independent and enabled to set tariff policies and implement prices. Ukrainian law should be adapted accordingly, with no legal provisions that conflict with each other. This appears to require an amendment to the Constitution, which cannot take place during a period of martial law, but should be fast-tracked after the war. (The independence of other regulatory bodies may depend on this as well.) Specifically, NEURC members should be selected on a competitive basis, and the President and Parliament of Ukraine granted the authority to participate in the competitive selection process to maintain a balance of interests among different branches of government and centers of political influence. Regulators should also consistently be given the power to issue final and binding decisions that are not subject to outside (ministerial) scrutiny or review (except for judicial review).

Another possibility is for the regulator to maintain oversight of the certificate market without directly issuing the certificates themselves. Such an approach could enhance market transparency and ensure compliance while allowing market participants to actively engage in the issuance process, promoting a more efficient and responsive certification system.

69 National Bank of Ukraine, "Financial Stability Report."

3.1.1.6. Electricity Export

Ukraine's Green Transformation Law stipulates that renewable-electricity producers can sell electricity under bilateral agreements on the day-ahead, intraday and balancing market at prevailing prices and under electricity export-import agreements or at a feed-in tariff. The possibility for export may need to be formalized through secondary legislation (this need should be determined through additional analysis), with special attention paid to the tax regulation of the export of electrical energy. It is advisable to explore opportunities for the Ukrainian Power Exchange to establish cooperation and integration agreements with other European power exchanges, promoting cross-border electricity trading, market efficiency, and regional energy market integration, which can be mutually beneficial for Ukraine and the European energy market.

Under original rules, facilities that planned to produce electricity at the feed-in tariff (for certain categories of energy sources) had to be commissioned by the end of 2023. Projects stopped due to the beginning of the full-scale invasion risked losing the formal renewable-energy status. This issue was resolved by the Green Transformation Law, which extended by one year the term for commissioning and by two years the validity of technical specifications for electricity facilities or their construction stages that produce renewable electricity by business entities that entered into electricity purchase and sale agreements under the feed-in tariff before 31 December 2019. This extension does not include solar-power facilities, and the provision should be revised to remedy this.

3.1.2. Intermittent Renewable Electricity

In terms of climate and environmental effects, solar and wind energy are among the star pupils of power generation.

3.1.2.1. Offshore Wind

To facilitate the launch of offshore wind power projects, Ukraine needs to address multiple legislative inconsistencies. In particular, the construction of offshore wind power projects requires several permits from the Ministry of Environment Protection and Natural Resources of Ukraine.

Additionally, there are no regulatory norms for connecting wind power plants to the transmission system operator (TSO) or distribution system operator (DSO) grids. The following actions would remedy the situation:

1. Special maritime spatial-planning legislation should be considered in line with the provisions of Directive 2014/89/EU of the European Parliament and the Council.
2. It is of high priority that the Law of Ukraine on Alternative Energy Sources be amended to include offshore power plants as eligible facilities for state-support programs and schemes, recognizing their potential contribution to Ukraine's renewable energy goals and encouraging their development in alignment with broader sustainability objectives.
3. Legislation on environmental impact assessments should be updated with provisions specific to offshore wind plants.
4. New regulations should enable the construction and maintenance of fixed and floating wind turbines, interconnection grids, offshore and onshore substations, as well as cable laying. Such regulations should define the process of identifying potential areas first, with subsequent allocation to companies through a structured tendering procedure. Such an approach would

ensure a systematic and transparent process for the allocation of resources or opportunities while encouraging fair competition among interested parties.

5. Regulatory gaps pertaining to management of land and underwater areas, the establishment of underwater easements in coastal areas and the sea shelf, designated areas for offshore wind power projects, procedures for construction permits, and overall construction activities both above and below the water surface should be addressed. The establishment of a national environmental agency could play a pivotal role in filling these regulatory gaps, ensuring comprehensive oversight, sustainable development, and environmental protection in such areas.
6. Amendments should be made to the Transmission System Code and the Distribution System Code to introduce regulatory norms for connecting wind power plants to the TSO and DSO grids.
7. Specific legal provisions should be developed for the operation and maintenance of offshore power plants. This should include legal provisions regarding the transportation of technicians to the wind farm and take into account possible interactions with vessel passage routes. Decommissioning obligations, a standard practice in most EU countries, should also be included in the legislation.

3.1.2.2. Solar Power

Ukraine is currently placing a great deal of emphasis on solar energy in particular, for a range of reasons, not least energy independence. To this end, the country has devised a comprehensive state strategy which aims to incentivize and bolster the adoption of energy storage technologies in solar power plants, enabling the efficient storage and regulation of generated energy. Meanwhile, a vast amount of legislative work needs to be carried out.

In Phase 1 (within 24 months of the end of the war), secondary legislation should be adopted to facilitate smart grids as envisioned by the Law of Ukraine on Energy Efficiency (this was postponed due to the military aggression). This will contribute to increasing energy efficiency and stabilizing the energy market. The relevant funding for relevant programs and measures should also be resumed (this, too, was stopped due to budgetary constraints when the full-scale invasion began).

In Phase 2 (three years after the end of the war and beyond), a specialized law on solar power should be adopted. This should aim to foster the development of a transparent solar energy market in line with European rules and standards.

Following the adoption of the framework law on solar power, sectoral legislation should be developed on:

1. rooftop solar, mandating that new buildings incorporate solar panels into their construction plans, and
2. greenfield solar, to identify and designate suitable areas for large-scale solar projects.

In conjunction with the above legal measures, it is advisable to introduce a state program to develop a domestic solar panel-production industry in Ukraine and implement a funding scheme that offers increased state aid for projects utilizing EU-manufactured solar panels.

3.1.2.3. General Recommendations

Both major types of intermittent renewable energy generation – wind and solar – are affected by many of the same types of general legislation. Recommendations for changes to these laws are enumerated in this section. Secondary legisla-

tion and regulations specific to each type of energy generation (onshore wind, offshore wind, and photovoltaic solar) will also be required to implement these reforms in practice.

Regional smart grids

To address different aspects of the deployment, operation, and regulation of smart grids, Ukraine should develop dedicated legislation – for instance, a regional smart-grid regulation law. Such a legal and regulatory framework can govern the planning, development, operation, and management of these advanced energy-distribution networks. The objective would be to ensure that regional smart grids are efficient, reliable, secure, and capable of integrating renewable-energy sources while protecting the interests of consumers and promoting sustainability.

The law should define legally what a smart grid is (in terms of both physical infrastructure and digital systems involved in communication, control, and data analytics) and specify its scope, as well as outline procedures for grid planning, investment, and development. Ukraine can draw valuable lessons from Germany’s recent initiatives in developing legal regulations for smart grids, particularly with regard to grid management and integration of renewable-energy and combined heat and power plants. Germany’s Network Expansion Acceleration Act 2.0 (NABEG 2.0), which came into force on 1 October 2021, presents four key takeaways.⁷⁰

First, the introduction of market-oriented actions and financial compensations for grid-congestion management offers an effective way to address grid bottlenecks and voltage problems. Ukraine could consider similar mechanisms to incentivize grid operators to resolve congestion issues efficiently. Second, the inclusion of all generation facilities, including renewable-energy plants and remotely controllable plants, in the redispatch process ensures a comprehensive approach to grid management. Ukraine should assess its grid infrastructure and determine which facilities should be subject to similar regulations to ensure grid stability.

Third, the redefinition of implementation mechanisms for the redispatch of renewable-energy and combined heat and power plants, to allow plant operators to receive financial compensation for lost revenue, can encourage the participation of renewable-energy sources in grid management. Ukraine may benefit from implementing similar compensation mechanisms to support the integration of renewables. Fourth, the consideration of costs and the formation of a “merit order” for redispatch decisions can help optimize the use of resources and minimize disruptions to generation. Ukraine should establish clear criteria for curtailment decisions while prioritizing cost-effectiveness.⁷¹

Tendering system for combining renewable-energy power plants with balancing technologies

The introduction of a tendering system that can balance renewable energy power plants in Ukraine can promote the effective integration of renewable energy into the grid while maintaining grid reliability. It will support the transition to cleaner energy sources and

⁷⁰ Mihai Mladin, “Regulatory Support Measures for Smart Grids and Promoting Flexibility - IEEE Smart Grid.”

⁷¹ Mihai Mladin, “Regulatory Support Measures for Smart Grids and Promoting Flexibility - IEEE Smart Grid.”

contribute to a more sustainable and resilient energy system. A regulatory framework should be developed that outlines the objectives, rules, and guidelines for the tendering system, while considering Ukraine's energy goals, renewable-energy targets, grid stability needs, and the integration of innovative technologies.

Acceleration areas for renewable energy generation (“go-to areas”)

On 12 September 2023, the European Parliament adopted the revised renewable energy directive (RED III) which will speed up procedures to grant permits for new renewable-energy facilities, such as solar panels or wind turbines, or to adapt existing ones. The directive dictates that national authorities should take no longer than 12 months to approve new renewable-energy installations that are located in so-called “renewables go-to areas”.⁷² These are locations that have been judged to be particularly suitable for the production of renewable energy with low environmental impact and where permitting and environmental assessment procedures are carried out in advance, sped up, or simplified.

Ukraine has chosen to adopt these measures before it is mandated to do so in its EU-accession process. It has an opportunity to develop the measures in its own way and even expand their scope beyond EU regulations to include various innovative technologies, including power-to-X solutions, especially when they are integrated with new renewable-power plants. This broader approach can promote technological diversity and support Ukraine's renewable energy objectives, while the introduction of go-to areas could significantly accelerate the rollout of renewable-energy facilities, which are currently often slowed down by cumbersome procedures.

3.1.3. Hydropower

The Ukrainian hydropower regulatory system comprises a cluster of regulatory acts, including:

- The Law of Ukraine on Alternative Energy Sources of 20 February 2003 № 555-IV⁷³
- The Law of Ukraine on the Electricity Market of 13 April 2017 №2019-VIII⁷⁴
- The Water Code of Ukraine⁷⁵
- The Law of Ukraine on Environmental Impact Assessments of 31 March 2023 № 2059-VIII⁷⁶
- The Hydropower Development Program for the period up to 2026, approved by the Cabinet of Ministers of Ukraine on 13 July 2016 p. № 552-p⁷⁷

72 European Parliament Press Room, “MEPs Back Plans to Boost Use of Renewable Energy.”

73 Parliament of Ukraine, Про альтернативні джерела енергії.

74 Parliament of Ukraine, Про ринок електричної енергії.

75 Parliament of Ukraine, Водний кодекс України.

76 Parliament of Ukraine, Про оцінку впливу на довкілля.

77 Cabinet of Ministers of Ukraine, Про схвалення Програми розвитку гідроенергетики на період до 2026 року.

The following recommendations suggest how these laws can be upgraded and harmonized with European laws and standards. They are divided into Phase 1 (the first two years after the end of the war) and Phase 2 (the period thereafter). The most urgent reforms are:

- transposition of Directive 2001/42/EC and Directive 2004/35/EC to ensure compliance with EU regulations and environmental impact assessments requirements for existing and new projects, and
- development of a national legal framework on the safety of hydro-technical structures.

In the longer term, the country should adopt specific legislation for the development of hydro power storage facilities, including additional regulations to sustain a supply-demand balance in the market to support the World Bank's 2023 project to equip four existing hydroelectric power plants with new high-power and fast-discharge battery energy storage systems. The scientific consensus does not currently favor new hydro power projects, which tend to have great environmental costs, and any legislative

acts that might foster the expansion of dams should be very carefully weighed for unforeseen consequences (for more information, see the relevant sections of the preliminary technical study carried out in the framework of the Ukraine Energy Roadmap project). This also means that it is crucial for Ukraine to prioritize the implementation of the EU environmental standards.

3.1.4. Bioenergy

The Energy Strategy of Ukraine until 2050 acknowledges significant potential for biomethane production in Ukraine.⁷⁸ Specifically, the Strategy optimistically states that the potential for biomethane production in Ukraine is some 10 billion cubic meters per year, of which 4.5 billion cubic me-

ters will be needed by Ukraine itself in 2050, and the rest can potentially be exported (there is more information on this topic in the relevant sections of the preliminary technical study). The regulatory basis of the bioenergy sector in Ukraine is laid by the following strategic and legislative acts:

1. The Laws of Ukraine on Alternative Types of Liquid and Gas Fuel⁷⁹ and on Alternative Energy Sources⁸⁰ provide the conceptual basis and foundation of regulating bioenergy in the country. They establish a "green" tariff which applies to business entities that produce electricity from biomass and biogas. This tariff, which is established by the National Energy and Utilities Regulatory Commission (NEURC) and applies until at least the end of 2029, is €0.1239/kWh without VAT for electricity obtained from biomass and biogas. Moreover, there is a possibility to receive a surcharge to the "green" tariff for compliance with a certain level of use of Ukrainian-made equipment for electric-power facilities commissioned between 1 July 2015 and 31 December 2024. The production of electricity from biomass and biogas is not currently attractive in Ukraine, primarily as a result of incomplete calculations and the indebtedness of the Guaranteed Buyer to electricity producers operating under the "green" tariff.
2. The establishment of the biomethane market started with the adoption of the Law of Ukraine on Amendments to Certain Laws of Ukraine Regarding the Development of Biomethane Production⁸¹. This law introduced a biomethane trade mechanism and guarantees of biomethane origin. It

78 Cabinet of Ministers of Ukraine, Про схвалення Енергетичної стратегії України на період до 2050 року.

79 Parliament of Ukraine, Про альтернативні види палива.

80 Parliament of Ukraine, Про альтернативні джерела енергії.

81 Parliament of Ukraine, Про внесення змін до деяких законів України щодо розвитку виробництва біометану.

- introduced the concept of biomethane as a separate type of biogas, and introduced the biomethane registry (for which a separate operating procedure was approved) and a procedure for the creation, transfer, distribution and cancellation of guarantees of origin for biomethane.⁸²
3. The Law of Ukraine on Heat Supply sets tariffs for thermal energy for business entities that produce such energy at installations that use alternative energy sources (including biomass/biogas) at 90% of the current price of thermal energy produced from natural gas.⁸³ If the producer does not have a set tariff for thermal energy from natural gas, 90% is calculated from the weighted average tariff for the needs of the relevant category of consumers and approved quarterly by the State Energy Efficiency Agency.⁸⁴ Notably, these tariffs are not enough to ensure the attractiveness of projects to produce heat from alternative energy sources and should be revised to be calculated based on economically justified costs.
 4. The Law of Ukraine on Amendments to Certain Laws of Ukraine Regarding the Improvement of State Regulation in the Field of Handling Pesticides and Agrochemicals introduced the concept of digestate – the remains of raw materials formed during the production of biogas.⁸⁵ Under this law, digestate is not subject to the requirements for state registration of pesticides and agrochemicals.
 5. The Resolution of the Cabinet of Ministers of Ukraine No. 823 on Approval of the Procedure for the Functioning of the Biomethane Register provides the legal basis for the launch of a biomethane registry.⁸⁶ This enables the verification of purified biogas (biomethane), the physical and chemical characteristics of which must meet the standards for natural gas, and ensures guarantees of origin for the biomethane supplied to the gas transportation system. The biomethane registry, developed in line with current legislation and the rules of operation of similar registries in the EU, allows for biomethane to be traded with a guarantee of origin both domestically and potentially in the EU.
 6. The draft Law on Amendments to Some Legislative Acts of Ukraine Regarding Mandatory Use of Liquid Biofuel (Biocomponents) in the Transport Sector was adopted to meet EU integration requirements.⁸⁷ It sets that gasoline used as fuel in cars must contain at least 5% liquid biofuel (biocomponents) by volume from 1 June 2024.
 7. The Resolution of the National Energy and Utilities Regulatory Commission (NEURC) No. 847 of 2 August 2022, on Amending the Gas Transmission System Code and the Gas Distribution System Code, regulates biomethane within the grids. It specifies that oxygen content should be increased from 0.02 mol. %: up to 0.2 mol. % for biomethane in the gas transmission system, and up to 1.0 mol. % for biomethane in the gas distribution systems. This makes it possible for biomethane producers to save costs on expensive oxygen purification filters without compromising safety in gas grids, thereby enhancing the profitability of biomethane projects.

82 Cabinet of Ministers of Ukraine, Про затвердження Порядку функціонування реєстру біометану.

83 Parliament of Ukraine, Про теплопостачання.

84 Cabinet of Ministers of Ukraine, “Про затвердження Порядку розрахунку середньозважених тарифів на теплову енергію, вироблену з використанням природного газу, для потреб населення, установ та організацій, що фінансуються з державного чи місцевого бюджету, її транспортування та постачання.”

85 Parliament of Ukraine, Про внесення змін до деяких законів України щодо вдосконалення державного регулювання у сфері поводження з пестицидами і агрохімікатами.

86 Cabinet of Ministers of Ukraine, Про затвердження Порядку функціонування реєстру біометану.

87 Parliament of Ukraine, Проект Закону про внесення змін до деяких законодавчих актів України щодо обов’язковості використання рідкого біопалива (біокомпонентів) у галузі транспорту.

8. The Green Transformation Law (explained at greater length in section 3.1.1 Legal Status of Renewable Energy in Ukraine Today) extends the regulation of guarantees of origin for biomethane provided for in the Law of Ukraine on Alternative Fuels to liquefied and compressed biomethane.⁸⁸ Within three months from the date of entry into force of the Law, the Ministry of Finance will need to ensure that biomethane (including liquefied or compressed biomethane) is included in the list of goods subject to customs clearance, bolstering the development of biomethane exports. These amendments are required given the current restrictions on gas exports from Ukraine.

State support for bioenergy development includes a number of tax benefits. According to the Tax Code of Ukraine, taxpayers can receive tax deductions on the costs of converting vehicles to bioethanol, biodiesel, or other types of biofuels. They are also exempt from VAT until 1 January 2026. This also applies to the import of new vehicles that run exclusively on biogas or, until 1 January 2031, the import of parts for own production of such vehicles. Alcohol made from bioethanol is exempt from excise tax. In force since 2020, the Law on State Support of Investment Projects with Significant Investments in Ukraine No. 1116-IX (usually known as the Law on State Support of Investment Projects) aims to provide state support to Ukrainian and foreign investors in order to attract investments (both domestic and foreign) to the country, stimulate regional economic development, and enhance the competitiveness of the Ukrainian economy.

This law was expanded on 9 August 2023 with amendments which broaden the field of application, adding notably biogas and biomethane production (including in liquefied or compressed forms) to the sectors in which state support can be given. To be eligible, projects must involve invest-

ments above the equivalent of €12 million and meet certain requirements for obligatory job creation. Support can be provided for five years at most.

The forms of state support range from tax benefits (for biomethane projects, that includes a five-year income tax exemption, VAT and import duty exemptions for new equipment and components, and relief from land tax payments) and allocation of investment project objects for adjacent infrastructure by the state to preferential land-use rights for state or communal land plots for investment-project implementation and securing investor guarantees through direct contracts with the government. Additionally, the government is considering creating a dedicated institution to assist investors from project initiation to completion. The total amount of state support must be determined within dedicated investment agreements and cannot exceed 30% of the projected investment amount.

There are still a number of measures that can bolster the production and export of bioenergy in Ukraine. In Phase 1 (immediately after the end of hostilities), they include:

1. Amending the Law of Ukraine on Heat Supply to enable thermal-energy producers from renewable sources (including biogas/biomethane) to receive tariffs on common grounds, calculated on economically justified costs. This will promote transparency in the calculation and establishment of tariffs for thermal energy from alternative energy sources, and provide protection for such enterprises against the imposition of economically unjustified tariffs.
2. Implementing a registry for guarantees of origin for biomethane, which includes liquefied/compressed biomethane.
3. Ensuring that liquefied/compressed biomethane is included in the list of goods subject to customs clearance by the Energy Customs of the State Customs Service, supporting the

88 Parliament of Ukraine, Про внесення змін до деяких законів України щодо відновлення та “зеленої” трансформації енергетичної системи України.

development of biomethane exports. This is required given the current restrictions on gas exports from Ukraine.

In Phase 2 (beyond two years after the end of hostilities) the following should be introduced:

- a legislative framework for the development of liquid biofuels (biocomponents) in the transportation sector, and
- regulations to strengthen a preference for bioenergy in the gas grid and promote energy production from sustainable biomass by:
 - ensuring support for bioenergy from sustainable sources only,
 - implementing a support scheme that includes subsidies for sustainable bioenergy,
 - focusing on waste and residual materials,
 - including residues from sunflowers and other renewable waste, and
 - avoiding conflict between food supply and energy generation, while strengthening energy production from sustainable biomass.

3.1.5. Green Hydrogen

Ukraine has been recognized to have potential for low-carbon hydrogen; among other things, the European Commission views the country as a promising partner in the EU Hydrogen Strategy 2050.⁸⁹ The Energy Strategy of Ukraine until 2050 acknowledges the importance of developing hydrogen production to replace many applications of fossil fuels, projecting its start in 2032.⁹⁰ By 2050, hydrogen production in Ukraine is hoped to reach as much as 1.65 million tons per year. This will ultimately require 10.08 GW of electrolysis capacities and 79.48 billion kWh of electricity, which can be provided by nuclear power or renewable sources.⁹¹

A number of licenses are required to produce hydrogen in Ukraine, including for the generation of electricity (a crucial component of electrolysis) or the production of any hazardous byproduct. The operation of electrolysis plants requires environmental permits such as for the intake, use and discharge of water for production purposes. Moreover, as Ukraine harmonizes its environmental legislation with EU regulations, significant changes to environmental permitting system may be in store in the future.

The production, storage and transportation of hydrogen will also require an environmental impact assessment, which covers:

- the production of any chemicals,
- the construction and operation of pipelines to transport chemicals if they have a diameter exceeding 800 mm and a length of at least 40 km, and
- storage facilities for chemicals with a capacity of more than 200,000 tons.

There are rules specific to the transport of hydrogen through the natural gas transmission or storage system. The current standards do not regulate the proportion of hydrogen that can or must be mixed with natural gas for injection into gas pipelines and storage facilities.

The production and distribution of green hydrogen from Ukraine will obviously depend directly on state-level legislation and regulations. While there are a number of draft documents on hydrogen expansion which cover both technical and legal factors, Ukraine's national legal framework for hy-

89 Wang et al., "Analysing Future Demand, Supply, and Transport of Hydrogen."

90 Cabinet of Ministers of Ukraine, Про схвалення Енергетичної стратегії України на період до 2050 року.

91 Van Wijk and Chatzimarkakis, "Hydrogen Europe, Green Hydrogen for a European Green Deal A 2x40 GW Initiative."

hydrogen development remains incomplete – for one thing, despite ongoing efforts, Ukraine has not yet completed a hydrogen strategy to outline the future role of hydrogen within its energy landscape.⁹² Even so, there has been significant progress to-

ward establishing relevant regulations within Ukraine’s legislative framework and harmonizing national practices with international standards. Amendments to national standards to this effect were adopted on 1 May 2021 and include:

- State Standard of Ukraine (DSTU) ISO 14687:2021 (ISO 14687:2019, IDT) on hydrogen-fuel quality and product specifications.
- DSTU ISO/TR 15916:2021 (ISO/TR 15916:2015, IDT) addressing fundamental safety considerations for hydrogen systems.
- DSTU ISO 22734:2021 (ISO 22734:2019, IDT) focusing on hydrogen generators which utilize water electrolysis for industrial, commercial, and residential applications.⁹³

These standards do not cover every aspect of green hydrogen production, however. The following recommendations would go some way to establish a more comprehensive framework.

1. Develop and adopt a national hydrogen strategy aligned with the EU’s strategic objectives that can guide the development of the relevant legislative framework. The strategy should foster the development and operation of critical hydrogen storage and transit infrastructure – a hydrogen backbone covering the whole country – to facilitate transit via water, rail, and freight.
2. Develop legal definitions for different types of hydrogen (blue, green, and grey) and implement them in the national legislation as well as in Ukraine’s hydrogen strategy.
3. Develop a specific regulation for blue hydrogen production, which should include guidelines for the efficient implementation of carbon capture technology, carbon storage, and emissions monitoring to minimize environmental impact and maximize the potential of blue hydrogen as a transitional energy source.
4. Introduce a dedicated hydrogen market platform for trade, providing a structured marketplace for hydrogen transactions and fostering market transparency.
5. Develop potential global hydrogen projects to harness the full potential of hydrogen as a clean energy carrier through international cooperation and partnerships.
6. Harmonize Ukraine’s regulatory framework with the EU’s while maximizing benefits for Ukraine. Sectors that require regulatory changes include:
 - technical regulations on hydrogen production processes as well as additional market incentives for investors initiating pilot projects related to hydrogen production, and
 - facilitation of the transportation and use of hydrogen mixed with natural gas by reprofiling the natural gas transmission system and amending the Gas Transmission System Code.
7. Establish guarantees of origin for green hydrogen and include them in a unified registry of guarantees of origin, including rules for combination with biomethane, electricity from renewable energy sources, and energy produced by highly efficient cogeneration.

92 Cabinet of Ministers of Ukraine, “Воднева стратегія має передбачати конкурентоздатність України у виробництві водню та його транспортуванні до ЄС.”; Cabinet of Ministers of Ukraine, “В Міністерстві енергетики розроблено три важливих документи для підготовки Водневої стратегії України.”; Підкоморна, “Ministry of Energy has completed the discussion of the Hydrogen Strategy, Міністерство енергетики завершило обговорення Водневої стратегії – Юлія Підкоморна | Міністерство енергетики України.”

93 Ukrainian Research and Training Centre for Standardisation Problems, Про прийняття національних стандартів.

3.2. Nuclear energy

The reconstruction of nuclear power generation facilities and deployment of nuclear power must be considered against the background of the still-open question of how long and to what extent nuclear power will continue to be considered climate neutral in the EU. While member states and EU accession candidates are granted a wide scope in determining their national energy mix, they

are nonetheless subject to several constraints in terms of security, climate and environmental policy. This section describes EU law related to nuclear power followed by the Ukrainian legal situation, and then proposes several recommendations. More information on the topic of nuclear energy can be found in the preliminary technical study of the Ukraine Energy Roadmap.

3.2.1. EU law

For the time being, the EU has classified nuclear power as contributing substantially to climate change mitigation and a pathway to limit global temperature increases to 1.5 °C above pre-industrial levels. The Commission Delegated Regulation

(EU) 2022/121494 to the EU Taxonomy Regulation referring to Art. 10 (2) of the EU Taxonomy Regulation states that activities that can contribute to the EU's transition to climate neutrality include:⁹⁵

- advanced technologies with closed fuel cycles (“Generation IV”),
- new nuclear power-plant projects for energy production using the best available technologies (“Generation III+”) until 2045 (date of granting of construction permit), and
- modifications and upgrades to existing nuclear facilities for the purpose of life extension until 2040 (date of approval by the competent authority).

3.2.2. Ukrainian law

On nuclear energy, nuclear safety and radiation protection, Ukraine is party to all international conventions concluded under the auspices of the International Atomic Energy Agency, including on early notification of a nuclear accident and the Convention on Nuclear Safety. Commitments and obligations resulting from international treaties, conventions and other agreements which fall under the responsibility of the State Nuclear Regulatory Inspectorate of Ukraine are fully implemented and enforced.

EU's post-Fukushima nuclear safety stress tests, as well as the first topical peer review (TPR) on fire protection under the Nuclear Safety Directive, and the EU has supported safety upgrades through Euratom and EBRD loans. To date, Ukraine has updated its National Action Plans for both the stress tests and the reports on the first TPR as required (submitted at end 2021). Ukraine has also indicated that it will participate in the second TPR in 2023-2024. However, the country is experiencing setbacks in terms of implementation of the Euratom Directives on nuclear safety, management of spent fuel and radioactive waste, and basic safety standards.

The current national regulatory framework is largely in line with the Euratom acquis in the field of nuclear energy. Ukraine participated voluntarily in the

94 European Commission, Commission Delegated Regulation (EU) 2022/1214 of 9 March 2022 amending Delegated Regulation (EU) 2021/2139 as regards economic activities in certain energy sectors and Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities (Text with EEA relevance).

95 European Parliament and Council of the European Union, Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (Text with EEA relevance).

The legislation framework for nuclear power includes a number of legislative acts which regulate the generation and safe use of nuclear energy and the related infrastructure:

- The Law of Ukraine on the Use of Nuclear Power and Radiation Security,⁹⁶
- The Law of Ukraine on Human Protection against Impact of Ionizing Radiation,⁹⁷
- The Law of Ukraine on Permit Activity in Nuclear Energy Use,⁹⁸
- The Law of Ukraine on Arrangement of Issues on Nuclear Safety Assurance,⁹⁹
- The Law of Ukraine on Radioactive Waste Management,¹⁰⁰
- The Law of Ukraine on the Use of Nuclear Energy and Radiation Safety,¹⁰¹ and
- The Law of Ukraine on Physical Protection of Nuclear Facilities, Nuclear Materials, Radioactive Waste, and Other Sources of Ionizing Radiation.¹⁰²

Moreover, a significant part of the regulation of the nuclear power sector originates in acts of the Cabinet of Ministers and the State Nuclear Regulatory Inspectorate of Ukraine, namely:

- Resolution of the Cabinet of Ministers of Ukraine dated 16 November 2000 No. 1718 on the Issues of State Regulation of Activities Related to the Use of Ionizing Radiation Sources,
- Order of the State Nuclear Regulatory Inspectorate of Ukraine dated 13 August 2018 No. 331 on Approval of the General Safety Provisions for Radioactive Waste Disposal, and
- Order of the State Nuclear Regulatory Inspectorate of Ukraine dated 1 August 2017 No. 279 on Approval of the General Safety Provisions for Radioactive Waste Management Prior to Disposal.

As member of the International Atomic Energy Agency, Ukraine is signatory to the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the

Safety of Radioactive Waste Management. Under articles 7-8 of the former and 19-20 of the latter, the country has undertaken to:

- establish and maintain a regulatory and legislative framework to ensure the safety of nuclear energy, providing for:
 - appropriate national safety requirements and regulations,
 - a system of licensing with regard to nuclear energy use,
 - prohibition of nuclear energy use without a license,
 - a system of appropriate institutional and regulatory control and documentation and reporting,

96 Parliament of Ukraine, Про використання ядерної енергії та радіаційну безпеку.

97 Parliament of Ukraine, Про захист людини від впливу іонізуючого випромінювання.

98 Parliament of Ukraine, Про дозвільну діяльність у сфері використання ядерної енергії.

99 Parliament of Ukraine, Про впорядкування питань, пов'язаних із забезпеченням ядерної безпеки.

100 Parliament of Ukraine, Про поводження з радіоактивними відходами.

101 Parliament of Ukraine, Про використання ядерної енергії та радіаційну безпеку.

102 Parliament of Ukraine, Про фізичний захист ядерних установок, ядерних матеріалів, радіоактивних відходів, інших джерел іонізуючого випромінювання.

- enforcement of applicable regulations and license terms, and a clear separation between the functions of bodies involved in different stages of spent fuel and radioactive waste management;
- establish and designate a regulatory body entrusted with the implementation of the legislative and regulatory framework and provided with adequate authority, competence, and financial and human resources to fulfill its assigned responsibilities; and
- take all appropriate steps to ensure an effective separation between the regulatory and other functions.

Cooperation between Ukraine and the EU in the field of nuclear safety is provided for in Article 342 and the updated Annex XXVIII (section “Nuclear Energy”) of the Association Agreement, which includes implementation of the provisions of the following directives: Council Directive 2013/59/Euratom, Council Directive 2006/117/Euratom,

Council Directive 2014/87/Euratom, Council Directive 2009/71/Euratom and Council Directive 2011/70/Euratom. Three legal acts were furthermore adopted on 16 November 2022 to further harmonize the national legislation of Ukraine on nuclear energy safety with the provisions of the EU acquis:

- the Law of Ukraine on Amendments to the Law of Ukraine on the Use of Nuclear Energy and Radiation Safety concerning the Radiation Protection Expert” No. 2758-IX, implementing the provisions of Council Directive 2013/59/Euratom pursuant to the subparagraph 1 of paragraph 740 of the Action plan on Implementation of the Association Agreement between Ukraine and the EU, and establishing the institution of the radiation protection expert;
- the Law of Ukraine on Amendments to the Law of Ukraine on the Use of Nuclear Energy and Radiation Safety No. 2762-IX, implementing the provisions of Council Directives 2013/59/Euratom, 2009/71/Euratom and 2014/87/Euratom and harmonizing nuclear-energy use and safety with EU law; and
- the Law of Ukraine on Amendments to Certain Laws of Ukraine Concerning the Improvement of Permits Issuance for Nuclear Energy Use No. 2755-IX, implementing Council Directive 2013/59/Euratom and improving the procedure for issuing permits for the deployment of nuclear energy.

At the time of publication of this study, work is ongoing on a draft Law of Ukraine on the National Nuclear Regulatory Commission, which aims to implement Council Directive 2011/70/Euratom, Council Directive 2013/59/Euratom and Council Directive 2014/87/Euratom. The goal is to enshrine at the legislative level the status of the state regulator of nuclear and radiation safety as a central executive authority with special status, which is meant to foster its efficiency and independence in making regulatory decisions. In addition to EU laws, this draft law builds on International Atomic Energy Agency documents and the experience of the state regulation of nuclear and radiation safety.

Moreover, discussions with stakeholders are being held as input to a draft Law of Ukraine on Amendments to the Law of Ukraine on Human Protection against the Impact of Ionizing Radiation, implementing Council Directive 2013/59/Euratom. The goal of this draft law is to harmonize the system of radiation protection for personnel and the public in situations of exposure with EU legal instruments and the experience of state regulation of nuclear and radiation safety.

3.2.3. Recommendations

Nuclear power generation and use in Ukraine can benefit from a number of legal measures, which should be implemented in Phase 1 and Phase 2 of the postwar period.

In the immediate aftermath of the war, Ukraine should first address nuclear-safety policies. There has already been progress in 2021 on strengthening nuclear safety and in preparations for the decommissioning of ageing nuclear power units. However, the country still needs to align its legal and regulatory framework to the Euratom legislation on nuclear safety, safe management of spent fuel and radioactive waste, and radiation protection. In particular, Energoatom is still affected by governance and economic issues, and doubts persist as to the independence of the State Nuclear Regulatory Inspectorate of Ukraine following the dismissal of its chair in late 2021.

These problems can best be addressed by proceeding with the implementation of the Association Agreement. Specifically, this includes the approval of the organizational and technical measures de-

veloped by entities which handle and manage nuclear energy to ensure radiation safety during the handling of materials containing radionuclides of natural origin; this is provided for in Council Directive 2006/117/Euratom of 20 November 2006.

In Phase 2, Ukraine should keep its nuclear-energy sector aligned with its EU rules. The EU's delegated Regulation 2022/1214 to the EU Taxonomy Regulation states that the use of nuclear power will be classified as sustainable until 2050, and there is little reason to assume this will change beyond that date. However, rules on nuclear waste storage and safety may change over time. It will be necessary to determine which nuclear-power plants can and should be upgraded and when, which services they can offer to the system in terms of balancing and stability, when they will be decommissioned, and if and when investment in new nuclear-power plants makes economic sense. Additional information on potential approaches to address these questions can be found in the preliminary technical study of the Ukraine Energy Roadmap.

3.3. Coal and the Coal Phase-Out

Ukraine has a great deal of coal-fired power generation today. The creaking coal infrastructure still provides a crucial service, however, and cannot be innovated away overnight. A reinvention of Ukraine's electricity-generation system will have to be flexible, shoring up coal plants in the immediate afterwar era without creating lock-in effects while phasing out and gradually replacing them with re-

newable-energy sources in the longer term in a way that cushions any resulting social hardships.

This section analyzes general EU legislation relevant to Ukraine's coal deployment and EU regulations specifically designed to accompany the coal phase-out. It then looks at Ukrainian law on the matter and the best path to follow after the war ends.

3.3.1. EU law

In deference to the sovereignty of member states, EU law does not codify a date by which coal-fired power plants must cease operation. However, it does place restrictions on the operation of such plants and provide incentives for renewable energy sources and disincentives for coal-based electricity. At any rate, all member states bar Poland have spontaneously decided on a coal phase-out date (or never used coal in the first place).¹⁰³

The Renewable Energy Directive (EU) 2018/2001 (RED) on the promotion of the use of energy from renewable sources and derived legal acts sets a binding target for the overall share of energy from renewable sources in the Union's gross final

consumption of energy in 2030 to at least 32%, with national contributions to be set by member states.¹⁰⁴ Furthermore, the Directive lays out a minimum share of renewable energy in member states' gross energy consumption.¹⁰⁵ A revision of the Renewable Energy Directive currently in the works but not yet adopted will specify a binding share of renewable energy in the Union's gross final energy consumption of 42.5 % in 2030 (a provisional deal to this affected was by the Council and Parliament on 30 March 2023).

There are a number of other European legal instruments which are indirectly relevant to the extraction and burning of coal, namely:

- Directive 2006/21/EC on the management of waste from extractive industries (this also amends rules in Directive 2004/35/EC on environmental liability for environmental damage),
- Directive 2011/92/EU: the Environmental Impact Assessment Directive or EIAD,
- Directive 1992/43/EEC: the Habitats Directive
- Directive 2010/75/EU: the Industrial Emissions Directive or IED, and
- Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund.

103 Beyond Fossil Fuels, "Europe's Coal Exit."

104 European Parliament and Council of the European Union, Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast) (Text with EEA relevance.).

105 Regulation (EU) 2018/1999 of the European Parliament and of the Council 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 (Text with EEA relevance).

Union legislation is increasingly placing financial burdens on coal-fired electricity generation, undermining its profitability compared to other sources of electricity. Under Directive 2003/87/EC, which established the EU Emissions Trading System (EU-ETS), installations with a total rated thermal input exceeding 20 MW must match their carbon-dioxide emissions with emission allowances, which are partly allocated for free and partly auctioned by the member states and can be traded freely. The total amount of allowances generated every year is constantly diminishing, leading to higher prices, and creating a financial incentive to reduce emissions. The amount of annually generated allowances will reach 0 around the year 2039, and all remaining available certificates will have to be surrendered around 2055.¹⁰⁶ The free allocations will gradually diminish from 2026 and be completely phased out by 2034. Carbon capture & storage and carbon capture & utilization technologies can be used to reduce the allowances required for a given level of emissions.

Under Article 363 of its Association Agreement with the EU, Ukraine is obliged to implement a national emissions trading scheme modelled after key provisions of the EU's. The latest revision of the EU scheme, which introduces faster reduction rates for the annual number of new allowances and phase-out of free allowances for electricity, is not part of this implementation obligation, however.

Ukraine's Association Agreement with the EU also stipulates in its Article 353, Annex XXVIII that the country must gradually implement the provisions of Council Directive 2003/96/EC for the taxation of energy products and electricity, which determines an excise duty for electrical energy. The duty arises when electrical energy is released for consumption and amounts to at least €0.50 per MWh for businesses and €1.00 per MWh for personal use. Article 15 of the Directive allows member states to partially or totally exempt electricity from renewable sources, hydroelectric installations, methane emitted by abandoned coalmines, fuel cells, and environmentally friendly combined heat and power generation, which can – at the discretion of each member state – place coal-fired plants at a disadvantage. As a member state of the En-

ergy Community, Ukraine has committed to implementing the Renewable Energy Directive and various other EU legislative acts which are part of the *acquis communautaire* on energy. Article 25 of the Energy Community Treaty allows for this obligation to be dynamic, that is, include subsequent amendments to the *acquis* – something that is likely to be relevant with the upcoming revision of the Renewable Energy Directive. This obligation is reiterated in Annex XXVII-B Nr. 1 and Annex XXVII-A Nr. 2 of Ukraine's Association Agreement with the EU.

Furthermore, Ukraine as an EU candidate should (and eventually must) align its national policies and strategies with EU climate and energy policies and strategies. By demonstrating its commitment to the goals of the European Green Deal and the just transition principles, Ukraine will position itself favorably for future funding opportunities from the EU's Just Transition Fund (JTF), which is based on its broader European Green Deal initiative, Multiannual Financial Framework (MFF) for the years 2021-2027, and the Regulation (EU) 2021/241 establishing the Recovery and Resilience Facility.

The JTF was established in 2021 through the Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund. It is intended as a critical tool for supporting regions that face economic and social challenges due to the transition to a greener economy. It aims to facilitate the transformation to a greener economy helping these regions diversify their economies and create new opportunities while addressing the social and economic impacts of decarbonization.¹⁰⁷ Ukraine can benefit from access to various pre-accession funds designed to support countries' alignment with EU policies and standards. While the JTF primarily targets EU regions most affected by the transition to a greener economy, candidate members may be eligible for certain EU funding programs, including technical assistance and capacity-building support, to help them prepare for future access to the JTF.

The coal phase-out is covered by the JTF Regulation in Article 8 (2) b, which mentions investments in the regeneration and decontamination

¹⁰⁶ Pahle et al., "The Emerging Endgame."

¹⁰⁷ European Commission, "Just Transition Funding Sources."

of brownfield sites, and land restoration. It also includes the upskilling and reskilling of workers and jobseekers, job-search assistance to jobseekers, and other activities in the areas of education and social inclusion, as well as as – where duly jus-

tified – investments in infrastructure for the purposes of training centers or child and elderly-care facilities, as indicated in territorial just transition plans in accordance with Article 11.

3.3.2. Ukrainian Law

Ukraine announced its plan to phase out coal in state-owned power generation by 2035 in 2021 at the COP26 in Glasgow, where it joined the Powering Past Coal Alliance (PPCA) – a coalition of national governments, businesses and organizations advocating for transition to renewable energy sources. A draft concept of the state target program for the coal industry reform and a draft law on coal industry reform have since been developed to help overcome the crisis in the domestic coal industry.

2022 envisaged a subvention to local budgets for the implementation of measures for the just transition of coal regions in the amount of UAH 118 million (around € 3 million).

Coal mono-cities in Ukraine are likely to be greatly affected by the phase-out in financial, social, cultural, and environmental terms. A just-transition process providing a comprehensive solution to the ills which arise from the reduction of coal extraction and gradual closure of coal mining and related enterprises is therefore crucial. The Cabinet of Ministers of Ukraine approved the concept of the State Target Program for the Just Transition of Coal Regions of Ukraine until 2030 on 22 September 2021 (Resolution Nr. 1024). In parallel, the Law of Ukraine on the State Budget of Ukraine for

Moreover, an inter-ministerial working group including representatives of local communities, enterprises, institutions in the coal industry, and donor organizations was established by an order of the Ministry of Regional Development on 25 November 2021. The Ministry of Regional Development actively encourages international partners to join the policy of just transition in terms of knowledge transfer, the development of the necessary legal framework and the creation of a multi-donor fund for just transition. An agreement between the German Agency for International Cooperation (GIZ) and Ukraine's Ministry of Communities and Territorial Development on the implementation of the project Supporting Structural Changes in Ukrainian Coal Regions was signed on 21 December 2021.

3.3.3. Recommendations

The main priority for Ukraine in Phase I (the first two years) of the postwar period is to update legal requirements related to technological processes and equipment used in coal production. The existing legal framework regulation does not facilitate sustainable development and restructuring of the industry nor offer opportunities for replacing coal with other energy resources. By some measures, out of 88 industry regulatory legal acts, every fifth has signs of illegality or irrelevance.¹⁰⁸

Almost 96% of Ukrainian mines have been operating without proper renovation for over 20 years, and two thirds of the existing equipment has exceeded its useful life.

Additionally, insufficient capital investment in new construction and renewal of fixed assets in relevant enterprises hamper the modernization of production and create dangerous operational problems.

One of the tasks in the framework of the process of gradual abandonment of coal mining will therefore be to establish guidelines for modernization that rest on principles of maximum eco-efficiency. The establishment of such guidelines will require a comprehensive assessment of potential technologies that can take over the system balancing tasks of coal power plants (for instance batteries) as well as additional capital investment, but this will attract investors to restructuring and modernization.

¹⁰⁸ Better Regulation Delivery Office, "Green Book 'Coal Market Regulation', Зелена Книга 'Регулювання Ринку Вугілля.'"

Ukraine should formulate a comprehensive coal transition plan that outlines a clear roadmap for the future of existing coal-power plants. This plan should include strategies for introducing an emissions trading system, establishing a phase-out timeline, and implementing a just transition for affected communities. Additionally, it should highlight the potential new opportunities for coal regions, such as transitioning to renewable-energy production, fostering green industries, and re-training the workforce for sustainable jobs.

In Phase 2 (the period beyond the first 24 months after the war), Ukraine should implement the environmental part of the State Target Program for the Just Transition of Coal Regions of Ukraine until 2030.¹⁰⁹ This entails, among other things, a

set of environmental protection measures that will ensure the ecologically balanced functioning of coal regions and enable citizens to effectively exercise their rights to environmental safety. This should remedy many of the environmental problems associated with mining activity, such as air pollution, water pollution, spoil tips within cities, increased radiation, or issues linked to the flooding of old mines, as well as the use of coal for heating, which leads to harmful air pollution and greenhouse-gas emissions.

The State Target Program for the Just Transition of Coal Regions of Ukraine until 2030 should be translated into ambitious legislation at least in terms of the following components:

- complex land reclamation and ecological restoration of territories in coalmining regions,
- ensuring the preservation, restoration and balanced use of protected areas,
- reproduction of ecosystems and improvement of land structure,
- facilitating the efficient use of gas (methane) from coal deposits, in particular to produce heat and electricity (including cogeneration potential) for the needs of coal regions,
- ensuring the development of environmental education, including educational activities related to the sustainable use of natural resources, and
- ensuring the effective use of mine water through effective technologies for cleaning, neutralization and disposal, use in energy systems, etc.

A second ambition for Phase 2 should be a gradual increase of fiscal pressure on coal enterprises. There are currently no effective fiscal mechanisms to mitigate the negative impact on the environment of coal extraction and combustion. For example, the rent rate for coal (as a percentage of the cost of manufactured products) is currently significantly lower than the rate for natural-gas extraction, and the environmental tax does not apply to coal market players. The rent and environmental

tax for carbon-dioxide emissions should therefore be substantially increased in the future.

Since the phase-out will be gradual and take years, coal enterprises in Ukraine should in the meantime prioritize the implementation of advanced technologies which aim to enhance the stability and resilience of the energy system as well as carbon capture and carbon storage technologies.

109 National Energy and Utilities Regulatory Commission, Про затвердження Методики формування, розрахунку та встановлення тарифів на електричну та (або) теплову енергію, що виробляється на теплоелектроцентралях, теплових електростанціях та когенераційних установках.

3.4. Energy Transmission and Distribution

The future transmission and distribution network for electricity should interlink a centralized network for long distance electricity transportation, electricity exports and storage with regional networks with decentralized components to support the integration of renewable energy sources into the energy mix. A decentralized energy system based on multiple small-scale sources located close to the point of consumption can help Ukraine reduce its vulnerability to any Russian attacks while also reducing the risk of blackouts and other disruptions that can occur when a centralized power plant fails.

Plans of future transmission infrastructure should be developed in parallel with the broader strategies for the coming expansion of – mostly intermittent – renewables. Measures including

ramping up digitization and advanced grid management, creating demand-side flexibility, integrating energy storage as well as taking steps towards more interconnectivity and regional grid integration will be essential to ensure grid reliability, and maximize energy utilization.

Furthermore, a decentralized system reduces transmission losses and increases energy efficiency because electricity generated on a local scale travels a shorter distance to consumers. Distributed generation can also pave the way for the formation of local energy cooperatives, allowing residents to participate in the production and use of energy in their communities. This section provides an overview of the current state and legal challenges in the field of energy transmission and distribution as well as the best ways to address them.

3.4.1. Current Situation and Legal Challenges

Ukraine's transmission system operator (TSO) Ukrenergo is fully owned by the Ukrainian government through the Ministry of Energy. It plays a vital role among other things in implementing EU regulations on fundamental data transparency in the electricity market. Following its unbundling and conditional certification under the ISO model by Ukraine's National Energy and Utilities Regulatory Commission (NEURC) in December 2021, Ukrenergo has been actively working to meet the outstanding certification requirements and finalize its supervisory board appointments. NEURC has endorsed Ukrenergo's compliance officer program, and Ukrenergo secured observer status in ENTSO-E by April 2022.

Ukrenergo owns and operates Ukraine's high-voltage transmission grid (including the 220–750kV lines and almost all interstate transmission lines) and operates the central dispatch center in Kyiv. It is a member of the wholesale electricity market and works closely with Energorynok, the market operator, though these two entities are separate and have independent budgets. Ukrenergo is also independent from the generation and distribution companies.

Access to transmission and distribution systems in Ukraine is ensured through publicly available tariffs, which also apply to generators. The current version of the EU's Renewable Energy Directive does not provide a grid-connection guarantee for renewable energy, merely (in Article 17) a simple notification procedure for grid connections, with either priority access or guaranteed access to the grid system for renewable electricity. In member states like Germany, the grid connection of renewable energy systems is also guaranteed, regardless of current European law. Section 8 of Germany's Renewable Energy Act (EEG) stipulates that grid operators must prioritize the connection of systems that generate renewable electricity. Ukraine should similarly guarantee access to the grid for renewable energy, and avoid a grid tariff.

Ukraine's distribution system operators (DSOs) are legally and functionally unbundled in compliance with EU acquis. According to the NEURC's register of licensees, there are 32 functional DSOs, which have diverse ownership structures. The State Property Fund is a major shareholder in eight of them: Zaporizhiaoblenergo (60%), Odessaoblenergo (25%), Kharkivoblenergo (65%), Cherkasyoblenergo (46% + 25%), Mykolaivoblenergo (70%),

Khmelnyskoblenenergo (70%), PJSC Sumyoblenergo (25%) and PJSC Ternopiloblenergo (51%).¹¹⁰ Twelve are now privatized or privately controlled. VS Energy (a Dutch/Slovak company) holds controlling stakes in five: Rivneoblenergo, Khersonoblenergo, Zhytomyroblenergo, Chernivtsioblenergo, and Kirovohradoblenergo.

A recent NEURC resolution of 14 March 2023 introduced the requirement for DSOs to develop and submit development plans and investment programs.¹¹¹ These plans aim to ensure efficient, transparent, and renewable energy-friendly grid planning, enhancing grid stability, regulatory oversight, and consumer protection while aligning with national energy goals.

It is important to note that, while the Transparency Regulation has been transposed, the publication of the compliance officer's reports and the regulator's opinion on the NEURC website has been suspended for the period of martial law in Ukraine. NEURC has also adopted a separate procedure for temporary connection to the distribution grid for the period of martial law.¹¹²

In August 2023, NEURC reinstated its Methodology (Procedure) for Calculating Connection Fees to the Transmission and Distribution Systems as well as the operation of specific provisions of the Distribution System Code, which regulate the procedure for grid connection.¹¹³

The transmission tariff applies to exporters, while the dispatch tariff applies to exporters and importers. This is contrary to Energy Community rules. At the same time, NEURC has amended Ukrenergo's tariff methodologies and the transmission grid code to reflect the planned inclusion of Ukrenergo into the EU's inter-transmission system operator compensation mechanism. The Connection Network Codes are not yet transposed by a formal governmental or regulatory act, but the necessary requirements are implemented through grid codes.

110 OECD, "Реформа Підприємств Державної Форми Власності у Секторі Електроенергетики України."

111 National Commission for State Regulation of Energy and Public Utilities, Про внесення змін до Порядку розроблення та подання на затвердження планів розвитку систем розподілу та інвестиційних програм операторів систем розподілу.

112 National Energy and Utilities Regulatory Commission, Про особливості тимчасового приєднання електроустановок до системи розподілу у період дії в Україні воєнного стану.

113 National Commission for State Regulation of Energy and Public Utilities, "НКРЕКП відновила дію окремих положень Кодексу систем розподілу."

3.4.2. Recommendations

Six priority reforms to the legal framework covering energy transmission and distribution should be adopted, all within Phase I (the first two years) of the postwar period.

1. Harmonization with Energy Community law: Alignment with Energy Community regulations is crucial to maintain consistency with regional energy standards. The existing tariff structure should be revised and access to transmission and distribution systems should be facilitated through transparent and publicly available tariffs applicable to both generators and users. There should be special consideration for renewable-energy sources and battery-storage systems. Renewable-energy installations should be granted exemptions from certain tariffs, as should battery-storage systems, as they interact with the grid twice (during charging and discharging), warranting fair and supportive tariff policies to encourage their widespread adoption and integration into the energy grid. This may also involve simplifying approval processes for smart-grid projects.
2. Reform of the transmission tariff structure: The application of tariffs to both exporters and importers is essential to foster fairness and equal participation in the energy market. Ukraine should align its tariff structure with international best practices and Energy Community directives. For instance, among the 28 members of the EU's Agency for the Cooperation of Energy Regulators (ACER), 21 countries apply time-of-use tariffs and three apply dynamic tariffs or market-based elements in network charging.¹¹⁴ An assessment of the most suitable tariffs for Ukraine should be undertaken soon. Tariff structures should reward electricity companies for enhancing grid efficiency through smart-grid technologies.
3. Inclusion of Ukrenergo in the EU's inter-TSO compensation mechanism: Continual monitoring of and adjustments to Ukrenergo's tariff methodologies and the transmission grid code should be carried out to ensure that Ukrenergo is effectively integrated within the EU's inter-TSO compensation mechanism.
4. Transposition of Connection Network Codes: Although the necessary requirements have been implemented through grid codes, it is recommended to formally transpose the Connection Network Codes into governmental or regulatory acts. This will provide a clear legal framework and regulatory certainty for all stakeholders involved in grid-connection processes. Relevant grid and network codes should be developed by the energy ministry of Ukraine, following the guidelines and principles provided by the Agency for the Cooperation of Energy Regulators (ACER) at the European level. To ensure uniformity and compliance, Ukraine's Energy Law should specify that these grid and network codes, once developed and approved, become the sole accepted standards for the country's energy sector. By adopting and adhering to these codes, Ukraine can align its energy infrastructure with European standards and facilitate seamless integration into the broader European energy market.
5. Ongoing review of the temporary connection procedure: The separate procedure for temporary connection to the distribution grid during periods of martial law is a prudent measure. This procedure should be periodically updated to improve its effectiveness and ensure alignment with changing circumstances and legal developments. This should continue to apply after the end of martial law. Furthermore, it's essential to assess how easily renewable energy sources can obtain grid connection, especially in a scenario where numerous such projects

114 ACER, "Report on Electricity Transmission and Distribution Tariff Methodologies in Europe."

are simultaneously applying for access. This evaluation should focus on streamlining the connection process, minimizing bottlenecks, and enhancing transparency to expedite the integration of renewable energy into the grid.

6. Resumption of publication on the Transparency Platform: Transparency in energy operations is essential for maintaining stakeholder trust and adhering to regulatory standards. Publication of relevant information on the Transparency Platform should continue once martial law is lifted. Additionally, to enhance transparency and facilitate long-term planning, it is advisable that transmission and distribution system operators collaborate on the creation of a comprehensive grid master plan, which should encompass data on grid development over the next decade, providing for renewable-energy projects to identify areas with optimal grid access. This would also help landowners anticipate the development of smart grids in specific regions, promoting informed decision-making and efficient resource allocation.

One component of transmission and distribution structures that would be a constructive part of a future energy system based largely on intermittent renewable energy are smart grids. They are particularly helpful in functions such as balancing

electricity supply and demand, ensuring the long-term ability of the grid to meet the needs of domestic and cross-border trade, and actively modernizing power grids. The development of smart grids in Ukraine could be fostered by:

- eliminating legislative and institutional barriers to their development,
- creating the appropriate conditions, incentives, motivations, demand, and methods for their deployment by electricity companies, businesses, and citizens, and
- establishing regulations that mandate that both the transmission system operator (TSO) and distribution system operators (DSOs) actively develop comprehensive plans for grid improvement and expansion.

3.5. Energy Storage

Energy-storage technologies play a pivotal role in offering critically needed balancing services within an energy system that comprises a significant proportion of intermittent renewable generation. Both small, decentralized battery technologies and grid-scale storage – including long-duration storage – have a role to play. The successful use of storage technologies on a large scale hinges on the existence of a comprehensive legal framework that enables their efficient deployment. For

instance, to unlock the potential for domestic battery and component manufacturing, it is advisable for Ukraine to establish a battery program in alignment with the new EU Batteries Regulation.¹¹⁵ This section explores how regulations shape the deployment of energy storage and which obstacles hinder its seamless integration into the energy infrastructure. There is more information on battery technologies in the preliminary technical study published in parallel with this report.

3.5.1. Ukrainian Law

Adopted on 16 July 2022, the Law of Ukraine on Amendments to Certain Laws of Ukraine Regarding the Development of Energy-Storage Facilities is the first law from the EU hydrogen integration package outlined in the Association Agreement, and represents another step towards synchronizing the Ukrainian energy system with the European ENTSO-E system. The Law envisions the emergence of a new participant in the electricity market – the energy storage facility operator –, regulates its legal status, sets the terms of operation of the energy storage system, and authorizes energy producers to install batteries. The energy storage-facility operator can be either a natural person or a legal entity (except for hydroelectric power stations) that utilizes an energy storage facility for the purpose of selling electricity, providing ancillary services, or balance-related services.

The expected need for the capacity of the system ranges from 0.5 to 2 GW. The law is meant to motivate energy producers to install their own battery storage facilities to mitigate issues with imbalances in the system.¹¹⁶

On 22 July 2022, the National Energy and Utilities Regulatory Commission (NEURC) approved Licensing Conditions for Energy Storage Business Activities (Resolution No. 798) in compliance with EU Directive 2019/944 of 5 June 2019. The licensing conditions define the procedure for obtaining a license to carry out energy storage activities, the specifics of its implementation, as well as general requirements for operators of electricity storage facilities. A license is required for energy-storage facilities with capacity of more than 150 kW, with the following exceptions:

- renewable-energy producers who only store electricity they themselves have generated (adding an energy-storage unit to a renewable-power plant does not trigger any changes to the feed-in tariff),
- consumers who only store electricity for their own use, and
- the transmission system operator and distribution system operators in instances specified by NEURC.

115 European Parliament and Council of the European Union, “Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 Concerning Batteries and Waste Batteries, Amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and Repealing Directive 2006/66/EC (Text with EEA Relevance).”

116 Parliament of Ukraine, Про внесення змін до деяких законів України щодо розвитку установок зберігання енергії.

Other than that, it is prohibited to simultaneously carry out energy-storage activities, electricity transmission & distribution or gas transportation & distribution and perform the functions of a market operator and a Guaranteed Buyer. This regulation of energy-storage activities has been long awaited by the market, as the Ukrainian integrated power system needs additional flexibility tools.

On 1 November 2022, NEURC supplemented the Distribution Systems Code with regulations applicable to energy-storage facilities. These include procedures for connecting facilities to the grid, requirements for relevant contracts, a mechanism for

calculating the distribution-services fee, and peculiarities of distribution system operators owning, using, and managing the facilities, among others.

The adoption of these laws and approval of licensing conditions have created the conditions necessary for the implementation of energy-storage projects. Given the payback period (5-6 years), new investments in the industry are expected despite the absence of additional incentives for storage operators in the legislation. On 8 June 2023, NEURC issued the first license for energy storage in Ukraine's history, to the company Budpower LLC.¹¹⁷

3.5.2. Recommendations

The recent amendments to Ukraine's legislation enabling the establishment of energy-storage facilities will have a positive impact on the development of the electricity market in the medium and long term. Now and in the afterwar period it will be crucial to attract investment to the development of concrete energy-storage projects. Further expansion will depend on the quality of the electricity market, the transparency of pricing in the market, and the perceived fairness of the relevant regulations and contracting procedures.

A more comprehensive regulatory framework should be established to foster the prompt development and introduction of energy storage in Ukraine. This can be achieved by ensuring favorable tariffs (including benefits for batteries which store only power produced from renewable sources), combining differently sized batteries with matching energy production and consumption patterns, supporting domestic suppliers involved in battery manufacturing, and improving access to grid services. More specifically, Ukraine should:

1. implement the recently introduced EU Batteries Regulation,
2. develop the state battery program to bolster domestic battery manufacturing capacity, in alignment with the EU Batteries Regulation,
3. adopt a dedicated law to ensure a stable and sustainable supply of raw materials needed for battery manufacturing and other energy storage technologies,
4. adopt a circular-economy law that acknowledges battery materials as valuable raw materials, fostering sustainability, and
5. develop a regulation that facilitates synergy between renewable energy and battery technologies within the Auction and Market Premium System and envision their deployment within the go-to-areas.

It is important to keep a technology-open approach, allowing for flexibility and innovation. Hydrogen and its derivatives, as well as various types of long-term energy storage, should all be considered for any application where they might make sense in the future, enabling Ukraine to

tap into a wide range of energy-storage solutions. Energy storage should become an everyday transmission asset and tool for congestion management fostering a more resilient and sustainable energy landscape.

¹¹⁷ Ekonomichna Pravda, "В Україні вперше видано ліцензію на зберігання енергії."

4. Energy Demand

The legal aspects of energy demand in Ukraine are considered in this section across four sectors: energy efficiency, industrial applications, building and commercial & public services, and transport. The analysis of each sector is divided into EU and Ukrainian law segments, except the section on industrial sectors, which takes a more thematic approach.

4.1. Energy Efficiency

Energy efficiency will be a linchpin in achieving sustainable and resilient recovery and reconstruction in Ukraine and can be expanded in a range of sectors. Embedding energy-efficient practices into

its reconstruction strategy will enable the country to address both short-term recovery needs and long-term sustainability goals, creating a modern energy market that is fully integrated in the EU.

4.1.1. EU Law

Energy efficiency is one of the key principles of the Energy Union.¹¹⁸ The central legal instrument in this regard is the revised Energy Efficiency Directive, of 20 September 2023 (RED III).¹¹⁹ As a successor to Directive 2012/27/EC (EED I) and Directive (EU) 2018/2002 (EED II) of December 2018,¹²⁰ the revised Directive significantly raises the EU's commitment to energy efficiency and enshrines 'energy efficiency first' as a fundamental and legally binding principle of EU energy policy. The 'energy efficiency first' principle underscores the importance of regarding energy efficiency as a viable energy source, encouraging both the public and private sectors to invest in it ahead of more intricate or costly energy sources. This approach involves prioritizing demand-side solutions whenever they prove to be more cost-effective than new energy infrastructure in fulfilling policy objectives. In addition to its role in reducing the consumption of fossil fuels and enhancing energy independence and security, this principle places a strong emphasis on decreasing overall energy production. By reducing energy demand, it becomes possible to manage the required investments for transitioning to renewable energy sources more

effectively. Furthermore, it promotes a more sustainable utilization of finite resources and bolsters the resilience of the EU's energy system.

In practical terms, this entails that EU member states must factor in energy efficiency when making pertinent policy and significant investment choices, whether in the energy sector or other sectors unrelated to energy. RED III sets a more ambitious EU energy efficiency target, requiring EU countries to collectively achieve an additional 11.7% reduction in energy consumption by 2030, compared to 2020 reference projections. This translates to a maximum overall EU energy consumption of 992.5 million tons of oil equivalent (Mtoe) for primary energy and 763 Mtoe for final energy by 2030. To achieve this goal, EU countries will establish indicative national contributions based on objective criteria, considering factors like energy intensity, GDP per capita, energy savings potential, and fixed energy consumption reduction. The directive also introduces an enhanced "gap-filling mechanism" to address shortfalls in national contributions. RED III makes the annual energy savings obligation significantly more ambitious by 2028 (Article

¹¹⁸ European Parliament, "Energy Efficiency Fact Sheet."

¹¹⁹ European Parliament and Council of the European Union, Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast) (Text with EEA relevance).

¹²⁰ European Parliament and Council of the European Union, 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. Text with EEA relevance.

8), promoting energy savings in a range of sectors like buildings, industry, and transport. EU countries must achieve cumulative end-use energy savings for the entire period from 2021 to 2030, starting with at least 0.8% of final energy consumption in 2021-2023, rising to 1.3% in 2024-2025, 1.5% in 2026-2027, and 1.9% in 2028-2030. The directive also places a stronger emphasis on addressing energy poverty, empowering consumers, and providing energy-efficiency information. It encourages the creation of one-stop shops, offers technical and financial advice, and enhances consumer-protection mechanisms for dispute resolution.

Furthermore, RED III includes provisions to identify and remove barriers related to energy-efficiency renovations, especially concerning tenants, owners, and multiple-property owners. EU countries must prioritize energy-efficiency improvements for vulnerable customers, those affected by energy poverty, and individuals in social housing. Under the energy savings obligation, each EU country must allocate a portion of its energy savings to vulnerable customers and those affected by energy poverty, with criteria defined by each country based on their specific circumstances. Revenue from the extension of the EU Emissions Trading System (ETS) to buildings and transport will support these efforts through the Social Climate Fund.

RED III expands energy-audit obligations to cover all companies above a certain energy consumption threshold, including small and medium-sized en-

4.1.2. Ukrainian Law

Ukraine has adopted several important primary legal acts in the field of energy efficiency. The Law on Energy Efficiency implements the Energy Efficiency Directive, Directive 2009/125/EC establishing a framework for the setting of eco-design requirements for energy-related products, and Regulation (EU) 2017/1369 setting a framework for energy labelling. Laws on the Energy Efficiency of Buildings and on the Energy Efficiency Fund were adopted in 2022 and the Law on the Development of High-Efficiency Cogeneration was adopted in March 2023. The robust progress in the field of energy-efficiency legislation contributed to enabling Ukraine to be connected to the EU's electricity grid

terprises (SMEs) with significant energy-saving potential. Large industrial energy consumers will be required to implement energy management systems to monitor and optimize energy efficiency.

Moreover, EU countries must ensure a suitable level of competence among energy efficiency professionals, such as service providers, auditors, managers, and installers, that are aligned with market needs. The directive mandates reporting on energy-efficiency investments, including energy-performance contracts, enhancing transparency and accountability. It also establishes assistance mechanisms at national, regional, and local levels to support energy-efficiency investments and achieve ambitious targets.

Regarding heating and cooling, RED III aims for fully decarbonized district heating and cooling by 2050. It revises the definition of efficient district heating and cooling to integrate renewable energy and waste heat & cold progressively. Support for new high-efficiency cogeneration units linked to district heating will be limited to natural gas until 2030, with other fossil-fuel use banned. EU countries must promote local heating and cooling plans in large municipalities. Additionally, RED III introduces monitoring of data center energy performance, with an EU-level database collecting and publishing relevant data on energy consumption and water footprint for data centers with significant energy use.

in March 2022 and to gradually increase its electricity exports.

A National Action Plan for Energy Efficiency until 2030 has been adopted by the Cabinet of Ministers of Ukraine with a national energy-efficiency target of primary energy consumption of no more than 91.5 million tons of oil equivalent, and final energy consumption of 50.5 million tons of oil equivalent. The Energy Strategy of Ukraine until 2050 also highlights energy efficiency, and the Economic Strategy of Ukraine until 2030 defines it as a major benchmark for the development of the national economy.

4.1.3. Recommendations

Ukraine's regulations for local energy planning and promoting the use of energy-management systems by state and municipal authorities have integrated many of the EU's best practices. How-

ever, the country must enact more implementing legislation to effectively bring its energy-efficiency laws into action. This includes:

1. establishing a proactive energy efficiency strategy;
2. reinforcing the implementation and enforcement of energy-efficiency laws by:
 - preparing an assessment of the performance of the current regulatory framework (carried out by an objective research platform) and introducing the requirement for the government to provide regular updates on energy efficiency status in annual reports to monitor progress consistently, and
 - incorporating penalties in existing regulations which mandate energy audits for large corporations;
3. supplementing the Law of Ukraine on High-Efficiency Cogeneration with legal provisions to:
 - introduce a unified system of licensing and setting tariffs,
 - regulate the energy-transmission process to other local critical-infrastructure facilities,
 - introduce a unified system of licensing and setting tariffs for heat energy,
 - embed the use of cogeneration in a methodology for the development of heat supply schemes for residential settlements;
4. highlighting the principle of energy efficiency at the regional level by drafting and adopting a methodology for the development of local energy plans and regional energy-efficiency programs;
5. boosting energy-efficiency measures in transport and building sectors;
6. designing energy efficiency standards and building codes for industrial facilities aligned with EU energy efficiency goals and focused on heating, cooling, lighting, and machinery;
7. conducting energy audits and performance benchmarking to identify areas for improvement and setting energy reduction targets; and
8. developing sector-specific energy efficiency guidelines and best practices to help industries tailor their energy management efforts to their specific industry requirements.

4.2. Industrial Sectors

Ukraine's aspiration to reduce carbon emissions while meeting growing energy demands, particularly in energy-intensive sectors such as steel, chemicals, cement, and paper production, demands a careful approach in the reconstruction

phase, when industrial plants and gas pipelines are to be rebuilt. It is crucial to prevent lock-in effects – that is, situations where outdated technologies and systems become entrenched, hindering progress.

4.2.1. Strategic Approaches for the Reconstruction of Ukraine's Industry Sector

Ukraine's progress towards climate neutrality hinges on wise choices during its industrial reconstruction. With carefully chosen strategic steps, the country can navigate the complex journey of sustainable industrial transformation while safeguarding economic stability and environmental responsibility. There are two main elements to ensure the sustainability of the industry: establishing renewable energy sources as the backbone of the energy supply, and implementing a robust greenhouse-gas emissions certification scheme to effectively guide and accelerate the path towards achieving net-zero emissions.

Given its EU candidacy, Ukraine must join the EU's emissions trading scheme (ETS) or develop its own carbon-pricing system. Both options have economic implications that need careful evaluation. Joining the ETS is a shortcut to high standards but requires adjusting to demanding EU policies. Establishing a national scheme would offer more flexibility but less access to European markets moreover, an increasing number of EU funding instruments - such as the Hydrogen Bank, the Innovation Fund, the Modernization Fund and potentially a new facility for sustainable aviation fuel - are linked to the ETS.

It is essential to incorporate transition clauses in order to manage uncertainty in evolving climate policies. Such clauses provide a grace period for industries to adapt to new regulations, such as the EU's Carbon Border Adjustment Mechanism (CBAM)¹²¹ and ETS. They would allow Ukraine to protect its economic interests during any policy shifts and to engage constructively with the EU

while demonstrating its commitment to balancing its goals with shifting EU regulations. In keeping with this logic, Ukraine has been granted observer status in the Seville process, which provides for systematic updating of environmental standards and reduction of industrial emissions into the air, water, and soil in line with Article 13 of the EU's Directive 2010/75/EU (the Industrial Emissions Directive).¹²²

It is also important for Ukraine to support the establishment of a circular economy that is also seamlessly digitalized. This approach should be embedded in a comprehensive circular economy law (to be adopted) and will not only guarantee alignment with the EU taxonomy requirements, but also enable Ukraine to take the lead in fostering the transparency of supply chains.

Ukraine must prioritize the rebuilding and reconstruction of destroyed energy infrastructure using the best available technologies that minimize greenhouse-gas emissions. Such technologies should include carbon capture and storage (CCS) and carbon capture and utilization (CCU), used for instance during the production of eFuels, which requires the use of carbon-negative sources. This innovative approach can be initiated promptly to support sustainable-energy development.

Additionally, it is vital to rebuild or refurbish pipelines in a way that enables them to transport hydrogen, where possible. Such a dual strategy would ensure that Ukraine's industrial infrastructure aligns with sustainability goals while being adaptable to future energy trends.

¹²¹ For more information, see the relevant sections of the preliminary financial study carried out in the framework of the Ukraine Energy Roadmap project

¹²² Belousova, "Україна долучилася до міжнародного процесу зі зменшення промислових викидів."

4.2.2. Legislation Relevant to Industrial Sectors

Two major laws affecting industrial activities have recently been adopted by Ukraine. The Law on Amendments to the Law on State Support of Investment Projects (Law Nr. 8138 adopted on 9 August 2023) provides for a new form of state support for investors – partial compensation for the cost of construction of adjacent infrastructure facilities, and expands the areas in which an investment project with significant investments can be implemented. The areas include processing industry, transport, agriculture, logistics, education, scientific and technical activity, healthcare, art, culture, sport, tourism, recreation, IT, and waste management.

Under this law, the threshold at which investment projects are considered to comprise significant investments and are thus eligible for state support has been reduced to €12 million. Investors can now also commence a project even before the conclusion of a special investment contract, provided that this early investment occurs no earlier than 18 months before the submission date of the application to the authorized body, and does not exceed 30% of the total. Projects that focus on sustainability and rely on renewable energy sources for their operations should be prioritized.

The second relevant act is the Law on Ensuring the Constitutional Rights of Citizens to Life and a Healthy Environment (Nr. 6004-d, also known as the Law on Industrial Pollution), which provides that all industrial installations will be modernized within 12 years. There was public criticism of this law, particularly from experts at the European Business Association, with concerns raised about factors such as the complexity and length of the document-collection process of the new permit system, which doesn't consider the challenges posed by the ongoing conflict.

Another point of contention is the stipulation under this law to maintain current technological standards for new integrated permits, even for installations that are economically unfeasible or impossible to upgrade and have limited lifespans. There are also calls for a reevaluation of the requirements for automated emission-monitoring systems (EMS), with a suggestion to exempt installations planned for decommissioning within a short time frame (two to three years) after the implementation of the law. This requires a comprehensive assessment of the law carried out by an independent research platform and with the implementation of annual reporting on progress and challenges, which should be an essential legal requirement embodied in the Law on Industrial Pollution.

4.2.3. Recommendations

There are nine major recommendations related to industrial activity for the postwar reconstruction in Ukraine:

1. A comprehensive assessment of the Law on Industrial Pollution should be carried out to identify areas for improvement. The law should be expanded to include the preparation of an annual report that highlights progress, challenges, and opportunities, with the aim of providing valuable insights to the Ukrainian government, fostering a more dynamic and responsive approach to policy refinement, and promoting sustainable practices in the energy sector.
2. An emissions trading scheme must be introduced, as per Ukraine's commitments under its Association Agreement with the EU. Considering circumstances post-war, it may be prudent to introduce a gradual and phased approach to avoid overburdening the industrial sector, with a longer starting phase.
3. A legal basis for an energy exchange must be established. This would:
 - allow energy-market participants to be given access to transparent liquidity and to manage and transfer their risks through the trading of standardized contracts and centralized clearing,
 - consolidate the status of the energy exchange, and
 - encourage participation in the bidding of a wide range electricity producers, not least solar and wind-power producers.
4. A legal framework for the operation of industrial plants should be developed. This would:
 - make it easier for industrial enterprises to run small-scale renewable-power plants themselves to meet their own demand,
 - create clear climate and energy-saving goals for the industry, and
 - implement supporting schemes to facilitate the adoption of innovative technologies in the industry.
5. A legal framework should be established to enable the construction of small power plants to supply industrial enterprises.
6. Mandatory energy-management audits for energy efficiency and energy-management systems should be introduced.
7. A specialized legal framework specifically for hydrogen should be created to support the deployment of green hydrogen in steel and iron production, ensuring their competitiveness in global markets.
8. A circular economy law to promote sustainable resource management and foster economic & environmental benefits should be adopted.
9. A comprehensive legal framework for assessing the feasibility and development of supply-chain components in innovative technologies such as batteries in Ukraine should be developed and adopted. This is essential to promote transparency, sustainability, and responsible investment in these critical industries.

4.3. Building Sector and Commercial & Public Services

As shown in the preliminary technical study of the Ukraine Energy Roadmap, the building sector and commercial & public services have comparable energy consumption. Strengthening the energy efficiency of both public and private buildings is an essential component of Ukraine's energy security today and in the future. The development of a comprehensive, coordinated system for im-

plementing large-scale thermal modernization of multi-apartment buildings, individual residences, and public buildings can lead to significant energy-efficiency improvements and reduced greenhouse-gas emissions. This section provides an overview of the relevant legal framework and sets out a number of legislative recommendations.

4.3.1. EU law

According to the European Commission, buildings are responsible for some 40% of energy consumption and 36% of carbon dioxide emissions in the EU, making them the single largest energy consumer in Europe.¹²³ Against this backdrop, the Commission has stated that making buildings more energy efficient is of the utmost importance for its energy and climate goals.

Directive 2018/844/EU (the Energy Performance of Buildings Directive), which amended the previously existing Directive 2010/31/EU on the same topic, was adopted in the wake of the Clean Energy for all Europeans Package of 2018, and built on Directive 2018/2002/EU (the Directive on Energy Efficiency), which itself amended Directive 2012/27/EU (the Energy Efficiency Directive). This sent a strong political signal on the EU's commitment to modernize the buildings sector and increase the rate of renovating or constructing buildings to a near-zero-emissions standard.¹²⁴

On 14 July 2021, the European Commission adopted a package of further proposals to bring the EU's climate, energy, land-use, transport, and taxation policies more in line with the European Green Deal – that is, helpful for reducing net greenhouse-gas emissions by at least 55% by 2030 compared to 1990 levels.¹²⁵ Some of these proposals concern the development of renewable and less polluting energy systems in homes and public buildings.¹²⁶ The most important proposal in this context aims to revise the Energy Performance of Buildings Directive.¹²⁷ This would align the energy-performance requirements for new buildings with long-term climate-neutrality goals and aim to move from nearly zero-emission building (NZEB) to zero-emission building (ZEB). The aim of this proposal is to contribute to the target of an emissions reduction of at least 60% by 2030 in the building sector in comparison to 2015, and to help achieve climate neutrality by 2050.¹²⁸

123 See European Commission, "Clean Energy for All Europeans Package."

124 See European Commission, "Energy Performance of Buildings Directive."

125 See European Commission, "European Green Deal: Commission Proposes Transformation of EU Economy and Society to Meet Climate Ambitions."; See also European Council and Council of the European Union, "Timeline - European Green Deal and Fit for 55."

126 European Commission, "Buildings Factsheet."

127 European Commission, Proposal for a Directive of the European Parliament and of the Council on the energy performance of buildings (recast).8,24]]], "issued": {"date-parts": [{"2021", 12, 15}]}}], "schema": "https://github.com/citation-style-language/schema/raw/master/csl-citation.json"}]

128 European Commission, "Energy Performance of Buildings Directive."

The main measures suggested are:

- gradual introduction of minimum energy performance standards to trigger renovation of the worst performing buildings,
- a zero-emission-building requirement applying to all new buildings by public authorities from 2027 and to all new buildings from 2030,
- a more ambitious vision for zero-emission buildings,
- enhanced long-term renovation strategies (national building-renovation plans),
- increased reliability, quality and digitalization of energy performance certificates (with energy performance classes to be based on common criteria),
- a definition of deep renovation,
- the introduction of building-renovation passports,
- modernization of buildings and their systems, and
- better energy-system integration (for heating, cooling, ventilation, the charging of electric vehicles, and renewable energy).¹²⁹

This proposal is complemented by other initiatives under the European Green Deal, in particular the new ETS Directive, the Energy Efficiency Directive, and the Alternative Fuels Infrastruc-

ture Regulation.¹³⁰ On 30 March 2023, the Council and the Parliament reached a provisional political agreement on the revision of the Renewable Energy Directive, which contains the following:

- a rise of renewable energy share in buildings in 2030 to at least 49%,
- a gradual increase in renewable targets for heating and cooling, with a binding increase of 0.8% per year at national level until 2026 and 1.1% from 2026 to 2030,
- additional indicative increases calculated specifically for each member state over the existing minimum annual average rates.¹³¹

In addition, the new Effort Sharing Regulation sets national emission reduction targets for all member states by 2030 for sectors including buildings.¹³² Finally, the new Social Climate Fund, financed by revenues from emissions trading in road transport and buildings, is meant to provide

financial support to citizens to enable them to invest in renovating heating systems and to ensure a fair transition.¹³³ More information on financial instruments is available in the preliminary financial study of the Ukraine Energy Roadmap.

129 European Commission.

130 European Commission.

131 European Council and Council of the European Union, “Council and Parliament Reach Provisional Deal on Renewable Energy Directive.”

132 See European Commission, “Effort Sharing 2021-2030.”

133 European Commission, “Buildings Factsheet.”

4.3.2. Ukrainian law

The Law of Ukraine on the Principles of Town Planning defines the legal, economic, social and organizational principles of urban development in Ukraine and aims to ensure a high-quality living environment while ensuring environmental protection, the rational use of natural resources, and the preservation of cultural heritage.¹³⁴ The Law of Ukraine on the Regulation of City Planning Activity establishes the legal and organizational principles of city-planning activity and aims to foster sustainable development of territories with due consideration of state, community and private interests.¹³⁵ Other relevant laws in Ukraine include the Law on Architectural Activity,¹³⁶ the Law on the Main Principles of State Supervision in the Area of Commercial Activity,¹³⁷ and the Law on Construction Regulations.¹³⁸

The Law of Ukraine on the Energy Efficiency of Buildings, adopted in 2017, aims to increase energy efficiency of buildings, taking into account local climatic conditions and ensuring healthy living conditions (households in Ukraine waste 60% of energy or USD 3 billion annually through the inefficient use of energy resources).¹³⁹ This Law established minimal requirements for the energy efficiency of buildings in Ukraine and implemented a mandatory certification system for all buildings except buildings with a primary economic, religious, cultural, or military purpose, individual houses, and buildings with a heating area of less than 50 square meters.¹⁴⁰

This certification of energy efficiency is performed by a certified energy auditor at the expense of the building owners, homeowners' associations, managing associations of multi-family buildings, or state authorities (in compliance with the applicable regulations). Optional certification of buildings not covered by law can be performed at owners' request and expense.¹⁴¹

The Law of Ukraine on Amendments to Certain Laws of Ukraine Regarding the Creation of Conditions for the Introduction of Comprehensive Thermal Modernization of Buildings of 3 August 2022 simplified the process of implementing energy-efficient measures in buildings and structured & facilitated cooperation with the Energy Efficiency Fund.¹⁴² This Law envisages the possibility of involving the Energy Efficiency Fund in the energy-efficient renovation of damaged and destroyed buildings (replacement of broken windows and doors with highly energy-efficient ones, restoration of damaged thermal insulation on the walls), if this is approved by the EU and Ukraine's Cabinet of Ministers.

The Law of Ukraine on the Comprehensive Reconstruction of Neighbourhoods (Microdistricts) of Outdated Housing Stock defines the legal, economic, social and organizational framework for the reconstruction of outdated residential and non-residential stock.¹⁴³

134 Parliament of Ukraine, Про основи містобудування.

135 Parliament of Ukraine, Про регулювання містобудівної діяльності.

136 Parliament of Ukraine, Про архітектурну діяльність.

137 Parliament of Ukraine, Про основні засади державного нагляду (контролю) у сфері господарської діяльності.

138 Parliament of Ukraine, Про будівельні норми.

139 Parliament of Ukraine, Про енергетичну ефективність будівель.

140 Parliament of Ukraine.

141 Parliament of Ukraine.

142 Parliament of Ukraine, Про внесення змін до деяких законів України щодо створення умов для запровадження комплексної термомодернізації будівель.

143 Parliament of Ukraine, Про комплексну реконструкцію кварталів (мікрорайонів) застарілого житлового фонду.

Finally, new state-building standards (obligatory for any construction activity in Ukraine) came into force in September 2022 and regulate, among other things, energy efficiency during the entire life-

cycle of the object. The standards call for the use of building information modelling technologies and establish modern requirements for such facilities as refrigerators, warehouses, or grain silos.

4.3.3. Recommendations

There are several high-priority reforms which Ukraine should implement during Phase I in the first two years after the end of the war.

1. Directive 2018/844/EU (the Energy Performance of Buildings Directive) should be transposed in its entirety, both to contribute to the country's EU accession process and to help frame its reconstruction.
2. Compliance issues related to the transposition of Directives 2010/31/EU and 2018/844 need to be addressed, especially when it comes to inspections of engineering systems and certification and energy audits of buildings. This should include the following:
 - Updates to the Building Code Rules, which should at least comprise:
 - near-zero-emissions standards; even higher zero-emissions standards could be considered in keeping with the revision proposals for the Energy Performance of Buildings Directive;
 - requirements for decarbonizing construction inputs, e.g., using more recycled materials and less cement;
 - quotas for renewable energy in buildings; and
 - implementation of energy-performance certification.
 - Development and adoption of a long-term renovation strategy including a comprehensive framework for enhancing energy efficiency, promoting sustainable construction practices, and ensuring lower carbon emissions across the building sector.¹⁴⁴
 - Development and adoption of an energy building code, which should:
 - define energy-performance standards, especially in multi-apartment residential buildings, including, for instance, requirements for the thermal conductivity of walls and windows or the use of motion sensors for lighting in common areas,
 - define quantitative retrofitting targets for the public building stock by 2030, and
 - set targets for the maximum permissible final energy consumption (especially for space and water heating) for different types of buildings and climate zones.

The implementation of other measures contained in the proposed revision to the Energy Performance of Buildings Directive which do not concern new buildings may be an additional task for Phase 2. Another focus should be compliance with the Renewable Energy Directive II (RED II) in terms of implementing renewable-energy solutions in buildings. Measures to consider include robust digital solutions for the monitoring and management of energy in buildings, such as smart meters, internet of things devices, and data analytics, to accurately measure and track energy consumption, thus providing occupants with

real-time feedback and incentives to adopt energy-efficient behaviors, ultimately contributing to reduced energy consumption.

Ukraine has strong potential to become a leader in innovative digital solutions for energy efficiency and sustainability in building management. Leveraging its expertise in technology and innovation, Ukraine can play a pivotal role in developing and promoting cutting-edge solutions that not only benefit its own sustainability goals but also contribute to global advancements in energy-efficient building practices.

144 Energy Community Secretariat, "Ukraine, Annual Implementation Report, 1 November 2022," 12.

4.4. Transport Sector

Reconstructing Ukraine's postwar transport sector while aiming for net-zero emissions is a complex and multifaceted challenge. It requires a comprehensive and integrated approach that considers the immediate needs of postwar recovery, the long-term goals of achieving carbon neutrali-

ty, and the unique characteristics of the Ukrainian transport system. Following a concise overview of the current EU and Ukrainian legal framework, this section will offer a series of pertinent legal recommendations.

4.4.1. EU law

As mentioned above, the European Commission adopted its Fit-for-55 Package on 14 July 2021 to make the EU's climate, energy, land-use, transport, and taxation policies fit for reducing net greenhouse-gas emissions by at least 55% by 2030, compared to 1990 levels. These proposals included a revision of the carbon-dioxide standards for cars and vans set by Regulation (EU) 2019/631, which aimed to accelerate the production and sale of low and zero-emissions vehicles and put road transport on a firm path to zero-emission mobility in 2050.¹⁴⁵ These targets were made more ambitious by Regulation (EU) 2023/851 of 19 April 2023, which, among other things, set a 100% reduction target from 2035 onwards.¹⁴⁶

The Fit-for-55 Package also included a proposal for a new Regulation on RefuelEU Aviation¹⁴⁷, supporting a swift transition from fossil fuels to-

wards sustainable fuels in air transport and a new FuelEU Maritime Regulation proposal¹⁴⁸ to stimulate the uptake of sustainable maritime fuels and zero-emission marine-propulsion technologies by setting a maximum limit on the greenhouse-gas content of energy used by vessels calling at European ports.¹⁴⁹

On 28 March 2023, a political agreement was reached on another Fit-for-55-package-proposal for an Alternative Fuels Infrastructure Regulation.¹⁵⁰ This act will replace the current Directive 2014/94/EU and ensure that the greening of transport fleets is supported by adequate recharging and refueling infrastructure. The European Commission also chose to apply emissions trading to transport, where stronger reductions are needed to reach the 2030 target,¹⁵¹ with Directive (EU) 2023/959 (the ETS Directive).¹⁵²

¹⁴⁵ European Commission, "Q&A."

¹⁴⁶ European Commission, "CO₂ Emission Performance Standards for Cars and Vans."

¹⁴⁷ European Commission, Proposal for a Regulation of the European Parliament and of the Council on ensuring a level playing field for sustainable air transport.

¹⁴⁸ European Commission, Proposal for a Regulation of the European Parliament and of the Council on the use of renewable and low-carbon fuels in maritime transport and amending Directive 2009/16/EC.

¹⁴⁹ European Commission, "Q&A."

¹⁵⁰ European Parliament and Council of the European Union, Proposal for a Regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council.

¹⁵¹ European Commission, "Make Transport Greener."

¹⁵² European Parliament and Council of the European Union, Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system (Text with EEA relevance).

As mentioned above, on 30 March 2023, the Council and the Parliament reached a provisional political agreement on a revision of the Renewable Energy Directive, which encompasses binding sector-specific targets in transport for 2030. These include a choice for member states between either a 14.5% reduction of greenhouse-gas intensity in transport through the use of renewables or a share of at least 29% of renewables within the final consumption of energy in the transport sector. In addition, the proposed revision sets a binding combined sub-target of 5.5% for advanced bio-fuels (derived from non-food feedstocks) and renewable fuels of non-biological origin (mostly re-

newable hydrogen and hydrogen-based synthetic fuels) in the share of renewable energy supplied to the transport sector. This target includes a minimum requirement of 1% of renewable fuels of non-biological origin.¹⁵³

Other proposed legislative acts are the Effort Sharing Regulation, which specifies that member states will have to do more at the national level to decarbonize transport and thus reach the increased national emission reduction objectives,¹⁵⁴ as well as a revision of the Energy Taxation Directive which foresees removing subsidies for and increasing taxation on fossil fuels in transport.¹⁵⁵

4.4.2. Ukrainian law

Effective and functional transport links are a prerequisite for the stabilization and structural transformation of Ukraine's economy, as well as the development of exports, and the wellbeing of the population. The country's transport system comprises extensive infrastructure and provides a full range of transport services, including for the storage of cargo and its preparation for transportation within and outside the country.¹⁵⁶ Russia's ongoing war against Ukraine has caused very high material damage to transport infrastructure, and its reconstruction is crucial to postwar recovery.¹⁵⁷

Transport in Ukraine is covered by vast and sophisticated legislation. The Law of Ukraine on Transport defines the legal, economic, organizational, and social basis of transport operation, sets the rights,

obligations, and powers of authorities, and covers international cooperation.¹⁵⁸ The Law of Ukraine on the Transit of Cargos defines the principles of cargo transit by air, road, rail, sea, and river transport across the territory of Ukraine.¹⁵⁹

The Law of Ukraine on Railway Transport defines the main legal, economic, and organizational bases of the activities of the public railway system and its role in the economy and the social sphere of Ukraine.¹⁶⁰ The sphere of railway transport in Ukraine is also regulated by numerous bylaws, resolutions, and regulations. Similarly, the Merchant Shipping Code of Ukraine regulates merchant shipping,¹⁶¹ while the Law of Ukraine on Ukrainian Sea Ports¹⁶² covers activities in Ukrainian seaports and the Law of Ukraine on Inland Waterway Trans-

153 European Council and Council of the European Union, "Council and Parliament Reach Provisional Deal on Renewable Energy Directive."

154 European Commission, "Effort Sharing 2021-2030."

155 European Commission, Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity (recast).

156 Ministry of Justice of Ukraine, "Питання врегулювання транспортного законодавства."

157 Vox Ukraine, "Challenges to Ukraine's Compliance with Obligations under the Association Agreement."

158 Parliament of Ukraine, Про транспорт.

159 Parliament of Ukraine, Про транзит вантажів.

160 Parliament of Ukraine, Про залізничний транспорт.

161 Parliament of Ukraine, Кодекс торговельного мореплавства України.

162 Parliament of Ukraine, Про морські порти України.

port¹⁶³ defines the legal, economic and organizational principles of inland waterway transport.

The main provisions for the sphere of automobile transport in Ukraine are determined by the Law of Ukraine on Motor Vehicle Transport,¹⁶⁴ while electric transport is regulated by the Law of Ukraine on Municipal Electric Transport.¹⁶⁵ During the last several years the Parliament of Ukraine has adopted several key legislative acts facilitating the development of green transport and infrastructure. A recent legislative act in this sphere is the Law of Ukraine on Certain Issues of the Use of Vehicles Equipped with Electric Motors and Amendments to Certain Laws of Ukraine on Overcoming Fuel Dependence and Development of Electric Charging Infrastructure and Electric Vehicles, which mainly defines concepts and relations arising from the use of electric vehicles.¹⁶⁶ The Law of Ukraine on the Electricity Market defines providing the service of charging electric vehicles as a form of consumption and not supply of electricity.¹⁶⁷

Green transport is facilitated by considerable tax and customs relief, such as by the Law on Amendments to Section XX “Transitional Provisions” of the Tax Code of Ukraine Regarding Stimulation of Development of the Environmental Transport Industry in Ukraine.¹⁶⁸ The Law on Amending Paragraph 4 of Section XXI “Final and Transitional Provisions” of the Customs Code of Ukraine Regarding the Stimulation of the Development of the Environmental Transport Industry in Ukraine establishes exemptions from import duty until 2031 for vehicles equipped exclusively with electric motors.¹⁶⁹ A key secondary legislative act in this sphere is the Resolution of the Cabinet of Ministers of Ukraine of 27 February 2019 No. 157 on the Approval of the Technical Regulations on Eco Design Requirements for Electric Motors.¹⁷⁰

In addition to legislation, there are several national strategies relevant to transport in Ukraine. The National Transport Strategy Drive Ukraine 2030 of 7 April 2021 is the main document determining the development of the transport industry.¹⁷¹ It covers:

- transport infrastructure development at regional and cross-country levels which aims to improve the safety, quality and accessibility of transport,
- innovative technologies and incentives to support national producers proposed by specialized associations,
- improvement of the quality of transport services, their environmental friendliness and compliance with international standards, and integration of the Ukrainian transport system into the European network, and
- 50% proportion of alternative fuels and all types of electricity in transport by 2030.

163 Parliament of Ukraine, Про внутрішній водний транспорт.

164 Parliament of Ukraine, Про автомобільний транспорт.

165 Parliament of Ukraine, Про міський електричний транспорт.

166 Parliament of Ukraine, Про деякі питання використання транспортних засобів, оснащених електричними двигунами, та внесення змін до деяких законів України щодо подолання паливної залежності і розвитку електророзрядної інфраструктури та електричних транспортних засобів.

167 Parliament of Ukraine, Про ринок електричної енергії.

168 Parliament of Ukraine, Про внесення зміни до пункту 4 розділу XXI “Прикінцеві та перехідні положення” Митного кодексу України щодо стимулювання розвитку галузі екологічного транспорту в Україні.

169 Parliament of Ukraine.

170 Cabinet of Ministers of Ukraine, Про затвердження Технічного регламенту щодо вимог до екодизайну для електродвигунів.

171 Cabinet of Ministers of Ukraine, Про схвалення Програми розвитку гідроенергетики на період до 2026 року.

Ukraine's Second Nationally Determined Contribution under the Paris Agreement includes the goal to increase electric vehicles to 15% of annual car registrations in 2030. And Ukraine's Energy Strategy until 2050 provides for the share of elec-

tric vehicles to increase to 15% of the total in 2032 and 50% in 2050, and for public transport to run on more sustainable fuels (it does not, however, call for increasing public transportation).

4.4.3. Recommendations

The need to rebuild Ukraine's transportation infrastructure, especially roads, presents a pivotal opportunity for the country to accelerate its transition towards electrified transportation. Such an approach would align with environmental, economic, and strategic objectives, allowing the

country to reduce its dependence on oil, promote sustainable practices, and position itself as a leader in the global push for clean energy solutions.

In Phase 1, Ukraine should implement the following high-priority strategies:

1. develop the legal framework for the implementation of the Alternative Fuels Infrastructure Regulation, Updated Renewable Energy Directive, and Energy Taxation Directive,
2. integrate individual transport policy measures into a comprehensive strategic framework that encompasses all sectors of the economy,
3. update the Low Emissions Development Strategy until 2050 and the Transport Strategy 2030, and
4. develop a dedicated public-transport strategy to strategically harness innovative technologies in a way that helps enhance the efficiency, accessibility, and reliability of public-transportation systems, providing alternatives to private car usage and promoting sustainable urban mobility.

In Phase 2, Ukraine should:

1. develop the legal framework for supporting and promoting the use of liquid biofuels;
2. ensure that restoration of transport infrastructure is in long-term compliance with EU legislation, especially in terms of:
 - the feasibility of investing in high-speed rail transport instead of developing domestic air travel,
 - prioritization of the greenest and most energy-efficient modes of transportation, such as water and rail transport,
 - development of a network of charging stations for electric cars;
3. encourage refinery companies to diversify their operations by exploring and investing in emerging sectors such as renewable-energy production, sustainable biofuels, and carbon capture and utilization, thereby transitioning towards a more environmentally conscious and economically resilient future.

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6. Annex I: Energy System Integration

According to existing decarbonization scenarios, to reach climate neutrality by 2050, Europe will have to more than double the share of electricity in its energy mix.¹⁷² This will require rapid expansion of renewables, advanced electrification, and robust sector coupling. It is projected that the EU's annual electricity consumption between today and 2050 will grow from 3,000 TWh to 6,800 TWh.¹⁷³

Ukraine must go through a similar process but from a much harder starting point: it must rebuild much of its economy without returning to what

were high levels of fossil fuel consumption and greenhouse-gas emissions. The answer is large-scale electrification of manufacturing, transportation, heating and building sectors through integrated planning and sector coupling, and massive targeted investments.

This section describes the risks and opportunities linked to systems coupling, the Ukrainian perspective, and the legal background of EU law with which Ukraine must comply during its transition, and provides recommendations for the postwar period.

6.1. Ukraine's Reconstruction and Energy System Integration

In the medium and long term, Ukraine must eventually achieve a paradigm shift from large-scale, centralized conventional power generation – with one-way transmission and distribution of electricity to consumers – towards a flexible, renewables-based, distributed and decentralized energy system with two-directional flows of energy and data. Sector coupling, namely the electrification and interconnection of all energy-using sectors – transport, manufacturing, heating and cooling, buildings and municipal utilities – must become a basic principle of infrastructure planning and development.

In practice, this means ensuring energy-efficient and energy-sufficient buildings, energy efficient and electrified public and commercial-service facilities, electrification of logistics, public and individual transportation, and modern factories, in particular green steel production, all with built-in distributed energy resources such as batteries, solar, and other local generation, as well as power supply automation, heat pumps, and other controllable loads. Huge investments will be needed to

build enabling infrastructure, particularly when it comes to the modernization of distribution grids to adapt them for broader electrification of the economy and the deployment of renewables and distributed energy resources.

These investments should be steered and directed by integrated infrastructure planning. This will require a type of technical and administrative support which is currently in short supply in Ukraine. The expert survey carried out in the framework of the Ukraine Energy Roadmap project suggests that there are difficulties in communication at the administrative level between the central government, regional governments, and other stakeholders. Integrated energy-infrastructure planning should therefore become a major area for international support in Ukraine. Taking this approach will allow Ukraine to receive a significant boost for its economic development while solving many structural problems, from guaranteeing real energy security to eradicating energy poverty and achieving a deep degree of decarbonization.

172 Dickson, "Electrifying Europe with Wind Energy – towards Net-Zero by 2050 - The European Files."

173 ETIPWind, "Getting Fit for 55 and Set for 2050."

6.2. EU Rules for Energy System Integration

On 8 July 2020, the European Commission published a communication on the EU's Strategy for Energy System Integration.¹⁷⁴ The Strategy proposed the first concrete policy and legislative measures at the EU level to gradually shift from a linear and segmented energy system to an integrated and multidirectional paradigm. Its six pillars are:

1. a circular energy system based on efficiency,
2. increased electrification based on renewable electricity sources,
1. renewable and low-carbon fuels (incl. hydrogen) in hard-to-abate sectors,
2. empowering of consumers,
3. infrastructure integration (mainly gas, electricity, heating and transport), and
4. digitalization for smarter interconnection.

According to the European Commission, the Clean Energy Package adopted in 2018-2019 lays the foundation for system integration and adds scope and speed to actions in the context of the Green Deal. A major role is played by the abovementioned Hydrogen and Decarbonised Gas Market Package, which introduces the necessary measures to scale up the uptake of hydrogen in the context of an integrated energy system. Implementing this package will support measures such as the decarbonization of the transport sector through the introduction of (renewable and low-carbon) e-fuels where electrification is difficult and thus

enable flexible cross-sector integration. Having said that, the European Commission recognized in its communication that system integration will not be a one-size-fits-all process and that the proposed strategy can offer only a compass to direct the efforts on national levels in the same directions. Despite a common objective of EU climate neutrality by 2050, EU member states will follow different pathways, depending on their respective circumstances, endowments and policy choices, which are already reflected in the respective national energy and climate plans (NECPs). The same will apply to Ukraine.

This study recommends that Ukraine take proactive steps to develop a comprehensive, system-integrated plan outlining a vision for its energy system in a fully integrated, sustainable future. The system-integrated plan should encompass all aspects of the energy sector, including electricity generation, distribution, transmission, renewable-energy integration, energy efficiency, and grid-infrastructure development. This plan should serve as a roadmap that clearly defines the key milestones, strategies, and actions required to achieve a clear overarching vision. It is advisable to draw inspiration from countries like Germany, which have embarked on similar initiatives to guide their energy transitions.

6.3. Ukraine's Plans for Energy System Integration

While the potential benefits of energy system integration are broadly recognized, there is not yet a comprehensive legal framework or specific legal acts that fully address the complexities of energy system integration in Ukraine. The country's Energy Strategy until 2050 does, however, comprise some provisions which lay the foundation for energy system integration:

Diversification of energy sources: The Strategy recognizes the importance of reducing Ukraine's dependence on imported energy sources, particularly natural gas. It emphasizes the need to develop domestic energy resources, especially renewable energy sources.

Renewable energy development: The Strategy sets ambitious targets for increasing the share of renewable energy in the energy mix. It highlights the importance of transitioning to clean energy sources to mitigate climate change and improve energy security.

Energy efficiency: The Strategy emphasizes the importance of energy efficiency measures across sectors, which can also enhance the effectiveness of integrated energy systems.

Decentralization: The Strategy supports the development of local energy systems and encourag-

174 European Commission, "EU Strategy on Energy System Integration."

es decentralized energy generation. This approach fosters energy system integration by promoting the integration of smaller-scale renewable energy sources into the grid and enhancing energy security at the local level.

Innovation and technology: The Strategy acknowledges the role of innovation and technolo-

gy in modernizing the energy sector. This includes advancements in grid management, smart meters, energy storage, and digital solutions, which are essential for effective energy system integration.

Figure 7 shows a summary of the ways in which the Energy Strategy of Ukraine until 2050 meets targets of the EU's Strategy for Energy System Integration.

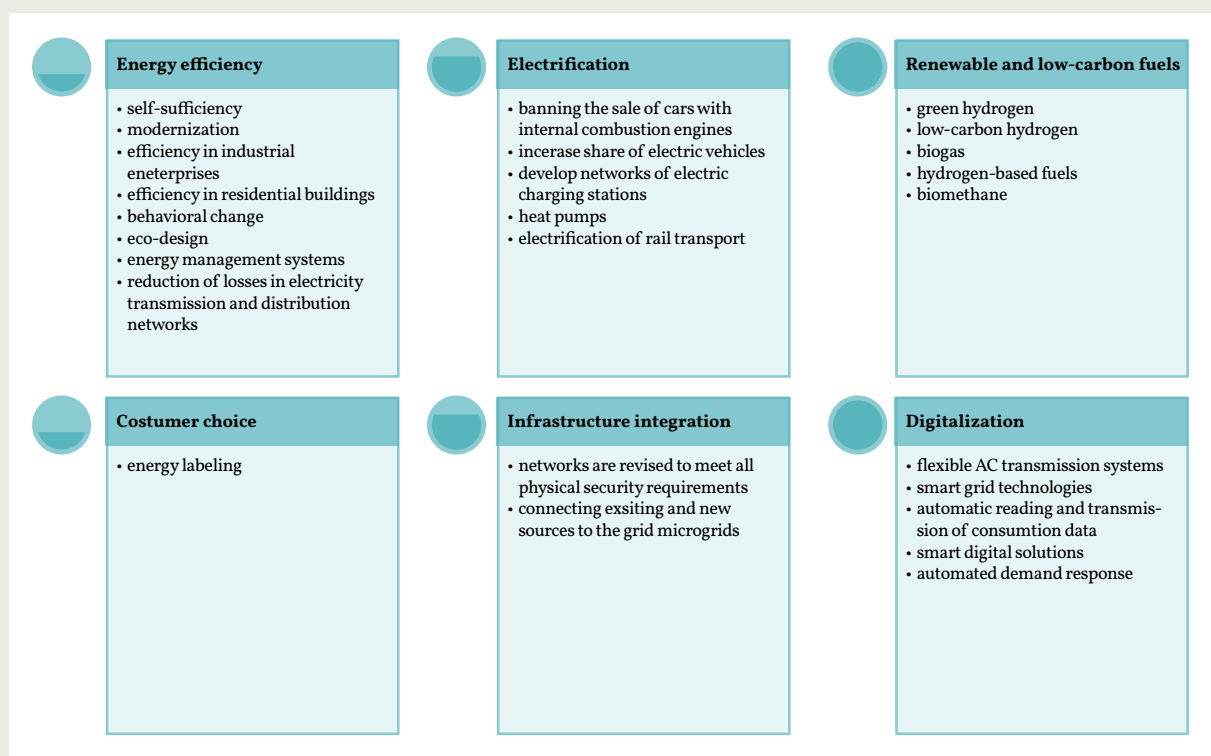


Figure 7: Energy System Integration according to the Energy Strategy of Ukraine until 2050
Source: Own Illustration

However, there is still need for more detailed and specific legal acts that should provide clear guidelines, regulatory frameworks, and incentives for energy system integration. These legal acts could cover areas such as grid modernization, energy storage regulations, renewable energy integration, electric vehicle charging infrastructure, and cross-sector coordination.

To fully realize the potential of energy system integration, Ukraine should consider drafting new laws and regulations or amending existing ones to create a comprehensive legal framework that supports the integration of different energy sectors. This would provide the necessary clarity and predictability for investors, encourage technological

innovation, and enable a smoother transition to a more sustainable and resilient energy system.

Moreover, it is advisable for Ukraine to adopt a holistic, cross-sectoral perspective through a comprehensive system integration plan, mirroring efforts undertaken by countries like Germany. Such a plan would articulate a visionary roadmap for Ukraine's energy landscape, detailing the steps required to achieve a fully integrated, sustainable future. By emphasizing this approach, the long-term viability and success of Ukraine's energy transition efforts can be ensured, promoting energy security, economic growth, and environmental sustainability.

6.4. Recommendations

Regulatory recommendations for fostering the establishment of an interconnected energy system can be divided into the period immediately after the end of hostilities (Phase 1, or the first 24 months) and the period thereafter (Phase 2). To begin with, Ukraine should develop:

1. strategies with a comprehensive approach to the energy market which link all sectors together, especially a national strategy on energy system integration and a national energy and climate plan;
2. a cross-sectoral legislative package for integrated planning which:
 - ensures cross-sectoral implementation of the efficiency-first principle,
 - links energy generation with energy consumption in a comprehensive framework, and
 - promotes the six pillars of the EU's energy system integration strategy.

Longer-term measures should include:

1. the development of a hydrogen strategy, which should cover:
 - regulations on green hydrogen and other renewable fuels of non-biological origin from the delegated acts based on Article 27(3) of the Renewable Energy Directive, and
 - regulations for power-to-X technologies, with hydrogen as a base, which are not covered by the delegated acts, and
 - the development of a legislative package to support its implementation, in particular:
 - legislation on hydrogen transportation, including by road and sea,
 - legal norms for the construction of new gas pipelines for green hydrogen,
 - legislation to guarantee the origin of green hydrogen,
 - bylaws on environmental protection considering green hydrogen projects,
 - updates on procedures for conducting environmental impact assessments, and
 - updates to standards governing the gas transportation system;
2. updating Ukraine's Energy Strategy until 2050 to ensure it:
 - places stronger focus on energy system integration,
 - encompasses the principle of 'energy efficiency first',
 - includes measures to support customer choice, and
 - ensures linkages between energy demand and generation in multiple sectors, including construction and buildings.

7. Annex II: EU Energy Acquis Already Implemented in Ukraine

Ukraine became a member of the Energy Community in 2011. By signing the Energy Community treaty, Ukraine committed to transpose and implement key EU energy laws, develop an adequate regulatory framework, and liberalize its energy markets in line with the EU acquis within a fixed timeframe. **The Energy Community acquis comprises legal acts in the following areas: electricity, gas, renewable energy, energy efficiency, climate, environment, competition, statistics, infrastructure, and oil.** Since joining the Energy Community, Ukraine has been working towards aligning with the EU energy acquis.

To approximate Ukrainian energy legislation with that of the EU, Ukraine follows a procedure and list of Regulations and Directives specified in Annex XXVII of the Association Agreement. The list of legislation from the EU acquis to be imple-

mented is divided into two categories: 1) those to be implemented within the framework of the Energy Community Treaty and 2) those to be implemented beyond it. These energy obligations are further divided into spheres such as “Electricity,” “Gas,” “Renewable energy sources,” “Oil,” “Energy infrastructure,” “Energy efficiency,” and “Nuclear.”

Notably, the majority of adopted legal acts revolve around the critical subjects of Electricity Transport Network operations, Share of Market Data, and the Independence of Grid Operators, while further implementation and assessment of these regulations will likely be essential for ensuring the efficient, transparent, and reliable functioning of the energy sector. Continued monitoring and potential adjustments to these legal frameworks may be necessary to adapt to evolving energy market dynamics and technological advancements in the future.

7.1. Screening of the EU energy acquis implemented already into Ukrainian legislation

Electricity and energy sector:

Update and Implementation of the Energy Strategy of Ukraine (In pursuance of Article V.I.338 of the Agreement):

- Energy strategy until 2050 approved by the Cabinet of Ministers of Ukraine;
- The Action Plan on the implementation of the Energy Strategy for the period until 2020. *However, the plan for the period until 2025 and for the period until 2035 has not yet been approved.*

Definition of an independent regulatory body for electricity and gas markets that meets the criteria established by EU legislation (In pursuance of Article IV.II.277 of the Agreement, in order to implement the provisions of Directive No. 2009/72/EC; Regulation No. 714/2009):

- Adopted Law of Ukraine “On the National Commission carrying out state regulation in the spheres of energy and communal services”. The composition of the National Commission has been formed.

Legislative consolidation of the new model of functioning of the electricity market (In pursuance of Article V.1.341 of the Agreement, Annex XXVII, in order to implement the provisions of Directive No. 2009/72/EC; Regulation No. 714/2009; Directive No. 2005/89/EU):

- Adopted Law of Ukraine “On Electricity Market”;

Creation of conditions for guaranteed provision of electricity and gas to all citizens within the framework of public service obligations established by the EU (In pursuance of article IV.II.278, Section III of the Treaty on the Establishment of the Energy Community)

- The creation of conditions for the supply of electricity to all categories of citizens within the framework of established social obligations has been ensured.

Safety of electricity supply (Pursuant to Article V.1.341 of the Agreement, Annex XXVII, in order to implement the provisions of Directive No. 2005/89/EU):

- The requirements for the minimum reserve of production capacities, which are dispatched by electricity transmission operators, have been developed and approved;
- The safety rules for the supply of electrical energy have been developed and approved;
- A report on monitoring security of supply was submitted to the Secretariat of the Energy Community;

Creation of an information platform for the publication of data on the electricity market of Ukraine (Pursuant to Article IV.II.278 of the Agreement, in order to implement the provisions of Regulation No. 543/2013 /Third energy package):

- A normative legal act regarding on imposing obligations on market participants to provide data was adopted;
- The publication of the received data on the main site of the ENTSO-E Transparency Platform (by sections) is ensured;

Bringing the rules of access to the capacity of interstate electrical networks of Ukraine into compliance with EU legislation (Pursuant to Article V.1.341, in order to implement the provisions of Regulation No. 714/2009):

- A normative legal act on conducting electronic auctions for the distribution of capacity of interstate power grids of Ukraine was adopted;

Ensuring a transparent price and tariff policy in the field of electricity (Pursuant to Article V.1.341, in order to implement the provisions of Directive No. 2009/72/EC; Regulation No. 714/2009)

- A methodology of incentive tariff formation was adopted;

- A normative legal act regarding the parameters of price regulation and tariffs in the field of electricity was adopted;
- A normative legal act was adopted on the creation of a system of providing state support to a vulnerable category of consumers [There is no specially developed procedure, but there is such a legal act].

Planning the development of the unified energy system (Pursuant to Article V.I.341, in order to implement the provisions of Directive No. 2009/72/EC; Regulation No. 714/2009):

- The procedure for preparing the transmission system development plan for the next ten years was approved;
- The transmission system development plan for the next ten years was approved [annually];
- A monitoring mechanism for ensuring the implementation of the transmission system development plan for the next ten years has been implemented.

Joining the mechanism for financial compensation of the costs of the operator of the internal electricity transmission system for the placement of cross-border electricity flows within the energy system of continental Europe ENTSO-E (Pursuant to Article IV.II.278, in order to implement the provisions of Regulation No. 838/2010 / Third energy package):

- The procedure for determining the value of losses in the transmission system (Value of losses for ITC)* was approved;

* In this regard, the Report on the implementation of the action plan indicates that by letter No. 01/37271 dated September 13, 2018, SE NEC "Ukrenergo" sent to the NEURC a draft regulatory document on the approval of the Procedure for providing the operator of the transmission system with compensation to cover losses arising from the cross-border transmission of electricity. **However, the Order itself cannot be found.**

Creation of a mechanism for approval of priority Projects of Energy Community Interest (PECI) in the field of electricity, natural gas and oil within the framework of the Energy Community (Pursuant to Article V.I.341, Annex XXVII, in order to implement the provisions of Regulation No. 347/2013 /Third energy package):

- A coordinating body for the creation of a mechanism for approving priority Projects of Energy Community Interest (PECI) in the field of electricity, natural gas, and oil within the framework of the Energy Community has been determined;
- A list of projects of common interest was developed by Ukraine, worked out with interested parties, and approval of the list by the Ministerial Council of the Energy Community was ensured*

*During the Council of Ministers of the Energy Community, which took place on November 29, 2018 in Skopje, Republic of Macedonia, the list of projects of common interest of the Energy Community was adopted by decision D/2018/11/MC-EnC. The mentioned list includes the following projects that will take place on the territory of Ukraine:

- in the gas sector "Transbalkan Pipeline";

- in the oil sector, the Ukraine-Poland oil pipeline project “Brody-Adamova zastava”.

Also, by decision R/2018/1/MC-EnC, a list of projects of mutual interest (PMI) was published, in particular, the following projects from Ukraine were included in this list:

- in the gas sector: “Construction of the gas pipeline-interconnector Poland-Ukraine”;
- in the field of electric power: “Restoration of the existing interstate line Velke Kapushany (SK) - Mukacheve (UA)” and the project “Restoration and rehabilitation of the 750 kV substation of Yuzhno-Ukrainian NPP - Isakcha”;
- in the oil sector: “Southern Friendship”.

Experts of SEnS, together with consultants, carry out the preliminary selection of candidate projects (PECI, PMI), working out the relevant issues in close cooperation with the relevant ministries and agencies of the applicant countries.

Separation and Certification of the Transmission System Operator (Pursuant to Article V.I.34I, Annex XXVII, in order to implement the Article 9 (1) of Directive No. 2009/72/EC):

- A regulatory act* + Approval from the Cabinet of Ministers of Ukraine regarding the corporatization of the state enterprise “NEC Ukrenergo” was adopted;
- The procedure for certification of the operator of the electric energy transmission system was approved;
- The procedure for obtaining the license for activity by the operator of the electric energy transmission system has been elaborated.

*This is an Order of the Ministry of Finance dated February 15, 2019 No. 73 “On the transformation of the state-owned enterprise “National Energy Company “Ukrenergo”, but for some reason, it is not publicly available. There are only mentions of him.

Establishment of a market operator and a Guaranteed Buyer of electricity (Pursuant to Article V.I.34I, Annex XXVII, Article 9 (1) of Directive No. 2009/72/EU) Formed state enterprise performing the functions of a guaranteed electricity buyer;

- Created a joint-stock company performing the functions of an electricity market operator.

Ensuring the implementation of a new model of functioning of the electricity market (Pursuant to Article V.I.34I, Annex XXVII, in order to implement the provisions of Directive No. 2009/72/EU; Regulation No. 714/2009):

- Relevant legal acts have been developed in accordance with organization plan for the preparation of draft acts necessary to ensure the implementation of the Law of Ukraine “On Electricity Market”***.

***A list of such items is given at the end of this paragraph 2.1.

Demarcation of functions of supply and distribution of electric energy by participants in the electricity market (In pursuance of Article V.1.341, Annex XXVII, in order to implement the provisions of Directive No. 2009/72/EC):

- An appropriate normative legal act has been developed regarding the procedure for drawing up and approving the distribution system operator's compliance program with established requirements.

Ensuring the implementation of EU Regulation No. 838/2010 (Pursuant to Article 338, Annex XXVII, in order to implement the provisions of Regulation No. 838/2010):

- Developed and adopted draft of the normative legal act on the implementation of the requirements of EU Regulation No. 838/2010.

In order to implement Regulation No. 543/2013 (Pursuant to Article 338, Annex XXVII):

- (the task "Legislative consolidation of the procedure for providing the operator with information on electricity markets and its publication") - A draft* of regulatory act on the procedure for providing the transmission system operator with certain information on electricity markets, in particular on balancing, and its publication was developed and approved;
- (the task "Determining information about the total load, which is provided to the information platform for publicizing data on the electricity market of Ukraine") - Developed and approved draft* of regulatory act on the procedure for providing and publishing information on the total load, on the unavailability of consumption units, which is provided to the information platform for publishing data on the electricity market of Ukraine;
- (the task "Determining the obligation of the transmission system operator to provide the NCRECP with forecasting indicators for the year ahead") - A draft* of the normative legal act regarding the obligation of the system operator to provide the NCRECP with forecasting of indicators for the year ahead was developed and approved;
- (the task "Determining the obligation of transmission system operators to provide information on the transfer of infrastructure and on the impossibility of its transfer") - A draft* the normative legal act regarding the obligation of transmission system operators to provide the NCRECP with information on the transfer of infrastructure and on the impossibility of its transfer was developed and approved;
- (the task "Determining the obligation of transmission system operators to provide information on congestion management measures") - A draft* of the regulatory act regarding the obligation of transmission system operators to provide information on congestion management measures was developed and approved;
- (the task "Determining the obligation of transmission system operators to provide information about the generation forecast, the absence of generation and production units, and the actual generation") - Developed and approved draft of the regulatory act on the obligation of transmission system operators to provide information on the generation forecast, the absence of generation and production units, and the actual generation.

* Identical legal act.

In order to implement Regulation No. 2016/1952 (Pursuant to Article 338 of the Agreement, Annex XXVII):

- (the task “Determining the procedure for the transfer of statistical data on natural gas and electricity prices to the competent authority”) - The project was developed and adopted regulatory act* regarding the procedure for transferring statistical data on natural gas and electricity prices to another interested central body of the executive power;
- (the task “Legislative consolidation of the provision regarding the periodicity of providing statistical data on natural gas and electricity prices”) - The project was developed and adopted regulatory act* regarding reporting periods and the frequency of transmission of statistical data on natural gas and electricity prices to the central executive body;
- (the task “Determining the obligation to ensure the reliability of statistical data on natural gas and electricity prices”) - The project was developed and adopted regulatory act* regarding the duty of the competent authority to ensure the reliability and relevance of statistical data on natural gas and electricity prices and their distribution within the established period.

*Identical legal act.

In order to implement the provisions of Commission Regulation (EU) No. 2016/1388 (In pursuance of Article 337, Annex XXVII):

- (the task “Bringing the terminology regarding the requirements for connecting electrical installations to networks in compliance with EU law”) - Developed and adopted legal act* on amendments to some legislative acts of Ukraine regarding the definition of concepts and terms regarding the requirements for connecting electrical installations to networks*
Note: valid during the period of martial law in Ukraine decree about the peculiarities of temporary connection of electrical installations to the distribution system;
- (the task “Application of requirements and provisions for connection to the trunk network in accordance with EU law”) - Developed and adopted draft* of normative legal act regarding the requirements and provisions for connection to the main network of energy consumption facilities and electrical installations in accordance with EU law;
- (the task “Establishing general requirements for energy consumption facilities, distribution facilities and distribution networks connected to the main network”) - Developed and adopted project of the normative legal act regarding the general requirements for connection to the main network of energy consumption objects, distribution objects and distribution networks, regarding the relevant frequency ranges and voltage ranges and time periods of their operation;
- (the task “Fixing the order of operational notice on the permission to join a new energy consumption object, a new distribution object and a new distribution network”) - Developed and adopted draft of the normative legal act regarding the procedure for prompt notification of permission to connect each new power consumption object connected to the main network, new distribution object and each new distribution network, including notifications of permission to supply voltage (EON); on the temporary permit for operation (ION) and on the final permit for operation (FON);
- (the task “Establishment of general requirements for the connection of electrical installations of consumers, energy consumption facilities and closed distribution networks regarding the provision of demand management services to relevant system operators and trunk network operators (OMM)”) - Developed draft regulatory act on establishing general requirements for the connection of electrical installations of consumers, energy consumption facilities and closed distribution networks in terms of providing demand management services to relevant

- system operators and relevant trunk network operators (OMM);
- (the task “Fixing the order of operational notification for electrical installations of consumers at the facility of energy consumption or closed distribution network, connected at a voltage level of more than 1000 V (or below)”) - Developed and approved draft of the normative legal act on the procedure of prompt notification for electrical installations of consumers at the energy consumption facility or in the closed distribution network, connected at a voltage level of 1000 V or below and at a level of more than 1000 V;
- (the task “Establishing the obligation to monitor the responsibility of the owner of the energy consumption facility, operators of distribution networks and closed distribution network; procedures for testing, modeling and compliance control”) - Developed and approved draft regulatory act on the control of the responsibility of the owner of the energy consumption facility, operators of distribution networks and closed distribution network; regarding the procedure for compliance testing and information exchange; regarding verification of conformity by simulation modeling and control of conformity of energy consumption objects and distribution objects;
- (the task “Establishment of norms regarding non-binding instructions and relevant provisions of monitoring of the execution of contracts by regulatory bodies”) - Developed and adopted draft regulatory act on the possibility of introducing non-binding instructions (explanation of technical issues, conditions and interdependence), relevant provisions and rules for monitoring the performance of contracts and agreements by regulatory bodies.

* an identical legal act

In order to implement the provisions of Commission Regulation (EU) No. 2016/631 (In pursuance of Article 337, Annex XXVII):

- (the task “Bringing the terminology regarding the requirements for connecting generating units to the network in accordance with EU norms”) - A draft law on amendments to some legislative acts of Ukraine regarding the definition of concepts and terms related to the requirements for connecting generating units to the network was developed and adopted;
- (the task “Fixing the requirements for joining for generating units”) - Developed draft of the normative legal act regarding the technical requirements for the connection for the specified generating units and setting the limit of threshold values for them (in kV or MW);
- (the task “Establishing general requirements for generating units of various types”) - Developed and approved draft regulatory act on general requirements for generating units of various types (A, B, C, D);
- (the task “Establishment of requirements for synchronous generating units”) - Developed and approved draft regulatory act on requirements for synchronous generating units;
- (the task “Establishing requirements for power center units and power center marine modules”) - Developed and approved draft of the normative legal act regarding the requirements for the energy center units and regarding the requirements for the marine units of the energy center;
- (the task “Establishing the obligation to monitor the compliance of generating units with the requirements of Regulation No. 2016/631, conducting testing and modeling”) - Developed and approved draft of the normative legal act on monitoring the compliance of generating units with the requirements of Regulation No. 2016/631, on conducting testing of generating units and modeling.

In order to implement the provisions of Commission Regulation No. 2016/1447 (Pursuant to Article 337, Annex XXVII):

- (the task “Reducing the terminology regarding the general requirements for connection to the network of high-voltage direct current systems and connection of power center units in accordance with EU regulations”) - Developed and adopted Law on amendments to some legislative acts of Ukraine regarding the definition of concepts and terms in the field of connection to the network of high-voltage direct current systems and regarding the connection of energy center units in accordance with EU norms;
- (the task “Establishment of rules for existing high-voltage direct current systems and connected units of the power center”) - Developed and adopted draft of the normative legal act on application to existing high-voltage direct current systems and connected units of the energy center;
- (the task “Consolidation of requirements for regulation of active power and maintenance of frequency and reactive power and maintenance of voltage”) - Developed and adopted draft regulatory act regarding requirements for active power regulation and frequency maintenance and requirements for reactive power and voltage maintenance;
- (the task “Establishment of provisions on the ability of high-voltage direct current systems and connected units to undergo damage without disconnection from the network, requirements for protective devices and requirements for restoring operation”) - Developed and adopted draft regulatory act regarding requirements for the ability of high-voltage direct current systems and connected units to withstand damage without disconnection from the network, requirements for protective devices and protection schemes, requirements for restoring the power system operation mode;
- (the task “Fixing the requirements for connected units of the power center and converting substations of high-voltage direct current systems”) - Developed and adopted draft regulatory act regarding requirements for connected units of the power center and requirements for converting substations of high-voltage direct current systems at the remote end of the system;
- (the task “Establishing the rules of information exchange and the procedure for prompt notification of granting permission to connect”) - Developed and adopted draft of the normative legal act on the rules of information exchange and the procedure for prompt notification of the granting of permission to connect.

Planning and ensuring the connection of the unified energy system of Ukraine to the energy system of continental Europe ENTSO-E (Pursuant to Article V.1.341 of the Agreement, Annex XXVII, in order to implement the provisions of Directive No. 2009/72/EC; Regulation No. 714/2009):

- An Agreement* on the unification of the energy systems of Ukraine and Moldova with the continental European energy system ENTSO-E was concluded;
- Synchronous connection of the unified energy system of Ukraine to the energy system of continental Europe ENTSO-E has been ensured.

* The text of the Agreement is not publicly available.

*****Regarding the task “development of relevant drafts of normative legal acts in accordance with the organization plan for the preparation of draft acts necessary to ensure the implementation of the Law of Ukraine “On the Electric Energy Market”:**

In order to transition to the new electric energy market, a number of normative legal acts of secondary legislation had to be developed, adopted and implemented, for the development of which the Ministry of Energy and Coal has been designated as responsible.

Currently, in accordance with the Law of the **Ministry of Energy and Coal**, the following normative legal acts of the Ministry of Energy and Coal have been developed:

- Resolution of the Cabinet of Ministers of Ukraine dated February 14, 2018 No. 77 “Some issues of the State Energy Supervision Inspection of Ukraine”;
- Resolution of the Cabinet of Ministers of Ukraine dated April 18, 2018 No. 324 “On Approval of the Procedure for the provision of temporary support to producers carrying out combined production of electricity and thermal energy at thermal power plants”;
- Resolution of the Cabinet of Ministers of Ukraine No. 325 of April 18, 2018 “On the formation of the Commission for the preparation of an opinion on the expediency of providing temporary support to manufacturers engaged in the combined production of electricity and thermal energy at thermal power plants”;
- Resolution of the Cabinet of Ministers of Ukraine dated 04.07.2018 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 the departmental military guard”;
- Order of the Ministry of Energy and Coal dated August 27, 2018 No. 448 “On approval of the Rules on the safety of electric energy supply”, which was registered with the Ministry of Justice of Ukraine on September 19, 2018 under number 1076/33528.
- Resolution of the Cabinet of Ministers of Ukraine dated 12.12.2018 No. 1055 “On approval of the Procedure for conducting a competition to determine a universal service provider”;
- 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”;
- Decree of the Cabinet of Ministers of Ukraine dated 12.12.2018 No. 1023-r “On the designation of the State Enterprise of Foreign Economic Activity “Ukrinterenergo” as a supplier of “last hope”;
- Order No. 539 of the Ministry of Energy and Coal dated October 26, 2018; “On the approval of the Procedure for the formation of the forecast balance of electric energy of the unified energy system of Ukraine for the accounting year”, which was state registered in the Ministry of Justice of Ukraine on 11/20/2018 under number 1312/32764;
- Resolution of the Cabinet of Ministers of Ukraine dated December 27, 2018 No. 1209 “Some issues of electricity supply to protected consumers and recognition of certain resolutions of the Cabinet of Ministers of Ukraine as having lost their validity”;
- Draft law “On measures aimed at repayment of the debt, which was formed on the wholesale market of electric energy”;
- Order of the Cabinet of Ministers of Ukraine dated March 27, 2019 No. 200-r “On Amendments to Order of the Cabinet of Ministers of Ukraine dated December 12, 2018 No. 1023”.

Developed draft of normative legal act:

- the draft resolution of the Cabinet of Ministers of Ukraine “On approval of the Procedure for performance of work by third parties in the territory of the prohibited zone of hydrotechnical structures”, which was sent to the Government for consideration on 10.08.2018.

In order to resolve legislative conflicts, amendments to the Law of Ukraine “On Electricity Market” were developed by Ministry of Energy and Coal and sent to the Committee of the Verkhovna Rada of Ukraine on Fuel and Energy Complex, Nuclear Policy and Nuclear Safety by letter No. BP/1-29-566 dated February 26, 2019.