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NATIONAL ENERGY AND CLIMATE PLAN for the period until 2030

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LIST OF ABBREVIATIONS

aFRR	Automatic Frequency Restoration Reserve
CCR	Capacity calculation region
CNG	Compressed natural gas
DLR	Dynamic Line Rating
ENTSO- E	European Network of Transmission System Operators for Electricity
ENTSOG	European Network of Transmission System Operators for Gas
GDP	Gross domestic product
GDS	Gas distribution system
GTS	Gas transportation system
HFC	Hydrofluorocarbons
HPP	Hydropower plant
JCM	Joint Crediting Mechanism
LCP	Large combustion plants
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
NPP	Nuclear power plant
PSHP	Pumped-storage hydropower plant
RES	Renewable energy sources
SAIDI	System Average Interruption Duration Index
Spent fuel	Used nuclear fuel
TEN- E	Trans-European energy networks
TIMES	Model generator -*The Integrated MARKAL-EFOM System*
TYNDP	10-year-old plan development networks EU (Union-wide Ten-Year Network Development Plan)
VVER -1000	Pressurized light water energy reactor with nominal electric power 1 000 megawatt
WAM	Scenario with additional policies and measures
WAMS	*Wide Area Monitoring System*)
WEM	Scenario with existing policies and measures
WPP	Wind power plant
cPPA	Corporate Power Purchase Agreement

ICE	Internal combustion engine
ESCO	Energy service company
ESU	Energy strategy of Ukraine until 2050 year, approved by the Order of the Cabinet of Ministers of Ukraine dated April 21, 2023 No. 373 (hereinafter referred to as the Energy Strategy of Ukraine until 2050)
EBRD	European Bank Reconstruction and Development
LULUCF	Land use, land use change and forestry
IEPF NASU	SO"Institute for economy and forecastingof the NAS of Ukraine"
CF	Capacity factor
IEA	International energy agency
mln	Million
bln	Billion
NDC	Nationally determined contribution of Ukraine
NES	National economic strategy till 2030
NEURC (Regulator)	National energy and utilities regulatory commission
NECP	National energy and climate plan till 2030
Refinery	Oil refining plant
NERP	National Plan for Reducing Emissions from Large Combustion Plants
NWMP	National waste management plan
NTSU	National transport strategy of Ukraine
EIA	Environmental impact assessment
OGDS	Operator of gas distribution system
OGTS	Operator of gas transmission system
Local government	Local government bodies
IPS	Integrated power system of Ukraine
CIF	critical infrastructure facilties
UN	United Nations Organization
OUGS	Operator of gas storage facilities
TSO	Transmission system operator
DSO	Distribution system operator
HW	Household waste
GHG	Greenhouse gases
VAT	Value added tax
Tax code	Tax code of Ukraine

TSDP	10-years transmission system development plan
UGS	Underground gas storage
PSO	Public service obligation
EPR	Extended producer responsibility
UNFCCC	United Nations Framework Convention on Climate Change
RCC	Regional coordination center
RNBOU	Council national security and defense Ukraine
FCR	Frequency containment reserve
SEA	Strategic environmental assessment
SPP	Solar power plant
TPP	Thermal power plant
CHP	Combined heat and power plant
toe	Tonne of oil equivalent
ESS	Energy storage system

SECTION A. NATIONAL PLAN

1. OVERVIEW AND PROCESS FOR ESTABLISHING THE PLAN

1.1. Executive summary

1.1.1. Political, economic, environmental, and social context of the plan

The NECP is a strategic document aimed at harmonizing energy and climate policies to ensure sustainable development and economic recovery in Ukraine.

The preparation of the NECP is an obligation of Ukraine within the framework of the Treaty establishing the Energy Community in accordance with the requirements of the Regulation of the European Parliament and of the Council (EU) 2018/1999 of 11 December 2018 on the Governance of the Energy Union and Climate Change Mitigation, amending Regulations (EC) No 663/2009 and (EC) No 715/2009, Directives of the European Parliament and of the Council 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU,
Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (hereinafter referred to as Regulation (EU) 2018/1999). The NECP was initially developed in accordance with the Decrees of the President of Ukraine dated November 8, 2019 No 837 and dated March 23, 2021 No. 111. In addition, the development and approval of the NECP was a condition for the distribution of EU financial assistance under the Ukraine Facility. The NECP was updated in accordance with paragraph 3 of the Order of the Cabinet of Ministers of Ukraine dated June 25, 2024 No. 587-r.

The NECP was prepared in accordance with the clear requirements of the Regulation (EU) 2018/1999, Article 10 of the Law of Ukraine No. 3991-IX of October 8, 2024 "On the Basic Principles of State Climate Policy", the Procedure for the Preparation of the National Energy and Climate Plan approved by the Resolution of the Cabinet Ministers of Ukraine dated January 2, 2026. No. 3, as well as taking into account the experience of preparing similar documents by the EU Member States and the Contracting Parties of the Energy Community and previous developments. Development of the draft NECP and its update was carried out by a group of leading experts from the DiXi Group analytical center and the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine with the support of the British Embassy, and in terms of modeling, also by the US initiative Net Zero World.

On the part of the Government of Ukraine, the development of the NECP is coordinated by the Ministry of Economy. By the Cabinet of Ministers of Ukraine Resolution dated August 19, 2023 No. 924 (Official Gazette of Ukraine, 2023 p., No. 84, p. 4855), an Interdepartmental Working Group was established to prepare proposals and recommendations for the development of the National Energy and Climate Plan, which includes all key ministries and departments.

At the same time, the full-scale invasion of Ukraine by the Russian Federation has a serious impact on Ukraine’s economy, in particular the energy sector. One of the most important aspects is the destruction of critical infrastructure facilities as a result of hostilities, which causes significant disruptions in the supply of electricity and gas, as well as disrupts the operation of district heating system. Further attacks on critical infrastructure facilities could lead to an aggravation of the energy crisis and restrictions on access to key resources. In addition, hostilities affect the provision of labor and the activities of enterprises.

Overall, from the beginning of the full-scale invasion until the beginning of the autumn-winter period of 2025/2026, more than 50% of the available generating capacity and transformer substations of the transmission system were temporarily lost (damaged and occupied). According to the assessment of the Kyiv School of Economics (KSE)[1] in line with the World Bank methodology, as of December 2024, as a result of the full-scale invasion of the Russian Federation into the territory of Ukraine, the energy sector suffered direct losses and indirect financial losses on amount almost 93 billion dollars, while the recovery needs, which include the complete reconstruction of destroyed facilities in line with the principle “build back better”, amount to 68

[1] https://documents1.worldbank.org/curated/en/099022025114040022/pdf/P180174-ca39eccd-ea67-4bd8-b537-ff73a675a0a8.pdf

billion dollars. About half of the high-voltage substations of the electricity transmission system were damaged, virtually all oil refineries and a significant part of the infrastructure for storing oil and oil products were destroyed. As a result of the full-scale invasion of Ukraine by the Russian Federation since February 2022, natural gas and electricity consumption has significantly decreased (-33.8% in 2024 compared to 2021)[2], natural gas production has decreased (-6.7% in 2022 compared to 2021).

As of June 2025, environmental damage from the war had reached almost €108 billion from over 9,000 cases of environmental destruction.[3] The prosecution authorities were investigating (as of July 2024) 209 criminal proceedings concerning 367 war crimes against environment[4] and 14 of them were previously classified as ecocide[5] (Article 441 of the Criminal Code of Ukraine).

The energy and fuel consumption sectors also suffered significant damage and losses. According to DAMA4, direct damage to buildings and infrastructure amounted to about US$176 billion. The housing sector (over US$57 billion, or 33% of the total damage) and the transport sector (over US$36 billion, or 21%) were the most affected, while the trade and industry sectors also suffered losses (over US$17 billion, or 10%)[6].

At the same time, the process of post-war recovery and reconstruction of damaged infrastructure poses additional challenges for climate policy. According to estimates[7], the recovery of destroyed facilities could cause additional emissions of about 73.3 million tons of $CO_{2\text{-eq.}}$ In this context, the issue of low-carbon reconstruction becomes strategically important to ensure the coherence of short-term recovery measures with long-term goals of reducing emissions and achieving climate neutrality.

Thus, key problems of the NECP development and implementation are:

- The continuation of hostilities and the need to take into account their consequences, uncertainty about the scale of the destruction caused and the pace of recovery, which directly affect the possibility of implementing certain identified policies and measures, the pace of their implementation and success;
- Economic recession and the associated decline in real incomes of the households, leading to political reluctance to apply market mechanisms pricing of energy resources and related services, as well as practical difficulties in identifying vulnerable consumers;
- Weakened capacity of state institutions to simultaneously carry out crisis management in war-time conditions together with execution their own key functions in development and implementation of public policy in the fields of energy and climate, especially taking into account the challenge of reforming them in accordance with the requirements of EU law;
- Accumulated large-scale arrears in natural gas and electricity supply chains, which requires comprehensive regulation at the state level;
- Limited investment capacity of the energy sector in conditions of full-scale war, due to high security risks, instability of demand and income forecasts, limited access to long-term financing, as well as the need to apply special risk reduction mechanisms (de-risking) to attract capital;
- Losses and exhaustion of human capital in the energy sector because of war, mobilization, migration and long-term crisis load which restricts the ability to planning, implementing complex projects and implementing reforms.

1.1.2. *Strategy relating to the five dimensions of the Energy Union*

[2] https://www.nerc.gov.ua/storage/app/sites/1/Docs/Byuleten_do_richnogo_zvitu/broshura_do_richnogo_zvitu_nkrekp-2024.pdf
[3] https://mepr.gov.ua/svitlana-grynchuk-zbytky-dovkillyu-vid-vijny-vzhe-syagayut-108-mlrd-yevro-vidnovlennya-ye-pytannyam-ne-lyshe-natsionalnoyi-bezpeky-ale-j-bezpeky-vsogo-kontynentu/
[4] https://ecoaction.org.ua/vijna-ta-shkoda-dlia-dovkillia-prytiahtuny-rosiu.html
[5] https://interfax.com.ua/news/general/1026087.html
[6] https://documents1.worldbank.org/curated/en/099052925103531065/pdf/P180174-93c8e8c1-83a2-487d-aaec-a8435f9db418.pdf
[7] https://en.ecoaction.org.ua/wp-content/uploads/2026/02/climate-damage-rusagression_48months_en-2s.pd

Ukraine has a well-developed legal and regulatory framework, as well as a fairly broad set of policies and measures in the energy, climate and related areas. Both at the national and regional levels (within the Energy Community), Ukraine has identified key objectives by 2030, including:

- Reduction of greenhouse gases emissions by more than 65% compared to1990 levels;
- The share of renewable energy sources in the structure gross final energy consumption of at least 27%;
- Primary consumption energy not more 59,382 million t not., final consumption energy – 38.073 million tons of equivalent;
- Expected saving energy in buildings organs state authorities not Less 11.5 tons of CO/year;
- Decrease in import dependence (gross imports in general primary energy supply) up to 33%;
- Deepening diversification sources and ways supply energy resources - not more than 30% from one supplier;
- Complete and comprehensive integration of electricity and natural gas markets of Ukraine with the European market;
- Market-based pricing on energy markets with mechanisms to support vulnerable consumers;
- Development and financing innovations and research in sector clean technologies, renewable energy and low-carbon production;
- Increase of competitiveness.

Further, Ukraine introduced a target for achieving climatic neutrality by 2050.

At the same time, issues of completeness (sufficiency), relevance and harmonization of policies and measures aimed at achieving key strategic goals come to the fore, especially given the need to build a full-fledged climate governance architecture taking into account sustainable corporate governance standards. Actually, the NECP aims to align energy and climate policies, fill gaps, and adjust the content of individual measures to achieve defined goals.

A detailed overview of key energy and climate policies and measures related to the five dimensions of the Energy Union is presented in Section 1.2.2. The modelling scenarios were developed in accordance with the requirements of Regulation (EU) 2018/1999, taking into account the specificities of public administration in Ukraine (see Annex 1 for details).

1.1.3. *Overview table with key objectives, policies and measures of the plan*

Dimension	Objectives	Existing policies and measures (WEM scenario)	Additional policies and measures (WAM scenario)
Decarbonization	• Reduction of greenhouse gases emissions by more than 65% compared to1990 levels by 2030 year • Climatic neutrality by 2050 • Decommissioning of a coal-fired power plants by 2035 • Reduction of methane emissions by 30% by 2030 from 2020 levels • Strengthening the adaptive capacity and resilience to climate change of social, economic and environmental systems • The share of renewable energy sources in the structure of gross final energy consumption should be not less than 27% in 2030 • Share of alternative energy sources (renewable energy sources and secondary energy resources) in the heat generation in 2035 – 40% • Reduction of total greenhouse gas emissions by 2030 by road, air, water and rail transport up to 33% from the 1990 level or up to 90% of the 2021 level (approximately up to 23 million tons CO_2-eq.) due to significant increase in the use of electricity for	PM_D_WEM_01 Environmental tax on carbon dioxide emissions PM_D_WEM_02 Action Plan for the Implementation of Ukraine's Climate Policy within the Framework of Participation in the Global Methane Pledge Initiative to Reduce Methane Emissions PM_D_WEM_ 03 Increase of fuel excise tax rates to the minimum level in the EU PM_D_WEM_04 Promoting the development of organic crop production PM_D_WEM_05 Increasing the forest cover in Ukraine PM_D_WEM_06 Development of horticulture PM_D_WEM_07 Demining and restoration of forests the combat actions PM_D_WEM_08 "Green" tariff for electricity producers from renewable energy sources PM_D_WEM_09 Incentive tariff for thermal energy from renewable sources PM_D_WEM_10 Tax benefits for the import of equipment that operates on renewable energy PM_D_WEM_11 Feed-in-premium mechanism for electricity producers from RES PM_D_WEM_12 Direct power purchase and sale contracts between producers and end energy consumers PM_D_WEM 13 "GreenDIM" Programme of the Energy Efficiency Fund PM_D_WEM_14 Program "Energy independence of individuals - household owners" PM_D_WEM_15 Auction system for allocation of support quota for RES PM_D_WEM_16 Guarantees of origin of electricity from renewable energy sources PM_D_WEM_17 Stimulating the use of liquid biofuels (biocomponents) in the transport sector	PM_D_WAM_01 National Plan for Reducing Emissions from Large Combustion Plants PM_D_WAM_02 National GHG Emissions Trading System PM_D_WAM_03 Implementation of the carbon crediting mechanism PM_D_WAM_04 Implementation of measures to reduce emissions of ozone-depleting substances and fluorinated greenhouse gases PM_D_WAM_05 Implementation of climate-smart agriculture PM_D_WAM_06 Improvement of manure management systems and biogas production PM_D_WAM_07 Development of agroforestry PM_D_WAM_08 Implementation of climate-smart forestry PM_D_WAM_09 Nationwide targeted programme on the use and protection of land PM_D_WAM_10 Establishing a peatland management system PM_D_WAM_11 Simplification of land conservation procedures PM_D_WAM_12 Implementation of measures for waste prevention PM_D_WAM_13 Promoting the practice of reusing household waste components PM_D_WAM_14 Promoting household waste recycling practices PM_D_WAM_15 Promoting practices of biological treatment of organic components of household waste PM_D_WAM_16 Promoting the practice of thermal treatment of household waste PM_D_WAM_17 Increasing the volume of disposal (recovery and flaring) of biogas at landfills PM_D_WAM_18 Introduction of electronic trade in solid biofuels PM_D_WAM_19 Development of the energy crops sector PM_D_WAM_20 Mapping of areas required for achievement national target indicator and national contribution to the objectives of the Energy Community, introducing zones for accelerated development of renewable energy sources and simplification of permitting procedures PM_D_WAM 21 Introduction of sustainability criteria for

			biofuels, bioliquids and biomass fuels PM_D_WAM_22 Establishment of a legislative and regulatory framework to stimulate the use of biomethane as a motor biofuel in the transport sector PM_D_WAM_23 Establishment of a legislative and regulatory conditions for the development offshore wind energy PM_D_WAM_24 Risk reduction mechanism for investments in renewable energy sources

	electric vehicles, as well as alternative and renewable fuels for rolling stock of the relevant transport sectors	PM_D_WEM_18 Hydropower development program for the period until 2035 PM_D_WEM_19 Implementation of a policy for just transition of Ukraine's regions dependent on fossil fuels and carbon-intensive industries PM_D_WEM_20 Implementation of climate change adaptation policies at the national and local levels PM_D_WEM_21 Tax benefits for transport vehicles equipped with electric motors PM_D_WEM_22 Promoting the development of electric charging infrastructure PM_D_WEM_23 Stimulating the development of low-carbon municipal transport	
Energy efficiency	● Primary energy consumption in 2030 should not exceed 59 382 thousand t AD, and final energy consumption – 38,073 thousand tons AD. ● Cumulative end-use energy savings for 2021-2030 years should be at least 16,720 thousand tons of CO. ● The expected energy savings in government buildings are at least 11.5 t CE/year	PM_EE_WEM_01 Energy Efficiency Fund PM_EE_WEM_02 State Decarbonization and Energy Efficiency Transformation Fund PM_EE_WEM_03 State target economic program to support thermal modernization of buildings until 2030 PM_EE_WEM_04 Energy service in the public sector PM_EE_WEM_05 Minimum energy performance requirements for buildings PM_EE_WEM_06 Nearly zero-energy buildings PM_EE_WEM_07 Energy performance certification of buildings and inspection of building technical systems PM_EE_WEM_08 Exemplary role of public bodies' buildings PM_EE_WEM_09 National base data energy and operational characteristics of buildings PM_EE_WEM_10 Energy management in public authorities PM_EE_WEM_11 Energy management in local authorities	PM_EE_WAM_01 Energy efficiency obligation scheme PM_EE_WAM_02 Assessment of the energy efficiency potential of the gas transportation system, electricity transmission system, gas distribution system, electricity distribution system PM_EE_WAM_03 National action plan for modernization and decarbonization of district heating systems PM_EE_WAM_04 Improving the model of state regulation in the field of heat supply PM_EE_WAM_05 Settlement of debts of heat supply enterprises for consumed natural gas PM_EE_WAM_06 Assessment of the potential for the application of high-efficiency cogeneration and efficient district heating

		PM_EE_WEM_12 Local Energy Plans PM_EE_WEM_13 Regional offices decarbonization and energy efficiency (one-stop shops) PM_EE_WEM_14 Energy efficient procurements PM_EE_WEM_15 Energy labelling and ecodesign PM_EE_WEM_16 Energy audit of large enterprises PM_EE_WEM_17 Confirmation of the qualifications of energy auditors PM_EE_WEM_18 Smart metering PM_EE_WEM_19 Regulation of combined heat and power production (cogeneration) PM_EE_WEM_20 Heat supply schemes PM_EE_WEM_21 Qualification of cogeneration units PM_EE_WAM_22 Guarantees of origin of electricity produced by a high-efficiency cogeneration unit PM_EE_WEM_23 Heat metering PM_EE_WEM_24 State target Economic program for the energy modernization of heat-producing enterprises in state or municipal ownership until 2030 PM_EE_WEM_25 State target economic program for the energy modernization of water supply and wastewater utilities in state or municipal ownership until 2030 PM_EE_WEM_26 Promotion of heat pump deployment	
Energy security	● Reducing import dependence (gross imports in the PPE) up to 33% ● Deepening the diversification of sources and routes of energy supply from third countries • ensuring diversification supplies on a level not more 30% from one supplier, • reducing the share of one supplier in the nuclear fuel market to 60% ● Increasing the flexibility of national energy system ● Addressing energy supply constraints or disruptions to increase resilience	PM_ES_WEM_01 Development of routes for the imports of petroleum products and natural gas PM_ES_WEM_02 Creation of fuel assembly manufacturing capacities to meet at least 50% of the needs of Ukrainian NPPs with VVER-1000 reactors PM_ES_WEM_03 Creation of gas reserves (achieving the target level of gas storage facilities' filling) PM_ES_WEM_04 Creation of coal and backup fuel (fuel oil) reserves PM_ES_WEM_05 Creation of minimum stocks of crude oil and petroleum products PM_ES_WEM_06 Implementation of the first standard of conduct for gas infrastructure facilities (N-1 Standard), standards of conduct for gas suppliers PM_ES_WEM_07 Implementation of the minimum criteria for the security of electricity supply PM_ES_WEM_08 Experiment on the construction, repair and other engineering and technical measures for the protection of CIF in the fuel and energy sector PM_ES_WEM_09 Financial reserve for the decommissioning	PM_ES_WAM_01 Incentives for increasing gas production for maximum self-sufficiency PM_ES_WAM_02 Restoration of oil refining and/or construction of a new refining complex PM_ES_WAM_03 Creation of fuel assembly manufacturing capacities to meet all of the needs of Ukrainian NPPs with VVER-1000 reactors PM_ES_WAM_04 Development of uranium production PM_ES_WAM_05 Implementation of EU rules on security of electricity and gas supply PM_ES_WAM_06 Ensuring cyber protection of the CIF in fuel and energy sector PM_ES_WAM_07 Creation of backup power sources for CIF, including using distributed renewable energy generation

		of nuclear installations PM_ES_WEM_10 Management of spent nuclear fuel (SNF) and radioactive waste (RAW)	
Internal energy market (common objectives, policies and measures)	● Comprehensive integration with European energy markets ● Market-based energy pricing for all categories of consumers ● Energy market customer protection and combatting energy poverty ● Development of competition in energy markets	PM_IM_WEM_01 Current procedures for planning of energy infrastructure development PM_IM_WEM_02 Ensuring the independence of the National Energy and Utilities Regulatory Commission (NEURC) PM_IM_WEM_03 Provision of targeted subsidies for partial compensation for the costs of paying for housing and communal services PM_IM_WEM_04 Regulation and liberalization of retail energy prices PM_IM_WEM_05 Supplier of last resort and universal service supplier PM_IM_WEM_06 Ensuring consumer access to important information PM_IM_WEM_07 Application of price comparison tools PM_IM_WEM_08 Ensuring the consumer's right to free choice supplier and effective switching procedure PM_IM_WEM_09 Development of organized wholesale energy markets	PM_IM_WAM_01 Promoting the development of new cross-border connections PM_IM_WAM_02 Additional procedures for planning of energy infrastructure development PM_IM_WAM_03 Institutional protection of vulnerable consumers PM_IM_WAM_04 Activities for monitoring and overcoming energy poverty
Internal	● Integration of the power system of Ukraine with ENTSO-E countries' systems (interconnectivity) at the level of 10% by 2030	PM_IME_WEM_01 Transposition of Electricity Integration	PM_IME_WAM_01 Implementation of smart grids

energy market: electricity	● Resource adequacy and flexibility in the power system of Ukraine ● Implementation of smart metering of electricity and smart grids ● Reducing the average duration of power interruptions (SAIDI) to 150 minutes in urban areas and 300 minutes in rural areas (until 2050)	Package PM_IME_WEM_02 Stimulating regulation of distribution system operators PM_IME_WEM_03 Development of aggregation PM_IME_WEM_04 Ensuring the development of energy storage facilities PM_IME_WEM_05 Support of active consumers by the self-production mechanism (net billing) PM_IME_WEM_06 Ensuring the development of distributed generation PM_IME_WEM_07 Tenders for the construction of generating capacity and implementation of demand-side management PM_IME_WEM_08 Special auctions for long-term procurement of ancillary services PM_IME_WEM_09 Simplification of permission procedures for distributed generation PM_IME_WEM_10 Reservation of electricity network connection capacity for generation facilities PM_IME_WEM_11 Prioritization of RES facilities in dispatching PM_IME_WEM_12 Compensation for curtailment of RES producers (under the “green” tariff) in re-dispatching PM_IME_WEM_13 Harmonization of price limits in wholesale market segments PM_IME_WEM_14 Free choice of forms of market participation by RES producers PM_IME_WEM_15 Non-discriminatory integration of demand-side management, energy storage and aggregation into the power system and market PM_IME_WEM_16 Service quality standards and compensation to consumers for non-compliance PM_IME_WEM_17 Electricity supply to protected consumers PM_IME_WEM_18 Time-of-use prices for household consumers PM_IME_WEM_19 Dynamic prices for consumers	PM_IME_WAM_02 De-risking mechanism for participants of special auctions for the long-term procurement of ancillary services PM_IME_WAM_03 Implementation of real-time pricing PM_IME_WAM_04 Integration of spot markets (market coupling) PM_IME_WAM_05 Integration of the balancing market PM_IME_WAM_06 Pilot microgrid projects and management systems, establishing organized energy islands PM_IME_WAM_07 Implementation of European and international standards for smart grid development

Internal energy market: gas (including biomethane, hydrogen, oil)	● Increasing and promoting biomethane production ● Ensuring 100% gas metering ● Reliability and completeness of commercial gas accounting ● Achieving sufficient domestic natural gas production	PM_IMG_WEM_01 Creation of legal conditions for optimization of oil and gas infrastructure PM_IMG_WEM_02 Current measures to ensure the production of sufficient volumes of natural gas PM_IMG_WEM_03 Creation of technical policy and effective system of state (energy) supervision of the natural gas market PM_IMG_WEM_04 Creating legal conditions for the transition to commercial accounting of gas in units of energy during martial law PM_IMG_WEM_05 Ensuring the attractiveness of Ukrainian oil and gas infrastructure for use by foreign customers PM_IMG_WEM_06 Ensuring effective balancing rules PM_IMG_WEM_07 Current measures to promote biomethane production PM_IMG_WEM_08 Basic annual offer of the natural gas supplier PM_IMG_WEM_09 Strengthening the requirements for unbundling of OGDS	PM_IMG_WAM_01 Transposition of the new EU legislation package in the field of natural gas and hydrogen PM_IMG_WAM_02 Conducting a study of the potential of hydrogen production, transportation, storage and use in Ukraine PM_IMG_WAM_03 Conducting a study of the potential of carbon capture, use and storage (CCUS) in Ukraine PM_IMG_WAM_04 Ensuring effective regulation of the oil pipeline system PM_IMG_WAM_05 Establishing systematic involvement of the Ukrainian sides in EU processes related with the future of energy infrastructure PM_IMG_WAM_06 Additional measures to ensure the production of sufficient volumes of natural gas PM_IMG_WAM_07 Opening up natural gas exports PM_IMG_WAM_08 Ensuring proper management of the quality of natural gas supplied to gas networks PM_IMG_WAM_09 Ensuring an effective management regime for GDS PM_IMG_WAM_10 Additional measures for promoting biomethane production PM_IMG_WAM_11 Additional measures for the development of an organized wholesale gas market PM_IMG_WAM_12 Ensuring 100% gas metering PM_IMG_WAM_13 Creation of a system of commercial gas accounting PM_IMG_WAM_14 Creating conditions for using contractual practices of voluntary consumption reduction

Research, innovation and competitiveness	● Development and financing of innovation and research in the clean technology, renewable energy and low-carbon sectors production ● Implementation of clean energy solutions and low-carbon technologies ● Increasing competitiveness	PM_RIC_WEM_01 Modernization educational programs with to cover the skills gap in the field of green transition and renewable energy PM_RIC_WEM_02 Availability of grant funding for scientific research in the field of renewable energy and climate innovation PM_RIC_WEM_03 Development of corporate investments in the purchase of climate technologies and renewable energy solutions PM_RIC_WEM_04 Competitiveness of the Ukrainian economy and key industrial clusters against the background of the implementation of EU legislation in the field of energy labeling and ecodesign	PM_RIC_WAM_01 Development of corporate and international partnerships for preparation specialists in the energy and climate sector PM_RIC_WAM_02 Expansion financing scientific research in the field of renewable energy and climate innovation PM_RIC_WAM_03 Actively attracting venture capital investments in companies in the climate innovation and renewable energy sector PM_RIC_WAM_04 Development of exports of climate and renewable energy technologies PM_RIC_WAM_05 Promotion competitiveness of small and average business through green transformation and access to new markets PM_RIC_WAM_06 Restoration of action and bringing to practice EU rules state assistance for business entities PM_RIC_WAM_07 Creation systems monitoring benefits for fossil fuel and mechanisms their gradual reduction

1.2. Overview of current policy situation

1.2.1. National and Energy Community energy system and policy context of the national plan

As a Contracting Party to the Energy Community, as well as within the framework of the EU accession process, Ukraine has undertaken to develop a NECP in accordance with Regulation (EU) 2018/1999.

Since 2016, Ukraine has been working on the implementation of the Association Agreement between Ukraine and the EU, including the Deep and Comprehensive Free Trade Area. According to the assessment of the Cabinet of Ministers Ukraine,[8] as of 2024, 81% of commitments foreseen in the Association Agreement were implemented, in particular: in the energy sector – 78%, environment and civil protection – 83%, energy efficiency and housing and utilities – 83%. On February 28, 2022, Ukraine officially submitted an application for membership in the European Union. On March 1, 2022, the European Parliament adopted a resolution supporting Ukraine's application for the EU membership, and on March 10-11, 2022, at the informal summit of the European Council in Versailles, EU leaders recognized the European prospects and European choice of Ukraine, as stated in the Association Agreement and supported the decision of the Council of the EU to invite the Commission to provide its opinion on this application in accordance with the provisions of the relevant treaties. On April 17, 2022, Ukraine submitted responses to the European Commission's Questionnaire on Ukraine's compliance with the political and economic criteria for the EU membership, and on May 9, the second part of the Questionnaire on the compliance of Ukraine's legislation, institutions and practice with EU law in 33 areas. The EU decision to grant Ukraine the official status of candidate country was adopted on June 23, 2022.

The European Commission in its Communication on EU enlargement policy, published on 4 November 2025[9] noted good progress made by Ukraine in some sections of the EU acquis. In particular, it noted a good level of preparation in the energy sector and some progress achieved, despite the fact that the energy sector was operating under extraordinary conditions due to attacks by the Russian Federation on Ukraine's energy infrastructure. Harmonization of Ukrainian legislation with EU legislation continued, in particular, legislation on renewable energy sources and NECP was adopted, and measures on market transparency (REMIT) were introduced. However, constant shelling of energy infrastructure by the Russian Federation had a negative impact on the security of energy supply and planning capabilities. Measures taken under martial law have led to increased monopolization in the gas sector, with the exception of the biomethane industry.

In the areas of environmental protection and climate policy, Ukraine has a certain level of preparation and good progress has been made. In terms of climate policy, the European Commission noted the resumption of mandatory monitoring, reporting and verification of greenhouse gas emissions, the adoption of an action plan to establish a national emissions trading system and a framework law on climate policy that is in line with the EU's long-term goal of climate neutrality by 2050, as well as a national waste management plan and legislation on the prevention, reduction and and control of industrial pollution, river basin management plans and environmental control reform strategy.

The Annual Implementation Report of the Energy Community Secretariat 2025[10] contains an assessment of Ukraine's implementation of the Energy Community acquis as of November 2025 in 5 main areas (clusters). Ukraine as a whole is marked by one of the highest indicators (56%): progress in implementation for the cluster "Energy Markets and Integration" is estimated at 56%, "Decarbonization of the Energy Sector" sector" - at 72%, "Ensuring energy security» – at 26%, "Improvement of the environment" - at the level of 53%, "Activities of government bodies" - at the level of 75%.

On 14 December 2023, EU leaders took a historic decision to open accession negotiations with Ukraine. The European Commission prepared the technical aspects of the negotiations (the so-called negotiating framework) without further delay. At the first Intergovernmental Conference on 25 June 2024, the EU officially opened accession negotiations with Ukraine. In September 2025, Ukraine successfully completed the screening process according to the negotiating chapters.

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[8] https://www.kmu.gov.ua/diyalnist/yevropejska-integraciya/vikonannya-ugodi-pro-asociaciyu/zviti-pro-vikonannya-ugodi-pro-asociaciyu

[9] https://enlargement.ec.europa.eu/ukraine-report-2025_en

[10] https://www.energy-community.org/dam/jcr:ee52fae5-11ae-49f5-b731-3f82f9178e73/ECS_IR2025.pdf

In early 2024, the European Council supported the revision of the EU budget, which provides for €50 billion in macro-financial support to Ukraine under the Ukraine Facility for the period 2024-2027. The Ukraine Facility, approved by Regulation (EU) 2024/792 of the European Parliament and of the Council of 29 February 2024, provides for providing EUR 38.27 billion to the state budget of Ukraine to strengthen macro-financial stability, as well as EUR 6.97 billion through a special investment instrument to cover investor risks in priority sectors through the EBRD, EIB and other international financial institutions. It is expected that the implementation of projects within the framework of the instrument will allow attracting additional 30 billion euro investments. Also Ukraine Facility provides 4.76 billion euros for technical and administrative support, including funds to cover interest on loans.

Support is provided quarterly for the implementation of indicators for the implementation of reforms provided for in Plani Ukraine, approved by order of Cabinet Ministers Ukraine from March 18, 2024 No. 244 (Official Gazette of Ukraine, 2024 p., No. 32, p. 2035). The plan provides for the implementation of structural reforms in the public sector, a number of economic reforms aimed at developing the business climate and entrepreneurship, as well as steps to develop priority sectors that can ensure rapid economic growth.

The EU has a transitional period for the implementation of the Carbon Border Adjustment Mechanism (CBAM) since 1 October 2023. By the end of 2025, importers only reported (without any financial obligations) on volumes of imported goods, their direct and indirect emissions and payments for CO_2 emissions paid in the country of origin. From January 1, 2026, CBAM has become fully operational: importers of cement, steel, aluminum, fertilizers, electricity and hydrogen will purchase CBAM certificates at a price equal to the average weekly auction price of quotas in the EU ETS, taking into account payments already paid for carbon emissions in the country of origin.

Considering the destructive influence of the full-scale war on the economy and the need to maximize the mobilization of resources for the post-war reconstruction, the application of the CBAM to Ukraine's exports during the war and immediately after its end will create additional significant pressure on industry and power generation. The Ukraine's economy is largely dependent on access to the EU market, where more than half of exports are currently directed. At the same time, 15–17% of this volume may fall under the scope of CBAM.[11] According to the estimates of the Kyiv School of Economics,[12] during 2026-2030 Ukrainian businesses could lose about 396 million euros annually, which will lead to a decrease in GDP by 0.08% annually until 2030.

Regulation (EU) 2023/956 of the European Parliament and of the Council establishing the Carbon Border Adjustment Mechanism includes a force majeure clause (Article 30(7) of the CBAM Regulation): "Where an unforeseeable, exceptional and unprovoked event has occurred that is outside the control of one or more third countries subject to the CBAM, and that event has destructive consequences on the economic and industrial infrastructure of such country or countries concerned, the Commission shall assess the situation and submit to the European Parliament and to the Council a report, accompanied, where appropriate, by a legislative proposal, to amend this Regulation by setting out the necessary provisional measures to address those exceptional circumstances".

In the context of the ongoing full-scale armed aggression of the Russian Federation, unprecedented difficult operating conditions for industry, deficit energy resources, destruction, and also taking into account the transformation processes taking place in relation with the preparation for Ukraine's future membership in the EU, representatives of Ukraine, during meetings with representatives of the European Commission, namely with representatives of the European Commission's Directorate-General for Climate Change (DG CLIMA) and the European Commission's Directorate-General for Taxation and Customs Union (DG TAXUD), have repeatedly raised the issue of postponing the CBAM for Ukraine in accordance with paragraph 7 of Article 30 CBAM Regulation. On May 16, 2025, a letter was sent to the EU Commissioner for Climate, Net Zero and Clean Growth regarding the possibility of applying special conditions under the force majeure clause.

In addition, in order to ensure the proper functioning of the state's energy sector during martial law, the Ministry of Energy, by letter dated June 28, 2025 No. 26/1.1-3.4-11633, sent an appeal to European Commission and Energy Community Secretariat on the exemption of the electricity sector of Ukraine from the effects of the CBAM for the period of martial law and at least 5 years from the

[11] GMK Center. How European CBAM can weaken the economy of Ukraine. https://gmk.center/wp-content/uploads/2024/10/CBAM24-research_10-2024_ukr.pdf

[12] Kyiv School of Economics. Report on the impact of the introduction of CBAM by the European Union on Ukraine's economy. https://kse.ua/wp-content/uploads/2021/12/ENG_20211115-KSE_CBAM_for- publication.pdf

date of its termination or cancellation.

Thus, the government is taking the necessary steps to conduct negotiations with the European Commission and implement necessary measures to minimize the negative impact of the CBAM on Ukraine's enterprises.

1.2.2. Current energy and climate policies and measures relating to the five dimensions of the Energy Union

Decarbonization (reduction of greenhouse gas emissions)

Ukraine was one of the first countries to ratify the Paris Agreement (July 14, 2016). The Agreement entered into force on November 4, 2016, the thirtieth day after its ratification by the 55 Parties to the United Nations Framework Convention on Climate Change, which are estimated to collectively account for at least 55% of total global emissions of greenhouse gases (GHG).

In order to implement the Paris Agreement, Parties are required to prepare, communicate and maintain consistent nationally determined contributions for the global response to climate change. Ukraine's intended nationally determined contribution, which was approved by the Order of the Cabinet of Ministers of Ukraine "On approval of the Intended Nationally Determined Contribution of Ukraine to the draft of a new global climate agreement" dated September 16, 2015 No. 980 (Government Courier, 2015, No. 179), after the entry into force of the Paris Agreement, it automatically became the first nationally determined contribution (NDC) of Ukraine.

According to the first NDC, Ukraine undertook a commitment to not exceed 60% of the level of greenhouse gas emissions in 1990 by 2030. Considering that in 2012, Ukraine's GHG emissions were at the level of 375.4 million tons of $CO2_{-eq.}$ (including land use, land-use change and forestry — LULUCF), which was 42.9% of the 1990 emission level, it was assumed that by 2030 Ukraine's GHG emissions could increase after the restoration of the country's territorial integrity and economy.

The updated Nationally Determined Contribution of Ukraine to the Paris Agreement, which was approved by the Order of the Cabinet of Ministers of Ukraine dated July 30, 2021 No. 868 "On Approval of Updated Nationally Determined Contribution of Ukraine to Paris Agreement" (Official Gazette of Ukraine, 2021 p., No. 62, p. 3956), significantly strengthened Ukraine's contribution to overcoming global climate change. The document envisions the reduction of Ukraine's GHG emissions by 2030 by 65% compared to the 1990 emissions level. The same goal is set out in the Decision of the Council of Ministers of the Energy Community 2022/02/MC-En.

By the Resolution of the Cabinet of Ministers of Ukraine dated October 29, 2025 No. 1172-r, the Second Nationally Determined Contribution of Ukraine was approved, which provides for the establishment of a goal to reduce greenhouse gas emissions by more than 65% from the 1990 level by 2035 (Government Courier, 2025 p. No. 223).

By Order of the Cabinet of Ministers of Ukraine dated May 30, 2024 No. 483-r, the Strategy for the Development and Implementation of State Policy in the Field of Climate Change for the Period Until 2035 and the Operational Plan of Measures for its Implementation in 2024-2026 were approved. (Government Courier, 2024 p. No. 114), which was developed to establish organizational and legal foundations for the development and implementation of state policy in the field of climate change to achieve sustainable development and ensure an effective transition to low-carbon development of the state under the condition of economic, energy, food and environmental security, increasing the level of well-being of citizens, reducing the impacts and consequences of climate change and taking into account the goals of state climate policy during the post-war reconstruction of Ukraine.

In addition, on October 8, 2024, the Verkhovna Rada adopted Law No. 3991-IX "On the Basic Principles of State Climate Policy", which regulates the relations arising during the establishment and implementation of state climate policy and aimed at ensuring the achievement of climate neutrality, mitigating the effects of climate change and adapting to it, ensuring low-carbon and sustainable development, and defines:

- main principles of state climate policies;
- particular issues on the establishment and achievement of climate policy goals;
- principles for ensuring climate planning at the national, regional and local levels;
- Features of reporting in accordance with the requirements of the UN Framework Convention on Climate Change and data collection for these purposes;

- main principles of national systems tracking implementation of policies, measures and climate change forecasting.

The law was developed to implement several international obligations of Ukraine. It is directional on the implementation of the EU legislation in the field of climate change, in particular Regulation (EU) 2018/1999 and Regulation (EU) 2021/1119. The law set a long-term goal of achieving climate neutrality of Ukraine by 2050, which ensured alignment with the EU goal.

Ukraine is a party to the Montreal Protocol on Substances that Deplete the Ozone Layer (hereinafter referred to as the - Montreal Protocol) since 1988 and conscientiously fulfills its obligations. In particular, national legislation already provides for requirements for labeling, record-keeping and reporting, quota allocation and licensing of import and export operations of controlled substances, as well as for training and certification of enterprise personnel and mandatory registration of business entities in the Unified State Register of Operators of Controlled Substances. At the same time, the processes provided for by the regulatory legal acts of Ukraine are currently not fully implemented, given the full-scale invasion of the Russian Federation. Ratification of the Amendment to the Montreal Protocol (Kigali Amendment) and development of a strategy to reduce HFC emissions are expected in 2026 and accordingly, the action plan for its implementation (see PM_D_WAM_04 for details).

During the first year of implementation of the National Energy and Climate Plan, a number of important strategic documents were approved that will contribute to the decarbonization of these sectors and the reduction of GHG emissions at the national level.

Thus, by resolution No. 1550 of December 27, 2024, the Cabinet of Ministers of Ukraine approved the new National Transport Strategy (NTSU) for the period until 2030 (Official Gazette of Ukraine, 2025 p., No. 8, p. 665) in which the issue of decarbonization is covered mainly in the third comprehensive strategic goal - safe, human-centered, environmental and energy efficient transport with the focus on decarbonization. Among the expected results of the implementation of the NTSU is a reduction of combined GHG emissions from road, aviation, water transport and rail to 90% of the 2021 level (or up to 33% of the 1990 level) by 2030. The NTSU emphasizes the need to implement measures to accelerate the growth of the share of electric cars and electric buses, plug-in hybrid electric cars and, in the future, electric cars with hydrogen fuel cells in the structure of the vehicle fleet, as well as the development of related infrastructure for charging and refueling these vehicles, stimulating the development of public electric transport and electrification of the railway network.

To fulfill obligations under the Law of Ukraine dated June 20, 2022 No. 2320-IX “On Waste Management”, the Cabinet of Ministers approved the National Waste Management Plan (NWMP) until 2033 and the action plan for its implementation (Official herald Ukraine, 2025 p., No. 13, Art. 1001) by order dated December 27, 2024 No. 1353-r. The NWMP is a framework planning document that defines the main directions of implementing state policy in the field of waste management. In return, regional and local waste management plans determine specific measures, necessary infrastructure facilities, technologies that take into account local conditions, economic estimates, and implementation capacity.

The NWMP aims to ensure the transition to modern waste management for its effective use as a resource and sustainable development by preventing their formation in accordance with state policy in the field of waste management; implementing measures in the field of waste management without threatening human health and the environment by reducing the negative consequences of waste formation and its management; ensuring and improving the efficiency of such use, which is crucial for the transition to a circular economy and ensuring long-term competitiveness. One of the main targets set in the NWMP is to reduce the share of municipal waste landfilling to 30% of the total amount of their generation during 2025-2033. This indicator is consistent with the requirement of Directive 2018/850/EU of the European Parliament and of the Council of 30 May 2018 amending Council Directive 1999/31/EC, namely: reducing the disposal of municipal waste in landfills to 10% by 2035. The NWMP includes measures covered by five policies under the “decarbonization” dimension.

By Order No. 1163-r of November 15, 2024, the Cabinet of Ministers approved the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the period until 2030 and approved the operational plan of measures for its implementation in 2025-2027 (Official Gazette of Ukraine, 2024 p., No. 108, p. 6884). The fifth goal of the Strategy covers climate-oriented agriculture (mitigation of

climate change consequences and adaptation to them), which is discussed in more detail in policy PM_D_WAM_05.

Besides that, just transition of coal regions is an integral part of the NECP implementation and during the first year of its implementation a significant progress has been made in this direction. Thus, by resolution No. 711 of June 18, 2025, the Cabinet of Ministers approved the State Target Program for the Just Transition of Coal Regions of Ukraine for period until 2030 (Official Gazette of Ukraine, 2025 p., No. 57, p. 3920), the approval of which was postponed by three years due to the full-scale invasion of the Russian Federation. The program serves as the main tool for managing social, economic and environmental consequences and gradual phase-out of coal and directing green investments to the affected territories. The implementation of the program will contribute to a comprehensive solution to problematic issues, in particular in the economic, social, cultural, housing and communal and environmental areas, which arise as a result of the reduction of coal mining and the gradual closure of coal mining and related enterprises. The program includes measures that will contribute to structural transformation of the local economy, mitigation of social consequences and development of human capital, transition to renewable energy and increasing energy efficiency, solving environmental problems and combating climate change.

During 2024-25, the Action Plan for the Just Transformation of the Coal Microregion of Lviv Region for the Period Until 2030, the Action Plan for the Just Transformation of the Chervonohrad Urban Territorial Community for the Period Until 2030 and Action Plan for Just Transition of Volynskyi Coal Microregion by 2030 were approved at the local level.

Decarbonization (development of renewable energy sources)

The main documents establishing the legislative framework for renewable energy sources are the Laws of Ukraine “On Alternative Energy Sources” and “On Alternative Fuels”. These laws partially transpose into Ukrainian legislation some of the provisions of Directive (EU) 2018/2001 of 11 December 2018 on the promotion of the use of energy from renewable sources.

At the same time, there is a legal conflict between the current legislation of Ukraine and the law of the European Union in terms of the definition of alternative fuels for transport. Alternative fuels, in accordance with the Law of Ukraine "On Alternative Fuels", are identified only as biofuels and other renewable fuels. At the same time, European Union law, in particular Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU (AFIR), applies a broader concept of alternative fuels for transport, which includes electricity for electric vehicles, hydrogen, liquefied petroleum gas (LPG), compressed and liquefied natural gas (CNG and LNG), synthetic fuels, other fuels for transport, regardless of their affiliation to renewable or non-renewable fuels that serve, at least in part, as a substitute for energy from fossil oil resources and have the potential to contribute to decarbonization of transport and increasing its environmental efficiency. Amendments to the legislation to establish a separate term "alternative fuels for transport" are provided for National program on adaptation of legislation of Ukraine to the EU acquis, approved by the Resolution of the Cabinet of Ministers No. 438 of 01.04.2026 (Government Courier, 2026 p., No. 73), until February 2027.

Since 2009, the development of renewable energy sources in the power generation sector has taken place with the introduction of the "green" tariff (feed-in tariff) model. Thus, as of the beginning of 2022, the total installed capacity of renewable energy facilities under the "green" tariff was more than 9.5 GW (10.1 GW taking into account facilities occupied by February 24, 2022), and the volume of investments in the industry reached over 12 billion USD.

At the same time, the support system based on the "green" tariff model, due to the lack of feedback and market pricing mechanisms, has not formed a sustainable basis for the development of renewable energy in Ukraine. The rapid, more than threefold increase in electricity production from alternative energy sources during 2019-2021 has created a number of economic and technical challenges, related to the absence of permanent financial payment systems for electricity produced from renewable sources, as well as to the limited capabilities of the Integrated Power System of Ukraine for integrating objects of renewable electricity.

In order to resolve problematic issues in the field of renewable energy, the Government in October 2019 launched public discussions with all stakeholders, involving the Center for Dispute Resolution

and Negotiations of the Energy Community Secretariat as a mediator, as a result of which compromise agreements were reached, set out in the Memorandum of Understanding on the Resolution of Problematic Issues in the Field of Renewable Energy in Ukraine.

The key ones are: on the part of investors – voluntary agreement to reduce “green” tariffs, increased responsibility for imbalances, limitation of the terms of commissioning of solar power plants under the "green" tariff model; on side of a state – ensuring stable payment for generated electricity, repayment of accumulated debt and promotion of further development of the industry on a competitive basis.

Considering the complex situation in the sector, Ukraine avoided a one-sided decrease of "green" tariffs, and achieved a settlement of this issue through lengthy negotiations with investors, finding compromises and concluding a Memorandum, which became the basis of the relevant law of Ukraine. Since then, partial repayment of debt to investors in renewable generation has been ensured. Currently, the relevant problematic issues are related to the challenges facing the energy system, in connection with the full-scale invasion of the Russian Federation into Ukraine.

At the end of 2021, Ukraine, within the framework of the Energy Community Treaty (by Decision of the Energy Community Council of Ministers of November 30, 2021 No. 2021/14/MC-EfC), undertook to implement the fourth energy package "Clean Energy for Europeans", which includes Directive (EU) 2018/2001 of December 11, 2018 "On the Promotion of the Use of Energy from Renewable Sources" (RED II). In October 2023, the EU approved Directive EU 2023/2413, which updated the provisions of RED II, and since then the Directive has received the conditional name RED III, which, in particular, provides for an increase in the share of energy from renewable sources. In the event of Ukraine's accession to the EU, Ukraine will potentially also have to implement the provisions of the RED III Directive and the relevant delegated regulations, which are stricter than the current requirements for Energy Community member states.

A government bill "On Amendments to Certain Laws of Ukraine on the Implementation of European Union Legislation in the Field of Renewable Energy Sources" (Registration No. 14271 of December 13, 2025) has been submitted to the Verkhovna Rada. The bill provides for the fulfillment of Ukraine's obligations as a party to the Energy Community Treaty and the implementation of European Union legislation in terms of bringing the national regulatory framework in the field of renewable energy sources in line with the requirements of the 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 (as amended).

National Economic Strategy of Ukraine for the period until 2030, approved by the resolution of the Cabinet of Ministers of Ukraine from March 3 2021 No. 179 (Official Bulletin of Ukraine, 2021 p., No. 22, p. 1015) (hereinafter referred to as the NES), defines the decarbonization of the economy (increasing energy efficiency, developing renewable energy sources, developing a circular economy, and synchronizing with the European Green Deal initiative) as one of the key guidelines in Ukraine's economic policy .

Also, by the order of the Cabinet of Ministers of Ukraine dated April 21, 2023 No. 373 (Official Gazette of Ukraine, 2023 p., No. 47, p. 2575), the Energy Strategy of Ukraine for the period until 2050 (hereinafter referred to as the ESU) was approved, which, in particular, determines indicative indicators for the future development of renewable energy. Among them: achieving a share of 27% of energy produced from renewable energy sources by 2030 in gross final energy consumption, 70% of energy from renewable sources in the total primary energy supply by 2050 and approaching climate neutrality of the energy sector by 2050.

On August 13, 2024 The Government approved the National Renewable Energy Action Plan (NREAP) for the period until 2030 and an action plan for its implementation. The NREAP outlines the state policy in the renewable energy sector and provides indicative targets for the development of RES by 2030 in heating and cooling systems, electricity generation, and the transport sector.

On July 10, 2025 at the Ukraine Recovery Conference (URC) in Rome, EBRD and the European Commission announced the launch of the Renewable Energy Investment Risk Reduction Facility Ukraine (URMM), which has goals to increase attractiveness investment in renewable energy projects by ensuring key financial and operational risks arising in wartime conditions. The mechanism is expected to help mobilize €1.5 billion in investments in 1 GW of new renewable energy capacity.

In addition, the Energy Community Secretariat (EnCS) and NPC Ukrenergo are developing a mechanism to reduce risks for participants in long-term special auctions for the purchase of ancillary services. The corresponding Memorandum of Understanding was signed within the framework of the Ukraine Recovery Conference (URC). The objectives of the risk reduction mechanism are: support for the implementation of projects that won special auctions of the NPC Ukrenergo for the provision of support services; reduction of specific project risks, including damage to infrastructure due to hostilities; financial support or capital release for investors, which participate in special auctions of NPC "Ukrenergo".

The World Bank Group is working on a project proposal to initiate a joint project with the World Bank for Reconstruction and Development, the Renewable Energy Acceleration and Market Development Program for Ukraine (RAMP UP). The objectives of the RAMP UP project are to: launch donor-supported competitive tenders for onshore wind and solar power, as well as hybrid systems with electricity storage using a contract for difference mechanism, which will attract 1-1.5 GW of initial capacity and create the basis for phase two auctions with a cumulative target of 10 GW by 2040; increase energy security and stability through reducing seasonal fuel imports, adding renewable energy to reliable renewable generation and creating decentralized solutions for households/small and medium-sized enterprises (SMEs); accelerating the transition from "green" tariff to the market and preparation for auctions financed by the Government at the second stage; strengthen the legal, regulatory and institutional framework (including settlement and unbundling arrangements) in line with the EU acquis and Energy Community obligations.

The Energy Community Secretariat, supported by the European Climate The Fund implemented a project aimed at identifying the most suitable areas for the development of renewable energy sources - places where the infrastructure, environmental conditions and policy frameworks contribute to rapid and sustainable growth. These areas were identified taking into account the need for cross-border cooperation, combining the efforts of neighboring EU countries and Moldova.

On July 17, 2025, the digital Register of RES facilities, created for the National Commission for State Regulation of Energy and Public Utilities on the Diya.Engine platform, was launched, which contains data on companies and their facilities that produce electricity from RES. The launch of the digital register ensures the implementation of part of the EU requirements in the energy sector, will contribute to supporting the development of "green" energy, and facilitate access to European electricity markets.

In general, over the past year and a half of the implementation of the NECP, significant progress has been made in improving policies in the field of renewable energy development, in particular, regarding the issuance of guarantees of origin for electricity from RES (see more details PM_D_WEM_16) and the system of auctions for the allocation of support quotas for RES (see more details PM_D_WEM_15). In addition, by order No. 612-r of June 25, 2025, the Cabinet of Ministers of Ukraine approved the Roadmap for separating the renewable energy surcharge from the tariff for electricity transmission services (Official Gazette of Ukraine, 2025 p., No. 58, p. 4012), the implementation of which should ensure a systematic solution to the problem of debt to producers of electricity from RES (see more details PM_D_WEM_08).

The use of renewable energy sources is one of the most important directions of Ukraine's energy policy, aimed at saving traditional fuel and energy resources, improving the state of the environment, and preventing climate change. Increasing the share of renewable sources in energy balance of Ukraine will contribute to the process of decarbonization of the economy, necessary for the fulfillment of Ukraine's international obligations to reduce greenhouse gas emissions, and to reduce the consequences of the introduction of the European Union's Carbon Border Adjustment Mechanism (CBAM). Increasing the share of energy carriers obtained from renewable sources will also contribute to ensuring energy security and achieving energy independence of the state by diversifying energy sources.

Public policies and measures in the area of "decarbonization" are presented in detail in section 3.1 of this Plan.

Energy efficiency

The ESU identifies energy efficiency and energy self-sufficiency as key strategic priorities. The principal legal framework governing energy efficiency policy in Ukraine is the Law of Ukraine “On Energy Efficiency”. This Law transposed into national legislation most provisions of 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 (Energy Efficiency Directive). The Law establishes the legal, economic, and organizational framework for improving energy efficiency in the production, transportation, transmission, distribution, supply, and consumption of energy. It also requires that priority be given to energy efficiency measures that reduce energy demand when developing legislation, strategic policy documents, and financing decisions concerning the development of Ukraine's integrated energy system, gas infrastructure, and district heating systems, where such measures are more cost-effective. In doing so, the Law incorporates the "energy efficiency first" principle into Ukrainian legislation.

At the same time, legislative amendments are being introduced to strengthen the regulatory framework for demand-side management. The Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Recovery and Green Transformation of Ukraine's Energy System" introduced new mechanisms for the purchase and sale of electricity generated by consumer-owned generation facilities, established new market participants such as aggregators and active consumers, and created additional pathways for achieving energy efficiency and demand-side flexibility. The amendments also encourage consumers to install energy storage systems and hybrid generating installations to facilitate participation in demand response and improve the security of electricity supply.

Central executive authorities will take into account Commission Recommendation (EU) 2024/2143 of 29 July 2024 to ensure the proper application of the energy efficiency first principle when preparing secondary legislation. A comprehensive review of Ukraine's energy efficiency legislation is planned following the transposition of Directive (EU) 2023/1791 on energy efficiency, through the adoption of a primary legislative act expected by the end of the fourth quarter of 2027.

Certain provisions of Directive 2012/27/EU have been implemented through sector-specific legislation. For example, the issues of commercial metering of thermal energy and water are regulated by the Law of Ukraine "On Commercial Metering of Thermal Energy and Water Supply". State support for energy efficiency investments in the residential sector is provided through the Energy Efficiency Fund, which operates in accordance with the Law of Ukraine "On the Energy Efficiency Fund".

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (EPBD) has been transposed through the Law of Ukraine "On the Energy Performance of Buildings". The Law establishes minimum energy performance requirements for buildings, provides for the energy performance certification of buildings and the inspection of technical building systems, and regulates the certification of building energy auditors.

In December 2023, the Government approved the Long-Term Building Renovation Strategy until 2050 through CMU распорозhennya No. 1228 of December 29, 2023, "Certain Issues of the Strategic Development of Building Energy Performance" (Official Gazette of Ukraine, 2024, No. 13, Art. 843).

The Law of Ukraine "On Combined Production of Heat and Electricity (Cogeneration) and the Use of Waste Energy Potential" regulates activities related to the generation, transmission, distribution, and supply of electricity and heat from cogeneration installations.

To ensure full implementation of Ukraine's obligations under the Association Agreement and the Treaty Establishing the Energy Community, Ukraine is also aligning its legislation on energy labeling and ecodesign with the EU acquis. Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labeling and repealing Directive 2010/30/EU has been partially transposed through the Technical Regulation on the Energy Labeling of Energy-Related Products, approved by MinEnergy Order No. 164 of April 27, 2022 and registered with the Ministry of Justice on June 9, 2022 under No. 615/37951. Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products has been partially transposed through the Technical Regulation Establishing a Framework for Ecodesign Requirements for Energy-Using Products, approved by CMU Resolution No. 804 of October 3, 2018 (Official Gazette of Ukraine, 2018, No. 80, Art. 2678). In addition, Ukraine has adopted 37 product-specific ecodesign technical regulations and 20 technical regulations on energy labeling.

The main barriers to the implementation of energy efficiency measures include distorted tariff structures, a shortage of qualified specialists capable of identifying and implementing energy efficiency projects, limited access to financing and the high cost of capital, and the absence of stable state co-financing mechanisms for energy efficiency investments. An additional challenge is the insufficient staffing capacity of central executive authorities responsible for the development and implementation of energy efficiency policy.

Energy security

The key documents defining both goals and policies in terms of deepening the diversification of sources and ways of supplying energy resources from third countries with the potential goal of reducing dependence on the import of energy resources are NES and ESU. The first defines the general goal in the form of ensuring the diversification of energy supplies at the level of no more than 30% from one supplier, the second is a key strategy for diversification, stimulation of own production and development of further elements of added value (in particular, oil and gas processing). It should be noted that the ESU - setting the goal of comprehensive integration with the EU energy markets and ensuring the effective functioning of internal energy markets - defines the construction of an export-oriented energy industry as one of the indicators.

The National Security Strategy approved by the Decree of the President of Ukraine of September, 14 2020 No.392 (Official Gazette of Ukraine, 2020, No. 75, p. 2377), declares the need to diversify the sources and routes of the supply of energy resources among the goals. The Energy Security Strategy, approved by the order of the Cabinet of Ministers of Ukraine of August 4, 2021 No. 907 (Official herald Ukraine, 2021, No. 64, Art. 4071), envisages among the priority tasks the stimulation of import substitution, in particular through the development of bioenergy, wind energy, and the justified increase in the production of energy resources. The Concept of the state target economic program (with a planning horizon until 2026) and the program itself (for the period until 2028) were developed specifically for the nuclear industrial complex.

As for increasing the flexibility of the national energy system, the above-mentioned strategies include, in order to ensure the balance reliability of the UES of Ukraine and support the further integration of RES, the introduction of highly maneuverable capacities.

In the issue of eliminating restrictions or interruptions in the supply of energy resources in order to increase the stability of energy systems, the main policies and measures include the ESU, the Law of Ukraine "On Critical Infrastructure", the Cybersecurity Strategy of Ukraine, approved by the Decree of the President of Ukraine of August 26, 2021 No. 447 (Official Gazette of Ukraine, 2021, No. 70, p. 4417), the Law of Ukraine "On the Basic Principles of Ensuring Cybersecurity of Ukraine", separate decisions of the National Security and Defense Council of Ukraine. The target indicator is the provision of physical, engineering and cyber protection of 100% of objects. It is stipulated separately that in the conditions of a full-scale invasion of the Russian Federation into Ukraine, the priority is the protection of critical infrastructure facilities (CIPs).

The Laws of Ukraine "On the Electricity Market", "On the Natural Gas Market", and relevant subordinate regulatory legal acts regulate measures to ensure security of supply, in particular the responsibility of the Ministry of Energy to approve the rules on the security of natural gas and electricity supply and the National Action Plan, which are mandatory for all subjects of the relevant markets, as well as to monitor the security of supply (for electricity – together with the Regulator, the transmission system operator and other relevant institutions).

Another group of policies is the formation and maintenance of reserves of the main fuel energy resources: natural gas, coal, oil and petroleum products. Most of them are regulated at the level of legislation. At the end of 2022, amendments to the Law of Ukraine "On the Natural Gas Market" defined the obligation of the Ministry of Energy to calculate the target level of gas storage filling and to form a gas storage filling schedule. In 2023, the Law of Ukraine "On Minimum Stocks of Oil and Petroleum Products" was adopted, which provides for the creation of reserves for 90 days of net imports or 61 days of domestic consumption. The creation and maintenance of the minimum necessary reserves of coal and reserve fuel (fuel oil) is regulated by the Procedure for the formation of the forecast balance of electricity of the IPS of Ukraine and the Rules on the Security of Electricity Supply.

Internal energy market (electricity)

The reform and integration of the Ukrainian electricity market with the EU markets will take place

within the framework of European legislation, in particular the provisions of the Electricity Integration Package. The policies and measures implemented by Ukraine in terms of market development are determined by such key priorities as further liberalization of the electricity market and deepening the integration of power systems and markets of Ukraine and the EU countries. In terms of integration, Ukraine seeks to improve the efficiency of the use of existing interconnectors and strengthen cross-border electricity connections with ENTSO-E countries through the implementation of projects of mutual and common interest.

The expansion of cross-border infrastructure combined with the integration of spot and balancing electricity markets will improve the competitiveness and liquidity of the domestic market by activating international electricity trade and providing ancillary services, and will create better conditions for attracting investments in the development of the sector and the deployment of new energy technologies.

Ukraine is implementing a policy of implementing European rules for international electricity trade through the use of joint auctions for the allocation of available capacity of interconnector, including the organization of auctions on the European auction platform Joint Allocation Office (JAO). The next stage of integration will be day-ahead and intraday electricity markets coupling, with implicit auctions for the allocation of cross-border network capacity and joint pricing in coupled markets. Also, the integration of the balancing market into European balancing platforms is planned.

The market transformation will take place towards a balanced combination of the advantages of large-scale and decentralized energy. The priority is the development of distributed generation based on RES in combination with flexible energy capacities and technologies to ensure resource adequacy, flexibility, operational security and stability of the power system and market. Ukraine has set a national indicative target of 29.4% of renewables in gross final energy consumption by 2030 for the electricity sector.

To improve the stability of the power system and market competitiveness, Ukraine is implementing policies to promote the development of distributed energy resources (primarily based on renewables, flexible generation and energy storages) and smart grids. These policies imply more active participation of consumers in the market and the use of new business models – mechanism of self-production (net billing), aggregation, demand response, microgrids, citizen energy communities, etc.

The development of smart metering and smart grids should take place within the framework of the Concept of the implementation of smart grids in Ukraine until 2035. Electricity distribution system operators (DSOs) within the framework of five-year plans for the development of distribution systems develop measures for the digitalization of networks and include relevant projects in their investment programs, which are subject to approval by the Regulator. The financing of the investment programs is carried out through electricity distribution tariffs, which for the vast majority of DSOs are applied on the principles of incentive regulation (RAB tariffs).

In 2019, Ukraine implemented a radical reform of the wholesale and retail electricity markets, moving from a single-buyer model to a competitive one based on the EU countries' model by introducing the appropriate institutional environment and structural organization of the market, following the provisions of the Third EU Energy Package. Currently, Ukraine is working on creating an institutional environment for the implementation of the provisions of the Fourth EU Energy Package (Clean Energy Package). In addition to the above, the basic policies and measures for the development of the electricity market include:

- Ensuring the proper functioning of the market by deepening its liberalization in combination with temporary regulatory measures aimed at stabilization market at the stage of immaturity of the competitive environment and limited integration with EU markets , as well as taking into account the military factor;

- Development of exchange trading, introduction of market pricing in all market segments, in particular, the use of real-time prices, gradual abandonment of cross- subsidization;

- Deepening the market integration of renewable energy producers by ensuring their participation in organized market segments and direct electricity trading, taking into account responsibility for imbalances;

- Ensuring the protection of vulnerable consumers through targeted monetized subsidies, preferential prices, provided by mechanisms for imposing public service obligations (PSO) on individual market entities.

To introduce market pricing, electricity prices for the population will be gradually brought to a market-determined level with parallel protection of vulnerable consumers, development of competition in the retail market and application of mechanisms for their active participation in the market (price comparison tools, "smart metering" and time-differentiated prices, self-generation, etc.). Energy-poor consumers will be protected through targeted support and incentives for improving energy efficiency.

Internal energy market (gas)

According to the NES, ESU, taking into account the requirements of the Law of Ukraine "On the Natural Gas Market", other laws, as well as international obligations of Ukraine, the development of oil and gas infrastructure is aimed at achieving the following goals:

- Ensuring sufficient connectivity with the EU/Energy Community for natural gas export/import, as well as developing oil transportation system connections;
- Determination and realisation of the potential for using existing oil and gas infrastructure for new activities within the framework of decarbonization.

Accordingly, the main policies and measures aimed at achieving these goals relate to promoting the development of new interstate connections, improving energy infrastructure planning procedures and establishing its involvement in future EU energy markets, optimizing existing oil and gas infrastructure, and building an analytical and regulatory framework for new energy markets.

In terms of integrating natural gas, renewable and low-carbon gas markets, the main objectives relate to integration with EU energy markets, biomethane production and natural gas extraction, ensuring the completeness and reliability of gas metering (both in terms of the availability of metering facilities and in the context of creating a working commercial accounting system), as well as the introduction of market-based pricing for energy resources for all buyers (consumers, wholesale buyers) while protecting those consumers who need state support. Accordingly, among the main policies and measures aimed at achieving these goals, it is worth highlighting:

- Transposition new package of EU legislation in field natural gas, renewable and low-carbon gases;
- Research into the potential for the development of hydrogen production, transportation, storage and use in Ukraine, as well as the development of carbon capture, transportation, storage and use (CCUS) infrastructure;
- Creation of prerequisite for the increase in natural gas and biomethane production, and also ensuring the possibility of exporting these goods;
- Resolution of technical questions of the quality of gas injected into gas networks, and also safety issues;
- Implementation of accounting in units of energy;
- Ensuring effective management of GDS;
- Increase in the effectiveness of the gas balancing system;
- Ensuring 100% gas metering;
- Creation of a functioning system of commercial accounting.

More in detail these politicians and events described in section 3 this Plan.

In terms of reducing energy poverty, the task is to legislatively define this concept, define a methodology for monitoring the state of energy poverty, and define a list of measures to reduce energy poverty in Ukraine. This may include both social policy measures and other measures.

1.2.3. Key issues of cross-border relevance

1) Issues related to financing new capacities from EU involvement:

- **Financing projects of natural gas and oil:**

The new TEN-E Regulation no longer provides for the financing of natural gas and oil projects from the Connecting Europe Facility (CEF). However, both this NECP and the NECPs of the EU Member States indicate that the need for natural gas and oil will not completely disappear by 2030, and in order to avoid supply disruptions, construction or other additional measures for individual oil and gas infrastructure facilities are necessary. The relevant projects are described in Section 3.

Accordingly, it is necessary to agree on financing mechanisms for such projects, which are necessary from the point of view of security of supply and the livelihoods of the population and the economy.

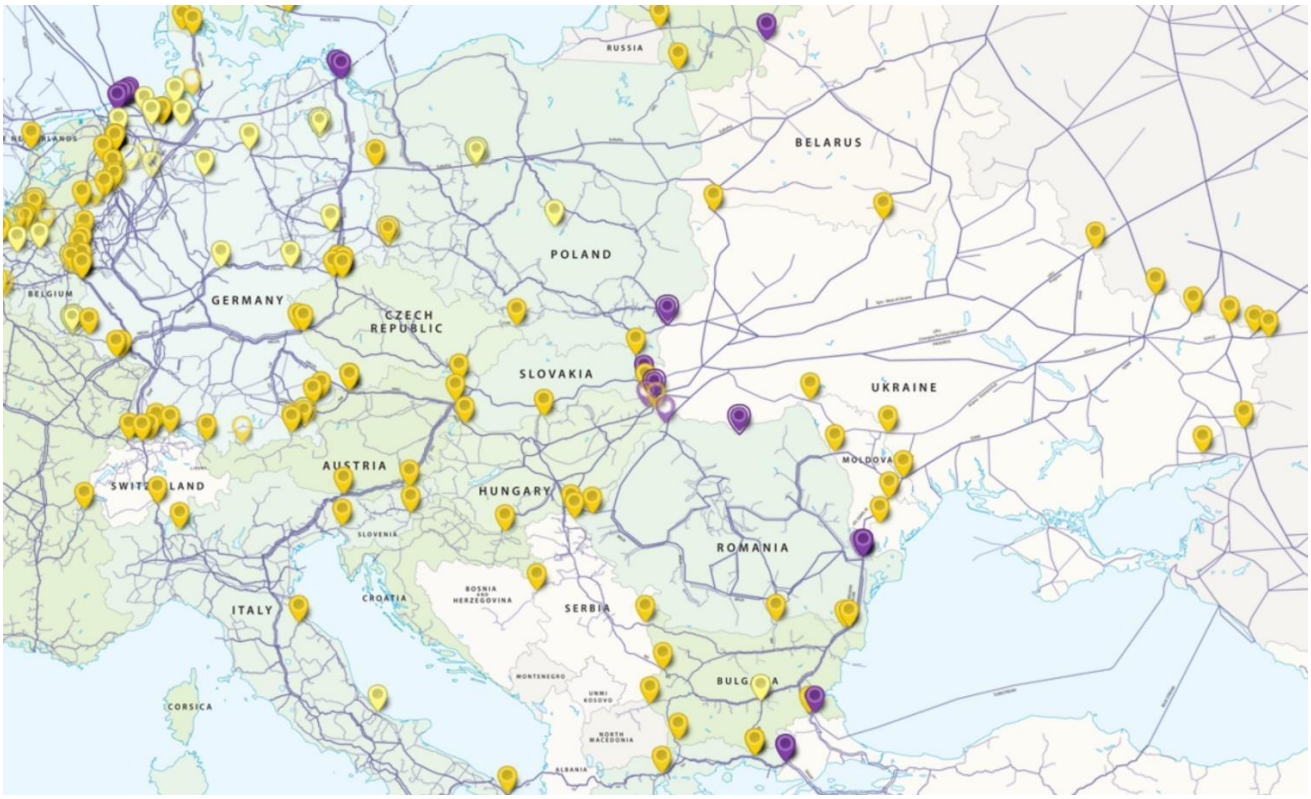
- **Financing hydrogen projects:**

In March 2023, the European Commission outlined the details of the creation of a European Hydrogen Bank, the idea of which was announced in September 2022 (COM/2023/156 final). The proposed activities of this financial mechanism include the provision of financing in the form of a "green" premium distributed at auctions, including for hydrogen producers outside the EU. A third auction is expected to be held by the end of 2025 with support for domestic producers, with conditions for international support still under discussion. It is expected that the H2Global project platform will be used to conduct support auctions for hydrogen imports to the EU.

In this regard, it is advisable to involve the Ukrainian side in the preparation of the conditions of future auctions, in particular to ensure non-discriminatory participation of Ukrainian companies in future tenders. Thus, in July 2025, the European Commission published a study with recommendations on the design of an auction for renewable hydrogen from third countries.

2) Main issues related to infrastructure projects of other countries (natural gas):

After the adoption of the RePowerEU plan, which fixed the gradual rejection of Russian gas as soon as possible and preferably by 2027, the map of gas flows and gas infrastructure began to change dramatically. Moreover, in the period 2025-2030, no natural gas transit through the territory of Ukraine from the Russian Federation to the EU and the Energy Community is expected. In terms of the development of natural gas infrastructure, Ukraine is significantly dependent on infrastructure projects of other states.



Source: ENTSOG Transparency Platform

In general one can highlight few directions on which the development of mportant for Ukraine projects (both necessary and alternative) are happening:

1. Corridor: Turkey-Greece-Bulgaria-Romania-Hungary-Slovakia;
2. Corridor: Germany-Poland-Lithuania;
3. Corridor: Italy-Austria-Slovakia.

Corridor Turkey-Greece-Bulgaria-Romania-Hungary-Slovakia:

Since the beginning of independence, natural gas transiting through Ukraine has been delivered to consumers in Hungary, Slovakia, as well as Romania, Bulgaria, and through it to Greece, Serbia, and Turkey. With the construction gas pipelines BlueStream (2005) and TurkStream (2019) gas from the Russian Federation is transported directly to Turkey. Given the cessation of transit through the territory of Ukraine from 2025, a radical change in flows has occurred along this corridor from south to north due to a significant increase in regasification capacities in Greece, as well as increasing the possibilities of receiving additional volumes of gas from other sources (in the future - new volumes of own production from Romania).
Thus, as of November 2024, the total regasification capacity of Greece is 12.5 billion m3 / year (in addition, it is planned to launch another 18 billion m3 / year of regasification capacity between 2025 and 2028), which is many times higher than the current consumption of this country. The TAP gas pipeline also passes through Greece, the capacity of which is proposed to be increased to 20 billion m3 / year. In addition, the construction of new EastMed and Poseidon projects is proposed on the territory of Greece: the first is to connect new sources of gas supply to the EU from Cyprus and the Middle East; the second will provide an underwater connection between Greece and Italy. Both new projects are included in the TYNDP 2024 draft. The EastMed project is included in the list of PCI/PMI projects from December 2025 under number 15.2.

To the north, Greece connects to Bulgaria at two interconnection points. One of them, the IGB gas pipeline with a capacity of 3 billion m3/year began operating in October 2022 (with the possibility of expansion to 5 billion m3 / year, for which a market demand study has begun in 2025).

The option of expanding the capacity of another point of the interstate connection Kulata/Sidirokastron is also being considered (according to Bulgartransgaz, it is planned from 2026); for this purpose, it is also necessary to strengthen the Bulgarian GTS (currently, the corresponding project TRA-N-1140 is included in the ENTSOG TYNDP 2024 draft).

Like Greece, Bulgaria expects to increase its role as a gas transit country. In particular, gas arriving

in Bulgaria from Greece and Turkey will be transported to Serbia, Romania, and through them to other countries. In addition to Greece, gas can also enter Bulgaria directly through the territory of Turkey. Given the insignificant volumes of gas consumption by Bulgaria (even with the prospect of increasing), the available gas resource will exceed its needs, and therefore is intended for transit to other countries via Serbia or Romania. The latter covers its own needs by about 70% due to its own production, which is planned to be gradually increased, so significant volumes of gas can be expected to be transported to other countries at the exit from Romania. Bulgaria is connected to Romania by gas pipelines, which were used primarily for transit gas from Russia (Kardam/Negru Voda 1, 2, 3); by 2026, it is planned to carry out work on strengthening the Bulgarian gas transmission system to increase the possibility of gas movement to Romania by 4.7 billion m3 / year (the project is included in the ENTSOG TYNDP 2024 draft, TRA-N-1124).

In accordance with the NES, full technical, institutional and legislative integration into European gas transportation networks must be ensured, cooperation with the countries of North-Western, Southern Europe and other regions must be developed regarding joint implementation of gas supply diversification projects to Central Eastern Europe. In this context, in January 2024, Ukraine and Moldova joined the Memorandum on the Vertical Corridor, which provides for coordination at the operator level with the participation of operators from Greece, Bulgaria, Romania, Hungary and Slovakia, in order to ensure the movement of gas from the south to the north of Europe (using the capacities of the Trans-Balkan gas pipeline). In the context of the operation of this corridor, in June 2025, a special joint product was launched for the transportation of gas from Greece to Ukraine (via Bulgaria, Romania, Moldova) using the Trans-Balkan discount route ("Route 1"), which provides for access to the Greek virtual trading point and the LNG terminal in Revitus. In addition, with the involvement of the operator of the interstate connection Greece-Bulgaria (IGB), the GTS operators of Greece, Bulgaria, Romania, the Republic of Moldova and Ukraine developed and agreed with national regulators in the second half of 2025 the introduction of additional joint products, namely "Route 2", intended for the transportation of gas from the Greek LNG terminal in Alexandroupolis via IGB to Ukraine, and "Route 3" - for transportation of gas from the TAP gas pipeline through IGB to Ukraine, which became operational on January 1, 2026. All three joint products are valid until the end of April 2026.

Corridor Germany-Poland- Lithuania:

Since the beginning of independence, natural gas transiting through Ukraine has been delivered to consumers in Poland and Germany through Ukraine. After launch of gas pipelines Yamal (2006) and №rd Stream (2011) gas from the Russian Federation began to be supplied to these countries directly. At the same time, part of the Russian Federation's hybrid aggression was the reduction in gas transportation volumes through the territory of Ukraine and Poland.

Given the cessation of gas transit from the Russian Federation to European countries via the territory of Ukraine from January 1, 2025, this corridor is expected to receive a consistently large volume of gas (given the significant domestic needs of Germany) due to the increase in regasification capacities in Germany, Poland and Lithuania, and therefore an increase in the potential for gas movement from north to south.

The regasification capacity in the region is: Germany - about 25 billion m3 / year (according to GIE data), Poland - 8.3 billion m3 / year (taking into account the increase from January 1, 2025), Lithuania - 3.75 billion m ^{3} /year. Except that, according to the data of the German Ministry of Economy and Climate Protection in 2025-2030, the annual capacity of all LNG terminals in Germany will increase from 37 billion m3 ^{to} 54 billion m3. Poland also plans to launch an FSRU near Gdansk in 2028 with a capacity of 6.1 billion m3 / year, with the possibility of expanding it in connection with the expected cessation of the EU's consumption of natural gas from the Russian Federation (analysis of market demand for additional capacity started in September 2025). This project is included in the TYNDP 2024 draft (LNG-A-947).

It is important for Ukraine to ensure sufficient connectivity between the north and south of Poland to obtain an additional source of gas supply and export. Historically, the Polish gas transmission system has had problems ensuring the movement of gas from north to south (in this regard, the TRA-N-245 project is included in the TYNDP 2022 project).

Corridor Italy-Austria- Slovakia:

Since the beginning of independence, natural gas transiting through Ukraine has also been delivered to consumers in Austria and Italy. Given the cessation of gas transit from the Russian Federation to

European countries via Ukraine from 2025, this corridor has seen a dramatic shift in flows from south to north, strengthening Italy's role as a gas transit point between Africa and the Middle East and Europe.

In 2022-2023, Italy significantly increased its regasification capacity, but these projects did not completely eliminate its dependence on Russia. By 2025, this need is expected to be closed through new internal mining, arrivals of pipe and liquefied gas, as well as energy savings and the replacement of natural gas with biomethane. This requires, in particular, strengthening the internal network of Italy through the implementation of the Linea Adriatica project. Gas exports to Austria can currently only take place through the Tarvisio/Arndstein interstate connection point. Separate attention should be paid to the needs of Austria, which still needs to strengthen its own measures to abandon Russian gas. It is possible to use the Trans-Balkan gas pipeline (as part of the "Vertical Corridor") to meet Austria's needs for additional gas volumes, including using the additional advantages of Ukrainian UGS.

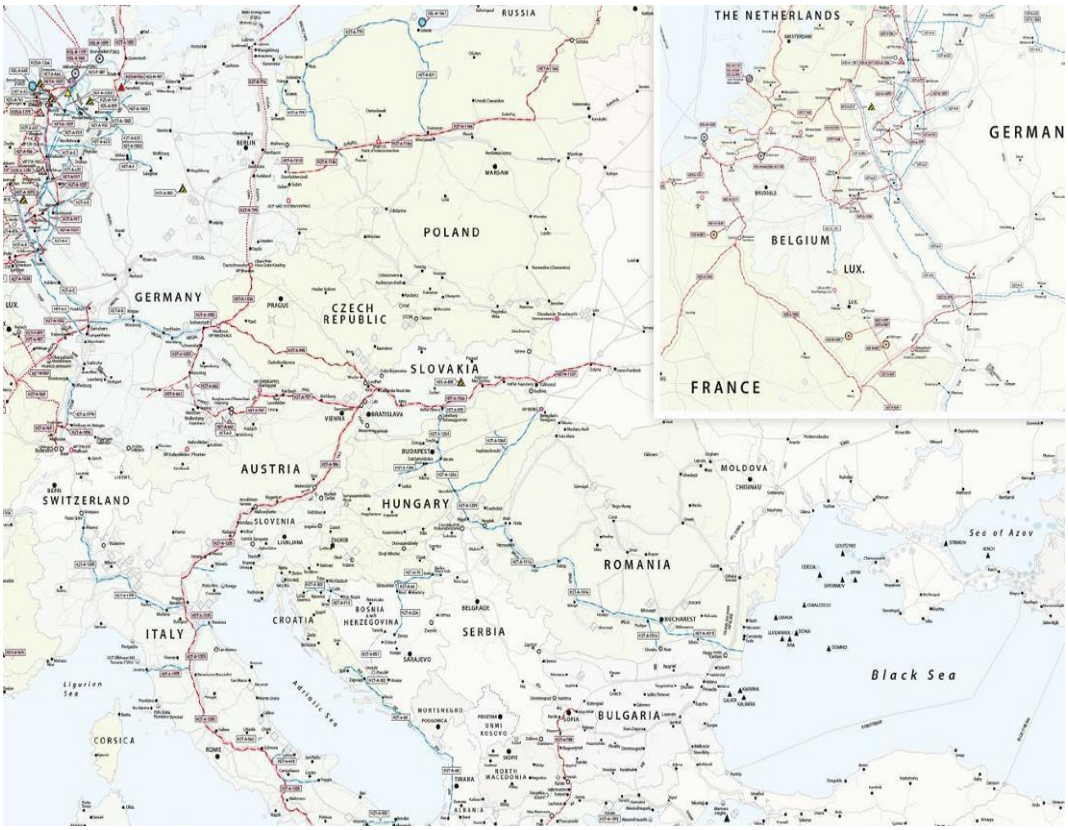
3) Main question related to infrastructural projects others states (hydrogen):

According to the International Energy Agency, global hydrogen production in 2024 reached 100 mt, with only 1% of this volume accounting for low-carbon hydrogen. Low-carbon hydrogen production could reach 37 mt in 2030 if data on announced projects are to be followed. At the same time, some EU Member States predict some import of renewable hydrogen as early as 2030 (Germany, Italy). Ukraine, as a potential exporter of renewable hydrogen to the EU, competes for this opportunity, in particular, with countries in North Africa and the Middle East (in particular Egypt and Oman).



Source: European Hydrogen Alliance

To deliver hydrogen to the EU and transport it to consumers, it will be necessary to provide appropriate infrastructure. The Central European Hydrogen Corridor (CEHC) project, in which LLC is a participant "GTS Operator of Ukraine", included in the second PCI/PMI list of December 2025 under numbers 10.5 and 10.13 ("Internal hydrogen infrastructure in Ukraine [currently known as 'Central European Hydrogen Corridor (UKR part)']").
In addition, the planning processes for the future hydrogen infrastructure take place within the framework of ENTSOG, in particular during the preparation of the TYNDP. It should be noted that inclusion in the TYNDP is a condition for inclusion in the PCI/PMI list, which paves the way for receiving grants from the Connecting Europe Facility, for which Ukraine has recently also been competing.



Source: ENTSOG TYNDP 2024 (draft) Map
To the TYNDP 2024 draft two projects concerning Ukraine were included:

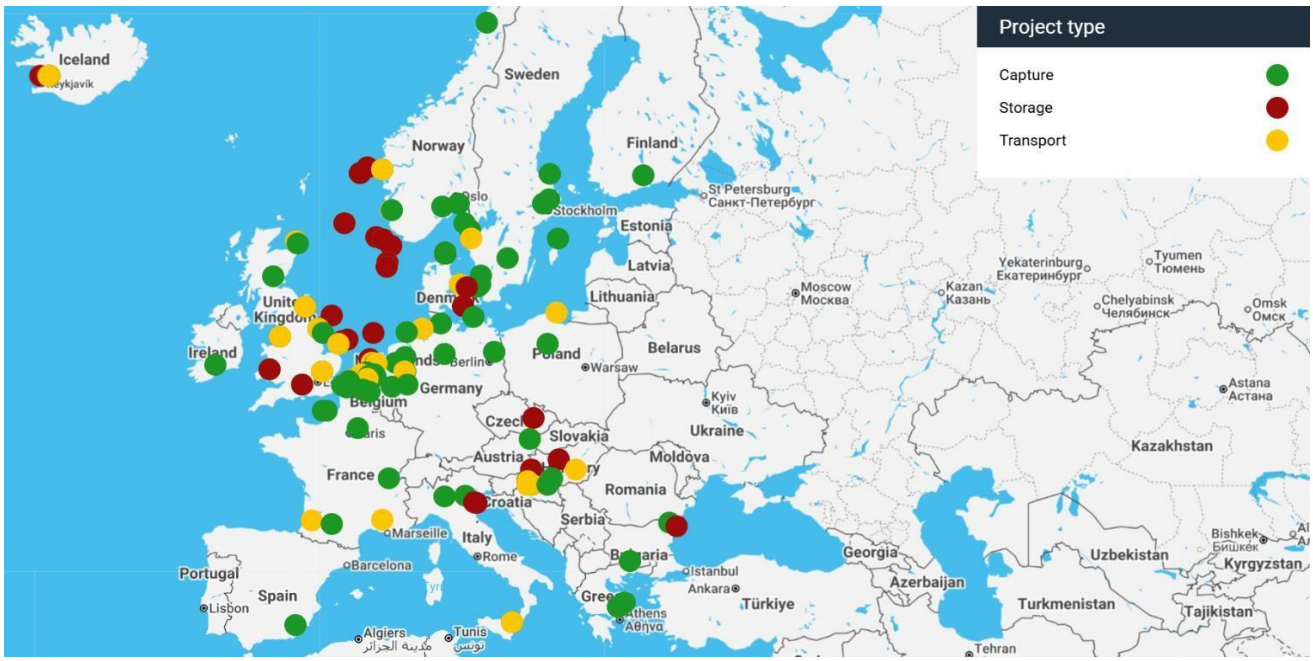
project LLC "Operator GTS Ukraine" H2T-A-1137 "Central European Hydrogen Corridor (CEHC) (UKR part)" (has a PCI/PMI status);

Project of the Hungarian TSO H2T-A-1065 "HU hydrogen corridor I "HU/UA" (has not a PCI/PMI status).

4) The main issues related to infrastructure projects of other countries (carbon dioxide, hereinafter - CO_2):

According to the International Energy Agency, in 2024, the total global capacity of carbon capture facilities was only about 50 million tons, with the United Kingdom of Great Britain and Northern Ireland, Denmark, Sweden, and Norway leading the way in the development and implementation of these technologies in Europe.

Regulation (EU) 2024/1735 of 13 June 2024 sets a target for ensuring annual CO_2 injection capacity at the level of 50 million tons by 2030, which, according to the Regulation, can be achieved at the expense of facilities on the territory (including within the exclusive economic zone and continental shelf) of the EU, also taking into account the countries of the European Economic Area zones. As of December 2023, 22 projects related to CO2 capture, storage and use (hereinafter referred to as CCUS) technologies are being developed within the EU Innovation Fund. In addition, in November 2023, the European Commission decided to include 14 CCUS projects in the list of PCI/PMI projects. These projects form part of the picture of CCUS projects in Europe.



Source: IOGP

On 06 February 2024, the European Commission adopted the Industrial Emission Management Strategy, which identifies not only the potential for these technologies to contribute to emission reductions, but also future measures for the development of pan-European infrastructure. According to this strategy, recognition of CO2 storage facilities outside the EU is possible if there is a synchronised EU ETS or if the CO2 is stored safely and environmentally friendly, resulting in emission reductions.

5) Issues related to the interaction of the power systems of Ukraine and the EU countries in wartime conditions

Provision of emergency support. In March 2026, the transmission system operator of Ukraine, NPC Ukrenergo, received an official letter from the Slovak TSO SEPS regarding the unilateral termination of the Agreement on Mutual Provision of Emergency Support between the TSOs of Ukraine and Slovakia. The final termination of the contractual terms is scheduled for May 2026. The reasons for the termination of the agreement remained unexplained. For its part, NPC Ukrenergo did not allow any violations of contractual terms with SEPS, acting in the spirit of good neighborliness and respect for the norms of European legislation. According to the assessment of NPC Ukrenergo, the termination of emergency support will not have a critical impact on the stability of the Integrated Power System of Ukraine (IPS). Together with that, the restoration of the mutual provision of emergency support will contribute to strengthening the energy security and reliability of the power systems of Ukraine and Slovakia.

Incomplete utilization of interconnector capacity. In the context of military aggression and systemic attacks by the Russian Federation on Ukrainian energy infrastructure facilities during 2022-2026, the stability of IPS deteriorated due to a decrease in resource adequacy and interruptions in the operation of electrical networks. Balancing in the power system cannot be fully secured only by score internal resources, ago for support The balance applies cross-border electricity trade, emergency assistance from the power systems of neighboring EU countries, and consumer disconnection.

The maximum permitted capacity for import and export of electricity between EU countries and the common regulatory block of Ukraine and Moldova is determined within the framework of the Eastern Europe Capacity Calculation Region (EE CCR) on a monthly basis. basis with taking into account operating room security. These volumes there are lower by technical opportunities for cross-border transmission of electricity through the existing interconnectors of Ukraine. In some periods, the actual capacity of electricity imports to Ukraine from the EU countries reached the maximum level of permitted transfer capacity of interconnectors, and was accordingly limited. Such regulation and restriction of cross-border trade in conditions of military risks and unstable operation of IPS complicates investment decisions regarding modernization of existing and construction new interconnectors. It is expected that the gradual stabilization of the operation of IPS and the reduction

of military risks will contribute to a more complete use of existing interconnectors and investment in new projects.

1.2.4. Administrative structure of implementing national energy and climate policies

In order to implement the NECP, including monitoring the implementation of policies and measures, preparation of integrated national progress reports on energy and climate, the Cabinet of Ministers of Ukraine will adopt a separate decision that will determine the framework conditions for such monitoring and implementation.

The implementation of the just transformation policy will be carried out within the framework of the institutional framework created by the State Target Program for the Just Transformation of Coal Regions of Ukraine for the period until 2030, with the participation of responsible authorities (Ministry of Development, Ministry of Energy, local governments, social partners, including trade unions, civil society).

Powers with implementation politician in field energy and climate have such organs authorities:

- The President of Ukraine (in terms of exercising constitutional powers to ensure national security, implementing the state's strategic course towards Ukraine's full membership in the EU and NATO);
- The Verkhovna Rada of Ukraine (in terms of adopting laws, the state budget, approving national programs for economic, scientific and technological development, and environmental protection);
- The Cabinet of Ministers of Ukraine (as the highest body in the system of executive bodies, which directs and coordinates the work of ministries and other executive bodies);
- Ministry of Economy;
- Ministry of Energy;
- Ministry of Development;
- NEURC;
- State Agency for Energy Efficiency, State Geological Survey of Ukraine, State Energy Supervision Agency, others central executive authorities;
- Operators objects infrastructure and separate subjects energy markets;
- Organs local municipality (further - Local self-government).

The Ministry of Economy is the central executive body, the activities of which are directed and coordinated by the Cabinet of Ministers of Ukraine, and which ensures the formation and implementation of the state policy of economic, social development and trade, the state policy in the field of technical regulation, the state investment policy, the state innovation policy in the real sector of the economy, the state foreign economic policy, the state policy in the field of entrepreneurship development, public-private partnership, the state policy in the field of labor and employment of households, the formation of the state policy in the field of consumer protection, the state policy on price control, the state regulatory policy and the state policy on licensing, the permitting system, and supervision (control) in the field of economic activity.

The powers of the Ministry of Economy as the central executive body that participates in the formation and implementation of state policy in the field of public procurement are important, particularly in the implementation of energy-efficient procurement. To the powers of the Ministry of Economy are included determining permissible energy efficiency classes for the procurement of energy-consuming products.

Among other things, the Ministry of Economy plays a key role in coordinating work on bringing the national system of technical regulation and national standardization into line with EU legislation and European and international standards. The Ministry of Economy also analyzes the state of competitiveness and resource efficiency of industrial sectors, develops and coordinates the implementation of measures to improve their level.

By Resolution of the Cabinet of Ministers of Ukraine No. 903 of July 21, 2025, the Government renamed the Ministry of Economy to the Ministry of Economy, Environment and Agriculture and liquidated the Ministry of Agrarian Policy and Food and the Ministry of Environmental Protection and Natural Resources (Official Gazette of Ukraine, 2025 p., No. 66, p. 4566). The newly created ministry is the legal successor to the functions, rights and obligations of the liquidated ministries. Thus, the functions of the former Ministry of Environment were transferred to the Ministry of Economy, which ensures the formation and implementation of state policy in the field of

environmental protection, state policy in the field of forestry and hunting, the formation of state policy in the field of geological study and rational use of subsoil, and the implementation of state supervision (control) in the field of environmental protection, rational use, reproduction and protection of natural resources.

The Ministry of Energy is the central executive body, the activities of which are directed and coordinated by the Cabinet of Ministers of Ukraine, and which ensures the formation and implementation of state policy in the electric power, nuclear industry, coal industry, peat mining, oil and gas and oil and gas processing complex, the formation and implementation of state policy in the field of renewable energy sources and alternative types of gas fuels and in the field of supervision (control) in the electricity and heat supply sectors, as well as in the natural gas market.

It is worth noting that the Cabinet of Ministers of Ukraine and the Ministry of Energy also exercise the rights of the state as the owner of individual entities of the natural gas and electricity markets, as well as individual objects gas and electricity infrastructure, in particular the Ministry of Energy exercises the rights of the state as the owner regarding the operator and property of the gas transportation system (GTS) and electricity transmission system, gas distribution system (GDS) and electricity distribution systems, and underground gas storage facilities (UGS).

The State Service for Geonadra is a central executive body, the activities of which are directed and coordinated by the Cabinet of Ministers of Ukraine through the Minister of Economy, Environment and agriculture and which implements state policy in the field of geological study and rational use of subsoil, is the authorized body for the implementation of production sharing agreements.

The National Commission for the Regulation of Energy and Utilities of Ukraine (NEURC) is a permanent collegial central executive body with a special status that carries out state regulation, monitoring and control over the activities of business entities in the energy and utilities sectors. The main tasks of the Regulator are:

1. ensuring the effective functioning and development of markets in the energy and utilities sectors;
2. promoting the effective opening of energy and utilities markets to all consumers and suppliers and ensuring non-discriminatory access of users to networks/pipelines;
3. promoting the integration of the electricity and natural gas markets of Ukraine with the relevant markets of others states, in particular in within the framework Energy Communities, cooperation with the Energy Community Regulators Board, the Energy Community Secretariat and national energy regulators of other states;
4. ensuring the protection of the rights of consumers of goods and services in the energy and utilities sectors to receive these goods and services of appropriate quality in sufficient quantities at reasonable prices;
5. promoting cross-border trade in electricity and natural gas, ensuring investment attractiveness for infrastructure development;
6. realization of price and tariff-setting policies in energy and communal services;
7. promoting the implementation of energy efficiency measures, increasing the share of energy production from renewable energy sources and protecting the environment ;
8. creating favorable conditions for attracting investments in the development of markets in the energy and utilities sectors;
9. promoting the development of competition on markets in areas energy and communal services;
10. others tasks provided by law.

MinDevelopment is the central executive authority whose activities are directed and coordinated by the Cabinet of Ministers of Ukraine. It is responsible for the formulation and implementation of state policy in the fields of road, rail, maritime, inland waterway, and air transport, as well as the use of Ukrainian airspace, multimodal transport, and the protection of critical infrastructure in the relevant sectors. In addition, MinDevelopment is responsible for state regional policy, local self-government

development, territorial organization of government, administrative-territorial structure, housing policy, housing and communal services, municipal waste management, construction, urban planning, spatial planning, architecture, the recovery of regions, territories, and infrastructure affected by the armed aggression of the Russian Federation, and the efficient use of fuel and energy resources, alternative liquid and solid fuels, energy conservation, and energy efficiency.

Particular attention should be paid to the division of responsibilities between NEURC and MinDevelopment in the district heating sector. NEURC is responsible for the regulation, licensing, and tariff-setting of entities producing thermal energy at combined heat and power plants (CHPs), thermal power plants, nuclear power plants, and cogeneration installations. At the same time, MinDevelopment is responsible for the formulation of state policy in the district heating sector. Licensing of thermal energy production from other types of installations, as well as the transmission and supply of thermal energy, is carried out by regional and the Kyiv City State (Military) Administrations, while tariffs are set by local self-government bodies in accordance with procedures established by the Cabinet of Ministers of Ukraine.

Together with MinEnergy and NEURC, MinDevelopment is one of the key institutions responsible for operationalizing the "energy efficiency first" principle and ensuring its systematic application across the energy sector.

SAEE is a central executive authority whose activities are directed and coordinated by the Cabinet of Ministers of Ukraine. Its primary responsibilities include implementing state policy on energy efficiency and alternative fuels, increasing the share of alternative fuels in Ukraine's energy balance, and promoting energy efficiency improvements across all sectors of the national economy. SAEE is also responsible for developing technical regulations related to energy efficiency and alternative fuels, as well as technical regulations on ecodesign and energy labeling of energy-related products.

The **Energy Efficiency Fund** began operating in July 2018. Its purpose is to support government energy efficiency initiatives and implement incentive and support mechanisms for energy efficiency investments, particularly in the residential sector, in line with the Paris Agreement, the EU acquis, and the Treaty Establishing the Energy Community. The activities of the Fund are coordinated by MinDevelopment.

In 2024, another financial instrument was launched—the **Decarbonization and Energy Efficiency Transformation Fund**, which is coordinated by SAEE. The Fund may allocate resources to support state programs in the fields of energy efficiency and renewable energy development, subsidize and compensate loan and leasing obligations related to the implementation of such projects, and enable the state to meet debt obligations associated with investment projects in these areas.

Local self-government bodies also play an important role, particularly in the field of energy efficiency.

Derzhenergonaglyad is a central executive body, the activities of which are directed and coordinated by the Cabinet of Ministers of Ukraine through the Minister of Energy and which implements state policy in the field of supervision (control) in the electricity and heat supply sectors, as well as in the natural gas market. The main tasks of Derzhenergonaglyad are to implement state policy, submit proposals for consideration by the Minister of Energy to ensure the formation of state policy, as well as organize and implement state policy in the field of supervision (control) in the electricity and heat supply sectors, as well as in the natural gas market.

In the natural gas market operates **the GTS operator** (LLC "GTS Operator of Ukraine"), which is responsible for the reliable and safe operation, maintenance and development of the state-owned GTS. The TSO is independent of other activities in the natural gas market and has been certified under the ISO model since 2020, as well as an observer member with ENTSOG. Storage of natural gas is provided by the **operator of gas storage facilities** (JSC "Ukrtransgaz"). OUGS is certified in 2023 in accordance with requirements Regulations (EU) No. 715/2009 (as amended in 2022).

In the electricity market, the system-forming element is **the transmission system operator** (TSO) - NEC "Ukrenergo", which is responsible for the development of the transmission system, including interstate power transmission lines. NEC "Ukrenergo" is a member of the European energy association ENTSO-E and is certified as a TSO according to the ISO model. The TSO also performs

the functions of operational and technological management (dispatching) in the Unified Energy System (UES) of Ukraine, is the operator of the balancing market, the ancillary services market, the administrator of commercial accounting and settlement administrator, and the operator of auctions. on the allocation of bandwidth of interstate networks.

electricity **markets "day-ahead" (DAA) and the intraday market (IDM) is JSC "Market Operator", which is responsible for organizing the purchase and sale of electricity and settlements in these segments. JSC "Guaranteed Buyer" was created to perform the functions of a guaranteed buyer** , which operates in three main areas: 1) purchase of electricity at a "green" tariff, 2) implementation of PSO mechanisms to ensure general public interests in the electricity market (in terms of the development of RES, providing the population with affordable electricity and ensuring the security of electricity supply during martial law) and 3) organization of auctions for renewable generation entities.

The distribution of natural gas and electricity is carried out, respectively, **by gas distribution system operators** (GDSs) and **distribution system operators** (DSOs), which are natural monopolies and are subject to regulation by the Regulator, in particular in terms of licensing activities and implementation of license conditions, approval/approval of system development plans and relevant investment programs, approval of tariffs for distribution services, quality control of service provision, etc.

Since the beginning of the full-scale invasion of Ukraine by the Russian Federation, significant changes have occurred in the management of these companies. In the spring of 2022, at the request of the State Bureau of Investigation, they were arrested by court decision and transferred to the National Agency of Ukraine on the identification, tracing and management of assets obtained from corruption and other crimes (ARMA) corporate rights 26 OGDS. By order of the Cabinet Ministers of Ukraine dated May 28, 2022 No. 429 "Some issues of managing assets that have been seized in criminal proceedings, in exceptional cases" (Official Gazette of Ukraine, 2022 p., No. 45, p. 2474) in order to prevent the risk of an emergency situation in the energy sector, the Cabinet of Ministers of Ukraine agreed to transfer the seized blocks of shares to the State Joint-Stock Company "Chornomornaftogaz" for management "for the period until the risk of failure and/or interruption of the functioning of assets, which may lead to the emergence of emergency situations, and until the completion of procedural measures". At the same time, by the Resolution of the Cabinet of Ministers of Ukraine dated November 25, 2022 No. 1335 "On the regulation of the issue of the use of gas distribution systems or their components" (Official Gazette of Ukraine, 2022 p., No. 97, p. 6042) approved under the proposal of the Ministry of Energy it was decided to conclude in accordance with the model agreement approved by the Cabinet Resolution Ministers of Ukraine dated February 21, 2017 No. 95 "On ensuring the effective use of gas distribution systems or their components" (Official Gazette of Ukraine, 2017 p., No. 20, p. 559) with LLC "Gas Distribution Networks of Ukraine" contracts for the operation of gas distribution systems or their components and terminate in this regard the contracts for the operation of gas distribution systems or their components concluded with the OGDS in accordance with the provisions of the specified resolutions. In this connection, LLC "Gas distribution networks of Ukraine",which is part of the Naftogaz Group, received a license to conduct natural gas distribution activities in accordance with the Resolution of the National Commission for the Regulation of the National Energy and Natural Resources Commission of Ukraine No. 1839 dated December 26, 2022, the territory of which is gradually increasing with the transfer of assets from previous OGDS. In this case, the licenses of previous operators are suspended. Some decisions are under judicial review.

A major player in the natural gas market, operating in the retail and wholesale markets, as well as performing a number of PSOs is **the Naftogaz Group** which includes extractive companies (JSC "Ukrgazvydobuvannya" and PJSC "Ukrnafta"), supplier companies (LLC "Gas Supply Company "Naftogaz of Ukraine", LLC "Gas Supply Company "Naftogaz Trading"), as well as NJSC "Naftogaz of Ukraine" as a wholesaler.

The Naftogaz Group also includes JSC Ukrtransnafta, which is **an operator of main oil and oil product pipelines** based on a license for the transportation of oil by main pipeline, as well as the transportation of oil products by main pipeline on the part of the main oil product pipeline "Samara - Western Direction" (as a manager). JSC Ukrtransnafta is the founder of LLC Naftogaz Oil Trading, which carries out wholesale fuel trade.

1.3. Consultations and involvement of national and Energy Community entities and their outcome

1.3.1. Involvement of the national parliament

On April 22, 2024, at a meeting of the Committee of the Verkhovna Rada of Ukraine on Environmental Policy and Nature Management with the participation of representatives of the Ministry of Economy and the Ministry of Environment, the NECP draft was presented, which received a positive assessment from those present and information about which was entered into the minutes of the committee meeting.

On May 29, 2024, the NECP draft was also presented at a meeting of the Committee of the Verkhovna Rada of Ukraine on Energy and Housing and Communal Services with the participation of representatives of the Ministry of Economy, whose members provided comments and decided to take note of information regarding the development of this strategic document.

1.3.2. Involvement of local and regional authorities

On March 14, 2024, the draft NECP was presented to the Ministry of Economy as part of the hearings of the Congress of local and regional authorities under the President of Ukraine. About 1,100 participants (representatives of local self-government bodies, district, regional, Kyiv city state (military) administrations, all-Ukrainian associations) registered for the hearing, which is the highest rate of involvement of the Congress in 2024.

During the event, the participants drew attention to the importance of synchronizing the tasks of NECP with local development strategies, which will allow attracting funds from structural funds for the implementation of tasks for the development of the energy sector and climate protection. Also, representatives of local self-government authorities emphasized that in the process of ensuring energy sustainability of Ukraine, it is worth paying attention to the process of decentralization and achieving energy autonomy of territorial communities. In addition, representatives of local self-government bodies were involved in public online consultations on the dimensions of NECP and on certain cross-sectoral issues (see below).

1.3.3. Consultations of stakeholders, including the social partners, and engagement of civil society and the general public

The main assumptions for modeling the scenarios in the preparation of the NECP and the description of the main parameters of the modeling scenarios were agreed by the Ministry of Economy with the Ministry of Energy, and the Ministry of Infrastructure.

During the development of NECP, the expert group carried out:

● working consultations with representatives of the Ministry of Environment on the issues of goals and policies under the dimension "decarbonization" (September 28, 2023), CBAM and carbon pricing tools (November 1, 2023), the status of the preparation of key documents for the "decarbonization" dimension (January 24, 2024 .), decarbonization policies in the waste sector (January 23, 2024);

● working consultations with representatives of the Ministry of Infrastructure on issues of goals, adopted and planned policies in the direction of "energy efficiency" (September 28, 2023);

● working consultations with representatives of the Ministry of Energy on the issues of goals, policies and measures regarding renewable energy (in particular, the development of biofuels) and the development of the nuclear industrial complex (12.10.2023), future goals, policies and measures regarding hydrogen (15.12.2023), agreement on indicative indicators for the development of renewable energy sources (10.01.2024), policy in the coal mining sector (11.04.2024);

● working consultations with representatives of the Ministry of Agrarian Policy on the issues of forecasting GHG emissions and decarbonization policies in the agricultural sector (January 18, 2024, April 2, 2024);

● working consultations with infrastructure operators and the largest players of the respective markets, in particular JSC "Ukrgazvydobuvannya" (21.11.2023), JSC "Ukrtransnafta" (22.11.2023), JSC Ukrtransgaz (November 29, 2023), Ukrenergo NEC (November 30, 2023, May 20, 2024), GTS Operator of Ukraine LLC (December 11, 2023);

● working consultations with representatives of the Regulator (NEURC) on 04/04/2024 and 04/26/2024 on issues of reforming and developing the electricity and gas markets, the development of renewable energy.

In preparation for the NECP update, the expert group also held a series of working consultations with key central executive authorities and infrastructure operators. For example, the just transition policy was expanded and more deeply integrated, climate change adaptation policies were significantly revised, and greenhouse gas emission projections were updated (including for the waste, agriculture, and LULUCF sectors).

The specialists of the State Institution "Institute of Economics and Forecasting" of the NAS of Ukraine conducted new modeling for both scenarios of the NECP based on the improved TIMES-Ukraine model with updated/revised economic and demographic forecasts, dynamics of world energy prices and foreign trade. The updated assumptions were agreed with the relevant central executive authorities (in particular, Ministry of Economy, Ministry of Energy, Ministry of Development, NEURC, as well as key state-owned companies (in particular, Ukrenergo and Naftogaz Group).

In the course of the approval procedure of the NECP in 2024, more than 170 comments and observations were processed by the interested bodies, most of them were taken into account.

In addition, the following public online consultations were held on the dimensions of the NECP and on individual cross-sectoral issues:

● "Energy efficiency in municipalities" (November 29, 2023, about 150 registered participants):

As part of the consultation, the participants raised the issue of the delay in the development of secondary legislation. In particular, at the time of the consultations, the issue of developing local energy plans had not been settled, the mechanism for local government access to information from suppliers of electricity and natural gas was noted to be ineffective, and secondary legislation for the certification of energy auditors had not been prepared.

● "Energy Security" (November 30, 2023, about 110 registered participants);

In the course of the discussion, the participants expressed proposals for strengthening the stability of the energy system, including the protection of critical infrastructure, in the conditions of attacks by the Russian Federation. The discussion also concerned such issues as the economic rationale for the restoration of oil refining, the realistic terms of the formation of minimum reserves of oil and oil products, ensuring greater flexibility of the energy system.

● "Decarbonization: development of RES" (December 13, 2023, about 100 registered participants):

As part of the online consultation, the basis of RES development goals, as well as existing and planned policies were presented. The participants discussed the problems of RES sector development, the effectiveness of current policies and the need to introduce new ones.

In the context of renewable gasses, issues were raised regarding the negative impact of regulated prices and the ban on gas exports on the development of the industry, the difficulties of interacting with GDSO/OSR during the connection, the non-competitive cost of connection and other problems, which together can make it possible to achieve production of only 50-100 million m 3 biomethane by 2030, the need to adapt existing support mechanisms to small producers, as well as integration into the Union Database for Biofuels.

● "Decarbonization: integration of RES into energy systems and markets" (December 14, 2023, about 70 registered participants):

In the context of the development and integration of renewable energy sources into the power system and the electricity market, the issues of integration of markets with EU countries (market coupling), mechanisms for ensuring the sufficiency of generating capacities, in particular capacities for reserving generating facilities based on renewable energy sources, were discussed. In the context of renewable gasses, the issues were discussed regarding the difficulties of connecting biomethane production facilities to gas and electricity networks, the need to determine the further fate of gas distribution networks, improving their condition, regulating the use of gas for production and technological needs, as well as ensuring the cost-reflectivity in operators' tariffs (in including the GTS operator for the second regulatory period of 2025-2030).

● "Decarbonization: policies and measures to reduce GHG emissions" (December 18, 2023, about 80 registered participants);

The main topics of the discussion concerned the realism of the goals and effectiveness of the main policies and measures to reduce greenhouse gas emissions, including the procedure for deploying the emissions trading system, reforming the environmental tax for carbon dioxide emissions, as well as

additional measures for decarbonization in the sectors of agriculture, LULUCF, and waste.

● "Research, innovation and competitiveness" (January 8, 2024, about 100 registered participants);

During the consultations, an active discussion took place regarding the renewal of educational and scientific priorities, targeted investments for the development of production and export of energy and climate technologies, as well as closing the need for specialists in the fields of clean production and carbon-free energy.

● "Development of energy markets for 2025-2030." (January 16, 2024, about 150 registered participants):

In the context of the development of the electricity market, the issues of integration/unification with the markets of EU countries (market coupling) and the choice of the NEMO model were discussed; liberalization of pricing, in particular the gradual elimination of PSO mechanisms, the use of price caps; mechanisms for ensuring the sufficiency of generating capacities; the development of "smart" networks, the stimulating regulation of OSR and target indicators for the reduction of electricity losses in networks; formation of debts in the market. In the context of the gas market, the issues were raised as regards the need to cancel PSO and the moratorium on prices for consumers, the separate development and analysis of the energy market for use in transport, including such fuels as CNG and LNG.

● "Increasing the energy efficiency of enterprises and energy companies" (January 18, 2024, 115 registered participants):

Among the main directions that require additional efforts of the state, the participants noted the creation of financial support tools for enterprises for the implementation of energy-efficient measures.

● "Motor fuel market and its decarbonization (oil refining, import, development of RES in transport)" (January 25, 2024, about 75 registered participants):

During the discussion, it was noted the need for a more systematic state attention to the issue of energy use in transport. The issues of developing alternative types of fuel (CNG, LNG), ensuring the preservation of minimum reserves of oil and oil products, as well as obligations regarding mixing fuels with components of biological origin were raised.

In the course of public consultations after the publication of the draft NECP, more than 550 comments, remarks and suggestions were received and processed from various groups of stakeholders, including business entities and business associations (Naftogaz of Ukraine, LLC "Operator of the Gas Transport System of Ukraine", JSC "Ukrtransgaz", LLC "Ukrainian Energy Exchange", LLC "Orlen Ukraine", European Business Association, Ukrainian Wind Energy Association, Ukrainian Association of Bioethanol Producers), public associations (Association of Coal Communities of Ukraine, World Wide Fund for Nature Ukraine (WWF-Ukraine), Center for Environmental Initiatives "Ekodiya", "Energy Transition" Coalition), analytical centers and advisory bodies (Green Deal Ukraine, Recovery and Reform Support Team under the Ministry of Energy), international financial organizations (European Bank for Reconstruction and Development), international aid projects (USAID energy security project), natural persons.

In the process of updating the NECP in 2026, the following public online consultations were held by stakeholder groups:

- Discussions with representatives of civil society organizations and the expert community (February 6, 2026, 44 registered participants representing 27 organizations)

During the discussion, participants commented on the need to correlate the goals set by territorial communities in municipal energy plans with national goals at the NECP level, as well as the importance of the Ministry of Development participation in this process. In addition, a proposal was made to conduct relevant explanatory work with representatives of local governments.

The issue of including, under the Decarbonization dimension, certain clarifications or caveats regarding the principles of restoring damaged infrastructure to avoid significant greenhouse gas emissions was also raised. In the context of simplifying permitting procedures for RES facilities, a proposal was made to specify an exception regarding conducting EIA and SEA.

- Discussions with international and Ukrainian business associations and companies (February 13, 2026, 91 registered participants)

The participants of the consultations raised the issue of the feasibility of an optimistic scenario of

GDP growth in the modeling of the updated NECP. There were also comments on the feasibility of presenting in the modeling not only the volumes of electricity production by technology, but also other elements of the energy system balance - in particular, imports, exports, consumption and storage of energy. Among other things, the participants proposed to emphasize in the document the development of self-production of energy from RES for decentralized energy supply, as well as to simplify permitting procedures as much as possible, to ensure the right to collective self-consumption and distribution of excessive electricity between subjects such communities. In addition, in the direction of bioenergy, it was recommended to make proposals on the use of oilseeds for fuel production.

- Discussion with representatives territorial communities (February 20, 2026, 130 registered participants)

Participants discussed potential mechanisms for setting targets for municipalities, in particular regarding energy efficiency. The participants expressed their views on the need to develop baseline scenarios on which territorial communities should rely on the formation of their own energy plans. In addition, under the Internal energy market dimension, possible tools for using excess electricity generated from solar energy by installations on municipal buildings were discussed - in particular, the possibility of its accumulation, on-site consumption or supply to the network.

- Discussions with international partners working in the fields of energy, climate, environmental protection and other areas related to NECP (February 25, 2026, 58 registered participants)

During the discussion, questions were raised about individual accounting heat consumption at the household level as part of the requirements of EU law and its potential for saving natural gas resources. In particular, the low level of commercial metering coverage at the building level, slow progress in this area and possible incentive mechanisms were discussed. In addition, in the modeling part, the participants discussed the forecasts for the development of RES and nuclear energy under the WAM scenario. They also discussed industrial assets and approaches to decarbonization of the metallurgical industry - in particular, the possibility of switching to electric arc furnaces or direct iron reduction technology.

- Discussion with representatives of central executive authorities responsible for the implementation of the NECP (March 9, 2026, 76 participants)

During the presentation of changes to the NECP in the Decarbonization dimension, participants drew attention to the need to define separate goals and trajectories for the development of renewable energy in the buildings, industry, and use of renewable fuels of non-biological origin taking into account the requirements of Directive (EU) 2018/2001. The issue of measures to adapt the energy sector to climate change was also raised. Separately, the participants discussed the issues of the fiscal regime and amendments to the Tax Code, which should be excluded from the draft of the updated NECP, since they are not subject to its regulation and should be implemented in accordance with the National Revenue Strategy until 2030, approved by the Resolution of the Cabinet of Ministers of Ukraine of December 27, 2023 No. 1218-r.

In compliance with the requirements of the Law of Ukraine "On Strategic Environmental Assessment", a strategic environmental assessment (SEA) was conducted by assessing the likely significant impacts on the environment during the implementation of the NECP project. In the process of SEA, an analysis of the impact of the implementation of the decisions of the NECP project on individual components of the natural environment, as well as the overall impact on natural processes and complexes, was carried out. A significant negative impact on the environment and public health during the planned activity is not expected. The draft NECP duly takes into account the SEA report, the results of public discussion and consultations. For more details, see Unified register of the SEO, case number 26-03-5322-24.

In accordance with the requirements of parts seven and eight of Article 10 of the Law of Ukraine “On Strategic Environmental Assessment”, the Ministry of Economy, as the customer, has decided not to conduct an SEA of the updated NECP due to minor changes to the state planning document for which an SEA was previously conducted. The relevant decision, together with its justification, has been published in accordance with the procedure established by law. For more information, see the Unified Register of SEA, case No. 17-03-20578-26.

1.3.4. Consultations of other Contracting Parties and Member States of the European Union

As part of the preparation of the NECP, a High Level Advisory Group (HLAG) was established with the participation of representatives of the European Union, the Secretariat of the Energy Community

and the governments of the G7 countries. During regular meetings, HLAG participants were presented with key objectives, policies and measures of the NECP, key assumptions and preliminary modeling results, and discussed how to overcome the main challenges for harmonizing energy and climate policies.

Official letters with an invitation to submit comments and proposals to the NECP draft were sent to neighboring EU member states and Contracting Parties of the Energy Community. Comments were received from the Republic of Poland, which were discussed at the HLAG meeting on March 4, 2024. Comments related to the need for consultations at an early stage between operators of electricity transmission systems regarding the development of prospective projects of interstate connections (and, accordingly, the expediency of mentioning individual projects of interconnectors), compliance with technical requirements for the synchronous operation of the energy system of continental Europe. In the gas sector, comments related to technical and economic analysis, in particular demand assessment and business case construction, with the aim of increasing guaranteed capacity on existing interstate connections. The issues of updating the status of the "Brody - Adamowa Zastava" project, potential cooperation in the trade of renewable gases (biomethane, hydrogen) and repurposing of the gas infrastructure, policies to reduce emissions in the sector of GHG were also discussed.

On May 3, 2024, bilateral consultations were held with representatives of the Republic of Moldova. The Moldovan side was interested in the issue of taking into account in the NECP draft of the territories where hostilities are (were) being conducted or temporarily occupied by the Russian Federation (hereinafter referred to as the temporarily occupied territories), plans to launch ETS, prospects for replacing coal-fired power generation with new technologies and the corresponding impact on the possibilities of exporting electricity from Ukraine, coordinated development of infrastructure.

In turn, the representatives of the government of Moldova presented their draft NECP, including key goals and targets, a list of policies and measures, and modeling results. The discussion concerned, among other things, the integration of the electricity markets of Ukraine and Moldova with the EU market, measures to implement Regulation (EU) 2022/869 on guidelines for trans-European energy infrastructure, development of gas transport infrastructure (Trans-Balkan pipeline, "Vertical Corridor" initiative), use Ukrainian gas storage capacities, time frames for the liberalization of energy markets, increasing the share of RES in the transport sector. The Ukrainian side had the opportunity to receive answers to questions regarding decarbonization measures in the field of heat supply, increasing the share of RES in the industrial and building sectors.

On February 27, 2026, cross-border consultations on the updated NECP were held, with 34 participants (18 participants registered). The event was attended by representatives of the governments of Moldova, Romania, Poland, Hungary and Slovakia, as well as the Energy Community Secretariat, embassies (U.S., Italy, Netherlands, Germany, France), as well as the World Bank, the European Commission, the German Society for International Cooperation (GIZ), the Swedish Energy Agency and the Italian Agency for Development Cooperation (AICS). During the consultations, representatives of neighboring countries expressed interest in the joint development of carbon capture, transport, storage and utilization (CCUS) technologies, in particular carbon storage plans. Among other things, questions were raised about the prospects for the development of green hydrogen production in Ukraine and the development of hydrogen corridors between Ukraine and neighboring countries.

1.3.5. Iterative process with the Secretariat

The European Commission and the Secretariat of the Energy Community were involved in the High Level Advisory Group (HLAG) meetings. Also, the relevant directorates of the European Commission and the Secretariat of the Energy Community provided comments on the previous draft of the NECP.

On March 22, 2024, a presentation of the NECP project was held in Brussels with the participation of representatives of the Government of Ukraine and representatives of the European Commission, in particular the Directorate General for Energy (DG ENER), the Directorate General for Neighborhood Affairs and Enlargement Negotiations (DG NEAR), the Directorate General for Combating climate change (DG CLIMA), other stakeholders from the European Commission.

In accordance with the requirements of Regulation (EU) 2018/1999, the draft NECP was submitted to the Secretariat of the Energy Community for recommendations and their further processing for the preparation of the final draft of the NECP. The recommendations were duly considered and taken into account. Representatives and structural divisions of the European Commission were involved in the

process on an ongoing basis for the purpose of information and discussions.

While preparing the proposals for the update of the NECP, the aforementioned recommendations were re-examined and duly taken into account, taking into account the realities of the full-scale Russian invasion of Ukraine and its negative consequences. The Energy Community Secretariat also had the opportunity to comment on the draft of the updated NECP, which were also considered and taken into account to the maximum extent possible.

1.4. Regional cooperation in preparing the plan

1.4.1. Elements subject to joint or coordinated planning with other Contracting Parties and Member States of the European Union

By decision 2022/02/MC-EnC 88 of December 15, 2022, the Council of Ministers of the Energy Community adopted the common energy and climate goals of the Contracting Parties until 2030. Among other things, the following goals have been set for Ukraine:

● Reduction of greenhouse gas emissions by 65% compared to the level of 1990 to 309 million tons of CO2-eq.;

● The share of renewable energy sources in the structure of gross final energy consumption is at least 27%;

● Primary energy consumption is no more than 91.47 million tons of energy, final energy consumption is 50.45 million tons of energy.

The Contracting Parties of the Energy Community should take a coordinated approach to the implementation of policies to reduce dependence on fossil fuels in the short term and achieve climate neutrality of their economies by 2050. At the same time, as far as Ukraine is concerned, the goals should be revised at the meeting of the Council of Ministers of the Energy Community, following the termination of martial law in Ukraine.

All issues related to construction, expansion, as well as legal provision of guaranteed access to cross-border infrastructure, in particular in the field of gas-methane, oil, hydrogen and electricity, require a joint and coordinated solution.

1.4.2. Explanation of how regional cooperation is considered in the plan

In appropriate cases, NECP describes measures of regional cooperation. Among other things, this concerns cooperation in terms of the development of the electricity transmission system and GTS, in terms of regional integration of markets and trade development, in terms of risk assessment and planning of response measures to crises in the supply of energy resources, in terms of reducing emissions through the conclusion of agreements on bilateral cooperation in within the framework of Article 6 of the Paris Agreement.

2. NATIONAL OBJECTIVES AND TARGETS

2.1. Dimension decarbonisation

2.1.1. GHG emissions and removals

2.1.1.1. The elements set out in point (a)(1) of Article 4

Ukraine's updated Nationally Determined Contribution to the Paris Agreement, which the Government approved on July 30, 2021, significantly strengthened Ukraine's[13] contribution to overcoming global climate change. Thus, the document envisages **a reduction in Ukraine's total GHG emissions by 2030 by 65% compared to the 1990 emission level.** The same goal is fixed in the Council decision Ministers of the Energy Community 2022/02/MC-EnC.

Ukraine's national GHG emission reduction target covers all GHG emissions[14] and all sectors (energy, industrial processes and product use, agriculture, LULUCF, waste). Ukraine's commitment under the updated NDC includes temporarily occupied territories, although information of economic activities and GHG emissions levels on these territories are unavailable (expert assessments have been carried out). It is assumed that the NDC will be revised after the restoration of the territorial integrity of Ukraine.

According to the GHG emissions Inventory for 1990-2023, GHG emissions amounted to 221.7 million tons of $CO_{2\text{-eq.}}$ (taking into account the LULUCF sector) in 2023 year, which is by 75.8% lower from 1990 year. In the base year of 1990, emissions amounted to 916.5 million $CO_{2\text{-eq.}}$

By the Resolution of the Cabinet of Ministers of Ukraine dated October 29, 2025 No. 1172-r, the Second Nationally Determined Contribution of Ukraine was approved, which provides for the establishment of a target[15] to reduce greenhouse gas emissions by more than 65% from the 1990 level by 2035 (Government Courier, 2025 p. No. 223). That is, the level of emissions in 2035 should be less than 320.8 million $CO_{2\text{-eq.}}$.

2.1.1.2. Where applicable, other national objectives and targets consistent with the Paris Agreement and the existing long-term strategies. Where applicable for the contribution to the overall Contracting Parties' commitment of reducing the GHG emissions, other objectives and targets, including sector targets and adaptation goals, if available

On 8 October 2024 parliament approved Law No. 3991-IX "About main principles of State Climate Policy", which sets a long-term and legally binding goal of **achieving climate neutrality in Ukraine by 2050.** Thus, Ukraine's long-term climate goal is aligned with the EU's long-term goal.

The law also details the long-term goals of the state climate policy, which include achieving climate neutrality through a socially just and economically efficient transition to low-carbon development with the aim of holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the increase in the global average temperature to 1.5°C above pre-industrial levels by:

- reducing anthropogenic greenhouse gas emissions and increasing removals by sinks of greenhouse gases in accordance with Article 2 of the Paris Agreement;

[13] First NDC actually predicted GHG emissions reduction by 40% by 2030 from 1990 levels. The updated NDC increased the GHG emission reduction target to 65% of 1990 levels.

[14] Carbon dioxide - CO_2 , methane - CH_4, oxide nitrogen (I) - N_2O , hydrofluorocarbons - HFC, perfluorocarbons – PFC, sulfur hexafluoride – SF_6 , nitrogen trifluoride – NF_3.

[15] https://unfccc.int/sites/default/files/2025-11/2%20Ukraine%20NDC2_adj_v2.pdf

- increasing resilience and reducing risks, including to public health, associated with climate change, through the implementation of climate change adaptation measures in accordance with Article 7 of the Paris Agreement;
- ensuring low-carbon and sustainable development of Ukraine.

In addition, the corresponding target for **Achieving climate neutrality in Ukraine's energy sector by 2050** is set by the Energy Strategy of Ukraine for the period until 2050**.**

Ukraine also took on additional obligation of reduction of methane emissions by joining the Global Methane Pledge initiative, which was announced during the UNFCCC Conference of the Parties in Glasgow in November 2021. To implement Ukraine's climate policy within the framework of participation in the "Global Methane Pledge", an action plan was approved by the Order of the Cabinet of Ministers of Ukraine dated July 7, 2023 No. 607 (see description of planned activities in section 3.1).

The goal to reduce methane emissions is formulated as the expected result of implementing a number of tasks provided for in the Action Plan - **reducing methane emissions by 30% by 2030 from the 2020 level** , as provided for by the "Global Methane Pledge" initiative.

According to the GHG Emissions Inventory for 1990-2023, in 2020 methane emissions amounted to 83.6 million tons of $CO_{2\text{-eq.}}$, and in 2023 reduced to 62.8 million tons of $CO_{2\text{-eq.}}$ due to the devastating impact of the full-scale invasion of the Russian Federation on the energy sector. Accordingly, as of 2023, methane emissions have already decreased by almost 25% from the 2020 level. However, in the post-war period, methane emissions may increase due to the recovery of the economy and the energy sector. That is why it is important to ensure the full implementation of the Methane Emission Reduction Action Plan.

Ukraine also has an important sectoral target that will contribute to reducing GHG emissions. Thus, in 2021, Ukraine joined the Powering Past Coal Alliance[16] during an international conference in Glasgow and announced a target of abandoning coal in electricity generation by 2035. The ESU confirmed previously announced plans, in particular, stating that **the use of coal-fired generation will be reduced until it is completely decommissioned in 2035.** However, the feasibility of achieving this goal by 2035 will be assessed after the completion of the full-scale invasion of the Russian Federation into Ukraine, taking into account the state and existing capacities that will remain operational after the end of hostilities.

In recent years, Ukraine has also begun to develop a national policy in the field of adaptation to climate change. Thus, by the order of the Cabinet of Ministers of Ukraine dated October 20, 2021 No. 1363 the Strategy for Environmental Safety and Adaptation to Climate Change for the period until 2030 (Official Gazette of Ukraine, 2021 p., No. 87, p. 5584) in order to increase the level of environmental safety, reduce the impacts and consequences of climate change in Ukraine.

Energy is identified as one of the socio-economic sectors vulnerable to climate change, as the expected consequences pose threats to reliable energy supply for all types of consumers. In particular, the deepening of seasonal and daily changes in energy demand due to climate change will complicate the balancing of the Integrated Power System of Ukraine. Besides that, extreme weather phenomena can increase accident rate at electrical networks.

One of the goals of the Strategy is **to strengthen the adaptive capacity and resilience of social, economic and ecological systems to climate change,** to achieve which a number of tasks and measures have been formulated.

[16] Coalition national and subnational governments, enterprises and organizations, which are working on promoting the transition from coal-fired power generation to renewable energy sources.

2.1.2. Renewable energy

2.1.2.1. The elements set out in point (a)(2) of Article 4

By the Resolution of the Cabinet of Ministers of Ukraine dated August 13, 2024 No. 761-p 13, the National Renewable Energy Action Plan (NREAP) for the period until 2030 and the action plan for its implementation were approved. The NREAP outlines the state policy in the renewable energy sector and provides indicative targets for the development of RES by 2030 in heating and cooling systems, electricity generation and the transport sector. The updated indicative targets were developed as part of the preparation of the new edition of the NECP and are presented in the subsection 2.1.2.2.

The NREAP determines that **the share of energy carriers produced from renewable energy sources in the structure of gross final energy consumption should be at least 27% in 2030.** The same target is also set in the Decision of the Energy Community Council of Ministers 2022/02/MC-EnC. According to the results of the modelling carried out in the framework of the preparation of the updated version of the NECP (see sections 4 and 5), achieving 27% of RES in gross final energy consumption is possible only under the WAM scenario, which assumes the implementation of all existing and planned policies and measures. At the same time, their implementation will depend on the duration of the martial law and its consequences, the availability of financial resources, in particular the volume of private investments and the support of international partners.

2.1.2.2. Estimated trajectories for the sectoral share of renewable energy in final energy consumption from 2025 to 2030 in the electricity, heating and cooling, and transport sector

Table 2.1 presents an estimate of the expected gross final energy consumption by 2030 according to the results of the WAM scenario modeling (see Section 5).

Table. 2.1. Expected gross final energy consumption by 2030

(thousands toe)

Energy consumption sector	2020	2026	2027	2028	2029	2030
Heating and cooling	30,922	21,691	22,130	22,568	23,006	23,443
Electricity generation	12,805	8,379	8,950	9,521	10,093	10,664
Transport	8,018	6,672	7,040	7,408	7,776	8 144
Gross final energy consumption	**51,745**	**36,742**	**38 120**	**39,497**	**40,874**	**42,251**
including:						
Buildings	18,438	15,675	16,155	16,634	17,112	17,591
Industry	15,980	9,611	9,782	9,952	10 123	10,293

The national indicative target for RES in gross final energy consumption by 2030 in heating and cooling systems, electricity generation and the transport sector is presented in Table 2.2, in particular, in the following sectors:

- electricity generation — increasing the share of RES in energy consumption by 2.5 times from 2020 to 2030 - from 13.9% to 35%;
- heating and cooling — increasing the share of RES in energy consumption by 3.5 times from 2020 to 2030 - from 9.3% to 32.8%;
- increasing the share of RES in consumption by the transport sector by almost 10 times from 2020 to 2030 — from 2.5% to 24.1%;
- buildings — increasing the share of RES in consumption from 22.8% in 2026 to 30.1% in 2030;
- industry — increasing the share of RES in consumption from 15.9% in 2026 up to 29.9% in 2030

Table 2.2. **National indicative target for renewable energy sources in gross final energy consumption by 2030 in heating and cooling systems, electricity generation and the transport**

sector

Direction using energy from renewable energy sources	2020	2027	2028	2029	2030
Heating and cooling	9.3%	23.5%	26.7%	29.8%	32.8%
Electricity generation	13.9%	28.6%	31.2%	33.3%	35.0%
Transport	2.5%	12.0%	16.3%	20.3%	24.1%
Gross final energy consumption	**9.2%**	**19.8%**	**22.4%**	**24.8%**	**27.0%**
including:					
Buildings	**22.8%**	**24.9%**	**26.8%**	**28.5%**	**30.1%**
Industry	**15.9%**	**19.6%**	**23.1%**	**26.5%**	**29.9%**

2.1.2.3. Estimated trajectories by renewable energy technology that the Contracting Party projects to use to achieve the overall and sectoral trajectories for renewable energy from 2025 to 2030, including expected total gross final energy consumption per technology and sector in Mtoe and total planned installed capacity (divided by new capacity and repowering) per technology and sector in MW

The calculated table of the contribution of renewable energy sources to the energy consumption of each sector is presented in the table 2.3. According to estimates, the largest contribution of RES in the energy consumption is expected for heating and cooling sectors – 7 689 thousand tons of CO_2 in 2030, while for the electricity and transport sectors this figure is 2,666 thousand tons of CO_2 and 1,964 thousand tons of CO_2, respectively.

Table 2.3. Calculated table of the contribution of renewable energy to the energy consumption of each sector to gross final energy consumption, thousand toe

Direction of energy use with renewable energy sources	2020	2026	2027	2028	2029	2030
Heating and cooling	3,371	4,365	5,197	6,028	6,859	7,689
Electrical energy without including consumed for RFNBO production	1,774	2,169	2,557	2,968	3,362	3,729
without electric energy, which consumed by electric vehicles	*1,283*	*1,662*	*1,910*	*2,182*	*2,437*	*2,666*
Transport:	148	495	845	1,204	1,581	1,964
without taking into account multipliers (coefficients)	*95*	*253*	*443*	*636*	*833*	*1,032*
Gross final energy consumption	**4,749**	**6,279**	**7,551**	**8,846**	**10 129**	**11,387**
including:						
Buildings		3,570	4,027	4,452	4,877	5,291
Industry		1,525	1,917	2,298	2,687	3,078

Estimate of the total contribution expected from each type of RES to achieving the indicative targets by 2030 in the heating and cooling sector is presented in table 2.4. It is assumed that solid biomass will provide the largest share of the sector's energy consumption in 2030 – expected to be 80%, while the contribution of energy from heat pumps will be about 1% , and solar and biogas – 3% and 6%, respectively.

Estimate of the total contribution expected from each type of RES to achieving the indicative 2030 target in the electricity generation sector is presented in table 2.5. It is estimated that by 2030 installed capacity of RES objects will reach 24 GW, and generation - 43 TWh. In the structure of electricity production from RES in 2030, wind and solar will contribute the most, at 42% and 28%, respectively. In addition, the installed capacity of energy storage is expected to reach 4,552 MW in 2030.

Estimate of the total contribution expected from each type of renewable energy to achieving the

indicative 2030 targets in the transport sector is presented in Table 2.6. Thus, it is expected that the use of electricity from renewable sources in the transport sector will reach 363 thousand toe in 2030; rail transport will account for 29%, and electric vehicles for 63%. It is assumed that the total consumption of liquid biofuels will be 669 thousand toe in 2030, with the lion's share (72%) falling on bioethanol from food and feed crops.

Table. 2.4. Estimate of total contribution (gross final energy consumption), expected for each renewable energy source, to achieve the mandatory indicative targets for 2030 and the indicative intermediate trajectory for achieving the share of energy from renewable energy sources in heating and cooling systems for 2025-2030, thousand toe

Heat generation by type of source	**2020**	**2026**	**2027**	**208**	**2029**	**2030**
Geothermal (except low-temperature geothermal heat for use in heat pumps)	0	0	0	0	0	0
Energy solar radiation	1	55	103	151	199	247
Bioenergy objects including:	2816	3656	4402	5148	5894	6640
biomass	2797	3498	4163	4828	5493	6158
biogas	19	158	239	320	401	482
Energy from thermal pumps, including:	52	83	85	86	87	89
aerothermal	36	67	69	70	71	73
geothermal	10	10	10	10	10	10
hydrothermal	6	6	6	6	6	6
Renewable e/e for heat pumps with efficiency over 100%	n.d.	9	11	13	15	16
Energy from coolers	n.d.	218	224	231	237	243
Renewable energy for coolers with efficiency over 1.4	n.d.	22	27	31	35	38
Waste heat	502	321	345	369	393	417
Total	**3,371**	**365**	**5197**	**6028**	**6859**	**7689**

Table 2.5. Estimated total consumption (installed capacity, electricity production) expected from each renewable energy source in Ukraine to achieve the mandatory indicative targets for 2030 and an indicative intermediate trajectory for achieving the share of energy from renewable sources in gross final energy consumption for 2025-2030

Electricity generation by types of sources	**2020**		**2026**		**2027**		**2028**		**2029**		**2030**	
	MW	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**	**MW**	**GWh**
Hydropower plants:	**4824**	**6002**	**4716**	**8722**	**4721**	**8734**	**4726**	**8746**	**4731**	**8758**	**4736**	**8770**
power over 10 MW	4708	5793	4485	8151	4485	8151	**4485**	8151	4485	8151	4485	8151
power up to 10 MW	116	209	231	571	236	583	**241**	595	245	607	250	619
Geothermal energy			0	**0**	0	**0**	**34**	**180**	46	**240**	57	**300**
Solar power plants, including:	**6872**	**5969**	**9317**	**10723**	**10488**	**125930**	**11658**	**14463**	**12829 0**	**16333**	**14000**	**182031**
producers	6093	5236	6090	6549	6567	7523	7045	8497	7522	9470	8000	10444
active consumers	779	733	3227	4173	3920	5070	4614	5966	5307	6863	6000	7759
Wind power plants, including	**1314**	**3271**	**1406**	**3929**	**2129**	**5952**	**2853**	**7975**	**3576**	**9998**	**4300**	**12021**
onshore	1314	3271	1406	3929	2129	5952	2853	7975	3576	9998	4300	12021
offshore												

Bioenergy objects, including:	**210**	**755**	**417**	**1740**	**471**	**2005**	**526**	**2271**	**581**	**2536**	**636**	**2802**
biomass	107	284	236	958	279	1170	321	1382	364	1593	406	1805
biogas	103	471	180	782	193	835	205	889	217	943	230	996
Highly maneuverable capabilities with the ability of fast start/stop			**1199**	**6447**	**1232**	**6439**	**1264**	**6431**	**1297**	**6423**	**1329**	**6416**

storage installations, including	**1488**	**1557**			**2290**	**4560**	**2856**	**6228**	**3421**	**7895**	**3986**	**9563**	**4552**	**11230**
Rechargeable batteries					**775**	2625	1341	4368	1906	6111	2471	7853	3037	9596
PSPP	1488	1557			1515	1935	1515	1860	1515	1785	1515	1709	1515	1634
Total (from renewable sources)	**13220**	**15997**			15855	**25114**	**17809**	**29284**	**19798**	**33634**	**21763**	**37865**	**23729**	**42095**
e/e for RFNBO production		0				165		249		333		416		500
Total, taking into account normalization and excluding e/e for RFNBO production		20636				25229		29732		34517		39101		43374
Hydropower plants		10685				9920		9931		9941		9951		9961
Wind power plants		3227				3011		5453		7996		10457		12608

Table. 2.6. Estimated general contribution (gross final energy consumption), expected for each renewable energy source, to achieve the mandatory indicative targets for 2030 and the indicative intermediate trajectory for achieving the share of energy from renewable energy sources in the transport sector for 2025-2030, thousand toe

Direction of energy use with renewable energy sources	**2020**	**2026**	**2027**	**2028**	**2029**	**2030**
Electricity from renewable energy sources, which is consumed by transport, in including :	54,7	118,9	176,1	234,7	298,2	363,2
electric cars	11,7	59,4	97,6	138,4	183,2	229,8
railway transport	35	52,1	66,4	79,2	92,4	105,2
others types of electric transport	8	7,5	12,1	17,1	22,6	28,3

Consumption of liquid biofuels (bioethanol, biodiesel), including :	51	133,7	267,4	401,1	534,8	668,5
bioethanol:	51	95,7	191,4	287,1	382,9	478,6
bioethanol from food and forage crops	51,0	95,7	191,4	287,1	382,9	478,6
bioethanol from waste, residues (2nd generation)						
biodiesel:	0	16	32	48	64	80
biodiesel from food and forage crops						
biodiesel from waste, residues (2nd generation)	0	16	32	48	64	80
Biopropane:	0	3	5	8	11	14
from waste, residues (2nd generation)	0	2,7	5,4	8,1	10,8	13,6

Biokerosene:	0	19	39	58	77	97
from waste, residues (2nd generation)	0	19	39	58	77	97
Consumption of biomethane, in including	0	0	0	0	0	0
biomethane from food and forage crops						
biomethane waste, residues (2nd generation)						
biomethane from methanation of hydrogen and biogenic CO_2						
RFNBO consumed in transport (Green hydrogen, e-fuels)	0	0	0	0	0	0
Total renewable energy consumption in the transport sector	95,0	252,6	443,5	635,8	833,0	1031,8
Total contribution of renewable energy to the indicative target of renewable energy sources in the transport sector*	148	495	845	1204	1581	1964

*Note: *With taking into account multiplication factors (for 2020 year - Directive 2009/28/EC, for 2025-2030 – Directive 2018/2001).*

2.1.3.4. Estimated trajectories on bioenergy demand, disaggregated between heat, electricity and transport, and on biomass supply by feedstocks and origin (distinguishing between domestic production and imports). For forest biomass, an assessment of its source and impact on the LULUCF sink

Tables 2.4, 2.5 and 2.6 present the contribution of biomass to energy consumption in the heating and cooling, power generation and transport sectors, broken down by bioenergy type (solid biomass, biogas, biomethane, bioethanol I and II generation, biodiesel I and II generation). No more detailed estimates of the trajectory of bioenergy demand have been made.

2.1.3.5. Where applicable, other national trajectories and objectives, including those that are long term or sectoral (e.g. share of renewable energy in district heating, renewable energy use in buildings, renew able energy produced by cities, renewable energy communities and renewables self-consumers, energy recovered from the sludge acquired through the treatment of wastewater)

In addition to the indicative goals for the development of the renewable energy sector presented above, some other strategic documents of Ukraine also contain goals for renewable energy, which were taken into account when developing the NECP.

In the Concept for the Implementation of State Policy in the Field of Heat Supply, approved by the Cabinet Order Ministers of Ukraine dated August 18, 2017. No. 569 (Official Gazette of Ukraine, 2017 p., No. 70, p. 2127), established goals for **achieving the share of use of alternative energy sources (renewable energy sources and secondary energy resources) in the production of energy in in the field of heat supply in 2035 year at 40%.**

In the new National Transport Strategy of Ukraine for the period until 2030, among the expected results is **a reduction by 2030 in the volume of total greenhouse gas emissions from road, aviation, water and rail transport to 33% of the 1990 level or to 90% of the 2021 level (approximately 23 million tons of CO_2-eq.).**

2.2. Dimension energy efficiency

2.2.1. The elements set out in point (b) of Article 4

1) Indicative national contribution in the field of energy efficiency to the achievement of the energy efficiency targets as referred to in Article 1(1) and Article 3(5) of Directive 2012/27/EU, based on primary or final energy consumption, primary or final energy savings or energy intensity.

The current national indicative energy efficiency targets are set by Decision of the Energy Community Council of Ministers 2022/02/MC-EnC and the National Energy Efficiency Action Plan for the period

up to 2030, approved by the order of the Cabinet of Ministers of Ukraine dated December 29 2021 No. 1803 (Official Gazette of Ukraine, 2022, No. 8, p. 439). According to these documents, primary energy consumption in Ukraine in 2030 should not exceed 91,468 thousand tons of energy equivalent, and final energy consumption should not exceed 50,446 thousand tons of energy equivalent.

Taking into account the consequences of the full-scale invasion of Ukraine by the Russian Federation and its impact on the economy in general and the energy sector in particular, changes in the demographic situation, within the framework of the preparation of the NECP were ndicative values for primary and final energy consumption were calculated. The targets for primary energy consumption and final energy consumption were determined based on the results of modeling based on TIMES modeling, which allows taking into account both technical and economic aspects of energy systems. A detailed description of the assumptions used for the modeling is provided in Section B "Analytical Framework" of the NECP.

Based on the modelling results, primary energy consumption in Ukraine by 2030 could be reduced to 59,382 thousand tonnes of COE, while final energy consumption could be reduced to 38,073 thousand tonnes of CO. It should be noted that the specified targets for primary and final energy consumption were calculated in accordance with the approaches set out in Article 3 of Directive 2012/27/EU and, as provided for by that Directive, are indicative (non-binding) in nature.

Table 2.6. Indicative indicators of primary energy consumption and final energy consumption, thousand tons of energy equivalent.

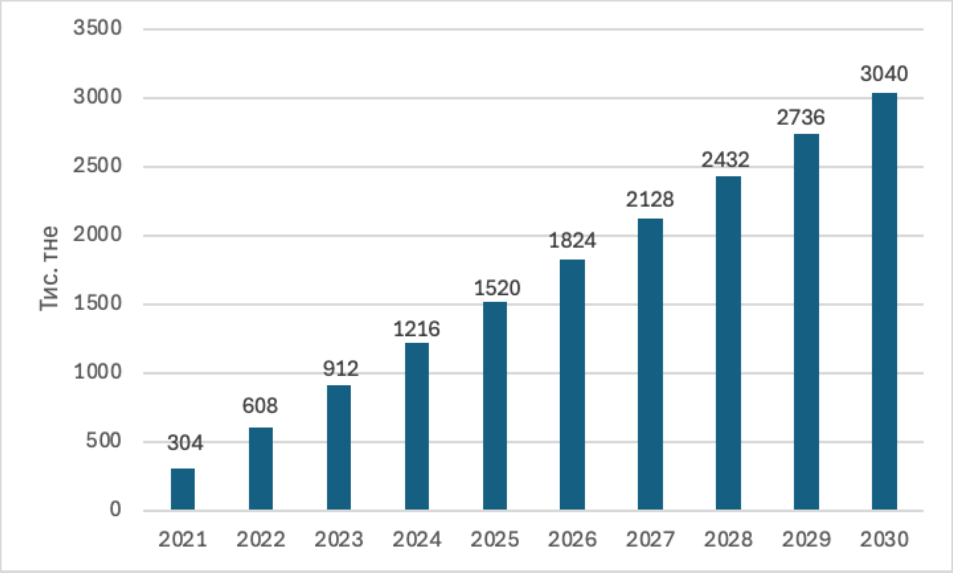
Rating energy consumption	2020	2025	2030	2040	2050
General primary consumption energy	83,687	48,418	59,382	63,345	61,891
General final consumption energy	44,098	32,143	38,073	43,179	46,375

The ESU also projects a reduction in the total energy intensity of the economy from approximately 89 t.e.e./million USD (in 2020 prices) in 2023 to 76 t.e.e./million USD in 2032. It is assumed that What target will be achieved in result implementation events, which directed to increase the efficiency of energy resources use in all sectors of the economy. The NES also sets a sectoral target of reducing the energy intensity of the extractive industry by 30% by 2030.

2) The total amount of end-use energy savings to be achieved over the period from 2021 to 2030 in accordance with point (b) of Article 7(1) of Regulation (EU) 2018/1999 on energy savings obligations under Directive 2012/27/EU

Article 9 of the Law of Ukraine "On Energy Efficiency", which transposes Article 7 of Directive 2012/27/EU, establishes that the annual end-use energy savings target shall be no less than 0.8% of the total annual volume of energy supply to consumers, averaged over the period from January 1, 2017 to December 31, 2019. The volumes of energy supply in the transport sector are not taken into account when calculating and setting the annual end-use energy savings target. The the annual end-use energy savings target of 304 thousand tons of oil equivalent was approved by the Resolution of the Cabinet of Ministers of Ukraine dated October 10, 2025 No. 1125 "On Approval of the Target Indicator for Annual Energy Consumption Reduction" (Official Gazette of Ukraine, 2025, No. 87, p. 6101). The total amount of energy saved in end-use, which shall be achieved over the period from 2021 to 2030, is 16,720 thousand tons of oil equivalent. Information on the calculation of this target is provided in Appendix 5 to this Plan.

Figure 2.1. Cumulative end-use energy savings for 2021-2030, thousand tons of energy equivalent.



Source: calculation taking into account the order of the target indicator of annual energy consumption reduction

3) Indicative interim indicators of the Long-term strategy for thermal modernization of buildings owned by the state, municipal and private sectors, road a map with internally defined measurable progress indicators, an empirically based assessment of the expected amount of energy savings and other benefits, and contributions to the Union's energy efficiency targets in accordance with Directive 2012/27/EU and Article 2(a) of Directive 2010/31/EU.

The long-term strategy for thermal modernization of buildings for the period until 2050 was approved by the order of the Cabinet of Ministers of Ukraine dated December 29, 2023 No. 1228 (Official Gazette of Ukraine, 2024 p., No. 13, p. 843) (hereinafter referred to as the Strategy for Thermal Modernization of Buildings 2050). The main goal of the Strategy for Thermal Modernization of Buildings 2050 is the decarbonization of the national building stock by 2050. The Strategy defines the following as interim goals for 2030:

- achieving the target energy savings in government buildings by levels of annual reduction in energy consumption of 1% of the area of the relevant buildings;
- implementation and operation of energy management systems in at least 90% of territorial communities;
- final consumption energy in sector buildings abbreviated on 15%;
- fraction residential and public buildings, What respond minimal requirements to the energy efficiency of buildings is at least 36%;
- fraction public buildings with close to zero level consumption energy is at least 10%;
- amount investments, involved in software energy efficiency buildings constitutes at least 87 million euros;
- amount qualified personnel in field energy efficiency on levels not Less 100 thousand people/year.

Targets for the share of residential and public buildings meeting minimum energy performance requirements for buildings, as well as the share of public buildings with close to to zero level consumption energy include, in ago number, restoration and new construction of buildings to replace damaged or destroyed buildings, with adhering to the principle of “Build Back Better”.

The collection, accumulation, recording, processing, storage and protection of information on immovable property damaged or destroyed as a result of military operations, terrorist acts or sabotage caused by the armed aggression of the Russian Federation against Ukraine shall be carried out through

the State Register of Property Damaged and Destroyed as a Result of Military Operations, Terrorist Acts or Sabotage Caused by the Armed Aggression of the Russian Federation against Ukraine (hereinafter referred to as the Register of Damaged and Destroyed Property). MinDevelopment is the holder of the Register of Damaged and Destroyed Property. Based on the data contained in the Register of Damaged and Destroyed Property, analytical and statistical information (documentation) may be generated. The information may also be used by MinDevelopment for the preparation of plans for the restoration and reconstruction of buildings.

Table 2.7. Some expected results of the first stage of the Strategy for Thermal Modernization of Buildings 2050

Name	Units of measurement	Residential buildings		Non-residential buildings	
		individual no	BKB	public	others non-residential
Thermally modernized buildings (completely or partially)	units	3 088 352	97,916	15,784	74,192
Updated areas buildings	million m²	220.6	260.0	59.4	66.8
Annual natural gas savings (equivalent to natural gas)*	billion m³	2.5 (8.37)	0.71 (2.36)	0.17 (0.58)	0.12 (0.40)
Annual saving thermal energy	GWh	31,606	22,595	7,389	5 136
Annual saving electrical energy	GWh	247	453	1,062	1 105
Annual savings	million euro	1,022.2	939.2	580.3	397.9

*Note: * annual natural gas savings according to its share in thermal energy generation (30%) (and the estimated amount of energy savings in natural gas equivalent)*

The expected level of thermal modernization of buildings is determined by the Strategy based on an ambitious scenario. However, given the negative consequences of a full-scale invasion of Ukraine by the Russian Federation, including the difficulty of attracting private investment and debt capital, for the purposes of the NPEK, the WAM scenario is based on the Strategy's baseline scenario for thermal modernization. According to the baseline scenario, thermal modernization is expected at the level of 10% of buildings.

At the same time, it should be noted that after filling the National Database of Operational and Energy Characteristics of Buildings (PM_EE_WEM_09 National Database of Energy and Operational Characteristics of Buildings), taking into account the accumulation of up-to-date information on the volumes, condition and needs for modernization of the building stock of Ukraine, and taking into account the consequences of the full-scale invasion of the Russian Federation into Ukraine, it will be necessary to revise the Strategy for Thermal Modernization of Buildings 2050 , in particular, in order to update the pace of thermal modernization of buildings and the values of expected target indicators.

Concept of implementing state policy in the field of ensuring energy efficiency of buildings in part magnification quantities buildings with close to zero level energy consumption, approved by the Cabinet of Ministers of Ukraine Resolution No. 88 of January 29, 2020 (Official Gazette of Ukraine, 2020, No. 14, p. 580) (hereinafter referred to as the NZEB Concept) also defines targets for improving energy efficiency in the buildings sector. Thus, the NZEB Concept envisages achieving in 2025 year abbreviation final consumption energy in residential sector in 24% and a 16% reduction in final energy consumption in public buildings.

4) Total usable floor area to be renovated or equivalent annual energy savings to be achieved from 2021 to 2030 in accordance with Article 5 of Directive 2012/27/EU on the exemplary role of public authority buildings.

Ukraine has chosen an alternative approach to the implementation of Article 5 of Directive 2012/27/EU. The energy saving target for public authority buildings is expressed as a numerical value of the annual reduction in energy consumption achieved by bringing buildings with an area of at least 1% of the building area up to the minimum energy efficiency requirements, which meet all of the following criteria:

1. are in state or municipal property;
2. in whose is placed apparatus central organ executive authorities;
3. heated area exceeds 250 square meters.

The annual target for energy savings in government buildings is 133.8 thousand kWh (11.5 tcoe), the annual target for energy savings in government buildings, expressed in primary energy terms, is 253.3 thousand kWh (21.8 tcoe).

Simultaneously, trace to note, What for definition and monitoring achievement target energy saving indicator in government buildings, in accordance with the Law of Ukraine "On Energy Efficiency of Buildings", a database of government buildings has been created, which is a component of the general national Building Database (PM_EE_WEM_09 National Database of Energy and Operational Characteristics of Buildings), which as of 2025 is at the stage of filling with information. .

2.2.2. The indicative milestones for 2030, 2040 and 2050, the domestically established measurable progress indicators, an evidence-based estimate of expected energy savings and wider benefits, and their con-tributions as included in the roadmaps set out in the long-term renovation strategies for the national stock of residential and non-residential buildings, both public and private, in accordance with Article 2a of Directive 2010/31/EU as adapted and adopted by Ministerial Council Decisions 2010/02/MC-EnC and 2021/14/MC-EnC

See above, in section 2.2.i. of this Plan (indicators of the Strategy for the thermal modernization of buildings 2050).

2.2.3. Where applicable, other national objectives, including long-term targets or strategies and sectoral targets, and national objectives in areas such as energy efficiency in the transport sector and with regard to heating and cooling

Heat supply

Current target indicators for the heat supply sector are defined by the Concept of State Policy Implementation in in the field of heat supply, approved by the order Cabinet of Ministers of Ukraine dated August 18, 2017 No. 569, the implementation period of the specified concept is 2017-2035. According to this concept, it was planned to achieve the following indicators by 2025:

- software 100 percent commercial accounting consumed thermal energy;
- specific costs conditional fuel under time production thermal energy boiler rooms — 155 kg of energy per Gcal at the first stage of implementation;
- fraction losses in heating networks — 12% on the first and 10% on third stage implementation.

As of 2025, it can be stated that only part of the measures envisaged have been implemented. Concept and not was achieved key targeted indicators. Necessary is to monitor the current state of development of the heat supply sector, determine the directions of development of the sector and update target indicators, and adopt, on the basis of such analytical work, an updated program document to replace the current Concept (PM_EE_WAM_03 National Action Plan for the Modernization and Decarbonization of District Heating Systems).

2.3. Dimension energy security

2.3.1. The elements set out in point (c) of Article 4

The key documents defining the goals in terms of **deepening the diversification of sources and ways of supplying energy resources** from third countries with the potential goal of reducing dependence on the import of energy resources are NES, ESU, as well as the Energy Security Strategy.

Increasing the flexibility of the national energy system is not directly declared as a clear goal in policy documents.

Among its goals, the NES includes ensuring the formation of the volume of flexible capacities sufficient to ensure the economically feasible operation of all types of power generation.

The Energy Security Strategy includes two relevant strategic goals:

- Goal 2. Resilience of the functioning of the energy sector;

- Goal 4. Efficiency of the use of energy resources and energy efficiency of the national economy.

One of the tasks of the ESU includes, in order to ensure the balance reliability of the UES of Ukraine and support the further integration of RES, the introduction of highly maneuverable capacities:

- flexible capacities of hydroelectric and pumped hydropower stations;
- balancing and reserve capacities of TPPs on combined fuel (natural gas and/or biomethane), other technologies; gas turbine and gas piston installations are also mentioned;
- capacities of energy storage facilities, including Power-to-X long-term (seasonal) storages.

The target indicators for 2032 in terms of total available capacity is 9.4 GW of semi-peak and peak generation (without detailing technologies), as well as 4.9 GW of hydroelectric power plants and 4.1 GW of pumped hydropower plants. The increase in available HPP capacity will be 30%, the PHPP capacity will be approximately 2.4 times. At the same time, the ESU contains a reference to the Hydropower Development Program of Ukraine for the period until 2026, which includes the goal of increasing the share of flexible capacities of HPPs and PHPPs in the total balance by 2026 with an indicator of 15.5%.

As for ESS, ESU predicts by 2050 the capacity will be 1.56 GW. As part of the demand management program, which should become a separate area of energy efficiency, the ESU envisages only the implementation of pilot projects until 2032.

Detailed target indicators are presented by the TSO in the 2024 adequacy assessment report (and in subsequent years), which is not subject to publication during the period of martial law.

The issue of **eliminating restrictions or interruptions in the supply of energy resources** in order to increase the stability of regional and national energy systems is indicated in the provisions of the ESU, the Cybersecurity Strategy of Ukraine, approved by the Decree of the President of Ukraine No. 447 of August 26, 2021, the Laws of Ukraine "On Critical Infrastructure", "On Basic Principles of Cyber Security of Ukraine", "On Electricity Market", "On Natural Gas Market", and regulatory and legal acts on their implementation.

For Ukraine, it is especially important to ensure a constant supply of energy without restrictions or interruptions. That is why much attention is paid to the protection of energy facilities.

Among the goals, the ESU singles out the provision of complex security of infrastructure facilities of the energy sector. The target indicator is the provision of physical, engineering and cyber protection of 100% of facilities. It is stipulated separately that, in the conditions of a full-scale invasion of the Russian Federation into Ukraine, the priority is the protection of critical infrastructure facilities (CIF), the management system of such protection is defined at the level of the Law of Ukraine "On Critical Infrastructure". The Concept of Ensuring the National Resilience System, approved by the Decree of the President of Ukraine of September 27, 2021, No. 479, also indicates that such a system should provide as a basic element the safety and security of critical infrastructure facilities, in particular, sustainable energy and heat supply.

Another group of policies is the formation and maintenance of reserves of the main fuel and energy resources: natural gas, coal, crude oil and petroleum products. As a rule, target indicators are determined at the government level in the form of orders or departmental decisions (plans-schedules) based on the results of the agreement of specific indicators with market players. Some of the goals are regulated at the level of legislation. At the end of 2022, amendments to the Law of Ukraine "On the Natural Gas Market" defined the obligation of the Ministry of Energy to calculate the target level of gas storage filling and to form a filling schedule. In 2023, the Law of Ukraine "On Minimum Reserves of Crude Oil and Petroleum Products"118 was adopted, which provides for the creation of reserves for equivalent of 90 days of net imports or 61 days of domestic consumption.

After all, the framework laws of Ukraine on the gas and electricity markets determine the government's responsibility for the minimum standards of security of supply and their monitoring. The Ministry of Energy is tasked with approving the rules on the security of natural gas and electricity supply, as well as the National Action Plan (regulates preparation and response to a crisis situation regarding the supply of natural gas), which are mandatory for all players of the relevant markets, as well as to monitor security of supply (for electricity – jointly with the Regulator, TSO and other relevant institutions).

All the specified elements found their place in the comprehensive Energy Security Strategy, which is a strategic planning document, contains analysis of threats, identifies priorities, describes strategic

choices, goals and objectives aimed at preventing threats to Ukraine's energy security. Tasks of the Strategy are built around eight strategic goals:

1. Availability of energy sources and energy carriers of all types for consumers;

2. Resilience of the functioning of the energy sector;

3. Economic efficiency of the functioning of the energy sector, energy supply systems and import substitution of mineral raw materials;

4. Efficiency of the use of energy resources and energy efficiency of the national economy;

5. Environmentally acceptable impact of energy;

6. Integration of the energy sector into the political, technological, technical, economic and legal space of the EU;

7. Independence of the state in the formation and implementation of domestic and foreign policy in the field of energy, ensuring the realization of national interests;

8. Development of scientific and technical, innovative and educational potential of Ukraine for the needs of the energy sector.

In the context of the EU accession, it is important for Ukraine to integrate into the processes of ensuring security of supply, which is manifested in participation in regional and pan-European risk assessment measures, planning of preventive steps and proper response to crisis situations in the supply of natural gas (according to Regulation (EU) 2017/1938) and electricity (according to Regulation (EU) 2019/941).

2.3.2. National objectives with regard to increasing: the diversification of energy sources and supply from third countries for the purpose of increasing the resilience of regional and national energy systems

The National Security Strategy among the goals declares the need to diversify the sources and routes of the supply of energy resources. NES defines a general goal in the form of ensuring the diversification of energy supplies at the level of no more than 30% from a single supplier. However, the target is formally set for nuclear fuel (see below), as imports of gas, petroleum products and coal, like electricity, are sufficiently diversified in terms of suppliers' structure and countries of origin – and this trend has intensified since the ban on imports of any goods from the Russian Federation and the actual suspension of trade with the Republic of Belarus.

2.3.3. Where applicable, national objectives with regard to reducing energy import dependency from third countries, for the purpose of increasing the resilience of regional and national energy systems

The Energy Security Strategy includes among the priority tasks:

● on the achievement of Strategic Goal 3 "Economic efficiency of the functioning of the energy sector, energy supply systems and import substitution of mineral raw materials"

- ● incentivizing import substitution, in particular through the development of bioenergy, wind energy, justified increase in the extraction of energy resources;

● on the achievement of Strategic Goal 7 "Independence of the state in the formation and implementation of domestic and foreign policy in the field of energy, ensuring the realization of national interests":

- ● prevention of increasing Ukraine's dependence on external suppliers, ensuring the appropriate level of diversification of energy resources and technologies, in particular due to an economically justified increase in the share of renewable energy sources and local energy sources in the energy balance of Ukraine; economically justified growth in the production of natural gas and oil, other types of energy resources;

- ● bringing the volume of coal production in line with the energy needs of Ukraine on the basis of market principles of management and competition with determination of the period of use of coal for energy needs.

Under the strategic goal "Ensuring a high level of energy security and integration of Ukraine into the European energy market", the NES envisages the following indicators:

● formation and maintenance of reserves of crude oil and petroleum products in the amount of at least 90 days of average daily consumption in Ukraine;

● decrease in the level of import dependence (gross import of energy resources in the total primary energy supply) to 33%;

● reduction of the share of a single supplier in the nuclear fuel market to 60%.

In particular, the document notes high import dependence on nuclear fuel (due to the depletion of existing uranium deposits and the high cost of production, own production provides only a third of needs) and gas, a high level of depletion of wells from hydrocarbons production, more than 70% import dependency on petroleum products and a low level of diversification, which collectively form a high risk of potential interruptions in the supply of energy resources for the needs of the economy.

Separately, in the part regarding the development of the extractive industry, NES provides for the strategic goal 3 "Ensuring the satisfaction of the needs of the national economy, creating a reliable basis for the production with high added value" an indicator in the form of providing 100% of the households' needs for natural gas at the expense of own production. At the same time, the prospect of gradual deregulation of the gas market after the end of the martial law regime does not allow to allocate the resource of Ukrainian production for the needs of a specific category of consumers, e.g. population (households). Setting goals for reducing import dependence requires taking into account the complete demand in the economy (that is, all categories of consumers).

Among the goals of the ESU, there is comprehensive integration with the EU energy markets and ensuring the efficient functioning of internal energy markets. One of the indicators of its achievement is the construction of an export-oriented energy industry, which includes, inter alia, the production and exports of hydrogen and alternative gases, equipment and components for the energy sector, various components for nuclear generation, and the implementation of the nuclear cycle from the production of nuclear fuel to the management of radioactive waste.

2.3.4. National objectives with regard to increasing the flexibility of the national energy system, in particular by means of deploying domestic energy sources, demand response and energy storage

See above and section 2.4.3. "Market integration", Dimension Internal energy market.

2.4. Dimension internal energy market

2.4.1. Electricity interconnectivity

2.4.1.1. The level of electricity interconnectivity that the Contracting Party aims for in 2030 in accordance with Article 4(d)(1) with a strategy with the level from 2025 onwards defined in close cooperation with affected Contracting Parties and/or Member States of the European Union, taking into account the 2020 interconnection target and the following indicators of the urgency of action:

(1) Price differential in the wholesale market exceeding an indicative threshold of EUR 2/MWh between Contracting Parties and/or Member States of the European Union, regions or bidding zones;

(2) Nominal transmission capacity of interconnectors below 30 % of peak load;

(3) Nominal transmission capacity of interconnectors below 30 % of installed renewable generation.

Each new interconnector shall be subject to a socioeconomic and environmental cost-benefit analysis and implemented only if the potential benefits outweigh the costs.

The target level of integration (interconnectivity) of the Integrated Power System of Ukraine (IPS) with the power systems of ENTSO-E countries in 2030 is at least 10%. The target indicator may be revised taking into account the consequences of the war, as well as ENTSO-E decisions on the permitted capacity for import and export of electricity between Ukraine and EU countries.

Analysis of price dynamics on the day-ahead markets (DAM) of Ukraine and EU countries (Poland, Romania, Slovakia and Hungary) based on available data from Market Operator shows that during 2020-2025 (in 2025, data for January-September was analyzed) the difference between daily price indices Base DAM in the vast majority periods (days) is higher than 2 EUR/MWh (relative to Poland – in 96.4% of periods, Romania – 94.4%, Slovakia – 93.9%, Hungary – 93.0%). The average difference of daily indices of the Base DAM of Ukraine relative to the markets Poland was 35.4

euros/MWh, Romania – 56.4 euros/MWh, Slovakia – 55.9 euros/MWh, Hungary – 67.8 euros/MWh.

The relatively low level of price convergence between the electricity markets of Ukraine and the EU countries is not only due to insufficient permitted capacity of interconnectors for cross-border trade. To some extent, it is also caused by the incomplete integration of spot electricity markets and the regulation of prices in the Ukrainian DAM by the Regulator through the application of price caps and floors.

After the start of the full-scale invasion of Ukraine by the Russian Federation on February 24, 2022 total electricity consumption in IPS significantly decreased - by approximately 30-35%. The peak loads in the power system have also changed accordingly. In 2024, the ratio of the maximum permitted ENTSO-E value of the net transfer capacity (NTC) of interconnectors of Ukraine (2100 MW for import and 550 MW for export) to the peak load in the power system of Ukraine was about 11.5% for import of electricity and 3% for export to EU countries. For January-October 2025, the corresponding figures were about 12.9% and 5.5% (with the maximum permitted ENTSO-E values of transfer capacity of interconnectors of Ukraine: 2100 MW for imports and 900 MW for exports)

As a result of the full-scale invasion of the Russian Federation into Ukraine, intense hostilities, especially in areas with the highest concentration of RES electricity generation facilities in the southern and eastern regions, and systematic shelling of Ukraine's energy infrastructure, the installed generating capacity of RES facilities operating in IPS has changed due to their damage, destruction and/or occupation. It is estimated that in 2024, the ratio of the maximum permitted ENTSO-E value of NTC of Ukraine's interconnectors to the installed capacity of RES electricity generation (including large hydropower) was about 15.2% (in the direction of electricity import) and 4% (in the direction of export to EU countries). For January-October 2025, the corresponding figures were about 15% and 6.4%.

All of the above indicators indicate the need to improve the efficiency of utilization of existing Ukraine's interconnectors and increase the permitted capacity of interconnectors to ensure better integration of electricity markets and more intensive cross-border electricity trade with EU countries.

2.4.2. Energy transmission infrastructure

2.4.2.1. Key electricity and gas transmission infrastructure projects, and, where relevant, modernisation pro jects, that are necessary for the achievement of objectives and targets under the five dimensions of the Energy Union Strategy

Electricity infrastructure

List and description of key projects of Ukraine for the development of the transmission system in terms of the construction of cross-border networks are contained in the Transmission System Development Plan for 2025-2034 (TSDP), developed by TSO and approved by the Regulator (NEURC). With taking into account high military risks, public access to this document is limited for the period of martial law in Ukraine .

In order to strengthen cross-border electricity connections, Ukraine is implementing the following key projects of mutual interest (PMI)[13]:

- restoration of the 400 kV overhead line Mukachevo (Ukraine) - Velké Kapušany (Slovakia), aimed at increasing the cross-border capacity to 1,000 MW. Expected capital investments are 10.5 million euros. The planned project implementation period is 2028;

- construction of a two-circuit 400 kV overhead power line Artsyz (Ukraine) - Isaccea (Romania), aimed at increasing the cross-border capacity to 1,000–1,200 MW. Expected capital investments - 383.3 million euros. The planned project implementation period is 2028.

In the list of projects of Energy Community's interest (PECI), the following projects have been included:

- E08 / construction of the 330 kV Bălți (Moldova) - Dniester HPP-2 (Ukraine) transmission line

[13] https://energy.ec.europa.eu/document/download/f3358e26-6bec-444b-8024-05385c28d00c_en?filename=delegated-regulation-second-union-list-projects-common-and-mutual-interest_Annex_en.PDF

to strengthen electrical connections between the power systems of Ukraine and Moldova. The maximum cross-border capacity is 600 MW. Expected capital investment is EUR 54 million. The expected commissioning period is 2032. The project is under consideration;

- E13 / construction of DTEK Storage 225 MW (450 MWh energy capacity) energy storage facilities to provide vibration damping control capacity and provision of ancillary services (frequency containment reserve (FCR) and automatic frequency restoration reserve (aFRR)). Expected capital investment – EUR 289.8 million. The expected commissioning period – 2025-2028. The project is at the stage of making a final investment decision.

Also, the construction of the 750/400/330 kV Lvivska substation (SS) is planned to strengthen electrical connections with ENTSO-E. This project plans to build the 400 kV Lvivska - Rzeszow 2 overhead line (OHL) in 2027 and the 400 kV OHL Lvivska - Chełm in 2029. Also in perspective, after 2025 year, under consideration the possibility of construction of 400 kV OHL Lvivska - Krosno. All of these new lines are in the pre-design stages.

Implementation of all the above measures, along with the construction of static reactive power generators (STATCOM) to damp low-frequency oscillations voltages will allow increasing the level of electricity export/import from/to the Integrated Power System of Ukraine.

Infrastructure transportation and storage natural gas

The development plan of the GTS and other gas infrastructure operators for the next 10 years is information with restricted access for the period of martial law. At the same time, LLC "GTS Operator of Ukraine" participates in the processes of developing gas and hydrogen infrastructure of the EU and the Energy Community within the framework of the processes of preparing TYNDP and approving the list of PCI/PMI projects, which is approved by the European Commission.

From January 1, 2025, the transit of natural gas from the territory of the Russian Federation through Ukraine to the EU ceased. Given that demand for natural gas within the country will remain until 2030, and also maybe be generated potential for export natural gas to EU, in 2026 - 2030 main goals and projects of infrastructure transportation and natural gas storage are as follows.

1) Sufficient connection for gas transportation between the EU/Energy Community/Ukraine.

As of on February 2026, on IPs with EU and Energy Community the following volumes of firm capacity are available:

Table. 2.8. Capacity of entry/exit points on IPs with the EU and the Energy Community

No.	Name of the point (VTZ – virtual interconnection; TMZ – interconnection point)	Country	Entry into Ukraine, million m3 / day	Exit from Ukraine, million m3 / day	Notes
1	VTZ Ukraine- Poland	Poland	11.7	12.9	Firm capacity for entry into Ukraine in the amount of 11.7 million m3/day will be available until June 30, 2026. In the period from July 1 to September 30, 2026, firm capacity for entry into Ukraine will be available in the amount of 7.7 million m3/day. At the same time, the general amount of physical capacity from Poland to Ukraine (including interruptible capacity) between February 1 and 30 April will be 18.4 million m3/day, and for the period from May 1 to September 30, 2026 – 15.3 million m3/day

2	TMZ Uzhgorod/Velke Kapushany	Slovakia	0	281	
3	TMZ Budince	Slovakia	42	19	Firm capacity of 42 million m3/day is available up to 31 March 2026. From 01 April 2026, firm capacity will be 27 million m3/day
4	VTZ Bereg	Hungary	9.76	48.8	Firm capacity for entry in the amount of 9.76 million m3/day is available up to 30 June 2026 (inclusive)
5	TMZ Isaccea 1/Orlivka 1	Romania	11.5	19.1	Capacity for entry is available in case of booking capacity at the Causani exit point and/or virtual exit point to border consumers of the Republic of Moldova
6	TMZ Ananyiv	Moldova	0	0	
7	TMZ Hrebenyky	Moldova	11.5	36	From October 1, 2025, firm capacity for entry into Ukraine increased from 7 million m3/day to 11.5 million m3/day
8	TMZ Causani	Moldova	36	11.5	Capacity is available when booking capacity at entry and/or exit point Isaccea 1/Orlivka 1 and/or virtual exit point to border consumers of the Republic of Moldova. From 01 September 2024, exit capacity is available as firm in the amount of 11.5 million m3/day
9	TMZ Oleksiyevka	Moldova	0.1	4.9	From October 1, 2025, firm capacity of 0.1 million cubic meters/day has been introduced. Interruptible capacity for entry is available in the amount which should not exceed the amount of nominations for exit from Ukraine, depending on the possibility of transportation using virtual reverse

10	Virtual access point to border consumers of the Republic of Moldova	Moldova	-	4.6	From October 1, 2025, the firm capacity for exit has been increased from 0.85 million cubic meters/day to the nominal technical capacity of the point at the request of the Moldovan side. The capacity is available in case of capacity booking in Causani entry point and/or Isaccea1/Orlivka 1 entry point

Source: LLC "Operator GTS Ukraine»

The goal of ensuring sufficient interconnection for gas transportation between the EU/Energy Community/Ukraine, taking into account the NES and ESU, is implemented in the following main areas:

- ensuring guaranteed capacities on IPs with the EU/Energy Community, which primarily includes legally securing physically available capacities for long-term booking by customers of transportation services;
- development of new capacity as a result of market demand analysis.

As of September 2025, all or part of the capacity to enter Ukraine from Poland, Hungary and Slovakia was available for booking by customers services transportation only for limited periods of time even if the appropriate physical infrastructure is available. Legally securing physically available capacities as firm is important both for the development of energy markets, as well as as a matter of security. This issue deserves separate attention from the European Commission.

In addition, in accordance with the GTS Code, the OGTS regularly assesses market demand for increased capacity for interconnection points. The last (third) assessment of potential demand for new (increased) capacity was carried out from July 7 to August 31, 2025 inclusive. During the specified period, all customers of transportation services had the right to submit non-binding applications. Based on the results of the non-binding applications received the demand for firm entry capacity was identified from natural gas market entities to Ukraine from Poland in the volume of 12 million m3 / day for the period 2025/2026-2034/2035 gas years. In accordance with the EU Capacity Allocation Network Code (CAM NC) and the GTS Code LLC "GTS Operator of Ukraine" in cooperation with the Polish operator GAZ-SYSTEM developed and published a joint report on the assessment of market demand for the Ukraine-Poland gas pipeline on its website in Ukrainian and English. In addition, the operators developed project documentation and launched public consultations on the project of new (increased) capacity on the border between Poland and Ukraine, which will last until February 27, 2026.

It should also be noted that the TYNDP 2024 draft includes the project of LLC "GTS Operator of Ukraine" "Trans-Balkan Bi-directional Flow (Third stage)" (TRA-N-1169).

2) Identifying and unlocking the potential of using existing gas infrastructure facilities for new activities within the framework of decarbonization.

The ESU envisages the introduction and implementation of projects aimed at carbon capture, storage and utilization (CCUS), which will allow to offset the existing residual volume of emissions in 2050. In addition, the ESU is considering the possibilities of alternative use of existing infrastructure for transportation of biomethane, synthetic methane and hydrogen.

In terms of preparing for the transportation of hydrogen, from an infrastructure point of view, Ukraine plans to create a dedicated corridor for its transportation through repurposed or new networks. At the same time, plans of mixing methane gas with hydrogen in existing gas networks have not been announced.

As of early 2022, a draft of the technical requirements had been prepared, and preliminary agreement had been reached with the European Commission's Delegation to Ukraine to conduct a comprehensive study on the feasibility of using Ukraine's gas transmission system to transport hydrogen, with an estimated budget of 3 million euros. In addition, the G.V. Karpenko Institute of Physics and Mechanics of the National Academy of Sciences of Ukraine (Lviv), a specialized research institution, is carrying out a project of fundamental research into the mechanisms of hydrogen interaction with

pipeline steels, their hydrogenation, corrosion, and degradation at the micro- and macro-levels, taking into account the condition of existing gas pipelines and operational factors (loads, environments). The project began in May 2023, with a planned completion date of June 2024. LLC “GTS Operator of Ukraine” joined the project by providing pipe segments for research—including those that had been in service (for 34 years) and similar pipes from emergency reserve stockpiles.

In addition, in November 2021, a memorandum of understanding was signed between GTS Operator of Ukraine LLC, Ukrtransgaz JSC, Naftogaz of Ukraine NJSC, Eco-Optima LLC, RAG Austria AG, Open Grid Europa GmbH, Gas Connect Austria GmbH, Bayerngas GmbH, Eustream a.s., Nafta a.s., and Bayernets GmbH regarding the launch of the H2EU+Store project, which involves the development of hydrogen production and underground storage in Ukraine, as well as the creation of a pipeline corridor from Ukraine through Slovakia and Austria to Germany.

Oil Transportation and Storage Infrastructure

The ESU envisages a number of infrastructure projects related to oil. Their implementation is entrusted to JSC "Ukrtransnafta". The company’s plans include modernization of oil transportation system, as well as its development, including in order to ensure the energy security of Ukraine and neighboring states by diversifying oil and petroleum product delivery routes via pipelines.

Two promising projects aim to diversify oil supply sources and routes to attract additional transportation volumes:

1) The “Brody–Adamova Zastava” project:

Until recently, Ukraine had two routes for oil supplies—the “Druzhba” oil pipeline, through which oil was transported from Russia, and the “Pivdennyi” offshore oil terminal, which received oil from the Black Sea. The situation was similar in Poland, which until recently imported oil via the “Druzhba” pipeline system and through the oil port in Gdańsk on the Baltic Sea.

In response to the Russian Federation’s full-scale invasion of Ukraine, in June 2022 the Council of the EU adopted a sixth package of sanctions, which prohibits, among other things, the purchase, import, or transport by sea of oil and certain petroleum products from Russia to the EU. A temporary exemption from the sanctions applies only to oil imported via pipeline to EU countries that, due to their geographical location, are particularly dependent on supplies from Russia and have no other viable alternatives due to insufficiently developed oil transportation infrastructure. Hungary and Slovakia benefit from this exemption.

The significant restriction on Russian oil supplies, as well as the constant risk of these supplies being cut off, opens up broad opportunities for sourcing oil from the Caspian region, provided that the necessary infrastructure is built.

The “Brody–Adamowa Zastawa” project will connect the oil transportation systems of Ukraine and Poland, with the latter connected to Germany’s oil transportation system. The project provides for the transportation of oil in both directions—from the Polish port of Gdańsk to Ukraine, as well as from Ukraine’s Black Sea ports to Poland and Germany—through the construction of a 700-mm-diameter, 396.3-km-long oil pipeline (125.7 km in Ukraine and 270.6 km in Poland). Once implemented, the project will initially allow for the transportation of up to 10 million metric tons of oil per year from the Baltic Sea to Ukraine (or in the opposite direction), with the potential to increase volumes to 20 million metric tons per year.



Fig. 2.2. Map of project "Brody" – "Adamov Zastava"

Source: "Sarmatia"

To implement the project, a joint venture named MPR "Sarmatia" sp. z o.o. was established, with the following participants: JSC "Ukrtransnafta" (28.78%), the Polish operator PERN (28.78%), the Azerbaijani company SOCAR (25.32%), the Georgian company GOGC (16.10%), and the Lithuanian company AB Klaipedos Nafta (1%). Preparatory work, including market research and a feasibility study, has been virtually completed. The project is currently in the stage of seeking a strategic investor; the estimated cost is 548.5 million euros, including 14 million euros for design work. Provided that financing is secured and there is government support in Ukraine and Poland, the project could be implemented within 2–3 years.

2) Implementation of the possibility of transporting various types of oil (except Urals) via the southern branch of the Druzhba oil pipeline

Currently, only one grade of crude oil is being transported via the southern branch of the Druzhba pipeline in transit from the Republic of Belarus. At the same time, if measures are taken to transport other grades of crude oil, it would be possible to use the existing infrastructure to transport crude oil from Ukrainian ports to Slovakia, Hungary, and the Czech Republic.

No additional investment is required to implement the project. JSC "Ukrtransnafta" already has experience transporting various grades of crude oil from the port of Odesa to the Kremenchuk Oil Refinery. However, the project's implementation requires support from the recipient countries at both the governmental and corporate levels. Furthermore, it is worth noting that the project depends on the ability to use Ukrainian Black Sea ports for oil supplies from other countries. Currently, the Ukrainian (JSC "Ukrtransnafta") and Slovak (Transpetrol, a.s.) operators of oil transportation systems have agreed on the technical aspects of cooperation regarding the organization of the transportation of various grades of crude oil.

Hydrogen Transportation and Storage Infrastructure

NES provides for the regulation of market, regulatory, and technical aspects of hydrogen production and export from renewable energy sources and nuclear power plants, with a guaranteed price in euros and long-term contracts. ESU sets the goal of building an export-oriented energy sector, a key component of which is the production and export of hydrogen and alternative gases. According to the draft Hydrogen Strategy of Ukraine for the period up to 2050, renewable hydrogen production is expected to begin in 2030, coinciding with the commissioning of the Central European Hydrogen Corridor, and export volumes are projected to reach 0.3–0.4 million metric tons per year by 2035 and 1.5–2 million metric tons by 2050.

In this context, it is important to take into account the criteria for green hydrogen in effect in the EU pursuant to Commission Delegated Regulation 2023/1184 of February 10, 2023. At the same time, the optimal method of hydrogen transportation is the subject of ongoing political and scientific

discussions. Three transportation methods can be identified that are linked to oil and gas infrastructure and may be relevant for Ukraine:

1. transportation via dedicated (or retrofitted) pipelines;

2. transportation via oil infrastructure (in the form of LOHC);

3. transportation via an ammonia pipeline.

1) Transporting hydrogen via dedicated (or retrofitted) pipelines.

The Central European Hydrogen Corridor (CEHC) project,139 is a joint initiative of the gas transmission system operators of Ukraine (Gas Transmission System Operator of Ukraine LLC), Slovakia (Eustream s.a.), the Czech Republic (NET4GAS s.r.o.), and Germany (Open Grid Europe GmbH). Launched in September 2021, the project aims to create a pipeline corridor for transporting hydrogen from Ukraine to Germany with a planned capacity of 144 GWh/day, mainly based on existing gas pipelines. The length of the corridor will be approximately 1,446 km.

In the part concerning Ukraine, this project is included in the TYNDP 2024 draft as project H2T-A-1137 "Central" European Hydrogen Corridor (SENSE) (Ukr part)", which is implemented by LLC "GTS Operator of Ukraine". By the decision of the European Commission of December 2025, this project was included in the PCI/PMI list under number 10.13. The project is currently preparing a Pre-Feasibility Study, the completion date of this stage is June 2024.

In addition, the TYNDP 2024 draft includes the Hungarian TSO's project H2T-A-1065 "HU hydrogen corridor I HU/UA" (without PCI/PMI status).

2) Transportation via oil infrastructure (in the form of LOHC).

The use of oil transportation infrastructure to transport hydrogen over certain distances is currently one of the promising areas of scientific research involving European companies. At the EU level, such research is often funded by public funds (for example, the UNLOHCKED project (Spain), the SHERLOHCK project (France), and the HYSTOC project (Germany)).

JSC "Ukrtransnafta" could be involved in this promising area of research and the potential industrial use of existing infrastructure for hydrogen transportation.

3) Transportation via an ammonia pipeline.

ESU also notes the feasibility of using the "Tolyatti–Odesa" ammonia pipeline, which runs through six regions of Ukraine (Kharkiv, Dnipropetrovsk, Zaporizhzhia, Kherson, Mykolaiv, and Odesa regions) and branches off to the city of Horlivka (Donetsk region), to transport ammonia produced from hydrogen, in conjunction with the city of Odesa (Odesa Port Plant). The operator of the ammonia pipeline is the state-owned enterprise "Ukrkhimtransamiak". Currently, the starting point of the ammonia pipeline is located in an area of active hostilities.

2.4.2.2. Where applicable, main infrastructure projects envisaged other than Projects of Energy Community Interest (PECIs) and Projects of Mutual Interest (PMIs)

Electricity infrastructure

The list and description of key projects of Ukraine for the development of the electricity transmission system in terms of the development of internal trunk networks is contained in the Transmission System Development Plan for 2025-2034, developed by the TSO and approved by the Regulator (NEURC). Taking into account the high military risks, public access to this document is limited for the period of martial law in Ukraine. Projects for technical modernization and development of the transmission system are primarily aimed at increasing the reliability of the system and the security of electricity supply by releasing locked capacities, removing internal systemic restrictions, and decreasing electricity losses in transmission.

In accordance with the Transmission System Development Plan for 2022-2031, NPC Ukrenergo has developed a comprehensive program for the reconstruction, modernization and automation of substations, which provides for the phased reconstruction of all substations of the transmission system, with the introduction of automated process control systems on them. Substations that provide power supply to administrative centers have been selected for the first stage of the Program and large industrial facilities. The service life of such substations and the equipment installed on them exceeds

35 years, which is beyond the design period of operation. When selecting reconstruction facilities, the prospects for the development of systems were taken into account distribution relevant regions, their infrastructure, ecological and social risks for population. Financing is carried out at the expense of loans from international financial institutions.

Table 2.9. Projects within the framework of the Program for the Reconstruction, Modernization and Automation of Substations of NPC Ukrenergo (pre-war assessment)

Name project	MFI	Substations	Years of completion
Program increase reliability substations	EIB	11 SS 330 kV 1 SS 750 kV	2024- 2025
Increase efficiency of electricity transmission (integration IPS to European system) III	KfW	7 SS 330 kV 1 SS 750 kV	2028
Second electricity transmission project	IBRD	2 SS 220 kV 18 SS 330 kV 1 SS 750 kV	2022- 2025
Increase efficiency transmission electricity	KfW	2 SS 330 kV	2025
Reconstruction substations in eastern part of Ukraine	KfW	2 SS 330 kV 2 SS 750 kV	2028
Construction of 750 kV OHL Rivne NPP – Kyivska	EIB	1 SS 330 kV	2024- 2025

The key effects of the implementation of the Program for the Reconstruction, Modernization and Automation of TSO Substations are as follows:

- increasing the reliability of the transmission system substations through the use of modern, economical, highly reliable and environmentally safe equipment, which will ensure the stable operation of substations while complying with the criteria for network stability and electricity quality indicators;
- Replacing outdated switching equipment, which uses oil and air as an insulating substance, with modern SF6 equipment will reduce electricity consumption at substations by 3-5 times.
- replacement devices relay protection and emergency automation with electromechanical on the microprocessor will reduce the electricity consumption of each panel (cabinet) to 10 times.

In general, the reduction in electricity consumption for the substations' own needs is expected to be about 30-35%. Also, all air circuit breakers with a voltage of 110-330 kV are planned to be replaced with SF6 ones.

With purpose modernization electronic communication networks and software transmission information high-speed flows between energy facilities of IPS NPC Ukrenergo in projects of new construction, reconstruction and technical re-equipment of transmission system facilities provides for the development of fiber-optic communication lines. In order to ensure reliable operation of IPS and operational security criteria of the transmission system, Taking into account the challenges of information security, the TSO is implementing a development program information technologies (through “roadmaps” in the following areas: “IT solutions for reliable dispatching of the Integrated Power System of Ukraine”, “Information security”, “IT infrastructure and transfer of technological information”, “Business process automation”, “Service-oriented IT organization” processes”).

Oil and gas transportation infrastructure

ESU defines the strategic goal of renewing and modernizing the energy infrastructure according to the best global standards, which includes optimizing the unused gas infrastructure and further effective operation of its facilities that will remain in operation. In this regard, it is envisaged, in particular:

- increasing the level of automation in monitoring parameters and controlling gas distribution stations (GDS);
- reducing the amount of process gas losses;
- optimizing the number of GDS, taking into account the decrease in consumption;
- replacing GDS with new automated modular units;

● reconstructing GDS and priority compressor stations (CS).

In addition, NES provides for the optimization of the GTS capacity and operational parameters in accordance with expected load scenarios, as well as the development and implementation of economically viable projects to optimize and modernize gas distribution networks in line with economic needs, the reconstruction of legacy networks, and a thorough assessment of gas distribution networks to determine their suitability for hydrogen transportation.

The implementation of energy efficiency measures in the networks is provided for in the National Energy Efficiency Action Plan. Additionally, the Action Plan for Implementing Ukraine's Climate Policy as part of its participation in the "Global Methane Pledge"—a global initiative to reduce methane emissions—calls for a comprehensive effort to reduce methane leaks and emissions during the extraction, processing, and transportation of natural gas and oil, using loan funds or funds from international partners.

In addition, as part of the modernization of the oil infrastructure, JSC "Ukrtransnafta" plans to:

● repair and reconstruction of tank farms, oil pumping stations, and the pipeline network: automation of technological processes, expansion of IT infrastructure, and replacement of equipment, including in accordance with energy efficiency requirements;

● monitoring and implementing measures to reduce greenhouse gas emissions at facilities within the oil pipeline system;

● programs to decarbonize and improve the energy efficiency of the oil pipeline system.

2.4.3. Market integration

The priority of the EU's energy policy, as set out in the REPowerEU plan, includes several components that have significantly influenced the importance of natural gas as an energy resource for the transition to a carbon-neutral economy by 2050. Many EU member states, particularly those with domestic natural gas production and/or those that are heavily dependent on gas, explicitly highlight the key role of gas in meeting energy needs in the medium term in their NECPs. This recognition is accompanied by a number of policies and measures related to natural gas and oil, namely:

● increasing domestic production, including the development of continental shelf resources (Romania, Italy);

● new construction, modernization, and optimization of infrastructure to increase cross-border flows, including strengthening the capacity of domestic systems (Romania, Italy, Bulgaria).

As a result, they project that natural gas will account for a significant share of energy demand in 2030 (for example, in Italy—33–38%, down from 41% in 2021).

At the same time, other countries are setting a deadline for ending hydrocarbon exploration and production: for example, the Netherlands has set 2040 as its target. In both cases, the trend toward decarbonizing the oil and gas sector is evident, as is the recognition that a decline in consumption is inevitable; consequently, the following measures are being taken:

- setting specific goals, obligations and promoting the development of biomethane and other types of gas from renewable or alternative sources in heat production and transport (France, Italy);
- optimization of gas infrastructure for both transport and storage (Netherlands, France);
- repurposing gas infrastructure for the transportation/storage of hydrogen or carbon dioxide (Netherlands) or implementing research projects in this direction (Italy).

Ukraine would be well advised to take these approaches into account when formulating its short- and medium-term energy policy. The presence of significant natural gas production—the largest in the EU—along with an extensive and well-developed system for the transportation, storage, and distribution of natural gas presents both opportunities and additional obstacles on the path to decarbonization under incredibly complex conditions.

On the one hand, in the period leading up to 2030, Ukraine has the potential to meet a significant portion of its energy needs through domestically produced natural gas. Furthermore, there may be surplus natural gas available for export to the EU. On the other hand, Ukraine must take steps to reduce natural gas consumption, including by shifting toward gas and other forms of energy from renewable or alternative sources. Thus, policies and measures aimed at developing the domestic market should address not only electricity but also, in particular, natural gas. These policies and measures should, in general, ensure:

● access for gas consumers to reliable and affordable energy;

● reducing consumption of all types of energy, including natural gas;

● increasing the share of natural gas from renewable or alternative sources in total natural gas consumption;

● increasing competition in the relevant markets and enabling consumers to benefit from liberalized markets;

● creating the necessary conditions and providing appropriate incentives and signals to natural gas market participants to prepare for operating in a decarbonized economy.

2.4.3.1. National objectives related to other aspects of the internal energy market such as increasing system flexibility, in particular related to the promotion of competitively determined electricity prices in line with relevant sectoral law, market integration and coupling, aimed at increasing the tradeable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, and real-time price signals, including a timeframe for when the objectives shall be met

Complete and comprehensive integration with European energy markets

ESU sets out a strategic goal of fully and comprehensively integrating Ukraine's energy markets with European markets by ensuring legal, technical, and economic harmonization, accompanied by expanded trading opportunities between neighboring countries, increased competition, and the effective functioning of the domestic market. At the same time, in the long term, the development of an export-oriented energy sector is possible.

The Law of Ukraine "On the Electricity Market" stipulates that regional cooperation should contribute to the harmonization of the regulatory framework and the development of electricity exchanges between states, the coordinated allocation of transmission capacity at cross-border interconnections based on non-discriminatory market decisions, regional integration of the day-ahead market (DAM), and mechanisms for balancing and reserve capacity.

It should be noted that this integration is based on the principles of the Treaty Establishing the Energy Community and the Association Agreement with the EU, the main ones being:

● harmonization of Ukraine's legislation with EU energy law, both in terms of legislative regulation and law enforcement;

● the free movement of energy resources across borders between Ukraine and the EU without customs duties or other barriers to trade;

● the existence of an independent and competent national energy regulator.

As noted above, full and comprehensive integration will require appropriate measures, including on the part of the EU and its member states (particularly in the context of creating conditions for the import of renewable gas from Ukraine).

Establishing market-based energy prices for all categories of consumers

Among the target indicators under Strategic Objective 3, "Ensuring the Functioning of Free, Efficient, and Competitive Markets," NES sets the goal of establishing market-based energy prices for all categories of consumers, while providing for effective mechanisms to support vulnerable segments of the population and ensuring that energy market participants do not face a debt burden.

In accordance with the Law of Ukraine "On the Natural Gas Market," natural gas is supplied at prices freely agreed upon between the supplier and the consumer, except in cases provided for by this Law. The Law of Ukraine "On the Electricity Market" establishes the right of traders to buy and sell electricity on the market and to export and import it at freely determined prices. Similarly, the supply of electricity to consumers is carried out at freely determined prices, except in cases established by this Law. Among the principles governing the functioning of the electricity market, the Law of Ukraine "On the Electricity Market" stipulates non-discriminatory pricing and tariff setting that reflects economically justified costs.

Similarly, ESU is based on the principle of market orientation, which stipulates that the development of the energy sector must be accompanied by competition in the markets and fair pricing.

Smart grids, aggregation, demand management, energy storage, distributed generation,

dispatching, re-dispatching and capping mechanisms, real-time price signals

According to the Concept of Implementation of Smart Grids in Ukraine until 2035, it is planned to introduce smart metering of electricity during 2022-2035. It is planned to provide 100% commercial metering on energy markets resources, automatic removal and transmission in processing indicators consumption. As a result, consumers should be able to manage their electricity consumption, reduce energy costs without compromising their lifestyle and excessive restrictions on electricity consumption to meet household needs. Targets for smart metering will be determined taking into account the results of the assessment of the economic feasibility of their implementation. Also, the legislative level provides for the possibility of active consumers, microgrids and aggregation (see section 3.4.3.3. of this Plan).

Planned reduction of the index of electricity not supplied (ENS) by 2030 - at least 3 times.

According to the ESU, as a result of the modernization of electrical networks in the long term, it is planned to ensure a reduction in power supply interruptions according to the SAIDI indicator (average duration of power outages) to 150 minutes in urban areas and 300 minutes in rural areas. The targeted weighted average SAIDI indicator for urban areas for 2021 was 475 min., for rural areas – 958 min. According to the reporting data of the NEURC, in 2024, SAIDI indicators were: due to the fault of companies (due to technological disruptions in the networks of companies and planned outages without warning consumers) – 502 min.; due to planned outages with warning consumers – 597 min.; due to force majeure circumstances and the fault of other persons (including the application of outage schedules) – 29,210 min.

One of the key principles of the ESU is the decentralization of the energy sector – all measures must be implemented taking into account the strategic orientation towards the development of distributed generation. and control consumption. Among strategic initiatives and tasks to 2025 year The ESU defines the rehabilitation of damaged energy infrastructure with a focus on minimizing GHG emissions by:

- development of renewable energy, which includes a set of measures for the construction of renewable energy plants, wind generation and promotion of the development of distributed solar generation to cover its own consumption;
- active implementation of energy storage technologies with the subsequent expansion of their use.

Among the key tasks of the transformation of Ukraine's energy sector by 2032, an increase in the share of electricity and heat production from renewable sources has been identified. The National Renewable Energy Action Plan for the period till 2030 sets an indicative target of achieving a share of RES of 29.4% in gross final energy consumption by 2030 for the electricity sector. To achieve this target, it is necessary to additionally deploy battery energy storage systems (BESS). They will ensure increased flexibility of the power system, the formation of the necessary capacity reserve, and will also contribute to covering the forecasted demand. The development of BESS is a key prerequisite for the effective integration of growing volumes of generation from RES, minimizing curtailments of electricity production by RES facilities during periods of surplus, and ensuring the reliability and security of electricity supply.

2.4.3.2. Where applicable, national objectives related to the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets, including a timeframe for when the objectives are to be met

Electricity market

The Law of Ukraine “On the Electricity Market” provides for non-discriminatory participation in the electricity market of all its participants, in particular in terms of licensing activities, access to networks and congestion management, allocation of capacity of interconnectors, tender procedures for attracting new investments in generating capacities, dispatching (operational and technological) management of the power system, purchase of balancing services, pricing and tariff formation, supply of electricity, etc. Also, the main tasks of the Regulator in the electricity market include promoting the development of a safe, reliable and efficient Integrated Power System of Ukraine, focused on the needs of buyers, which will ensure non-discriminatory access to it for existing and potential users of the system, sufficiency of capacity for the needs of the electricity market and its energy efficiency, as well as integration into the distribution systems of distributed generation and producers of electricity

from alternative energy sources.

Market natural gas

The ESU sets out objectives for implementing biomethane production projects and overcoming barriers to the effective development of such production. In addition, in accordance with the Law of Ukraine “On the Natural Gas Market,” the main objectives of the NEURC as the energy regulator include, in particular:

- non-discriminatory application of legislation on the natural gas market to biogas or other types of gas from alternative sources; promotion of safe, reliable and economical functioning of gas infrastructure (gas transportation and distribution systems, gas storage facilities and LNG facilities), which will provide opportunities for gas producers from alternative sources to enter the natural gas market, regardless of production volumes;
- ensuring simple and unburdensome conditions for connection to gas transportation and gas distribution systems for new customer facilities, ensuring simple and unburdensome conditions for access to gas transportation and gas distribution systems, gas storage facilities and LNG facilities for new customers, in particular removing barriers that may prevent such access for new wholesalers or suppliers, as well as for wholesalers or suppliers of gas from alternative sources.

The Law of Ukraine "On Alternative Fuels" provides for the main principles of state policy in the field of alternative fuels, in particular, promoting the development and rational use of non-traditional sources and types of energy raw materials for production (extraction) alternative species fuel with purpose savings fuel and energy resources and reducing Ukraine's dependence on their imports.

ESU also notes the need to take measures to promote the use of biomethane as a motor fuel, adopt European standards for the use of biomethane in the transport sector, and introduce a mechanism to stimulate biomethane production.

The overall goal of promoting the development of biomethane production is supported by special mechanisms and guarantees provided for by the new EU gas legislation package (Gas Decarbonisation Package), the implementation of which is planned in Ukraine and which will also apply to hydrogen.

2.4.3.3. Where applicable, national objectives with regard to ensuring that consumers participate in the energy system and benefit from self-generation and new technologies, including smart meters

Electricity market

Ukraine has not set specific goals for ensuring consumer participation in the operation of the energy system, their benefits from generation for their own needs and new technologies, including smart meters. At the same time, the ESU envisages providing all consumers with the opportunity to interact interactively with all electricity service providers through the implementation of smart metering systems, automatic collection and transmission of consumption indicators for processing. The legislation also provides for new models of consumer participation in the electricity market: active consumers through the mechanism of self-generation (net billing), demand response, including through aggregation, citizen energy communities, etc.

Natural gas market

Ensuring 100% gas metering and justified implementation of intelligent natural gas metering systems

The NES includes a goal to ensure the installation of meters for gas metering and the installation of a system for remote metering and automation of natural gas balancing.

According to the National Commission for the Regulation of Energy and Utilities of Ukraine as of the end of the 2nd quarter of 2025 (excluding territories for which data are unavailable), the total number of natural gas customers without natural gas metering devices is 705,611, including by categories:

- Comprehensively, in ago number for heating (plate gas household, gas column, gas heating) – 36,575;
- For heating water and preparation food (plate gas household, gas column) – 38,269 ;
- Only for preparation food – 630 767.

The Law of Ukraine "On Ensuring Commercial Metering of Natural Gas" (Official Gazette of Ukraine, 2011, No. 52, p. 24, p. 2067) provides for the deadline for equipping all consumers with meters - 01.01.2023. On January 14, 2026, the Ministry of Energy published a draft Law, which provides for the postponement of this deadline for a period of seven years from the date of termination or cancellation of martial law. .

The installation of intelligent natural gas metering systems depends on the results of a cost-benefit analysis, which must be conducted as specified in the Law of Ukraine "On natural gas market". This analysis should be carried out in synchronization with a similar process in the electricity market. Only after this can a decision be made on the large-scale implementation of the relevant systems, taking into account the positive conclusion of the analysis.

Certainty and completeness commercial accounting gas

The ESU has set a goal to improve the quality of commercial gas accounting.

The commercial gas accounting system generally serves to determine data on the quality and quantity of gas to be used in settlements between gas market participants. The relevant data should be generated based on meter readings; however, these readings are often unavailable—for example, when a gas meter (metering unit) is missing, malfunctioning, or when its readings cannot be promptly transmitted to market participants for mutual settlements.

In general, a large number (though not all) of commercial accounting issues could be resolved by ensuring 100% meter-based metering using meters capable of remote data transmission. However, first, the decision to equip all consumers with such state-of-the-art devices and systems requires a comprehensive cost-benefit analysis as well as the allocation of funds; second, even if such a decision is made, its implementation will take a considerable amount of time. Finally, there may still be situations where meter reading data is unavailable.

The commercial metering system must perform several functions[14]:

● clearly identify the entity that owns the gas volumes that were transmitted/supplied/consumed;

● ensure the determination of the volume of gas transmitted/supplied/consumed;

● if meter data is not available at a given time, use substitute data generated in a transparent and well-founded manner, taking into account available meter data from other periods;

● ensure a continuous flow of data, its reliability, and secure storage, including responding to serious discrepancies identified between actual volumes and the volumes used in calculations;

● resolve disputes regarding metering data that may arise between market participants, including by taking into account their conflicting interests;

● create incentives for the development of competition in the retail gas market (in accordance with Directive 2009/73/EU, consumers must have the right to dispose of their consumption data by transferring it to a supplier or other parties of their choice).

The Ministry of Energy, together with the NEURC and the OGTS (with their consent), is recommended to define indicators for achieving the goal of reliability and completeness of commercial metering by 2026, which may relate to discrepancies between forecast and actual data, the presence of complaints,

[14] Problems are being observed in all these areas in Ukraine. Since 2015, a significant number of legal disputes have concerned the allocation of delivered/consumed gas among market participants (gas transmission system operators, gas distribution system operators, PSO suppliers, heat producers, and "last resort" suppliers). For commercial balancing purposes, data reported by consumers or calculated are used; a significant amount of the data used for these calculations is estimated rather than actual. As a result of the control reconciliation of meter readings, which is conducted by the gas distribution system operator at least once every six months, the relevant commercial metering data is not adjusted; there are instances where the gas distribution system operator fails to fulfill its obligations regarding the regular conduct of control reconciliations. Consumption data is accumulated at the gas distribution system operator level and is not yet transmitted to a centralized database. The existing model for collecting and processing commercial natural gas metering data in the natural gas distribution sector is characterized by limitations related to the level of digitization and the technical condition of the metering infrastructure.

the volume of unauthorized consumption etc.

2.4.3.4. National objectives with regard to ensuring electricity system adequacy, as well as for the flexibility of the energy system with regard to renewable energy production, including a timeframe for when the objectives are to be met

Electricity market

Ensuring power systems adequacy

ESU assumes that growth demand electricity will be covered, in the first in turn, due to carbon-neutral sources (RES and nuclear generation). Since wind power and solar power are non-guaranteed capacity, its balancing in the system will be carried out due to:

- hydropower and pumped-storage hydropower plants;
- balancing and reserve capacities – combined fuel thermal power plants (natural gas and/or biomethane) and in the future other technologies with similar technical characteristics parameters;
- increasing the capacity of energy storage, including long-term (seasonal) storage using Power-to-X technology (hydrogen, ammonia, etc.).

It is envisaged that a significant share of nuclear generation will be maintained in the overall electricity mix in the Integrated Power System of Ukraine in 2050. To replace coal-fired generation, natural gas/biomethane-fired TPP and CHP will be used, or alternative technologies with similar characteristics, in particular, nuclear power plants with small modular reactors.

Ensuring system flexibility

The Integrated Power System of Ukraine does not have a sufficient level of flexibility and will need to gradually increase it to ensure proper integration into the power system of power plants with non-guaranteed capacity based on RES (solar and wind power plants) in the period until 2030 and beyond.

According to the conclusions of the Report on the Assessment of Generating Capacity Adequacy to cover the projected electricity demand and ensuring the necessary reserve in 2024, the Integrated Power System of Ukraine does not meet the requirements for generating capacity adequacy, and with the further increase in power plants with unguaranteed capacity based on RES, the problems of ensuring operational security will worsen.

Commissioning of highly flexible capacity with the possibility of quick start (starting from zero and reaching nominal capacity in 10-15 minutes) and high-speed reserves based on BESS will provide the Integrated Power System of Ukraine with the necessary reserves to meet adequacy requirements in the future.

To ensure the flexibility of the energy system, it is necessary to introduce new electricity generation facilities, in particular, in accordance with the volumes of capacity introduction provided for by the Distributed Generation Development Strategy for the period until 2035, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 713-r dated July 18, 2024. According to the Strategy, until the end 2026 year planned introduction in operation 4 GW new capacities, with 30-50% will be natural gas-fired installations as the primary energy resource, designed to operate in the electricity market. Also, in order to ensure the flexibility of the energy system, it is necessary to deploy BESS. By NEC Ukrenergo's data, as of mid-August 2025, technical conditions for connecting BESS to the grid were issued in the amount of 2342 MW, which is approximately 1 GW more than on the corresponding date last year, which indicates the growing interest of market participants in the implementation of this technology.

Several BESS projects with a total capacity of about 235 MW have already been implemented. Also in 2024 and 2025, the TSO held special auctions for the long-term procurement of ancillary services for five years, including the frequency containment reserve and the frequency restoration reserve, which contribute to the growth of the installed capacity of BESS. In addition, it is planned to implement a project to build a BESS with a power capacity of about 200 MW with an energy capacity of 400 MWh as part of hybrid systems based on existing HPPs on the Dnieper and Dniester rivers. These systems are designed to expand the control range of existing HPPs and provision their speed of operation for working in the market ancillary services and balancing market.

Natural gas market

Achieving sufficient levels of domestic production

NES sets "meeting 100 percent of Ukraine's natural gas needs through domestic production" as a target indicator for 2030. ESU sets two objectives: on the one hand, self-sufficiency, and on the other, the development of an export-oriented energy sector, a key component of which is the export of Ukrainian gas to the EU. In this regard, ESU identifies natural gas exports as a goal by 2050, noting that domestic production is projected to reach 21.5 billion m³ by 2032 under the baseline scenario and 26.8 billion m³ under the optimistic scenario. In addition, the Law of Ukraine "On the Approval of the National Program for the Development of Ukraine's Mineral Resource Base for the Period until 2030" sets a target of increasing oil and condensate reserves to 72.5 million metric tons and natural gas reserves to 287.0 billion cubic meters, respectively, by 2030.

At the same time, ESU identifies, among its priority tasks, a well-founded increase in the production of energy resources within the framework of Strategic Objective 3: "Economic efficiency of the energy sector, energy supply systems, and import substitution of mineral resources."

Efforts to increase natural gas production should be aimed at meeting the targets set by ESU, while taking into account the need for significant investments required for the exploration and development of gas fields, the possibility of alternative uses of funds (in particular, lost state budget revenues resulting from tax breaks and rebates), and the principle of prioritizing energy efficiency, as well as the prospects for the development of natural gas consumption in Ukraine and the EU.

2.4.3.5. Where applicable, national objectives to protect energy consumers and improve the competitiveness of the retail energy sector

Protecting Consumers in Energy Markets and Combating Energy Poverty

NES aims to establish market-based pricing for energy resources for all categories of consumers, while providing for effective mechanisms to support vulnerable segments of the population.

One of the principles governing the operation of the natural gas market, in accordance with the Law of Ukraine "On the Natural Gas Market," is ensuring a high level of protection for the rights and interests of natural gas consumers, including prioritizing the security of natural gas supply, particularly through the diversification of natural gas supply sources. This law defines the basic rights of consumers, including minimum contractual terms, information that must be included on billing documents, the right to change suppliers, and so on. The Regulator's main tasks include promoting a high level of compliance with specific obligations to safeguard the public interest in the natural gas market, protecting vulnerable consumers, and establishing the data exchange process necessary for consumers to exercise their right to switch suppliers.

According to the Law of Ukraine "On the Electricity Market," in order to ensure the protection of consumer rights, participants in the electricity market may not engage in unfair competitive practices against consumers. The terms and conditions of contracts with consumers must be transparent and easy to understand. Electricity supply must be provided on a non-discriminatory basis, and disconnections of consumers may be carried out only in accordance with the procedure established by this Law of Ukraine and the rules of the retail electricity market. Disconnections of protected consumers must be carried out in compliance with the requirements for ensuring electricity supply to protected consumers.

Vulnerable consumers are entitled to support to cover the costs of energy resources consumed in accordance with the Law of Ukraine "On the Natural Gas Market" and to the support and/or protection from disconnection during certain periods as provided by law in accordance with the Law of Ukraine "On the Electricity Market." Additional assistance is provided for the purchase of solid domestic heating fuel, namely firewood and coal.

The state of energy poverty must be assessed, and measures must be taken to combat energy poverty.

Ensuring Competition in Energy Markets

According to data from the NEURC, there is significant concentration in the wholesale and retail markets for natural gas and electricity. Given the administrative price controls for residential consumers, the rate at which consumers switch suppliers is low. Martial law and energy security challenges have a significant impact on market development.

In accordance with the European Commission's recommendations (COM(2019) 285 final), energy

market activity should be monitored using the following parameters:

- concentration index (Herfindahl-Hirschman Index, HHI);
- comparison of price trends in the domestic market and at developed hubs in Europe;
- trends in supplier switching;
- tariff deficit (the share of uncovered costs in the regulated components of the final price).

Other specific indicators may also be used, the selection of which can be tailored to the characteristics of the domestic market. In accordance with the Law of Ukraine "On the National Commission for State Regulation in the Spheres of Energy and Public Utilities," the NEURC monitors the functioning of markets in the energy and public utilities sectors. At the same time, the Procedure for the National Commission for State Regulation in the Energy and Utilities Sectors to Monitor Markets in the Energy and Utilities Sectors, approved by NEURC Resolution No. 1120 of September 14, 2017, stipulates that during the market monitoring process, the indicator/ metric shall be determined for each monitoring subject, specifying (where applicable) target (established) values or an acceptable range of values, and the target (established) values of indicators/metrics shall be determined by applicable law and by decisions of the NEURC or other state bodies adopted within the scope of their authority.

It is proposed that, by 2026, that the NEURC define, for each monitoring area (where practically feasible), key indicators and target values or ranges of acceptable values for such indicators, which will enable the assessment of the effectiveness of energy market regulation and the implementation of NEPC policies and measures aimed at developing energy markets.

2.4.4. Energy poverty

Where applicable, national objectives with regard to energy poverty, including a timeframe for when the objectives are to be met In accordance with Regulation (EU) No 347/2013 as adapted and adopted by Ministerial Council Decision 2015/09/MC-EnC

Reducing energy poverty, protecting vulnerable consumers, and promoting gender and social inclusion are strategic goals of ESU. It is expected that the transformation of the energy sector will significantly reduce the level of energy poverty in Ukraine and enable the country to reach and maintain the European average of 7.9%.

The EU defines energy poverty as a situation in which the cost of energy consumed by a household accounts for a large portion of its income, making it impossible for the household to pay for the energy consumed and/or forcing it to reduce its consumption, which, in turn, negatively affects its quality of life. However, there is currently no such definition at the legislative level, nor are there quantitative and qualitative indicators that provide grounds for classifying individuals as energy-poor. Thus, setting a target to reduce energy poverty must occur in parallel with the adoption of a legal definition of energy poverty, along with the establishment of a specific mechanism for assessing the actual situation. Relevant measures will be implemented, in particular, to carry out the relevant policy of the NECP.

Despite this, work on collecting and analyzing information in this area is already underway. Specifically, by Order of the Cabinet of Ministers of Ukraine No. 1190-r dated November 29, 2024 (Official Gazette of Ukraine, Official Publication, 2024, No. 110, Art. 7064), tasks for achieving the Sustainable Development Goals for the period up to 2030 and the indicators for their achievement were approved, and target values and other information regarding these indicators—which serve as benchmarks for the activities of government agencies—were adopted. This document provides, in particular, for Target 6, "Promoting the reduction of energy poverty among the population," and defines four indicators and target values for each indicator. The State Statistics Service conducted an assessment of the current status for each indicator (once every two years) based on statistical data and the results of a sample survey of household living conditions, conducted in accordance with the Methodological Guidelines for the "Survey of Household Living Conditions" (State Statistics Service Order No. 172 of June 9, 202

Table 2.10. Share of persons living in households and suffering from insufficient funds for timely and full payment for housing and communal services and the purchase of liquefied gas, solid and liquid household heating fuel, etc., % *(SDG indicator 7.6.1)*

	2015	2016	2017	2018	2019	2020	2021	2022	2023 *	2024
Total	**19.6**	–	**25.3**	–	**18.8**	–	**15.4**	–	–	–

by type place of residence										
urban	20.0	–	25.5	–	19.1	–	13.9	–	–	–
rural	18.8	–	25.0	–	18.3	–	18.3	–	–	–
by age										
to 18 years	21.9	–	25.4	–	18.4	–	14.1	–	–	–
18–29 years	18.9	–	23.8	–	15.7	–	15.5	–	–	–
30–59 years	18.2	–	23.5	–	16.6	–	13.7	–	–	–
60 years and older	20.7	–	29.5	–	25.0	–	19.5	–	–	–
by gender										
women	20.2	–	26.5	–	19.6	–	16.3	–	–	–
men	19.1	–	23.9	–	18.0	–	14.3	–	–	–

Source: State Statistics Committee (data are being developed one time on two years) Notes:

** In accordance with the norms of the Law of Ukraine "On Protection of the Interests of Subjects of Reporting and Other Documents" During the period of martial law or state of war, due to Russia's armed aggression against Ukraine, starting from February 2022, state statistics bodies do not conduct sample surveys of the population (households), as a result of which they are unable to obtain information based on their results.*

Targeted value indicator on 2030 year: reduction up to 25

Table 2.11. Share of people living in households who lack the funds to maintain a sufficiently warm temperature in their homes (to purchase fuel, a heater, etc.) during the heating season, % *(SDG indicator 7.6.2)*

	2015	2016	2017	2018	2019	2020	2021	2022	2023 *	2024
Total	**24.2**	**–**	**25.6**	**–**	**21.8**	**–**	**17.2**	**–**	**–**	**–**
by type place of residence										
urban	20.1	–	21.7	–	17.3	–	12.6	–	–	–
rural	32.3	–	33.3	–	30.5	–	26.4	–	–	–
by age										
to 18 years	23.3	–	23.9	–	20.3	–	14.0	–	–	–
18–29 years	21.5	–	24.6	–	17.8	–	16.5	–	–	–
30–59 years	23.8	–	23.9	–	20.5	–	15.8	–	–	–
60 years and older	27.6	–	30.9	–	27.3	–	22.5	–	–	–
by gender										
women	25.6	–	26.3	–	22.1	–	17.9	–	–	–
men	23.0	–	24.8	–	21.3	–	16.3	–	–	–

Source: State Statistics Committee (data are being developed once every two years) Notes:

** In accordance with the norms of the Law of Ukraine "On Protection of the Interests of Subjects of Reporting and Other Documents during the Period of Martial Law or State of War", due to Russia's armed aggression against Ukraine, starting from February 2022, state statistics bodies do not conduct sample surveys of the population (households), as a result of which they are unable to receive information based on their results.*

Targeted value indicator on 2030 year: reduction up to 20

Table 2.12. Average monthly share of total expenses of an average household for payment of housing and communal services (services for management of an apartment building, services for supply and distribution of natural gas, supply and distribution of electricity, supply of thermal energy, supply of hot water, centralized water supply, centralized sewage, management household waste) taking into account amounts cashless benefits and subsidies,

% ***(indicator SDG 7.6.3)***

	2015	2016	2017	2018	2019	2020	2021	2022 *	2023 *	2024 *
Total	**10.2**	**14.7**	**15.4**	**13.9**	**13.0**	**12.9**	**13.8**	**–**	**–**	**–**
by type place of residence										
urban	11.4	15.7	16.6	15.0	14.4	14.6	15.4	–	–	–
rural	7.4	12.5	12.8	11.4	9.7	9.0	10.1	–	–	–
by household type										
households with children	9.5	13.8	14.6	12.8	12.0	12.4	12.7	–	–	–
households without children	10.8	15.4	16.2	14.9	13.8	13.3	14.8	–	–	–

Source: State Statistics

Service Notes:

** In accordance with the norms of the Law of Ukraine "On Protection of the Interests of Subjects of Reporting and Other Documents during the Period of Martial Law or State of War", due to Russia's armed aggression against Ukraine, starting from February 2022, state statistics bodies do not conduct sample surveys of the population (households), as a result of which they are unable to receive information based on their results.*

Targeted value indicator on 2030 year: reduction up to 12

Table 2.13. Average monthly share of total expenses of an average household for housing and communal services (apartment building management services, natural gas supply and distribution services, electricity supply and distribution services, heat supply, hot water supply, centralized water supply, centralized sewage treatment, household waste management), which is covered by benefits and subsidies, % ***(SDG indicator 7.6.4)***

	2015	2016	2017	2018	2019	2020	2021	2022 *	2023 *	2024 *
Total	**1.4**	**5.1**	**5.3**	**3.3**	**0.9**	**0.1**	**0.1**	**–**	**–**	**–**
by type place of residence										
urban	1.3	4.3	4.9	3.0	0.9	0.2	0.1	–	–	–
rural	1.6	6.9	6.3	4.0	1.0	0.1	0.1	–	–	–
by household type										
households with children	0.9	4.4	4.5	2.5	0.7	0.1	0.1	–	–	–
households without children	1.8	5.7	6.1	4.0	1.1	0.2	0.2	–	–	–

Source: State Statistics

Service Notes:

** In accordance with the norms of the Law of Ukraine "On Protection of the Interests of Subjects of Reporting and Other Documents during the Period of Martial Law or State of War", due to Russia's armed aggression against Ukraine, starting from February 2022, state statistics bodies do not conduct sample surveys of the population (households), as a result of which they are unable to receive information based on their results.*

Targeted value indicator on 2030 year: reduction up to 0.5

It is important to further explore the possibilities of synchronizing these indicators and their target levels with the approach of EU Member States in order to achieve comparability.

2.5. Dimension research, innovations and competitiveness

2.5.1. National objectives and funding targets for public and, where available, private research and inno-vation, including, where appropriate, a timeframe for when the objectives are to be met

According to experts from the International Energy Agency, "accelerating innovation is crucial to achieving net-zero emissions by 2050, and policies in this direction will play a crucial role. Almost half of the emission reductions needed to achieve net-zero emissions by 2050 will be provided by technologies that are still in the demonstration phase today. This is particularly true for sectors that remain stubbornly dependent on fossil fuels, such as long-distance transport and heavy industry. The goal of achieving net-zero emissions by 2050 will be unattainable without significant innovative efforts, aimed at improving and commercializing established technologies in this decade, as well as bringing less mature ideas to market as quickly as possible, to minimize the costs of the energy transition"[15] .

Key relevant national documents that define priorities in the direction of research, innovation and competitiveness are:

- National economic strategy on period to 2030 year
- Strategy development spheres innovative activities on period to 2030 year;
- Strategy digital development innovative activities Ukraine on period to 2030 ;
- Strategy formation and implementation state politicians in field changes climate for the period until 2035;
- Energy strategy Ukraine on period to 2050 ;
- Concept implementation "smart" networks" in Ukraine to 2035 year;
- Law Ukraine "About priority directions development sciences and techniques";
- Law Ukraine "About priority directions innovative activities in Ukraine".

The priority areas of science and technology development, as well as innovation activity, fixed at the legislative level, were adjusted for the period of martial law. The Law of Ukraine of December 21, 2023 No. 3534-IX "On Amendments to Certain Laws of Ukraine Regarding Priority Areas of Science Development and techniques and innovative activities» Priorities have been identified for the period until December 31 of the year following the termination or abolition of martial law. In particular, among the priority areas of science and technology development:

1) national security and defense;
2) fundamental scientific research on the most important problems of scientific development technical, socio-economic, socio-political, human potential to **ensure Ukraine's competitiveness** in the world and sustainable development of society and the state;
3) informational and communication technologies;
4) **energy and energy efficiency** ;
5) rational nature management;
6) sciences about life, new technology prevention and treatment the most common diseases;
7) **new substances and materials** .

Updated strategic priority directions innovative activities defined:

1) technological renewal and development spheres national security and defense;
2) **development of new energy transportation technologies, introduction of energy-efficient, resource-saving technologies, development of alternative energy sources** ;

[15] Tracking Clean Energy Innovation in the Business Sector: an Overview https://www.iea.org/reports/tracking-clean-energy-innovation-in-the-business-sector-an-overview/executive-summary

3) development of new technologies **for the high-tech development of the transport system** , the rocket and space industry, aircraft and shipbuilding, weapons and military equipment;

4) development of new technologies for the production of materials, their processing and joining, creation of the nanomaterials and nanotechnology industry ;

5) technological renewal and development **agro-industrial complex** ;

6) introduction of new technologies and equipment for high-quality medical care, treatment, and pharmaceuticals;

7) **widespread use of cleaner production** and environmental protection technologies;

8) development modern informational, communication technologies, robotics.

NES contains number goals (in terms Strategies - "expected result implementation"), for the implementation of which:

- Required use innovative products or high technology
- Needed state support development innovative projects and innovative activity
- Requires state assistance in that one or another form

Among the expected implementation results , the following are directly related to innovation and competitiveness:

definition and public support strategic course states in economic area, the consistent implementation of which will allow:

- to form **anti-competitive conditions for business yes investments** and to restore trust in the state;
- become **competitive on international market** ;
- **to stimulate development innovation and modernization** sectors **economics** to ensure their competitiveness in international markets;

- to provide **development human potential** and win **competition by talents**;
- to provide **levels rights and opportunities women and men** in all areas life of society.

National economic strategy determines such landmarks, principles and values in economic policy:

- decarbonization of the economy (increasing energy efficiency, developing renewable energy sources, developing a circular economy and synchronizing with the European Green Deal initiative);
- development entrepreneurship, innovations and talents;

Also strategy determines number unacceptable steps, (“red lines”), in particular:

- monopolization competitive markets;
- dishonest using economic incentives;
- retreat from reformation underdeveloped markets;
- deterioration state surrounding environment.

Under the strategic goal of “Ensuring mutually beneficial trade with countries of the world and achieving expanded access to foreign markets,” the National Economic Strategy, in particular, defines the following tasks:

- formation of an individual approach in applying the adjustment mechanism to Ukraine carbon on border (Carbon Border Adjustment Mechanism, CBAM) as to the state that

took on himself obligation concerning political associations and economic integration with the EU within the framework of the Association Agreement between Ukraine and the EU

- harmonization with everyone stakeholders parameters viewing Applications XXX and XXXI to the Association Agreement between Ukraine and the EU (environmental protection)
environment and climate)

The NES also provides for a wide range of measures targeting various sectors of the economy, which will require the implementation of research and innovation projects to support the competitiveness of the Ukrainian economy. In particular, the vision of the ICT direction in the NES says "Ukraine is […] a European center for performing scientific research and development work".

The strategic goal of the National Economic and Social Development Agency **"Creation of new production capacities through stimulating innovative activity of enterprises in all regions of the country by using the competitive advantages of each of them"** among the list of challenges includes the following points:

- high cost and long duration of connecting production facilities to the power grid (cost connection to electrical networks in Ukraine in few times higher than the cost in EU countries);
- low level of funding for research and development (investment in low-tech production and low research and development costs);
- lack of close cooperation between scientific institutions and industrial enterprises (detachedness of Ukrainian science from the real needs of industry and lack of effective cooperation between science and industry);

The NES also draws attention to the high energy intensity of Ukraine's GDP, but does not offer specific indicators and goals for reducing the economy's energy intensity:

> "High energy intensity and low productivity lead to a decrease in the competitiveness of the Ukrainian processing industry. In 2017, in In Ukraine, the volume of GDP generated per unit of total primary energy supply reached 5,054 US dollars, which is close in value to the countries of Eastern Europe, the Caucasus and Central Asia. Although Ukraine is characterized by an annual increase in GDP generated per unit of total primary energy supply (on average by 100-200 US dollars). Poland generates 10,620 US dollars (twice as much) per 1 thousand tons of oil equivalent, and in EU countries the average figure is 2.53 times higher (12,802 US dollars) than in Ukraine.

The NES devotes a significant role to the energy sector, in particular, it identifies significant ways in terms of research, innovation and competitiveness to achieve the strategic goal of "Ensuring the functioning of a smart, modernized and reliable energy system that fully meets the requirements and needs of end consumers":

Ways achieving a strategic goal	Task
1. Modernization and optimization of capacity operations	[…] • Settlement works aggregators distributed generations and balancing service providers • […]
Ways achieving a strategic goal	Task

	● Ensuring the increase in energy storage capacities - a battery system for storing electrical energy ● Consideration of the possibility of hydrogen production using excess electricity in the system with the aim of further hydrogen export to the EU ● Regulation of the operation of localized generation with renewable energy sources, which is connected directly to the consumer's networks, without any fees for the distribution and transmission of electrical energy […]
2. Promoting infrastructure development	● Support for the reconstruction and development of distribution networks in line with the development of distributed electricity generation ● Formation and implementation of economically feasible projects for optimization and modernization of gas distribution networks in accordance with the needs of the economy, carrying out the necessary reconstruction of outdated networks and preparing gas distribution networks for the transportation of hydrogen ● […] ● Release of locked-in capacities as a result of the implementation of the power grid development program and the implementation of projects aimed at removing internal constraints ● Providing a clear definition of the purpose and limits of use of a small distribution system ● […] ● Consideration of the issue of forming infrastructure for ensuring Ukraine's integration into the hydrogen economy ● […] ● Support for the reconstruction and development of distribution networks in line with the development of distributed electricity generation

Within the framework of the ways to achieve the strategic goal “Increasing the energy efficiency of the economy and ensuring the environmental friendliness of the energy sector”, the following tasks are envisaged:

Ensuring sustainability development	● Stimulating research and development in the field of energy efficiency and hydrogen technologies with the involvement of scientific institutions, higher education institutions and business entities ● Regulation of market, regulatory and technical opportunities for the production and export transfer of hydrogen from renewable energy sources and nuclear power plants with a guaranteed price in euros and long-term contracts

In the NES, the strategic goal “Strengthening the competitiveness of industrial products produced in Ukraine, introducing resource- and energy-efficient technologies”, in particular, indicates one of the ways to achieve the strategic goal of increasing resource efficiency with the following tasks:

Increasing resource efficiency	• increase equal awareness about introduction of resource-efficient technologies • implementation of effective regulation in the field of resource conservation and using renewable energy sources • involvement grants and loans for resource-saving and energy-saving technologies • software access to high quality energy audits
	• ensuring the implementation of energy management systems • development of sustainable public procurement by raising awareness among market participants and providing methodological support for the application of sustainability criteria • implementation systems tax incentives for eco-modernization • introduction of a greenhouse gas emissions trading system and other tools for setting a price for greenhouse gas emissions • introduction the best available technologies and methods management

The above strategic goal also provides for stimulating the development of a circular economy with the following tasks:

Stimulating the development of the circular economy	• creation of transparent and competitive markets for secondary raw materials by improving and harmonizing Ukrainian legislation with relevant EU legislation and norms and rules • stimulation abbreviation volumes formation waste • simplification order implementation operations with scrap metal • formation politicians circular economy • introduction systems expanded producer responsibility • implementation complex events of commercial development of industrial waste dumps

Another strategic goal relevant to NECP within the framework of the NES is goal 4 “Creation of new production capacities through stimulation of innovative activity of enterprises in all regions of the country by using the competitive advantages of each of them”, which refers to the ways of achieving the implementation of innovative technologies with the following tasks:

Introduction of innovative technologies	• creating a platform for exchanging experience in implementing innovative technologies • improvement mechanism commercialization scientific and technical developments, research works • reduction risk implementation innovative projects through insurance tools for such projects • creation favorable conditions for development clusters • building relationships and strengthening cooperation between higher education institutions, research centers and industry • integration of industrial clusters of Ukraine with the European Cluster Cooperation Platform • creation of scientific and technical clusters with the participation of basic enterprises • implementation the best available technologies in accordance to EU Best Available Techniques reference documents (European reference documents)

Also within the framework of Goal 4, a significant role is given to Industry 4.0 and related research. and innovative projects:

Implementation of Industry 4.0	● popularization of the concept of "Industry 4.0" and its individual elements as a mandatory factor in increasing the competitiveness of industrial enterprises in international markets ● institutionalization Industries 4.0 — synchronization strategies
	● involving industrial companies in the implementation the concept of "Industry 4.0" at the expense of EU funds, in particular, under the European Union Framework Programme for Research and Innovation "Horizon Europe" (2021-2027) ● promoting educational activities on the transfer of best practices from the IT sector to industrial sectors ● ensuring the integration of innovations in the field of Industry 4.0 into the country's defense complex and security strategy ● formation of new competences of personnel in industry in order to implement digital technologies ● full-scale digitalization of key industrial sectors ● software clustering in field Industries 4.0 — on national and regional levels

The strategic policy course in the field of agro-industrial sector development, defined in the NES, provides for several ways to achieve the strategic goal of "Providing stimulating and advisory agricultural policy", which are relevant to the issues of the NECP:

State policy in the agro-industrial sector of environmental protection and natural resource management in agriculture	● approximation of national legislation, standards and practices to the pan-European **principles of sustainable agricultural policy** and good agricultural practices, gradual **harmonization of state agricultural policy with the EU Green Deal** in agriculture ● development and monitoring of indicators of the impact of agricultural activities on the state of ecosystems ● development, promotion of implementation and monitoring of compliance with minimum environmental standards ● introduction of **a national report on the level of greenhouse gas emissions** during the production and circulation of agricultural crops ● introduction of economic incentives for land use and protection and increasing soil fertility, reducing the level of pollution of water and other components of the environment from agricultural sources, improving the structure of the country's lands and lands, restoring anthropogenically altered ecosystems, implementation sustainable land use and achievement neutral equal degradation lands
Increasing manufacturability regarding monitoring the quality of land resources	● conducting systematic monitoring of soil fertility indicators and their quality, introducing satellite monitoring ● reforming the system of state research institutions institutions, improving the quality and efficiency of scientific support for the agro-industrial complex, expanding the holding of relevant agricultural producers of scientific research, **strengthening innovation potential, deepening the integration of domestic scientific institutions into the international scientific and research community** ● software adjustment technologies growing cultures with taking into account results navigations with system global positioning and agricultural machinery

The NES strategic goal "Balancing the production of high- and low-margin products to increase the profitability of the [agricultural] sector" provides for:

Ensuring development sustainable production	• promoting sustainable agricultural production, protection of the environment and animals, the spread of **organic production methods** and the use of biotechnology, " **climate-smart** " agriculture and forestry with **greenhouse gas emission reduction and adaptation to climate change** , sustainable management of natural resources resources and preservation and multiplication biodiversity

The Strategy for the Development of the Innovation Sector of Ukraine for the Period Until 2030 does not single out low-carbon sectors and technologies as one of the priority areas, but refers to the Strategy for Low-Carbon Development until 2050 as one of about 40 strategic sector-level documents related to the development of innovations in a particular area. At the same time, attention should be paid to the status of this document, which was supported and approved by the protocol decision of the Cabinet of Ministers of Ukraine on July 18, 2018[16] and published on the UNFCCC website[17], but is not available in the databases of official documents of state bodies of Ukraine. As of the end of 2025, an updated version of the Strategy for Low-Carbon Development of Ukraine for the period up to 2050[18], which approved by the Interagency Working Group on Coordination of Climate Change Response .

The Low-Carbon Development Strategy of Ukraine for the period until 2050 defines the following instruments for stimulating supply and demand for relevant scientific, technical and innovative solutions:

- increase funding for research and development in areas and projects that involve reducing carbon emissions, with subsequent implementation of the results;
- to introduce relevant scientific and technical programs and research competitions and developments, in particular - within the framework of the National Fund for the Development of the Russian Federation;
- strengthen the financial capacity of the Innovation Development Fund and the State Innovation Finance and Credit Institution to support innovative low-carbon development projects;
- promote development and implementation new low-carbon technologies;
- promote and stimulate the "double transition" and the circular economy, including the digital transformations enterprises, by support activities digital innovation hubs, voucher schemes, grants, etc.;
- popularize and promotion implementation ESG principles in management companies and criteria for impact on carbon emissions when making decisions on financing scientific, scientific-technical and innovative projects

Among the program measures aimed at solving the problems of innovation activity in Ukraine, the Strategy for the Development of the Sphere of Innovation Activity for the Period Until 2030 calls for a review of priority areas of science and technology development in order to bring them closer to directions identified in developed countries of the world, based on modern global technological trends.

Given the extremely high priority of research in the climate field and the field of low-carbon technologies in most highly developed countries of the world, this indirectly confirms the trend towards the development of low-carbon technologies in the Ukrainian scientific and innovation sphere.

The program measures of the Strategy for the Development of the Sphere of Innovation Activity also include the creation of schools for the exchange of experience and national resources for training in entrepreneurship and innovation, including a network of advanced training for both teachers and heads of higher education institutions and scientific institutions, with the involvement of world experts, trainers, mentors, the European Entrepreneurship Network (EEN).

[16] https://mepr.gov.ua/diyalnist/napryamky/zmina-klimatu/pom-yakshennya-zminy-klimatu/strategiya-nyzkovugletsevogo-rozvytku-ukrayiny-do-2050-roku/

[17] https://unfccc.int/sites/default/files/resource/Ukraine_LEDS_en.pdf

[18] https://me.gov.ua/download/ba4565a8-544b-4c90-af84-49b2b718f629/file.pdf

The Strategy for the Development of the Sphere of Innovation Activity calls the introduction of European technical standards in Ukraine, stipulated by the Association Agreement between Ukraine and the EU, one of the most transformative factors for the entire Ukrainian economy and for the low-carbon technology sector in particular.

Among the indicators of the implementation of the Strategy for the Development of the Innovation Sector of Ukraine indicated (base year - 2017):

- the share of expenses for **scientific and scientific and technical work in the gross domestic product is 3%** (in 2017 - 0.45%);
- fraction **innovative enterprises** in general number of enterprises - **not Less 30%** (in 2017 - 16.2%);
- the share **of exports of goods produced by enterprises of the high- and medium-tech sectors of industry** in the total volume of exports of goods is **30%** (in 2017 - 15.4%);
- the share **of employees** employed at enterprises belonging to **the high- and medium-tech sectors of industry** in the total number of employees employed in industry - **20.5%** (in 2017 - 21.5%);
- **innovative products** sold in the total volume of industrial products sold is **10%** (in 2017 - 0.7%).

The Action Plan for 2021-2023 for the implementation of the Strategy for the Development of the Innovation Sector for the Period until 2030, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 9, 2021 No. 1687 (Official Gazette of Ukraine, 2022 p., No. 1, p. 6), provides for several important steps for the low-carbon technologies sector:

Promoting the development of a network of Industry 4.0 centers (Ministry of Economy, Ministry of Education and Science, Ministry of Infrastructure, Ministry of Digital Economy, Ministry of Strategic Industry, industry and business associations (upon consent)

Expected result:

- the competencies and capabilities of Industry 4.0 centers have been expanded, and such centers are cooperating with the network of Digital Innovation Hubs (DIHs)

Development networks centers support technologies and innovations by assistance World Intellectual Property Organization (Ministry of Economy, Ministry of Education and Science, Ukrpatent (with consent))

Expected result:

- created centers support technologies and innovations in all regions
- subjects innovative activities have access to patent databases and receive basic consulting services

Providing financial support to higher education institutions and scientific institutions for innovative activities (MES)

Expected result:

- Higher education institutions and scientific institutions receive financial support for innovative activities based on the results of a competitive selection of scientific, scientific and technical works and projects, which are financed by the external assistance instrument of the European Union to fulfill Ukraine's obligations in the European Union Framework Programme for Research and Innovation "Horizon 2020"

Ensuring information campaigns on the possibility of participating in domestic competitions and international innovation programs, on success stories of innovative activities (MES, Ministry of Digital Affairs, Ministry of Economy, Ministry of Infrastructure)

Expected result:

- increased awareness of innovators regarding opportunities participation in domestic competitions and international programs, regarding success stories of innovative activities

- held informational days for innovators with purpose informing on the possibility of participating in the European Union Framework Programme for Research and Innovation "Horizon Europe" in terms of supporting innovation
- held informational days for innovators with purpose informing about the possibility of participating in the “EUREKA” program

The Strategy for the Digital Development of Innovative Activity of Ukraine for the period until 2030 in the context of achieving strategic goal 16 "Ensuring the creation of conditions for the development of internal infrastructure for research, innovation and implementation of solutions in the field of artificial intelligence" in the field of green transformation provides for the implementation of the following tasks and measures:

- creation of a **competence center for the use of artificial intelligence** for energy security, effective dispatching and the development of “smart grids”;
- providing **financial incentives** for **projects** aimed at green innovation;
- organization of **advanced training programs** for **specialists** working in the energy sector;
- providing informational and organizational **support for the participation of startups and other innovative companies in green transformation support programs from partners** , in particular regarding climate innovation vouchers.

Strategy for the formation and implementation of state policy in the field of climate change for the period until 2035 year accordingly to strategic goals "Mitigation" changes climate and software socially just and economically efficient transition to a low-carbon development of the state" plans, among other things:

- reduce **energy intensity gross internal product** ;
- **increase the total amount of investment in scientific research** in the field of climate change, the development of low-carbon technologies;
- **create new jobs and increase the share of innovative enterprises** in the regions in order to solve the problem of closing enterprises engaged in the extraction, processing and/or combustion of fossil fuels.

The Energy Strategy of Ukraine for the period until 2050 includes among its strategic goals the target indicator **“Reduced by 50 percent the energy intensity of GDP due to the implementation of an effective policy of using energy resources”** .

In making assumptions about the energy intensity of individual industries, the ESU is guided by the indicators listed below:

- Mining industry: reduction in energy intensity by 21% by 2032 compared to 2023.
- Manufacturing industry: the main changes will concern the metallurgy sectors (reduction in energy intensity by 51% by 2050) and mechanical engineering (reduction by 50%), while gas consumption will decrease due to substitution with hydrogen.
- Services sector: transition to the use of renewable energy, natural gas and electricity will reduce specific consumption energy by 22% by 2032 and double by 2050 (compared to 2023).

The concept of implementing “smart grids” in Ukraine until 2035, which was approved by the order of the Cabinet of Ministers of Ukraine dated October 14, 2022. No. 908 (Official Bulletin of Ukraine, 2022, No. 84, p. 5201), - a document establishing the obligations of the state in the field of implementation "smart" networks”. And despite the fact that the word “innovation” is used in This document is only mentioned once, the entire Concept is dedicated to the implementation of a set of technologies that are innovative in nature. An important feature of this document is that it pays significant attention to:

- work on changing legislation to facilitate the implementation of “smart grid” technologies;
- coordination between various government bodies (Ministry of Energy, Ministry of Digital Economy, Ministry of Education and Science, Ministry of Justice, National Commission for the Regulation of the Economy of Ukraine, Ministry of State Special Communications) to improve

the regulatory framework, which will contribute to the implementation of “smart grids”;

- involving private and public stakeholders in organizational activities aimed at promoting “smart grids” in Ukraine

The purpose of the Concept is to “determine directions and objectives, as well as ensure coordination of actions to implement “smart grids” taking into account existing and planned state and regional programs for the development and modernization of the energy sector.”

The Concept notes that measures to implement "smart grids" require significant funding, however, the Concept notes that the financing of the measures provided for by the document should be carried out at the expense of:

- including measures to implement “smart grids” in the investment programs of regulated companies (distribution system operators, transmission system operators, electricity producers; other sources not prohibited by law);
- involvement funds from donors and international financial institutions

The appendix to the Concept is the "Plan of Actions for the Implementation of the Concept for the Introduction of "Smart Grids" in Ukraine to 2035 year”, What provides consistent implementation 33's specific interrelated measures during 2022-2035. The measures include both regulatory and organizational and technical measures, the time for their implementation is indicated, and the responsible state authorities determine the expected results of the implementation of the measures.

It is noteworthy that in order to ensure the formation of the main principles of state policy in the field of digital development, digital transformations and digitalization of the fuel and energy complex, the Ministry of Energy proposed a draft Concept for the Application of Artificial Intelligence in the Fuel and Energy Complex[19]. Its goal is to create organizational, regulatory and technological conditions for increasing the efficiency, safety, reliability and sustainability of the industry through the systematic implementation of artificial intelligence in the processes of generation, transportation, distribution and consumption of energy resources.

In addition to the above provisions, joint work is currently underway with the Ministry of Digital Affairs on the possibilities of using artificial intelligence technologies in the fuel and energy complex. Consultations are also ongoing on possible ways of cooperation, the result of which should be the creation of a center of competences for the use of artificial intelligence for energy security, effective dispatching and the development of "smart grids".

2.5.2. Where available, national 2050 objectives related to the promotion of clean energy technologies and, where appropriate, national objectives, including long-term targets (2050) for deployment of low-carbon technologies, including for decarbonising energy and carbon-intensive industrial sectors and, where applicable, for related carbon transport and storage infrastructure

See above in section 2.5.1 of this Plan, in particular in the section on individual indicators of the Energy Strategy of Ukraine for the period until 2050.

Additionally, Strategy restoration, sustainable development and digital transformations small and average entrepreneurship on period to 2027 year includes operating room target 2.3. "Stimulation "green" transition"", which provides for:

- supporting sustainable practices to ensure the “green transition” and environmental modernization of small and medium-sized businesses, in particular by financing energy-efficient investments and creating eco-industrial parks;
- stimulating the use of circular economy practices, which will contribute to increasing the resource intensity and competitiveness of domestic business, decoupling economic growth from the intensive use of natural resources, and improving the environmental well-being and health of citizens.

2.5.3. Where applicable, national objectives with regard to competitiveness

See. above in section 2.5.1.

[19] https://mev.gov.ua/rehulyatornyy-akt/povidomlennya-pro-oprylyudnennya-proyektu-rozporyadzhennya-kabinetu-ministriv-2

3. POLICIES AND MEASURES

3.1. Dimension decarbonization

3.1.1. GHG emissions and removals

3.1.1.1. Policies and measures to achieve the economy-wide target covering all key emitting sectors and sectors for the enhancement of removals, with an outlook to the long-term vision and goal to become a low emission economy and achieving a balance between emissions and removals in accordance with the Paris Agreement

Cross-sectoral policies and measures

PM_D_WEM_01 Environmental tax on carbon dioxide emissions

Goal: Stimulation of carbon dioxide emissions reduction (in million t CO_2), increasing revenue to the budget (million UAH).

Legal basis: Tax code of Ukraine, Budgetary code of Ukraine

Time frame: from 2010 year

Type of policy / measure: Fiscal

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations: Ministry of Economy, Ministry of Finance, Ministry of Energy, State Tax Service, State Agency for Energy Efficiency

Emission reduction type: CO_2

Description: An environmental tax on carbon dioxide emissions in Ukraine was introduced in 2010 with the approval of the new Tax Code of Ukraine. The tax is levied on emissions of carbon dioxide into the atmosphere by stationary sources of pollution. Entities emitting CO_2 in the amount of not more than 500 tons per year, are not payers of environmental tax. In case of exceeding this amount, the entities are obliged to register as taxpayers in the tax (reporting) period, prepare and submit tax reports, calculate and pay tax for the tax (reporting) period. For entities whose annual emissions exceed 500 tons, the tax base is based on the results of the tax (reporting) year is reduced by the amount of such emissions in the amount of 500 tons per year.

In addition, carbon dioxide emissions from power generation plants are not subject to tax (for the period of martial law). Also, no tax is charged. and the environmental tax is not paid in territories where active hostilities are (were) underway, and in temporarily occupied territories (for the period of martial law).

Initially tax rate was only 0.2 hryvnia per 1 ton of emissions and gradually increased until 2018. In 2019, the tax rate was increased more than 24 times - from 0.41 UAH/t to 10 UAH/t, and in 2022 - 3 times more. As of 2025, the tax rate is 30 UAH/t. It is expected that the tax rate will continue to increase.

With the increase in the tax rate, tax revenues to the state budget gradually increased. Thus, in 2021, the tax brought UAH 1.2 billion to the state budget. Although the tax rate was increased 3 times since 2022, tax revenues increased by only 25% to UAH 1.5 billion, which is associated with a significant decline in industrial production and heat and electricity generation due to the full-scale invasion of Ukraine by the Russian Federation. In 2024, tax revenue from the environmental tax for carbon dioxide emissions amounted to about UAH 2 billion[24] . The Tax Code of Ukraine stipulates that at least 70% of revenue from the payment of the environmental tax for carbon dioxide emissions must be directed to measures leading to emission reduction (decarbonization) by industries classified in Section C "Manufacturing Industry" and Section D "Supply of Electricity, Gas, Steam and Air Conditioning" of the National Classifier of Ukraine "Classification of Types of Economic Activity" DK 009:2010, in accordance with the procedure established by the Budget Code of Ukraine. (see more details in section 3.2 of this Plan, PM_EE_WEM_02).

Ministry of Economy together with Ministry of Finance are developing environmental tax reform of tax on carbon dioxide emissions. In particular, National Revenue Strategy until 2030 year, approved

[24] https://openbudget.gov.ua/national-budget/incomes

by order of Cabinet Ministers of Ukraine from December 27 2023 No. 1218 (Official Bulletin of Ukraine, 2024 p., No. 11, p. 722), stipulated that a transition model should be developed during 2024-2025 from taxing actual volumes of carbon dioxide emissions to taxing the volume of extraction (import) of fossil fuels (oil, gas, coal, etc.) depending on the carbon dioxide content, and a schedule for implementing changes to environmental and tax legislation has also been determined.

In addition, the Verkhovna Rada of Ukraine registered the draft Law of Ukraine "On Amendments to the Tax Code of Ukraine on Establishing a Zero UAH Environmental Tax Rate for Carbon Dioxide Emissions for Installations That Generate Such Emissions as a Result of Biofuel Combustion" (Registration No. 9596 of 09.08.2023), which was adopted as a basis on July 16, 2024 with the finalization of the provisions. Also, the draft Law of Ukraine "On Amendments to the Law of Ukraine "On Alternative Fuels" on the Establishment of a Register of Installations That Use Biofuel as the Only Type of Fuel" (Registration No. 9597 of 09.08.2023) was adopted as a basis on June 18, 2024. The adoption of these draft laws will allow Ukraine to apply generally accepted global practices regarding the use of biofuels for energy production and reduce the tax burden on bioenergy facilities, which will promote their development.

PM_D_WAM_01 National Plan for Reducing Emissions from Large Combustion Plants

Goal: To progressively reduce emissions (in million tonnes) of sulphur dioxide, nitrogen oxides and non-differentiated particulate matter from existing large combustion plants with a rated thermal input of 50 MW or more and for which the first emission permit or design permit was issued before 1 July 1992; to ensure compliance with Directive 2010/75/EU on industrial emissions.

Legal basis: Order of the Cabinet of Ministers of Ukraine dated November 8, 2017 No. 796 "On the National Plan for Reducing Emissions from Large Combustion Plants (Government Courier, 2017, No. 226)

Time frame: from 2017

Type of policy / measure: Planning

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy

Emission reduction type: CO_2, SO_2, NO_x

Description: The Government approved the National Plan for Reducing Emissions from Large Combustion Plants (hereinafter referred to as the National Plan) (Government Courier, 2017, No. 226) on November 8, 2017 in order to fulfill Ukraine's obligations under the Treaty on the Establishment of the Energy Community in terms of limiting emissions of pollutants. The Ministry of Energy has been designated as the coordinator for the implementation of the said National Plan.

Although the NERP is directly aimed at reducing atmospheric pollution, and not at reducing GHG emissions, the implementation of the NERP will indirectly contribute to reducing GHG emissions due to the reduction in the operation of thermal generation facilities. Thus, Annex 4 to the NERP lists the installations that must be closed after a certain limit of operating hours. Also, all other installations from Annex 2 to the National Plan that have not been environmentally modernized in accordance with the requirements of Directive 2010/75/EU on industrial emissions, are subject to decommissioning. In addition, sulfur dioxide and nitrogen oxides are precursors of GHGs, i.e., they contribute to the formation of GHGs under the influence of certain factors. Accordingly, reducing sulfur dioxide and nitrogen oxides emissions will have an additional positive impact on reducing GHG emissions.

Due to the decrease of demand, temporary loss of control or damaged objects of thermal generation, the production of thermal and electrical energy, and therefore the level of emissions, decreased rapidly. Therefore, the actual total emissions for 2022-2023 were significantly lower than established by the requirements of the NERP[20] . However, after the end of the war and the restoration of energy demand, emissions from heat generation facilities will increase and it will be impossible to meet the requirements of the NERP without carrying out ecological modernization of old facilities and/or construction of new capacities with significantly lower emissions. The source of financing for these measures has not yet been determined. The draft Action Plan for the Implementation of the Energy Strategy of Ukraine for the Period Until 2050 plans to develop a regulatory act on determining the

[20] https://mev.gov.ua/storinka/ukrayina-prodovzhuye-realizatsiyu-zakhodiv-u-ramkakh-chlenstva-v- enerhetychnomu

procedure and sources of financing for environmental protection measures provided for in the National Environmental Strategy by 2032.

In order to maintain or restore access to electricity for as many people as possible, the Council of Ministers of the Energy Community adopted Decision 2024/01/Mc-EnC (hereinafter referred to as the Decision) on February 1, 2024, amending Decision 2013/05/Mc-EnC and providing for certain derogations for Ukraine regarding the implementation of the provisions of the NERP for the duration of martial law in Ukraine, but in general no later than December 31, 2025.

In order to ensure the implementation of the NERP under martial law, as well as taking into account the significant impact of the armed aggression of the Russian Federation on the functioning of the energy sector, the Ministry of Energy initiated a review of approaches to the implementation of the NERP.

On May 15, 2025, the Ministry of Energy held a meeting to address problematic issues of the implementation of the NERP with the participation of representatives of interested entities of the fuel and energy complex. As a result of the meeting, it was decided, among other things, to begin a negotiation process within the Energy Community regarding the need for a comprehensive revision of the NERP and the possibility of extending the operating periods of large combustion plants (LCPs) until January 1, 2029.

In order to ensure the implementation of Ukraine's obligations under the Treaty on the Establishment of the Energy Community during martial law, taking into account the results of the meetings, Ministry of Energy on 27 June 2025 year sent to Secretariat Energy Community appeal to put to a vote on amendments to Decision of the Ministerial Council of the Energy Community 2024/01/MC-EnC of 1 February 2024 in order to foresee for Ukraine a temporary retreat from execution provisions of the NERP for the period of martial law, but no later than December 31, 2028.

On 18 December 2025, the Energy Community Ministerial Council adopted Decision 2025/10/MC-EnC, which supported the appeal of Ukraine and introduction of relevant changes to NERP regarding the continuation of the operation of the LCPs specified in the NERP, for the period of martial law, but no later than December 31, 2028 (hereinafter referred to as the Decision of the Council of Ministers of the Energy Community).

The said Decision of the Council of Ministers of the Energy Community takes into account the force majeure circumstances caused by the full-scale armed aggression of the Russian Federation against Ukraine, which seriously affected the implementation of the NERP, as well as the need to ensure the uninterrupted operation of the energy system.

In order to bring the NERP in line with the Decision of the Council of Ministers of the Energy Community and harmonize Ukraine's international obligations with the provisions of the Law of Ukraine "On the Electricity Market" regarding ensuring the adequacy of generating capacities, the Cabinet of Ministers of Ukraine adopted the Resolution No. 1499-r of December 24, 2025 "On introduction changes to orders Cabinet Ministers Ukraine from 8 November 2017 No. 796 and dated November 24, 2021 No. 1512" (Government Courier, 2026, No. 4, hereinafter referred to as the Order).

The order amends the NERP regarding the extension of the operational terms of the LCPs for the period of martial law, but no later than December 31, 2028, which allowed avoiding premature decommissioning of individual power units of TPPs and CHPs, ensuring the stability of the power system and forming the necessary reserves of generating capacities.

Within six months after the termination or cancellation of martial law in Ukraine in accordance to point 5 order Cabinet Ministers Ukraine from 24 November 2021 No. 1512-r “On Amendments to the National Plan for Reducing Emissions from Large Combustion Plants and Recognizing as Invalid the Order of the Cabinet of Ministers of Ukraine dated June 13, 2018 No. 428” (as amended by the Order of the Cabinet of Ministers of Ukraine of Ministers of Ukraine dated December 24, 2025 No. 1499-r “On Amendments to the Orders of the Cabinet of Ministers of Ukraine” Ministers Ukraine from 8 November 2017 No. 796 and from 24 November 2021 No. 1512"), the Ministry of Energy, together with the National Commission for the Regulation of Energy and Utilities, the Ministry of Economy, and the Ministry of Finance must develop and submit to the Cabinet of Ministers of Ukraine a draft act on determining the procedure and sources of financing for environmental protection measures provided for by the NERP.

PM_D_WAM_02 National GHG Emissions Trading System

Goal: Stimulation of GHG emissions reduction (in million t $CO_{2\text{- eq.}}$)

Legal basis: Law of Ukraine "On the principles of monitoring, reporting and verification of greenhouse gas emissions", regulation of the Cabinet Ministers Ukraine dated February 21, 2025 No. 146-r "On approval of the action plan for the creation of a national system of trading in greenhouse gas emission quotas" (Official Gazette of Ukraine, 2025 p., No. 24, p. 1567)

Time frame: from 2025 year

Type of policy / measure: Economic, Planning

Sector(s) affected: Energy - supply, Energy - consumption, Industrial processes

Responsible bodies/organizations: Ministry of Economy

Emission reduction type: CO_2

Description: Ukraine has undertaken the obligation to implement Directive No. 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading when signed and ratified the Association Agreement between Ukraine, of the one part, and the European Union, the European Atomic Energy Community and their Member States, of the other part, in 2014. The first step towards creating a system of trading quotas for GHG emissions (hereinafter referred to as ETS) was the adoption of the Law of Ukraine "On the Principles of Monitoring, Reporting and Verification of Greenhouse Gas Emissions" (hereinafter referred to as MRV) in 2019 and the by-laws that allowed the MRV system to be fully launched from 2021. Before the full-scale invasion of the Russian Federation's to Ukraine, there were more than a thousand installations that should have been covered by the MRV. According to preliminary estimates by the Ministry of Economy, the number of such installations decreased by 40% due to the destruction of industrial facilities by Russian invaders in the territories of Donetsk and Luhansk regions and in other regions of Ukraine. Registration of installations in the MRV system continued even during the full-scale invasion of Ukraine by the Russian Federation. However, the functioning of the MRV system was limited due to provided that the submission of reports and other documents required in accordance with the norms of current legislation in documentary and/or electronic form is voluntary during the period of martial law or a state of war in accordance with the provisions of the Law of Ukraine "On Protection of the Interests of Subjects of Reporting and Other Documents During the Period of Martial Law or a State of War". However, on January 8, 2025, the Verkhovna Rada adopted the Law of Ukraine No. 4187-IX "On Amendments to Certain Legislative Acts of Ukraine Regarding the Resumption of Monitoring, Reporting and verifications emissions greenhouse gases", which acquired validity on the 1st of February.

The restoration of mandatory reporting on GHG emissions for operators of installations covered by the MRV is an important prerequisite for the creation of the ETS. The law takes into account the realities of wartime and provides for relaxation of requirements for MRV reporting depending on the location of the facilities and the degree of their destruction. Registration has also been simplified and voluntary reporting for previous years (2021, 2022 and 2023) has been introduced in order to reduce the organizational and financial burden on enterprises. The adoption of the Law ensured the approximation of Ukrainian legislation to the EU acquis, in particular, some provisions of Directive No. 2003/87/EC, Commission Regulation (EU) No. 600/2012 and Commission Regulation (EU) No. 601/2012 have been implemented.

By Order No. 146-r of February 21, 2025, the Cabinet of Ministers approved an action plan for the creation of a national greenhouse gas emissions trading system. The introduction of the ETS is an important step to stimulate the decarbonization of the economy, in particular, post-war reconstruction based on low-carbon technologies, integration with the EU, and minimizing the consequences of CBAM for Ukraine. The plan contains 15 tasks for the launch of the ETS, which will be implemented in three stages:

- **preparatory** (2025–2027 years) – development legislative basis and creation of necessary tools for the operation of the ETS;
- **first,** "pilot" (with 2028 year) – test launching ETS;
- **second,** operating – will begin not earlier than through three years after lifting martial law for the operation of the ETS in a stable economic situation.

The action plan includes 15 tasks, the implementation of which should ensure the launch and effective functioning of the ETS. In particular, in 2025-2026 it is planned to develop and agree with

stakeholders on substantiated proposals for key components of the ETS in Ukraine that take into account national circumstances and comply with the Directive of the European Parliament and of the Council No. 2003/87/EC of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC (hereinafter referred to as Directive 2003/87/EC) and other acts of the EU acquis. The development and adoption of a draft law on the principles of the functioning of the ETS and draft regulatory legal acts are planned for 2025-2028.

PM_D_WEM_02 Action Plan for the Implementation of Ukraine's Climate Policy within the Framework of Participation in the Global Methane Pledge Initiative to Reduce Methane Emissions

Goal: Stimulation of reduction of methane emissions (in million t)

Legal basis: Order of Cabinet Ministers Ukraine from 07 July 2023 No. 607 "On approval of the plan measures to implement Ukraine's climate policy within the framework of participation in the global initiative to reduce methane emissions "Global Methane Pledge" (Official Gazette of Ukraine, 2023 p., No. 67, p. 3842)

Time frame: 2023-2030 years

Type of policy / measure: Economic, Planning, Regulatory

Sector(s) affected: Energy - supply, Agriculture, Waste

Responsible bodies/organizations: Ministry of Economy, Ministry of Energy

Emission reduction type: CH_4

Description: In order to fulfill Ukraine's obligations within the framework of participation in the global initiative to reduce methane emissions "Global Methane Pledge", the Government has developed and approved the Action Plan on July 7, 2023.

It is expected that the implementation of the plan will ensure a reduction in methane emissions by 30% by 2030 from the 2020 emission level. According to the GHG Emissions Inventory for 1990-2023, methane emissions amounted to 83.6 million tons of $CO2_{-eq.}$ (including the LULUCF sector) in 2020. Due to the decline in economic activity and the reduction in coal production due to the full-scale invasion of the Russian Federation into Ukraine, methane emissions in 2023 amounted to 62.8 million t $CO_{2\text{-eq.}}$ (taking into account the LULUCF sector), which is 24.9% less than the emission level in 2020. However, after the end of the war and the recovery of the economy, methane emissions may increase. That is why it is important to fully implement all measures provided for in the Plan.

The plan envisages the implementation of 23 measures by 2030 in the sectors of extraction, processing and transportation of natural gas and oil, coal mining, waste management and agriculture. As of the end of 2024, six measures have already been fully implemented, four of which are in the waste sector and two in the oil and gas sector, with the remaining measures in the implementation phase. In particular, significant progress has been made in recent years in implementing measures to reduce methane emissions by state-owned companies in the oil and gas sector, which are presented in more detail below.

LLC "GTS Operator of Ukraine" has introduced accounting for methane leaks according to OGMP 2.0 standards. and a plan for controlling leaks from GTS equipment has been approved (order dated 16.12.2021 No. 1039). In 2024, due to the work of mobile laboratories, responsible personnel eliminated leaks of natural gas in volume 2.4 million m^3/year. In 2024 with help of a set of measures aimed at reducing natural gas leaks, the volume of leaks was reduced by 24% with a target of 5% compared to the previous period. For 2025-2026, it is planned to implement a gas leak accounting system in the SAP system from the moment of detection to the moment of elimination of the leak. The implementation of this leak accounting system will ensure automatic daily accounting. The investment programs also plan to update the material base aimed at reducing methane emissions into the atmosphere.

Legal entities of the Naftogaz Group are implementing measures to track methane leaks. Thus, the **JSC "Ukrtransgaz"** has introduced a system monitoring emissions methane in compliance with the OGMP 2.0 methodology and reporting for 2022-2024 was carried out on the basis of forms developed and approved by NJSC "Naftogaz of Ukraine". The inventory of methane leaks is carried out by two

independent units, namely: a mobile laboratory for the detection and elimination of natural gas leaks of Uhersky VVROPSG and VCTD "Techdiagaz". At JSC "Ukrtransgaz", measures to reduce methane emissions along the entire gas supply chain are implemented as part of a program to save and prevent overspending on fuel and energy resources.

JSC "Ukrgazvydobuvannya" continues to conduct research on production and processing facilities by mobile laboratories of the UkrNDIgaz branch using LDAR technology. During 2024, more than 100 sources of leaks were examined and eliminated, thanks to which 834.39 thousand m ^{3} of natural gas was saved.

In addition, JSC "Ukrgazvydobuvannya" has developed and approved a "Decarbonization Map" and a "Policy in the field of decarbonization of production", which determine the priority areas for the implementation of "green projects" for the period until 2030, taking into account current legislation and planned changes to it with defined time limits. To priority areas of activity Companies are classified as technical measures with re-equipment (modernization) of existing equipment, as well as research aimed at detecting and eliminating leaks due to equipment leaks using modern devices.

LLC "Gas Distribution Networks of Ukraine" carries out the detection and elimination of natural gas leaks, including using mobile laboratories equipped with devices for determining gas leak locations. The Development Plans provide for the modernization of existing equipment.

In addition, work is underway to develop and approve the Technical Regulations for Natural gas (see PM_IMG_WAM_08), 23 April 2023 year DP "UkrNDNC" developed the national Standard DSTU EN 16723-1:2023 “Natural gas and biomethane for use in transport and biomethane for injection into the natural gas network” and other measures are being implemented to promote biomethane production (see PM_IMG_WEM_07, PM_IMG_WAM_10, PM_D_WAM_06 **.** Work is also underway to implement the Carbon Crediting Mechanism (see PM_D_WAM_03), the implementation of the State Target Program for the Just Transition of Coal Regions of Ukraine for the period until 2030 (see PM_D_WEM_19), implementation of policies and measures in the waste sector (see PM_D_WAM_12-17), which will contribute to the reduction of methane emissions.

PM_D_WEM_ 03 Increase of fuel excise tax rates to the minimum level in the EU

Goal: Increase revenues to the consolidated budget (million UAH), stimulate reduction in fossil fuel consumption (million tons) and, accordingly, reduce GHG emissions (million tons of $CO_{2\text{-eq.}}$)

Legal Basis: Tax code Ukraine, Law of Ukraine from 07/18/2024 No. 3878-ИХ “On Amendments to the Tax Code of Ukraine Regarding the Implementation of the Provisions of the European Union Legal Acts on Excise Tax”, Resolution of the Cabinet of Ministers of Ukraine dated December 27, 2023 No. 1218 “On Approval of the National Revenue Strategy until 2030” (Official Gazette of Ukraine, 2024 p., No. 11, p. 722)

Time frame: 2024-2028

Type policy/measure: Fiscal

Sector(s) affected: Energy – consumption, Transport

Responsible bodies/organizations: Ministry of Finance, State Tax Service

Emission reduction type: CO_2

Description: A comprehensive reform of excise taxation is provided for by the National Revenue Strategy until 2030, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 27, 2023 No. 1218 (Official Gazette of Ukraine, 2024 p., No. 11, p. 722) and includes, in particular, an increase in rates for fuel and electricity used for heating to the level of EU minimum rates, as well as improving excise tax administration.

In order to approximate national legislation to the EU legislation, the Verkhovna Rada of Ukraine adopted the Law of Ukraine No. 3878-ИХ of July 18, 2024 “On Amendments to the Tax Code of Ukraine Regarding the Implementation of the Provisions of the European Union Law on Excise Tax”, which provides for the implementation of a schedule of fuel excise tax rates increases during 01.09.2024–31.12.2027, until they reach the minimum level of excise taxation established by Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity.

The law provides, in particular, in subparagraph 215.3.4 of paragraph 215.3 of Article 215 of the Tax Code for the establishment of new excise tax rates on fuel, taking into account their minimum level, provided for by Directive No. 2003/96/EC, which will come into force on January 1, 2028. In particular, the following excise tax rates are provided for the main types of fuel: for gasoline - 359 EUR per 1,000 liters, for gas oil (diesel fuel) - 330 EUR per 1,000 liters, for liquefied gas - 250 EUR per 1,000 liters.

At the same time, the new paragraph 48 of subsection 5 of section XX "Transitional provisions" of the Tax Code establishes a schedule for the annual increase of such rates from 01.07.2024 to 31.12.2027 inclusive (for four years) taking into account the total difference between the rates provided for as of 01.01.2028 and the excise tax rates on these goods in accordance with subparagraph 215.3.4 points 215.3 articles 215 of the Tax Code. It is foreseen that this transitional norm shall apply from 01.07.2024.

PM_D_WAM_03 Implementation of the carbon crediting mechanism

Goal: attract investments (in million USD) for decarbonization of various sectors of the economy (reduction of emissions in million tons of $CO_{2\text{-eq.}}$)

Legal basis: Order of Cabinet Ministers Ukraine from 30 May 2024 No. 483- r
"On approval of the Strategy for the formation and implementation of state policy in the field of climate change for the period until 2035 and approval of the operational plan of measures for its implementation in 2024-2026" (Government Courier, 2024 p. No. 114), Resolution of the CMU dated 12/31/2024 No. 1540 “On the establishment of the Ukrainian part of the Ukrainian-Japanese Joint Committee on the implementation of the joint lending mechanism” (Official Gazette of Ukraine, 2025 p., No. 8, p. 679)

Time frame: from 2023

Type policy/measure: Economic

Sector(s) affected: Energy - supply, Industrial processes, LULUCF, Agriculture

Responsible bodies/organizations: Ministry of Economy

Emission reduction type: CO_2

Description: Article 6 of the Paris Agreement, which Ukraine signed and ratified in 2016, provides for a mechanism for voluntary cooperation between Parties in implementing their nationally determined contributions to ensure increased ambition of their actions on climate change mitigation and adaptation, as well as to promote sustainable development and ecological integrity. Since 2022, the Government of Ukraine has been taking steps to establish international cooperation in this area. Thus, on July 4, 2022, during the Ukraine Recovery Conference in Lugano (Switzerland) an Implementation Agreement to the Paris Agreement was signed between the Government of Ukraine and the Swiss Federal Council.

On February 19, 2024, during the Japan-Ukraine Conference on Promoting Economic Development and Recovery in Tokyo (Japan), a Memorandum of Cooperation on the Joint Crediting Mechanism (JCM) was signed between the Government of Ukraine and the Government of Japan, and at the end of the year by resolution of December 31, 2024 No. 1540 the Cabinet of Ministers approved the Ukrainian part of the Ukrainian-Japanese Joint Committee on the implementation of the joint lending mechanism. According to the Resolution, the Ukrainian part of the Joint Committee:

- participates in the development, review and approval of rules and guidelines necessary for the implementation of the Joint Crediting Mechanism/JCM, including procedures of project cycle, guidance on developing methodologies, project and technical documentation, reports on monitoring results, approval of independent legal entities authorized to conduct validation and/or verification, and resolution of other issues;

- takes participation in approvals involvement of legal persons, regardless from organizational and legal form (including foreign ones) as independent legal entities authorized to conduct validation and/or verification;

- takes participation in approvals of project proposals for their implementation within the framework Joint Crediting Mechanism/JCM by adopting a no-objection decision;

- participates in the approval of the methodology for use within the framework of the Joint

Crediting Mechanism/JCM;

- participates in acceptance of the decision about registration projects and distribution of credit units;
- informs the Cabinet of Ministers of Ukraine and, if necessary, the Government of Japan about the approval of the issue of credit units;
- performs other functions in accordance with the Rules for the Implementation of the Joint Crediting Mechanism/JCM and decisions of the Joint Committee.

Participation in this mechanism will allow attracting investments from Japanese organizations for decarbonization of various sectors of the economy through the implementation of leading technologies. The reduction of greenhouse gas emissions obtained from the implementation of such projects will be counted partly as a contribution to achieving Japan's goals and partly towards fulfilling Ukraine's greenhouse gas emission reduction commitments.

In addition, the development of other regulatory and legal acts necessary for the implementation of the carbon crediting mechanism in accordance with Article 6 of the Paris Agreement is ongoing. Thus, in accordance with the operational plan of measures for the implementation in 2024-2026 of the Strategy for the Formation and Implementation of State Policy in the Field of Climate Change for the Period Until 2035, by 2025, draft acts on the approval of the carbon crediting mechanism and the Procedure for consideration, approval and implementation of projects aimed at reducing anthropogenic emissions or increasing the absorption of greenhouse gases.

GHG emissions reduction policies and measures in the industry sector

Two cross-sectoral decarbonization policies (PM_D_WAM_02, PM_D_WAM_03) apply to the industrial sector and the policy PM_D_WAM_04 is presented below.

In addition, industrial decarbonization will also be facilitated by policies and measures aimed at to increase energy efficiency (PM_EE_WEM_02, PM_EE_WEM_12 PM_EE_WEM_16), development of hydrogen technologies (PM_IMG_WAM_02), carbon capture, transportation, storage and utilization (CCUS) infrastructure and creation of mechanisms to ensure investment in development renewable energy and decarbonization technologies (PM_RIC_WAM_09).

PM_D_WAM_04 Implementation of measures to reduce emissions of ozone-depleting substances and fluorinated greenhouse gases

Goal: to reduce emissions of ozone-depleting substances and fluorinated greenhouse gases. ***Legal basis:*** Law of Ukraine “On Regulation of Economic Activities with Ozone-Depleting Substances and Fluorinated Greenhouse Gases” (Official Gazette of Ukraine, 2020 p., No. 2, p. 45), draft Law "On the ratification of the Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer" (Registration No. 0303 dated 27.02.2025).

Time frame: 2026-2036

Type policy/measure: Regulatory, Planning

Sector(s) affected: Industrial processes

Responsible bodies/organizations: Ministry of Economy

Emission reduction type: ozone-depleting substances and fluorinated greenhouse gases.

Description: Ukraine has been a party to the Montreal Protocol since 1988 and has been implementing state policy in the field of regulating economic activities with ozone-depleting substances and fluorinated greenhouse gases. In 2020 the Law of Ukraine “On Regulation of Economic Activities with Ozone-Depleting Substances and Fluorinated Greenhouse Gases” (Official Gazette of Ukraine, 2020 p., No. 2, p. 45) was approved, which regulates legal issues of production, import, export, storage, using, placing on the market and handling of ozone-depleting substances, fluorinated greenhouse gases, goods and equipment containing them or used, which affects the ozone layer and global warming, as well as a number of other regulatory and legal acts in this area. Starting from 2021 the State operator register of controlled substances in Ukraine is functioning.

On November 8, 2024, the Ministry of Environment published for discussion a draft order “On

Approval of the List of Measures to Reduce the Consumption of Controlled Substances"[21], which was developed in accordance with Part Three of Article 3 of the Law "On Regulation of Economic Activities with Ozone-Depleting Substances and Fluorinated Greenhouse Gases".

The draft order provides for the approval of the List of measures that business entities (operators of controlled substances) can choose to prevent losses and reduce consumption of controlled substances, taking into account the type of activity of the operator and the availability of technical capabilities, as well as safety requirements. The developed list provides for organizational measures, as well as measures to use alternative refrigerants in equipment, prevent leaks, use recovered and regenerated controlled substances, the implementation of which will contribute to reducing the consumption of ozone-depleting substances and fluorinated greenhouse gases.

The implementation of the order will ensure the establishment of a list of measures to reduce the consumption of controlled substances, which will contribute to reducing the consumption of controlled substances at the country level and fulfilling international obligations under the Montreal Protocol on Substances that Deplete the Ozone Layer, as well as implementing the requirements of the EU legislation in the field of regulating economic activities with ozone-depleting substances and fluorinated greenhouse gases.

On February 27, 2025, the President submitted for consideration by the Verkhovna Rada a draft law (reg. No. 0303 dated February 27, 2025) "On the ratification of the Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer", which was adopted at the twenty-eighth Meeting of the Parties to the Montreal Protocol on October 15, 2016 in Kigali, Rwanda (hereinafter referred to as the Kigali Amendment), on the gradual reduction of the consumption of hydrofluorocarbons (hereinafter referred to as HFCs) from high or very high global warming potential. HFCs are used mainly as refrigerants in air conditioners and refrigeration equipment.

According to Article IV, Part Two of the Kigali Amendment, Parties to the Montreal Protocol are prohibited from importing and/or exporting HFCs from/to any State that is not a Party to the Protocol as of 1 January 2033. And in accordance with Regulation (EU) 2024/573 of the European Parliament and of the Council, the EU is introducing a ban on such trade as of 1 January 2028.

The Kigali Amendment contains commitments to phase down HFCs consumption and sets out schedules for its Parties to do so. For countries not operating under Article 5 of the Montreal Protocol (including Ukraine), the Kigali Amendment provides for phased reductions in hydrofluorocarbons (HFCs) consumption, with a 10% reduction as the initial stage. There are 5 stages for reductions in such countries: (Stage 1 (2019 year) – 10%, Stage 2 (2024 year) – 40%, Stage 3 (2029 year) – 70%, Stage 4 (2034) – 80%, Stage 5 (2036) – 85%. Considering this schedule and the fact that ratification of Kigali amendments is expected in Ukraine in 2026 year, then the target for reducing the use of HFCs will be set at 40% immediately. For Ukraine, the baseline consumption level is calculated based on the average level of HFCs production/consumption in 2011, 2012 and 2013 plus 15% of the baseline level of HCFCs production/consumption. The Ukrainian side has already collected data for calculating the baseline, which will be transferred to the UNEP Ozone Layer Secretariat after ratification of the Kigali Amendment. The Secretariat will verify the data and determine the baseline for Ukraine. For the implementation of Ukraine's commitments to reduce HFCs, a strategy need to be approved and, accordingly, an action plan for its implementation. In addition, in the coming years, it is planned to implement the updated EU acquis on ozone-depleting substances and fluorinated GHGs into Ukrainian legislation and revise national standards.

GHG emissions reduction policies and measures in the transport sector

To stimulate the reduction of GHG emissions in the transport sector, a number of measures are envisaged to develop the use of renewable energy (PM_D_WEM_17), electrification (PM_D_WEM_21, PM_D_WEM_22), and the transition of municipal transport to low-carbon alternatives (PM_D_WEM_23).

GHG emissions reduction policies and measures in the agriculture and LULUCF

PM_D_WEM_04 Promoting the development of organic crop production

[21] https://mepr.gov.ua/informatsiya-pro-oprylyudnennya-proyektu-nakazu-ministerstva-zahystu-dovkillya-ta- pryrodnyh-resursiv-ukrayiny-pro-zatverdzhennya-pereliku-zahodiv-iz-skorochennya-spozhyvannya-kontrolovanyh- rechovyn

Goal: to stimulate an increase in the area under organic crop production (agricultural land area (thousand hectares); share of agricultural land under organic production in the total area of agricultural land, %)

Legal basis: Law of Ukraine "On the Basic Principles and Requirements for Organic Production, Circulation and Labeling of Organic Products" dated July 10, 2018 No. 2496-VIII, National Economic Strategy of Ukraine for the period until 2030, Strategy for the Development of Agriculture and Rural Areas in Ukraine for the Period Until 2030

Time frame: from 2018

Type policy/measure: Regulatory, Economic

Sector(s) affected: Agriculture

Responsible bodies/organizations: Ministry of Economy

Emission reduction type: CO_2 , N_2O

Description : In accordance with the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the Period Until 2030, approved by order of the Cabinet of Ministers of Ukraine from November 15, 2024 No. 1163-p, the development of organic agriculture is one of the priority areas of the medium-term "green transformation" of agriculture. Organic production can play an important role in adapting to climate change and mitigating its consequences (strategic goal 5 of the Strategy), as well as in preserving biodiversity.

One of the indicators of the implementation of the Strategy is the achievement of a share of agricultural land under organic farming production to 3% of the general area of agricultural land by 2030.

Before the full-scale Russian invasion, the organic production sector in Ukraine was actively growing: in 2017–2021, the area of organic land increased by 46% (from 289 to 422 thousand hectares), and the number of producers by 5% (from 504 to 528 operators). However, as a result of the Russian aggression, the organic production sector, like the entire agricultural sector, suffered significant losses, as part of the organic lands ended up in the combat zone or were on temporarily occupied territories. Thus, in 2022, compared to 2021, the area of organic land decreased by 37.5%, the number of operators by 12.5%, in particular, agricultural producers by 9%.

In recent years, Ukraine has been one of the largest exporters of organic products to the EU. In particular, in 2022 the EU imported 2.73 million tons of organic agricultural production, about 8% of which comes from Ukraine. Ukraine, as a candidate for EU membership, can strengthen the EU organic market and reduce its dependence on organic imports products from countries outside Europe.

The EU strategic documents set a target of achieving at least 25% of agricultural land under organic production. In addition, the strategic plans of the EU Member States within the framework of the new Common Agricultural Policy contain indicative indicators for the share of agricultural land planned to be converted to organic production by 2030. The implementation of these goals is planned, first of all, by providing financial support to farmers who are already implementing or planning to switch to organic farming methods. The transition of EU farmers to organic production is also stimulated through environmental programs and interventions aimed at the development of rural areas.

Ukrainian legislation in the field of organic production, circulation and labeling of organic products has been harmonized with Council Regulation (EC) No. 834/2007 and work is underway to further adapt it to the new Regulation (EU) No. 2018/848 of the European Parliament and of the Council of May 30, 2018 on organic production and labeling of organic products, which entered into force in January 2022. Thus, on June 18, 2025, the Verkhovna Rada adopted as a basis (with amendments to the provisions in accordance with Part 1 of Article 116) the draft Law (Reg. No. 13204-1 dated May 2, 2025), which is aimed at improving the legal regulation of organic production, circulation and labeling of organic products and ensures that the Law of Ukraine "On the Basic Principles and Requirements for Organic Production, Circulation and Labeling of Organic Products" is brought into line with the provisions of Regulation (EU) No. 2018/848 of the European Parliament and of the Council of May 30, 2018. The draft Law clarifies and expands the scope of application, strengthens control and introduces new requirements for certification and labeling of organic products.

In addition, the NES is expected to develop financial and advisory support programs. producers of organic products and attracting more producers to organic production by improving state regulation in this area. The mechanism of state support is determined by current legislation. Thus, Article 8 of the Law of Ukraine "On Basic Principles and Requirements for Organic Production, Circulation and

Labeling of Organic Products" provides for the provision of state support to producers of organic products within the framework nationwide programs at the expense of and within expenses by budget programs aimed at supporting the development of agricultural producers. Clause 9 of Article 172 of the Law of Ukraine "On State Support for Agriculture of Ukraine" dated June 24, 2004 No. 1877-IV defines the areas of state support for producers of organic products, namely:

- providing budget subsidies per unit of cultivated land and/or one head of cattle;
- reimbursement to 30% cost expenses on carrying out certifications organic production;
- reimbursement to 30% cost expenses on acquisition permitted for using plant protection products and fertilizers, seeds, planting material and feed.

The Resolution of the Cabinet of Ministers of Ukraine No. 77 of February 8, 2017 approved the Procedure for the Use of Funds Provided in the State Budget for Financial Support of Agricultural Producers (Official Gazette of Ukraine, 2017 p., No. 17, p. 489), according to paragraph 3 of which, one of the directions of budget funds is state support for producers of organic agricultural products. However, it is worth noting that state support was not provided for these purposes.

PM_D_WAM_05 Implementation of climate-smart agriculture

Goal: promoting climate change mitigation and adaptation through the development of climate-smart agriculture.

Legal basis: Order of the Cabinet of Ministers of Ukraine dated November 15, 2024 No. 1163-r "On approval of the Strategy for the development of agriculture and rural areas in Ukraine for the period until 2030 and approval of the operational plan of measures for its implementation in 2025-2027" (Official Gazette of Ukraine, 2024 p., No. 108, p. 6884), Order of the Cabinet of Ministers of Ukraine dated May 30, 2024 No. 483-r "On approval of the Strategy for the formation and implementation of state policy in the field of climate change for the period until 2035 and approval of the operational plan measures for its implementation in 2024-2026 years» (Government Courier, 2024 p. No. 114).

Time frame: 2024- 2030

Type policy/measure: Planning

Sector(s) affected: Agriculture, LULUCF

Responsible bodies/organizations: Ministry of Economy

Type of emission reduction: CO_2 , N_2O, CH_4

Description: Agriculture in Ukraine is one of the key sources of greenhouse gas emissions. gases associated with crop production activities (e.g., due to the use of fertilizers), livestock (e.g. emissions from enteric fermentation and manure management), intensive land use (loss of soil organic carbon due to intensive farming) or land use change (e.g. loss of soil organic carbon due to ploughing up pastures), as well as fuel and energy consumption by agricultural enterprises.

The National Economic Strategy for the period until 2030 provides for the approximation of national legislation, standards and practices to the European principles of sustainable agriculture policy and good agricultural practices, the gradual harmonization of state agricultural policy with the EU Green Deal (EU Green Deal) in rural economy (in accordance with the tasks within the framework of strategic objective 1 "Ensuring stimulating and advisory agricultural policy").

Climate aspects are taken into account in many EU strategic documents on the development of the agricultural sector and the preservation of soil quality, in particular, the Farm to Fork Strategy and the Soil Strategy for 2030. In addition, various policies and measures aim to reduce greenhouse gas emissions and increase carbon sequestration in agriculture in the EU, in particular the Effort Sharing Regulation, the EU Regulation on Land Use, Land Use Change and Forestry (LULUCF Regulation), as well as the instruments of the EU Common Agricultural Policy and other documents.

The strategic guideline for Ukraine in the field of agriculture on the way to joining the EU is the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the period up to 2030. One of the strategic goals is "Climate-oriented agriculture: climate change mitigation and adaptation" (Strategic Goal 5).

Climate change mitigation is achieved by reducing anthropogenic greenhouse gas emissions and increasing greenhouse gas removal by sinks. Climate technologies in the agricultural sector that have significant potential to reduce greenhouse gas emissions and increase carbon sequestration include

minimum tillage technologies, technologies for increasing fertilizer use efficiency, increasing carbon sequestration through the use of cover crops, and plants and organic fertilizers, compliance with optimal crop rotation, preservation of pastures and haymaking, as well as emission reduction technologies in livestock farming (use of feed additives and improvement of manure management systems).

Achievement of strategic goals possible from using tools, state support and other measures to support the recovery and sustainability of the agricultural sector, including taking into account the requirements for approximation of national legislation to the EU acquis.

The operational plan of measures for the implementation of this strategy provides for a number of steps aimed at forming a state policy for the development of agriculture, improving the organizational principles of providing support in the agricultural sector, and supporting climate-oriented agriculture, namely:

- measures to develop the state support system: improving the information and communication system "State Agrarian Register", making the necessary changes to the legislation to create the Paying Agency (within the framework of measures of Strategic Objective 1), improving the procedure and mechanisms for providing state support to farms and other agricultural producers, etc. (within the framework of measures of Strategic Goal 3);

- other measures to support the recovery and sustainability of the agricultural sector: improving mechanisms to support business entities within the framework of existing grant programs, conducting an information campaign on the unification of small agricultural producers into cooperatives and other associations, etc. (within the framework of measures of Strategic Goal 3);

- measures to improve the data collection system: introduction of a data collection system for the sustainable development of agricultural enterprises (FSDN) to improve the process of forecasting and assessing the impact of state policy on the development of agriculture (as part of the measures of Strategic Goal 1), creation and implementation of an automated information system for monitoring land and soil, etc. (as part of the measures of Strategic Goal 4);

- measures to support innovation and digitalization: creating an effective system for disseminating of agricultural knowledge and innovations, improving the provision of digital agricultural advisory services, developing a national strategy for the digitalization of agriculture (within the framework of measures under Strategic Goal 5);

- measures to promote climate change mitigation and adaptation: development of a national action plan for a circular bioeconomy adapted to the conditions of Ukrainian agriculture (within the framework of measures of Strategic Goal 5).

Creating an effective system of state support, improving data collection on soil conditions and the impact of agriculture on climate change, supporting innovation and digitalization will ensure support for the use of climate technologies to reduce greenhouse gas emissions and increase carbon sequestration in the agricultural sector.

Additional measures to contribute to climate change mitigation may be developed at later stages of implementation. Strategies, and the measures envisaged adaptation to the consequences of climate change (in particular, development of a draft order of the Cabinet of Ministers of Ukraine on approval of the plan of measures to adapt agriculture to climate change) will have additional benefits for reducing greenhouse gas emissions.

The National Economic Strategy of Ukraine for the period up to 2030 also provides for increasing the level of technological sophistication of the agricultural sector and monitoring the quality of land resources. The objectives of the National Economic Strategy, in particular, include conducting systematic monitoring of soil fertility indicators and their quality, creating development programs and attracting companies to open research centers, as well as developing a program and tools for introducing technologies into the agro-industrial sector with the help of state support with an emphasis on domestic producers. The development of information and electronic communication technologies makes it possible for their effective using in crop production with the purpose multilateral of monitoring of agricultural lands and effective planning and implementation of field crop cultivation technologies. Increasing the efficiency of resource use, including through differentiated fertilizer application technologies, will reduce greenhouse gas emissions.

The Strategy for the Formation and Implementation of State Policy in the Field of Climate Change for the Period Until 2035 (Government Courier, 2024 p. No. 114) determines that one of the indicators

of strategic goal 2 (Mitigation of climate change and ensuring a socially just and economically efficient transition to low-carbon development of the state) is to increase the area of agricultural land with carbon farming. In addition, in accordance with the operational plan of measures for the implementation of the Strategy for the Formation and Implementation of State Policy in the Field of Climate Change for the Period Until 2035 in 2024-2026, in 2025, assessment of risks and vulnerability of agriculture to climate change, and on In 2026, it is planned to develop and submit to the Cabinet of Ministers of Ukraine proposals for a program document on the adaptation of agriculture to climate change.

Climate-smart agriculture technologies will contribute to reducing greenhouse gas emissions in the Agriculture category and reducing emissions or increasing removals in the Land Use, Land Use Change and Forestry category (emissions associated with the loss of soil organic carbon in the Cropland and Pasture subcategories).

PM_D_WAM_06 Improvement of manure management systems and biogas production

Goal: establishing conditions for sustainable development of the livestock industry and reducing the impact of livestock on the environment and climate

Legal basis: Resolution of the Cabinet of Ministers of Ukraine dated January 21, 2026 No. 72 “On approval of the State Targeted Economic Program for the Development of Livestock Breeding for the Period until 2033” (Official Gazette of Ukraine, 2026 p., No. 13, p. 949)

Time frame: 2025-2033

Type policy/measure: Planning

Sector(s) affected: Agriculture, Energy - supply, Waste

Responsible bodies/organizations: Ministry of Economy, Ministry of Energy, State Agency for Energy Efficiency

Emission reduction type: CO_2 , N_2O, CH_4

Description: Manure management is a significant source of GHG emissions, in particular methane, in Ukraine. In accordance with the provisions of the Law of Ukraine "On Animal By-Products Not Intended for Human Consumption" dated April 7, 2015 No. 287-VIII, manure (any excrement and/or urine of farm animals with or without bedding) is classified as animal by-products of category II.

By the Resolution of the Cabinet of Ministers of Ukraine dated January 31, 2025 No. 76-r, the Concept of the State Targeted Economic Program for the Development of Livestock Breeding for the Period Until 2033 was approved (Official Gazette of Ukraine, 2025 p., No. 18, p. 1246), and on January 21, 2026 by the Resolution No. 72 the Cabinet of Ministers of Ukraine approved the State target economic program on the development of livestock farming for the period until 2033 (Official Gazette of Ukraine, 2025 p., No. 18, p. 1246), the purpose of which is to create conditions for the sustainable development of the livestock industry by stimulating the achievement of competitive production of animal products to adequately meet the needs of the domestic market and increasing export potential.

Expected results of the programme implementation include in particular:

- reducing the impact of livestock farming on the environment and climate change, in particular by increasing the efficiency of manure management and other animal by-products not intended for human consumption, according to the principles of a circular economy, preserving pastures and hayfields, and development and implementation of climate change adaptation measures;
- reducing pollution levels and preventing environmental pollution at all stages of livestock production;
- reduction in the consumption of traditional energy resources in the industry (increase in the number of enterprises that have switched from traditional to alternative and energy-saving technologies, up to 30%);
- improving the system of state support for livestock farming and ensuring its transparency.

In addition, the order of the Cabinet of Ministers of Ukraine dated July 7, 2023 No. 607-p “On approval of the action plan for the implementation of Ukraine's climate policy within the framework of participation in the global initiative to reduce methane emissions “Global Methane Pledge” provides for a list of tasks, which includes the development of the potential for biomethane production

from agricultural waste. In particular, the measures include partial reimbursement of the cost of facilities (up to 50% of the cost, and agricultural cooperatives up to 70% of the cost) for the processing of animal by-products belonging to categories II and III.

In accordance with the Order of the Ministry of Agrarian Policy dated 11/24/2021 No. 382 “On Approval of the Rules for Ensuring Soil Fertility and the Use of Certain Agrochemicals” (Official Gazette of Ukraine, 2022 p., No. 8, p. 453) in section No. 5 describes the rules for storing manure, which corresponds to VNTP-APK-09.06 Systems removal, processing, preparation and use manure. In 2025, in cooperation with the Ministry of Agrarian Policy and the Ministry of Environment, with the expert and methodological support of the State Institution "Institute of Soil Protection of Ukraine" ("State Soil Protection"), the Rules of Good Agricultural Practice for Farmers, Producers were adopted and land users in Ukraine, which describes manure management plans (section 3.2.), collection, storage and treatment of farm animal manure and wastewater (section 4.3.).

In accordance with the Procedure for the Use of Funds Provided in the State Budget for State Support for the Development of Animal Husbandry and Processing of Agricultural Products, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 950 of August 6, 2025 (Official Gazette of Ukraine, 2025 p., No. 71, p. 4866), state support is provided in the form of partial compensation of the cost of construction and/or reconstruction of livestock farms and complexes for keeping cattle, milking parlors and/or facilities (objects) for processing animal by-products in the livestock sector, belonging to categories II and III.

Livestock is one of the sectors where it is difficult to achieve significant emission reductions, however, biogas production from livestock waste and other measures to improve waste management systems (e.g., the abandonment of uncovered lagoons for waste storage and the use of covered lagoons, the use of additives to inhibit methanogenesis or improve aeration, etc.) allow for reductions in methane and nitrous oxide emissions (N_2O). By replacing fossil fuels, the produced biogas or biomethane also provides a reduction in greenhouse gas emissions in the category “Fuel combustion activities”.

PM_D_WEM_05 Increasing the forest cover in Ukraine

Goal: increase in GHG emission absorption (in million tons of $CO_{2\text{-eq.}}$) by increasing forest area.

Legal basis: Order of the Cabinet Ministers of Ukraine from 29 December 2021 No. 1777-r “On approval of the State Strategy for Forest Management of Ukraine until 2035” (Official Gazette of Ukraine, 2022, No. 4, p. 265)

Time frame: from 2021

Type of policy / measure: Planning, Regulatory, Economic

Sector(s) affected: LULUCF

Responsible bodies/organizations: Ministry of Economy, State Forestry Agency

Emission reduction type: CO_2

Description: According to the State Forest Management Strategy of Ukraine until 2035 (hereinafter referred to as the Strategy), the total area of forest fund of Ukraine is 10.4 million hectares, including 9.6 million hectares covered with forest vegetation. The forest cover of Ukraine is 15.9%, with an optimal indicator of 20%[22]. The strategy envisages increasing the forest cover of the country's territory to at least 18%, which should be achieved by:

- legislative regulation of the issue of establishing restrictions on changing the intended purpose (use) of land plots covered with forest vegetation owned by citizens and legal entities, except in cases of their withdrawal (repurchase) for public needs;
- development of programs to increase forest cover, which will provide methods, ways and incentives for creating new plantations at the expense of state and local budgets;
- identification and conservation of self-seeding forests on lands whose categories are different from forestry lands;
- afforestation on degraded and low-productive lands of all forms of ownership with mandatory consideration of the natural conditions of the area and refusal to afforest unique steppe areas;
- introduction of mechanisms to stimulate afforestation by private owners;
- refusal to transfer forested lands to other forms of land use, except in cases where such transfer is carried out in the event of a public need in the absence of other alternatives.

As of the beginning of 2025, since the approval of the Operational Plan for the Implementation of the Strategy in 2022-2024, enterprises under the management of the State Forestry Agency have created new forests (through afforestation) on an area of 13.8 thousand hectares, including 1.8 thousand hectares in 2022, 5.9 thousand hectares in 2023 and in 2024 – 6.1 thousand hectares.

By Decree of the President of Ukraine dated 07.06.2021 No. 228/2021 "On Some Measures to Preservation and Restoration of Forests" (Official Gazette of Ukraine, 2021 p., No. 46, p. 2843) launched the environmental initiative "Large-scale Afforestation of Ukraine", which aims to plant 1 billion trees in 3 years and increase the area of forests by 1 million hectares in 10 years. As of November 2025, about 95.86 thousand hectares of forests have already been planted[23] , although in most cases this is reforestation, not afforestation. In particular, in 2021, 59.7 million trees were planted, in 2022 – 184.6 million trees, in 2023 – 220.7 million trees, and in 2024 – 238.3 million trees.

The increase in forest cover directly depends on the volume of afforestation - the creation of forests on lands suitable for forest creation that are not covered by forest vegetation. That is, to achieve the planned forest cover indicators, it is necessary to have land available for afforestation. For example, these can be degraded and low-productive lands, that do not have steppe, meadow, or forest vegetation cover, whose economic use there are environmentally dangerous and economically ineffective, man-made contaminated land areas, where it is impossible to grow environmentally clean products, and also land plots, contaminated with chemical substances as a result of armed aggression and hostilities during martial law. According to Article 51 of the Law of Ukraine "On Land Protection", such lands are subject to conservation, which, in particular, can be carried out through their afforestation.

One way to increase forest cover is to preserve self-seeding forests that have grown over the past few decades on lands of other categories. Preserving self-seeding forests by granting them appropriate status will allow Ukraine not only to make its contribution to the global fight against climate change, but will also preserve recreational areas for territorial communities, picking mushrooms and berries.

With the help of data of "Geoinformation" system of forest resources Ukraine» and based of data in "Ukrderzhlisproekt", 241,687 land plots were identified on the territory of Ukraine, that are probably covered with forest vegetation, on an area of 1,907,970 hectares.

The territorial bodies of the State Forestry Agency, in accordance with Article 57-1 of the Land Code of Ukraine, sent to executive authorities and local self-government bodies 2391 applications for 237866 land plots, probably covered with forest vegetation, with an area of 1897554.6 hectares, to be classified as self-forested. Executive authorities and local self-government bodies approved applications for classifying 3268 land plots with a total area of 54344 hectares as self-forested.

In addition to the territorial bodies of the State Forestry Agency, 6,699 applications were submitted

[22] https://forest.gov.ua/news/zelena-krayina-yak-zminitsya-ploshcha-lisiv-v-ramkah-realizaciyi-programi-prezidenta
[23] https://zelenakraina.gov.ua/

to executive authorities and local self-government bodies regarding the transfer of self-forested areas of state and municipal property to permanent use was directed by the state specialized economic enterprise "Forests of Ukraine" for a total area of 192,252 hectares, of which local governments agreed to transfer for permanent use self-forested land plots for a total area of 38,244 hectares, from which extracts from the State Register of Real Property Rights for a total area of 10,837 hectares were obtained.

In addition, at the initiative of the Ministry of Economy, the IPRSA expert group, with the support of the European Union, is currently developing a draft law "On attracting investments and economic stimulation of the implementation of afforestation measures and forest management."

PM_D_WEM_06 Development of horticulture

Goal: increasing GHG emission absorption (in million tons of $CO_{2\text{-eq.}}$) and adaptation to climate change by increasing the area of tree plantations on agricultural lands

Legal basis: Order of the Cabinet of Ministers of Ukraine dated November 15, 2024 No. 1163-r "On approval of the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the period until 2030 and approval of the operational plan of measures for its implementation in 2025-2027 years" (Official Gazette of Ukraine, 2024 p., No. 108, Art. 6884), Order of the Cabinet of Ministers of Ukraine dated March 3, 2021 No. 179 "On approval of the National Economic Strategy for period until 2030" (Official Gazette of Ukraine, 2021 p., No. 22, p. 1015), Resolution of the Cabinet of Ministers of Ukraine dated June 21, 2022 No. 738 "Some issues of providing grants to business" (Official Gazette of Ukraine, 2022 p., No. 54, p. 3159)

Time frame: from 2022

Type of policy / measure: Economic, Regulatory

Sector(s) affected: LULUCF, Agriculture

Responsible bodies/organizations: Ministry of Economy

Type of emission reduction: CO_2

Description: State support horticulture and viticulture is envisioned by the National economic strategy on period to 2030 year. Besides that, operational plan of measures for 2025-2027 of the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the period until 2030 provides for development of grant programs aimed at supporting the horticulture, berry growing and viticulture industries.

The government grant program "eWork" has been operating since July 1, 2022, the main goal of which is to support small and medium-sized businesses and create new jobs. The program has several areas, including support for horticulture, berry growing, and viticulture. The program is regulated by the Resolution of the Cabinet of Ministers of Ukraine dated June 21, 2022 No. 738 "Some Issues of Providing Grants to Business", which approved, in particular, the Procedure for Providing Grants for creation or development of horticulture, berry growing and viticulture (hereinafter referred to as the Procedure). According to the Procedure, grants for the development of horticulture, berry growing and viticulture are provided in the amount of up to 50% of the cost of the planting project, but do not exceed 10,000,000 hryvnias and amount to no more than 400,000 hryvnias per 1 hectare, and subject to financing by the recipient's own funds (own and/or credit) the difference between the cost of the planting project specified in the application and the amount of the grant. The main condition for providing grant support is the creation of new permanent and seasonal jobs by the grant recipient.

The State Budget of Ukraine for 2025 provides UAH 1.370 billion under the program "Provision of grants for the creation or development of a business". The volume of expenditures for 2025 under the budget program KPKVK 1201350 "Provision of grants for the creation or development of a business" for 2025 in the direction of "Provision of non-refundable state aid in the form of grants for the creation or development of horticulture, berry growing and viticulture" is UAH 293.1 million.

From the beginning of the program until August 2025, 297 orders were adopted to provide grants for the creation or development of horticulture, berry growing and viticulture in the amount of UAH 1,151.7 million, which should ensure the creation of 1,168 permanent and 36,676 seasonal jobs, and the area of plantations will be 3,789.12 hectares. As of August 2025, grant funds were paid to 196 business entities in the amount of UAH 1,020.8 million. In accordance with the Strategy for Low-

Carbon Development of Ukraine until 2050, thanks to grants provided under the "eWork" program, about 900 hectares of fruit and berry orchards, as well as vineyards, were created annually.

PM_D_WAM_07 Development of agroforestry

Goal: increase of GHG emission absorption (in million tons of $CO_{2\text{-eq.}}$) and adaptation to climate change by increasing the area of tree plantations on agricultural lands

Legal basis: Order of the Cabinet Ministers of Ukraine from 29 December 2021 No. 1777-r "On approval of the State Strategy for Forest Management of Ukraine until 2035" (Official Gazette of Ukraine, 2022, No. 4, p. 265), Resolution of the Cabinet of Ministers of Ukraine dated July 22, 2020 No. 650 "On approval of the Rules for the maintenance and preservation of field shelterbelts located on agricultural lands" (Official Gazette of Ukraine, 2020, No. 62, p. 2007)

Time frame: from 2020

Type of policy / measure: Regulatory

Sector(s) affected: LULUCF, Agriculture

Responsible bodies/organizations: Ministry of Economy, State Forestry Agency

Emission reduction type: CO_2

Description: Agroforestry (agroforestry) is a farming system that involves combining woody vegetation (trees, bushes), agricultural crops, and cultures and/or cattle[24]. Agroforestry has a number of environmental, economic and social benefits. Among the environmental ones, in particular, soil protection from erosion and restoration of soil fertility, biodiversity conservation, absorption of GHG emissions and adaptation to climate change (contributes to improving the microclimate of fields). In Ukraine, the most widespread form of agroforestry is field shelterbelts, which provide increasing crop yields, protecting crops from dry winds, improving soil condition and preventing soil erosion.

Field protection forest strips are part of the forest fund of Ukraine and are under state protection. However, they are usually located on agricultural lands, which in turn are provided for use by agricultural producers with different forms of ownership.

Basic requirements for the maintenance and preservation of field protection forest strips, located on agricultural lands, carrying out a set of measures to ensure the performance of functions of agroforestry reclamation determined by the Rules for the maintenance and preservation of forest shelterbelts located on agricultural lands, approved by the resolution of the Cabinet of Ministers of Ukraine from July 22 2020 No. 650 (Official Gazette of Ukraine, 2020, No. 62, p. 2007). These Rules are mandatory for all owners, tenants and users of land plots on which forest shelterbelts are located. Maintenance and preservation of forest shelterbelts is carried out at the expense of the owners, tenants and users of land plots on which forest shelterbelts are located, as well as other sources not prohibited by the law.

According to the Strategy for Low-Carbon Development of Ukraine until 2050, it is necessary to create about 120-150 thousand hectares of forest belts that can ensure the annual absorption of greenhouse gases at the level of 0.5 million tons of $CO_{2\text{-eq.}}$

In addition, it is important to provide measures to restore and, if possible, increase the area of green spaces in the right-of-way of highways and railways, damaged by the Russian Federation's attacks on this infrastructure and destroyed for use by households as firewood for heating .

PM_D_WEM_07 Demining and restoration forests after combat actions

Goal: establishing effective forest management in territories that have been negatively affected by the armed aggression of the Russian Federation against Ukraine for their demining and restoration (thousands of hectares of demined forests; thousands of hectares of restored forests)

Legal basis: Forest Code of Ukraine, Resolution of the Cabinet of Ministers of Ukraine dated December 29, 2021 No. 1777-r "On Approval of the State Forest Management Strategy of Ukraine until 2035" (Official Gazette of Ukraine, 2022, No. 4, p. 265)

[24] https://wwf.ua/?17338441/farmforce-wwf-ukraine

Time frame: from 2024

Type of policy / measure: Planning, Economic

Sector(s) affected: LULUCF

Responsible authorities/organizations: Ministry of Economy, State Forestry Agency, State Forest Service, State Emergency Service, Ministry of Defense, Regional State Administration

Emission reduction type: CO_2

Description: According to the Forest Management Strategy of Ukraine until 2035, approved by the Order of the Cabinet of Ministers of Ukraine dated December 29, 2021 No. 1777-r (Official Gazette of Ukraine, 2022, No. 4, p. 265), as a result of the armed aggression of the Russian Federation against Ukraine since February 20, 2014, hostilities continue on an area of about 2,731 thousand hectares of forests (as of September 2023). Heavy military equipment is being moved in the forests, hostilities were or are being conducted, which may lead to contamination with explosive objects, as well as to the disruption of terrestrial ecosystems, soils, water bodies and water management systems.

According to the Ministry of Economy[25], it is necessary to demine at least half a million hectares of forests in territories under the control of Ukraine and another 0.8 million hectares in temporarily occupied territory.

The Forest Management Strategy of Ukraine until 2035 provides for the establishment of effective forest management in the exclusion zone and in territories that have been negatively affected by the armed aggression of the Russian Federation against Ukraine.

The operational plan for the implementation of the Strategy provides for the approval of action plans (projects) aimed at the rehabilitation of forests and the restoration of forest natural complexes damaged as a result of hostilities, as well as the inspection of forests contaminated with explosive objects in the deoccupied territories. And after the end of hostilities, it is planned to carry out work on the detection, removal and neutralization of explosive objects (demining, in particular humanitarian) in forest areas in the deoccupied territories.

At the end of December 2024, the State Forestry Agency developed an Action plan on the rehabilitation of forests and the restoration of forest natural complexes damaged as a result of hostilities (approved by Order of the State Forestry Agency dated December 31, 2024 No. 403). The action plan primarily provides for an analysis of negative impacts (in particular, hostilities, terrorist acts, sabotage, emergencies) and an assessment of their consequences (damage) on the forest.

According to the Ministry of Economy, 75.3 thousand ha were already examined. In 2024, 2 thousand hectares of forests were demined and about 7.5 thousand hectares of forests were identified that have the greatest economic, social and ecological importance and should be demined first.

In April 2025, the Government allowed[26] to use 1.5 million USD from international donors (collected within the United24 fundraising platform) for demining, and part of these funds will be directed to demining 103 hectares of forestry territories of the State Enterprise "Forests of Ukraine" in the Kyiv and Chernihiv regions.

In addition, a commercial demining mechanism has been launched since 2023. Thus, in 2023, with the support of the Ministry of Economy, a pilot project for the procurement of demining services through open tenders was launched. Over 30 hectares of forest were demined commercially.

PM_D_WAM_08 Implementation of climate-smart forestry

Goal: contributing to climate change mitigation and adaptation through the development of climate-smart forestry.

Legal basis: Order of the Cabinet of Ministers of Ukraine dated December 29, 2021. No. 1777-r “On approval of the State Strategy for Forest Management of Ukraine until 2035” (Official Gazette of Ukraine, 2022, No. 4, p. 265), Order of the Cabinet of Ministers of Ukraine dated October 20, 2021 No. 1363 “On approval of the Strategy for Environmental Security and Adaptation to Climate Change for the period until 2030” (Official Gazette of Ukraine, 2021 p., No. 87, p. 5584), Order of the Cabinet

[25] https://mepr.gov.ua/lisy-na-liniyi-frontu-ukrayinsko-nimetska-spivpratsya-zarady-poryatunku-pryrody/

[26] https://forest.gov.ua/news/103-ha-lisiv-na-kyivshchyni-ta-chernihivshchyni-rozminuiut-zavdiaky-mizhnarodnii- dopomozi

of Ministers of Ukraine dated February 7, 2025 No. 96-r “On approval of the operational plan of measures in 2025-2027 for the implementation of the Strategy for Environmental Safety and Adaptation to Climate Change by 2030» (Official Gazette of Ukraine, 2025 p., No. 20, p. 1341), Order of the Cabinet Ministers of Ukraine from 15 November 2024 No. 1163-r "On the approval of the Strategy for the Development of Agriculture and Rural Areas in Ukraine until 2030 and approval of the operational plan of measures for its implementation in 2025-2027" (Official Gazette of Ukraine, 2024 p., No. 108, p. 6884)

Time frame: 2025-2030

Type of policy / measure: Planning, Regulatory

Sector(s) affected: LULUCF

Responsible bodies/organizations: Ministry of Economy

Emission reduction type: CO_2

Description: According to the Strategy for Environmental Security and Adaptation to Climate Change for the period until 2030, in Ukraine, as in many other countries of the world, mass drying of coniferous forests associated with climate change is rapidly spreading, and resistance to mass infestation by harmful insects, in particular bark beetles, decreases. In general, the expected impacts of climate change on the forests of Ukraine are multidirectional, depend on the climatic zone, habitat and type of forest and include: changes in the hydrological regime and shifts in the boundaries of climatic zones, which affects the range of forest-forming species; a decrease in the stability and viability of forest ecosystems; an increase in the frequency and intensification of negative natural phenomena (mass outbreaks of diseases and pest reproduction, forest fires, etc.); deterioration in the quality of ecosystem services; changes in the productivity of forest stands and non-timber forest products.

In response to the challenges of climate change, the practice of climate-friendly orientated forestry, which combines approaches to increasing the carbon capacity of forests, adapting forest ecosystems to climate change and strengthening their resilience[27]. It should be noted that climate-oriented forestry management should ensure the conservation of all primary and old-growth forests that hold significant amounts of carbon, which is in line with the objectives of the EU Biodiversity Strategy to 2030, as well as Regulation (EU) 2022/869 on nature restoration.

In Ukrainian legislation, the term climate-smart forestry is mentioned only in the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the Period up to 2030 and the Strategy for Low-Carbon Development of Ukraine up to 2050. However, key strategic documents mention tasks and measures that will contribute to the gradual implementation of climate-oriented forestry practices.

Thus, among the main tasks of the Strategy for Environmental Safety and Adaptation to Climate Change for the period until 2030 are: strengthening the resilience of forest ecosystems to pests and new climatic conditions, implementing measures to prevent and respond quickly to fires, conducting a national forest inventory, and reducing the total logging systems in the Carpathian region. The operational plan of measures for the implementation of the Strategy in 2025-2027 provides for the formation of an action plan for adaptation to climate change, in particular in the field of forest resources.

The State Forest Management Strategy of Ukraine until 2035 provides for the development of measures to adapt forests to climate change and increase the resilience of forests to climate change by:

- improvement of the regulatory framework for felling, formation and rehabilitation of forests and rules for main use felling in the forests of Ukraine, taking into account the need to adapt forests to climate change;
- transition to growing and formation forests, close to natural, of different species and ages, using local tree species that are resistant to climate change in favorable soil and climatic conditions;
- using natural regeneration to restore forests;
- carrying out measures to preserve and reproduce the genetic diversity of forests ;

[27] https://www.fao.org/climate-smart-agriculture-sourcebook/production-resources/module-b3-forestry/chapter-b3-3/es/?utm_source

- taking measures to prevent the spread of invasive species of trees and plants and to combat them;
- carrying out measures aimed at preventing erosion in forest clearings, especially in the mountains;
- use of environmentally friendly logging technologies, especially in mountainous areas;
- introduction of modern (innovative) technologies in afforestation, forest care, forest protection and conservation.

To introduce climate-oriented forestry approaches in Ukraine, the State Forestry Agency is conducting scientific research and adapting the regulatory framework. In particular, the State Forestry Agency has made a number of amendments to the regulatory acts regarding the conduct of transformation fellings, as a result of which even-aged, single-story forest is transformed into a forest similar to natural. That is, the gradual transformation of stands that do not meet the target composition for a certain type of forest is carried out into mixed-age, multi-story stands by selectively removing part of the wood. These fellings are used to improve the structure and stability of the forest, bringing it closer to natural types, and also creating conditions for natural regeneration. When carrying out such fellings, not all the wood is removed, but only part of it (for example, 20-33% of the stock), which allows preserving the forest structure and continuous forest cover.

By the Resolution of the Cabinet of Ministers of Ukraine dated 04/23/2024 No. 454 "Some Issues of Forest Management during the Period of the Legal Regime of Martial Law and Amendments to the Resolution of the Cabinet of Ministers of Ukraine dated May 12, 2007 No. 724" (Official Gazette of Ukraine, 2024 p., No. 41, p. 2501), continuous main use felling will be prohibited in the mountain forests of the Carpathians from the spring of 2027. Selective and gradual felling systems close to nature will be introduced.

The State Forestry Agency is also preparing amendments to documents in the field of forest management, in particular, on the definition of target stands for each type of forest. The final stage will be the update of forest management materials, which will allow for the official transition to ecological, selective forest management.

In addition, according to a specially developed curriculum from the National Forestry University of Ukraine, employees of forestry enterprises are trained in the correct selection of trees for felling, the transformation of even-aged stands into mixed-age stands, and the appointment of transformation fellings taking into account natural processes.

PM_D_WAM_09 Nationwide targeted programme on the use and protection of land

Goal: implementation of the state policy of Ukraine to ensure sustainable development of land use, create environmentally safe living conditions for the population and conduct economic activities, protect land from depletion, degradation and pollution, restore and increase soil fertility, preserve soil cover functions, preserve landscape and biological diversity in a market environment and taking into account global climate change.

Legal basis: Law of Ukraine "On Land Protection" No. 962-IV of June 19, 2003, Order of the Cabinet of Ministers of Ukraine of January 19, 2022 No. 70-r "On Approval of the Concept of the National Target Program for Land Use and Protection" (Official Gazette of Ukraine, 2022, No. 11, p. 588)

Time frame: from 2027 (approximately six months after the end of martial law)

Type of policy / measure: Regulatory, Planning, Informing

Sector(s) affected: LULUCF

Responsible bodies/organizations: Ministry of Economy

Emission reduction type: CO_2, N_2O

Description: Concept of the Nationwide targeted programme on the use and protection of land (hereinafter - Program) approved by Order of the Cabinet Ministers ofUkraine from 19 January 2022 No. 70-r (Official Gazette of Ukraine, 2022, No. 11, p. 588), it is determined that the main result of the implementation of the Program is the preservation and reproduction of the productive potential of land as the main means of production in agriculture and forestry in the context of global climate change, the land market, and decentralization of power.

The first stage of the Program implementation involves improving the legislative, scientific, informational, and organizational support for the rational use of land resources and their protection at the national level, creating a regulatory, legal, and technical framework, including norms and rules in the field of land management, for the implementation of the Program as a whole, as well as the development of land management schemes and feasibility studies for the use and protection of lands of administrative-territorial units, territories of territorial communities; comprehensive plans for the spatial development of the territory of territorial communities; development of criteria for monitoring; principles of monitoring based on automated information and analytical systems and remote sensing of the Earth. It is also planned to implement urgent and effective measures for the use and protection of lands, which will ensure the achievement of a positive economic, social and environmental effect, and stopping of soil degradation.

At the second stage, it is planned to implement measures provided for by land management schemes and feasibility studies for the use and protection of lands of administrative-territorial units and territories of territorial communities; comprehensive plans for the spatial development of the territory of territorial communities; development and implementation of algorithms and technologies for automated collection, processing, supply and publication of land and spatial information within the framework of a national-level geoinformation automated platform.

It is expected that the implementation of the measures defined by the Program will ensure the achievement of the following results:

- reduction in agricultural development (by 5%) and plowing of the territory (by 10%);
- optimization of the agricultural landscape and land structure;
- increasing the productivity of agricultural lands (by 40-50%) through the rational use of organic, organo-mineral and mineral fertilizers and chemical ameliorants on acidic and saline soils;
- increasing the area of land with natural landscapes to a level sufficient to preserve landscape and biological diversity (up to 10.5% of the total area of the country);
- establishment of a unified and complete system of forest reclamation measures, preservation of protective forest plantations, taking measures for their restoration;
- conservation of degraded, low-productive and technogenically polluted lands;
- preservation of natural wetlands lands;
- implementation of environmental and socio-economic rehabilitation of soil polluted with radionuclides ;
- reducing the threat to land resources from degradation processes and contributing to achieving a neutral level of land degradation;
- establishment and arrangement of water protection zones and coastal protection strips of water bodies, introduction of a special regime for land use in river headwaters;
- preservation of natural landscapes on industrial, transport, communications, defense, etc. lands;
- development of environmental and economic, soil and erosional and other types of zoning of Ukrainian lands, which generalize the idea of the country's land fund and are the basis of the information base and justification of the system of environmental protection measures;
- improvement of natural and agricultural zoning of Ukrainian lands taking into account global climate change;
- introduction of a holistic system of regulatory legal acts and regulatory and technical documents in the field of land use, accounting and protection;
- substantiation of directions of fundamental and applied scientific research in the field of land use and protection;

- introduction of land use regime in protective and conservation zones ;
- introduction of periodic soil surveys; improvement of monitoring soils on lands of all categories and forms of ownership;
- improving public administration in the field of land use and protection;
- developing a model of sustainable land use for natural and agricultural regions of Ukraine and ensuring sustainable development of land use in general;
- development of scientific and methodological principles for land monitoring based on remote sensing of the Earth and geoinformation technologies;
- ensuring information exchange using unique identifiers of information system objects.

The development and submission for consideration by the Verkhovna Rada of Ukraine of the draft Law of Ukraine on Approval of the National Target Program for Land Use and Protection is provided for by the Resolution of the Cabinet of Ministers of Ukraine dated January 19, 2022 No. 70-r "On Approval of the Concept of the National Target Program for Land Use and Protection" and was planned for 2022. However, due to the full-scale invasion of the Russian Federation, the development of the program was postponed due to the impossibility of assessing the condition of the lands in the temporarily occupied territories.

PM_D_WAM_10 Establishing a peatland management system

Goal: establishing conditions for effective peatland management, inventorying and management regimes to prevent greenhouse gas emissions

Legal basis: Land Code of Ukraine, Law of Ukraine "On Amendments to Certain Legislative Acts acts of Ukraine regarding planning and using lands» dated 17.06.2020 No. 711–IX (Official Gazette of Ukraine, 2020, No. 60, p. 1897)

Time frame: 2025-2030

Type of policy / measure: Regulatory

Sector(s) affected: LULUCF, Agriculture

Responsible bodies/organizations: Ministry of Economy, State Geocadastre

Emission reduction type: CO_2

Description: In Ukraine, in 1959, the area of natural peat bogs was 1,146 thousand ha of which by 2005, according to official data, 800 thousand hectares had been drained. The rest of the peatlands lost water and dried up due to climate change. In 1991, the area occupied by natural peat bogs was estimated at 693,700 hectares. Today, this figure has decreased due to droughts, mining, burning of peatlands, the use of hydrotechnical land reclamation, etc.[28] According to the State Service for Geodesy, Cartography and Cadastre, as of January 1, 2020, there were 973,800 hectares of open wetlands in Ukraine[29], but some peat bogs may also be included in other categories of land.

Peatlands with a peat depth of more than one meter and drained peatlands are defined by Article 150 of the Land Code of Ukraine as especially valuable. Peatlands as part of wetlands of international importance are also especially valuable. The above-mentioned article stipulates that "the features of the legal regime for the use of lands under peatlands and possible types of their intended purpose shall be determined by the Cabinet of Ministers of Ukraine" (clause 3 of Article 150 of the Land Code of Ukraine).

In 2021, the Ministry of Economy developed and published a draft resolution of the Cabinet of Ministers of Ukraine "On the peculiarities of the legal regime for the use of lands under peatlands and possible types of their intended purpose"[30]. This draft resolution was never adopted, but in 2025 the Ministry of Environment initiated the development of a new draft of the relevant resolution. After the reorganization of ministries, work on the draft resolution was continued at the Ministry of Economy.

[28] https://www.undp.org/uk/ukraine/publications/palyudykultura-dosvid-yes-ta-perspektyvy-vprovadzhennya-v-ukrayini
[29] https://stat.gov.ua/uk/publications/statystychnyy-shchorichnyk-ukrayiny-2023
[30] https://me.gov.ua/Documents/Detail/9313e4cf-63f0-423a-bfe4-28fcd2e57c45?id=e2438229-ebef-4296-9ce5-f5ea2e68a59f&lang=uk-UA&title=PropozitsiiZaiavnikivKomisiiaZPitanViznachenniaObsiaguKoshtivDliaZadovolenniaPotrebIzZdiisnenniaZakhodivGumanitar#goRozminuvannia&showMenuTree=true

In January 2026, the draft resolution, finalized by the Ministry of Economy, was submitted for public discussion and on 6 May 2026 the Cabinet of Ministers of Ukraine approved resolution No. 579 "On the peculiarities of the legal regime for the use of lands under peat bogs and possible types of their intended purpose" (Government Courier, 2026, No. 99). The resolution establishes a special legal regime for lands where there are peatlands; limits the possible types of intended purpose of such lands; determines which agricultural soil groups are considered peatlands and provides for the establishment of a separate information layer in the State Land Cadastre regarding peatlands.

In addition, natural peatlands are one of the most effective natural reservoirs of greenhouse gases. According to the Law of Ukraine “On Approval of the National Program for the Development of the Mineral and Raw Materials Base of Ukraine for the Period Until 2030”, it is determined that “...the negative consequences of peat extraction require coordination of further exploration and development of new peat deposits with state climate policy and state environmental protection policy.”

In accordance with the Strategy for the Formation and Implementation of State Policy in the Field of Climate Change for the period until 2035, to achieve Strategic Goal 2 "Mitigation of climate change and ensuring a socially just and economically efficient transition to low-carbon development of the state", it is necessary, in particular, to ensure the preservation and further sustainable use of peatland resources, increase absorption in the land use and forestry sectors. The operational plan of measures for the implementation of the Strategy in 2024-2026 provides for the development of a methodology for measurement, verification and reporting to assess greenhouse gas flows in peatlands by 2025.

PM_D_WAM_11 Simplification of land conservation procedures

Goal: establishing conditions for effective land conservation, ensuring the transition of land from a source of greenhouse gas emissions to a sink.

Legal basis: Land Code of Ukraine, Law of Ukraine "On Land Protection", Order of the Cabinet of Ministers of Ukraine dated November 15, 2024 No. 1163-r "On approval of the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the period until 2030 and approval of the operational plan of measures for its implementation in 2025-2027" (Official Gazette of Ukraine, 2024 p., No. 108, p. 6884)

Time frame: 2025-2030

Type of policy / measure: Regulatory, Planning

Sector(s) affected: LULUCF, Agriculture

Responsible bodies/organizations: Ministry of Economy, State Geocadastre, regional military administrations, local government bodies

Emission reduction type: CO_2

Description: In accordance with the provisions of Part 2 of Article 172 of the Land Code of Ukraine, land conservation is carried out by terminating or restricting their economic use for a certain period and by grassing, afforestation or renaturalization. The Law of Ukraine “On "Land Protection", defines land plots that are subject to conservation, in particular:

- land plots used in violation of requirements for land protection from erosion and landslides, which include a ban on plowing slopes with a steepness of more than 7 degrees (except for areas for grazing, afforestation and implementation of soil protection measures);
- arable land with soil properties that necessitate land conservation in accordance with the Procedure of land conservation determined by the Resolution of the Cabinet of Ministers of Ukraine No. 35 dated January 19 2022;
- degraded lands, low-productive lands that do not have steppe, meadow, or forest vegetation cover, the economic use of which is environmentally dangerous and economically inefficient, as well as technogenically polluted land plots on which it is impossible to obtain environmentally friendly products, and the presence of people on these land plots is dangerous to their health;
- land plots, contaminated with chemical substances because of extraordinary situations and/or armed aggression and hostilities during martial law;
- land plots on which military engineering and/or fortification structures are located ;

- other degraded and unproductive land.

Although Ukrainian legislation provides for the procedure for the conservation of land plots in accordance with the Resolution of the Cabinet of Ministers of Ukraine dated January 19, 2022 No. 35, there are still only a few examples[31] of withdrawal of small areas from agricultural use, including withdrawal of arable land from economic circulation for the reproduction of steppe phytocenoses.

The Resolution of the Cabinet of Ministers of Ukraine dated January 19, 2022 No. 35 "On Approval of the Procedure for Land Conservation" (Official Gazette of Ukraine, 2022, No. 10, p. 532), although adopted relatively recently, is quite comple[32], in particular in terms of developing a working project for land management on land conservation, which determines the types and methods of land conservation, the term of conservation, and directions of land use. Therefore, simplifying the land conservation procedure is necessary to ensure the implementation of the Law of Ukraine "On Land Protection" and achieving the 4th strategic goal of the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the period until 2030.

GHG emissions reduction policies and measures in the waste sector

PM_D_WAM_12 Implementation of measures for waste prevention

Goal: to reduce the volume of household waste generation (amount of household waste generation in kg per person), ensure the transition to rational consumption and production models (resource intensity of GDP), reduce the volume of waste generation from all types of economic activity (volume of waste generated from all types of economic activity per unit of GDP)

Legal basis: Law of Ukraine "On Waste Management" dated 20.06.2022 No. 2320-IX, National Waste Management Plan of Ukraine until 2033 (Official Gazette of Ukraine, 2025 p., No. 13, p. 1001)

Time frame: 2025-2033

Type of policy / measure: Regulatory, Planning, Fiscal, Informing, Training

Sector(s) affected: Waste

Responsible bodies/organizations: Ministry of Economy, Ministry of Development, Ministry of Finance, regional military administrations, local government bodies

Emission reduction type: CO_2, CH_4

Description: The Law of Ukraine "On Waste Management" (hereinafter referred to as the Law) establishes the fundamental principle of the waste management hierarchy, which determines priority actions for waste management. The five levels of the hierarchy (from the most priority to the least desirable) are as follows:

- prevention waste;
- waste preparation for reuse;
- recycling (in particular composting);
- other recovery operations (including waste incineration with energy production);
- disposal (including incineration of waste without energy production, landfilling).

The key priority is waste prevention, focused on changing production and consumption patterns, including eco-design, packaging minimization, reusable solutions instead of disposable plastic products (dishes, hygiene products, etc.).

The provisions of Article 56 of the Law of Ukraine "On Waste Management" stipulate that encouraging compliance with the waste management hierarchy and ensuring financing of waste management activities is carried out, in particular, by establishing rates of the environmental tax levied on waste disposal at landfills, depending on the type of waste. The Ministry of Economy has developed a draft Law of Ukraine "On Amendments to the Tax Code of Ukraine Regarding the Environmental Tax levied on Waste Disposal and Placement of Waste from the Extractive Industry"[33].

[31] https://ecoaction.org.ua/pryklady-konserv-zemel-v-ukraini.html

[32] https://www.succow-stiftung.de/fileadmin/Ablage/Projekte/Ukraine/Practical_experience_of_land_abandoment_in_Ukraine.pdf

[33] https://mepr.gov.ua/povidomlennya-pro-oprylyudnennya-proyektu-zakonu-ukrayiny-pro-vnesennya-zmin-do- podatkovogo-

The law provides for the development of national and local waste management plans. The Cabinet of Ministers of Ukraine, by Resolution No. 1353-r of December 27, 2024, approved the National waste management plan of Ukraine (NWMP) up to 2033. National plan is a kind of "roadmap" that will define the architecture of the national waste management system within the framework of Ukraine's integration into the EU.

The NWMP also includes the National Program for Reducing Biowaste Landfilling and the National Program for Preventing Waste Generation. The implementation of the NWMP will contribute to the transition to a circular economy and sustainable use of resources.

The operational plan for the implementation of the NWMP provides for the period 2025-28 implementing a number of measures at the national level to prevent waste generation, in particular:

1) formation of state policy in the field of waste prevention by developing and submitting to the Cabinet of Ministers of Ukraine draft acts:

- on approval of measures to encourage food establishments and retail chains to reduce prices for products with an expiring shelf life;

- on approval of the Procedure for reducing food waste generation in primary production, processing and manufacturing, retail trade and other types of food distribution, restaurants and public catering establishments, as well as in households;

- on approval of a list of materials and raw materials that are critically important for the Ukrainian economy, in order to identify them in waste and ensure recycling and resource recovery;

- on approval of the Rules for retail and other retail chains, public catering establishments regarding the use of products in reusable containers in compliance with sanitary and hygienic requirements.

2) implementation of other measures for waste prevention, in particular:

- amendments to the resolution of the Cabinet of Ministers of Ukraine “Some issues of declaring the termination of waste status” regarding the expansion of the list of waste types for which the termination of waste status may be declared;

- implementing the best available technologies and management methods in the industrial production process to reduce and prevent waste generation.

3) increase awareness of households on waste prevention, in particular:

- development and implementation of advanced training programs, trainings and seminars for employees of executive authorities, business entities, the public on the issue of waste prevention;

- integrating the topic of waste prevention and circular economy principles into educational programs of general secondary and higher education institutions, including practical classes and projects;

- conducting information campaigns to encourage the reuse and repair of products, including electrical and electronic equipment, textiles, furniture and other goods.

In addition, the plan of Ukraine, approved by the order of the Cabinet of Ministers of Ukraine dated March 18, 2024 No. 244-p (Official Gazette of Ukraine, 2024 p., No. 32, p. 2035), provides for the development and adoption of the Circular Economy Strategy and an action plan for its implementation by the 1st quarter of 2026.

PM_D_WAM_13 Promoting the practice of reusing household waste components

Goal: increase the volume of household waste, prepared to reusing, and recycling (thousand tons/year)

Legal basis: Law of Ukraine "On Waste Management" dated 20.06.2022 No. 2320-IX, National Waste Management Plan of Ukraine until 2033 (Official Gazette of Ukraine, 2025 p., No. 13, p. 1001)

Time frame: 2025-2033 years

Type of policy / measure: Regulatory

Sector(s) affected: Waste

Responsible bodies/organizations: Ministry of Economy, Ministry of Development, regional military

kodeksu-ukrayiny-shhodo-ekologichnogo podatku-shho spravlyayetsya-za-zahoronennya-vidhodiv- ta-rozmishhenny-2/

administrations, local government bodies

Emission reduction type: CO_2, CH_4

Description: The Law of Ukraine "On Waste Management" (Article 37) establishes the following target indicators:

- by 2025 - not less than 10% of their mass;
- by 2030 - not less than 20% of their mass;
- by 2035 - not less than 25% of their mass;
- by 2040 - not less than 35% of their mass.

The Law of Ukraine "On Packaging and Packaging Waste" was to become a key tool for increasing the share of packaging reuse and recycling, in accordance with European environmental standards. Its goal should have been to implement the "polluter pays" principle and create a system of extended producer responsibility that encourages businesses to finance the collection, sorting, and recycling of packaging. In September 2023, the Cabinet of Ministers registered draft law No. 10066, which provided for mandatory packaging labeling, a ban on excessive packaging, and the establishment of recycling targets. Despite being included in the agenda, the document was not considered in the first reading, and after the resignation of the Shmyhal Government in July 2025, it was automatically withdrawn. Alternative versions of the deputies remained without support, and in the summer of 2025, the relevant committee resumed work on a new version that should take into account EU Regulation 2025/40 - a document mandatory for EU countries from August 2026, which establishes strict requirements for the recyclability of packaging, minimum content of secondary raw materials, container return systems, and eco-design. As of October 2025, the law has not been adopted, and its adoption is expected not earlier than 2026. It is the untimely adoption of the Law of Ukraine "On Packaging and Packaging Waste" that significantly increases the risk of untimely implementation of the NWMP, and, accordingly, the achievement of the NWMP target indicators after 2033.

According to the action plan of the NWMP, the Ministry of Economy and the Ministry of Development until 2027 should develop and submit to the Cabinet of Ministers of Ukraine a draft law on amendments to the Law of Ukraine "On Waste Management" regarding the establishment of target indicators for reducing the volume of municipal waste landfilled and reducing the volume of biodegradable municipal waste landfilled.

Under the responsibility of the Ministry of Economy is the development of the Order on approval of Recommendations for the reuse and charitable donation of products until 2028.

The NWMP action plan also plans to update the material and technical base for separate collection of household waste for which extended producer responsibility has not been introduced during 2025-2030 and create an appropriate infrastructure for collection, storage, preparation for reuse, recycling, and other recovery of packaging waste. Also, during 2025-2033, it is planned to create centers/mobile points for separate collection and preparation for reuse of household waste for which extended producer responsibility systems have not been established.

To ensure a reduction in the share of household waste landfilled up to 30%, the share of reuse of the total amount of household waste generated should be at least 10%[34] .

PM_D_WAM_14 Promoting household waste recycling practices

Goal: increase the volume of household waste recycled (thousand tons/year)

Legal basis: Law of Ukraine "On Waste Management" dated 20.06.2022 No. 2320-IX, National Waste Management Plan of Ukraine until 2033 (Official Gazette of Ukraine, 2025 p., No. 13, p. 1001)

Time frame: 2025-2033

Type of policy / measure: Regulatory

Sector(s) affected: Waste

Responsible bodies/organizations: Ministry of Economy, Ministry of Development, regional military administrations, local government bodies

Emission reduction type: CO_2, CH_4

[34] tap-mitigation-report-ukraine- 2021-08-31-1.pdf

Description: According to the Law of Ukraine "On Waste Management", *"recycling is a recovery operation, as a result of which waste is processed into products, materials or substances for their use for the original or other purpose. This operation includes the processing of organic material, but does not include the production of energy or the transformation of waste into materials that can be used as fuel or as backfill materials."*

According to the National Waste Management Plan, there are currently 94 waste recycling enterprises in Ukraine: 17 waste paper recycling enterprises, 39 polymer recycling enterprises, 19 plastic bottle recycling enterprises, and 19 cullet recycling enterprises. However, their capacities are only used by 50–70% due to the shortage of secondary raw materials on the domestic market, which is covered by imports. The secondary raw materials obtained are of rather low quality due to improper waste management, primarily packaging. Legislation should establish mechanisms for financing the recycling sector, which will facilitate the creation of sorting facilities and recovery facilities that will provide the market with sufficient quantities of high-quality raw materials.

An important systemic mechanism for ensuring high-quality secondary raw materials and increasing the level of recycling is the implementation and development of effective systems of expanded Producer Responsibility (PR), in accordance with Article 8 of Directive 2008/98/EC and national legislation. PR creates the organizational and financial conditions for the proper collection, sorting and recycling of packaging waste, which is a key element of the functioning of the secondary raw materials market.

The government bill "On Packaging and Packaging Waste" (reg. No. 10066 dated 09/18/2023), which provided for the establishment of a general packaging recycling rate at the level 30% was automatically revoked after the resignation of the Government of D. Shmyhal in July 2025. The relevant committee resumed work on a new version of the draft law in the summer of 2025, which should be adopted in 2026.

According to the NWMP action plan, the Ministry of Economy and Ministry of Development until 2027 should develop and submit to the Cabinet of Ministers of Ukraine a draft law on amendments to the Law of Ukraine “On Waste Management” regarding the establishment of target indicators for reducing the volume of household waste landfilled.

In addition, the NWMP action plan plans to create infrastructure for the collection, storage, preparation for reuse, recycling, and other recovery of packaging waste during 2025-2033.

To ensure a reduction in the share of municipal waste landfilling up to 30%, the share of recycling of the total amount of municipal waste generated should be at least 34%[35] .

PM_D_WAM_15 Promoting practices of biological treatment of organic components of household waste

Goal: to increase the volume of household waste subject to biological treatment operations treatment by anaerobic digestion and composting methods (thousand tons/year)

Legal basis: Law of Ukraine "On Waste Management" dated 20.06.2022 No. 2320-IX, National Waste Management Plan of Ukraine until 2033 (Official Gazette of Ukraine, 2025 p., No. 13, p. 1001)

Time frame: 2025-2033

Type of policy / measure: Planning

Sector(s) affected: Waste

Responsible bodies/organizations: regional military administrations, local government bodies, Ministry of Development, Ministry of Economy

Emission reduction type: CH_4

Description: The average annual volume of biowaste accounts for about half of the total volume of household waste generated in Ukraine, which, in turn, varies significantly by region and type of settlement. Biowaste generated by household waste sources is currently practically not collected separately.

According to the NWMP, in 2025-2033, waste composting facilities will be built in the territories of territorial communities (including using the territorial cooperation instrument) with a population of

[35] tap-mitigation-report-ukraine- 2021-08-31-1.pdf

100 thousand residents. These objects will have an average optimal capacity of 5.0 thousand tons of finished compost per year and will be created as part of mechanical-biological treatment complexes or regional waste separation centers. This approach will significantly shorten the process of designing and constructing composting facilities, as there will be no need for additional procedures for land acquisition and development and approval of project documentation, and logistical and operating costs will also be significantly reduced. There is a positive experience of such a project in the city of Lviv. The implementation of composting and the choice of technology are determined by regional and local waste management plans. In the territories of territorial communities with a population of up to 100 thousand people, it is advisable to carry out composting at specialized composting sites, and for small territorial communities, composting at waste disposal sites in mounds or "sleeves". Composting of biowaste can be carried out in rural areas and suburban areas of cities by their creators on household plots, summer cottages and garden plots. Composting operations can be used by waste collection/reception centers to treat separately collected waste from green spaces (waste from households, parks, gardens, other green space facilities). Composting of the above waste can be carried out outdoors.

The NWMP action plan plans for 2025-2033 to build facilities for composting of household waste and waste from green spaces from landscaping facilities, as well as to promote the introduction of composting of waste by producers on homesteads and summer cottages and garden areas. Besides that, installation of sorting lines is expected on landfills for non-hazardous waste for the separation of biodegradable waste and the creation of composting sites to reduce the landfilling of biodegradable waste: by 2030 – at landfills that accept up to 100 tons of waste per day; by 2033 – at landfills that accept more than 100 tons of waste per day.

To ensure a reduction in the share of household waste landfilled to 30%, the share of waste recovered by biological methods from the total amount of household waste generated must be at least 16%[36] .

PM_D_WAM_16 Promoting the practice of thermal treatment of household waste

Goal: increase the volume of household waste subject to recovery operations (incineration with energy recovery, production of fuel from waste), as well as waste subject to processing operations using other thermal methods (including pyrolysis, gasification, plasma process) (thousand tons/year)

Legal basis: Law of Ukraine "On Waste Management" dated 20.06.2022 No. 2320-IX, National Waste Management Plan of Ukraine until 2033 (Official Gazette of Ukraine, 2025 p., No. 13, p. 1001)

Time frame: 2025-2033

Type of policy / measure: Regulatory

Sector(s) affected: Waste

Responsible bodies/organizations: Ministry of Economy, Ministry of Development, Ministry of Energy, regional military administrations, local government bodies

Emission reduction type: CH_4

Description: According to the Law of Ukraine "On Waste Management" , *thermal treatment of waste is a technological process for thermal treatment of waste, which complies with the rules of technical operation of the relevant installation.* The Resolution of the Cabinet of Ministers of Ukraine dated March 1, 2024 No. 229 approved the technical requirements for the operation of waste incineration plants and waste co-incineration plants (Official Gazette of Ukraine, 2024 p., No. 25, p. 1613), which entered into force on September 5, 2024.

The development of thermal treatment capacities for municipal waste will be carried out exclusively in compliance with the waste management hierarchy defined by Directive 2008/98/EC and after the potential for waste prevention, preparation for reuse and recycling has been exhausted. Thermal treatment should not create obstacles to the development of separate collection, sorting and recycling systems, and should not lead to an increase in the volume of landfilling of residual waste. The policy will be implemented taking into account the requirements of Directive 1999/31/EC on the landfill of waste and principles of the circular economy.

There is only one waste incineration plant in Ukraine - with a capacity of about 250 thousand tons per year in the city of Kyiv, which produces thermal energy for the communal and household needs of

[36] tap-mitigation-report-ukraine- 2021-08-31-1.pdf

the nearby housing stock, and provides processing of about 2% of the total volume of waste generated in the country and about 25% of the volume of waste generated in Kyiv[37]. Currently, household waste is not used as an alternative fuel in industry.

In order to introduce expanded production of alternative fuel from waste in Ukraine (SRF, RDF) and establishment of systems its energy disposal, the deputies of Ukraine, with the participation of representatives of the Ministry of Energy, developed and registered in the Verkhovna Rada of Ukraine a draft Law "On Amendments to Certain Legislative Acts of Ukraine on Energy Utilization of Waste" (Registration No. 5611 dated 03.06.2021). The draft law provides for amendments to a number of legislative acts of Ukraine on the development of electricity and heat production from renewable waste fuels (SRF, RDF) and exactly to: Land Code of Ukraine, laws of Ukraine "About alternative types of fuels", "On heat supply", "On energy lands and the legal regime of special energy facilities", "On the electricity market" in order to introduce additional measures to stimulate and support the activities of electricity entities, which produce electricity from renewable fuel from waste.

The NWMP action plan provides for the development and approval of technical requirements for the production and use of fuel derived from waste (RDF/SFR) by 2028. In addition, during 2025-2033, the construction of household waste processing facilities, including thermal treatment, is planned within the framework of budget financing, provided for local executive authorities and local self-government, for resources from the environmental protection fund, the attraction of "green" bonds, funds from international technical assistance and other sources not prohibited by law.

On August 26, 2025, the Strategic Investment Council approved[38] the Single Project Pipeline of Public Investments of the State (Single Project Pipeline) for 2026, which includes 149 initiatives (total estimated cost of UAH 11.4 trillion), in particular, the Program for the Development of the Solid Fuel CHP Network (RDF/SRF) worth UAH 34.6 billion, which is to be implemented within 5 years.

To ensure a reduction in the share of municipal waste landfilling up to 30%, the share of thermal treatment of the total amount of generated municipal waste should be at least 10%[39].

PM_D_WAM_17 Increasing the volume of disposal (recovery and flaring) of biogas at landfills

Goal: increase the share of biogas disposal (recovery and flaring) at landfills and municipal waste landfills (% of the total volume of methane generated)

Legal basis: Law of Ukraine "On Waste Management" dated 20.06.2022 No. 2320-IX, National Waste Management Plan of Ukraine until 2033 (Official Gazette of Ukraine, 2025 p., No. 13, p. 1001)

Time frame: 2025-2033

Type of policy / measure: Regulatory

Sector(s) affected: Waste

Responsible bodies/organizations: Ministry of Economy, Ministry of Development, regional military administrations, local government bodies

Emission reduction type: CH_4

Description: The technology of flaring of landfill methane became widespread in Ukraine in 2005-2010 within the framework of the financial incentives of the Kyoto Protocol. Over the next 10 years, this technology was completely replaced by electricity generation plants, the financial incentive for which was the "green tariff". Nevertheless, flaring is a cheaper technology, so its use is advisable under conditions of low biogas flow rates and a significant increase in operating costs associated with emissions of pollutants, especially the greenhouse gas methane.

According to the NWMP, the closure and reclamation of waste disposal sites that do not meet the requirements of current legislation (waste dumps, overcrowded landfills) will be carried out in parallel with the construction of new regional landfills. The Law of Ukraine "On Waste Management" prohibits the operation of landfills and dumps that are not equipped with systems of withdrawal and disposal of biogas and filtrate (item 5 of the Final and Transitional Provisions), systems for monitoring

[37] https://kte.kmda.gov.ua/my-stvoryly-film-pro-unikalne-pidpryyemstvo-analogiv-yakomu-v-ukrayini-poky-shho- nemaye/
[38] https://me.gov.ua/News/Detail?id=8d3db9b8-3cf9-4a17-b99d-84924f21e432
[39] tap-mitigation-report-ukraine- 2021-08-31-1.pdf

emissions into the atmosphere and monitoring soil and groundwater pollution. Therefore, by this time, measures must be foreseen and implemented in regional and local plans for the closure, reclamation and construction of landfills. If it is impossible to implement these measures by 2030, the ban does not apply if a plan is being implemented to bring the waste disposal site into compliance with the requirements of the law.

The NWMP action plan provides for the construction of regional landfills for non-hazardous waste during 2025-2033 with the possibility of creating separate landfill maps for the disposal of inert or hazardous waste or other waste processing facilities, and during 2028-2033, it is planned to gradually discontinue the operation of household waste disposal sites (landfills, dumps) that do not meet the requirements of the legislation (after the construction of new landfills), in particular, those landfills that, as of January 1, 2030, will not be equipped with biogas extraction and neutralization systems in accordance with paragraph 5 of the Final and Transitional Provisions of the Law of Ukraine "On waste management".

On February 10, 2025, the Ministry of Environment adopted Order No. 263 "On Approval of the Rules for the Technical Operation of Landfills, Termination of Operation, Reclamation and Management of Landfills after Termination of Their Operation" (Official Gazette of Ukraine, 2025 p., No. 29, p. 1952), which was developed taking into account the main requirements of Directive No. 2008/98/EC and Directive No. 1999/31/EC. These rules define organizational and technical requirements to ensure the safe operation of landfills throughout their entire life cycle in order to prevent or reduce the negative impact of landfills on the environment, risks to human health, and gradually reduce the volume of waste buried in landfills, in particular that which is suitable for preparation for reuse, recycling, and other waste recovery operations. The order regulates, in particular, the collection and processing of biogas, its use for energy purposes, and combustion. However, the order will not enter into force before the date of termination or cancellation of the legal regime of martial law in Ukraine.

3.1.1.2. Where relevant, regional cooperation in this area

The government is working to implement a carbon crediting mechanism in accordance with Article 6 of the Paris Agreement (see PM_D_WAM_03 for details), which provides for the possibility of concluding bilateral cooperation agreements by initiating voluntary cooperation.

3.1.1.3. Without prejudice to the applicability of State aid rules, financing measures in this area at national level, where applicable

Within the framework of the budget program KPKVK 2701530 "State support for measures aimed at reducing emissions (increasing absorption) of greenhouse gases, including insulation of premises of social security institutions, development of international cooperation on climate change", funding is provided for measures for thermal modernization of social sector buildings, but since 2022, funds have not been allocated under this program.

In 2024, the State Fund for Decarbonization and Energy Efficiency Transformation was established, which provides support for the implementation of projects to improve energy efficiency and develop renewable energy sources (see section 3.2, PM_EE_WEM_02 for more details).

3.1.1.4. Development of carbon pricing instruments and when relevant, functioning of the carbon market or any carbon pricing instruments

See. PM_D_WAM_02 National GHG Emissions Trading System.

3.1.2. Renewable energy

3.1.2.1. Policies and measures to achieve the national contribution to the 2030 Energy Community target for renewable energy and trajectories as referred to in point (a)(2) Article 4, and, where applicable or available, the elements referred to in point 2.1.2 of this Annex, including sector- and technology-specific measures

PM_D_WEM_08 "Green" tariff for electricity producers from renewable energy sources

Goal: stimulate the development of the renewable energy sector (share in the structure of total final

energy consumption)

Legal basis: Law of Ukraine "On Alternative Energy Sources", Law of Ukraine "On the Electricity Market", Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the introduction of "green" tariff", Law Ukraine "On the introduction of changes to some laws of Ukraine on improving the conditions for supporting the production of electricity from alternative sources sources energy", Order of the Cabinet Ministers from 25 June 2025 No. 612-r "On approval of the Roadmap for separating the surcharge for renewable energy from the tariff for electricity transmission services and the action plan for implementing the Roadmap for separating the surcharge for renewable energy from the tariff for electricity transmission services for 2025 and 2026" (Official Gazette of Ukraine, 2025 p., No. 58, p. 4012), Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine dated April 26, 2019 No. 641 "On approval of regulatory legal acts regulating the activities of a guaranteed buyer and the purchase of electricity at a "green" tariff, the purchase of services under the market premium mechanism".

Time frame: 2009-2029

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible authorities/organizations: Ministry of Energy, National Commission for the Promotion of Energy and Utilities of Ukraine, SE "Guaranteed Buyer", NPC "Ukrenergo"

Type of emission reduction: CO_2

Description: The key instrument for stimulating the development of the renewable energy sector has long been the "green" tariff, which was introduced in 2008 by the Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Establishment of a "Green" Tariff".

According to the Law Ukraine "On alternative energy sources" (hereinafter referred to as the Law), the “green” tariff – a special tariff at which electricity generated at power plants, in particular at commissioned stages of construction of power plants (start-up complexes), from alternative energy sources (and using hydropower only by micro-, mini- and small hydroelectric power plants) is purchased.

"Green" tariff for business entities that generate electricity from wind energy, is set at the level of the retail tariff for consumers of the second voltage class as of January 2009, multiplied by the coefficient of the "green" tariff. For business entities, private households and consumers, including energy cooperatives, which generate electricity using alternative energy sources, the "green" tariff is set until January 1, 2030. The fixed minimum size of the "green" tariff for business entities, private households and consumers, including energy cooperatives, is set by converting the "green" tariff calculated in accordance with the rules of this Law into EUR as of January 1, 2009 by official national currency exchange rate of the National bank of Ukraine on a specified date. Also the "green" tariff is calculated in accordance with the requirements of the Law and is converted into national currency quarterly at the average official exchange rate of the National Bank of Ukraine.

The state guarantees for the purchase of all electricity generated at power plants using alternative energy sources (and using hydropower - only generated by micro, mini and small hydroelectric power plants) at the established "green" tariff are carried out by the guaranteed buyer and universal service providers as part of the implementation of special obligations to ensure an increase in the share of electricity generation from alternative energy sources. In turn, the guaranteed buyer and universal service providers receive compensation from the transmission system operator NPC Ukrenergo for the service of ensuring an increase in the share of electricity generation from alternative energy sources.The cost of supporting producers of renewable energy is laid down in tariff on transmission electricity of the NPC "Ukrenergo".

Considering rapid construction of new RES objects, the value of "green" tariffs, total capacity of projects for which preliminary contracts have been concluded, as well as the imbalance that has arisen in the system and on the electricity market, the Government has initiated negotiations with investors in renewable energy about voluntary restructuring of "green" tariffs through the mediation of the Energy Community Secretariat.

On June 10, 2020, the key parties signed a Memorandum of Understanding on the settlement of problematic issues in the field of renewable energy in Ukraine. The provisions of the Memorandum

were reflected in the Law of Ukraine "On Amendments to Certain Laws of Ukraine on Improving the Conditions for Supporting the Production of Electricity from Alternative Energy Sources", which provides for a reduction in benefit rates for wind and solar power plants by 7.5% and 15%, respectively, the introduction of liability for electricity imbalance, debt repayment and etc. Considering the complex situation in the industry, Ukraine did not unilaterally reduce "green" tariffs, but achieved a settlement of this issue through lengthy negotiations with investors, finding compromises and conclusion of the Memorandum, which became the basis of the relevant law of Ukraine.

On June 30, 2023, the Verkhovna Rada of Ukraine adopted the Law of Ukraine No. 3220-IX "On Amendments to Certain Laws of Ukraine on the Restoration and "Green" Transformation of the Energy System Ukraine", which with January 1 2024 narrows the application of "green" tariff only for private households provided available in within their buildings and other capital constructions and electricity consumption by private households. Incentive mechanism manufacturers of electricity with RES and private households in the form of "green" tariff will be functioning until 31 December 2029.

During 2024-2025, the Government took a number of important steps to comprehensively address the problem of debt to renewable energy producers operating under a "green" tariff.

The NEURC established a tariff[40] on the electricity transmission services of the NPC "Ukrenergo" at the level of UAH 686.23/MWh, which is 29.8% higher than the tariff in 2024, from January 1, 2025. This increase ensured that the company's special obligations to compensate for the production of "green" electricity, which make up the largest share in the tariff, were taken into account almost in full[41], which will allow it to stop accumulating debts and settle with electricity producers from RES on time. Thus, the state of settlements of the State Enterprise "Guaranteed Buyer" with producers of "green" energy has significantly improved since the beginning of 2025.

In addition, by adopting the Resolution of 02/25/2025 No. 250, the NEURC settled the issue of partial repayment of debts on the balancing market and to electricity producers from renewable energy sources (including domestic solar power plants) at the expense of funds saved by the NPC Ukrenergo on dispatching (UAH 10.7 billion) in 2023 in accordance with the Law of Ukraine No. 4213-IX dated January 14, 2025.

By Order No. 612-r of June 25, 2025, the Cabinet of Ministers approved the Roadmap for separating the renewable energy surcharge from the electricity transmission service tariff and the action plan for its implementation for 2025 and 2026, which ensured the timely implementation of the indicator of Section 10 "Energy" of the Plan of Ukraine. The Roadmap provides for measures aimed at improving the current mechanism for imposing special obligations to ensure an increase in the share of electricity generation from alternative sources and reducing debt accumulation during the transition period (until January 1, 2030) and the introduction of a renewable energy surcharge separately from the electricity transmission service tariff and a new system for paying such a surcharge, taking into account the results of auctions, from July 1, 2026.

In the third quarter of 2025, the NEURC began implementing the Roadmap measures. In particular, on September 16, the NEURC adopted amendments to the Procedure for Establishing (Forming) Tariffs for Electricity Transmission Services (NEURC Resolution No. 1461) and the Transmission System Code (NEURC Resolution No. 1462) to ensure transparent and effective accounting of the transmission system operator's costs separately from the costs of fulfilling special obligations to ensure an increase in the share of electricity generation from alternative energy sources.

In addition, on September 10, the National Commission for the Regulation of Energy and Power Sectors of Ukraine published[42] the draft Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Implementation of the Roadmap for Separating the Renewable Energy Surcharge from the Tariff for Electricity Transmission Services for 2025 and 2026", which provides for the integration of the requirements and provisions defined by the Roadmap into the Laws of Ukraine "On electricity market", "On alternative energy sources » and "On "NEURC".

From January 1, 2025 to January 1, 2026, the Guaranteed Buyer State Enterprise paid UAH 53.2 billion (including VAT) to producers of electricity from renewable sources. At the same time, during

[40] https://ua.energy/peredacha-i-dyspetcheryzatsiya/taryfy/

[41] https://ua-energy.org/uk/posts/v-ukrenerho-prokomentuvaly-pidvyshchennia-taryfu-na-peredachu-elektroenerhii

[42] https://www.nerc.gov.ua/news/oprilyudnyuyetsya-proyekt-zu-pro-vnesennya-zmin-do-deyakih-zu-shchodo-realizaciyi-dorozhn№yi-karti-vidokremlennya-nadbavki-na-vde-vid-tarifu-na-poslugi-z-peredachi-ee-2025-2026

2025, the debt of NPC “Ukrenergo” to the Guaranteed Buyer State Enterprise for payment for the service of ensuring an increase in the share of electricity production from alternative sources decreased from UAH 20.8 billion to UAH 15.5 billion, as well as for payment for the service under the market premium mechanism from UAH 0.35 billion to UAH 0.09 billion. In general, the balance of payments was:

- SE "Guaranteed buyer" to renewable energy producers – 68.2 % by 2022, 98.6 % by 2023, 92.1 % for 2024 and 94.9% for 2025;
- NPC “Ukrenergo” to the State Enterprise "Guaranteed Buyer" for the service of ensuring the increase of the share of electricity production from alternative sources – 59.4 % for 2022, 100.0% for 2023, 87.6% for 2024 and 82.5% for 2025;
- NPC "Ukrenergo" to SE "Guaranteed buyer" for service of market premiu mechanism – 85.4% for 2024 and 74.4% for 2025.

By resolution of the Cabinet of Ministers from 10 December 2025 year No. 1633 formed joint-stock company company "Guaranteed buyer", 100 percent of whose shares belong to the state, through transformation of the state enterprise "Guaranteed Buyer" (Official Gazette of Ukraine, 2025 p., No. 102, p. 7229).

PM_D_WEM_9 Incentive tariff for thermal energy from renewable sources

Goal: stimulate the generation of thermal energy from alternative sources (share of use of alternative energy sources in the production of thermal energy by facilities in the heat supply sector)

Legal basis: Law of Ukraine "About heat supply"

Time frame: from 2017

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Development, State Agency for Energy Efficiency, NEURC, local government bodies

Emission reduction type: CO_2

Description: In order to stimulate the production of thermal energy from renewable sources, the Verkhovna Rada of Ukraine adopted the Law of Ukraine "On Amendments to the Law of Ukraine "On Heat Supply" regarding the stimulation of the production of thermal energy from alternative sources Energy Sources" dated March 21, 2017 No. 1959-VIII. The law provided for the calculation and establishment of tariffs at the level of 90% of the tariff for thermal energy produced using natural gas applicable to the business entity (and in its absence - at the level of the weighted average tariff for thermal energy from gas by region).

On 10 February , 2026, the Verkhovna Rada approved the Law No. 4777-IX “On the introduction of amendments to certain legislative acts of Ukraine on improving the functioning of energy markets, competitive conditions for the production of electricity from alternative energy sources and strengthening energy sustainability", which, in particular, provides for two models of tariff setting for thermal energy from alternative sources for business entities that produce it at installations using alternative energy sources for the needs of institutions and organizations financed from the state or local budget, as well as for the needs of households at the choice of the producer: at the level of the weighted average tariff for heat from gas or as an economically justified tariff (cost-based) taking into account the costs of production, transportation and supply in accordance with approved methods.

PM_D_WEM_10 Tax benefits for the import of equipment that operates on renewable energy

Goal: Stimulating the development of renewable energy by reducing the cost of imported equipment powered by renewable energy (share in the structure of total final energy consumption)

Legal basis: Tax Code of Ukraine, Customs Code of Ukraine, resolutionof the Cabinet of Ministers dated March 30, 2016 No. 293 “Issues of import into the customs territory of Ukraine of energy-saving materials, equipment, facilities and components under Japanese demonstration projects technologies» (Official Gazette of Ukraine, 2016 p., No. 31, p. 1242)

Time frame: from 2010

Type of policy / measure: Fiscal

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Finance, State Tax Services, State Customs Service

Emission reduction type: CO_2

Description: The Tax Code of Ukraine provides a number of tax benefits for businesses operating in the renewable energy sector. In particular, it provides VAT exemption on import operations into the customs territory of Ukraine of:

- equipment that runs on renewable energy sources, energy-saving equipment and materials, means of measuring, controlling and managing the consumption of fuel and energy resources, equipment and materials for the production of alternative fuels or for the production of energy from renewable energy sources;
- materials, equipment, components, that are used for production:

  of equipment, which works on renewable sources energy;

  materials, raw materials, equipment and components that will be used in the production of alternative fuels or the production of energy from renewable energy sources;

  energy-saving equipment and materials, products, the operation of which ensures savings and rational use of fuel and energy resources.

In addition, Article 282 of the Customs Code of Ukraine stipulates that the above machinery and equipment are exempt from customs duties when imported into the customs territory of Ukraine or exported outside it. However, the exemption from customs duties applies only if these goods are used by the taxpayer for his own production and if identical goods with similar quality indicators are not produced in Ukraine.

Moreover, the application of the above norms is possible only on condition that such goods are included in the List of energy-saving materials, equipment, facilities and components under Japanese technology demonstration projects, which are exempt from import duty and operations for import of which into the customs territory of Ukraine are exempt from value added tax, approved by the resolution of the Cabinet of Ministers of Ukraine dated March 30 2016 No. 293 (Official Gazette of Ukraine, 2016 p., No. 31, p. 1242).

In addition, on July 16, 2024, the Verkhovna Rada adopted the Law of Ukraine No. 3853-IX and the Law of Ukraine No. 3854-IX, which exempted from VAT and import duty goods for the restoration of energy infrastructure, in particular equipment for solar/wind generation. On December 3, 2025, the Verkhovna Rada adopted the Law of Ukraine No. 14097, which extended the VAT exemption until 2028 for operations on the import of energy equipment into Ukraine, in particular for wind and solar power plants.

At the same time, the above tax benefits are considered a temporary measure. The National Revenue Strategy until 2030 provides for the development of a unified approach to the application of tax incentives in the period from 2025 to 2030 and a plan for reforming tax legislation to implement such an approach. Thus, by order of the Ministry of Finance dated September 27, 2024 No. 474 approved the Methodology for assessing tax policy instruments that lead to tax expenditures. The methodology defines the rules and approaches for both analyzing existing tax benefits (retrospective assessment) and developing new tax changes (forecast assessment).

PM_D_WEM_11 Feed-in-premium mechanism for electricity producers from RES

Goal: ensuring the development of renewable electricity on a competitive basis, integration of "green" generation into the energy system and the electricity market

Legal basis: Law of Ukraine "On the Electricity Market", Law of Ukraine "On Alternative Energy Sources", Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine No. 641 dated April 26, 2019 "On approval of regulatory legal acts regulating the activities of a guaranteed buyer and the purchase of electricity at a "green" tariff, the purchase of services under the market premium mechanism"

Time frame: from 2024

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, NEURC, SE "Guaranteed Buyer", NPC "Ukrenergo"

Emission reduction type: CO_2

Description: On June 30, 2023, the Verkhovna Rada of Ukraine adopted the Law of Ukraine No. 3220-IX "On Amendments to Certain Laws of Ukraine on the Restoration and "Green" Transformation of the Energy System of Ukraine", which introduced a number of new market instruments to support electricity producers from RES, in particular, the feed-in-premium mechanism for producers at a "green" tariff and contracts for difference for auction winners.

To implement the norms of the Law of Ukraine dated June 30, 2023 No. 3220-IX "On Amendments to Certain Laws of Ukraine Regarding the Restoration and "Green" Transformation of the Energy System of Ukraine", the Resolution of the National Commission for Energy and Utilities of Ukraine dated January 24, 2024 No. 178 "On Amendments to Certain Resolutions of the National Commission for State Regulation of Energy in the fields of energy and utilities", according to which:

- amendments have been made to the procedure for the purchase by a guaranteed buyer of electricity generated from alternative energy sources, in particular regarding the determination of the cost of the service under the market premium mechanism and the procedure for concluding an agreement on the provision of services under the market premium mechanism;
- a model agreement on the provision of services to support the production of electricity from alternative sources under the market premium mechanism was approved;
- the issue of entry and exit of an electric power facility from the balancing group of a guaranteed buyer has been resolved. That is, one electric power facility can be in the balancing group group, and another carry out activity on segments market and get difference between "green" tariff and market (calculated) price;
- when a guaranteed buyer leaves the balancing group, the "green" tariff is not canceled; the licensee or individual facility may return to the balancing group and continue to supply electricity at the "green" tariff.

The feed-in-premium mechanism is a system for stimulating the production of electricity from alternative energy sources, under which the guaranteed buyer pays to economic entities that have been assigned a "green" tariff and to economic entities that have acquired the right to support based on the results of the auction, the difference between the amount of the "green" tariff or auction price, taking into account the surcharge to it, and the calculated price, determined in accordance with the procedure established by the Law of Ukraine "On the Electricity Market". The financing of the market premium mechanism is carried out in accordance with the procedure established by legislation and does not involve raising funds from state and local budgets.

The market premium mechanism creates conditions for renewable electricity producers to become fully-fledged market participants and independently sell the electricity they produce, reducing their imbalances and optimizing their revenues.

As of December 31, 2025, the total capacity of generating plants that have switched to the feed-in-premium mechanism is 658 MW (101 plants).

PM_D_WEM_12 Direct power purchase and sale contracts between producers and end energy consumers

Goal: Stimulation of the RES sector development on market principles

Legal basis: Law of Ukraine "On Alternative Energy Sources", Law of Ukraine "On the Electricity Market"

Time frame: from 2024

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, NEURC

Emission reduction type: CO_2

Description: The Law of Ukraine of June 30, 2023 No. 3220-IX "On Amendments to Certain Laws of Ukraine on the Restoration and "Green" Transformation of the Energy System Ukraine" has removed a number of regulatory obstacles to the conclusion of direct electricity purchase and sale agreements between producers and end consumers of energy (corporate PPAs), according to which the buyer of electricity is a private consumer, and not the state in the person of a guaranteed buyer. In particular, the obligation for renewable energy generation to sell electricity under bilateral agreements at electronic auctions has been removed, but the right to continue to use this instrument has remained on a voluntary basis. The Law of Ukraine also expanded the list of counterparties for concluding an agreement on the provision of services to ensure the stability of the price of electricity generated from alternative energy sources, in addition to the consumer, to the electricity supplier and trader. In addition, the right of the National Commission for the Regulation of Energy and Utilities of Ukraine to establish the maximum term of bilateral contracts now does not apply to contracts concluded by RES electricity producers. These changes have created opportunities for businesses that produce electricity from RES or plan to become such a producer to seek partners for long-term bilateral electricity purchase and sale contracts even at the project development stage.

It was expected that the legislative changes introduced by the Law of Ukraine No. 3220-IX of June 30, 2023 "On Amendments to Certain Laws of Ukraine on the Restoration and "Green" Transformation of the Energy System of Ukraine" would stimulate the development of the segment of direct electricity purchase and sale agreements between the producer of electricity from alternative energy sources and consumers (Corporate PPAs) both physical and virtual. However, the dynamic development of the corporate PPAs market has not yet occurred, the business is only studying and testing this tool. During 2024-2025, only a few PPAs were concluded.

PM_D_WEM_13 "GreenDIM" Programme of the Energy Efficiency Fund

Goal: to stimulate and support initiatives to implement energy efficiency measures, the implementation of which ensures a reduction in the consumption of energy resources, including measures aimed at increasing the share of energy produced from renewable energy sources

Legal basis: Law of Ukraine "On Energy Efficiency Fund"

Time frame: from 2024

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Energy Efficiency Fund, Ministry of Development

Emission reduction type: CO_2

Description: On 7 May 2024, the Supervisory Board of the Energy Efficiency Fund approved[43] the Programme "GreenDIM"[44], which aims to stimulate the use of alternative energy sources by providing grants for partial reimbursement of the cost of equipment and materials during the implementation of measures to increase the share of electricity generated from renewable energy sources in the residential sector.

Beneficiaries of the Programme can become:

- Association of co-owners of apartment buildings (OSBB);
- Residential and construction cooperatives.

Under the Programme, the Energy Efficiency Fund partially compensates for the cost of:

1. Equipment and materials:

- thermal pumps — source of thermal energy — soil, water or air (for heating and hot water supply);

[43] https://eefund.org.ua/novyny/naglyadova-rada-fondu-energoefektyvnosti-zatverdyla-novu-programu-grindim/
[44] https://eefund.org.ua/documents/programa_grindim-redakcziya-vid-04-05-2024/

- solar power plants (SES).

2. Building energy efficiency certification before applying for a grant and after project implementation .

Under the terms of the Program, the Fund provides funding for participants in the form of a grant on a free and non-refundable basis.

On October 21, the Supervisory Board of the Energy Efficiency Fund approved a number of important changes[45] to the GreenDIM Programme, including increasing the maximum grant amount and the specific maximum cost for basic equipment, abolishing the requirement for the mandatory presence of an individual heat point, etc. These changes made the program more accessible and profitable for condominiums and housing associations.

On January 28, 2025, the Supervisory Board of the Energy Efficiency Fund approved changes[46] regarding the amount of grant support under the GreenDIM program. Thus, the grant amount was reduced to 50% of the total cost of equipment and materials to ensure support for more projects.

However, as of March 3, the acceptance of new applications has been temporarily suspended due to lack of funds[47]. The Fund's management is working to attract additional funding to resume accepting applications.

On May 7, the Energy Efficiency Fund, the State Agency for Energy Efficiency and Energy Saving of Ukraine, and the Decarbonization Fund of Ukraine signed a memorandum of cooperation[48] on the establishment of a new financial mechanism for energy modernization for condominiums and housing and construction companies and cooperatives, which actually will become continuation of the "GreenDIM" programme. The new mechanism will provide for the acquisition of the equipment, such as heat pumps and solar power plants, under financial leasing with the subsequent attraction of grant funds for partial reimbursement of costs.

As of the end of September 2025, the Energy Efficiency Fund had approved[49] 183 applications for participation in the Programme “GreenDIM” with an expected sum of grants close to 200 million UAH. Simultaneously, 128 projects are already fully implemented. In addition to that, the Energy Efficiency Fund provides for the implementation of two other programs aimed at stimulating energy efficiency improvements in buildings, which are described in detail in section 3.2 (see PM_EE_WEM_01).

PM_D_WEM_14 Program "Energy Independence of Individuals - Household Owners"

Goal: increase the production of electricity from renewable energy sources by private households

Legal basis: Resolution of the Cabinet of Ministers of Ukraine dated June 7, 2024 No. 673 “On providing financial state support to individuals who install generating units in their own households that produce electricity from alternative energy sources” (Official Gazette, 2024, No. 58, p. 3424)

Time frame: from 2024

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, National development institution

Emission reduction type: CO_2

[45] https://eefund.org.ua/novyny/grindim-staye-dostupnishoyu-naglyadova-rada-fondu-uhvalyla-nyzku-zmin-do- programy/

[46] https://eefund.org.ua/novyny/naglyadova-rada-uhvalyla-zminy-do-programy-grindim-fondu-energoefektyvynosti/

[47] https://eefund.org.ua/greendim/

[48] https://eefund.org.ua/novyny/fond-energoefektyvynosti-derzhenergoefektyvynosti-ta-fond-dekarbonizacziyi-pidpysaly-memorandum-pro-spivpraczyu-osbb-otrymayut-novyj-finansovyj-instrument-dlya- energomodernizacziyi/

[49] https://sites.google.com/eefund.org.ua/monitoring/%D0%BF%D1%80%D0%BE%D0%B3%D1%80%D0%B0%D0%BC%D0%B0-%D0%B3%D1%80%D1%96%D0%BD%D0%B4%D1%96%D0%BC/%D0%BF%D0%B5%D1%80%D1%96%D 0%BE%D0%B4%D0%B8%D1%87%D0%BD%D1%96-%D0%B7%D0%B2%D1%96%D1%82%D0%B8-%D0%BF%D1%80%D0%BE%D0%B3%D1%80%D0%B0%D0%BC%D0%B0-%D0%B3%D1%80%D1%96%D0%BD%D0%B4%D1%96%D0%BC?authuser=0

Description: The Resolution of the Cabinet of Ministers of Ukraine No. 673 of June 7, 2024 approved the Procedure for providing financial state support for individuals who install generating plants in their own households that produce electricity from alternative energy sources using the Net Billing mechanism (PM_IME_WEM_05 Support for active consumers through the self-generation mechanism (net billing)).

The procedure determines the conditions, criteria and mechanism for providing financial state support to individuals who install generating installations that produce electricity from alternative energy sources in their own households by reducing the cost of loans. State support is provided in order to reduce the cost of loans attracted for the purchase and installation of photovoltaic modules and/or wind power plants with an installed capacity of 1 kW to 10 kW, together with hybrid inverters capable of operating both in autonomous and synchronous mode with the external network, and energy storage installations with a capacity of 1 kW·h for every 1 kW of installed capacity of the generating installation.

PM_D_WEM_15 Auction system for allocation of support quota for RES

Goal: Creating a competitive framework for supporting renewable energy projects and achieving a balance between the interests of society, electricity consumers and other market participants, while ensuring the further development of renewable energy and reducing the burden on the price of electricity.

Legal basis: Law of Ukraine "On Alternative Energy Sources", Law of Ukraine "On the Electricity Market", Law of Ukraine dated April 25, 2019 No. 2712-VIII "On Amendments to Certain Laws of Ukraine on Ensuring Competitive Conditions for the Production of Electricity from Alternative Energy Sources", Resolution of the Cabinet of Ministers of Ukraine dated December 29, 2019 No. 1175 "On the introduction of competitive conditions for stimulating the production of electricity from alternative energy sources" (Official Gazette of Ukraine, 2020 p., No. 10, Art. 388), Resolution of the National Energy Regulatory Commission of Ukraine No. 641 dated April 26, 2019 "On approval of regulatory legal acts, that regulate activity of guaranteed buyer and purchases electric energy by "green" tariff, purchase of services under the feed-in-premium mechanism", Order of the Ministry of Energy of September 14, 2020 No. 596 "On approval of the Model Agreement on conducting electronic auctions with the distribution of quotas support between the auction customer and operator of electronic platform".

Time frame: 2024-2029

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, NEURC, JSC "Guaranteed buyer", JSC "Transparent.Sales", NPC "Ukrenergo"

Emission reduction type: CO_2

Description: In order to increase the competition in the renewable energy market, the Law of Ukraine No. 2712-VIII in 2019 introduced an auction mechanism for large renewable energy installations. According to the Law of Ukraine, wind and solar installations with an installed capacity of more than 5 MW and 1 MW, respectively, are required to participate in auctions for the allocation of support quotas, while small producers can participate voluntarily. Small installations at the household level with a capacity of no more than 50 kW are still eligible for "green" tariffs until 2029.

In order to launch auctions for renewable energy sources, the Cabinet of Ministers of Ukraine adopted a resolution dated December 27 2019 No. 1175 “On the introduction of competitive conditions for stimulating the production of electric power energy with alternative energy sources» (Official Gazette of Ukraine, 2020 p., No. 10, Art. 388), which approves the procedure for conducting auctions and allocating quotas for supporting renewable energy. In addition, the Ministry of Energy issued an order dated September 14, 2020 No. 596, which approved the Model Agreement on Conducting Electronic Auctions for the Distribution of Support Quota between the Auction Customer and the Operator of the Electronic Platform, and the National Commission for the Regulation of Energy and Utilities of

Ukraine adopted a resolution dated December 13, 2019 No. 2803, which approved the Model Agreement for the Purchase and Sale of Electricity between a Guaranteed Buyer and a Business Entity that, based on the results of the auction, acquired the right to support.
On June 30, 2023, the Verkhovna Rada of Ukraine adopted the Law of Ukraine No. 3220-IX "On Amendments to Certain Laws of Ukraine on the Restoration and "Green" Transformation of the Energy System of Ukraine", which improved the model for conducting auctions for the allocation of quotas to support electricity producers from energy sources, in particular, the above-mentioned Law introduced the following changes:

- establishing a support period of up to 12 years;
- introduced a contract for difference model (feed-in-premium mechanism) instead of a fixed tariff to simplify the conditions for participation in auctions;
- carrying out auctions on the construction of renewable energy objects combined with energy storage installations;
- determining specific hours of the day during which support may be provided based on the results of the auction;
- granting the Cabinet of Ministers of Ukraine the right to determine the share of the auction price that is fixed in euros, but not less than 50%;
- determining the load profiles of renewable energy facilities for which the right to support was acquired based on the results of the auction.

A number of regulatory legal acts were adopted in implementation of Law No. 3220-IX.

In accordance with Article 9 [3] of the Law of Ukraine "On Alternative Energy Sources", the Cabinet of Ministers of Ukraine, upon the submission of the Ministry of Energy, shall annually, no later than December 1, establish the annual support quota and the auction schedule for the following year, as well as indicative forecast indicators of annual support quotas for the four years following the year for which the annual support quota is established. Proposals on the size of annual support quotas are being prepared by the NPC “Ukrenergo” taking into an account international obligations of Ukraine for the development of renewable energy, the Energy Strategy of Ukraine, the national action plan for the development of renewable energy, the report on the assessment of the conformity (sufficiency) of generating capacities and the transmission system development plan, the status of implementation of projects for the construction of renewable energy facilities. Proposals for the maximum price offered by the auction participant for the next year for individual alternative energy sources are prepared by the NEURC.

The Cabinet of Ministers of Ukraine's Resolution No. 757-r of August 13, 2024 established an additional annual quota for supporting electricity producers from renewable energy sources for 2024 in the amount of 110 MW, of which 11 MW from solar power plants, 88 MW from wind power plants, and 11 MW from other types of alternative energy sources (biomass, biogas, small hydropower plants) – 11 MW (Official Gazette of Ukraine, 2024 p., No. 77, p. 4552). In October-November 2024, pilot auctions were held for the allocation of support quotas for RES, but the effectiveness was low: out of the available quota of 110 MW, only 0.9 MW was identified for support, the auctions on the allocation of quotas for solar power plants and wind power plants did not take place due to an insufficient number of participants. The winner of the auction for other types of renewable energy became LLC "Waterstrum" with an offer of 900 kW of hydropower at a price of 11.1 euro cents/kWh[50] . Market participants cite the non-payment crisis and financial risks, regulatory barriers, low investment attractiveness, and systemic problems in the electricity market as the main reasons for the low efficiency of the pilot auctions[51] .

The Cabinet of Ministers of Ukraine's Resolution No. 1195-r of November 29, 2024 established an additional annual quota for supporting electricity producers from renewable energy sources for 2025 in the amount of 330 MW, of which 33 MW for solar power plants, 250 MW for wind power plants, and 47 MW for other types of renewable energy sources (biomass, biogas, small hydropower plants) (Official Gazette of Ukraine, 2024 p., No. 109, p. 6997). The order also sets out indicative forecast figures for annual support quotas for 2026-2029. The annual support quota is planned to increase from 340 MW in 2026 to 400 MW in 2029.

[50] https://interfax.com.ua/news/greendeal/1032044.html
[51] https://expro.com.ua/statti/white-paper-persh-zelen-aukconi-v-ukran-chi-pracyu-mehanzm-pdtrimki-generac-z-vde

On July 31, 2025, the auction[52] for the allocation of support quotas for new wind power capacity announced by the State Enterprise "Guaranteed Buyer" took place. According to the results of the auction, 120 MW (out of 150 MW offered) of support quotas were allocated at a price of 7.96 EUR cents/kWh with a starting price of 8 EUR cents/kWh. The three previous auctions this year did not take place due to lack of business interest.

Law of Ukraine No. 4213-IX of January 14, 2025 increased the share of the quota that one participant can claim (independently or with a joint ultimate beneficial owner) from 25% to 50%, which may interest a larger number of RES market players in participating in auctions.

On February 10, 2026, the Verkhovna Rada of Ukraine adopted the Law of Ukraine No. 4777-IX "On Amendments to Certain Laws of Ukraine on Improving Competitive Conditions for the Production of Electricity from Alternative Energy Sources", which is aimed at increasing the efficiency of the competitive model of supporting the development of renewable energy sector by improving the procedure for organizing and conducting auctions with allocation of quotas to support the production of electricity from renewable energy sources, in particular in terms of changing the contract for difference model to the "pure" market premium model.

The Ministry of Energy will develop a draft resolution on amendments to the Procedure for conducting auctions for the allocation of support quotas, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 1175 of December 27, 2019.

PM_D_ WEM_16 Guarantees of origin of electricity from renewable energy sources

Goal: to stimulate the development of renewable electricity on a competitive basis and to implement the provisions of european legislation, in particular, Directive 2018/2001/EU of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources

Legal basis: Law of Ukraine "On Alternative Energy Sources", Law of Ukraine "On the Electricity Market", decree of the Cabinet of Ministers from 27 February 2024 No. 227 "On the introduction of guarantees of origin of electricity generated from renewable energy sources" (Official Gazette of Ukraine, 2024 p., No. 26, Art. 1653), Resolution of the National Commission for the Regulation of the National Energy and Power Sector of Ukraine dated December 27, 2023 No. 2624 "On approval of the Procedure for forming and maintaining a register of electric power facilities and electrical installations of consumers (including active consumers) that use alternative energy sources for the production of electric energy", DSTU EN 16325:2022 Energy-related guarantees of origin. Guarantees of origin of electricity (EN 16325:2013+A1:2015, IDT)

Time frame: from 2024

Type of policy / measure: Informing, Regulatory, Other

Sector(s) affected: Energy - supply

Responsible bodies/organizations: NEURC, Ministry of Energy

Emission reduction type: CO_2

Description: At the end of June 2023, the Verkhovna Rada of Ukraine approved Law of Ukraine from June 30, 2023 No. 3220-IX "On Amendments to Certain Laws of Ukraine Regarding restoration and "green" transformation of the energy system of Ukraine", which introduced a mechanism for issuing, using and terminating guarantees of origin for electricity generated from renewable energy sources. The Law of Ukraine determines that guarantees of origin for electricity generated from renewable energy sources are an electronic document generated on the basis of information from the register of guarantees of origin for electricity generated from renewable energy sources, which confirms that a certain amount of electricity is generated from renewable energy sources, confirms its environmental value and certifies the rights associated with the positive effect of generating electricity from renewable energy sources. Guarantees of origin confirm the origin of electricity generated from renewable energy sources:

- a business entity that produces electricity from renewable energy sources, ,
- a consumer who has installed a generating plant for their own consumption, or
- active consumer.

[52] https://prozorro.sale/auction/REM001-UA-20250627-15813/

A guarantee of origin is issued for 1 MWh of electricity from renewable sources, supplied to the grid or produced and used for own consumption. A guarantee of origin is automatically generated in a special register and is issued free of charge in accordance with the procedure for issuance, circulation and redemption, which is approved by the Cabinet of Ministers of Ukraine. The NEURC is the body responsible for the issuance, circulation and redemption of guarantees of origin and ensures the functioning of the register of guarantees of origin.

The circulation of the guarantee of origin of electricity from renewable sources is carried out within 12 months from the date of its production. At the same time, the owner of the guarantee of origin has the right to redeem it within 18 months from the date of production of the corresponding volume of electricity. Purchase and sale of guarantees of origin of electricity, produced with renewable energy sources, is carried out on a market basis at free prices.

The issue of international circulation of guarantees of origin of electricity is considered in the context of the gradual approximation of the Ukrainian system of guarantees of origin with European practice.

To this end, the NEURC cooperates with the Association of Issuers (AIB), within which Ukraine acquired AIB member status in 2024 and applied to join the Electrical Scheme group. In 2025, an assessment of the compliance of the Ukrainian system of guarantees of origin with the EECS rules and the CEN 16325 standard was launched. In parallel, legislative amendments were prepared (draft law No. 13219) aimed at introducing the principle of reciprocity in the recognition of guarantees of origin between Ukraine, EU Member States and Energy CommunityContracting Parties . Further development of these processes, as well as dialogue with the European Commission and the Energy Community Secretariat, will form the basis for a gradual expansion of the possibilities for import and export of guarantees of origin.

A decision of the Energy Community Council of Ministers is expected to be adopted at the end of 2026 to define the requirements for the Energy Community Treaty States Parties necessary for the further recognition of guarantees of origin of electricity from renewable sources at the EU level. This decision will be an important step towards the integration of the Ukrainian market guarantees of origin in European space and creating prerequisites for Ukraine's full participation in mechanisms for interstate trade in "green" electricity.
In addition, in accordance with the requirements of the Law of Ukraine No. 3220-ИХ dated June 30, 2023 "On Amendments to Certain Laws of Ukraine on the Restoration and "Green" Transformation of the Energy System of Ukraine", the National Commission for the Regulation of Energy Efficiency and Energy Efficiency adopted the following resolutions:

- dated December 27, 2023 No. 2624 “On approval of the Procedure for the formation and maintenance of register of electric power facilities and electrical installations of consumers (including active consumers), that use alternative energy sources for electricity production", which provides for the introduction of a relevant register of generating facilities of producers and consumers, the information from which will be part of the register of GOs for electricity from RES. On March 25, 2024, the NEURC published the relevant register in public access;

- dated December 27, 2023 No. 2626 "On approval of the Procedure for disclosing information to consumers of electricity about energy sources in the general structure of the balance of electricity purchased by an electricity supplier and/or produced at its own electrical installations", which is necessary for the introduction of the mechanism of guarantees of origin.

The Cabinet of Ministers of Ukraine adopted a resolution dated February 27, 2024 No. 227 “On the introduction of guarantees origin of electricity, produced with renewable energy source" (Official Gazette of Ukraine, 2024, No. 26, p. 1653), which approved the Procedure for issuing, circulating and redeeming guarantees of origin of electricity generated from renewable energy sources and the Procedure for determining the environmental value of electricity generated from renewable energy sources.

The last preparatory steps for the launch of the Register of Guarantees of Origin were the adoption of the Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine No. 1475 dated August 14, 2024 “On approval of the forms of applications for creating an account, terminating and resuming the use of an account in the Register of Guarantees of Origin of Electricity Generated from Renewable Energy Sources, and instructions for filling them out” and the approval by the Order of the Ministry of Energy dated September 3, 2024 No. 325 of the environmental value of electricity generated from renewable energy sources.

On October 4, 2024, the National Commission for the Energy and Utilities of Ukraine issued the first

guarantees of origin for electricity generated from renewable energy sources for PJSC "Ukrhydroenergo" (for 96,441 MWh). According to estimates[53] of the "Ukrainian Energy Exchange", the annual supply of guarantees of origin of electricity from renewable sources will be about 10 million MWh with a prospect of growth to 20-30 million MWh by 2030.

In 2025, the National Energy Regulatory Commission issued 14,896 997 guarantees of origin of electricity generated from renewable energy sources for a total volume of 14,896,997 MWh. Auctions for the sale of guarantees of origin are held on the platforms of the Market Operator and the Ukrainian Energy Exchange. However, the demand for guarantees of origin is currently low. Over the 10 months of operation of trading platforms for the sale of guarantees of origin, 1,244 auctions were held[54] (as of early August 2025), but only 18 of them were completed successfully.

It is expected that further development and full use of the system of guarantees of origin for electricity from renewable sources will be a significant impetus for the development of the renewable energy sector in Ukraine and will create the prerequisites for the export of "green" electricity. At the same time, it is important to form a sustainable domestic demand for guarantees of origin from consumers, producers and the business environment, as well as expand the possibilities of using guarantees of origin in various sectors of the economy.

PM_D_WEM_17 Stimulating the use of liquid biofuels (biocomponents) in the transport sector

Goal: development of the production, circulation and use of sustainable liquid biofuels in transport

Legal basis: Energy Strategy of Ukraine for the period until 2050, Law of Ukraine dated June 4, 2024 No. 3769-IX "On Amendments to Certain Legislative Acts of Ukraine Regarding the Mandatory Use of Liquid Biofuels (Biocomponents) in the Transport Sector"

Time frame: from 2026

Type of policy / measure: Regulatory

Sector(s) affected: Transport

Responsible bodies/organizations: Ministry of Development, State Agency for Energy Efficiency, State Environmental Inspectorate

Emission reduction type: CO_2

Description: On June 4, 2024, the Verkhovna Rada of Ukraine approved Law of Ukraine No. 3769-IX "On Amendments to Certain Legislative Acts of Ukraine Regarding the Mandatory Use of Liquid Biofuels (Biocomponents) in the Transport Sector", which provides for the creation of a regulatory framework for the development of the production, circulation and use of liquid biofuels in transport and the establishment of a mandatory share of biofuel use in the transport sector, as well as introduction of sustainability criteria for liquid biofuels (biocomponents) and biogas intended for use in the transport sector. Thus, the Law establishes a regulatory mandatory share of liquid biofuel (biocomponents) in the volume of automobile gasoline at the level of 5% by volume. However, this requirement does not apply to gasoline with an octane number of 98 and higher and gasoline supplied for the needs of the Ministry of Defense, the central executive body implementing state policy in the field of state material reserves, and for the creation of minimum reserves of oil and petroleum products.

It is expected that the introduction mandatory use of liquid biofuels (biocomponents) in the transport sector will contribute to:

- increasing the workload of distilleries and the production potential of related sectors;
- creation of additional jobs;
- improving the environmental situation by reducing emissions of harmful substances into the atmosphere that are formed during the combustion of fossil fuels;
- creating prerequisites for attracting foreign and domestic investments in the field of liquid biofuel (biocomponents) production.

During 2024-2025, the Government took a number of steps to implement the requirements of the Law

[53] https://ua-energy.org/uk/posts/ueb-torhuvatyme-harantiiamy-pokhodzhennia-elektryky-z-vde

[54] https://dixigroup.org/ukrayina-pochala-prodavaty-zeleni-sertifikaty-odnak-ry №k-poky-ne-aktyvnyj-yak- pozhvavyty-torgy/

of Ukraine № 3769-IX. Thus, on May 15, 2025, the State Agency for Energy Efficiency adopted Order No. 99-25 "On approval of the form of a protocol on offenses for untimely submission or failure by business entities to submit information on the content of liquid biofuels (biocomponents) in the volumes of release on the customs territory of Ukraine from places of production and wholesale trade in automotive gasoline fuel, provided for by clause 2 of part two of Article 14 of the Law of Ukraine "On Alternative Fuels".

However, on June 18, 2025, the Verkhovna Rada voted for Law 4505-IX, and on July 3, it was signed by the President, which postpones the introduction of fines for the sale of gasoline without the addition of at least 5% bioethanol until January 1, 2026. The decision to postpone the fines was made due to operational and logistical difficulties[55] in the market.

In addition, on November 19, 2025, by Resolution No. 1482, the Cabinet of Ministers approved the Technical Regulations on requirements for alternative motor fuels (Government Courier, 2025 p., No. 240), which is based on Directive 98/70/EC and Directive 2018/2001/EC. The Regulation will enter into force one year after the date of its publication.

The Technical Regulation establishes mandatory requirements for the quality and circulation of alternative motor fuels and liquid biofuels (biocomponents) produced, imported and put into circulation in Ukraine for use in internal combustion engines of vehicles. The scope of application of this Technical Regulation applies to:

- automotive gasolines with a bioethanol content of more than 10% and no more than 50% by volume;
- diesel fuels with a volume content of fatty acid methyl esters (biodiesel) of more than 7% and not more than 30% by volume.

On February 10, 2026, the Verkhovna Rada of Ukraine adopted the Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding Improving Competitive Conditions for the Production of Electric Energy from Alternative Energy Sources" by No. 4777-IX, which, in particular, provides for a mandatory bioethanol content of at least 7% in automobile gasolines (except A-98 and higher) from July 1, 2026.

PM_D_WEM_18 Hydropower development program for the period until 2035

Goal: to stimulate the development of hydropower plants and pumped storage power plants, including small ones.

Legal basis: order of Cabinet Ministers Ukraine from 13 August 2024 No. 761- r "On approval of the National Renewable Energy Action Plan for the period until 2030 and the action plan for its implementation" (Official Gazette of Ukraine, 2024 p., No. 77, p. 4554)

Time frame: from 2026 to 2035

Type of policy / measure: Regulatory, Planning

Sector(s) affected: Energy - supply

Responsible authorities/organizations: Ministry of Energy, NEURC, PJSC "Ukrhydroenergo" (with consent), NPC Ukrenergo (with consent)

Emission reduction type: CO_2

Description: Hydropower enterprises are stable employers in the regions, sources of revenue for local budgets, and also provide support for the social and critical infrastructure of nearby settlements. In addition, reservoirs and hydraulic structures perform important functions in the field of mitigating the consequences of extreme weather events: regulating flow during floods and low water levels, accumulating water for irrigation needs and water supply for the population and industry, which is becoming especially relevant in the context of the projected increase in the frequency and intensity of extreme hydrological events.

Currently, the Hydropower Development Program for the period until 2026 is in force, approved by the Resolution of the Cabinet of Ministers of Ukraine dated July 13, 2016 No. 552 (Official Gazette of Ukraine, 2016 p., No. 60, p. 2065), which defines the main directions of hydropower development, promising projects for new construction and reconstruction of large hydropower generating capacities.

[55] https://ua-energy.org/uk/posts/bioetanolu-benzyni-novi-vymohy-stari-ryzyky-ta-vidkladeni-shtrafy

However, this Program requires revision and updating, taking into account the consequences of armed aggression against Ukraine and the definition of not only large hydropower projects, but also a focus on small hydroelectric power plants.

Potential investors are interested in the development of small hydropower in Ukraine. Thus, within the framework of the pilot auctions to support renewable energy sources held in the fall of 2024, only one was held to support bioenergy facilities and small hydropower plants. 2 participants applied for the auction - small HPPs, of which one installation won. Thus, there is a need to support the development of this segment of distributed generation by identifying a list of potential projects at the regional level, preparing feasibility studies for them, which can be presented to potential investors, and approving the relevant projects at the state level with the formation of a development plan.

In addition, it is advisable to attract financing for the modernization and construction of hydropower facilities through "green bonds", loans from international financial institutions, blended financing mechanisms, as well as instruments provided for in Article 6 of the Paris Agreement, taking into account the compliance of such projects with the criteria of the EU Taxonomy for Sustainable Activities.

PM_D_WAM_18 Introduction of electronic trade in solid biofuels

Goal: development of solid biofuel market by establishing an electronic solid biofuel trading platform

Legal basis: Energy Strategy of Ukraine for the period until 2050, Cabinet order Ministers Ukraine from 13 August 2024 No. 761-r "About approval "National Action Plan on Renewable Energy for the Period Until 2030 and the Action Plan for its Implementation" (Official Gazette of Ukraine, 2024 p., No. 77, p. 4554)

Time frame: from 2028

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, State Agency for Energy Efficiency, Ministry of Development

Emission reduction type: CO_2

Description: Today, the solid biofuel market has a number of problems, including instability of biofuel prices, low quality, and unreliability of supply. The mechanism for organizing the biofuel market in Ukraine should be the use of an electronic platform (exchange), where all interested producers and consumers will trade in biofuels.

A package of draft laws has been registered in the Verkhovna Rada of Ukraine, which provides for the establishment of legislative prerequisites for the introduction of electronic trade in solid biofuels, and exactly:

- the draft Law of Ukraine “On Amendments to Certain Legislative Acts of Ukraine on the Development of Electronic Trade in Alternative Fuels” (Registration No. 8052 of September 19, 2022), which, in particular, provides for the establishment of legislative prerequisites for the introduction of electronic trade in solid alternative fuels;
- Draft Law of Ukraine "On Amendments to the Code of Ukraine on Administrative Offenses regarding the liability for offenses in the field of electronic trading in alternative fuels" (Registration No. 8053 of September 19, 2022).

The above-mentioned draft laws require further development by the Verkhovna Rada of Ukraine Committee on Energy and Housing and Communal Services. The Ministry of Energy, the State Agency for Energy Efficiency and the Ministry of Development are responsible for their support.

The introduction of a solid biofuel trading exchange will: create a transparent and competitive biofuel market in Ukraine; contribute to reducing biofuel prices; provide generating capacities with biofuel; stimulate investment in Ukraine's bioenergy sector.

PM_D_WAM_19 Development of the energy crops sector

Goal: establishing prerequisites to facilitate economic activity in the cultivation of energy crops

Legal basis: Energy Strategy of Ukraine for the period until 2050, Order of the Cabinet of Ministers of Ukraine dated August 13, 2024 No. 761-r "On Approval of the National Action Plan for Renewable Energy for the Period until 2030 and the Action Plan for its Implementation" (Official Gazette of Ukraine, 2024 p., No. 77, p. 4554)

Time frame: from 2028

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply, LULUCF

Responsible bodies/organizations: Ministry of Energy, State Agency for Energy Efficiency, Ministry of Development, Ministry of Economy, Ministry of Finance

Emission reduction type: CO_2

Description: A promising renewable source for thermal energy production is energy plants, which are grown on low-productive lands and can be stable to arid conditions and require less or no use of chemical plant protection products.

Energy crop cultivation in Ukraine is at an early stage of development, which is associated with a number of barriers that hinder such development, in particular legislative (the absence of the term "energy crops" in Ukrainian legislation, the complicated procedure for leasing state and municipal land), administrative (short terms of land lease agreements, the absence of a civilized biomass market) and financial (the need to attract significant investments at the initial stages of establishing energy plant plantations, long payback period of projects).

At the same time, the cultivation of energy crops has significant potential for strengthening Ukraine's energy independence and developing renewable energy sources by replacing the use of natural gas in the production of thermal and electrical energy.

The implementation of projects for growing energy plants has a number of positive consequences, including:

- development of new kind of activities and internal market biofuels;
- reducing greenhouse gas emissions through the use of CO_2 - neutral fuels and replacing fossil fuels with biomass;
- receiving profit with low-productivity or degraded agricultural lands and restoring their fertility;
- cleaning contaminated lands;
- creation of new jobs and providing budget revenue at all levels, socio-economic stability for regions.

In order to ensure the possibility of using the potential of low-productive lands for growing energy crops and their further use in the energy sector, the People's Deputies of Ukraine have developed a package Draft Laws of Ukraine:

- "On Amendments to Certain Legislative Acts of Ukraine on Promoting the Development of the Energy Crop Cultivation Sector" (Reg. No. 5227 of March 12, 2021);
- "On amendments to Article 288 of the Tax Code of Ukraine regarding rent for land plots on which energy plants are grown" (Registration No. 5228 dated March 12, 2021).

The main provisions of draft laws are:

- setting the maximum rent for land plots owned by the state and municipal authorities at 5% of the normative monetary assessment;
- introduction of a minimum lease term for land plots provided for growing energy crops – 20 years;
- granting in rent unproductive and marginal land plots state and communal property (without conducting land auctions);
- providing the definition for the term "energy" plants» and introducing state support for growing energy crops.

However, these draft laws are already outdated due to significant changes in legislation in recent years and there is a need to develop new draft laws.

By Resolution No. 949 of August 6, 2025, the Cabinet of Ministers established the Coordination Council for the Development of Bioenergy Potential of Agriculture, which is a temporary consultative and advisory body of the Cabinet Ministers of Ukraine the main tasks of which include ensuring coordination between state bodies, preparing proposals and recommendations for the formation and implementation of state policy on the production, sale, use and transportation of biofuels, determining measures and mechanisms to stimulate an increase in the share of biofuel use, development of the raw material base, etc. (Official Gazette of Ukraine, 2025 p., No. 71, p. 4865).

PM_D_WAM_20 Mapping of areas required for achievement national target indicator and national contribution to the objectives of the Energy Community, introducing zones for accelerated development of renewable energy sources and simplification of permitting procedures

Goal: acceleration of the implementation of renewable energy development projects .

Responsible organs: Ministry of Energy, NEURC

Time frame: from 2026

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Legal basis: Law of Ukraine "On Alternative Energy Sources", Law of Ukraine "On the Electricity Market", draft Law of Ukraine "On Amendments to Certain Laws of Ukraine on the Implementation of European Union Legislation in the Field of Renewable Energy Sources" (Registration No. 14271 of December 13, 2025)

Emission reduction type: CO_2

Description: 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, revised in 2023, provides for the implementation of coordinated mapping of areas suitable for the development of renewable energy in Ukraine, in order to determine the internal potential and available land plots, subsoil, water areas (water space) of water bodies of Ukraine, for the installation of renewable energy facilities and related infrastructure, such as network infrastructure and energy storage facilities, including with thermal ones, which are necessary to achieve the national target and the national contribution to the Energy Community objectives. The Directive also provides that in renewable energy acceleration zones the time for obtaining permits for new power plants shall not exceed one year and six months for the permitting process for repowering projects, including all administrative permits, permits for joining the electricity grids and environmental impact assessments. EU member states must now consider renewable energy projects as being of “overriding public interest” to speed up the resolution of any legal issues.

The principle of overriding public interest, which has been introduced in EU countries, provides for the simplification of permit procedures and the introduction of a presumption of feasibility and absence of negative environmental impact for renewable energy projects, etc.

Today, the procedure for obtaining permits for the implementation of renewable energy projects in Ukraine is complex and lengthy. Project developers face a number of bureaucratic barriers, which take 3-5 years to overcome and obtain all the necessary permits and approvals, which is unacceptable given the current difficult situation in the energy sector of Ukraine, caused by the constant shelling of the energy infrastructure of Ukraine by the Russian Federation. Simplifying the permitting procedure, early identification of "No.-go" risks and identification of sites with the greatest cumulative potential for the state and the developer of renewable energy projects will help unblock existing projects at the permitting stage and accelerate the implementation of new projects. Reducing bureaucratic barriers for renewable energy projects will reduce the time and effort required to obtain the necessary permits, which will contribute to a faster launch and implementation of projects. Taking into account paragraph 33 of the preamble to Directive (EU) 2023/2413, the conduct of EIA and SEA procedures in full remains mandatory, which is also provided for by the Law of Ukraine "On Environmental Impact Assessment" and the Law of Ukraine "On Strategic Environmental Assessment".

On December 3, 2025, the Verkhovna Rada of Ukraine registered under No. 14271 the draft Law of Ukraine “On Amendments to Certain Laws of Ukraine Regarding the Implementation of European Union Legislation in the Field of Renewable Energy Sources”, initiated by the Government. The draft law provides for the fulfillment of Ukraine’s obligations as a party to the Treaty Establishing the Energy Community and the implementation of European Union legislation in terms of bringing the national regulatory framework in the field of renewable energy sources into line with requirements of Directive (EU) 2018/2001 European Parliament and Councils from December 11, 2018 on promoting the use of energy from renewable sources. The draft law provides for coordinated mapping of territories suitable for the development of renewable energy in Ukraine, provided that the designated territories for the development of renewable energy, including existing renewable energy facilities, comply with the calculated trajectories for achieving the targets and the total planned installed capacity of renewable energy facilities provided for in the National Energy and Climate Plan for the relevant period. The draft law also provides for the determination of the features of the formation of special zones for the accelerated development of renewable energy, as well as the introduction of the main principles of permitting procedures for investments in renewable energy, which should significantly simplify and accelerate the implementation of renewable energy projects.

To implement the provisions of the draft law, the Cabinet of Ministers must approve a plan (or plans) defining zones of accelerated development of renewable energy, as well as requirements for measures to mitigate the effects of climate change in zones of accelerated development of renewable energy within six months from the date of entry into force of the Law. In addition, the Ministry of Energy is obliged to develop and publish on its website methodological recommendations for the implementation of renewable energy projects, including for projects with an installed capacity of up to 1 MW and consumers of renewable energy of their own production.

PM_D_WAM_21 Introduction of sustainability criteria for biofuels, bioliquids and biomass fuels

Goal: to prevent potentially negative environmental impacts from the increased use of biofuels, bioliquids or biomass fuels

Legal basis: order of Cabinet Ministers Ukraine from August 13 2024 No. 761-r “On approval of the National Action Plan for Renewable Energy for the period until 2030 and plan of measures for its implementation" (Official Gazette of Ukraine, 2024 p., No. 77, Art. 4554), draft Law of Ukraine “On Amendments to Certain Laws of Ukraine Regarding the Implementation of European Union Legislation in the Field of Renewable Energy Sources” (Reg. No. 14271 of December 13, 2025)

Time frame: from 2026

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, State Agency for Energy Efficiency, Ministry of Development, Ministry of Economy

Emission reduction type: CO_2

Description: The Action Plan of the National Renewable Energy Action Plan for the period up to 2030, the implementation of European Union legislation on sustainability and greenhouse gas emission criteria for biofuels, bioliquids and biomass fuels, fuels from recycled carbon and renewable fuels of non-biological origin is envisaged in accordance with Commission Implementing Regulation (EU) 2022/996 of 14 June 2022 on rules for the verification of sustainability and greenhouse gas emission saving criteria, as well as low indirect land-use change risk criteria by the second quarter of 2026.

On December 3, 2025, the Verkhovna Rada registered a government draft law "On Amendments to Certain Laws of Ukraine on the Implementation of European Union Legislation in the Field of Renewable Energy Sources" (Reg. No. 14271 of December 13, 2025), which provides for the harmonization of national legislation with the requirements of the 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, in particular the introduction of sustainability criteria and greenhouse gas emission reductions for biofuels, bioliquids and biomass fuels, and their compliance.

According to the draft law, biofuels, bioliquids, and biomass fuels, regardless of where the raw materials for their production are grown, must meet sustainability and greenhouse gas emission

reduction criteria for the purposes of:

- calculating the contribution to achieving the Energy Community target and the national target;
- increase using renewable energy in the transport sector.

Business entities engaged in economic activities in the production and sale of biofuels, bioliquids, and biomass fuels are required to confirm the compliance of these types of biofuels with sustainability criteria.

To implement the provisions of this draft law, the Cabinet of Ministers must approve the criteria for sustainability and greenhouse gas emission reduction and the rules for confirming compliance with the criteria for sustainability and greenhouse gas emission reduction and the criteria for low risk of changing the intended purpose of land use within six months from the entry into force of the Law. In addition, the Ministry of Economy must approve the procedure for determining land plots covered with perennial herbaceous vegetation that are of increased importance for biological diversity, as well as the justification for the possible use of these plots for collecting raw materials.

By Resolution No. 949 of August 6, 2025, the Cabinet of Ministers established the Coordination Council for the Development of Bioenergy Potential of Agriculture, which is a temporary consultative and advisory body of the Cabinet Ministers of Ukraine the main tasks of which include ensuring coordination between state bodies, preparing proposals and recommendations for the formation and implementation of state policy on the production, sale, use and transportation of biofuels, determining measures and mechanisms to stimulate an increase in the share of biofuel use, development of the raw material base, etc. (Official Gazette of Ukraine, 2025 p., No. 71, p. 4865).

PM_D_WAM_22 Establishment of a legislative and regulatory framework to stimulate the use of biomethane as a motor biofuel in the transport sector

Goal: to ensure a favorable legislative and regulatory framework for the use of biomethane as a motor biofuel in the transport sector

Legal basis: resolution of Cabinet of Ministers from 22 April 2026 No. 514 " On approval Biomethane Production Development Program for the Period Until 2035 and the Operational Plan of Measures for Its Implementation " , Order of the Cabinet of Ministers of Ukraine dated August 13, 2024 No. 761-r "On Approval of the National Action Plan for Renewable Energy for the Period Until 2030 and the Plan of Measures for Its Implementation" (Official Gazette of Ukraine, 2024 p., No. 77, p. 4554)

Time frame: from 2030

Type of policy / measure: Regulatory

Sector(s) affected: Transport

Responsible bodies/organizations: Ministry of Energy, Ministry of Development, State Agency for Energy Efficiency

Emission reduction type: CO_2

Biomethane (in liquefied or compressed form) is a promising kind of alternative fuel for transport, characterized by:
1) significant potential for reduction of GHG emissions (to 80–90% compared to fossil natural gas);
2) the possibility of using the existing gas infrastructure;
3) supporting the development of a circular economy through the use of organic waste;
4) promoting Ukraine's energy independence.

At the same time, the lack of a comprehensive state policy on the use of biomethane as a motor fuel hinders the development of the relevant market segment and limits the attraction of investments in its production and infrastructure.

On April 22, 2026, the Cabinet of Ministers of Ukraine approved the Program for the Development of Biomethane Production for the Period Until 2035 and the Operational Plan of Measures for its Implementation (Government Courier, 2026, No. 89), one of the goals of which is formation of a regulatory framework for the development of domestic and foreign biomethane markets. The program, in particular, provides for the development of regulatory acts regulating the use of biomethane as a motor fuel by 2030.

PM_D_WAM_23 Establishment of a legislative and regulatory conditions for the development of offshore wind energy

Goal: establishment of favorable legislative and regulatory framework conditions for the development of offshore wind energy

Legal basis: order of Cabinet of Ministers of Ukraine from August 13 2024 No. 761-r "On approval of the National Action Plan for Renewable Energy for the period until 2030 and the plan of measures for its implementation" (Official Gazette of Ukraine, 2024 p., No. 77, p. 4554)

Time frame: from 2029

Type of policy / measure: Regulatory

Sector(s) affected: Energy – supply

Responsible bodies/organizations: Ministry of Energy, Ministry of Development, Ministry of Economy, NEURC

Emission reduction type: CO_2

Description: In April 2023, a Memorandum of Understanding on the Expansion of Energy Partnership in the Field of Wind Generation was signed between the Ministry of Energy of Ukraine and the Ministry of Climate, Energy and Utilities of the Kingdom of Denmark. As part of the first stage of cooperation, an accelerated study of the potential of Ukrainian offshore wind energy was carried out by the World Bank and the Technical University of Denmark (DTU Wind). The results of the study proved the possibility of developing offshore wind projects in the waters of Ukraine, the Black and Azov Seas. According to experts, the potential for the implementation of offshore technologies in Ukraine is about 50 GW, in particular for fixed-foundation wind farms - 3 GW, while for floating offshore wind turbines - 20 GW.

However, today the country lacks a legislative framework for offshore wind energy, which completely blocks the development and implementation of offshore wind energy technologies in Ukraine. The development and implementation of legislation for the development of offshore wind energy will facilitate the development and construction of offshore wind farms in Ukraine, which will help to increase or replace damaged generating capacities of the energy system, diversify energy sources and reduce dependence on traditional energy sources and their imports. In addition, offshore wind power will not only increase the volume of electricity production in the domestic market, but also the export of "green" electricity.

The action plan of the National Renewable Energy Action Plan for the period until 2030 provides for the development of a draft law on the development of offshore wind energy, including on marine spatial planning and determining the status of territories for the construction of offshore wind power plants by the fourth quarter of 2027.

PM_D_WAM_24 Risk reduction mechanism for investments in renewable energy sources

Goal: attracting investments in new renewable energy capacities

Legal basis: ESU

Time frame: from 2026

Type of policy / measure: Regulatory, Planning

Sector(s) affected: Energy – supply

Responsible bodies/organizations: Ministry of Energy, Ministry of Economy

Emission reduction type: CO_2

Description: On July 10, 2025, at the Ukraine Recovery Conference (URC) in Rome, the EBRD and the European Commission announced the launch of the Ukraine Renewable Energy Risk Reduction Facility (URMM), which aims to increase the attractiveness of investments in RES projects by insuring of key financial and operating risks arising in wartime conditions. The mechanism is expected to help mobilize €1.5 billion in investments in 1 GW of new renewable energy capacity.

The World Bank Group is working on a project proposal to initiate a joint project with the World Bank for Reconstruction and Development, the Renewable Energy Acceleration and Market Development Program for Ukraine (RAMP UP). The objectives of the RAMP UP project are to: launch donor-supported competitive tenders for onshore wind and solar and hybrid systems with storage using a contract for difference mechanism, which will attract 1-1.5 GW of initial capacity and create the basis for phase two auctions with a cumulative target of 10 GW by 2040; increase energy efficiency; security and sustainability through reduced seasonal fuel imports, add renewable energy to reliable renewable generation and create decentralized solutions for households/SMEs; accelerate the transition from the "green" tariff to the market and prepare for auctions financed by the EU; in the second stage, strengthen the legal, regulatory and institutional framework (including settlement and unbundling arrangements) in line with the EU acquis and the Energy Community commitments Communities.

3.1.2.2. Where relevant, specific measures for regional cooperation, as well as, as an option, the estimated excess production of energy from renewable sources which could be transferred to other Contracting Parties and/or Member States of the European Union in order to achieve the national contribution and trajectories referred to in point 2.1.2

The government draft law "On Amendments to Certain Laws of Ukraine Regarding implementation of European Union legislation in the field of renewable energy sources" (Reg. No. 14271 of December 13, 2025) provides for provisions to determine the mechanism for conducting statistical transfers with Member States (parties) of the European Union or the Energy Community, as well as the implementation of joint projects and the introduction of joint support schemes.

3.1.2.3. Specific measures on financial support, where applicable for the promotion of the production and use of energy from renewable sources in electricity, heating and cooling, and transport

The cost of price support for RES electricity producers who sell their electricity at a feed-in tariff in 2020 reached UAH 39,033 million[56]. RES electricity producers are eligible for a number of tax incentives (described above PM_D_WEM_10). However, the cost of such support (in the form of foregone tax revenues to the state budget) to the RES sector has not been estimated in recent years. However, the National Revenue Strategy provides for an inventory of tax incentives and incentives available in Ukraine, an assessment of their effectiveness and the reasonableness of their timeframe, the development of a unified approach to the application of tax incentives in the period from 2025 to 2030, and a plan for reforming tax legislation to implement such an approach (implementers of the measure are the Ministry of Finance; State Tax Service; central government bodies).

In addition, since 2024, support for the development of RES has been provided by the State Fund for Decarbonization and Energy Efficient Transformation (Decarbonization Fund). In particular, the funds of the Decarbonization Fund can be used to finance measures and state target programs in the field of increasing the use of RES and alternative fuels; financing compensation, reimbursement, and reduction of the obligations of individuals and legal entities under loan and leasing agreements concluded to implement the increase in the use of RES and alternative fuels; fulfillment of debt obligations under borrowings received by the state for the implementation of investment projects in the field of increasing the use of RES and alternative fuels. In the first six months of 2025, the Decarbonization Fund financed 14 projects in the field of RES (see policy PM_EE_WEM_02 for details).

3.1.2.4. Where applicable, the assessment of the support for electricity from renewable sources that Contracting Parties are to carry out pursuant to Article 6(4) of Directive (EU) 2018/2001, as adapted and adopted by Ministerial Council Decisions 2021/14/MC-EnC and 2022/02/MC-EnC

In 2025, the Ministry of Energy assessed the effectiveness of schemes to support the production of electricity generated from renewable energy sources and published a corresponding report[57] .

3.1.2.5. Specific measures to introduce one or more contact points, streamline administrative

[56] https://www.eu4environment.org/app/uploads/2023/09/Review-of-Energy-Subsidies-in-the-Context-of-Energy-Sector-Reforms-Ukraine-prefinal.pdf

[57] https://mev.gov.ua/en/rubrika/reports- 0

procedures, provide information and training, and facilitate the uptake of power purchase agreements

NEURC is consistently expanding the digitalization of connection processes. About a quarter of all applications are submitted to distribution system operators online. By NEURC Resolution No. 2061 of 09.12.2025 “On Approval of Amendments to the Transmission System Code”, the regulator is introducing a corresponding service for customers of services for connection to the TSO electricity networks. Service "Customer's personal account" will provide online submission of documents and tracking of applications and must be implemented by July 1, 2026.

In addition, some large operators place contact centers/consumer service centers in their services for submitting applications for connection and supporting documents.

The regulator is constantly working on optimizing administrative procedures. New changes to the procedure for connecting to distribution systems, which will come into force in 2026, are aimed at shortening deadlines, unifying requirements, and generally increasing the efficiency of distribution systems[58].

Regarding informing market participants, the regulator and TSOs publish explanations regarding requirements, standard contracts and procedures (official instructions, contract templates, explanatory materials on websites), which should help avoid typical errors when submitting applications.

3.1.2.6. Summary of the policies and measures under the enabling framework Contracting Parties have to put in place pursuant to Article 21(6) and Article 22(5) of Directive (EU) 2018/2001 as adapted and adopted by Ministerial Council Decisions 2021/14/MC-EnC and 2022/02/MC-EnC, to promote and facilitate the development of self-consumption and renewable energy communities

Current legislation already provides opportunities for the development of decentralized generation based on RES and incentives to consume energy of its own production. In particular, the Law No. 3220-IX introduced aggregation (PM_IME_WEM_03) and support for active consumers through the self-production mechanism (PM_IME_WEM_05) (see more details in section 3.4.3.2 of this Plan). In addition, the draft law "On Amendments to Certain Laws of Ukraine on the Implementation of European Union Legislation in the Field of Renewable Energy Sources" (Registration No. 14271 of December 13, 2025) provides for the introduction of the definition of renewable energy communities, as well as their features in accordance with Directive (EU) 2018/2001.

3.1.2.7. Where applicable, specific measures on the promotion of the use of energy from biomass, especially for new biomass mobilisation taking into account:
- biomass availability, including sustainable biomass: both domestic potential and imports from third countries
- other biomass uses by other sectors (agriculture and forest-based sectors); as well as measures for the sustainability of biomass production and use

Most of the policies and measures described in section 3.1.2 of this Plan above are available to producers of electricity and heat from biomass, as are those for producers based on other renewable sources. In addition, additional policies aim to stimulate the cultivation of energy crops (PM_D_WAM _ 19), introduce electronic trade in solid biofuels (PM_D_WAM _ 18) and introduce sustainability criteria for biofuels, bioliquids and biomass fuels (PM_D_WAM _ 21).

3.1.3. Others elements of the dimension

3.1.3.1. Where applicable, national policies and measures affecting the European Union Emissions Trading System sector, as well as an assessment of complementarity and impact on the European Union Emissions Trading System

Not applicable.

3.1.3.2. Policies and measures to achieve other national targets, where applicable

PM_D_WEM_19 Implementation of a policy for just transition of Ukraine's regions dependent

[58] https://www.nerc.gov.ua/news/regulyator-zvertaye-uvagu-na-zmini-shchodo-proceduri-priyednannya-do-sistem-rozpodilu-shcho-naberut-chin№sti-z-2026-roku?utm_source=chatgpt.com

on fossil fuels and carbon-intensive industries

Goal: Overcoming the problems of socio-economic development, primarily of coal regions, due to the closure of coal mining and coal processing enterprises, as well as coal mining enterprises thermal generation, and in long-term perspective others territorial communities of carbon-intensive and mono-industrial regions

Legal basis: ESU, Resolution of the Cabinet of Ministers of Ukraine dated June 18, 2025 No. 711 "On Approval of the State Target Program for the Just Transition of Coal Regions of Ukraine for the Period Until 2030" (Official Gazette of Ukraine, 2025 p., No. 57, p. 3920), Strategy for Low-Carbon Development of Ukraine until 2050

Time frame: 2025-2050

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Development, Ministry of Energy

Emission reduction type: CO_2

Description: The ESU envisages a reduction in the consumption of coal and other solid fossil fuels in households and other sectors by 2025 and a complete phaseout of their use by 2035. At the same time, a gradual reduction in the use of coal and other solid fossil fuels in industry is envisaged by 2050. The ESU also states that the use of coal-fired generation will be reduced until its complete decommissioning in 2035. In order to overcome the problems of socio-economic development of coal regions due to the closure of coal-mining and related enterprises, as well as coal-fired thermal generation enterprises.

By Resolution No. 711 of June 18, 2025, the Cabinet of Ministers approved the State Target Program for the Just Transformation of Coal Regions of Ukraine for the period until 2030. The program defines a just transition as a model for the development of the region, which provides for a decent life and sufficient income for all residents, including workers who will be affected by the process of abandoning fossil fuels (liquidation of production facilities, closure of coal mining enterprises, etc.).

The program serves to implement state regional policy and ensure a just transition of coal regions of Ukraine by comprehensively addressing problematic issues, in particular in the economic, social, cultural, housing and communal services and environmental spheres, which arise as a result of the reduction in coal production and the gradual closure of coal mining and related enterprises. The program includes measures that will contribute to the structural transformation of the local economy, mitigation of social consequences and development of human capital, transition to renewable energy and increased energy efficiency, solving environmental problems and combating climate change, in particular:

- complex measures for creation industrial parks in territorial communities in coal regions;
- creation of business support institutions;
- providing support (financial, consulting, etc.) to small and medium-sized businesses, including in the field of startups, new technologies and innovations;
- development complex plans of spatial development of territorial communities of coal regions;
- development of plans for the use of mine waste rock and mine water in production;
- measures for development social infrastructure;
- advanced training and retraining of employees of coal enterprises (and their family members) and provision of services to promote employment and self-employment of residents of territorial communities in coal regions;
- implementation of energy-efficient measures in social and communal infrastructure facilities;
- construction of solar (including rooftop) power plants; ;
- measures to decentralize, modernize, increase efficiency, adaptability and decarbonize heating systems with a transition to alternative sources;
- renewal of movable warehouse public transport with taking into account need for its decarbonization;

- measures for adaptation of territorial communities of coal regions to changes climate;
- restoration of ecosystems and creation of appropriate recreation and leisure areas;
- construction of household waste management facilities in territorial communities of coal regions, etc.

For 2024-2025 years also were approved regional plans for just transition of territorial communities in coal regions, in particular:

- On March 18, 2025, the Volyn Regional Military Administration approved the Action Plan for the Just Transition of the Volyn Coal Microregion[59],
- On June 20, 2025, the Sheptytsk City Council approved the Action Plan for the Just Transformation of the Chervonohrad Urban Territorial Community for the period until 2030[60].
- On October 4, the Lviv Regional Executive Committee approved the Action Plan for the Just Transition of the Coal Microregion of Lviv Oblast for the Period Until 2030[61]. Within the framework of the plan, 47 project ideas with a total value of UAH 10.1 billion were developed, which will serve to implement strategic goals.

In addition, the Strategy for Low-Carbon Development of Ukraine until 2050 states that carbon-intensive and mono-industrial communities, such as those dependent on the extraction of gas, oil and other mineral and fossil resources, as well as industrial enterprises dependent on fossil fuels that will reduce their activities or close completely, should also be covered by government just transition policies. The positive experiences of just transition in coal regions should be used to introduce just transition principles and definitions into other sectors.

Thus, in the short term – until 2030 – it is necessary, first of all, to implement the State Target Program for the Just Transformation of Coal Regions and relevant regional programs. However, in the long term – until 2050 – it will be necessary to extend the policy of just transformation to other territorial communities of coal-rich and mono-industrial regions in connection with the gradual decarbonization of the economy.

PM_D_WEM_20 Implementation of climate change adaptation policies at the national and local levels

Goal: reducing the impacts and consequences of climate change in Ukraine

Legal basis: Law of Ukraine dated October 8, 2024 No. 3991-IX "On the Basic Principles of State Climate Policy in Ukraine", Order of the Cabinet of Ministers of Ukraine dated October 20 2021 No. 1363 "On approval Environmental security strategies and adaptation to climate change for the period until 2030" (Official Gazette of Ukraine, 2021 p., No. 87, p. 5584), Order of the Cabinet of Ministers of Ukraine dated February 7, 2025 No. 96-r "On approval of the operational plan of measures for the implementation in 2025-2027 of the Strategy of Environmental Security and Adaptation to Climate Change for the period until 2030", Order of the Cabinet of Ministers of Ukraine dated May 30, 2024 No. 483-r "On approval of the Strategy for the formation and implementation of state policy in the field of climate change for the period until 2035 and approval of operational plan of measures with its implementation in 2024-2026 years" (Governmental courier, 2024 p. No. 114)

Time frame: from 2021

Type of policy / measure: Planning

Sector(s) affected: Agriculture, LULUCF, Energy - supply, Transport, Other

Responsible bodies/organizations: Ministry of Economy

Description: The Law of Ukraine No. 3991-IX of October 8, 2024 "On the Basic Principles of State Climate Policy in Ukraine" defines the state climate policy, aimed, in particular, at ensuring the mitigation of the consequences of climate change and adaptation to it. The law defines the long-term goals of the state climate policy, including — increasing resilience and reducing risks, including to public health, associated with climate change, through the implementation of climate change adaptation measures in accordance with Article 7 of the Paris Agreement.

[59] https://npa.voladm.gov.ua/search.php
[60] https://sheptytska-rada.gov.ua/Rishennia-sesii/p- 4211
[61] https://loda.gov.ua/news/117979

Law No. 3991-IX formulates requirements for the Climate Change Adaptation Strategy and sectoral program documents on climate change adaptation. As part of state climate policy planning at the regional and local levels, the Law also provides for the development of regional and local climate change adaptation strategies or the integration of measures to mitigate the effects of climate change and adapt to it into regional development strategies, development strategies of territorial communities and action plans for their implementation, local and regional environmental protection programs and other local planning documents. Climate change adaptation issues should also be taken into an account in comprehensive restoration programs (as well as other state and/or local planning documents) of the territory of the territorial community (its parts) for elimination of the consequences of emergency situations, as well as the consequences of the armed aggression of the Russian Federation against Ukraine.

In the Strategy for the Formation and Implementation of State Policy in the Field of Climate Change for the Period Until 2035, approved by the Resolution of the Cabinet of Ministers dated May 30, 2024 No. 483-r (Government Courier, 2024 p. No. 114), the issue of adaptation to climate change is covered in strategic goal 3 - adaptation to climate change, increasing resilience and reducing risks associated with climate change. At the first stage (2024-2026) of the implementation of the strategy, it is envisaged to conduct an assessment of risks and vulnerability of socio-economic sectors and natural components to climate change, as well as develop relevant program documents for adaptation to climate change, regional and local adaptation strategies or include adaptation issues in regional development strategies.

At the same time, the Strategy for Environmental Safety and Adaptation to Climate Change for the period until 2030 is currently in force, approved by the Resolution of the Cabinet of Ministers of Ukraine dated October 20, 2021 No. 1363, one of the strategic goals of which is to strengthen the adaptive capacity and resilience of social, economic and environmental systems to climate change. The Strategy is implemented through the implementation of measures defined by operational implementation plans, which are approved by the Resolutions of the Cabinet of Ministers of Ukraine for a three-year period.

During 2023-2025, the Government, in cooperation with development partners, took a number of steps to further develop and implement climate change adaptation policies.

In accordance with paragraph 2 of the Operational Plan for the Implementation of the Strategy for Environmental Safety and Climate Change Adaptation for the Period up to 2030 in 2022-2024, the Order of the Ministry of Environment dated 03.06.2023 No. 386 approved Methodological recommendations for assessing risks and vulnerability of socio-economic sectors and natural components to climate change, which disclose the context and objectives of risk assessment for each sector and natural component and vulnerability to climate change, the main impacts and the chains of impacts of climate change, recommended example indicators of risks and vulnerabilities, sensitivity and indicators of adaptive capacity.

In accordance with paragraph 4 of the Operational Plan for the Implementation of the Strategy in 2022-2024 environmental safety and adaptation to climate change, on October 31, 2024, by Order No. 1382, the Ministry of Environment approved Methodological Recommendations on Taking the Climate Component into Account in State Planning Documents and During Strategic Environmental Assessment and environmental impact assessments, which contain recommendations and practical advice on integrating climate change issues into planning documents and during strategic environmental assessment and taking into account the requirements of Directive 2001/42/EC of the European Parliament and of the Council of 27.06.2001 on the assessment of the effects of certain plans and programmes on the environment, European Commission guidelines and the experience of good practices in other countries.

On September 18, 2024, the Ministry of Environment, together with experts from the APENA3 project and regional departments of ecology, presented climate change adaptation strategies for three pilot regions: Mykolaiv, Lviv and Ivano-Frankivsk. Leading experts and scientists conducted a thorough assessment of the risks and vulnerability to climate change in these regions and developed recommendations for the necessary adaptation measures. According to estimates, Lviv region needs 273.7 million euros for adaptation, Mykolaiv region - 155.7 million euros, Ivano-Frankivsk region - 152.650 million euros.

In early December 2024, Ukraine submitted its first official notification on adaptation to climate change (1st Adaptation Communication) to the Secretariat of the Framework of the United Nations Framework Convention on Climate Change (UNFCCC), which describes national climate risks and

vulnerabilities, prioritized and planned adaptation measures in key sectors, as well as Ukraine's needs for financial, technical and institutional support to increase climate resilience.

By Order No. 96-r of February 7, 2025, the Cabinet of Ministers approved the operational plan of measures for the implementation of the Strategy for Environmental Safety and Adaptation to Climate Change for the period until 2030 in 2025-2027. The operational plan includes 8 tasks, 2 of which directly relate to climate change adaptation issues, in particular:

- formation of action plans for adaptation to climate change in the areas of water resources management (within the framework of the basin management plan), biodiversity conservation, forest resources, energy, public health, agriculture and soils, transport and infrastructure, and tourism;
- ensuring that current and projected impacts of climate change are taken into account in strategic planning at the national, regional and local levels, as well as during the construction of infrastructure facilities.

However, a new national strategy on adaptation and climate change is planned to be adopted in 2026.

Climate change adaptation measures in agriculture and forestry are provided for within the framework of other policies (PM_D_WEM_04, PM_D_WEM_06, PM_D_WAM_05, PM_D_WAM_07, PM_D_WAM_08).

3.1.3.3. Policies and measures to achieve low emission mobility (including electrification of transport)

PM_D_WEM_21 Tax benefits for transport vehicles, equipped with electric motors

Goal: Stimulating the production and use of vehicles equipped with electric motors.

Legal basis: Tax code Ukraine, Customs code Ukraine, Law of Ukraine "On the levy on mandatory state pension insurance", Law of Ukraine "On the Customs Tariff of Ukraine"

Time frame: with 2018 year

Type of policy / measure: Fiscal

Sector(s) affected: Transport

Responsible bodies/organizations: Ministry of Finance, State Tax Service, State Customs Service

Emission reduction type: CO_2

Description: The Tax and Customs Codes of Ukraine provide for a number of tax benefits to stimulate the use of electric passenger cars. In particular, until 2026, operations on import into the customs territory were exempted from VAT (clause 64, subsection 2, section XX of the Tax Code of Ukraine). In addition, no duty is charged on the import of electric cars, the excise tax rate for electric cars is significantly lower than for cars with internal combustion engines or hybrids - 1 EUR per 1 kWh of electric battery capacity.

From July 1, 2022, electric passenger cars are also exempt from paying mandatory state pension insurance upon first registration in accordance with the Law of Ukraine "On the Fee for Mandatory State Pension Insurance".

To stimulate the domestic production of electric vehicles, from January 1, 2022 to January 1, 2031, import operations for customs territory of goods used for the own production of vehicles equipped exclusively with electric engines.

In addition, from January 1, 2022 to December 31, 2035, the profits of enterprises engaged exclusively in the production of electric motors, as well as manufacturers, are exempt from taxation and also lithium-ion (lithium-polymer) batteries and chargers intended for vehicles equipped exclusively with electric engines, as well as manufacturers of vehicles equipped exclusively with electric engines in accordance with the Tax Code of Ukraine. At the same time, the released funds (tax amounts that are not paid to the budget and remain at the disposal of the taxpayer) should be used for scientific research and development of work in the field of electric transport, creation or re-equipment of the material and technical base, increase in production volume, introduction of new technologies.

According to estimates by the Ministry of Finance[62], the expected amount of budget losses in 2022 due to the tax benefits provided is:

- in connection with the exemption from VAT of operations for the supply of vehicles equipped exclusively with electric engines on the customs territory of Ukraine - about UAH 364 million;
- in connection with the exemption from taxation of profits of enterprises engaged exclusively in the production of electric motors intended for vehicles, equipped exclusively with electric engines, and electric vehicles - UAH 584 million.

At the same time, the National Revenue Strategy until 2030 provides for the development of a unified approach to the application of tax incentives in the period from 2025 to 2030 and a plan for reforming tax legislation to implement such an approach. Thus, the Order of the Ministry of Finance of September 27, 2024 No. 474 approved the Methodology for the Evaluation of Tax Policy Instruments That Lead to Tax Expenditures. The methodology defines the rules and approaches both for the analysis of existing tax benefits (retrospective evaluation) and for the development of new tax changes (forecast evaluation).

[62] https://itd.rada.gov.ua/billinfo/Bills/pubFile/1473870

PM_D_WEM_22 Promoting the development of electric charging infrastructure

Goal: Reduce the consumption of fossil fuel and energy resources by the transport sector

Legal basis: Law of Ukraine dated February 24, 2023 No. 2956-IX "On some issues of the use of vehicles equipped with electric engines and amendments to certain laws of Ukraine on overcoming fuel dependence and developing electric charging infrastructure and electric vehicles" (hereinafter referred to as the Law of Ukraine on Electric Transport), the order of Cabinet Ministers Ukraine from August 13 2024 No. 761-r "On approval of the National Action Plan for Renewable Energy for the period until 2030 and the plan of measures for its implementation" (Official Gazette of Ukraine, 2024 p., No. 77, p. 4554)

Time frame: from 2023

Type of policy / measure: Regulatory, Planning, Economic

Sector(s) affected: Transport

Responsible bodies/organizations: Ministry of Development, Ministry of Energy, NJSC "Energoatom", DSO

Emission reduction type: CO_2

Description : On September 27, 2022, the Cabinet of Ministers adopted Resolution No. 848-r "On the Creation by the state enterprise "National nuclear energy-generating company "Energoatom" network of high-speed car electric charging stations" (Official Gazette of Ukraine 2022, No. 80, p. 4873). Energoatom planned to create a network of 120 electric car charging stations in two years: 40 high-power (160+ kW) and 80 medium-power (60+ kW) in regional centers and on the main highways of Ukraine[63]. However, due to the full-scale invasion of the Russian Federation, the implementation schedule of this project was postponed.

Within the framework preparation for implementation of the project Energoatom done the following:

- analyzed modern market electric transport and chargers stations;
- prepared the project of requirements and main technical characteristics;
- optimal sites for the location of the stations have been identified, negotiations have begun with the owners/managers of the relevant land plots;
- prepared and agreed on the full kit of tender documentation for conducting procurement;
- done previous economic calculations for different the degree of network utilization;
- networks, prepared the first version of the investment project.

Key factors influencing the investment attractiveness and effectiveness of the project and which cannot be assessed during the large-scale armed aggression of the Russian Federation against Ukraine have been identified, namely: forecast development of the electric car market, the degree of network utilization, the cost of electricity that the electric charging station will consume.

The determination of these issues will become possible after the end of martial law and will require regulation. As of today, seven automobile electric charging stations (one with a capacity of 60 kW, four with a capacity of 44 kW, two with a capacity of 22 kW) are installed and operated by branches of JSC "NNEGC "Energoatom".

In March 2023, the Law of Ukraine No. 2956-IX of February 24, 2023 "On Some Issues of the Use of Vehicles Equipped with Electric Engines and Amendments to Some Laws of Ukraine on Overcoming Fuel Dependence and the Development of Electric Charging Infrastructure and Electric Vehicles" came into force. According to this Law, ensuring the development of electric vehicles and the infrastructure of electric vehicle charging stations are identified as a priority in the formation of state policy in the field of road transport. The concept of an electric vehicle covers both an electric passenger car and an electric truck equipped exclusively with electric motors (one or more) and an electric energy storage system.

[63] https://www.mev.gov.ua/ №vyna/enerhoatom-stvoryt-merezhu-shvydkisnykh-avtomobilnykh-elektrozaryadnykh-stantsiy

According to current building codes (DBN V.2.3-15:2007. Parking lots and garages for passenger cars) at least 5% of the total number of parking spaces in parking lots and parking lots must be provided for parking electric vehicles. Such spaces may be equipped with charging stations.

In accordance with the Law of Ukraine dated February 24, 2023 No. 2956-IX "On some issues of the use of vehicles equipped with electric engines and amendments to certain laws of Ukraine on overcoming fuel dependence and developing electric charging infrastructure and electric vehicles" by December 31, 2023, state authorities and local governments were to approve programs for the development of electric charging infrastructure, which provide for the provision of facilities under state or municipal ownership property, electric vehicle charging stations in existing parking lots, garages and other parking spaces (except for those used exclusively by such bodies, or by state or municipal legal entities) in accordance with building codes. In accordance with such programs, legal entities, the sole participant (founder) of which is the state and municipal commercial enterprises, business entities of the public sector of the economy, had to provide existing facilities owned by such entities or assigned to them on the right of economic management, by December 31, 2024, the necessary contractual capacity and electric vehicle charging stations in existing parking lots, garages and other parking spaces (except those used exclusively by such entities).

The Law of Ukraine on Electric Transport provides that projects for new construction of multi-storey residential buildings must take into account the need to provide at least 50% of parking spaces for electric vehicles with charging stations. It is also envisaged to develop electric charging infrastructure for existing buildings: associations of co-owners of apartment buildings have the right to equip charging stations on the premises and independently determine the procedure for using and paying for such stations.

In addition, it is planned to harmonize national legislation with Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU (AFIR) by 2028.

Ministry of Energy created[64] and made public in October 2025 year interactive map of favorable locations for the placement of charging stations for electric vehicles[65] , which takes into account the provisions of the Regulation (EU) 2023/1804 of European Parliament and Councils from 13 September 2023 on the deployment of alternative fuels infrastructure, which repealed Directive 2014/94/EU. The map was created in cooperation with distribution system operators and electromobility specialists. It contains information on the most promising points for the installation of new charging stations or complexes, taking into account the available capacity and will contribute to the effective planning of the development of a network of charging stations on international, national, regional and territorial roads. Today, the Ministry of Energy, within the limits of available resources and capabilities, promotes the establishment of effective cooperation between business and distribution system operators to develop electric charging infrastructure.

In order to assess the current state of the electric transport market and charging infrastructure in Ukraine and identify key user needs, on September 19, 2025, the Ministry of Development and Trade launched a national survey on electromobility[71] . The survey results will form the basis for the development of the Concept of State Policy in the field of development of charging station infrastructure for electric vehicles, the development of which is provided for in the action plan of the National Renewable Energy Action Plan.

PM_D_WEM_23 Stimulating the development of low-carbon municipal transport

Goal: Reduce the consumption of fossil fuel and energy resources by the transport sector

Legal basis: Law of Ukraine No. 2956-IX of February 24, 2023 "On some issues of the use of vehicles equipped with electric engines and amendments to some laws of Ukraine on overcoming fuel dependence and the development of electric charging infrastructure and electric vehicles"

[64] https://www.mev.gov.ua/novyna/minenerho-stvorylo-interaktyvnu-kartu-spryyatlyvykh-mists-roztashuvannya-zaryadnykh-stantsiy
[65] https://tinyurl.com/yva2bzvd

Time frame: 2023-2036

Type of policy / measure: Regulatory

Sector(s) affected: Transport

Responsible bodies/organizations: Ministry of Development

Emission reduction type: CO_2

Description: The Law of Ukraine of June 29, 2004 No. 1914-IV "On Urban Electric Transport" provides for the gradual replacement of municipal transport with low-carbon alternatives. On urban bus routes in cities with a total population of over 250 thousand people, the number of electric buses and/or buses operating exclusively on methane (compressed or liquefied) or biogas, and/or buses with a hydrogen fuel cell as a percentage of the bus fleet must be no less than:

- 25% on January 1, 2030 ;
- 50% on January 1, 2033.

In addition, passenger transportation on public city bus routes in the mode of regular passenger transportation in cities of the district and of regional importance from January 1, 2036, only electric buses or buses operating exclusively on methane (compressed or liquefied) or biogas, and/or buses with a hydrogen fuel cell.

However, local governments have the opportunity to revise these shares (but not by more than 50%) and terms (not more than two years).

Gradual restrictions on the purchase of buses with internal combustion engines for use in public transport will be introduced from January 1, 2028. Cities that have urban electric transport will need to upgrade their vehicles to new energy-efficient ones.

3.1.3.4. Where applicable, national policies, timelines and measures planned to phase out energy subsidies, in particular for fossil fuels

According to Ukraine Plan, approved by order of Cabinet Ministers of Ukraine from 18 March 2024 No. 244 (Official Gazette of Ukraine, 2024 p., No. 32, p. 2035), the development and approval of the Roadmap for the gradual liberalization of the gas and electricity markets by the Cabinet of Ministers of Ukraine is envisaged by the 2nd quarter of 2026.

Concrete steps regarding reforming energy subsidies, in particular, for fossil fuels, presented under the Internal Energy Market dimension (PM_IM_WEM_03, PM_IM_WEM_04, PM_IM_WAM_03, PM_IM_WAM_04).

3.2. Dimension energy efficiency

Planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2, including planned measures and instruments (also of a financial nature) to promote the energy performance of buildings, in particular with regard to the following:

3.2.1. Energy efficiency obligation schemes and alternative policy measures under Articles 7a and 7b and Article 20(6) of Directive 2012/27/EU as adapted and adopted by Ministerial Council Decisions 2015/08/ MC-EnC, 2021/14/MC-EnC and 2022/02/MC-EnC, and to be prepared in accordance with Annex III to this Regulation

The Law of Ukraine “On Energy Efficiency” provides for an alternative approach to the implementation of Article 7 of Directive 2012/27/EU. The achievement of the target of annual energy consumption reduction is ensured in the following ways:

- implementation activities By the Foundation energy efficiency and others funds;
- implementation state targeted programs in field software energy efficiency;
- adoption of standards, norms and rules regarding increasing energy efficiency efficiency of goods Law of Ukraine on electric transport and services, including buildings and vehicles, the requirements of which exceed the requirements of European

standards, norms and rules that are mandatory in accordance with acts of European Union legislation, decisions of the Energy Community;

- introduction of requirements for energy labeling and ecodesign of energy-consuming products for which requirements are not established in accordance with the norms of European Union legislation and decisions of the Energy Community;
- implementation of other measures, the result of which is to ensure an annual reduction in energy consumption.

Within the framework of the implementation of this policy, the following instruments are available or planned: PM_EE_WEM_01 Activities of the Energy Efficiency Fund; PM_EE_WEM_02 State Fund for Decarbonization and Energy Efficient Transformation; PM_EE_WAM_01 Energy Efficiency Obligation Scheme; PM_EE_WAM_02 Implementation of the State Targeted Economic Program to Support Thermal Modernization buildings to 2030 year; PM_EE_WAM_10 Realization State target economic program for energy modernization of enterprises - thermal energy producers, which are in state or municipal ownership, for the period until 2030.

PM_EE_WEM_01 Energy Efficiency Fund

Goal: Support for energy efficiency initiatives, implementation of incentive instruments and support for the implementation of measures to improve the energy performance of buildings and promote energy savings, particularly in the residential sector.

Legal basis: Law of Ukraine "On the Energy Efficiency Fund"

Timeframe: Since 2018

Policy measure type: Economic

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): Energy Efficiency Fund (upon consent), MinDevelopment

Type of emission reduction: CO_2

Description:

a) Enerhodim Program

The Fund provides partial reimbursement of the costs of energy efficiency measures under the Fund's Enerhodim Program.

In accordance with the Law of Ukraine "On the Energy Efficiency Fund", the Fund provides grants exclusively to homeowners associations of multi-apartment buildings (HOAs).

The establishment of an HOA is not mandatory in Ukraine. According to the State Statistics Service, as of January 1, 2025, 40,725 HOAs were registered[66] while the total number of multi-apartment buildings was approximately 180 thousand. Pursuant to the Law of Ukraine No. 3270-IX of July 14, 2023, "On Amendments to Certain Laws of Ukraine Regarding the Simplification of Multi-Apartment Building Management", as a general rule, an HOA decision is considered adopted if it receives the support of co-owners holding more than half of the total number of votes of all co-owners.

An HOA may increase the required number of votes (up to 67 percent of the total number of votes of all co-owners) for decisions concerning the following issues: election of the governing bodies of the association, change of the management model, establishment and modification of contributions/payments, and approval of the budget estimate.

Beneficiaries of the Fund may choose one of two packages of energy efficiency measures for implementation in their building: the Light Package or the Comprehensive Package.

The Light Package (Package A) includes the following mandatory measures:

- installation of a building-level thermal energy meter;
- installation or modernization of an individual heating substation (IHS).

In addition, HOAs may receive partial reimbursement of the cost of implementing additional measures specified under the Enerhodim Program.

[66] https://www.ukrstat.gov.ua/edrpoy/ukr/EDRPU_2024/ks_opfg/ks_opfg_s_0124_ue.xls

The Comprehensive Package (Package B) includes the following mandatory measures:

- mandatory measures under Package A;
- thermal insulation and/or replacement of pipelines of the internal heating system and domestic hot water supply system in unheated premises;
- installation of automatic (balancing) valves;
- replacement or repair of external doors and/or construction of entrance vestibules; replacement or repair of windows in the common areas of the building.

Similarly to Package A, HOAs may obtain a grant for the implementation of additional (non-mandatory) measures specified by the Program. The amount of partial reimbursement of the cost of energy efficiency measures (grant) varies depending on the date of application submission (an increased grant amount is available for the first 500 applications) and the selected package of measures. The current grant levels are:

- 70% of the cost of the preliminary energy audit; preparation of design documentation and its expert review; technical supervision and author supervision services; energy performance certification after project implementation; and inspection of the building engineering systems where energy efficiency measures have been implemented during project implementation – for both packages of measures;
- 60% of the cost of works, equipment, and materials – for Package A;
- 70% of the cost of works, equipment, materials – for Package B[67].

The Government plans to gradually reduce the share of reimbursement for energy efficiency measures following the termination/cancellation of martial law[68] .

Grants are provided by the Energy Efficiency Fund in separate tranches after completion of the relevant stage of the project and its verification by the Fund. HOAs may receive partial advance financing for construction works provided that the contractors selected by the HOA are confirmed to comply with the Fund's requirements established under the Enerhodim Program.

The program is expected to achieve an average level of energy savings across all projects financed under the Enerhodim Program of at least 20 percent. The amount of energy savings resulting from the implementation of energy efficiency measures is determined in accordance with the Methodology for Calculating Energy Savings Resulting from Energy Efficiency Measures Financed by the State Institution "Energy Efficiency Fund", approved by CMU Resolution No. 149 of February 28, 2018.

Results: The main results of the Enerhodim Program as of the end of 2024 are presented in the table below.

Table 3.1. Main results of the Enerhodim Program for 2019-2024

Name	2019 year	2020 year	2021 year	2022 year	2023 year	2024 year	Total
Number of completed Projects, units	0	1	32	72	33	76	**214**
Grant amount paid, million UAH	0.04	7.02	143.79	585.58	344.15	595.88	**1,676.47**

[67] https://eefund.org.ua/documents/programa-pidtrymky-energomodernizaczyiy-bagatokvartyrnyh-budynkiv-energodim-redakcziya-vid-24-grudnya-2024-roku/

[68] Operating plan events from implementation in 2024-2026 years Long-term strategies thermal modernization of buildings for the period until 2050. https://zakon.rada.gov.ua/laws/show/1228-2023-p#Text

The heated area of apartment buildings in completed Projects, m2	0	12.49	169.49	493.57	213.82	449.09	**1,338.46**
Annual and cumulative value savings energy, MWh	0	2.69	7,376	36,969	65,669	84,489	**194,507**

b) VidnovyDim Program

In August 2022, amendments were introduced to the Law of Ukraine "On the Energy Efficiency Fund", enabling the Fund to finance not only energy efficiency measures but also programs related to the restoration of buildings destroyed and/or damaged as a result of armed aggression. In November 2022, a new Fund Program, VidnovyDim, was launched.

Participants in this Program are also exclusively homeowners associations of multi-apartment buildings (HOAs).

Financing under the VidnovyDim Program is provided for the implementation of the following types of works (services):

- replacement or repair of damaged windows, external doors, and internal vestibule doors;
- repair of damage to building façades;
- repair of damage to roof structures/building roofing;
- repair of damaged rooftop boiler house equipment and engineering networks;
- installation of individual heating substations (IHSs);
- repair and restoration of interior finishes in entrance halls and stairwells;
- installation of accessibility facilities for persons with reduced mobility (ramps and/or lifts);
- emergency stabilization construction works;
- technical supervision services.

Financing is provided for construction works, as well as for the procurement of materials and equipment necessary for carrying out such works. Such financing is provided in the form of a grant covering 100% of the cost of eligible project expenditures, but not exceeding UAH 7.2 million.

Table 3.2. Main results of the VidnovyDim Program for 2022–2024

Name	2022 year	2023 year	2024 year	Total
Number of completed Projects, number	0	57	250	**307**
Grant amount paid, million UAH	10.6	300.7	824.5	**1135.7**
The heated area of apartment buildings in completed Projects, thousand m2	0	216.2	1440.9	**1657.1**

Financing: Ensuring annual improvements in the energy efficiency of energy consumption through the activities of the Energy Efficiency Fund largely depends on stable state funding. At the same time, expenditures for the operation of the Fund were not provided for in the State Budget for 2020, nor for 2023–2024. In 2025, UAH 240 million was allocated to the Fund from the State Budget.

It should be noted that, based on the results of January–September 2025, approximately 70 percent of State Budget expenditures were directed toward defense and the maintenance of public order, which complicates the financing of development projects under current

conditions.

The Strategy of the Energy Efficiency Fund envisages that, under the implementation of the Enerhodim Program, more than 800 projects will be completed by the end of 2026, achieving an average energy savings level of 20%, while 300 projects will remain under implementation[69].

The expected volume of CO_2 emissions reductions exceeds 120 thousand tonnes per year. Under the VidnovyDim Program, more than 1,000 buildings are planned to be restored by the end of 2026[70].

Planned measures:

- Ensuring the sustainable operation of the Energy Efficiency Fund's Enerhodim and VidnovyDim programs – annually.

PM_EE_WEM_02 State target economic program to support thermal modernization of buildings until 2030

Goal: Co-financing of projects (measures) that result in CO_2 emissions reductions.

Legal basis: Budget Code of Ukraine; CMU Resolution No. 761 of June 21, 2024, "On Approval of the Procedure for the Use of Funds of the State Decarbonization and Energy Efficiency Transformation Fund" (Official Bulletin of Ukraine, 2024, No. 63, Art. 3747).

Timeframe: Since 2023

Policy measure type: Economic

Sector(s) affected: Energy – supply; Energy – consumption; Industrial processes

Responsible authority(ies)/organisation(s): Decarbonization Fund (upon consent), SAEE

Type of emission reduction: CO_2

Description: In May 2023, amendments to the Budget Code of Ukraine entered into force, providing for the establishment of the State Decarbonization and Energy Efficiency Transformation Fund.
The Budget Code provides that the resources of this Fund may be allocated to:

- financing measures and state target programs in the field of energy efficiency, increasing the use of renewable energy sources (RES) and alternative fuels, and reducing CO_2 emissions;
- financing compensation, reimbursement, and reduction of obligations of individuals and legal entities under credit and leasing agreements concluded for the implementation of energy efficiency measures, energy service projects, increased use of RES and alternative fuels, and CO_2 emissions reductions;
- fulfillment of debt obligations related to borrowings obtained by the state for the implementation of investment projects in the field of energy efficiency, increased use of RES and alternative fuels, and CO_2 emissions reductions.

The Decarbonization Fund commenced operations in 2024.

The functioning of the State Decarbonization and Energy Efficiency Transformation Fund is ensured through the Joint Stock Company "Ukraine Decarbonization Fund", 100 percent of whose shares are state-owned (hereinafter – the Decarbonization Fund), while SAEE exercises the functions of managing the state's corporate rights in the company.

The mechanism for providing funds from the Decarbonization Fund and the detailed list of eligible financing measures are regulated by the Procedure for the Use of Funds of the State Decarbonization and Energy Efficiency Transformation Fund, approved by CMU Resolution No. 761 of June 21, 2024 (hereinafter – the Procedure).

Recipients of state support may include individual entrepreneurs, legal entities, homeowners

[69] https://rp.gov.ua/upload-files/Activity/Collegium/2025/28-5_2025/Vysn_28-5_2025.pdf
[70] https://eefund.org.ua/wp-content/uploads/2024/01/strategiya-fondu-energoefektyvnosti-2024-2026-povna- versiya-1.pdf

associations of multi-apartment buildings (HOAs), housing construction cooperatives, service cooperatives, state-owned or municipal enterprises, and local self-government bodies.

The Fund provides direct state support through the following instruments:

- lending for measures under projects in the fields of energy efficiency, increased use of renewable energy sources and alternative fuels, and reduction of carbon emissions;
- financial leasing of equipment;
- factoring financing for borrowers under loans in the fields of energy efficiency, increased use of RES and alternative fuels, and reduction of carbon emissions, or for energy service providers;
- provision of financing in 2025 and 2026 for energy performance certification and/or energy audits of facilities held on the balance sheet (or under the ownership) of ministries, other central executive authorities, as well as state unitary enterprises, institutions, and organizations within their sphere of management, and business entities in which more than 50 percent of shares (stakes) are state-owned (hereinafter – institutions);
- financing in 2025 and 2026 for the installation at facilities held on the balance sheet (or under the ownership) of institutions of photovoltaic modules together with hybrid inverters and energy storage systems with a capacity of at least 1 kWh for each 1 kW of installed generating capacity;
- financing in 2026 for the procurement and delivery of portable charging stations with an approximate capacity of 2 kWh for children with disabilities of subgroup A.

State support is also provided through the reduction of the cost of obligations under credit agreements concluded between business entities and authorized banks with a state ownership share exceeding 50 percent that have entered into a cooperation agreement with SAEE, for the implementation of projects aimed at improving the energy efficiency of production processes, energy modernization of heat-producing enterprises and water supply and wastewater enterprises, implementation of energy service projects, and realization of projects involving alternative fuels and renewable energy sources.

Ninety-five percent of the Fund's total budget is allocated to the provision of direct state support by the Fund, while five percent is allocated to the subsidization of loans provided by state-owned banks.

Practical implementation of the Procedure began in August 2024 after the Fund obtained an NBU lending license and was entered into the register of financial companies. On September 20, 2024, the first concessional loan was issued for a street lighting energy service project in the city of Voznesensk, Mykolaiv Oblast.

Table 3.2. Main results for 2022-2024

Name indicator	2024 year	2025 year
Loans provided, UAH million	180.89	1385.65
Projects financed, number	17	57
Planned energy savings, toe	614.4	11 015.2

In 2024–2025, financing was provided for 32 renewable energy projects, 27 energy service (ESCO) projects, 6 cogeneration projects using alternative fuels, 4 cogeneration projects, 3 energy storage systems, 1 industrial energy efficiency improvement project, and 1 building thermal modernization project. The combined result of the implemented measures is more than 135 thousand MWh of potential annual savings in electricity and thermal energy consumption and a reduction in carbon emissions of nearly 40 thousand tonnes per year, contributing to Ukraine's commitment under the Paris Agreement.

Financing: The authorized capital of the Decarbonization Fund is replenished through allocations from the CO_2 emissions tax (a component of the environmental tax), state borrowings, and other revenues. The State Budget for 2025 provided financing for the

Decarbonization Fund in the amount of UAH 1.75 billion. Total budget appropriations amounted to UAH 2.17 billion, while the Fund utilized UAH 1.52 billion.

Planned measures: Ensuring sustainable financing of the Decarbonization Fund – annually.

Given that the primary source of financing for the Decarbonization Fund is the CO_2 emissions tax, the transition from taxation of actual CO_2 emissions volumes to taxation of fossil fuel extraction (or import) volumes (oil, gas, coal, etc.) based on their carbon content will have a direct impact on the Fund's financing levels (see PM_D_WEM_01 Environmental Tax on CO_2 Emissions). The introduction of a market-based carbon pricing mechanism will also affect the Fund's financing (see PM_D_WAM_02 National Greenhouse Gas Emissions Trading System).

PM_EE_WAM_01 Energy efficiency obligation scheme

Goal: Implementation of energy efficiency measures under market-based conditions.

Legal basis: Law of Ukraine "On Energy Efficiency"; CMU Ordinance No. 1125 of October 10, 2025, "On Approval of the Annual Energy Savings Target" (Official Bulletin of Ukraine, 2025, No. 87, Art. 6101).

Timeframe: During the period determined by the CMU

Policy measure type: Economic

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment, SAEE

Type of emission reduction: CO_2

Description: The Law of Ukraine "On Energy Efficiency" provides for the possibility of introducing an energy efficiency obligation scheme. The relevant provisions may be activated by the CMU subject to the following stages:

- the CMU approves an end-use energy savings target (hereinafter – the target);
- to achieve the target, organizational, economic, and legal measures to promote energy efficiency are implemented, the Energy Efficiency Fund carries out its activities, and other mechanisms may be introduced;
- SAEE conducts monitoring and evaluation of the achievement of the target;
- if the target is not achieved, SAEE informs the CMU accordingly;
- the CMU adopts a decision on the introduction of the procedure governing the operation of the energy efficiency obligation scheme.

The Law of Ukraine "On Energy Efficiency" designates electricity suppliers and natural gas suppliers as obligated parties. Obligated parties may comply with the requirements of the scheme through:

- independent implementation of eligible energy efficiency measures at the level of final energy consumers;
- engagement of energy service providers and other business entities to implement energy efficiency measures;
- payment of a contribution to the Energy Efficiency Fund.

The lists of eligible measures under the energy efficiency obligation scheme, the determination of energy savings targets for individual obligated parties, and the procedure for monitoring achieved energy savings will be regulated through secondary legislation.

The expected cumulative and annual amount of energy savings, the duration of the energy efficiency obligation scheme period(s), target sectors, the share of energy savings to be achieved in households affected by energy poverty, the volume of energy savings achieved by energy service providers or other third parties, and the possibilities for the use of borrowed funds have not yet been determined, as the energy efficiency obligation scheme has not been introduced.

Planned measures: MinDevelopment is carrying out analytical work to prepare regulatory acts governing the energy efficiency obligation scheme.

3.2.2. Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, including policies, measures and actions to stimulate cost-effective deep renovation and policies and actions to target the worst performing segments of the national building stock, in accordance with Article 2a of Directive 2010/31/EU as adapted and adopted by Ministerial Council Decisions 2010/02/MC-EnC, and 2021/14/MC-EnC

PM_EE_WEM_03 State target economic program to support thermal modernization of buildings until 2030

Goal: Achievement of long-term objectives in the field of improving the energy performance of buildings.

Legal basis: Law of Ukraine "On the Energy Performance of Buildings"; Building Thermal Modernization Strategy 2050; CMU Ordinance No. 694 of July 14, 2025, "On Approval of the State Target Economic Program for Support of Building Thermal Modernization until 2030" (Official Bulletin of Ukraine, 2025, No. 64, Art. 4425).

Timeframe: 2024–2030

Policy measure type: Economic

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment, SAEE

Type of emission reduction: CO_2

Description: To ensure the achievement of the objectives of the first phase of the Building Thermal Modernization Strategy 2050, the CMU approved the State Target Economic Program for Support of Building Thermal Modernization until 2030 (hereinafter – the Building Thermal Modernization Support Program).

The Building Thermal Modernization Support Program establishes the following objectives:

- Objective 1. Promoting improvements in energy efficiency in the residential sector;
- Objective 2. Ensuring the exemplary role of public authorities in improving the energy performance of buildings;
- Objective 3. Encouraging local self-government bodies to improve the energy performance of buildings;
- Objective 4. Implementation of energy management systems;
- Objective 5. Ensuring proper collection and analysis of data on the energy and operational performance of buildings;
- Objective 6. Creating a favorable market environment for building thermal modernization;
- Objective 7. Raising public awareness of energy efficiency in buildings.

Under Objective 1, aimed at improving energy efficiency in the residential sector, the Building Thermal Modernization Support Program provides for the expansion of state support instruments for the implementation of energy efficiency projects for different categories of society, taking into account the achieved level of energy performance. In particular, support is envisaged for owners of individual residential buildings to implement energy efficiency measures or renewable energy measures. Support is also envisaged for the construction of nearly zero-energy individual residential buildings for owners whose buildings were destroyed as a result of military actions.

For co-owners of multi-apartment buildings, support is envisaged for the reconstruction (modernization) or major repair of heating and domestic hot water systems in buildings connected to district heating systems. Regardless of the building category, the Program provides for incentives for the installation of heat pumps, solar power systems, and mechanical ventilation systems with heat recovery. The Program also provides support for the implementation of energy-efficient lighting in apartments, common areas, and adjacent

territories of both multi-apartment and individual residential buildings.

To ensure the exemplary role of public authorities in improving the energy performance of buildings (Objective 2), the Building Thermal Modernization Support Program provides for energy performance certification of buildings occupied by public authorities, implementation of priority energy efficiency measures or building thermal modernization projects for public authority buildings, and the construction (reconstruction) of public authority buildings in compliance with the requirements for nearly zero-energy buildings. The Program also envisages incentives for the installation of heat pumps, solar power systems, mechanical ventilation systems with heat recovery, and energy-efficient lighting.

Under Objective 3, local self-government bodies are encouraged to implement measures similar to those envisaged under Objective 2.

Objective 4 provides for the implementation of energy management systems by public authorities and by enterprises, institutions, and organizations within their sphere of management, the implementation of such systems by local self-government bodies, certification of energy management systems, and encouragement of local energy planning by local self-government bodies.

Objective 5 is aimed at establishing an analytical foundation in the field of energy efficiency. In accordance with this objective, analytical studies (surveys) of the national stock of residential and public buildings will be conducted, and the operation of the National Database of Energy and Operational Performance of Buildings will be ensured. In addition, this objective provides for the installation of commercial metering units for thermal energy supply and domestic hot water supply services in state-owned buildings.

Objective 6 is aimed at stimulating business activity. It provides for partial state guarantees and reimbursement of a portion of interest payments on loans obtained by microenterprises and small enterprises that carry out or plan to carry out economic activities in the field of building thermal modernization, for the financing of building thermal modernization projects. The Program also promotes the development of manufacturing of energy-efficient equipment and energy-saving construction products in Ukraine.

To increase public awareness of opportunities for building thermal modernization (Objective 7), the Program provides for public information campaigns and promotion of the benefits of building thermal modernization and state support programs for building thermal modernization through mass media, as well as educational and awareness-raising activities targeted at citizens of different age groups and audiences. These activities are intended to foster responsible attitudes and motivation toward improving energy and resource efficiency, developing energy-saving behavior, and related objectives.

Financing: The projected financing volume of the Program amounts to UAH 205.1 billion over its entire implementation period (until 2030), of which UAH 58.6 billion is planned to be financed from the State Budget, UAH 44 billion from local budgets, and the remaining amount is expected to be attracted from other sources (including funds from foreign financial institutions, international financial organizations, and technical assistance programs, among others).

Planned measures: The expected results of Program implementation in the residential sector are presented in the table below. At the same time, the results related to financial incentives for the implementation of specific policy instruments are presented in the descriptions of those policies (see PM_EE_WEM_06 Nearly Zero-Energy Buildings, PM_EE_WEM_07 Energy Performance Certification of Buildings and Inspection of Building Technical Systems, and PM_EE_WEM_08 Exemplary Role of Public Authority Buildings).

In addition, financing of the Program is planned to be ensured for subsequent budget periods starting from 2026.

Table 3.5. Expected Results of the Building Thermal Modernization Support Program in the Residential Sector.

Name indicator	Value indicator	
		by years

	total	2025	2026	2027	2028	2029	2030
Individual residential buildings, in which have been carried out thermal modernization, units	51276			700	9250	17800	25000
Individual residential buildings, affected because of combat actions, in which have been thermally modernized to the level of buildings with a close to zero level consumption energy, units	941			45	149	297	450
Multi-apartment houses, in whose thermal modernization carried out, units	5875		450	450	825	1650	2500
Apartment buildings that have been modernized engineering systems, units	588		45	45	83	165	250
Houses, in whose installed heat pumps, units	9025			70	1485	2970	4500
Houses, in whose installed solar power plants, units	9025			70	1485	2970	4500
Households, which established energy-efficient ventilation systems in multi-apartment and individual residential buildings, units	46170			400	7590	15180	23000
Households, which established energy-efficient indoor lighting systems for apartments and common areas use and house-related territories apartment buildings residential buildings, units	46170			400	7590	15180	23000
Households that have installed energy-efficient in-house systems lighting and systems lighting of the adjacent territory of individual (manor) houses, units	46170			400	7590	15180	23000

3.2.3. Description of policy and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers that impede the uptake of energy performance contracting and other energy efficiency service models

PM_EE_WEM_04 Energy service in public sector

Goal: Attracting financing for the implementation of energy efficiency measures in state-owned and municipal assets.

Legal basis: Law of Ukraine "On the Introduction of New Investment Opportunities, Guaranteeing the Rights and Legitimate Interests of Business Entities for Large-Scale Energy Modernization"; Law of Ukraine "On Public Procurement"; Budget Code of Ukraine; Law of Ukraine "On Energy Efficiency"; CMU Resolution No. 1178 of October 12, 2022, "On Approval of the Peculiarities of Public Procurement of Goods, Works and Services for Contracting Authorities Provided for by the Law of Ukraine 'On Public Procurement', for the Period of the Legal Regime of Martial Law in Ukraine and Within 90 Days Following Its Termination or Cancellation" (Official Bulletin of Ukraine, 2022, No. 84, Art. 5176).

Timeframe: Since 2015

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment; SAEE

Type of emission reduction: CO_2

Description: In 2015, the framework for the provision of energy services for state-owned and municipal assets (buildings, structures, groups thereof, public improvement assets and/or

their elements) was established. At the same time, amendments were made to the Budget Code of Ukraine allowing budgetary institutions to undertake long-term energy service obligations.

Energy service contracts are concluded through public procurement procedures using the Prozorro electronic procurement system. The main criterion for selecting a tender proposal is the energy service contract performance indicator, defined as the cumulative value over a twenty-year period of the discounted differences between the customer's annual cost savings and the annual payments to the energy service provider.

The CMU has approved a model energy service contract that serves as a reference document for budgetary institutions and investors.

The Law of Ukraine "On Energy Efficiency" expanded the scope of energy service contracts to include engineering infrastructure systems integrated within a single technological cycle, as well as their individual energy-consuming equipment. The Law also provides that public authorities and local self-government bodies must assess the possibility of concluding an energy service contract when procuring electricity supply, natural gas supply, thermal energy supply, and hot water supply services. Such assessment is to be carried out in accordance with a methodology to be approved by MinDevelopment.

In accordance with the Licensing Conditions for Conducting Business Activities in the Field of Heat Supply, approved by NEURC Resolution No. 308 of March 22, 2017, business entities engaged in thermal energy transprtation must refrain from taking any actions that hinder the implementation of energy service projects and other energy efficiency measures, impede the development of energy service markets and other energy efficiency markets, including through delays in issuing technical conditions for network connection, abuse of monopoly position, unfair competition, creation of obstacles to competition, or obtaining unlawful competitive advantages, as provided by law.

SAEE ensures the operation of information databases of potential energy service assets and energy service providers. However, during the period of martial law and until its termination, open access to these information databases has been temporarily restricted.

As of December 2025, 793 energy service contracts had been concluded in Ukraine with a total value of UAH 3.59 billion.

According to UNDP, [77] the market for energy performance contracts in Ukraine consists of 41 ESCOs, although approximately 68 percent of the total contract value is concentrated among five market participants.

Barriers to the wider use of energy service contracts include limited access of ESCOs to credit financing and the high cost of borrowed funds. Following the full-scale invasion of Ukraine by the Russian Federation, access to credit resources declined, the cost of equipment and materials increased, and the overall risks associated with business activities rose significantly. As a result, the pace of concluding energy service contracts in Ukraine decreased substantially. Consequently, the energy service mechanism required state support to ensure its continued operation.

For this purpose, in 2023 and 2024 the CMU established peculiarities of public procurement of goods, works, and services during the period of martial law in Ukraine and within 90 days following its termination or cancellation[71], providing significant simplifications and easing of procedures for concluding energy service contracts during this period, namely:

- simplification of the procedure for determining the baseline level of consumption of fuel and energy resources and housing and utility services;
- introduction of the possibility of withholding certain procurement information from publication in the electronic procurement system;
- expansion of the list of cases in which energy service procurement may be carried out through the conclusion of an energy service contract without the use of open tender procedures;
- removal of the requirement for contracting authorities to submit the essential terms of energy service contracts to SAEE (for state-owned assets), the Verkhovna Rada of the Autonomous Republic of Crimea, or the relevant local council (for municipal assets);

[71] https://www.undp.org/sites/g/files/zskgke326/files/2023-05/ukrainian.pd

- expansion of the powers of budget managers responsible for assets subject to energy service procurement, allowing them to undertake long-term energy service obligations without approval of the essential terms of energy service contracts by SAEE (for state-owned assets), the Verkhovna Rada of the Autonomous Republic of Crimea, or the relevant local council (for municipal assets).

Results: Despite the full-scale invasion, the number of energy service contracts concluded in Ukraine continues to grow, demonstrating adaptation to the challenging wartime conditions. While in 2021, 129 tenders were conducted and 28 contracts were concluded with a total value of UAH 113.89 million (approximately EUR 3.88 million), by 2025 these indicators had increased significantly, with 188 tenders conducted and 81 contracts concluded with a total value of UAH 959.94 million (approximately EUR 18.81 million). This corresponds to nearly a threefold increase in the number of contracts and more than an eightfold increase in their financial volume.

At the same time, energy service contracts have become highly demanded as an instrument for the construction of renewable energy generation facilities aimed at ensuring reliable energy supply under attacks by the Russian Federation on energy infrastructure, whereas the use of this instrument for deep building thermal modernization remains limited.

Fig. 3.1. Dynamics of tender procedures for the conclusion of energy service contracts during 2017-2025.



Fig. 3.2. Dynamics of concluding energy service contracts and their total cost for 2017-2024 .



The Law of Ukraine “On Amendments to Certain Legislative Acts of Ukraine Regarding the Improvement of the Functioning of Energy Markets, Competitive Conditions for Electricity Generation from Renewable Energy Sources, and Strengthening Energy Resilience” expanded the scope of energy service contracts for legal entities operating under

regulated tariffs to include measures such as renewable energy projects and the installation of energy storage systems.

Planned measures: Continued operation of the energy service mechanism.

3.2.4. Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2 (for example measures to promote the exemplary role of public buildings and energy-efficient public procurement, measures to promote energy audits and energy management systems, consumer information and training measure, and other measures to promote energy efficiency)

PM_EE_WEM_05 Minimum energy performance requirements for buildings

Goal: Establishment of the maximum permissible energy consumption per unit of area or volume in new and existing buildings.

Legal basis: Law of Ukraine "On the Energy Efficiency of Buildings"; MinRegion Order No. 170 of July 11, 2018, "On Approval of the Methodology for Determining the Cost-Optimal Level of Energy Performance of Buildings", registered with the Ministry of Justice on July 16, 2018, under No. 822/32274; MinRegion Order No. 260 of October 27, 2020, "On Approval of the Minimum Energy Performance Requirements for Buildings", registered with the Ministry of Justice under No. 825/32277.

Timeframe: Since 2021

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment

Type of emission reduction: CO_2

Description: The minimum energy performance requirements for buildings are calculated on the basis of the cost-optimal level and are reviewed at least every five years.

The maximum values of specific energy consumption for heating and cooling of residential buildings must range from 65 to 120 kWh/m², depending on the number of storeys and the climatic zone. In the case of reconstruction or major renovation, a correction factor of 1.2 is applied to these values.

The current minimum requirements were adopted in 2020 and entered into force in January 2021.

The minimum requirements do not apply to construction works involving the restoration of individual building structures and facilities for the purpose of eliminating the consequences of emergency situations (accidents) and restoring the functioning of facilities intended to ensure the essential needs of the population, provided that their geometric dimensions are not altered.

According to the Building Thermal Modernization Strategy 2050, at least 36% of residential buildings should comply with the minimum energy performance requirements for buildings by 2030; this share should increase to 71% by 2040.

Planned measures: MinDevelopment plans to introduce amendments to the legislation of Ukraine for the transposition of the requirements of Directive (EU) 2024/1275 on the energy performance of buildings by the end of the fourth quarter of 2027. Subsequently, the Methodology for Determining the Cost-Optimal Level of Energy Performance of Buildings will be updated and revised minimum energy performance requirements for buildings will be adopted.

PM_EE_WEM_06 Nearly zero-energy buildings

Goal: Encouraging the construction and thermal modernization of buildings with the highest level of energy efficiency.

Legal basis: Law of Ukraine "On the Energy Efficiency of Buildings"; NZEB Concept; Building Thermal Modernization Support Program; MinDevelopment Order No. 168 of February 6, 2025, "Certain Issues of Introducing Requirements for Nearly Zero-Energy Buildings", registered with the Ministry of Justice on February 21, 2025, under No. 284/43690.

Timeframe: Since 2025

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment

Type of emission reduction: CO_2

Description: In implementation of the requirements of Directive 2010/31/EU and the Law of Ukraine "On the Energy Efficiency of Buildings", the NZEB Concept and the National Plan for Increasing the Number of Nearly Zero-Energy Buildings were adopted in 2020.

According to the NZEB Concept, it is envisaged that no later than December 31, 2027, the energy efficiency class of all buildings commissioned for operation must be no lower than the requirements applicable to energy-independent buildings in force on the date construction works commenced. In addition, no later than December 31, 2025, the energy performance of state-owned and municipal buildings commissioned for operation must be no lower than the requirements applicable to energy-independent buildings in force on the date construction works commenced.

MinDevelopment Order No. 168 of February 6, 2025, "Certain Issues of Introducing Requirements for Nearly Zero-Energy Buildings", establishes requirements regarding the energy efficiency class, the indicator of primary energy consumption from non-renewable energy sources, the share of energy produced from renewable energy sources, the thermal characteristics of building envelope components, building airtightness, and the engineering systems of nearly zero-energy buildings.

For new construction, nearly zero-energy buildings must comply with energy efficiency class A; for reconstruction, they must comply with at least class B.

The share of energy produced from renewable energy sources in such buildings and consumed for heating and cooling purposes must be at least 53% in Temperature Zone I and at least 57% in Temperature Zone II.

The application of nearly zero-energy building requirements is currently voluntary. The mandatory introduction of such requirements will be implemented gradually, taking into account the current state of the real estate market. Due to low activity in the primary housing market, resource shortages, and limited mortgage lending, the premature introduction of mandatory standards could slow down the recovery of the sector. Voluntary application of these requirements allows for their gradual integration in safer regions, creating conditions for market adaptation.

The residential real estate market is gradually recovering but remains structurally imbalanced. Demand is growing primarily for completed and more affordable housing, mainly in the secondary market. The number of transactions amounts to approximately 70% of the pre-war level, of which 60% relate to apartments and the remainder to private houses. The highest demand is for smaller dwellings: the median apartment area is 48 m², while the median house area is 71 m². The majority of transactions concern properties constructed more than 35 years ago, whereas housing less than 15 years old accounts for only one quarter of sales.

The primary residential real estate market remains characterized by low activity, with transaction volumes not exceeding 20% of the pre-war level. Construction activity is concentrated mainly in the western regions and consists predominantly of completing existing projects. The pace of new construction remains low due to shortages of resources and labor.

Mortgage lending remains limited. In the first half of 2025, approximately 5% of transactions were concluded with mortgage financing, after which the share declined to 4%.

More than 96% of all new mortgages are provided under the state eOselia program, which is primarily targeted at military personnel, teachers, and healthcare workers. The state's ability to subsidize mortgages under the current model is limited[72].

Despite the partial recovery, wartime risks and the imbalance between supply and demand continue to result in slow market dynamics. Further growth will depend on security stability, recovery of household incomes, and access to financial resources.

The retail real estate market demonstrates positive dynamics: shopping center footfall and tenant demand are increasing, vacancy rates remain low, and rental rates are gradually rising. At the same time, investment activity in the construction of new retail properties remains limited.

The office real estate segment is recovering slowly: vacancy rates remain high, rental rates are lower than before the COVID-19 lockdown and the full-scale invasion, and no new construction is taking place. The attractiveness of this segment for investors remains low at present [79].

Planned measures:

- The Building Thermal Modernization Strategy 2050 provides that at least 10% of public buildings will comply with the requirements for nearly zero-energy buildings by 2030, and by 2040 at least 25% of residential buildings are expected to comply with such requirements.
- For the fourth quarter of 2025, it is planned to conduct monitoring of compliance with the requirements for nearly zero-energy buildings, identify the categories of public buildings to which such requirements will apply, and introduce the necessary regulatory framework to ensure actual compliance with these requirements[73].
- By the end of the fourth quarter of 2026, MinDevelopment plans to approve:
  - the Methodology for Calculating and Monitoring Target Indicators for Increasing the Number of Nearly Zero-Energy Buildings;
  - target indicators for increasing the number of nearly zero-energy buildings;
  - the Procedure for Monitoring the Number of Nearly Zero-Energy Buildings.
- Within the framework of the implementation of the Building Thermal Modernization Support Program (see PM_EE_WEM_03 Implementation of the State Target Economic Program for Support of Building Thermal Modernization until 2030), the following targets are planned to be achieved with respect to increasing the number of nearly zero-energy buildings.

Table 3.6. Expected Results of the Building Thermal Modernization Support Program Regarding the Increase in the Number of Nearly Zero-Energy Buildings

Name indicator	Value indicator						
	total	by for years					
		2025	2026	2027	2028	2029	2030
Individual residential buildings damaged as a result of hostilities in whose accomplished thermal modernization to the level of buildings with close to zero level energy consumption, units	941			45	149	297	450

[72] https://bank.gov.ua/ua/news/all/strategiya-z-rozvitku-ipotechnogo-kredituvannya
[73] https://bank.gov.ua/ua/news/all/zvit-pro-finansovu-stabilnist-cherven-2025-roku

Number built (in ago number of rebuilt buildings damaged as a result of military actions) of state authorities in compliance with the requirements for buildings with close to zero energy consumption level, units	10		2	2	2	2	2
Number built (in ago number rebuilt damaged due to military actions) public buildings of municipal ownership, which house local government bodies, in compliance with the requirements for buildings with a close to zero level consumption energy, units	12		_	3	3	3	3

PM_EE_WEM_07 Energy performance certification of buildings and inspection of building technical systems

Goal: Assessment of compliance of the energy performance of the building and its elements with the established minimum requirements for the energy efficiency of buildings

Legal basis: Law of Ukraine "On the Energy Efficiency of Buildings"; MinRegion Order No. 169 of July 11, 2018, "On Approval of the Methodology for Determining the Energy Efficiency of Buildings", registered with the Ministry of Justice on July 16, 2018, under No. 822/32274; MinRegion Order No. 172 of July 11, 2018, "On Approval of the Procedure for Energy Efficiency Certification and the Form of the Energy Certificate", registered with the Ministry of Justice on July 16, 2018, under No. 825/32277; MinRegion Order No. 276 of October 18, 2018, "On Approval of the Procedure for Independent Monitoring of Energy Certificates", registered with the Ministry of Justice on November 23, 2018, under No. 1323/32775; MinRegion Order No. 173 of July 11, 2018, "On Approval of the Methodology for Inspection of Building Engineering Systems", registered with the Ministry of Justice on July 16, 2018, under No. 826/32278; MinRegion Order No. 274 of October 18, 2018, "On Approval of the Procedure for Independent Monitoring of Reports on the Results of Inspections of Engineering Systems", registered with the Ministry of Justice on November 9, 2018, under No. 1277/32729.

Timeframe: Since 2018

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment, SAEE

Type of emission reduction: CO_2

Description: Energy efficiency certification of buildings was introduced in 2018 pursuant to the Law of Ukraine "On the Energy Efficiency of Buildings". Under the current legislation of Ukraine, energy efficiency certification is a type of building energy audit that may be conducted by a certified energy auditor. Professional certification is carried out in accordance with the Procedure for Certification of Persons Intending to Conduct Activities Related to Energy Efficiency Certification, Building Energy Audits, and Inspection of Technical Systems, approved by CMU Resolution No. 40 of January 16, 2024 (Official Bulletin of Ukraine, 2024, No. 15, Art. 954).

Energy efficiency certification is mandatory for:

- construction projects;

- buildings in which thermal modernization and/or insulation measures are planned and for which state support is provided;

- state-owned buildings occupied by executive authorities that use more than 250 square meters of heated floor area;

- municipally owned buildings occupied by local self-government bodies that use more than 250 square meters of heated floor area;

- municipally owned buildings with a heated floor area exceeding 250 square meters that are frequently visited by the public.

In addition to energy efficiency certification, the Law of Ukraine "On the Energy Efficiency of Buildings" also introduced the inspection of building technical systems (referred to as inspection of building engineering systems in the initial version of the Law). Technical systems with a nominal capacity of 70 kW or more are subject to mandatory inspection in the following buildings:

- state-owned buildings occupied by executive authorities that use more than 250 square meters of heated floor area;

- buildings occupied by local self-government bodies that use more than 250 square meters of heated floor area;

- buildings undergoing thermal modernization and/or energy efficiency measures aimed at improving the energy performance of technical systems for which state support is provided.

Information on issued building energy certificates and reports on the results of inspections is publicly available through the portal of the Unified State Electronic System in the Construction Sector. The same portal also contains information on certified building energy auditors and specialists authorized to conduct inspections of engineering systems.

The inclusion of an energy certificate in advertisements for the sale or lease of a building is mandatory where such a certificate exists. Consequently, this requirement applies to new or thermally modernized buildings.

As of December 2025, the Unified State Electronic System in the Construction Sector contained 23,505 valid building energy certificates for buildings[74].

During 2025, SAEE conducted independent monitoring of 151 energy certificates, the results of which established that:

- 145 (96%) energy certificates complied with legislative requirements;
- 6 (4%) energy certificates did not comply with legislative requirements.

The Register of Energy Efficiency Reports contains information on 432 valid reports on the results of inspections of building technical systems. Independent monitoring of inspection reports is also carried out by SAEE.

Planned measures:

- During 2025-2026, the Decarbonization Fund is providing financing for the energy efficiency certification of buildings held on the balance sheet (or under the ownership) of public authorities. SAEE selected 2,918 buildings for energy efficiency certification under the Decarbonization Fund program. By the end of 2025, energy efficiency certification is planned to be completed for 2,000 buildings held on the balance sheet (or under the ownership) of public authorities.
- The Building Thermal Modernization Support Program also provides for an increase in the number of certified buildings occupied by public authorities and local self-government bodies.

[74] https://e-construction.gov.ua/document/optype=13/filter=728_1

Table 3.7. Expected Results of the Building Thermal Modernization Support Program with Regard to Increasing the Number of Buildings for Which Energy Efficiency Certification Has Been Conducted

Name indicator	Value indicator						
	total	by for years					
		2025	2026	2027	2028	2029	2030
Number energy certificates buildings organs state power, units, units	1000		150	150	200	200	300
Number manufactured building energy efficiency certificates municipal property, units	1200		100	200	300	300	300

PM_EE_WEM_08 Exemplary role of public bodies' buildings

Goal: Demonstrating the benefits of implementing energy efficiency measures, increasing demand for energy-efficient materials and technologies, and creating additional jobs.

Legal basis: Law of Ukraine "On the Energy Efficiency of Buildings"; Building Thermal Modernization Support Program; CMU Ordinance No. 1181 of October 29, 2025, "On Establishing the Energy Savings Target for Public Authority Buildings" (Official Bulletin of Ukraine, 2025, No. 91, Art. 6414); MinDevelopment Order No. 1196 of October 28, 2024, "On Approval of the Procedure for Monitoring the Achievement of the Energy Savings Target in Public Authority Buildings", registered with the Ministry of Justice on November 27, 2024, under No. 1802/43147.

Timeframe: Since 2021

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment, SAEE

Type of emission reduction: CO_2

Description: The requirements of Article 5 of Directive 2012/27/EU have been transposed through the Law of Ukraine "On the Energy Efficiency of Buildings". In accordance with this Law, the Cabinet of Ministers of Ukraine establishes an energy savings target for public authority buildings, which is reviewed every five years. The requirement to achieve the energy savings target for public authority buildings applies to buildings that meet all of the following criteria:

- are state-owned or municipally owned;
- accommodate the central office of a central executive authority;
- have a heated floor area exceeding 250 square meters.

To ensure the exemplary role of public authority buildings, the Building Thermal Modernization Support Program (PM_EE_WEM_03) provides for the following measures:

- energy efficiency certification of public authority buildings;
- implementation of priority energy efficiency measures or building thermal modernization projects (including the use of renewable energy sources);
- construction (including reconstruction of buildings damaged as a result of military actions) of state-owned public buildings occupied by public authorities in compliance with the requirements for nearly zero-energy buildings;
- installation of heat pumps, solar power systems, and mechanical ventilation systems with

heat recovery in public authority buildings;

- encouraging public authorities to improve the energy efficiency of internal lighting systems in office premises, common areas, and the surrounding grounds of state-owned buildings.

MinDevelopment approved the Procedure for Monitoring the Achievement of the Energy Savings Target in Public Authority Buildings. Such monitoring is carried out by SAEE through determining the overall change in energy consumption in public authority buildings during the reporting period and comparing it against the established target.

Planned measures: The Building Thermal Modernization Support Program provides for an increase in the number of certified buildings occupied by public authorities and local self-government bodies.

Table. 3.8. Expected Results of the Building Thermal Modernization Support Program with Regard to Ensuring the Exemplary Role of Public Authorities in Improving the Energy Performance of Buildings

Name indicator	Value indicator						
	total	by for years					
		2025	2026	2027	2028	2029	2030
Number buildings organs state authorities that have undergone thermal modernization, units	10		2	2	2	2	2
Number built (in ago number of reconstructed buildings of state authorities damaged as a result of military actions, in compliance with the requirements for buildings with a close to zero level consumption energy, units	10		2	2	2	2	2
Number buildings organs state authorities, in whose installed heat pumps, units	10		2	2	2	2	2
Number buildings organs state-owned, in which solar panels are installed power plants, units	10		2	2	2	2	2
Number projects from installation systems energy efficient ventilation in government buildings	5		1	1	1	1	1
Number projects from installation of energy-efficient systems indoor lighting systems office premises, places public and residential use territories buildings state property, units	10		2	2	2	2	2

PM_EE_WEM_09 National database of energy and operational characteristics of

buildings

Purpose: Monitoring the energy and operational characteristics of buildings, monitoring the achievement of the energy saving target in government buildings, providing government bodies and local governments with data on energy consumption and utility services

Goal: Monitoring the energy and operational performance of buildings, monitoring the achievement of the energy savings target in public authority buildings, and providing public authorities and local self-government bodies with data on energy and utility consumption.

Legal basis: Law of Ukraine "On the Energy Efficiency of Buildings"; CMU Resolution No. 1254 of November 1, 2024, "Certain Issues of Ensuring the Functioning of the National Database of Energy and Operational Performance of Buildings" (Official Bulletin of Ukraine, 2024, No. 101, Art. 6454).

Timeframe: Since 2024

Policy measure type: Other

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment, SAEE; entities responsible for submitting information to the database (upon consent)

Description: Since 2017, Ukraine has operated a database of energy certificates that collects and stores information on the energy efficiency classes and energy performance indicators of buildings that have undergone energy efficiency certification. However, these data are based on calculated methods for assessing the energy performance of buildings and cover a relatively small share of the existing building stock in Ukraine.

In order to create a source of data on the condition of the national building stock and its energy and operational performance, the Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Creation of Conditions for the Introduction of Comprehensive Building Thermal Modernization" established the legal framework for the introduction of the National Database of Energy and Operational Performance of Buildings in Ukraine.

The building database ensures the creation, collection, accumulation, processing, protection, and registration of information on the main technical indicators of construction projects, technical characteristics of engineering systems, and energy consumption of:

- buildings occupied by public authorities;
- enterprises, institutions, and organizations within the sphere of management of public authorities;
- local self-government bodies and municipally owned buildings;
- multi-apartment buildings.

The building database is an integral part of the Unified State Electronic System in the Construction Sector.

Entities responsible for submitting information to the National Database of Energy and Operational Performance of Buildings include public authorities, enterprises, institutions, and organizations within the sphere of management of public authorities, local self-government bodies, and local state (military) administrations.

Results: As of the end of December 2025, 2,807 reporting entities had uploaded information relating to 3,081 buildings.

Of these, 240 buildings were included in the inventory list of buildings subject to the energy savings target applicable to buildings occupied by the central offices of central executive authorities, established for the purpose of ensuring the exemplary role of public authorities in improving the energy performance of buildings.

Planned measures: Ensuring the gradual population of the electronic building database with

building operational performance data and the geospatial mapping of such data – on an ongoing basis.

PM_EE_WEM_10 Energy management in state authorities

Goal: Planning, implementation, and monitoring of the results of energy efficiency measures, and reduction of the financial burden on the budget.

Legal basis: Law of Ukraine "On Energy Efficiency"; Law of Ukraine "On the Energy Efficiency of Buildings"; CMU Resolution No. 1460 of December 23, 2021, "On the Implementation of Energy Management Systems" (Official Bulletin of Ukraine, 2022, No. 16, Art. 846).

Timeframe: Since 2021

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): Public authorities in accordance with Part 2 of Article 12 of the Law of Ukraine "On Energy Efficiency"; MinDevelopment; SAEE

Type of emission reduction: CO_2

Description: The Law of Ukraine "On Energy Efficiency" requires public authorities, as well as enterprises, institutions, and organizations within their sphere of management, to implement management systems that define energy policy, objectives, energy targets, and action plans for achieving those objectives. Energy management systems in public authorities do not require certification and are implemented in accordance with the Procedure for the Introduction and Functioning of Energy Management Systems in Public Authorities and Enterprises, Institutions, and Organizations within Their Sphere of Management, approved by CMU Resolution No. 1460 of December 23, 2021 (Official Bulletin of Ukraine, 2022, No. 16, Art. 846). SAEE monitors the implementation of energy management systems and reports to the Government twice a year on the progress achieved.

In order to facilitate the implementation of energy management systems in state authorities, SAEE has developed and published a sample (template) order "On the implementation of an energy management system"[75] and a sample (template) plan for the implementation and functioning of an energy management system[76] .

Results: As of August 2025, 59 public authorities and state institutions had initiated the implementation of energy management systems in 13,257 buildings (held under ownership and/or use, economic management, or operational management rights). The total heated floor area of these buildings exceeds 12.9 million m².

Planned measures: Phased completion of the implementation of energy management systems in central executive authorities and in enterprises, institutions, and organizations within the sphere of management of public authorities.

PM_EE_WEM_11 Energy management in local authorities

Goal: Planning, implementation, and monitoring of the results of energy efficiency measures, and the efficient use of budgetary funds.

Legal basis: Law of Ukraine "On Energy Efficiency"; Law of Ukraine "On the Energy Efficiency of Buildings"; CMU Resolution No. 1460 of December 23, 2021, "On the Implementation of Energy Management Systems" (Official Bulletin of Ukraine, 2022, No.

[75] https://saee.gov.ua/sites/default/files/blocks/Energy_management_order_EXAMPLE_2023_0.pdf
[76] https://saee.gov.ua/sites/default/files/blocks/Energy_management_plan_EXAMPLE_2023_0.pdf

16, Art. 846).

Timeframe: Since 2021

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): Local self-government bodies (upon consent), MinDevelopment, SAEE

Type of emission reduction: CO_2

Description: The Law of Ukraine "On Energy Efficiency" provides for the implementation of energy management systems by local self-government bodies on a voluntary basis, pursuant to a decision of the respective council.

At the same time, a mandatory condition for receiving state support (assistance) for the implementation of energy efficiency measures is the adoption of a decision on the introduction of an energy management system by the respective local self-government body.

The Government recommends that local self-government bodies apply the Procedure for the Introduction and Functioning of Energy Management Systems in Public Authorities and Enterprises, Institutions, and Organizations within Their Sphere of Management when implementing energy management systems.[77]

A mandatory condition for receiving state support (assistance) for the implementation of energy efficiency measures is the existence of a decision on the introduction of an energy management system by the respective local self-government body.

SAEE is responsible for monitoring the status of implementation of energy management systems by local self-government bodies. Such monitoring is to be carried out in accordance with the procedure established by MinDevelopment.

Results: As of August 2025, 20 regional military administrations had initiated the implementation of energy management systems in 17,856 municipally owned buildings with a total heated floor area of 28.8 million m².

Planned measures: Phased completion of the implementation of energy management systems in local self-government bodies.

PM_EE_WEM_12 Local energy plans

Goal: Analysis of the condition of energy and other infrastructure, assessment of the potential for implementing energy efficiency measures and increasing the share of renewable energy use, efficient use of budgetary funds, and identification of priority projects for attracting investment.

Legal basis: Law of Ukraine "On Energy Efficiency"; MinDevelopment Order No. 1163 of December 21, 2023, "On Approval of the Methodology for the Development of Local Energy Plans", registered with the Ministry of Justice on February 16, 2024, under No. 245/41590.

Timeframe: 2022–2030

Policy measure type: Planning

Sector(s) affected: Energy – supply / Energy – consumption / Transport / Industrial processes / Agriculture / Waste / Other

Responsible authority(ies)/organisation(s): Local self-government bodies (upon consent), MinDevelopment, SAEE

Type of emission reduction: CO_2

Description: The Law of Ukraine "On Energy Efficiency" established the framework for the mandatory introduction of local energy planning. In accordance with this Law, local self-government bodies are required to develop local energy plans by November 14, 2025.

[77] https://zakon.rada.gov.ua/laws/show/1460-2021-%D0%BF#n664

Local energy plans are divided into two categories:

- municipal energy plans – developed and approved for each territorial community by the respective village, settlement, city council, or by the Kyiv City Council and Sevastopol City Council;
- regional energy plans – developed for each oblast by the respective local state administration and approved by the respective oblast council.

The structure, content, procedures for development, and updating of local energy plans are determined by the Methodology for the Development of Local Energy Plans. Local energy plans cover the following sectors:

- public and residential buildings;
- district heating;
- water supply and wastewater services;
- municipal waste management;
- natural gas distribution and supply;
- electricity distribution and supply;
- public lighting;
- public transport;
- industry;
- agriculture;
- other service sectors and other modes of transport.

Local energy plans are developed for a 10-year period (the energy planning period). The first local energy plans are developed for the period up to and including 2030.

Local energy plans contain information on the baseline state of energy development in the territorial community or oblast, sustainable energy development objectives, sustainable energy development projects, approaches to organizing the implementation and financing of the municipal energy plan, and the expected results of implementation of the local energy plan.

A number of local self-government bodies in Ukraine had already gained experience in developing similar plans through participation in the Covenant of Mayors before local energy planning was regulated by the Law of Ukraine "On Energy Efficiency". Currently, Ukraine has 217 active signatories to the Covenant of Mayors (368 signatories in total), and 198 Sustainable Energy and Climate Action Plans (SECAPs) have been approved.[78]

Results: As of the end of December 2025, 64 territorial communities out of more than 1,400 territorial communities in Ukraine had approved municipal energy plans, and 1 oblast council out of 24 oblast councils in Ukraine had approved a regional energy plan.

At the same time, most territorial communities recognize the importance of energy planning but face shortages of financial, human, and institutional resources for the development and implementation of such plans.

Planned measures:

- ensuring the approval of local energy plans by all local self-government bodies required to do so;
- ensuring the implementation of local energy plans – on an ongoing basis.

PM_EE_WEM_13 Regional Decarbonization and Energy Efficiency Offices (One-Stop Shops)

Goal: Strengthening cooperation between central and local public authorities in the

[78] https://com-east.eu/uk/

implementation of energy efficiency measures.

Legal basis: Law of Ukraine "On Local Self-Government in Ukraine" (the establishment of such offices is not mandatory but is permitted within the powers of local self-government bodies); Law of Ukraine "On Energy Efficiency".

Timeframe: Since 2023

Policy measure type: Information

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): SAEE, local self-government bodies (upon consent)

Type of emission reduction: CO_2

Description: SAEE initiated the establishment of Regional Decarbonization and Energy Efficiency Offices (hereinafter – the Offices) as an institutional and advisory instrument to support territorial communities and regions in the implementation of projects related to energy efficiency, decarbonization, renewable energy, and climate resilience.

The Offices provide consultations, expert assessments, support for project implementation, assistance in expanding energy management systems, monitoring and analysis of energy-related processes, and support for adaptation and recovery mechanisms following wartime events.

The Offices provide free-of-charge consultations to citizens, businesses, and organizations; analyze energy efficiency indicators of residential buildings and enterprises; disseminate information on national and international support programs; promote modern energy efficiency technologies; and provide support in the preparation and implementation of relevant projects.

Results: Within the framework of cooperation between SAEE and local self-government bodies, 8 Decarbonization and Energy Efficiency Offices have been established, including:

- 2 offices in 2023;
- 5 offices in 2024;
- 1 office in 2025.

In 2025, the Offices conducted more than 500 educational, information, and awareness-raising activities, provided more than 600 consultations, and expanded project portfolios, including projects related to applications to the Decarbonization Fund.

Planned measures: It is planned to establish Offices in other regions, taking into account the security situation, potential demand, regional and local initiatives, and the capacities of local state (military) administrations and local self-government bodies.

PM_EE_WEM_14 Energy efficient procurements

Goal: Efficient use of public funds and increased demand for energy-efficient materials and technologies.

Legal basis: Law of Ukraine "On Energy Efficiency"; Law of Ukraine "On Public Procurement".

Timeframe: Since 2024

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinEconomy, MinDevelopment

Type of emission reduction: CO_2

Description: In 2020, amendments were introduced to the Law of Ukraine "On Public Procurement" allowing the use of life-cycle costing as a criterion for evaluating tender proposals.

Life-cycle costing is the total of the cost of the procurement item or its part (lot) and other costs that will be incurred directly by the contracting authority during the use, maintenance, and end-of-life stage of the procurement item. MinEconomy is currently implementing a project aimed at promoting the use of the life-cycle costing evaluation method in public procurement.

In addition, the Law of Ukraine "On Energy Efficiency" establishes the legal basis for the introduction of energy-efficient public procurement. When conducting public procurement of energy-related products, the energy efficiency class of such products must not be lower than the energy efficiency class established by the CMU, taking into account the regulatory framework on energy labeling, or the energy performance indicators of such products must comply with the indicative benchmarks established under ecodesign legislation, or such products must comply with Type I environmental labeling standards. This requirement applies to all contracting authorities within the meaning of the Law of Ukraine "On Public Procurement". As of September 2025, the permissible energy efficiency classes for energy-related products had not yet been established.

Planned measures: Ensuring the adoption of amendments to the Law of Ukraine "On Public Procurement" in order to regulate energy-efficient public procurement through a dedicated legislative framework – by the end of the fourth quarter of 2026.

PM_EE_WEM_15 Energy labelling and ecodesign

Goal: Reduction of final energy consumption.

Legal basis: Law of Ukraine "On Energy Efficiency"; Law of Ukraine "On State Market Surveillance and Control of Non-Food Products"; MinEnergy Order No. 164 of April 27, 2022, "On Approval of the Technical Regulation on Energy Labeling of Energy-Related Products", registered with the Ministry of Justice on June 9, 2022, under No. 615/37951; CMU Resolution No. 804 of October 3, 2018, "On Approval of the Technical Regulation Establishing a Framework for Setting Ecodesign Requirements for Energy-Related Products" (Official Bulletin of Ukraine, 2018, No. 80, Art. 2678).

Timeframe: Since 2015

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment; MinEconomy; SAEE; State Service of Ukraine on Food Safety and Consumer Protection

Type of emission reduction: CO_2

Description: In order to fulfill Ukraine's obligations under the Association Agreement between Ukraine and the European Union and the Treaty Establishing the Energy Community, Ukraine is implementing a system of energy labeling and ecodesign requirements for energy-related products in accordance with EU legislation.

Ukraine currently has two framework technical regulations in force. In addition, 37 technical regulations establishing ecodesign requirements for specific groups of energy-related products and 20 technical regulations on energy labeling have been adopted.

Market surveillance of compliance with ecodesign and energy labeling requirements is carried out by the State Service of Ukraine on Food Safety and Consumer Protection.

Results: During 2021–2025, the State Service of Ukraine on Food Safety and Consumer Protection carried out market surveillance activities related to energy-related products. The activities conducted and their results are presented in the table below.

Table 3.9. Market surveillance in the areas of energy labeling and ecodesign during 2021-2024.

Requirements to energy-consuming products	Year	Number of checks	Checks with violations	Quantity of products with broken-mute, units	Restrictive measures	Detailing solutions

Energy labeling of household electric refrigerators (CMU Resolution No. 702 of August 7, 2013)	2021	20	2	6	17	6 – bringing in accordance; 5 – elimination of formal inconsistency and
Energy labeling of household electric refrigerators (CMU Resolution No. 702 of August 7, 2013)	2021	20	2	6	17	6 – bringing in accordance; 5 – elimination of formal inconsistencies and
	2022	2	1	32	13	13 – elimination of formal inconsistency and
Energy labelling of household dishwashers» (decree Cabinet of Ministers dated July 17, 2015 No. 514)	2021	11	0	-	-	-
Ecodesign requirements for energy-consuming appliances products (CMU Resolution No. 804 of October 3, 2018)	2021	15	0	-	-	-
	2023	81	54	2299	300	134 – alignment; 25 – elimination of formal inconsistencies and; 6 – ban
	2024	-	-	90,935	-	8,645 – provision restrictions on the market; 2 – prohibition granting on the market

Ecodesign requirements for household refrigeration appliances (decree Cabinet of Ministers of Ukraine dated February 27, 2019 No. 158)	2021	12	0	-	-	-
Requirements to ecodesign for household lamps of non-directional radiation (CMU resolution from 14 August 2019 No. 734)	2023	130	115	4074	617	241 – alignment; 32 – elimination of formal inconsistencies ; 21 – prohibition of granting market

	2024	-	-	507,028	-	506 014 – restrictions on provision on the market; 20 594 – prohibition of providing market
Requirements to ecodesign for space heaters and combination heaters (decree Cabinet of Ministers from December 27 2019 No. 1184)	2024	-	-	95	-	95 – restrictions on the provision of services on the market

Planned measures: The following EU regulations are planned to be transposed by the end of the fourth quarter of 2026:

- Commission Regulation (EU) 2023/1670 laying down ecodesign requirements for smartphones, mobile phones other than smartphones, cordless phones, and slate tablets;
- Commission Regulation (EU) 2024/1834 laying down ecodesign requirements for fans driven by motors with an electric input power between 125 W and 500 kW;
- Commission Regulation (EU) 2024/1103 of April 18, 2024 laying down ecodesign requirements for local space heaters and separate related controls;
- Commission Regulation (EU) 2023/2533 of November 17, 2023 laying down ecodesign requirements for household tumble dryers;
- Commission Regulation (EU) 2023/826 laying down ecodesign requirements for off mode, standby mode, and networked standby energy consumption of electrical and electronic household and office equipment;
- Commission Delegated Regulation (EU) 2023/1669 of June 16, 2023, supplementing Regulation (EU) 2017/1369 with regard to the energy labeling of smartphones and slate tablets;
- Commission Delegated Regulation (EU) 2023/2534, supplementing Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to the energy labeling of household tumble dryers;
- Regulation (EU) 2020/740 on the labeling of tires.

PM_EE_WEM_16 Energy audit of large enterprises

Goal: Analysis of energy consumption profiles and identification of optimal energy efficiency measures.

Legal basis: Law of Ukraine "On Energy Efficiency"; CMU Resolution No. 1258 of December 1, 2023, "On Approval of the Procedure for Conducting Energy Audits of Processes and Transport and the Requirements Therefor" (Official Bulletin of Ukraine, 2024, No. 4, Art. 155).

Timeframe: Since 2021

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment, SAEE

Type of emission reduction: CO_2

Description: The Law of Ukraine "On Energy Efficiency" introduced mandatory energy audits for business entities with an average annual energy consumption of 100,000 MWh or more, to be conducted every four years. The first energy audits were required to be completed by November 14, 2025.

In December 2023, the Procedure for Conducting Energy Audits of Processes and Transport and the Requirements Therefor was adopted. It regulates the procedures for the

preparation, conduct, and documentation of energy audits of processes and transport, as well as the minimum requirements for the format and content of the energy audit report and the extract from the energy audit report.

Energy audits shall be carried out in accordance with national standards harmonized with European standards:

- DSTU EN 16247-3:2015 "Energy Audits – Part 3: Processes" (EN 16247-3:2014, IDT);
- DSTU EN 16247-4:2015 "Energy Audits – Part 4: Transport" (EN 16247-4:2014, IDT).

The objectives and scope of energy audits are determined by the client. In the future, this may lead to situations in which mandatory energy audits of enterprises operating within the same sector are not directly comparable.

Mandatory energy audits may be carried out by energy auditors who have undergone qualification confirmation in the fields of buildings, processes, or transport.

Alternatively, the obligated business entities may implement energy management systems and/or environmental management systems. Such systems must be certified in accordance with ISO 50001 and/or ISO 14001 standards.

During 2025–2026, the Decarbonization Fund provides state support for financing energy audits of facilities held on the balance sheet (or under the ownership) of public authorities, state organizations (institutions and establishments), as well as state unitary enterprises, institutions, and organizations within their sphere of management, and business entities in which more than 50 percent of shares (stakes) are state-owned.

As part of the public consultations on the NECP, stakeholders noted that the state establishes requirements for conducting mandatory energy audits but does not provide sufficient opportunities for implementing energy efficiency measures. The main barrier to improving the energy efficiency of enterprises is the difficulty and high cost of accessing financing.

Results: As of August 29, 2025, SAEE had not received any extracts from energy audit reports submitted by business entities.

Planned measures:

- ensuring the operation of the database of extracts from energy audit reports – 2025;
- introduction of a financing program for energy audits for small and medium-sized enterprises – first quarter of 2026[79].

PM_EE_WEM_17 Confirmation of the qualifications of energy auditors

Goal: Ensuring the quality of energy audits.

Legal basis: Law of Ukraine "On Energy Efficiency"; Law of Ukraine "On the Energy Efficiency of Buildings"; CMU Resolution No. 589 of May 21, 2024, "On Approval of the Procedure for Qualification Confirmation of Persons Intending to Conduct Energy Audits of Processes or Transport and the Qualification Requirements for Energy Auditors of Processes or Transport" (Official Bulletin of Ukraine, 2024, No. 50, Art. 3047); CMU Resolution No. 40 of January 16, 2024, "On Approval of the Procedure for Certification of Persons Intending to Conduct Energy Efficiency Certification, Building Energy Audits, and Inspection of Technical Systems" (Official Bulletin of Ukraine, 2024, No. 15, Art. 954); MinDevelopment Order No. 1041 of November 16, 2023, "On Approval of the Procedure for Maintaining and Publishing the Database of Energy Auditors", registered with the Ministry of Justice on November 30, 2023, under No. 2084/41140.

Timeframe: Since 2021 (for energy auditors of processes and transport)

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

[79] Operating plan events from implementation in 2024-2027 years Strategies restoration, sustainable development and digital transformation of small and medium-sized businesses for the period until 2027. https://zakon.rada.gov.ua/laws/show/821-2024-%D1%80#n14

Responsible authority(ies)/organisation(s): National Qualifications Agency (upon consent), qualification organizations (upon consent), MinDevelopment, SAEE

Description: Qualification confirmation of persons intending to conduct energy audits in the fields of processes, transport, and buildings is carried out by qualification organizations accredited by the National Qualifications Agency.

The qualification confirmation procedure is conducted separately for each field and includes the following stages: submission of an application and the required documents, an interview to assess acquired competencies, a decision on admission to assessment, taking a qualification examination, adoption of a decision based on the examination results, and issuance of a qualification certificate.

The qualification certificate is valid for five years.

Persons may be admitted to the qualification confirmation procedure only if they simultaneously meet the established requirements applicable to the respective field.

For conducting energy audits of processes, applicants must:

- hold higher education of at least the second (master's) level in the fields of knowledge Mechanical Engineering and/or Electrical Engineering;
- have completed training in the field of Conducting Energy Audits of Processes;
- have at least three years of professional experience in the fields of energy, energy efficiency, energy conservation, energy auditing, energy efficiency certification of buildings, construction, architecture, or housing and communal services.

For conducting energy audits of transport, applicants must:

- hold higher education of at least the second (master's) level in the fields of knowledge Transport, Mechanical Engineering, and/or Electrical Engineering;
- have completed training in the field of Conducting Energy Audits of Transport;
- have at least three years of professional experience in the fields of transport, energy, energy efficiency, energy conservation, energy auditing, energy efficiency certification of buildings, construction, architecture, or housing and communal services.

For conducting energy audits of buildings, applicants must:

- hold higher education of at least the second (master's) level in the fields of knowledge Architecture and Construction and/or Electrical Engineering, or an equivalent qualification recognized under legislation;
- have at least one year of professional experience in the fields of energy, energy efficiency, energy conservation, construction, architecture, or housing and communal services.

Results: As of the end of 2025, four qualification centers were operating in Ukraine and providing qualification confirmation for energy auditors of processes. SAEE maintains and publishes the database of energy auditors in the fields of processes and transport. As of December 2025, SAEE had received 46 notifications from qualification centers regarding certified energy auditors in the field of processes. The relevant information was processed, entered into the database of energy auditors, and published on the SAEE web portal. As of December 2025, no information regarding certified energy auditors in the field of transport had been submitted to SAEE.

As of the beginning of October 2025, the Unified State Electronic System in the Construction Sector contained information on 52 attestation commissions and 1,889 specialists in building energy efficiency auditing and inspection of engineering systems.

Planned measures: ensuring compliance with the requirements governing qualification confirmation and certification procedures for energy auditors – on an ongoing basis.

3.2.5. Where applicable, a description of policies and measures to promote the role of local renewable energy communities in contributing to the implementation of policies and measures in points 3.2.1., 3.2.2., 3.2.3. and 3.2.4.

The provisions of Directive (EU) 2018/2001 concerning the operation and promotion of

renewable energy communities have not yet been fully transposed into Ukrainian legislation. The Law of Ukraine "On Alternative Energy Sources" regulates support mechanisms for one type of renewable energy community, namely energy cooperatives. Energy cooperatives may receive a feed-in tariff for electricity generated or benefit from incentives under the self-generation (net-billing) mechanism.

In addition to further legislative development aimed at expanding the role of renewable energy communities, it is also necessary to undertake activities to raise awareness among citizens and representatives of local self-government bodies regarding the benefits of establishing energy cooperatives. Such activities may be carried out by the Regional Decarbonization and Energy Efficiency Offices as well as by SAEE.

3.2.6. Description of measures to develop measures to utilise energy efficiency potentials of gas and electricity infrastructure

PM_EE_WAM_02 Assessment of the energy efficiency potential of the gas transportation system, electricity transmission system, gas distribution system, electricity distribution system

Goal: Improving the efficiency of energy networks and stimulating investment in energy efficiency measures.

Legal basis: Law of Ukraine "On Energy Efficiency"; MinEnergy Order of October 7, 2025, "On Approval of the Methodology for Assessing the Energy Efficiency Potential of the Gas Transmission System, Electricity Transmission System, Gas Distribution System, and Electricity Distribution System", registered with the Ministry of Justice on November 28, 2025, under No. 1786/45192.

Timeframe: Since 2021

Policy measure type: Planning

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): Transmission System Operator (upon consent), Distribution System Operators (upon consent), Gas Transmission System Operator (upon consent), Gas Distribution System Operators (upon consent), SAEE, MinEnergy, NEURC (upon consent)

Description: Operators of the gas transmission system, gas distribution systems, electricity transmission system, and electricity distribution systems (hereinafter – the operators) shall, every five years by March 1 of the reporting year, carry out an assessment of the energy efficiency potential of the respective systems in accordance with the Methodology for Assessing the Energy Efficiency Potential of the Gas Transmission System, Electricity Transmission System, Gas Distribution System, and Electricity Distribution System, approved by MinEnergy Order No. 404 of October 7, 2025.

In accordance with the Methodology, operators are required to give priority to cost-effective energy efficiency measures that reduce energy demand when preparing development plans for the gas transmission system, gas distribution systems, electricity transmission and distribution systems, conducting assessments of energy efficiency potential, and developing investment programs, thereby applying the "energy efficiency first" principle.

The purpose of the assessment of energy efficiency potential is to identify and plan the most cost-effective measures for improving the energy efficiency of the gas transmission system, gas distribution systems, and electricity transmission and distribution systems. Such measures are intended to reduce the consumption of energy resources used for the transmission and distribution of natural gas and the transmission and distribution of electricity, and to achieve target indicators for reducing energy resource consumption in these systems.

Planned measures: Conducting assessments of energy efficiency potential by the operators in accordance with the Methodology.

PM_EE_WEM_18 Smart metering

Goal: Promoting the active participation of consumers in managing their energy consumption (demand response), as well as the participation of other electricity market participants in the provision of balancing and ancillary services, and ensuring access to accurate information for billing based on actual energy consumption and the actual time of consumption.

Legal basis: Law of Ukraine "On Energy Efficiency"; Commercial Metering Code for Electricity, approved by NEURC Resolution No. 311 of March 14, 2018 (Uriadovyi Kurier, 2018, No. 75); CMU Order No. 908 of October 14, 2022, "On Approval of the Concept for the Implementation of Smart Grids in Ukraine until 2035" (Official Bulletin of Ukraine, 2022, No. 84, Art. 5201).

Timeframe: Since 2018

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinEnergy, NEURC (upon consent)

Description: Pursuant to the Law of Ukraine "On Energy Efficiency", the electricity transmission system operator, electricity distribution system operators, the gas transmission system operator, and gas distribution system operators shall, based on an assessment of the technical feasibility and economic viability of deploying smart metering systems, take measures to install such systems.

The installation of smart meters and automated commercial electricity metering systems (ACEMS) is regulated by the Commercial Metering Code for Electricity. The Commercial Metering Administrator is required to provide NEURC with:

- the results of an economic analysis of all long-term costs and benefits for market participants arising from the deployment of smart meters and ACEMS;
- the functional requirements for such equipment; and
- proposals regarding the economically justified and cost-effective approach to the deployment of smart meters and ACEMS, including the timeframe within which such automated metering can be implemented.

The following commercial metering points must be equipped with smart meters:

- electrical installations with a connected capacity of 150 kW or more or an average monthly electricity consumption exceeding 50,000 kWh at consumer facilities (excluding multi-apartment residential buildings and household consumers);
- generating installations and/or energy storage installations capable of exporting electricity to the grid;
- consumer electrical installations where installation is requested by the consumer.

To facilitate the deployment of smart meters, distribution system operators are required to conduct awareness-raising activities among consumers regarding the benefits of smart metering and to apply economic incentives to ensure that commercial electricity metering systems comply with legislative requirements.

Issues related to smart natural gas metering systems are addressed under PM_IMG_WAM_12 Ensuring 100% Gas Metering Coverage and PM_IMG_WAM_01 Transposition of the New EU Legislative Package on Natural Gas and Hydrogen.

Results: On average across electricity distribution system operators, as of December 31, 2024, the overall share of consumers equipped with smart meters amounted to 19.66% of the total number of installed consumer meters (excluding temporarily occupied territories). The share of household consumers equipped with smart meters was 19.72%.

Planned measures: Conducting assessments of the technical feasibility and economic viability of deploying smart metering systems for electricity and natural gas, subject to the availability of external financing.

PM_EE_WEM_19 Regulation of combined heat and power generation (cogeneration)

Goal: Establishing the legal framework for improving fuel efficiency in energy generation and other technological processes, and for the development and deployment of cogeneration technologies.

Legal basis: Law of Ukraine "On Combined Heat and Power Generation (Cogeneration) and the Use of Waste Energy Potential"; Law of Ukraine "On Heat Supply"; Law of Ukraine "On Energy Efficiency"; Law of Ukraine "On the Electricity Market"; CMU Resolution No. 1010 of December 13, 2017, "On Approval of the Criteria for Determining Planned Activities Not Subject to Environmental Impact Assessment and the Criteria for Determining Modifications and Extensions of Activities and Facilities Not Subject to Environmental Impact Assessment" (Official Bulletin of Ukraine, 2018, No. 3, Art. 115); CMU Resolution No. 1320 of December 7, 2023, "Certain Issues Related to the Construction and/or Restoration, and/or Reconstruction, and/or Placement, and/or Major Repair of Gas Piston and Gas Turbine Units, Including Cogeneration Units, Modular Boiler Houses, Diesel/Gasoline and Gas Generators, Gas Storage Facilities, Oil and Gas Production Facilities, Certain Gas Transmission System Facilities, and Electricity Transmission Lines during Martial Law" (Official Bulletin of Ukraine, 2024, No. 8, Art. 376); CMU Order No. 713 of July 18, 2024, "On Approval of the Distributed Generation Development Strategy until 2035 and the Operational Action Plan for Its Implementation in 2024–2026" (Official Bulletin of Ukraine, 2024, No. 73, Art. 4366); CMU Resolution No. 1556 of December 1, 2025, "On Amendments to the Regulation on the Imposition of Public Service Obligations on Natural Gas Market Participants to Ensure Public Interests in the Functioning of the Natural Gas Market" (Uriadovyi Kurier, 2025, No. 247); CMU Order No. 1391 of December 9, 2025, "On Measures to Ensure Electricity Supply during the Autumn-Winter Period of 2025/26" (Official Bulletin of Ukraine, 2025, No. 102, Art. 7238); NEURC Resolution No. 308 of March 22, 2017, "On Approval of the Licensing Conditions for Conducting Business Activities in the Heat Supply Sector"; NEURC Resolution No. 310 of March 14, 2018, "On Approval of the Distribution Systems Code"; NEURC Resolution No. 352 of March 26, 2022, "On Specific Aspects of Temporary Connection of Electrical Installations to Distribution Systems during Martial Law in Ukraine"; NEURC Resolution No. 1823 of October 4, 2023, "On Approval of the Procedure for Connection to Heat Networks".

Timeframe: Since 2005

Policy measure type: Regulatory

Sector(s) affected: Energy – supply

Responsible authority(ies)/organisation(s): MinDevelopment, NEURC (upon consent), MinEnergy

Type of emission reduction: CO_2

Description: State policy on the deployment of cogeneration units is defined by the Law of Ukraine "On Combined Heat and Power Generation (Cogeneration) and the Use of Waste Energy Potential" and is based on the following principles:

- promoting the conversion of existing heat generation facilities into combined heat and power generation units;
- creating distributed (local) electricity generation capacity as a means of enhancing the reliability and security of energy supply at the regional level;
- providing economic incentives for the use of cogeneration units by enterprises regardless of ownership structure or sector.

Under the Law, support mechanisms for cogeneration include granting owners (operators) of cogeneration units the right to non-discriminatory access to local electricity networks and the right to sell generated electricity directly to individual consumers under contractual arrangements, including the right to supply electricity during periods of peak and semi-peak network demand simultaneously with (in addition to) the main electricity supplier.

The Law of Ukraine "On Heat Supply" identifies the deployment of cogeneration units, including at existing heating boiler houses, as one of the key directions for the development of heat supply systems.

During 2023–2024, a number of legislative amendments were introduced to increase the

deployment of cogeneration units:

- a simplified procedure was introduced for connecting certain energy consumers to the networks of electricity producers operating cogeneration units (CHP units) with a capacity of up to 20 MW. Such producers are entitled to supply electricity to their own critical infrastructure facilities through internal electricity networks or to supply critical infrastructure facilities upon agreement with local self-government bodies;
- specific arrangements were established governing the relationship between consumers and electricity producers operating CHP units with a capacity of up to 20 MW during emergency or planned interruptions or restrictions imposed by electricity distribution or transmission system operators. In such cases, electricity may be supplied under a backup electricity supply agreement. Backup electricity supply is not considered an electricity supply or transmission/distribution activity and may be provided exclusively through electricity networks physically separated from the Integrated Power System of Ukraine;
- specific provisions were introduced governing the connection of critical infrastructure facilities to CHP units with a capacity of up to 20 MW;
- licensing requirements for heat generation activities were waived where heat is generated solely for self-consumption without the intention of sale, or where heat is produced by CHP units with a total nominal active electrical capacity (total installed thermal capacity) not exceeding 5 MW (4.3 Gcal/h) and used as backup energy sources during electricity outages affecting critical infrastructure facilities and/or heat supply, water supply, wastewater infrastructure, and social sector facilities (educational institutions and healthcare facilities, excluding health resorts);
- the methodology for calculating and setting heat generation tariffs was simplified for licensees producing heat using CHP units with a thermal capacity of not more than 4.3 Gcal/h per unit (excluding installations using renewable energy sources);
- procedures for connecting generation units (gas turbine, gas piston, cogeneration, and similar units) to electricity and heat networks were simplified;
- compliance requirements under construction legislation were simplified. During martial law, the construction and/or placement of cogeneration units by business entities may be carried out under a simplified procedure without the preparation of urban planning documentation, obtaining urban planning conditions and restrictions, conducting design documentation expertise, obtaining construction permits, preparing heat supply schemes, allocating land plots for energy facilities or utility networks, or obtaining commissioning certificates, provided that comprehensive testing of electrical installations is carried out in accordance with established procedures. Such activities are exempt from environmental impact assessment requirements. Business entities that construct or place cogeneration units during martial law are required, within 24 months after completion of construction and no later than six months after the termination or cancellation of martial law, to formalize land use rights, prepare and approve design documentation, conduct the required expertise, and obtain commissioning certificates in accordance with legislation.

In 2025, the Government imposed public service obligations on Naftogaz Trading Gas Supply Company LLC to supply natural gas to new business entities engaged in electricity generation at CHP plants located in the oblasts of Chernihiv, Sumy, Kharkiv, Dnipropetrovsk, Donetsk, Zaporizhzhia, Kherson, Mykolaiv, and Odesa at a fixed price of UAH 19,000 per 1,000 cubic meters of gas for the duration of martial law, but no later than December 1, 2026.

Results: In 2024, Ukraine commissioned 68 cogeneration units with a total capacity of 77 MW. During the first six months of 2025, an additional 320.2 MW of cogeneration capacity was installed.

Planned measures: MinEnergy, together with other central and local executive authorities, will carry out verification of cogeneration units that have been commissioned but are not supplying electricity to the networks of distribution system operators or the transmission system operator, as well as units that have been constructed but not yet commissioned. Measures will be taken to ensure electricity generation by such facilities and the supply of

electricity to the networks of distribution system operators and the transmission system operator by the end of the first quarter of 2026.

PM_EE_WAM_03 National action plan for modernization and decarbonization of district heating systems

Goal: Defining the strategic directions for the development of the heat supply sector, taking into account the need to facilitate the transition to efficient district heating.

Legal basis: EU acquis

Timeframe: By the fourth quarter of 2027

Policy measure type: Planning

Sector(s) affected: Energy – supply

Responsible authority(ies)/organisation(s): MinDevelopment, NEURC (upon consent)

Description: The national indicative target for the share of renewable energy sources in gross final energy consumption by 2030 envisages a significant increase in the share of renewable energy in the heating and cooling sector, from 9.3% in 2020 to 32.5%.

Achieving this target, as well as meeting the criteria for efficient district heating and cooling within the meaning of the Law of Ukraine "On Energy Efficiency", requires a substantial revision of medium-term planning approaches in the heat supply sector. Against this background, MinDevelopment has initiated the development of the National Action Plan for the Modernization and Decarbonization of District Heating Systems, which aims to define the strategic directions for the sector's development in line with the requirements of Directive (EU) 2023/2413 on the promotion of the use of energy from renewable sources and Directive (EU) 2023/1791 on energy efficiency. The document will serve as a basis for the development of state programs and projects aimed at modernizing district heating systems and facilitating the gradual transition to renewable energy sources. In particular, the National Action Plan is expected to be based on the "energy efficiency first" principle and to support the achievement of the criteria for efficient district heating and cooling.

PM_EE_WAM_04 Improvement of the state regulatory model in the heating sector

Goal: Streamlining the powers of public authorities and local self-government bodies to support the recovery and development of heat supply infrastructure, attract investment, and improve the quality of services (products).

Legal basis: Law of Ukraine "On Natural Monopolies"; Law of Ukraine "On Heat Supply"; Law of Ukraine "On the National Energy and Utilities Regulatory Commission".

Timeframe: Within one year following the termination or cancellation of martial law in Ukraine

Policy measure type: Regulatory

Sector(s) affected: Energy – supply

Responsible authority(ies)/organisation(s): NEURC (upon consent), MinDevelopment

Description: Currently, Ukraine operates a dual system of state regulation in the heat supply sector. State regulation, licensing, and tariff setting for business entities engaged in heat generation at combined heat and power plants (CHPs), thermal power plants, nuclear power plants, and cogeneration units are carried out by NEURC.

At the same time, licensing of heat generation from other types of installations, as well as heat transmission and heat supply activities, is carried out by oblast and Kyiv City state (military) administrations, while tariff setting is performed by local self-government bodies in accordance with procedures established by the CMU[80].

This regulatory model gives rise to a number of challenges:

- inefficient use of public funds due to the need to maintain parallel regulatory systems;

[80] https://zakon.rada.gov.ua/laws/show/869-2011-%D0%BF#Text

- fragmentation of information on heat supply undertakings among NEURC, MinDevelopment, oblast and Kyiv City state (military) administrations, and local self-government bodies;
- the absence of a mechanism for objective, factor-based analysis and monitoring of undertakings regulated by different authorities, making it difficult to assess the overall situation in the sector and identify potential threats to the sustainable operation of heat supply enterprises in a timely manner;
- insufficient oversight by oblast and Kyiv City state (military) administrations of compliance with the Licensing Conditions for Conducting Business Activities in the Heat Supply Sector;
- limited opportunities for out-of-court dispute resolution involving undertakings that are not licensed by NEURC;
- a low level of investment in the sector;
- the unresolved conflict of interest whereby local self-government bodies simultaneously act as tariff-setting authorities, owners of heat generation, transmission, and supply undertakings, and consumers of thermal energy.

In the Concept of the State Target Economic Program for the Energy Modernization of Heat Energy Producing Enterprises in State or Municipal Ownership until 2030, approved by CMU Order No. 1082-r of November 24, 2023 (Official Bulletin of Ukraine, No. 2, Art. 59), the Government concluded that the policies of local and national authorities regarding the development of district heating systems are inconsistent and unbalanced.

Planned measures: Optimization of the regulatory model for the heat supply sector, including tariff-setting arrangements, the preparation and implementation of investment programs by undertakings licensed by oblast and Kyiv City state (military) administrations, the introduction of mandatory five-year investment planning based on city heat supply schemes, and the establishment of effective mechanisms for monitoring the implementation of investment programs and the targeted use of funds included in heat tariffs by authorized authorities.

PM_EE_WAM_05 Settlement of debts of heat supply enterprises for consumed natural gas

Goal: Improving the financial condition of heat supply enterprises.

Legal basis: Law of Ukraine "On the Specific Regulation of Relations in the Natural Gas Market and Heat Supply Sector during Martial Law and the Subsequent Restoration of Their Functioning"; Law of Ukraine "On Measures Aimed at Settling the Debts of Heat Supply and Heat Generating Organizations and Centralized Water Supply and Wastewater Enterprises"; CMU Resolution No. 977 of September 15, 2021, "On Approval of the Methodology for Determining Tariff Difference Debt" (Official Bulletin of Ukraine, 2021, No. 76, Art. 4794).

Timeframe: 2026

Policy measure type: Economic

Sector(s) affected: Energy – supply

Responsible authority(ies)/organisation(s): MinDevelopment

Description: On July 29, 2022, the Verkhovna Rada of Ukraine adopted the Law of Ukraine "On the Specific Regulation of Relations in the Natural Gas Market and Heat Supply Sector during Martial Law and the Subsequent Restoration of Their Functioning".

This Law introduced a moratorium on increases in heat supply tariffs, including tariffs for thermal energy (its production, transmission, and supply) for households, as well as tariffs for heat supply services and hot water supply services provided to households.

At the same time, the Law provides that business entities engaged in the production, transmission, and/or supply of thermal energy, and providing heat supply and hot water supply services that are subject to the moratorium, are entitled to compensation for tariff

difference debt related to the production, transmission, and supply of thermal energy, thermal energy tariffs, district heating services, centralized hot water supply services, heat supply services, and hot water supply services. Such debt is subject to settlement under the conditions and procedures established by the Law of Ukraine "On Measures Aimed at Settling the Debts of Heat Supply and Heat Generating Organizations and Centralized Water Supply and Wastewater Enterprises".

Under the Extended Fund Facility (EFF) program agreed with the International Monetary Fund, Ukraine committed itself, through the Letter of Intent of the Government of Ukraine and the National Bank of Ukraine to the IMF dated June 19, 2025, and the Memorandum on Economic and Financial Policies (hereinafter – the Memorandum), to reform the energy sector and mitigate the adverse effects of the war on the sector.

According to paragraphs 77 and 79 of the Memorandum, the problem of debt and overdue debt of district heating enterprises should be addressed comprehensively once war-related pressure on the state budget decreases. This includes the development of a new tariff calculation methodology that fully reflects costs, as well as gradual post-war tariff adjustments, taking into account the new tariff methodology and social considerations.

As of July 1, 2025, the amount of tariff difference debt for thermal energy and heat supply and hot water supply services agreed by the Territorial Commissions for the Settlement of Tariff Difference Debt amounted to UAH 62 billion.

At the same time, the debt of thermal energy producers for consumed natural gas amounted to UAH 111.7 billion as of May 30, 2025, significantly exceeding the amount of tariff difference debt.

Therefore, settling tariff difference debt owed to heat supply enterprises is a necessary but insufficient condition for improving the financial situation of such enterprises and attracting investment.

Planned measures: In order to improve the financial condition of heat supply enterprises, the Government plans to develop and adopt amendments to Ukrainian legislation concerning:

- the lifting of the moratorium on increases in heat tariffs for households (except in territories where active hostilities are taking place or in temporarily occupied territories) – by the end of the fourth quarter of 2026;
- the restructuring of heat supply enterprises' natural gas debt owed to natural gas suppliers in an amount corresponding to the tariff difference debt, in accordance with procedures and timeframes established by the CMU (where no state budget allocations are available to finance tariff difference debt), through amendments to the Law of Ukraine "On Measures Aimed at Settling the Debts of Heat Supply and Heat Generating Organizations and Centralized Water Supply and Wastewater Enterprises";
- the introduction of a special-use current account mechanism, replacing the guaranteed supplier with an entity subject to public service obligations, through amendments to the Law of Ukraine "On Heat Supply";
- the introduction of mechanisms for the recovery of debts owed by household consumers for heat supply services, including the possibility of advance payments for heat supply services, debt restructuring arrangements taking into account household affordability under conditions of tariff increases, and simplified judicial procedures for debt recovery.

In accordance with the Law of Ukraine "On the State Budget of Ukraine for 2026", an additional 4 percent of personal income tax revenues is allocated to local budgets and is to be directed, as a priority, toward the settlement of tariff difference debt related to the production, transmission, and supply of thermal energy.

PM_EE_WAM_06 Assessment of the potential for the application of high-efficiency cogeneration and efficient district heating

Goal: Improving the efficiency of heat generation and transmission, identifying the optimal

portfolio of energy efficiency measures, and stimulating investment in energy efficiency improvements.

Legal basis: Law of Ukraine "On Energy Efficiency"; Law of Ukraine "On Combined Heat and Power Generation (Cogeneration) and the Utilisation of Waste Energy Potential".

Timeframe: Since 2021

Policy measure type: Planning

Sector(s) affected: Energy – supply

Responsible authority(ies)/organisation(s): MinDevelopment

Description: The assessment of the potential for the deployment of efficient district heating and high-efficiency cogeneration is carried out at both local and national levels.

At the local level, the assessment of the potential for the deployment of efficient district heating and high-efficiency cogeneration constitutes a separate section of district heating schemes. It is prepared on the basis of a cost-benefit analysis and includes, inter alia:

- a description and map of the area indicating existing and potential heat demand sites, existing and planned district heating facilities, and potential heat sources, including industrial installations and other facilities generating waste heat;
- an assessment of the energy and technical potential for the deployment of efficient district heating and high-efficiency cogeneration;
- a calculation of the primary energy savings target;
- an assessment of local, regional, national, and international support programmes for heat generation, transmission, and supply, including, where applicable, the potential share of non-repayable financial assistance.

Assessments of the potential for high-efficiency cogeneration are mandatory at the level of individual installations where a significant refurbishment of an existing heat generation installation or the construction of a new heat generation installation with a thermal capacity exceeding 20 MW is planned. Such assessments must be carried out prior to the commencement of construction, major repair, reconstruction, or technical modernisation works.

MinDevelopment is required to approve a National Report on the Comprehensive Assessment of the Potential for the Deployment of Efficient District Heating and High-Efficiency Cogeneration every five years and submit it to the Energy Community Secretariat.

Planned measures: A prerequisite for the preparation of the National Report is the adoption of the Procedure for Preparing the National Report on the Comprehensive Assessment of the Potential for the Deployment of Efficient District Heating and High-Efficiency Cogeneration.

The adoption of this Procedure, as well as the Template and Procedure for Submitting Regional Reports on the Potential for the Deployment of Efficient District Heating and High-Efficiency Cogeneration, is planned for 2026.

The preparation and approval of the National Report on the Comprehensive Assessment of the Potential for the Deployment of Efficient District Heating and High-Efficiency Cogeneration will be carried out by MinDevelopment during 2027–2028.

PM_EE_WEM_20 Heat supply schemes

Goal: Planning the most cost-effective heat supply system for a settlement and reducing the amount of energy resources required to generate, transmit, and supply a unit of thermal energy to consumers.

Legal basis: Law of Ukraine "On Heat Supply"; Order of the Ministry of Regional Development No. 235 of 2 October 2020 "On Approval of the Methodology for Developing Heat Supply Schemes for Settlements in Ukraine", registered with the Ministry of Justice on 18 November 2020 under No. 1144/35427; Order of the Ministry of Regional Development No. 101 of 28 April 2020 "On Approval of the Procedure for Approval by the Ministry of

Regional Development of Heat Supply Schemes for Settlements with More than 20,000 Inhabitants and Regional Programmes for the Modernisation of Heat Supply Systems", registered with the Ministry of Justice on 23 June 2020 under No. 564/34847.

Timeframe: Since 2005

Policy measure type: Planning

Sector(s) affected: Energy – supply

Responsible authority(ies)/organisation(s): Local self-government bodies, MinDevelopment

Description: A heat supply scheme is a long-term heat supply planning instrument for a settlement, developed on the basis of an optimal combination of district heating and autonomous heating systems. The preparation of a heat supply scheme is based on the settlement's master plan.

Heat supply schemes are developed using a cost-benefit analysis methodology to identify the preferred heat supply scenario. Long-term heat supply planning is aimed at the development of efficient district heating systems, with the gradual replacement of conventional heat generation sources based on natural gas by:

- combined heat and power (cogeneration) installations;
- installations using renewable energy sources;
- installations utilising waste heat.

Heat supply schemes define the areas where district heating, autonomous heating, and individual heating systems should be applied. Such schemes have a validity period of ten years. Heat supply schemes for settlements with a population exceeding 20,000 inhabitants are approved by MinDevelopment and adopted by the relevant local self-government body.

The Methodology for Developing Heat Supply Schemes for Settlements in Ukraine should be revised to support the gradual transition to efficient district heating and to reflect the need to designate district heating, autonomous heating, and individual heating zones.

According to the Law of Ukraine "On Energy Efficiency", an efficient district heating system is a district heating system that uses at least 50% renewable energy, 50% waste heat, 75% heat generated through cogeneration, or 50% of a combination of such energy and heat sources.

To ensure compliance with the energy efficiency first principle, projects for the modernisation of heat generation facilities and district heating networks should be developed taking into account planned and completed building renovation measures. At present, deep renovation is implemented only in a limited number of buildings. However, the Building Renovation Strategy 2050 envisages a significant increase in the scale of building renovation activities. The renovation of buildings and the modernisation of district heating systems should therefore be implemented in a coordinated manner as part of an integrated approach.

Results: As of the end of 2024, 40 heat supply schemes were in force out of 128 settlements required to have such schemes. Of these, only 20 schemes were developed in accordance with the Methodology for Developing Heat Supply Schemes for Settlements in Ukraine approved by Order No. 235 of the Ministry for Communities and Territories Development of Ukraine of 2 October 2020. The remaining 20 schemes were prepared under the Methodological Recommendations for Developing Energy- and Environmentally Efficient Heat Supply Schemes for Settlements in Ukraine approved by Order No. 147 of the Ministry of Construction, Architecture and Housing and Communal Services of Ukraine of 26 April 2006. During the first half of 2025, an additional six heat supply schemes were approved.

Planned measures: Development and updating of 100 heat supply schemes for settlements with a population exceeding 20,000 inhabitants by the end of the fourth quarter of 2028.

PM_EE_WEM_21 Qualification of cogeneration units

Goal: Verifying compliance of cogeneration plant operating conditions and performance parameters with the requirements established by law.

Legal basis: Law of Ukraine "On Combined Heat and Power Generation (Cogeneration) and the Utilisation of Waste Energy Potential"; Order of MinDevelopment No. 200 of 5 March 2024 "On Approval of the Methodology for Determining the Efficiency of the Cogeneration Process", registered with the Ministry of Justice on 30 April 2024 under No. 624/41969.

Timeframe: Since 2024

Policy measure type: Regulatory

Sector(s) affected: Energy – supply

Responsible authority(ies)/organisation(s): SAEE

Description: Cogeneration plants may be recognised as qualified cogeneration plants if they meet the criteria for high-efficiency cogeneration, based on primary energy savings calculations carried out in accordance with the Methodology for Determining the Efficiency of the Cogeneration Process.

The current policy incentives supporting the deployment of qualified cogeneration plants include:

- exemption from the 3.2% excise tax on the sale of electricity generated by qualified cogeneration plants (subparagraph 213.2.8 of paragraph 213.2 of Article 213 of the Tax Code of Ukraine);
- eligibility to obtain guarantees of origin for electricity generated by high-efficiency cogeneration plants.

Results: In 2025, SAEE qualified 71 cogeneration plants, representing a 40% increase compared to 2024 (42 plants), including:

- 32 newly commissioned cogeneration plants;
- 39 requalified cogeneration plants.

The total capacity of qualified high-efficiency cogeneration plants reached:

- 3.1 GW of electrical capacity, representing a 20% increase compared to 2024 (2.57 GW);
- 9.2 thousand Gcal/h of thermal capacity, representing an 11% increase compared to 2024 (8.3 thousand Gcal/h).

Planned measures: Continued provision of the administrative service for the qualification of cogeneration plants on an ongoing basis.

PM_EE_WAM_22 Guarantees of origin of electricity produced by a high-efficiency cogeneration unit

Goal: Providing final electricity consumers with information that the electricity supplied was generated by a high-efficiency cogeneration plant.

Legal basis: Law of Ukraine "On Combined Heat and Power Generation (Cogeneration) and the Utilisation of Waste Energy Potential"; CMU Resolution No. 1077 of 20 September 2024 "On Approval of the Procedure for Issuing Guarantees of Origin for Electricity Generated by High-Efficiency Cogeneration Plants and the Procedure and Format for Maintaining the Electronic Register of Guarantees of Origin for Electricity Generated by High-Efficiency Cogeneration Plants" (Official Gazette of Ukraine, 2024, No. 88, Art. 5683).

Timeframe: Since 2024

Policy measure type: Information; Economic

Sector(s) affected: Energy – supply

Responsible authority(ies)/organisation(s): State Agency on Energy Efficiency and Energy Saving of Ukraine (SAEE)

Description: The owner or operator of a high-efficiency cogeneration plant is entitled to

obtain a guarantee of origin for electricity generated by a high-efficiency cogeneration plant.

Guarantees of origin are issued by SAEE free of charge in electronic form. Each guarantee of origin corresponds to a standard quantity of electricity supplied to the grid, measured with a precision of 1 MWh. The validity period of a guarantee of origin is 12 months.

To obtain guarantees of origin for generated electricity, the owner or operator of a high-efficiency cogeneration plant must first complete the qualification procedure for the cogeneration plant.

Planned measures: The mechanisms for the issuance, transfer, use, and cancellation of guarantees of origin for electricity generated by high-efficiency cogeneration plants within the electronic register will become operational 12 months after the termination or lifting of martial law in Ukraine.

At the same time, SAEE has already developed the Technical Requirements for the Information and Communication System "State Register of Guarantees of Origin for Electricity Generated by High-Efficiency Cogeneration Plants".

These technical requirements will be used for the subsequent development and deployment of the software system "Register of Guarantees of Origin for Electricity Generated by High-Efficiency Cogeneration Plants" (including technical specifications; software development and testing; technical documentation; user manuals; training programmes; user training materials).

PM_EE_WEM_23 Heat metering

Goal: Providing consumers with accurate information on the volume of utility services consumed (heat supply, domestic hot water supply, and centralised water supply services).

Legal basis: Law of Ukraine "On Commercial Metering of Thermal Energy and Water Supply"; Order of the Ministry of Regional Development No. 206 of 9 August 2018 "On Approval of the Procedure for Equipping Buildings with Commercial Metering Units and Engineering System Equipment Required for Such Metering", registered with the Ministry of Justice on 31 August 2018 under No. 990/32442; Order of the Ministry of Regional Development No. 205 of 9 August 2018 "On Approval of the Procedure for Equipping Individual Premises in Buildings with Heat Consumption Allocation Meters/Heat Cost Allocators and Engineering System Equipment Required for Such Metering", registered with the Ministry of Justice on 31 August 2018 under No. 981/32433; CMU Resolution No. 829 of 10 October 2018 "On Approval of the Procedure for Determining the Technical Feasibility of Installing Heat Consumption Allocation Meters and the Economic Feasibility of Installing Heat Cost Allocators" (Official Gazette of Ukraine, 2018, No. 82, Art. 2725).

Timeframe: Since 2017

Policy measure type: Regulatory

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organisation(s): MinDevelopment, SAEE

Description: The Law of Ukraine "On Commercial Metering of Thermal Energy and Water Supply" introduced mandatory commercial metering of thermal energy and water supply services.

The Law prohibits the connection of residential and non-residential buildings to external utility networks unless such buildings are equipped with commercial metering units for the relevant utility services. Newly constructed residential and non-residential buildings may be commissioned only if the buildings and their premises are equipped with the required commercial and consumption allocation metering devices.

The obligation to install commercial metering units rests with the operator of the external utility network (the owner of the external utility network or the entity to which the network has been entrusted for operation). Building owners or co-owners may also independently equip buildings with commercial metering units in accordance with the legislation.

The costs incurred by external utility network operators for installing commercial water and

heat metering units in existing buildings are included in tariffs for the relevant utility services. The Law also provides for the possibility of financing the installation of commercial metering units in existing buildings from local budgets and the State Budget.

Full commercial metering of thermal energy must be achieved within 24 months following the termination or lifting of martial law in Ukraine. This target was originally scheduled to be achieved by 3 August 2018, subsequently postponed to 1 September 2022, and later deferred again by the Law of Ukraine "On the Specifics of Regulating Relations in the Natural Gas Market and the Heat Supply Sector during Martial Law and the Subsequent Recovery of Their Functioning".

Achieving full commercial metering of thermal energy will require an assessment of the necessary financial resources and the establishment of an obligation to include the required investments in the investment programmes of external utility network operators or to secure financing from other sources, including the State Target Economic Programme for the Energy Modernisation of Heat-Producing Enterprises in State or Municipal Ownership until 2030 (PM_EE_WEM_24).

The Law of Ukraine "On Commercial Metering of Thermal Energy and Water Supply" also regulates individual heat consumption metering. The installation of individual heat meters is mandatory before the commissioning of new residential and non-residential buildings.

Where it is technically impossible to equip a building's central heating system with individual heat meters, the allocation of consumed thermal energy among individual premises is carried out using heat cost allocators, except where such installation is not economically justified.

Readings from heat cost allocators may be used for allocating a building's total heat consumption only where at least 50% of heating appliances in the building (excluding those located in common areas of multi-apartment buildings) are equipped with such devices.

Results: As of 20 January 2026, 86.7% of residential buildings and 85.2% of non-residential buildings were equipped with commercial thermal energy metering units.

PM_EE_WEM_24 State target economic program for the energy modernization of heat-producing enterprises in state or municipal ownership until 2030

Goal: Improving the efficiency of district heating systems in populated areas, reducing the specific consumption of fuel and energy resources, and increasing the share of renewable energy, waste heat, and heat generated through cogeneration in district heating systems.

Legal basis: Law of Ukraine "On Energy Efficiency"; CMU Order No. 1083 of October 1, 2025 "On Approval of the State Target Economic Program for the Energy Modernization of Heat-Producing Enterprises in State or Municipal Ownership until 2030" (Official Gazette of Ukraine, 2025, No. 86, Art. 5972).

Timeframe: 2025–2030

Policy measure type: Economic

Sector(s) affected: Energy – supply

Responsible authority(ies)/organization(s): MinDevelopment; regional state administrations (military administrations), including the Kyiv City State Administration (Military Administration) (subject to consent); local self-government bodies (subject to consent); business entities (subject to consent)

Type of emission reduction: CO_2

Description: The State Target Economic Program for the Energy Modernization of Heat-Producing Enterprises in State or Municipal Ownership until 2030 (hereinafter, the Program for the Energy Modernization of Heat-Producing Enterprises) provides for the implementation of the following measures:

- development and updating of heat supply schemes for populated areas;
- achievement of 100% commercial metering of thermal energy;

- modernization of consumer heat substations through the installation of individual heating substations;
- major rehabilitation and reconstruction of district heating infrastructure assets;
- improving the efficiency and reliability of district heating systems and supporting decarbonization through reduced consumption and substitution of natural gas, as well as expanded use of renewable energy sources;
- implementation of energy management systems and expansion of supervisory control and dispatch systems in district heating networks.

Financing: The estimated total budget of the Program amounts to UAH 292.4 billion, including:

- UAH 37.47 billion from the State Budget;
- UAH 117.65 billion from local budgets;
- UAH 137.28 billion from other sources.

Financing from the State Budget will commence from the second budget period following the termination or lifting of martial law in Ukraine. State Budget financing for measures implemented by municipally owned heat-producing enterprises will be provided subject to co-financing from the relevant local budgets.

Table 3.10. Expected results of the implementation of the Program for the Energy Modernization of Heat-Producing Enterprises

Name indicator	Value indicator						
	total	by years					
		2025	2026	2027	2028	2029	2030
Providing up-to-date heat supply schemes for settlements with a number of residents more as 20 thousand persons, %	100	41	61	81	100	100	100
Software commercial accounting thermal energy, %	100	86	92	100	100	100	100
Reduction in annual natural gas consumption as a result of modernization thermal inputs consumers (installation of individual heat points), million cube. m	253.8	36.3	145	253.8	253.8	253.8	253.8
Reduction in annual natural gas consumption as a result of capital investment repair and reconstruction of heat supply facilities in centralized heating systems heating, million cube. m	334	24.1	78.9	144.3	211	277.3	334
Reduction in annual natural gas consumption as a result of natural gas substitution and expansion using RES, million cube. m	217	7	31	68	123.6	156	217
Reduction in annual natural gas consumption as a result of implementing energy management systems and development dispatching in centralized systems heating, million cube. m	15.8	3.7	7.4	11.6	15.8	15.8	15.8

PM_EE_WEM_25 State target economic program for the energy modernization of

water supply and wastewater utilities in state or municipal ownership until 2030

Goal: Improving the energy efficiency of centralized water supply and wastewater systems by stimulating the modernization of physical infrastructure, enhancing resource efficiency and energy conservation, promoting innovative technical solutions, and creating economically attractive conditions for the implementation of investment projects.

Legal basis: Law of Ukraine "On Energy Efficiency"; CMU Order No. 1133 of November 15, 2024 "On Approval of the State Target Economic Program for the Energy Modernization of Water Supply and Wastewater Utilities in State or Municipal Ownership until 2030" (Official Gazette of Ukraine, 2024, No. 105, Art. 6705).

Timeframe: 2024–2030

Policy measure type: Economic

Sector(s) affected: Energy – consumption

Responsible authority(ies)/organization(s): MinDevelopment; regional state administrations (military administrations), including the Kyiv City State Administration (Military Administration) (subject to consent); local self-government bodies (subject to consent); business entities (subject to consent).

Type of emission reduction: CO_2

Description: The State Target Economic Program for the Energy Modernization of Water Supply and Wastewater Utilities in State or Municipal Ownership until 2030 (hereinafter, the Program for the Energy Modernization of Water Supply and Wastewater Utilities) provides for the implementation of the following measures:

- creating an innovation-friendly environment to improve the energy efficiency of water supply and wastewater utilities;
- strengthening the institutional capacity of water supply and wastewater service providers;
- hydraulic optimization of water supply and wastewater networks;
- replacement of inefficient water supply and wastewater equipment;
- automation and supervisory control of production processes related to drinking water treatment and distribution, as well as wastewater collection and treatment;
- deployment of energy- and resource-efficient technologies in the water supply and wastewater sector;
- installation of heat and electricity generation systems for own-use purposes based on alternative energy sources at water supply and wastewater facilities;
- implementation of an energy modernization management system for water supply and wastewater utilities.

Financing: The estimated total budget of the Program amounts to UAH 50 billion, including:

- UAH 10 billion from the State Budget, of which:
  - UAH 5 billion for co-financing Program measures; and
  - UAH 5 billion for interest rate compensation on loans obtained by utilities;
- UAH 10 billion from local budgets;
- UAH 30 billion from other sources.

Table 3.11. Main expected results of the implementation of the Program for the Energy Modernization of Water Supply and Wastewater Utilities

Name indicator	Value indicator							
	everything at		by years					
		2024	2025	2026	2027	2028	2029	2030
Reduction volume energy consumption in the field of centralized water supply and centralized drainage, %	30		5	10	15	20	25	30

Reduction volume losses and expenses drinking water under time its fence, transportation and supply, %	20		1	3	5	10	15	20
Reduction volume emissions CO2, tons	1070			50	100	200	300	420

PM_EE_WEM_26 Promotion of heat pump deployment

Goal: Decarbonization of the district heating sector.

Legal basis: Law of Ukraine "On Alternative Energy Sources"; Subsoil Code of Ukraine; CMU Resolution No. 1374 of October 15, 2004 "On Approval of the Methodology for Determining the Initial Sale Price at an Auction (Electronic Auction) of a Special Permit for Subsoil Use" (Official Gazette of Ukraine, 2004, No. 42, Art. 2772; 2025, No. 33, Art. 2216); MinRegion Order No. 52 of March 12, 2018 "On Approval of the Methodology for Calculating the Share of Energy Produced by Heat Pumps from Renewable Sources", registered with the Ministry of Justice on April 3, 2018 under No. 395/31847.

Timeframe: Since 2016

Policy measure type: Regulatory

Sector(s) affected: Energy – supply; Energy – consumption

Responsible authority(ies)/organization(s): MinDevelopment, MinEnergy, MinEconomy

Type of emission reduction: CO_2

Description: Under the Law of Ukraine "On Alternative Energy Sources", aerothermal, hydrothermal, and geothermal thermal energy generated using heat pumps is considered renewable energy provided that the final energy output significantly exceeds the primary energy input required to operate such installations.

Consumers, including energy cooperatives, may receive a feed-in tariff for electricity generated from geothermal energy installations (for details, see PM_D_WEM_08 Feed-in Tariff for Renewable Electricity Producers). In addition, non-household consumers are eligible for support under the self-generation mechanism (net billing) for electricity generated from geothermal energy where the generating installations are connected directly to the consumer's electrical installations or through its internal networks (for details, see PM_IME_WEM_05 Support for Active Consumers under the Self-Generation (Net Billing) Mechanism).

Additional financial support instruments have also been introduced. The Decarbonization Fund provides preferential leasing conditions for heat pumps and hybrid solar power systems for homeowners' associations and housing cooperatives. The Energy Efficiency Fund provided grants for the installation of heat pumps in multi-apartment buildings under the GreenDIM program. Although the program was suspended in March 2025, it may be resumed subject to the availability of funding (for details, see PM_D_WEM_13 Energy Efficiency Fund GreenDIM Program).

At the same time, the Subsoil Code of Ukraine stipulates that the use of subsoil resources for geothermal energy extraction requires a special permit issued without an auction for a period ranging from three to twenty years. The permit fee is calculated as the product of the drilling depth (in linear meters), the number of minimum wages established by the State Budget Law for the relevant year, and a coefficient of 0.5. In practice, the fee for obtaining a special permit for the construction and operation of underground facilities unrelated to mineral extraction remains a significant barrier to the development of geothermal heat pump projects, as the permit cost may exceed the cost of the equipment itself.

Planned measures: Draft Law No. 14271 of December 3, 2025, "On Amendments to Certain Laws of Ukraine Regarding the Implementation of European Union Legislation in the Field of Renewable Energy Sources", provides for shorter permitting and approval procedures for renewable energy projects involving heat pumps. The total duration of administrative procedures, including the conclusion of a grid connection agreement and the issuance of technical connection conditions, would be limited to one month for heat pump

projects with an installed capacity of 50 MW or less. For geothermal heat pump projects, the maximum duration would be three months.

In addition, the draft Law "On Amendments to Certain Legislative Acts of Ukraine Regarding the Improvement of Certain Provisions Related to Economic Activities in the Energy Sector", prepared by MinEnergy and published for public consultation, recognizes that the current fee for obtaining a special permit for subsoil use for non-extractive purposes, specifically for geothermal energy projects, exceeds the cost of implementing many geothermal heat pump projects. This makes most potential geothermal projects economically unviable and unattractive to investors, including municipal utilities whose primary objective is to meet the needs of local communities. The draft therefore proposes exempting geothermal projects from the fee for obtaining a special subsoil use permit, thereby creating more favorable conditions for attracting investment. As part of the ongoing consideration of the draft law, the possibility of establishing the permit fee at 20% of the current level is also being examined.

3.2.7. Regional cooperation in this area, where applicable

Not applicable

3.2.8. Financing measures, in the area at national level

Name funding programs	**Source of funding**	**Implementation period**	**The amount of funding**	**Goal**
State targeted economic program for energy efficiency and development of the production sector energy carriers from renewable energy sources and alternative species fuel on 2010-2021 years	State Budget of Ukraine	2010-2021	3.8 billion UAH	Bringing the energy intensity of Ukraine's gross domestic product closer to the level of developed countries and European Union standards, optimizing the structure of the state's energy balance.
Stock energy efficiency	State Budget of Ukraine	2018-2025	2.8 billion UAH	Supporting the implementation of measures to increase the energy efficiency of buildings, particularly in the residential sector, and reduce carbon dioxide emissions
Stock decarbonization and energy-efficient transformation	State Budget of Ukraine	2024-2025	1.9 billion UAH	Ensuring a sustainable source of funding support government programs for energy efficiency, alternative energy sources and decarbonization.
Energy Efficiency Support Program in Ukraine – EE4U	European Neighbourhood Instrument	2018-2025	104 million euros	Support activities Ukrainian Energy Efficiency Fund ; increase equal awareness and support investment in events on energy efficiency from the general public at the local level, familiarization with energy saving measures and popularization of the Fund's support mechanisms energy efficiency; training of energy auditors to support the implementation of energy efficiency reforms and preparation and verifications activities Foundation energy efficiency

Project development urban infrastructure - 2	International Bank for Reconstruction and Development	2014-2024	326.6 million USD	Increase qualities and efficiency of water supply, wastewater treatment and household waste treatment services in selected cities of Ukraine.

Project "Improving energy efficiency in the district heating sector" "Ukraine"	International Bank for Reconstruction and Development	2014-2023	202 million dollars USA (part of the loan in total 180 million USD was annulled on)	Provision to utility companies – project participants help in increasing economic and energy efficiency, minimization fuel and energy costs resources, improving their institutional potential and investing in improving reliability functioning heating systems by score works on the reconstruction of centralized systems heat supply (heat generation and transportation), as well as improving the environmental situation of the regions.
Project "Municipal Infrastructure Development Program" "Ukraine"	European Investment Bank	2016-2025	400 million euros	Implementation projects aimed at reconstructing, renewing and/or minimizing the deterioration of infrastructure in the areas of: heat supply, water supply and drainage, energy efficiency of buildings, outdoor lighting of settlements, household waste management .
Project "Energy Efficiency of Public Buildings" buildings in Ukraine"	European Investment Bank	2021-2046	407 million euros	Improving the energy efficiency of buildings owned by local governments (including kindergartens, hospitals, schools, cultural and administrative buildings).
Foundation E5P "Eastern European Partnership for Energy Efficiency" and the environment"	European Bank for Reconstruction and development	2009-2029	137.5 million euro	Support for investments in municipal infrastructure, which are designed to increase energy efficiency in Ukraine, as well as have a positive impact on the environment and struggle from climate change
Project "Energy Efficiency" in communities"	KfW - German Credit Institution for Reconstructio n	2021 - 2025	25.5 million euros	Increasing the energy efficiency of selected budget buildings in the cities of Zhytomyr and Zaporizhia through thermal modernization of public buildings, What has promote significant reducing city budget expenditures on energy costs
Project "Refinancing of energy efficiency investments" small and medium-sized enterprises of Ukraine through financial sector"	KfW - German Credit Institution for Reconstructio n	2022 - 2052	7.4 million euros	Financing eligible Ukrainian financial institutions by providing sub-loans to Ukrainian small and medium-sized enterprises and private entrepreneurs for the purpose of financing investment in energy efficiency

3.3. Dimension energy security

3.3.1. Policies and measures related to the elements set out in point 2.3

PM_ES_WEM_01 Development of routes for the imports of petroleum products and natural gas

Goal: Maintaining diversification of the supply of oil products, natural gas; utilization of infrastructure (gas transmission system, oil products pipelines)

Legal basis: ESU

Time frame: until 2025/2032, depending on tasks

Policy / measure type: Economic, Other

Sector of influence: Energy - supply

Responsible bodies/organizations*:* Ministry of Energy

Description: Before the full-scale invasion of the Russian Federation into Ukraine, the fuel market was 80% dependent on imports, mainly from the Russian Federation and the Republic of Belarus; also, a part of imports came by sea. In 2022, there was a complete reorientation of supplies in the fuel market: due to the destruction of oil refining capacities in 2022, domestic gasoline production decreased by 55%, diesel fuel by 59%, liquefied petroleum gas (LPG) by 32%, while the share of imports increased to 82%. In addition, due to the ban on fuel supplies from the Russian Federation and the Republic of Belarus, as well as blockades of seaports and the impossibility of importing fuel by these routes, full diversification of supply sources and routes was ensured for petroleum products and LPG, primarily from EU member stares. In the future, the geography of imports will be affected by the speed of unblocking the operation of sea ports and the restoration of oil refining industry.

The 2050 Energy Strategy of Ukraine foresees among the strategic initiatives and tasks:

● by 2025: diversification of technologies and supply routes in order to eliminate possible energy crises and shortages in the event of emergency situations;
● by 2032: expansion of oil product supply channels from the EU-based refineries and ports.

In the natural gas market, the task by 2025 is to diversify supply routes in order to eliminate possible energy crises and shortages in the event of emergency situations, including the creation of routes for the import of liquefied natural gas (LNG). To a large extent, this task has been achieved: in 2025, the gas TSOs of Poland and Ukraine doubled the firm capacity for entry into the Ukrainian system by September 2026, expanding access to LNG terminals in Poland and Lithuania, and through the efforts of 5 TSOs (Ukraine, Bulgaria, Greece, Moldova and Romania) the Vertical Corridor was launched, with three routes operating as a joint product for capacity booking. According to the Ministry of Energy, the cost of transportation through the Vertical Corridor has decreased by 25%, and by 2025, the capacity booking of the Trans-Balkan route has increased by 2.6 times[81].

A long-term initiative is the creation of a gas hub, which includes providing access to LNG terminals in Poland, Greece, Croatia, Turkey, Italy and Germany. The practical implementation of the policy will depend on market actors - gas imports from LNG terminals can be implemented both through long-term contracts and through the purchase and reservation of available free volumes on the spot markets through swap operations and adjacent routes.

PM_ES_WAM_01 Incentives for increasing gas production for maximum self-sufficiency

Goal: Maintaining diversification of natural gas supply; utilization of infrastructure (GTS); providing the economy with own resources

[81] https://mev.gov.ua/novyna/2025-rik-vidmova-vid-rosiyskoho-hazu-dyversyfikatsiya-dzherel-ta-marshrutiv-postachannya-y

Legal basis: ESU

Time frame: until 2025/2032, depending on tasks

Type of policy / measure: Economic, Regulatory

Sector of influence: Energy - supply

Responsible bodies/organizations: Ministry of Energy, State Geological Survey

Description: The 2050 Energy Strategy of Ukraine provides, in particular, among strategic initiatives and tasks:

- by 2025:
    - Increase in production under PEC contracts;
    - Implementation of production sharing agreements signed in 2020-2022 for 11 fields with hydrocarbon deposits;
    - Research and industrial development of plots that extractive companies received on the basis of electronic auctions;
    - Active involvement of international service companies with modern technologies by extractive companies;
- by 2032:
    - Involvement of investors in the conclusion of new PSAs;
    - Making changes to the legislation and providing tight gas a separate legal status, as a separate mineral;
    - Attracting investments to increase gas production at existing fields, development of gas fields of unconventional deposits;
    - Adoption of normative acts regarding the rules for resuming operation of mothballed and liquidated wells.

Subject to the implementation of the strategic initiatives specified in the ESU, the forecast volume of extraction by 2030 will be approximately 21.5 bcm. The start of production is predicted in 2025-2032. By 2032, private companies should produce 5.8 bcm annually, state-owned ones (Ukrnafta, Ukrgazvydobuvannya) - about 15.5 bcm. The total volume of investments is estimated at about UAH 100 billion by 2030.

In an optimistic scenario, by 2032, private companies should produce 6.7 bcm annually, state-owned companies - 20.1 bcm. The total amount of investments is estimated at about UAH 150 billion by 2030. At the same time, reaching the total extraction volume of 26.8 bcm will be possible only at the expense of investments in new deposits, including development of tight gas deposits and the Black Sea offshore.

By estimates of market players and taking into account consequences of purposeful attacks of Russian troops on oil and gas production infrastructure facilities, it is realistic to restore and maintain production volumes at the current level with a small increase in the medium term, which will allow to somewhat reduce dependence on imports. In particular, under the legal regime of martial law, the implementation of large investment projects is problematic: as of the end of 2025, investors in 7 out of 12 concluded PSAs are actually not carrying out geological exploration. At the same time, in 2025, the transfer of the rights and obligations of the PSA investor for the Oleska field in favor of PJSC "Ukrnafta" was approved, and tight gas was granted the status of a mineral of national importance by amending the Resolution of the Cabinet of Ministers of Ukraine of December 12, 1994, No.827 "On Approval of Lists of Minerals of National and Local Importance" (as amended by the Resolution of the Cabinet of Ministers of Ukraine of May 23, 2025, No.600). Competitions for the conclusion of PSA for the Mezhyhirska and Svichanska oil and gas fields, announced in 2025, did not take place due to the lack of applications for participation.

The transition to full self-sufficiency in domestic consumption by 2030 is possible under

the conditions of additional measures to support biomethane production and reduce domestic consumption of natural gas. Continuation of this policy will make it possible to count on the exports of residual volumes (or an increase in the production of goods that require the use of gas as a commodity) in the later period.

See as well as policies and measures of the Dimension Internal energy market, in particular PM_IMG_WAM_06 Additional measures to ensure the production of sufficient volumes of natural gas.

PM_ES_WAM_02 Restoration of oil refining and/or construction of a new refining complex

Goal: Meeting the demand for oil products at the expense of domestic oil refining

Legal basis: ESU

Time frame: until 2028/2032, depending on tasks

Type of policy / measure: Economic, Fiscal, Regulatory, Research

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, JSC "Naftogaz of Ukraine" (upon consent), JSC "Ukrnafta" (upon consent), JSC "Ukrtransnafta" (upon consent)

Description: The 2050 Energy Strategy of Ukraine, aiming at the development of oil production and the restoration of oil refining on the basis of one of the existing refineries and/or the construction of a new complex, provides among the strategic initiatives and tasks:

- by 2025:
  - Conducting a feasibility study of the restoration of domestic oil refining and starting the relevant preparatory works;
- by 2032:
  - Facilitating the implementation of individual oil projects by improving geological research and establishing competitive fiscal conditions (including PSAs);
  - Identification and elimination of legislative barriers to increase the national production of petroleum products;
  - Stimulating the introduction of new oil extraction and preparation technologies that maximize energy efficiency (in particular, at state-owned enterprises);
  - Restoration of oil refining capacities through modernization/reconstruction on the basis of one of the existing refineries and/or construction of a new complex, where it is most economically feasible;
  - Increasing the level of technological equipment of refineries and supplementing them with new petrochemical processes, which increases their competitiveness;
  - Analysis of the development of small modular refineries;
  - Restoration and expansion of LPG production capacity up to 200,000 tons/year and of gas condensate up to 40,000 tons/year.

Given the necessity and possibility of conducting feasibility studies for the restoration of oil refining capacities only after the end of martial law, a realistic deadline for the implementation of the relevant task is 2028. According to official statements, the developed project for the modernization of the Kremenchuk Refinery worth $2.7 billion has been submitted for consideration to the US International Development Finance Corporation (DFC) within the framework of the implementation of the Agreement on the Establishment of the US-Ukrainian Reconstruction Investment Fund[82].

The recovery of the industry is aimed at partially covering the demand for petroleum products. The rest of the needs will be covered by diversified imports in order to maximize energy security (see PM_ES_WEM_01 Development of routes for the imports of petroleum products and natural gas). A clear perspective of the industry's development is also an important component of the policy to reduce emissions of methane and non-methane volatile organic compounds during oil and gas processing.

[82] https://kyivindependent.com/exclusive-ukraine-pitches-deepwater-gas-oil-refinery-projects-to-us-under-landmark-minerals-deal-06-2025/

PM_ES_WEM_02 Creation of fuel assembly manufacturing capacities to meet at least 50% of the needs of Ukrainian NPPs with VVER-1000 reactors

Goal: Build-up own production capacities and magnification particles in meeting the needs of Ukrainian nuclear power plants

Legal basis: ESU

Time frame: 2024-2027 years

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, AT "NAEK" "Energoatom" (by consent)

Description: In Ukraine, it is planned to increase the installed capacities of nuclear power plants due to the construction of new power units, as well as the implementation of a project on the own production of fuel assemblies. The 2050 Energy Strategy of Ukraine, among the strategic initiatives and tasks until 2032, also provides for its own production of assemblies for nuclear reactors.

Ensuring 100% of the nuclear fuel needs for the VVER-440 reactors of power units 1 and 2 of the Rivne NPP until the end of their operational life is provided for by the terms of the current contract between JSC "NAEK "Energoatom" and Westinghouse Electric Sweden AB. The project to create a technological complex for the production of fuel assemblies using the technology of Westinghouse Electric Sweden AB involves the creation of fuel assembly assembly capacities only for the VVER-1000 reactors of the Ukrainian NPPs.

In 2021, the separate division Atomenergomash of JSC "NAEK "Energoatom" began work on setting up production. On January 17, 2022, JSC "NAEK "Energoatom" and Westinghouse signed an agreement on the assessment and qualification of production lines for the production of fuel assemblies.

As of 2025, Westinghouse Electric Sweden AB officially recognized Atomenergomash as a qualified supplier of fuel assembly components for VVER-type reactors, this decision is valid until April 2028 and confirms the previously obtained licenses for the manufacture of top and bottom nozzles[83]. In support of the implementation of the project, the Ministry of Energy is also preparing an order of the Cabinet of Ministers of Ukraine "On the location, design and construction of a nuclear facility for the production of fuel assemblies for nuclear reactors of nuclear power plants".

According to the agreement between JSC "NAEK "Energoatom" and Westinghouse Electric Sweden AB, the project implementation schedule for the completion of the production qualification process and the manufacture of the first batch of fuel assemblies for VVER-1000 reactors is scheduled for the end of 2028. Accordingly, ensuring 50% of the needs of Ukrainian NPP power units with VVER-1000 reactors is possible no earlier than 2029.

PM_ES_WAM_03 Creation of fuel assembly manufacturing capacities to meet all of the needs of Ukrainian NPPs with VVER-1000 reactors

Goal: Increasing own production capacity and increasing the share in meeting the needs of Ukraine's nuclear power plants

Legal basis: ESU

Time frame: 2029-2034

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, JSC "NAEK "Energoatom" (upon consent)

[83] https://energoatom.com.ua/en/news/westinghouse-electric-sweden-ab-viznav-filiiu-energoatoma-vp-atomenergomas-kvalifikovanim-ta-zatverdzenim-postacalnikom-komponentiv-iadernogo-paliva-tvz-dlia-reaktoriv-vver

Description: The 2050 Energy Strategy of Ukraine, among the strategic initiatives and tasks until 2032, also provides for its own production of heat-releasing assemblies for nuclear reactors.

It is planned to implement a project to build a nuclear facility for the production of fuel assemblies for nuclear reactors, the capacity of which is intended to cover the needs of all Ukrainian NPP power units with VVER-1000 reactors. Taking into account the fact that the production of the first batch of fuel assemblies for VVER-1000 reactors is scheduled for the end of 2028, ensuring 100% of the needs of Ukrainian NPP power units with VVER-1000 reactors is possible in the period 2029-2034.

PM_ES_WAM_04 Development of uranium production

Goal: Increasing own production capacity and increasing the share in meeting the uranium needs of Ukraine's nuclear power plants at the expense of natural resources and technological capacities

Legal basis: ESU, Concept of the State Targeted Economic Program for the Development of the Nuclear Industrial Complex for the Period Until 2026 (approved by the Order of the Cabinet of Ministers of Ukraine of December 29, 2021, No.1804-r)

Time frame: 2024-2032

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy

Description: The development of nuclear energy in Ukraine will require an increase in production and an increase in the efficiency of uranium ore processing, taking into account the presence of a significant amount of explored reserves and promising resources, effective extraction and processing technology.

The Concept of the State Targeted Economic Program for the Development of the Nuclear Industrial Complex for the Period Until 2026 states that Ukrainian NPPs use nuclear fuel in an amount that, in terms of the volume of uranium oxide concentrate required for its production, is equivalent to 2.2-2.4 kt per year. The document defines the optimal option for increasing the production capacity of SE "ShidGZK" and ensuring a gradual increase in the share of domestic uranium in nuclear fuel used by Ukrainian NPPs, which requires state support and budget financing to carry out relevant tasks and measures. Given the limited budget resources in the period of martial law and the allocation of available financial resources primarily to the needs of defense, security, the functioning of the budget sector, support for the population and economic recovery, financing from the state budget was not performed. The goal of the future program is declared to be "modernization and expansion of production capacities of the uranium mining industry to fully meet the needs of domestic nuclear energy, development of technologies for the production of nuclear-pure zirconium".

The 2050 Energy Strategy of Ukraine actually repeats the provisions of the Concept and the draft Program, proposing among the strategic initiatives and tasks:

- Maintenance of the existing capacities of the plant for the extraction of uranium ores;
- Implementation of the state investment project "Novokostiantynivska mine. Development of production capacities";
- Development of new uranium deposits;
- Increasing the volume of uranium production and reducing the costs of its production;
- Increasing the efficiency of uranium ore processing and uranium production.

In the context of the development of uranium production, the Cabinet of Ministers of Ukraine has introduced to the Verkhovna Rada the draft Law "On joint-stock company company "Eastern Mining and Processing Plant" (Registration No. 15122 of April 1,

2026[84]), developed by the Ministry of Energy. The draft law defines the procedure for transforming SE "Eastern Mining and Processing Plant" into a joint-stock company, with 100% of shares belonging to the state, and defines the features of forming the authorized capital and the functioning of such a company. As noted by the Ministry of Energy, the implementation of a modern corporate governance model will allow the enterprise become more attractive for investment, and as consequence will allow to increase volumes of uranium ore mining, uranium oxide concentrate and sulfuric acid production[85].

At the same time, the preamble of the draft law declares further merger of JSC "SkhidGZZK" with JSC "NNEGC "Energoatom", and the final and transitional provisions of the draft law provide for the assignment of the Cabinet of Ministers of Ukraine, within four months from the date of state registration of the company, to ensure the development and approval of an action plan for such merger, specifying the stages, deadlines and bodies responsible for its implementation, as well as to ensure the implementation of relevant actions.

PM_ES_WEM_03 Creation of gas reserves (achieving the target level of gas storage facilities' filling)

Goal: Ensuring security of natural gas supply in Ukraine

Legal basis: Laws of Ukraine "On the Natural Gas Market", "On Amendments to Certain Legislative Acts of Ukraine Regarding the Certification of Gas Storage Operators and Continuation of Measures to Prevent the Bankruptcy of the State Joint Stock Company Chornomornaftogaz"

Time frame: constantly

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, market players (primarily NJSC "Naftogaz of Ukraine") (upon consent)

Description: The Law of Ukraine "On the Natural Gas Market" provides for the possibility of establishing an obligation on all suppliers to form an insurance reserve of natural gas in the amount of no more than 10% of the planned monthly supply to consumers for the next month. The size of the insurance reserve is set annually by the Cabinet of Ministers of Ukraine at the same level for all suppliers.

However, in recent years this level was zero, and the universal obligation was difficult to fulfill due to the projected financial burden on market participants and the administrative burden on state authorities. The level of the insurance reserve at 3% proposed by the Ministry of Energy in 2023 assumed that the costs associated with meeting the requirements would amount to UAH 848.5 million during the first 3-6 months[86], in 2025 the estimated additional costs of suppliers to form the insurance reserve at 0.5% (10% in the event of an emergency-level crisis) and provide a financial guarantee amounted to UAH 833 million per month, with total costs in the first year being UAH 69.6 billion[87].

Adopted in 2022, the Law of Ukraine of December 13, 2022, No. 2850-IX "On Amendments to Certain Legislative Acts of Ukraine Regarding the Certification of Gas Storage Operators and Continuation of Measures to Prevent the Bankruptcy of the State Joint Stock Company Chornomornaftogaz", which, inter alia, implements Articles 6a and 6c of the Regulation (EU) 2017/1938, defines the filling target as "the mandatory level of filling underground gas storages as of the relevant date, set as a percentage of the total capacity of underground gas storages, which is indicated in the schedule of filling gas storages". The development of the schedule is entrusted to the Ministry of Energy, monthly reports are submitted by the GSSO to the Ministry of Energy and the Regulator in

[84] https://itd.rada.gov.ua/billinfo/Bills/Card/69791

[85] https://mev.gov.ua/novyna/uryad-skhvalyv-proyekt-zakonu-pro-korporatyzatsiyu-skhidhzk

[86] https://mev.gov.ua/rehulyatornyy-akt/povidomlennya-pro-oprylyudnennya-do-proektu-postanovy-kabinetu-ministriv-ukrayiny

[87] https://www.mev.gov.ua/rehulyatornyy-akt/povidomlennya-pro-oprylyudnennya-proyektu-postanovy-kabinetu-ministriv-19

accordance with the procedure provided by the Rules on the Security of Natural Gas Supply.

However, the regulatory framework needs improvement to fully implement the requirements of the Regulation (EU) 2017/1938 (see PM_ES_WAM_05 Implementation of EU rules on security of electricity and gas supply). This concerns amendments to the Law of Ukraine "On the Natural Gas Market" regarding the mechanisms for the target level of filling of gas storage facilities, as well as by-laws regarding calculating the target filling level of gas storage facilities and forming a gas storage filling schedule.

In the absence of a fully formed legal framework, decisions on the target filling level of gas storage facilities are made at the Cabinet of Ministers level (for example, within the framework of action plans to prepare housing and utilities' facilities and the fuel and energy complex of Ukraine for the autumn-winter period and its passage), and the main costs are borne by NJSC "Naftogaz of Ukraine" as the entity responsible for the formation of natural gas resources for household consumers, gas DSOs, electricity producers and district heating companies, within the framework of the PSO mechanism.

PM_ES_WEM_04 Creation of coal and backup fuel (fuel oil) reserves

Goal: Ensuring security of electricity supply

Legal basis: Procedure for forming the forecast balance of electricity of the Unified Energy System of Ukraine for the accounting year (approved by order Ministry of Energy and Coal Industry of October 26, 2018 No.539), Rules on the Security of Electricity Supply (approved by order of the Ministry of Energy and Coal Industry No. 448 of August 27, 2018), decisions of the government in the framework of preparation for the autumn-winter periods

Time frame: constantly

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, market players (by consent)

Description: The formation and maintaining of reserves of fossil energy resources for generating facilities (natural gas, coal, fuel oil) is carried out as a measure within the framework of the government's activities to coordinate the preparation of the industry for each autumn-winter season. As a rule, target indicators are determined in the form of orders of the Cabinet of Ministers of Ukraine.

However, the basis is the forecast balance of electricity of the UES of Ukraine for the accounting year, which is compiled by the TSO and approved by the Ministry of Energy. In accordance with the Rules on the Security of Electricity Supply, to ensure the security of supply in the short term, the Ministry of Energy approves the Forecast balance of electricity of the UES of Ukraine, the coal accumulation schedule at the end of each month of the accounting year for electricity producers of thermal power plants and combined heat and power plants (no later than December 1, which precedes the forecast). Monitoring of security of supply is carried out, inter alia, regarding the schedule and volumes of supply and accumulation (reserves) of all types of fuel within the forecast balances of electricity production.

In accordance with a separate Procedure, the calculations of the basic and marginal variants of the balance must take into account assumptions regarding the volumes of own extraction (production) of fuel and its processing products, forecast prices, as well as the risk of insufficient fuel supply for generating facilities.

When determining the amount of fuel supply, the following should be taken into account:

- for TPPs:
    - formation of guaranteed reserves of coal corresponding to 10- or 20-day volumes

of consumption, depending on the remoteness of the point of its extraction;

- preventing reserve fuel (fuel oil) stocks from falling below the 10-day volume needed to ensure unit start-ups and necessary lighting;

● for CHPs:

- formation of guaranteed coal reserves corresponding to the 20-day average daily consumption required to ensure the heat load schedule in accordance with the concluded contracts for heat supply in the forecast month (at CHPs for which coal is the main fuel);

- preventing the reserve fuel (fuel oil) from falling below the 10-day volume required for unit start-ups and necessary lighting (at CHPs for which coal is the main fuel);

- preventing a decrease in the 10-day supply of reserve fuel (fuel oil) to ensure the survivability of CHPs and heat networks in the event of a complete shutdown of natural gas supply (at CHPs for which natural gas is the main fuel).

After approval of the forecast balance, electricity producers at TPPs and CHPs provide the Ministry of Energy with data on the forecast fuel structure. During the development of such forecasts, electricity producers at TPPs are obliged to ensure:

● supply of coal in the amount of planned costs in accordance with the approved forecast balance of electricity;

● the formation of guaranteed coal reserves corresponding to the 10-day (for the G+D grades) or 20-day (for the ASh+P grades) volume of average daily coal consumption (based on consumption data for the last three years and the weighting factor depending on the month).

● formation of a 10-day supply of reserve fuel (fuel oil) at TPPs, for which the main fuel is coal, for units start-ups and possible lighting.

In turn, producers of electricity at CHPs are obliged to ensure the formation of guaranteed reserves of coal and reserve fuel (fuel oil) at the same level as when determining the amount of fuel supply.

Based on the information received from the generating companies, the Ministry of Energy compiles a consoliof forecast structure of fuel for TPPs and CHPs, forms and approves the schedule for the accumulation of coal and reserve fuel (fuel oil) at the end of each month of the accounting year for TPPs and CHPs. Electricity producers at TPPs and CHPs also monitor the implementation of the approved schedule and, in the event of a decrease, inform the Ministry of Energy and TSO about the reasons and measures to bring fuel stocks in warehouses in line with the schedule. Monitoring of indicators of the forecast balance of electricity, in particular fuel reserves, is also carried out independently by both the Ministry of Energy and TSO.

Reduction of guaranteed coal reserves is allowed in case of force majeure in the supply of coal, as well as with the approval of the Ministry of Energy (but not more than 15% and for a period of up to 20 days). Volumes of guaranteed coal reserves must be restored within 20 days from the last day of the month when the reduction of these volumes began.

PM_ES_WEM_05 Creation of minimum stocks of crude oil and petroleum products

Goal: Ensuring uninterrupted supply of oil and petroleum products to the domestic market of Ukraine, in the event of a crisis situation on the oil and petroleum products market, by implementation of the requirements of the Council Directive 2009/119/EC, which provides for the creation of a level of minimum stocks equal to 90 days of average daily net imports or 61 days of average daily consumption, depending on which of the indicators is higher.

Legal basis: Law of Ukraine "On Minimum Stocks of Crude Oil and Petroleum Products"

Timeframe: In stages, with the achievement of the target volume within 8 years from the implementation (after 12 months from the date of entry into force); approximately until 2032. At the same time, obligations to create minimum reserves of crude oil from the composition of the minimum stocks arise for market players 6 months after the termination or cancellation of martial law.

Type of policy / measure: Contractual, Regulatory, Other

Sector(s) affected: Energy - supply, Energy - consumption, Transport

Responsible authorities/organizations: Ministry of Energy, State Customs Service, State Tax Service, State Statistics Service, market players (upon consent)

Description: The complete destruction of the oil refining industry as a result of the full-scale invasion of the Russian Federation into Ukraine and the constant attacks on logistics nodes create a risk of disruptions in the supply of petroleum products. In the event of a cessation of the flow of oil and petroleum products without the presence of the minimum stocks, Ukraine could satisfy for no more than 10-30 days due to own oil production and processing and existing commercial reserves of petroleum products[88].

The minimum stocks system in Ukraine is in the process of formation. The Law has been adopted, defining the basic principles of the creation and functioning of the minimum stocks system in Ukraine, and also regulates relations in this area (functions and powers of state regulatory bodies, the administrator of the reporting system). The act defines the concept of a crisis situation in the oil and petroleum products market, its levels, the procedure for creating, storing, replacing the minimum stocks, as well as disclosure in the event of a crisis, the procedure for financing the functioning of the minimum stocks system.

The military risks of creating a military intelligence agency are mitigated by the provision that, during martial law, part of reserves maybe to be kept by abroad in member countries EU, What border with Ukraine (no more than 50% of the total), and EU countries bordering such states (no more than 25% of the total). At the same time, according to market participants, in the short and medium term there will be a shortage of available storage capacity in neighboring EU Member States. The 2050 Energy Strategy of Ukraineincluded, among its strategic initiatives and tasks by 2025, the construction of secure storage facilities for oil reserves.

The formed minimum stocks can be used only in crisis situations related to disruptions in supply and fuel shortages, and cannot act as a tool for regulating market prices. The law of Ukraine provides for liability for violation of the rules and conditions of storage of stocks.

In addition, JSC "Ukrtransnafta" was planned to be involved in the implementation of the requirements for storage of minimum stocks. In particular, it was assumed that the operator of oil and oil product pipelines would act as a responsible custodian, and other companies would be the owners. At the same time, to implement this project, JSC Ukrtransnafta will have to take additional measures by increasing the tank fleet, given that the requirements of Council Directive 2009/119/EC prohibit storage in pipelines (similarly, the Law of Ukraine contains a restrictive definition of tanks). At the same time, a temporary derogation is allowed in martial law conditions, since Ukraine has sufficient free pipeline capacities that are not used for the transportation of oil and oil products, as well as experience in using them for the storage of oil/oil products.

With purpose of implementing the Law provisions, such regulatory acts were approved:

- Resolution of the Cabinet of Ministers of Ukraine No. 1443 of December 17, 2024 “Some issues of monitoring the market of oil, oil products and liquefied gas in Ukraine”;

[88] https://itd.rada.gov.ua/billInfo/Bills/pubFile/1853886

● Resolution of the Cabinet of Ministers of Ukraine No.1455 of Decemebr 20, 2024 “On approval of the order for creation, management and operation of a system of minimum reserves of oil and petroleum products in Ukraine”;

●Order of the Cabinet of Ministers of Ukraine No.601 of May, 23, 2025 “On some issues of implementation of the Article 4 of the Law of Ukraine "On Minimum Stocks of Oil and Petroleum Products", which approved an action plan to overcome the crisis situation in the oil and petroleum products market of Ukraine.

The Ministry of Energy has also prepared a draft order on approving the Methodology for calculating the level of minimum stocks[89], which will approve the requirements for calculation, in particular the total volume of minimum stocks, the list (nomenclature) of oil and oil products that should be included in the minimum stocks, as well as the mechanism for calculating market prices for oil and oil products from the minimum stocks.

PM_ES_WEM_06 Implementation of the first standard of conduct for gas infrastructure facilities (N-1 Standard), standards of conduct for gas suppliers

Goal: Ensuring the safety of natural gas supply in Ukraine by forecasting and assessing possible risks, taking measures to prevent them, eliminate or reduce damage from crises. Defining protected consumers, mandatory measures for market players.

Legal basis: Law of Ukraine "On the Natural Gas Market", Rules on the Security of Natural Gas Supply (approved by order Ministry of Energy and Coal Industry of November 2, 2015 No.686), National Action Plan (approved by order of the Ministry of Energy and Coal Industry of November 2, 2015 No.687)

Time frame: constantly

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy

Description: The N-1 Standard stipulates that in the event of failure of the largest main gas pipeline or the largest gas storage facility, the capacity of the remaining gas infrastructure facilities on the territory of Ukraine must ensure the ability to meet peak demand (days when there is an extremely high demand, the statistical probability of which is once every 20 years). The annual calculation of the N-1 Standard is entrusted to the Ministry of Energy.

Also, all suppliers of natural gas are obliged to take measures to ensure a sufficient resource of gas for the needs of their consumers belonging to the protected category. Among the measures are maintenance of stocks in gas storage facilities, conclusion of purchase and sale contracts for additional volumes, restriction or termination of supplies to consumers that are not protected. Appropriate standards of conduct should be observed in the following cases:

● extreme temperatures during a 7-day peak period, the statistical probability of which is once in 20 years (Standard 1);

● a period of extremely high demand for natural gas lasting 30 days or more, the statistical probability of which occurs once every 20 years (Standard 2);

● failure of the main gas pipeline under normal winter conditions for a period of 30 days (Standard 3).

The Rules on the Security of Natural Gas Supply are regularly revised. The next update should take into account the measures necessary to meet the gas supply standard under all scenarios specified in Article 6(1) of the Regulation (EU) 2017/1938.

The Ministry of Energy is also responsible for the development and implementation of the

[89] https://mev.gov.ua/rehulyatornyy-akt/povidomlennya-pro-oprylyudnennya-proyektu-nakazu-ministerstva-enerhetyky-37

National Action Plan, which defines measures to respond to crisis situations of various levels, as well as for the organization and monitoring of security of supply. Annual updates of the National Action Plan and publication of reports on the results of security of supply monitoring should take place. It is important to note that such revision is also due to the cooperation of the Ministry of Energy with the Joint Research Center of the European Commission.

PM_ES_WEM_07 Implementation of the minimum criteria for the security of electricity supply

Purpose: Determination of measures to ensure the security of electricity supply (both preventive and in case of violations), minimum criteria for security of electricity supply, mandatory measures for market players

Legal basis: Law of Ukraine "On the Electricity Market", Rules on the Security of Electricity Supply (approved by order of the Ministry of Energy and Coal Industry of August 27, 2018, No. 448)

Time frame: constantly

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, NEURC, TSO (by consent)

Description: Most of the threats and their prevention/response measures are in the field of view of the TSO, which monitors compliance with the standards of operational security of supply (defined by the Transmission System Code). The Ministry of Energy is responsible for organizing and conducting monitoring security of supply (together with the Regulator, transmission system operator and other relevant institutions). Every two years, a report on the results of the security of supply monitoring should be published.

As for security of electricity supply to protected consumers and granting of the relevant status, the norms of the Procedure for Ensuring the Supply of Electricity to Protected Consumers, approved by the Resolution of the Cabinet of Ministers of December 27, 2018 No.1209, and in terms of priority power supply to critically important facilities – of the Procedure for determining and applying limit values for electricity consumption, approved by the Resolution of the Cabinet Ministers of May 24, 2024, No.600.

PM_ES_WAM_05 Implementation of EU rules on security of electricity and gas supply

Goal: Ensure security of supply of electricity and natural gas by assessing risks and preparing action plans

Legal basis: EU legislation

Time frame: 2025-2028

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible authorities/organizations: Ministry of Energy, NEURC, TSO, DSOs, ENTSO-E (upon consent), regional coordination centers (RCCs) and other parties (upon consent)

Description: For Ukraine, it is necessary to implement the requirements of EU legislation, in particular the Regulation (EU) 2019/941 on preparedness for risks in the electricity and the repeal of Directive 2005/89/EC, the Regulation (EU) 2019/943 on the internal electricity market (regarding the implementation of the electricity supply standard), as well as the Regulation (EU) 2017/1938 on measures to guarantee the security of gas supply and on the repeal of Regulation (EU) No. 994/2010 (except for the part on filling gas storages).

The Regulation (EU) 2019/941 requires the determination of the authorized body that must carry out a risk assessment of electricity supply taking into account the regional risk

assessment (performed by ENTSO-E), prepare and approve a risk preparedness plan with a list of measures planned or taken for prevention, preparation and mitigation of crises. This plan should be prepared in accordance with Articles 11 and 12 of the Regulation and the template provided in the Annex to the Regulation, with the participation of all necessary stakeholders. This will require amendments to the legislation, as well as the approval at the sub-legal level of the procedure for preparing for and managing crises in the electricity sector, and the risk preparedness plan.

Regulation (EU) 2019/943 requires a national resource adequacy assessment based on a pan-European resource adequacy assessment methodology approved by ACER. The Regulation also provides for the possibility of applying capacity mechanisms.

Commission Regulation (EU) 2017/2196 will require the adoption of amendments to the Transmission System Code, approved by the NEURC Resolution of March 14, 2018 No.309 (as amended), and the Market Rules, approved by the NEURC Resolution of March 14, 2018 No.307 (as amended), to ensure full compliance with its provisions.

The Regulation (EU) 2017/1938 requires the designation of an authorized body that must carry out a coordinated regional assessment of gas supply risks, prepare and approve preventive action plans and emergency plans. These plans must be prepared in accordance with Articles 9 and 10 of the Regulation, as well as the templates provided in the annexes to the Regulation, with the participation of all necessary stakeholders. Implementation of the N-1 Standard and the infrastructure standard is reinforced by solidarity and cooperation measures at the regional level. Full harmonisation of the terms, institutional structure, rules and procedures for risk assessment, preparation and response to situations posing a threat to the security of natural gas supply will require amendments to the legislation, and also approval on subordinate levels of the preventive action plan and an action plan for crisis of emergency level.

In order to bring the Rules on Security of Natural Gas Supply into line with the requirements of Regulation (EU) 2017/1938, in 2023 the Ministry of Energy published draft amendments[90] regarding the conduct of risk assessments in accordance with the form and requirements of the Regulation, and in 2024 - another draft amendment[91] in part of the assessment risks and calculation targeted levels filling gas storage facilities and forming a schedule for filling gas storage facilities.

PM_ES_WEM_08 Experiment on the construction, repair and other engineering and technical measures for the protection of CIF in the fuel and energy sector

Goal: Creation of multi-level engineering and technical protection of key critical infrastructure facilities of the fuel and energy sector

Legal basis: Resolution of the Cabinet of Ministers of Ukraine dated December 27, 2022 No. 1482 "On the implementation of a pilot project on the construction, repair and other engineering and technical measures to protect critical infrastructure facilities of the fuel and energy sector of critical infrastructure", Resolution of the Cabinet of Ministers of Ukraine dated February 7, 2025 No. 142 "On the implementation of a pilot project on new construction, reconstruction, overhaul, repair and other engineering and technical measures to protect critical infrastructure facilities of the fuel and energy sector, the railway transport subsector of the transport and postal sector, the sector of critical infrastructure life support systems"

Time frame: 2023-2026

Type of policy / measure: Economic, Other

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Development, State Agency for Restoration and Infrastructure Development (Restoration Agency)

[90] https://mev.gov.ua/rehulyatornyy-akt/povidomlennya-pro-oprylyudnennya-proektu-nakazu-ministerstva-enerhetyky-3

[91] https://mev.gov.ua/rehulyatornyy-akt/povidomlennya-pro-oprylyudnennya-proyektu-nakazu-ministerstva-enerhetyky-14

Description: The coordinators of both pilot projects are the Ministry of Development and the Recovery Agency. For the first project, the participants are the Ministry of Energy, the General Staff of the Armed Forces of Ukraine, the State Emergency Service, critical infrastructure operators, the State Special Communications Administration, regional, Kyiv City State Administrations (military administrations), the Recovery Agency, infrastructure recovery and development services in the regions, design and construction organizations (upon consent). For the second – the Ministry of Energy, the State Emergency Service, operators of critical infrastructure of the fuel and energy sector, subsector railway transport transport and postal sector, critical infrastructure life support systems sector, State Special Communications Administration, regional, Kyiv City State Administrations (military administrations), Ministry of Development, Recovery Agency, state enterprises, institutions and organizations that fall under the management of the Recovery Agency, JSC "Ukrzaliznytsia", infrastructure recovery and development services in the regions, design and construction organizations (with consent).

As part of the implementation of the first pilot project, it was planned to establish two levels of protection — against strike UAVs and against missiles — for 22 main substations of the Ukrainian IPS[92], for which Ukrenergo formed a task for design and construction. In total, it was planned to create three levels of protection[93]:

1. passive protection against fragments (gabions and big bags), protection of 103 objects (73 electricity infrastructure, 30 – gas infrastructure)[94] in 21 regions;
2. protection autotransformers from fragments and drones attacks (reinforced concrete structures), protection of 63 autotransformers of 22 substations in 14 regions[95] is provided ;
3. experimental protection from rocket attacks (reinforced concrete structures); Protection of 22 substations in 14 regions is provided.

As of 2025, there were 46 protection elements within the perimeter of responsibility of the Recovery Agency, of which 38 were fully implemented, and another 8 were to be completed by the end of the year[96]. However, the completion of the construction of protective structures in full requires additional extra-budgetary sources of financing. The project "Construction of protective structures from destroying unmanned aerial vehicles and missiles at energy infrastructure facilities" provides for two components - the construction of protective structures of the II level of protection at 22 electrical substations (55.742 billion UAH) and the construction of protective structures of the III level level protection (from missiles' damage) on 22 electric substations (144.52 billion UAH)[97].

As part of the second pilot project, the Recovery Agency will be responsible for building protection for an additional 125 elements of the fuel and energy complex[98].

PM_ES_WAM_06 Ensuring cyber protection of the CIF in fuel and energy sector

Goal: The Energy Security Strategy identifies among the priority tasks for achieving Strategic Goal 2. Stability of the energy sector functioning, among other things, ensuring cyber security and physical security of the critical infrastructure of the energy sector. Cybersecurity Strategy of Ukraine among the foundations of the development of the national cyber defense system indicates the achievement of cyber resilience - the ability to quickly adapt to internal and external threats in cyberspace, support and restore the sustainable functioning of the national information infrastructure, primarily critical

[92] https://focus.ua/uk/economics/599528-do-kincya-zimi-u-mininfrastrukturi-nazvali-termini-vstanovlennya -zahistu-na-klyuchovi-pidstanciyi-video

[93] https://restoration.gov.ua/press/news/58489.html , https://mtu.gov.ua/news/35069.html

[94] https://interfax.com.ua/news/eco #mic/953814.html

[95] https://mtu.gov.ua/news/35002.html

[96] https://epravda.com.ua/biznes/do-kincya-roku-bude-zahishcheno-shche-sto-ob-yektiv-kritichnoji-infrastrukturi-813591/

[97] https://dream.gov.ua/ua/public-program/DREAM-UA-060825-7846A759?fromUri=/spp-pipeline

[98] https://epravda.com.ua/interview/kuleba-pro-zahist-energetiki-hto-vidpovidaye-ta-logika-vidbudovi-pid-chas-viyni-816214/

information infrastructure facilities.

Legal basis: ESU, Laws of Ukraine “On Critical Infrastructure”, “On Basic Principles ensuring cybersecurity of Ukraine”, Cybersecurity Strategy of Ukraine, separate resolutions of the Cabinet of Ministers of Ukraine

Time frame: by 2032, depending on tasks

Type of policy / measure: Regulatory, Planning, Other

Sector(s) affected: Energy - supply

Responsible authorities/organizations: Ministry of Energy, critical infrastructure operators in the fuel and energy sector, Administration of the State Service for Special Communications and Information Protection, Security Service, Ministry of Foreign Affairs, National Coordination Center for Cyber Security (NSDC)

Description: ESU provides among strategic initiatives and tasks:

- to 2025 year (with taking into account positions Administration of the State Service for Special Communications and Information Protection):
    - Introduction comprehensive approach to software security (physical security, engineering safety and cybersecurity);
    - Development and approval of an effective methodology for assessing threats and the state of the energy sector security, which b answered challenges reliability and security of energy supply;
    - Coordination of the location of new energy facilities (large assets of state-owned companies) with representatives of the security and defense sector and determination of the responsible state body;
    - Strengthening the capacity for timely detection, prevention and neutralization of threats to the security of energy infrastructure;
    - Development programs comprehensive protection objects energy infrastructure, which will include a safety data sheet;
    - Development plan protection object critical infrastructure by project threat to critical infrastructure at the national level "cyber attack/cyber incident";
    - Realization complex events protection in energy sector;
    - Implementation events with cyber defense with taking into account results management cybersecurity risks ;
    - Improving engineering, technical and other measures to prevent and/or prevent unlawful actions on CIF in fuel and energy sector;
    - Software viewing standards of software CIF emergency a reserve of necessary equipment and supplies;
    - Review of the design threat for nuclear and industrial complex facilities and other CIF, taking into account the results of the full-scale invasion of Ukraine by the Russian Federation;
    - Development programs with strengthening events with security already existing energy infrastructure facilities;
    - Software developments projects development systems gears and gas networks taking into account all physical security requirements;
    - Definition responsible organ by engineering safety and distribution powers to implement engineering safety measures;
    - Studying the feasibility and implementation of pilot projects for placing individual elements of energy infrastructure underground, taking into account the feasibility and possibility of placement (for example, substations in a protected design).
- to 2032 year (operationalized Ministry of Energy):
    - development of a cybersecurity system and implementation of cyber protection measures in fuel and energy sector of critical infrastructure in order to achieve a

specific cyber resilience target state;

- development of an information exchange platform on cyber threats to the energy industry (MISP), which ensures response and operational exchange of information regarding cyber incidents, cyber attacks and cyber threats between the main cybersecurity entities and enterprises of the fuel and energy complex of Ukraine, critical infrastructure operators of the fuel and energy sector of critical infrastructure;
- creation of industry cybersecurity centers and industry teams for responding to cyber incidents, cyber attacks, and cyber threats (industry CSIRTs);
- implementation of Requirements for cyber protection of the fuel and energy sector of critical infrastructure;
- conducting an annual self-assessment in accordance with the Cybersecurity Capability Maturity Model C2M2 (developed by the United States Energy Agency), as defined by the Methodology for Assessing the State of Cybersecurity of Electric Grids and Cybersecurity Practices of Electric Grids;
- ensuring the annual Cybersecurity Status Review fuel and energy sector critical infrastructure;
- implementing industry-specific security profiles for the system in fuel and energy complex of Ukraine;
- carrying out exercises with cybersecurity and cyber hygiene;
- stimulating investments in ensuring digitalization and strengthening cybersecurity in the fuel and energy sector of critical infrastructure.

By the decision of the National Security and Defense Council of Ukraine dated October 17, 2023, the Cabinet of Ministers of Ukraine was tasked with guaranteeing implementation works from engineering and physical protection objects critical infrastructure and the fuel and energy complex, approve the Action Plan for the restoration of critical infrastructure facilities that were destroyed or damaged as a result of Russian aggression, develop and approve in 2023 the Energy Sustainability Plan of Ukraine with determining sources of funding. In turn, the Ministry of Energy, together with the Ministry of Development, the State Emergency Service, critical infrastructure operators, and local state (military) administrations must ensure engineering protection of critical infrastructure facilities and their restoration in case of damage.

Responsibility for ensuring cyber protection of CIF communication and technological systems, protection of technological information in accordance with legal requirements, for immediately informing the national team for responding to cyber incidents, cyber attacks, cyber threats CERT-UA about cybersecurity incidents, for organizing an assessment of the state of cyber protection at such facilities, it is entrusted to the cyber security manager or responsible persons who perform the functions and tasks of cyber security managers .

The Administration of the State Service for Special Communications coordinates, organizes and conducts assessments of the state of cyber defense, state control over compliance with the requirements of legislation in the field of cyber defense. The SBU carries out the prevention, detection, suppression and disclosure of criminal offenses in cyberspace, as part of the fight against cyber terrorism and cyber espionage covertly. checks readiness CIF to possible cyberattack and cyber incidents.

To a large extent, cyber protection of CIF is related to the implementation of the requirements of the Law of Ukraine "On Critical Infrastructure". Also by resolution Cabinet Ministers Ukraine from 13 November 2025 No. 1470 amendments were made to the General Requirements for Cybersecurity of Critical Infrastructure Facilities, approved by the Resolution of the Cabinet of Ministers of Ukraine dated June 19, 2019 No. 518 (Official herald Ukraine 2019 r., No. 50, Art. 1697), and by resolution Cabinet Ministers of Ukraine dated November 26, 2026 No. 1531 amended the Resolution of the Cabinet of Ministers of Ukraine dated March 29, 2006 No. 373 “On Approval of Minimum Requirements for the Protection of Information, Electronic Communication, Information and Communication and Technological Systems” (Official Gazette of Ukraine 2006, No. 13, p. 878).

In accordance with Part One of Article 6 of the Law of Ukraine "On the Basic Principles of

Ensuring Cybersecurity of Ukraine", officials of critical infrastructure operators, owners or managers of critical information infrastructure facilities are obliged to ensure compliance with cyber security requirements, report cyber incidents, cyber attacks, cyber threats in the established manner, fulfill other obligations regarding information protection and cyber security in accordance with the legislation, and are also responsible for failure to comply with such requirements in accordance with the law. The Ministry of Energy, as a sectoral body in the field of critical infrastructure protection, responsible for the fuel and energy sector of critical infrastructure, coordinates the development of cybersecurity and the implementation of cyber security measures.

By order of the Ministry of Energy dated October 7, 2025 No. 403, registered with the Ministry of Justice of Ukraine on November 3, 2025 under No. 1599/45005, approved the Requirements for Cybersecurity of the Fuel and Energy Sector of Critical Infrastructure. The positive consequences of their implementation are the creation of a regulatory framework for the practical implementation of cybersecurity measures that increase the cyber resilience of critical infrastructure facilities, as well as significantly reduce the likelihood of a crisis situation in the field of cybersecurity.

Within the framework of the implementation of the Concept for the Implementation of “Smart Grids” in Ukraine by 2035, approved by the Resolution of the Cabinet of Ministers of Ukraine dated October 14, 2022 No. 908-r, by the Order of the Ministry of Energy dated August 5, 2024 No. 285, registered with the Ministry of Justice of Ukraine on August 21, 2024 under No. 1278/42623, the Methodology for Assessing the State of Cybersecurity of Electric Grids and Cybersecurity Practices of Electric Grids has been approved. The Methodology defines the maturity model of S2M2 cybersecurity capabilities, indicators and indices of the state of cybersecurity of electric grids. The corresponding self-assessment allows you to improve cybersecurity programs of critical infrastructure operators, strengthen the cyber resilience of electric grids, and increase their security.

The Order of the Ministry of Energy of September 10, 2024 No. 338, registered with the Ministry of Justice of Ukraine on September 24, 2024 No. 1438/42783, approved the Procedure for conducting a review of the state of cybersecurity of the fuel and energy sector of critical infrastructure (hereinafter referred to as the Review).

Based on the results of the Review of Critical Infrastructure Operators, the Ministry of Energy forms an assessment of the state cybersecurity fuel and energy sector critical infrastructure, carries out a description of identified real and potential cyber threats, prepares proposals for measures to ensure cyber resilience, as well as improving Ukrainian legislation in the field of cybersecurity. Thus, the creation of a multi-level cybersecurity system involves:

a) directly responsibility operators critical infrastructure;

b) the monitoring and expert role of industry cyber centers and industry teams for responding to cyber incidents, cyber attacks, and cyber threats (industry CSIRTs) under the leadership of the Ministry of Energy;

c) activities of subjects of the national cybersecurity system (Administration of the State Special Communications Service, SBU, Ministry of Foreign Affairs, and others).

In addition, at the working level, it was planned to develop a sectoral cybersecurity strategy for energy sector CIF and conduct an assessment of the state of cyber protection at such CIF[99].

The Action Plan for 2023-2024 for the Implementation of the Cybersecurity Strategy of Ukraine, approved by the order Cabinet Ministers Ukraine from December 19 2023 No. 1163 (Official Bulletin of Ukraine 2024, No. 9, p. 508), provides, among other things, for the development and approval of standard targeted profiles cybersecurity for sectors critical infrastructure. While The action plan for the implementation of the Concept for Ensuring the National Resilience System by 2025, approved by the Resolution of the Cabinet of Ministers of Ukraine dated November 10, 2023 No. 1025 (Official Gazette of Ukraine 2023, No. 103, p. 6179), includes ensuring by the end of 2024 cyber protection of generation,

[99] https://www.mev.gov.ua/sites/default/files/field/file/budget/%D0%97%D0%B2%D1%96%D1%82%20%20%D0%B1%D0%B5%D0%B7%D0%BF%D0%B5%D0%BA%D0%B0%20%D0%BF%D0%BE%D1%81%D1%82%D0%B0%D1%87%D0%B0

transportation, distribution systems, etc. by creating or connecting critical information infrastructure facilities to cyber incident response centers (computer events), creating or organizing interaction with computer emergency response teams, the Situation Center for Cybersecurity of the SBU.

The General Requirements for Cybersecurity of Critical Infrastructure Facilities approved by Resolution of the Cabinet of Ministers of Ukraine dated June 19, 2019 No. 518 (Official Gazette of Ukraine 2019, No. 50, p. 1697) and the Minimum Requirements for the Protection of Information, Electronic Communication, Information and Communication and Technological Systems approved by Resolution of the Cabinet of Ministers of Ukraine dated March 29, 2006 No. 373 (Official Gazette of Ukraine 2006, No. 13, p. 878) provide that in order to properly implement cybersecurity measures, owners or managers of systems develop a cybersecurity plan taking into account cybersecurity risk management based on a catalog of cybersecurity measures which includes descriptions of the current and/or target state cyber defense. Owners or system administrators gradually and consistently reach the target state of cyber protection by implementing measures stipulated in the cyber protection plan. The Law of Ukraine "On the Basic Principles of Ensuring Cyber Security of Ukraine" provides that owners or managers of critical information infrastructure facilities appoint a responsible person who performs functions and tasks manager with cyber defense, and in if necessary with In order to ensure compliance with cyber security requirements, a cyber security unit is formed. The National Response Plan to Cyber Incidents, Cyber Attacks and Cyber Threats, approved by the Resolution Cabinet of Ministers of Ukraine dated November 26, 2025 No. 1533 (Official Gazette of Ukraine 2025, No. 29, Art. 6927) provides, What organs state authorities and organs local self-government as subjects of cybersecurity in the manner established by law may create sectoral or regional teams for responding to cyber incidents, cyber attacks, cyber threats (hereinafter referred to as CSIRTs), as well as engage the services of private response teams that can perform the tasks of the CSIRT in full or in part. The creation of sectoral CSIRTs is initiated by sectoral bodies in the field of critical infrastructure protection. The creation of regional CSIRTs is initiated by state authorities and bodies of local municipalities taking into account administrative-territorial divisions.

At the same time, the creation of a multi-level cyber defense system involves: 1) appointing a responsible person who performs the functions and tasks of the cyber defense manager; 2) developing a cyber defense plan based on a catalog of cyber defense measures that includes descriptions of the current and/or target state of cyber defense; 3) implementing cyber defense measures taking into account the results of cybersecurity risk management; 4) creating an industry-wide cyber incident, cyber attack, and cyber threat response team (CSIRT).

PM_ES_WAM_07 Creation of backup power sources for CIF, including using distributed renewable energy generation

Goal: Ensuring the resilience of critical infrastructure to security threats, the continuity of vital services

Legal basis: Concept of the State Targeted Economic Program for Energy Modernization of Enterprises - Thermal Energy Producers, State or Municipally Owned, for the Period Until 2030 (approved by the Resolution of the Cabinet of Ministers of Ukraine dated November 28, 2023 No. 1093-r); State Strategy for Regional Development for 2021-2027 (approved by the Resolution of the Cabinet of Ministers of Ukraine dated August 5, 2020 No. 695, as amended by the Resolution of the Cabinet of Ministers of Ukraine dated August 13, 2024 No. 940)

Time frame: 2023-2030

Type of policy / measure: Economic, Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, Ministry of Development, local self-government authorities

Description: The Concept of the State Targeted Economic Program for the energy

modernization of state- or municipally-owned heat energy producing enterprises includes increasing the efficiency and reliability of district heating systems. In turn, implementation of the measures envisaged by the program will make it possible to strengthen Ukraine's energy security, improve the safety and quality of heat supply services for 5.3 million households (see also PM_EE_WAM_08).

Stimulation measures are provided in the form of support for local self-government authorities and enterprises in the field of heat supply by partially reimbursing the cost of measures provided for by the current heat supply scheme, including:

- construction and connection to the district heating system of reserve (in addition to the existing) sources of heat energy and separate heat-generating units that use energy sources other than the main ones;
- installation of backup sources of electricity at facilities in the field of heat supply in district heating systems.

In turn, taking into account the challenges associated with the full-scale invasion of the Russian Federation into Ukraine, the Ministry of Infrastructure was provided with an update of the provisions of the State Strategy for Regional Development for 2021-2027. In particular, one of the operational goals of the mentioned strategy is "Infrastructure resistant to security, social and economic challenges", within the framework of which the following tasks are proposed under the "Energy infrastructure" direction:

- development of distributed generation of electricity in territorial communities;

- development of electricity generation from renewable sources and the use of ESS in centralized water supply and drainage systems in territorial communities.

It is worth noting that local self-government authorities, especially at the level of large cities, have already implemented or are planning to implement projects for equipping life support facilities (in particular, boiler houses, pumping stations of water utilities), as well as public buildings (healthcare facilities, educational institutions, and administrative buildings) with backup power sources. At the same time, among the applied technologies are not only diesel generators, but also gas piston units, solar panels and hybrid systems (a combination of different sources), often with ESS.

PM_ES_WEM_ 09 Financial reserve for the decommissioning of nuclear installations

Goal: Providing the necessary financial resources for the timely decommissioning of NPP power units

Legal basis: Law of Ukraine "On regulating issues related to ensuring nuclear safety", Resolution of the Cabinet of Ministers of Ukraine dated April 27, 2006 No. 594 "Issues of creating, accumulating and using a financial reserve for decommissioning nuclear facilities" (Official herald Ukraine, 2006 r., No. 18, Art. 1339; 2012 r., No. 24, Art. 917; 2017 r., No. 36, p. 1136), Resolution of the Cabinet of Ministers of Ukraine dated January 22, 2014 No. 21 “On the Supervisory Board for Control over the Use and Investment of Funds of the Financial Reserve Intended for the Decommissioning of Operating Power Units of Nuclear Power Plants” (Official Gazette of Ukraine, 2014, No. 10, p. 325; 2021, No. 80, p. 5071), Resolution of the Cabinet of Ministers of Ukraine dated February 21, 2023 No. 156 "On approval of the Procedure for the use of funds provided for in the state budget for the purchase by the Ministry of Energy of domestic state loan bonds in accordance with Article 9 of the Law of Ukraine "On regulating issues related to ensuring nuclear safety" and recognizing as invalid certain resolutions of the Cabinet of Ministers of Ukraine" (Official Gazette of Ukraine, 2023, No. 25, p. 1410), Order of the Ministry of Energy and Coal dated December 10, 2015 No. 798 "On approval of the Concept of withdrawal from operation of operating nuclear power plants of Ukraine"

Time frame: since 2005 (constantly)

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, JSC NAEK Energoatom, State

Nuclear Regulatory Inspectorate

Description: According to the ESU, for the period until 2030, it is planned to extend the service life of the existing NPP power units based on the results of their safety reassessment. Termination of operation and preparation for decommissioning of power units that have exhausted their lifetime is planned on the horizon until 2050.

The main document, on the basis of which preparation for the decommissioning of nuclear power plants is carried out, is the Concept of Decommissioning of Existing Nuclear Power Plants of Ukraine. According to the results of the comparative analysis, the Concept concludes that the most acceptable option is the delayed dismantling with an initial storage period of 30 years. Taking into account the fact that the Concept is subject to revision every 6 years, its update in order to review the cost estimation for decommissioning NPP power units must be provided within the capabilities of the Ministry of Energy to conduct scientific research and scientific and technical developments.

In accordance with the Law "On Regulation of Issues Related to Ensuring Nuclear Safety", Energoatom JSC as an operating organization (operator) deducts funds to a special account of the Treasury for the formation of a financial reserve. Funds from the financial reserve are used exclusively for financing the development of the nuclear installation decommissioning project, measures related to the termination of operation and decommissioning of the nuclear installation, which are provided for by this project, and for investing in domestic government bonds in order to protect against inflation and obtain additional source of its formation.

The amount of deductions is provided for by the Concept of decommissioning the operating nuclear power plants of Ukraine, and the mechanism for establishing this amount is defined in a separate Procedure (approved by Resolution No. 594 of the Cabinet of Ministers of Ukraine of April 27, 2006). In accordance with the Law of Ukraine "On Regulation of Issues Related to Ensuring Nuclear Safety", after approval of the decommissioning project, the amount of deductions is revised taking into account ensuring the necessary amount of costs; the revision is carried out according to the procedure determined by the Cabinet of Ministers of Ukraine, and may be carried out if necessary, but not more than once time per year. For increase predictability and financial stability of the reserve formation mechanism, it is advisable to provide for a regular planned review of the methodological parameters of the calculation (in particular, basic assumptions regarding costs and decommissioning periods) and to take into account, during such a review, updated estimates of costs and periods, the results of financial control/audits, and macroeconomic indicators that affect the real cost of future costs.

The investment policy is determined by the Procedure for the use of funds provided in the state budget for the Ministry of Energy's purchase of domestic government bonds in accordance with Article 9 of the Law of Ukraine "On Regulation of Issues Related to Ensuring Nuclear Safety". This Procedure provides for the Ministry of Energy's acquisition of government bonds issued by the Ministry of Finance with a maturity of one to five years (medium-term bonds) and more than five years (long-term bonds).

Control over the use and investment of the funds of the financial reserve is carried out by a seven-person supervisory board, which functions in accordance with a separate procedure. The supervisory board is formed by representatives of the Ministry of Finance, the Ministry of Economy, the Ministry of Energy, the State Nuclear Regulatory Inspectorate, the operating organization (operator), as well as with the consent of representatives of the NEURC and the National Securities and Stock Market Commission. Every year by March 25, it reports to the Cabinet of Ministers of Ukraine and submits recommendations on improving the use of the financial reserve.

PM_ES_WEM_10 Management of spent nuclear fuel (SNF) and radioactive waste (RAW)

Goal: Ensuring safe storage and disposal of spent nuclear fuel and radioactive waste

Legal basis: Laws of Ukraine "On the Use of Nuclear Energy and Radiation Safety", "On Management of Radioactive Waste", "On Management of spent nuclear fuel on the placement, design and construction of a centralized storage facility for spent nuclear fuel of VVER type reactors of domestic nuclear power plants", Resolution of the Cabinet of

Ministers of Ukraine dated April 29, 1996 No. 480 "Some issues of radioactive waste management" as amended by Resolutions of the Cabinet of Ministers of Ukraine dated April 8, 1996 No. 323 (Official Gazette of Ukraine, 2009, No. 26, Art. 872) and from 22 August 2012 No. 788 (Official herald Ukraine, 2012 r., No. 64, Art. 2620), order CMU of August 19, 2009 No. 990-r "On approval of the Strategy for radioactive waste management in Ukraine" (Official Gazette of Ukraine, 2009, No. 65, p. 2275), CMU resolution dated April 25, 2018 No. 330 "On approval of the Procedure for the use of funds of the State Fund for Radioactive Waste Management" (Official Gazette of Ukraine, 2018, No. 37, p. 1310), Resolution of the Cabinet of Ministers of Ukraine dated August 11, 2021 No. 847 "On approval of the State Economic Program for the Management of Spent Nuclear Fuel of Domestic Nuclear Power Plants" power plants for the period until 2025" (Official Gazette of Ukraine, 2021, No. 66, p. 4190), Resolution of the Cabinet of Ministers of Ukraine dated November 4, 2022 No. 992-r "On Approval of the Concept of the National Target Environmental Program for Radioactive Waste Management", Draft Concept of the State Economic Program for the Management of Spent Nuclear Fuel of Domestic Nuclear Power Plants for the Period Until 2030[100], Draft Law on the National Target Environmental Program for Radioactive Waste Management[101]

Time frame: constantly

Type of policy / measure: Economic

Sector(s) affected: Other

Responsible bodies/organizations: Ministry of Energy, State Agency for the Exclusion Zone Management (SAEZM), JSC NAEK Energoatom (upon consent), SSP Radon Association (upon consent), SSP Central Enterprise for Radioactive Waste Management (SSP CEMRW) (upon consent), State Nuclear Regulatory Inspectorate

Description: As for spent nuclear fuel, Ukraine has chosen the path of long-term safe storage in intermediate storage facilities. A decision on further processing or disposal is expected to be made before the end of the operational life of such storage facilities. The State Economic Program for the Management of Spent Nuclear Fuel of Domestic Nuclear Power Plants for the Period Until 2025 determines that after unloading of spent nuclear fuel from storage pools, the following actions are carried out by the operating organization (operator):

- SNF of the VVER-1000 type reactors of the Zaporizhzhia NPP is stored in a dry on-site storage facility;
- SNF of the VVER-440 type reactors of the Rivne NPP and the VVER-1000 type reactors of the Rivne, Khmelnytskyi and South Ukraine NPPs are subject to removal for long-term storage (100 years) to the Centralized Spent Nuclear Fuel Storage Facility (CSNFSF).

Funding of the Program's activities is carried out at the expense of own and credit (loan) funds raised by Energoatom, as well as other sources of funding not prohibited by law. The Program also provides for the development of a long-term Concept for management of spent nuclear fuel of Ukrainian nuclear power plants, which will determine the strategic directions of the specified activity for the period up to 2035 and beyond.

Thus, the following are currently operating in Ukraine: a wet type storage facility at the Chornobyl NPP site (SNFSF-1), a dry type storage facility at the Chornobyl NPP site (SNFSF-2), a dry on-site storage facility at the Zaporizhzhia NPP, and the CSNFSF. The creation of the latter allowed Ukraine to finally get rid of dependence on the Russian Federation in the matter of SNF storage. Current work on putting it into operation is being carried out by Energoatom in accordance with the terms of the permit documents received from the State Nuclear Regulatory Inspectorate in accordance with the established procedure. From 2023, the direct delivery of spent nuclear fuel to the CSNFSF site began. The design life of the CSNFSF is 100 years.

The draft Concept of the State Economic Program for Waste Management nuclear fuel of domestic nuclear power plants for the period until 2030 defines the following tasks for the future program:

[100] https://www.mev.gov.ua/proyekt-normatyvno-pravovoho-aktu/pro-skhvalennya-kontseptsiyi-derzhavnoyi-ekonomichnoyi-prohramy

[101] https://itd.rada.gov.ua/billinfo/Bills/Card/55509

- technological aging of SNF in reactor aging pools (wet type storage), ensuring transportation of SNF to special storage facilities for safe storage;
- ensuring the safe operation of the spent fuel storage facility of Zaporizhzhia NPP (from the moment when Energoatom will be able carry out functions of the operator as provided by national legislation and international obligations, i.e. after de-occupation);
- continued introduction in operation and operation of the CSNFSF starting complexes;
- continued implementation of the necessary infrastructure at operating NPP units using HOLTEC technology for the shipment of SNF from reactor storage pools;
- implementation of scientific and technical support for SNF management measures at NPPs and dry-type storage facilities, in particular, development of material for creating a long-term SNF management strategy, as well as materials for determining the final method of SNF management (disposal or reprocessing)
- informing public and others interested parties.

In accordance with the provisions of the ESU and the Strategy for Radioactive Waste Management in Ukraine, the safe handling of radioactive waste is one of the most important factors for the sustainable development of the nuclear energy industry in Ukraine, as well as the use of radiation-nuclear technologies in medicine, science and industry. In order to ensure an integrated process of RAW management in Ukraine, facilities designed for RAW management must be created in sufficient quantity and operate safely, taking into account all sources, volumes and characteristics of waste.

The priority tasks and measures to create a comprehensive system of RAW management are defined in the Strategy for Radioactive Waste Management in Ukraine, approved by the Order of the Cabinet of Ministers of Ukraine No. 990 of August 19, 2009, in the National Targeted Environmental Program for the Management of Radioactive Waste, approved by the Law of Ukraine of September 17, 2008, No. 516-VI, and in the Concept of the State-Wide Targeted Environmental Program for the Management of Radioactive Waste, approved by the Order of the Cabinet of Ministers of Ukraine of November 4, 2022, No. 992.

The Law of Ukraine "On the Management of Radioactive Waste" specifies that the financing of works related to RAW management is carried out at the expense of the State Fund for the Management of RAW. The manager of the funds is SAEZM, the funds themselves are directed to the implementation of programs and the execution of works, determined in accordance with the Procedure for the use of funds of the State Fund for the Management of RAW. To ensure predictability of the State Fund for the Management of RAW and execution long-term obligations in the field of RAW and SNF, the Cabinet of Ministers of Ukraine approves a mechanism for regular review of financial parameters (planning of revenues and expenditures) at least once every three years based on approved work plans and updated cost estimates, as well as the results of financial audits. The SAEZM provides annual public reporting on revenues and use of funds of the State Fund for the Management of RAW according to a unified structure of indicators.

Also, in accordance with the Law of Ukraine "On the Management of Radioactive Waste", State accounting of radioactive waste is ensured, including maintenance of the State Register of radioactive waste and maintenance of the State Cadastre of radioactive waste storage facilities and the list of places of temporary storage of radioactive waste. State inventories are carried out once every three years to ensure constant renewal and timely changes to the State Register of RAW and the State Cadastre of RAW storage facilities. The functions of maintaining the State Register and Cadastre are assigned to SSP Radon Association.

At the same time, the Concept of the National Targeted Environmental Program for the Management of Radioactive Waste foresees a number of measures aimed at solving complex problems in the specified area, creating and ensuring the effective functioning of an integrated system of RAW management in Ukraine. The implementation of the program is expected during 2022-2031, among the ways and means of solving the problem of RAW management, it is worth highlighting:

- improvement of the legal framework taking into account Council Directive 2011/70/Euratom on the introduction of a framework for responsible and safe management

of spent fuel and radioactive waste and Council Directive 2013/59/Euratom on establishing basic safety standards for protection against threats caused by exposure to ionizing radiation;

● development and implementation of a quality management system at all stages of RAW management, improvement of the RAW generation control system;

● carrying out a reassessment and update of the justification for the safety of the storage facilities of SSP CEMRW;

● reconstruction of the existing storage facilities of CEMRW for RAW disposal;

● technical re-equipment (in particular, modernization of the physical protection system) of the SSP Radon Association and CEMRW facilities;

● improvement and implementation of the RAW management system at NPPs, in particular, minimization of the volume of their generation;

● continuation of operation and development of the first stage of the Vector complex, acceptance of conditioned RAW from operating nuclear power plants of Ukraine to the existing storage facilities of the Vector complex's first stage;

● design and construction of the second stage of the Vektor complex;

● carrying out a complex of works with the aim of selecting sites potentially suitable for placing RAW storage at medium depths and geological RAW storage, as well as research works on choosing the optimal system of engineering barriers for such storage.

The draft law on the National Targeted Environmental Program for Radioactive Waste Management (Registration No. 12356 of December 23, 2024) submitted to the Verkhovna Rada provides for approval new programs for 2025-2032 in cumulative volume of financing at UAH 20 billion (including UAH 9.65 billion from the state budget). Financing will be provided by the State Fund for the Management of RAW and the general fund of the state budget, funds from radioactive waste producers, as well as international technical assistance, voluntary contributions from enterprises, institutions, organizations, citizens and other sources not prohibited by law.

Policies and measures to **increase the flexibility of the national energy system** are the subject of a multi-level regulatory system - from strategic to specific mechanisms.

Inter alia, the Energy Security Strategy provides among the priority tasks

- on the achievement of Strategic Goal 2 "Sustainability of the functioning of the energy sector":
    - ensuring the balanced development of energy supply systems, taking into account the unevenness of the consumption schedule and the work of individual energy producers;
    - adaptation of the energy sector to the negative impact of climate change;
- on the achievement of Strategic Goal 3 "Economic efficiency of the functioning of the energy sector, energy supply systems and import substitution of mineral raw materials":
    - modernization of fixed assets in the energy sector, in particular by creating favorable conditions for the introduction of mechanisms to support the implementation of large-scale investment projects for the development of critical infrastructure in the energy sector;
- on the achievement of Strategic Goal 4 "Energy efficiency of the use of energy resources and energy efficiency of the national economy":
    - implementation of a set of measures to expand the use of local alternative fuels;

- development of a set of measures for the integration of consumers using RES for their own consumption into the operation of the UES of Ukraine.

The 2030 National Economic Strategy is limited to the task of "ensuring guaranteed adequacy of generating capacities with the volumes and regimes of electricity consumption in the UES of Ukraine, in particular in terms of the availability of regulatory capacities".

The 2050 Energy Strategy of Ukraine provides greater clarity in the setting of targets for the development of highly flexible generation, ESS and demand management systems, among strategic initiatives and tasks:

- by 2025:
  - Development of distributed generation using natural gas, by installing gas turbines and gas piston turbines at the sites of the gas transmission system, CHPs and boiler plants;
  - Development of RES, which includes a set of measures for the construction of ESS, wind generation and promoting the development of distributed solar generation to cover own consumption;
  - Installation of wind/solar systems and ESS for critical infrastructure facilities and private households;
  - Active implementation of energy storage technologies with further expansion of their use in the following time horizons;
  - Studying the feasibility of creating microgrids and decentralized power supply to ensure the stability of the energy system;
  - Studying the feasibility of creating a demand management program.
- by 2032:
  - Decentralization of the energy system by increasing the number of energy generation facilities while simultaneously reducing spatial disparities in their localization, which will contribute to increasing the overall reliability of the functioning of energy systems and reducing their vulnerability to threats of a physical and virtual nature.
  - Implementation of pilot projects for the creation of microgrids and decentralized power supply to ensure the stability of the energy system.
  - Implementation of pilot projects on the creation of a demand management program.
  - Support for the implementation of energy storage technologies.

Among the practical tools, which should be highlighted:

- **participation in the balancing market and the market of auxiliary services** on a general basis;
- **tenders for the construction of generating capacity and implementation of demand management measures**;
- provision of balancing services and auxiliary services **by aggregators and active consumers using the mechanism of self-production.**

For more details, see section 3.4.3. of this Plan, Market Integration (Dimension internal energy market).

3.3.2. Regional cooperation in this area

The current rules of preparation and response to crisis situations in the supply of natural gas or electricity provide for a mechanism for constant exchange of information between Ukraine, on the one hand, and the Energy Community Secretariat (in particular, the Security of Supply Coordination Group) and competent authorities of neighboring EU member states. At the same time, the development of gas and petroleum products supply routes requires active cooperation between Ukraine and the states of Central-Eastern and South-

Eastern Europe, in particular Poland, Slovakia, Hungary, Romania, Bulgaria, as well as the Baltic states.

The Energy Community Secretariat and the governments of neighboring EU member states play a critical role in the mechanism of supplying equipment to energy companies of Ukraine affected by the consequences of hostilities. In particular, the Energy Community Secretariat together with the European Commission, the EU Emergency Response Coordination Center and the Ukrainian authorities ensures the delivery of energy carriers and goods - both provided free of charge and purchased with the funds of the Ukraine Energy Support Fund administered by it287; equipment purchases are carried out according to international standards of transparency by the United States Agency for International Development (USAID).

Ukraine's implementation of the Clean Energy Package provides for market coupling and strengthening of mutual energy security based on the principle of solidarity. In particular, the Ukrainian TSO should use the opportunities of full membership in the ENTSO-E and join the activities of the Regional Coordination Center (RCC) to participate in seasonal and short-term assessments of resources adequacy. The implementation of the Regulation (EU) 2019/941 on preparedness for risks in electricity and the Regulation (EU) 2017/1938 on measures to guarantee the security of gas supply provide for the strengthening of regional cooperation - in particular, Ukraine can participate in the work of the relevant coordination groups of the EU (Electricity Coordination Group, Gas Coordination Group), as well as cooperate with the EU member states and the Contracting Parties of the Energy Community in the process of risk assessment and preparation of relevant plans (consultations to ensure consistency).

The integration of gas systems and markets with the participation of GTSOU LLC, JSC Ukrtransgaz and other market entities is a subject of cooperation within the framework of initiatives such as CESEC (Central and South Eastern Europe Gas Connectivity Initiative) and SEEGAS (South-East European Gas Initiative). Ukrainian companies also participate in the joint EU gas procurement platform AggregateEU.

Cooperation with the governments and operators of neighboring states in the process of identification and implementation of projects of mutual interest (PMIs) and projects of common interest within the framework of the Energy Community (PECIs) is also promising. See more details in section 3.4. Dimension internal energy market.

Regional cooperation is also envisaged when Ukraine creates minimum stocks of crude oil and petroleum products. The Law of Ukraine on the minimum stocks of crude oil and petroleum products contains provisions, according to which, during the period of martial law, part of the stocks can be stored abroad in EU member states bordering Ukraine (no more than 50% of the total volume) and EU countries bordering such states (no more 25% of the total volume). Beyond the state of war, it is possible to store in EU member states bordering Ukraine no more than 25% of the total volume of minimum stocks, if the central storage agent or economic entity has free tanks at its disposal.

In May 2023, Ukraine officially joined the NATO Cooperative Cyber Defence Centre of Excellence (CCDCOE), which supports combating cyber attacks and cyber defense of information systems, as well as education and training of cyber defense specialists[102]. Ukraine's participation in the activity of CCDCOE will strengthen the exchange of cyber experience with other participating countries, in particular in matters of protection of CIF in the fuel and energy sector.

An important platform for political dialogue and technical cooperation on energy security issues is the Partnership for Transatlantic Energy and Climate Cooperation (P-TECC) with the participation of Ukraine, the U.S., the EU and 24 European countries[103].

3.3.3. Where applicable, financing measures in this area at national level

The vast majority of the necessary financing is made up of investments made by energy market players - extractive companies, TSO and GTSO, DSOs and GDSOs, traders and

[102] http://twitter.com/MFA_Ukraine/status/1658432462689652738

[103] https://www.energy.gov/ia/partnership-transatlantic-energy-and-climate-cooperation-p-tecc

suppliers (in particular, in terms of creating minimum reserves of crude oil and petroleum products), operators of oil refining facilities, generating companies, etc. At the same time, a form of state aid is the creation of favorable tax and regulatory conditions, in particular for companies in the extractive sector.

Funding from the state budget is provided for part of the activities of the experimental project on construction, repair and other engineering and technical measures for the protection of key CIF. In particular, according to the Ministry of Finance, during 2023-2024, 18,465.9 million UAH were allocated to the Reconstruction Agency from the State Budget of Ukraine (of which cash expenditures in 2023 - 13,955.6 million UAH, planned expenditures for 2024 - 4,510.3 UAH million) for the implementation of protection measures at 22 substations of Ukrenergo. In addition, Ukrenergo carries out measures to ensure protection at other 63 substations at the expense of international financial organizations, in particular by repurposing a part of loan and grant funds within the framework of current joint projects with the IBRD, EIB, EBRD, KfW. The implementation of a full-fledged set of measures to protect these facilities requires the involvement of additional non-budgetary sources of funding.

With regard to the financing of future state targeted economic programs for the development of the nuclear-industrial complex and the development of distributed generation of electricity from renewable sources, paragraph 12 of the Measures on the effective and rational use of state funds provided for the maintenance of state authorities and other state institutions, and enterprises, institutions and organizations established by state authorities that use the funds of the state budget, approved by the resolution of the Cabinet of Ministers of Ukraine of October 11, 2016, No. 710 (Official Gazette of Ukraine, 2016, No. 83, Article 2739)290, it is provided for the suspension of the preparation of new targeted economic programs or making changes to approved targeted programs that require additional funding from the state budget. Therefore, implementation of the specified programs can be carried out at the expense of investments, international aid and other sources not prohibited by law.

A significant amount of technical assistance, including for preparing bankable projects and improving the quality of public administration, can be obtained through participation in the EU programs - the Horizon Europe research and innovation program, the Euratom Research and Training Programme (2021-2025), Connecting Europe Facility (CEF), Digital Europe Programme, LIFE. A separate direction will be financing opportunities within the Ukraine Facility, which is designed for 2024-2027.

3.4. Dimension internal energy market

3.4.1. Electricity infrastructure

3.4.1.1. Policies and measures to achieve the targeted level of interconnectivity as set out in point (d) of Article 4

Planning development of interconnectors

The development of interconnectors with neighboring countries is ensured within the framework of the transmission system development plan for the next 10 years (TSDP), which the transmission system operator develops annually in accordance with the procedure approved by the Regulator and submits to the Regulator for approval. The TSDP must ensure that the transmission system meets the needs of the market and the interests of security of electricity supply. The TSDP, in particular, contains:

- main transmission system facilities, the construction or reconstruction of which is advisable within the next 10 years, including projects for the development of interconnectors;
- information about transmission system facilities that are to be constructed and/or reconstructed during the following 10 years, deadlines their construction and/or reconstruction, sources of funding;
- information about investments in objects systems transmission, of whose already accepted decision and which are under implementation, indicating the projected investments to be made over the next three years.

The TSO develops the TSDP based on the report on the assessment of the adequacy of

generating capacities, as well as development plans for adjacent transmission systems, electricity distribution systems. The TSO also develops a corresponding investment program and submits it to the Regulator together with the calculation of the tariff for electricity transmission services.

Simplification of administrative procedures and attraction of investments in infrastructure projects of mutual interest is ensured through the implementation of policy **PM_IM_WAM_01 Promoting the development of new cross-border connections** (see section 3.4.2.1).

3.4.1.2. Regional cooperation in this area

In 2017, the TSO NPC Ukrenergo signed an Agreement on the terms of the future integration of the Ukrainian power system with the power system of continental Europe, which provided for implementation of the catalog of measures for preparing for and passing the test in the form of a 3-day isolation from the power systems of the Russian Federation and the Republic of Belarus. Since March 16, 2022, the Unified Energy System (UES) of Ukraine has been urgently integrated and operates in synchronous mode with the power system of Continental Europe within the framework of the European Network of Transmission System Operators in Electricity (ENTSO-E). During 2022-2023, the TSO of Ukraine completed the implementation of the Catalog of Measures, which is part of the Agreement on the Conditions for the Future Interconnection of the Power Systems of Ukraine and Continental Europe. The catalog contains more than 200 technical measures in 9 areas. All these measures are an integral part of the Framework Agreement on the Synchronous Area of Continental Europe (SAFA), to which NPC Ukrenergo also joins. On November 28, 2023, the ENTSO-E Regional Group "Continental Europe" confirmed the full implementation of the Catalogue of Activities by NPC "Ukrenergo", which means the completion of the synchronization project between the Ukrainian power system and the European continental grid.[104]

Until December 2023, the TSO of NPC Ukrenergo was an observer member in ENTSO-E and carried out software technical compliance works IPSUkraine standards and requirements of ENTSO-E. On December 14, the ENTSO-E Assembly approved the acquisition of full membership status by Ukrainian TSOs in the organization from January 1, 2024.[105] The status of ENTSO-E membership provides TSOs with the opportunity to deepen regional cooperation:

- in preparing proposals and adopting the annual work program of ENTSO-E, which defines priorities regarding key issues of the electricity market, the development of trans-European energy infrastructure, and risk management in the energy sector;
- when adopting the 10-year European Network Development Plan and the strategy for events that significantly affect the technical, security, market or financial conditions of the European TSOs;
- in preparing recommendations for the ENTSO-E Assembly on strategic priorities for TSO cooperation and key decisions;
- participate in the work of Committees and working groups (Committees on Market Issues, Network Development, Research, Development and Innovation, Information and Communication Technologies), in the development of network codes, regional investment plans and work in the group on legal and regulatory issues.

The TSO of Ukraine carries out bilateral and multilateral communication and cooperation with the TSOs of neighboring countries in terms of increasing capacity and developing interconnectors. The TSO also organizes cooperation in accordance with the Plan of Interaction of NPC Ukrenergo with stakeholders within the framework of reconstruction/construction projects.[106]

The development of regional cooperation is carried out within the framework of cooperation between the TSOs of Ukraine and the TSOs of other countries in the region (MAVIR

[104] https://www.entsoe.eu/news/2023/11/28/continental-european-tsos-announce-completion-of-synchronisation-project-with-ukrenergo-and-significant-increase-in-export-capacity-from-continental-europe-to-ukraine/
[105] https://www.entsoe.eu/news/2023/12/14/ukrainian-transmission-system-operator-npc-ukrenergo-joins-entso-e-as-new-member/
[106] https://ua.energy/wp-content/uploads/2023/08/Plan_vzayemodiyi_NEK.pdf

(Hungary), PSE SA (Poland), SEPS as (Slovakia), Transelectrica (Romania) and SE Moldelectrica (Moldova)) in interaction with the Regional Coordination Center (RCC). The role of the RCC is performed by TSCNET. On November 1, 2024, the Agreement on Cooperation within the Eastern European Capacity Calculation Region (EE CCR) and the Agreement with TSCNET on the provision of services for monthly calculation of capacity on the borders between the Ukraine-Moldova block and the rest of the Continental Europe synchronous area entered into force. Interaction is carried out within the framework of the functionality defined in Annex I to Regulation (EU) 2019/943 on the internal market in electricity, in particular, in terms of creating a regional network model, coordinated calculations of regimes and determination of corrective actions in the region, determination of the volume of capacity of interconnectors, etc.

The issue of the configuration of the Capacity Calculation Region was worked out in the EnC CCR Workstream East Working Group with the participation of ENTSOE, MAVIR, PSE, SEPS, Transelectrica, SE Moldelectrica and NPP Ukrenergo. The parties reached an agreement on the configuration of the EE CCR in accordance with the adapted version of the EU Regulation 2015/1222 and in the long term plan to join the CCR CORE.

Starting from January 2025, EE CCR TSOs started work on the creation and by implementing a roadmap for the development and implementation of rules, conditions and methodologies necessary for the functioning of the Eastern Europe Capacity Calculation Region. Currently, work is underway within the EE CCR to develop a day-ahead capacity calculation methodology. In addition, by ACER Decision 10-2025 of 16 December 2025 “On Amendments to the Methodology for Determining the Configuration of Capacity Calculation Regions”, the EE CCR region was included in the list of CCRs of EU member states.

NPC Ukrenergo, in accordance with the regulations and procedures established by ENTSO-E, participates in the development of the 10-year European Network Development Plan (TYNDP) of ENTSO-E. Selected specialists of NPC Ukrenergo are members of the ENTSO-E Network Development Committee, where strategic decisions on the development of ENTSO-E networks are discussed and adopted. As a result of the work carried out by NPC Ukrenergo and cooperation with neighboring system operators, ENTSO-E made a decision to include in the Electricity Development Plan networks ENTSO-E 2024 two new interconnectors: OHL 400 kV Mukachevo - Velke Kapushany and Artsyz – Issacea. NEC "Ukrenergo" takes direct participation in systematic work on creating the ENTSO-E 2026 Electricity Network Development Plan.

3.4.1.3. Where applicable, financing measures in this area at national level

The revenues that the TSO receives from the auctions for the allocation of inter-zonal capacity are used for the purposes of ensuring the availability of allocated capacity, maintenance and increasing capacity through investments in the transmission system, in particular in the construction of new inter-zonal transmission lines. Use of revenues from the allocation of cross-zonal capacity is carried out in accordance with European rules and the legislation of Ukraine. At the same time, temporarily, due to the introduction of martial law in Ukraine, the funds received by the TSO from the allocation of the capacity of the interstate crossing are also used for other purposes specified in the final and transitional provisions of the Law of Ukraine “On the Electricity Market”.

To develop the system of project transfer and financing, the TSO cooperates with leading international financial institutions, including the World Bank, the European Bank for Reconstruction and Development, the European Investment Bank, the Credit Institution for Reconstruction (KfW), etc.

Credit resources are provided by international financial institutions (IFIs) under state guarantees for 15-20 years or more with low interest rates compared to the terms of lending by Ukrainian commercial banks and the cost of other financial instruments. The loan portfolio with IFIs is about 1.7 billion euros. The largest investment projects are financed, which ensure increased reliability of electricity supply to industrial consumers and the population, energy security of the state, development of the national economy, and also have a social and environmental focus [113] .

It is also envisaged that Ukraine will participate and raise funds for the implementation of projects for the development of interstate electricity infrastructure within the framework of

the EU Connecting Europe Facility program. The relevant agreement between Ukraine and the EU was ratified by the Verkhovna Rada of Ukraine in November 2023. In particular, according to the decision of the European Commission dated 1.12.2025, two projects to strengthen the interconnectors of Ukraine with the power systems of Slovakia (No. 2.28. Mukachevo - Velké Kapušany) and Romania (No. 2.29. Artsyz - Issaccia) received the status of projects of mutual interest (PMI). Accordingly, these projects may apply for financing within the framework of the EU Connecting Europe Facility program and the application of simplified and accelerated permitting and regulatory procedures.[114]

3.4.2. Energy transmission infrastructure

3.4.2.1. Policies and measures related to the elements set out in point 2.4.2, including, where applicable, specific measures to enable the delivery of Projects of Energy Community Interest (PECIs), Projects of Mutual Interest and other key infrastructure projects

PM_IM_WAM_01 Promoting the Development of New Inter-State Connections / Interconnections

Goal: To promote the creation of new or the expansion of existing physical capacity of cross-border gas and electricity interconnections, in particular through funding from private investors, by establishing mechanisms to stimulate cross-border investment.

Legal basis: Regulation (EU) 2022/869 on guidelines for trans-European energy infrastructure, Regulation (EU) 2019/942 establishing the European Union Agency for the Cooperation of Energy Regulators, the Law of Ukraine “On the Natural Gas Market,” Law of Ukraine “On the Electricity Market”

Timeframe: 2024–2027

Type of policy / measure: Regulatory

Sector of Impact: Energy – Supply

Responsible Authorities/Organizations: Ministry of Energy, NEURC

Description: Stimulating investment, particularly private investment, in new cross-border natural gas interconnections and international electricity interconnections requires the establishment of support mechanisms for such investments, similar to those in place in the EU. These mechanisms include:

● Establishing a coordinated, transparent procedure for obtaining the necessary permits to implement cross-border projects, granting regulatory authorities the power to make decisions on cross-border cost allocation, etc., which enables the transposition and implementation of Regulation (EU) 2022/869 on guidelines for trans-European energy infrastructure (hereinafter referred to as the TEN-E Regulation);

● Creation of a separate regulatory regime for the most necessary, but at the same time risky projects, as provided for in Article 54 of the Law of Ukraine “On the Natural Gas Market” and Article 24 of the Law of Ukraine “On the Electricity Market”;

● Coordination of decision-making by authorities of different states thanks to the powers of the European Union Agency for the Cooperation of Energy Regulators (ACER), as provided for in Regulation (EU) 2019/942 establishing the European Union Agency for the Cooperation of Energy Regulators.

A draft Law of Ukraine has been developed with the participation of experts and representatives of state authorities to transpose the TEN-E Regulation "Draft Law on Infrastructure Projects in the Energy Sector of Public Interest" (Registration No. 13450 dated July 4, 2025). The adoption of the draft law will ensure: international and state support for the implementation of infrastructure projects in the energy sector of public interest, the introduction of a clear and transparent procedure for their implementation; regulation of the process of obtaining all necessary permits for the implementation of projects; provision of appropriate incentives to the developer of infrastructure projects in the energy sector that are of public interest and carry increased risks in the process of their implementation, construction, operation or maintenance; development of a joint energy system with the EU

infrastructure, which will contribute to strengthening Ukraine's energy security.

The provisions of the draft act specifically address the following issues: establishing the procedure for selecting energy infrastructure projects that are in the public interest, as well as the criteria for their selection; the activities of the interdepartmental advisory council as an advisory and coordinating body in the process of reaching a comprehensive decision; the requirement to prepare, approve, and implement a project implementation plan and a timeline for obtaining a comprehensive decision, in order to comply with the implementation deadlines for such projects (3.5 years) set forth in Regulation (EU) 2022/869; determining the possibility and procedure for the cross-border allocation of investment costs for Energy Community projects of common interest among the countries that stand to benefit most from the projects' implementation; promoting infrastructure projects; and developing a procedural guide for project implementation to enhance accessibility and attractiveness for investors.

Article 78 of Regulation (EU) 2024/1789 and Article 63 of Regulation (EU) 2019/943 provide for the possibility, based on a decision by the regulator, of establishing a separate regulatory regime (granting exemptions from the general regulatory regime) for operators of new cross-border infrastructure facilities. These provisions have been incorporated into Ukrainian law (Article 54 of the Law of Ukraine "On the Natural Gas Market" and Article 24 of the Law of Ukraine "On the Electricity Market"). At the same time, the implementation of cross-border projects based on these provisions of Ukrainian law—given the need to establish a single, predictable legal framework across several countries—requires, first, a review of these provisions to ensure full compliance with EU legislation and, second, the development and adoption of additional regulatory acts.

Regulation 2019/942 establishing ACER, as implemented within the Energy Community, provides for the expansion of ACER's powers to cover cross-border issues involving at least one Contracting Party to the Energy Community and one EU Member State, which is essential for the implementation of cross-border projects. A prerequisite for the expansion of ACER's powers is the transposition of Regulation 2019/942 and notification of this to the Energy Community Secretariat. ACER's relevant powers pertain to both the electricity market and the natural gas market. The Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Implementation of European Law Provisions on Energy Market Integration, Enhancing Security of Supply, and Competitiveness in the Energy Sector No. 4834-IX of April 7, 2026" contains provisions extending ACER's powers to the electricity market. At the same time, similar provisions regarding the natural gas market (including renewable gases) will be included during the transposition of the new EU legislative package on natural gas (see **PM PM_IMG_WAM_01 Transposition of the New EU Legislative Package on Natural Gas and Hydrogen**). Between 2025 and 2027, efforts should be made to bring Ukrainian legislation into full compliance with these EU requirements, potentially with the assistance of international technical support and in consultation with EU institutions and potential investors.

PM_IM_WEM_01 Current procedures for planning of energy infrastructure development

Goal: To develop energy infrastructure in line with the objectives of the National Energy and Climate Policy (NECP) and the principle of "energy efficiency first"

Legal basis: Law of Ukraine "On the Natural Gas Market," Law of Ukraine "On the Electricity Market," Gas Transmission System Code, Transmission System Code

Timeframe: 2024–2030 (ongoing)

Type of policy / measure: Planning

Sector of Impact: Energy – Supply

Responsible Authorities/Organizations: OGTS, TSO, NEURC

Description: The Law of Ukraine "On the Natural Gas Market" and the Law of Ukraine "On the Electricity Market" require the OGTS, TSO, OGDS, DSO, and other operators of energy

infrastructure facilities to develop development plans for these facilities, which must then be approved and monitored for implementation by the Regulator. In addition, the TSO develops, and the Regulator approves, a report assessing the adequacy of generating capacity to meet projected electricity demand and ensure the necessary reserve. The relevant plans are prepared annually by the operators and approved by the NEURC.

Furthermore, in accordance with the GTS Code, immediately after the start of the annual capacity allocation auction in each odd-numbered year, the GTS Operator cooperates with the relevant neighboring GTS operators of other countries in assessing market demand for capacity increases and conducting technical studies of new (increased) capacity projects for cross-border interconnection points. The first market demand assessment was conducted in 2021. The second market demand assessment was conducted in 2023. The third demand assessment was conducted in 2025 (its results are described in section 2.4.2.1. above).

PM_IM_WAM_02 Additional Procedures for Planning the Development of Energy Infrastructure

Goal: To develop energy infrastructure in line with the objectives of the National Energy Efficiency Program (NEPE) and in accordance with the "energy efficiency first" principle

Legal Basis: Law of Ukraine "On Energy Efficiency," amendments to Directive 2009/73/EU and Regulation (EU) No. 715/2009, Electricity Integration Package

Timeframe: 2024–2030 (ongoing)

Type of policy / measure: Planning

Sector of Impact: Energy – Supply / Energy – Consumption / Other

Responsible Authorities/Organizations: NEURC, Ministry of Energy, Ministry of Development, OGTS (upon agreement), TSO (upon agreement)

Description: In light of EU Directive 2024/1788 and Regulation 2024/1789, measures must be taken during 2024–2030 to improve energy infrastructure planning procedures:

● Incorporating the "energy efficiency first" principle, as recognized by the EU, into energy infrastructure planning procedures. According to this principle, plans to expand the physical capacity of natural gas and electricity must comply with this principle, which, in particular, prioritizes investments in energy efficiency and consumption reduction over the construction of new energy and energy resource delivery infrastructure. At the same time, the relevant risks to other objectives of the NECP (in particular, energy security) must be analyzed. In this regard, the Methodology for Assessing the Energy Efficiency Potential of the Gas Transmission System, the Electricity Transmission System, the Gas Distribution System, and the Electricity Distribution System, approved by Order No. 404 of the Ministry of Energy dated October 7, 2025, plays an important role;

● ensuring that TSOs prepare ten-year development plans for the electricity transmission system in accordance with the provisions of EU Directive 2019/944 (Article 51);

● establishing powers to develop and approve hydrogen infrastructure development plans (see **PM_IMG_WAM_01 Transposition of the New EU Legislation Package on Natural Gas and Hydrogen**);

● mutual coordination of planning processes in the electricity, gas, oil, and hydrogen markets through the efforts of the NEURC;

● ensuring the coordination of energy infrastructure development plans with the development plans of territories and local communities, in particular plans for the development of heat supply and renovation systems, as well as municipal energy plans;

● ensuring alignment of energy infrastructure development plans with the owner's letters of expectations, which are approved in accordance with the State Property Policy adopted by Cabinet of Ministers Resolution No. 1369 of November 29, 2024.

PM_IMG_WAM_01 Transposition of the new EU legislation package in the field of natural gas and hydrogen

Goal: development of regulatory and legal bases sufficient for development of the market for

renewable, low-carbon gases and hydrogen

Legal basis: ESU

Time frame: 2024-2027 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations: Ministry of Energy, NEURC

Description: ESU, as well as the draft Hydrogen Strategy of Ukraine for the period up to 2050, defines the task of creating legal, economic and organizational foundations for the functioning of hydrogen energy in Ukraine. Given the strategic course of integration with the EU, it is logical that this process should follow the practice at the level of the EU and the EU Member States with the most developed hydrogen technologies and/or markets. In 2024, the EU adopted a new package of legislation in the gas sector, namely: Directive 2024/1788 and Regulation 2024/1789 (Gas Decarbonisation Package). Its transposition and further implementation will allow creating necessary foundations for the development of hydrogen markets, as well as strengthening the integration of biomethane into the natural gas market.

In this regard, during 2025, the Ministry of Energy will prepare a draft law for the transposition of the aforementioned Directive and Regulation. Its approval by the Cabinet of Ministers of Ukraine is expected during 2026, with approval by the Parliament in 2027.

PM_IMG_WAM_02 Conducting a study of the potential for the development of hydrogen production, transportation, storage and use in Ukraine

***Goal*:** identify new opportunities for the development of business activities, including on the basis of existing oil and gas infrastructure

***Legal basis*:** ESU

***Timeline* :** 2025-2028 years

Type of policy / measure: Research

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / Others

Responsible bodies/organizations: Ministry of Energy, Ministry of Economy

Description: The modeling conducted during the preparation of the NECP sets out certain expectations regarding volumes of production and consumption, transportation and storage of hydrogen in Ukraine:

Scenario			2020- 2024	2025- 2029	2030- 2039	2040- 2049	2020- 2049
Export hydrogen to EU							
WAM		**pj**	0.00	0.00	324.00	1176.00	**1500.00**
		mt	0.00	0.00	2.70	9.80	**12.50**
Production hydrogen							
WEM	with natural gas	**pj**	200.39	60.39	153.96	174.28	**589.01**
		mt	1.67	0.50	1.28	1.45	**4.91**
	electrolysis	**pj**	0.00	0.00	0.00	3.74	**3.74**
		mt	0.00	0.00	0.00	0.03	**0.03**
	electrolysis "green"	**pj**	4.58	23.13	137.68	231.27	**396.65**
		mt	0.04	0.19	1.15	1.93	**3.31**

WAM	with natural gas	**pj**	200.39	54.78	101.44	42.72	**399.32**
		mt	1.67	0.46	0.85	0.36	**3.33**
	with natural gas with CCS	**pj**	0.00	5.61	85.83	171.62	**263.06**
		mt	0.00	0.05	0.72	1.43	**2.19**
	electrolysis "green"	**pj**	4.58	19.34	456.14	1554.41	**2034.47**
		mt	0.04	0.16	3.80	12.95	**16.95**
	with biomass	**pj**	0.00	0.00	0.00	70.54	**70.54**
		mt	0.00	0.00	0.00	0.59	**0.59**
Consumption hydrogen							
WEM	production ammonia	**pj**	200.39	59.14	148.63	175.85	**584.02**
		mt	1.67	0.50	1.28	1.45	**4.91**
	on synthesis renewable synthetic methane and kerosene (only "green hydrogen")	**pj**	3.14	22.22	143.00	233.44	**401.80**
		mt	0.00	0.00	0.00	0.03	**0.03**
WAM	production ammonia	**pj**	200.39	59.14	148.63	175.93	**584.09**
		mt	1.67	0.49	1.24	1.47	**4.87**
	Transport	**pj**	0.00	0.00	33.13	84.26	**117.39**
		mt	0.00	0.00	0.28	0.70	**0.98**
	on synthesis renewable synthetic methane and kerosene (only "green hydrogen")	**pj**	3.14	18.41	123.18	338.73	**483.45**
		mt	0.03	0.15	1.03	2.82	**4.03**
	On production heat	**pj**	0.00	0.00	0.00	11.78	**11.78**
		mt	0.00	0.00	0.00	0.10	**0.10**

However, to date, no detailed study of the potential of this sector has been conducted. At the same time, it is important for gas infrastructure operators to understand the volumes of future system loading in order to further optimize their own assets and costs.

By 2028, the Ministry of Energy will ensure that a study of the development potential for production, transportation, storage and use of hydrogen in Ukraine is conducted (with broad stakeholder involvement); however, given the martial law conditions that may affect investments in hydrogen production capacity, the study may be postponed as necessary. For this purpose, international technical assistance is required.

PM_IMG_WAM_03 Carrying out research on the potential for the development of infrastructure for capture, transportation, storage and carbon use (CCUS) in Ukraine

Goal **:** identify new opportunities for the development of business activities, including on the basis of existing oil and gas infrastructure

Legal basis **:** ESU

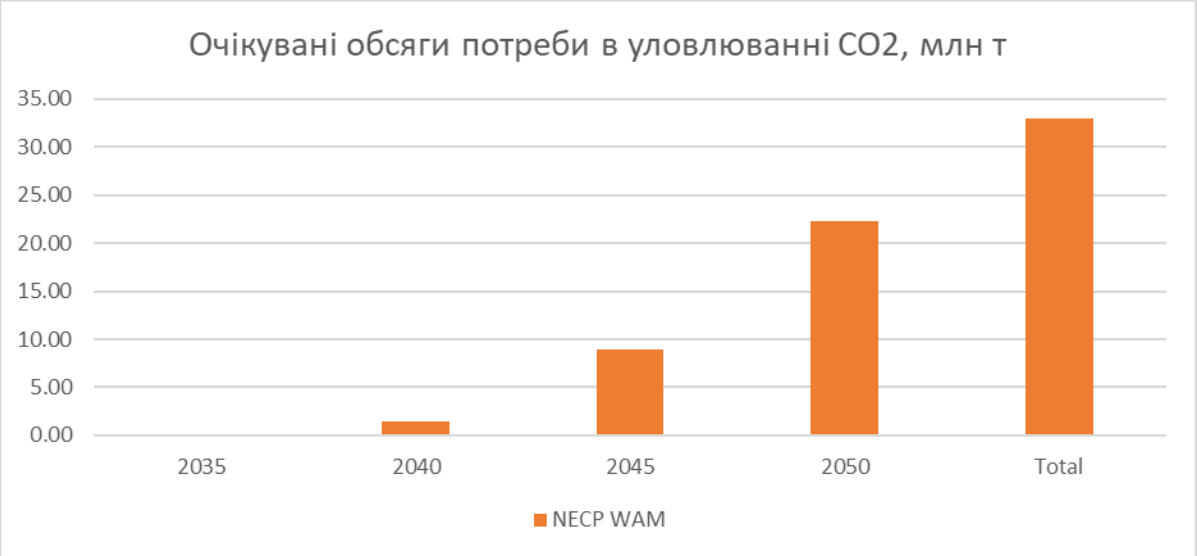
Timeline **:** 2025-2028 years

Type of policy / measure: Research

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / LLP / Waste / Other

Responsible bodies/organizations: Ministry of Energy, Ministry of Economy, State Geological Survey of Ukraine

Description: According to the NECP scenario modeling with additional measures (WAM), by 2050 the total volume of CO2 capture needs is expected to be 22.35 million tons.



At the same time, there are no studies of the potential of this sector to date, including taking into account EU forecasts on the volume of future demand for additional CCUS capacities, in particular transportation and storage, and the projected location of CO2 capture points in the EU. The development of CCUS infrastructure in Ukraine may create additional opportunities for both investment and the use of existing oil and gas infrastructure.

By 2028, the Ministry of Energy will ensure that a study of the potential for CCUS infrastructure development in Ukraine (with broad stakeholder involvement) is conducted. International technical assistance is required for this purpose.

PM_IMG_WAM_04 Ensuring effective regulation of the oil pipeline system

Goal **:** cost optimization of the existing system of main oil pipelines with the participation of an effective regulator

Legal basis **: -**

Timeline **:** 2025-2028 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, NEURC, Ministry of Economy

Description: Despite the fact that the current legislation provides for licensing of economic activities for the transportation of oil through main pipelines, the calculation and approval by the National Commission for the Regulation of Energy and Utilities of Ukraine of tariffs for the transportation of oil through main pipelines (for domestic consumers), other elements of regulation important for network markets (by analogy with the natural gas and electricity markets) regarding the relevant activity are absent. This is historically related to the operation of foreign economic agreements and a significant share of oil transportation is based on these agreements. In connection with the potential reduction or termination of these supplies, as well as taking into account the needs of decarbonization, including oil infrastructure, it is advisable to create a legal basis for the development by the operator of the main oil pipeline system and the approval by the Regulator of a development plan for such a system in order to plan its future fate (in terms of both new construction and decommissioning of facilities) taking into account feasibility and economic reasonableness such expenses, principle integration of energy systems, and also the principle of “energy efficiency first”. To this end, the Ministry of Energy will develop a relevant draft law during 2026 - 2027.

PM_IMG_WEM_01 Creating legal conditions for optimization and transition to sustainable types of oil and gas infrastructure activities

Goal **:** remove legal obstacles to the optimization and sustainable use of oil and gas infrastructure, taking into account the NECP objectives

Legal basis **:** ESU

Timeline **:** 2024-2026 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, Ministry of Economy

Description: The Law of Ukraine dated 08.21.2024 No. 3915-IX "On Amendments to Certain Laws of Ukraine Regarding the Regulation of Certain Issues of the Use of Terminology in the Energy Sector" amended the Law of Ukraine "On Oil and Gas", which provides for a separate regime for optimizing gas infrastructure in conditions of limited natural gas transit - temporary conservation of GTS and UGS facilities. Furthermore, in the context of oil pipeline operations, pursuant to subparagraph 2 of paragraph 2.4 of the Licensing Conditions for Economic Activities Involving the Transportation of Oil and Petroleum Products via Main Pipelines, approved by NEURC Resolution No. 202 dated February 16, 2017, the licensee must perform preservation or switch from the transportation mode to the safe-condition maintenance mode for pipelines or their facilities that, for one reason or another, have not been in operation for more than one year, while ensuring continuous technical supervision of the pipelines’ condition to maintain their operational suitability.

It is expected that provisions regarding repurposing (further use for hydrogen purposes) and changing the use of existing oil and gas infrastructure to CO_2 transportation/storage will be included in the law drafted to transpose the Gas Decarbonization Package (see **PM_IMG_WAM_01 Transposition of the New EU Legislation Package on Natural Gas and Hydrogen**).

At the same time, based on the law that has already been adopted, it is necessary to remove obstacles to the optimization of the existing oil and gas infrastructure at the level of subordinate legislation, namely:

- The Procedure for Decommissioning Main Pipelines for Oil, Gas, and Their Refined Products, approved by Resolution of the Cabinet of Ministers of Ukraine No. 209 dated March 28, 2018 (Official Gazette of Ukraine, 2018, No. 29, p. 45, Art. 1025), requires amendments to simplify the procedure for decommissioning GTS facilities, taking into account the specificities of optimizing excess GTS capacity;

- The procedure for reclassifying GTS infrastructure elements as gas distribution network (GDS) assets must be simplified in order to transfer satellite gas distribution station (GRS) infrastructure to the balance sheet of the gas distribution network operator (OGDS), subject to the adoption of relevant organizational and administrative decisions regarding the transfer of assets;

- A mechanism should be introduced for the reuse of equipment that is not actually used in gas transportation processes and has been placed in a state of temporary simplified conservation, in particular through the adoption of a relevant resolution by the Cabinet of Ministers of Ukraine.

- Upon the proposal of the Ministry of Energy, the Cabinet of Ministers of Ukraine should adopt the relevant resolutions in 2026.

- In addition, consideration should be given to the advisability of enacting legislative amendments that would allow the Gas Transmission System Operator (OGTS) to use state property—which is not involved in the transportation of natural gas and to which a simplified temporary conservation regime (special operating regime) was applied in accordance with Article 42-1 of the Law of Ukraine "On Oil and Gas," including its individual components obtained as a result of its partial dismantling (disassembly), and/or the relevant units of technological equipment (fixed assets, fixed asset facilities) - by way of relocation, provided that such use does not result in the liquidation or loss of state property.

In addition, by 2027, the divestiture of GTS assets used for electricity generation activities must be ensured. This will require the adoption, at the level of the Government and the Ministry of Energy, of appropriate organizational and administrative decisions regarding the transfer of such assets in compliance with the requirements of legislation on the separation and independence of the GTS Operator's activities from the future entity managing these assets, or amendments to the legislation to extend the GTS Operator's right to carry out the specified type of activity.

PM_IMG_WAM_05 Establishing systematic involvement of the Ukrainian side in EU processes related to the future of energy infrastructure

Goal **:** ensuring that Ukraine's energy infrastructure is taken into account in the development of energy markets in the EU

Legal basis **:** Article 274 of the Association Agreement, Memorandum of Understanding on a Strategic Energy Partnership between Ukraine and the European Union, jointly with the European Atomic Energy Community

Timeline **:** 2024-2030 years

Type of policy / measure: Other

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, OGTS (by consent), TSO (by consent), Ministry of Foreign Affairs, State Energy Efficiency Agency, Ministry of Education and Science

Description: Planning of the development of energy infrastructure in the EU is a continuous and complex process, which, in particular, includes the stages of development, discussion and approval of the EU 10-year network development plans (TYNDP) and the EU lists of projects of common/mutual interest (PCI/PMI list), submission of applications and obtaining coordinated decisions on cross-border cost allocation, submission and consideration of applications for funding from the Connecting Europe Facility, and also submitting applications and participation in projects financing promising research in this area, in particular through the EU Innovation Fund. Ukraine's participation in the EU program "Connecting Europe Facility" is carried out in accordance with the Agreement between Ukraine and the European Union, concluded on June 6, 2023 in Lviv.

At the level of EU strategic documents, Ukraine's potential is not always taken into account. Ukraine and Ukrainian companies rarely participate in large-scale research projects (with exceptions, for example, the Biomethaverse project, which includes non-state actors from Ukraine). At the same time, Ukrainian companies participate in the development of TYNDP, PCI/PMI list, as well as the procedures of the United Europe Mechanism.

The Ukrainian side will take measures to ensure that Ukrainian energy infrastructure is taken into account during the processes:

- the formation of strategic documents and relevant internal EU research carried out with the help of external contractors or the Joint Research Centre of the European Commission;
- planning and implementation of large-scale research projects (see also **PM_RIC_WAM_02**

Expanding funding for research in the field of renewable energy and climate innovation);

- planning and financing critical elements of future energy infrastructure;
- creation and operation of the infrastructure for decarbonization of energy markets, in particular traceability systems and mutual recognition of guarantees of origin in accordance with the RED III Directive.

In addition, it is advisable to obtain full membership of the Ukrainian side in the EU standardization bodies (CEN, CENELEC), as well as in ENTSOG.

In order to implement this policy, additional agreements should be reached with by the European side, as well as additional organizational measures taken by the Ukrainian side (responsible persons identified, creation of additional working or interdepartmental working groups, conclusion of memoranda of intent with research institutes or other institutions, etc.)

3.4.2.2. Regional cooperation in this area

Electricity Infrastructure

Regional cooperation in the development of the electricity transmission system of Ukraine is envisaged mainly within the framework of planning and implementation of projects that strengthen cross-border electricity connections of the Integrated Power System of Ukraine with the power systems of ENTSO-E member countries. to improve their level of integration. Such projects are coordinated by the TSOs within the framework of ENTSO-E and are implemented in the format of projects of mutual interest (PMI). Ukraine is implementing several projects of mutual interest (PMI) and projects of Energy Community interest (PECI) are under consideration (their description is given in section 2.4.2.1).

To develop regional interaction, the TSO of Ukraine cooperates with the TSOs of other countries in the region and the Regional Coordination Center (RCC) TSCNET. The interaction is carried out within the framework of the functionality defined in Annex 1 to this Regulation (EU) 2019/943 on the internal electricity market, in particular, in terms of creating a regional network model coordinated by carrying out calculations modes and definition corrective actions in region, determining the volume of capacity of interconnectors, etc.

Oil and gas infrastructure

LLC “GTS Operator of Ukraine” cooperates with GTS operators of neighboring countries within the framework of ENTSO-G, as well as within the following initiatives:

- Central and South-Eastern Europe Energy Connectivity (CESEC);
- South-East European Gas Initiative (SEEGAS);
- European Hydrogen Backbone and others initiatives of hydrogen;
- Biomethane Industrial Partnership, in particular thematic direction 6.

3.4.2.3. Where applicable, financing measures in this area at national level

Electricity infrastructure

For funding the development of transmission system several sources are used:

- transmission tariff that contains appropriate an investment component to finance projects for the modernization and development of the transmission system;
- income, received by TSO on auctions with distribution access to transfer capacity of interconnectors ;
- fee for connection to transmission system;
- funds attracted by TSOs within the framework of international technical assistance programs and other funds attracted from IFIs.

The tariff for electricity transmission services of the TSO is determined in accordance with the Procedure for establishing (forming) the tariff for electricity transmission services and is established by the Regulator. The transmission tariff, in particular, includes the costs of implementing the TSO investment program, which determines the volumes and sources of financing for planned projects for the development of the transmission system. The investment program is formed in accordance with

the Procedure for developing, submitting for approval and implementing the investment program of the transmission system operator, which is an appendix to the Transmission System Code, and is also considered and approved by the Regulator.

According to Article 43 of the Law of Ukraine "On the Electricity Market", any income from the cross-border capacity allocation can be used for the following purposes: guaranteeing the actual availability of allocated capacity; maintenance and increasing capacity through investments in the transmission system, in particular in the construction of new interstate transmission lines.

Along with the need to develop and modernize the transmission system in the volumes determined by the TSO, the TSO also has contractual obligations to develop the transmission system to connect customer facilities. At the same time, financing the development of the transmission system required for accession objects customers, is carried out by score pay by joining by customers.

The formation of fees for connection to the TSO networks is determined in accordance with the Methodology (procedure) for forming fees for connection to the transmission system and distribution system.

Methods of financing projects for the modernization and development of the transmission system using IFI funds are described in section 3.4.1 of this Plan.

Oil and gas infrastructure

Financing the costs of operators of oil and gas infrastructure facilities is possible at the expense of revenue received from customers of their services, at the expense of funds from other investors or at the expense of additional (grant) sources. For example, the Central European Hydrogen Corridor project is eligible for financing from the Connecting Europe Facility. Financing of hydrogen projects is also possible at the expense of the EU Innovation Fund, including the European Hydrogen Bank, etc. At the same time, as noted above, financing the costs of natural gas and oil transportation and storage infrastructure, which will not be further repurposed for hydrogen activities, will no longer be subject to under financing main mechanisms financing EU (including through the Connecting European Facility). Thus, the main source of funding for the necessary measures may be revenue from the TSO received from service customers or funds from private investors.

ESU foresees the need to adapt tariff and regulatory policy to the current volumes of gas transportation and the socio-economic environment in order to ensure the long-term financial sustainability of the OGTS. In 2025-2029, the second regulatory period for the purposes of stimulating tariff formation by LLC "GTS Operator of Ukraine" is underway.
At the same time, it should be noted that according to the current law Ukraine continues to have a moratorium on increasing tariffs for natural gas distribution, which limits the possibilities for financing the costs of such operators.
Thus, the main focus in financing the projects included in the NECP should be on attracting financing from investors, in parallel with the possibility of attracting additional (grant) funds. To this end, the necessary regulatory requirements should be created to facilitate the attraction of such investments.

3.4.3. Market integration

3.4.3.1. Policies and measures related to the elements set out in point 2.4.3

Electricity market

In 2019, Ukraine carried out a radical reform of the wholesale and retail segments of the electricity market, moving from a single-buyer model to a competitive one based on the EU countries' model by introducing the appropriate institutional environment and structural organization of the market, following the provisions of the Third EU Energy Package. Further transformation of the electricity market is taking place within the framework of the provisions of the Fourth EU Energy Package (Clean Energy Package). In terms of reforming and developing the electricity market, Ukraine is implementing the following basic policies and measures:

- Deepening integration with EU markets by increasing cross-border capacity and the introduction of European rules for its allocation at joint auctions using the pan-European trading platform Joint Allocation Office (JAO). It is also planned to connect the spot markets of Ukraine and the EU countries as soon as possible, in particular the day-ahead market and the intraday market (market coupling), and integrate the balancing market into European balancing platforms.
- Ensuring the proper functioning of the competitive electricity market by deepening its

liberalization in combination with temporary regulatory measures aimed at stabilizing the market at a stage of insufficient maturity of the competitive environment, limited integration with the markets of the EU countries and ENTSO-E and taking into account military risks. At the same time, gradual harmonization with the EU markets of the areas, methods, scales and other parameters of regulation is envisaged, in particular in terms of the application of limit prices on spot (DAM, IDM) and balancing electricity markets.

- Development of electricity exchange trading with the introduction of standardized trading products, introduction of market pricing in all market segments, in particular, the use of real-time prices, and gradual abandonment of cross- subsidization.
- Incentive regulation (RAB-tariff formation) for electricity network operators to ensure economic conditions for the modernization and development of network infrastructure, the introduction of smart grids.
- Increasing the stability and flexibility of the power system through the development of distributed generation, the introduction of flexible generating capacities, and energy storage facilities and events management in demand. Based on priorities for technological development of the power system of Ukraine, identified by TSO through resource adequacy assessment, in particular in terms of the structure of generating and other capacities, it is envisaged to hold tenders for the construction of generating capacity and the implementation of demand management measures with appropriate incentive (support) mechanisms and special auctions for the purchase of ancillary services by the transmission system operator for a period of up to five years.
- Deepening market integration of electricity producers from RES and other types of distributed energy resources by ensuring their active participation in organized market segments, introducing new business models (active consumers, aggregation etc., with the promising development of microgrids as a tool for integrating renewable energy and other types of distributed energy resources), the possibility of implementing direct electricity trading with taking into account responsibility by imbalances.
- Ensuring the protection of vulnerable consumers through direct monetized subsidies, preferential prices, provided by mechanisms for imposing special obligations to ensure general public interests in the process of functioning of the electricity market (PSO) on individual market entities, which must be temporary, targeted, transparent and non-discriminatory.

More details separate politicians and events are revealed in paragraphs 3.4.3.2.-3.4.3.5. this Plan.

3.4.3.2. Measures to increase the flexibility of the energy system with regard to renewable energy production such as smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, real-time price signals, including the roll-out of intraday market coupling and cross-border balancing markets

Electricity market

PM_IME_WEM_01 Transposition of Electricity Integration Package

Goal: development regulatory and legal bases, necessary for development and integration of the electricity market of Ukraine with the markets of EU countries.

Legal basis: ESU, Resolution of the Cabinet of Ministers of Ukraine dated April 1, 2026 No. 438 "On Approval of the National Program for Adaptation of the Legislation of Ukraine to the Law of the European Union (EU Acquis)" (Government Courier, 2026, No. 73).

Time frame: 2024-2027 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations: Ministry of Energy, NEURC

Description: The ESU defines the tasks of ensuring the effective functioning of internal energy markets and their full integration with the EU energy markets. On 15 December 2022, the Energy Community Council adopted Decision 2022/03/MC-EnC on the incorporation legislation EU of market electricity to Energy Community (Electricity Integration Package) together with Procedural Act 2022/01/MC-EnC on promoting regional energy market integration. Ukraine, as a contracting party to the Energy Community, is obliged to transpose the Electricity Integration Package. Its transposition and further implementation will allow creating the necessary legal, organizational and economic framework for the development of the Ukrainian electricity market and ensuring its

integration with the markets of the EU countries, in particular in terms of market coupling (PM_IME_WAM_04 Integration of spot markets (market coupling)) and integration into balancing platforms (PM_IME_WAM_05 Integration of the balancing market).

In this regard, during 2026-2027, the Ministry of Energy and the National Energy Regulatory Commission will prepare draft laws for transpositions Directives and Regulations, which are included in the Electricity Integration Package. During 2026-2027 years expected their approval by Cabinet Ministers and adoption by the Verkhovna Rada. The development and adoption of relevant legislative changes will take place in accordance with the action plan for implementation of the National program for the adaptation of legislation of Ukraine to the law of the European Union (EU acquis), approved by the CMU on April 1, 2026.

PM_IME_WAM_01 Implementation of smart grids

Goal: Implementation of smart grids taking into account existing and planned state and regional programs for the development and modernization of the energy sector. The expected results of the implementation of the Concept for the implementation of smart grids in Ukraine by 2035 are:

- improving the reliability and quality of electricity supply, operational performance and overall productivity of the energy sector;
- increasing operational efficiency, effective integration of distributed generation, conducting remote monitoring and diagnostics, optimizing the use of assets and resources, improving the configuration of power grids;
- increasing energy efficiency, which will reduce losses in the electricity networks of transmission and distribution system operators, improve the efficiency of load management (active and reactive), and reduce carbon emissions;
- reduction frequencies and duration outages consumers;
- enabling consumers to manage their electricity consumption, reduce energy costs without compromising their lifestyle and excessive restrictions consumption electric energy for pleasure own household needs (expected reduction in the average duration of long interruptions in the system (SAIDI) and the index of undersupplied electricity (Electricity №t Supplied) by at least three times).

Legal basis: Order of the Cabinet of Ministers of Ukraine dated October 14, 2022 No. 908 “On approval of the Concept of implementation of “smart grids” in Ukraine until 2035” (Official Gazette of Ukraine 2022, No. 84, p. 5201)

Time frame: 2022 – 2035 years

Type of policy / measure: Planning

Sector(s) affected: Energy - supply, Energy - consumption

Emission reduction type: CO_2

Responsible bodies/organizations: Ministry of Energy, NEURC

Description: The development of smart grids will be carried out within the framework of the Concept of the Implementation of Smart Grids in Ukraine by 2035, approved by the Government in 2022, and the corresponding plan of measures for its implementation. The implementation of pilot projects specified in the plan of measures for the implementation of the Concept is envisaged on the basis of the property of business entities (operators of BESS, TSOs, DSOs, electricity producers). The implementation of projects is carried out using the procedures for forming development plans and investment programs of electricity producers, TSOs, DSOs, plans for reconstruction and modernization of TPPs, CHPs, approved by the National Energy Regulatory Commission.

The concept envisages the implementation of pilot projects for smart cities, namely the integration of information and communication technologies, with the aim of effectively managing the city's infrastructure. Efforts are aimed at improving the quality of life of city residents and reducing infrastructure maintenance costs.

As part of the digitalization of the transmission system, the Wide Area Monitoring System (WAMS) was put into commercial operation in 2022, providing continuous monitoring of dynamic parameters of the Integrated Power System of Ukraine. In 2025, the system's software modules were implemented WAMS: Inertia Monitoring Application, for estimating the effective inertia of a power system; GE PSLF, for modeling and planning power system operating modes.

In 2026 year planned realize such measures:

- expansion of the WAMS system by installing additional equipment at 26 transmission system substations;
- Amendments to the Transmission System Code regarding the use of WAMS systems at generating facilities and/or transmission/distribution system users to monitor transients and reduce the risks of system accidents;
- implementation of decentralized redundant precise time systems at Ukrainian power facilities;
- implementation of a pilot project to introduce a system for dynamically determining the permissible load of overhead power lines in real time, taking into account meteorological and operational conditions (DLR - Dynamic Line Rating).

By 2030 year and in further perspective planned implementation such events:

- implementation of the WAMS Proxy solution for organizing secure information exchange between the WAMS system of NPC Ukrenergo and external objects using the C37.118.2 protocol;
- realization project construction systems synchronization accurate time for PMU (WAMS) at substations of NPC Ukrenergo;
- implementation of the first stage implementation DLR systems on main lines 330–750 kV overhead lines.

The implementation of the Concept does not require expenditures from the state and local budgets. The main current source of financing for the development of smart grids is the TSO tariff for electricity transmission services and the DSO tariffs for electricity distribution services. The tariffs are regulated by the national Regulator (NEURC), are subject to annual review and approval and, in particular, must take into account the costs of implementing network development measures provided for in the medium and long-term plans for the development of the transmission and distribution systems, as well as in the relevant annual investment programs of network operators. Network development plans and investment programs are subject to approval by the Regulator. At the same time, the implementation of smart grids will require significant investments from other sources (except tariffs on transmission and distribution of electricity), including donor funding, etc.

NEURC within the scope of competence contributes to anticipating events with automation, telemechanization and implementation of electricity metering also within the framework of consideration of transmission (TSDP) and distribution system development plans (DSDP) and investment programs (IP).

The development of intelligent electricity metering is also implemented within the framework of the policy PM_EE_WEM_18 Intelligent energy metering systems. The level of equipping consumers with intelligent meters and the schedule for their further implementation in the DSO varies. On average, as of December 31, 2024, the total level of providing consumers with intelligent meters was 19.66% of the total number of meters installed at consumers (excluding temporarily occupied territories), while the level of providing household consumers with intelligent meters was 19.72%. When approving the RDP for 2025-2029 and the IP for 2025, it was envisaged to increase the annual volume of implementation of the DSO smart meters by at least 15% compared to the volumes provided for in the RDP for 2024-2028 and the IP for 2024. Similar measures are being taken when considering the RDP for 2026-2030 and will be implemented when considering the IP for 2026 and in the future. Taking into account the available staff, the cost of smart meters and other factors, most DSOs estimate the possibility of ensuring 100% installation of smart meters for their household consumers by 2040. This period is an estimate, since various factors (economic, social, military-political, etc.) may affect the practical implementation of the introduction of “smart meters” for household consumers.

Smart meters and electricity metering systems are implemented taking into account the results of the assessment of the economic feasibility of their implementation, which is carried out by the Ministry of Energy. If the assessment result is positive, the Ministry of Energy approves the schedule for the implementation of smart meters and metering systems. If the assessment result is negative, a reassessment is carried out at least once every four years or more often - if there are significant changes in the main assumptions, technological or market conditions. Control and monitoring of the implementation of smart meters and metering systems are carried out by the Regulator.

Also, DSOs, within the framework of IPs approved by the Regulator, are carrying out measures to reconstruct 10 kV overhead lines with the installation of reclosers. At the same time, for the period of martial law in Ukraine, the policy of stimulating regulation of distribution system operators (PM_IME_WEM_02 Stimulating regulation of distribution system operators) is implemented in a limited form, which significantly reduces the possibilities of financing measures for the modernization of distribution systems and the implementation of smart grids.

Ensuring coordination of actions, control and monitoring of the status of implementation of the Concept and implementation of the action plan is carried out by the Ministry of Energy. The instrument for implementing the Concept is a corresponding action plan with defined performance indicators.

PM_IME_WEM_02 Stimulating regulation of distribution system operators

Goal: Stimulation investment in modernization and development electric networks, achieving targets for the quality and reliability of electricity supply

Legal basis: decree NEURC 05 October 2018 No. 1175 "About approval of the Procedure for establishing (forming) tariffs for electricity distribution services"

Time frame: since 2018

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Emission reduction type: CO_2

Responsible bodies/organizations: NEURC, DSO (by consent)

Description: Tariffs for distribution services for the vast majority of DSOs are built on the principle of incentive regulation (RAB-tariff formation), which is aimed at stimulating investments in the modernization and development of electricity networks, including smart grids, as well as achieving targets for the quality and reliability of electricity supply by determining the necessary income of DSOs to ensure carrying out activities related to the distribution of electrical energy.

Due to the special conditions of DSO operations and increased physical risks during the martial law period, the policy is applied in a limited form. The regulator has amended the resolutions governing the application of DSO incentive regulation (Resolution of the National Commission for the Regulation up to 3% and 0% (for licensees whose controller or ultimate beneficial owner of a controlling stake is an individual or legal entity subject to economic and restrictive measures (sanctions)) for the period 2023-2026; mitigated requirements of targeted values general indicator efficiency (0%) and efficiency indicator of technological electricity consumption in voltage classes 1 and 2 (0 relative units) for the period 2024-2026.

The NEURC should create a working group of representatives of DSOs, central executive authorities, specialized associations and other stakeholders to develop comprehensive approaches to determining obligations and indicators for the second regulatory period, taking into account the analysis of DSO indicators (benchmark analysis) to assess the results of the first regulatory period. During 2026, the Regulator, when conducting control measures, must verify the reliability and sufficiency of the implementation of the DSO obligations and indicators, which are a condition for the transition to the next regulatory period.

After the transposition of the Electricity Integration Package (PM_IME_WEM_01 Transposition of Electricity Integration Package), the NEURC will develop a comprehensive action plan that provides for the update of the current regulatory framework and the development of new acts of secondary legislation in accordance with the requirements of the EU acquis. The action plan will provide for the introduction of relevant amendments to key documents, in particular, the Transmission System Code; Distribution Systems Code; Commercial Electricity Metering Code; Licensing Conditions for

Conducting Activities in the Electricity Sector; Procedures for Forming Tariffs for Transmission and Distribution of Electricity, etc.

PM_IME_WEM_03 Development of aggregation

Goal: Creation of an institutional environment for the implementation of aggregation activities in the electricity market

Legal basis: Law of Ukraine "On the Electricity Market", Resolution of the National Commission for the Regulation

Time frame: since 2023

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations: NEURC

Description: Aggregation activities are subject to licensing, except in cases where the market participant has a license for the production and/or storage, and/or supply of electricity to consumers, and/or for the performance of the functions of a guaranteed buyer. To avoid excessive concentration, the key restrictions on the aggregator's activities include the condition that the aggregation unit cannot include an electrical installation for the production of electricity, the installed capacity of which exceeds 20 MW.

From the point of view of market participation, an aggregator, including an independent aggregator, may, on a non-discriminatory basis, purchase and sell electricity on the market, taking into account liability for imbalances, as well as provide balancing and ancillary services.

Market participants have the right to freely enter and change the aggregated group. Exit with aggregated groups has to be carried out in the shortest possible term subject to conditions contract, but such the deadline cannot exceed 21 calendar days. In Contracts on participation in an aggregated group allow penalties (fees) for the withdrawal of an electrical installation from the aggregated group. Such penalties (fees) must be proportional and must not exceed the direct losses and/or expenses of the aggregator as a result of the termination of the contract, including the cost of services already provided under the contract. Penalties (fees) cannot be applied to household and small non-household consumers.

The regulator has adopted a number of resolutions to legally regulate activities with aggregation and activity of active consumers in the electricity market.[107] To increase the flexibility of the energy system, within the framework of the implementation of the provisions of the Electricity Integration Package, the possibility of providing flexibility services to distribution system operators and demand response by aggregators will be ensured.

PM_IME_WEM_04 Ensuring the development of energy storage facilities

Goal: To create an institutional environment for energy storage activities and the participation of

[107] Decree NEURC from 22 February 2024 river No. 370, which one provided changes to Rules market and The issue of the activities of aggregators and active consumers in the electricity market has been resolved; Resolution of the National Commission for the Regulation of the National Energy and Utilities Commission of Ukraine No. 57 of January 10, 2024, which provides for amendments to the Commercial Accounting Code electric energy and settled question of features organizations commercial accounting for active consumers, generating installations of private households, aggregation units; Resolution of the National Commission for the Regulation of the Energy and Utilities Sector No. 2649 of December 29, 2023, which provides for amendments to the Code transmission systems in electrical networks; Resolution of the National Energy Regulatory Commission of Ukraine No. 2 of January 10, 2024, which provides for amendments to the Distribution System Code and regulation of issues related to the activities of active consumers and aggregators; Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine No. 3 dated January 10, 2024, which provides for amendments to the Rules of the Retail Electricity Market and regulates the issue of the activities of aggregators and active consumers in the retail electricity market; Resolution of the National Commission for the Regulation of Energy and Utilities of December 29, 2023 No. 2651 "On Approval of the Procedure for the Sale and Accounting of Electricity energy, produced active consumers, and calculations by her" of regulation of relations between electricity market participants and active consumers.

energy storage operators in the electricity market

Legal basis: Law of Ukraine "On the Electricity Market", Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine No. 798 dated July 22, 2022 "On Approval of the Licensing Conditions for Conducting Economic Activities in Energy Storage", ESU

Time frame: since 2022

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply, Energy - consumption

Emission reduction type: CO_2

***Responsible bodies/organizations*:** NEURC

Description: The development of BESS is at an early stage. As of April 2026, the Integrated Power System of Ukraine is working industrial BESS with total power capacity about 500 MW and energy capacity 1000 MWh; technical specifications for new renewable energy plants have been issued in the amount of about 1.4 GW. Since the installed RES capacities during 2010-2025 are based mainly on technologies whose operating profile depends on weather conditions (wind and sun) and which operate with low capacity factor, it is planned to expand the network infrastructure and develop renewable energy plants. According to the ESU, among the strategic tasks is the active implementation of energy storage technologies. It is also planned to create incentives / market conditions for the construction of renewable energy plants (industrial scale). In particular, special auctions have been introduced, providing for the use of long-term contracts (up to five years) for the provision of ancillary services (FCR and aFRR) (PM_IME_WEM_08 Special auctions for long-term procurement of ancillary services).

Energy storage activities are provided for in the Law of Ukraine "On the Electricity Market". The regulator has approved the licensing conditions for conducting economic activities in energy storage. To simplify licensing procedures, the licensing conditions define cases when entities using BESS do not require licensing.

Also, to simplify the procedure for connecting BESS to the power grids during the period of martial law, in accordance with the Procedure for temporary connection of electrical installations to the distribution system during the period of martial law in Ukraine, the DSO connected BESS customers to 01 January 2025 year without pay by accession power (Resolution NEURC dated 03/26/2022 No. 352 "On the peculiarities of temporary connection of electrical installations to the distribution system during the period of martial law in Ukraine").

From the point of view of market participation, the BESS operator (as well as the aggregator) can, on a non-discriminatory basis to purchase and sell electricity on the electricity market, taking into account responsibility for imbalances, as well as to provide balancing and ancillary services. To ensure proper conditions for the development of BESS, the problem of accumulated debt on the balancing electricity market must be resolved.

To increase the flexibility of the energy system, as part of the implementation of the Electricity Integration Package provisions, the possibility of providing flexibility services to distribution system operators by BESS operators will be ensured.

PM_IME_WEM_05 Support of active consumers by the self-production mechanism (net billing)

***Goal*:** Creating an institutional environment for the participation of active consumers in the electricity market and stimulating the development of distributed sources of electricity generation

***Legal basis*:** Law of Ukraine "On the Electricity Market", Law of Ukraine "On Alternative Energy Sources", Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine No. 2651 dated December 29, 2023 "On Approval of the Procedure for the Sale and Accounting of Electricity Generated by Active Consumers, and Settlements for It"

***Timeline* :** since 2024

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply, Energy - consumption

Emission reduction type: CO_2

Responsible bodies/organizations **:** NEURC

Description **:** Support for active consumers under the self-production mechanism (ACSPM) is provided by guaranteeing the purchase of electricity generated mainly from alternative sources and released to ACSPM on the basis of a concluded purchase and sale agreement. electrical energy by mechanism self-production, which is application to the contract on the supply of electricity to the consumer. The self-production mechanism is a scheme to support active consumers, designed to encourage the consumption of electricity of their own production, under which the cost of the volume of electricity supplied to the electricity grid by the generating installations of such consumers and the cost of the volume of electricity withdrawn by them from the grid are offset, taking into account the cost of transmission and/or distribution services.

The self-production mechanism provides an opportunity for household and non-household consumers to install generating capacities within their contractual capacity (but not more than 30 kW for household consumers and 50 kW for small non-household consumers). Technical requirements related to the connection of ACSPM generating installations are determined by the Distribution Systems Code and the Transmission System Code. The permitted ACSPM electrical capacity for release to the network (except for household consumers and small non-household consumers), including generating installations and energy storage installations of third parties, may not simultaneously exceed 50 % from quantities permitted (contractual) power of electrical installations of such consumers, intended for electricity consumption. In case the active consumer fulfills certain technical requirements of the DSO or the TSO to which the active consumer's electrical installations are connected, in accordance with the distribution systems code or transmission system code, approved for injection to the network can be increased.

The production or storage of electricity by active consumers, third parties connected to the electricity networks of active consumers, is considered production or storage of electricity for own needs and does not require obtaining a license for the production or storage of electricity, provided that the installed capacity of generating power plants or BESS at one measurement site does not exceed 5 MW (separately for generation and storage plants).

The ACSPM must conclude a contract for the purchase and sale of electricity under the self-production mechanism with its electricity supplier. The price of electricity sales by household and small non-household consumers is determined at the price level established on the DAM in the relevant period. Electricity price for non-household consumers is determined by agreement of the parties. The universal service supplier cannot refuse a household or a small non-household consumer in concluding an electricity purchase and sale agreement using the self-production mechanism, provided that an electricity supply agreement has been concluded with such a consumer.

The regulator has adopted a number of resolutions to legally regulate the activities activity of active consumers and aggregation in the electricity market (see PM_IME_WEM_03 Development of aggregation). Sale, accounting of electricity generated by active consumers and settlements for it must be carried out in accordance with the Procedure for the sale and accounting of electricity generated by active consumers and settlements for it approved by the Regulator. The Regulator must ensure monitoring of the activity of active consumers in the retail electricity market in order to increase the efficiency of their activities, facilitate the development of demand response measures; identify practices that limit the activity of active consumers, etc. To this end, the Regulator must adopt the Procedure for monitoring the activity of active consumers in the retail electricity market.

To increase the flexibility of the energy system, as part of the implementation of the Electricity Integration Package, active consumers will be able to provide flexibility services to distribution system operators. To ensure the possibility of providing flexibility services by active consumers who are household consumers, it is necessary to reform the pricing for household consumers in the electricity market (PM_IM_WEM_04 Regulation and liberalization of retail energy prices).

PM_IME_WEM_06 Ensuring the development of distributed generation

Goal **:** Ensuring the stimulation and balanced development of distributed generation (DG) of electric energy to ensure the sufficiency of generating capacities, improve the reliability of electricity supply,

flexibility and sustainability of the energy system of Ukraine by creating favorable conditions for the development of DG, in particular high-maneuverability capacities

Legal basis **:** Strategy for development distributed generations until 2035

Timeline **:** 2024 – 2035 years

Type of policy / measure: Planning

Sector(s) affected: Energy - supply, Energy - consumption

Emission reduction type: CO_2

Responsible authorities/organizations **:** Ministry of Energy, National Commission for the Regulation of Energy and Utilities of Ukraine, TSO (upon consent), DSO (upon consent), OGTS (upon consent), OGRM (upon consent), AMCU

Description : The policy is implemented within the framework of the implementation of the Distributed Generation Development Strategy for the period until 2035 and the operational plan of measures for its implementation in 2024 - 2026 and the corresponding operational plans for further periods of implementation of the Strategy. For the purposes of deploying the DG system, the types of electricity facilities are divided into the following groups:

1) facilities that provide guaranteed output of available power and use natural gas as fuel (gas turbine, gas piston, cogeneration plants);

2) renewable energy facilities (wind, solar, bioenergy, small hydroelectric power plants);

3) energy storage units (ESU), which can be used separately or as part of generating plants.

The priority is the use of power plants that provide guaranteed output of available power in the presence of fuel (natural gas), unlike solar and wind power plants, the available power of which depends on weather conditions. In conditions of constant deficit of generating capacity, BESS are used mainly for the purposes of redistribution of available volumes of electricity during the day, without eliminating the deficit entirely.

The Strategy outlines the role models of participation of DG facilities in various segments of the electricity (and heat) market, as defined by law, and the mechanisms of their state support, in particular for electricity producers, BESS operators, consumers and active consumers. For electricity producers or BESS operators, the possibility is provided:

- sales electric energy on market electric energy by free prices;
- sale of thermal energy to heat supply enterprises or heat consumers through district heating systems (in the case of application of cogeneration);
- provision of balancing and ancillary services to the transmission system operator, in particular by concluding long-term contracts (within the framework of policy PM_IME_WEM_08 Special auctions for long-term procurement of ancillary services);
- obtaining state support based on the results of a tender for the construction of generating capacity and the implementation of demand management measures (within the framework of the policy PM_IME_WEM_07 Tenders for the construction of generating capacity and implementation of demand-side management).

Additionally for DG facilities on RES provided possibilities:

- obtaining state support in the form of concluding an agreement with a guaranteed buyer for granting services by mechanism market premium for the term for 12 years by participation and victory in auctions for the allocation of support quotas (within the framework of policy PM_D_WEM_15 Auction system for the allocation of support quotas for renewable energy sources);
- concluding an agreement with a consumer, electricity supplier or trader on the provision of services to ensure the stability of the price of electricity (corporate purchase and sale agreements (cPPAs)) (within the framework of policy PM_D_WEM_12 Direct electricity purchase and sale agreements between producers and end consumers of energy).

For active consumers, in particular third parties and energy service customers, the following options are provided:

- purchase and sale of electricity using the self-generation mechanism (Net Billing) (PM_IME_WEM_05 Support of active consumers by the self-production mechanism (net

billing));
- provision of balancing services and/or ancillary services, in particular by joining the aggregated group of the aggregator (PM_IME_WEM_03 Development of aggregation).

The Strategy is being implemented in three stages. The first stage – until the end of 2024 – envisaged: taking measures for the rapid construction and/or placement of as many as possible volumes established power objects DG and, in accordance, achievement to 1 GW additional generating capacities. In the second stage – by the end of 2026 – it is expected to achieve up to 4 GW of additional generating capacity. In addition, it is expected to:

- continuing the implementation and expansion of state support programs for the installation of solar and/or wind power plants together with BESS for the population (within the framework of policy PM_D_WEM_13 Program of the Energy Efficiency Fund "GreenDIM" and policy PM_D_WEM_14 Program "Energy Independence of Individuals - Household Owners"), scaling up projects for the installation of solar and/or wind power plants together with BESS in public and administrative buildings;
- creating the necessary legislative framework for the development of renewable energy facilities and/or energy storage facilities within public energy associations and renewable energy consumer communities;
- accelerated renovation and automation of distribution electrical networks in the most priority areas, power nodes, and districts;
- formation highly automated, managed and predicted microgrids;
- full implementation provisions legislation EU in part development DG and RES;
- identification of priority areas for the development of renewable energy, network infrastructure and renewable energy.

The implementation of the first and second stages is carried out by implementing the measures defined in the operational plan of measures for the implementation of the Strategy in 2024–2026. The implementation of the third stage (from 2027) will be carried out within the framework of the relevant operational plans, which will subsequently be developed by the Ministry of Energy and submitted for consideration by the Cabinet of Ministers.

At the regional level, the development of DGs, in particular, is carried out within the framework of the regional energy sustainability passports tool, which reflect comprehensive assessment of the potential for the development of DG in each region. Accordingly, Kyiv city state administrations (military administrations) have to develop action plans for development DG with taking into account specifics of each region of Ukraine.

To ensure proper integration of DG facilities into electrical networks, it is assumed that when planning the development of the distribution system, DSOs should foresee the need to build and/or reconstruct distribution systems to connect new generating capacities, in particular RGs, and consumer facilities, in particular electric charging stations. Distribution system development plans should include an assessment of the medium- and long-term need for flexibility services, take into account energy efficiency measures, response demand, the use of energy storage facilities or other resources as alternative solutions to the expansion of the distribution system. Taking into account the introduction of distributed energy resources, the further development of TSO and DSO networks may require tariff reform, in particular the introduction of differentiated network tariff rates.

Also to accelerate the implementation of construction projects and integration into the energy system DG facilities provide for the application of simplified permitting procedures (PM_IME_WEM_09 Simplification of permission procedures for distributed generation).

IN part financial support for policy implementation is expected promoting the implementation by private business entities of the construction and commissioning of all types of DGs by:

- involvement private investments, in particular foreign investments;
- insurance (reinsurance) military and political risks;
- involvement credit financing, in particular:

  affordable lending within the framework of the state program “Affordable Loans 5-7-9%” in accordance with the Procedure for Providing Financial State Support to Business Entities, approved by the resolution of the Cabinet of Ministers of Ukraine dated January 24 2020 No. 28 (Official Gazette of Ukraine, 2020, No. 12, p. 489; 2023, No. 33, p. 1763);

accessible lending in accordance with the terms of the Memorandum on Bank Lending for Energy Infrastructure Restoration Projects, concluded by Ukrainian banks on June 25, 2024;

lending international financial organizations and foreign banks.

The construction and commissioning of the new DG will also be facilitated by measures to provide tax and customs benefits when importing energy equipment into the territory of Ukraine.

PM_IME_WEM_07 Tenders for the construction of generating capacity and implementation of demand-side management

Objective **:** Stimulate the construction of new highly maneuverable generating capacities and implement demand management measures to ensure resource adequacy (sufficiency), stability and flexibility of the power system

Legal basis **:** Law of Ukraine "On the Electricity Market", Resolution of the Cabinet of Ministers of Ukraine dated July 10, 2019 No. 677 "On Approval of the Procedure for Conducting the Competition for the construction of generating capacity and implementation events with management demand" (Official Gazette of Ukraine, 2019 p., No. 61, p. 2126)

Timeline **:** with 2024 year

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Emission reduction type: CO_2

Responsible bodies/organizations **:** Ministry of Energy, NEURC, TSO (by consent)

Description **:** To ensure resource adequacy (sufficiency), stability and flexibility of the power system on basis priorities technological development the IPS of Ukraine, certain TSOs, within the framework of assessing resource adequacy/sufficiency, in particular in terms of the structure of generating and other capacities, the state holds competitions for the construction of generating capacity and the implementation of demand management measures in accordance with the approved procedure for their conduct. Competitions are held on the principles of: non-discrimination and fair competition; openness and transparency; objective and impartial assessment of participants' bids; prevention of corrupt practices and abuse during the competition; impossibility of using cross-subsidies to stimulate competition winners.

Based on the report on the assessment of the conformity (sufficiency) of generating capacities and the results of monitoring the security of electricity supply, the TSO submits Ministry of Energy conclusions and proposals regarding the need to hold a competition, the volume of procurement of generating capacity and/or demand management measures, the minimum and maximum amount of additional capacity and/or the impact on the electricity schedule load due to demand management, technical requirements and characteristics of generating capacities and/or equipment for implementing demand management measures.

The decision to hold the competition is made by the Cabinet of Ministers of Ukraine upon submission The Ministry of Energy determines:

1. deadlines carrying out competition;
2. the volume of procurement of the necessary generating capacity and/or demand management measures ;
3. incentives and the procedure for their application for the winner of the competition, including the maximum purchase price for the service to ensure the development of generating capacity and the minimum payment deadline for the service provided in the case of using the fee for the service to ensure the development of generating capacity as an incentive;

4. maximum deadline for commissioning generating capacity and/or starting demand management measures;
5. the minimum and maximum amount of additional capacity and/or the value of the impact on the electrical load schedule as a result of the implementation of demand management measures;
6. requirements for the minimum period of guaranteed (design) operation (hours of operation) of equipment after commissioning of generating capacity and/or demand management measures;
7. basic technical requirements and characteristics to ensure the necessary operating modes of generating capacities and/or equipment for implementing demand management measures.

For stimulation winners competition can apply such mechanisms support:

- fee for the service of ensuring the development of generating capacities and/or demand management measures, which does not exceed the maximum purchase price of the service of ensuring development generating capacities and/or events with management demand. Such payment is made by including the relevant costs in the tariff for the transmission of electricity to the TSO;
- public-private partnership mechanism (the competition is held in accordance with the Law of Ukraine "On Public-Private Partnership");
- The provision of state aid at the expense of state or local resources and other forms of support are not prohibited by law.

In accordance with the target development scenario proposed in the Report on the Generation Capacity Adequacy Assessment to Cover the Forecasted Demand for Electric Energy and Ensure the Necessary Reserve in 2023, it is proposed to hold a competition for the construction of new generating capacities with a total capacity of 1,400 MW of highly maneuverable power plants with quick start-up (up to 15 min.) to ensure the availability of in the Integrated Power System of Ukraine guaranteed reserves of secondary regulation (frequency restoration reserves), in two stages. In the first stage of the competition, the following are purchased: 700 MW divided into 2 lots:

- Lot 1 – 500 MW power from construction on territories priority regions;
- Lot 2 – 200 MW with construction in regions not related to priority.

In order to increase the reliability of operation of individual large power nodes and existing limitations of the internal network of the Unified State Electric Power System of Ukraine, according to the assessment of NPC Ukrenergo, the priority is the placement of new generation facilities in the following regions: Kyiv, Chernihiv, Cherkasy, Poltava, Sumy, Kirovohrad, Mykolaiv, Odessa, Kharkiv, Dnipropetrovsk, Zaporizhia, Donetsk, Luhansk and Kherson. It is also allowed to place generation facilities within the regions that are not considered priority: Ternopil, Chernivtsi, Vinnytsia, Zhytomyr, Ivano-Frankivsk, Lviv and Zakarpattia.

Among main conditions competition defined such as:

- incentive for participants competition – installation pay for the service from ensuring the development of generating capacity, the maximum purchase price of which is 854,977.5 euros/MW, the minimum payment term is 10 years;
- maximum very term introduction in operation object – 31 December 2027 year;
- minimal installed power object – 5 MW, maximum – 80 MW;
- The minimum guaranteed (design) period of operation of the generating unit equipment is at least 20 years (or 100 thousand hours in generation mode).

Based on the results of the first competition in 2025, the winners of the competition received support on construction of a new flexible generation totaling 316.4 MW, which is 45.2% of the planned volume.

In the future, Ukraine plans to update the terms of the competition and introduce a market-oriented form of support for the winners of the competition, in particular through the market premium mechanism. In 2026, it is planned to announce a new competition for the construction of generating capacity of about 1.3 GW, in accordance with the updated procedure for its conduct.

In accordance with the Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Implementation of European Law on the Integration of Energy Markets, Improving Security of Supply and Competitiveness in the Energy Sector" No. 4834-IX of 07.04.2026 Article 29 of the Law Ukraine "On the electricity market" will cease to be valid from May 1, 2028. At the same time, the obligations

that arose on its basis before this date remain valid until their full and proper fulfillment. In the future, capacity provision mechanisms may be introduced in Ukraine, which will be temporary in nature (for a period of no more than 10 years) and must comply with European legislation.

PM_IME_WEM_08 Special auctions for long-term procurement of ancillary services

Objective **:** Creating sufficient reserves for primary and secondary frequency control in the power system by stimulating the construction of new highly maneuverable generating capacities

Legal basis **:** Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine No. 307 dated March 14, 2018 "On Approval of the Market Rules"

Timeline **:** since 2024

Type politicians / Event: Economic

Sector(s) affected: Energy - supply

Emission reduction type: CO_2

Responsible bodies/organizations **:** NEURC, TSO (by consent)

Description **:** In order to stimulate the construction of new highly maneuverable generating capacities necessary to improve resource adequacy, energy system stability, and integrate larger volumes of renewable energy, a new mechanism for the long-term purchase of ancillary services (AS) by the transmission system operator (TSO) at special auctions has been introduced. At such auctions, the TSO purchases ASs for the provision of frequency control and active power reserves, namely frequency containment reserve (FCR) and automatic frequency restoration reserve (aFRR), the term of which exceeds one year, but not more than five years. Taking into account the increased risks and peculiarities of activities during martial law, the special auction mechanism provides for the possibility of postponing the start of the provision of such ASs for up to three years (inclusive).

To participate in a special auction, an existing or potential supplier of AS, planning to build a new generation facility, concludes an agreement with the TSO on the provision of AS in the future and provides a guarantee deposit. The FCR and aFRR offered at the special auction must provide for the provision of AS continuously for at least two weeks.

The minimum reserve volumes required to maintain the operational security of the system are determined in accordance with the Transmission System Code (Resolution of the National Commission for the Regulation of the National Energy and Power Sector No. 309 of 14.03.2018), as well as the forecast need for auxiliary services to ensure frequency and active power regulation in the Integrated Power System of Ukraine. Taking into account the ENTSO-E requirements for capacity reserves, the Ukrainian TSO purchases the following volumes of DP at auctions:

- 99 MW - symmetrical FCR;
- 1000 MW - aFRR, in particular, 579 MW - upward reserve; 421 MW - symmetrical reserve, i.e. the ability of electrical installations to unload and load, depending on the needs of the Ukrainian power system.

The winners of the auction must confirm the financial security for the fulfillment of the terms of the contract for the provision of the power plant in the future. The amount of the financial security is 30,000 euros multiplied by the maximum capacity value, which according to the results of a special The auction price must be provided by a potential unit of AS provision. The price of AS provision determined by the auction results is converted into euros at the official exchange rate of the National Bank of Ukraine (NBU), average by month, in to whom was held such auction, with subsequent conversion into hryvnia at the official exchange rate of the NBU against the euro, the average for the month in which the relevant AS was provided, which provides investors with better predictability and stability of cash flows.

NPC Ukrenergo held special auctions for the supply periods 01.10.2025 - 30.09.2030, 01.01.2026 - 31.12.2030 and 01.12.2026 - 30.11.2031. According to their results, the need for FCR was satisfied by 100%, in aFRR in the symmetrical range - by 86.65%, in aFRR for loading - by 48.93%.

PM_IME_WAM_02 De-risking mechanism for participants of special auctions for the long-term procurement of ancillary services

Objective **:** Stimulating the creation of flexible electricity generation and storage capacities to support the stability of the power system and the integration of renewable energy by reducing risks for participants in long-term special auctions for the purchase of ancillary services

Legal basis **:** Resolution of the National Commission for the Energy and Utilities of Ukraine No. 307 dated March 14, 2018 “On Approval of the Market Rules”

Timeline **:** since 2026

Type of policy / measure: Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations **:** NEURC, Ministry of Energy, TSO (by consent)

Description **:** Based on the Memorandum of Understanding concluded in 2025 between the Energy Community Secretariat and NPC Ukrenergo, a mechanism is being developed to reduce risks for participants in long-term special auctions for the purchase of ancillary services. The objectives of the mechanism are:

- support for the implementation of projects that won special auctions of Ukrenergo for the provision of auxiliary services;
- decrease specific project risks, including damage infrastructure due to hostilities;
- financial support or release capital for investors, which participate in special auctions.

It is planned that the mechanism for reducing investment risks will be applied within the framework of the activities of the Ukraine’s Energy Support Fund, which is administered by the Energy Community Secretariat. The financing of the mechanism is expected to be at the expense of donors. The principles of building and applying the mechanism will be detailed and agreed upon in the framework of consultations with potential donors.

PM_IME_WEM_09 Simplification of permission procedures for distributed generation

Purpose **:** Assistance development of distributed generation by reduction regulatory burden on investors

Legal basis **:** decree Cabinet Ministers Ukraine from 7 December 2023 No. 1320 “Some question construction and/or restoration, and/or reconstruction, and/or placing, and/or major repairs of gas piston and gas turbine installations, in particular cogeneration, block-modular boiler houses, diesel/gasoline and gas generators, gas storage facilities, oil and gas extraction, some facilities of the gas transportation system and power transmission lines of the transmission system, for the period of martial law” (Official Gazette of Ukraine, 2024 r., No. 8, Art. 376), decree Cabinet Ministers Ukraine from 13 December 2017 No. 1010 “On approval of criteria for determining planned activities that are not subject to environmental impact assessment, and criteria for determining expansions and changes to activities and facilities, which are not subject to environmental impact assessment” (Official Gazette of Ukraine, 2018, No. 3, p. 115), Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine dated March 26, 2022 No. 352 “On the features of temporary connection of electrical installations to the distribution system during the period of martial law in Ukraine”, Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine dated March 29, 2022 No. 355 “On the features of providing services for connection to gas distribution systems systems under time actions military "state", decree NEURC from 04.10.2023 No. 1823 "About approval In order accession to thermal networks”, resolution NEURC dated 01.11.2023 No. 2053 “On Amendments to the Licensing Conditions for Conducting Economic Activities in the Production of Thermal Energy”, resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine dated 25.04.2023 No. 725 “On Amendments to the Licensing Conditions for the Production of Electricity”, resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine dated 15.07.2025 No. 1056 “On approval of Methodological recommendations on the functioning of the connection monitoring system and the Schedule for the implementation of the connection monitoring system”

Timeline **:** since 2023

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

***Responsible bodies/organizations* :** NEURC, Ministry of Energy

***Description* :** Given the shortage of generating, including maneuverable, capacities in the power system, Ukraine is implementing a policy of simplifying permitting procedures and processes to accelerate the development of distributed generation and other generation facilities using RES. To this end, during 2023-2025, the Cabinet of Ministers of Ukraine, the Regulator and the Verkhovna Rada of Ukraine adopted a number of legislative changes relating to the processes of design, land acquisition, environmental impact assessment (EIA), construction, licensing, connection to networks, etc. In particular, the construction and commissioning of the new DG will be facilitated by the following measures:

- for the period of war state simplification of the conditions for the construction and/or placement of gas piston and gas turbine plants, in particular cogeneration, block-modular boiler houses, diesel/gasoline and gas generators, energy storage facilities, power transmission lines of the transmission system, as well as related electricity, heat, gas, water supply networks, metering units, other related equipment necessary to provide critical infrastructure facilities (heat supply, water supply, sewage), social institutions (educational institutions, healthcare institutions), consumers with heat and/or electricity (in accordance with the Resolution of the Cabinet of Ministers of Ukraine dated December 7, 2023 No. 1320 (Official Gazette of Ukraine, 2024, No. 8, p. 376)). Accordingly, the construction and/or placement of such objects is carried out without: relevant urban planning documentation; obtaining urban planning conditions and restrictions on the development of the land plot; obtaining a report on the results of the examination of project documentation for the construction of facilities; obtaining the right to perform construction work; using the Unified State Electronic System in the field of construction; heat supply schemes for settlements; allotment of land plots for an energy facility; allotment and approval of land plots for power transmission lines, gas supply and water supply in case of connection to networks. Construction work can be carried out simultaneously with the development of project documentation. Start of operation of gas piston and gas turbine installations, in particular cogeneration, etc. is carried out without a certificate of acceptance into operation of the completed construction facility, issued in accordance with to legislation in the field of urban planning activities, by conditions carrying out complex tests electrical installations in the volumes provided for by industry regulatory documents and on the basis of the certificate of readiness of the facility for operation;
- determination of the construction and/or placement during martial law of gas piston and gas turbine installations, in particular cogeneration, as well as related electricity, heat, gas, water supply networks, metering units, and other related equipment, planned activity, which not subject to assessment influence on environment in accordance to criteria for determining planned activities that are not subject to environmental impact assessment, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 13, 2017 No. 1010 (Official Gazette of Ukraine, 2018, No. 3, p. 115);
- simplification procedures accession:

  electrical installations to the distribution system in accordance with the resolution of the National Commission for State Regulation in the Fields of Energy and Utilities No. 352 of March 26, 2022. A business entity (in particular a consumer) that intends to connect generating installations and carry out electricity generation activities has the right to apply to the DSO with an application for temporary connection by May 1, 2026. It is envisaged to reduce the terms of issuance and approval of technical conditions (with 10 to 2 days); reduction in the number of documents for obtaining connection services (from 7 to 2 documents: a certificate from the military administration on the need for urgent connection of such electrical installations and graphic materials in any form indicating the location of the electrical installations); ensuring minimum technical requirements for parallel operation of generating installations with the power system; priority use of the existing energy infrastructure;

  to gas distribution systems in accordance with the resolution of the National Commission for State Regulation in the Fields of Energy and Utilities No. 355 of March 29, 2022. It is envisaged to reduce the terms for providing connection services to gas distribution systems (from 3 to 1 month); reduce the number of documents for obtaining connection services; allow the use of customer materials;

  to heating networks in accordance with the resolution of the NEURC No. 1823 of October 4,

2023. It is envisaged to reduce the period for considering an application for connection (from 10 to 1 day); reduce the period for submitting a draft connection agreement (from 10 to 1 day); reduce the number of documents for obtaining a connection service; the fee for connecting to heating networks is not charged provided that the relevant local government body makes a decision to allocate funds from the local budget to compensate for the relevant costs; allow the use of customer materials.

Regulator (NEURC) amended Licensed conditions proceedings economic activities for thermal energy production (from November 2, 2023) in order to simplify the conditions for the operation of cogeneration plants installations total power to 5 MW, which are used as backup energy sources for critical infrastructure facilities and will not require licensing. This rule is temporary and is valid during the period of martial law in Ukraine and for six months after its end or cancellation. The goal is to reduce the regulatory burden on developers of cogeneration plants for powering heat supply, water supply, sewage systems, social institutions (education, healthcare (except sanatoriums and resorts)) during emergency power outages.

The regulator amended Licensing Conditions for Electricity Generation (from April 25) 2023), according to which the production of electricity by mobile (autonomous) power plants (self-propelled or non-self-propelled, which can be moved by road, rail, sea or inland waterway transport without their depreciation and change of purpose) will not require obtaining a license for electricity production. This norm is temporary and is valid during the period of martial law in Ukraine and for six months after its end or cancellation.

In order to increase the efficiency of connection to electricity networks, the Regulator has been In 2025, a monitoring system for connection to electricity networks was introduced (Resolution of the National Commission for the Regulation of Energy and Utilities of Ukraine dated 15.07.2025 No. 1056 “On approval of Methodological recommendations on the functioning of the connection monitoring system and the Schedule for the implementation of the connection monitoring system”). The monitoring system allows for automatic collection, control and generalization of information on how system operators provide connection services; timely detection, response and prevention of possible violations; control compliance with deadlines; and make it impossible to manipulate reporting data. The adopted changes are aimed at improving consumer service by implementation of automated systems for monitoring connection services; strengthening control over compliance with TSO and DSO requirements; simplification of reporting procedures; ensuring real-time exchange of information on the status of service provision.

PM_IME_WEM_10 Reservation of electricity network connection capacity for generation facilities

Goal: Promoting the development of wind generation by improving the conditions for connecting power plants with a capacity of 20 MW and more to the electricity transmission system networks

Legal basis: Law of Ukraine “On Amendments to Certain Laws of Ukraine in the Spheres of Energy and Heat Supply Regarding the Improvement of Certain Provisions Related to the Conduct of Economic Activities and the Effect of Martial Law in Ukraine”.

Time frame: since 2025

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: NEURC, TSO (by consent)

Description: The capacity reservation service is provided by the transmission system operator to the capacity reservation customer for the reservation of technical solutions for the connection scheme of wind power generation installations with an installed capacity of 20 MW and more under the capacity reservation mechanism for such customer for a period of no more than two years. During this period, the developer has the opportunity to conduct the necessary wind and environmental studies, as well as take actions to obtain land rights that are necessary to make a decision on the implementation of the project and conclusion of the main contract on the provision of services for connecting the power plant to electrical networks.

The capacity reservation fee is EUR 5,000 per 1 MW of capacity booked. If, within two years of the conclusion of the contract, the developer decides to implement the project and conclude a connection

services agreement, the capacity reservation fee will be included as part of the connection fee. Otherwise – the capacity reservation agreement is terminated, and funds from the escrow account of the capacity reservation customer are credited to the TSO account and used by it to implement measures provided for in the transmission system development plan.

It is expected that the introduction of a capacity reservation mechanism will reduce the investment risks of wind generation project developers and costs at the initial stage of project implementation (before the final investment decision is made).

PM_IME_WEM_11 Prioritization of RES facilities in dispatching

Goal **:** Ensuring conditions for increasing the volume of electricity production from renewable sources when dispatching power facilities in the power system

Legal basis **:** Law Ukraine "On the Electricity Market", Code systems transmission

Timeline **:** since 2018

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Emission reduction type: CO_2

Responsible bodies/organizations: NEURC, TSO (by consent)

Description **:** According to with Code systems transmission, at facility dispatching RES, are provided the following priorities:

- inclusion to dispatcher graphics load on next day all declared generating capacities;
- priority load generating capacities at implementation dispatcher load schedule;
- postponement, by conditions software operating room security networks, unloading or disconnection of generating capacities.

At the same time, priorities are not given to RES facilities in the event of violations of the network's operational security, the occurrence of emergency or emergency situations, if the measures necessary to normalize the operation of the Integrated Power System of Ukraine involve partial loading, unloading, or shutdown of these power plants.

Also, when dispatching generating capacities, the TSO applies non-discriminatory, competitive and transparent market mechanisms when planning and implementing schedules. load of generating capacities and BESS.

New mechanisms to support the development of renewable energy ("green" auctions and The "market premium" mechanism, corporate purchase and sale agreements for electricity from renewable sources (cPPAs) provide for the participation of electricity producers from renewable sources in the balancing market on a general market basis.

As part of the implementation of the Electricity Integration Package, it is envisaged to re-dispatch generation, energy storage and demand response on objective, transparent and non-discriminatory terms, using market mechanisms. When dispatching generating installations, TSOs and DSOs, subject to operational security, give priority, in particular, to generating installations that produce electricity from renewable energy and have an installed electrical capacity of up to 200 kW.

PM_IME_WEM_12 Compensation for curtailment of RES producers (under the "green" tariff) in re-dispatching

Goal **:** Creation of favorable economic conditions for the operation of renewable energy generation facilities under restrictions imposed by the transmission system operator on their electricity supply

Legal basis **:** Law Ukraine "On electricity market", Code systems transmission

Timeline **:** 2018 – 2029 years

Type of policy / measure: Economic.

Sector(s) affected: Energy - supply

Responsible authorities/organizations **:** NEURC, TSO (upon consent), guaranteed buyer (upon consent)

Description **:** According to the Transmission System Code, in the case of applying curtailments on electricity production by facilities using alternative energy sources in order to ensure operating security networks and security electricity supply TSO has to provide the regulator with information of such curtailments, indicating the reasons and measures it plans to take to prevent these curtailments. Also, the application of curtailments for RES electricity producers operating under the “green” tariff mechanism shall be compensated to these producers by the TSO in the form of the purchase of a load reduction service by the producer selling electricity at the “green” tariff, at the expense of the costs included in the tariff for electricity transmission services. The cost of a load reduction service by the producer selling electricity at the “green” tariff, provided as a result of the TSO’s command, shall be equal to the cost of electricity not released by such producer at the “green” tariff.

In accordance with the requirements of the Law of Ukraine “On the Electricity Market”, the National Commission for the Regulation of the Energy and Utilities of Ukraine on as a result of executing load reduction commands (received through the load limit management system of the service providers' release units from load reduction of RES with support) at a “green” tariff. The mechanism for compensating for the volume of unsold electricity resulting from the execution of operational security commands is not defined by current legislation.

At the same time, compensation to producers operating under the "green" tariff mechanism will be provided until 2029 inclusive (as long as the "green" tariff mechanism is in effect). Starting from 2030, financial compensation for reduced electricity production RES producers, which occurs as a result of TSOs issuing unloading commands, will experience on non-discriminatory basis, by the rules market and on prices on unloading, taking place in the balancing market.

New mechanisms to support the development of renewable energy ("green" auctions and The "market premium" mechanism, corporate purchase and sale agreements for electricity from renewable sources (cPPAs) provide for the participation of electricity producers from renewable sources in the balancing market on a general market basis.

PM_IME_WAM_03 Implementation of real-time pricing

Purpose **:** Software correct price signals for participants market on basis real supply and demand ratio

Legal basis **:** Law Ukraine "On the Electricity Market” (Art. 19)

Timeline **:** 2026-2028 years

Type of policy / measure: Economic

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations **:** NEURC, Ministry of Energy, TSO (by consent)

Description **:** The policy provides for the creation of prerequisites for a more flexible and objective reflection through prices of the dynamics of the ratio of demand and supply in organized segments of the electricity market, as well as for the purpose of deepening its integration with the electricity markets of EU countries (market coupling).

Reduction of settlement periods. On the organized segments of the spot electricity market of Ukraine (DAM, IDM) and the balancing market, marginal pricing is applied on a competitive basis. Prices on all three market segments are the result of interaction demand and offers in every specific settlement period and are determined on an hourly basis (60 min.). For a more detailed display of dynamics of supply and demand in the market, harmonization of pricing and integration with the electricity markets of the EU countries, it is planned to use a larger number of settlement periods on the DAM, IDM and the balancing market by reducing their duration to 15 minutes. In particular, after the transposition of the Electricity Integration Package norms, the NEURC, together with the transmission system operator, must assess the duration of the implementation of the 15-minute period of imbalance calculation in the electricity market within six months and approve its results. Within six months from the date of approval of the assessment results, the NEURC must make a decision on the date of transition to the 15-minute period of imbalance calculation and develop a plan for the implementation of real-time prices on the market segments: DAM, IDM and the balancing market.

Introduction negative prices. The full implementation of real-time prices will allow for the possibility of negative electricity prices on the DAM, the IDM and the balancing market, depending on the dynamics and supply-demand balance in each individual settlement period. This will provide objective signals to market participants regarding rational market behavior and economic actions, in particular

regarding stimulating electricity consumption, investing in flexible generation and storage capacities, demand management and improving forecasting. The implementation of this policy will be carried out taking into account the related policy PM_IME_WEM_13 Harmonization of price limits in wholesale market segments.

PM_IME_WEM_13 Harmonization of price limits in wholesale market segments

Objective **:** Application of price caps on wholesale segments of the Ukrainian electricity market harmonized with European markets, allowing free market pricing

Legal basis **:** Law of Ukraine "On the Electricity Market", Resolution of the National Commission for the Regulation of the National Energy Regulatory Commission of Ukraine No. 1221 dated September 27, 2022 "On Approval of the Methodology for Determining Significant Price Fluctuations and Establishing Limit Prices on the Day-Ahead Market, Intraday Market and Balancing Market"

Timeline **:** 2024 – 2028 years

Type of policy / measure: Regulatory / Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations **:** NEURC, AMCU.

Description **:** The Regulator shall establish or revise the price caps on the electricity market in accordance with the Methodology for determining significant price fluctuations and establishing price caps on the day-ahead market, intraday market and balancing market. When revising the price caps, the Regulator shall take into account, in particular: information on consumer price indices and producer prices; the price of electricity that has developed on the market; received proposals on the price cap level. The price cap level shall have the least impact on the formation of the free (market-based) price. The decision to establish or revise the price caps is made by the Regulator in a transparent manner, taking into account the positions of stakeholders and consultations with the Antimonopoly Committee of Ukraine.

As part of the transposition of the Electricity Integration Package (PM_IME_WEM_01 Transposition of Electricity Integration Package) and the integration (coupling) of the electricity markets of Ukraine and the EU countries, price regulation will be harmonized with the pan-European approach, which will be implemented in the form of establishing technical price restrictions on the DAM, IDM and the balancing electricity market of Ukraine. Such reform will ensure market pricing, What will give correct price signals existing and potential market participants to make investments and optimize market behavior. Such harmonization is one of the key prerequisites for deepening the integration (connection) of relevant segments of the Ukrainian electricity market with European markets, as well as attracting investments in new flexible generating capacities and other energy technologies.

In accordance with the Law of Ukraine "On Amendments to Certain Laws of Ukraine on the Implementation of European Law on the Integration of Energy Markets, Improving Security of Supply and Competitiveness in the Energy Sector" No. 4834-IX dated 07.04.2026, the maximum prices on the electricity market should be abolished from May 1, 2027. At the same time, before the start of the operation of the single day-ahead market coupling, during the emergency regime in the Integrated Power System of Ukraine, introduced in accordance with the Transmission System Code, the Regulator has the right to establish, for the duration of the emergency regime in the Integrated Power System of Ukraine, but not longer than 90 days, maximum prices on the day-ahead market, the intraday market and the balancing market for each trading zone with appropriate justification. When establishing maximum prices, prices on adjacent European spot markets are taken into account. The level of cap prices should have the least impact on the formation of market prices and should not limit the possibility of unhindered commercial import and export of electricity.

PM_IME_WAM_04 Integration of spot markets (market coupling)

Goal **:** Ensuring integrated operation of the day-ahead and intraday markets of Ukraine with the relevant segments of the electricity markets of EU countries

Legal basis **:** Plan of Ukraine, approved by order of the Cabinet of Ministers of Ukraine dated March 18, 2024 No. 244-r (Official Gazette of Ukraine, 2024 p., No. 32, p. 2035), implementation of the Electricity Integration Package norms

Timeline **:** 2024-2029 years

Type of policy / measure: Regulatory / Economic

Sector(s) affected: Energy - supply, Energy – consumption

Responsible bodies/organizations **:** Ministry of Energy, NEURC, TSO (by consent)

Description **:** To increase transparency, competitiveness, and liquidity of the Ukrainian electricity market, ensure more effective distribution of available capacity at interconnectors, and improve operational security, a connection should be implemented connection of organized segments of the Ukrainian electricity market (DAM and IDM) with the corresponding markets of European countries (market coupling).

To implement the policy of unifying the DAM and the IDM, a reform should be carried out, which provides for the following steps: implementation of the electricity market integration package; determination of the nominated electricity market operator (NEMO); implementation of the Law of Ukraine No. 3141-IX of June 10, 2023 "On Amendments to Certain Laws of Ukraine on Preventing Abuse in Wholesale Energy Markets" (REMIT), which will allow the Regulator to carry out full market supervision.

After the transposition of the Electricity Integration Package (PM_IME_WEM_01 Transposition of Electricity Integration Package) at the legislative level by adopting the Law of Ukraine “On Amendments to Certain Laws of Ukraine on the Implementation of European Law on the Integration of Energy Markets, Improving Security of Supply and Competitiveness in the Energy Sector" No. 4834-IX dated 07.04.2026. The National Commission for the Regulation of Energy and the Energy Sector will develop a comprehensive action plan that provides for the updating of the current regulatory framework and the development of new acts of secondary legislation in accordance with the requirements of European law necessary for the implementation of the specified Law. The action plan will provide for amendments to key documents, in particular, the Market Rules; Day-Ahead Market and Intraday Market Rules; Rules retail market electric energy; Transmission System Code; Distribution Systems Code; Commercial Electricity Metering Code; Licensing conditions for conducting activities in the electricity sector; procedures for forming tariffs for the transmission and distribution of electricity. The NEURC will also ensure the implementation of pan-European and regional rules, methods and procedures.

Ukraine will introduce a competitive model for the functioning of nominated market operators (NEMO); the legislative basis and principles of NEMO activities will be ensured in accordance with the EU acquis. The National Commission for the Regulation of Energy and Power Generation within four months from the date of entry into force of the Law of Ukraine “On Amendments to Certain Laws of Ukraine on the Implementation of European Law on the Integration of Energy Markets, Improving Security of Supply and Competitiveness in the Energy Sector” will approve the Procedure for the Appointment of a Nominated Market Operator, Suspension of Its Activities, Termination of Execution functions of the nominated market operator, and the appointment of the nominated electricity market operator(s) is ensured .

To ensure the connection of the spot electricity markets of Ukraine and the EU countries, it is envisaged to adopt legislation on changing the regimes of foreign economic activity by participants market electricity, after transpositions Electricity Integration Package.

The purchase and sale of electricity during the single day-ahead market coupling and during the single intraday market coupling is carried out according to the trading rules of the relevant nominated market operator, which must be published on its website and comply with European and regional rules, as well as regulatory legal acts regulating the functioning of the electricity market.

For software combination spot markets Ukraine and countries EU has be also pricing reform was carried out based on policies PM_IME_WAM_03 Implementation of real-time pricing and PM_IME_WEM_13 Harmonization of price limits in wholesale market segments.

Ukraine in cooperation with ENTSO-E, transmission system operators of neighboring EU countries and Moldova and in accordance with the provisions of the EU acquis, in particular Regulation (EU) 2019/943, will take measures to more effectively use existing interconnectors and ensure the minimum necessary level of interconnector capacity available to market participants for cross-border electricity trade (at a level of not less than 70%, depending on the approach to determining the interconnector capacity values and taking into account the restrictions on the permitted capacity of Ukraine's interconnectors for the import and export of electricity, determined taking into account the operational

security of the power systems).

PM_IME_WAM_05 Integration of the balancing market

Goal **:** Ensuring integrated operation of the balancing electricity market of Ukraine with the corresponding segment of the markets of EU countries

Legal basis **:** Plan of Ukraine, approved by order of the Cabinet of Ministers of Ukraine from 18 March 2024 year no. 244-r (Official herald Ukraine, 2024 p., No. 32, Art. 2035), Electricity Integration Package

Timeline **:** 2024-2028 years

Type of policy / measure: Regulatory / Economic

Sector(s) affected: Energy - supply, Energy – consumption

Responsible bodies/organizations **:** NEURC, Ministry of Energy, TSO (by consent)

Description**:** To ensure regional TSO interaction and further unification balancing market of Ukraine with European balancing platforms for their integrated operation and exchange of balancing electrical energy and power in mode real time is expected legislative definition such European concepts such as the system operation region (SOR) and capacity calculation region (CCR), contractual relations of TSO in within SOR and CCR, involvement of TSOs in the activities of the Regional Coordination Center (RCC), the role of the RCC in the electricity market and the tasks of the RCC, a list of pan-European, regional and national detailed rules and procedures (TCM) that are mandatory for application in the market electric energy, as well as ACER's powers to market electrical energy.

After the adoption of the Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Implementation of European Law on the Integration of Energy Markets, Improving Security of Supply and Competitiveness in the Energy Sector" No. 4834-IX dated 07.04.2026, legislation will be adopted and enter into force within the framework of the Electricity Integration Package, which will harmonize Ukrainian legislation with the Clean Energy Package, which was included in the Energy Community acquis in December 2022.

During 2025-2026, the TSO of Ukraine must ensure compliance with the requirements necessary to obtain observer member status in European balancing platforms, which will subsequently allow it to obtain full membership in the relevant platforms.

Within the framework of the policy PM_IME_WEM_01 Transposition of Electricity Integration Package, the EBGL Regulation will be transposed. In accordance with the requirements of the EBGL Regulation, the Ukrainian TSO must ensure connection to European balancing platforms for implementation of interstate exchange of balancing electrical energy:

- Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation (PICASSO);
- platforms for exchanging manual frequency restoration reserves (mFRR) – Manually Activated Reserves Initiative (MARI);
- Platform for the imbalance netting process (IN-Platform).

PM_IME_WAM_06 Pilot microgrid projects and management systems, establishing organized energy islands

Goal: ensuring the effective implementation and functioning of microgrids as single managed facilities capable of operating in parallel with the Integrated Power System of Ukraine or in island (isolated) mode to ensure electricity supply to consumers and critical infrastructure facilities

Legal basis: Law of Ukraine "On the Electricity Market", Distribution System Code, approved by the Resolution of the National Commission for the Regulation of the National Energy and Power Sector of Ukraine No. 310 dated March 14, 2018, Order of the Cabinet of Ministers of Ukraine No. 713-r dated July 18, 2024 "On Approval of the Strategy for the Development of Distributed Generation for the Period Until 2035 and Approval of the Operational Plan of Measures for Its Implementation in 2024-2026" (Official Gazette of Ukraine. 2024, No. 73, p. 4366), Order of the Cabinet of Ministers of Ukraine No. 908-r dated October 14, 2022 "On Approval of the Concept for the Implementation of "Smart Grids" in Ukraine by 2035" (Official Gazette of Ukraine, 2022, No. 84, p. 5201)

Time frame: since 2026

Type of policy / measure: Research, Regulatory, Economic

Sector(s) affected: Energy – supply, Energy - consumption

Responsible authorities/organizations: Ministry of Energy, National Commission for Energy and Utilities of Ukraine, DSO (upon consent), TSO (upon consent), Municipalities (upon consent), NAS of Ukraine (upon consent)

Description: One of the priority areas for the development of Ukraine's electric power industry is the introduction of distributed generation technologies and microgrids based on smart grids. Development strategy distributed generations and Plan events with implementation Concepts implementation smart grids by 2035 provide for the creation of modern infrastructure, in particular, capable of ensuring sustainable electricity supply even in the absence of centralized power sources.

By the end of 2025, only about 20% of BESS met the requirements for autonomous start-up capability, islanding capability, and rapid resynchronization capability in accordance with the requirements of the Transmission System Code, approved by the resolution of the NEURC dated March 14, 2018 No. 309. To ensure the possibility of autonomous operation of BESS and power supply to consumers, in particular critical infrastructure facilities and ensuring the vital activity of the population, it is advisable to implement pilot projects to create microgrids that can operate in an isolated (autonomous) mode and in parallel with the Integrated Power System of Ukraine, in particular, based on municipal CHP, RES, BESS.

At the same time, a power system with distributed energy resources and renewables is more complex for management and requires new approaches to planning and dispatching. The development of microgrids with intelligent energy management systems allows optimizing the operation of RES, BESS, CHP and charging stations for electric vehicles, ensuring reliable power supply to critical consumers. Government plans to increase the number of charging stations and the share of RES in the transport sector by 2030 also require modern solutions in the field of microgrid management. This justifies the need for development of control, monitoring and energy management systems for microgrids, primarily for non-domestic consumers of electricity, in particular, active consumers, ensuring their economic efficiency under normal power supply conditions and maintaining readiness for isolated operation. Organizations implementing international technical assistance projects (programs) may be involved in the implementation of such pilot projects.

It is important to ensure sources of available funding for the implementation of scientific and practical work and the implementation of pilot projects to create control, monitoring and energy management technologies for microgrids. It is necessary to work out sources of funding for the implementation of relevant work and the purchase of additional equipment, etc., in particular, from the side of the DSO, the possibility of including relevant costs in the DSO investment programs in accordance with the Distribution Systems Code (clause 4.1.42. of the Code).

PM_IME_WAM_07 Implementation of European and international standards for smart grid development

Goal: unification of the regulatory framework and ensuring its compliance with international and European standards in the field of smart grids development, which will facilitate the implementation of modern technologies for information exchange, substation automation, and cybersecurity in the energy sector

Legal basis: order Cabinet Ministers Ukraine from 14 October 2022 No. 908 “On approval of the Concept for the implementation of “smart grids” in Ukraine by 2035” (Official herald Ukraine 2022, No. 84, Art. 5201); order Ministry of Energy from 05 July 2024 No. 244 "On approval of the Action Plan for the implementation of modern European and international standards in the field of development of smart grids until 2035"

Time frame: 2026-2035 years

Type policy/measure: Regulatory

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations: Ministry of Energy, NEURC, TSO (upon consent), TSO (upon consent), State Enterprise "UkrNDNC" (upon consent), National Electrotechnical Committee of Ukraine (upon consent), IED of the NAS of Ukraine (upon consent)

Description: The development of smart grids in Ukraine is key to the modernization of the energy sector, the integration of renewable energy and distributed energy resources into the energy system and the electricity market. As part of the implementation of the policy, there should be a unified

regulatory framework that corresponds to international and European standards, which will contribute to the implementation of modern technologies of information exchange, substation automation and cybersecurity in the energy sector. In particular, it is planned to update the terminology, harmonize IEC, ISO and other standards, as well as ensure coordinated work in this area. This will contribute to minimizing barriers and creating prerequisite for increase energy efficiency, involvement investment and implementation of the Concept for the Development of Smart Grids, approved by the Resolution of the Cabinet of Ministers of Ukraine dated October 14, 2022 No. 908-r and the Strategy for the Development of Distributed Generation for the Period Until 2035, approved by the Resolution of the Cabinet of Ministers of Ukraine dated July 18, 2024 No. 713-r.

In Ukraine, processes have been initiated to identify and adopt priority international and European standards within the framework of the Action Plan for the Implementation of Modern European and International Standards in the Field of Smart Grid Development by 2035, approved by Order of the Ministry of Energy of Ukraine No. 244 of July 5, 2024. The first step was the adoption in 2024 of the international standard IEC 63097 as a national standard, which is the basic document for determining further standardization measures in the field of smart grids, as well as the adoption of in 2025 year standards multipartite international standard IEC TS 62898 "Microgrids". In the future, it is necessary to implement coordinated measures to adapt and adopt relevant standards, attract additional funding, and coordinate the work of stakeholders.

Natural gas

PM_IMG_WEM_02 Current measures to ensure the production of sufficient volumes of natural gas

Goal: ensuring natural gas production at the level of the ESU baseline scenario (21.5 billion m3 ⁄ year by 2030)

Legal basis: Tax Code of Ukraine, Law of Ukraine No. 2545-VI of September 18, 2018, "On Ensuring Transparency in the Extractive Industries," Law of Ukraine No. 2805-IX of December 1, 2022, "On Amendments to Certain Legislative Acts of Ukraine Regarding Support for the Development of Domestic Subsurface Resource Use Sectors," Safety Rules for the Oil and Gas Production Industry, approved by Order of the Ministry of Economy dated April 27, 2023, Law of Ukraine No. 4154-IX of December 18, 2024, "On Amendments to Certain Legislative Acts of Ukraine Regarding the Update of the National Program for the Development of Ukraine's Mineral Resource Base for the Period until 2030 and the Regulation of Certain Issues Concerning Minerals and Components of Strategic and Critical Importance," Resolution of the Cabinet of Ministers of Ukraine No. 481 of April 29, 2025, "On Amendments to Resolution of the Cabinet of Ministers of Ukraine No. 1320 of December 7, 2023" (Official Gazette of Ukraine, 2024, No. 8, p. 54, Art. 376).

Time frame: 2024-2030 years (constantly)

Type of policy / measure: Fiscal / Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, State Geological Survey of Ukraine, Ministry of Finance, Ministry of Economy

Description: In recent years, the following legislative measures have been taken to stimulate domestic natural gas production:

- introduction of the concept of a new well (drilling of which began after January 1, 2018), differentiation of the rent rate for new and old wells and depending on the levels of prices (from December 2024 - up to 400 USD/thousand m ^{3} and over 400 USD/thousand m ^{3}) with the state guaranteeing that the rates will remain unchanged until 2032 at the level of those established by paragraph 252.20 of Article 252 of the Tax Code of Ukraine as of March 1, 2022;
- the legal framework for regulating and organizing the collection, disclosure and dissemination of information in order to ensure transparency in the extractive industries in Ukraine has been defined, taking into account the requirements of the Extractive Industries Transparency Initiative;
- establishing at the level of the law the cases of granting special permits for the use of subsoil without an auction and on the basis of an auction, the grounds for amending them, extending their validity period, as well as the grounds for refusing to grant and amend special permits and amending agreements on the terms of subsoil use, which are an integral part of special

permits; the Resolution of the Cabinet of Ministers of Ukraine dated September 23, 2020 No. 993 (as amended) adopted the Procedure for conducting an auction (electronic bidding) for the sale of a special permit for the use of subsoil (Official Gazette of Ukraine, 2020, No. 88, Art. 13);

- the possibility of buying and selling subsoil use rights (special permits for subsoil use);
- the possibility of assessing mineral reserves according to international standards (in addition to the mandatory assessment according to national standards);
- digitalization of the subsoil use sector and creation of a Unified State Electronic Geoinformation System for Subsoil Use;
- organizational and technical safety requirements have been defined during the design, drilling, construction and operation, overhaul and exploration of oil, gas and other wells related to oil and gas production, industrial and inter-industrial oil and gas collection systems, preparation of oil and gas for transportation through main pipelines and to technological equipment of oil and gas industry facilities, which allows the use of "Air drilling" technology;
- The National Program for the Development of the Mineral and Raw Materials Base of Ukraine for the period until 2030 has been updated, including in the areas of oil and natural gas.

In addition, for the duration of the ban on natural gas exports, a deferral of royalty payments has been established for volumes of gas produced but not sold, as well as special rules for determining the actual sales price to which royalty rates are applied. Also, in April 2025, for the duration of martial law and to repair damage to gas storage facilities and compensate for losses in natural gas production resulting from the armed aggression of the aggressor state, the procedures for the construction, restoration, reconstruction, siting, and major repairs—in particular, oil and gas production facilities and/or pipeline transport facilities related to their maintenance, the connection of such facilities to the gas transmission system, geological studies of oil and gas reserves in the subsoil, and the conduct of exploration work by a gas production enterprise or an investor (operator) under a hydrocarbon production-sharing agreement, with the subsequent completion of the relevant procedures within 24 months after the completion of such construction or installation, but no later than six months after the termination or repeal of martial law. It should be noted that this exception also applies to the conduct of environmental impact assessments.

PM_IMG_WAM_06 Additional measure for ensuring the sufficient volumes of natural gas productions

Goal: ensure natural gas production above the ESU baseline scenario, taking into account the analysis of the benefits and advantages of subsidies to fossil fuel producers

Legal basis: ESU

Time frame: 2024-2030 years (constantly)

Type of policy / measure: Fiscal / Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, Ministry of Finance, Ministry of Economy, State Geological Survey of Ukraine, State Emergency Service

Description: For ensuring the volumes of natural gas production above ESU a number of additional measures is envisaged:

- Stimulating geological exploration and development activities in previously undeveloped deposits, including in offshore areas and unconventional deposits:

It should be noted that further increase in natural gas production beyond the baseline scenario is possible due to the development of new promising areas (Black Sea shelf, extraction in deoccupied territories) or the use of new extraction methods (unconventional deposits). At the same time exploration and development of new plots require significant investment at the start of operations.

The State Emergency Service, together with other bodies and organizations, is constantly involved in the demining of these territories.

Regarding unconventional deposits, on September 25, 2025, the Cabinet of Ministers adopted Resolution No. 600, which amended the Resolution of the Cabinet of Ministers of Ukraine dated December 12, 1994 No. 827 “On Approval of Lists of Mineral Resources of National and Local Importance” and included gas from rock-tight reservoirs as one of the types of unconventional deposits in the list. At the same time, in order to begin geological research and commercial production of such deposits, it is necessary to develop and approve methodological recommendations for the classification, resource assessment and calculation/approval of reserves of such gas. This should be done in 2026-2027.

At the same time, unconventional deposits, which are recorded in significant volumes on the territory of Ukraine, require the use of advanced and expensive extraction technologies. Wells for the extraction of unconventional deposits have a significantly shorter "life span" compared to traditional wells. To stimulate such activities, as well as exploration and development of subsoil within the continental shelf and/or exclusive (maritime) economic zone of Ukraine, stimulating rent rates may be considered.

In 2026, a new edition of the Classification of Mineral Reserves and Resources was approved and published. The new Classification requires the improvement of the Instructions for the Evaluation of Oil and Gas Fields, as the current instructions have not been updated for almost 30 years. These documents will improve the assessment of reserves, geological and economic assessment and state accounting of minerals, taking into account the level of their study and the readiness of explored deposits for industrial development. This, in turn, should increase the reliability and efficiency of reserve assessment and contribute to the development of the geological industry and the attraction of investments in the geological exploration and production sector of Ukraine. The approval of the Instructions is expected in 2026;

- increasing transparency and predictability of the procedure for concluding and implementing production sharing agreements:

During 2026, the draft Law of Ukraine No. 4344 “On Amendments to Certain Legislative Acts on Stimulating the Development of the Oil and Gas Extraction Industry” should be adopted. The activities of the interdepartmental commission should be properly formalized, and the society and investors should be informed about its current work and results;

- easing existing approaches to procurement procedures, in particular regarding the purchase of oilfield service equipment and services, regarding which the Ministry of Economy should take appropriate measures during 2026;

- stepping up the efforts of government agencies to improve the procedure for reallocating special permits that have already been issued but are not being used (“dormant”), as well as ensuring their effective use;

- additional tax measures:

Currently, the highest rate (70%) is applied to natural gas produced under joint activity agreements, despite the fact that this type of activity is not actually carried out. At the same time, under conditions of a more favorable tax regime, the implementation of joint activity agreements between JSC “Ukrgazvydobuvannya” and JSC “Ukrnafta” may allow increasing the volume of natural gas production in 2026 by 0.2 billion m3, in 2027 by 0.8 billion m3, and in 2028 by 1.2 billion m3. In this regard, during 2026-2028, the Ministry of Finance together with Ministry of Economy and representatives gas producing companies will consider a proposal to determine the rent rate for extracted natural gas under joint activity agreements, which will ensure the commercial attractiveness of this type of activity and new revenues to the State Budget.

At the same time, it should be noted that the National Revenue Strategy through 2030, approved by Cabinet of Ministers of Ukraine Order No. 1218-r of December 27, 2023 (Official Gazette of Ukraine, 2024, No. 11, p. 722) (hereinafter referred to as the NRS), provides for the development of legislative amendments in 2024 to limit the application of preferential taxation of subsoil use royalties for natural

gas extraction by restricting the period from the date a well is put into operation during which wells are considered new for the purposes of royalty taxation. The relevant amendments were not adopted in 2024, and similar legislative initiatives were rejected by Parliament.

In addition, the NRS provides for conducting, in the post-war period with the participation of relevant central executive authorities and with the assistance of international partners, an analysis and assessment of taxation in the extractive industries in accordance with the country's post-war reconstruction needs. According to the 2024 report on the implementation of the National Revenue Strategy through 2023, the revision of the tax regime for the extractive sector will be successful provided that favorable conditions are created for investment in the sector (both domestic and foreign), the introduction of advanced technologies for extraction and comprehensive processing of extracted raw materials; however, full implementation is impossible under the current martial law in Ukraine due to heightened security risks, economic instability, labor shortages, and other factors. That said, comprehensive reform of the extractive industry will be possible once martial law is lifted. Additionally, regarding the development of a taxation model for the transition from an environmental tax on CO2 emissions to a tax on the volume of fossil fuel production (imports), the report notes that the Ministry of Ecology and Natural Resources and KPMG Ukraine have signed a Memorandum of Cooperation in the field of climate and environmental finance, and expert-level discussions are currently underway regarding the optimal taxation model.

Given that gas production companies identify fiscal measures as the most effective way to maintain natural gas production volumes, under martial law (and after its conclusion or lifting), ensuring that incentive royalty rates for new gas wells remain unchanged through 2032 is and must remain the key element in sustaining gas production, and tax reform for the extractive industries in the post-war period must be based on transparency and predictability.

While certain policies and measures may entail only minor marginal costs (such as administrative measures), others will require significant investments to generate new production volumes. Given that the implementation of additional measures results in new production volumes only after a minimum of 3–5 years, new investments in natural gas production—particularly when state budget funds or public sector resources are involved—must be evaluated in terms of their potential for alternative use in more sustainable activities. Furthermore, even non-financial measures (such as granting land use rights) may, in certain cases, limit opportunities for the development of renewable energy sources. At the same time, it cannot be ruled out that the sale of natural gas and oil during a period of expected high prices (peaking in 2035–2037 and beyond) could be financially beneficial for the state, including for the purpose of subsequently investing these funds in decarbonization efforts.

In accordance with the recommendations of the European Commission (COM(2019) 285 final, June 18, 2019), NECPs must systematically identify and quantify all types of explicit and implicit subsidies for fossil fuels provided in the form of grants, support measures, tax measures, and subsidies arising from regulatory obligations, in accordance with the definition of energy subsidies in the EU and globally. Currently, Ukraine lacks a policy for monitoring, reducing, and/or phasing out fossil fuel subsidies. All various types of such subsidies must be properly systematized, described, and their application monitored, taking into account the objectives of the NECP. Throughout 2026, the Ministry of Economy, together with other relevant agencies, will develop a framework for classifying, monitoring, reducing, and phasing out government support for fossil fuels.

PM_IMG_WAM_07 Lifting the natural gas export ban

Goal: ensuring unhindered gas export opportunities from Ukraine to EU and the Energy Community

Legal basis: Art.41 of the Treaty establishing the Energy Community

Time frame: 2025-2030 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, Ministry of Finance

Description: In accordance with the Resolution of the Cabinet of Ministers of Ukraine dated December 31, 2024 No. 1795 "On Approval of Lists of Goods, Export and Import of which are Subject to Licensing, and Quotas for 2026" (Official Gazette of Ukraine, 2026 p., No. 7, p. 61) (as amended), a zero quota volume for UKT ZED 2711 11 00 00, 2711 21 00 00 "Natural Gas of Ukrainian Natural Gas Origin" was approved for 2026.

In general, unhindered exports of energy products (including natural gas) are guaranteed Art. 41(1) of

the Treaty Establishing the Energy Community. Part two of this article allows an exception to this rule, in particular for reasons of public security, provided that such exceptions may not constitute a means of arbitrary discrimination or a disguised restriction on trade between States. Furthermore, the lifting of the ban on natural gas exports is a precondition for exports to the EU envisaged by the ESU.

The main reason for the existing restrictions is public security, in particular security of natural gas supply. Since natural gas exports can have a positive effect on other aspects of energy markets, in the coming years, the Ministry of Energy, as part of its regular assessment of risks to the security of natural gas supply, will analyze the feasibility of this measure and alternative ways to ensure security of natural gas supply that would not harm natural gas exports to the EU and the Energy Community. This work will require taking into account the level of obligations regarding the security of natural gas supply that will be imposed on natural gas market entities at that time, and the availability of effective mechanisms to ensure their compliance (in particular, taking into account the unsatisfactory practice at the beginning of the full-scale invasion in February-April 2022).

PM_IMG_WEM_03 Development of a technical policy and an effective system of government (energy) oversight in the natural gas market

***Purpose*:** ensuring proper regulatory and legal regulation and supervision of established requirements for technical operation and technical condition of the gas system.

***Legal basis* :** Articles 8, 8-1, and Article 18, Part 3, of the Law of Ukraine "On the Natural Gas Market."

Time frame: 2024-2030 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: Ministry of Energy, State Energy Supervision Agency

Description: The Law of Ukraine "On the Natural Gas Market" defines the competence of the Ministry of Energy in part of technical policy formation, in particular:

- approval of technical and safety standards applicable to gas transportation and gas distribution systems, gas storage facilities, installation LNG, including safety regulations, minimum technical requirements for design and operation, requirements for technical inspections, and requirements for the professional qualifications and experience of individuals and legal entities performing construction, engineering, and maintenance work on gas transmission and distribution systems, gas storage facilities, and LNG facilities;
- regulatory framework regarding:

  1) the technical operation of natural gas supply systems;

  2) the technical operation of liquefied natural gas (LNG) supply systems;

  3) the technical operation of liquefied petroleum gas (LPG) supply systems;

  4) supervision (monitoring) to ensure the proper technical condition of gas infrastructure facilities (excluding gas production enterprises and gas storage facilities);

  5) organizing the preparation and conduct of training on the technical operation of gas supply systems at specialized training, training and simulation, and industry coordination centers;
- technical regulations, standards, and rules regarding requirements for components of natural gas metering systems, rules for the operation of metering devices, and procedures for measuring volumes and determining the quality of natural gas.

In July 2023, amendments were made to this Law of Ukraine, defining the term "state energy supervision (control)" and specifying the powers of the state authority (State Energy Supervision) regarding the implementation of the relevant policy. The corresponding amendments were made in early 2024 to the Regulations on Derzhenergonaglyad. Order No. 25 of Derzhenergonaglyad dated March 4, 2024, stipulated that, effective March 5, 2024, the agency would begin exercising its powers and functions to implement state policy in the field of supervision (control) in the natural gas market, specifically regarding the conduct of technical investigations into the circumstances and causes of accidents related to the use of gas in households, as well as the implementation of scheduled and unscheduled state supervision (control) measures in accordance with the procedure established by the Law of Ukraine "On the Basic Principles of State Supervision (Control) in the Sphere of Economic Activity." By Order No. 402 of the Ministry of Energy dated October 21, 2024, the Rules for the

Technical Operation of Gas Supply Systems were adopted. In 2024–2026, work is to be carried out to adopt secondary acts implementing the amendments, as well as to build the institutional capacity of Derzhenergonaglyad, with the subsequent expansion of the scope of technical supervision to the entire gas sector, given the risks these may pose to people, property, and the environment, specifically with the following objectives:

- A clear list of regulatory documents and technical regulations that regulate the technical operation and technical condition of gas infrastructure facilities, gas production facilities and consumer facilities;
- Formation of a risk-based approach to verifying compliance with established requirements, stimulating declaration and self-audit of business entities;
- Simple and effective procedures related to technical safety issues, including those involving the State Energy Supervision Agency;
- Analysis of incidents and addressing their root causes.

PM_IMG_WAM_08 Ensuring proper management of the quality of natural gas supplied to gas networks

Goal: balancing the interests of producers and operators of gas infrastructure facilities for economically viable gas production/extraction.

Legal basis **:** NES, ESU

Time frame: 2024-2027

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible authorities/organizations: Ministry of Energy, National Commission for the Regulation of Energy and Utilities of Ukraine, OGTS, OPSG, OGRM, gas producing companies.

Description: Natural gas and biomethane are supplied to the GTS from gas producing companies, which, by virtue of the GTS Code and technical agreements, are responsible for bringing the supplied gas into compliance with the gas quality requirements established in the GTS Code until the adoption of technical regulations on natural gas quality. The technological process of transporting natural gas through the main gas pipelines of the Gas Transmission System does not involve any processes related to the comprehensive treatment or modification of the quality parameters of the transported gas. Gas distribution system operators also do not alter the quality parameters of the gas. The UGS operator (JSC "Ukrtransgaz") has the necessary capacity and, when withdrawing natural gas from UGS facilities and feeding it into the gas transmission system, ensures that the natural gas meets the specified quality requirements. However, during natural gas storage, due to the natural geological characteristics of UGS facilities, the quality of natural gas deteriorates compared to its initial parameters (in particular, the water content increases). From a regulatory perspective, throughout the entire chain of transactions, parties that transfer gas to other parties are subject to penalties for the transferred gas failing to meet established requirements. Several issues arise in this process.

First, according to information from LLC "Gas Transmission System Operator of Ukraine," the natural gas supplied to Ukraine's gas transmission system by gas producers contains CO_2 in quantities that violate the gas quality requirements set forth in the Gas Transmission System Code. In addition, at a significant number of entry points into the GTS, natural gas is being supplied that does not meet other requirements of the GTS Code regarding the following parameters:

- moisture dew point temperature,
- hydrocarbon dew point temperature,
- higher heating value.

The main violations are recorded in terms of the moisture and hydrocarbon dew point temperatures of natural gas injected in summer. From 2021 to 2024, the share of natural gas fed into the GTS in violation of gas quality requirements rose from 25% to 42%, reaching 60% in 2023. The total share of such gas for the first 7 months of 2025 was 31%.

Feeding natural gas into the GTS with parameters that do not meet the requirements of the GTS Code leads to significant risks and negative consequences, primarily regarding the ability to transport natural gas to Ukrainian consumers, through interconnection points, and to underground gas storage facilities. Non-compliance with gas quality standards leads to the accumulation of liquid (condensate) in main gas pipelines, which creates conditions for pipeline corrosion, forms hydrate plugs, and

increases the risk of equipment failure at gas distribution stations and compressor stations.

The steady increase in the proportion of gas deliveries that do not meet established requirements indicates that the current regulatory framework is ineffective in achieving its objective, namely ensuring compliance with established natural gas quality requirements.

Second, according to information from LLC "Gas Transmission System Operator of Ukraine," the total amount of funds that the GTSO pays in fines for non-compliance with gas quality requirements exceeds the amount it receives from other natural gas market participants; however, as a transportation service provider, the GTSO cannot be held responsible for violations of gas quality requirements by other parties.

Third, the law does not provide for systematic compensation to consumers for non-compliance with natural gas quality requirements. This, in turn, means that the system of penalties needs to be adjusted. The issue of maintaining gas quality when it is fed into the GTS/gas distribution network also applies to biomethane producers. Some TSO and UGS operators (in Germany, Denmark, and France) in the EU have reported on problems that may arise when feeding increased volumes of biomethane into existing gas networks, as well as on additional measures that need to be taken. It has already been found that significant biomethane injection leads to increased levels of oxygen, hydrogen, terpenes, cellophanes, ammonia, and other substances, and operators must take additional measures to transport gas from the distribution system to the transmission system (using reverse-flow compressors) and to deodorize the gas flowing from the distribution system to the transmission system. At the same time, the Action Plan for Implementing Ukraine's Climate Policy as part of its participation in the "Global Methane Pledge"—a global initiative to reduce methane emissions—includes a proposal to update the requirements by setting the maximum regulatory limit for the molar fraction of oxygen in biomethane at 0.5% (up from the current 0.2% for the GTS).

To address this situation between 2025 and 2027, the Ministry of Energy and the National Energy and Utilities Regulatory Commission (NEURC), together with natural gas market participants, must review existing regulations on natural gas quality assurance, determine optimal parameters for gas supply to the GTS/GDS, and establish an effective natural gas quality management system. At the same time, another important step toward resolving these issues is:

● the adoption by the Cabinet of Ministers of Ukraine of the Rules for Determining the Quality of Natural Gas: Law No. 4777-IX of February 10, 2026, the Law of Ukraine "On the Natural Gas Market," was amended by Article 18-2, pursuant to which the quality standards and physicochemical characteristics of natural gas will be established by the Rules for Determining the Quality of Natural Gas, to be approved by the Cabinet of Ministers of Ukraine upon the recommendation of the central executive authority in the oil and gas sector.

● Implementation of a policy on the transition to natural gas metering in energy units (see PM_IMG_WEM_04 Creating Legal Conditions for the Transition to Commercial Gas Metering in Energy Units During Martial Law).

PM_IMG_WEM_04 Creating Legal Conditions for the Transition to Commercial Gas Metering in Energy Units During Martial Law

Goal: the use of energy units in settlements between natural gas market entities, in particular between OGTS, OUGS and customers of their services, is ensured

Legal basis: Law of Ukraine dated November 2, 2021 No. 1850-IX "On Amendments to Certain Laws of Ukraine Regarding the Introduction of Natural Gas on the Market accounting and calculations by gas volume in energy units"

Time frame: 2024-2026

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations: Ministry of Energy, Ministry of Finance, NEURC, OGTS, OGDS, OUGS

Description: The Law of Ukraine No. 1850-IX of November 2, 2021 "On Amendments to Certain Laws of Ukraine Regarding the Introduction of Gas Volume Accounting and Settlements in Energy Units in the Natural Gas Market" provides for the use of energy units for natural gas accounting. In July 2022, the date of entry into force of this Law of Ukraine was postponed to May 1, which follows the date of termination or cancellation of martial law in Ukraine.

In the EU, natural gas is accounted for in energy units, as in the relationship between sellers and buyers of gas, as well as in relations with operators of gas infrastructure facilities (however it is also widespread from consumers to pay for natural gas per m3 used). Instrumental metering in both the EU and Ukraine is carried out in units of volume. In Ukraine, commercial metering in m3 occurs essentially in parallel with the use of energy units for individual market transactions, in particular to determine the volume of biomethane production, as well as the volume import-export natural gas and biomethane, which is carried out using energy units. This situation may lead to the creation of settlement differences that require separate settlement.

In 2026, the Ministry of Energy will develop a draft law to enable the transition to accounting in energy units before the end of the legal regime of martial law.

PM_IMG_WEM_05 Ensuring the attractiveness of Ukrainian oil and gas infrastructure for use by foreign customers

Goal: increase the use of GTS and UGS capacities by customers from the EU, Energy Community and others countries (which can be evaluated depending on increase in the number of customers, increase in transportation/storage volumes or increase in tariff revenue from such services)

Legal basis: ESU

Time frame: 2024-2030

Type of policy / measure: Economic / Regulatory

Sector(s) affected: Energy - supply

Responsible authorities/organizations: Ministry of Energy, National Commission for the Regulation of Energy and Utilities of Ukraine, Ministry of Foreign Affairs, OGTS (upon consent), OPSG (upon consent)

Description**:** ESU sets out objectives regarding the use of tariff policy and the creation of new commercial products with the aim of further utilizing Ukraine's gas infrastructure by EU customers.

Capacity allocation for the gas transmission system (at cross-border interconnections) and underground gas storage facilities is already carried out on transparent market terms. In recent years, several new commercial products have been developed and are already in operation, aimed at attracting new customers, namely the service of natural gas storage in Ukrainian UGS facilities under customs warehouse conditions, as well as the short-haul transportation of natural gas via the GTS. These services are in demand among customers from the EU and the Energy Community even amid a full-scale invasion. Additionally, Resolution No. 631 of the NEURC dated April 3, 2024, introduced new products for use in underground storage facilities. The resilience of Ukraine's gas transmission system and UGS facilities to risks has been tested through stress tests conducted in recent years with the involvement of the European Commission, the Energy Community Secretariat, and the USAID Energy Security Project.

It is essential to maintain prices for GTS and UGS services that are competitive with external markets, as well as to stabilize tariffs during periods of uncertainty. An important step in this direction is not only ensuring competitive tariffs for services and optimizing other conditions for access to Ukraine's GTS and UGS facilities, but also taking measures to ensure the competitiveness of entire natural gas supply routes, including by following the EU Network Code on tariff harmonization. It is essential to maintain prices for gas transmission and underground gas storage services that are competitive with external markets, as well as to stabilize tariffs during periods of uncertainty. An important step in this direction is not only ensuring competitive tariffs for services and optimizing other conditions for access to Ukraine's GTS and UGS facilities, but also taking measures to ensure the competitiveness of entire natural gas supply routes, including by following the EU Network Code on tariff harmonization. An example of the start of this initiative is the creation of a "super-aggregated" capacity product extending from Greece, through Bulgaria, Romania, and Moldova, and ending in Ukraine, which became available to customers in June 2025. Government authorities (in particular, the Ministry of Energy) were involved in the creation of this product, and coordinated decisions were adopted by the national regulators of these countries, including the NEURC. Additionally, during 2026, the OGTS will consider the possibility of creating virtual interconnection points at all borders with Energy Community member states and will provide the Ministry of Energy and the NEURC with the results of its analysis, including a conclusion on the feasibility of establishing such points.

Furthermore, the Government will take measures to amend EU regulations with the aim of creating competitive conditions for the use of Ukrainian underground gas storage facilities, particularly in the

context of mandatory requirements for filling underground gas storage facilities in the EU.

PM_IMG_WAM_09 Ensuring effective regime for the management of GDS

Goal: a predictable legal regime for gas distribution activities, as well as GDS property, should be created, which will increase the investment attractiveness of OGDS

Legal basis: NES, ESU

Time frame: 2024-2030

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations **:** Ministry of Energy, NEURC, Ministry of Economy

Description: NES envisages the introduction of incentive tariff formation in the gas market (a similar task is envisaged by the National Energy Efficiency Action Plan). ESU identifies the need for modernization and effective management of the gas distribution systems. At the same time, both incentive tariff formation and the development or modernization of networks will not be successful if the legal regime of the relevant activities and property is not predictable .

During 2022-2023, significant changes occurred regarding the management and conduct of distribution activities for natural gas. Based on a series of decisions by government authorities and courts, the shareholdings in gas distribution system operators were transferred to the management of the State Joint-Stock Company "Chornomornaftogaz," which is part of the Naftogaz Group. This management arrangement is temporary in nature, as it is intended to last for the duration of the seizure of these assets.

At the same time, another series of decisions authorized the conclusion of agreements for the operation of gas distribution networks and their components—those owned by the state and those on the balance sheet of NJSC "Naftogaz of Ukraine"—with LLC "Gas Distribution Networks of Ukraine," as well as the termination of similar agreements with previous operators. This decision is also temporary in nature, as Resolution No. 1335 of the Cabinet of Ministers of Ukraine dated November 25, 2022 (Official Gazette of Ukraine, 2022, No. 97, Art. 6042) grants an exemption from the requirement to enter into lease agreements for these networks for the duration of martial law in Ukraine and for five years following its termination or repeal, in accordance with the Procedure for Leasing State and Municipal Property, approved by CMU Resolution No. 483 of June 3, 2020 (Official Gazette of Ukraine, 2020, No. 51, Art. 1585). Certain decisions are currently under judicial review.

At the same time, the Law of Ukraine "On the Peculiarities of Regulation of Relations in the Natural Gas Market and in the Heat Supply Sector during Martial Law and Subsequent Restoration of Their Functioning" (Vidomosti of Verkhovna Rada (VVR), 2023, No. 19-20, p. 83) (hereinafter referred to as the Moratorium Law) establishes a ban on changing tariffs for the distribution of natural gas for household consumers from the 2022 level.

This situation does not contribute to the creation of a predictable stable environment capable of attracting new investments of transparent foreign and domestic capital. In 2024, at the request of the Ministry of Energy, the USAID/ESP project "Development of an operating model of the GDs operator" was launched, purpose whose there are development effective operating model for software financial and operational independence of the OGDS in Ukraine by comparing it with the practice of OGDS in EU Member States. This project analyses the activities and their impact on the financial performance of 5 European OGDSs compared to Ukrainian operators. It is expected that further technical assistance will be available to continue this direction. Accordingly, during 2024-2030, the Ministry of Energy, together with the National Commission for the Regulation of Energy and Utilities of Ukraine, should develop a comprehensive solution to this issue, which includes the following aspects: permanent legal regime of property of the GDS, permanent legal regime of corporate rights of the GDS, optimal business and operating model and based on it the optimal regulatory regime for all main types of OGDS activities, proper state control over all aspects of OGDS activities.

PM_IMG_WEM_06 Ensuring effective functioning of the gas balancing system

Goal **:** improving the functioning of the GTS balancing system, ensuring the creation of a liquid short-term wholesale gas market

Legal basis: ESU, Regulations (EU) 312/2014

Time frame: 2025-2030

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations: NEURC, Ministry of Energy, OGTS

Description: The development of the short-term wholesale market is the main objective of the balancing system established by Regulation (EU) 312/2014 (hereinafter referred to as BAL NC), which is mandatory for Ukraine from the end of 2020. The implementation of BAL NC in Ukraine began back in 2016, and in 2017, major amendments to the by-laws were adopted for this purpose.

ACER determines such main elements systems balancing according to with BAL NC:

1. There are enabling measures in place, namely: a virtual trading point has been created and the possibility of trading imbalances has been ensured through trade notifications, and obligations to provide sufficient information to customers for balancing are being fulfilled, access to system flexibility is provided through right on submission of renominations close to real time;
2. The TSO has access to and uses a trading platform where short-term standardized products are available and used as the first priority during residual balancing by the TSO;
3. There is a daily closing of imbalances at the end of each gas day, and the application of prices during the daily closing of imbalances is not prevented by tolerances or other instruments;
4. The neutrality of the GTS operator's balancing activities is ensured, which means that customers receive a refund or pay additional fees to the GTS operator depending on the balance of the neutrality account, there is transparent reporting on neutrality, and funds related to neutrality are recorded in other accounts compared to funds from tariffs;
5. Temporary measures such as tolerances, balancing platform, alternative price (other than market price) for daily closing of imbalances, etc. are not applied.

Today, a virtual trading point has been created in the gas transportation system and service customers have the right to submit trade notifications for the purpose of regulating imbalances. The OGTS information platform provides transportation service customers with information on the forecast of withdrawals/consumption that is not measured daily. The OGTS has access to and uses the trading platform as the first priority when performing balancing actions. The choice of the OGTS trading platform is approved by the Regulator. Marginal prices are determined on the basis of data from such a trading platform. In general, the balancing system is daily, that is, imbalances are closed based on the results of the day and are not subject to adjustment. From April 1 2025, a balancing neutrality fee was introduced, which is a critical element of the balancing regime under the BAL NC.

At the same time, some BAL NC norms, due to objective factors, were not applied or require full implementation.

Currently, due to military restrictions, the information provided to customers for independent balancing is not fully provided to customers of transportation services in accordance with Article 32 of the BAL NC. In August 2025, the NEURC approved changes to the GTS Code in ensuring that information provided to customers complies with the requirements of the BAL NC; however, the publication of such information is limited to the period of wartime.

In addition, temporary measures such as tolerances are applied, which is due to the insufficient liquidity level of the trading platform, as well as limited access of service customers to sufficient information about volumes of their injections and offtakes of natural gas.

In August 2025, the National Energy Regulatory Commission of Ukraine approved amendments to the GTS Code, which obliged the OGTS to prepare an annual report on the application of the permissible deviation. The adoption of this norm creates the prerequisites for a gradual departure from the permissible deviation regime and is generally based on Article 46 of the BAL NC, and is also necessary from the point of view of understanding the level of development of the short-term wholesale natural gas market.

While daily cashout of customer imbalances is generally applied, certain exceptions and tools are used to limit its effect (for example, within the PSO regime).

Also, the BAL NC norms regarding the methodology for forecasting non-daily measured withdrawals need to be fully implemented. In particular, this concerns the need to develop and publish such a methodology so that suppliers can familiarize themselves with it and, including, complain about its incorrect application. A similar methodology is being developed in the electricity market.

To improve the balancing system, it is necessary to increase the accuracy of forecasting natural gas withdrawals that are not measured daily, and to develop a liquid short-term natural gas market, where the GTS Operator and customers of transportation services will settle GTS imbalances.

During 2025-2030, the National Commission for Energy and Utilities of Ukraine, together with the Ministry of Energy and the OGTS, should work to further bring the balancing regime into line with the BAL NC.

3.4.3.3. Where applicable, measures to ensure the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets

Electricity market

Ukrainian legislation provides for non-discriminatory integration of renewable energy production facilities into the electricity market, and also ensures their priority participation in the market.

PM_IME_WEM_14 Free choice of forms of market participation by RES producers

Goal **: Promoting the integration of** renewable energy-based generating capacities into the electricity market

Legal basis **:** Law Ukraine "On the Electricity Market", Law Ukraine "On alternative energy sources"

Timeline **:** 2024-2029 years

Type of policy / measure: Regulatory / Economic

Sector(s) affected: Energy - supply

Responsible bodies/organizations **:** NEURC

Description **:** Renewable energy producers operating under a "green" tariff have the opportunity to choose the form of their participation in the market. In particular, they can be in the balancing group of a guaranteed buyer and operate under the "green" tariff mechanism or sell electricity in competitive market segments: under bilateral contracts, on the day-ahead market, intraday and balancing markets at prices established in the relevant markets or under the market premium mechanism, as well as under electricity export-import contracts.

Renewable energy producers can sell electricity independently or within balancing groups or use other forms of market participation (e.g. active consumers). by the mechanism of self-production, aggregation (only RES generating installations with a capacity of up to 20 MW) etc.).

Also, in order to minimize the risks of price fluctuations in the electricity market, a producer of electricity from alternative energy sources operating in the market without the use of incentives under the mechanisms of a "green" tariff or market premium within the framework of a balancing group of a guaranteed buyer, may conclude an agreement with a consumer, electricity supplier or trader on the provision of services to ensure the stability of the price of electricity, produced with alternative sources energy (corporate contracts purchase and sale (cPPA)).

PM_IME_WEM_15 Non-discriminatory integration of demand-side management, energy storage and aggregation into the power system and market

Goal **:** Creating an institutional environment for the introduction of new models of participation in the electricity market in order to improve the stability and flexibility of the power system and the

reliability of electricity supply to consumers

Legal basis **:** Law Ukraine "On the Electricity Market"

Timeline **:** since 2024 year

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations **:** NEURC, AMCU

Description **:** The state policy in the electric power sector of Ukraine, among other things, is aimed at ensuring conditions and applying measures for the development of energy efficiency in the electric power sector, demand management; promoting the production of electricity from alternative energy sources and the development of distributed generation and energy storage facilities.

The legislation provides that preference is given to investments aimed at increasing energy efficiency and load management measures, rather than investments in increasing generating capacities, if the former are a more effective and economical option, taking into account the positive impact on the environment as a result of reducing energy consumption and aspects related to security of supply, and the associated distribution costs. In particular, the Government has introduced the Procedure for conducting a tender for the construction of generating capacity and the implementation of demand management measures. In terms of demand management, the TSO, based on the report on the assessment of the conformity (sufficiency) of generating capacities and the results of monitoring the security of electricity supply, submits conclusions and proposals to the Ministry of Energy on: 1) the need to conduct tenders; 2) the volume of procurement of demand management measures; 3) the volume of impact on the electrical load schedule as a result of the implementation of demand management measures; 4) technical requirements, including technical characteristics of the equipment used to implement demand management measures.

When planning the development of the distribution system, distribution system operators (DSOs) should anticipate the need to build and/or renovate the distribution system to connect new generating capacities, in particular distributed generation, and consumer facilities, in particular electric charging stations. Distribution system development plans should include an assessment of the medium and long-term need for flexibility services, and should also consider energy efficiency measures, demand response, the use of energy storage facilities or other resources as alternative solutions to the expansion of the distribution system.

Also, promotion of non-discriminatory integration into the energy system and the demand management market, energy storage and aggregation is carried out within the framework of the policies PM_IME_WEM_03 Development of aggregation, PM_IME_WEM_04 Ensuring the development of energy storage facilities, PM_IME_WEM_05 Support of active consumers by the self-production mechanism (net billing), PM_IME_WEM_06 Ensuring the development of distributed generation, PM_IME_WEM_08 Special auctions for long-term procurement of ancillary services, PM_IME_WEM_09 Simplification of permission procedures for distributed generation.

Within the implementation of the Electricity Integration Package, such consumers, including those offering demand response through aggregation, have equal rights to participate in all segments of the electricity market on non-discriminatory terms with producers. When purchasing ancillary services, TSOs and DSOs are obliged to ensure the involvement of aggregators that provide demand response aggregation on equal terms with producers, taking into account their technical capabilities, and to adhere to the principles of non-discrimination. The regulator, in close cooperation with market participants, including consumers, develops technical requirements for demand response in all segments of the electricity market.

Natural gas market

PM_IMG_WEM_07 Current measures for promotion of biomethane production

Goal: achievement production biomethane in volume 100 million m ^{3} /year to 2030 year

Legal basis **:** Law of Ukraine “On the Natural Gas Market”, Law of Ukraine “On Alternative Fuels”, Law of Ukraine dated 09.08.2023 No. 3311-IX “On Amendments to some legislative acts of Ukraine on the implementation of investment projects with significant investments" (Vidomosti Verkhovnoi Rada (VVR), 2023, No. 90 , p. 342), Procedure for the functioning registry biomethane, approved by resolution Cabinet of Ministers from 22 July 2022 No. 823 (Official Gazette of Ukraine, 2022 p., No. 61, p. 3652), GTS Code, GRM Code, standard DSTU EN 16723-1:2023

Time frame: 2024-2030

Type of policy / measure: Economic / Regulatory

Sector of influence : Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / Waste

Responsible bodies/organizations: State Agency for Energy Efficiency, Ministry of Economy, Ministry of Energy, National Commission for Energy and Utilities of Ukraine, Ministry of Foreign Affairs

Description: The following measures were used in recent years to support biomethane production:

- Legal right on access and connection to gas networks:

According to the Law of Ukraine "On the Natural Gas Market", producers of biogas or other types of gas from alternative sources have the right to access gas transportation networks and gas distribution systems, gas storage facilities, LNG installations, subject to compliance with technical standards and safety requirements in accordance with the law and provided that biogas or other types of gas from alternative sources in terms of their physical and chemical characteristics comply with the regulatory legal acts on natural gas. In addition, it is stated that the provisions of this Law of Ukraine on natural gas apply on a non-discriminatory basis to biogas or other types of gas from alternative sources, if biogas or other gas from alternative sources meets the requirements for access to gas transportation and gas distribution systems, gas storage facilities, LNG facilities. The GTS Code clearly applies this provision to biomethane producers. The conditions for connection have been clarified for biomethane installations to GTS and GDS, in particular enacted concepts of "biomethane" and "reverse" compressor station", connection rules for this group of customers have been clarified.

These rules are expected to be strengthened as part of the implementation of the Gas Decarbonisation Package (see **PM_IMG_WAM_01 Transposition of the new EU legislation package in the field of natural gas and hydrogen**).

- Loosening requirements related to the quality of biomethane injection:

The supply of biomethane to the GTS has been simplified by increasing the permissible oxygen content in the gas supplied to the GTS and GDS to 0.2 mol.% for the GTS and 1% for the GDS. In general, this level is within the average value in the EU and the Energy Community (according to CEER-ECRB data). At the same time, further simplification of the requirements for access to the GTS and GDS in terms of gas quality may occur within the framework of a separate policy (see **PM_IMG_WAM_06 Ensuring proper management of the quality of natural gas supplied to gas networks**).

- Approval of the standard for biomethane:

By order of the State Enterprise "Ukrainian Research and Training Center for Standardization, Certification and Quality" dated April 3, 2023 No. 55, the DSTU EN 16723-1:2023 standard was adopted for natural gas and biomethane for use in transport and biomethane for injection into the natural gas network.

- Promotion of large biomethane production projects in accordance with the Law of Ukraine No. 3311-IX of August 9, 2023 “On Amendments to Certain Legislative Acts of Ukraine Regarding the Implementation of Investment Projects with Significant Investments ” ;
- Provision for the creation of a biomethane register, guarantees and certificates of origin for biomethane:

The Law of Ukraine No. 1820-IX of October 21, 2021 “On Amendments to Certain Laws of Ukraine” of development production biomethane" (Vidomosti of Verkhovna Rada (VVR), 2021, No. 52, Art. 431) and the Law of Ukraine dated June 30, 2023 No. 3220-IX "On Amendments to Certain Laws of Ukraine Regarding the Restoration and "Green" Transformation of the Energy System of Ukraine" (Vidomosti of Verkhovna Rada (VVR), 2023, No. 82, Art. 301):

provides for the definition of biomethane as a gas that meets regulatory requirements acts for natural gas for supply to gas networks or for use as motor fuel;
the concepts of a guarantee of origin of biomethane and a certificate of origin of biomethane are defined;
provides for the existence of a register of biomethane (both fed into gas networks and liquefied or compressed biomethane) and procedures and powers for its creation and functioning.

In particular, it is stipulated that the creation of an account in the biomethane registry is carried out after an independent audit of the biomethane production facility, confirming its capacity to carry out production of biomethane and is regulated by the order on functioning of the biomethane register. Simultaneously with the cancellation of the guarantee of origin of biomethane, a certificate of origin of biomethane is formed, while these procedures should be regulated by an international agreement on the interaction of registers, if it concerns the export of biomethane. In order to implement this Law of Ukraine, the Resolution of the Cabinet of Ministers of Ukraine dated July 22, 2022 No. 823 (Official Gazette of Ukraine, 2022 p., No. 61, p. 3652) approved the Procedure for the functioning of the biomethane register. The State Agency for Energy Efficiency and Energy Efficiency successfully conducted a test operation of the biomethane register and plans to begin trial operation by February 16, 2026.

The State Agency for Energy Efficiency has a status observer in the Association of Issuing bodies in 2022.

- Simplification accession to gas networks:

By resolution of NEURC 05 November 2024 No. 1879 changes were made to GDS Code, which provide for a single form of technical conditions for connection, which is an integral part of the contract for connection to the GDS for producers of biomethane and other types of gas from alternative sources.

By the law of Ukraine from 14 January 2025 No. 4213 "About introduction changes to some laws Ukraine in the spheres of energy and heat supply on improving certain provisions related to conducting economic activities and the effect of martial law in Ukraine” (Vidomosti Verkhovnoi Rada (VVR), 2025, No. 30, p. 98) amendments were made to the Law of Ukraine "On the natural gas market" gas" in terms of the creation and publication by the OGTS and OGDS of a geoinformation system regarding the gas transportation or gas distribution system and its components in accordance with the Law of Ukraine "On the National Geospatial Data Infrastructure". This information can be used as a basis to improve accession procedures networks and formation of networks for the desired development of new installations. At the same time, the publication of relevant information is limited to the period of validity of the legal regime of martial law.

- Opening of biomethane exports to the EU, creation of a biomethane traceability system integrated with the EU, elimination of double counting of biomethane volumes exported to the EU:

On May 16, 2024, the Law of Ukraine No. 3613-IX of March 20, 2024 “On Amendments to the Customs Code of Ukraine and Other Laws of Ukraine Regarding the Peculiarities of Customs Control and Customs Clearance of Certain Categories of Goods” (Vidomosti Verkhovnoi Rada (VVR), 2024, No. 22, p. 194) came into force, designed to unblock the export of biomethane from Ukraine. This Law, in particular, stipulates that temporarily, until the entry into force of the decision of the Cabinet of Ministers of Ukraine on the accession of the biomethane register, established in accordance with Article 8-1 of the Law of Ukraine "On Alternative Fuels", to the EU Database (Union database, UDB), and the recognition by the European Union of guarantees of origin of biomethane issued in Ukraine, the passage through the customs border of Ukraine and/or the release into the customs regime of export of volumes of biomethane transported across the customs border of Ukraine by pipeline transport may be carried out without providing the customs authorities with information on the account number of the biomethane producer in the biomethane register and on guarantees of origin of biomethane, provided for in Articles 8-1 and 8-2 of the Law of Ukraine "On Alternative Fuels", provided that the declarant submits for customs clearance of such volumes of biomethane together with a customs declaration of a certificate of compliance with the sustainability criteria for biomethane regarding producer of the relevant volumes of biomethane, as well as proof of sustainability of biomethane for the relevant volumes of biomethane. Thus, in the future, a biomethane register should be created, its integration with the UDB should be ensured, and a corresponding decision should be made by the CMU.

In order to implement this Law, the Order of the Ministry of Finance of August 1, 2024 No. 380 “On Amendments to Certain Regulatory and Legal Acts of the Ministry of Finance of Ukraine on Customs Matters” was adopted (Official Gazette of Ukraine, 2024, No. 77, p. 4565), which determines the procedure for customs clearance of biomethane transported by pipeline across the customs border. In February 2025, the customs clearance of the first in history biomethane batches for export by pipeline was carried out. At the same time, biomethane export is possible not only by pipeline, but also by other means. Thus, in May 2025, the first export delivery of Ukrainian biomethane in a liquefied state was made. The final destination of these deliveries is Germany.

An important condition for biomethane exports to the EU is the recognition of Ukrainian biomethane supplies on an equal footing with biomethane supplies originating in the EU, when the relevant supplies from Ukraine have been certified under relevant voluntary schemes recognized by the European Commission. In this context, integration with the UDB is also important. During 2024-2026, the Ministry of Energy, together with other bodies and organizations, is taking measures to join Ukraine to the UDB, as well as to include Ukraine in the mass balance system operating in the EU, taking into account that: (i) the GTS of Ukraine is integrated with GTS of neighboring EU Member States; (ii) existing Ukrainian biomethane producers are certified under voluntary certification schemes recognized by the European Commission.

The first pilot deliveries of Ukrainian biomethane to the EU were carried out in early 2025. On February 7, 2025, the first batch of biomethane in the history of Ukraine for export by pipeline was customs cleared. In May 2025, the first export of liquefied biomethane from Ukraine was reported.

At the same time, to prevent an export barrier, it is necessary to obtain an official clarification from the European Commission regarding equal treatment of biomethane from Ukraine for the purposes of fulfilling the requirements of RED III. In addition, in the event of Ukraine's non-accession by the time of the launch of the UDB, this actually will make it impossible to export Ukrainian biomethane to the EU. From the side of the Ministry of Energy, as well as other involved bodies, measures will be taken to address these issues during 2026-2027, in particular in the context of the implementation of the Operational Action Plan for implementation of the Biomethane Production Development Program for the period until 2035, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 514 of April 22, 2026.

In general, according to information received during public consultations on December 13, 2023. within the framework of the development of the NECP, existing policies and measures (even before the full unblocking of biomethane exports from Ukraine) are capable of stimulating biomethane production at the level of 50-100 million m3 / year by 2030. At the same time, according to the data of the NEURC natural gas market monitoring, the following volumes of biomethane were supplied to gas networks: for the IV quarter of 2024 - 2.3 million m3 ; for the I quarter of 2025 - 2.6 million m3 ; for the II quarter of 2025 - 3.8 million m3 · In previous monitoring periods, no biomethane supply to

gas networks was detected.

PM_IMG_WAM_10 Additional measures to support biomethane production

Goal: achieve biomethane production of 1 billion m3 / year by 2030

Legal basis **:** ESU, "Global Methane Pledge" Action Plan

Time frame: 2024-2030

Type of policy / measure: Economic / Regulatory

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / Waste

Responsible bodies/organizations: State Agency for Energy Efficiency, Ministry of Economy, Ministry of Energy, National Commission for Energy and Utilities of Ukraine, Ministry of Foreign Affairs

Description: The volume of biomethane production at the level of 50-100 million m3 / year by 2030 (as envisaged by the WEM scenario) is significantly lower than the announced potential for biomethane production in Ukraine, as well as the declared goals for 2030 of other countries with a similar base for the development of the industry (France – 4 billion m3, the Netherlands – 2 billion m3). Thus, according to estimates by the NGO "Bioenergy Association Ukraine" under an optimistic scenario of developments in Ukraine by 2030 there is a possibility of achieving 1 billion m3 / year of biomethane production, distributed in a 50/50 ratio between domestic consumption and export.

To increase production volumes, additional measures are necessary (taking into account the sustainability criteria that apply in the EU and should be implemented in Ukraine, as well as resolving issues related to establishing biomethane exports to the EU on an equal basis):

- Creating a system of guarantees of origin in the internal market and ensuring their recognition in the EU:

Export of biomethane from Ukraine to the EU without guarantees of origin issued by the Ukrainian authorities is commercially feasible. However, the system of guarantees of origin should create conditions for increasing demand for biomethane on the domestic market, as well as for the possibility of further introduction of a mandatory share of biomethane in the volume of gas supply/consumption/transportation or distribution.

The State Agency for Energy Efficiency and Efficiency has successfully conducted a test operation of the biomethane registry and plans to begin trial operation by February 16, 2026. During 2026-2030, measures should be developed and implemented to launch a system of guarantees of origin within the country.

In addition, the recognition of guarantees of origin issued by Ukrainian authorities in the EU may further increase the profitability of Ukrainian biomethane production. For the recognition of Ukrainian guarantees of origin for biomethane in the EU, it is necessary to conclude a relevant agreement with the EU and to have a comparable system of guarantees of origin. A relevant agreement may be reached within the framework of amendments to the Energy Community Treaty. In addition, the recognition of guarantees of origin requires cooperation between the relevant authorities within specialized organizations, such as the Association of Issuing Authorities (AIA) or ERGaR.

- Launching organized market for solid biofuels:

ESU notes the need to create a legislative basis for the development of trade in solid biofuels, which consists in creating a biomass market and developing regulatory acts that will regulate its activities (see **PM_D_WAM_18 Introduction of a unified electronic trade in solid biofuels**).

- Financial support to small manufacturers biomethane:

The law of Ukraine from 09 August 2023 No. 3311-IX "About introduction changes to some legislative acts of Ukraine on the implementation of investment projects with significant investments" (Vidomosti Verkhovnoi Rada (VVR), 2023, No. 90, p. 342) provides for support for significant biomethane production projects. At the same time, according to the results of public consultations held on December 13, 2023, it was found that the main producers of biomethane are small productions (up to 3 million m3/year), while significant producers are large companies potentially capable of attract capital on favorable terms. Thus, the support allocated to large producers biomethane, may be be revised for its distribution among small legal persons.

For example, the Action Plan for the Implementation of Ukraine's Climate Policy within the

framework of participation in the global initiative to reduce methane emissions "Global Methane Pledge" provides for partial reimbursement of the cost of facilities (up to 50 percent of the cost, and for agricultural cooperatives up to 70 percent of the cost) for the processing of animal by-products belonging to categories II and III, as well as reducing the cost of construction by agricultural producers of livestock complexes with biogas plants for the purpose of biomethane production. for diversification of sources energy, accelerating the transition to “clean” energy, increasing energy conservation and import substitution natural gas.

- Application of discounts to tariffs GTS operator :

The new EU gas legislation package provides for the possibility of providing discounts at entry/exit points of the gas transmission system for renewable and low-carbon gases, namely:

discounts on tariffs:

Up to 100% on entry points to GTS from installations with production renewable gases;

Up to 75% - from low-carbon gas production plants;

Up to 100 % - for renewable gases on IPs from one systems to another;

Up to 75% - for low-carbon gases on IPs from one system to another;

100% for renewable and low-carbon gases on entry/exit points to/from GTS from/to underground storage facilities.

The transposition of this legislative package is provided for in a separate policy (**PM_IMG_WAM_01 Transposition of the new EU legislative package in the field of natural gas and hydrogen**).

- Creation of biomethane development priority zones, including taking into account needs to optimize the use of gas networks:

The Gas Decarbonisation Package guarantees access of the produced biomethane to both the GTS and the GDS, as well as to the wholesale market, i.e. to a virtual trading point. As of September 2025, in accordance with the requirements of current legislation, biomethane producers who are connected, in particular, to the GDS and have concluded a natural gas transportation contract with the OGTS, have the right on general grounds to supply biomethane to the GTS via a virtual trading point at the entry point from the GDS (the place of gas receipt from the biomethane producer at the point of its connection to the gas distribution system) and transport it (commercially/virtually) to the exit point from the GTS, in particular, to the UGS, on IPs, to the virtual trading point (VTT), which meets the requirements of EU legislation. At the same time, it should be understood that this is a limited volume of biomethane production. With a significant increase in the volume of biomethane production throughout the territory of Ukraine, additional needs for the development of gas infrastructure or the adoption of alternative measures should be taken into account.

In the context of additional infrastructure, this primarily concerns reverse compressor stations. The decision on financing the installation of reverse compressor stations, enshrined in the resolution of the National Commission for the Regulation of the Energy and Utilities of Ukraine No. 1021 dated June 8, 2023, requires further analysis, taking into account the goal of developing a competitive market, as well as preventing the creation of conditions for monopoly abuse of access to important infrastructure. Current regulation creates a situation where one biomethane producer can create an infrastructure facility, access to which will be needed in the future by other producers - its competitors. According to EU practice, the owners of reverse compressors are OGTS (Denmark, Austria). At the same time, given that there are expectations regarding the significant export orientation of the biomethane industry, the inclusion of the costs of creating these stations in the OGTS tariff requires additional justification.

In the context of alternative measures, it is important to promote the location of production facilities where the need for additional infrastructure investments will be the lowest. In Ukraine, there are already studies defining "renewable go-to zones" based on zoning already carried out by the NGO "Bioenergy Association of Ukraine" (UABIO) with the support of the EBRD (Biomethane Zoning and Assessment of the Possibility and Conditions for Connecting of Biomethane Producers to the Gas Transmission and Distribution Systems of Ukraine).

In addition, further work is needed to create biomethane clusters. Thus, in September 2024, a memorandum of cooperation was concluded between the OGTS and LLC "Gas Distribution Networks of Ukraine", in particular, to analyze the prospects for the development of the biomethane market and consider the possibility of creating biomethane clusters. As part of the implementation of the specified

measure of the memorandum, as well as plans for optimizing the GTS, the transfer of part of technological operations to the so-called "nodal" GDS with the creation of the appropriate satellite infrastructure is being considered, which in turn improves the conditions for connecting biomethane production to the GTS and will facilitate the redistribution (sale) of biomethane in the regions of its production. This work should be carried out under the coordination of the Ministry of Energy, with the involvement of the National Energy Regulatory Commission and natural gas market entities.

3.4.3.4. Policies and measures to protect consumers, especially vulnerable and, where applicable, energy poor consumers, and to improve the competitiveness and contestability of the retail energy market

PM_IM_WEM_02 Ensuring the independence of the National Energy and Utilities Regulatory Commission (NEURC)

Purpose **:** to provide institutional environment for balancing interests of different market participants and the state

Legal basis **:** Plan Ukraine, approved by order of the Cabinet of Ministers of Ukraine dated 18 March 2024 No. 244 (Official herald Ukraine, 2024 p., No. 32, (Art. 2035)

Time frame: 2024-2026 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations: Ministry of Energy, NEURC

Description: In 2023, the Energy Community Secretariat, in a special report, noted certain shortcomings and the need to strengthen the institutional independence of the National Commission for the Regulation of Energy and Power Generation of Ukraine, and the Regulator itself developed an Action Plan to ensure its independence in accordance with Ukraine's international obligations, which was sent to the Cabinet of Ministers of Ukraine together with a justification letter. .

In order to comply with the Energy Community acquis requirements regarding independence of the Regulator, the Law of Ukraine dated 21.08.2024 No. 3915-IX "On Amendments to Certain Laws of Ukraine Regarding the Regulation of Certain Issues of the Use of Terminology in the Field of "energy" entered changes to Art. 53 of the Law of Ukraine of 24 August 2023 No. 3354-IX "On law-making activity" to release NEURC acts which are regulatory legal acts, from the state registration procedure, as well as to provide for the inclusion into the Unified State Register of Regulatory and Legal Acts of the Regulator after their publication in the manner prescribed by law. Members of the NEURC were also appointed from among the candidates selected based on the results of an open and professional competition.

The financial independence of the NEURC is ensured by quarterly payment of regulatory contributions by business entities listed in the Register of Business Entities Operating in the Energy and Utilities Sectors, whose activities are regulated by the Regulator regardless of ownership. The regulatory contribution rate is determined annually (planned rate) and is reviewed by the Regulator quarterly. In particular, the regulatory contribution rate for the 4th quarter of 2025 is 0.061% (+0.027 percentage points compared to the rate for the 3rd quarter of 2025). The planned regulatory contribution rate for 2026 is set at 0.062%. The basis for calculating the regulatory contribution is the net income of the regulatory contribution payer from conducting activities regulated by the NEURC.

In terms of staffing the Regulator, in 2025 the CMU appointed three new members of the NEURC, selected through an open competition as candidates with the highest rating and who successfully passed a special review. Accordingly, the Regulator operates with a full management team consisting of six members and the Chairman of the NEURC.

By amending the legislation, a special status for the NEURC should be defined to ensure the independence of the Regulator in accordance with the principles provided for in Directive (EU) 2019/944. In 2026, it is planned to adopt amendments to the legislation (the Law of Ukraine on the National Commission for Energy and Utilities and other acts) developed by the Ministry of Energy together with the National Commission for Energy and Utilities, in order to strengthen the independence, institutional and financial capacity of the Regulator. Two parliamentary bills have been registered in the Verkhovna Rada of Ukraine: Draft Law on Amendments to Certain Laws of Ukraine on Strengthening Guarantees for the Exercise of the Powers of the National Commission for State

Regulation in the Spheres of Energy and Utilities No. 14282 of 08.12.2025; Draft Law on Amendments to Certain Laws of Ukraine on the Independence and Guarantees for the Exercise of the Powers of the National Commission for Energy and Utilities No. 14282-1 dated 12/22/2025. Relevant amendments to the legislation are aimed at fulfilling international obligations of Ukraine in the context of European integration, in particular, the recommendations of the Energy Community Secretariat regarding Ukraine's implementation of pan-European requirements on the status, independence and tasks of the national energy regulator. It is expected that the Verkhovna Rada will adopt a revised version of the draft law during 2026.

PM_IM_WEM_03 Provision of targeted subsidies for partial compensation for the costs of paying for housing and communal services

Goal: to provide vulnerable categories of the population with state support to reimburse the costs of housing and communal services, taking into account their financial and property status

Legal basis: Law of Ukraine "On Housing and Communal Services", Law of Ukraine "On the Natural Gas Market", Law of Ukraine "On the Electricity Market", Regulations on the Procedure for Assigning Housing Subsidies, approved by the Cabinet of Ministers resolution of October 21 1995 No. 848 (Law of Ukraine, 1996, No. 2, Art. 76; Official Gazette of Ukraine, 2000, No. 5, Art. 178), Plan of Ukraine, approved by the order of the Cabinet of Ministers of Ukraine dated March 18, 2024. No. 244 (Official Gazette of Ukraine, 2024 p., No. 32, p. 2035)

Time frame: 2025-2030 years

Type of policy / measure: Fiscal / Regulatory

Sector(s) affected: Energy - consumption

Responsible bodies/organizations: Ministry of Social Policy, Ministry of Finance

Description: During 2018-2021, Ukraine moved from indirect subsidies to paying subsidies to vulnerable categories of the population in cash to reimburse the cost of consumed electricity, gas, heat and other housing and communal services. Citizens, Those who receive a housing subsidy are required to pay the cost of actually consumed housing and communal services every month.

Financing of targeted subsidies to households for partial compensation of expenses for payment of housing and communal services, purchase of solid and liquid household fuel and liquefied gas is carried out at the expense of funds provided for in the state budget of Ukraine for the relevant year. The Pension Fund of Ukraine is the administrator of the relevant funds.

During 2025-2030, monitoring of the housing subsidy program will be ensured and the targeting of their provision will be strengthened as needed.

For the period of martial law, additional support may be provided to households living in frontline territories (territories of active or possible hostilities). In particular, from October 1, 2025, residents of frontline territories will receive additional funds to pay for electricity. Assistance will be provided within the framework of the Frontline Territories Support Program (CMU Resolution of August 13, 2025 No. 990 "Some issues of providing additional support for payment for electricity supply and distribution services or covering the costs of alternative sources of energy supply to recipients of benefits and housing subsidies" (Government Courier, 2025, No. 167)). The funds will be automatically accrued together with subsidies and benefits and will be calculated at the rate of 100 kWh per household member, but not more than 300 kWh per household. Payments will be made by the Pension Fund of Ukraine. Households living in front-line regions will receive this assistance until the household moves out of a dangerous territory, loses the right to a subsidy or benefit, or the status of the territory changes to conditionally safe or temporarily occupied.

PM_IM_WAM_03 Institutional protection of vulnerable consumers

Goal: create system for identification and support individual categories consumers

Legal basis: Law of Ukraine "On the Natural Gas Market", Law of Ukraine "On the Electricity Market"

Time frame: 2024-2026 years

Type of policy / measure: Regulatory / Informing

Sector(s) affected: Energy - consumption

Responsible bodies/organizations **:** Ministry of Energy, NEURC, Ministry of Social Policy

Description: The Law of Ukraine "On the Natural Gas Market" defines vulnerable consumers as household consumers who are entitled to state aid in accordance with the procedure established by the Cabinet of Ministers of Ukraine, which, in particular, establishes the criteria for classifying consumers as vulnerable. Vulnerable consumers are entitled to a subsidy to reimburse the costs of consumed natural gas and other targeted assistance provided in accordance with the procedure established by the Cabinet of Ministers of Ukraine, as well as to special measures to protect vulnerable consumers in relation to disconnections during critical periods in order to meet the needs of such consumers in natural gas.

The Law of Ukraine "On the Electricity Market" provides that vulnerable consumers have the right to legally provide support to reimburse the costs of paying for consumed electricity in accordance with the procedure established by the Cabinet of Ministers. The Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Implementation of European Law on the Integration of Energy Sectors" markets, increase security supply and competitiveness in field of energy" No. 4834-ИХ dated 07.04.2026 provides for certain changes to this definition without changes to its general content.

The procedures for protecting vulnerable consumers of gas and electricity have not been approved as of February 2026. Their development and approval should be coordinated and are part of the roadmap for the gradual liberalization of the gas and electricity markets, which is provided for in the Plan of Ukraine, approved by the Resolution of the Cabinet of Ministers of Ukraine dated March 18, 2024 No. 244 (Official Gazette of Ukraine, 2024 p., No. 32, p. 2035), with a deadline of implementation by the 2nd quarter of 2026.

PM_IM_WEM_04 Regulation and liberalization retail prices for energy resources

Goal: ensure gradual introduction of market pricing for energy resources

Legal basis: Law on Moratorium, Regulation on Imposing Special Obligations on Electricity Market Participants to Ensure General Public Interests in the Process of Operating the Electricity Market, approved by Resolution of the Cabinet of Ministers of Ukraine No. 483 of June 5, 2019 (Official Gazette of Ukraine, 2019, No. 49, p. 1658), Regulation on Imposing Special Obligations on Natural Gas Market Entities to Ensure General Public Interests in the Process of Operating the Natural Gas Market, approved by Resolution of the Cabinet of Ministers of Ukraine No. 222 of March 6, 2022 (as amended), Regulation on Imposing Special Obligations on subjects market natural gas to ensure general public interests in in the process of functioning market natural gas regarding delivery details natural gas to thermal energy producers and budget institutions, approved by the resolution of the Cabinet of Ministers of Ukraine dated 07/19/2022 No. 812 (as amended).

Time frame: 2024-2026 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations: Ministry of Energy, NEURC, Ministry of Finance, Ministry of Social Policy, AMCU

Description: In addition to direct support for household consumers through subsidies, Ukraine maintains relatively low prices for natural gas and electricity for household consumers.

The Law on the Moratorium establishes that during the period of martial law in Ukraine and six months after the month in which martial law is terminated or abolished, the price of natural gas for household consumers, as well as for certain related categories of consumers, shall not be subject to an increase from the price applied in relations between suppliers and the relevant consumers as of February 24, 2022.

The electricity market has a corresponding mechanism of special obligations to ensure general public interests in the functioning of the electricity market (hereinafter referred to as PSO). The natural gas market has PSO mechanisms, according to which the conditions for gas supply to other categories of consumers, except for households, are determined.

These measures create significant obstacles to the development of a competitive gas market, as they limit price formation through the forces of demand and supply, and are temporary in nature. At the same time, it is envisaged to maintain time-differentiated electricity prices for households (depending on the time zone) in the future (for more details, see section 3.4.3.5 of this Plan).

The reform of pricing for the population will take place taking into account the relevant EU acquis, in

particular Directive 2019/944. The Plan of Ukraine, approved by the Order of the Cabinet of Ministers of Ukraine dated March 18, 2024 No. 244 (Official Gazette of Ukraine, 2024 p., No. 32, p. 2035), by the 2nd quarter of 2026, the Ministry of Energy and the National Commission for the Regulation of Energy and Utilities of Ukraine are tasked with preparing a roadmap for the gradual liberalization of gas markets and electricity and the Cabinet of Ministers to approve it. The roadmap will focus on:

- steps needed to reform the PSO with the aim of gradually liberalizing market prices after the lifting of martial law;
- steps that need to be taken to ensure adequate protection of vulnerable consumers after the liberalization of household prices (in particular in the context of strengthening incentives for energy efficiency and demand management, taking into account the decentralization of energy supply, etc.).

PM_IM_WEM_05 Supplier of last resort and universal service supplier

Goal: to provide reliability and continuity supply electric energy and gas to consumers

Legal basis: Law of Ukraine "On the Natural Gas Market", Law of Ukraine "On the Electricity Market"

Timeline **:** 2024-2030 years (constantly)

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations **:** Ministry of Energy, NEURC

Description: The Law of Ukraine "On the Natural Gas Market" stipulates that in certain cases and for a limited period, the supply of natural gas to the consumer is carried out by the supplier of "last resort" on the terms and conditions determined by the Regulator. These cases concern situations when the consumer is left without a supplier through no fault of the consumer. The supplier of "last resort" is determined by the Cabinet of Ministers for a period of three years based on the results of a competition held in accordance with the procedure established by the Cabinet of Ministers. For the period of martial law and for 6 months after its termination or cancellation, the supplier of "last resort" is appointed without competition. By the order of the Cabinet of Ministers of Ukraine dated September 12 2023 No. 793 (Official Gazette of Ukraine, 2023 p., No. 88, p. 5149) LLC "GC "Naftogaz of Ukraine" is determined as the supplier of "last resort" for this period. At the same time, earlier the PSO Regulation, approved by the resolution of the Cabinet of Ministers of Ukraine dated March 6 2022 No. 222 (Official Gazette of Ukraine, 2022, No. 25, p. 1297), the supplier of the "last resort" was entrusted with special responsibilities with supply gas separate categories consumers. At the same time, the procedure for determining compensation for the performance of PSO does not provided for such compensation for the supplier of last resort. This distorts the main function of such a supplier and its functioning on a market basis, which reduces the interest of alternative suppliers in performing this function.

The supplier of last resort (SoLR) in the electricity market provides services for the supply of electricity to consumers in cases specified by the Law of Ukraine "On the Electricity Market". The SoLR shall be determined by a decision of the Cabinet of Ministers based on the results of a competition. The SoLR supplies electricity to consumers at a price formed in accordance with the methodology (procedure) approved by the Regulator.

In addition, the electricity market provides for the function of a universal service supplier (USS). A universal service provider cannot refuse to provide electricity to a household and/or small non-household consumer located in the territory of its activity. in concluding an electricity supply contract, which will guarantee household and small non-household consumers the opportunity to receive electricity supply services. The Cabinet of Ministers of Ukraine must hold a competition to select the USS by July 1, 2028 in accordance with the Law of Ukraine "On the Electricity Market".

For 2025-2030 inconsistencies between the status of supplier of "last resort" under the law and its current status and tasks in the market have to be eliminated, taking into account the influence of martial law on functioning markets of natural gas and electricity. The function of the supplier of last resort should not be used for supply beyond a specified short period or to consumers who are left without a supplier through the consumer's fault. Other safeguards should be used to ensure the

reliability and continuity of supply to these consumers.

PM_IM_WEM_06 Ensuring consumer access to important information

***Goal*:** protection of consumer rights, activation of consumer participation in the market

***Legal basis* :** Law of Ukraine "On the Natural Gas Market", Law of Ukraine "On the Electricity Market", Rules for the Supply of Natural Gas, approved by resolution NEURC dated September 30, 2015 No. 2496, Rules of the retail electricity market, approved by the NEURC resolution dated March 14, 2018 No. 312.

***Timeline* :** 2024-2030 (constantly)

Type of policy / measure: Regulatory / Informing

Sector(s) affected: Energy - supply / Energy - consumption

***Responsible authorities/organizations*:** NEURC, suppliers (upon consent), OGDS/DSO (upon consent)

Description: Consumers (including households) have the right to receive information important for them. Suppliers and OGDS/DSO are obliged to place such information on payment documents (invoices) that they issue to the consumer, in the consumer's personal accounts and on the supplier/OGDS/DSO website. The information to be placed concerns general terms and conditions of supply and terms of contracts, prices, means of submitting complaints and claims, changing suppliers, opportunities and means of improving energy efficiency, demand management, etc. The information in the consumer's personal accounts must contain data on the dynamics of energy consumption by the consumer, payment volumes, etc. Law Ukraine "On amendments to certain laws of Ukraine regarding the implementation of European law on the integration of energy markets, increasing security of supply and competitiveness in the energy sector" No. 4834-IX dated 07.04.2026 provides for bringing these requirements in line with EU law. The implementation of similar provisions in the natural gas market should also be ensured within the framework of a separate policy (see **PM_IMG_WAM_01 Transposition of the new EU legislation package in the natural gas and hydrogen sector**). In particular, an important mechanism for protecting consumer rights is the creation of a "single point of contact" in the electricity and natural gas markets, as well as the introduction of digital solutions for obtaining information by consumers, settling complaints and resolving disputes.

PM_IM_WEM_07 Application of price comparison tools

***Purpose* :** activation of consumer participation in the market and formation of rational economic behavior

***Legal basis* :** Law Ukraine "On the Electricity Market"

Time frame: 2025-2030

Type of policy / measure: Regulatory / Informing

Sector(s) affected: Energy - supply / Energy - consumption

***Responsible bodies/organizations* :** NEURC, Ministry of Energy

Description: In Ukraine there exist independent tools (online services) for facilitating the comparison of price offers of electricity suppliers and consumers' decision on the choice or change of supplier. Similar tools operate in the natural gas market: for example, service "Gasoteka" from DiXi Group and consulting center for population "GazPravda" from the All-Ukrainian Industry Association "Federation of Oil and Gas Industry Employers".

Additional measures are in place in the electricity market. In order to improve the availability of information on available commercial offers of suppliers for consumers, the Regulator acts as an aggregator of public commercial offers and publishes relevant links on its website. website. To indirectly stimulate competition, the Regulator uses a rating tool and publishes a rating of companies based on electricity supply quality indicators. The rating, in particular, highlights the assessment of the activities of universal service suppliers (USSs) in terms of the commercial quality of service provision (average response time to a consumer for an application/complaint/claim, call center service level within 30 seconds, and the percentage of calls lost in the call center queue).

During 2025-2026, requirements of the EU/Energy Community acquis regarding the operation of tools facilitating the comparison of commercial offers should be implemented. Thus, the relevant provisions on tools for comparing offers are contained in the Law Ukraine "On amendments to certain laws of Ukraine regarding the implementation of European law on the integration of energy markets, increasing security of supply and competitiveness in field energy" No. 4834-IX from 07.04.2026.

Implementation of similar provisions in the natural gas market should also be ensured within the framework of a separate policy (see **PM_IMG_WAM_01 Transposition of the new EU legislation package in the field of natural gas and hydrogen**).

PM_IM_WEM_08 Ensuring the consumer's right to free choice supplier and effective switching procedure

Goal: ensuring that consumers received benefits from liberalization of energy markets

Legal basis **:** Law of Ukraine "On the Natural Gas Market"; Law of Ukraine "On the Electricity Market"

Time frame: constantly

Type of policy / measure: Regulatory / Informing

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations **:** NEURC, OGTS (by consent), TSO (by consent), AMCU

Description**:** The procedure for changing supplier in the natural gas and electricity markets is similar, should guarantee the consumer's right to change supplier and ensure the speed and convenience of the supplier switching procedure. This procedure contains the following requirements:

- Conditions of the contract supply cannot limit the right of the consumer to change supplier.
- The supplier switching is carried out on a free of charge basis. In general, it is not permitted to charge a fee or other compensation for switching suppliers.
- The supplier switching at the initiative of the consumer has to be completed not more than three weeks from the date of notification by the consumer of the intention to change supplier.

In the electricity market, at the request of the consumer, the change of supplier must be completed according to the shortened rule within a period of no more than 3 calendar days (subject to the reading of the actual readings of the consumer's meter by the automated commercial accounting system or the consumer's agreement with the previous and new suppliers of forecast data on shows counter on date changes supplier). On the natural gas market in practice, the procedure takes place in even shorter terms, which is due to the fact that during this procedure, actual meter readings are not taken. From a technical point of view, the process of switching suppliers in the electricity market is organized through the central information and communication platform DataHub, which houses a centralized register of commercial metering points. In the natural gas market, similar functions are performed by the OGTS information platform.

The Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Implementation of European Law on the Integration of Energy Markets, Improving Security of Supply and Competitiveness in the Energy Sector" No. 4834-IX dated 07.04.2026 provides for bringing the current legislation into line with the requirements of EU law. Also, the possibility of changing the supplier within 24 hours on any working day should be ensured. The implementation of similar provisions in the natural gas market should also be ensured within a separate policy (see **PM_IMG_WAM_01 Transposition of the new EU legislation package in the field of natural gas and hydrogen**). Moreover, during 2025-2030, the procedure for changing suppliers in both markets

should be monitored in order to timely identify shortcomings in its functioning.

PM_IM_WEM_09 Development of organized wholesale energy markets

Goal **:** reduce the cost of energy supply to consumers through functioning wholesale markets

Legal basis **:** Laws Ukraine "About markets capital and organized commodity markets» and "On Commodity Exchanges" in the new version of the Law of Ukraine dated June 19, 2020 No. 738-IX (Official Gazette of Ukraine, 2020, No. 67, p. 9, p. 2145); Law of Ukraine "On Amendments to Certain Laws of Ukraine on Preventing Abuse in Wholesale Energy Markets" (Vidomosti Verkhovnoi Rada (VVR), 2023, No. 77, p. 270); Ukraine's plan, approved by order Cabinet of Ministers from 18 March 2024 No. 244 (Official herald Ukraine, 2024 p.,
No. 32, p. 2035)

Time frame: 2024-2030 years

Type of policy / measure: Regulatory / Other

Sector(s) affected: Energy - supply

Responsible bodies/organizations: NEURC, National Securities and Markets Commission (by consent), AMCU, Ministry of Energy

Description: The laws of Ukraine "On the capital markets and organized commodity markets» and "On commodity exchanges" in the new version of the Law of Ukraine dated June 19, 2020 No. 738-IX laid the foundation for the creation of organized wholesale markets in Ukraine according to the European model, including energy markets. They provide for updated powers for state bodies and requirements for operators of such markets, including the concept of clearing. Thus, the activities of commodity exchanges are subject to licensing by the National Securities and Markets Commission of Ukraine. As of September 2025, 4 commodity exchanges have the relevant licenses.

For further development wholesale energy markets used additional measures:

- Implementation of REMIT Regulations:

By adopting the Law of Ukraine "On the introduction of changes to some laws Ukraine on preventing abuse in wholesale energy markets" dated June 10, 2023 No. 3141-IX and subsequent amendments thereto, Ukraine has fulfilled the main obligations regarding the transposition of the requirements of the Regulation of the European Parliament and the Council (EU) No. 1227/2011 of October 25 2011 on wholesale energy market integrity and transparency (hereinafter referred to as REMIT), as well as certain provisions of Commission Implementing Regulation (EU) No 1348/2014 of 17 December 2014 on the implementation of Article 8(2) and Article 8(6) of the REMIT Regulation (hereinafter referred to as the Implementing Regulation).

The said Law of Ukraine, in particular: introduces the registration of wholesale energy market participants (participants of the electricity market and subjects of the natural gas market), reporting on the implementation of economic and trade transactions on the wholesale energy market, including executed and unexecuted offers (applications) and basic (fundamental) data; establishes the obligation of wholesale energy market participants to publish (disclose) insider information available to them; prohibits abuse and other violations on the wholesale energy market (manipulation and attempts at manipulation, insider trading, non-disclosure or disclosure insider information in violation of established requirements, transactions with wholesale energetic product without relevant registration) and establishes liability, in the form of fines for abuse and other violations.

The Law of Ukraine empowers the National Commission for the Regulation of Energy and Utilities of Ukraine to carry out market supervision and conduct the investigation of abuses and others violations on wholesale energy market. In order to ensure the implementation of the requirements of the Law of Ukraine and to implement the provisions of REMIT, the NEURC has adopted a number of regulatory legal acts. The specified regulatory legal acts of the NEURC have been adopted within the terms established by the Law of Ukraine and which were provided for by the Plan for Ukraine Facility 2024-2027. Since November 1, 2023, NEURC has already been registering wholesale energy market participants. Since January 2, 2024, in accordance with the requirements of the Law of Ukraine, the Register of Wholesale Energy Market Participants has been operating.

Taking into account the adopted by-laws and for the full implementation of the functions of NEURC in terms of market supervision and detection of abuses, NEURC is implementing the necessary organizational measures. Within the framework of the international technical assistance project “Ukraine: Rapid Support for Energy Security and Transparency – REMIT”, with the support of the

European Bank for Reconstruction and Development, a minimum viable product of the REMIT information system was developed, which is at the stage of trial operation of NEURC. A technical task has also been developed for the creation of a full-fledged REMIT information system. Work is currently underway to develop a full-fledged REMIT information system within the framework of cooperation with the EBRD under the international technical assistance project "Ukraine: Increasing Energy Market Transparency – Phase 1".

For the full implementation of REMIT norms, it is necessary to transpose two key powers of the NEURC, in particular, regarding on-site inspections and the power to obtain existing telephone and existing data traffic records. In the first half of 2026, the NEURC will develop a relevant draft law. At the same time, the transposition of the updated REMIT (REMIT 2.0) is planned through the development of a draft law of the NEURC (after the adoption of a relevant decision by the Council of Ministers of the Energy Community).

- Interaction between regulatory bodies:

On April 3, 2024, the National Securities and Markets Commission of Ukraine and NEURC signed an Agreement on Interaction and Cooperation, which will allow coordinating regulatory oversight of the activities of wholesale energy markets in accordance with EU best practices.

- International cooperation:

Within the framework of the SEEGAS initiative, which brings together representatives of South-Eastern and Eastern Europe (including Ukraine) with the support of the Energy Community Secretariat and the EBRD, work is underway to create an effective clearing system for gas transactions and related derivatives.

PM_IMG_WAM_11 Additional measures for the development of organized wholesale gas market

Goal **:** reduce the cost of gas supply to consumers through functioning wholesale markets

Legal basis **:** -

Time frame: 2025 - 2030 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations: NEURC, Ministry of Energy, AMCU, National Securities and Markets Commission (by consent)

Description: In 2025-2030 NEURC, together with Ministry of Energy, where needed in consultations with AMCU and National Securities and Markets Commission, should analyze the state of wholesale gas market and consider the need to take additional measures to increase the liquidity of wholesale organized gas market (outside the scope of the PSO Regulations), taking into account the state of development of the infrastructure of organized wholesale markets, as well as consultations with market participants. Liquidity in the gas market should be created both by attracting additional resources, which should be traded on organized markets, and by sufficient demand for this additional resource, from buyers who are ready and able to work in these markets. In addition, in organized markets there must be mechanisms that make the exchange trading attractive to bidders, in particular reducing the risks of default by customers, and protected from price manipulation. The relevant powers for the Regulator are provided for in Article 78(4)(b) of Directive 2024/1788, which will be transposed as part of a separate policy (see **PM_IMG_WAM_01 Transposition of the new EU natural gas and hydrogen legislation package**).

It should also be noted that the decision of December 24, 2020 No. 811-r, adopted in the context of the case on obtaining a permit for concentration in the form of acquisition of NJSC Naftogaz of Ukraine into ownership of a share in the authorized capital of Nadra Yuzivska LLC, the AMCU obliged Naftogaz Group, after the concentration, to provide an offer for the sale on a competitive basis, namely on commodity exchanges, of natural gas in the amount of at least 15 percent of the total volume of marketable gas produced during the year by the entities of the Naftogaz Group (except for PJSC Ukrnafta), excluding the volumes of gas sales within the framework of the PSO.

Electricity market

PM_IME_WEM_16 Service quality standards and compensation to consumers for non-compliance

Purpose **:** Improvement qualities services electricity supply and protection rights consumers

Legal basis **:** Resolution of the National Commission for the Energy and Utilities of Ukraine No. 373 dated June 12, 2018 "On approval of the Minimum Requirements for the Quality of Service to Electricity Consumers by Call Centers", No. 374 "On approval of reporting forms on electricity supply quality indicators and instructions for filling them out", No. 375 "On approval of the Procedure for ensuring electricity supply quality standards and providing compensation to consumers for their non-compliance"

Timeline **:** since 2018

Type of policy / measure: Regulatory / Economic

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations **:** NEURC

Description **:** In order to protect consumer rights, the Regulator approved the Procedure for ensuring electricity supply quality standards and providing compensation to consumers for their non-compliance (determines the quality standards of services of TSOs, DSOs and suppliers), as well as the Minimum Requirements for the Quality of Service of Electricity Consumers by Call Centers. The Procedure defines a list of general and guaranteed electricity supply quality standards; regulates relations related to electricity supply in accordance with the specified standards; ensures the protection of consumer rights by providing compensation for non-compliance with guaranteed electricity supply quality standards; establishes the amount of compensation to consumers for non-compliance with guaranteed standards. The Rules of the Retail Electricity Market determine the procedure for retail market participants when considering consumer appeals, complaints and claims.

Consumers receive compensation for non-compliance with standards, in particular regarding: the duration of power supply restoration after the start of a power outage, the frequency of power outages; deadlines for issuing technical conditions for connection, meter checks, responses to consumer requests; quality of electricity (voltage).

Regulator carries out monitoring compliance TSO, DSO and electricity suppliers general and guaranteed standards of quality of service provision and amounts of compensation provided for non-compliance with guaranteed service quality standards through analysis of relevant reporting regularly provided by licensees and during state control measures.

To indirectly stimulate the improvement of the quality of service provision, the Regulator uses a rating tool and publishes a rating of companies based on electricity supply quality indicators[108]. The rating provides an assessment of the performance of distribution system operators (DSOs) and universal service suppliers (USSs). The analysis covers indicators of electricity supply reliability (average interruption duration index – SAIDI; a targeted reduction in SAIDI is one of the essential conditions for RAB regulation of DSOs) and commercial quality of service provision (average response time to a consumer for an application/complaint/claim, call center service level within 30 seconds and the percentage of calls lost in the call center queue).

In the conditions of martial law and a significant capacity deficit in the Integrated Power System of Ukraine due to systemic attacks on power system facilities, to ensure operational security and To maintain balance, shutdowns and/or capacity limitations are applied as forced measures consumers electricity, in particular emergency outages, scheduled hourly outage schedules, capacity limitation schedules, etc. The procedure and conditions for their application are regulated by relevant legislative acts, in particular the Transmission System Code, the Distribution Systems Code, the Retail Electricity Market Rules, and others. Power outages or restrictions are used as exceptional measures when it is not possible to ensure adequate power supply to consumers through other measures. When applying power outages or restrictions, consumers must be properly informed about on the part of electricity suppliers and distribution system operators.

PM_IME_WEM_17 Electricity supply to protected consumers

Goal **:** Ensuring reliable supply of electricity to certain categories of consumers.

Legal basis **:** Law of Ukraine "On the Electricity Market", 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 invalid" (Government Courier, 01.02.2019, No. 21), Resolution of the CMU of July 14, 2025 No. 833 "On approval of the

[108] https://www.nerc.gov.ua/news/rejting-kompanij-za-pokaznikam-yakosti-elektropostachannya

Procedure for the distribution of funds received on current accounts with a special use regime of a protected consumer or a consumer whose facilities are designated as critical infrastructure facilities" (Government Courier, 16.07.2025, No. 142)

Timeline **:** since 2018

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations **:** Ministry of Energy, AMCU

Description **:** The Law of Ukraine "On the Electricity Market" (Article 60) identifies a category of protected consumers to whom a special regime of disconnection and/or restriction of electricity supply is applied to prevent the occurrence of man-made emergencies. Disconnection of protected consumers is carried out in compliance with the requirements of the Procedure for Ensuring the Supply of Electricity to Protected Consumers, approved by the Cabinet of Ministers of Ukraine, which determines: 1) the procedure for compiling a list of protected consumers; 2) order limitation, disconnection electricity supply protected consumers 3) mechanisms software full current payments protected consumers electricity by ensuring prepayment of the forecasted consumption volume and/or providing a financial guarantee of payment or in another way.

Some protected consumers (water supply and wastewater utilities, state-owned coal mines, subways etc.) have significant arrears for supplying electricity to the supplier of last resort (SoLR), which, in turn, causes the emergence of debt on the balancing market to producers who are providers of balancing services. To solve the problem of accumulation of debts of protected consumers for electricity (supply, transmission, distribution services), in 2025 a number of legislative decisions were introduced to guarantee payment by protected consumers and consumers whose facilities are designated as critical infrastructure facilities.

In particular, in accordance with paragraph 15-2 of Section XVII of the "Final and Transitional Provisions" of the Law of Ukraine "On the Electricity Market", temporarily until 01.01.2028, the following are protected: consumers or consumers whose facilities are designated as critical infrastructure facilities, the lists of which are approved in accordance with the procedure established by law and who have debts for the supply of electricity to the SoLR, may apply to the SoLR for the supply of electricity to them, provided that the debt is restructured and an account with a special use regime is open in one of the authorized banking institutions and other requirements are met. In order to implement these norms, the CMU Resolution No. 833 of 14.07.2025 approved the Procedure for the Distribution of Funds Received to Current Accounts with a Special Use Regime of a Protected Consumer or a Consumer whose Facilities are Designated as Critical Infrastructure Facilities. Thus, mechanisms have been established at the legislative level to ensure sustainable electricity supply to protected consumers and consumers whose facilities are designated as critical infrastructure facilities (in particular, electricity supply by SoLR for more than 90 days), and to guarantee their payment for electricity transmission, distribution and supply services.

Also, in 2026, the CMU should adopt legislative amendments to improve the Procedure for Ensuring the Supply of Electricity to Protected Consumers, in order to optimize the list of such consumers, the conditions for disconnecting electricity supply, guaranteeing their payment for electricity, etc. Within the framework of the policy PM_IME_WEM_01 Transposition of Electricity Integration Package, during 2026-2027, compliance of the terminology and process of disconnecting and/or restricting and restoring electricity supply to such consumers with the requirements of Commission Regulation (EU) 2017/2196 of November 24, 2017 establishing a network code for energy emergencies and restoration will be ensured.

Natural gas market

PM_IMG_WEM_08 Basic annual offer supplier natural gas

Goal **:** development and proper application of commercial offers of natural gas suppliers

Legal basis **:** Rules for the supply of natural gas, Model contract for the supply of natural gas to household consumers, approved by the resolution of the National Commission for the Regulation of the National Energy and Power Sector of Ukraine dated September 30, 2015. No. 2500

Time frame: 2024-2030 years (constantly)

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations **:** NEURC

Description: The supply of natural gas to household consumers in accordance with the Law of Ukraine "On the Natural Gas Market" is based on a standard contract, the terms of which cannot be changed by the parties.

In order to enable suppliers to offer new products while maintaining consumer protection, amendments to some acts of NEURC introduced the concept of a "basic annual offer", which each supplier supplying gas to household consumers must offer in terms of mandatory elements determined by NEURC (validity period from May 1 to April 30 of the following year, prohibition of price increases during this period, term and procedure for payments, etc.). At the same time, the supplier has the right to independently determine the price of the basic annual offer, as well as to offer consumers other commercial offers within the framework of the flexibility provided by the Standard Natural Gas Supply Agreement. The basic annual offer is an analogue of a fixed-term fixed-price contract, the conclusion of which is considered favorable for protecting consumers from significant fluctuations in natural gas prices.

At the same time, the Law on the Moratorium provides for the actual extension of the basic supply levels of suppliers, which were in effect as of February 24, 2022, during the duration of martial law in Ukraine and for six months after the month in which martial law is terminated or canceled.

PM_IMG_WEM_09 Strengthening requirements for OGDS unbundling

Objective **:** remove restrictions on competition in the retail market from abuses by natural monopolists

Legal basis **:** Law Ukraine "On the natural gas market", Directive 2009/73/EC

Timeline **:** 2024-2030 years

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply

Responsible bodies/organizations **:** Ministry of Energy, NEURC, Ministry of Economy, Naftogaz of Ukraine (upon consent), OGRM (upon consent).

Description **:** The requirements for the unbundling of the OGDS are defined by the Law of Ukraine "On the Natural Gas Market". At the same time, these requirements must be brought into full compliance with the best practices of the EU and the recommendations of the Energy Community, as well as taking into account the need to ensure their effective functioning. Thus, according to the EU/Energy Community *acquis*, the requirements for the unbundling of the OGDS concern the legal form (legal unbundling), the performance of functions and decision-making (functional unbundling), and accounting (accounting unbundling). At the same time, the unbundling of functions and decision-making consists of several mandatory elements, in particular, separation at the level of governing bodies, independence and efficiency of decision-making, separate identity, communication and branding, and confidentiality. Paragraph 48 of the State Property Policy, approved by resolution Cabinet of Ministers from 29 November 2024 No. 1369 (Official Bulletin of Ukraine, 2025, No. 1, p. 39), states that the Ownership Policy will enable the implementation of OECD corporate governance reforms in distribution system operator companies to improve competition in natural gas markets.

Paragraph 12 of the Plan for organizing the preparation of draft acts and the performance of other tasks necessary for the implementation of the above-mentioned resolution (resolution of the Prime Minister of Ukraine dated 04.01.2025 No. 7538/102/1-24), the measure "Development of a roadmap for the reform of corporate governance of gas distribution system operators" is provided. For gas distribution system operators that are part of an integrated or vertically integrated organization, functioning separate legal persons with independent structure management, organization, operations and decision-making should be organised. The legal entity will be separated from other activities not related to gas distribution, in compliance with the OECD criteria on corporate governance and Article 46 of EU Directive 2024/1788, and will also have an independent supervisory board with a majority of independent members to prevent any market distortions", the development of which is assigned to the Ministry of Energy.

Minutes No. 9 of the CMU meeting of January 24, 2025 took note of the roadmap for the reform of corporate governance of gas distribution system operators developed by the Ministry of Energy. Paragraphs 5 and 6 of the aforementioned roadmap provide for:

- preparation and adoption of the charter of the GDS operator in a new version, which should provide, in particular, for the creation, determination of the quantitative composition, functioning

and powers of an independent supervisory board with a majority of independent members, appointment of members of the collegial executive body by decision of the supervisory board, determination of the company's management system - a two-tier one, description of the organizational structure of management, description of the internal control system applied in the company, as well as compliance with the requirements of the Law of Ukraine "On the Management of State Property" in revisions of the Law #3587 and the State Property Policy approved by resolution Cabinet of Ministers from 29 November 2024 No. 1369, requirements of the Law of Ukraine "On the Natural Gas Market" regarding the conditions for maintaining the independence and unbundling of the gas distribution network operator, development and monitoring of compliance with the compliance program;

- preparation and adoption of the regulation on the supervisory board of the GDS operator, which should include in the exclusive competence of the supervisory board the powers to appoint the chairman and members of the board, approve the terms of the employment contract, and the amount of remuneration.

In accordance with the above, by the decision of the shareholder of LLC "Gas Distribution Networks of Ukraine" (hereinafter also referred to as LLC "GRMU") dated August 27, 2025 No. 166, amendments were made to the charter of LLC "GRMU" by approving it in a new version and the Regulations on the Supervisory Board of LLC "GRMU" were approved, which, among other things, provided for the formation of the Supervisory Board of LLC "GRMU" consisting of 5 people with a majority of independent members of the Supervisory Board.

During 2026, the Ministry of Energy, together with NJSC Naftogaz of Ukraine, will ensure the publication of the aforementioned roadmap, as well as its implementation, including, if necessary, together with the NEURC, work on making the necessary amendments to the Law of Ukraine "On the Natural Gas Market" and other regulatory acts, if necessary.

3.4.3.5. Description of measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing

Electricity market

PM_IME_WEM_18 Time-of-use prices for household consumers

Purpose **:** Create economic incentives for management in demand household consumers of electrical energy

Legal basis **:** Resolution of the Cabinet of Ministers of Ukraine dated June 5, 2019 No. 483 "On Approval of the Regulation on Imposing Special Obligations on Electricity Market Participants to Ensure General Public Interests in the Process of Operating the Electricity Market" (Official Gazette of Ukraine, 2019, No. 49, p. 1658; 2021, No. 67, Art. 4232; 2022 r., No. 87, Art. 5385; 2024 r., No. 11, Art. 671; 2024 r., No. 43, (Art. 2604)

Timeline **:** since 2019
Type of policy / measure: Regulatory / Economic

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations **:** Ministry of Energy

Description **:** In order to encourage household consumers to implement smart meters and demand management, in addition to the fixed price for electricity, the Cabinet of Ministers of Ukraine has also established differentiated prices taking into account time zones of the day - two-zone or three-zone prices, which allow partially shifting electricity consumption from peak periods to other periods of the day. If there is a record of electricity consumption by time periods, household consumers are billed at a fixed price for electricity using coefficients (at the consumer's choice):

- *at a two-zone price:* during the hours of nighttime minimum load of the power system (from 23:00 to 7:00), a coefficient is applied to the base price for electricity 0.5; in other hours of the day – full fixed price;
- *at a three-zone price:* during the hours of night minimum load of the power system (from 23:00 to 7:00), a coefficient of 0.4 is applied to the fixed price for electricity; during the half-peak period (from 7:00 to 8:00, from 11:00 to 20:00, from 22:00 to 23:00), the full fixed price for electricity is applied; during the hours of maximum load of the power system (with 8:00 to 11:00, with 20:00 to 22:00) to fixed prices on electricity, a coefficient of 1.5 is applied.

According to the Regulator, as of the beginning of 2025, the level of provision of household consumers with smart meters is about 20%. Installation of smart meters for household consumers is carried out by distribution system operators (DSO) within the framework implementation of five-year development plans distribution systems and annual investment programs of DSOs approved by the Regulator. Also, the installation of "smart meters" can be carried out by distribution system operators at the initiative of household consumers, at their own expense.

Further reform of electricity pricing for households will take place within the framework of policy PM_IM_WEM_04 Regulation and liberalization of retail energy price. At the same time, it is expected to retain the possibility of using time-differentiated prices, as well as their modification in accordance with the dynamics of electricity consumption and the needs of ensuring balance in the energy system.

PM_IME_WEM_19 Dynamic prices for consumers

Purpose **:** Create economic incentives for management in demand consumers electrical energy

Legal basis **:** decree NEURC from 14 March 2018 No. 312 "On approval of the Rules of the Retail Electricity Market"

Timeline **:** since 2018

Type of policy / measure: Regulatory / Economic

Sector(s) affected: Energy - supply, Energy - consumption

Responsible bodies/organizations **:** NEURC

Description **:** Since the launch of the new retail electricity market model on January 1, 2019, dynamic pricing for non-household consumers has been the subject of contractual relations between suppliers and consumers. Suppliers have the right to purchase electricity in different segments of the wholesale market at prices taking into account the time of day, in particular, on the DAM at hourly prices, and sell it to non-household consumers equipped with smart meters and metering systems (consumers of group "A") at dynamic prices, which enables demand management. The implementation of smart meters and metering systems is implemented within the framework of related policies PM_EE_WEM_18 Smart energy metering systems, PM_IME_WAM_01 Implementation of smart grids.

According to the Retail Electricity Market Rules, public commercial offers of electricity suppliers must be clearly separated according to their terms and method of determination. prices for electricity. In particular, commercial offers from suppliers may provide for prices differentiated by time of day or hourly prices, etc.

As part of the implementation of the Electricity Integration Package, the following changes will be introduced: electricity suppliers will be given the right to offer consumers contracts with dynamic the price of electricity; an obligation has been established for electricity suppliers supplying electricity to more than 200 thousand consumers to have a public commercial proposal of supply electric energy by by contract with dynamic price; NEURC will be carry out monitoring application contracts with dynamic at the price and assessment of related risks in accordance with the procedure established by the National Commission for the Regulation of Energy and Utilities of Ukraine.

Natural gas market

PM_IMG_WAM_12 Ensuring 100% gas metering

Goal**:** ensuring 100% gas metering

Legal basis: Article 18 of the Law of Ukraine "On the Natural Gas Market", Law of Ukraine "On Ensuring Commercial Accounting of Natural Gas"

Time frame: 2024-2030

Type of policy / measure: Economic / Regulatory

Sector(s) affected: Energy - consumption

Responsible bodies/organizations: OGDS, NEURC, Ministry of Energy

Description: As noted above, in Ukraine (excluding territories for which data is unavailable) there are a total of 705 thousand gas subscribers without metering devices, of which the vast majority (630 thousand) use natural gas for cooking.

According to Art.2 of the Law of Ukraine "On ensuring commercial accounting of natural gas" by January 1, 2023, all natural gas consumers must be equipped with meters of gas. The Ministry of Energy on 14 January 2026 published a draft Law which provides for the postponement of this period to a period of seven years from the date of termination or abolition of martial law.

In addition, in accordance with Part 4 of Article 18 of the Law of Ukraine “On the Natural Gas Market”, the Ministry of Energy, within its powers, coordinates the implementation of a comprehensive analysis of long-term economic benefits and costs of implementing the latest systems, including hardware, for natural gas metering, in particular those that enable consumers to actively manage their own consumption and their optimal list. Based on the results of such an analysis, the same body approves a plan for implementing the selected set of measures. As of February 2026, the relevant comprehensive analysis has not been conducted. It should be conducted during 2025-2027.

At the same time, within the framework of the draft law for the transposition of the new EU legislation package in the field of natural gas (Gas Decarbonisation Package), new regulations regarding the installation of intelligent natural gas metering systems should be transposed (see **PM_IMG_WAM_01 Transposition of the new EU legislation package in the field of natural gas and hydrogen**).

PM_IMG_WAM_13 Creation of the system of commercial gas accounting

Goal: ensuring reliability in gas accounting

Legal basis: ESU, Law of Ukraine "On ensuring commercial metering of natural gas"

Time frame: 2024-2030

Type of policy / measure: Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations: Ministry of Energy, NEURC

Description: ESU envisages the creation of a Datahub by analogy with the electricity market to solve the problems of commercial gas metering and automate information exchange between natural gas market entities.

The creation of an information database on natural gas consumption is already provided for by Article 2-1 of the Law of Ukraine “On Ensuring Commercial Accounting of Natural Gas”. The Resolution of the Cabinet of Ministers of Ukraine No. 547 of May 13, 2025 (Official Gazette of Ukraine, 2025, No. 46, p. 3158) approved the Regulations on the Information Database on Natural Gas Consumption, and designated the state, represented by the Ministry of Energy, as the owner of the information database and exclusive intellectual property rights to its software and the holder of the information database, and the administrator of the information database - LLC “GTS Operator of Ukraine”. It is envisaged that the information database is created and operates with the funds of international financial assistance (grants), as well as other sources not prohibited by law. This is the first step towards creating an information database by analogy with the Datahub in the electricity market, as well as further development of an effective commercial accounting system.

Among other measures, it is necessary to integrate into the operation of the gas market a separate function of the commercial accounting administrator so that it is responsible for monitoring the application of the current commercial accounting rules and developing the necessary changes to them, coordinating the development of a methodological basis for forecasting in the natural gas market, having the authority to resolve or provide expert assessments to resolve technical problems between gas market entities, and being a legitimate source of data for suppliers, consumers and other players. This will be implemented as part of the transposition of the new EU natural gas legislation package

(see **PM_IMG_WAM_01 Transposition of the new EU natural gas and hydrogen legislation package**), which in particular provides for rules on consumer data management.

PM_IMG_WAM_14 Creating conditions for the use of contractual gas demand management practices

Purpose **:** creation of a mechanism for the management in gas demand

Legal basis **:** Art. 6 Law Ukraine "On the natural gas market"

Time frame: 2024-2027

Type of policy / measure: Contractual / Regulatory

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations: Ministry of Energy, NEURC

Description: The Law of Ukraine "On the Natural Gas Market" stipulates that market-based measures used to overcome a crisis situation at all levels include, in particular, the use of contracts, the terms of which provide for the interruption (suspension) of the actual supply of natural gas in certain cases. According to the EU/Energy Community acquis, when overcoming crisis situations, priority should be given to market-based measures (as opposed to non-market measures).

In order to increase the flexibility of the energy system, in particular to enable demand management by gas consumers, it is necessary to use the experience of countries such as France, which creates legislative conditions for the contractual practice of gas demand management. The experience of France consists of approving the necessary amendments to the legislative acts regulating gas market which enable the conclusion of contracts on contractual reduction of demand and their implementation as well as in the setting of the target of the % of consumers to be covered by this regime. According to the said rules, consumers have the right to enter into an agreement with the TSO/GDS for voluntary interruption of consumption. The legislation further details which consumers can exercise this right, as well as the procedure for verification by operator of the possibility to promptly reduce consumption. In this way, preparation is carried out, among other things, to counteract the negative consequences of crisis situations on the gas market.

For 2024-2027, appropriate practice should be studied and where necessary amendments to regulatory legal acts have to be adopted to provide the opportunity to conclude agreements on the interruption (suspension) of the actual supply of natural gas in certain cases.

3.4.4. Energy poverty
Where applicable, policies and measures to achieve the objectives set out in point 2.4.4

PM_IM_WAM_04 Activities for monitoring and overcoming energy poverty

Goal: reduction of the financial burden from market prices on energy resources for those households that need it most

Legal basis **:** ESU

Time frame: 2024-2030

Type of policy / measure: Fiscal / Regulatory / Informing / Teaching

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations **:** Ministry of Energy, NEURC, Ministry of Social Policy, State Statistics Committee

Description: ESU defines energy poverty as a situation where the cost of energy consumed by a household consumer constitutes a large part of their income, resulting in their inability to pay the cost of consumed energy and/or a decrease in its consumption and, in turn, negatively affects the quality of life. Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding the Implementation of the Norms of European Law on the Integration of Energy Markets, increase security supply and competitiveness in field energy" No. 4834-IX of 07.04.2026 introduces a definition of energy poverty at the legislative level, in line with Directive 2019/944 and the Energy Efficiency Directive: "limited access of individual household consumers to basic energy services that ensure a basic and decent standard of living and health, including adequate heating, hot water, cooling, lighting and electricity for electrical installations, in the relevant national context, existing national social policy and other relevant national policies, caused by a combination of factors including, at a minimum, inaccessibility, low income, high energy costs and low energy efficiency".

The same draft law stipulates that the assessment of energy poverty shall be carried out in accordance with the procedure established by the Cabinet of Ministers, and the assessment of energy poverty and the number of consumers in energy poverty shall be carried out taking into account the recommendations of the Energy Community Secretariat. The said draft law was adopted in the second reading by the Parliament in April 2026. Similar provisions should be provided for in the legislation on the natural gas market as part of the implementation of a separate policy (see **PM_IMG_WAM_01 Transposition of the new EU legislation package in the field of natural gas and hydrogen**).

The procedure for assessing the state of energy poverty should be developed during 2026. In addition to the procedure for assessing the state of energy poverty, as required by the Operational Plan of Measures for the Implementation of the Long-Term Strategy for Thermal Modernization of Buildings for the Period Until 2050 in 2024-2026, the following measures should be taken during 2025-2026:

- setting medium-term and long-term goals for reducing the number of people, who are below the energy poverty line, in particular, reducing the need for benefits and subsidies for housing and communal services;
- approval of a comprehensive plan of measures to overcome energy poverty, in particular by increasing the energy efficiency of buildings, taking into account the housing subsidy system.

A corresponding action plan should be provided for in the Roadmap for the Liberalization of Energy Markets, in particular in the context of the future fate of the PSO.

3.5. Dimension research, innovations and competitiveness

3.5.1. Policies and measures related to the elements set out in point 2.5

The implementation of programs in the field of energy decarbonization, green energy transition, hydrogen export, implementation of energy storage facilities, microgrids and smart grids, and projects in the field of green metallurgy require both large-scale retraining of existing employees in the energy sector and other related sectors, and the training of a new generation of specialists for the design, implementation, and operational activities of new projects in the energy sector and related sectors.

PM_RIC_WEM_01 Modernization of educational programs to cover the skills gap in the field of green transition and renewable energy

Goal: preparation specialists for new projects in energy and related sectors

Legal basis: Strategy for the development of the sphere of innovation activity for the period until 2030, Strategy for the digital development of innovation activity of Ukraine for the period until 2030

Time frame: 2024-2030 years

Type of policy / measure: Regulatory / Teaching

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / FFG / Waste / Other

Responsible bodies/organizations: Ministry of Education and Science, Ministry of Energy, Ministry of Digital Economy, National Commission for Energy and Utilities of Ukraine, National Power Company “Ukrenergo” (upon consent), higher educational institutions (upon consent)

Description: Post-war reconstruction of the energy sector using advanced technologies specified in the Government's strategic documents will require cooperation from the Ministry of Energy, MES, other stakeholders to create and modernize relevant educational programs in the higher and vocational education sector. Also, an urgent task is to modernize the material and technical support of scientific and educational institutions used to train specialists in the energy sector, and to create international partnerships in this direction.

Among the national strategic documents that prioritize the modernization of educational programs for the transition of the Ukrainian economy to a new level of development, the current Strategy for the Development of the Sphere of Innovation Activity for the Period Until 2030 includes the need to:

- creation of schools of experience exchange and national resources for entrepreneurship and innovation training, including a network of advanced training for both teachers and heads of higher education institutions and scientific institutions, involving global experts, mentors, the European Entrepreneurship Network (EEN);
- improvement qualities education by approximation its to needs global market and needs in specialists capable of creating, adapting and using technological innovations;
- ensuring state support for the creation and effective functioning of elements of innovation

infrastructure in higher education institutions, scientific institutions and other entities of innovation activity;

- ensuring state support for the creation and effective functioning of a continuous chain of startup schools - accelerators - business incubators based on higher education institutions and scientific institutions;
- promoting the creation of clusters that will unite industrial enterprises with vocational (professional) education institutions and with scientific institutions and higher education institutions.

The Strategy for the Digital Development of Innovative Activity in Ukraine for the Period Until 2030, among other things, includes the organization of advanced training programs for specialists working in the energy sector to support innovations in the field of green transformation. The document indicates as current task "engagement" leading international educational institutions, What have successful programs in the areas of distributed generation, energy decarbonization, artificial intelligence for energy, hydrogen energy, and other areas" to create joint educational courses and accredited educational programs.

The strategy provides for the creation of a center of competence for the use of artificial intelligence for energy security, effective dispatching and the development of "smart grids" in order to increase the efficiency and reliability of the energy sector, assist in the implementation of the Concept for the introduction of "smart grids" in Ukraine by 2035 (in terms of reducing energy losses, improving the quality of energy supply and ensuring sustainable development of the energy sector).

According to experts from the resource-analytical center "Society and Environment", the "green" vector of post-war reconstruction creates significantly more jobs than the "business as usual" approach. In the case of the "green" reconstruction scenario, these are also "green" jobs with a focus on climate and energy innovations.

Calculation of the need for jobs for the reconstruction of Ukraine under the baseline and green scenarios

Source: "Green jobs and post-war reconstruction of Ukraine"[109]

One of the biggest barriers to a green recovery after a lack of capital is a shortage of qualified personnel, which can only be partially covered by attracting external personnel resources. Therefore, human resource development is one of the priorities in the research, innovation and competitiveness sector.

PM_RIC_WAM_01 Development corporate and international partnerships for training of specialists

Goal: increase qualifications specialists for software application new technologies

Legal basis: ESU, Law "About scientific and scientific and technical activity"

Time frame: 2025-2030 years

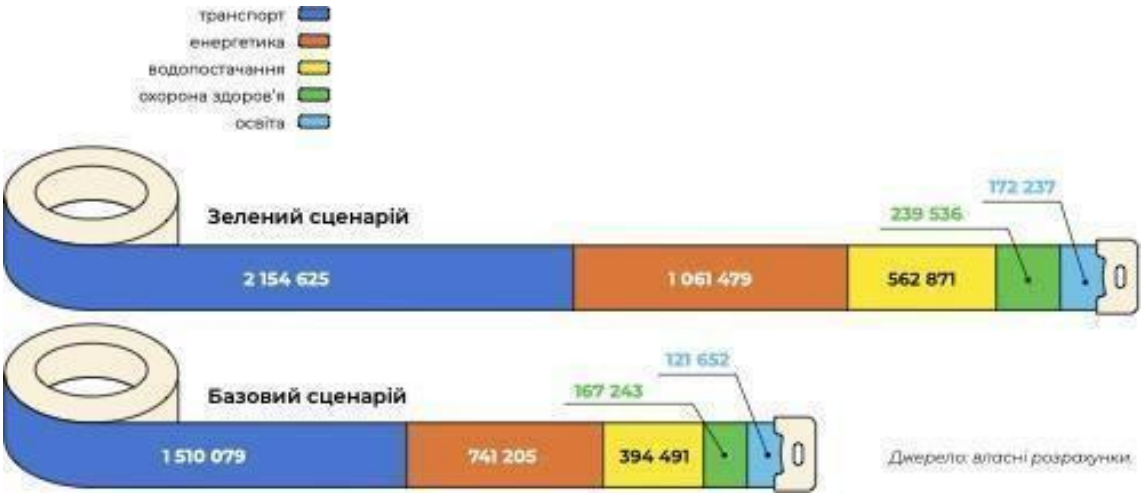
Type of policy / measure: Contractual / Informing / Teaching

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / FFG / Waste / Other

Responsible bodies/organizations: Ministry of Energy, Ministry of Education and Science, subjects

[109] Green jobs and post-war reconstruction of Ukraine. Andrusevych A., Andrusevych N., Kozak Z. Ptashnyk I., Romanko S. - Analytical document. - October 2023

entrepreneurial activities



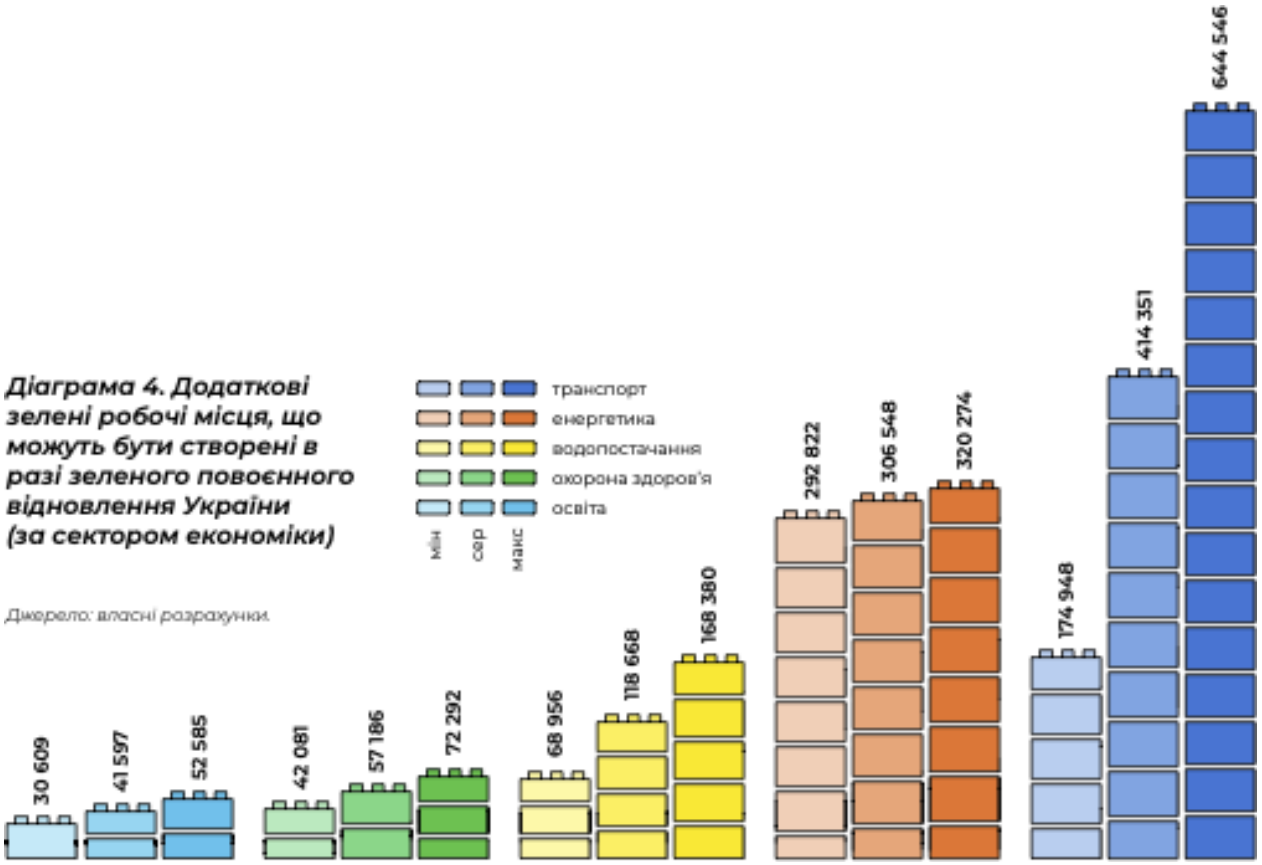
Description: Considering on big duration cycle preparation specialists for energy through system higher and professional education, extremely important there are task (together Ukrenergo, distribution system operators, NJSC Naftogaz of Ukraine, other players in the energy sector market state and private forms property) plan and embody advanced training programs for specialists working in the energy sector to ensure their ability to implement and operate projects in such areas as:

- Decentralized generation and micro- grids;
- Smart networks;
- Settings storage energy;
- Electrolyzers, synthesis hydrogen, safe storage and transportation hydrogen;
- Green ammonia, its production, storage and transportation;
- Energy efficiency and energy efficient construction;
- Cybersecurity in energy systems, and others.

The implementation of such training programs will require both state funds and funds from international donors and international financial organizations. and energy sector companies.

To accelerate the launch of specialized educational programs, it is important to involve leading international educational institutions that have successful programs in the areas of distributed generation, energy decarbonization, artificial intelligence for energy, hydrogen energy, and other areas defined by the Government's strategic documents in the creation of joint educational courses and accredited educational programs. Also an effective tool access to advanced knowledge in field energy modernization there are programs exchange and academic mobility.

Possible dynamics of innovative creation workers places at different Recovery scenario under the baseline and green scenarios



Source: "Green jobs and post-war reconstruction Ukraine"

Special attention will be required to modernize the training of specialists in the field of nuclear energy, because the introduction of small modular reactor technologies and reactors with the ability to maneuver power will be based on a different culture of operation and management, a different technological base than the Soviet-style reactors built in Ukraine.

PM_RIC_WEM_02 Availability of grant funding for scientific research in the field of renewable energy and climate innovation

Goal: development scientific research cooperation

Legal basis: Law of Ukraine "On Priority Areas of Innovation Activity in Ukraine", Law of Ukraine "On Scientific and Scientific-Technical Activity", Resolution of the Cabinet of Ministers of Ukraine dated July 4, 2018 No. 528 "On the National Research Fund of Ukraine" (Official herald Ukraine, 2018 r., No. 55, Art. 1915), Law Ukraine "About priority directions of development of science and technology", Procedure for forming the topics of scientific research and scientific and technical (experimental) developments financed from the state budget, approved by the resolution of the Cabinet of Ministers of Ukraine dated January 11, 2018 No. 13 (Official Gazette of Ukraine, 2018, No. 3558, p. 313).

Time frame: 2021-2030 years

Type of policy / measure: Economic / Informing

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / FFG / Waste / Other

Responsible bodies/organizations: National stock research Ukraine, Ministry of Education and Science, Ministry of Energy, Ministry of Economy

Description: In accordance with Article 5 of the Law of Ukraine "On Priority Areas of Development of Science and Technology", the list of priority thematic areas of scientific research and scientific and technical developments for the period until December 31 of the year following the termination or the abolition of martial law in Ukraine, approved by the Resolution of the Cabinet of Ministers of Ukraine dated April 30, 2024 No. 476 (Official Gazette of Ukraine, 2024, No. 43, p. 2613). Among them is the direction "Energy and Energy Efficiency" with the following topics:

- Systems generations and transportation electric and thermal energy;

- Fuel bases, systems transportation and using;
- Technologies development and using new species fuel, renewable and alternative energy sources and fuels;
- Energy efficiency and energy saving, markets energy resources;
- Energy management, information and analytical and normative and methodological ensuring the energy industry.

At the same time, the thematic area “Ecologically balanced energy security” has been included in the direction “National security and defense”, and related topics have been recorded in the directions “Information and communication technologies” and “Rational use of nature”.

According to Part Five of Article 5 of the Law of Ukraine “On priority areas of innovation activity in Ukraine” The Cabinet of Ministers of Ukraine, by its resolution No. 1056 dated December 28, 2016, approved medium-term priority directions innovative activities at the national level for the period until December 31 of the year following the termination or abolition of martial law in Ukraine (Official Gazette of Ukraine, 2017, No. 8, p. 237). Among them is the direction “Development of new energy transportation technologies, introduction of energy-efficient, resource-saving technologies, development of alternative energy sources” with the following topics:

- Systems generations and transportation electric and thermal energy;
- Fuel bases, systems transportation and using;

- Technologies development and using new species fuel, renewable and alternative energy sources and fuels;
- Energy efficiency and energy saving, markets energy resources;
- Ecologically balanced energy security.

Relevant topics are recorded in the areas of “Wide application of cleaner production and environmental protection technologies”, “Development of modern information and communication technologies, robotics”.

A significant part of the technologies, the implementation of which is planned in the relevant government program documents, are still in the phases of scientific research or experimental operation. The development of international cooperation in energy science, innovative metallurgy, and other sectors is an important direction for overcoming the technological gap that has been characteristic of the sector over the past decades.

The status of a candidate country for accession to the European Union provides additional opportunities for access to the European innovation and scientific ecosystem, which, in particular, provides for significant funding mechanisms for energy and climate science, including in the areas of decarbonization, green hydrogen, distributed generation, cybersecurity, and other relevant areas.

The creation of the Horizon Europe Office in Ukraine on the basis of the National Research Foundation of Ukraine (NRFU)[110] opens up new opportunities for cooperation between Ukrainian researchers, scientists, innovative enterprises and ecosystem organizations with European research, science and innovation centers and institutions such as the European Innovation Council, the European Institute of Technology and Innovation, Euratom. With a budget of €95.5 billion for 2021-2027, the European Union's Framework Programme for Research and Innovation "Horizon Europe" is a powerful source of funding for research cooperation of European innovators, and has among its key priorities (as part of Pillar II) the direction "Climate, Energy, Mobility". It is expected that the direction of green transformation will be among the priority areas of grant programs that the National Research Fund will implement in cooperation with the EU Framework Programme for Research and Innovation "Horizon Europe".

The existing grant programs of the National Research Fund, which provide, in particular, grants of up to 50,000 / 100,000 euros for scientific projects of Ukrainian researchers, are also a significant mechanism for financing research and innovation projects relevant to the decarbonization and modernization of the Ukrainian energy sector.

PM_RIC_WAM_02 Expanding funding for research in renewable energy and climate innovation

Goal: involvement knowledge and technologies for overcoming technological rupture

Legal basis: Law “On Scientific and Scientific-Technical Activities”, Resolution of the Cabinet of Ministers of Ukraine dated July 4, 2018 No. 528 “On the National Research Fund of Ukraine” (Official Gazette of Ukraine, 2023, No. 72, p. 4114, 2023, No. 77, p. 4357)

Time frame: 2025-2030 years

Type of policy / measure: Economic / Contractual / Other

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / FFG / Waste / Other

Responsible bodies/organizations: National stock research Ukraine, Ministry of Education and Science, Ministry of Finance, Ministry of Energy, Ministry of Economy

Description: NFDU contributes construction scientific connections between Ukrainian and foreign research institutions, What relevant for development modern directions energy and climate science. However, to achieve a tangible effect in energy and climate research, it is necessary There is a significant increase in funding, according to expert estimates, up to at least 250 million euros per year.

In this direction, the development of scientific and research diplomacy with key partner countries for Ukrainian energy and green reconstruction is important. In addition to the European Union, key partners in this direction can be the United States of America, Great Britain, Japan, South Korea,

[110] https://nrfu.org.ua/news/vidbulasya-urochysta-czeremoniya-vidkryttya-ofisu-goryzont-yevropa-v-ukrayini/

Scandinavian countries, Switzerland and other leading countries in the field of energy innovation and green transformation.
Collaboration with the listed partners in the field of energy research and innovation will allow to attract critical knowledge and technologies to overcome the technological gap in the sector. Also, joint projects with them create a basis for further attracting funding for research and innovation in the field of energy and climate.

The ambitious plans declared by the Government of Ukraine in the field of development of renewable energy, hydrogen energy, localization of production of energy equipment, localization of production of small modular reactors and fuel assemblies for nuclear power plants and other areas are extremely science-intensive and require the formation of a new research and innovation ecosystem. For full deployment, the need for financing of research and innovation activities will be from 750 million euros per year.

The scale of the challenges facing Ukraine in the context of developing research and innovation in the context of energy and climate are not unique. These challenges face all countries, that are restructuring their economies to become carbon neutral. According to the IEA's ETP Clean Energy Technology Guide, there are currently over 550 innovative technologies and components "that are pervasive throughout the energy system, contributing to the goal of zero emissions"[111].

PM_RIC_WEM_03 Development of corporate investments in the purchase of climate technologies and renewable energy solutions

Goal: creation favorable conditions for investment

Legal basis: -

Time frame: 2024-2030 years

Type of policy / measure: Contractual / Informing / Teaching / Other

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / LLP / Waste / Other

Responsible bodies/organizations: Ministry of Economy, Ministry of Energy, Ministry of Economy, other stakeholders

Description:

Increase energy efficiency industry

Reducing industrial energy consumption per unit of GDP in Ukraine is an important reserve in decarbonization, energy security, and enabling the export of energy resources as one of the growth items of the Ukrainian economy.

Outdated production base, lack of adequate energy management mechanisms, high cost of capital for capital investments reduce the competitiveness of Ukrainian enterprises on international markets, especially considering on implementation mechanisms CBAM (Carbon Border Adjustment Mechanism).

Solving this challenge is possible by stimulating businesses that implement energy-efficient solutions and modern standards for the construction of production complexes (for example, BREAM) by score financial tools (compensation percent by loans, targeted subsidies), tax mechanisms (tax breaks for the import or production of energy-efficient equipment and technologies) and the introduction into the regulatory framework of new building standards, consistent with European regulations on energy-efficient construction, with appropriate confirmation and certification mechanisms.

Also an important task for competitiveness through efficiency are training programs for owners and management of enterprises, modernization of relevant training programs in the higher and vocational education system, and holding relevant communication and educational events.

One of the drivers of energy efficiency is also the desire of business owners to ensure energy security and continuity of enterprise operations through the development of their own generation against the backdrop of Russian attacks on Ukrainian Unified Power System facilities.

Green chemistry

The direction of "green chemistry" is an important component for the implementation of decarbonization and green transition projects, because the development of research and development in this area is necessary for the processing of waste and biomass, for the production of biomethane and "green ammonia", green products of basic chemical synthesis (synthesis gas, methanol, propylene,

[111] ETP Clean Energy Technology Guide https://www.iea.org/data-and-statistics/data-tools/etp-clean-energy- technology-guide

butylene, etc. to replace fossil raw materials).

Research in the field of green chemistry is also necessary for the low-carbon modernization of the oil industry, the capture, storage and conversion of carbon dioxide (in particular, into biomethane), the development of new solutions in the field of hydrogen technologies and energy efficiency.

Green transformation and climatic adaptation agricultural sector

The full-scale invasion of Ukraine by the Russian Federation not only destroyed two the largest metallurgical enterprises of Ukraine (PJSC "MK "Azovstal" and PrJSC "MMK named after Ilyich"), but also caused extreme damage to the most important sector of Ukrainian exports - the agricultural industry. Blocking sea export routes, Systematic attacks on grain storage facilities and processing plants, occupation and destruction of a large part of agro-processing, seizure and mining of arable land, destruction of irrigation systems due to the explosion of the Kakhovka hydroelectric power station dam, environmental crimes of the Russian occupiers led, in addition to huge human casualties, to the loss of jobs, foreign exchange earnings in Ukraine, reduction of sales markets, and general pessimism of agricultural enterprise owners.

In addition, agricultural enterprises in southern Ukraine are suffering from climate change and are increasingly dependent on artificial irrigation of land, suffering from anomalous climatic conditions. phenomena and the emergence of invasive species, which reduces the productivity of agricultural enterprises, increases their capital costs and limits the possibilities of attracting capital to this sector.

On the other hand, the development of bioenergy, biomethane and bioethanol production, the active introduction of agrovoltaics and precision farming and point irrigation technologies can provide Ukrainian farmers with new opportunities for export, ensure their energy self-sufficiency by switching vehicles and land cultivation equipment to biofuels of their own production, and reduce greenhouse gas emissions from land use. and the dependence of agricultural production on artificial irrigation. Given the capital intensity of implementing climate-friendly agro-innovations, an important area, in addition to research and development, is ensuring the availability of financing through interest compensation programs, tax incentives, grant programs from state partners and international financial organizations.

Technologies withdrawal and preservation dioxide carbon

Given the current structure of generation and industry in Ukraine, long cycles of green transformation of the economy, rapid implementation of carbon dioxide capture, storage and processing systems are a significant factor in the decarbonization of the economy. Available research and technological base technologies withdrawal and storage CO2 in Ukraine is staying on at an embryonic level, therefore, stimulating research in this area and implementing relevant technologies is an important element of reducing emissions in the near future.

Technologies artificial intelligence for energy

The growth of the share of renewable sources in the Ukrainian energy mix, the development of decentralized generation, the need to implement demand-side response solutions, the spread of energy storage installations, microgrids and smart grids will require speed. solutions that will often be unavailable to dispatchers of the Integrated Power System of Ukraine. Artificial intelligence should come to the aid of human intelligence in this area, ensuring both frequency stability and prompt response to dynamic changes in the power system, as well as protection against cyber threats and cyber attacks on the power grid, which will remain relevant for a very long time. Supporting innovations in this area and their responsible implementation will help increase the flexibility of the power system and create new, dynamic mechanisms for responding to challenges. In the future, the development of artificial intelligence systems for the energy sector together with new pricing mechanisms can create conditions for the active development of virtual power plants technologies and the integration of small distributed energy assets into the power system.

Innovation leapfrogging / innovative jump

In Ukraine, the capacity for innovative sectors was demonstrated primarily by those sectors that were less dependent on the legacy of past investments and complex state regulation.

It is precisely due to the fact that Ukraine has practically "skipped" the stage of development of Internet networks based on telephone networks and DSL technology that we have the fastest and cheapest Internet services sector in Europe.

A sufficiently high-quality education system and the lack of government regulation (and the practical absence of a domestic market) contributed to the launch and rapid growth of the IT services industry, the third largest Ukrainian export industry.

The absence of the tradition of paper bills and the electronic banking clearing system created in the 1990s enabled extremely fast and cheap banking transactions and launched Ukrainian digital banks.

Transition to informational technologies certification persons gave possibility launch e-passport and e- passport for traveling abroad, driver's license and many other electronic public services on the Unified State Web Portal of Electronic Services, which is held by the Ministry of Digital Affairs.

Innovation leapfrogging becomes possible in sectors where the system Innovation skips several stages of development, overcoming regulatory restrictions and taking advantage of the availability of the latest solutions, which have gone from exclusive to mass.

This opportunity also exists for the Ukrainian energy sector, as many technologies in the areas of smart grids, micro-grids, energy storage installations, renewable energy, and consumption data metering and transmission systems have improved significantly over the past decade, while radically decreasing in pFig. And where the price drop is insufficient, mass production of certain solutions can trigger economies of scale and reduce the cost of these innovations.

PM_RIC_WEM_04 Competitiveness of the Ukrainian economy and key industrial clusters against the background of the implementation of EU legislation in the field of energy labeling and ecodesign

Goal: mitigation negative consequences from changes regulatory bases

Legal basis: ESU, Law of Ukraine "On priority areas of development sciences and Technology", Procedure for forming the topics of scientific research and scientific and technical (experimental) developments financed from the state budget (approved by the Resolution of the Cabinet of Ministers of Ukraine dated January 11, 2018 No. 13)

Time frame: 2025-2030 years

Type of policy / measure: Economic / Informing / Research / Other

Sector(s) affected: Energy - supply / Energy - consumption

Responsible bodies/organizations: Ministry of Economy, Ministry of Energy, State Agency for Energy Efficiency, other stakeholders

Description: Adoption and alignment of technical regulations applied in the energy sector with EU legislation, adaptation of Ukrainian legislation in the field of energy labeling and ecodesign to EU legislation, formation and approval of national standards, methodological recommendations for the application of technical regulations opens up new opportunities for the Ukrainian economy, but at the same time creates significant challenges for Ukrainian producers, in particular key enterprises and production facilities. clusters of traditional industries.
Changes to key standards and technical regulations governing the production of equipment, technologies, and materials for the energy, construction, metallurgical, agricultural, and other sectors will require Ukrainian enterprises to make significant investments in employee training, adjusting production and business processes, implementing new production standards, and conducting conformity assessment. In some cases, this may require significant modernization of production facilities and a long shutdown. production.

Maintaining the competitiveness of Ukrainian industry and mitigating economic stress from changes in the regulatory framework requires active informing economic entities about the process of changes, wide deployment of training programs and their financial support (in particular, from the state budget and international donors), financial and tax incentives for the modernization of production capacities of companies operating in this market.

It is also important to have a clear planning a transition period between the current and new technical regulations in order to provide economic operators with sufficient time for such a transition.

Effective changes to the system of standards and technical regulations can create new export sectors of the Ukrainian economy and compensate for the loss of traditional markets with post-Soviet standards.

In accordance with Article 5 of the Law of Ukraine "On Priority Areas of Development of Science and Technology", by Resolution No. 476 of April 30, 2024, the Cabinet of Ministers approved a list of priority thematic areas of scientific research and scientific and technical developments for the period until December 31 of the year following the termination or abolition of martial law in Ukraine. Among them is the area "Fundamental scientific research on the most important problems of developing scientific and technical, socio-economic, socio-political, human potential to ensure the competitiveness of Ukraine in the world and the sustainable development of society and the state". Topics in this area include, among others:

- Fundamentals problems physics, astrophysics, materials science, atomic energy and radiation safety;
- Fundamental research in Earth sciences and geoecology problems, Fundamental principles of functioning and adaptation of biological systems (flora and fauna) of different levels of organization under the influence of various external factors - in essence, we are talking about research in the field of adaptation to climate change;
- National interests of Ukraine in the context of geopolitical problems of the modern globalized world and the formation of a new international legal order;
- Forecasting current challenges and threats to the development of the economy and its sectors in medium and long term perspective;
- Harmonization of the interests and needs of the individual with the demands of society on the labor market, dual education, forecasting of qualifications and competencies required for the labor market in Ukraine in the medium and long term.

Relevant topics are recorded in the direction of "New substances and materials" - in particular, "New resource-saving, energy-saving and environmentally friendly processes for obtaining competitive substances and materials and products from them". A similar topic is included in the medium-term priority areas of innovation activity at the national level for the period until December 31 of the year following the termination or abolition of martial law in Ukraine (resolution of the Cabinet of Ministers of Ukraine dated December 28, 2016 No. 1056 in editorial staff resolutions Cabinet Ministers Ukraine from 1 March 2024 No. 220).

PM_RIC_WAM_03 Active involvement venture capital investment in companies sector climate innovation and renewable energy

Goal: creation favorable conditions for investment

Legal basis: -

Time frame: 2025-2030 years

Type of policy / measure: Informing / Other

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / FFG / Waste / Other

Responsible bodies/organizations: Ministry of Economy, Ministry of Energy, others stakeholders

Description: The Ukrainian venture capital sector has strengthened and supported many breakthrough companies in various sectors, but its key focus remains innovation in the software and IT sectors. If we compare the energy solutions sector with IT, it is much more capital-intensive, has longer investment return cycles, and is riskier due to the high level of regulation in the sector.

Today, most companies that have successfully attracted venture capital investments in the energy and climate innovation sector operate primarily in export-oriented markets. Among Ukrainian venture capital funds, which have in to his/her portfolio investments in
"green startups", investors such as Startup Network, SMRK Venture Fund, Angel One Fund and Vesna Capital. Capital volume and deal value in the IT-centric startup market in Ukraine an order of magnitude larger.

However, this trend is not unique, as in the global venture capital markets, the key players in the energy and climate sector are not so much traditional venture capital funds as corporate funds and accelerators. Thus, among the companies that have invested the most in "green startups", such giants as Shell Technology Ventures and BP Ventures, the Bright Technology Coalition / Bright Technology Ventures created by Bill Gates actively invests in the sector, Khosla Ventures of IT entrepreneur Vinod Khosla is actively working in the sector, and functions many narrowly focused funds different sizes, such as Amazon's Cleantech Fund, Braemer Energy Ventures, Chrysalix Venture Capital, Emerald Ventures, Lowercarbon Capital, InveN Capital, Ecosummit Ventures and others.

As for acceleration services for green startups, the global trend in this area is either to form corporate accelerators (such as e.On agile by German energy giant e.On or TechX Clean Energy Accelerator, created jointly by the Scottish city of Aberdeen and companies involved in oil and gas production in the North Sea), or to partner leading accelerator networks with corporate partners (for example, the

creation of TechStars Energy in cooperation with the Norwegian corporation Equior or the RockStart Energy Program together with Shell, Orsted, Alliander and CEZ Group).

Given the leading world experience, the development of venture financing for the energy sector is possible on the basis of existing mechanisms, for example, the creation of profile grant programs of the Ukrainian Startup Fund, which operates at the pre-seed stage, as well as stimulating the creation of corporate programs for the development of innovations in the energy sector. sector and the launch of corporate accelerators by Ukrainian businesses, and active involvement of international venture funds and accelerators in Ukraine that focus on climate and energy areas.

PM_RIC_WAM_04 Development of export of climate technologies and renewable energy technologies

Goal: development competitive production energy equipment

Legal basis: NES, ESU

Time frame: 2025-2030 years

Type of policy / measure: Economic / Informing / Other

Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / LLP / Waste / Other

Responsible bodies/organizations: Ministry of Economy, Ministry of Energy, others stakeholders

Description: The program documents of the Government of Ukraine envisage a transition to domestic production of technologies and equipment for the energy sector, from transformers to elements of wind power plants and floating platforms of wind power plants. This ambitious task requires significant capital investment and effective public-private partnership. Given the state of many enterprises in the energy sector, the obsolescence of many technological developments and production base, effective development of competitive production of energy equipment is possible provided that:

- Development enterprises, oriented as on internal, EU and on export markets
- Using a base of technologies and standards that are compatible with the requirements of EU regulations and other potential markets
- War risk insurance and the introduction of special security standards for such enterprises (in particular, inclusion in the list of critical infrastructure facilities) and the creation of areas of reinforced protection by air defense systems)
- Involvement of leading international concerns in organizing such production in Ukraine
- Introduction of modern corporate governance standards for state-owned enterprises, their rehabilitation and restoration of profitability
- Privatization of state-owned enterprises, the resumption of which has become impractical due to the suspension of production and technological lag.

Since the Government's program documents also allow us to conclude that such equipment needs to be designed in Ukraine, it is necessary to provide advanced training programs for relevant specialists and modernize educational programs for energy equipment engineers, attract foreign specialists, and license technologies from leading international manufacturers for production in Ukraine.

The speed of launching and scaling such production will be a priority for the restoration of Ukraine's energy sector, which in some cases will require unpopular solutions: the creation of new modern flexible ones instead of attempts to revitalize the giants of the past.

PM_RIC_WAM_05 Assistance competitiveness small and average business through green transformation and access to new markets

Goal: increase competitiveness small and medium business (SMB) and the ability to integrate into supply chains of climate-friendly products

Legal basis: National Economic Strategy for the period until 2030, Strategy for the Development of Industrial Parks for 2023-2030, Strategy for the Recovery, Sustainable Development and Digital Transformation of Small and Medium-Sized Enterprises for the period until 2027

Time frame: 2025-2030 years
Type of policy / measure: Economic / Informing / Teaching / Other
Sector(s) affected: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture / LLP / Waste / Other
Responsible bodies/organizations: Ministry of Economy, Ministry of Finance, others stakeholders

Small and medium-sized businesses are among the most dynamic players in the Ukrainian economy in terms of creating new jobs and developing new products and services. However, SMEs are also quite vulnerable to war and post-war challenges, and therefore require measures to support competitiveness and economic stimulation.

Given the challenges facing the Ukrainian economy in the context of the full-scale invasion of Ukraine by the Russian Federation, important priorities for the preservation and development of small and medium-sized businesses may coincide with steps aimed at the green transformation of business, in particular:

- Promoting energy security for businesses through renewable sources and energy innovations, including energy storage systems, smart grids, and microgrids ;
- Encouraging access to export markets that set high climate and environmental standards for entrance (in particular, CBAM) and integration in relevant supply chains through training, certification and promotional initiatives;
- Stimulating the reduction of energy consumption and emissions - in particular, through ESCO mechanisms;
- Supporting technological modernization of production facilities and improving environmental standards of production facilities through access to “green” financing, interest reimbursement programs on commercial loans, and grant programs;
- Promoting the implementation of technological regulations in the field of energy, emissions and climate, provided for by the EU regulatory framework and developing relevant capacities in the SME sector;
- Increase resource efficiency and implementation principles circular economy;
- Development models industrial symbiosis (industrial symbiosis on based on industrial parks and cluster mechanisms
- Development common production and technological infrastructure for sharing of technological resources by small and medium-sized businesses.

Among the tools and measures that can support the development of small and medium-sized businesses, in parallel with the decarbonization of the economy, in particular the reduction of greenhouse gas emissions per unit of GDP:

- Development of financial products aimed at supporting the “green transition” of small and medium-sized businesses, their implementation of energy and resource-efficient technologies production. In addtiion to "green" credit products, leasing products, refinancing of existing loans and focused grant programs for SMEs can also be effective in this area. An important factor is the maximum simplification of the procedures of such financial programs, the digitalization of all processes and the maximum reduction of decision-making times.
- Development of business infrastructure for SMEs in the form of eco-industrial parks[112], which will allow small and medium-sized businesses to gain access to technologies, best practices,

[112] Eco-Industrial Parks: Creating Shared Prosperity And Safeguarding The Environment, UNIDO, 2016 https://downloads.unido.org/ot/42/49/4249024/UNIDO_EIP-brochure_high-res_15June.pdf

and financing, and reduce environmental damage from their activities[113] .

The creation of eco-industrial parks is in line with the Strategy for the Development of Industrial Parks for 2023-2030, and a favorable regulatory framework in the energy sector can help industrial parks provide resident businesses with electricity through their own generation, in particular from renewable sources.

The Strategy for the Recovery, Sustainable Development and Digital Transformation of Small and Medium-Sized Enterprises for the Period up to 2027 also provides for the support of sustainable practices for ensuring the "green transition" and ecological modernization of SMEs, in particular by financing energy-efficient investments and creating eco-industrial parks. In addition, the document speaks of the need to stimulate the use of practices circular economy, which will contribute to increasing resource intensity and competitiveness of business. Among tasks for the implementation of this The operational objective of the Strategy mentions:

- development of an online tool for SMEs' self-assessment of their carbon footprint based on developed national emission factors and generally accepted international approaches, standards and methodologies;
- launching preferential lending programs for enterprises that meet the criteria of the EU Green Taxonomy (or equivalent national taxonomy if approved), in particular for distributed generation projects, energy storage produced using low-carbon technologies;
- launching a program to conduct energy audits and provide subsidies to increase energy efficiency for micro and small businesses;
- information and educational campaigns for SME representatives on the issues of the "green transition", experience in deploying renewable energy sources, as well as the introduction of sustainable development reporting standards,
- conducting seminars and other capacity-building activities on the implementation of circular business models and the "green transition", developing training programs and materials.

PM_RIC_WAM_06 Restoration of the effect and alignment with EU practices of state aid rules for economic entities

Goal: ensuring transparency and efficiency in the provision, reporting and monitoring of state aid by state aid entities, which will contribute to increasing competitiveness in the field of innovation

Legal basis: Law of Ukraine "On State Aid to Economic Entities", Plan of Ukraine (approved by the order of the Cabinet of Ministers dated 18.03.2024 No. 244-r)

Time frame: 2025-2027 years

Type of policy / measure: Economic / Regulatory

Sector of influence: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture

Responsible bodies/organizations: Ministry of Economy, AMCU

Description: This policy aims to restore the full operation of state aid rules for business entities in Ukraine. Despite significant progress in this area after 2014, in connection with the full-scale invasion of the Russian Federation into Ukraine, certain legislative provisions were suspended. This decision was temporary in nature, but it created significant obstacles to ensuring transparency and effective monitoring of state aid, as well as to the development of fair competition in many sectors of the economy. The most noticeable consequences were in the energy, industry and transport sectors, where state support without proper control can distort the market environment.

In order to gradually restore the system, the AMCU has already prepared and approved a draft law on the restoration of partial provisions of the current legislation. At the same time, the ultimate goal is not only a return to the previous mechanisms, but also the construction of an updated, more effective system of state aid that will meet the modern needs of the economy and European standards. This involves not only stricter control over the provision of assistance, but also increasing the transparency of reporting, a clearer assessment of the effectiveness of support, as well as the application of principles enshrined in EU practice.

The reinstatement of state aid rules is of critical importance for Ukraine in the medium term. First, it

[113] Regional policies and eco-industrial development: The voluntary environmental certification scheme of the eco-industrial parks in Tuscany (Italy), Journal of Cleaner Production, April 2015 https://www.researchgate.net/publication/275634947

will contribute to increasing the competitiveness of enterprises, especially in the areas of innovation and energy transition, where justified and transparent state support can become a catalyst for structural reforms. Second, the full integration of the state aid system with EU law is a prerequisite for Ukraine's path to membership in the European Union. Therefore, the implementation of the policy will simultaneously strengthen investor confidence, minimize the risks of market distortions and ensure compliance with European state aid requirements.

According to Articles 262-264 of the Association Agreement with the EU, any aid that distorts or threatens to distort competition must meet the compatibility criteria and be applied taking into account the EU acquis, the case law of the Court of Justice of the EU and relevant secondary legislation. In this context, it will be important to bring the practices application of state aid rules in line with the updated framework adopted by the European Commission under the Clean Industrial Deal State Aid Framework (CISAF). The main objective of this framework is to create a transparent and predictable system that will incentivise investments in the decarbonization of key sectors of the economy and at the same time will ensure competitive conditions for reducing energy costs. A key element is the possibility of providing temporary assistance to energy-intensive enterprises to reduce electricity prices, combined with mandatory obligations to invest in the decarbonization of production. This will support the competitiveness of Ukrainian industry and avoid deindustrialization, while directing public resources to accelerate the transition to a climate-neutral economy. The CISAF rules provide for the use of competitive procedures, aid intensity limits and transparency mechanisms, which makes it impossible to create privileged conditions for individual entities. This is important for Ukraine in the context of integration into the EU internal market and the implementation of state aid control obligations.

Additionally, new rules allow combining national support with funding The EU, which opens up opportunities for attracting external resources to large-scale projects for the development of renewable energy, decarbonization of transport, and industrial processes.

PM_RIC_WAM_07 Creation of a monitoring system for fossil fuel subsidies and mechanisms for their gradual reduction

Goal: Regularly track the dynamics of fossil fuel subsidies in Ukraine, linked to mechanisms for gradual reduction and phasing out of such subsidies in favor of supporting decarbonization

Legal basis: Budget Code of Ukraine, Tax Code of Ukraine, Law “On Antimonopoly committee Ukraine", order Cabinet of Ministers from 1 August 2012 year No. 692- r
"On approval of the list of quasi-fiscal operations and authorities (departments) responsible for assessing the possible impact of such operations on budget indicators"

Time frame: 2025-2027 years

Type of policy / measure: Economic / Regulatory / Other

Sector of influence: Energy - supply / Energy - consumption / Transport / Industrial processes / Agriculture

Responsible bodies/organizations: Ministry of Economy, Ministry of Energy, Ministry of Finance, AMCU

Description: The measure envisages the creation of a monitoring system for all types of subsidies for fossil fuels in Ukraine and the introduction of transparent mechanisms for their gradual reduction (phase-out). This concerns not only direct budget expenditures in the form of subsidies or compensations, but also and about indirect tools, including quasi-fiscal transactions, tax benefits, regulatory rules (e.g., fixed prices) or cross-subsidization.

The European Commission regularly publishes reviews of energy and environmental subsidies, including fossil fuel subsidies[114], and uses this data to inform policy to reduce perverse incentives and shift resources towards decarbonisation. EU practice shows that systematic accounting and monitoring of such subsidies is a critical prerequisite for ensuring transparency in energy policy and achieving climate goals.

For Ukraine, the introduction of such a system will allow for the first time to obtain a complete and verified picture of state support for fossil fuels (see section 4.6.4. regarding the attempt to systematize

[114] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0017

energy subsidies in previous years). This is especially relevant in conditions where some subsidies are hidden and implemented through state-owned enterprises or regulatory mechanisms, which is not always reflected in budget statistics.

Such monitoring can be carried out **on the basis of data and reporting by the AMCU in the field of state aid control**. The development of a regulatory and methodological framework for such monitoring should be the task of the Government, in particular the Ministry of Economy with the participation of the Ministry of Finance, the Ministry of Energy and other central government agencies. It will be important to use the current list of quasi-fiscal transactions and update approaches to their assessment taking into account modern challenges.

The next step after the introduction of transparent accounting should be to create mechanisms for the gradual reduction of such subsidies, with clear deadlines and sectoral benchmarks. The released resources can be directed to support energy efficiency programs, the development of renewable energy sources, innovative technologies for reducing GHG emissions, and social protection of vulnerable consumers. It is important that the transition away from fossil fuel subsidies does not worsen the country's energy security and ensures stable access to energy for consumers.

3.5.2. Where applicable, cooperation with other Contracting Parties and/or Member States of the European Union in this area

See. above (section 3.5.i), in particular PM_RIC_WAM_01 Development corporate and international partnerships for training specialists in the energy and climate sector.

3.5.3. Where applicable, financing measures in this area at national level

Today, several grant programs are being implemented in Ukraine with the help of international donors and international financial organizations to support enterprises that create and implement climate and energy innovations. Among such programs is the EBRD project, funded by the EU

"Climate Innovation Vouchers", USAID's "Competitive Economy of Ukraine" program, European Innovation Council project "Seeds of bravery" and others.

These programs and projects provide significant assistance to Ukrainian small and medium-sized businesses, but the scale of support they provide is not attractive to large enterprises due to funding limitations (up to 50/100 thousand euros) and significant efforts to administer such grants.

Increase sum grant support in this field possible by score expansion possible pool of donors, attracting co-financing from the state budget, as well as reducing business expenses through mechanisms for subsidizing the lease of state property, creating and accessing technology and equipment parks, leasing equipment, and other tools to support grantors of such programs.

Another important tool for the development of energy sector enterprises that contribute to decarbonization and green transition can be financial innovations in the field of green banking and the formation of relevant financial products (credit, leasing, export) with the involvement of financing from international financial organizations to increase the availability of financing and reduce the cost of capital.

In particular, see above (section 3.5.1), PM_RIC_WEM_02 Availability of grant funding for research in renewable energy and climate innovation, PM_RIC_WAM_02 Expansion of research funding in renewable energy and climate innovation, PM_RIC_WEM_03 Development of corporate investment in the purchase of climate technologies and renewable energy solutions.

SECTION B. ANALYTICAL BASIS

4. CURRENT SITUATION AND PROJECTIONS WITH EXISTING POLICIES AND MEASURES

4.1. Projected evolution of main exogenous factors influencing energy system and GHG emission developments

The full-scale invasion of the Russian Federation into Ukraine caused significant damage to the country's economy, leading to population migration, destruction of production infrastructure, a decline in business activity and, as a result, a decrease in the quality of current statistical information and increased uncertainty about the paths of post-war recovery. Accordingly, modeling and forecasting for the NECPwere carried out in conditions of limited statistical information and access to official information, a high degree of uncertainty about the conditions and timing of the end of hostilities, and high dynamism and unpredictability of the development of the situation in the field of national and regional security.

In general, the prospective demand for energy, the resource and technological structure of meeting this demand, as well as the corresponding dynamics of GHG emissions are determined by macroeconomic factors, such as gross domestic product (GDP), industry output or value added, investment volumes, the number and structure of the population, etc. Meanwhile, the probability of the implementation of economic processes and, accordingly, the fulfillment of economic forecasts currently depend largely on the course of events on the front, the intensity and geography of hostilities and their consequences, the presence of attacks on critical infrastructure, and other factors of a full-scale war that cannot be predicted. Under such conditions, the presented forecast estimates should be considered as conditional generalized options with a significantly wider range of deviations than would be the case in peacetime forecasts.

4.1.1. Macroeconomic forecasts (GDP and population growth)

Since 2014, Ukraine's economy has been operating under conditions of a hybrid war waged by the Russian Federation against Ukraine. The Russian Federation's unprovoked, full-scale invasion of Ukraine, which began in 2022, became a new test for strength and Ukrainian stability in society and economy. In addition to the deaths and destruction that Ukraine is experiencing, the economy has had to adapt to:

- large-scale migration population and decrease purchasing capabilities;
- significant narrowing of logistics routes, decline in economic activity of enterprises, including export-oriented;
- significant electricity deficit and introduced outage schedules as for both industrial and residentialconsumers;
- hostile attacks on objects of oil and gas infrastructure, which led to gas shortages and rising costs for its import;
- growth expenses on defense, whichled to expansion deficit state budget;
- huge losses suffered due to Russian aggression, which are evaluated in trillions of hryvnias.

However, the successes of the Ukraine Defense Forces , the coordinated work of the Government and business, the indomitable spirit of the population, the speed of restoration of destroyed and damaged critical infrastructure facilities, as well as systematic financial support from international partners made it possible to maintain economic stability. As a result:

- the GDP decline turned out to be significantly smaller than expected, amounting to 28.8% in 2022 (at the beginning of the full-scale invasion of the Russian Federation into Ukraine, estimates ranged from 40-50%);
- The increase in consumer prices also turned out to be smaller than expected at the beginning of the full-scale invasion of the Russian Federation into Ukraine and was roughly comparable to price changes in a number of European countries, amounting to 26.6% (annualized);
- Business quickly adapted to the difficult conditions, and after the suspension in February-March 2022, almost 86.1% of enterprises returned to work by the end of 2022.

Therefore, despite all the difficulties and challenges, the economy managed to maintain relative macroeconomic and price stability in the context of hostilities, overcome the large-scale shutdown of production and the consequences of the outflow of labor resources caused by the movement to safe places.

The macroeconomic forecast of the NECP is based on the Forecast of Economic and Social Development

of Ukraine for 2026-2028, the indicators of which were extrapolated to 2050 by experts of the Institute of Economic and Social Development of the National Academy of Sciences of Ukraine (Table 4.1.).

Table. 4.1. Change volume GDP and gross added cost by species economic activities, % to previous year

Sector	2024	2025	2026- 2030	2031- 2040	2041- 2050
	fact	rating	forecast		
Agriculture, forestry and fishery	- 3.9	0.7	4.2	1.7	0.8
Mining industry	3.3	- 6.0	3.7	- 0.3	- 1.2
Manufacturing industry	5.4	3.2	6.2	5.7	4.0
Supply of electricity, gas and steam	- 2.2	0.7	4.2	1.5	0.5
Construction	18.4	14.0	12.4	10.9	3.1
Wholesale and retail trade; car and motorcycle repair	0.7	3.6	5.8	3.9	2.3
Transport, warehousing, postal and courier activities	10.8	1.3	6.1	3.5	1.8
Others types economic activities	4.6	3.1	3.8	3.5	2.5
GDP	**3.2**	**2.7**	**5.0**	**4.1**	**2.7**

Source: Ministry of Economy, SO "Institute for Economics and Forecasting of NAS of Ukraine""

Macroeconomic scenarios determine the prospective structure of the economy, the corresponding volumes of energy use and GHG emissions, and also set the conditions for demographic development.

As of January 1, 2022, the estimated population of Ukraine according to The State Statistics Service estimated the population at 41.2 million people (excluding the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol), or about 37.4 million people (excluding the temporarily occupied territories of the Autonomous Republic of Crimea, Donetsk and Luhansk regions) with a tendency to decrease.

For the purposes of the NECPNECP, the latest available demographic forecast of the Institute of Demography and Social Research of the NAS of Ukraine was used, taking into account available official statistics. and assumptions used for the macroeconomic projections described above. For this purpose, special assumptions were developed regarding life expectancy, mortality rate, fertility rate (number of children per woman), number of survivors, probability of death, number of children born alive, migration and other standard demographic parameters by age and sex. The results obtained are presented in Table 4.2, which also provides a forecast of the number of households, which took into account that the size of an urban household is 2.9 people and Agriculture is 2.7.

Table. 4.2. Demographic and sectoral forecast

	2024	2025	2030	2040	2050
	fact	rating	forecast		
Population, million	31.1	30.4	34.5	32.4	30.1
Share of population, %	69.7	67.9	71.4	70.0	68.8
Number of households, million	13.9	11.8	13.5	12.6	11.7
Added value in industry, billion UAH 2024	1310.7	1315.6	1689.8	2415.5	3155.6
Added value in agriculture, billion UAH 2024	558.9	562.8	691.8	817.8	890.1

Added valuein services, billion UAH 2024	4283.3	4421.6	5438.2	7732.9	9838.5
Passenger turnover, billion pas·km	43.4	42.8	63.4	88.4	95.6
Freight turnover, billion tkm	204.1	204.0	261.5	350.5	411.0

Source: Institute of Demography and Social Research of the NAS of Ukraine, State Institution "Institute of Economics and Forecasting of the NAS of Ukraine"

4.1.2. Sectoral changes expected to impact the energy system and GHG emissions

Reconstruction of destroyed infrastructure facilities (transport, energy), housing and social infrastructure, as well as development of the defense-industrial complex (DIC) will become the main security priorities of Ukraine in the medium term. Accordingly, investments will be directed both to construction and to equipment (DIC projects, energy, etc.), which will stimulate the development of construction, production of domestic engineering products, as well as the purchase of imports for investment purposes.

On the demand side, the growth driver will be investment demand resulting from the implementation of development projects. production and infrastructure and gradual reconstruction victims territories. Although This component will continue to occupy a leading position among other demand components in terms of growth rates; these rates will not be sufficient to restore most of the damaged production facilities and infrastructure and modernize production in the coming years.

Regarding the dynamics of the main components of GDP on the supply side in the short term, the following is forecast:

- The positive dynamics of the services sector, which is sensitive to the activity of the population and, given its mobility and significant level of IT use, is more autonomous, as well as quite maneuverable and flexible to the needs of consumers, which opens up not only domestic markets. Its further development will be aimed at expanding the arsenal of services provided using digital platforms (including EU markets) through improving existing or implementing new marketing development strategies, finding opportunities to diversify the market offer, and creating new virtual products and services.

- At the same time, industrial production will be restored. In the near future, the key task will remain the development of effective means, methods and technologies in the field of security and defense planning to meet the priority needs of the Ukrainian army, which will stimulate the further development of mechanical engineering. The mining industry will also be restored relatively quickly and stably, taking into account the achievements in the future of maximum production autonomy for the sake of creation strong foundation for restoration during the post-war period, which will allow us to gradually make up for the potential that has been reduced over a long period of decline.

- There will be an active recovery of enterprises in the food and chemical industries, textile production, since their activities are related to meeting primary needs, and they are mostly representatives of small and medium-sized businesses, which are more mobile and have wider opportunities to maneuver with logistics and sales of their products. The most difficult will be for large industrial enterprises, in particular metallurgical enterprises, some of which have been destroyed. It is not so easy for such enterprises to reconfigure logistics, move their production facilities, and their restoration or creation of completely new modern industries will require a longer period.

- The development of the domestic agro-industrial complex in the forecast period will take place in the context of ensuring food security and maintaining the country in world rankings as a leading exporter of agricultural products.

- The need to quickly restore infrastructure (roads, bridges, communications), industrial, social, and residential facilities that were significantly damaged or completely destroyed during hostilities will require active investment in the construction sector while maintaining the level of defense spending, which will contribute to its further development.

- The gradual activation of economic processes will also support the transport sector, the activities of which in most subspecies were both stopped during martial law and significantly damaged as a result of enemy attacks. The development of the transport sector will be facilitated by prioritizing the restoration of transport infrastructure and the development of new alternative transport routes as key logistics channels

for supplying products to international markets. The forecast of total passenger and freight traffic is given in Table 4.2. At the same time, if the passenger traffic of railway and road transport increases to the same level with a more rapid growth of railway transportation, then the freight traffic of railways, at the same time with a more rapid growth, reaches a significantly higher level – 270 billion t·km against 100 billion t·km of road freight transport.

- The growth of private consumption and production activities, the establishment of logistical connections will stimulate the development of trade.

Thus, taking into account all demand-side factors and production capabilities, the GDP recovery/growth rate at the 2023 level (5.5%) may persist until 2030, with a gradual slowdown to 3%-4.5% in the longer term.

4.1.3. Global energy trends, international fossil fuel prices, EU ETS carbon price

Assumption of world prices on fuel

The forecast of import prices of the main types of energy resources for Ukraine is based on the price forecast of the International Energy Agency (World Energy Outlook 2025)[115] (Table 4.3). As can be seen from the table below, prices for all carbon-intensive energy resources will decrease, albeit at a slow pace, but not compared to the crisis year 2022.

Table. 4.3. Forecast world prices on energy resources

Energy resource	Unit	2020	2025	2030	2040	2050
in current prices						
Coal	dollars US/ton	50.0	88.1	83.1	87.6	86.3
Oil	dollars USA/ barrel	42.0	68.0	77.7	93.2	99.4
Natural gas	dollars US/1000 m ^{3}	155.3	418.9	310.7	312.3	406.2
in prices 2020 year						
Coal	dollars US/ton	50.0	70.9	64.5	61.1	54.5
Oil	dollars USA/ barrel	42.0	54.7	59.8	64.9	62.7
Natural gas	dollars US/1000 m ^{3}	155.3	337.2	239.2	217.7	256.3

Source: International energy agency

Assumption of prices on carbon emissions

The assumptions regarding the price of greenhouse gas emissions vary depending on the scenario. For example, under the "with existing policies and measures" (WEM) scenario, the CO2 tax rate remains at the level of 30 UAH/t during the martial law regime and potentially for some time after it (until 2027 inclusive). It is expected that from approximately 2027, all taxes will be indexed, including a tax on CO_2 emissions. Accordingly, the tax rate for CO2 emissions will increase slightly and will be around 1 euro/t by 2050. However, it is expected that in the longer term a reform of the CO2 tax will be implemented (currently under development), which will include a revision of the tax rate and base. It is therefore expected that the application of the tax will be expanded[116] to the transport, agriculture, as well as the residential and commercial sectors.

In addition, the introduction of the ETS in a test mode is also planned from 2028. However, it is expected that the framework conditions of the ETS functioning in Ukraine will gradually approach the EU ETS. The introduction of the CBAM mechanism by the EU will further stimulate Ukraine accelerating the process of introducing the national ETS and harmonise it with the EU ETS. Therefore, it is assumed that the price for CO2 emissions (total impact of CO2 tax and ETS) on the domestic market will grow steadily until 2050. However, given that as of 2025, a full-scale war has been going on for the fourth year, a significant part of the industrial sector has been destroyed, real income of households shrunk, rapid growth

[115] https://www.iea.org/reports/world-energy-outlook-2025

[116] As of 2025, the environmental tax on carbon dioxide emissions applies to GHG emissions from stationary sources of pollution, that is, actually to energy, industry and energy supply, which are separately presented in the TIMES-Ukraine model.

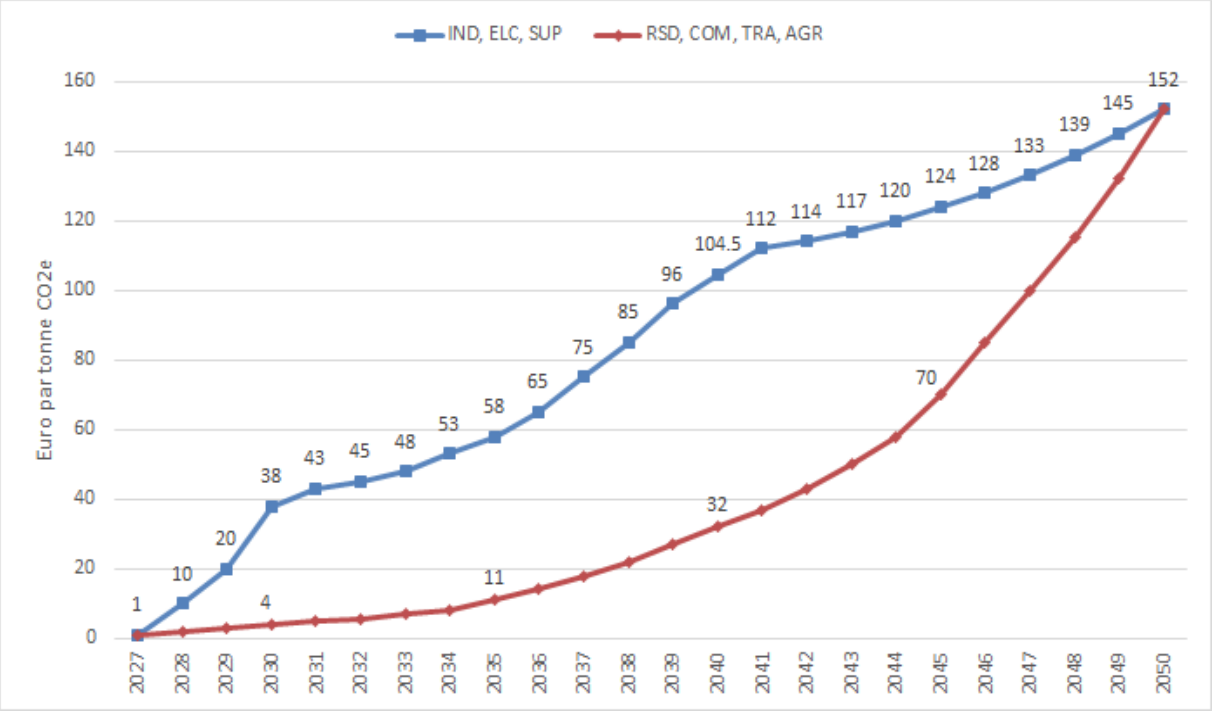
of prices on carbon to the level of the EU ETS already in 2030 is unrealistic, as it will take time for the economy and households of Ukraine to recover after war and adapt to significant growth prices on energy and carbon emissions. Therefore, it is assumed that the trajectory of the increase in the price of CO2 emissions in Ukraine will lag behind the price on the European carbon market, which is currently about 85 EUR/t CO_2, while in 2023 it was about 100 EUR/t CO2[117].

At the same time, the International Energy Agency (IEA) "announced commitments" scenario[118] for developing countries (which include Ukraine) with net-zero emissions commitments looks more realistic for Ukraine, but also quite ambitious. According to this scenario, the increase in the price of CO2 emissions expected at 40 USD (or 38 EUR) per ton of CO2 by 2030 and up to 160 USD (152 EUR) per ton of CO2 by 2050.

Thus, for modeling the "with additional policies and measures" (WAM) scenario within the NECP, in particular for the energy, industry and energy supply sectors, the assumption is made that the price of CO2 emissions by 2027 will be 30 UAH/t during the martial law regime, and from 2027 to 2028 – about 1 EUR/t, while in the future it will reach the levels of the IEA scenario mentioned above, i.e. in 2030 – 38 EUR/t, in 2040 p. – 104.5 EUR/t, and in 2050 p. – 152 EUR/t CO_2. At the same time, a slower price increase is foreseen for other sectors (transport, agriculture, residential and commercial sectors) (see the figure below).

At the same time, after the lifting of martial law, it is planned to update the NECP, which will include a revision of the assumptions regarding the price of CO2 emissions. After the launch of the national ETS and the adoption of the roadmap for carbon tax reform, which is expected within the next two years, it will be possible to formulate a clearer vision of the development of the national carbon market and a forecast of the price of CO2 emissions.

Fig. 4.1. Assumption of prices on emissions for different sectors to 2050 year, EUR/t CO_2



Source: International energy agency, SO "Institute for Economics and Forecasting of NAS of Ukraine""

4.1.4. Technology cost developments

Table D.3.1 in Annex 3 presents the key technical and economic characteristics of selected electricity and heat generation technologies that were used as assumptions in the modelling process underlying this NECP. Capital costs include the cost of capital, but the model also takes into account operating costs.

4.2. Dimension decarbonization

4.2.1. GHG emissions and removals

4.2.1.1. Trends in current GHG emissions and removals across the economy and different sectors

[117] https://tradingeconomics.com/commodity/carbon

[118] See. table B.2 Announced Pledges Scenario for Emerging market and developing economics with net zero emissions pledges, https://iea.blob.core.windows.net/assets/86ede39e-4436-42d7-ba2a-edf61467e070/WorldEnergyOutlook2023.pdf

According to the GHG Emissions Inventory for 1990-2023, in 2023, total GHG emissions in Ukraine amounted to 222 million t $CO_{2\text{-eq.}}$ (including "Land use, land use change and forestry" - LULUCF), which is by 75.8% less from volumes in 1990 and by 32% less than emissions level in 2021 (before the full-scale invasion of the Russian Federation).

As a result of the post-Soviet economic recession, GHG emissions in Ukraine decreased from 916.5 million t $CO_{2\text{-eq.}}$ (including LULUCF) in 1990 to 408 million tons of $CO_{2\text{-eq.}}$ in 2000. Although the economy began to recover after 2000, and annual GDP growth rates were significant, GHG emissions continued to decline (see Table 4.4). This is due to the fact that the Ukrainian economy was undergoing significant structural changes, and inefficient energy-intensive sectors were partially replaced by trade, services and financial sectors. In addition, the modernization of production, which allowed to reduce the energy intensity of major industrial goods, had a significant impact on GHG emission trends.

The trend in GHG emissions in 2008-2021 was determined by the impact of the global financial and economic crisis of 2008-2009 and the temporary occupation of part of Ukraine by the Russian Federation in 2014, which largely determined commodity production in the main export-oriented industries (metallurgy, chemical industry, mechanical engineering, etc.), which, in turn, affect on supply sectors – electric power industry, mining industry (production ores and coal). The economic recovery after strict COVID-19 measures in 2020 led to an increase in greenhouse gas emissions in all sectors except waste.

Table. 4.4. Emissions greenhouse gases in 1990-2023 years, million t $CO_{2\text{- eq.}}$

Gas	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021	2022	2023	GHG emissions relative to 1990, %
CO2 (without LULUCF)	706.5	390.2	285.7	313.5	294.4	223.8	234.1	223.3	231.9	222.2	207.1	210.6	143.0	139.3	- 80.3
CH 4	209.3	159.5	135.6	117.8	97.7	71.6	77.0	74.5	78.7	81.6	83.6	83.0	66.9	62.8	- 70.0
N2O	48.5	29.9	20.6	22.4	24.6	28.6	31.3	30.1	33.0	34.8	33.1	37.7	27.0	28.5	- 41.4
HFCs*	No.	No.	14.4	271.9	715.3	826.3	943.7	1076.5	1483.2	1849.2	2000.4	2245.1	2329.8	2423.1	100
PFCs*,**	212.0	160.1	104.0	128.0	24.0	No.	No.	No.	No.	No.	No.	No.	No.	No.	- 100
SF6 *	0.0	0.1	0.4	4.6	10.0	20.2	25.1	29.4	34.5	40.0	44.6	50.3	54.2	57.2	727229.5
NF 3 *	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	-
CO2 emissions net from LULUCF	- 48.1	- 46.3	- 33.6	- 18.5	- 21.2	3.9	5.9	- 2.7	6.9	4.9	- 16.1	- 5.6	- 15.9	- 11.3	- 76.4
CO 2 (with LULUCF)	658.4	343.9	252.0	295.0	273.2	227.8	240.0	220.6	238.8	227.1	191.0	205.0	127.2	128.0	- 80.6
Total (without LULUCF)	964.4	579.4	441.7	453.9	417.2	324.8	343.3	328.8	345.0	340.3	325.2	333.5	239.2	232.9	- 75.9
Total (with LULUCF)	916.5	533.4	408.3	435.7	396.2	328.9	349.3	326.3	352.1	345.4	309.7	328.1	223.5	221.7	- 75.8
Total (excluding LULUCF), including indirect emissions and CO2	964.4	579.4	441.7	453.9	417.2	324.8	343.3	328.8	345.0	340.3	325.2	333.5	239.2	232.9	- 75.9
Total (with LULUCF), including indirect emissions and CO2	916.5	533.4	408.3	435.7	396.2	328.9	349.3	326.3	352.1	345.4	309.7	328.1	223.5	221.7	- 75.8

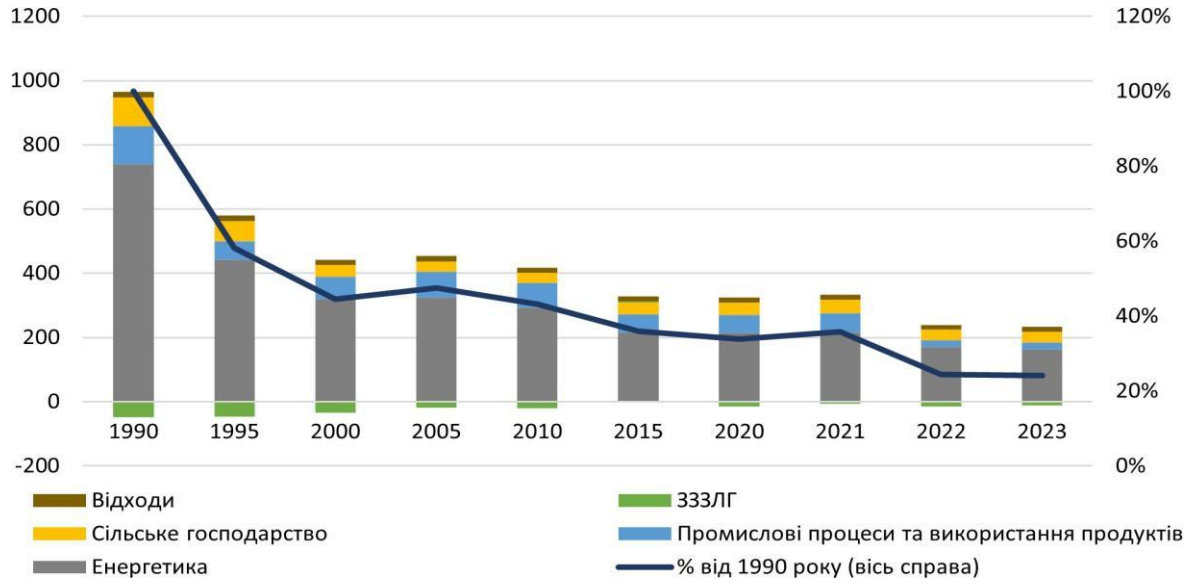
Notes:

** emissions specified in thousand t CO2- eq.*

*** no PFC emissions, as refrigerants containing gas were not imported in 2011-2021. Source: National Inventory of Anthropogenic Emissions by Sources and Removals by Sinks of Greenhouse Gases of gases in Ukraine for 1990-2023.*

The energy sector is the largest source of national GHG emissions, accounting for 74% of the total, while the contribution of the industrial processes and product use sector and agriculture (see detailed description of emissions in the agricultural sector in Annex 2) are 10% and 15%, respectively. The share of the waste sector is the smallest – 7%. As can be seen from Figure 4.2, the role of the LULUCF sector as a sink of GHGs is gradually decreasing, and in some periods (2013-2016 and 2018-2019) the sector was a net emitter of emissions. The removal of GHG emissions by the LULUCF sector ranged from -55.7 million t $CO_{2\text{-eq.}}$ in 1991 to -11.2 million t$CO_{2\text{-eq.}}$ in 2023 with peak emissions (7.1 million tons of $CO_{2\text{-eq.}}$) in 2018.

Fig. 4.2. Trends emissions (+) and absorption (-) of GHG for 1990-2021 years, million t $CO_{2\text{- eq.}}$



Source: National inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2023.

4.2.1.2. Projections of sectoral developments with existing national, Energy Community and European Union policies and measures at least until 2040 (including for the year 2030)

The table below presents the main results of modeling and forecasting of GHG emissions in Ukraine under the scenario with existing policies and measures (WEM) using the TIMES-Ukraine model.

Table 4.5. Mainmodeling results n GHG emissions in Ukraine by WEM scenario

Scenario with existing policies and measures (WEM)									
	1990	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Total emissions PG, *million t CO2-equiv.*	**916**	**329**	**310**	**186**	**260**	**273**	**285**	**287**	**287**
Energy, industrial processes and products use sectors	***858***	***273***	***271***	*142*	*211*	*219*	*227*	*232*	*236*
AgricultureAgriculture	***90***	***36***	***38***	***37***	***41***	***44***	***46***	***48***	***49***
Land use, changes in land use and	***- 48***	***4***	***- 16***	***- 8***	***- 7***	***- 5***	***- 3***	***- 5***	***- 9***

forestry									
Waste sector	***17***	***16***	***16***	***14***	***15***	***15***	***14***	***13***	***12***
Share of GHG emissions from the 1990 level, *%*	**100**	**36**	**34**	**20**	**28**	**30**	**31**	**31**	**31**
Energy, industrial processes and products use sectors	*100*	*32*	*31*	*15*	*22*	*23*	*24*	*24*	*24*
AgricultureAgriculture	*100*	*40*	*42*	*41*	*46*	*49*	*51*	*53*	*55*
Land use, changes in land use and forestry	*100*	*109*	*32*	*16*	*14*	*10*	*6*	*10*	***18***
Waste sector	*100*	*95*	*97*	*85*	*87*	*87*	*83*	*76*	*68*

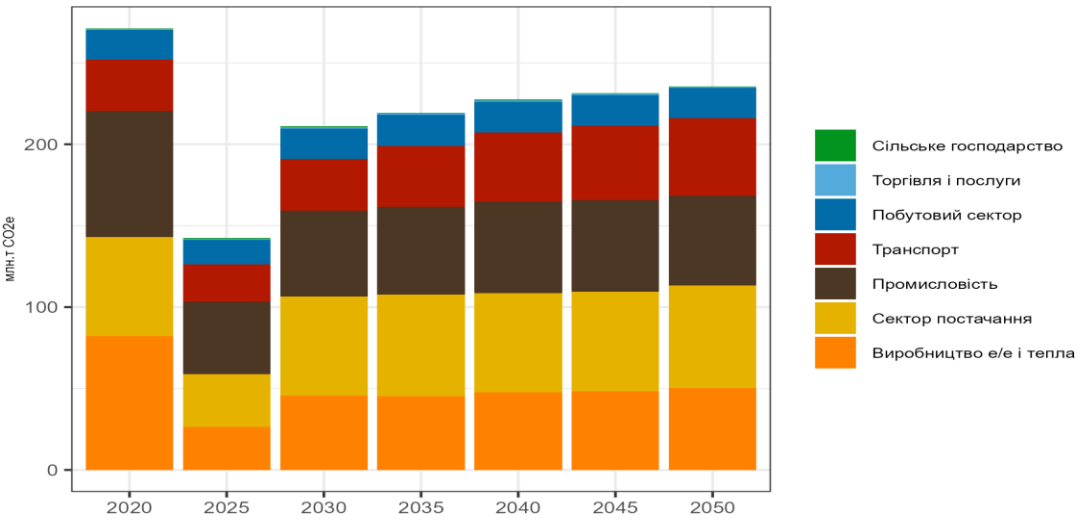
Source: National Inventory of Anthropogenic Emissions by Sources and Removals by Sinks of Greenhouse Gases of gases in Ukraine for 1990-2023, State Institution "Institute of Economics and Forecasting of the NAS of Ukraine".

Emissions greenhouse gases in sectors "Energy" and "Industrial processes and product use"

The figure below shows the forecast of GHG emissions in the Energy and Industrial Processes and Product Use sectors (as defined by the UN Intergovernmental Panel on Climate Change (IPCC)) under the scenario with existing policies and measures (WEM) until 2050, obtained using the TIMES-Ukraine economic and mathematical model, which describes all energy flows in the country.

The modeling results show that the rapid processes of recovery of the Ukrainian economy in the post-war period, without the implementation of additional measures and policies on energy efficiency, the expansion of the use of renewable energy sources, other measures for decarbonization and technological modernization of the energy sector, will cause a gradual increase in GHG emissions in the "Energy" and "Industrial processes and product use" sectors.

Fig. 4.3. Greenhouse gases emissions in sectors "Energy" and "Industrial processes and product use" under the WEM scenario, million tons of CO2-eq.



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

In WEM scenario, GHG emissions in the specified sectors at growth economy Ukraine can to shrink almost on quarter to 2030 comparatively from 2020 r., after what, without implementation of additional measures, GHG emissions in the above sectors will continue to grow until 2050, but will not reach the 2020 level and will be 13% less than the GHG emissions in in these sectors in 2020 and will be 28% of the 1990 level.

Greenhouse gases emissions in "Agriculture" sector

The greenhouse gas emission forecast was carried out in compliance with the principles of continuity and

imitation of the national inventory in accordance with the methodological recommendations of the "Guiding Principles for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change (IPCC)"[119]. The drivers for the forecast were key factors in agricultural activity. Their perspective is adjusted taking into account a set of conditions (see Appendix 2, Table D.2.1), namely: cessation of hostilities (both current active and further confrontation with periodic escalation); restoration of means of agricultural activity (reconstruction of destroyed/damaged livestock farms; demining of pastures, hayfields, arable and other lands; restoration/replenishment of the mechanized component of agricultural activity, etc.); restoration of the population size and resettlement (migration from abroad; return to places of residence before the start of the full-scale invasion of the Russian Federation into Ukraine/hostilities; settlement of temporarily displaced persons in new places of residence; natural population growth, etc.); quality of demographic policy; level of domestic demand for agricultural activity; export opportunities for agricultural activity; national strategy for post-war restoration and development of agriculture.

The trends in target indicators of agricultural activity are consistent with the expected results of the implementation of the approved resolution of the Cabinet of Ministers of Ukraine dated November 15, 2024 No. 1163-r Strategy for the development of agriculture and rural areas in Ukraine for the period until 2030.

On the path to EU membership, Ukraine has made progress in some areas of agricultural activity, in particular in strengthening market orientation, increasing competitiveness, etc. Organic production, bioenergy and climate-smart agriculture are considered important priorities in the agrarian policy of Ukraine. Their development plays a significant role in implementing the priority areas of the medium-term "green transformation" of agriculture and in adapting this sector to climate change. However, the WEM scenario assumes that development of these policies and approaches will take place gradually and slowly, which was observed during the last 5-10 years.

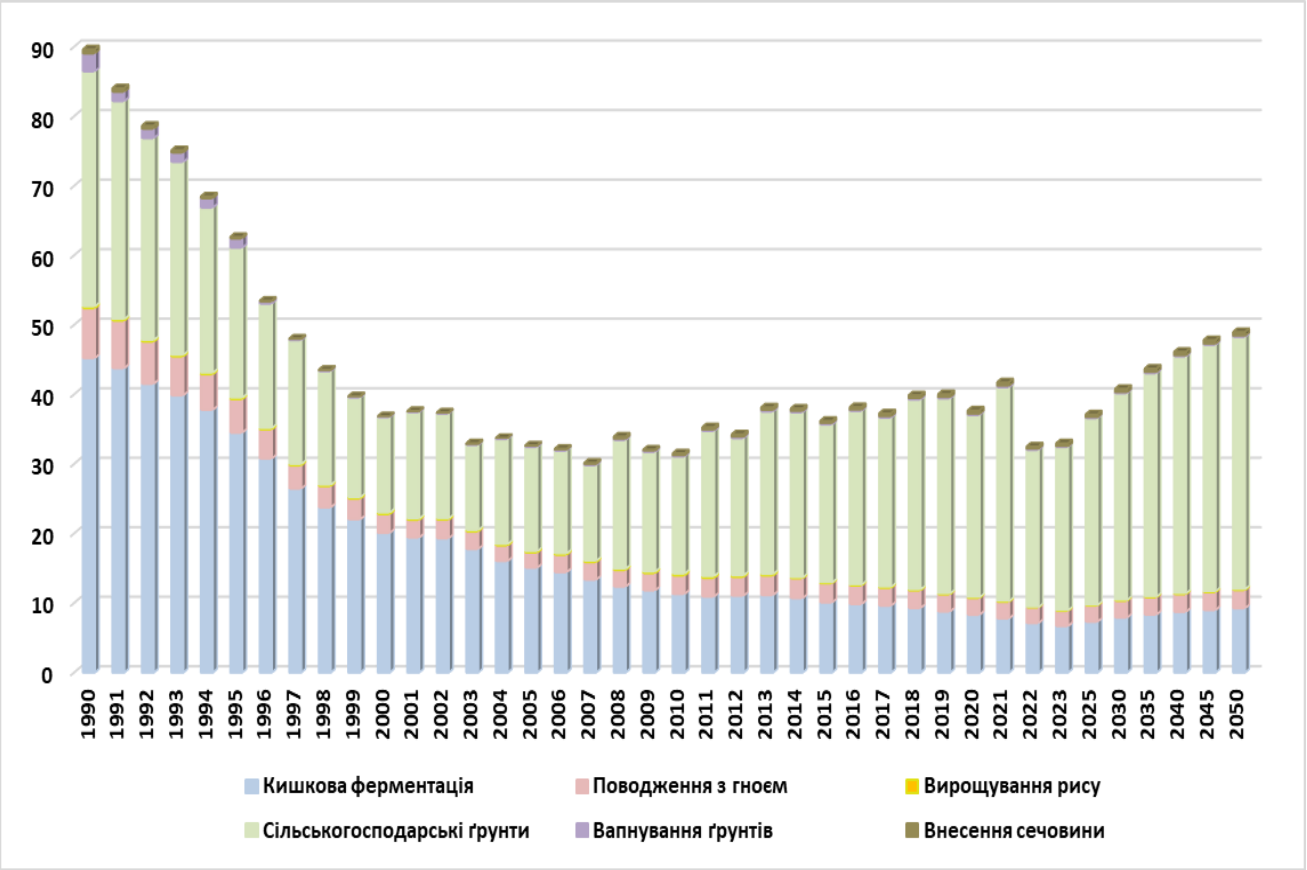
The WEM scenario for the development of agricultural activity is based on the implementation of the target indicators of the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the period until 2030, aimed at improving the socio-economic situation, ensuring food security, contributing to the mitigation of the consequences of climate change, etc. In conditions of military aggression, the implementation of strategic goals will be significantly hampered and will have a certain deterioration in the forecast (Table D.2.2).

The forecast estimate of greenhouse gas emissions takes into account the dynamics of key factors in different in agricultural activities (Fig. 4.4) and indicates that we should expect an increase in GHG emissions to 40.79 million tons of $CO_{2\text{-eq}}$, 46.12 million tons of $CO_{2\text{-eq}}$ and 48.96 million tons of $CO_{2\text{-eq}}$ in 2030, 2040 and 2050, respectively.

The indicated increase in GHG emissions is due to a complex of factors that are the result of strengthening the integration of Ukraine's agricultural sector into the global food system, increasing demand on the global food market, ensuring food security, etc. Despite the projected growth in GHG emissions, total emissions in various areas of agricultural activities under the influence of existing policies and measures in 2030, 3040 and 2050 will not exceed 45.5%, 51.5% and 54.6%, respectively, compared to the base year 1990.

[119] https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

Fig. 4.4. Forecast of emissions from agricultural activities in Ukraine under the WEM scenario, million tons of CO2 -eq



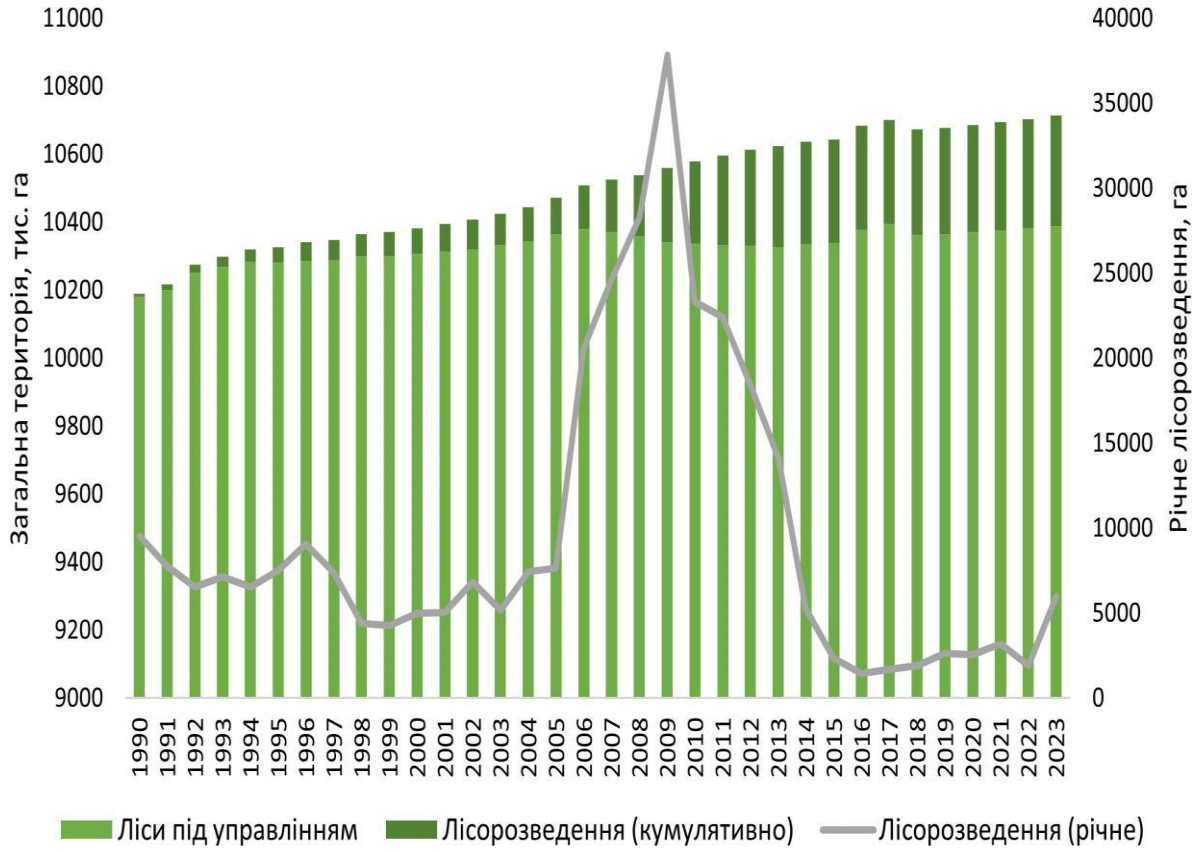
Greenhouse gas emissions in the Land Use, Land-Use Change and Forestry sector

The scenarios for greenhouse gas emission projections in the Land Use, Land-Use Change and Forestry (LULUCF) sector were prepared based on projections developed for the updated Strategy for Low-Carbon Development of Ukraine until 2050.

To project emissions under the WEM scenario, a conservative assumption was made that the current rate of afforestation (policy PM_D_WEM_05), which has been very low in recent years, will continue until 2050.

Thus, afforestation has been carried out since the 1990s and reached its greatest development in 2005-2015, when a state program for planting new forests was in effect (see Fig. 4.5). However, in 2017-2021, afforestation was carried out on only 1.7-3.2 thousand hectares.

Fig. 4.5. General area of forests and afforestation in Ukraine



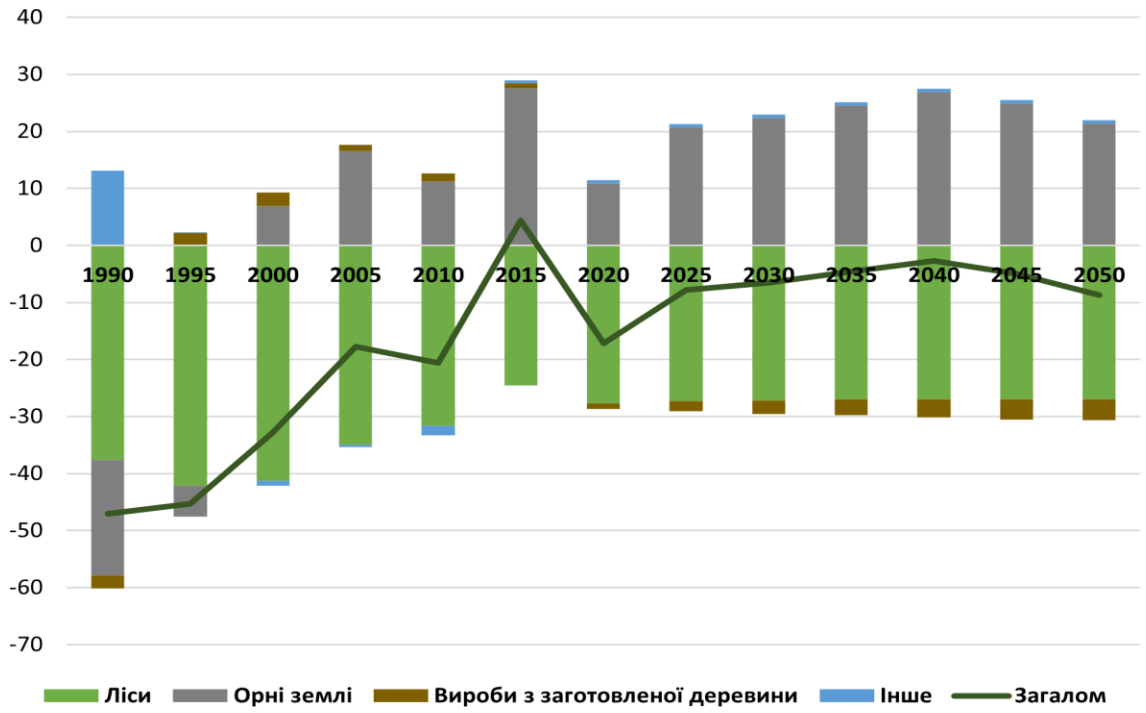
Source: prepared based on data from the Strategy on low-carbon development of Ukraine by 2050 year.

It is also assumed that support for horticulture, berry growing and viticulture will be continued within the framework of the "eWork" program (policy PM_D_WEM_06). According to The Strategy for Low-Carbon Development of Ukraine until 2050, thanks to state funding for the creation of fruit and berry orchards, as well as vineyards, about 900 hectares of plantations were created per year.

The forecast of GHG emissions in the LULUCF sector under the WEM scenario is presented in Fig. 4.6. The rather low rates of afforestation at the level of 2015-2021 will not allow to increase absorption in this sector. Instead, forest absorption is gradually decreasing from 27.3 million tons of $CO_{2\text{-eq.}}$ in 2025 to 27.2 million tons of $CO_{2\text{-eq.}}$ in 2030 and to 27 million tons of $CO_{2\text{-eq.}}$ in 2050. At the same time, in the category "Arable land", GHG emissions first increase from 20.7 million tons of $CO_{2\text{-eq.}}$ in 2025 up to 22.4 million tons of $CO_{2\text{-eq.}}$ in 2030 and 26.9 million tons of $CO_{2\text{-eq.}}$ in 2040, and then decrease to 21.4 million tons of $CO_{2\text{-eq.}}$ in 2050.

Overall, in the LULUCF sector under the WEM scenario, the absorption rate initially gradually decreases from 7.8 million tons of $CO_{2\text{-eq.}}$ in 2025 up to 6.5 million tons of $CO_{2\text{-eq.}}$ in 2030, but after 2040 year starts to increase and reaches 8.7 million tons of $CO_{2\text{-eq.}}$ in 2050 mainly due to the reduction of emissions in the category "Arable land".

Fig. 4.6. Emissions (+) and removals (-) of greenhouse gases in the LULUCF sector under the WEM scenario, million tons of CO2 -eq



Source: prepared based on data from the Strategy on low-carbon development of Ukraine by 2050 year.

Emissions of greenhouse gases in the "Waste" sector

WEM scenario involves saving long-term trends in the transformation of the waste management sector in Ukraine, namely: reducing the share of municipal waste landfilling to 70% by 2030 and to 30% in 2050; increasing the share of biogas generated at landfills to 16.5% in 2030 and to 36% in 2050, respectively; and building new waste composting plants with lower specific GHG emissions. This scenario also assumes that the sustainable development goals in Ukraine will be achieved by 2030, including: reducing the share of untreated wastewater, increasing the specific consumption of food products, reducing the specific consumption of water resources per GDP, etc.

It should be noted that under the WEM scenario, the increase in the share of biogas neutralization at landfills by 2030 is expected to occur mainly through the expansion of flaring capacities, rather than through methane recovery for electricity generation. This is due to a number of reasons: first, the installation of biogas neutralization technologies is a necessary condition for the extension of the operation of landfills, starting from January 1, 2030 in accordance with the adopted Law "On Waste Management"; at the same time, biogas flaring technologies are the cheapest alternative to complying with this requirement. And secondly, the economic potential of biogas recovery at landfills of household waste as a source of useful energy is almost exhausted - biogas recovery plants have already been installed at the largest landfills of household waste, and those landfills that are not yet equipped with biogas recovery plants have a rather low methane flow rate due to the peculiarities of construction and operation in the past. Starting from 2030, the growth of biogas disposal capacities at household waste landfills will be achieved exclusively through the further spread of biogas recovery technologies in parallel with the development of regional landfills, where placing such installations will have economic advantage over flaring due to the high level of insulation of the "body" of newly built landfills, and as a result, a significant methane flow rate.

Methodology for the development of the WEM scenario, GHG emission estimates and capital investment in the “Waste” sector is given in Annex 4. List of key indicators in the field of waste management under the WEM scenario are given below in Table 4.6.

Table. 4.6. Key policies and measures in the "Waste" sector under the WEM scenario

No.	Key policies	Quantitative indicator		
		2023 (statistical information)	2030	2050
1	Promoting the practice of reusing household waste components	1.95%* (and, 2024)	8%* (full implementation of current policies and measures)	10%*
2	Promoting household waste recycling practices ***	5.55%* (a, 2024)	10 %* (partial implementation of current policies and measures)	34%*
3	Promoting practices of biological treatment of organic components of household waste	1.25%* (a, 2024)	5%* (partial implementation of current policies and measures)	16%*
4	Promoting the practice of thermal treatment of household waste (with the production of useful energy)	1.60%* (a, 2024)	7%* (partial implementation of current policies and events)	10%*
5	Increasing the volume of disposal (recovery and flaring) of biogas at landfills	12.3%** (b, 2025)	16.5%**, of which: 12.3% – recuperation; 4.2% – flaring (quantitative the indicator is not explicitly legally defined)	36%**, of which: 30% – recuperation; 6% – flaring

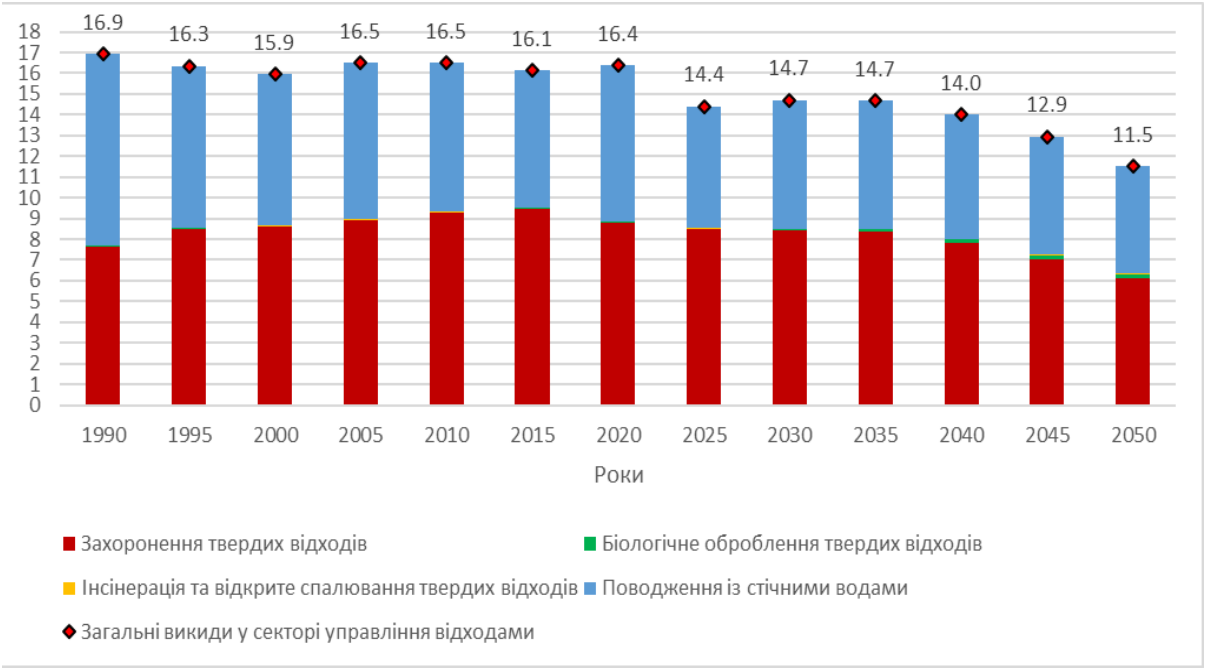
Notes:
Policy PM_D_WAM_12 "Implementation of measures for waste prevention" is taken into account indirectly through indicator that corresponds to moderate increase in specific volumes of household waste generation per person.
(a, 2024) Analysis of the state of household management waste in Ukraine by 2022 according to the Ministry of Development;
(b, 2025) National GHG emissions Inventory from sources and absorption of greenhouse gases, greenhouse gas emissions in Ukraine for 1990-2023; according to the Ministry of Economy ;
** - share from general volume of generated waste;*
***- share from general volume generated methane.*
**** - indicator that do not include activity from biological processing of household waste, including composting.*

Under the WEM scenario, GHG emissions in the waste management sector will decrease moderately and in 2030 will reach 14.7 million tons of $CO_{2\text{-eq.}}$, which is 13% lower than the level of emissions in 1990. In the future, emissions will continue to decrease, and in 2050 they will amount to 11.5 million tons of $CO_{2\text{-eq.}}$, which is 32% lower than the level of 1990 (see Fig. 4.7.).

In the period of 2020-2025, they will decrease from 16.4 million tons of $CO_{2\text{-eq.}}$ to 14.4 million tons of $CO_{2\text{-eq.}}$, or by 12.1%. During 2026-2030, total GHG emissions in the waste management sector will increase slightly and reach 14.7 million tons of $CO_{2\text{-eq.}}$ in 2030. The expected slight increase in GHG emissions in the period from 2026 to 2030 will be due to the return of citizens from abroad, as well as the intensification of nitrification-denitrification processes at wastewater treatment facilities due to an additional increase in protein consumption by households due to an improvement in the quality of life, which will accordingly affect the increase in N_2O emissions from household wastewater treatment.

Further, after 2030, under the WEM scenario, a peak in GHG emissions is expected in the waste management sector, and projected GHG emissions in the sector will gradually decrease and reach 11.5 million tons of $CO_{2\text{-eq.}}$ in 2050, which will be 68% of the 1990 level. GHG emissions in the waste management sector by IPCC categories by 2050 under the WEM scenario are shown in Fig. 4.7.

Fig. 4.7. GHG emissions in the waste management sector under the WEM scenario, million t $CO_{2\text{- eq.}}$



Note: for the period 1990-2020 years – statistical data, and for the period 2025-2050 years – forecast data.

Under the WEM scenario, the structure of emissions in the waste management sector does not undergo significant changes. Thus, the main source of GHG emissions in the sector will remain solid waste landfills, contributing 53-59% of total emissions in the sector, which is comparable to the corresponding figure in 2020, when this figure was 54%. The share of emissions associated with wastewater management will be 41-45% (with a maximum in 2050) in the period up to 2050, which is slightly lower than the corresponding figure in 2020, when it was 46%. The only source, in which a gradual increase in GHG emissions is expected, is biological treatment of solid waste, emissions from which will increase from 7.3 thousand tons of $CO_{2\text{-eq.}}$ (0.04% of total emissions in the sector) in 2020 to 68.1 thousand tons of $CO_{2\text{-eq.}}$ in 2030, and will reach 233.0 thousand tons of $CO_{2\text{-eq.}}$ (2% of total emissions in the sector) in 2050.

Such a considerable increase in emissions from biological treatment of solid waste will be caused by intensive distribution practices composting organic components of household waste, namely food waste and food industry waste at all stages of production and consumption, as well as waste from green spaces. At the same time, it should be noted that the practice of composting organic components of waste is an effective method of reducing GHG emissions, especially if it is considered as an alternative to landfilling, since the specific GHG emissions from composting the same amount of organic material are tens to hundreds of times lower than the corresponding indicators of anaerobic biodegradation processes at landfills of waste, i.e. their landfilling. Greenhouse gas emissions from thermal waste treatment methods will account for 0.1%-0.2% of total emissions in the waste management sector. They are the smallest source of emissions in the sector, as they include waste treatment activities without further obtaining useful energy. The latter type of activity is included in the energy sector, where it is taken into account as the use of renewable energy sources and alternative fuels.

In the WEM scenario, the main factors that will determine the trends in GHG emissions in the waste management sector are:

- moderate reduction in the share of landfilling of solid waste by 2050;
- moderate deployment of biogas neutralization technologies in the period until 2030 and this process in the period until 2050;
- intensification of nitrification-denitrification processes at wastewater treatment facilities due to increased protein consumption by the population.

A key risk to reducing GHG emissions under the WEM scenario is the low efficiency of biogas neutralization technologies to be implemented at landfills with low biogas flow rates.

4.2.2. Renewable energy

4.2.2.1. Current share of renewable energy in gross final energy consumption and in different sectors (heating and cooling, electricity and transport) as well as per technology in each of these sectors

Since 2009, the growth of installed capacity of renewable energy facilities This was mainly due to the introduction of the "green" tariff model in Ukraine.

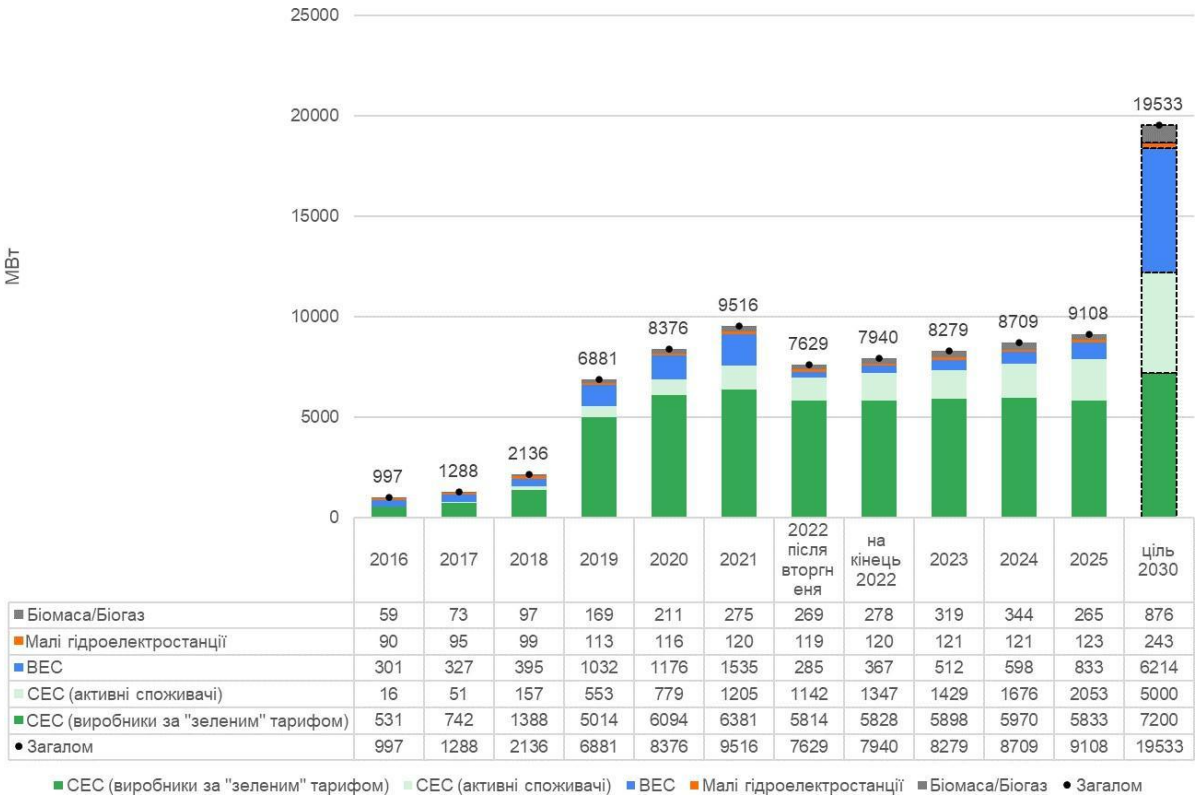
General installed power objects RES is close to 9.3 GW (without considering facilities located in temporarily occupied territories). The total volume of investments in RES has already exceeded €12 billion, and it is expected that by 2030 private investments in RES will reach €20 billion

During 2025, the share of generation from renewable energy sources was 10.8% (excluding large hydroelectric power plants). In the structure of electricity production from renewable energy sources, the largest share is traditionally occupied by solar power plants - 78%. The share of wind power plants is 12%, facilities that produce electricity from biogas and biomass - 8%, and small hydroelectric power plants - 2%.

As in all of Ukraine, the full-scale invasion of the Russian Federation in February 2022 significantly affected the functioning of the renewable energy sector. In particular, in 2022, about 25% of the installed renewable energy capacity was occupied. The situation with wind power plants is particularly difficult - about 1.25 GW is located on occupied territories of Kherson and Zaporizhia regions (taking into account the capacities occupied until 2022 - 1.4 GW). Also, about 0.6 GW of solar power plant capacities are under occupation. However, even during the war years, the development of renewable energy did not stop: since 2022, about 1.7 GW of new renewable energy capacity has been put into operation, including wind, solar, and bioenergy plants.

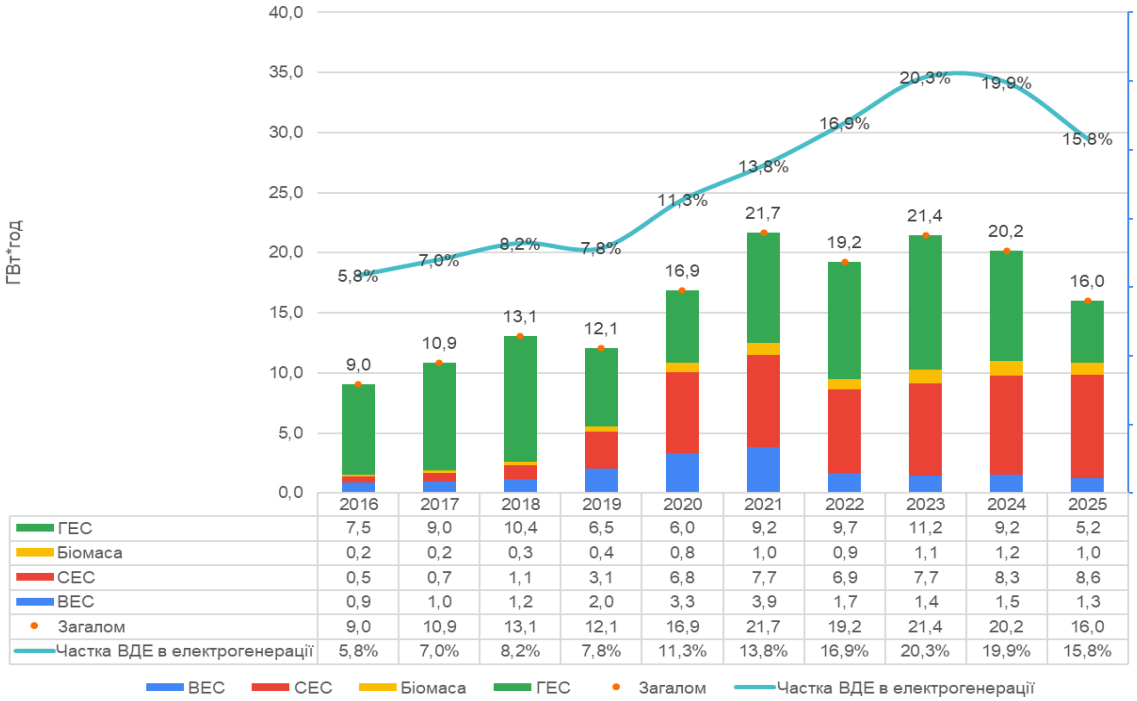
In 2020, the share of renewables in the structure of gross final consumption of energy resources was 8.4%. At the same time, the share of renewables in the heating and cooling, electricity and transport sectors was 9.3%, 10.7% and 2.5%, respectively.

Fig. 4.9. Installed power RES, by "green" tariff



Source: Ministry of Energy

Fig. 4.10. Production electric energy with RES (including with large Hydroelectric power plant)



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ГЕС	7,5	9,0	10,4	6,5	6,0	9,2	9,7	11,2	9,2	5,2
Біомаса	0,2	0,2	0,3	0,4	0,8	1,0	0,9	1,1	1,2	1,0
СЕС	0,5	0,7	1,1	3,1	6,8	7,7	6,9	7,7	8,3	8,6
ВЕС	0,9	1,0	1,2	2,0	3,3	3,9	1,7	1,4	1,5	1,3
Загалом	9,0	10,9	13,1	12,1	16,9	21,7	19,2	21,4	20,2	16,0
Частка ВДЕ в електрогенерації	5,8%	7,0%	8,2%	7,8%	11,3%	13,8%	16,9%	20,3%	19,9%	15,8%

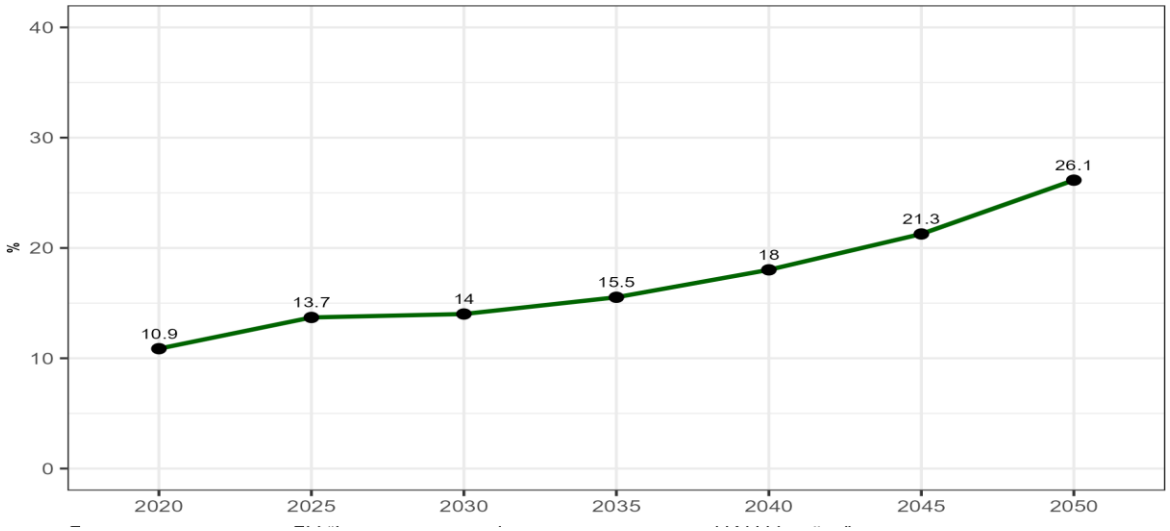
Source: Ministry of Energy

4.2.2.2. Indicative projections of development with existing policies for the year 2030 (with an outlook to the year 2040)

Given the current and potential consequences of the russian federation's full-scale invasion of Ukraine, achieving the target of 27% of renewables in the structure of gross final consumption of energy resources seems extremely ambitious.

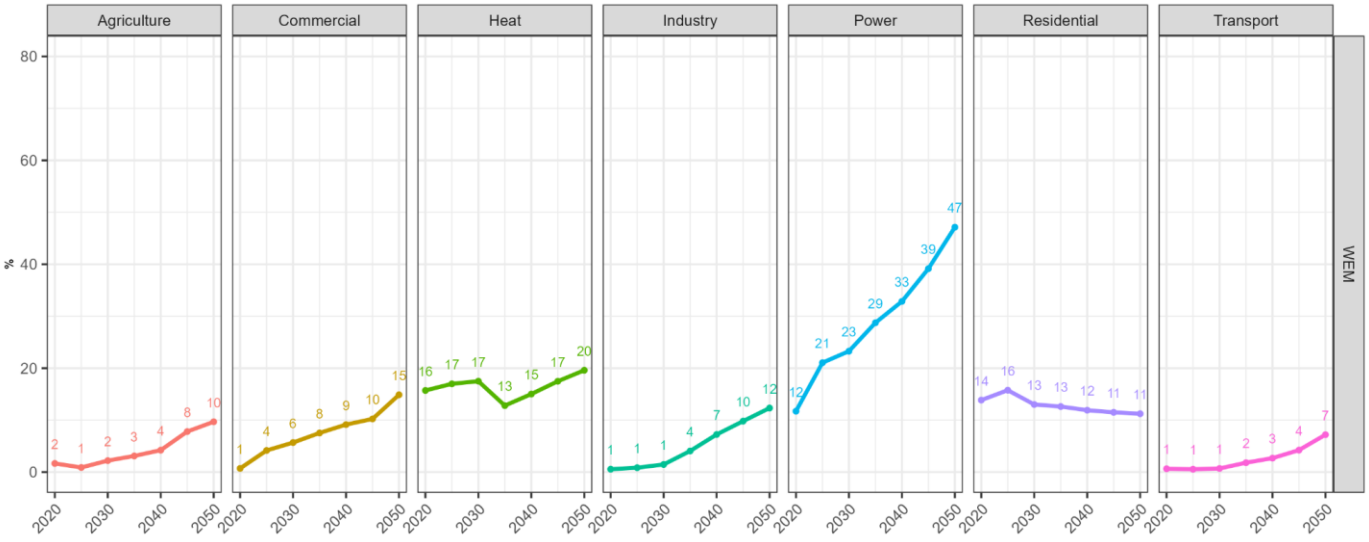
The results of modeling under the WEM scenario show that the share of RES in the structure of gross final energy consumption (GFEC) will constantly grow, but this growth will be minimal and achieving the target in 2030 does not seem possible (Fig. 4.11), primarily due to the low penetration of RES in energy consumption in industry, transport, replacement of carbon-intensive energy resources and low rates of natural gas replacement by RES in individual heating systems in the residential and commercial sectors (Fig. 4.12).

Fig. 4.11. RES sharein structure of gross final energy resources consumption according to WEM scenario, %



Source: calculations of the SO "Institute for Economics and Forecasting of NAS of Ukraine"" basing on TIMES-Ukraine model

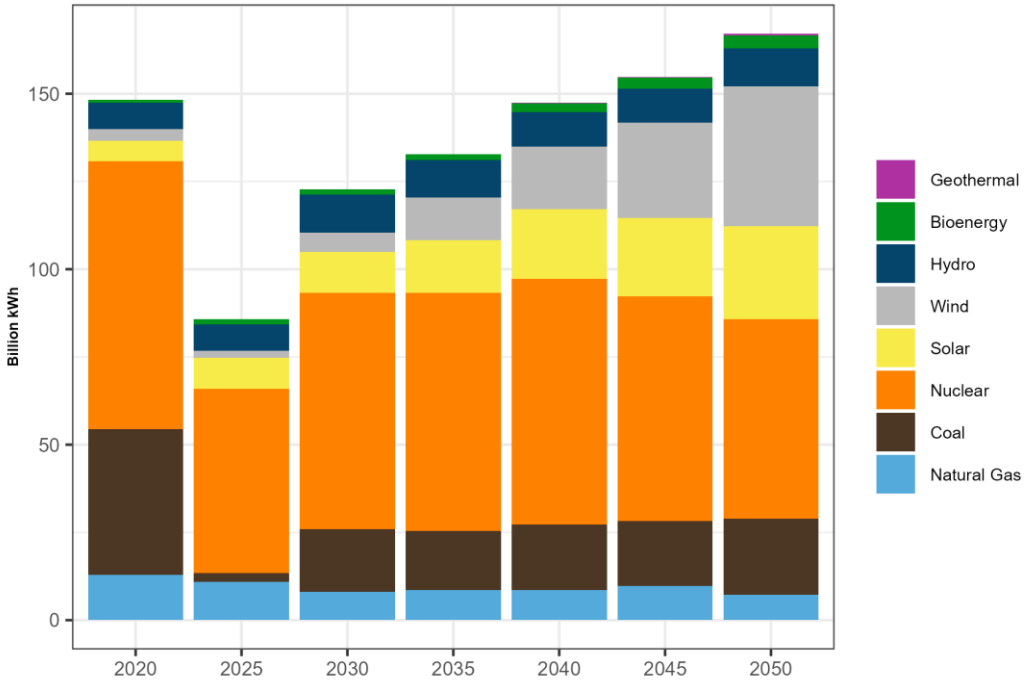
Fig. 4.12. Share of renewable energy sources in the structure of gross final consumption of energy resources under the WEM scenario by sectors, %



Source: calculations SO "Institute for Economics and Forecasting of NAS of Ukraine"" basing on TIMES-Ukraine model

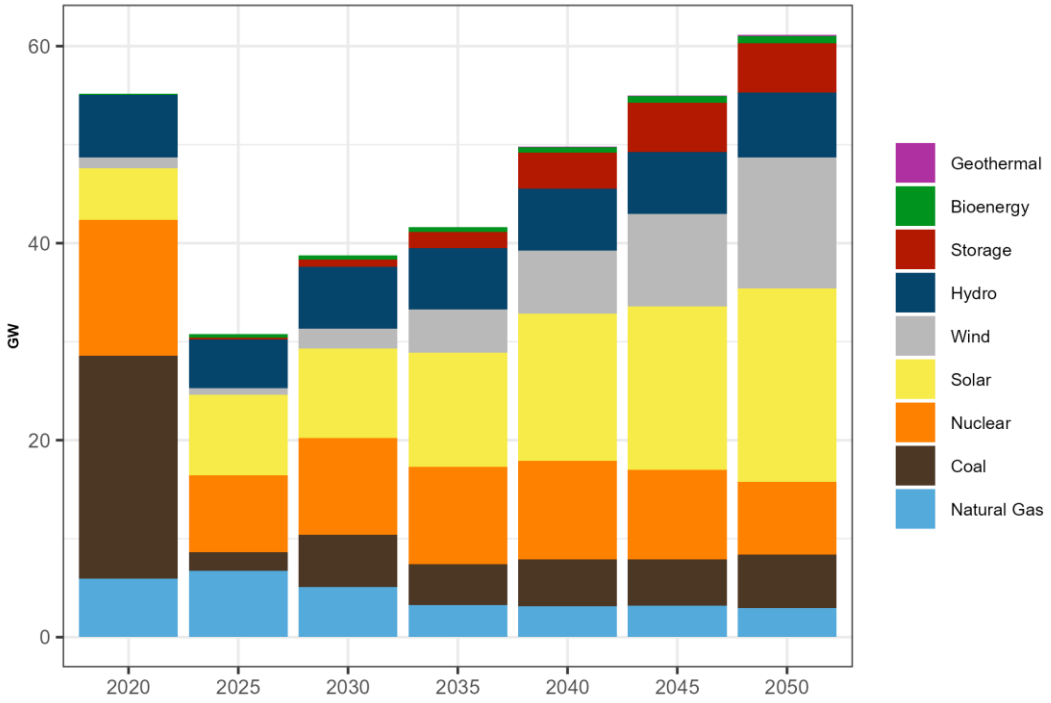
Fig. 4.13 and 4.14 show the dynamics and structure, respectively, of electricity production and installed capacities of generation facilities in Ukraine under the WEM scenario. Considering the modeling results, solar and wind demonstrate an extraordinary increase in energy generation , and also energy storage systems, at this structure established capacity looks quite balanced.

Fig. 4.13. Production of electricity by WEM scenario, billion kWh



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

Fig. 4.14. Installed capacities of electricity generation by WEM scenario, GW



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

The table below shows the forecast values and structure of total primary energy supply (TPES), final energy consumption (CES), production electric and thermal energy, generating capacities of the IntegratedSystem, as well as the share of renewable energy under the WEM scenario.

Table 4.7. Main modeling results of RES development in Ukraine by WEM scenario

		2020	2025	2030	2035	2040	2045	2050
Total primary energy supply (TPES)								
Total primary energy supply, Mtoe		86.4	49.4	66.0	69.1	73.7	75.2	76.0
Coal, %		27.4	12.2	21.1	18.7	17.6	16.9	17.0
Natural gas, %		26.9	34.1	27.3	28.4	27.6	27.6	26.3
Oil, %		16.3	15.5	15.1	16.1	16.6	17.2	17.5
Nuclear energy, %		23.2	27.8	26.7	25.6	24.8	22.1	19.2
Hydropower, %		0.8	1.0	1.1	1.1	1.0	1.0	1.1
Wind energy, %		0.3	0.3	0.7	1.5	2.1	3.1	4.5
Solar energy, %		0.6	1.6	1.5	1.9	2.3	2.6	3.1
Biofuel and waste, %		4.7	6.8	5.9	6.1	7.3	8.8	10.7
Share of RES in TPES, %		6.4	9.6	9.3	10.6	12.8	15.6	19.4
Final energy consumption (FEC)								
Total final energy consumption, Mtoe.		47.8	32.1	40.5	43.8	47.5	49.8	51.9
Coal, %		12.3	8.8	8.4	7.6	6.5	5.5	4.5

Natural gas, %		24.9	29.9	29.0	28.1	27.1	26.4	25.0
Oil, %		19.5	21.7	23.2	24.0	24.5	24.6	24.1
Heat, %		16.2	15.1	14.6	13.6	13.1	13.1	13.1
Electricity, %		22.1	19.8	20.8	21.4	22.3	22.5	23.4
RES (direct consumption), %		4.9	6.2	5.5	6.5	7.5	8.8	10.8
Share of RES in gross FEC, %		10.9	13.7	14	15.5	18	21.3	26.1
Electricity production								
Electricity production, TWh		149.8	93.8	126.7	137.8	152.5	160.0	172.5
Coal, %		27.7	2.8	14.0	12.2	12.2	11.5	12.5
Gas, %		8.6	11.6	6.4	6.3	5.6	6.1	4.2
Nuclear energy, %		50.9	56.0	53.2	49.2	45.9	40.0	33.0
Biofuel and waste, %		0.5	1.6	1.1	1.3	1.6	2.0	2.1
Wind energy, %		2.2	2.0	4.4	8.8	11.7	17.0	23.1
Solar energy, %		4.0	9.4	9.2	10.9	12.9	14.0	15.3
Hydropower, %		5.0	8.0	8.5	7.7	6.5	6.0	6.3
Share of RES, %		11.8	23.0	24.0	29.8	34.0	40.5	48.6
Installed capacities of IPSU								
Installed capacities of IPSU, GW		55.14	30.8	38.8	41.6	49.8	55.0	61.2
BESS, %		0	0.7	2.0	4.0	7.4	9.1	8.2
Coal, %		41.0	6.1	13.8	10.1	9.5	8.6	8.8
Gas, %		10.8	21.9	13.1	7.8	6.3	5.8	4.9
Nuclear energy, %		25.1	25.5	25.4	23.6	20.1	16.6	12.1
Biofuel and waste, %		0.2	1.2	1.1	1.1	1.1	1.3	1.3
Wind energy, %		2.0	2.2	5.2	10.5	12.9	17.1	21.7
Solar energy, %		9.4	26.5	23.4	27.9	30.0	30.2	32.1
Hydropower, %		11.5	16.0	16.1	15.0	12.6	11.4	10.8
Share of RES, %		23.1	45.9	45.8	54.5	56.7	60.0	66.0
Heat production (heating stations)								
Heat production (heating stations), Mtoe		9.2	5.6	7.0	7.1	7.3	7.6	8.0
Coal, %		23.7	6.7	16.9	12.5	11.9	11.1	11.3
Natural gas, %		50.9	65.5	57.1	66.0	64.7	63.3	59.9

Biofuel and waste, %		15.7	17.0	17.5	12.8	15.0	17.5	19.6
Waste heat utilization, %		5.5	5.3	5.7	5.7	5.9	5.9	6.0
Share of RES, %		15.7	17.0	17.5	12.8	15.0	17.5	19.6

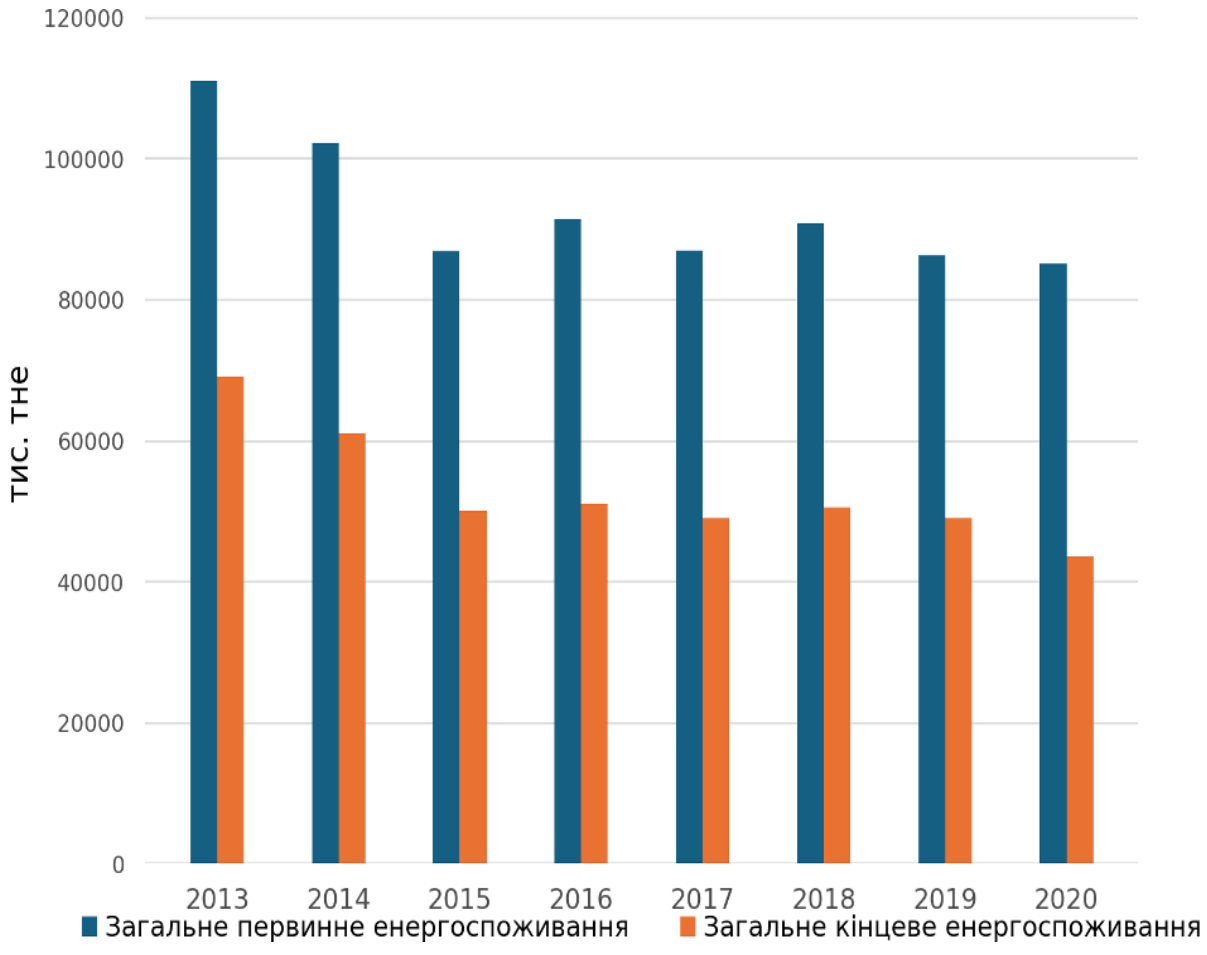
Source: State Statistics Service, SO "Institute for Economics and Forecasting of NAS of Ukraine""

4.3. Dimension Energy efficiency

4.3.1. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

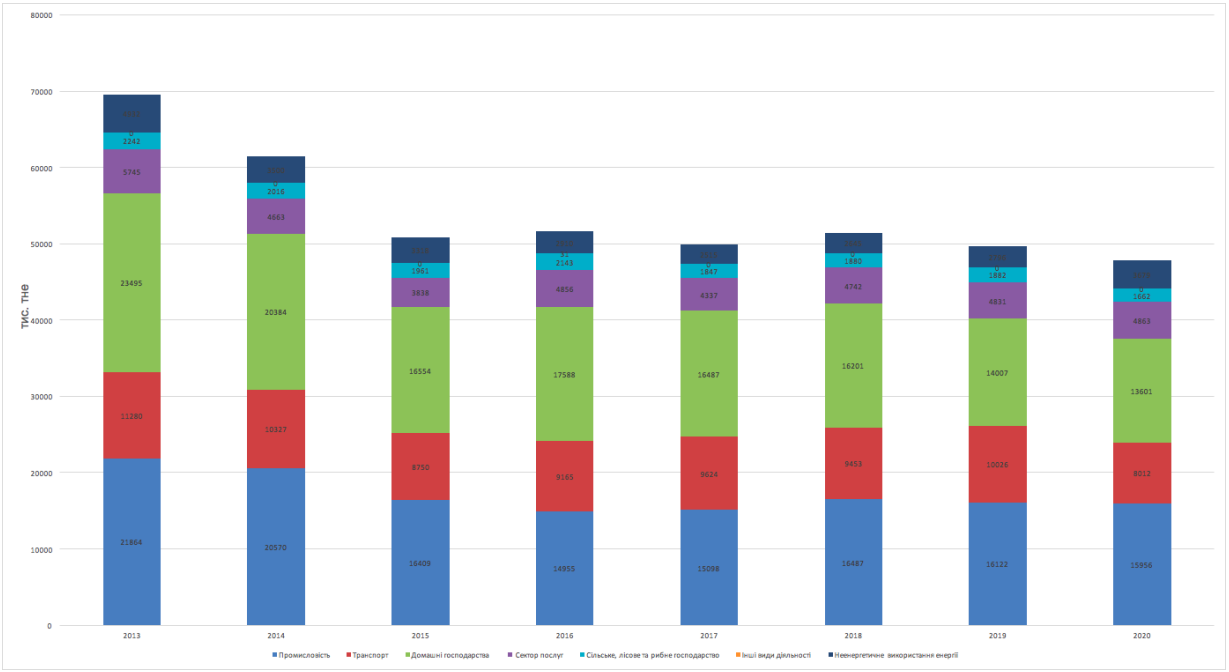
Final energy consumption as of 2020 was 47.8 million tons of equivalent (excluding the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk regions). Significant decrease final energy consumption occurred in 2014 (by 12.4%) due to the influence of a number of factors: occupation Autonomous Republic Crimea and significant territories industrial zones in Donetsk and Luhansk regions, economic recession, energy supply restrictions, rising energy prices. In 2016 and 2018, there was an increase in final energy consumption due to the impact of structural factors: economic recovery and normalization of energy supply. consumers. This growth in final energy consumption, accordingly, affected the growth in primary energy consumption in these years. As of 2020, total energy consumption was 85.1 million tons of oil equivalent.

Fig. 4.15. Dynamics changes primary and final consumption energy, 2013-2020 years



Source: State Statistics Service

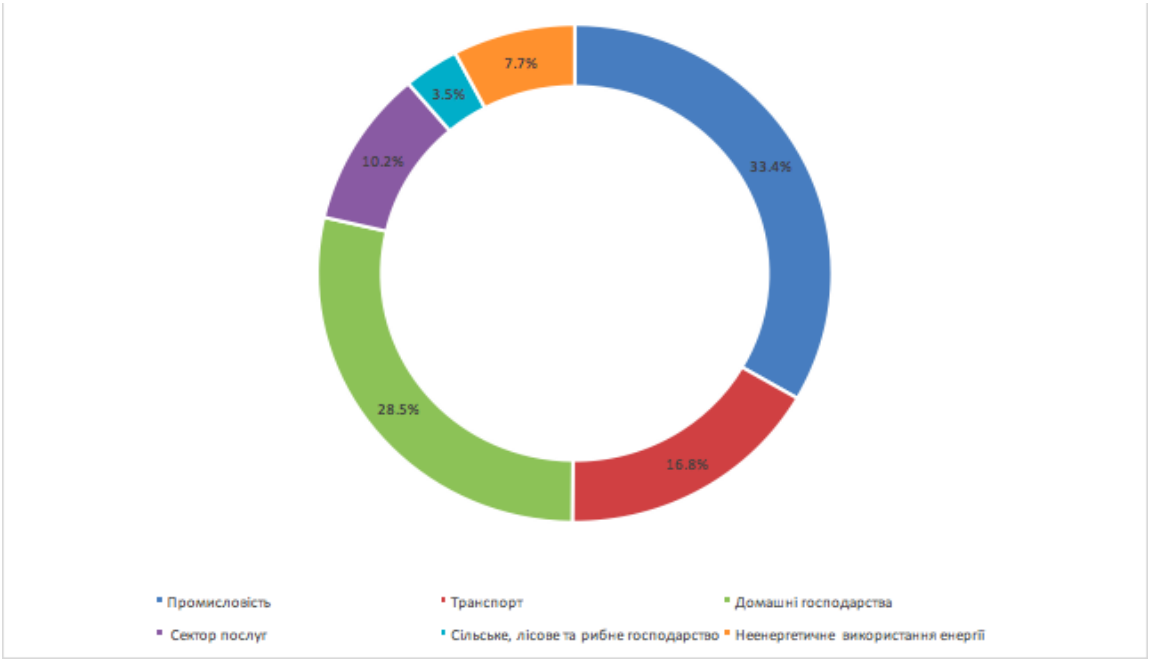
Fig. 4.16. Dynamics changes final consumption energy by sectors, 2013-2020 years



*Note: * for 2014-2021, excluding the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk regions.*
Source: State Statistics Service

In 2020, the largest share of final energy consumption was occupied by industry (33.4%). The second largest energy consumption was the residential sector, whose share was 28.5%. The transport sector consumed 16.8% of energy, the services sector - 10.2%, non-energy consumption - 7.7%, agriculture, forestry and fisheries - 3.5%.

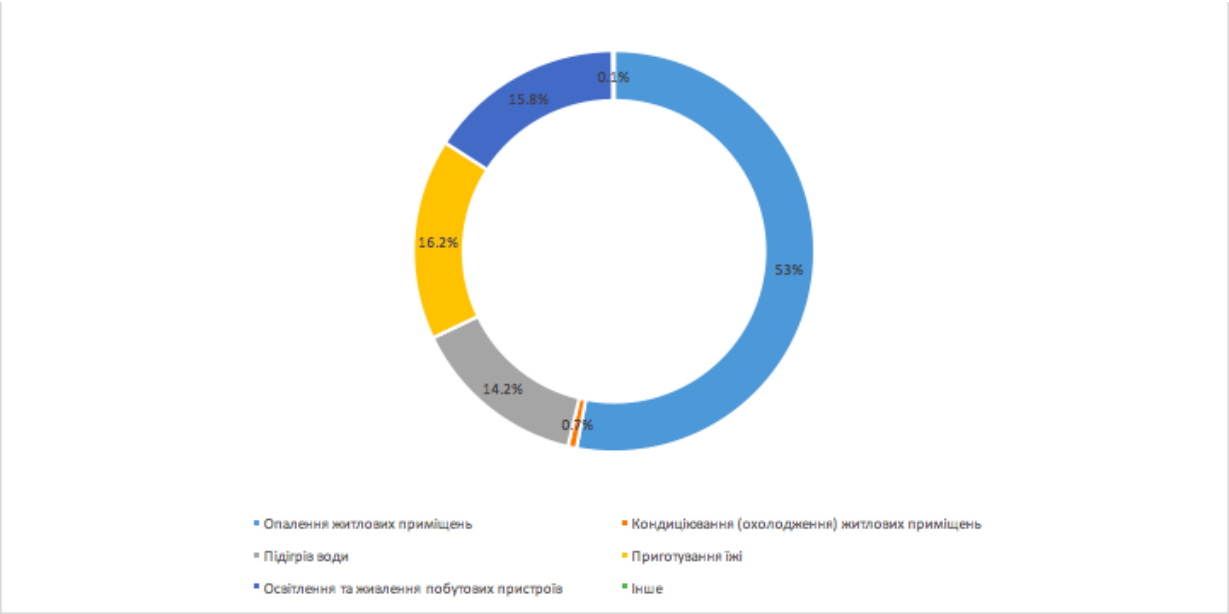
Fig. 4.17. Final energy consumption by sectors, 2020



Source: State Statistics Service

In the structure of final energy consumption by households, the largest share is occupied by heating (53%). Cooking uses 16.2% of energy, lighting and powering household appliances – 15.8%, and water heating – 14.2%.

Fig. 4.18. Structure final consumption energy households by goals appointment,



2020

Source: State Statistics Service

Given the full-scale invasion Russian federations in Ukraine, part respondents, exercising the right granted by the Law of Ukraine "On Protection of the Interests of Subjects of Reporting and Other Documents in period of military action state or state war", did not submit statistical and financial reporting for 2021-2024. This made it impossible for state statistics bodies to form a full range of objective statistical information.

In 2024, total electricity consumption in Ukraine decreased by approximately 33.8% compared to 2021. The decrease in consumption was recorded among both households and non-household consumers. Electricity consumption by households decreased by 21.4% — from 38 314 GWh in 2021 to 30 116 GWh in 2024. In the non-domestic sector reduction was more essential — by 39.2%, from 87 341 GWh in 2021 to 53 061 GWh in 2024 .

Consumption natural gas in Ukraine also decreased in all major consumer categories. Household consumption decreased from 8.2 billion m³ in 2020 to 7.1 billion m³ in 2024, which is about 13%. In industry and among other consumers, the decrease was more significant - from 11.2 billion m³ to 5.7 billion m³, i.e. by almost 50%. Teplokomunenergo also reduced gas consumption: for household needs - from 4.7 billion m³ in 2020 to 3.3 billion m³ in 2024 (-29.8%), for other consumers - from 3.5 billion m³ to 3.0 billion m³ (-14.6%)[120].

The full-scale invasion of Ukraine by the Russian Federation has a significant impact on all sectors of energy consumption:

- Buildings: as of January 2024, more than 50% of the housing stock was damaged or destroyed as a result of hostilities. The total number of destroyed or damaged housing stock objects was about 250 thousand buildings, of which 222.6 thousand were private (individual) houses; 27 thousand were apartment buildings; 0.53 thousand were dormitories. Significant destruction suffered also non-residential buildings: was damaged or destroyed at least 1,284 healthcare facilities; at least 380 educational infrastructure facilities have already been destroyed and 3,429 damaged; 160 social protection facilities have been damaged or destroyed;

- Industry: As of early 2024, assets of at least 426 large and medium-sized private enterprises, as well as state-owned enterprises, as well as tens of thousands of small private ones, have been damaged or destroyed.

- Transport: as of as of January 2024, direct losses, inflicted communal to enterprises and private carriers, in particular, in terms of destroyed transport, were estimated at 0.83 billion USD (destroyed trolleybuses, trams, buses). Direct losses to private passenger transport amounted to 1.9 billion USD, or 212 thousand cars. 1,629 units of fire-fighting equipment were also lost for the amount of 89 million

[120] https://energy-map.info/uk/datasets/ec1dfaf7-e9de-4eab-ac08-323f75cec2f8

USD[121].

Along with the destruction of housing and infrastructure, Ukraine has also experienced a significant population decline. According to the Institute of Demography and Quality of Life Problems of the National Academy of Sciences of Ukraine, as of July 2024, the population of Ukraine was 35.8 million people, including territories in which state authorities exercise their powers in full - 31.1 million people, while as of February 1, 2022, the estimated population, according to the State Statistics Service, was 41.1 million people (excluding the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol).

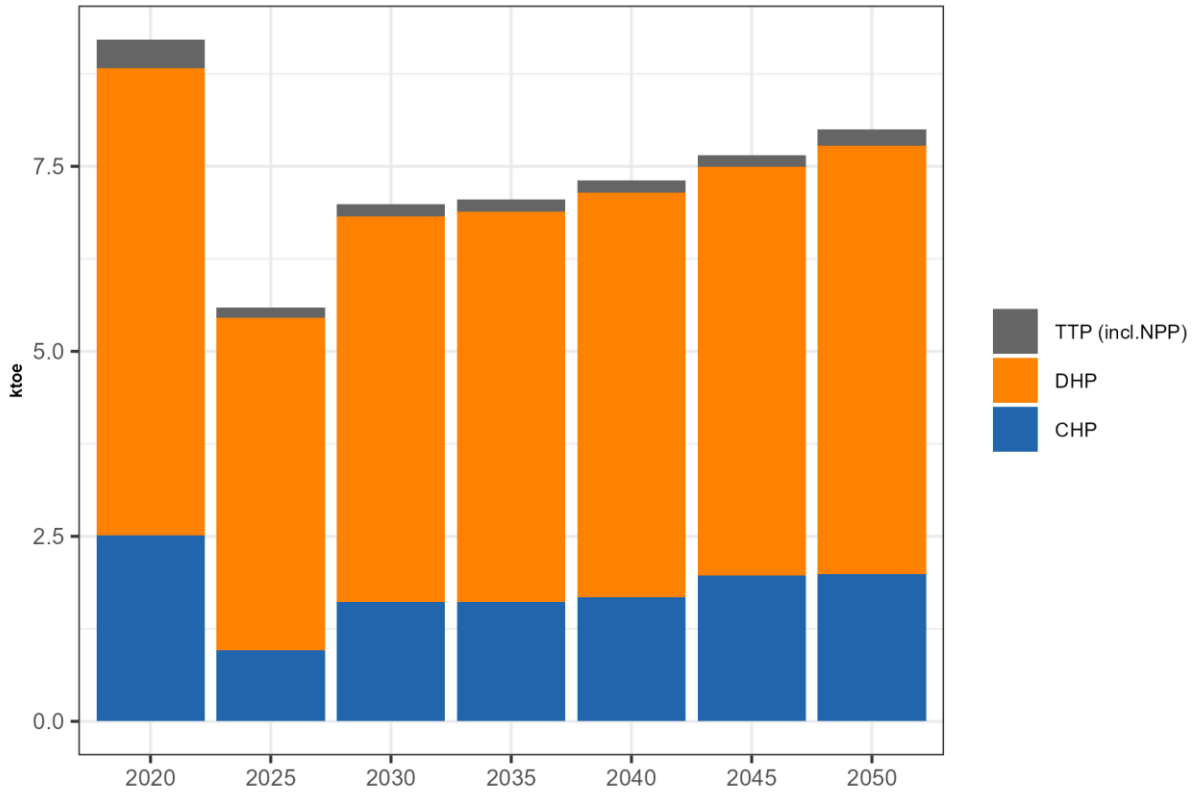
Large-scale destruction, structural changes in the economy and population decline will have a decisive impact on the change in final energy consumption. At the same time, the restoration of destroyed buildings, infrastructure and industry is expected to be carried out on the principle of "build back better", which will result in a reduction in energy consumption.

4.3.2. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling

As of the end of 2025, an assessment of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling in accordance with the requirements of Directive 2012/27/EU has not been carried out.

Results of modeling the scenario with existing policies and measures (WEM) using the model TIMES-Ukraine shows, what and absolute, and relative indicators cogeneration of electricity and heat on CHP to end model period will not reach the 2020 level year, after falling during the period of full-scale invasion (figure below), while heat production by SCT boiler plants and factory boiler plants (automakers) will increase (figure 4.20). In addition, heat production at nuclear power plants may increase, given the projected development of nuclear power, which is also cogeneration, in essence, but with a small share of heat. In terms of fuel use in CHP plants, the role of biomass will increase significantly.

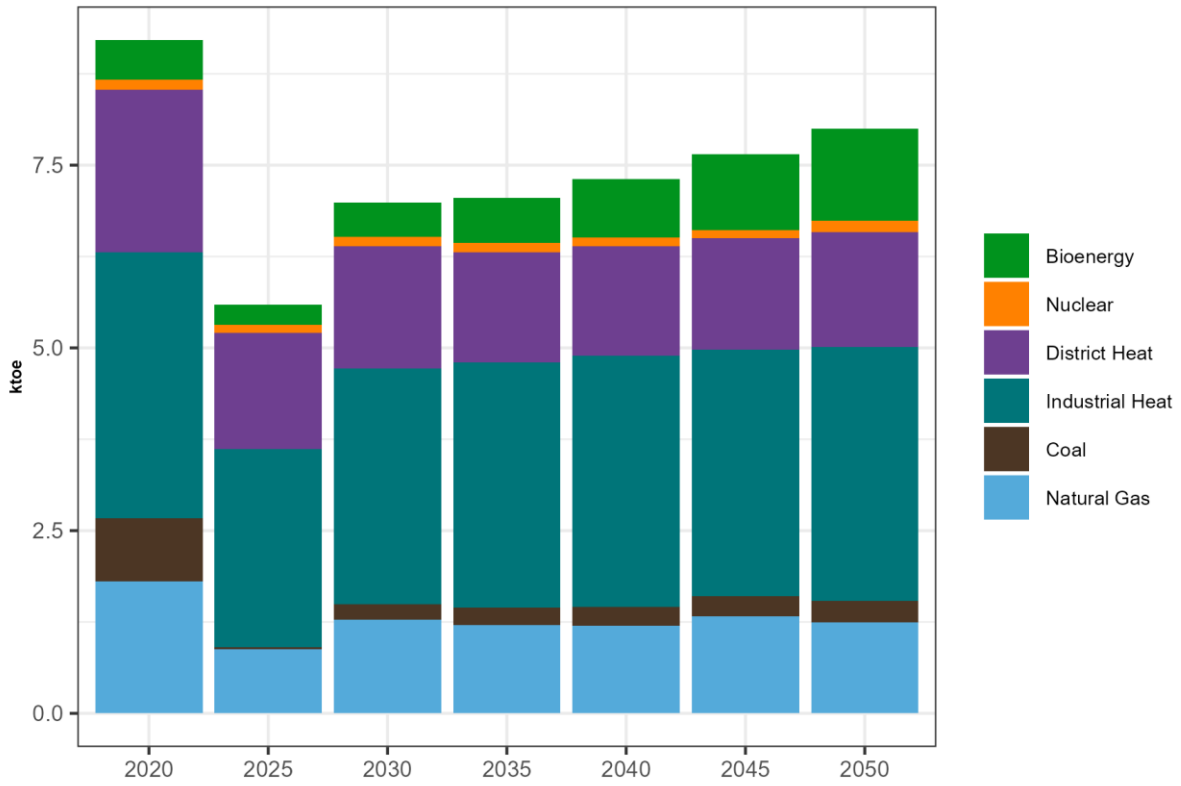
Fig. 4.19. Heat production by types of generating facilities in the WEM scenario, million tons of oil equivalent.



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

[121] https://kse.ua/wp-content/uploads/2024/04/01.01.24_Damages_Report.pdf

Fig. 4.20. Production of heat by fuel with allocation of district heating in the WEM scenario, million tons of oil equivalent.



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

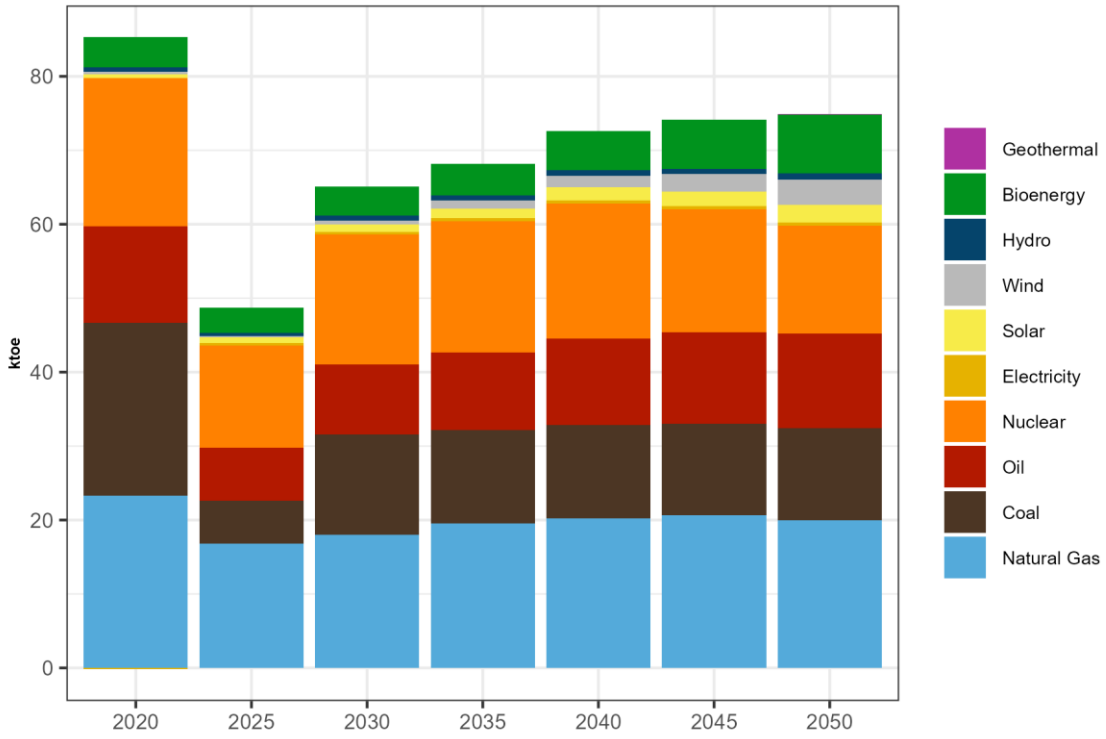
4.3.3. Projections considering existing energy efficiency policies, measures and programmes as described in point 1.2.(ii) for primary and final energy consumption for each sector at least until 2040 (including for the year 2030)

The results of modeling under the WEM scenario confirm that the post-war economic recovery and reintegration of temporarily occupied territories of Ukraine will contribute to a significant increase in demand for energy resources - especially in the first 5-10 years.

At the same time, existing policies and measures in the field of energy efficiency and renewable energy can ensure the stabilization of primary energy consumption (PEC) after the post-war recovery, and under the WEM scenario, the 2020 PEC level will not be reached. (see figure below), as and not will be surpassed level upper boundaries (91.47 million tons of oil equivalent), approved for Ukraine by the decision of the Energy Community Council of Ministers, in particular regarding national contributions to energy efficiency[122].

[122] Decision 2022/02/MC-EnC on amending Decision 2021/14/MC-EnC and incorporating Directives (EU) 2018/2001 and 2013/2002, Regulations (EU) 2018/1999, 2020/1044, and 2020/1208 in the Energy Community acquis

Fig. 4.21. Primary energy consumption in the WEM scenario, Mtoe



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

The dynamics of final energy consumption (FEC) are somewhat different from the dynamics of PEC, since in the WEM scenario the growth rate of FEC is slightly higher than the growth rate of PEC, and after 2035 FEC may exceed the 2020 level due to increased consumption of electricity, heat and biofuels, which may indicate an increase in the efficiency of the energy transformation sector.

Fig. 4.22. Final energy consumption by fuel in the WEM scenario, Mtoe

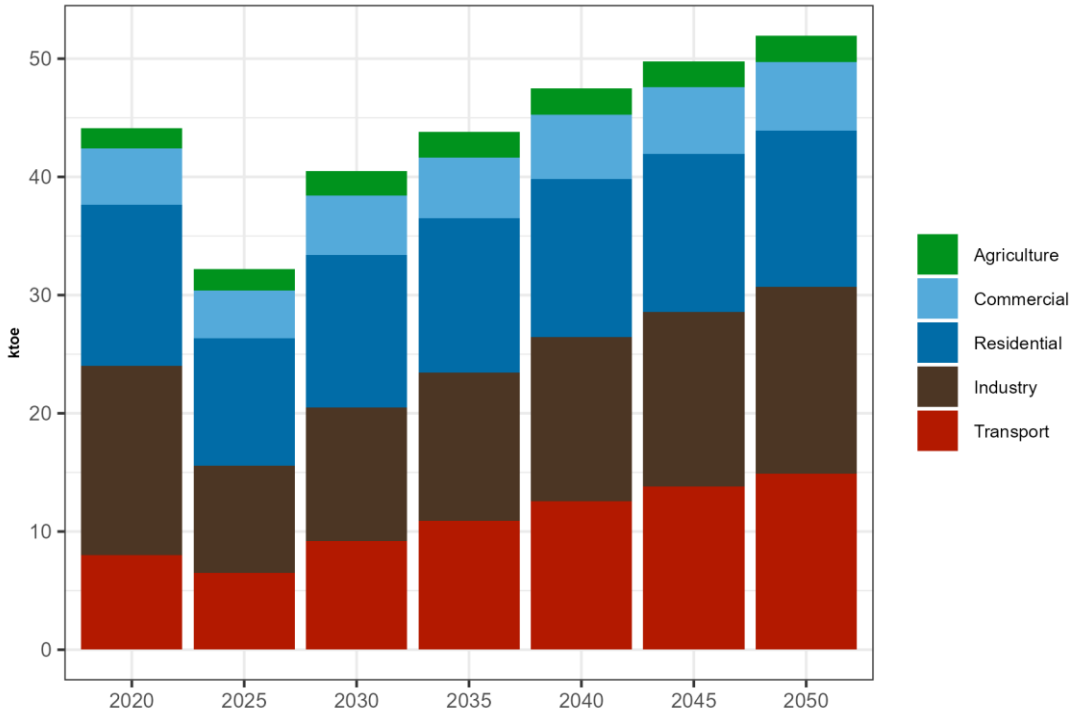


Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

After a radical drop in energy consumption in 2022 as a result of the Russian Federation's full-scale invasion of Ukraine, all sectors of the FEC will see an increase in energy demand by 2050, especially in industry and transport, driven by economic recovery and the reintegration of temporarily occupied

territories.

Fig. 4.23. Final energy consumption by sectors in the WEM scenario, Mtoe.



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

The results of modeling final energy consumption by sectors and fuel types in Ukraine are presented in the table below.

Table 4.8. Final energy consumption by sectors and fuel, Mtoe

		2020	2025	2030	2035	2040	2045	2050
Final energy consumption in the services sector								
FEC in the services sector, Mtoe.		4.8	**4.0**	**5.0**	**5.1**	**5.4**	**5.5**	**5.7**
Coal, %		8.8	0.0	0.6	0.9	0.6	0.1	0.0
Natural gas, %		17.4	17.7	18.2	19.6	18.8	16	8.6
Oil, %		2.6	3.2	1.8	0.2	0	0	0
Heat, %		31.7	41	38.1	33.9	33.6	35.7	38.4
Electricity, %		38.8	33.9	35.5	37.7	37.8	37.8	37.9
RES (direct consumption), %		0.7	4.2	5.7	7.5	9.1	10.2	14.9
Final energy consumption in industry								
FEC in industry, Mtoe		**16.0**	**9.1**	**11.3**	**12.6**	**13.9**	**14.8**	**15.8**
Coal, %		30.6	30.6	28.6	24.5	20.7	17.3	13.6
Natural gas, %		17.7	25.0	23.7	22.4	22.0	21.6	20.8
Oil, %		4.0	2.5	2.5	2.6	2.6	2.6	2.4
Heat, %		22.5	17.0	17.3	17.6	17.5	17.5	17.0
Electricity, %		24.7	24.1	26.4	28.9	30.0	31.2	33.9
RES (direct consumption), %		0.56	0.8	1.5	4.1	7.2	9.8	12.3
Final energy consumption in residential sector								

FEC in residential sector, Mtoe		**13.7**	**10.8**	**12.9**	**13.0**	**13.4**	**13.3**	**13.2**
Coal, %		1	0.0	0.7	1.0	1.0	1.0	1.0
Natural gas, %		48.0	52.5	53.4	53.1	51.8	51.9	51.7
Oil, %		0.24	0	0	0	0	0	0
Heat, %		13.9	12.4	12.7	12.4	11.8	11.6	11.4
Electricity, %		23.0	19.3	20.2	20.9	23.5	24.0	24.6
RES (direct consumption), %		13.8	15.8	13.0	12.6	11.9	11.5	11.2
Final energy consumption in transport sector								
FEC in transport sector, Mtoe		**8.0**	**6.5**	**9.2**	**10.9**	**12.6**	**13.8**	**14.9**
Coal, %		0.03	0.09	0.09	0.09	0.09	0.08	0.08
Natural gas, %		8.3	10.7	10.1	11.7	12.5	13.3	14.0
Oil, %		85.0	83.0	82.1	80.2	78.2	76.0	72.4
Electricity, %		6.1	5.7	7.1	6.2	6.5	6.3	6.3
RES (direct consumption), %		0.6	0.6	0.7	1.8	2.7	4.2	7.2
Final energy consumption in agriculture								

FEC in agriculture, Mtoe		**1.7**	**1.8**	**2.1**	**2.2**	**2.2**	**2.2**	**2.2**
Coal, %		0.32	0.5	0.5	0.5	0.5	0.5	0.5
Natural gas, %		7.4	7.7	7.6	7.5	7.4	7.0	6.8
Oil, %		60.5	63.1	62.0	61.2	60.3	57.0	55.3
Heat, %		10.4	12.6	12.6	12.7	12.7	12.7	12.7
Electricity, %		19.6	15.1	15.1	15.0	15.0	15.0	15.0
RES (direct consumption), %		1.7	0.9	2.2	3.1	4.2	7.8	9.7

Source: State Statistics Service, SO "Institute for Economics and Forecasting of NAS of Ukraine"

4.3.4. Cost-optimal levels of minimum energy performance requirements resulting from national calculations, in accordance with Article 5 of Directive 2010/31/EU, as adapted and adopted by Ministerial Council Decision 2010/02/MC-EnC and by the Ministerial Council Decision 2021/14/MC-EnC

The minimum requirements for the energy efficiency of buildings are established on the basis of data calculated for reference buildings, taking into account the requirements for the thermal characteristics of building envelopes and the energy efficiency of engineering systems (including equipment) of buildings, in accordance with the economically feasible level, taking into account the cost of discounted total costs for implementing measures to increase the level of energy efficiency relative to the estimated service life of each reference building, and are differentiated depending on the functional purpose, height of buildings and type of construction work (new construction, reconstruction, major repairs).

- At new construction, reconstruction, which leads to changes in the functional purpose of the building, the minimum requirement for the energy efficiency of the building is class "C".

- When reconstructing or overhauling buildings as a whole or their separate parts, the minimum requirement is to fulfill the following conditions:

$$EP_{use} \leq 1.2 \times ER_p, \quad (1)$$

where: EP_{use} - total specific energy consumption for heating and cooling, kW × h/m $^{-2}$, (kW × h/m $^{-3}$), calculated according to the Methodology for determining energy efficiency of buildings;

EP $_r$ - the limit value of specific energy consumption for heating and cooling residential and public buildings, kW × h/m $^{-2}$, (kW × h/m $^{-3}$), which is given in the table below.

- When reconstructing, overhauling, or repairing parts of a building (individual enclosing structures as a whole) specified in the design documentation, the minimum requirement is to fulfill the following conditions:

$$R_{\Sigma\ mp} \geq R_{q\ mir} (2)$$

where: $R_{\Sigma\ mp}$ - the heat transfer resistance of the enclosing structure is given, m $^{-2}$ × K/W, which is determined in accordance with DBN V.2.6-31:2016 "Thermal insulation of buildings" (hereinafter - DBN B.2.6-31);

Rq $_{min}$ - minimally permissible value resistance heat transfer, m $^{-2}$ × K/W, What determined according to DBN V.2.6-31.

Table 4.9. Limit values of specific energy consumption at heating and cooling of residential and public buildings

No.	View buildings (reference buildings)	The limit value of the specific energy consumption of buildings for heating and cooling, EPr, kWh/m $^{-2}$ [kWh/m $^{-3}$], for temperature zones of Ukraine	
		I	**II**
1	**Buildings residential (superficiality):**		
	from 1 to 3	120	110
	from 4 to 9	85	75
	from 10 to 16	75	70
	17 and over	70	65
2	**Public buildings (superficiality):**		
	from 1 to 3	[38Λbci + 15]	[34Λbci + 13]
	from 4 to 9	[30]	[25]
	10 or more	[25]	[20]
3	**Individual types public buildings:**		
3.1	Hotel buildings	57Λbci + 60	50Λbci + 55
3.2	Education institution buildings	[55Λbci + 24]	[52Λbci + 23]
3.3	Preschool education institution buildings	[32]	[28]
3.4	Health care institution buildings	[30]	[26]
3.5	Commercial buildings	[33Λbci + 17]	[26Λbci + 15]

Note: Λbci - coefficient compactness buildings, m $^{-1}$, is located according to with DBN V.2.6-31:2016 "Thermal insulation of buildings"

4.4. Dimension Energy security

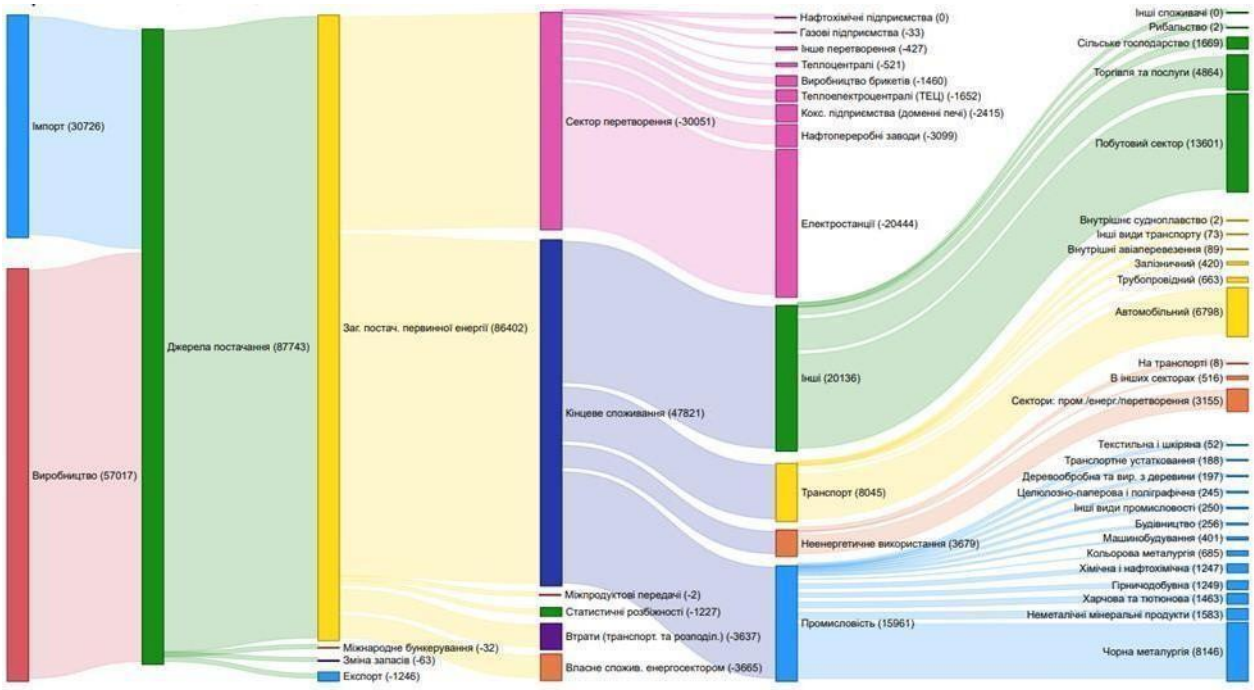
4.4.1. Current energy mix, domestic energy resources, import dependency, including relevant risks

In recent years, the total supply of primary energy in Ukraine has been at the level of 86-93 Mtoe, which is almost a third less than in 2010. The gradual decline corresponds, on the one hand, to the dynamics of economic development/decline, and on the other hand, to an increase in the efficiency of energy conversion and consumption.

At the same time, import indicators were quite stable. As of 2020, imports amounted to 30.7 Mtoe, or about 35% of the total sources of primary energy supply. The share of own production in TPES was 65% in 2020,

and did not exceed 70% in the previous 5 years.

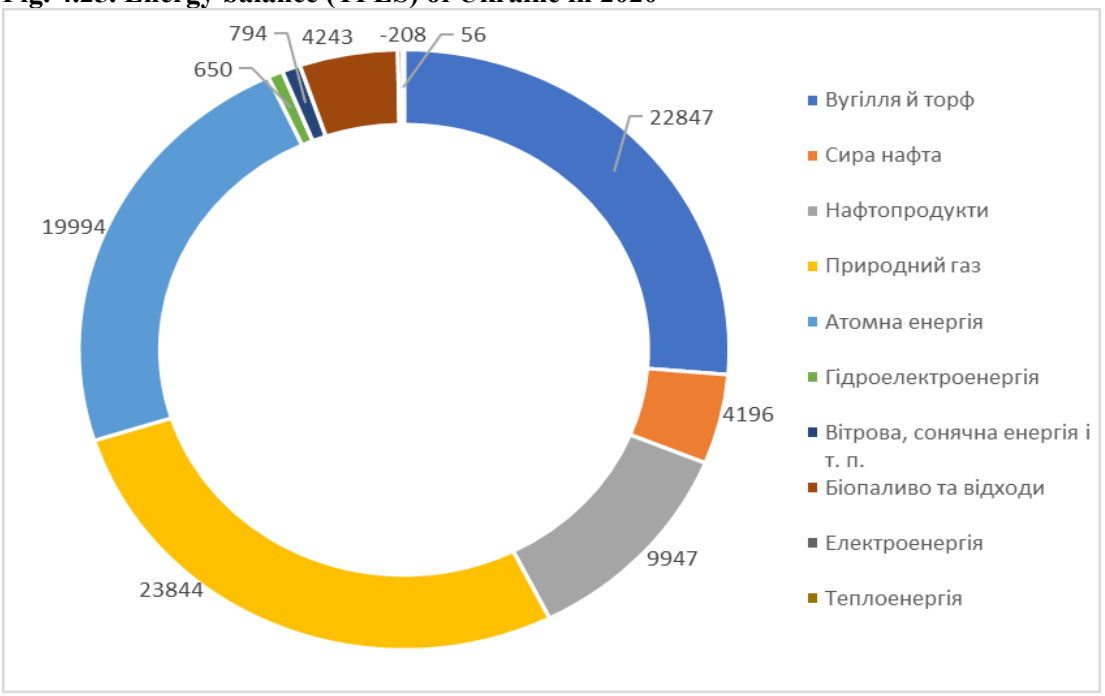
Fig. 4.24. Energy flows, ktoe., 2020



Source: State Statistics Service[123]

According to the Energy Balance for 2020, the current energy balance of Ukraine includes four main energy sources covering almost 90% of the total primary energy supply (TPES): coal (26.5%), natural gas (27.6%), nuclear energy (23.2%) and oil products (11.5%). The share of renewable energy sources, including hydropower, is 6.6%.

Fig. 4.25. Energy balance (TPES) of Ukraine in 2020



Source: State Statistics Service[124]

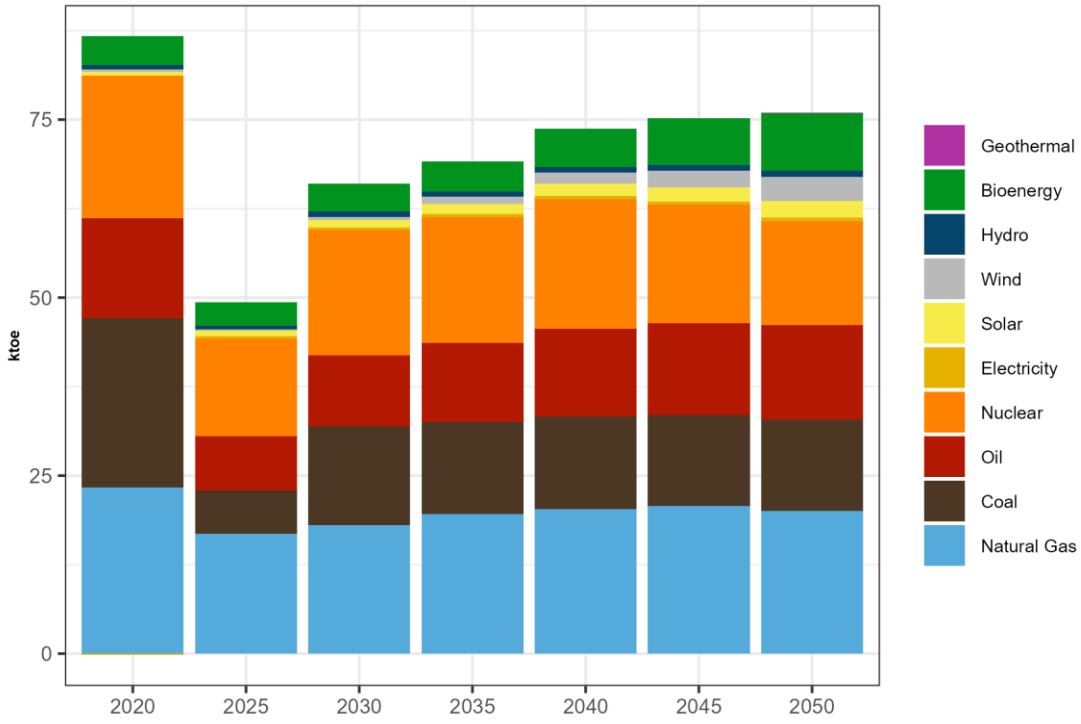
Actual data on the energy balance of Ukraine in 2021-2023 were not published due to martial law. Legislative restrictions that exempted respondents from the obligation to submit statistical and financial reporting were lifted only from July 5, 2025. Therefore, data processing and publication of more up-to-date information are expected in the future.

The figure below shows the results of the simulation of the dynamics of Ukraine's TPES under the WEM

[123] https://www.ukrstat.gov.ua/operativ/operativ2020/energ/drpeb/graf_u.zip
[124] https://www.ukrstat.gov.ua/operativ/operativ2021/energ/drpeb/EBTS_2021_ua.xls

scenario using the TIMES-Ukraine model.

Fig. 4.26. Total primary energy supply in 2020-2050, Mtoe



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

Despite the decline of net imports in absolute terms in the 1990s and 2000s, which has stabilized in the last 5 years, the dynamics of providing the economy with its own resources looks different in terms of individual energy resources.

Thus, there was a significant decline in the supply of coal and peat with own resources - from 98.5% in 2013 to 55.8% in 2020. This is largely due to the loss of control over the mining enterprises in the territories occupied by the Russian Federation, as well as the further decline in the production indicators of the state-owned mines. According to the State Customs Service, in 2022 Ukraine reduced the import of hard coal and anthracite by 4.2 times (by 14,932.904 thousand tons) compared to 2021 - to 4,630.144 thousand tons. Data for 9 months of 2025 indicate that needs remain – 3.25 million tons were imported, which, extrapolated to the full year, may amount to more than 4 million tons. The main trading partners in 2025 were the U.S., Australia, Poland, and the Czech Republic.

Similar dynamics were observed in meeting the needs of oil refining with crude oil. The share of domestic raw materials in the production of petroleum products was 59% in 2020. In the conditions of war this indicator increased through partial destruction of oil refining due to Russian Federation attacks and a decrease in the production of petroleum products. However, if we take into account the motor fuel market, in 2021 the share of imports amounted to almost 56% of domestic petroleum supplies, 86% for gas oil/diesel, 78% for liquefied petroleum gas. Under martial law, dependence on imports has reached critical levels. In 2025, the Energy Customs registered 8.82 million tons of imported petroleum products, including 1.49 million tons of petroleum, 6.47 million tons of diesel fuel, and 0.85 million tons of liquefied hydrocarbon gases.

On the other hand, the situation with regard to natural gas has significantly improved. Provision of own resources increased from 40.6% in 2013 to 66.5% in 2020. The main factors were the stabilization of production, despite the loss of resources in the occupied territories (in particular, the Black Sea offshore) and the low level of investment in new drilling, as well as a significant reduction in consumption in both the industrial and household segments. According to industry data, total gas consumption in 2022 decreased by 31% to 19.8 bcm, while production amounted to 18.5 bcm.

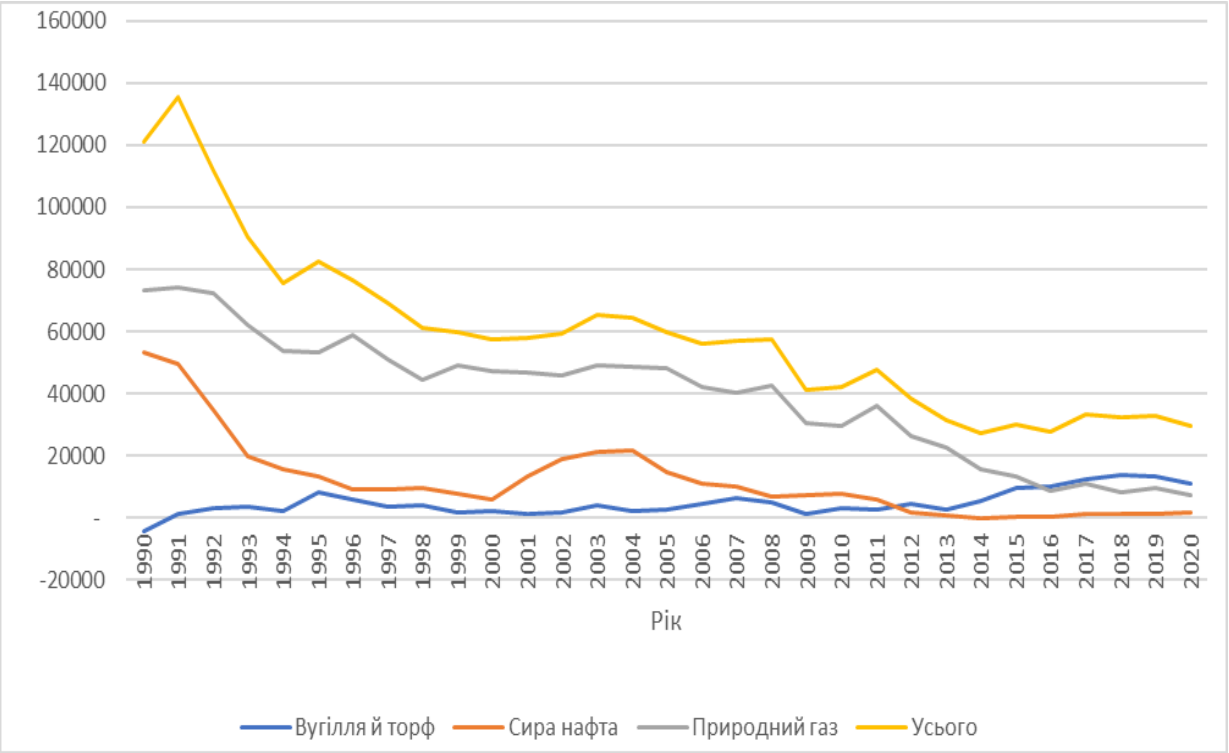
At the same time, in wartime, attacks on gas production facilities lead to a sharp increase in gas shortages and need to increase imports. It is estimated that imports of natural gas to Ukraine will reach 6.47 bcm in 2025, which is 9 times higher than the figure for 2024 (724 mcm) was[125] and became the highest since

[125] https://expro.com.ua/novini/mport-gazu-do-ukrani-u-2025-roc-zrs-u-9-razv--do-65-mlrd-kub-m

2020. At the same time, imports were and remain quite diversified: gas came from Hungary (45.5%), Poland (32.5%), Slovakia (20.5%), as well as from the Trans-Balkan (1.5%) directions; data of the State Customs Service on trading partners for 9 months of 2025 indicate that the main purchases were made through traders in Switzerland, Poland, Germany, Hungary, Luxembourg and other European countries.

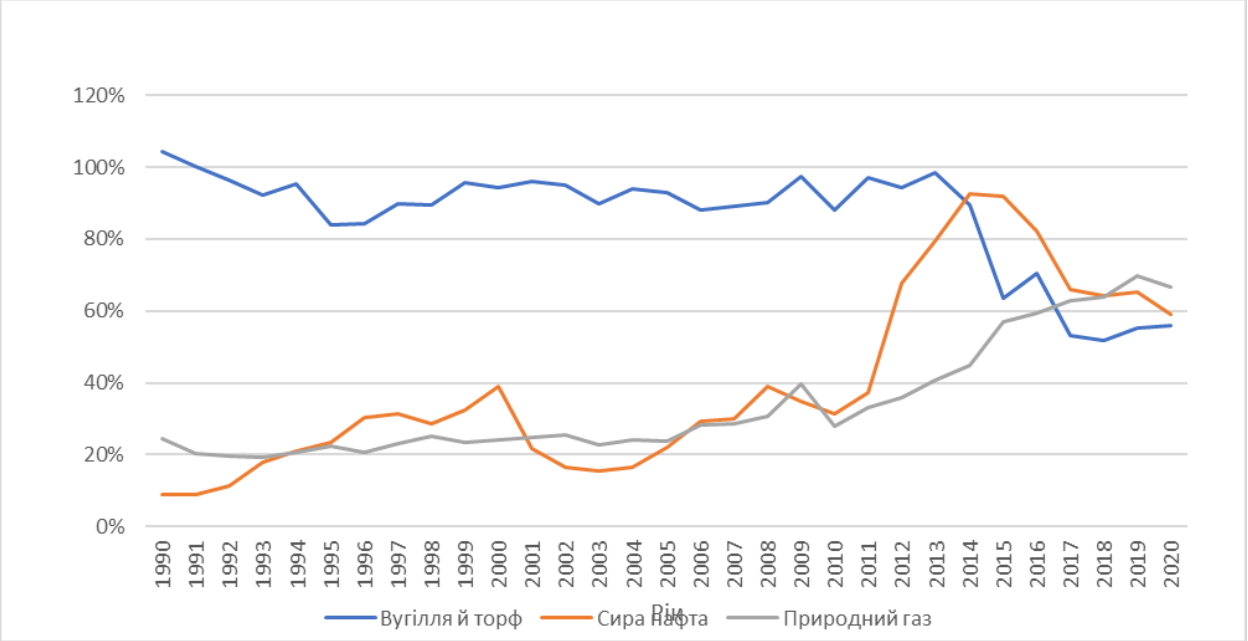
In terms of nuclear fuel, JSC NNEGC Energoatom has decided to stop importing Russian products in favor of Westinghouse assemblies (from 2022, 100% of supplies will come from Sweden, where the production is located), and from 2029 it plans to provide 50% of the needs of Ukrainian nuclear power plants with VVER-1000 reactors with products of its own production.

Fig. 4.27. Net energy imports, thousand toe



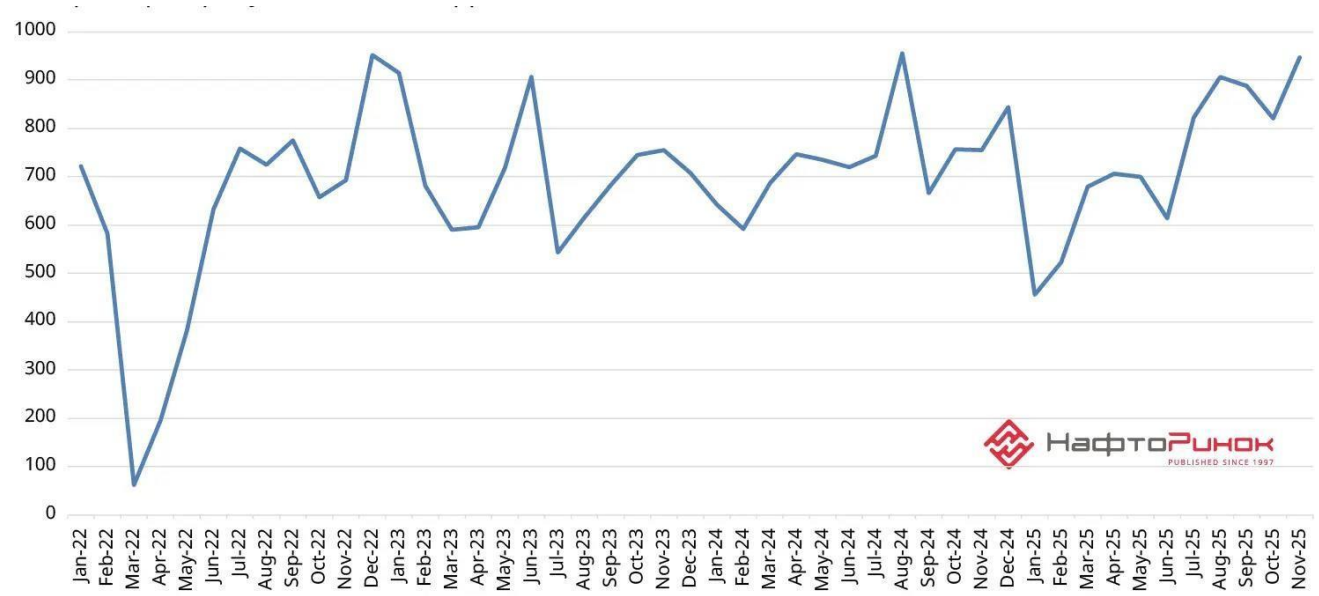
Source: State Statistics Service

Fig. 4.28. Provision of Ukraine's economy with its own resources, %



Source: State Statistics Service

Fig. 4.29. Dynamics of petroleum products imports in 2022-2025, thousand t

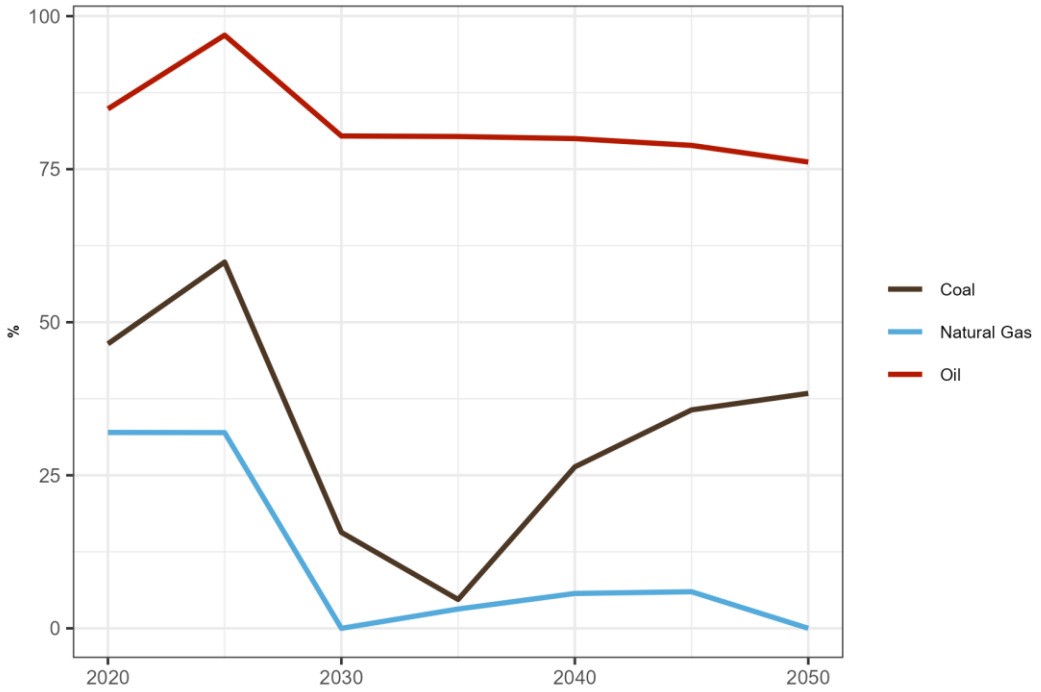


Source: Nefterynok[126]

4.4.2. Forecasts development with taking into account available politician and events at least to 2040 year (in including for 2030)

Under the WEM scenario, the challenge remains dependence on imports of oil and oil products, as well as coal. The recovery of demand for natural gas in the post-war years can be offset by increasing domestic production, as well as through energy efficiency measures and the development of renewable energy sources, thus reducing dependence on natural gas imports after 2025 will decrease (in the absence of attacks on extracting infrastructure), and will remain insignificant until 2050 (Fig. 4.29).

Fig. 4.29. Forecast of provision of Ukraine's economy with its own resources in WEM scenario, %



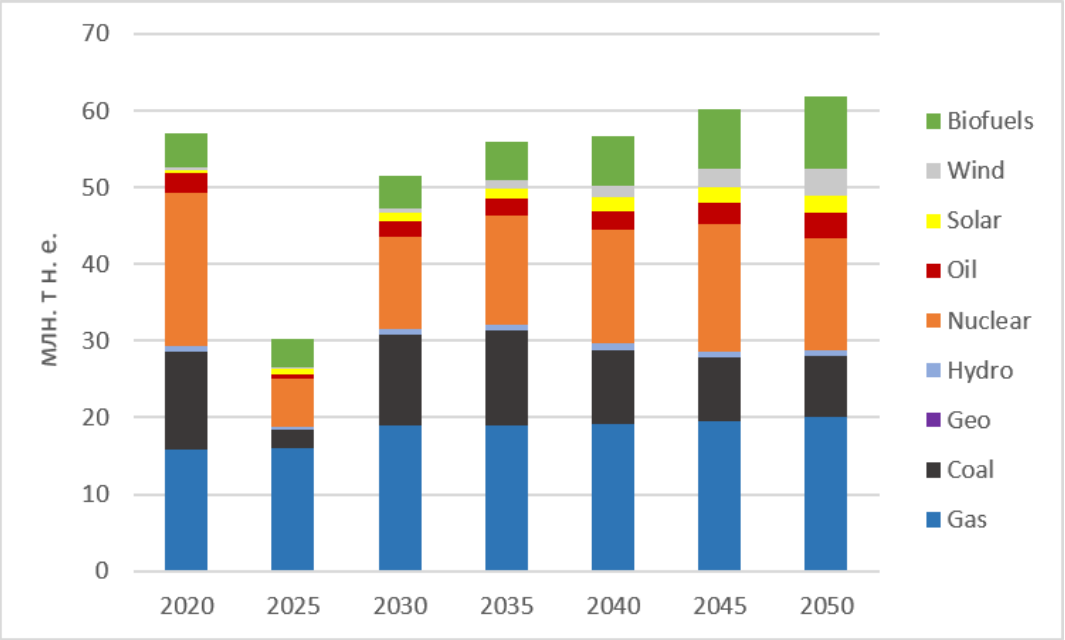
Note: curves reflect share of energy resource imports

Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

By scenario WEM predicted insignificant growth in mining/production of energy resources, primarily renewable energy resources.

[126] https://www.nefterynok.info/novosti/import-palnogo-v-listopadi-onoviv-16-misyachniy-rekord

Fig. 4.30. Forecast of production and supply of energy resources, Mtoe



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

4.5. Dimension Internal energy market

4.5.1. Electricity interconnectivity

4.5.1.1. Current interconnectivity level and main interconnectors

Ukraine has direct electricity connections with EU countries (Poland, Slovakia, Hungary, Romania) and Moldova. Until February 24, 2022, due to the technical features of the Ukrainian power system, there were two separate trading zones: "Burshtynskaya TPP Island" (synchronized with ENTSO-E) and "Integrated Power System of Ukraine" (synchronized with the Russian Federation and the Republic of Belarus), which were not interconnected. To conduct testing of the power system stability in preparation for integration with the power system continental Europe, since February 24, the Integrated Power System of Ukraine was disconnected from the systems of the Russian Federation and the Republic of Belarus, and the internal systems (trading zones) were synchronized. The single trading zone of the Integrated Power System of Ukraine, together with the power system of Moldova, has been operating synchronously with the unification of the power systems of continental Europe since March 16, 2022.

The task of integrating the Integrated Power System of Ukraine into the continental European power system has been completed, together with that, in accordance with conclusions report “Dynamic calculations for a synchronous interconnection of the grids of Continental Europe and Ukraine/Moldova using the present network” of the ENTSO-E Consortium, it is necessary to additionally implement technical measures to eliminate insufficient attenuation of low-frequency inter-regional power fluctuations involving the power systems of Ukraine and Moldova.

According to data as of 2022, NPC Ukrenergo can transmit electricity through interconnectors to Hungary (up to 650 MW), Slovakia (up to 400 MW), Romania (up to 400 MW), Poland (up to 1,210 MW), as well as to Moldova (based on the capacity of internal intersections of the Integrated Power System of Ukraine, the amount of commercial electricity flow between the Integrated Power System of Ukraine to the Moldovan power system can be up to 600 MW, but during peak hours it is limited to 260 MW, and during repair work on adjacent 330 kV overhead lines - to zero). According to the Transmission System Development Plan for 2024-2033, the purpose of the TSO is to implement measures aimed at improving the dynamic stability of the power system to ensure the technical feasibility of a gradual increase in electricity exports.

In 2023, Ukraine transitioned to unified European rules for the allocation of capacity of interstate lines for electricity exporters and importers. Market participants receive access to the capacity of interstate electricity networks of Ukraine based on the results of explicit auctions held by the auction office of the transmission system operator NPC Ukrenergo together with the TSOs of neighboring countries (Romania and Moldova). Auctions for the allocation of access to interconnectors of Ukraine with Poland, Slovakia

and Hungary since 2024 are taking place on the pan-European auction platform Joint Allocation Office (JAO). In particular, The National Commission for the Regulation of Energy and Power Generation of Ukraine, by resolutions No. 1557 of August 25, 2023, No. 1683 of September 12, 2023, and No. 226 of January 30, 2024, approved the Rules for the Allocation of Capacity of Interconnectors Ukraine - Romania, the Rules for the Allocation of Capacity of Interconnectors Ukraine - Poland, Ukraine - Slovakia, and Ukraine - Hungary. and Rules for the allocation of capacity of the Ukraine - Moldova interstate crossing.

During 2024, joint daily auctions were launched at the following interconnectors: Ukraine - Poland (from January 16, 2024), Ukraine - Hungary (from February 22, 2024), Ukraine - Moldova (from March 1, 2024), Ukraine - Slovakia (from March 4, 2024). In 2025, the National Commission for the Regulation of the National Energy and Power Sector of Ukraine adopted Resolution No. 1156 of July 29, 2025 "On approval of the rules for long-term capacity allocation of interconnectors of Ukraine". The specified rules implemented the agreements of the TSOs of Ukraine, Slovakia, Hungary and Romania on the implementation of medium-term (monthly) joint coordinated capacity allocation of interstate networks on Ukrainian borders based on the Joint Allocation Office (JAO) electronic auction platform. This solution expands opportunities for cross-border electricity trade, enhancing energy security and operational stability of the Integrated Power System of Ukraine. Also, throughout 2025 year Regulator agreed Regulations on intraday allocation of interconnectors on the borders with Moldova, Romania, Slovakia and Hungary (Resolutions of the National Commission for the Regulation of Energy and Power Generation of Ukraine No. 963 of June 24, 2025, No. 1437 of September 16, 2025 and No. 1929 of November 25, 2025). Intraday auctions for the allocation of interconnectors on the border with Moldova were launched on December 16, 2025 on the auction platform of NPC Ukrenergo. Intraday auctions for the allocation of interconnectors on the borders with Romania, Slovakia and Hungary are planned to be launched on 3 quarter of 2026 on the JAO auction platform.

Until the emergency synchronization of the Integrated Power System of Ukraine with the Continental European network on March 16, 2022 In 2018, the annual volume of electricity transmission amounted to 7 TWh (5 TWh through the interconnectors of "Burshtyn Island", up to 2 TWh of transmission was directed through the 220 kV transmission line "Dobrotvirska TPP - Zamosc"). According to estimates by NPC Ukrenergo, the additional volume of transmission, provided that the interconnectors "Khmelnytskiy NPP - Rzeszów" and "Pivdennokrainsk NPP - Issacea" are fully restored, may amount to 16 TWh per year. That is, the annual volume of electricity transmission from Ukraine to EU countries may reach up to 30 TWh.

Table 4.10. Cross-border power transmission lines of IPS (as of 2022)

Country	Number of power lines by voltage group (kV)						
	750 kV	400 kV	330 kV	220 kV	110 kV	35 kV	6-10 kV
Poland		1*		1			
Slovakia		1				1	
Hungary	1	1		2			
Romania		1					
Moldova			7		12	1	1
Total connections with ENTSO- E countries	1	4	7	3	12	2	1

*Note: * in 2023, NPC Ukrenergo implemented a project to restore the operation of the Khmelnytskiy NPP - Rzeszów line and transfer it to a lower voltage class (from 750 kV to 400 kV).*

After the synchronization of the power systems of Ukraine and Moldova with the continental European grid, ENTSO-E on June 7, 2022, decided to gradually expand the permitted capacity for commercial import/export of electricity. Commercial exchanges of electricity with EU countries at a minimum level began on June 30, 2022 (the permitted export capacity was 100 MW). Subsequently, during July 2022 - February 2026, there was a gradual increase in the volumes of permitted capacity for export and import of electricity.

In November 2023, the ENTSO-E Regional Group Continental Europe confirmed the full implementation by NPC Ukrenergo of all technical measures of the Catalogue of Measures[127], which is an integral part of

[127] The technical conditions (Catalog of measures) were enshrined in the Agreement on the conditions for the future interconnection of the energy systems of Ukraine and continental Europe, signed in 2017. The catalog contains more than 200

the Agreement on the Conditions for the Future Interconnection of the Integrated Power Systems of Ukraine and Continental Europe, announced the completion of the project for the full synchronization of the power systems of Ukraine and ENTSO-E and decided to increase the permitted capacity of interconnectors for the import of electricity to Ukraine and Moldova to 1,700 MW.[128] This decision is based on the results of studies on the security and stability of the synchronous operation of the Ukrainian and European power systems. From December 1, 2024, the maximum permitted value of capacity for importing electricity to Ukraine and Moldova was increased to 2,100 MW, from December 1, 2025 - to 2,300 MW, and from January 1, 2026 - to 2,450 MW.

Further gradual increase in the permitted technical capacity for imports is expected electricity from countries EU to common block regulation of Ukraine - Moldova. As of 2024, the maximum permitted capacity for electricity exports from Ukraine/Moldova to EU countries was 550 MW.[137] As a result of cooperation between the TSOs of the Eastern Europe Capacity Calculation Region (EE CCR) and the TSCNet Regional Coordination Centre, the maximum permitted capacity for export was increased to 650 MW from 1 May 2025, and to 900 MW from 1 July 2025. Within the framework of regional cooperation between the TSOs of the EE CCR and the TSCNet Regional Coordination Centre, the respective permitted capacity values for electricity import and export will be determined monthly and adjusted weekly, in accordance with operational security requirements. As of February 2026, the permitted capacity for commercial electricity import into the Ukraine-Moldova joint regulation block was 2,450 MW, for export to the EU countries – 800 MW. Also, in March 2023, a new agreement on emergency assistance for Ukrainian TSOs entered into force, allowing NPC Ukrenergo to request activation, and continental European TSOs to offer emergency assistance in cases of failure of generating or transmission capacities or situations of sudden imbalance between demand and supply of electricity[129]. Ukrainian TSOs can attract emergency assistance from EU TSOs in the amount of up to 250 MW.

4.5.1.2. Projections of interconnector expansion requirements (including for the year 2030)

Electricity infrastructure

The TSO, within the framework of the basic document assessing the prospects for the development of the electric power industry - the Report on the assessment of the adequacy (sufficiency) of generating capacities to cover the forecast demand for electric energy and ensure the necessary reserve in 2024, determines the forecast dynamics of the development of the maximum transfer capacity of interconnectors of Ukraine with adjacent countries for the period until 2050 (Table 4.11). The scenarios presented in Table 4.11 take into account changes in electricity consumption in the Integrated Power System of Ukraine, as well as the possibilities of coordinated increase in the capacity of Ukraine's interconnectors with operators of adjacent energy systems, determined based on the results of consultations between the TSOs of Ukraine and the TSOs of adjacent countries. At the same time, as of 2025, the nominal technically possible capacity of Ukraine's interconnectors with adjacent countries is significantly higher than the maximum volumes allowed by ENTSO-E (see Section 4.5.1.1).

Table 4.11. Forecast dynamics of cross-border transfer capacity for electricity exports/imports (NTC) (taking into account permitted cross-border capacity by ENTSO-E), MW

Scenario	Direction	Year						
		2025	2026	2027	2030	2035	2040	2050
Base	Imports	1700 2100*	1700 2100*	1700 2100*	2500 2870*	2700 3290*	2750 3350*	2800 3350*
	Export	650	650	650	650	650	650	650
Moderate and quick recovery	Imports	1700 2100*	1700 2100*	1700 2100*	3000	4500	5500	5500
	Export	0	0	550	1000	1000	1500	1500

*Note: * in winter period (from December 01 on 28 February)*

technical events by 9 directions. Catalog events there are integral part Framework agreements about the synchronous area of continental Europe (SAFA), to which NPC Ukrenergo joins.

[128] https://www.entsoe.eu/news/2023/11/28/continental-european-tsos-announce-completion-of-synchronisation- project-with-ukrenergo-and-significant-increase-in-export-capacity-from-continental-europe-to-ukraine/

[129] https://ua.energy/zagalni-novyny/entso-e-zbilshyla-obsyagy-propusknoyi-spromozhnosti-mizhderzhavnyh- interkonektoriv-dlya-eksportu-elektroenergiyi-z-ukrayiny-ta-moldovy-do-550-mvt/

According to the criterion of the target level of integration of IPS (interconnectivity) with the power systems of neighboring countries (see section 2.4.1), in accordance with the results of modeling using the TIMES-Ukraine model under the WEM scenario (Table 4.7), the target capacity of Ukraine's interconnectors in 2030 should be about 3.9 GW, and in 2040 - over 4.2 GW (10% from total volume installed generating capacity in IPS). These indicators exceed the TSOs' forecast estimates of the capacity of Ukraine's interconnectors, taking into account the restrictions applied by ENTSO-E (Table 4.11). Provided that the relevant restrictions are removed or relaxed, the forecast capacity of Ukraine's interconnectors as of 2030, taking into account the successful completion of the current projects for the modernization and construction of Ukraine's cross-border networks (section 2.4.2), will meet the target level of energy system integration.

By criterion of ratio to peak load in IPS, according to the modeling results under the WEM scenario, the nominal capacity of Ukraine's interconnectors in 2030 should be about 5.4 GW, and in 2040 - 5.9 GW (30% from peak load in the Integrated Power System of Ukraine).

According to the criterion of the ratio to the volume of installed RES generating capacity, according to the results of the WEM scenario modeling (Table 4.7), the nominal capacity of Ukraine's interconnectors in 2030 should be about 5.3 GW, in 2040 – 6.8 GW (30% of the total installed generating capacity based on RES in the Integrated Power System of Ukraine). These estimated values, according to both of the above criteria, exceed the forecast (expected) indicators for the development and available capacity of Ukraine's interconnectors for electricity import and export, provided by the transmission system operator NPP Ukrenergo, taking into account consultations with TSOs of neighboring countries and ENTSO-E.

Gas infrastructure

Long-term capacity requirements for interconnections between the GTS of Ukraine and the GTS of neighboring states are determined generally on the basis of a market demand assessment, which is regularly conducted in accordance with the CAM NC (the last one was conducted in 2025). According to the results of the final assessment and taking into account public consultations, a project for new (increased) capacity in the direction from Poland to Ukraine is being formed. Based on the results of non-binding applications received from natural gas market entities, a demand for guaranteed capacity for entry into Ukraine from Poland in the amount of 12 million m3 /day for the period 2025/2026-2034/2035 gas years was identified .

In addition, to ensure the security of natural gas supply and diversify routes and suppliers, the need to develop alternative routes for delivering natural gas to Ukraine from the south (in particular, through the Vertical Corridor) is also predicted, primarily with a focus on ensuring long-term and commercially attractive conditions. access.

4.5.2. Energy transmission infrastructure

4.5.2.1. Key characteristics of the existing transmission infrastructure for electricity and gas

Electricity infrastructure

The Integrated Power System of Ukraine (IPS) is a set of power plants, electrical networks, and other electric power facilities that are united by a common mode of production, transmission, and distribution of electric energy with centralized management of this mode. The IPS is the basis of the country's electric power industry, which provides centralized electricity supply to domestic consumers, interacts with the power systems of neighboring countries, and ensures the export and import of electricity. It combines generating capacities and distribution networks of the regions of Ukraine, interconnected by system-forming power transmission lines with a voltage of 220-750 kV (electric power transmission system). The IPS is one of the largest energy associations in Europe; in its warehouse are operating 6 regional electrical power systems and 32 distribution systems operators. Dispatching (operational and technological) management, maintaining balance in the Integrated Power System of Ukraine and organizing parallel operation with the power systems of ENTSO-E member countries are performed by the transmission system operator (TSO), Ukrenergo.

System-forming networks with a voltage of 220-750 kV include trunk and cross-border networks (electricity transmission system). They ensure the delivery of electricity from powerful power plants and its further transmission to distribution networks, as well as cross-border connections with the power systems of neighboring countries. Power transformation is provided by autotransformers and transformers with voltages of 750/500 kV, 750/330 kV, 500/220 kV, 330/220 kV, 400/330 kV, 330/110(150) kV, 220/110(150) kV, 150/110 kV. In TSO as of 01.01.2021, 21,861.6 km of overhead lines (OHL) along the route were in operation, and 23,559.1 km - along the circuits.

According to the Transmission System Development Plan for 2022-2031, as of the beginning of 2021, the

TSO had 141 substations (SS) with a voltage of 110-750 kV and a transformer capacity of 83,178.1 MVA on its balance sheet. Of these, 220 kV SS - 33 pcs., 330 kV - 88 pcs., 400 kV - 2 pcs., 500 kV - 3 pcs., 750 kV - 9 pcs. and 110 kV - 6 pcs. (station nodes of solar power plants). The electricity distribution system included more than 1 million km of overhead and cable power transmission lines with a voltage of 0.4-150 kV and about 200 thousand transformer substations with a voltage of 6-150 kV.

Fig. 4.31. IPS of Ukraine scheme (as of 2023)



The main equipment installed in the transmission system, which operates continuously and determines the reliability and efficiency of operation, was manufactured mainly in 1950-1970. According to the main technical characteristics (weight and dimensions, indicators reliability and efficiency, etc.) it is inferior to modern equipment and requires increasingly large volumes of repairs. This state of affairs significantly affects the increase in losses of electrical energy in the transmission system and limits the possibility of preventing technological violations - damage to electrical equipment or disruption of its performance, which leads to disruption of the normal and reliable operation of power plants of electric power facilities and the IPS as a whole.

According to the Regulator's reporting data, the average technological electricity consumption in trunk and interstate networks by 2023-2024 years constitute close 2-2.5%, in distribution networks – close 10.6-11.2%. To objective reasons, through which losses in IPS remain at a sufficiently high level, it is worth mentioning:

- transmission electricity on big distances, especially through distribution networks;
- unsatisfactory technical state of networks.

On substations TSO exploited main equipment with long-lasting terms of operation (Table 4.12).

Table. 4.12. Time of operation (as of 01.01.2021)

Name equipment	Power, MVA	Number of units	In operation, units			
			under 25 years	from 25 to 30 years	from 30 to 40 years	over 40 years
Autotransformers (220-750 kV)	78,450	359	76	49	156	78
Transformers power (35-220 kV)	4,722	106	24	12	26	44
Reactors shunting (35-750 kV)	8,230	109	88	4	14	3

Switches (35-750 kV)	-	3,326	1,134	260	777	1,115

According to the data given in Table 4.13, in the OHL 20,792 km of overhead power lines have been in operation for more than 30 years (88.0% of the length of all lines), of which 16,344 km have been in operation for more than 40 years (69.4% of the length of all lines). These data indicate a trend of further aging and insufficient pace of reconstruction of overhead lines, which complicates their operation by the OHL.

Table. 4.13. Time of operation of transmission OHL by voltage (as of 01.01.2021)

Voltage	Total, km		In operation (on chains), km			
	on tracks	by chains	under 25 years	from 25 to 30 years	from 30 to 40 years	over 40 years
800 kV	98.5	98.5	-	-	-	98.5
750 kV	4,403.2	4,403.2	692.6	-	1,905.4	1,805.2
500 kV	375.3	375.3	38.7	-	159.5	177.1
400 kV	339.0	339.0	-	-	-	339.0
330 kV	13,013.3	13,617.1	1,236.3	460.7	2062.3	9,857.9
220 kV	3,044.3	4,025.7	228.4	-	265.5	3,531.8
110 kV	458.3	568.9	66.4	5.4	42.4	454.7
35 kV	129.7	131.3	36.1	2.5	12.5	80.2
Total	21,861.6	23,559.1	2,298.6	468.5	4,447.7	16,344.3

Because of changes in the last decade climatic conditions, a significant number of lines built in 1970-1980 are vulnerable to elevated climatic impact.

This is largely manifested in the autumn-winter period in the southern and northern regions of Ukraine (Southern, Dnieper and Northern power systems). Due to increased loads and impacts of storm winds, ice, vibration and galloping of wires, the number of damages to overhead line elements has significantly increased and their wear has accelerated. As a result, there has been a need for radical technical re-equipment and reconstruction of overhead lines in the indicated regions and in general, since the design estimated service life (40 years) of most of them has already expired.

The need for reconstruction of 220 kV overhead lines of the IPS remains urgent, since the service life of most of them already exceeds 50 years. The annual plans provide for repair of foundations of metal supports, reinforced concrete supports, replacement of lightning protection cable, porcelain insulation and other works aimed at ensuring the reliability of overhead lines. However, due to the accelerated aging of overhead lines and the impact of increased loads, these works require more and more material and labor costs every year.

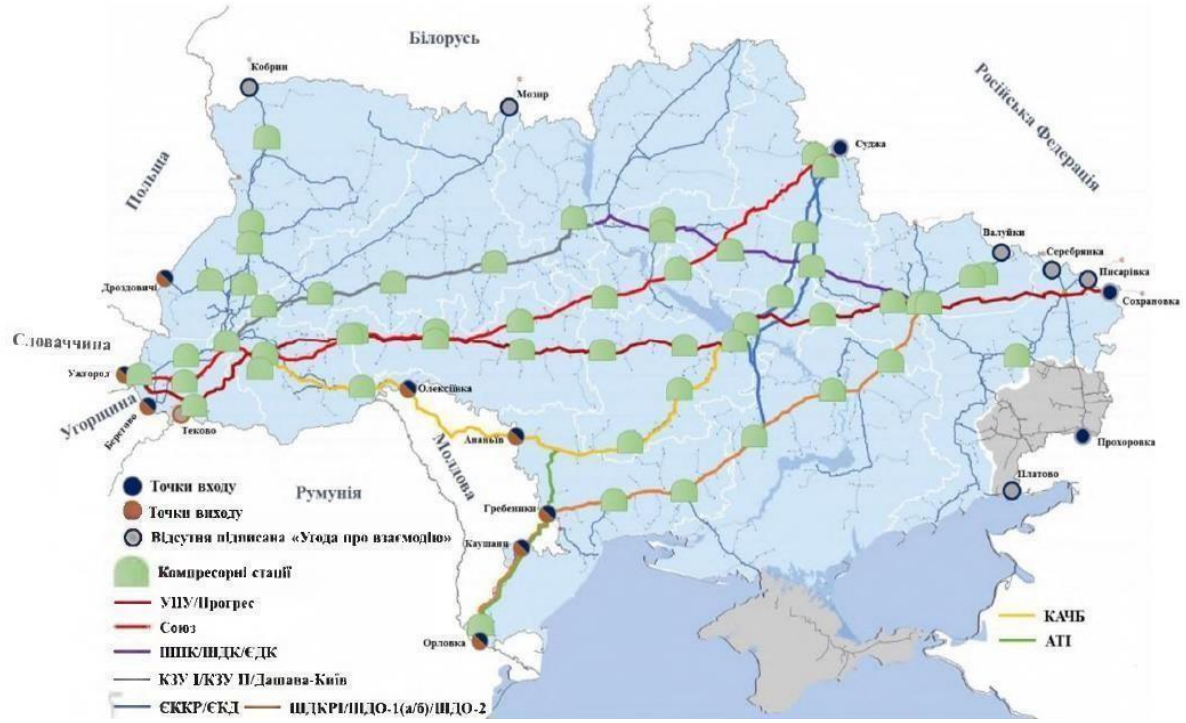
Analysis of financing and implementation of works on major repairs, technical re-equipment and reconstruction of overhead lines shows that the volumes of restoration do not reduce the existing disproportion between aging and restoration and do not cover the actual wear of overhead lines. Today, this is one of the main problems of operation of the overhead power transmission lines. In general, the aging of equipment occurs much faster than the replacement is carried out during reconstruction and major repairs.

Gas infrastructure

According to LLC "Operator of GTS of Ukraine", Ukrainian GTS has such technical characteristics:

- 33 395 km main roads gas pipelines,
- 1389 gas distribution stations,
- 57 compressor stations.

Fig. 4.32. Basic gas pipelines GTS Ukraine

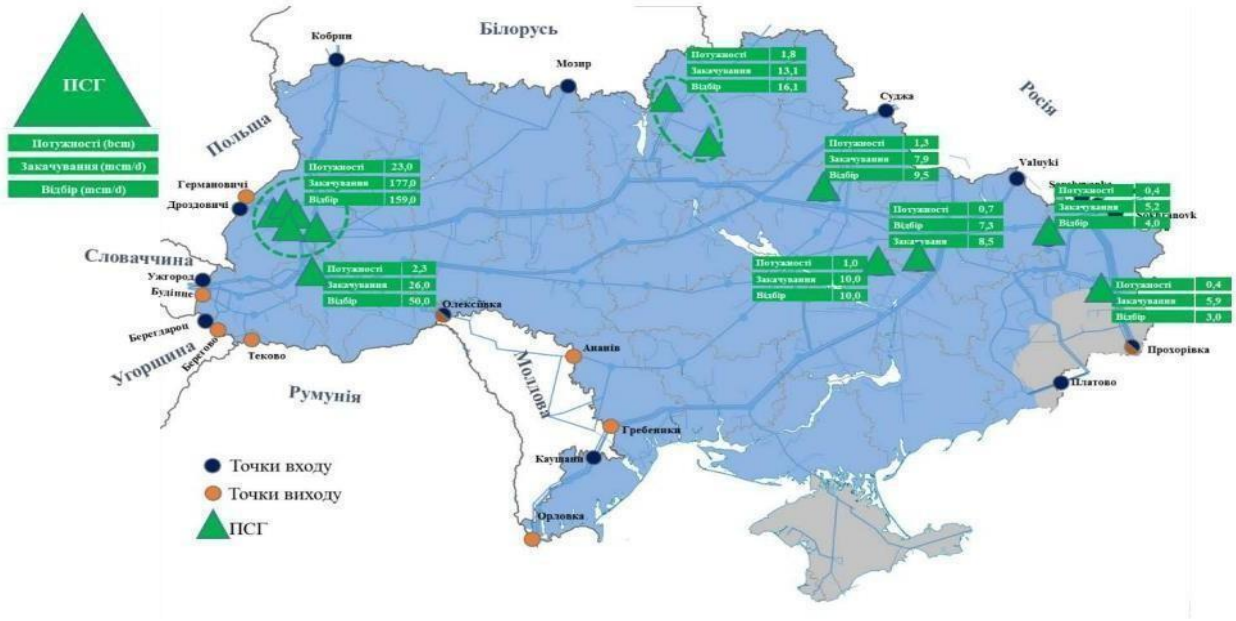


Source: LLC "Operator GTS Ukraine»

At the same time, the capacity at the entry to the GTS was 304 billion m3 , and at the exit - 146 billion m3 On the European side, the GTS has interstate connections with operators in Moldova, Romania, Poland, Hungary, and Slovakia. In general, the capacity at interstate connections is sufficient for meeting current needs, in particular taking into account the cessation of gas transit from the territory of the Russian Federation to European countries from 2025.

JSC Ukrtransgaz manages 12 underground natural gas storage facilities, two of which are based on aquifers, and the rest are based on depleted gas fields, with a total active capacity of early 2022 amounted to 30.95 billion m^3. As of the end of 2025, JSC Ukrtransgaz operates 10 UGSs in the controlled territory of Ukraine with a total active capacity of 30.13 billion m3 . The Eastern UGS complex, consisting of Krasnopopivske (0.42 billion m3) and Verhunske (0.4 billion m3), is located in the temporarily occupied territory; another storage facility of the Southern Complex, Hlibivske (1 billion m3), is in the temporarily occupied Crimea (operated by the State Joint-Stock Company Chornomornaftogaz).

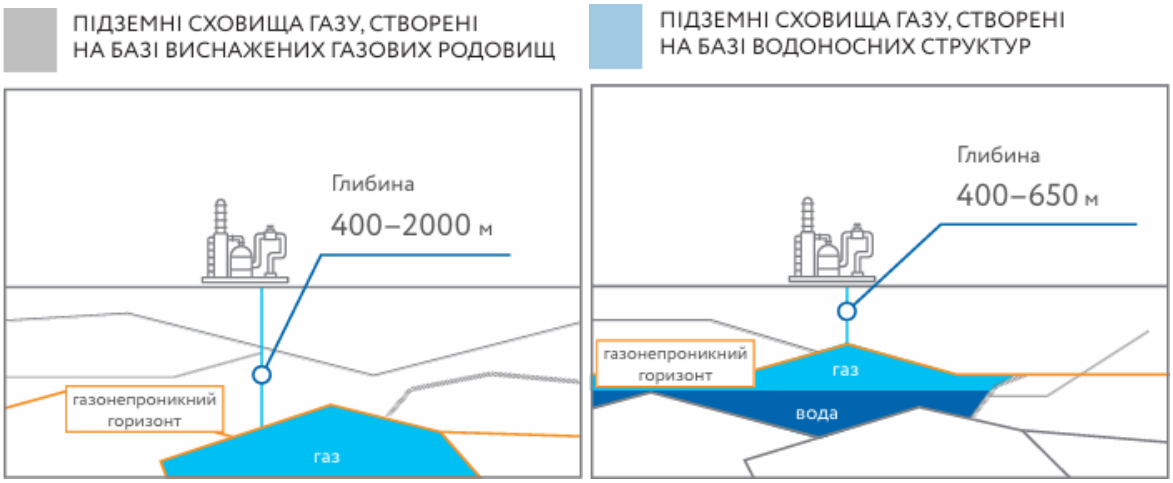
Fig. 4.33. Basic characteristics Underground storage facility AT "Ukrtransgaz"



Source: AT "Ukrtransgaz"

By geological structure underground storage facility under management AT “Ukrtransgaz” have such characteristics:

Fig. 4.34. Geological structure Underground storage facility AT "Ukrtransgaz"



Source: AT "Ukrtransgaz"

4.5.2.2. Projections of network expansion requirements at least until 2040 (including for the year 2030

Electricity infrastructure

Forecasts of the needs for the expansion of the transmission system's electricity networks are defined in the Transmission System Development Plan for 2025-2034, approved by the Regulator (Resolution of the NEURC No. 58 dated 21.01.2025). The TSDP is closely related to the results of the assessment of the adequacy of generating capacities in 2024. At the same time, in the conditions of the ongoing full-scale military aggression of the Russian Federation, energy infrastructure facilities are experiencing significant damage and destruction. Given the high uncertainty of the course and consequences of the war, the results of the assessment of the adequacy (sufficiency) of generating capacities may not be relevant. Therefore, after the adoption of documents that will relate to the restoration and development of Ukraine in the field of electric power and related areas in the post-war period, the results of the assessment of the adequacy (sufficiency) of generating capacities and regime calculations within the framework of the formation of the TSDP will require clarification.

TSDP for 2025-2034 contains data that, under martial law conditions, may be classified as restricted information, in particular information that may identify objects critical infrastructure or create idea about potential facility in the power system of Ukraine (due to the introduction of martial law in Ukraine, the NEURC adopted a resolution dated March 26, 2022 No. 349 "On the protection of information that, under martial law, may be classified as restricted information, including information regarding critical infrastructure facilities", according to which, during martial law in Ukraine and until the last day of the month following the month of termination or cancellation of martial law, access to information that, under martial law, may be classified as restricted information, in particular, information that may identify critical infrastructure facilities or provide an idea of the potential of a facility in the energy system of Ukraine, must be restricted.

TSDP for 2024-2033, in particular, provides for the continuation of the development and modernization of the transmission system in order to eliminate "bottlenecks" and replace outdated equipment. As for the transmission system facilities, where a comprehensive reconstruction with equipment replacement was envisaged, the postponement of the implementation dates to later periods is being considered, taking into account emergency and restoration work at such facilities, the redistribution of funding for emergency and restoration work, and a change in the concepts of development and reconstruction of transmission system facilities in order to physically protect them from missile strikes.

The main factors for development electric networks IPS there are:

- expansion of interconnectors with the power system of continental Europe;
- change of generation and consumption centers;
- extension of the lifetime of operating nuclear power plant units subject to positive safety assessment results;
- completion of power units of Khmelnytskyi NPP (KhNPP), possible construction of new power units of NPP. The power output scheme of KhNPP during the construction of new units can be assessed only after preliminary calculations of steady-state and transient modes of operation of the electrical network.

Based on the calculations necessary to assess network capacity of power output of the station in normal, repair and post-accident modes. After approval of the KhNPP unit construction projects and the power output scheme, the construction of networks necessary for the full output of KhNPP with appropriate deadlines will be considered in the next TSDP;

- construction of new and reconstruction of existing hydropower units at HPPs and PSHPs (taking into account environmental restrictions and the impact of such projects on river ecosystems);
- implementation of projects for the construction of generating capacities based on renewable energy sources, taking into account needs in optimizing the generation capacity mix in the IPS;
- decommissioning of TPP units, electrical and electrical measuring equipment of electrical networks that has exhausted its technical service life, has unsatisfactory energy efficiency indicators, and does not meet environmental and technogenic safety standards;
- magnification demand for electricity and increasing reliability of electricity supply in powerful power plants and distribution networks in the medium term.

All this leads to the need to build new substations and transmission lines, reconstruct existing transmission system facilities with an increase in their capacity. The development plan, in particular, provides for the construction of networks that will ensure the delivery of additional nuclear power plants in the amount of up to 2.2 GW. The construction of additional networks is also being considered to ensure the delivery of power from hydroelectric power plants. In terms of the development of smart grids, TSOs and DSOs will carry out measures within the framework of the action plan for the implementation of the Concept for the implementation of smart grids in Ukraine by 2035.

Oil and gas infrastructure

Plans for the development of the GTS are provided for in the GTS development plan for the next 10 years, the last of which was approved for the period 2026-2035 (under the legal regime of martial law, this plan is not public).

At the same time, in general, the GTS of Ukraine is well connected with the gas transportation systems of the EU Member States and the Contracting Parties of the Energy Community, and the amount of physical capacity at the interstate connection points is generally sufficient to meet the needs of import-export of natural gas. At the same time, as noted above, on interstate connections with Poland, Hungary and Slovakia (in terms of additional capacity), access to capacity is agreed by the GTS operators each time in advance, which does not allow booking by customers more than a year in advance. Access to available physical capacities on a long-term guaranteed basis is important both from the point of view of the functioning of the natural gas market and the security of natural gas supply.

In addition to the existing capacities, the OGTS conducts a regular analysis of market demand for additional capacity in accordance with the rules of the Network Code on capacity allocation mechanisms in the EU gas transmission systems (CAM NC). The last such analysis, conducted in mid-2025 with a horizon until 2040, identified a pressing need for additional capacity for entry into Ukraine from Poland. Based on the results of non-binding applications received from natural gas market entities, a demand for guaranteed capacity for entry into Ukraine from Poland in the amount of 12 million m3 /day for the period 2025/2026-2034/2035 gas years was [identified] .

Additional capacity needs, beyond those identified above, may not be declared at this time, but may also be related to the development of the natural gas supply and demand situation outside Ukraine, in particular the EU's decision to phase out Russian gas from the end of 2027, further development of domestic production in Romania and readiness for its export. In this regard, the development of existing or new interconnections with Moldova and/or Romania may be appropriate.

4.5.3. Electricity and gas markets, energy prices

4.5.3.1. Current situation of electricity and gas markets, including energy prices

Electricity market

a) Characteristic sector to and under time full-scale intrusion Russian federations to Ukraine

Before the start of the full-scale invasion of the Russian Federation (24.02.2022), Ukraine had excess generating capacity. According to ENTSO-E, as of 01.01.2022, their nominal volume was about 54.8 GW. The transmission system operator, NPC Ukrenergo, estimated the nominal volume of installed capacity at about 56.5 GW. The total generating capacity was more than 2.5 times higher than the maximum level of

demand (electrical load) observed in the winter period in the Integrated Power System of Ukraine during 2016-2022 – about 21-22 GW. Such excess capacity provided significant production potential for electricity exports, in particular to the EU countries, which was mainly limited by the capacity of interconnectors.

In 2021, coal generation dominated the structure of installed capacity, however, nuclear power has traditionally dominated electricity production.

Fig. 4.35. Installed capacity (2021)

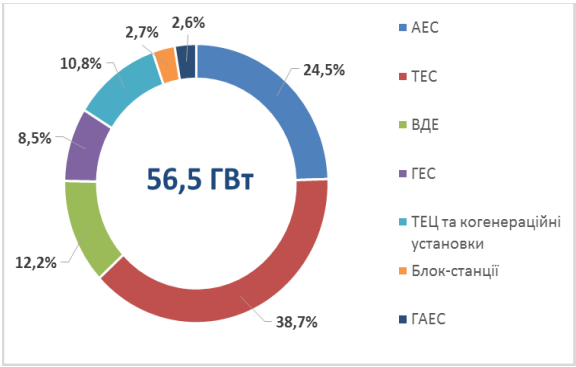
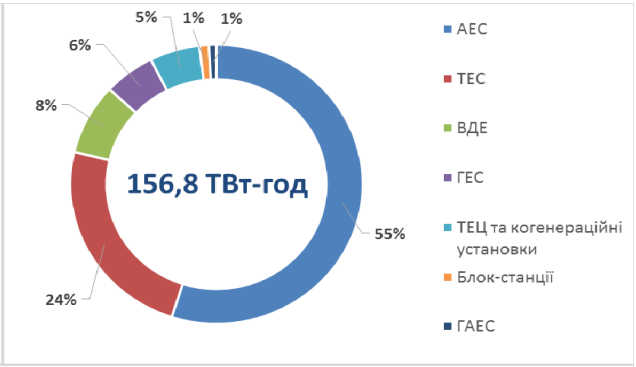


Fig. 4.36. Electricity mix (2021)



The full-scale invasion of the Russian Federation into Ukraine had a significant impact on the electricity sector. On the one hand, Ukraine was able to demonstrate a high level of energy system resilience by operating in isolation for three weeks and joining ENTSO-E in March 2022, and in June 2022, by starting commercial electricity exports to the EU.

On the other hand, massive missile and drone attacks on energy infrastructure caused significant destruction and damage to generation facilities and power grids. Most of the power plants were occupied – in particular, Zaporizhzhia NPP (6,000 MW), Luhansk, Zaporizhzhia and Vuglehirsk TPPs (about 7,700 MW). Kakhovka HPP (343 MW) was blown up and completely destroyed. In the territories not controlled by Ukraine, there are CHPs (with a total capacity of about 490 MW), a significant part of wind (WPP) and solar (SPP) power plants, as well as coal mines[130]. Due to the loss of a significant part of the power and its transmission capabilities in the power system, Ukraine suspended electricity exports to the EU countries from October 11 2022 to April 2023. Since March 2024, Russia has resumed large-scale combined attacks on the energy infrastructure of the IPS, focusing primarily on maneuverable generation facilities - thermal power plants and hydroelectric power plants. A number of large thermal power plants of regional importance were also destroyed.

During 2024, Ukraine's energy infrastructure was subjected to new massive attacks and damage from the Russian Federation. During March-June, August, November-December, the Russian Federation carried out 13 massive attacks. In particular, damage was recorded to generating facilities (flexible capacities: thermal power plants, hydroelectric power plants, gas-fired power plants, cogeneration plants), network facilities of TSO and DSOs. As a result, the total installed capacity available for use as of December 31, 2024 decreased to about 15 GW - which is significantly lower than the peak demand for electricity, especially in winter (about 18 GW). Regular massive attacks continued in 2025, and were especially active in October-December. Thus, Ukraine may have a significant deficit in generating capacity during the heating season – up to 6 GW, depending on weather conditions and further consequences of military actions and targeted attacks by the Russian Federation on IPS facilities.

Due to large-scale migration of the population abroad and a reduction in production and business activity, demand for electricity in the power system has decreased by approximately 30-35% compared to 2021. Despite this, in the conditions of the seizure and destruction of energy facilities, the volume of generation is insufficient to cover domestic demand.

To stabilize the operation of the power system, the volume of electricity imports and the involvement of emergency assistance with TSO of EU countries. Besides this, in conditions of the significant deficit of generating capacities in the power system, large-scale planned and emergency power outages for consumers began to be applied throughout the territory of Ukraine. At the same time, to cover the internal electricity deficit, the Government introduced the Regulation on the peculiarities of electricity imports under the legal regime of martial law in Ukraine (CMU Resolution dated 27.10.2023 No. 1127). These features determine that non-household consumers equipped with smart meters, when importing electricity

[130] https://www.energycharter.org/fileadmin/DocumentsMedia/Occasional/2022_11_24_UA_sectoral_evaluation_and_damage_a ssessment_Version_IV.pdf

in an amount of at least 60% from their own needs at certain hours, cannot be subject to forced restrictions on electricity supply by network operators during these hours.

b) Structural organization and functioning of electricity market

The Ukrainian electricity market, similar to European markets, consists of organized segments:

- day-ahead market (DAM);
- intraday market (IDM);
- balancing market (BM).

Also, the electricity market includes the bilateral contract market (BCM) and the ancillary services market (ASM). Electricity supply to consumers takes place on the retail market.

The operation of the markets is determined by the relevant market rules approved by the Regulator. According to the NEURC reporting data for 2024, the market of bilateral contracts in terms of electricity sales volumes occupies the largest share – 82%, fraction DAM was 15%, GDR – 1%. Total volume of electricity sales under bilateral agreements in 2024 amounted to 140.7 million MWh (+3.1% compared to 2023). In DAM, about 25.1 million MWh were sold (+20.9% by 2023), IDM – 2.4 million MWh (+44.1% by 2023). The total cost of electricity purchased on the Market Operator's platform in 2024 amounted to UAH 134.3 billion (excluding VAT).

As of December 31, 2025, there were 653 active contracts on participation in the DAM/IDM with companies trading on the Market Operator platform (+11.8% by 2024). Among them: 60 – electricity producers, 28 – DSOs, 1 – TSO, 478 – suppliers, 71 – traders, 2 – consumers, 1 – guaranteed buyer, 11 – BESS operators, 1 – aggregator.

Article 66 of the Law of Ukraine “On the Electricity Market” (as amended by the Law of Ukraine “On Amendments to Certain Laws of Ukraine on the Restoration and "Green" Transformation of the Energy System of Ukraine” No. 3220-IX of June 30, 2023) defines certain restrictions on the conclusion of bilateral agreements. In particular, producers of electricity (except producers of electricity from alternative energy sources (except blast furnace and coke oven gases, and using hydropower - only micro, mini and small hydroelectric power plants) sell electricity under bilateral agreements exclusively at electronic auctions, the procedure for which is approved by the Cabinet of Ministers of Ukraine. Producers of electricity from alternative energy sources (except blast furnace and coke oven gases, and using hydropower - only micro, mini and small hydroelectric power plants) have the right to sell electricity under bilateral agreements at electronic auctions on a voluntary basis.

Trading on the BCM takes place through the electronic platform of UEEX LLC, since, according to the results of the competitive selection of organizers of electronic auctions for the sale of electricity under bilateral agreements, UEEX LLC received the priority right to organize and conduct auctions.

At the same time, the DAM is often used as the leading indicative segment, the indexes of which are mainly used to determine the prices of electricity supply to consumers, as well as for calculating economic parameters in certain mechanisms of state support in the electricity market, in particular for RES facilities. It is worth noting that prices on the DAM and IDM, as well as the balancing market, are regulated by price caps. Considering market dynamics, the Regulator several times reviewed price caps on these market segments in 2022-2025. Price caps on DAM, IDM and balancing market were from July 31, 2025 to January 16, 2026[131] and from April 1-30, 2026:

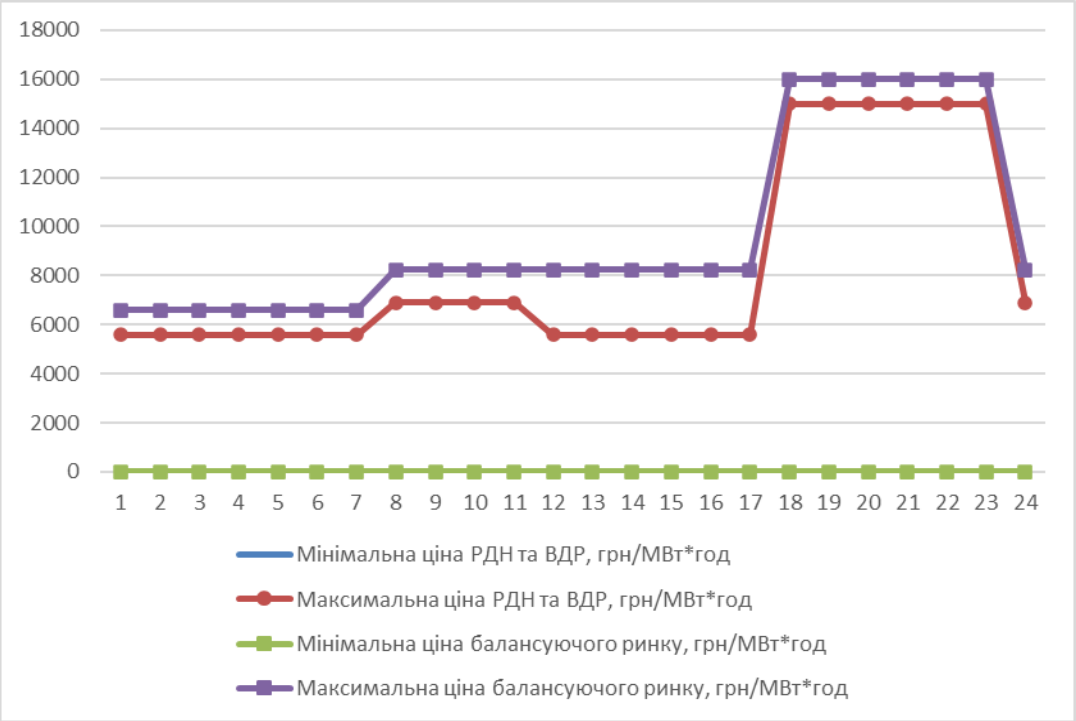
- maximum prices from 00:00 to 07:00 and from 11:00 to 17:00 – 5 600 UAH/MWh; from 07:00 to 11:00 and from 23:00 to 24:00 – 6 900 UAH/MWh; from 17:00 to 23:00 – 15 000 UAH/MWh;
- minimal price – 10 UAH/MWh;

on the balancing market:

- maximum price from 00:00 to 07:00 – 6 600 UAH/MWh; from 07:00 to 17:00 and from 23:00 to 24:00 – 8 250 UAH/MWh; from 17:00 to 23:00 – 16 000 UAH/MWh;
- minimal price – 0.01 UAH/MWh.

Fig. 4.37. Price caps on the DAM and IDM (until April 30, 2026)

[131] https://zakon.rada.gov.ua/rada/show/v1133874-25#Text



From May 1, 2026, the NEURC has set the maximum price for the DAM and IDM at the level of 15,000 UAH/MWh, the minimum price is 10 UAH/MWh for all hours of the day. On the balancing market, the maximum price is set at 17,000 UAH/MWh, the minimum price is 0.01 UAH/MWh for all hours of the day (NEURC Resolution dated 23.04.2026 No. 621 "On maximum prices on the day-ahead market, intraday market and balancing market").

According to Market Operator, which administers the DAM and the IDM, during the twenty-month period from March 2022 (the beginning of synchronized operation of the Integrated Power System of Ukraine and the power system of continental Europe) to November 2023, the cap prices had a significant impact on the DAM, since in 34.8% of settlement periods, hourly prices on the DAM were at or close (with a difference of less than 1%) to the established upper limit of the cap price of the corresponding settlement period for this market segment. However, after the Regulator reviewed the cap prices, for the period December 2023 - May 2024, the number of such cases (hourly calculated periods) substantially decreased – to equal 14.6%. By two subsequent revisions of the price caps by the Regulator, the number of such cases was 28.5% for the period June 2024 - July 2025 and 29.1% for the period August-December 2025. In general, during the war period (March 2022 - December 2025), the number of cases of a significant impact of limit prices on pricing on the DAM was observed in 29.6% of the calculation periods.

A comparison of price dynamics on the Ukrainian DAM and neighboring EU countries (Poland, Hungary, Slovakia and Romania) demonstrates a relatively low level of convergence. The main reasons for this phenomenon are 1) insufficient capacity of Ukraine's cross-border crossings permitted by ENTSO-E for electricity export and import, 2) lack of integration of Ukrainian spot markets with EU markets, and 3) price regulation on the Ukrainian DAM by the Regulator through the application of price caps. Analysis of price dynamics on the day-ahead markets (DAM) of Ukraine and EU countries (Poland, Romania, Slovakia and Hungary) based on data from JSC "Market Operator" shows that during 2020-2025, the difference between the daily price indices of the Base DAM in the vast majority of periods (days) is higher than 2 EUR/MWh (in relation to Poland – in 96.4% of periods, Romania – 94.4%, Slovakia – 94.1%, Hungary – 94.8%). The average difference between the daily Base DAM indices of Ukraine in relation to the Polish markets was 35.1 EUR/MWh, Romania – 55.0 euros/MWh, Slovakia – 54.8 euros/MWh, Hungary – 67.8 euros/MWh.

Trading on the BCM takes place in the form of auctions through the platform of UEEX LLC or in the over-the-counter segment. At the same time, generating companies, regardless of the form of ownership (except for producers of electricity from alternative energy sources (except for blast furnace and coke oven gases, and using hydropower - only micro, mini and small hydroelectric power plants) are obliged to sell the entire volume of electricity sold under bilateral agreements through electronic auctions of UEEX LLC in accordance with the Procedure for conducting auctions approved by the Cabinet of Ministers of Ukraine (the effect of this Procedure in terms of organizing and conducting electronic auctions applies to auctions

held in the form of a unilateral auction). Sale prices are not regulated and are determined based on the results of the auctions.

c) Features implementation and regulation cross-border trade

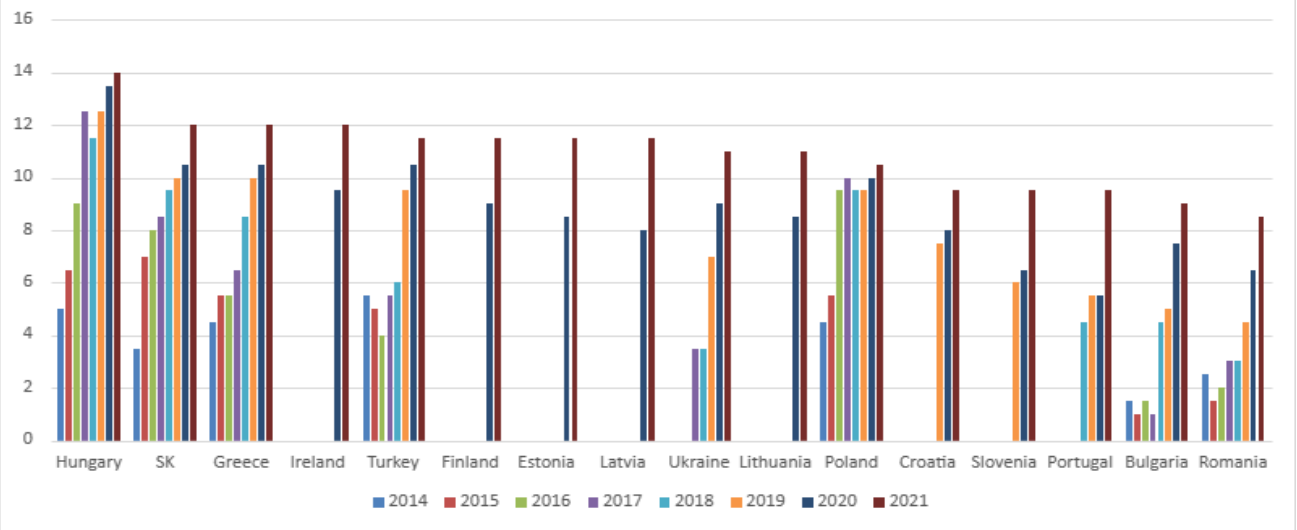
Cross-border electricity trade is based on explicit auctions for the allocation of capacity of Ukraine's interconnectors among potential exporters and importers (manufacturers, traders, suppliers). Available air routes to Poland, Romania, Hungary, Slovakia and Moldova is determined by NPC Ukrenergo together with the TSOs of the neighboring EU countries and Moldova and the TCSNet regional coordination center within the framework of the Eastern European Capacity Calculation Region EE CCR, based on technical capabilities of interconnectors and taking into account operational safety requirements, in agreement with ENTSO-E (for details, see section 4.5.1.1).

Natural gas market

Due to the full-scale invasion of Ukraine by the Russian Federation since February 2022, as well as the measures taken to counter its destructive consequences, the development of the gas market and competition in it have slowed significantly.

At the same time, since 2014, the Ukrainian gas market has developed significantly and has become part of the European energy market. In particular, according to the comparison of European gas hubs conducted by EFET (European Federation of Energy Traders) in 2021 the Ukrainian gas hub had fairly high development indicators and stable growth dynamics.

Fig. 4.38. Benchmarking of gas hubs (2021)



Source: EFET

ACER assessed the situation on the Ukrainian gas market in a similar way. The 2020 wholesale gas market monitoring report notes that in 2020, the trading volume on the Ukrainian Energy Exchange increased to 2 billion m3 (from 0.3 billion m3 in 2019), and the number of trading participants - twice. Most of the trading was for month-ahead products, but day-ahead trading was also scheduled. Most of the liquidity was created by Naftogaz Group, which was able to increase trading volumes on this platform after reducing the volume of special responsibilities assigned to it.

Since February 2022, natural gas consumption has significantly decreased, particularly by industry, and natural gas exports have been banned, creating negative incentives for the development of production by private companies. In addition, a significant portion of consumers receive gas at fixed prices.

In particular, the legally established moratorium on price increases above the level in effect as of February 24, 2022 applies to household consumers, associations of co-owners of apartment buildings, housing and construction cooperatives, and other persons authorized by co-owners in accordance with the law who, through self-sufficiency, maintain autonomous heat supply systems of an apartment building owned by co-owners on the right of joint ownership in an apartment building, in their interests, contracts are concluded for the supply of natural gas for the operation of gas boiler rooms (roof, attached and/or those located on the adjacent territory) to meet the needs of co-owners of an apartment building (except for non-residential premises), heat energy producers - if they use natural gas to produce heat energy for the population and have concluded a contract with a natural gas market entity, which, in accordance with part one of Article 11 of the Law of Ukraine "On the Natural Gas Market", has PSOs.

In the case of household consumers, this price is UAH 7,960/thousand m^3 (including VAT). In the context of the supply of natural gas to household consumers, the Regulation on the imposition of special obligations on natural gas market entities to ensure general public interests in the process of functioning of the natural gas market, approved by the Resolution of the Cabinet of Ministers of Ukraine dated March 6, 2022 No. 222 (Official Gazette of Ukraine, 2022, No. 25, as amended) (hereinafter referred to as the – PSO Regulation No. 222). In the context of the supply of natural gas to heat energy producers, including associations of co-owners of apartment buildings, housing and construction (housing, service) cooperatives, managers of apartment buildings, until March 31, 2026, the Regulation on imposing special obligations on natural gas market entities to ensure general public interests in the process of functioning of the natural gas market regarding the features of natural gas supply to heat energy producers and budgetary institutions, approved by resolution Cabinet Ministers Ukraine from 19 July 2022 No. 812 (Official herald Ukraine, 2022 r., No. 59, from changes) (hereinafter – Position PSO No. 812).

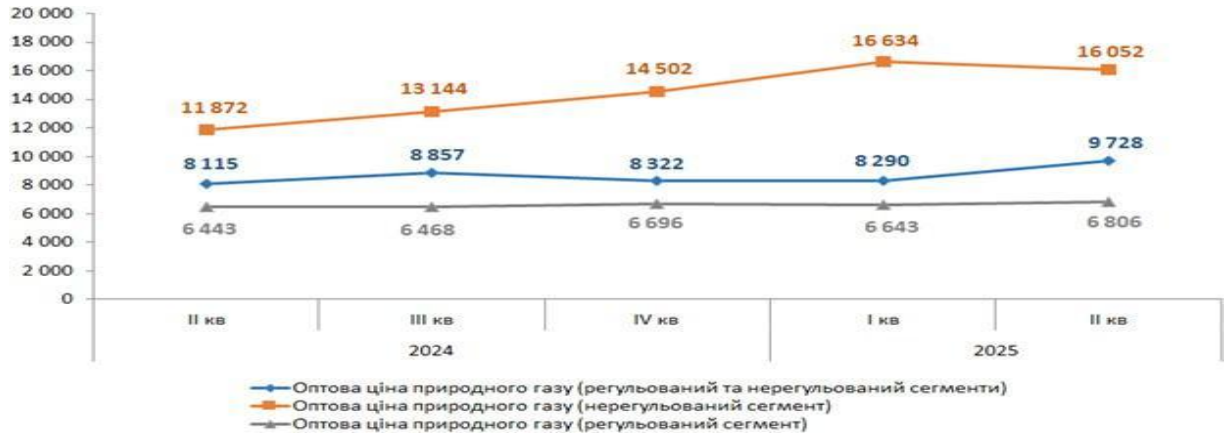
Table 4.14. Prices according with PSO provisions (as of September 2025)

Consumer category	Price, UAH/m^3, with VAT	Legal basis	Formula calculation (if any)	Term actions
Household consumers (Naftogaz Group)	7.96	Law about the moratorium	fixed price (base offer) supplier, which was in effect as of 02/24/2022)	6 months after termination martial law
Suppliers of gas to household consumers	6.86	PSO regulation #222	supplier's basic annual offer minus trade mark-up (margin) 1.0987 UAH/m3	31.03.2026
DHC for categories:				
population (within a fixed volume I), in including budget institutions - producers of heat for the population	7.42	PSO regulations #812	fixed price (in PSO regulations)	31.03.2026
budgetary institutions, religious organizations, enterprises DUS (within the fixed volume III)	16.39	PSO regulations #812	fixed price (in PSO regulations)	
others consumers (in within the framework of floating volume II)	Calculated by the formula		formula based on the weighted average price for the resource of the month preceding the month of natural gas supply and formed during results electronic stock trading on the commodity exchange LLC “UEB ”	
Dormitories	7.42	PSO regulations #812	fixed price (in PSO regulations)	31.03.2026
Budget institutions and religious organizations	16.39	PSO regulations #812	fixed price (in PSO regulations)	31.03.2026
Manufacturers e/e:				
Thermal power plant (condensing)	16	PSO regulations	fixed price (in PSO regulations)	31.03.2026

CHP (heating)	21	#222	fixed price (in PSO regulations)	
Gas turbine and gas piston	16		fixed price (in Regulations	
installations that produce exclusively electric energy			PSO)	
Gas turbine and gas piston plants that produce electricity energy and thermal energy in a combined way	21		fixed price (in PSO regulations)	
Operators Timing:				
Regulatory technological losses (volume I)	7.42	PSO regulations #222	fixed price (in PSO regulations)	31.03.2026
Additional technological losses (except "war losses") (volume III)	Calculated by the formula		formula on basis prices gas on the Slovak market, taking into account delivery to Ukraine	
"War Losses" (Losses caused by military actions and incurred in connection with the prevention/management of humanitarian crises) (volume II)	0.01		fixed price (in PSO regulations)	

According to NEURC, the price on the wholesale market, which is covered by PSO regimes, is significantly lower than the wholesale price on the unregulated segment:

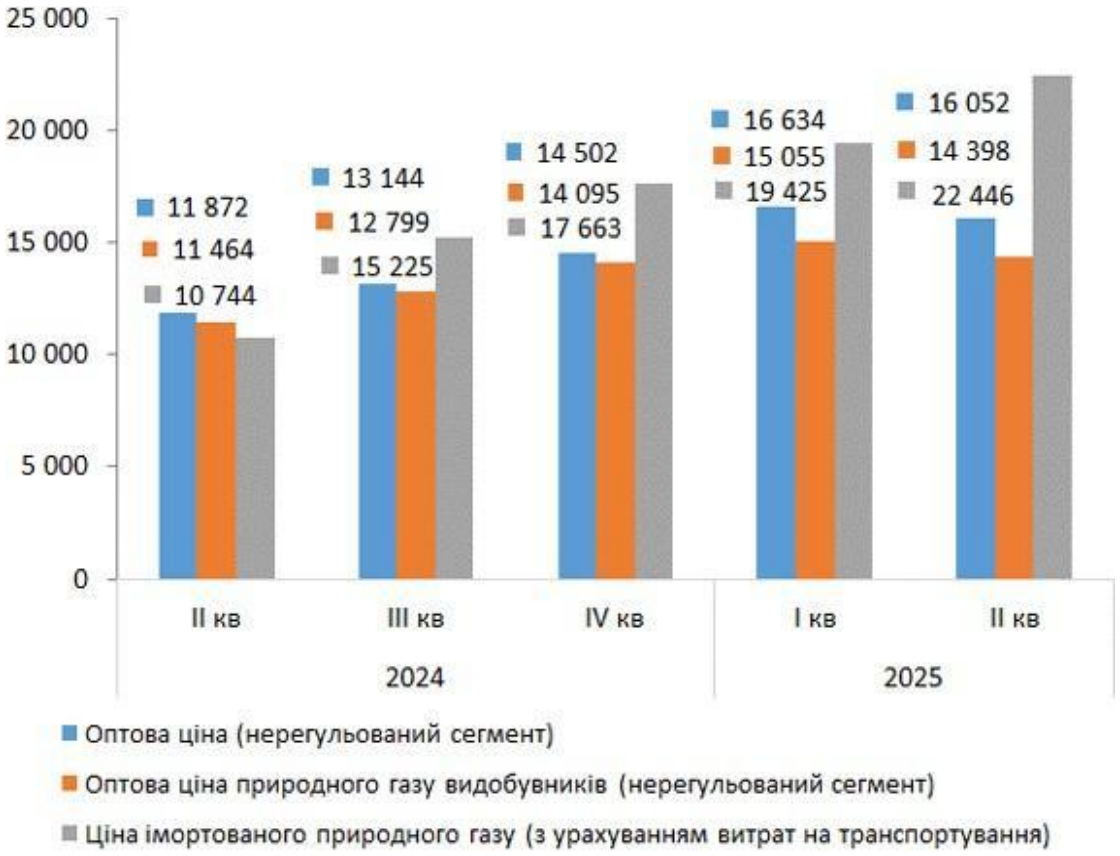
Fig. 4.39. Dynamics wholesale prices on natural gas (UAH/thousand) m ^{3}, without VAT)



Source: NEURC

Domestic natural gas needs are met by both domestically produced gas and imported natural gas. The price of domestically produced gas is usually lower than price of imported natural gas traded at the border with EU member states (including transportation costs):

Fig. 4.40. Wholesale prices on unregulated segment market natural gas (UAH/thousand) m ^{3}, excluding VAT)



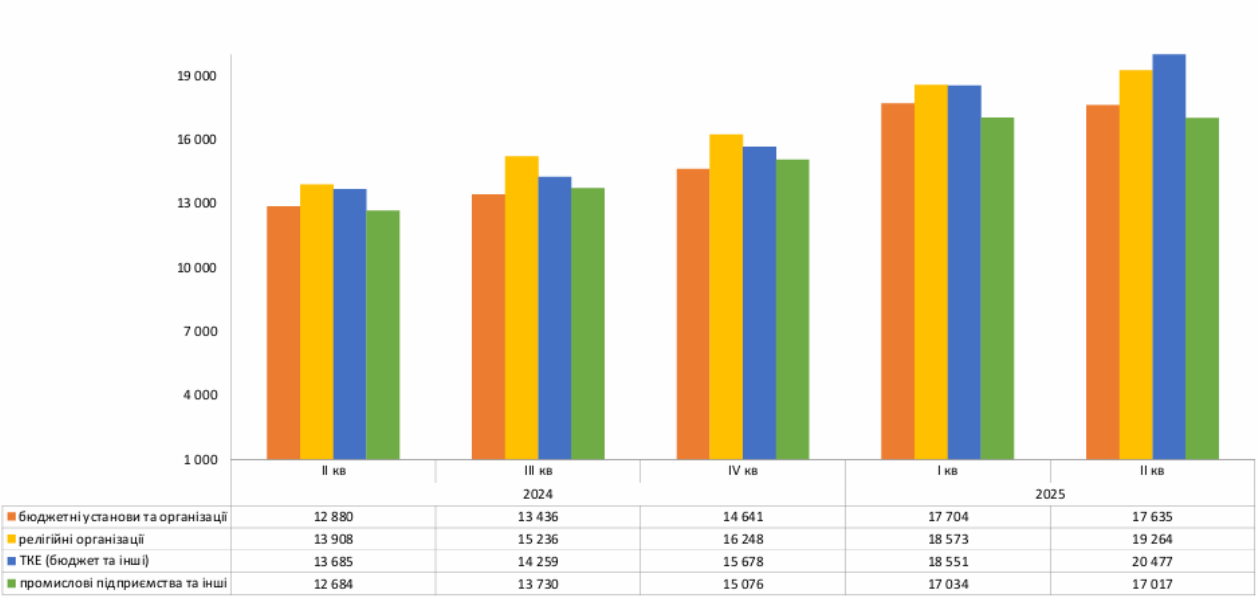
Source: NEURC

Given this perimeter of PSO provisions and other factors, only insignificant volumes are traded in the open market, as evidenced by what there are information from available trade platforms such as as LLC “UEB”. According to the data from SEEGAS, in 2022 auctions amounted to 167.45 million m3 at this exchange.

Thanks, in particular, to the moratorium on price increases for household consumers, almost 100% of natural gas supplies to household consumers are carried out by LLC "GC "Naftogaz of Ukraine", which is part of the Naftogaz Group.

At the same time, there is quite significant competition in the unregulated segment of the retail natural gas market: the number of suppliers supplying non-household consumers is more than a hundred, while the share and composition of the two largest suppliers is constantly changing (for example, in the first quarter of 2025, these are Naftogaz Group and DTEK, in the second quarter of 2025, DTEK and Interpipe Group). Prices in the unregulated segment of the retail market are presented in the figure below.

Fig. 4.41. Price dynamics in the unregulated retail market segment natural gas (excluding tariffs for transportation and distribution of natural gas and VAT (UAH/thousand ^{m3})



	II кв	III кв	IV кв	I кв	II кв
	2024			2025	
бюджетні установи та організації	12 880	13 436	14 641	17 704	17 635
релігійні організації	13 908	15 236	16 248	18 573	19 264
ТКЕ (бюджет та інші)	13 685	14 259	15 678	18 551	20 477
промислові підприємства та інші	12 684	13 730	15 076	17 034	17 017

Source: NEURC

In terms of protecting vulnerable consumers and combating energy poverty, according to data from NES, a significant part of the budget of households is spent on utilities. According to the results of a sample survey of household living conditions, utility expenses in 2021 amounted to about 14% of total household expenses.

Using energy on transport

Energy use in transport requires a separate review (separate from the review of the state of the electricity and natural gas markets), given the diversity of transport modes and the types of energy products used in different vehicles. This review is also necessary to provide context for the development of the related infrastructure: both fossil fuels (in particular oil and petroleum products) and electric vehicle charging infrastructure.

EU statistics define the division of transport into freight and passenger transport. Within freight transport, the following are distinguished:

- terrestrial transport (road transport, railway transport, pipeline transport);
- water transport (marine transport, internal water transport);
- air transport.

IN within the framework passenger transport stand out:

- land transport (road transport, rail transport); while road passenger transport is carried out by passenger cars, motorcycles and mopeds, as well as buses;
- water transport (marine transport, internal water transport);
- air transport.

From the beginning 2022, in connection with with the full-scale invasion of the Russian Federation into Ukraine The number of sea, inland waterway and air transport operations in Ukraine has significantly decreased.

JSC "Ukrzaliznytsia" is a consolidated railway transport operator. The main types of energy products used by JSC "Ukrzaliznytsia" to power trains are diesel fuel and electricity.

In Ukraine, the following types of energy products are used for road transport :

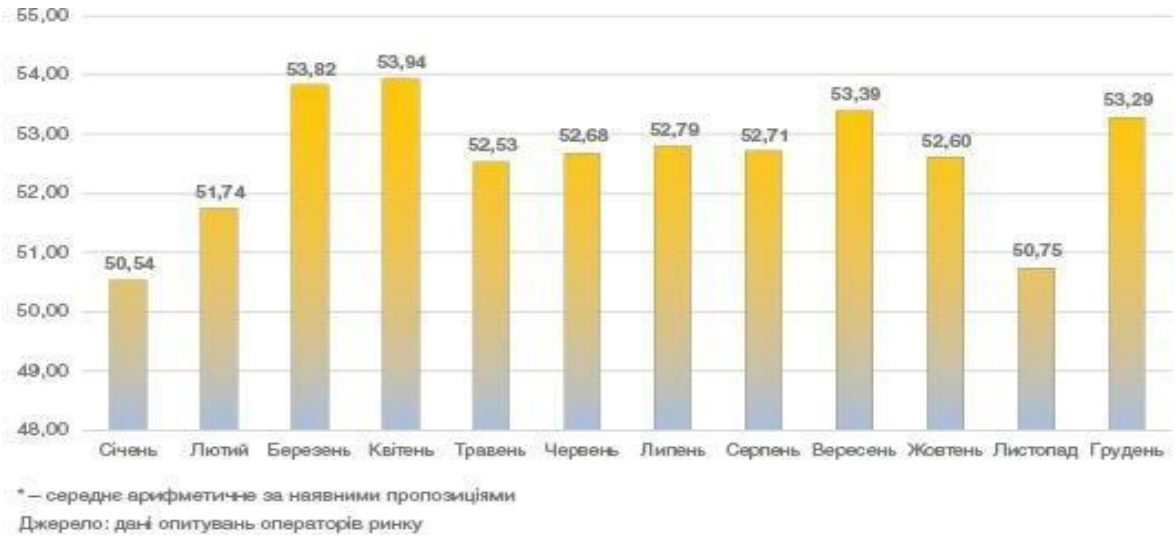
- Gasoline;
- Diesel fuel (DP);

- Liquefied (with drops) oil gas (LPG);
- Compressed natural gas (CNG);
- Electricity.

Liquefied natural gas (LNG) is currently largely unused for transport, but a 2020 study commissioned by the European Commission suggests that LNG could be a promising option for long-distance road freight transport, and potentially for rail transport.

Some gasoline, diesel fuel, and autogas (LPG, CNG) can be produced in Ukraine; however majority necessary volumes are imported. By data LLC "Consulting" group A-95"[132], in 2024 diesel accounted for 75% of all motor fuel imports (compared to gasoline and liquefied gas) and amounted to 6.65 million tons. Imports were carried out from 16 countries by 185 companies (compared to 20 countries and 318 companies in 2023), and the main supply directions were Romania, Poland, Greece, Lithuania and Hungary (they accounted for 93% of total imports). The main importers of diesel fuel in 2024 were OKKO, JSC "Energeo Trade", "Ukrpalet-system", WOG, etc. According to the same analytical center[133], gasoline imports in 2024 amounted to 1.24 million tons, mainly A-95. Imports were made from 11 countries, and the main destinations were: Romania, Poland, Lithuania, Germany, Moldova. The main importers of gasoline were OKKO, WOG, UPG, "Amik", "UNTK".

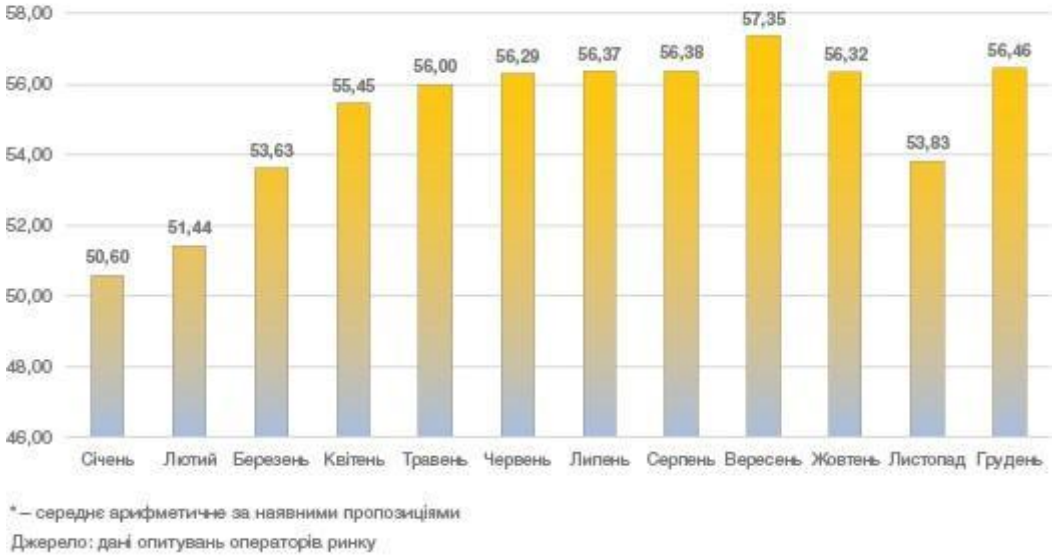
Fig. 4.42. Average weighted retail prices on diesel fuel on Gas station Ukraine in 2024 (UAH/l)



Source: State Foreign Information Service

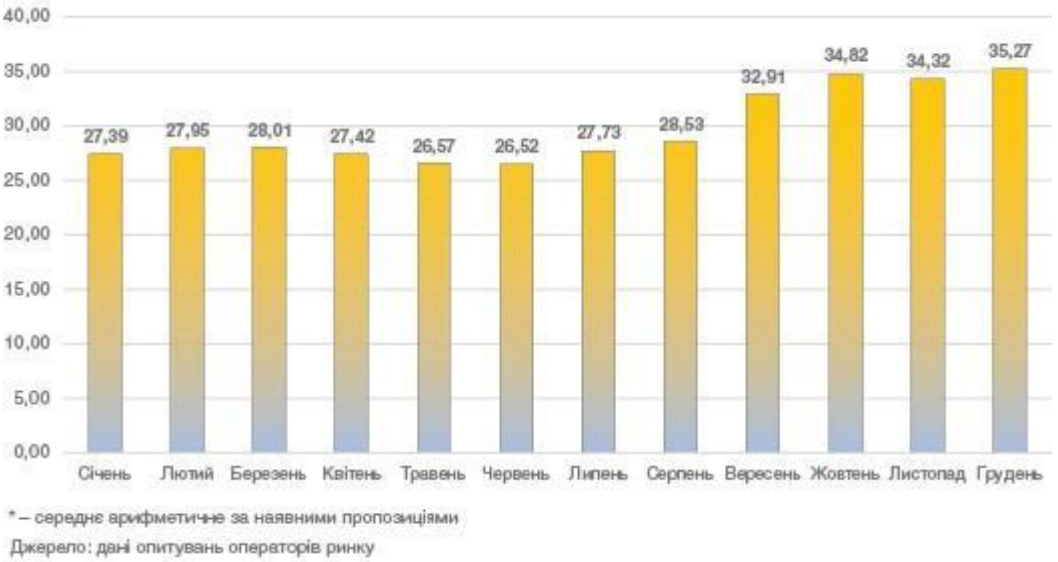
Fig. 4.43. Average weighted retail prices on gasoline A-95 on Gas station Ukraine in 2024 (UAH/l)

[132] Imports diesel fuel in Ukraine 2024 - who supplies and What changes - news Ukraine - ZN.ua
[133] Market fuel - As Ukraine built gasoline independence - ZN.ua



Source: State Foreign Information Service

Fig. 4.44. Average weighted retail prices on LPG on Gas station Ukraine in 2024 (UAH /l)

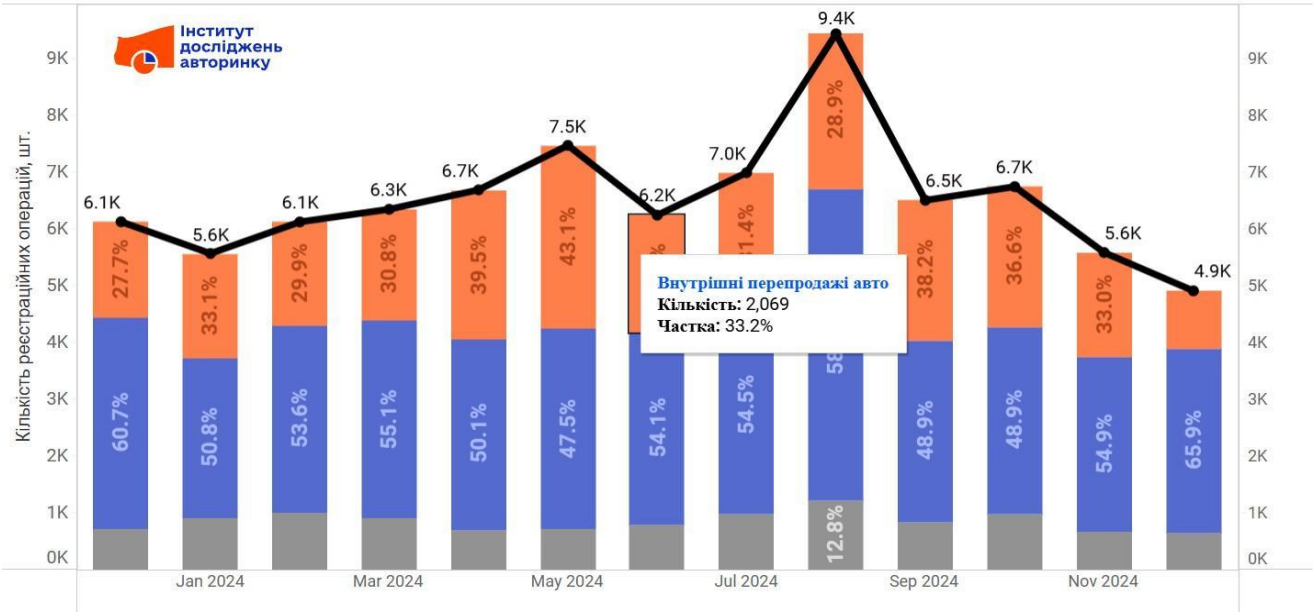


Source: State Foreign Information Service

According to the Main Service Center of the Ministry of Internal Affairs, as of August 15, 2025, 182 were registered in Ukraine 005 vehicles driven only electric engine, as well as 121 392 plug-in hybrid cars. According to the Institute research car market[134], in In 2024, imports of used electric vehicles significantly exceeded imports of new ones.

Fig. 4.45. Imports of new, imports of used and domestic resales compared to the total number of registrations of electric vehicles in 2024.

[134] Market electric vehicles in Ukraine: results 2024 year — Eauto



4.5.3.2. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

Electricity market

Among the key factors that will determine the situation in the Ukrainian electricity market and the potential for foreign trade after the lifting or termination of martial law, the following should be highlighted:

1. The scale of damage and destruction of generation facilities and electrical networks compared to the restoration and construction of new energy generation and storage capacities, network facilities, which will determine the volume, structure, flexibility of electricity supply and its capabilities transmission, as well as the price level in the domestic market;

2. The dynamics of the recovery of economic activity and socio-demographic dynamics in the country, which will determine the volume and structure of demand for electricity, as well as the consumption profile;

3. Price caps and other types of regulation in wholesale market segments;

4. A policy to bring electricity prices for households to market-determined levels, along with the gradual minimization of PSO and an increase in electricity supply in a competitive market;

5. Deepening integration with EU markets (increasing cross-border capacity and integration format), in particular, by combining day-ahead and intraday markets (market coupling) with Eastern European countries (Poland, Romania, Slovakia, Hungary and Moldova).

The forecast dynamics of the volume and structure of installed generating capacity and electricity production in IPS under the WEM scenario are given in Table 4.7. During 2030-2040, the forecast share of maneuvering capacities in IPS is estimated at about 30-38%, which, compared to the minimum required level according to the TSO estimates (15%), can be considered acceptable for software sufficient equal flexibility in power system and integration of renewables (the WEM scenario predicts an increase in the share of electricity generation from renewables in total production from 24.0% in 2030 to 29.8% in 2040).

Competition in the electricity market will gradually increase due to the introduction of new decentralized generation capacities and a corresponding decrease in the level of concentration in the market, as well as due to the increase in the number of players in the wholesale and retail market segments as part of the development of new business models (BESS operator, active consumers, aggregation, demand response, etc.).

Taking into account the factors of significant inflation, in the medium term we can expect a gradual increase in the level of price caps for electricity in the wholesale market segments (DAM IDM and the balancing market) with their subsequent elimination and replacement with technical price restrictions, in accordance with the reform of the wholesale market within the framework of European integration. Revision of the price caps combined with the preservation of the generation capacity deficit in IPS can cause appropriate growth in wholesale electricity prices, including in the BCM segment, which is guided by the DAM reference price indexes.

The expected dynamics of marginal prices for electricity for representative hours (taking into account the seasons of the year and the daily profile of the electrical load in the power system) based on the modeling results for both WEM and WAM scenarios are shown in Fig. 5.29 and 5.30. In general, the price level under the WAM scenario is expected to be higher by 2040 compared to the prices under the WEM scenario (Fig. 5.29). However, the trends in price dynamics under these scenarios are mostly opposite. Thus, under the WEM scenario, a gradual increase in prices is expected until 2045, while under the WAM scenario, a decrease in prices is expected for the spring, summer and autumn periods, and an increase for the winter period until 2040 (Fig. 5.30).

In terms of cross-border electricity trade, the modeling results for both WEM and WAM scenarios expect Ukraine to remain a net importer throughout the period by 2050 (Fig. 5.28). Moreover, in 2030 and 2040 years correlation of the total annual volume of electricity imports to its domestic production under the WEM scenario may be about 3.2% and 3.4%, respectively. Also, the ratio between the electricity imports and exports will be affected by the disparity between the permitted by ENTSO-E capacity of Ukraine's interconnectors for imports and exports. Thus, as of 2025, depending on the season of the year, the permitted ENTSO-E capacity for imports 1.8-2.3 times higher than the similar size for export. Maintaining disparity between these values is expected throughout the period until 2050.

Prices for households until the end of the heating season in 2024-2026 remained at the current level. Their upward revision during the martial law in Ukraine is possible - provided that there is a slight multi-stage increase, spread over time (at least 2-3 years). The Cabinet of Ministers of Ukraine will adopt a Roadmap for the gradual liberalization of the gas and electricity market with the steps that need to be taken and the corresponding deadlines that must be implemented after the end of martial law. The roadmap will be based on technical analysis to understand the financial condition of the sector.

As part of the deepening of European market integration, Market Operator joined the Committee of European Market Operators (NEMO Committee) as an observer for the work of the EU’s integrated spot electricity market – SDAC (Single Day-Ahead Coupling) and SIDC (Single Intraday Coupling). Observer status allows for the start of technical preparations for the coupling of the spot markets of Ukraine and European countries. Such market coupling is expected after 2027.

The planned development of interconnectors of IPS with the ENTSO-E power system and full participation of Ukraine in the unified spot market of Eastern European countries will expand the possibilities for the development of international electricity trade, which will be limited by the existing capacity of interstate networks. As a result, a gradual convergence of prices on the wholesale electricity market of Ukraine and the markets of Eastern European countries is expected. The directions, time periods and volume of international trade will be determined depending on the ratio of conjunctures on the unified spot electricity markets. In addition, the possibility of exporting electricity from Ukraine to EU countries will be influenced by the factor of application or avoidance of CBAM.

Natural gas market

Existing policies and measures generally do not allow for the achievement of all objectives set for the dimension “Internal Energy Market - Gas”.

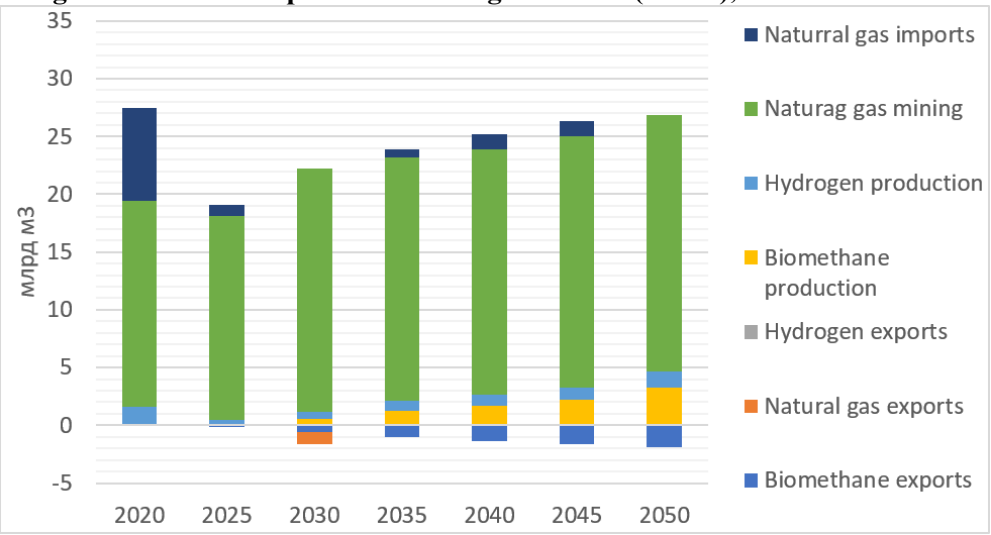
First, the existence of restrictions on the export of natural gas limits domestic production and distorts prices on the domestic market. It should be noted that such restrictions are a consequence of the response to the ongoing aggression against Ukraine, and the presence of natural gas in the system creates additional opportunities for flexibility and maintenance gas supply consumers Ukraine. Secondly, the presence of price restrictions (within the framework of the PSO provisions) for a large number of consumers also does not encourage an increase in production, including through the development of new technologies and the search for synergies. In addition, such restrictions lead to a weakening of competition due to a decrease in import volumes and importers, who usually compete with sellers of domestic gas. Third, without the introduction of additional measures, the operating conditions in the domestic gas market are difficult and burdensome for new players. This concerns the uncertainty of fate property and assets operators Timing, insufficient equal their separation from the interests of supply and production, as well as the lack of guarantees of adequate financing, which has a significant impact on the operation of the retail market. Dependent on this are also the problems of balancing rules and the lack of a comprehensive system of commercial gas metering (against the background of insufficient equipment of consumers with metering devices), which, under existing policies and measures, do not allow suppliers to independently manage their gas supply risks, especially to household consumers. At the same time, the quality of market operation should be reflected in the increase in competitive offers, which is available to household consumers. The lack of an effective system for identifying and protecting the real circle of vulnerable consumers hinders the development of receivables management tools by suppliers.

Existing policies and measures in terms of infrastructure development are generally adequate to ensure sufficient interconnection of the gas networks of Ukraine and the EU (in terms of planning and identifying market demand, creating new products). At the same time, they are not sufficient to properly adapt these networks to the requirements of the future energy market (in terms of optimization, integrated planning, switching to the use of new substances, balancing the interests of infrastructure operators and various gas producers, etc.).

In addition, existing policies and measures create positive incentives for the development of natural gas production, but, according to market participants, may be insufficient to achieve planned production volumes, let alone obtain additional volumes of gas for export.

The results of the WEM scenario modeling, based on the TIMES-Ukraine model, show that natural gas production in Ukraine may increase until 2030, but then stabilize at approximately the same level of 21-22 billion m3 until 2050. At the same time, after 2025, the need for imports gas will be minimal, not exceeding 1.4 billion m3 (figure below).

Fig. 4.46. Balance of production and gases trade (WEM), billion m ^{3}



*Note: * hydrogen production includes renewable hydrogen, and hydrogen from natural gas in chemical industry*

Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

4.6. Dimension Research, innovation and competitiveness

4.6.1. Current situation of the low-carbon-technologies sector and, to the extent possible, its position on the global market (that analysis is to be carried out at regional or global level)

International innovation rankings are one of the quality sources of information about the level of innovation in a country. This applies, in particular, to innovations in the field of energy and climate technologies.

European Innovation Scorecard

According to this European Innovation Scorecard (EIS) 2025[135], Ukraine belongs to the group "Emerging Innovators" Innovators) together with Bulgaria, Latvia, Poland, Romania, Slovakia and Serbia and demonstrates an efficiency indicator in innovation areas of 29% of the national average European Union. Compared to 2024, the figure decreased by 1.3%. Relatively EIS calls the export of intelligent services, friendly to the Ukrainian economy, the strengths of the Ukrainian economy. environment technology, employment in service industries, venture capital investments and innovations without a significant R&D component. On the other hand, the EIS attributes product innovation, design, sales of innovative products, involvement in international scientific publications, and R&D expenditures in budget-financed sectors to the relatively weak aspects of the Ukrainian economy.

Global Innovation Index

According to the Global Innovation Index 2025[136], which is compiled annually by the World Intellectual Property Organization (WIPO), Ukraine ranked 66th among all analyzed countries and entered the top three most innovatively growing countries together with India and Vietnam. According to the authors of the Global Innovation Index, in Ukraine, the results of the innovation sectors exceed the amount of investment in them (Output rank – 54 / Input rank – 80), which places Ukraine in the "innovation overperformer" group.

Clean Energy Demonstration Projects Database (IEA)

Some relevant international rankings and databases do not contain data on Ukraine or innovative energy and climate projects implemented in Ukraine. For example, one of the most famous databases of innovative energy projects - the Clean Energy Demonstration Database of the International Energy Agency - does not contain any mention of clean energy demonstration projects in Ukraine. At the same time, this database contains information on demonstration projects implemented in countries that are on the same level of innovation as Ukraine (according to the Global Innovation Index 2025) - for example, Vietnam and India.

[135] "European innovation scoreboard 2025." 15 July 2025, https://research-and-innovation.ec.europa.eu/knowledge-publications-tools-and-data/publications/all-publications/european-innovation-scoreboard-2025_en

[136] Global Innovation Index 2025, https://www.wipo.int/web-publications/global-innovation-index- 2025 /en/index.html

The absence of innovative energy projects from Ukraine in this particular database may be due to the fact that our country became an associate member of the IEA quite recently (in 2021), as well as the fact that clean energy demonstration projects in Ukraine are financed and implemented mostly by private companies without significant state participation.

Financing research and innovations in within the framework international agreements

A significant part of research and innovation activities in Ukraine in areas related to NECP are carried out within the framework of relevant agreements between Ukraine and the EU.

The legal basis for this interaction and for bilateral cooperation and dialogue in the field of research and innovations there are Agreement about scientific and technological cooperation between Ukraine and European Union[137], extended in 2022, as well as the Agreement between Ukraine, of the one part, and the European Union and the European Atomic Energy Community, of the other part, on the participation of Ukraine in the Horizon Europe Framework Programme for Research and Innovation and the Research and Training Programme of the European Atomic Energy Community (2021-2025), complementary to the Horizon Europe Framework Programme for Research and Innovation[138]. Under the terms of these agreements, Ukrainian players in the research and innovation sector can participate in them on equal terms with representatives of the EU Member States.

Horizon Europe, the European Union's framework programme for research and innovation, has a total budget for research grants of €95.5 billion for 2021-2027. A significant part of the funding is directed towards research in the field of solving climate and energy problems, in particular:

1. Cluster 5 Climate, Energy and Mobility: this cluster is designed to combat climate change, develop sustainable energy solutions and promote mobility, covering a variety of programs and funding opportunities for sectors such as clean energy, renewable energy, energy efficiency, climate adaptation and others;

2. European Green Deal Call: a funding program for projects that contribute to achieving the goals of the European Green Deal towards climate neutrality by 2050 ;

3. Mission Area on Climate-Neutral and Smart Cities: areas of activity aimed at combating from public challenges, in ago number to achieve climate neutrality and smart cities goals. The objective of this area is to support research and innovation projects that contribute to ensuring the sustainable development of European cities.

In October 2023, the structural unit “Horizon Europe Office in Ukraine” began operating in Ukraine on the basis of the National Research Foundation of Ukraine[139].

Also, within the framework of the aforementioned agreement, Ukraine gained access to research and innovation programs covering energy and climate issues:

- EIC4Ukraine[140] – a program of financial and consulting support for Ukrainian deep-tech startups with a total budget of 20 million euros;
- EU Mission for Climate Neutral and Smart Cities: a program with a budget of €5 million aimed at supporting partnerships with Ukrainian cities to support their reconstruction efforts taking into account the principles of climate neutrality;
- Technologies for extraction and processing of critical raw materials – an initiative to support the building of sustainable supply chains for critical materials and strengthen the EU's partnership with countries rich in relevant minerals to ensure the security of industrial sectors and the environmentally friendly transformation of extractive industries in partner countries;
- Excellence Hubs Initiative[141] is a “mentoring” program for the development of innovative components, to which Ukrainian participants are invited.

Several research projects in the energy sector are already being implemented within the framework of the

[137] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2022.095.01.0001.01.ENG&toc=OJ%3AL%3A2022%3A095%3ATOC
[138] https://zakon.rada.gov.ua/laws/show/984_005-21#n2
[139] The Horizon Europe Office in Ukraine has started its work at the NFDU https://nrfu.org.ua/news/rozpochav-svoyu-robotu-office-programs-horizont-europe-in-ukraine-based-nfdu/
[140] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3533
[141] https://rea.ec.europa.eu/funding-and-grants/horizon-europe-widening-participation-and-spreading-excellence/excellence-hubs_en

European Union's Framework Programme for Research and Innovation "Horizon Europe":

- BIOMETHAVERSE[142]: two Ukrainian organizations, Eco Energy and the Bioenergy Association of Ukraine, are participating in this strategic project with a budget of 12 million euros, aimed at developing biomethane and green hydrogen production technologies in Europe according to the Strategic Energy Technology Development Plans (SET plan);
- The TWISMA[143] project is aimed at increasing the level of scientific developments and innovative capacity of the Institute of Scintillation Materials (Kharkiv) and its partner institutions within the framework of Twinning programs for the development of innovative calorimeters based on advanced scintillation materials for use in high-energy physics;
- The iDesignRES[144] project aims to create open-source toolkits that help plan and optimize the implementation of low- and zero-emission energy sources at all levels, including multi-component models, comprehensive energy system modeling, and a cloud platform for running energy system models;
- and many others.

Others ratings and sources data

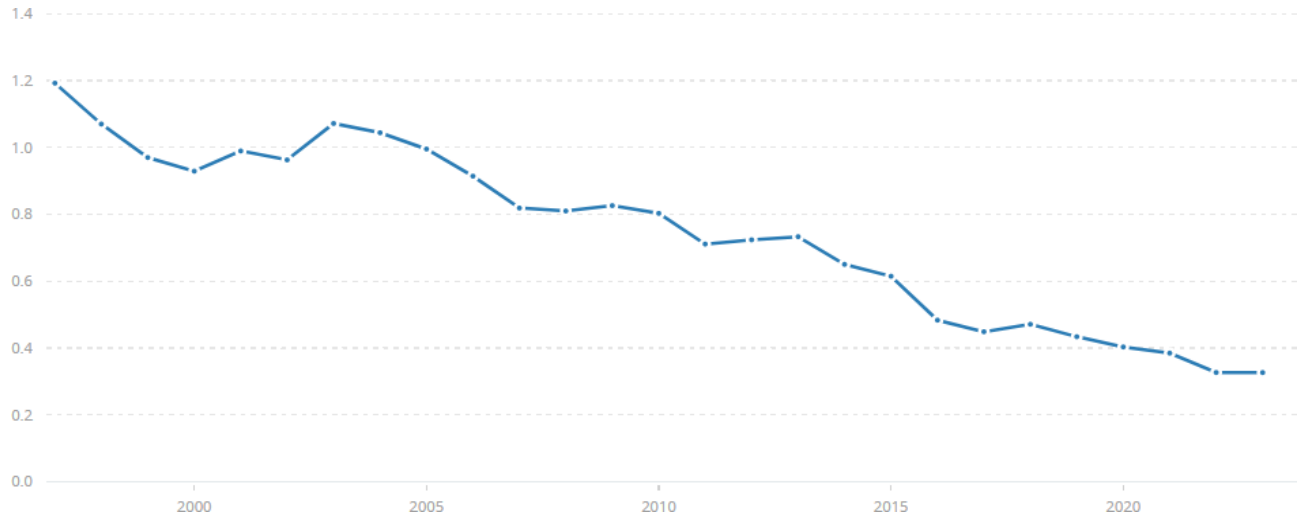
By data World economic forum in Report about global competitiveness 2020[145] , Ukraine ranked 94th among 142 countries studied.

According to index innovative development, presented by Bloomberg in In 2021, Ukraine ranked 58th among 60 countries studied[146].

4.6.2. Current level of public and, where available, private research and innovation spending on low-carbon-technologies, current number of patents, and current number of researchers

Ukraine has a relatively low level of R&D spending compared to other Eastern European countries. According to the World Bank[147], as of 2023, R&D spending in Ukraine amounted to only 0.33% of GDP.

Fig. 4.47. Expenses Ukraine on R&D in percentage from GDP



Research spending in the low-carbon technology and innovation sector in Ukraine is carried out by both public and private entities.

State institutions fund research and innovation development mainly through specialized research institutions and grant funding from the National Research Foundation. Key research institutions include:

1. State

[142] https://cordis.europa.eu/project/id/101084200
[143] https://cordis.europa.eu/project/id/101078960
[144] https://cordis.europa.eu/project/id/101095849
[145] Global Competitiveness Report 2020 | World Economic Forum, 16 Dec. 2020, https://www.weforum.org/publications/the-global-competitiveness-report-2020/competitiveness-rankings/
[146] https://www.bloomberg.com/news/articles/2021-02-03/south-korea-leads-world-in-innovation-us-drops-out-of- top-10
[147] https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?end=2023&locations=UA&start=1997&view=chart

- Institute renewable energy NAS Ukraine
- Institute technical thermal physics NAS Ukraine
- Institute bioenergetic cultures and sugar beets (National Academies of Agricultural Sciences)
- Institute electrodynamics NAS Ukraine
- Department hydrogen energy Institute problems engineering them. A.M. Pidgorny NAS of Ukraine
- Center hydrogen technologies Institute gas NAS Ukraine (IFNTUNG)
- Ivano-Frankivsk national technical university oil and gas

2. Private

- LLC "NTU "Biomass" (approximately 15 researchers)
- PrJSC "MHP" "Eco" Energy» (approximately 20 researchers)

2. Individual departments universities

- Educational and scientific institute energy, automation and energy saving (NUBIP)
- Chair renewable sources energy National technical university Ukraine "Kyiv" polytechnic institute name Igor Sikorsky» (NTU KPI)
- Direction engineering RES in IFNTUNG

It is worth mentioning that there are a number of training programs on renewable energy sources and energy efficiency. technologies from specialties "Electrical Engineering" or "Energy Production", which one teaches in series institutions higher education[148].

Estimating the specific volume of **private company investments** in research and innovation in low-carbon technologies in Ukraine is complicated by the non-public nature of a significant number of investments made by private companies. The latter can be divided into several groups with different business models and sources of capital.

Startups

These low-carbon innovation market participants in Ukraine are focused on working in global markets, largely ignoring the Ukrainian market as too small in scale for their developments. The main source of funding for Ukrainian climate startups is:

- angel/venture capital capital;
- own capital (bootstrapping);
- grant financing.

Clearly assessing investments in low-carbon technologies by Ukrainian startups is a difficult task due to the non-public nature of these investments and the own contribution of companies and their founders, which is often not expressed in financial terms.

Corporate innovations

The corporate sector in Ukraine relies more heavily on technologies that are much closer to the commercialization stage than those developed by startups, or are already commercially available globally, but are still very new to the Ukrainian market. The largest corporate innovators in Ukraine include:

- DTEK - invests in energy storage technologies, "smart grids", electromobility, has its own research centers and innovation program. DTEK became the first company to implement an energy storage installation;
- MHP - invests in biomass processing technologies, hydrogen technologies, energy storage, electromobility, has its own research centers;
- KNESS - invests in research and development of smart grid and energy storage technologies. First to receive a license for commercial use of energy storage installations;
- RGC (now the main assets under the management of Naftogaz Group) - carried out research into

[148] https://osvita.ua/consultations/vartist-navchannya/90674/

the possibility of transporting renewable gases (hydrogen and biomethane) through a distribution network built for natural gas;

- GALS Agro, VitAgro - invest in technologies for processing biomass into renewable gas (biomethane), are interested in biomethane-to-grid projects;
- Aventston;
- Atmosphere.

It should be noted that today a significant number of Ukrainian companies have begun investing in low-carbon technologies, primarily energy technologies. The drivers of such investments are the following factors:

- The need for businesses to ensure their own energy security and reduce costs. After the shelling of energy infrastructure by Russian troops, the problem of providing themselves with energy became acute for many businesses. Therefore, Ukrainian entrepreneurs began to install generating plants and energy storage facilities “beyond the meter”;
- Exporters' efforts to minimize the financial impact of CBAM implementation on them. Ukrainian companies exporting their goods to EU countries are calculating the financial consequences of CBAM implementation and investing in low-carbon production chains.

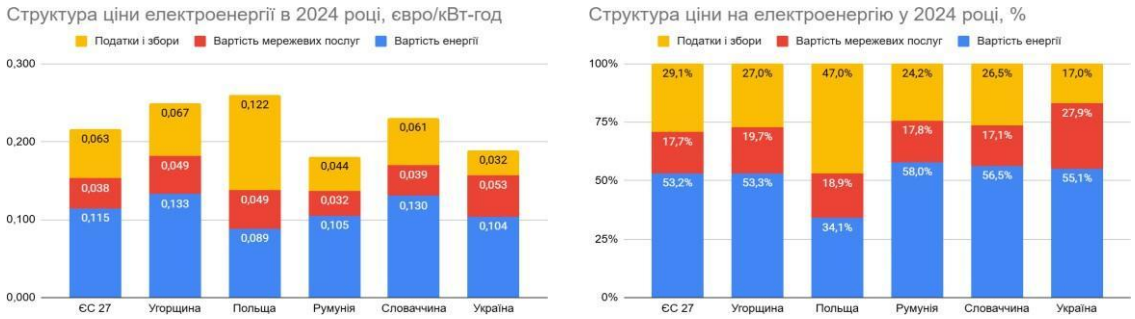
Table. 4.15. Number patents in subsectors green economy in Ukraine[149]

	CPC (Спільна патентна класифікація)	Кількість патентів (ранній пріоритет => 2010)
Вітрова енергетика	**Y02E10/70-766**	**270**
Сонячна енергетика	**Y02E10/40-47**	**153**
Гідроенергетика	**Y02E10/20-28**	**112**
Фотовольтаїка	Y02E10/50-58	52
Паливо з відходів	Y02E50/30-346	50
Сільське господарство	Y02P60	42
Ядерна енергетика	Y02E30	32
Морська енергетика	Y02E10/30-38	30
Переробка біоорганічної фракції	y02w30/40-47	13
Біопаливо	Y02E50/10-18	12
Воднева енергетика	Y02E70 Y02E60/30+	5
Гібридні сонячні технології	Y02E10/60	5
Надпровідникові електричні елементи	*Y02E40/60-69*	*0*
Геотермальна енергетика	*Y02E10/10-18*	*0*

4.6.3. Breakdown of current price elements that make up the main three price components (energy, network, taxes/levies)

In Ukraine, there are no official annual statistics on the structure of electricity and natural gas prices for consumers by main components (energy cost, network costs, taxes/fees). Also, the Eurostat platform does not have these data for Ukraine for the period after 2020. Taking into account the Eurostat approach, indicative indicators of the structure are given below electricity prices energy and natural gas for non-domestic consumers in Ukraine in 2024 compared to European indicators (EU-27 and neighboring Eastern European countries with which Ukraine has electricity and gas interconnectors and carries out cross-border trade).

[149] Yegorov I. Yu. Patent activity in the sphere of green economy: current state and problems / I. Yu. Yegorov, V. Yu. Griga, Yu. AT. Rozhkova //Science, technology, innovations. – 2021. – No. 3. – WITH. 36-44, https://nti.ukrintei.ua/wp-content/uploads/2022/11/%D0%84%D0%B3%D0%BE%D1%80%D0%BE%D0%B2_3-2021-1.pdf



Note: The price structure for electricity for non-household consumers in Ukraine was determined by calculation based on open data from information providers (SE "Market Operator", NEURC) and does not fully comply with Eurostat methodology. The cost of the energy component in the electricity price for Ukraine includes the average annual price index Base DAM (minus excise duty) tax 3.2%) and cost of electricity supply services to consumers (average tariff for supply by universal service providers). Network costs consist of tariffs for electricity transmission and distribution services (average tariff for distribution services for voltage class 2 - up to 27.5 kV). The tax component includes value added tax and excise duty. The environmental tax was not taken into account in the taxes section due to the complexity of its correct accounting.

Based on the calculations, the share of the energy component in the price of electricity in Ukraine generally corresponds to the average of the EU-27 and most neighboring countries of Eastern Europe (except Poland). On the other hand, the share of network costs in the price of electricity in Ukraine exceeds the European values by approximately 10 percentage points, while the share of taxes and fees is lower by the corresponding amount.



Note: The price structure for natural gas for non-household consumers in Ukraine was determined by calculation based on open data from information providers (NCRECP, GTS Operator of Ukraine LLC) and does not fully comply with the Eurostat methodology. The cost of the energy component in the gas price for Ukraine is determined by the average annual retail price of gas in the unregulated market segment for non-household consumers. Network costs consist of tariffs for gas transportation and distribution services (weighted average distribution tariff obtained by weighing the tariffs of individual TSO operators by the volume of annual ordered distribution capacity). The tax component includes value added tax. The environmental tax was not taken into account in the taxes section due to the complexity of its correct accounting.

A comparison of the price structure for natural gas shows that in Ukraine the share of the energy component is 6-12 percentage points higher than in EU countries, while the network and tax components have a proportionally smaller share. This distribution of the price structure in Ukraine is mainly due to the long-term absence of a review of gas distribution tariffs.

Prices for electricity and natural gas for household consumers in Ukraine are regulated, periodically reviewed within the framework of the relevant mechanisms for imposing special obligations (PSO) and do not reflect the real cost of price components. Also regulated are prices or individual components of electricity prices for other separate categories of consumers (in particular, enterprises of "green" metallurgy, other groups of household consumers, except for the population, etc.) and prices of natural gas for certain categories of consumers (in particular, producers of electricity and heat energy). Therefore, for these cases it is difficult to objectively determine the structure of energy prices based on open data.

4.6.4. Description of energy subsidies, including for fossil fuels

In Ukraine, there are several types of direct and indirect subsidies in the state-regulated energy markets (gas, electricity, district heating). The energy subsidy system in Ukraine is primarily aimed at protecting vulnerable households, which can be characterized as energy poor. However, the largest beneficiaries of this system are wealthy citizens. This is a result of the fact that the energy subsidy system in the mentioned markets consists of several levels:

1. Different prices/tariffs for households and legal entities. In the gas, district heating markets and electricity exist preferential prices/tariffs for households and market prices for legal entities. Separate preferential prices/tariffs also exist for religious organizations;
2. Targeted subsidies for vulnerable consumers allow for financial assistance to be provided to households whose utility costs exceed a percentage of their monthly income set by the Government.

Typical mechanisms that allow prices/tariffs for residential consumers (households) to be set at a level lower than economically justified are the following:

- Cross-subsidization at the expense of the revenues of electricity producers, determined by the Cabinet of Ministers of Ukraine within the framework of the mechanism of imposing special obligations on individual market participants to ensure general public interests (PSO) - for example, in the electricity market;
- Compensation through co-financing of state-owned companies involved in PSO from the state budget (for example, in the gas market);
- Support enterprises in field centralized heat supply from local budgets.

Terminological remarks

It is worth noting that there are several interpretations of subsidies in the Ukrainian legal framework, in particular, a number of different terms are used in relation to budgetary policy and state support. These terms can be compared with components of broader definitions, which they are used by international organizations.

A direct and rather narrow definition of subsidies is given in the Instructions on the Application of Economic Classification of Budget Expenditures, approved by Order of the Ministry of Finance No. 333 of March 12, 2012. According to the instructions, subsidies are defined as "all non-repayable current payments to enterprises that do not provide for compensation in the form of specially agreed payments or goods and services in exchange for payments made, as well as expenses related to compensation for losses of state-owned enterprises." The budget legislation of Ukraine contains the concepts of subventions, grants and other transfers that can be considered subsidies according to international definitions.

The Law of Ukraine "On State Aid to Economic Entities" defines state aid as support in any form to economic entities at the expense of state or local resources, which distorts or threatens to distort economic competition, creating advantages for the production of certain types of goods or the conduct of certain types of economic activity. This law also defines state aid as the transfer of state or local resources to individual economic entities, as well as losses of income of the relevant budgets. Forms of state aid include, in particular: the provision of subsidies and grants, the provision of subsidies, the provision of tax benefits, the deferral or installment payment of taxes, fees or other mandatory payments.

Also, since May 16, 2008, Ukraine has been a member of the World Trade Organization (WTO), therefore the definition of "subsidy" given in the Agreement on Subsidies and Countervailing Measures (Agreement (VZ)[150], automatically applies to state regulation in Ukraine.

> *1.1 For goals this one Agreements is considered, What subsidy there are:*
>
> *a) 1) a financial contribution provided in the territory of a WTO member by a government or any public body (referred to in this Agreement as the government), that is, when:*
>
> *i) the government practices direct transfers of funds (e.g. grants, loans or equity injections), potential direct transfers of funds or liabilities (e.g. loan guarantees);*
>
> *ii) the government forgoes or fails to collect revenues that are due to it (for example, fiscal stimulus measures such as tax credits)[1];*
>
> *iii) the government provides goods and services other than general infrastructure, or purchases goods or services;*
>
> *iv) the government makes payments to the financing mechanism or entrusts or directs a private entity to perform one or more of the functions referred to in subparagraphs "i" and "iii" above that would normally be performed by the government, and the practice of such entity in applying them is not materially different from the practice that the government would normally conduct;*

[150] Agreement about subsidies and compensatory measures, https://zakon.rada.gov.ua/go/981_015

or

a) 2) income or price support in any form within the meaning of Article XVI of GATT 1994 ; and

b) profit, What provided like this in a way.

A subsidy as defined in paragraph 1 falls within the provisions of Part II or Part III. or V only if such subsidy is targeted in accordance with the provisions of Article 2.

Subsidies on gas market

Subsidies in the natural gas market are received by all households (household consumers) without exception, regardless of their income level, in accordance with the Law of Ukraine "On the Peculiarities of Regulation of Relations in the Natural Gas Market and in the Heat Supply Sector during Martial Law and Subsequent Restoration of Their Functioning".

In addition, the natural gas market is subject to a PSO mechanism. For more information on price levels and other consumers covered by the PSO, see section 4.5.3.1.

The aforementioned NPAs define mechanisms for ensuring subsidized prices for gas used by households (domestic consumers):

- directly (in in the form of gas, What physically supplied households);
- through enterprises TKE, What produce warm and hot water for needs household consumers.

According to the Law of Ukraine "On the Natural Gas Market", a market entity that is entrusted with special obligations has the right to receive compensation for economically justified costs (minus the income received in the process of implementing the PSO) taking into account the permissible level of profit. The calculation of such compensation is carried out in accordance with the procedure approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 3, 2020 No. 1194.

Sphere of centralized heat supply

Centralized heat supply is also characterized by subsidized tariffs for heat and hot water supply for household consumers. This subsidy is implemented through a combination of subsidized gas prices for district heating companies and support for district heating companies from local budgets.

Such system developed in result combination two factors:

- Implementation of the PSO mechanism in the gas market, which ensured regulated prices for gas supplied by LLC "Gas Supply Company "Naftogaz Trading" to district heating companies for various needs;
- Transfer of authority to calculate and approve tariffs for heat and hot water supply from the National Commission for the Regulation on

Tariffs in the field of district heating and hot water supply for population in different cities differ significantly due to the economic parameters of district heating companies and the level of their support from local budgets.

Thus, a dual subsidy system operates in the field of district heating. – at the state and local levels. Tariffs approved by local councils often do not meet the requirements of the Law of Ukraine "On Heat Supply" in that tariffs must be no less than the cost. However, during the martial law in Ukraine and for 6 months after its end, the Law of Ukraine No. 2479-IX of 29.07.2022 (as amended) prohibits increasing tariffs for distribution services natural gas for all categories of consumers and on thermal energy (its production, transportation and supply), services for the supply of thermal energy and hot water for the population.

It should be noted separately that subsidizing gas prices negatively affects the production of heat from renewable energy sources, in particular from biomass. According to the legislation, a simplified tariff approval mechanism on gigacalorie of heat produced from biomass is 90% of the cost of a gigacalorie produced from gas. Since the state subsidizes the price of natural gas within the framework of the PSO, then the production of thermal energy from biomass for the needs of the population does not make economic sense, and this leads to the following consequences:

- Investors refuse to finance projects involving the use of biomass to supply heat to the population. Instead, they invest in projects involving the supply of heat to legal entities;
- District heating companies that use biomass for heat production are stopping their work or their work is subsidized from local budgets.

At the same time, in conditions of martial law, it is important to ensure the implementation of measures to develop decentralized heat supply systems (modular boiler houses, cogeneration plants , etc.).

Subsidies on electricity market

The key regulatory acts that determine the subsidy mechanisms in the electricity market are the Resolution of the Cabinet of Ministers of Ukraine dated June 5, 2019 No. 483 “On Approval of the Regulation on Imposing Special Obligations on Electricity Market Participants to Ensure General Public Interests in the Process of Market Functioning” electric energy» (Official herald Ukraine, 2019 r., No. 49, Art. 1658; 2021 r., No. 67, Art. 4232; 2022 r., No. 87, Art. 5385; 2024 r., No. 11, Art. 671; 2024 r., No. 43, Art. 2604) and Law of Ukraine "On the Electricity Market" (Official Gazette of Ukraine, 2019, No. 49, p. 1658; 2021 r., No. 67, Art. 4232; 2022 r., No. 87, Art. 5385; 2024 r., No. 11, Art. 671; 2024 r., No. 43, Art. 2604).

See. also PM_IM_WEM_04 Regulation and liberalization retail prices on energy resources.

Among mechanisms subsidization prices, What are being implemented through mechanism PSO and/or provide for the redistribution of funds in the market:

- subsidization prices for households;
- subsidization production electricity with RES through "green" tariff.

For the settlement of payments under the “green” tariff, ensuring the functioning of the PSO mechanism was responsible SE “Guaranteed Buyer”, created in June 2019 in accordance with the Cabinet resolution Ministers of Ukraine dated April 17, 2019 No. 324 “On establishment of state enterprises “Guaranteed Buyer” and “Market Operator” (Official Gazette of Ukraine, 2019 p., No. 34, p. 1206) to perform the functions of a guaranteed buyer of electricity from renewable sources. By Resolution of the Cabinet of Ministers of Ukraine dated December 10, 2025 No. 1633, the joint-stock company “Guaranteed Buyer”, 100 percent of whose shares belong to the state, was established by means of the transformation of the state enterprise “Guaranteed Buyer” (Official Gazette of Ukraine, 2025 p., No. 102, p. 7229).

In order to ensure the supply of electricity to the population at lower than market prices, JSC “NNEC “Energoatom” and PJSC “Ukrhydroenergo” compensate for losses incurred by universal service providers (USPs) when supplying electricity to the population. Considering on essential costs state generating companies (by 2023 year – 144.4 billion UAH, for 2024 – UAH 152.5 billion[151]; for 2025, JSC “NNEC “Energoatom” estimated the costs of implementing the PSO at UAH 168.546 billion[152]), these imposed obligations make it impossible directing investment resources to development programs, for example, accumulating resources for the future decommissioning of nuclear power plants.

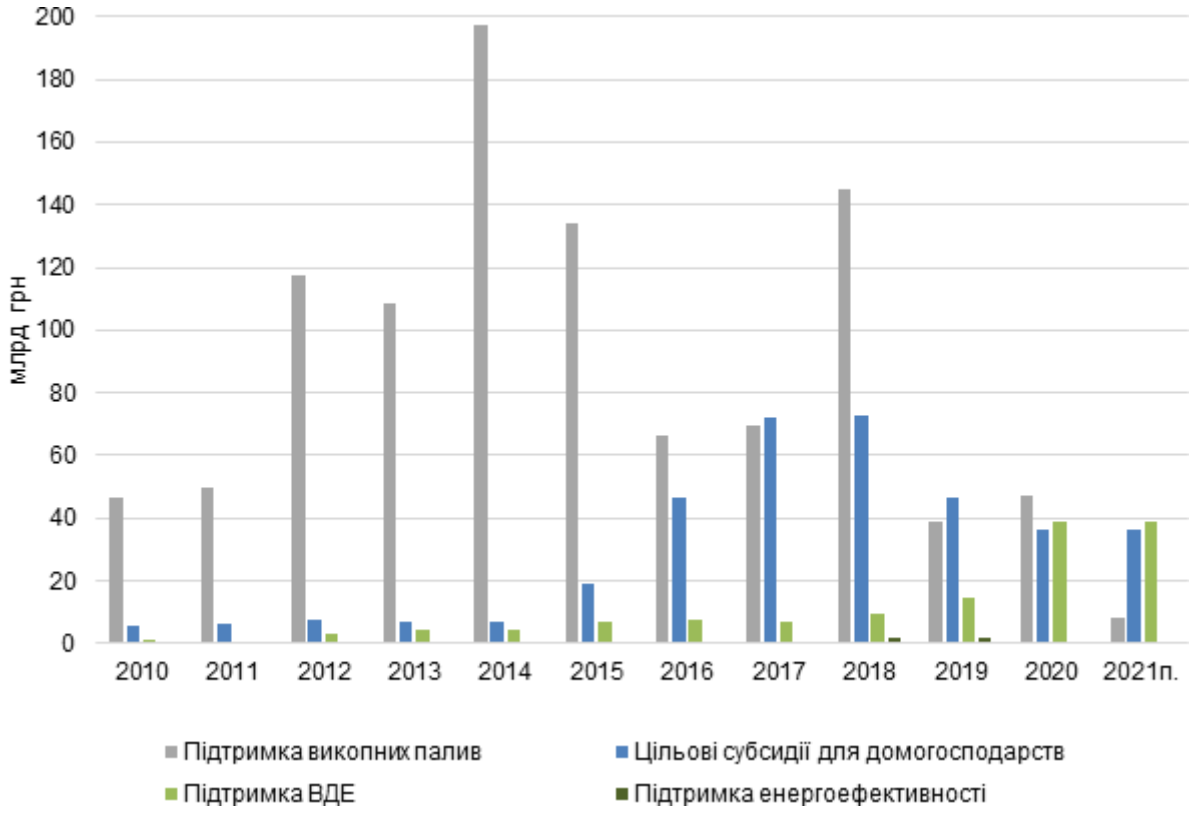
Transformation of subsidies in energy sector

The energy subsidy landscape has changed significantly since the publication of the first comprehensive analysis of fossil fuel subsidies in Ukraine (OECD, 2018). The chart below illustrates the evolution of state support for fossil fuel production and consumption, targeted subsidies to households, support for renewable energy sources and energy efficiency.

[151] https://energoatom.com.ua/news/energoatom-sprostovuje-manipuliativnu-informaciiu-media-shhodo-tarifiv-i-nadpributkiv

[152] https://energoatom.com.ua/news/energoatom-splativ-1685-mlrd-grn-za-poslugu-pso-zabezpecivsi-ukrayinciam- dostupnu-cinu-na-elektroenergiiu

Fig. 4.497. State support in energy, in ago number stimulation production of electricity from renewable sources



*AND exactly stimulation production electric energy with RES

Most of the energy used to produce energy for household consumption also falls into the “fossil” category. However, targeted subsidies for households are shown as a separate group because this type of support is more effective and is considered an acceptable form of social assistance for low-income households.

During 2014-2021, there was a clear trend towards the elimination of “general” fossil fuel subsidies, while the amount of targeted subsidies and benefits for households was increased to ensure support for the poor during feed-in tariffs increases. communal services. State support fossil fuel reached maximum in 197 billion UAH in 2014, although the level in 2018 was also very high (almost 145 billion UAH), mainly due to cross-subsidies in the electricity sector and the need for domestically produced gas to sell at regulated, below-market prices under the PSO regime[153].

In 2017 and 2019, the amount of targeted subsidies for households slightly increased the value of "general" subsidies for fossil fuels. However, it should be noted that estimates of subsidies for certain years should not be compared with each other, since in certain years, utility providers and Naftogaz of Ukraine received compensation for providing services at prices below market prices for several years. For example, in 2020, Naftogaz received compensation for the difference between the price of imported natural gas and its sale for the production of heat for households for the period 2015-2019.

Because production electricity with renewable sources energy quickly is growing, payment for electrical energy produced from RES has increased more than 11 times since 2012 to UAH 39 billion in 2020. At the same time, state support for energy efficiency remains minimal comparatively from subsidies in others sectors. In 2018 and 2019 from the budget About UAH 1.9 billion and UAH 1.8 billion were allocated, respectively, to support the Energy Efficiency Fund and the “warm loans” energy efficiency program. In subsequent years, funding these programs sharply decreased, partly through pandemic COVID-19.

[153] Prepared on basis previous grades subsidies on fossil fuel in countries Eastern partnerships published in the OECD report (2018), data from the Ministry of Finance (2020, 2018, 2017, 2014, 2013, 2010), NERC (2014), NEURC (2021, 2020, 2019, 2018, 2017, 2015), State treasury services (2021).

Table. 4.16. State support production and consumption fossil fuel in Ukraine, million UAH[154]

Program	Mechanism support	Indicator[155]	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021p.
Restructuring coal and peat industry	direct transfer	PVE	PVE	A.D.[156]	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	3 269	4 525
Breeding with operation unprofitable coal and peat mining enterprises	direct transfer	PVE	PVE	1 059	1 597	1 078	1 178	355	206	107	244	281	128	639
Rescue events on coal mining enterprises	direct transfer	PVE	275	378.6	414	430	288	234	263	288	290	289	290	340
Prevention and liquidation extraordinary situations on coal mines	direct transfer	PVE	n.s.	1.1	n.s.	0.4	n.s.	n.s.	n.s.	10	82	n.s.	n.s.	n.s.
Liquidation emergency situations on main road gas pipeline "Luhansk" - Lysychansk - Rubizhne»	direct transfer	PVE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	35	n.s.	n.s.	n.s.	n.s.
Liquidation emergency situations on TPP "Vuglehirska"	direct transfer	PVE	n.s.	n.s.	n.s.	111	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Partial compensation expenses on production ready commodity coal	direct transfer	PVE	5 807	6 710	10 172	13 302	8 705	1 212	1 373	2 122	1 072	n.s.	n.s.	n.s.
Improvement events security on coal mining enterprises	direct transfer	PVE	70	134	260	197	3	n.s.	n.s.	99	n.s.	n.s.	n.s.	n.s.
Construction and technical re-equipment enterprises coal and peat mining	direct transfer	PVE	337	1 719	1 293	343	54	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Replenishment of working capital or increase statutory funds coal mines for repayment debts from salary pay	direct transfer	PVE	n.s.	n.s.	n.s.	n.s.	n.s.	200	500	n.s.	n.s.	n.s.	n.s.	n.s.
Repayment debts by electricity state-owned coal mining enterprises	direct transfer	PVE	140	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	445	n.s.	n.s.
State support construction mines No. 10 "Novovolynska"	direct transfer	PVE	n.s.	n.s.	n.s.	n.s.	n.s.	146	50	70	35	62	n.s.	n.s.
Activities of support internal production coal and coal industry reform	direct transfer	PVE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	1 671	n.s.	n.s.	n.s.
State support STALEMATE "Main roads" gas pipelines "Ukraine"	direct transfer	PVE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	0.13	20	n.s.	n.s.	n.s.
Compensation of NJSC "Naftogaz of Ukraine" difference between purchasing prices on imported natural gas and its implementation for heat production for households	direct transfer	PSE	3 424	n.s.	3 900	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Budget transfer of "Smilakomunteploenergo" to prevent an emergency in the city of Smila through financial inability enterprises to pay for natural gas	direct transfer	PSE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	15	n.s.	n.s.
Subsidy from state budget local budgets for compensation differences between actual expenses on communal services and established tariffs	direct transfer	PSE	n.s.	2 857	14 443	2 052	12423	4 685	n.s.	1 798	978	n.s.	n.s.	n.s.

[154] Prepared on based on previous grades subsidies on fossil fuel in countries Eastern partnerships, published in report OECD (2018), data Ministry of Finance (2020, 2018, 2017, 2014, 2013, 2010), NERC (2014), NERC (2021, 2020, 2019, 2018, 2017, 2015), State Treasury Service (2021).

[155] PVE – support manufacturers energy, PSE – support consumers energy

[156] n.z.: not applies, -: missing data, Mr. – previous data

Subvention with state budget local budgets for the provision of benefits and housing subsidies for the payment communal services low-income households	direct transfer	PSE	5 131	6 069	6 718	6 046	6 173	17 995	44 120	69 740	69 977	21 561	n.s.	n.s.

Subvention with state budget local budgets for the provision of benefits and housing subsidies for the purchase solid and liquid household ovens and liquefied gas for low-income households	direct transfer	PSE	496	557	738	733	715	1 121	2 280	2 633	2 694	1 820	n.s.	n.s.
Payment benefits and residential subsidies citizens on payment of housing and communal services, purchase solid and liquid household heating fuel and liquefied gas in in cash	direct transfer	PSE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	23 267	36 357	35 208
Repayment debts from salary pay to employees of PJSC "Nadiya Mine"	direct transfer	PVE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	51	n.s.
Compensation NAC "Naftogaz" "Ukraine" by supply imported gas to PSO consumers	direct transfer	PSE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	32 205	n.s.
Securing the acquisition of GTS Operator LLC Ukraine» AT "Main roads" gas pipelines Ukraine» in AT "Ukrtransgaz"	direct transfer	PVE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	3 851	n.s.
Compensation to consumers who use electric heating, by increase prices on electricity	direct transfer	PSE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	1 400
Total straight transfers			**16 739.1**	**20023.3**	**39016.7**	**24393.3**	**28716.0**	**25799.0**	**48 692.6**	**77 039.6**	**77 100.7**	**50 856.3**	**78 057.9**	**41 105.2**
Deductions tax on profit enterprises for expenses energy enterprises, planned in within the framework investment programs	tax privilege	PVE	n.s.	263	975	761	957	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Tax credit with tax on profit enterprises on the amount of excise tax levied on heavy distillates (gasoline), What are used in transport means	tax privilege	PVE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	735	639	n.s.	n.s.
Deductions tax on profit enterprises on costs, related with intelligence and organization oil and gas fields	tax privilege	PVE	-	23	-	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Temporary privilege with VAT for operations with supply natural gas imported into the customs territory Ukraine NAC "Naftogaz" Ukraine»	tax privilege	PVE	n.s.	575	1 464	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Temporary VAT exemption for the supply of coal and/or products its enrichment on customs territories Ukraine	tax privilege	PVE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	2 116	2 609	3 042	2 808	1 333	1 431
Exemption from excise tax for transactions with sales ZVG on specialized auctions for needs households	tax privilege	PSE	n.s.	13	69	78	78	14	14	109	65	57	n.s.	n.s.

Reduction of excise tax rate for transactions with sales aviation gasoline and fuel for reactive engines, produced in Ukraine, and also imported	tax privilege	PSE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	5 191	2 235	2 398
Total tax benefits			**-**	**873.9**	**2507.5**	**838.8**	**1035.6**	**14.1**	**2 129.8**	**2 717.5**	**3 841.4**	**8 694.7**	**3 568.4**	**3 828.9**
Requirements to domestic manufacturers gas (more 50% in property state) of sales gas for household needs at regulated tariffs	indirect transfer	PSE	-	-	43 168	44 493	36 679	53 893	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Requirements to domestic manufacturers gas sell gas at regulated prices under the PSO regime	indirect transfer	PSE	n.s.	n.s.	n.s.	n.s.	n.s.	-	16404.7	25529.1	91092.72	n.s.	1683.45	n.s.
Cross subsidization in electrical power	indirect	PSE	23,326	28,048	34,467	37,557	40,825	43,848	45,466	36,595	45,344	26,053	n.s.	n.s.
Total indirect transfers		**PSE**	**23 326.4**	**28048.1**	**77634.6**	**82050.1**	**77503.3**	**97741.0**	**61 870.7**	**62 124.1**	**136 436.7**	**26 052.5**	**1 683.5**	**n.s.**
Increase in the authorized capital of Naftogaz NJSC Ukraine» by with help mechanism emissions state bonds to cover its deficit	transfer risk IN row	PSE	12 400	7 500	6 000	8 000	96 610	29 700	yes	yes	yes	yes	yes	yes
Total transfer risk In a row			12 400	7 500	6 000	8 000	96 610	29,700	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Total all mechanisms support			**2 465.5**	**56445.4**	**125158.8**	**115282.3**	**203864.5**	**153254.2**	**112 693.1**	**141 881.2**	**217 378.8**	**85 603.5**	**83 309.7**	**44 934.0**

Table. 4.17. State support events with energy efficiency and electricity, produced with renewable sources energy, million UAH[157]

Program	Mechanism support	Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021p.
Program cheaper loans	direct transfer	PSE	A.D. [497]	1	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Program energy efficiency	direct transfer	PSE	11	282	57	n.s.	2	302	861	818	418	546	384	150
Stock energy efficiency	direct transfer	PSE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	1 500	1 219	n.s.	100
Total support energy efficiency			11	283	57	n.s.	2	302	861	818	1 918	1 765	384	250
Exemption from corporate income tax concerning profit manufacturers electricity, which produce electricity exclusively from renewable sources energy	tax privilege	PVE	-	-	468	450	-	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Exemption from corporate income tax concerning income manufacturers biofuels, received from biofuel sales	tax privilege	PVE	120	-	15	15	15	yes	yes	yes	yes	yes	yes	yes
Exemption from corporate income tax regarding income from combined thermal power plants, What use biofuel, and thermal energy, What uses biofuel	tax privilege	PVE	-	-	548	0	0	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Zero rate excise tax tax of bioethanol, used for biofuel production and bioethanol and gasoline fuel mixtures	tax privilege	PSE	1 153	-	752	788	183	776	1 663	532	569	-	-	-
VAT exemption on materials, supplies and equipment for production renewable sources energy, production electricity with renewable sources, as well as equipment for servicing energy if the same ones are not produced in Ukraine goods	tax privilege	PVE	-	-	-	-	-	-	-	-	-	-	-	-
Exemption from import duty on materials, materials and equipment for production renewable energy sources, production electricity from renewable sources, as well as energy-saving equipment, if in Ukraine not the same goods are produced	tax privilege	PVE	-	64	-	-	-	-	-	-	-	-	-	-
Total tax benefits			1 273	64	1 783	1 253	198	776	1 663	532	569	-	-	-
"Green" tariff for manufacturers electricity with renewable sources (wind, solar energy, biomass, small hydropower etc)	indirect transfer	PVE	119	271	700	3 029	4 322	5 973	5 946	6 624	9 136	14 915	39 033	-
Total support manufacturers electricity with RES			1 392	336	3 484	4 282	4 520	6 748	7 610	7 156	9 706	14 915	39 033	-
Total support energy efficiency and RES			1 402	618	3 540	4 282	4 523	7 050	8 471	7 974	11 624	16 680	39 416	250

[157] Prepared on based on previous grades subsidies on fossil fuel in countries Eastern partnerships, published in report OECD (2018), data Ministry of Finance (2020, 2018, 2017, 2014, 2013, 2010), NERC (2014), NERC (2021, 2020, 2019, 2018, 2017, 2015), State Treasury Service (2021).

5. IMPACT ASSESSMENT OF PLANNED POLICIES AND MEASURES

5.1. Impacts of planned policies and measures described in section 3 on energy system and GHG emissions and removals, including comparison to projections with existing policies and measures (as described in section 4).

5.1.1. Projections of the development of the energy system and GHG emissions and removals as well as the impact of the implementation of Directive 2001/80/EC as adapted and ad-opted by Ministerial Council Decision 2013/05/MC-EnC, amended by Decision 2015/07/ MC-EnC and Directive 2010/75/EU as adapted and adopted by Ministerial Council Decision 2013/06/MC-EnC, amended by Decision 2015/06/MC-EnC, with particular regard to limited lifetime derogation

The table below presents the main modeling and forecasting results obtained using the TIMES-Ukraine model and other modeling tools for GHG emissions in Ukraine under the scenario with additional policies and measures (WAM).

Table 5.1. Main modeling results in field of GHG emissions in Ukraine in WAM scenario[158]

Scenario with additional policies and measures (WAM)

	1990	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Total amount of GHG emissions , *million tons of CO2-eq.*	**916**	**329**	**310**	**173**	**196**	**187**	**169**	**144**	**114**
Energy, industrial processes and products use sectors	858	273	271	130	149	138	117	95	69
Agriculture	90	36	38	37	41	43	46	47	48
Land use, land use change and forestry*	- 48	4	- 16	- 8	- 8	- 7	- 6	- 9	- 13
Waste sector	17	16	16	14	14	13	12	11	10
Shere of GHG emissions from the 1990 level, *%*	100	36	34	19	21	20	18	16	12
Energy, industrial processes and products use sectors	100	32	31	15	18	16	14	11	8
Agriculture	100	40	42	41	45	48	51	53	54
Land use, land use change and forestry	100	109	32	17	16	14	12	18	27
Waste sector	100	95	97	84	81	74	69	64	57

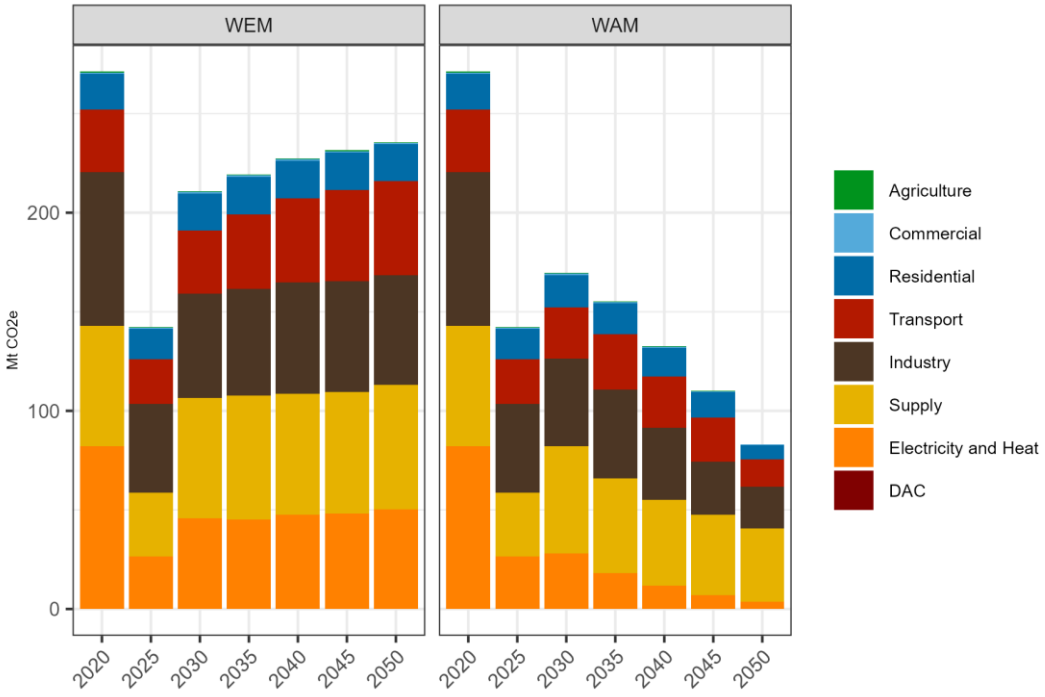
Source: National cadastre anthropogenic emissions from sources and absorption absorbers greenhouse gases in Ukraine for 1990-2023, State Institution "Institute of Economics and Forecasting of the NAS of Ukraine"

Emissions of greenhouse gases in sectors "Energy" and "Industrial processes and product use"

Lower on drawing depicted forecast emissions greenhouse gases to 2050 year in sectors "Energy" and "Industrial processes and using products" (in the sense of UN IPCC) with two scenarios WEM and WAM using the TIMES-Ukraine model.

[158] Data for 1990-2020 years from State Statistics Service, National Emissions Registry

Fig. 5.1 . Emissions of greenhouse gases in sectors "Energy" and "Industrial processes and use of products" under the WEM and WAM scenarios, million tons of $CO_{2\text{-eq.}}$



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

The modeling results show that even rapid processes of recovery of the Ukrainian economy in the post-war period, but subject to the "build back better" approach, the implementation of energy efficiency measures, the expansion of the use of renewable energy sources, other measures for decarbonization and technological modernization of the energy sector, can occur without increasing GHG emissions in the "Energy" and "Industrial processes and product use" sectors.

Under the WEM scenario, GHG emissions in the Energy and Industrial Processes and Product Use sectors could decrease by 22% in 2030 compared to 2020, after which, without additional measures, but with economic growth, emissions would increase by 2050, although the 2020 level would not be reached. At the same time, the implementation of additional, planned measures (WAM scenario) could lead to a significant reduction in GHG emissions by 2030 (-37% compared to 2020) and a further significant reduction by 2050 (-71% compared to 2020). Moreover, under the WAM scenario, it is possible to achieve net-zero GHG emissions in the electricity and heat production sector earlier than 2050 with the achievement of minimum emissions at the level of 3 thousand tons of $CO2_{\text{-eq.}}$ through a combination of bioenergy and carbon capture and storage (CCS) technologies. Although the ESU claims climate neutrality in energy by 2050 year, but policies and measures are currently insufficient to achieve this goal.

Emissions of greenhouse gases in the "Agriculture" sector

Decarbonization of agriculture requires the expanded implementation of information and electronic communication achievements, the improvement of agricultural tillage techniques and crop cultivation technologies, sustainable development of livestock farming, both in the context of animal breeding technologies and manure management. Given the identified priorities and the task of sustainable climate-friendly development from the existing measures to create favorable conditions for the development of a competitive, sustainable and diversified agricultural sector, the WAM scenario focuses on the expanded implementation of three policies in agriculture that will contribute to the reduction of greenhouse gas emissions (see Table 5.2, Table E.2.3).

Table 5.2. GHG emissions reduction as a result of implementation policies in agriculture, million tons of $CO_{2\text{-eq}}$.

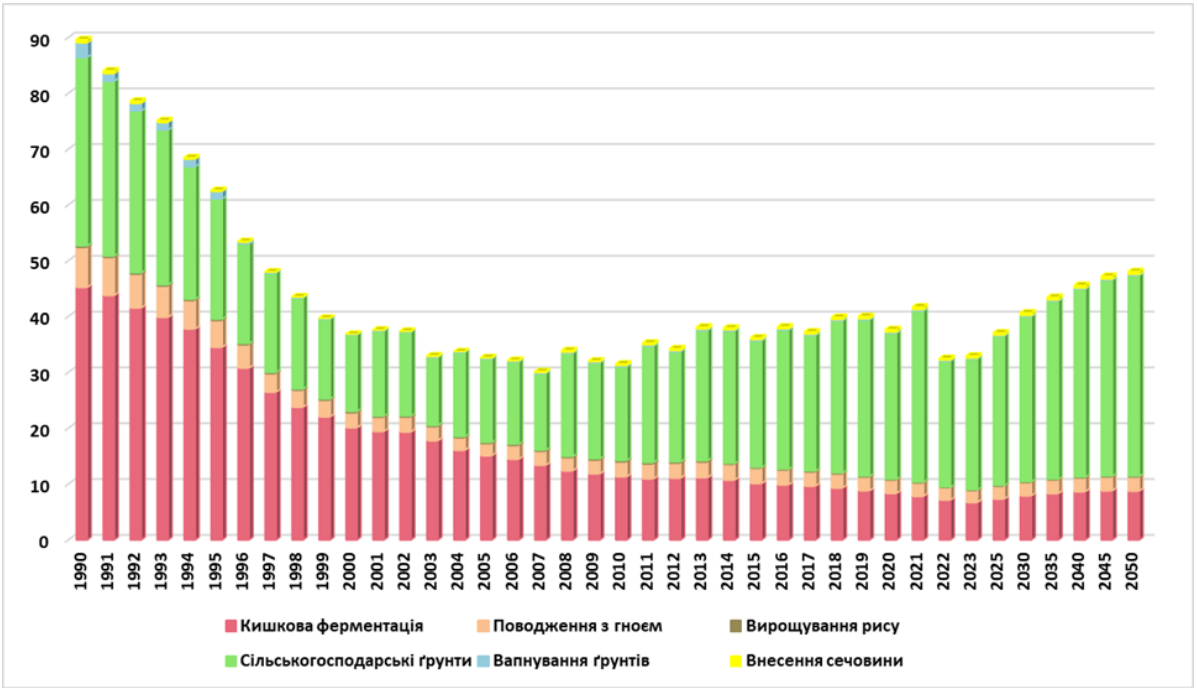
Policy	2025	2030	2035	2040	2045	2050
Promoting the development of organic crop production	0.013	0.032	0.083	0.222	0.159	0.127
Implementation of climate-smart agriculture	0.005	0.070	0.106	0.241	0.343	0.669
Improvement of manure management systems and biogas production	0.011	0.031	0.050	0.061	0.073	0.089
Together	**0.028**	**0.134**	**0.239**	**0.525**	**0.575**	**0.886**

Organic crop production has been known for a long time, but the production of organic products requires higher costs compared to traditional production. The key advantages of organic crop production are its climate orientation, greening of the agricultural sector, implementation of soil protection technologies, preservation biodiversity, production of safe products etc. In accordance to the WEM scenario, organic crop production develops along an inertial trajectory, and the area of agricultural land under organic production increases from 264 thousand ha in 2020 to 1,240 thousand ha in 2030, while in the WAM scenario, organic crop production develops more intensively and reaches 1,284 thousand ha by 2030.

Climate-smart agriculture is a multi-component policy aimed at adapting to climate change, transforming the agricultural sector, ensuring environmental protection, encouraging agricultural producers to conduct sustainable livestock farming, applying energy-saving and methane-absorbing technologies, promoting and supporting organic production, expanding the use of information and electronic communication technologies, etc.

Animal manure management is one of the main sources of GHG emissions, and therefore the introduction of measures to reduce GHG emissions from this activity is a priority for the development of livestock farming in Ukraine. Improving manure management practices has significant potential, which lies not only in the possibility of using animal manure in biogas plants for methanogenesis, but also in a set of measures for cleaning, transporting, storing and using manure.

Fig. 5.2. Forecast GHG emissions from agricultural activities in Ukraine under WAM scenario, million tons of $CO_{2\text{-eq}}$.



Given the historical trend of agricultural development, as well as the uncertainty regarding military aggression and the end of hostilities, it can be assumed that the degree of spread of the aforementioned practices and technologies is low. However, even partial realization of their potential will have an impact on reducing GHG emissions in agriculture (Figure 5.2).

Thus, GHG emissions in agriculture under the WAM scenario (Table 5.3) in 2030, 2040 and 2050 will be, respectively, 40.7 million tons of $CO_{2\text{-eq.}}$, 45.6 million tons of $CO_{2\text{-eq.}}$ and 48.1 million tons of $CO_{2\text{-eq}}$. Compared to the base 1990 year, the greenhouse gas emissions projected under the WAM scenario in 2030, 3040, and 2050 will be 45.4%, 50.9%, and 53.6%, respectively.

Table 5.3. Forecast of GHG emissions in the Agriculture sector under the WAM scenario , million tons of $CO_{2\text{-eq.}}$

Category	2025	2030	2035	2040	2045	2050
Intestinal fermentation	7.31	7.88	8.29	8.62	8.78	8.74
Manure management	2.31	2.38	2.42	2.45	2.46	2.47
Growing rice	0.05	0.08	0.09	0.09	0.09	0.09
Agricultural soils	26.88	29.68	32 .02	33.78	35.22	36.08
Liming soils	0.07	0.12	0.12	0.12	0.12	0.13
Application of urea	0.46	0.51	0.52	0.54	0.55	0.56
Total	**37.08**	**40.65**	**43.45**	**45.59**	**47.22**	**48.07**

Emissions greenhouse gases in sector 'Land use, land use change and forestry'

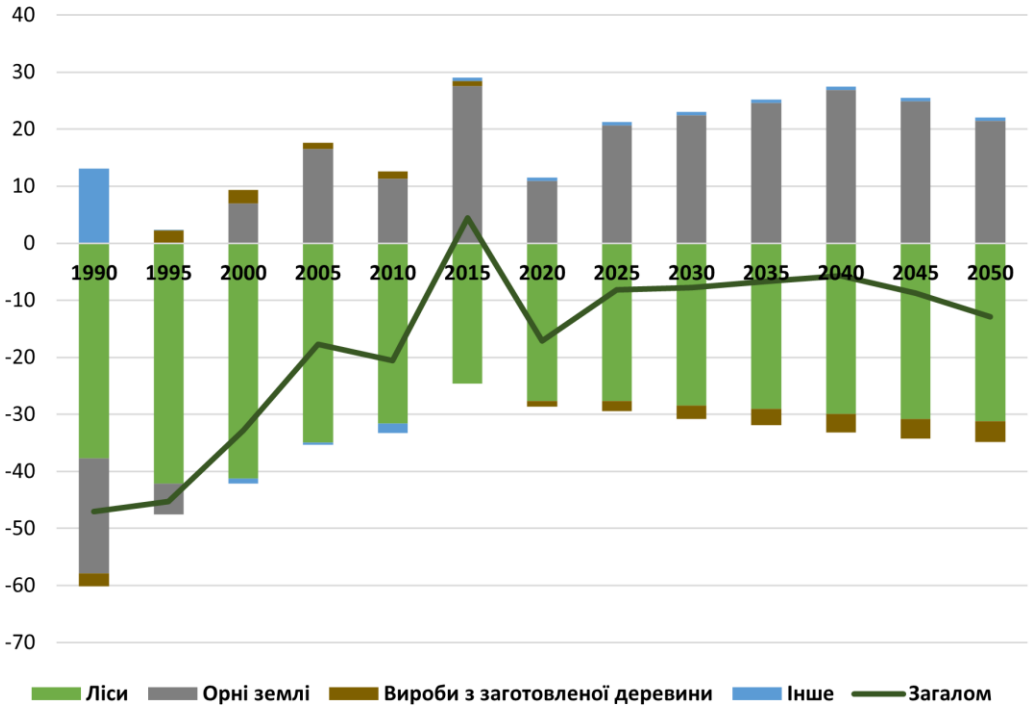
For the WAM scenario emission forecasting, it is assumed that the rate of afforestation (PM_D_WEM_05) will be in accordance with the maximum annual afforestation area for the period 1990-2021. As for the WEM scenario, it is also assumed that support for horticulture, berry growing and viticulture will continue under the e-Work program (PM_D_WEM_06).

Forecast of GHG emissions in the sector LULUCF for WAM scenario presented in Fig. 5.3. Considering that certain regions strongly mined, and significant areas of agricultural lands are very contaminated as a result of hostilities, the Strategy for Low-Carbon Development of Ukraine until 2050 envisages the alternative use of these lands for the creation of forests. According to estimates, under the most favorable conditions for planting new forests (as in 2009), Ukraine could gain 1 million hectares of new forest areas by 2050. However, it is worth noting that even within the framework of the WAM scenario, the goal of the State Strategy for Forest Management of Ukraine until 2035 regarding the increase in forest cover is not achieved of the territory of Ukraine from 15.9% to 18% in 2035, since this requires a significant increase in the scale of afforestation, which currently seems unrealistic.

Taking into account fairly intensive afforestation under the WAM scenario, forest absorption increases from 27.7 million t $CO_{2\text{-eq.}}$ in 2025 to 28.5 million t $CO_{2\text{-eq.}}$ in 2030 and to 31.2 million t $CO_{2\text{-eq.}}$ in 2050. The trajectory of GHG emissions in the "Arable Land" category remains the same as in the WEM scenario.

Overall, in the LULUCF sector under the WAM scenario, the absorption rate initially gradually decreases from 8.2 million tonnes of $CO_{2\text{-eq.}}$ in 2025 to 7.8 million tonnes of $CO_{2\text{-eq.}}$ in 2030, but after 2040 it starts to increase and reaches 12.9 million tonnes of $CO_{2\text{-eq.}}$ in 2050.

Fig. 5.3. Emissions (+) and absorption (-) of greenhouse gases in the LULUCF sector under WAM scenario, million tons of $CO_{2\text{-eq}}$.



Source: prepared based on data form the Strategy on low-carbon development of Ukraine up to 2050

GHG emissions in the "Waste" sector

The WAM scenario assumes strict compliance with the norms of the Law "On Waste Management" and state planning documents in the field of waste management. This scenario is developed on the basis that the National Waste Management Plan (NWMP) of Ukraine until 2033 and the Action Plan for the Implementation of the NWMP until 2033, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 27, 2024 No. 1353-r, will be implemented on time and in full. In more detail, the WAM scenario provides for a reduction in the share of municipal waste landfilling to 30% by 2033 and to 20% in 2050; an increase in the share of biogas disposal at landfills to 25.7% in 2030 and to 36% in 2050, respectively; as well as the construction of new waste composting plants with low specific CH_4 emissions and N2O.

It should be noted that, unlike the WEM scenario, under the WAM scenario, the increase in the share of biogas disposal at landfills for the period until 2030 will mainly occur due to the wider spread of biogas recovery technologies at landfills, rather than flaring, since the implementation of the NWMP will prevent the development of new regional landfills of household waste with parallel decommissioning of obsolete household waste disposal sites. The methodology for generating the WAM scenario, estimating GHG emissions and capital investments in the sector is given in Annex 4.

A list of key indicators in the field of waste management within the WAM scenario is given below in Table 5.4. Detailed ways of implementing these policies are defined in the NWMP and the NWMP Implementation Action Plan.

Table. 5.4. Key policies and measures in the "Waste" under the WAM scenario

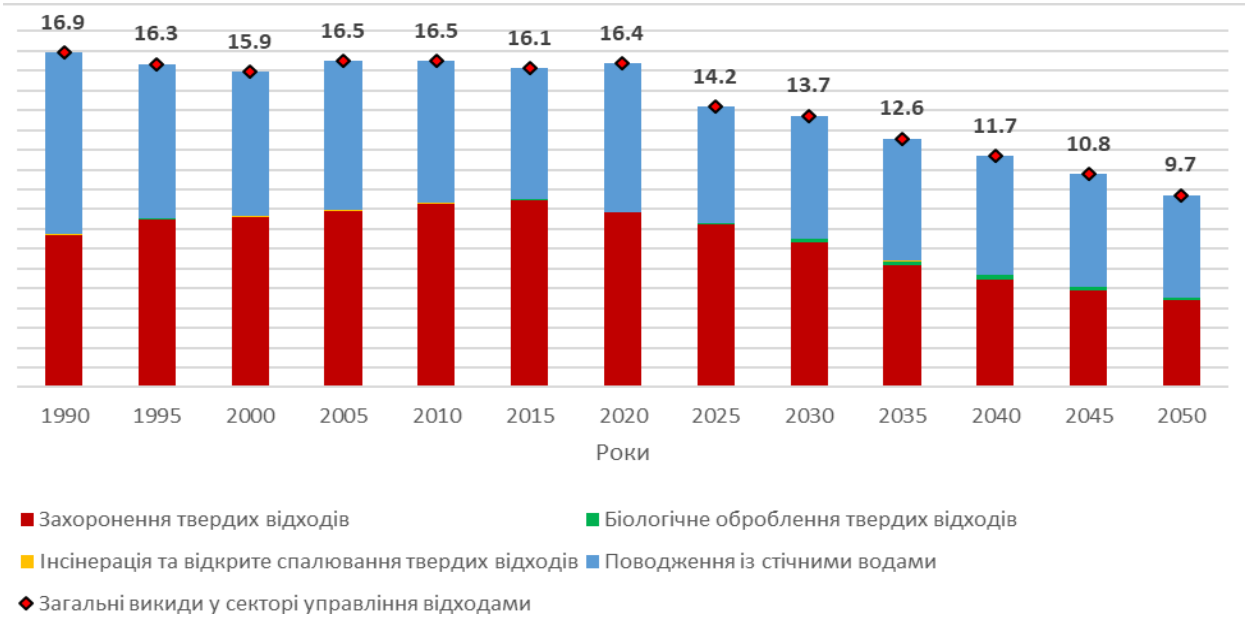
No.	Name key policy	Quantitative indicator		
		2030	2033	2050
1	Promoting the practice of reusing household waste components	7.2 %* (full realization of the trend implementation of planned policies)	10 %* (full implementation of planned policies)	10%*
2	Promoting household waste recycling practices ***	25.0 %* (full realization of the trend implementation of planned policies)	34 %* (full implementation of planned policies)	35%*

3	Promoting practices of biological treatment of organic components of household waste	10.7 %* (full realization of the trend implementation of planned policies)	16 %* (full implementation of planned policies)	20%*
4	Promoting the practice of thermal treatment of household waste (with the production of useful energy)	7.2 %* (full realization of the trend implementation of planned policies)	10 %* (full implementation of planned policies)	15%*
5	Increasing the volume of disposal (recovery and flaring) of biogas at landfills	25.7%**, of which: 21.5% – recovery; 4.2% – flaring burning (quantitative indicator is not explicitly established by law)	31.5 %**, of which: 25.5% – recuperation; 6.0% – flaring (quantitative indicator in explicit form is not legally required) installed)	36%**, of which: 30% – recuperation; 6% – flaring

Notes:
Policy PM_D_WAM_12 "Implementation of measures for waste prevention" is taken into account indirectly through an indicator that corresponds to moderate increase in specific volumes of household waste generation per person.
** - share from general volume of generated waste;*
***- share from general volume generated methane.*
**** - indicator does not include activity from biological processing of household waste including composting.*

Under the WAM scenario, GHG emissions in the waste management sector will continue to decline and in 2030 will reach 13.7 million tons of $CO_{2\text{-eq.}}$, which is 19% lower than the emission level in 1990. In the future emissions will continue to decrease, and in 2050 will be 9.7 million tons of $CO_{2\text{-eq.}}$, which is 43% less than the 1990 level. Detailed GHG emissions in the waste management sector by IPCC categories until 2050 are shown in Fig. 5.4.

Fig. 5.4. GHG emissions in the waste management sector under the WAM scenario, million t $CO_{2\text{-eq.}}$



Note: for period 1990-2020 years – statistical data, and for period 2025-2050 years – projections.

Under the WAM scenario, the structure of emissions in the waste management sector undergoes essential changes compared to 2020. Thus, the main source of GHG emissions in the sector by 2050 will be emissions caused by wastewater management – their share will increase from 46% in 2020 to 53% in 2050. Accordingly, the share of GHG emissions from landfills will decrease from 54% in 2020 to 45% in 2050. As in the WEM scenario, in the WAM scenario the only source from which a significant increase in GHG emissions is expected is the biological treatment of solid waste, emissions from which will increase from 7.3 thousand tons of $CO_{2\text{-eq.}}$ (0.04% of total emissions in the sector) in 2020 to 190.1 thousand tons of $CO_{2\text{-eq.}}$ in 2030, and then gradually decrease to 144.1 thousand tons of $CO_{2\text{-eq.}}$ (1.5% of total emissions in the sector) in 2050. Such a considerable increase in emissions from biological treatment of solid waste in the period up to 2030 will be

caused by the intensive spread of the practice of composting of solid waste in Ukraine.

Gradual reduction of GHG emissions from biological treatment of solid waste after 2030 will be associated with the introduction of modern technologies for composting of organic components of waste with lower emission coefficients of methane and nitrous oxide. The share of greenhouse gas emissions from thermal waste treatment methods (without obtaining useful energy) will increase from 0.1% of total emissions in the waste management sector in 2020 to 0.2% in 2050. Although in absolute terms, these emissions will not increase, the increase in the share of emissions in the sector will be caused by a significant reduction in GHG emissions in other emission sources.

In the WAM scenario, the main factors that will determine the trends in GHG emissions in the waste management sector are:

- intensive reduction of the share of landfilling of household waste by 2033, followed by a more moderate reduction of the share of landfilling of household waste by 2050;
- intensive deployment of biogas neutralization technologies at landfills in the period until 2033 with a subsequent moderate increase in the share of biogas neutralization until 2050;
- reduction of specific emissions of methane and nitrous oxide when composting waste after 2033.

The key risks to GHG emission reductions under the WAM scenario are:

- untimely adoption of by-laws necessary for compliance with the Law of Ukraine "On Waste Management" and the implementation of the National Waste Management Plan of Ukraine until 2033, including the draft the law "On packaging and packaging waste";
- slow deployment infrastructure with household waste recycling;
- low efficiency of biogas neutralization technologies that should be implemented on landfills with low biogas flow rates;
- introduction of technologies and practices for composting of organic components of waste with high specific emissions of methane and nitrous oxide.

Sensitivity analysis in the waste management sector

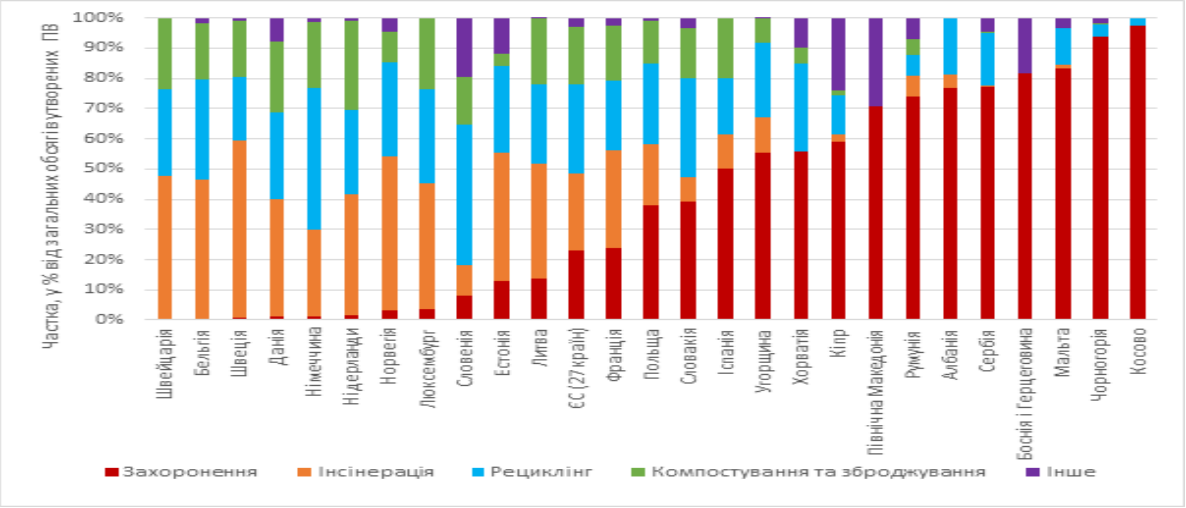
A sensitivity analysis was conducted to assess the additional (compared to the WAM scenario) potential for GHG emission reductions from the implementation in Ukraine of key principles of the circular economy (minimization of waste and pollutants, maximization of product and material cycles, and restoration of natural resources) for the period up to 2050.

According to the conditions of the sensitivity analysis, such documents as the NWMP and the NWMP Action Plan will be implemented on time and in full, that is, in fact, in the period from 2024 to 2033, the waste management system in Ukraine will develop according to the WAM scenario. At the same time, during the specified period, conditions will be created for the widespread implementation of the principles of circular economy. As a result, by 2050, advanced waste management practices will be implemented in Ukraine, which are already successfully operating in certain European countries that have made the greatest progress towards creating their own circular economies.

As part of the sensitivity analysis, the additional potential for GHG emission reductions was investigated in the measure of gradual reduction in the share of household waste landfilling from 30% in 2033 to 1% in 2050. Germany was taken as an example of such an existing waste management system - a country in which less than 2% of the total amount of waste generated is landfilled and about 47% of household waste generated is recycled. Detailed statistics on household waste management in European countries are illustrated in Fig. 5.5.

As additional measures to reduce GHG emissions, the sensitivity analysis also considered: increasing the share of biogas disposal at landfills from 31.5% in 2033 to 60% (compared to 36% under the WAM scenario) in 2050 and increasing the share of biogas disposal generated during treatment household and industrial sewage water, form 0% in 2033 to 94% in 2050. The UK was taken as an example, a country in which, as of 2022, the shares of biogas disposal at landfills and biogas from domestic wastewater were the largest among Annex I countries of the UN Framework Convention on Climate Change.

Fig. 5.5. Management of household waste in European countries as of 2022



Note: Indicators calculated based on data from Eurostat "Management of household waste"[159]

Table. 5.5. Key additional policies and measures, considered in sensitivity analysis of waste management sector

No.	Name key politicians	Quantitative indicator		
		2033	2050	
		WAM	WAM	Sensitivity analysis
1	Promoting the practice of reusing household waste components	10%*	10%*	10%*
2	Promoting household waste recycling practices ***	34%*	35%*	37%*
3	Promoting practices of biological treatment of organic components of household waste	16%*	20%*	24%*
4	Promoting the practice of thermal treatment of household waste (with the production of useful energy)	10%*	15%*	28%*
	Overall, the share of household waste landfilling	**30%***	**20%**	**1%***
5	Increasing the volume of disposal (recovery and flaring) of biogas at landfills	31.5%**	36%**	60%**
6	Implementation of the practice of recovery and flaring of biogas at municipal wastewater treatment facilities	0%**	0%**	94%**

Notes:
** - share from general volume of generated waste;*
***- share from general volume generated methane.*
**** - indicator does not include activity from biological processing of household waste including composting.*

The gradual implementation of global best practices in waste management will reduce annual GHG emissions in the Waste sector by 6.0 million tons of $CO_{2\text{-eq.}}$ by 2050 or by 62% compared to the WAM scenario. Thus, annual GHG emissions in the waste management sector in 2050 according to the sensitivity analysis would be 3.7 million tons of $CO_{2\text{-eq.}}$, or 22% of the corresponding figure in 1990.

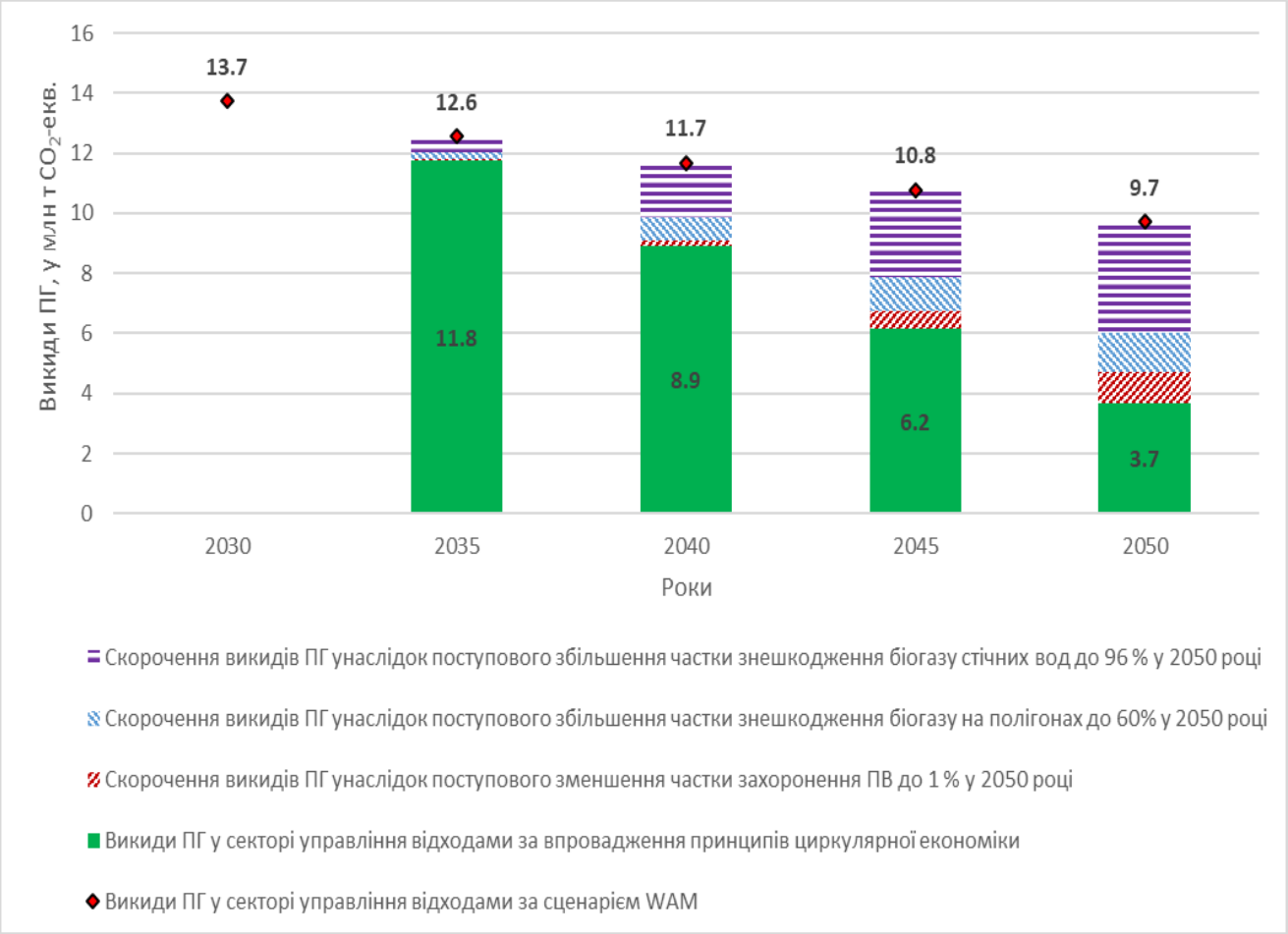
Also, the sensitivity analysis suggests that the largest contribution to the additional reduction in annual GHG emissions compared to the WAM scenario will come from the development of technologies of recovery and

[159] https://ec.europa.eu/eurostat/databrowser/view/env_wasmun/default/table?lang=en&category=env.env_was.env_wasst

flaring of biogas generated at wastewater treatment facilities – about 3.7 million tons of $CO_{2\text{-eq.}}$ in 2050; 1.3 million tons of $CO_{2\text{-eq.}}$ reduction of GHG emissions – due to intensification of biogas neutralization processes at landfills; and close to 1.0 million tons of $CO_{2\text{-eq.}}$ GHG emissions reduction – due to an almost complete ban on the disposal of waste in 2050.

The detailed results of the sensitivity analysis in the waste management sector are illustrated in Fig. 5.6 below.

Fig. 5.6. Sensitivity analysis in the waste management sector



The sensitivity analysis also revealed that in the long term, on the way to introducing a circular economy in Ukraine, the contribution of the following emission sources to total GHG emissions in the waste management sector will increase significantly:

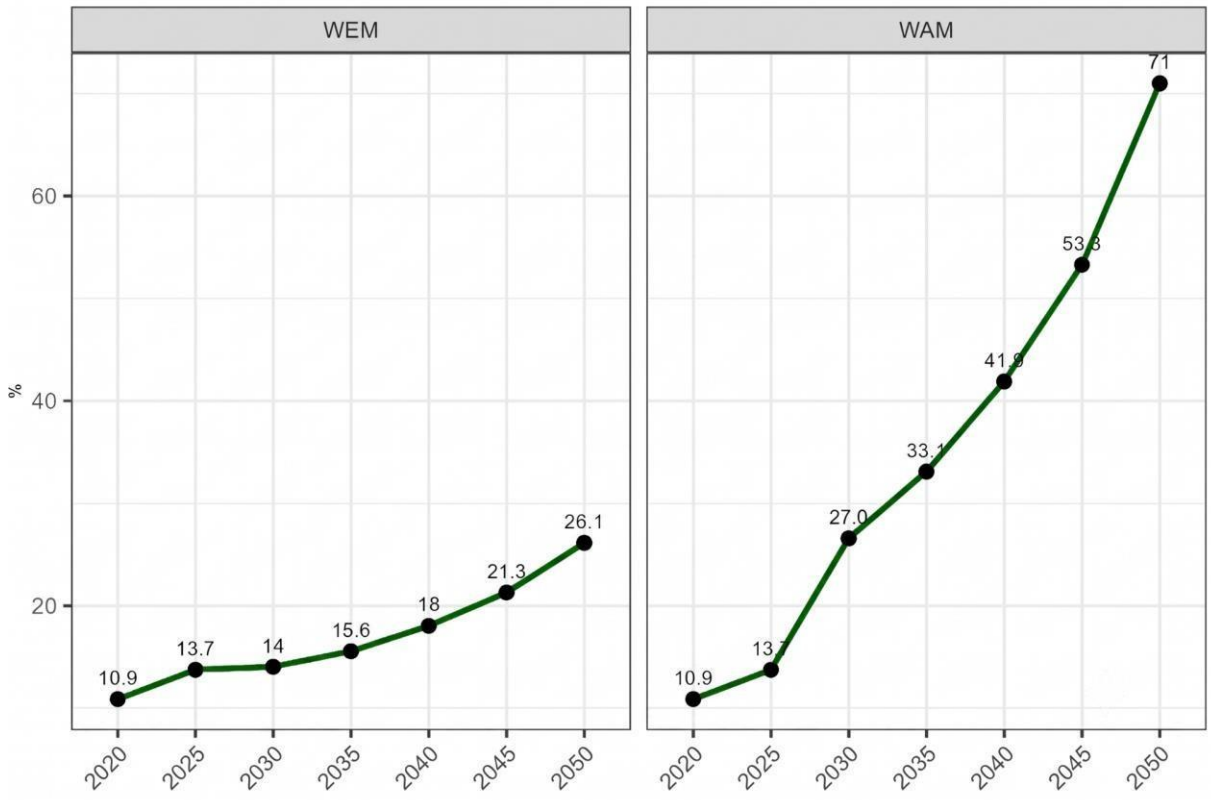
- closed landfills and household waste dumps – CH_4 emissions;
- centralized wastewater and sludge treatment facilities – N_2O emissions;
- decentralized facilities for the accumulation of human waste – CH_4 emissions.

Therefore, after the implementation of the priority measures identified in the Action Plan for the Implementation of the NWMP, in order to ensure further reductions in GHG emissions in the waste management sector for the period after 2033, it will be necessary to develop and implement additional measures designed to stimulate reductions in GHG emissions from the above-mentioned GHG emission sources.

Renewable energy

Given the current and potential consequences of Russia's full-scale military aggression against Ukraine, achieving the target of 27% renewables in the structure of gross final energy consumption seems extremely ambitious. Nevertheless, the results of the WAM scenario simulations show that this is theoretically possible, provided that measures are fully implemented and widespread use of renewable energy sources, primarily in industry, individual heating of houses, in particular, increasing the use of not only solid biofuels, but also renewable gases. In 2050, the share of renewables in the structure of gross final energy consumption may exceed 70% (Fig. 5.7.).

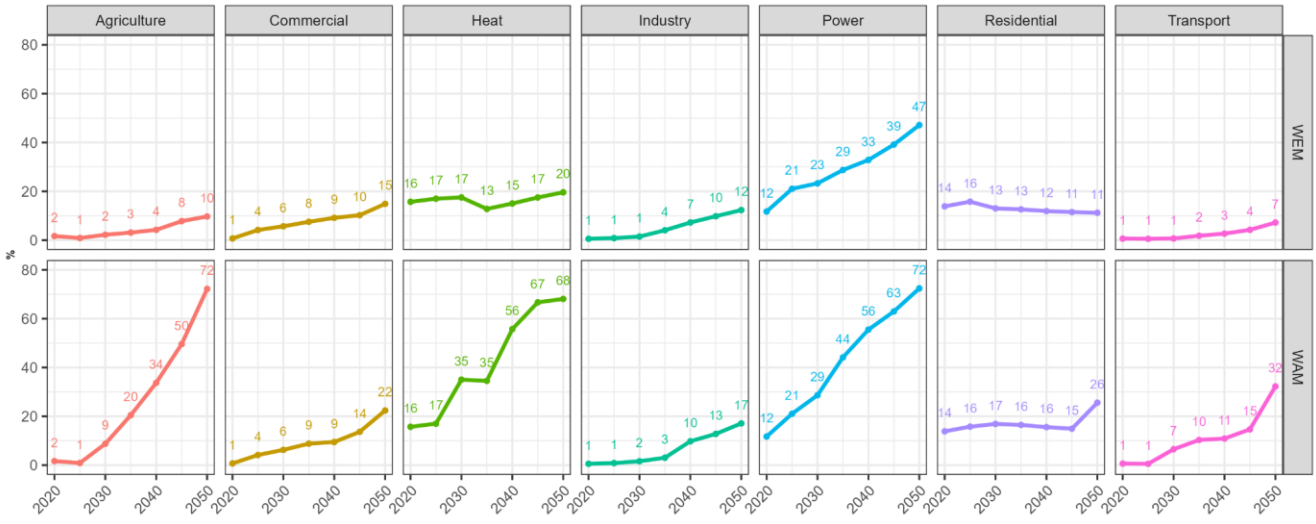
Fig. 5.7. Share of renewable energy sources in the structure of gross final consumption of energy resources under WEM and WAM scenarios, %



Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

For comparison, Fig. 5.8 shows the shares of direct consumption and use of RES in different sectors economy, without consideration "green" electric and thermal energy received (consumed) from networks.

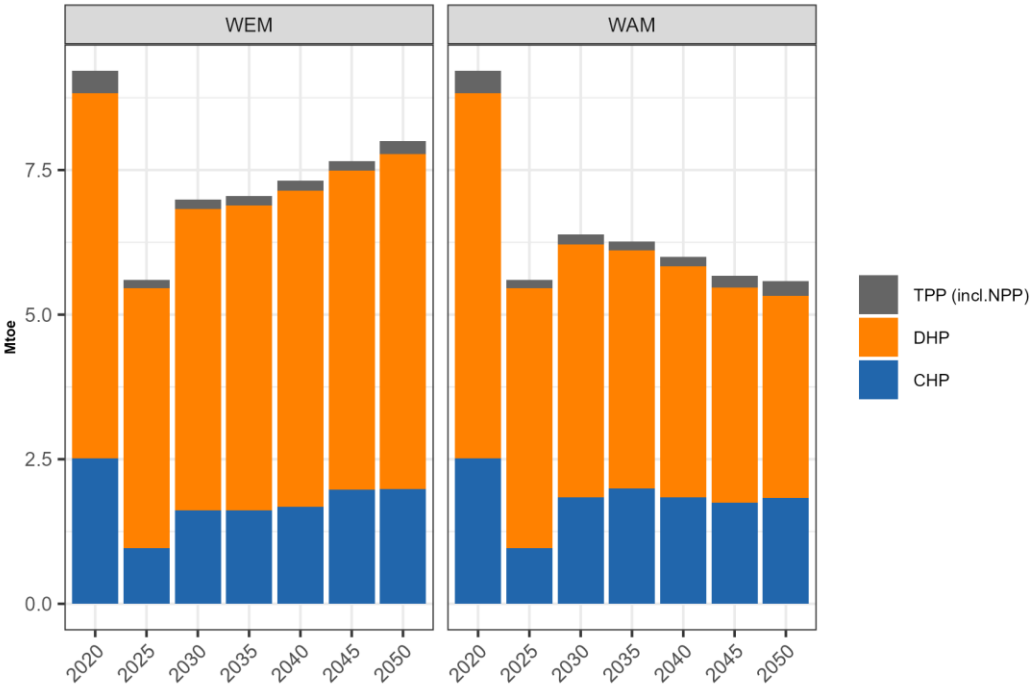
Fig. 5.8. Share of RES in the structure of consumption and use of energy resources in different sectors of the economy under WEM and WAM scenarios, %



Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

The results of modeling the WEM and WAM scenarios using the TIMES-Ukraine model show that high-efficiency cogeneration (CHP, especially on RES) will show an increase in its share in the structure of thermal energy production, compared to the corresponding indicator in the WEM scenario, but will not exceed 50%, and the volumes of thermal energy production, in turn, will not grow (Fig. 5.9).

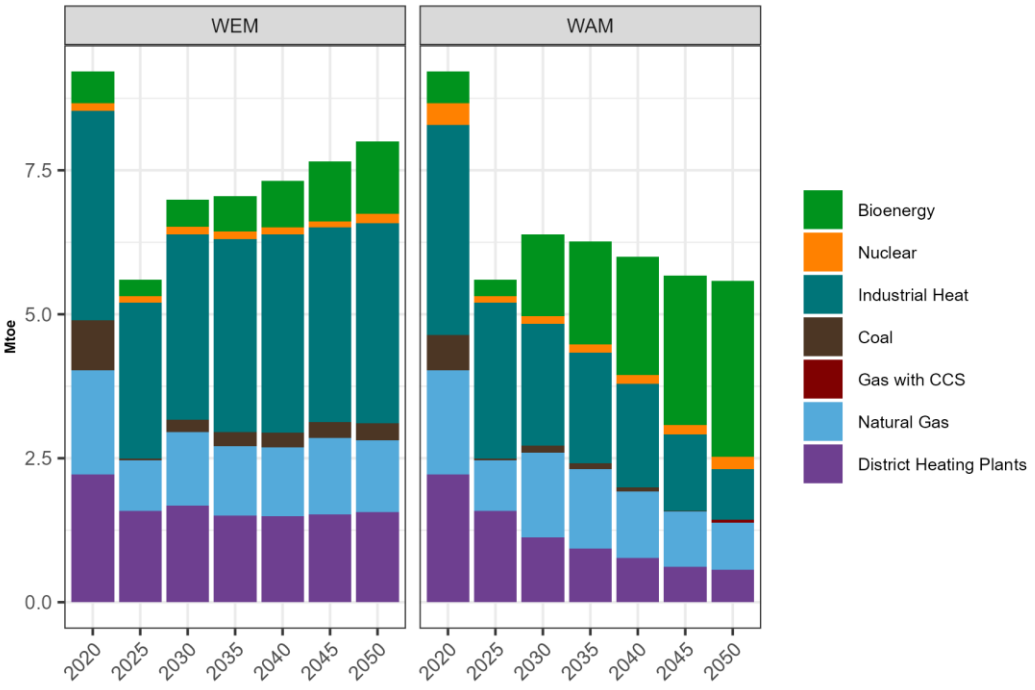
Fig. 5.9. Production of heat in scenarios WEM and WAM, Mtoe



Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

Fig. 5.10 shows the production of heat by type of producer, with the allocation of boiler houses of district heating systems, which are being significantly reduced due to planned large-scale thermal modernization of buildings.

Fig. 5.10. Heat production by energy type with the allocation of district heating in the WEM and WAM scenarios, Mtoe

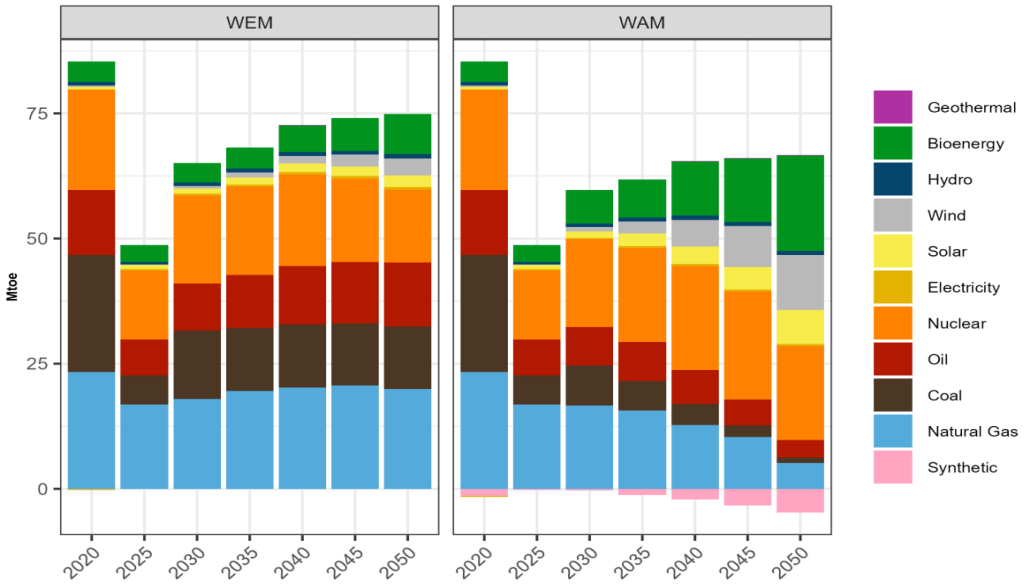


Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

In addition, the modeling results for both scenarios (WEM and WAM) confirm that the post-war economic recovery and reintegration of the temporarily occupied territories of Ukraine will contribute to a significant increase in demand for energy resources, especially in the first 5-10 years. At the same time, both existing (WEM) and planned (WAM) policies and measures in the field of energy efficiency and renewable energy will not ensure stabilization of primary energy consumption, especially if policies of export of renewable gases

(biomethane, hydrogen) and expansion of nuclear energy are implemented (Fig. 5.11).

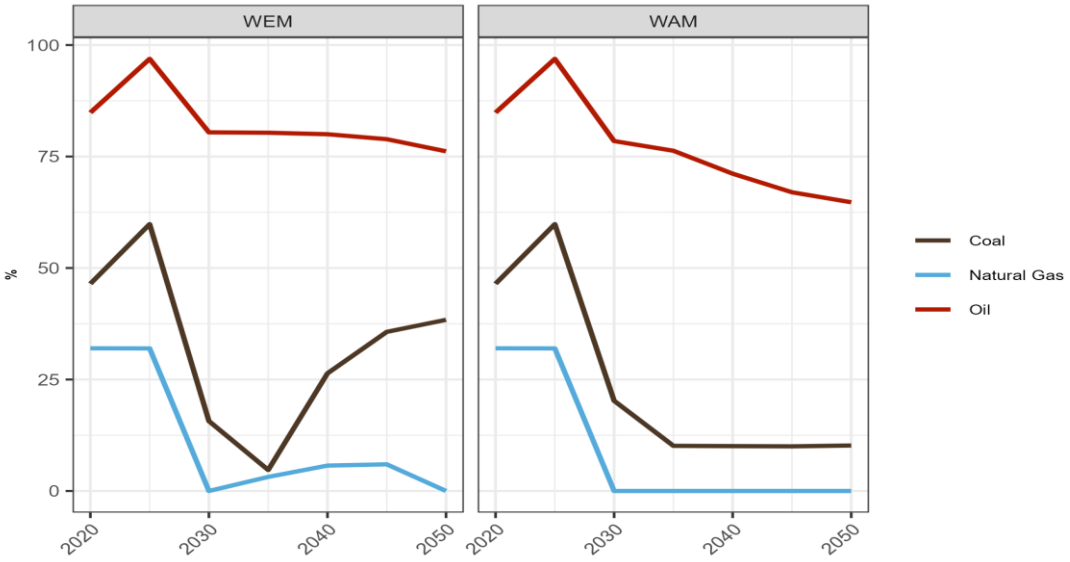
Fig. 5.11. Primary energy consumption by scenarios WEM and WAM, Mtoe



Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

Under the WAM scenario, the issue of dependence on imported energy resources will not be removed only for oil and oil products, the share of which in the structure of the FFE will be almost 80% by 2030 and will decrease to only 62% in 2050. For the remaining fossil fuels, under the conditions of implementation of all related planned policies and measures, from 2030 the share of their imports will be less than 20% (Fig. 5.12.). In terms of nuclear fuel, it is expected that at least 50% of Ukrainian NPP power units with VVER-1000 reactors will be supplied with domestically produced products by 2030 and 100% in the period until 2034. The issue of fuel supply for new NPP power units planned by construction using other technologies, in particular with AP-1000 reactors, is currently not regulated.

Fig. 5.12. Forecast of provision of Ukraine's economy with its own resources in WEM scenario, %

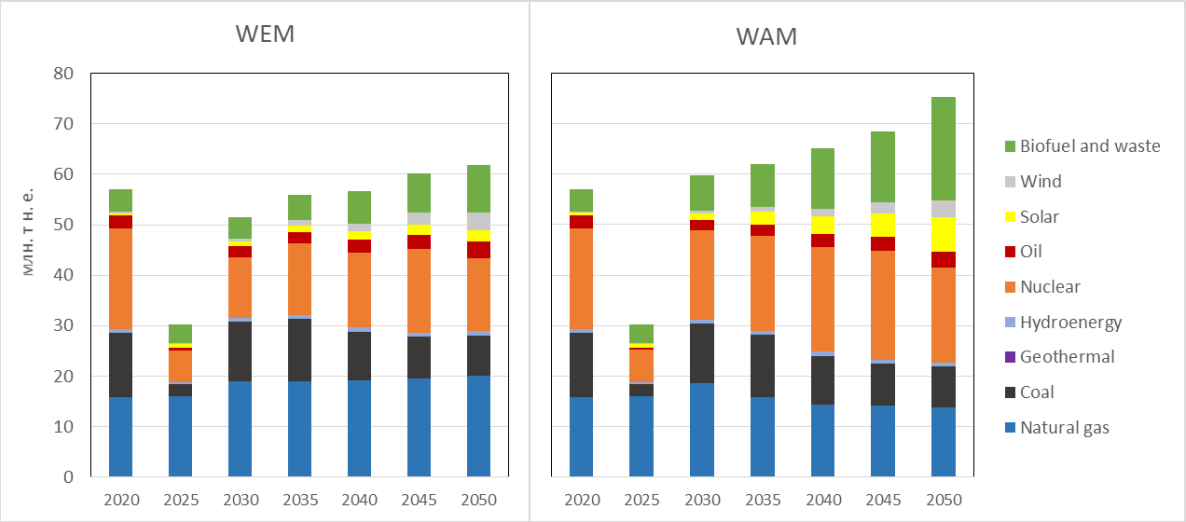


Note: curves reflect energy resource import share

Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

Under the WEM scenario, a slight increase in the production of energy resources is forecast, primarily natural gas, as well as renewable energy resources, while under the WAM scenario, significant rates of development of the potential of bioenergy and wind energy should be ensured. At the same time, the production of carbon-intensive fossil energy resources will decline under pressure from decarbonization and other measures.

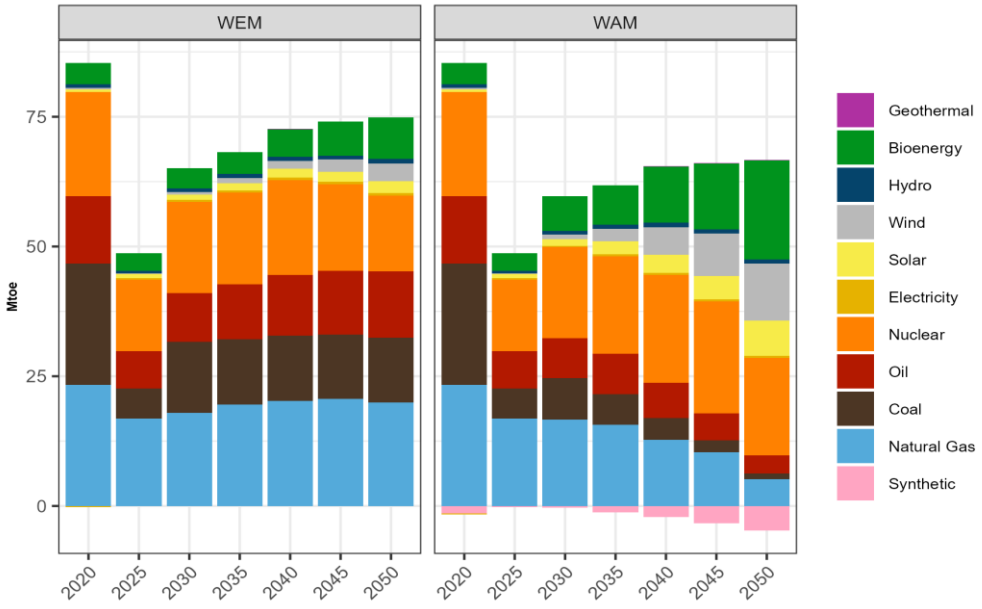
Fig. 5.13. Forecast of mining and supply of energy resources by scenarios WEM and WAM, Mtoe



Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

The trajectory of final energy consumption is similar to that of primary energy consumption, but the growth rate in the WEM scenario is slightly higher, indicating improved sector efficiency. transformations energy in scenarios WAM, in the first queue sector production electricity and heat. At the same time, in both scenarios, especially in WAM, there is also an increase in the share of electricity, as well as a significant increase in the direct consumption of bioenergy resources, in particular biomethane. Thanks to the reform of carbon pricing and a significant increase in the cost of CO2 emission allowances, biomethane can become an economically attractive fuel in industry from about 2030, and in the remaining sectors in 2040-2050, reaching 6.0 billion cubic meters in final energy consumption (approximately 37% of biomethane will be consumed in industry). Direct final consumption of hydrogen, according to the modeling results, will be possible in the transport sector at the level of about 2% of its consumption.

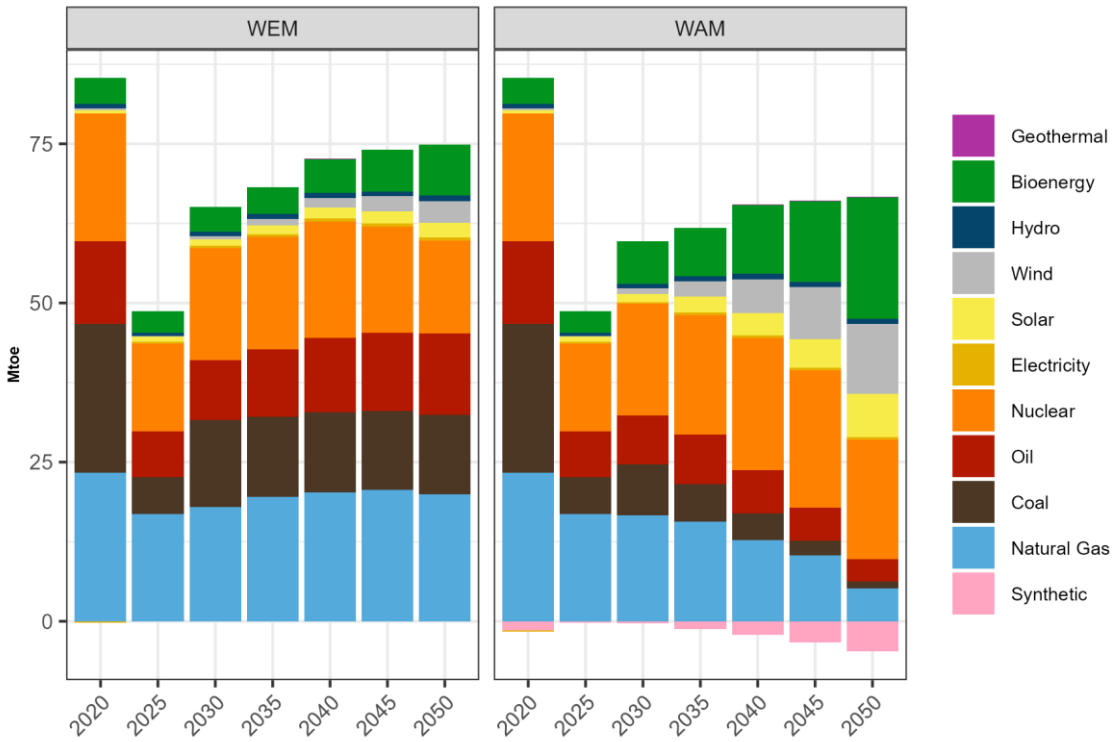
Fig. 5.14. Final consumption by type of energy by scenarios WEM and WAM, Mtoe



Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

After a radical drop in energy consumption in 2022 as a result of the full-scale invasion of the Russian Federation in Ukraine, already in all sectors final consumption energy demand will increase due to economic recovery and reintegration of temporarily occupied territories, which will continue until 2030. At the same time, additional planned Energy efficiency measures, renewable energy development, and other dimensions of NECP will reduce energy needs equally in all sectors.

Fig. 5.15. Final consumption of energy by sectors by scenarios WEM and WAM, Mtoe



Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

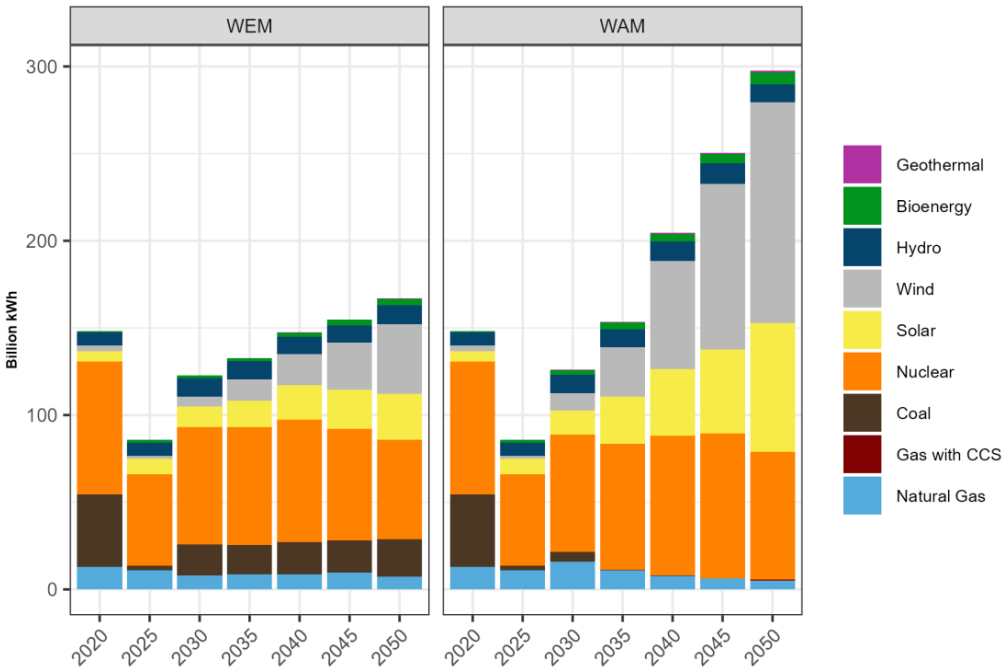
Fig. 5.16 and 5.17 show the dynamics and structure, respectively, of electricity production and power generation facilities in Ukraine under the WEM and WAM scenarios. As noted above, given the results of modeling using the TIMES-Ukraine model, in the WEM scenario, wind and solar energy demonstrate an extraordinary increase in generation. In the WAM scenario, renewable energy has an even more rapid dynamics and triples the volume of electricity production by 2050 relative to the WEM. Due to the increase in total production electricity more than 75% in 2050 p. comparatively with WEM, share NPP, while maintaining yours dominant position by 2035, will decline in 2040-2050, reaching 24%.

Importantly, the results of the WAM scenario modeling show that to achieve the national target of 27% of RES in 2030 in the structure of gross final energy consumption, it is necessary that the share of RES in the structure of electricity generation is at least 30%, which exceeds the ESU target of 25%.

Under such conditions of the WAM scenario modeling, the share of installed capacities of wind power plants and solar power plants may exceed the installed capacity of nuclear power plants several times. At the same time, ensuring the balance reliability of the Integrated Power System of Ukraine in the forecast period will be carried out with the increasing involvement of energy storage facilities, in particular, by 2050, according to the WEM scenario, their installed capacity will increase to 5 GW with an annual discharge of 10 TWh, according to the WAM scenario - to 13.2 GW with an annual discharge of 39 TWh. The TIMES-Ukraine model includes a condition for the mandatory availability in the Unified Energy System at any time of at least 20% of electricity originating from flexible dispatchable sources of electric power. Carbon capture and storage systems at bioenergy thermal power plants and CHP plants can also be built, which will bring the electricity and heat production sector closer to net-zero GHG emissions.

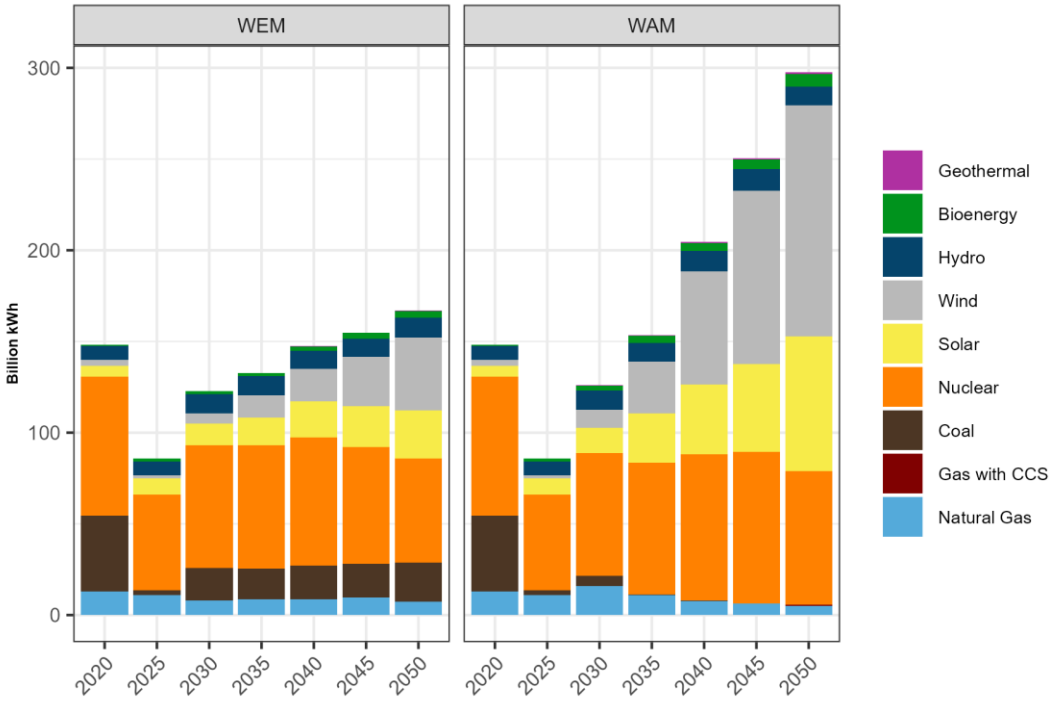
Currently, under all input conditions, nuclear capacity is not reaching the indicators planned by the ESU. However, If demand for electricity grows more rapidly or if the growth of renewable energy sources does not keep up with forecast indicators, the prerequisites may arise for the construction of more nuclear reactors.

Fig. 5.16. Production of electricity by WEM and WAM scenarios, TWh



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

Fig. 5.17. Installed capacities of electricity generation by WEM and WAM scenarios, GW



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

5.1.2. Assessment of policy interactions (between existing policies and measures and planned policies and measures within a policy dimension and between existing policies and measures and planned policies and measures of different dimensions) at least until the last year of the period covered by the plan, in particular to establish a robust understanding of the impact of energy efficiency / energy savings policies on the sizing of the energy system and to reduce the risk of stranded investment in energy supply

The table below shows the forecast values and structure of total primary energy supply (TPES), final energy consumption (FEC), electricity and heat production, generating capacities of the Unified Energy System (UES), as well as the share of RES under the WEM and WAM scenarios.

Table. 5.6. Main modeling results of Ukraine energy system development by WEM and WAM

scenarios

	Scenario WEM				Scenario WAM			
	2020	2030	2040	2050	2020	2030	2040	2050
Total primary energy supply (TPES)								
Total primary energy supply, Mtoe	**86.5**	**66.0**	**73.7**	**76.0**	**86.5**	**60.6**	**64.8**	**63.4**
Coal, %	27.4	21.1	17.6	17.0	27.4	13.7	7.0	2.3
Natural gas, %	26.9	27.3	27.6	26.3	26.9	27.6	19.8	8.2
Oil, %	16.3	15.1	16.6	17.5	16.3	13.5	11.4	6.4
Nuclear energy, %	23.2	26.7	24.8	19.2	23.2	29.0	32.1	29.5
Hydropower, %	0.8	1.1	1.0	1.1	0.8	1.2	1.3	1.3
Wind energy, %	0.3	0.7	2.1	4.5	0.3	1.4	8.2	17.2
Solar energy, %	0.6	1.5	2.3	3.1	0.6	2.2	5.4	10.7
Biofuel and waste, %	4.7	5.9	7.3	10.7	4.7	10.9	16.7	30.2
Share of RES in TPES, %	**6.4**	**9.3**	**12.8**	**19.4**	**6.4**	**15.9**	**31.8**	**59.6**
Final energy consumption (FEC)								
Final energy consumption, Mtoe.	**44.2**	**40.5**	**47.5**	**51.9**	**44.2**	**38.1**	**43.2**	**46.4**
Coal, %	12.3	8.4	6.5	4.5	12.3	7.5	4.2	0.5
Natural gas, %	24.9	29.0	27.1	25.0	24.9	27.1	20.3	6.5
Oil, %	19.5	23.2	24.5	24.1	19.5	19.9	15.5	7.6
Heat, %	16.2	14.6	13.1	13.1	16.2	14.1	11.8	10.2
Electricity, %	22.1	20.8	22.3	23.4	22.1	22.7	35.5	49.9
RES (direct consumption), %	4.9	5.5	7.5	10.8	4.9	8.6	12.4	24.9
Share of RES in gross FEC, %	**10.9**	**14.0**	**18.0**	**26.1**	**10.9**	**27.0**	**41.9**	**71.0**
Electricity production								
Electricity production, TWh	**149.8**	**126.7**	**152.6**	**172.5**	**149.8**	**130.5**	**209.7**	**302.8**
Coal, %	27.7	14.0	12.2	12.5	27.7	2.5	0.1	0.0
Gas, %	8.6	6.4	5.6	4.2	8.6	11.3	3.7	1.6
Nuclear energy, %	50.9	53.2	45.9	33.0	50.9	50.3	38.2	24.2
Biofuel and waste, %	0.5	1.1	1.6	2.1	0.5	1.9	2.1	2.5
Wind energy, %	2.2	4.4	11.7	23.1	2.2	9.0	29.6	41.8
Solar energy, %	4.0	9.2	12.9	15.3	4.0	13.6	18.3	24.4
Hydropower, %	5.0	8.5	6.5	6.3	5.0	7.8	5.3	3.4
Share of RES, %	**11.8**	**24.0**	**34.0**	**48.6**	**11.8**	**32.6**	**56.9**	**73.7**
Installed capacities of IPSU								
Installed capacities of IPSU, GW	**55.14**	**38.8**	**49.8**	**61.2**	**55.14**	**45.0**	**80.4**	**132.3**
BESS, %	0	2.0	7.4	8.2	0	6.7	9.4	10.0
Coal, %	41.0	13.8	9.5	8.8	41.0	3.7	0.3	0.1
Gas, %	10.8	13.1	6.3	4.9	10.8	11.7	3.9	1.6
Nuclear energy, %	25.1	25.4	20.1	12.1	25.1	21.8	14.0	7.3
Biofuel and waste, %	0.2	1.1	1.1	1.3	0.2	1.4	0.8	1.1
Wind energy, %	2.0	5.2	12.9	21.7	2.0	9.5	27.4	34.1
Solar energy, %	9.4	23.4	30.0	32.1	9.4	31.1	35.5	40.6
Hydropower, %	11.5	16.1	12.6	10.8	11.5	13.9	8.2	5.0
Share of RES, %	**23.1 4**	**45.8**	**56.7**	**66.0**	**23.1 4**	**56.1**	**72.3**	**81.0**
Heat production (stations heating)								
Heat production (heating stations), Mtoe	**9.2**	**7.0**	**7.3**	**8.0**	**9.2**	**6.4**	**6.0**	**5.6**

Coal, %	23.7	16.9	11.9	11.3	23.7	9.7	2.9	0.0
Natural gaz, %	50.9	57.1	64.7	59.9	50.9	47.0	32.3	18.6
Biofuel and waste, %	15.7	17.5	15.0	19.6	15.7	35.0	55.7	68.1
Waste heat utilization, %	5.5	5.7	5.9	6.0	5.5	5.8	6.1	6.3
Share of RES, %	**15.7**	**17.5**	**15.0**	**19.6**	**15.7**	**47.0**	**55.7**	**68.1**

Source: State Statistics Service, SO "Institute for Economics and Forecasting of NAS of Ukraine""

The table below in detail presents the structure of energy resources consumption in five main final sectors of the economy.

Table. 5.7. Final consumption energy by sectors and species fuel, million t not.

	Scenario WEM				Scenario WAM			
	2020	**2030**	**2040**	**2050**	**2020**	**2030**	**2040**	**2050**
Final energy consumption in services sector								
FEC in the services sector, Mtoe.	**4.8**	**5.0**	**5.4**	**5.7**	**4.8**	**4.7**	**4.8**	**4.9**
Coal, %	8.8	0.6	0.6	0	8.8	1.3	0.2	0
Natural gas, %	17.4	18.2	18.8	8.6	17.4	17.9	15.5	1.4
Oil, %	2.6	1.8	0	0	2.6	1.9	0.1	0
Heat , %	31.7	38.1	33.6	38.4	31.7	36.4	33.7	32.5
Electricity, %	38.7	35.5	37.8	37.9	38.7	36.1	41	43.4
RES (direct consumption), %	0.7	5.7	9.1	14.9	0.7	6.3	9.5	22.4
Final energy consumption in industry								
FEC in industry, Mtoe	**16.0**	**11.3**	**13.9**	**15.8**	**16.0**	**10.5**	**14.4**	**19.2**
Coal, %	30.6	17.4	12.4	9.5	30.6	26.6	12.4	1.1
Natural gas, %	17.7	27.4	24.3	21.8	17.7	23.5	10.0	0.7
Oil, %	4.0	2.9	2.8	2.6	4.0	2.6	1.7	0.8
Heat, %	22.5	20.0	19.4	17.8	22.5	18.2	12.9	7.4
Electricity, %	24.7	30.6	33.1	35.4	24.7	27.5	53.3	72.9
RES (direct consumption), %	0.56	1.7	8.0	12.9	0.56	1.6	9.8	17.1
Final energy consumption in residential sector								
FEC in residential sector	**13.7**	**12.9**	**13.4**	**13.2**	**13.7**	**12.3**	**11.9**	**10.3**
Coal, %	1	0.7	1.0	1.0	1	0.1	0.00	0.00
Natural gas, %	48.0	53.4	51.8	51.7	48.0	49.1	45.0	26.2
Oil, %	0.24	0.00	0.00	0.00	0.24	0.00	0.00	0.00
Heat, %	13.9	12.7	11.8	11.4	13.9	11.7	10.8	13.2
Electricity, %	23.0	20.2	23.5	24.6	23.0	22.3	28.6	35.1
RES (direct consumption), %	13.9	13.0	11.9	11.2	13.9	16.9	15.6	25.6
Final energy consumption in transport sector								
FEC in transport sector, Mtoe	**8.0**	**9.2**	**12.6**	**14.9**	**8.0**	**8.5**	**10.0**	**9.8**
Coal, %	0.03	0.09	0.09	0.08	0.03	0.1	0.1	0.1
Gas, %	8.3	10.1	12.5	14.0	8.3	9.9	11.3	1.1
Oil, %	84.9	82.1	78.2	72.4	84.9	71.3	57.9	34.1
Electricity, %	6.1	7.1	6.5	6.3	6.1	12.2	19.8	32.4
RES (direct consumption), %	0.64	0.7	2.7	7.2	0.64	6.5	9.3	30.3
Final energy consumption in agriculture								
FEC in agriculture, Mtoe	**1.7**	**2.1**	**2.2**	**2.2**	**1.7**	**2.0**	**2.0**	**2.0**
Coal, %	0.32	0.5	0.5	0.5	0.32	0.4	0.2	0
Natural gas, %	7.4	7.6	7.4	6.8	7.4	7.0	4.5	0.6
Oil, %	60.5	62.0	60.3	55.3	60.5	56.3	33.6	1.4
Heat, %	10.4	12.6	12.7	12.7	10.4	12.8	13.1	13.8
Electricity, %	19.6	15.1	15.0	15.0	19.6	14.7	14.8	12.0

RES (direct consumption), %	1.7	2.2	4.2	9.7	1.7	8.8	33.7	72.2

Source: State Statistics Service, SO "Institute for Economics and Forecasting of NAS of Ukraine"

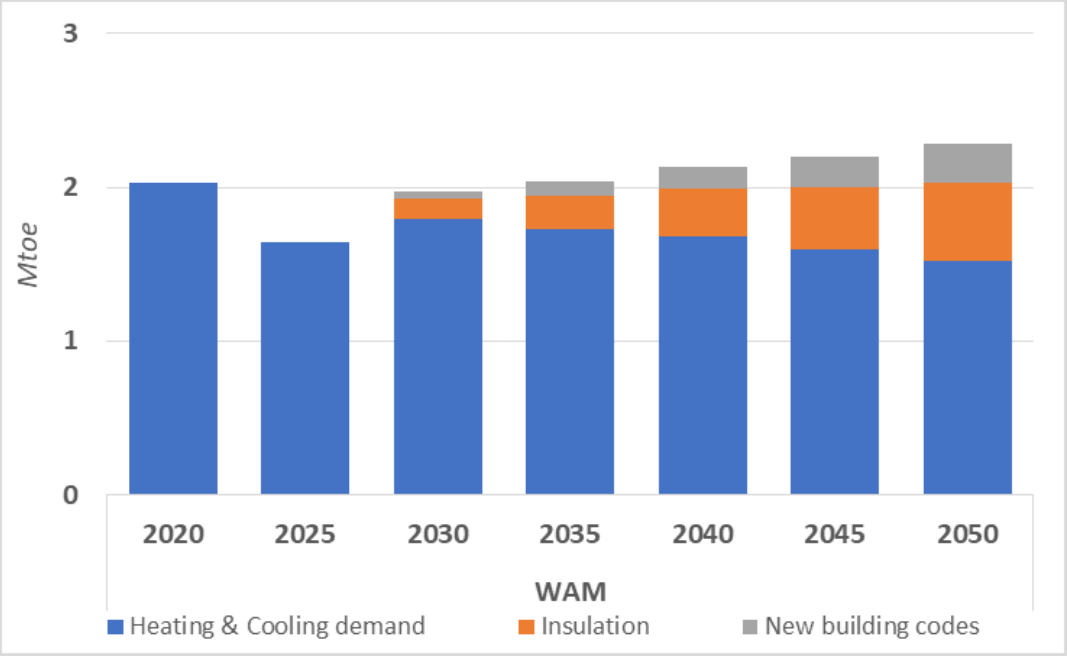
Figures 5.18 and 5.19 show the impact of planned policies and measures on reducing heating and cooling demand in the residential and service sectors, respectively, through thermal retrofitting of buildings and the introduction of new building codes. The simulation results show that by 2030, such measures could reduce about 8% of the total energy needs for heating and cooling demand, and by 2050, such a contribution can be 32%, i.e. almost a third of the needs, without taking into account the improvement of energy efficiency of equipment, household appliances, etc.

Fig. 5.18. Impact of policies and measures on thermal modernization and the introduction of new building codes in the residential sector, Mtoe



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

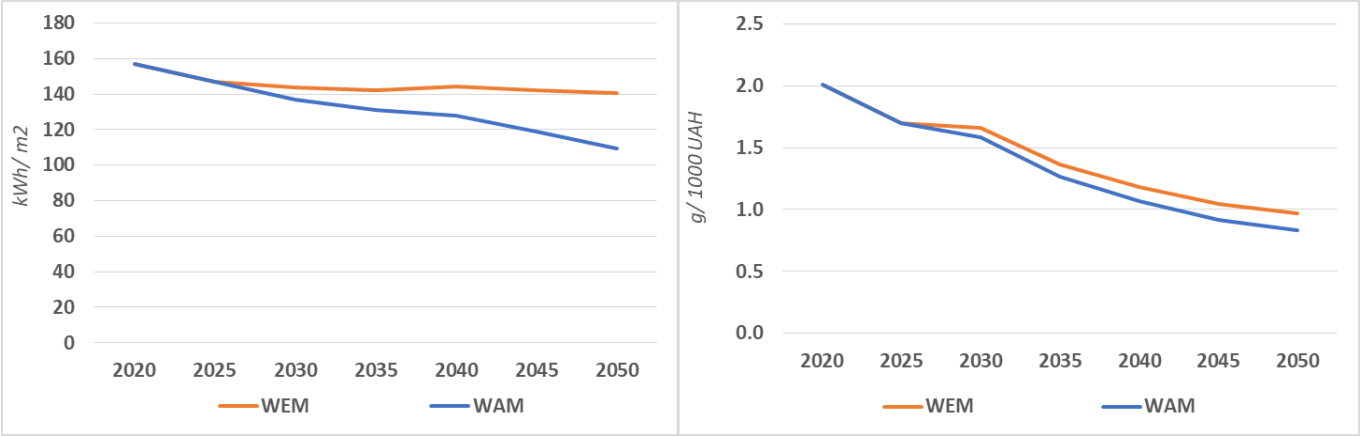
Fig. 5.19. Impact of policies and measures on thermal modernization and the introduction of new building codes in the services sector, Mtoe



Source: calculations of SO "Institute for Economics and Forecasting of NAS of Ukraine" basing on the model TIMES- Ukraine

Figure 5.20 depicts the influence of policies and measures on specific consumption of energy by different scenarios in the residential (population) sector and the services sector (commercial sector).

Fig. 5.20. Specific consumption energy per 1 m² in residential sector (Fig. 5.20a) and per 1000 UAH of value added in the services sector (Fig. 5.20b)

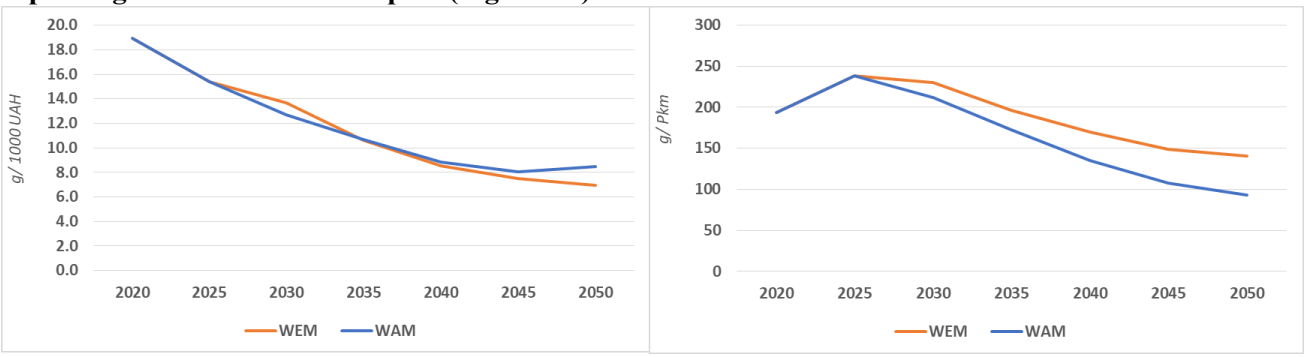


a) b)

Source: calculations by the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES- Ukraine model

Fig. 5.21 shows the specific energy consumption per 1000 UAH of added value in industry (Fig. 5.21a) and specific energy consumption per passenger-kilometer (number of passengers who traveled 1 km on average per year) (Fig. 5.21b).

Fig. 5.21. Specific energy consumption per 1000 UAH of added value in industry (Fig. 5.21a) and per passenger-kilometer in transport (Fig. 5.21b)



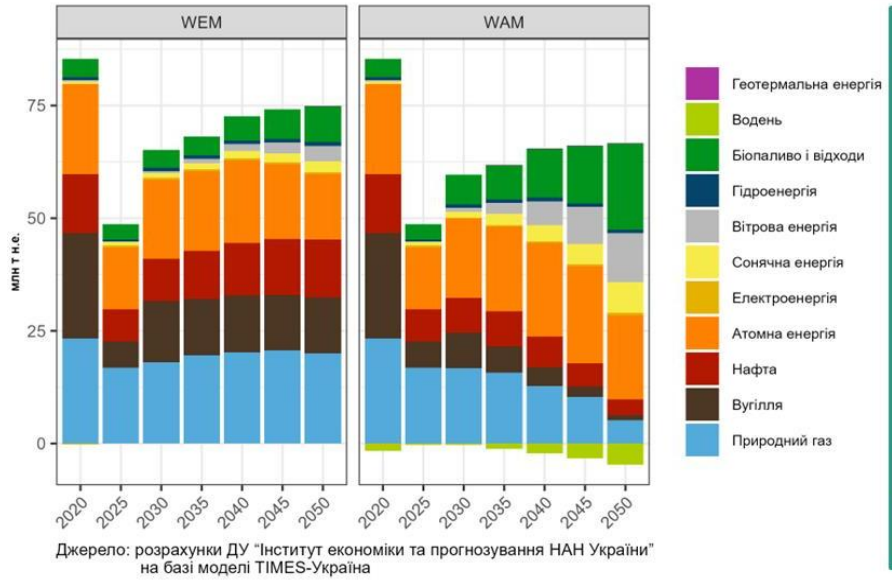
a) b)

Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

5.1.3. Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Energy Community climate and energy policy measures

According to with both scenarios (WEM and WAM), indicators primary and final consumption energy in Ukraine will not exceed the indicator for 2030 taken within the framework of the Energy Community (Figures 5.22 and 5.23), and the share of RES in the structure of gross final energy consumption will be 26.5% (Figure 5.24), which is slightly lower (27%) than the target set in the NAP RE and the target set in the decision of the Council of Ministers of the Energy Community 2022/02/MC-EnC. Therefore, it is necessary to increase the effectiveness of existing policies and introduce additional ones in order to achieve ambitious goals in the RES sector by 2030.

Fig. 5.22. Primary energy consumption in Ukraine and target indicators for the Energy Community member countries, million tons of equivalent.

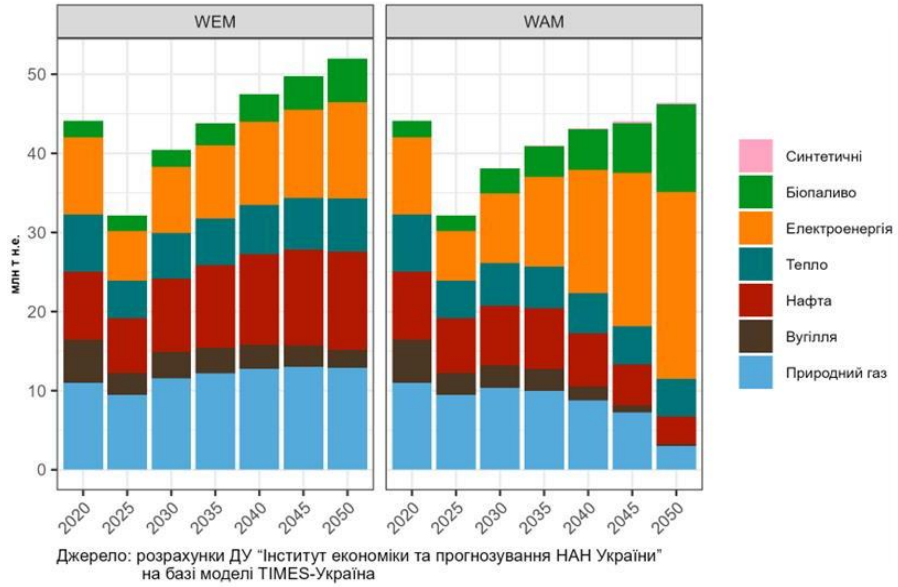


РІШЕННЯ РАДИ МІНІСТРІВ ЕНЕРГЕТИЧНОГО СПІВТОВАРИСТВА

Країна	PEC, 2030
Албанія	2,60
Боснія та Герцеговина	6,50
Грузія	5,45
Косово	2,70
Молдова	3,00
Чорногорія	0,92
Північна Македонія	2,30
Сербія	14,94
Україна	91,47
Енергетичне Співтовариство	129,88

Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

Fig. 5.23. Final consumption of energy in Ukraine and targeted indicators for of the Energy Community member countries, Mtoe

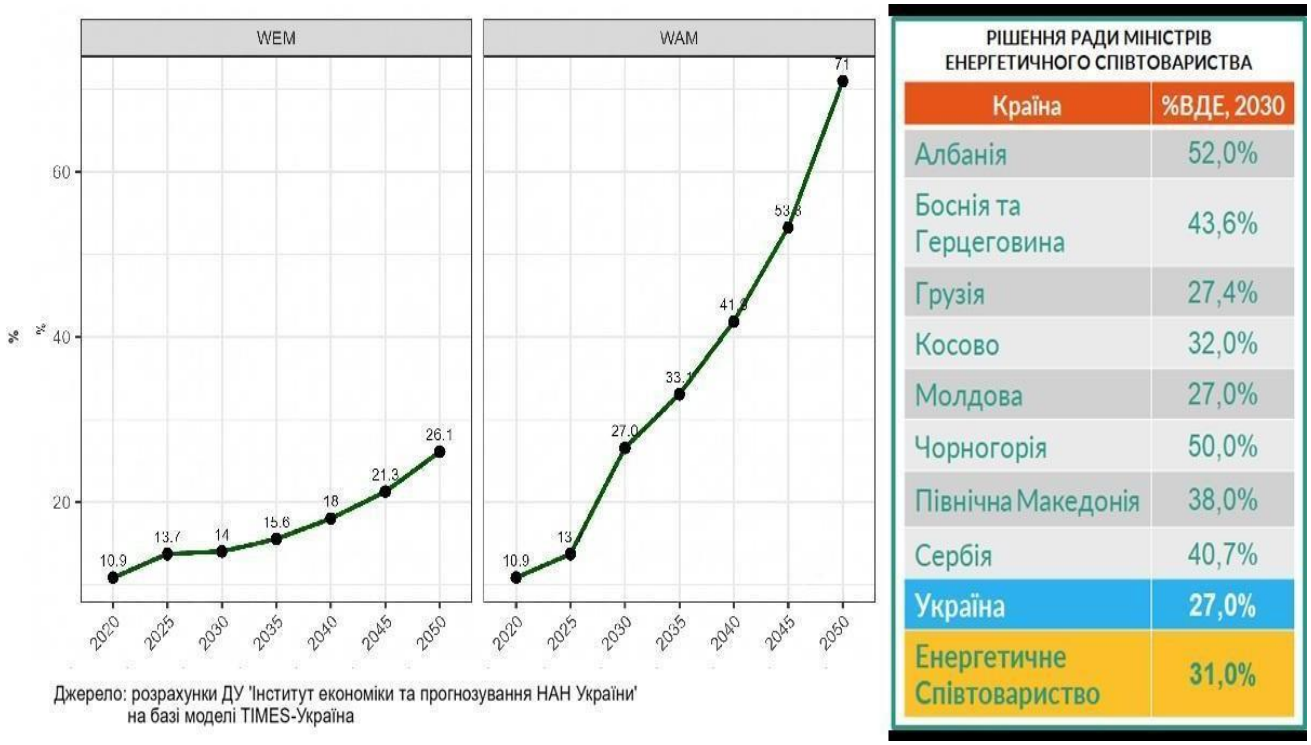


РІШЕННЯ РАДИ МІНІСТРІВ ЕНЕРГЕТИЧНОГО СПІВТОВАРИСТВА

Країна	FEC, 2030
Албанія	2,40
Боснія та Герцеговина	4,34
Грузія	5,00
Косово	1,80
Молдова	2,80
Чорногорія	0,73
Північна Македонія	2,00
Сербія	9,54
Україна	50,45
Енергетичне Співтовариство	79,06

Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

Fig. 5.24. Share of RES in gross final energy consumption in Ukraine and Targets for Energy Community member countries, %



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

Interaction between policies and measures between five directions NECP presented in tables 5.8.

Table. 5.8. Interaction between policies and measures

	Decarbonization	**Energy efficiency**	**Energy security**	**Internal energy market**	**Research, innovation and competitiveness**
Decarbonization					
PM_D_WEM_01 Environmental tax on carbon dioxide emissions		+		+	
PM_D_WEM_02 Action Plan for the Implementation of Ukraine's Climate Policy within the Framework of Participation in the Global Methane Pledge Initiative to Reduce Methane Emissions				+	
PM_D_WEM_ 03 Increase of fuel excise tax rates to the minimum level in the EU		+		+	
PM_D_WEM_08 "Green" tariff for electricity producers from renewable energy sources				+	
PM_D_WEM_09 Incentive tariff for thermal energy from renewable sources					
PM_D_WEM_10 Tax benefits for the import of equipment that operates on renewable energy				+	
PM_D_WEM_11 Feed-in-premium mechanism for electricity producers from RES				+	
PM_D_WEM_12 Direct power purchase and sale contracts between producers and end energy consumers				+	+
PM_D_WEM 13 "GreenDIM" Programme of the Energy Efficiency Fund				+	
PM_D_WEM_14 Program "Energy independence of individuals - household owners"				+	
PM_D_WEM_15 Auction system for allocation of support quota for RES				+	
PM_D_WEM_16 Guarantees of origin of electricity from renewable energy sources				+	+
PM_D_WEM_17 Stimulating the use of liquid biofuels (biocomponents) in the transport sector				+	
PM_D_WEM_18 Hydropower development program for the period until 2035				+	

PM_D_WEM_19 Implementation of a policy for just transition of Ukraine's regions dependent on fossil fuels and carbon-intensive industries				+	+
PM_D_WEM_21 Tax benefits for transport vehicles equipped with electric motors		+			
PM_D_WEM_22 Promotion the development of electric charging infrastructure		+		+	
PM_D_WEM_23 Stimulation the development of low-carbon municipal transport		+		+	
PM_D_WAM_01 National Plan for Reducing Emissions from Large Combustion Plants				+	
PM_D_WAM_02 National GHG Emissions Trading System		+		+	
PM_D_WAM_03 Implementation of the carbon crediting mechanism		+		+	+
PM_D_WAM_06 Improvement of manure management systems and biogas production				+	
PM_D_WAM_16 Promoting the practice of thermal treatment of household waste				+	
PM_D_WAM_17 Increasing the volume of disposal (recovery and flaring) of biogas at landfills				+	
PM_D_WAM_18 Introduction of electronic trade in solid biofuels				+	
PM_D_WAM_19 Development of the energy crops sector				+	
PM_D_WAM_20 Mapping of areas required for achievement national target indicator and national contribution to the objectives of the Energy Community, introducing zones for accelerated development of renewable energy sources and simplification of permitting procedures				+	
PM_D_WAM 21 Introduction of sustainability criteria for biofuels, bioliquids and biomass fuels				+	
PM_D_WAM_22 Establishment of a legislative and regulatory framework to stimulate the use of biomethane as a motor biofuel in the transport sector				+	
PM_D_WAM_23 Establishment of a legislative and regulatory conditions for the development offshore wind energy				+	
PM_D_WAM_24 Risk reduction mechanism for investments in renewable energy sources				+	
Energy efficiency					
PM_EE_WEM_01 Energy Efficiency Fund	+				
PM_EE_WEM_02 State Decarbonization and Energy Efficiency Transformation Fund	+				
PM_EE_WEM_03 State target economic program to support thermal modernization of buildings until 2030	+				
PM_EE_WEM_04 Energy service in public sector	+				
PM_EE_WEM_05 Minimum energy performance requirements for buildings	+				
PM_EE_WEM_06 Nearly zero-energy buildings	+				
PM_EE_WEM_07 Energy performance certification of buildings and inspection of building technical systems	+				
PM_EE_WEM_16 Energy audit of large enterprises	+				
PM_EE_WEM_17 Confirmation of the qualifications of energy auditors	+				
PM_EE_WEM_18 Smart metering				+	
PM_EE_WEM_19 Regulation of combined heat and power production (cogeneration)	+			+	
PM_EE_WEM_20Heat supply schemes	+			+	
PM_EE_WEM_21 Qualification of cogeneration units	+			+	
PM_EE_WEM_22 Guarantees of origin of electricity produced by a high-efficiency cogeneration unit	+			+	
PM_EE_WEM_23 State target Economic program for the energy modernization of heat-producing enterprises in state or municipal ownership until 2030	+			+	
PM_EE_WAM_01 Energy efficiency obligation scheme	+				
PM_EE_WAM_02 Assessment of the energy efficiency potential of the gas transportation system, electricity transmission system, gas distribution system, electricity distribution system	+			+	
PM_EE_WAM_03 National action plan for modernization and decarbonization of district heating systems	+			+	
PM_EE_WAM_04 Improvement of the state regulatory model in the heating sector				+	
PM_EE_WAM_05 Settlement of debts of heat supply enterprises for consumed natural gas				+	
PM_EE_WAM_06 Assessment of the potential for the application of high-efficiency cogeneration and efficient district heating	+			+	

Energy security					
PM_ES_WEM_01 Development routes for import petroleum products and natural gas				+	
PM_ES_WEM_02 Creation of fuel assembly manufacturing capacities to ensure at least 50% needs Ukrainian Nuclear power plant with reactors VVER-1000				+	
PM_ES_WEM_03 Creation stocks gas (achievement target indicator stocks in gas storage facilities)				+	
PM_ES_WEM_04 Creation stocks coal and reserve fuel (fuel oil)				+	
PM_ES_WEM_05 Creation minimal stocks oil and petroleum products				+	
PM_ES_WEM_06 Implementation the first standard behavior of objects gas infrastructure (Standard N-1), standards of conduct for gas suppliers				+	+
PM_ES_WEM_07 Implementation minimal criteria security electricity supply				+	+
PM_ES_WEM_10 Behavior with used up nuclear fuel (Spent fuel) and radioactive waste (RW)					+
PM_ES_WAM_01 Incentives with build-up mining gas for maximum self-sufficiency				+	
PM_ES_WAM_02 Restoration oil refining and/or construction new complex				+	
PM_ES_WAM_03 Creation capacities with production fuel cassette to meet all the needs of Ukrainian nuclear power plants with VVER-1000 reactors				+	
PM_ES_WAM_04 Development uranium production					+
PM_ES_WAM_06 Ensuring cyber protection of CIF fuel and energy critical infrastructure sector					+
PM_ES_WAM_07 Creation reserve sources feeding CIF, in including with using distributed renewable energy generation	+			+	
Internal energy market					
PM_IM_WEM_04 Regulation and liberalization retail prices		+	+		
PM_IM_WAM_01 Assistance development new interstate connections / intersections	+	+	+		
PM_IM_WAM_02 Additional procedures planning development energy infrastructure		+	+		
PM_IM_WAM_04 Activities for monitoring and overcoming energy poverty	+	+			
PM_IME_WEM_01 Transposition Electricity Integration Package	+	+	+		+
PM_IME_WEM_02 Stimulating regulation operators systems distribution	+	+			
PM_IME_WEM_03 Development aggregations	+				
PM_IME_WEM_04 Provision development installations storage energy	+		+		
PM_IME_WEM_05 Support active consumers by self-generation mechanism (net billing)	+	+	+		
PM_IME_WEM_06 Ensuring development distributed generations	+		+		
PM_IME_WEM_07 Competitions on construction generating power and implementation of demand management measures			+		
PM_IME_WEM_08 Special auctions with long-term acquisition auxiliary services			+		
PM_IME_WEM_09 Simplification permissive procedures for subjects distributed generation	+		+		
PM_IME_WEM_10 Booking power accession generating installations to electrical networks	+				
PM_IME_WEM_11 Prioritization objects RES at dispatching	+				
PM_IME_WEM_12 Granting compensations by limitation manufacturers RES (at the “green” tariff) during re-dispatching	+				
PM_IME_WEM_13 Harmonization borderline restrictions prices on wholesale market segments			+		
PM_IME_WEM_14 Free choice manufacturers RES forms participation in market	+				
PM_IME_WEM_15 Assistance non-discriminatory integration in power system and the demand response, energy storage and aggregation market	+		+		
PM_IME_WEM_18 Differentiated in time prices for household consumers	+		+		+
PM_IME_WEM_19 Dynamic prices for consumers	+		+		+
PM_IME_WAM_01 Implementation "smart" networks”	+	+	+		
PM_IME_WAM_03 Introduction prices real time	+		+		+
PM_IME_WAM_04 Integration (combination) spot markets (market coupling)	+		+		+
PM_IME_WAM_05 Integration balancing market			+		
PM_IMG_WEM_01 Creation legal conditions for optimization oil and gas infrastructure		+	+		

PM_IMG_WEM_02 Current events for software mining sufficient natural gas volumes	+		+		
PM_IMG_WEM_05 Software attractiveness Ukrainian oil and gas infrastructure for use by foreign customers			+		
PM_IMG_WEM_07 Current events for assistance production biomethane	+		+		+
PM_IMG_WAM_01 Transposition new package legislation EU in in the field of natural gas and hydrogen	+				+
PM_IMG_WAM_02 Carrying out research potential development production, transportation, storage and use of hydrogen in Ukraine	+				+
PM_IMG_WAM_03 Carrying out research potential development infrastructure catching, transportation, storage and using carbon (CCUS) in Ukraine	+				+
PM_IMG_WAM_04 Software effective regulation systems main oil pipelines			+		
PM_IMG_WAM_06 Additional events for software mining sufficient natural gas volumes	+		+		
PM_IMG_WAM_07 Discovery export natural gas			+		
PM_IMG_WAM_10 Additional events for assistance production biomethane	+				+
PM_IMG_WAM_12 Software 100% instrument accounting gas		+			
PM_IMG_WAM_14 Creation conditions for using contractual voluntary consumption reduction practices			+		
Research, innovation and competitiveness					
PM_RIC_WEM_01 Modernization educational programs with purpose coating skills gap in in the field of green transition and renewable energy	+	+		+	
PM_RIC_WEM_02 Accessibility grant financing for scientific research in the field of renewable energy and climate innovation	+			+	
PM_RIC_WEM_03 Development corporate investment in purchase climate technologies and renewable energy solutions	+			+	
PM_RIC_WEM_04 Competitiveness Ukrainian economy and key industrial clusters on background implementation acts legislation EU in in the field of energy labeling and ecodesign		+			
PM_RIC_WAM_01 Development corporate and international partnerships for training specialists in the energy and climate sector	+	+	+	+	
PM_RIC_WAM_02 Expansion financing scientific research in in the field of renewable energy and climate innovation	+			+	
PM_RIC_WAM_03 Active involvement venture capital investment in companies climate innovation and renewable energy sector	+			+	
PM_RIC_WAM_04 Development export climatic technologies and renewable energy technologies	+			+	
PM_RIC_WAM_05 Assistance competitiveness small and average business through green transformation and access to new markets	+	+		+	
PM_RIC_WAM_06 Restoration actions and bringing to practitioner EU rules state aid for business entities	+			+	
PM_RIC_WAM_07 Creation systems monitoring benefits for fossil fuel and mechanisms for their gradual reduction	+			+	

5.2. Macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts, including just transition aspects (in terms of costs and benefits as well as cost-effectiveness) of the planned policies and measures described in section 3 at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

The impact of implementing the scenarios with existing policies and measures (WEM) and planned policies and measures (WAM) on macroeconomic indicators was not assessed, since macroeconomic scenarios are exogenous factors in the modeling. However, an analogy can be drawn with the study of the macroeconomic impact of implementing the scenarios of Ukraine's updated Nationally Determined Contribution to the Paris Agreement, which was carried out within the framework of the EBRD project "Support to the Government of Ukraine in Updating the NDC"[160] and detailed described in Modeling Report of the IEPr NASU[161]. According to this study, among the analyzed policy implementation options, the path of intensive investment in energy

[160] https://www.ebrd.com/ukraine-es-ukr.pdf

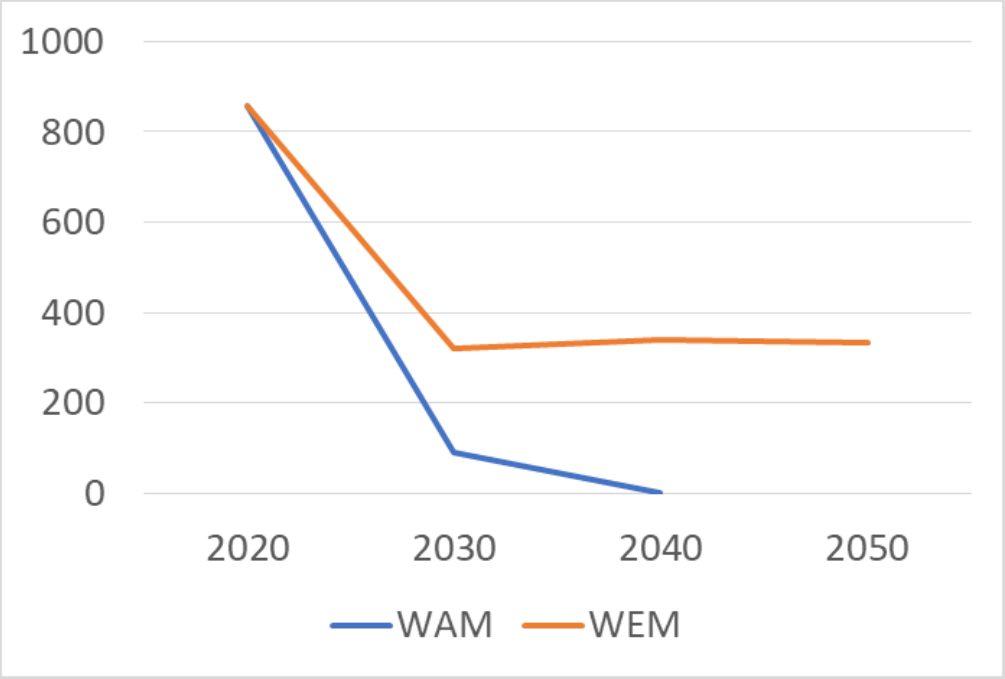
[161] Dyachuk O.A., Podolets R., Chepelev M. et al. Modelling Report under the EBRD Project "Support Government of Ukraine on the Update of the Nationally Determined Contribution" [Electronic resource] // Ministry of Environment. – Available at: https://menr.gov.ua/news/35316.html

efficiency technologies is the most attractive from both macroeconomic and sectoral perspectives. In the case of such an option, there are significant benefits for both the economy and the environment. In the case of higher levels of investment and improvements in energy efficiency and relatively low prices for GHG emission reductions by 2035-2040, GDP will grow at a faster pace. At the same time, after 2035, due to a higher level of ambition for GHG emission reductions and a corresponding increase in the price of emissions, additional GDP growth rates will slow down. A similar situation will occur with the income of households. The population will face higher emissions prices, which will affect their purchasing power. At the same time, even during the period 2040-2050, when the price of emissions exceeds $100/tonne $CO_{2\text{-eq.}}$, the population will still see an increase in real income compared to the baseline. Energy efficiency improvements play a key role in making this happen, thanks to a significant reduction in production costs and consequently lower prices for end-users in households.

Also, under ambitious energy and climate scenarios, significant transformations in the structure of production may be observed, leading to significant reductions in GHG emissions and energy intensity of GDP. This is especially characteristic of scenarios with high emission prices, for example, production/mining of coke and coal, which may fall by more than 75% in 2050. Other energy-intensive sectors, such as metallurgical production, petrochemicals, housing and utilities and metal processing, may also significantly reduce their production. At the same time, there will be a reorientation in side sectors, What generate investments and relevant services. Latest include increased production in the programming and research sector. The construction sector is increasing production as a key supplier of means of production. The increase in food production and the agricultural sector is largely driven by increased exports of these goods.

Figure 5.25 illustrates the reduction in pollutant emissions under the WEM and WAM scenarios. Thanks to implementation of the National Environmental Protection Agency and breeding with operation of coal mines power units TPP and CHP, emissions polluting substances from large incinerators installations disappear, which may not positively affect the state of the environment and public health, reducing risks diseases respiratory and circulatory systems, reducing vulnerability to respiratory viral infections.

Fig. 5.25. Total emissions of pollutants from large combustion plants, thousand tons



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

At the same time, the general course towards decarbonization of the economy, in particular the decommissioning of coal-fired power units of thermal power plants and combined heat and power plants and the closure of coal mines, may provoke socio-economic problems in some regions, to prevent which the State Target Program for the Fair Transformation of Coal Regions of Ukraine for the period until 2030 was approved (see PM_D_WEM_19 for more details).

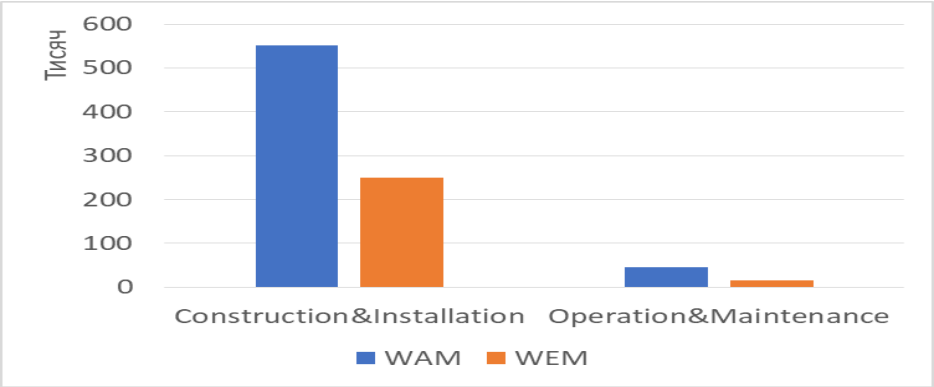
The program defines coal regions as regions with coal mining and coal processing enterprises, including those in the process of liquidation, conservation or reorientation to other types of economic activity, and coal-fired thermal generation enterprises, regardless of their form of ownership. In total, these are about 40 territorial communities of Volyn, Dnipropetrovsk, Donetsk, Luhansk, Lviv, Vinnytsia, Kyiv, Ivano-Frankivsk,

Zaporizhia and Kharkiv regions, where about 2.2 million people live.

According to the Program, in 2023, 15 thousand people worked at state-owned enterprises, of which 23.3% were pensioners. Over the previous five years, employment in the public sector decreased by 16 thousand people due to the temporary occupation of territories and the dismissal of employees. At the same time, employment in private enterprises also decreased, amounting to 6 thousand people in 2023. In general, in territorial communities of coal regions, 70% of the total employed population works at coal-mining or related mono-enterprises or in the social sphere that serves urban infrastructure, which leads to a critical dependence of local budgets on tax revenues from coal enterprises, which account for about 50% of the total amount of revenues to the territorial community budget.

At the same time, the rapid development of renewable energy sources will ensure the creation of new jobs, which should compensate for the loss of jobs due to the gradual decarbonization of the economy. Thus, using data NREL, was calculated predicted number jobs (person-years) at new power plants, separately through construction and through maintenance (Figure 5.26). The implementation of the WAM scenario allows for more than twice as many jobs. At the same time, 82% of jobs in construction and 89% in maintenance are related to RES.

Fig. 5.26. Projected number of jobs created through the construction and maintenance of new power plants in the WEM and WAM scenarios, thousands



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

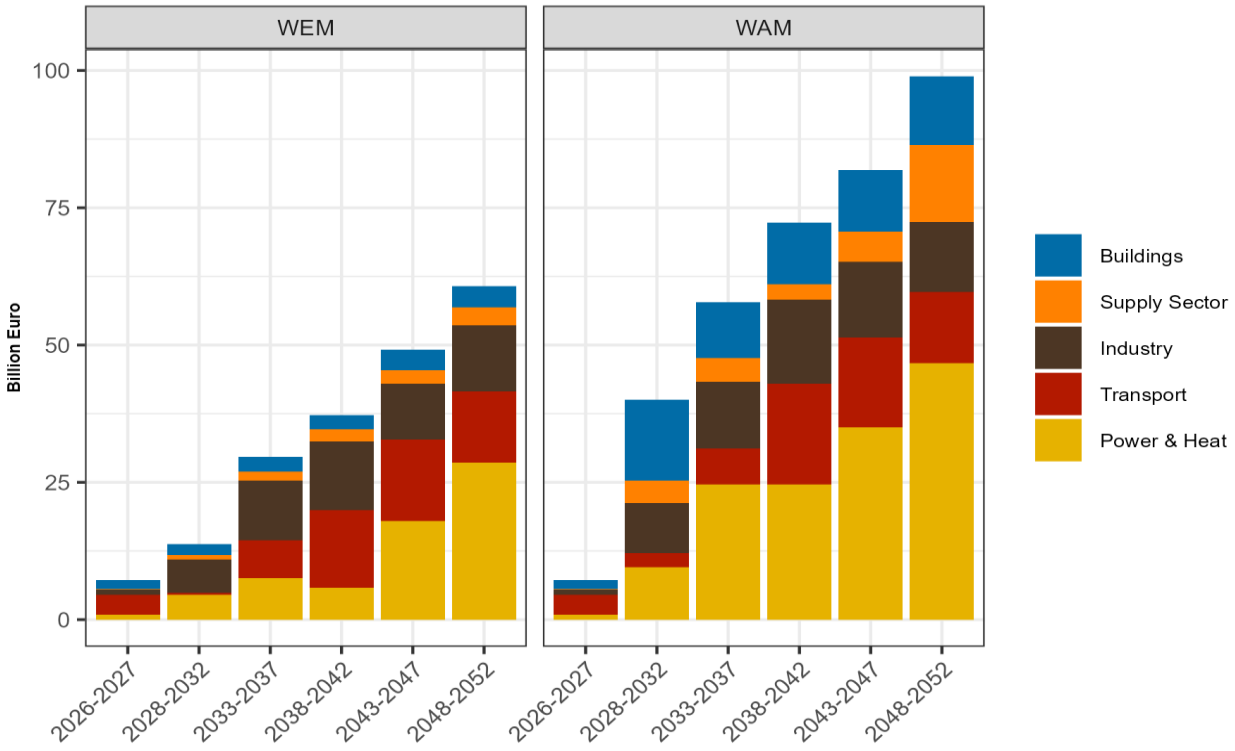
5.3. Overview of investment needs

5.3.1. Existing investment flows and forward investment assumptions with regard to the planned policies and measures

Investment needs in the Energy and Industrial Processes and Product Use sectors

Overall investment needs are high in both scenarios, but quite comparable. In both scenarios, the largest investment needs are for renovation and decarbonization (electrification) of the vehicle fleet (excluding public vehicles). Investments in electricity and heat generation facilities are also significant, however, due to the higher rates of thermal modernization of buildings, investment needs in cogeneration in the WAM scenario will be lower than in the WEM. Also, investments in transport are greater as such, as the service life of transport technologies is shorter and replacement is needed more often than for power plants and BESS. It should also be noted that in the WEM scenario, investments are mostly directed towards replacing existing equipment with the same but new equipment, while in the WAM scenario, more investments are made towards low-carbon technologies. The implementation of the WAM scenario requires 77% more investments, and the difference in total investment needs between the WEM and WAM scenarios is €160.4 billion.

Fig. 5.27. Investment needs for the implementation of WEM and WAM scenarios in the sectors "Energy" and "Industrial processes and product use"



Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

Investment needs for the implementation of just transition policy in coal regions

According to the State Target Program for the Just Transition of Coal Regions of Ukraine for the period until 2030, the estimated amount of its financing is UAH 30,443.2 million, including UAH 4,386.8 million from the state budget, UAH 5,526.8 million from local budgets, and UAH 20,529.6 million from other sources (see Table 5.9).

Table 5.9. Estimated amount and sources of financing of the State Target Program for the Just Transition of Coal Regions of Ukraine for the period until 2030, UAH million

Sources of funding	Amount	Including by years					
		2025	2026	2027	2028	2029	2030
State budget	4,386.8		786.2	1,340.8	2,259.8		
Local budget	5,526.8	48.9	520.2	796.1	1,196.4	1,352.1	1,613.1
Others sources	20,529.6	1,531.1	3,622.5	4,210.4	3,725.5	3,876.6	3,563.5
Total	30,443.2	1,580.0	4,928.9	6,347.3	7,181.7	5,228.7	5,176.6

Financing of measures for the implementation of the Program will be carried out from state and local budgets, as well as with the help of international technical assistance and other sources not prohibited by law. Financing of the Program with the state budget funds will be carried out starting from the second budget period after the termination or cancellation of martial law in Ukraine, provided that funds are foreseen in the relevant local budgets for co-financing of the specified measures. International financial instruments include, but are not limited to, the European Investment Bank's Just Transition and Just Resilience for Ukraine (JTR-U) program with an initial budget of EUR 19.6 million. The program is aimed at supporting projects that mitigate the socio-economic consequences of the gradual closure of the coal industry and contribute to the structural transformation of coal communities.

Investment needs in the Agriculture sector

The implementation of the policies and measures planned for the development of Ukraine's agro-industrial complex requires significant investments. Investment needs are characterized by significant variability: significantly depend on external and internal factors, risks associated with a full-scale invasion of the Russian Federation, the uniqueness of the needs of a particular agricultural enterprise/farm, etc.

To meet investment needs, it is advisable to consider funds from state and local budgets in terms of programs to support agricultural producers, financial (loan and grant) support from international development partners and international financial organizations, financial assistance within the framework of the Initiative to Support the Sustainability of Ukraine's Agricultural Sector AGRI-Ukraine, as well as other sources not prohibited by law.

Investment needs in Waste sector

To implement the WEM scenario in the Waste sector, it is necessary to attract about 1.36 billion EUR of capital investments in the period from 2024 to 2030 inclusive. In general, the implementation of the WEM scenario will require attracting about 5.15 billion EUR of capital investments in the waste management sector during the years 2024-2050.

To implement the WAM scenario, it is necessary to attract about 2.62 billion euros in the period from 2024 to 2030 inclusive. In general, the implementation of the WAM scenario will require attracting about 8.02 billion euros in capital investments. Tables 5.10 and 5.11 show the capital investment needs for the implementation of the WEM and WAM scenarios in cumulative terms over 2024-2050 and for individual periods, respectively.

Table 5.10. Capital investments for the implementation of WEM and WAM scenarios in cumulative terms until 2050, million EUR

	2025	2030	2035	2040	2045	2050
WEM	300.2	1058.5	205.6	3069.5	4103.6	5150.9
WAM	576.4	2045.7	3547.7	5046.5	6538.5	8024.7

Table. 5.11. Capital investments for implementation scenarios WEM and WAM and for individual periods until 2050, million euros

	2024-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	Total
WEM	300.2	758.3	995.0	1015.9	1034.1	1047.4	5150.9
WAM	576.4	1469.3	1501.,9	1498.8	1492.0	1486.2	8024.7

Investment needs for implementation of policies on adaptation to climate change

An assessment of the costs[162] of adaptation measures and needs in the four priority sectors was carried out even before the full-scale invasion of Ukraine by the Russian Federation (see Table 5.12). It is worth noting that the assessment of the necessary amounts for financing adaptation measures is indicative, since the available data for such an assessment are rather incomplete. Thus, the implementation of key adaptation measures in these sectors will require at least 44 billion US dollars by 2030.

Table. 5.12. Required costs on some adaptation measures in Ukraine to 2050, billion USD

Sector	Adaptive events	Costs	
		to 2030	to 2050
	Renewal of irrigation systems	3	n.d.
	Renewal of working drainage systems	0.7	n.d.
	Renewal of non-functioning drainage systems	2.5	n.d.

[162] Trypilska, G. Estimating climate change adaptation costs in Ukraine // Economy and forecasting 2020; 4:60-71. Available at: https://eip.org.ua/docs/EP_20_4_60_uk.pdf

Agriculture	Resource-saving agriculture (conservation agriculture)	2.4	3.4
	Renewal of rural roads	30.5	68
Water sector	Strengthening the Black Sea coastline and Azov seas (construction of a protective infrastructure)	0.17– 0.25	n.d.
Energy	Renewal of gas transportation system	2.19	n.d.
	Upgrading the system's main lines of electricity transmission	2,358	n.d.
Urban landscaping	Urban planting and urban greening	0.02	n.d.
Total		**43.9**	**71.4**

Note: n.d. - no data

5.3.2. Sector or market risk factors or barriers in the national or regional context

Lack of financing of existing and planned policies . Planned tax revenues for 2026 in accordance with the Law of Ukraine "On the State Budget of Ukraine for 2026" amount to 2.49 trillion UAH. At the same time, expenditures on the defense and security sector amount to 2.8 trillion UAH. In such conditions, the Government of Ukraine is forced to reduce other expenditures.

At the same time, the implementation of the State Target Economic Program to Support Thermal Modernization of Buildings by 2030 requires funding in the amount of UAH 172.91 billion to UAH 934.25 billion for the entire period of validity. Implementation of the State Target Economic Program for Energy Modernization of Enterprises - Thermal Energy Producers, State-Owned or Municipally-Owned, for the period to 2030 year from 168.7 billion UAH to 632.7 billion UAH. In the current conditions of high there is a risk, that the policies and measures of the NPEK, in particular in the dimension "Energy Efficiency", will be unfunded or partially funded.

Lack of demand among the population. The decisive factor that will contribute to the implementation of reforms and energy efficiency measures by the population is the introduction of market prices for energy. Currently, electricity prices for the population are set administratively, natural gas prices and thermal energy tariffs are also regulated and fixed at no higher than the corresponding levels on February 24, 2022 for the time being. military action state in Ukraine and six months after its abolition. However, the Government has limited opportunities for price/tariff liberalization due to the decline in population incomes due to the full-scale invasion of the Russian Federation into Ukraine: for example, real wages decreased by 11.4% in 2022. At the same time, risks of damage or destruction of buildings throughout Ukraine remain, which also contributes to postponing the demand for the implementation of energy efficiency measures until the post-war period.

Lack of qualified personnel. The need to rebuild on a "better than before" basis, the implementation of energy efficiency policies (local energy plans, implementation of energy management systems), the development of new production chains in the climate innovation and renewable energy sectors are increasing the demand for qualified personnel. At the same time, mobilization to the Armed Forces of Ukraine and other units of the Defense Forces, as well as the departure of a significant number of the population outside Ukraine as a result of the full-scale invasion of Ukraine by the Russian Federation, are already creating a shortage of workers who could improve their qualifications or acquire a new specialty.

5.3.3. analysis of additional public finance support or resources to fill identified gaps identified under point 5.3.2.

The possibilities of additional support from the State Budget of Ukraine are extremely limited. For the period of martial law, the directions of the state budget policy are focused on the redistribution of state budget funds in order to support the key needs of the Armed Forces of Ukraine and other units of the Defense Forces, ensuring the country's defense capability and implementing measures to ensure national security. Thus, there is a lack of funds even for financing existing economic programs. Paragraph 12 of the Measures on the effective and rational use of state funds provided for the maintenance of state authorities and other state institutions, enterprises, institutions and organizations established by state authorities that use state budget funds, approved by the resolution of the Cabinet of Ministers of Ukraine dated October 11 2016 No. 710 "On the effective use of public funds" (Official herald Ukraine, 2016 r., No. 83, Art. 2739; 2019 r., No. 47, Art. 1608, No. 94, Art. 3098; 2022 r., No. 10, Art. 531; 2024, No. 44, Art. 2687), provides for the termination of the preparation of projects of new state target programs or amendments to approved target programs that require additional funding from the state budget. The condition for including exceptions in the Measures is

the provision in new programs of funding from the state budget starting from the second budget period after the abolition of martial law in Ukraine.

Budget financing of state targeted economic programs can be considered through budget support grants from foreign governments, foreign financial institutions and international financial organizations (including loans and grants for achieving performance indicators), revenues under assistance programs and grants of the European Union, governments of foreign states, international organizations, donor institutions, as well as loans (loans) attracted by the state from foreign states, foreign financial institutions and international financial organizations for the implementation of investment projects. At the same time, in accordance with the requirements of the legislation, state borrowing and management of public debt, provision of state guarantees is carried out under a number of conditions and is limited – especially in circumstances where Ukraine does not have full access to the international borrowing market and has limited domestic market resources.

Similarly, local budget resources are also quite limited, and their availability depends on a number of factors - economic activity in the territory of the relevant territorial community, financial capacity of local governments, etc. Local borrowing and management of local debt, provision of local guarantees are also carried out under a number of conditions and have limitations.

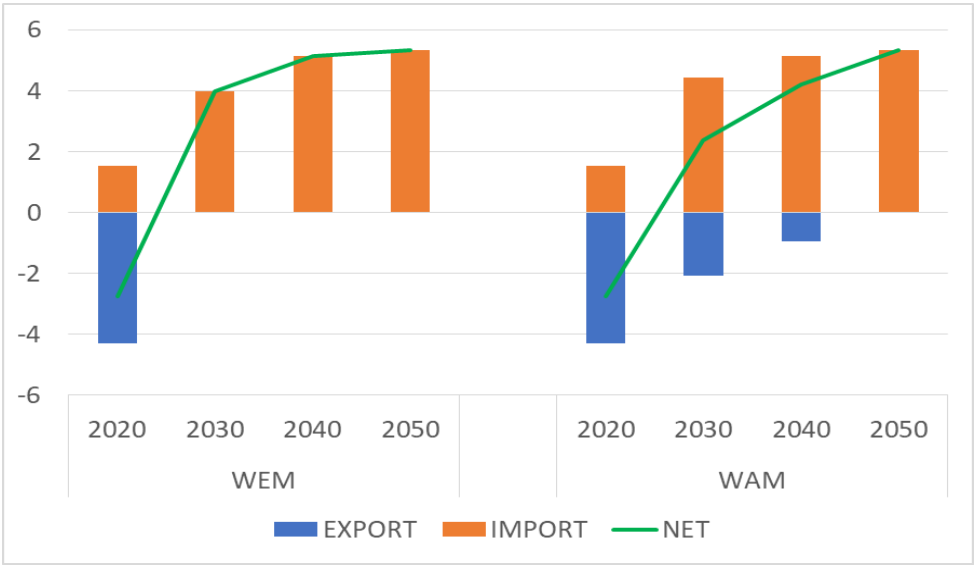
Thus, support should be provided at the expense of other sources not prohibited by law. These include, in particular, investors' funds (through the introduction of market mechanisms for their stimulation, simplification of permitting procedures, other non-fiscal forms of support), grant programs, other available financial instruments (e.g., syndicated loans under guarantees of foreign states, foreign financial institutions and international financial organizations, bonds issued by them, other forms of mixed financing), especially of a targeted nature (e.g., climate financing). Sources of such financing and/or provision of guarantees also include funds received at the expense of "frozen" assets Russian federations, and potentially themselves assets Russian federations "frozen" in the jurisdictions of Ukraine's allied states.

5.4. Impacts of planned policies and measures described in section 3 on other Contracting Parties and/or Member States of the European Union and regional cooperation at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

5.4.1. Impacts on the energy system in neighbouring and other Contracting Parties and/or Member States of the European Union in the region to the extent possible

Figure 5.28. demonstrates that in both scenarios, the IPS becomes a net importer of electricity. At the same time, in the WAM scenario, the Ukrainian power system will be able to simultaneously export electricity to neighboring countries due to greater volumes of generation from RES. However, over time, due to decarbonization measures in energy-consuming sectors, which in turn are often based on the electrification of equipment, domestic demand for electricity leads to a decrease in the surplus for exports.

Fig. 5.28. Import-export electricity from IPS of Ukraine to neighboring countries, billion kWh

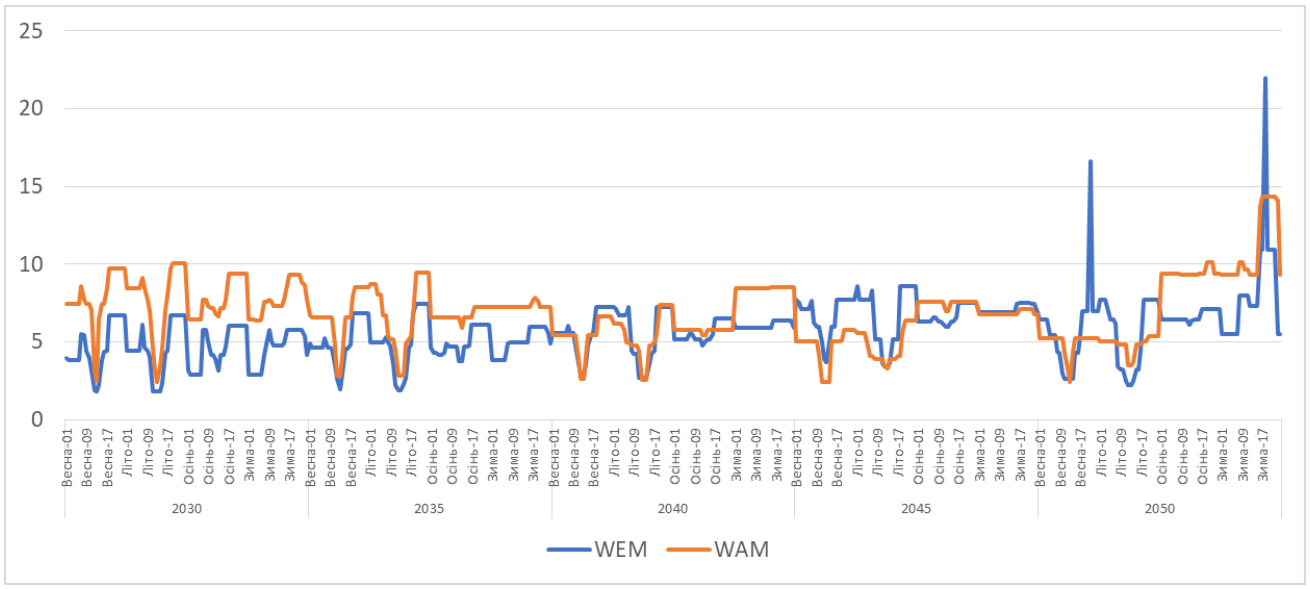


Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

5.4.2. Impacts on energy prices, utilities and energy market integration

The impact is expected to be planned policies and measures (scenario WAM) on prices on energy resources will be quite significant with the full implementation of the specified scenario (Fig. 5.29). In particular, the results of modeling using the TIMES-Ukraine model show that averaged marginal electricity prices may differ little, although they are higher in the WAM scenario, but the volatility in the WEM scenario is projected to be higher than in the WAM scenario.

Fig. 5.29. Limit price on electricity by scenarios WEM and WAM, eurocents/kWh

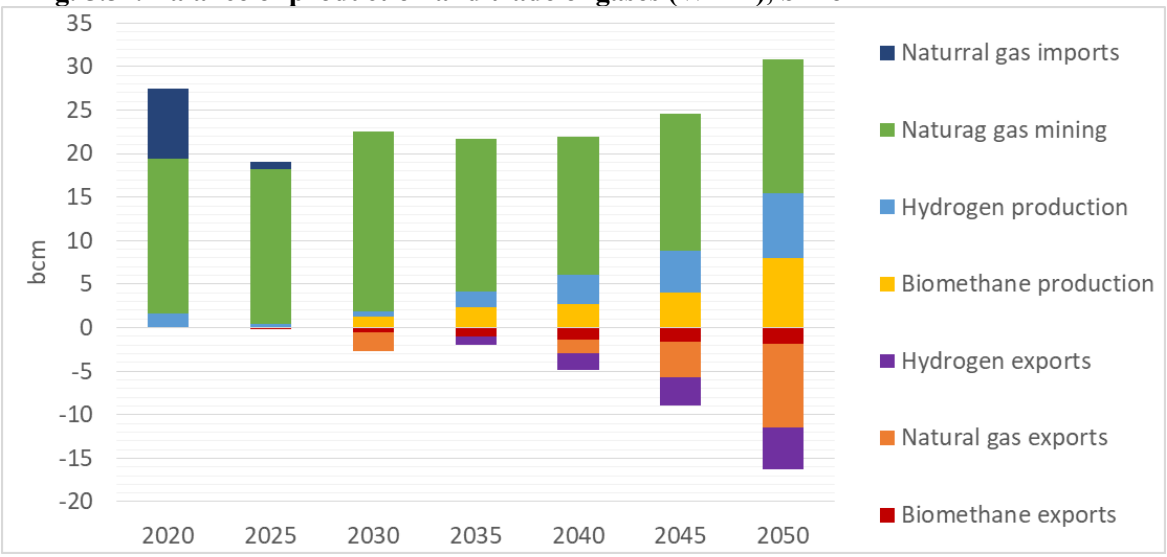


Note: on axes abscissa specified representative hours seasons, in to each 24 of these

Source: calculations of the Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine based on the TIMES-Ukraine model

Forecast of marginal prices at selected hours by year for spring, summer, autumn and winter periods are shown in Fig. 5.30, which shows the advantages of developing electricity from renewable sources, especially wind and solar, compared to coal-fired generation, even in winter.

Fig. 5.31. Balance of production and trade of gases (WAM), billion m^3



*Note: *hydrogen production includes renewable hydrogen, and hydrogen from natural gas in chemical industry*

Source: calculations of SO "Institute for Economics and Forecasting of NAS of Ukraine" based on the model TIMES-Ukraine

Fig. 5.30. Marginal electricity prices in selected hours in four seasons year under WEM and WAM scenarios, eurocents/kWh



Source: calculations of SO "Institute for Economics and Forecasting of NAS of Ukraine" basing on the model TIMES- Ukraine

Natural gas market

The planned policies and measures will ensure conditions for cross-border movement of natural gas across the border of Ukraine with the EU Member States and Contracting Parties to the Energy Community, as well as conditions for increasing domestic consumption of biomethane. These include measures to remove export bans from Ukraine, create a system of guarantees of origin and confirmations sustainability etc. Simultaneously, software unhindered movement of these goods with Ukraine to the EU and taking into account their real value, including "green" components, will be possible only if the necessary measures are taken by the EU and the EU Member States.

With the opening of gas exports to the EU, it is expected that some of the domestic production may be exported. This could be positive in terms of foreign exchange earnings and overall business integration, but could carry risks. from the point of view of the need to purchase the necessary volumes of the resource from abroad (i.e. issues of security of supply and purchase prices). Accordingly, comfortable conditions for the sale of domestically produced gas should be created on the domestic market. For this, the planned measures

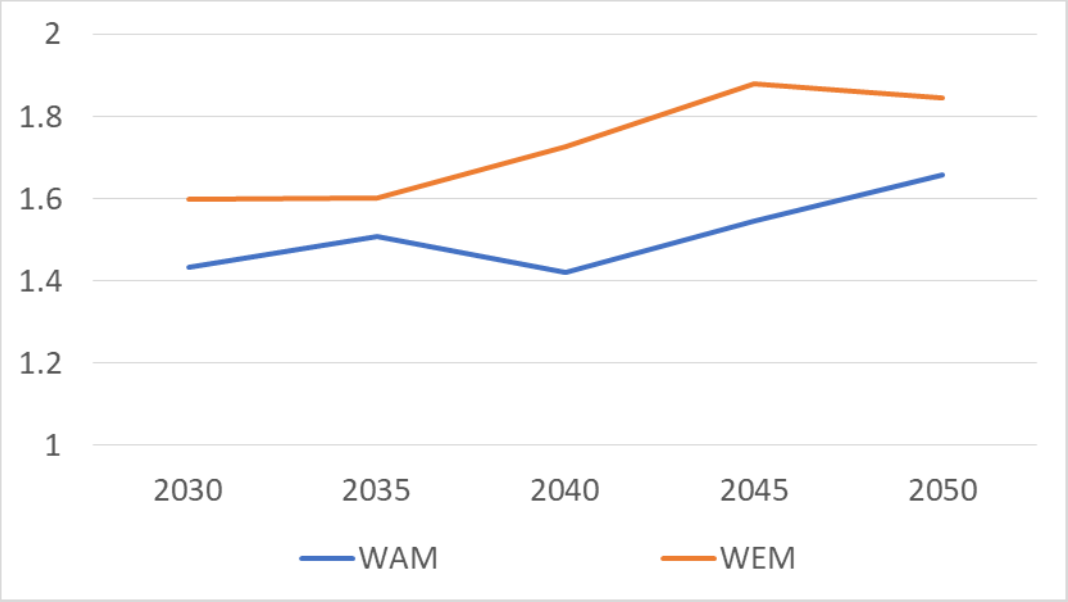
include, on the one hand, price liberalization (simultaneously with the renewal of the housing subsidy system, the creation of a system for protecting vulnerable consumers and monitoring and reducing the level of energy poverty), and on the other hand, improving the conditions for sellers to access the functioning wholesale market and the retail market (improving the rules of commercial accounting, balancing, reform of the management of gas transmission system operators).

In addition, the planned policies and measures will enable the existing energy infrastructure to adapt to new conditions, with an emphasis on deeper integration into EU policy, research, design and business processes. This, in turn, will reduce the burden of infrastructure construction and transformation costs on Ukrainian consumers, as well as increase revenues from foreign users of energy infrastructure facilities.

According to the results of modeling using the TIMES-Ukraine model, natural gas production for domestic consumption may be sufficient at the level of 19-20 billion m3 , after which, with a more intensive implementation of decarbonization measures, in particular a significant increase in the price of CO_2 emissions , and the expansion of renewable gas production (primarily biomethane), gas production will decrease to 15.4 billion m3 in 2050 (Figure 5.31). The marginal price for natural gas under the WAM scenarios may be lower than the corresponding price in the WEM scenario, since the demand for natural gas will be lower in the WAM scenario (Figure 5.32).

At the same time, biomethane production will increase from 1.3 billion m3 in 2030 to 8 billion m3 in 2050 and will be mainly consumed on the domestic market, reaching exports of 1.9 billion m3 in 2050. In contrast, hydrogen production may reach 1.8 billion m3 in 2035 and grow to 7.4 billion m3 , with only "green" hydrogen exported to the EU countries in the amount of up to 4.8 billion m3 , and the remaining 2.6 billion m3 consumed domestically. In turn, the share of hydrogen produced from natural gas is reduced from more than 80% now to 3.3% in 2050. Up to 1.45 billion m3 of " green " hydrogen can be used to produce renewable synthetic methane based on biogenic CO2 .

Fig. 5.32. Marginal price of natural gas by scenarios WEM and WAM, eurocents/kWh



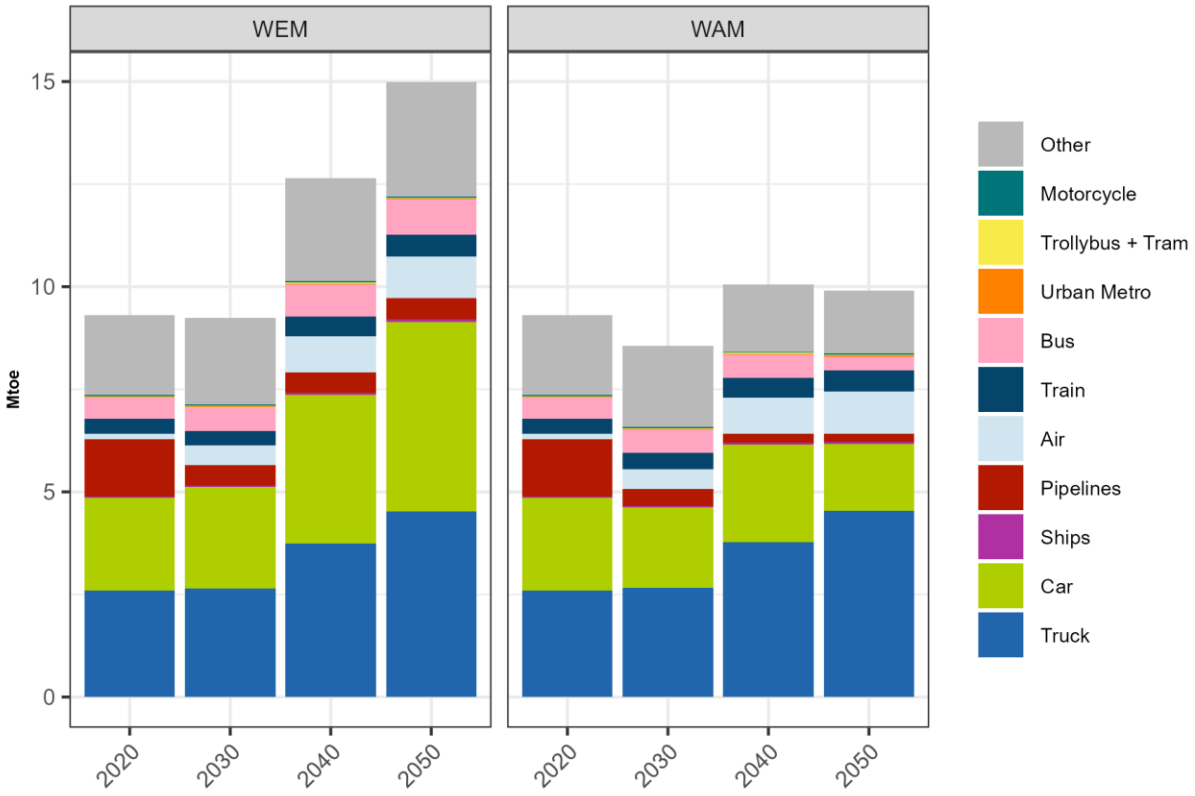
Source: calculations SO "Institute for Economics and Forecasting of NAS of Ukraine"" based on the model TIMES-Ukraine

Energy use in transport

The policies in effect in WEM and WAM to increase the share of liquid biofuels, develop charging infrastructure and tax incentives for electric vehicles undoubtedly contribute to the decarbonisation of the sector. However, since the policy on the share of liquid biofuels applies only to petrol and given the overall volume of consumption of all fuels in transport sector, it is possible achieve only 0.7% share of biofuels in WEM by 2030. Similarly, the share of electricity in consumption reaches 7%. In contrast, in WAM scenario the share of electricity could reach 12%, and biofuels - 6.5%. Accordingly, carbon taxation makes a greater contribution to reducing GHG emissions in the transport sector, since no other additional measures are foreseen for the transport sector.

Road freight transport is the most energy-intensive mode of transport in both scenarios. However, the WAM scenario manages to somewhat decarbonise this mode of transport by using biomethane, bioethanol and biopropane at the end of the simulation horizon.

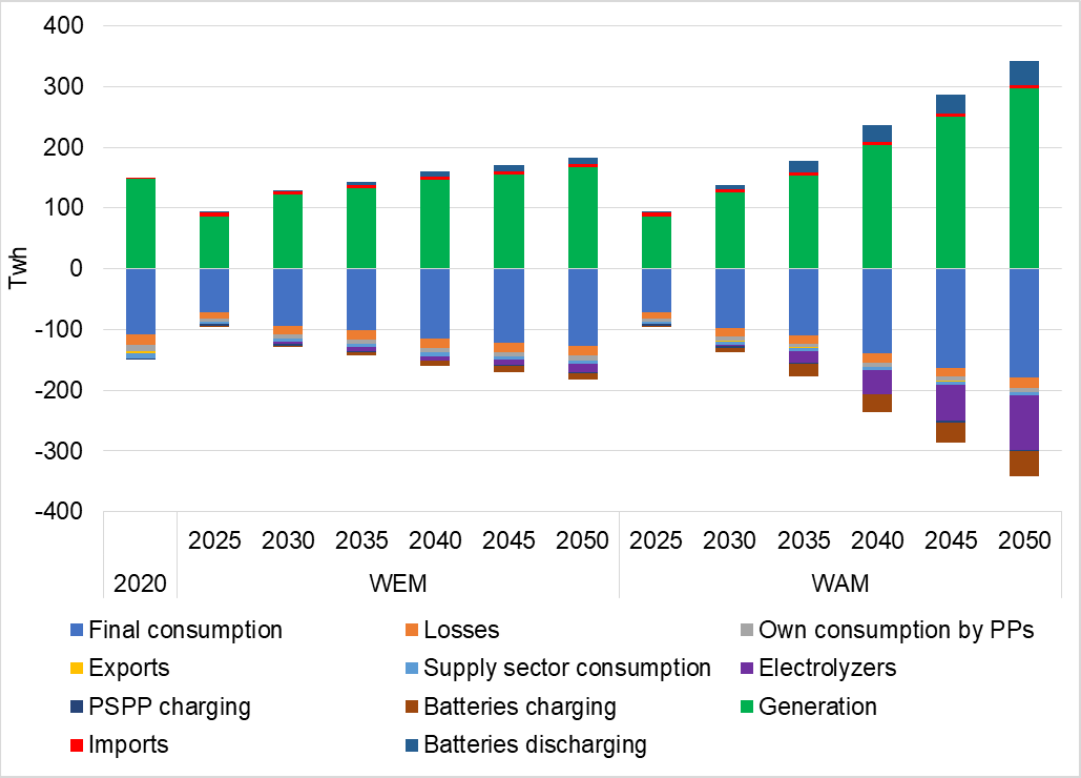
Fig. 5.33. Energy use in transport by transport mode, Mtoe



Source: calculations of SO "Institute for Economics and Forecasting of NAS of Ukraine" basing on the model TIMES- Ukraine

Fig. 5.34 provides information on the directions and volumes of electricity consumption in Ukraine, in particular for the purposes of producing “green” hydrogen, charging energy storage facilities, operating PSPs in pumped storage mode, as well as the volumes of imports and exports, forming a balance between production and consumption. Thus, electricity generated using renewable energy sources, in addition to being supplied to the Integrated Power System of Ukraine, will also be consumed for hydrogen production (up to 14 TWh in 2050), which by WEM scenario almost all will be used for synthesis of renewable methane. According to the WAM scenario, electrolyzers can consume up to 90 TWh in 2050, and the produced “green” hydrogen will go: 67% for export to the EU, for the synthesis of renewable methane - 21%, for the production of green fertilizers - 7%, the transport sector - 3%, for the production of process heat - 2.2%.

Fig. 5.34. Electricity production and use by main categories, TWh



Source: calculations of SO "Institute for Economics and Forecasting of NAS of Ukraine" basing on the model TIMES- Ukraine

5.4.3. Where relevant, impacts on regional cooperation

Liberalization and integration of energy markets, revitalization of trade in products (both energy resources and derived decarbonized industrial products) and services between Ukraine, on the one hand, and the EU Member States and Contracting Parties to the Energy Community, on the other, will require a fundamentally higher level of interaction. The realization of the export potential of the Ukrainian economy will depend not only on market conditions (price signals, market structure and concentration), but primarily on the pace of implementation of reforms on the path to EU membership and the corresponding removal of obstacles to interstate trade.

At the same time, such enhanced cooperation should take place at different levels (between Ukraine and the EU and Energy Community institutions, intergovernmental, between network and infrastructure operators, between local authorities and local self-government bodies, at the level of business and other business relations) and cover the entire spectrum of potential issues - from joint risk assessment, infrastructure development planning, to the development of harmonized policies, standards, approaches, implementation of joint investment projects. Regional initiatives such as P-TECC, CESEC, SEEGAS, European Hydrogen Backbone, etc. will play an increasingly important role.

IN within the framework acquisition membership Ukraine in EU part solutions will be accepted on supranational levels, within the framework of pan-European policies and/or mechanisms, which will be an advantage for Ukraine in those issues where neighboring states do not show counter-initiative or mutual interest. A significant factor in success will be the speed of Ukraine's accession to pan-European platforms, information exchange platforms, databases (both those regulated by EU acts and voluntary ones), cluster organizations. An additional opportunity for the development of cooperation is the industrial alliances supported by the European Commission in new value chains (hydrogen, renewable and low-carbon fuels, critical raw materials, batteries, circular plastics, semiconductors, other areas of advanced and low-carbon technologies).

Annex 1 to Plan.

Methodological basis for the formation of modeling scenarios in accordance with Regulation (EU) 2018/1999 and taking into account the specifics of public administration in Ukraine

For goals NECP modeling is being held by two mandatory scenarios:

1) with available politicians and measures (with existing policies and measures, WEM);

2) from planned politicians and measures (with planned policies and measures, WAM). In this regard, existing policies and measures include:

a) implemented politicians and events (implemented policies and measures);

b) approved politicians and events (adopted policies and measures).

Regulations separately determines what is available on attention under "realized", "approved" and "planned" politicians and measures. These definition useful to consider in English and Ukrainian languages:

Regulation 2018/1999[163]	**Regulations 2018/1999 (translation, available in database "Legislation of Ukraine"[164])**
'implemented policies and measures' means policies and measures for which one or more of the following applies at the date of submission of the integrated national energy and climate plan or of the integrated national energy and climate progress report: directly applicable Union or national law is in force, one or more voluntary agreements have been established, financial resources have been allocated, human resources have been mobilized;	"implemented policies and measures" means policies and measures to which, as of the date of submission of the integrated national energy and climate plan or the integrated national report about progress in in the field of energy and climate, one or more of the following conditions apply: there is existing Union or directly applicable national law, one or more voluntary agreements have been concluded, highlighted financial resource, mobilized human resource;
"adopted policies and measures" means policies and measures for which an official government decision has been made by the date of submission of the integrated national energy and climate plan or of the integrated national energy and climate progress report and there is a clear commitment to proceed with implementation;	"adopted policies and measures" means policies and measures for which, as of the date of submission of the integrated national energy and climate plan or the integrated national progress report in field energy and climate was approved official decision Government and exists clear commitments for further implementation;
"planned policies and measures" means options that are under discussion and that have a realistic chance of being adopted and implemented after the date of submission of the integrated national energy and climate plan or of the integrated national energy and climate progress report;	"planned policies and measures" means options, which are under discussion and have a real chance of being approved and implemented after the date of submission of the integrated national energy and climate plan or integrated national report about progress in field energy and climate;

These definitions will be applied with taking into account the following.

Firstly, given that the integrated national energy and climate progress reports are developed and approved on the basis of the approved NECP, for the purposes of qualification measures in accordance with the above definitions, the indicative date of submission of the NECP will be used. In this case, based on the terminology of the English version of the Regulation, this refers to the submission of the draft or final version of the NECP to the European Commission, and in the case of Ukraine - to the Energy Community Secretariat.

Secondly, the phrase “current Union [Energy Community] law or directly applicable national law” must be interpreted in the light of what EU law understands by directly applicable rules[165]. Directly applicable rules are rules that can be the legal basis for claims by individuals and legal entities for recognition of their rights both against the state (vertical direct application) and against other persons (horizontal direct application). A rule of direct application may be contained in a law, a by-law, and (in some cases) an international treaty. However, not every rule of a law, by-law or international treaty contract there are norm direct application. Norm has direct application, if she is specific (precise), clear (clear) and unconditional (unconditional), as well

[163] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02018R1999-20230516

[164] https://zakon.rada.gov.ua/laws/show/984_030-18#Text

[165] https://eur-lex.europa.eu/EN/legal-content/summary/the-direct-effect-of-european-union-law.html

as one that does not require additional implementation measures from the state. The status of a norm of direct application is determined by analyzing a specific norm against the specified criteria. In the context of Ukraine, an example of a norm of direct application can be the provision of the law on the operation of the principle of non-discrimination in relations between energy market entities. Norms of direct application are not norms that determine The goals or general objectives of the state, its bodies or other persons determine a wide range of discretion in their application or require additional implementation actions.

Thirdly, given the relatively small number of directly applicable norms in the energy legislation of Ukraine, as well as legal uncertainty regarding the direct application of norms from the Energy Community acts, the implemented policies and measures will primarily include policies and measures regarding which:

a) “one or more voluntary agreements have been concluded” (i.e. the application of the policy or measure is not in compliance with a legal provision, but in compliance with an agreement that has been concluded and is to be implemented), or

b) "allocated financial resources" (i.e. relevant costs included in the tariff of regulated market entities, allocated from the state budget or from international financial assistance funds, etc.), or

c) mobilized human resource.

With regard to concluded agreements, it is the agreements that are taken into account, not memoranda of understanding or intentions.

Regarding the allocation of financial resources, the presence of an approved, sufficiently clear mechanism for financing the relevant policies or measures is taken into account, which can be the basis for the formation of legal claims of the parties (for example, funds are included in the tariff, the right to conclude a purchase and sale agreement at a green tariff / tax discount / reduced tax rate is determined by law, and there are no regulatory restrictions for its implementation, etc.). Problems with application such mechanisms (for example, failure to fulfill payments parties, accumulation debts etc.) may be taken into account for the recognition of the status of policies and measures only in exceptional cases.

Implemented policies and measures are closely linked to adopted policies and measures, as they are combined within a single group of existing policies and measures. The criteria for adopted policies and measures are: a) "an official Government decision has been made" and b) "there is a clear commitment to further implementation".

Given that the executive branch usually adopts specific policies and measures, and the Cabinet of Ministers of Ukraine is the highest body in the system of executive bodies, the reference to the existence of a government decision does not imply a restriction on the decision-making body (i.e. not only the Government can make such a decision), but rather indicates the specificity and realism of policies and measures that belong to the group of adopted and, accordingly, existing policies and measures. At the same time, the adoption of a norm by the parliament on its own initiative (in the absence of the Government's initiative) may be an indicator, that a policy or measure cannot be considered as adopted and existing, in particular in the case of failure to meet the second criterion.

The criterion of the existence of a “clear obligation” regarding further implementation" is interpreted as follows: if there is a legal basis for the relevant policy and measure, the necessary actions and resources for its implementation are clearly defined, and there is an understanding that these resources must be allocated. The close connection with the implemented policies and measures indicates that in the case of adopted policies and measures, there is a clear commitment to allocate financial resources, mobilize human resources or be prepared to conclude voluntary agreements.

Fourth, it should be noted that planned policies and measures refer to “options” (and not “policies and measures” as in the previous definitions).

Two criteria are put forward for these options: a) being at the discussion stage; and b) “real chance to be approved and implemented after date submission". Considering the terminology of the English version, discussions do not mean formal public discussions, but rather the existence of a discussion of the relevant option in public circles. The existence of a discussion is presumed if we are talking about policies and measures that are planned in response to an already adopted act of higher legal force (law).

The second criterion is restrictive in terms of the range of all possible options being discussed. In this case, several cases are accepted that indicate the realism (“real chance”) of the options. The first case is the level of announcement of the option: it is taken into account that policies and measures can be considered realistic if they are officially announced by such state officials as the President, Prime Minister, Deputy Prime Minister, Minister, Head or Deputy Heads of the Office of the President), provided that they are sufficiently detailed and objectively realistic. The second case is the presence of specific external factors that determine or clearly

encourage the implementation of policies and measures. These external factors can be as part of Ukraine's international obligations, and may be contained in the legislation of other countries. To identify such external factors was not enough, so that they were part of international Ukraine's obligations. In addition to formal obligation, a factor of high risk of sanctions or other negative consequences from non-fulfillment of obligations or other external conditions (for example, failure to provide funds, refusal to purchase products, etc.) should be added. Examples of the second case may be SVAM, EU requirements for "green" hydrogen, sustainability of biofuels, etc.

Fifth, given that the planned policies and measures are options, several such options can be used during the modeling, forming several scenarios with the planned measures. In this case, Section 5 of the NECP should describe the macroeconomic impact, if possible - the impact in terms of health, environment, labor requirements and social impact, the ability to attract financing for implementation, as well as the significance in terms of achieving the principle of climate neutrality of the planned policies and measures or their groups, which will allow for an appropriate and comprehensive analysis of such options.

It should be noted that policies and measures are considered to be policies and measures adopted at the state level. Policies and measures at the level of companies, including state-owned ones, are not distinguished as separate policies and measures for the purposes of the NECP of Ukraine, but are adopted to determine the extent to which the goals of state policies and measures are achieved.

To simulate NECP scenarios, the TIMES-Ukraine model is used, developed at the Institute of Energy and Environmental Engineering of the National Academy of Sciences of Ukraine, improved and updated to the latest software in July 2023 thanks to global Net Zero World initiative[166]. The applicable model covers sectors "Energy" and "Industrial processes and product use" (as defined by the Intergovernmental Group of Experts on climate change issues, IPCC). For the remaining sectors (“Agriculture”, “LNG”, “Waste”), other modeling tools were used.

Modelling for NECP purposes is carried out to assess the extent to which existing and planned policies and measures allow achieving the objectives set at the EU or Energy Community level. Communities. In this case, due to the lack of data, the impact of individual existing and planned measures is not investigated, but the assumption is taken that those measures that are identified as existing or planned are sufficiently realistic and effective to achieve the full or expertly determined impact envisaged by their developers. Modeling for the purposes of the NECP is different from other approaches, such as modeling by goals, during which a separate goal is set as an assumption, and the goal of modeling becomes determining the optimal path to achieving the fixed goal.

Process modeling for goals NECP consists of with several stages:

1) formation of a number of assumptions common to all NECP scenarios, in particular regarding the main macroeconomic indicators, the future demographic situation, prices on external markets, the cost of technologies, the area of residential and non-residential premises, and the minimum or limit values of individual energy indicators;

2) distribution of all policies and measures described in the NECP between scenarios, as well as between scenario parameters and indicators; the main criteria for distribution between parameters and indicators:

a) parameters have a higher probability of occurrence of an impact that can be included in the NECP;

b) parameters not compete with others politicians and measures in within the framework one scenario;

3) formation scenarios as combinations assumptions and chosen ones parameters;

4) receiving the first results modeling;

5) consideration the first results modeling experts, and also their discussion through technical consultations or public discussions with various stakeholders;

6) taking into account the results of the discussions and expert assessment, and adjusting the scenarios and, if necessary, the objectives, policies and measures to conduct re-modeling and update the descriptive part of the NECP.

[166] https://www.nrel.gov/international/net-zero-world.html

Annex 2 to the Plan.

GHG emissions in agriculture and assumptions on key parameters of agricultural development

In agriculture, emissions of three greenhouse gases (methane (CH_4), nitrogen (I) oxide (N_2O) and carbon (IV) oxide (CO_2)) are considered, the emissions of which are caused by activities in two sectors - animal husbandry and crop production.

Livestock farming is characterized by two processes that are accompanied by the emission of mainly methane and, in relatively small quantities, nitrogen (I) oxide: intestinal (or enteric) fermentation of farm animals (mainly cattle); and the handling of farm animal manure.

Crop production has a more difficult organization and characterized by emission in all three greenhouse gases in the following processes:

- N_2O: application of nitrogen (mineral) fertilizers; application of organic fertilizers; application of organic fertilizers from grazing livestock; application of nitrogen (N) with crop residues; mineralization or immobilization of nitrogen (N) associated with the movement of organic matter in the soil; cultivation of organic soils; weathering of nitrogen (N); leaching of nitrogen (N);
- CH_4: growing rice;
- CO_2: urea introduction; liming of soils.

The key factors that determine the dynamics of greenhouse gas emissions in livestock farming are the livestock population and the manure management system, which collects, transports, stores and uses manure. The manure management system, as a separate factor, regulates greenhouse gas emissions both by the amount of manure entering it and by the type of system in which this manure is collected, transported, stored, and used. The following types of manure management systems are mainly used in the livestock industry of Ukraine: solid storage system; liquid manure storage system; storage system in open anaerobic lagoons; aerobic treatment system; composting; manure left on pasture, in pens, etc.

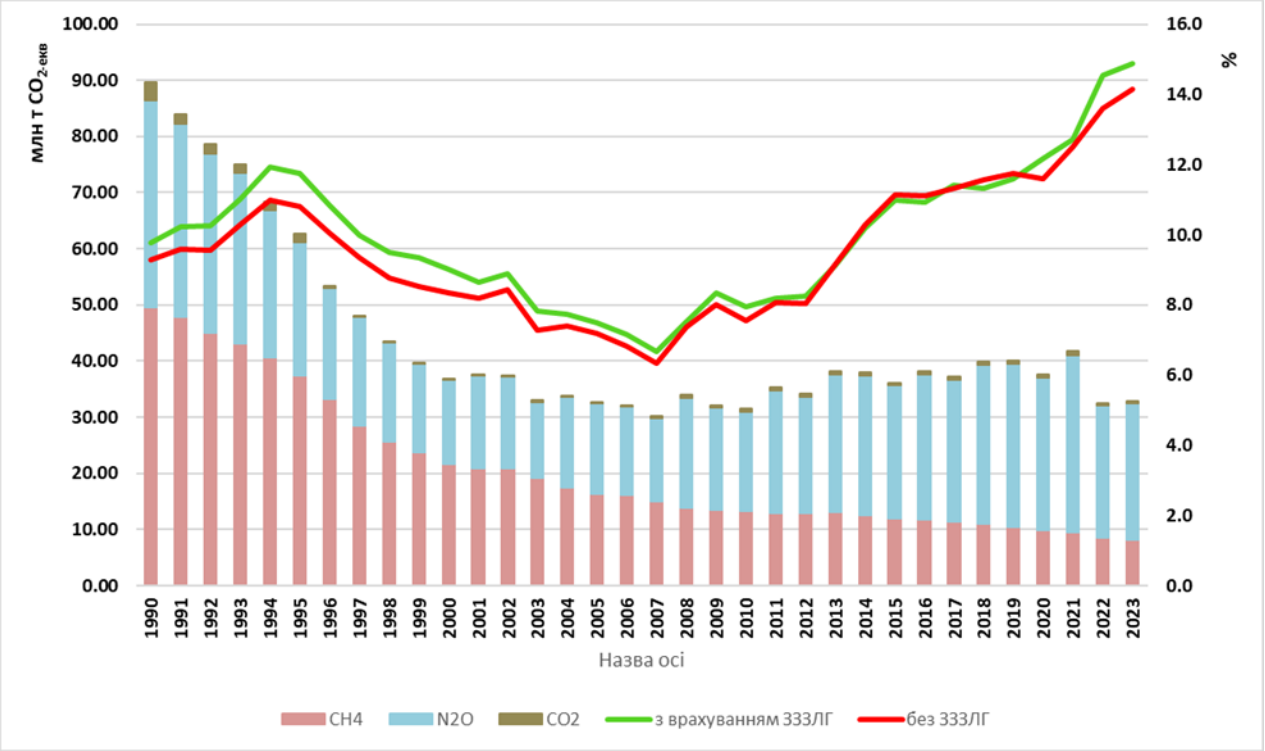
The crop sector in agriculture is multifaceted, and therefore it is impossible to identify general key factors that would determine the dynamics of greenhouse gas emissions in all or most processes - only special ones, namely:

introduction of nitrogenous (mineral) fertilizers	– amount of nitrogen (mineral) fertilizers applied to arable soils;
introduction of organic fertilizers	– amount of organic fertilizers applied to arable soils;
introduction of organic fertilizers from grazing livestock	– the amount of manure left on fields where farm animals graze ;
introduction of N from remnants of field crops	– the amount of N in crop residues (and consequently the amount of residues themselves) that remain in the fields after harvest and are plowed into the soil;
cultivation of organic soils	– area of organic soils allocated for field crops;
mineralization or immobilization of N associated with the movement of organic matter in the soil	– amount of N lost due to soil management (tillage, fertilizer application, plowing of crop residues, etc.);
weathering of N	– amount of N, contributed to soil from various sources;
leaching of N	– amount of N, contributed to soil from various sources;
growing rice	– area of agricultural soils, allocated under rice, and the amount of organic fertilizers applied;
introduction of urea	– amount of urea contributed to arable soils;
liming of soils	– amount of liming materials introduced.

Agriculture has a significant contribution to total greenhouse gas emissions in Ukraine, which during 1990-2023 fluctuated within the range of 7-15%. Despite the general trend towards a decrease in greenhouse gas emissions from agricultural activities, the contribution of agriculture to the economy to total emissions is gradually increasing (Fig. A2.1).

Fig. A2.1. GHG emissions from Agriculture (million t $CO_{2\text{-eq.}}$) and their contribution to total

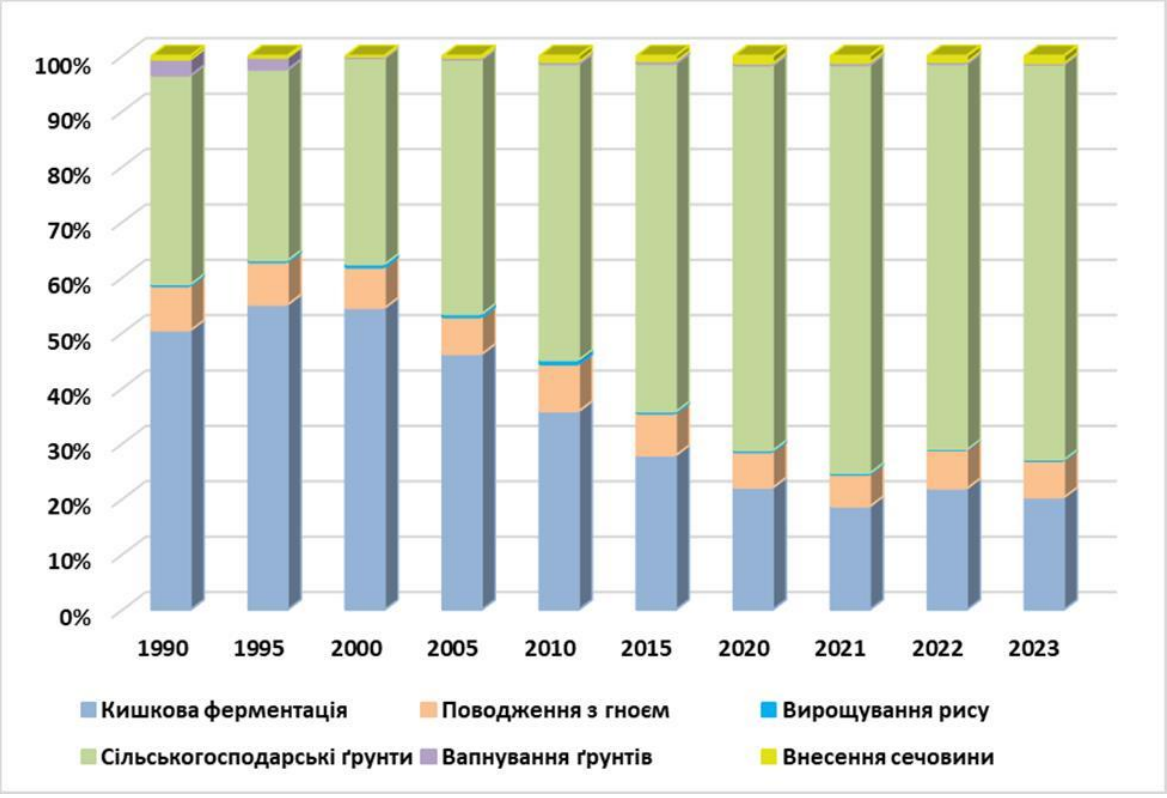
emissions (%) in Ukraine



The full-scale invasion of Ukraine by the Russian Federation, which began on February 24, 2022, has led to significant changes in the sector. In particular, there has been a reduction in the number of farm animals, a change in the ratio of manure management systems, a decrease in the amount of mineral and organic fertilizers applied, a decrease in the area of land occupied by field crops (both sown and harvested areas), a decrease in the volume of gross harvest, and accordingly, in productivity, etc. Such changes have led to a reduction in greenhouse gas emissions in 2022 by almost 22% compared to the previous year (Fig. A2.1).

Greenhouse gas emissions have been reduced in all sectors of agriculture, but the most "vulnerable" categories were "Rice cultivation" and "Agricultural soils" (Table A2.2). It should be noted separately that rice cultivation technology is a high-tech activity and is carried out in the south of Ukraine, and therefore suffered the most extensive (both direct and indirect) impact from hostilities.

Fig. A2.2. Dynamics of contribution of agricultural activities by GHG emission, %



For the purpose of continuity and imitation of the national greenhouse gas inventory for forecasting greenhouse gas emissions under the WEM scenario was applied IPCC 2006[167] methodology and coefficients used to estimate greenhouse gas emissions in the Agriculture sector in the National GHG Inventory of anthropogenic emissions from greenhouse gas sources and removals of greenhouse gases by sinks in Ukraine for 1990-2023.

The source of data on activities for the period 1990-2023 was the national greenhouse gas inventory database. The assessment of greenhouse gas emissions in 2030-2050 was carried out on the basis of assumptions regarding the main parameters of agricultural development (Table A.2.1).

Table A.2.1. Assumptions regarding the main parameters of agricultural development

Category	Units of measurement	2030	2040	2050
Total Cattle in Ukraine	thousand heads	2,984.65	3,305.36	3,508.01
Cattle in agricultural enterprises	thousand heads	1,112.58	1,246.08	1,345.77
Cows in agricultural enterprises	thousand heads	466.20	522.15	563.92
Cattle in household farms	thousand heads	1,872.07	2,059.28	2,162.24
Cows in household farms	thousand heads	1,263.12	1,389.43	1,458.90
Total sheep in Ukraine	thousand heads	801,757	841,845	858,682
Ewes and ewes 1 year and older in farms of all forms of ownership	thousand heads	545,781	573,070	584,532
Total pigs in Ukraine	thousand heads	6,125.37	6,272.92	6,301.64
Pigs in agricultural enterprises	thousand heads	3,858.03	4,050.93	4,212.97
Main sows in agricultural enterprises	thousand heads	242.46	254.58	264.76
Piglets from 2 to 4 months old in agricultural enterprises	thousand heads	1,106.48	1,161.80	1,208.28
Pigs being fattened in agricultural farms enterprises	thousand heads	1,449.46	1,521.93	1,582.81
Pigs in household farms	thousand heads	2,267.34	2,221.99	2,088.67
Basic sows in households	thousand heads	132.48	129.83	122.04
Piglets from 2 to 4 months in households	thousand heads	498.81	488.84	459.51
Pigs on fattening in households	thousand heads	735.67	720.95	677.70
Total horses in Ukraine	thousand heads	178.15	179.94	176.34
Total goats in Ukraine	thousand heads	521.24	526.46	521.19
Total buffaloes in Ukraine	thousand heads	0.30	0.32	0.35
Total rabbits in Ukraine	thousand heads	4,734.08	4,686.73	4,639.87
Total birds in Ukraine	thousand heads	221,003,700	222,549,760	222,878,400
Birds in agricultural enterprises	thousand heads	125,203.02	127,707.08	128,984.15
Chickens and roosters in agricultural enterprises	thousand heads	122,957.29	125,416.43	126,670.60
Geese in agricultural enterprises	thousand heads	50.45	48.94	48.45
Ducks in agricultural enterprises	thousand heads	268.15	260.10	257.50
Turkeys in agricultural enterprises	thousand heads	863.33	854.70	846.15
Birds in household farms	thousand heads	95,800.68	94,842.68	93,894.25
Chickens and roosters in household farms	thousand heads	79,736.86	78,939.50	78,150.10
Geese in household farms	thousand heads	3,812.65	3,774.53	3,736.78
Ducks in household farms	thousand heads	10,604.43	10,498.39	10,393.40
Turkeys in household farms	thousand heads	821.31	813.10	804.97
Milk yield from one cow in agricultural enterprises	kg/day head	17.50	18.00	18.20

[167] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Program, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan. – URL: https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4 . html

Milk yield from one cow in households	kg/day head	13.00	13.30	13.40
Amount of milk produced from one ewe per year in farms of all forms of ownership	kg/year head	139.0	141.0	143.0
Average shearing per head in all categories of farms	kg/year	3.09	3.17	3.20
Applied for field cultures (without rice *) expert data*	kg N/year	1,800 000 000.00	2,200 000 000.00	2,500 000 000.00
Applied for rice *data experts*	kg N/year	4 500 000.00	4 750 000.00	4 800 000.00
Annual amount used as urea fertilizer	t	698,423.3	733,344.5	770,011.7
Annual amount of applied limestone flour	t	308,700	324 135	340 341.7
General area of collected harvest in Ukraine	thousand ha	25,994.14	29,342.05	29,117.93
crops	thousand ha	13,941.13	15,767.11	15,612.15
wheat winter	thousand ha	6,238.32	7,043.41	6,973.66
wheat spring	thousand ha	161.87	183.60	181.73
corn on grain	thousand ha	4,709.10	5,345.34	5,290.46
barley winter	thousand ha	1,079.06	1,212.34	1,200.74
barley spring	thousand ha	1,225.45	1,381.38	1,367.85
rye winter	thousand ha	147.11	166.92	165.21
spring rye	thousand ha	0.85	0.97	0.96
triticale winter	thousand ha	7.00	7.91	7.87
triticale spring	thousand ha	0.85	0.97	0.96
oat	thousand ha	159.83	179.69	178.78
buckwheat	thousand ha	79.78	90.00	89.54
sorghum	thousand ha	41.22	45.92	45.70
millet	thousand ha	78.56	88.28	87.84
rice	thousand ha	8.63	16.46	16.94
Other grain crops, hybrids, mixtures of eared crops	thousand ha	3.49	3.94	3.92
legumes	thousand ha	293.92	328.77	327.15
bean	thousand ha	41.58	46.96	46.72
beans horse	thousand ha	1.62	1.83	1.82
chickpeas	thousand ha	7.17	8.11	8.06
lentil	thousand ha	4.62	5.21	5.18
pea	thousand ha	222.73	249.62	248.38
vetch winter	thousand ha	0.34	0.39	0.38
spring vetch	thousand ha	2.36	2.60	2.59
lupine sweet	thousand ha	2.90	3.28	3.26
lupine bitter	thousand ha	0.26	0.29	0.29
other leguminous crops	thousand ha	10.32	10.48	10.46
technical	thousand ha	8,172.34	9,206.76	9,159.79
soy	thousand ha	1,141.41	1,288.40	1,281.76
peanut	thousand ha	0.04	0.05	0.05
linen curly (oil)	thousand ha	34.61	37.76	37.60
long flax (on seed)	thousand ha	0.10	0.10	0.10
mustard	thousand ha	23.91	26.25	26.14
rapeseed winter	thousand ha	837.10	945.06	940.18
colza (rapeseed spring)	thousand ha	27.93	31.56	31.39
sesame	thousand ha	0.00	0.00	0.00
sunflower	thousand ha	5,887.93	6,630.24	6,596.50
castor oil	thousand ha	0.00	0.00	0.00
redhead	thousand ha	0.00	0.00	0.00
poppy oil	thousand ha	1.71	1.93	1.92

hemp Central Russian and southern (for seeds)	thousand ha	1.70	1.64	1.63
pumpkins (seed)	thousand ha	6.41	7.24	7.20
other oil crops	thousand ha	0.90	1.01	1.01
cotton	thousand ha	0.00	0.00	0.00
jute, kenaf and other textile bast fibres	thousand ha	0.00	0.00	0.00
long flax straw	thousand ha	0.40	0.39	0.38
hemp straw	thousand ha	0.30	0.29	0.29
other spinning crops	thousand ha	0.00	0.00	0.00
sugar beet factory	thousand ha	193.61	218.76	217.63
sugar beet	thousand ha	0.03	0.03	0.03
sugar beet seed	thousand ha	0.52	0.53	0.53
sugar cane	thousand ha	0.00	0.00	0.00
spices	thousand ha	2.73	3.09	3.07
essential oil crops	thousand ha	5.98	6.76	6.72
medicinal plants	thousand ha	3.25	3.67	3.65
plants with use mainly in perfumery, pharmaceuticals or as insecticides, fungicides, etc.	thousand ha	0.00	0.00	0.00
tobacco	thousand ha	0.85	0.97	0.96
shag	thousand ha	0.00	0.00	0.00
chicory	thousand ha	0.00	0.00	0.00
energy plants	thousand ha	0.94	1.06	1.06
other technical crops	thousand ha	0.00	0.00	0.00
root and tuber crops, vegetable and melon crops for open ground	thousand ha	1,597.76	1,798.96	1,789.81
potato	thousand ha	1,125.10	1,267.90	1,261.43
potato sweet	thousand ha	0.00	0.00	0.00
manioc	thousand ha	0.00	0.00	0.00
root vegetables and tubers edible with high in starch and inulin others	thousand ha	0.00	0.00	0.00
open and closed vegetable crops total	thousand ha	417.22	468.67	466.32
root vegetable crops	thousand ha	0.00	0.00	0.00
melon crops	thousand ha	55.01	61.89	61.58
seeds of annual vegetable crops	thousand ha	0.18	0.20	0.20
biennial vegetable seeds	thousand ha	0.09	0.10	0.10
seeds of perennial vegetable crops	thousand ha	0.09	0.10	0.10
seeds of melon crops for food	thousand ha	0.09	0.10	0.10
feed	thousand ha	1,988.99	2,240.44	2,229.03
fodder root crops	thousand ha	151.50	171.03	170.15
fodder sugar beet	thousand ha	0.68	0.77	0.77
beet fodder (chard), rutabaga	thousand ha	0.00	0.00	0.00
root vegetables feed others	thousand ha	0.00	0.00	0.00
fodder melon crops	thousand ha	43.81	49.49	49.24
fodder corn	thousand ha	189.10	213.18	212.09
herbs annuals on the hay	thousand ha	172.78	194.06	193.09
herbs annuals on feed green, haylage, silage, grass meal	thousand ha	81.43	91.30	90.85
herbs perennial on hay	thousand ha	606.28	683.49	679.99
herbs perennial on feed green, haylage, silage, grass meal + perennial grasses for grazing	thousand ha	120.47	135.80	135.11
haymakers on hay	thousand ha	595.87	671.06	667.64
haymakers on feed green, soilage, silage, grass meal	thousand ha	5.80	6.54	6.51
pastures cultivated on hay	thousand ha	4.95	5.60	5.57
pastures cultivated on feed green, hay, silage, grass meal	thousand ha	7.24	8.08	8.04
cultures feed others	thousand ha	1.34	1.36	1.36

seed beetroot feed	thousand ha	0.17	0.18	0.18
seed cultures feed melons	thousand ha	0.34	0.39	0.38
seed herbs annuals	thousand ha	1.71	1.93	1.92
seed herbs perennial	thousand ha	5.41	6.09	6.06
seed cultures feed others	thousand ha	0.09	0.10	0.10
root vegetables feed uterine	thousand ha	0.00	0.00	0.00
Organic agriculture	thousand ha	1,240	1,310	1,365
Increase productivity	%	State Statistics Service data by - - 2021	5% of the indicators by - 2030	5% of the indicators by - 2040
Annual area arable/drained organic soils (data from the State Water Agency)	ha	471,602,000	470,000	470,000

To model greenhouse gas emissions under the WAM scenario, key indicators of planned measures, as well as trends and objectives of sustainable agricultural development, were used. Based on them and taking into account the potential for their implementation, a forecast was made regarding the volume of greenhouse gas emission reductions in the relevant categories of agricultural activity and applied to the basic model of the development of the "Agriculture" sector (WEM scenario). Results of GHG emission assessment and their forecast according to the WEM scenario given in tables A.2.2. Implementation of measures, predicted by the WAM scenario lead to emission reductions as CH_4 and N_2O (Table A.2.3).

Table A.2.2. Greenhouse gas emissions in the Agriculture sector and their forecast under the WEM scenario, thousand tons

Category	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CH_4 emissions	1 769.7	1 709.6	1 611.0	1 539.4	1 451.0	1 333.3	1 188.3	1 016.9	913.9	850.7
including:										
Intestinal fermentation	1 615.4	1 563.6	1 483.4	1 423.9	1 349.4	1 232.3	1 099.3	945.2	848.4	786.9
big horned cattle	*1 509.3*	*1 464.1*	*1 390.6*	*1 336.2*	*1 268.7*	*1 161.8*	*1 039.3*	*894.2*	*802.1*	*742.3*
pigs	*29.5*	*27.9*	*25.5*	*23.6*	*21.9*	*20.3*	*18.3*	*15.5*	*14.7*	*15.1*
horses	*13.4*	*13.1*	*12.8*	*12.8*	*13.1*	*13.4*	*13.6*	*13.4*	*13.1*	*12.8*
goats	*2.5*	*2.7*	*3.0*	*3.5*	*3.8*	*4.2*	*4.4*	*4.2*	*4.1*	*4.1*
sheep	*56.0*	*51.0*	*46.5*	*42.7*	*36.7*	*27.6*	*19.2*	*13.6*	*10.2*	*8.4*
others animals	*4.7*	*4.8*	*4.9*	*5.2*	*5.1*	*4.9*	*4.6*	*4.2*	*4.2*	*4.2*
Handling with manure	145.7	138.8	120.1	108.5	94.9	94.4	82.1	65.1	59.3	57.3
big horned cattle	*89.2*	*86.9*	*75.0*	*69.5*	*61.2*	*51.4*	*44.3*	*32.5*	*29.1*	*26.7*
pigs	*39.3*	*35.3*	*29.5*	*24.8*	*21.0*	*31.8*	*27.8*	*23.5*	*21.3*	*21.8*
horses	*1.2*	*1.1*	*1.1*	*1.1*	*1.1*	*1.2*	*1.2*	*1.2*	*1.1*	*1.1*
goats	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
sheep	*1.5*	*1.4*	*1.3*	*1.2*	*1.0*	*0.8*	*0.5*	*0.4*	*0.3*	*0.2*
bird	*13.5*	*13.2*	*12.3*	*10.8*	*9.4*	*8.3*	*7.4*	*6.7*	*6.7*	*6.8*
others animals	*0.9*	*0.9*	*0.9*	*0.9*	*0.9*	*0.9*	*0.8*	*0.7*	*0.7*	*0.6*
Growing rice	8.7	7.1	7.4	7.1	6.7	6.6	6.9	6.7	6.2	6.5
N2O emissions	139.3	129.5	119.8	114.5	99.0	89.7	74.6	73.0	67.0	59.4
in ago including:										
Handling with manure	11.7	11.1	10.2	9.7	9.3	8.2	7.1	5.7	5.3	5.2
straight emissions	*6.5*	*6.2*	*5.7*	*5.5*	*5.3*	*4.7*	*4.1*	*3.3*	*3.0*	*3.0*
indirect emissions	*5.2*	*4.9*	*4.5*	*4.2*	*4.0*	*3.5*	*3.0*	*2.4*	*2.2*	*2.2*
Agricultural soils	127.6	118.4	109.6	104.8	89.7	81.4	67.5	67.3	61.7	54.2
introduction nitrogenous fertilizers	*28.9*	*24.6*	*20.3*	*15.9*	*12.6*	*9.2*	*5.8*	*6.5*	*6.4*	*5.1*
introduction organic fertilizers	*8.5*	*8.3*	*7.7*	*7.4*	*7.2*	*6.4*	*5.6*	*4.6*	*4.3*	*4.2*
urine and manure on fields / in squads	*10.8*	*10.3*	*10.0*	*10.0*	*9.8*	*8.8*	*8.0*	*6.9*	*6.4*	*6.1*

vegetable remains	*46.3*	*44.1*	*42.8*	*44.0*	*36.0*	*34.8*	*29.0*	*30.4*	*26.8*	*22.5*
mineralization/immobilization soil carbon	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
cultivation organic soils	*6.0*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*
indirect emissions	*27.2*	*25.0*	*22.8*	*21.3*	*18.1*	*16.0*	*12.9*	*12.8*	*11.7*	*10.1*
CO2 emissions	3 161.0	1 850.8	1 763.1	1 675.4	1 607.1	1 538.9	418.7	209.0	208.1	175.6
in ago including:										
Liming soils	2 592.1	1 351.3	1 351.3	1 351.3	1 351.3	1 351.3	299.2	76.4	77.8	70.6
Application urea	568.9	499.5	411.8	324.1	255.9	187.7	119.5	132.6	130.3	104.9

Category	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
CH_4 emissions	775.7	746.7	745.8	688.2	621.1	585.5	573.8	537.2	498.6	483.3
in ago including:										
Intestinal fermentation	717.3	693.4	689.8	634.4	573.1	538.4	515.5	477.5	441.4	422.1
big horned cattle	*675.4*	*652.7*	*647.6*	*594.1*	*536.2*	*502.9*	*479.5*	*441.6*	*406.7*	*386.9*
pigs	*13.3*	*12.0*	*13.2*	*12.4*	*10.3*	*10.1*	*11.3*	*11.3*	*10.2*	*10.6*
horses	*12.6*	*12.6*	*12.4*	*11.9*	*11.1*	*10.3*	*9.8*	*9.3*	*8.7*	*8.2*
goats	*4.3*	*4.8*	*5.1*	*5.0*	*4.6*	*4.1*	*3.6*	*3.3*	*3.2*	*3.2*
sheep	*7.5*	*7.2*	*7.1*	*6.8*	*7.0*	*6.9*	*7.3*	*8.1*	*8.7*	*9.2*
others animals	*4.1*	*4.2*	*4.4*	*4.3*	*3.9*	*4.0*	*4.0*	*3.9*	*3.9*	*4.1*
Manure management	50.9	47.6	50.4	47.1	41.7	40.8	51.9	53.5	51.3	53.9
big horned cattle	*23.9*	*22.8*	*22.2*	*20.2*	*18.2*	*16.1*	*15.4*	*14.3*	*13.2*	*12.6*
pigs	*18.4*	*16.0*	*18.6*	*17.4*	*13.9*	*14.7*	*26.1*	*28.7*	*27.3*	*30.0*
horses	*1.1*	*1.1*	*1.1*	*1.0*	*1.0*	*0.9*	*0.8*	*0.8*	*0.8*	*0.7*
goats	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
sheep	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*
bird	*6.6*	*6.9*	*7.5*	*7.6*	*7.7*	*8.2*	*8.5*	*8.7*	*9.0*	*9.6*
others animals	*0.6*	*0.6*	*0.6*	*0.6*	*0.6*	*0.6*	*0.6*	*0.7*	*0.7*	*0.7*
Growing rice	7.5	5.6	5.6	6.6	6.3	6.3	6.4	6.3	5.9	7.3
N2O emissions	56.6	62.4	61.7	50.8	61.1	60.6	59.8	55.7	73.5	68.7
including:										
Manure management	4.8	4.6	4.8	4.5	4.1	3.9	4.0	3.8	3.6	3.7
direct emissions	*2.8*	*2.7*	*2.8*	*2.6*	*2.3*	*2.2*	*2.2*	*2.1*	*2.0*	*2.0*
indirect emissions	*2.0*	*1.9*	*2.0*	*1.9*	*1.7*	*1.7*	*1.7*	*1.7*	*1.6*	*1.7*
Agricultural soils	51.8	57.8	56.9	46.2	57.1	56.6	55.8	51.9	70.0	65.0
Application of nitrogenous fertilizers	*3.5*	*5.0*	*4.9*	*4.2*	*5.7*	*5.9*	*7.3*	*9.1*	*11.5*	*9.9*
Application of organic fertilizers	*3.9*	*3.8*	*3.9*	*3.7*	*3.3*	*3.2*	*3.2*	*3.1*	*2.9*	*3.0*
urine and manure on fields / in squads	*5.8*	*5.7*	*5.7*	*5.4*	*5.0*	*4.7*	*4.4*	*4.1*	*3.9*	*3.8*
vegetable remains	*22.2*	*22.4*	*21.6*	*18.3*	*21.6*	*20.9*	*21.0*	*18.4*	*24.2*	*22.8*
mineralization/immobilization of soil carbon	*0.8*	*4.1*	*4.1*	*0.0*	*4.7*	*5.2*	*3.2*	*1.1*	*7.7*	*6.8*
cultivation of organic soils	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*
indirect emissions	*9.5*	*10.7*	*10.6*	*8.5*	*10.6*	*10.5*	*10.5*	*10.0*	*13.6*	*12.5*
CO2 emissions	134.9	173.2	170.7	240.5	119.2	211.2	269.9	333.7	480.1	326.9
including:										
Liming of soils	63.5	71.5	53.8	49.4	83.3	90.9	106.0	112.3	125.0	151.9
Application of urea	71.5	101.7	116.9	191.1	35.8	120.3	163.9	221.3	355.2	175.0

Category	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**

CH_4 emissions	472.1	459.5	463.3	469.5	451.3	427.8	417.7	407.0	393.0	373.7
including:										
Intestinal fermentation	403.5	390.3	395.0	397.9	382.4	360.1	351.7	343.5	331.5	314.0
big horned cattle	*367.5*	*355.0*	*360.3*	*363.3*	*348.8*	*328.1*	*320.9*	*313.8*	*302.9*	*286.6*
pigs	*11.7*	*11.5*	*11.2*	*11.6*	*11.6*	*11.2*	*10.7*	*10.0*	*9.5*	*9.2*
horses	*7.7*	*7.3*	*7.0*	*6.6*	*6.1*	*5.7*	*5.5*	*5.1*	*4.7*	*4.3*
goats	*3.2*	*3.2*	*3.3*	*3.3*	*3.2*	*3.1*	*3.2*	*3.2*	*3.1*	*3.0*
sheep	*9.4*	*9.3*	*9.0*	*8.8*	*8.4*	*7.9*	*7.5*	*7.5*	*7.5*	*7.1*
others animals	*4.1*	*4.1*	*4.2*	*4.3*	*4.2*	*4.0*	*4.0*	*3.9*	*3.9*	*3.8*
Manure management	59.9	60.4	60.6	64.4	65.9	64.2	62.4	59.7	57.8	56.5
big horned cattle	*12.1*	*11.8*	*12.0*	*12.1*	*11.8*	*11.2*	*11.0*	*10.8*	*10.6*	*10.1*
pigs	*35.8*	*36.5*	*36.3*	*39.3*	*40.9*	*40.0*	*38.8*	*36.4*	*34.4*	*33.2*
horses	*0.7*	*0.6*	*0.6*	*0.6*	*0.5*	*0.5*	*0.5*	*0.4*	*0.4*	*0.4*
goats	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
sheep	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*
bird	*10.2*	*10.5*	*10.7*	*11.4*	*11.7*	*11.5*	*11.2*	*11.1*	*11.5*	*11.9*
others animals	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*	*0.6*	*0.6*	*0.7*	*0.7*	*0.7*
Growing rice	8.7	8.8	7.7	7.2	3.0	3.5	3.6	3.8	3.7	3.1
N2O emissions	67.3	82.6	78.3	92.1	93.5	89.4	97.8	95.3	106.6	109.3
including:										
Manure management	3.8	3.7	3.7	3.8	3.8	3.6	3.5	3.4	3.5	3.3
direct emissions	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*1.9*	*1.8*	*1.8*	*1.8*	*1.7*
indirect emissions	*1.7*	*1.7*	*1.7*	*1.8*	*1.8*	*1.7*	*1.7*	*1.6*	*1.6*	*1.6*
Agricultural soils	63.6	78.9	74.5	88.2	89.7	85.8	94.3	91.9	103.2	106.0
introduction of nitrogenous fertilizers	*12.1*	*14.1*	*14.6*	*16.3*	*16.5*	*15.9*	*19.3*	*21.9*	*24.9*	*25.6*
introduction of organic fertilizers	*3.0*	*3.0*	*3.0*	*3.1*	*3.0*	*2.9*	*2.8*	*2.7*	*2.8*	*2.7*
urine and manure on fields / in squads	*3.7*	*3.6*	*3.7*	*3.7*	*3.6*	*3.5*	*3.4*	*3.3*	*3.6*	*3.4*
vegetable remains	*22.6*	*28.0*	*26.5*	*31.3*	*31.6*	*30.1*	*32.9*	*30.9*	*34.7*	*35.2*
mineralization/immobilization soil carbon	*3.5*	*8.5*	*5.8*	*10.3*	*11.1*	*10.3*	*11.0*	*8.2*	*10.0*	*11.3*
cultivation organic soils	*6.1*	*6.1*	*6.1*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*6.0*	*5.9*
indirect emissions	*12.5*	*15.6*	*14.8*	*17.6*	*17.9*	*17.0*	*19.0*	*18.8*	*21.3*	*21.9*
CO2 emissions	462.2	518.7	531.8	580.6	530.3	514.8	540.3	604.0	601.1	595.4
including:										
Liming of soils	127.5	127.2	161.7	182.3	156.3	169.8	140.1	168.6	163.7	141.4
Application of urea	334.7	391.5	370.1	398.3	374.0	345.0	400.2	435.4	437.3	454.0

Category	**2020**	**2021**	**2022**	**2023**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
CH_4 emissions	356.2	337.6	307.4	291.6	317.8	342.2	358.9	374.8	384.4	394.6
including:										
Intestinal fermentation	296.8	278.2	254.2	238.6	261.0	282.1	297.4	312.1	321.0	330.3
big horned cattle	*270.4*	*252.6*	*230.3*	*216.0*	*238.0*	*256.9*	*271.9*	*286.3*	*295.1*	*304.5*
pigs	*9.1*	*9.0*	*8.4*	*8.1*	*8.3*	*9.2*	*9.3*	*9.4*	*9.4*	*9.5*
horses	*3.9*	*3.5*	*3.2*	*2.8*	*2.9*	*3.2*	*3.2*	*3.2*	*3.2*	*3.2*
goats	*2.9*	*2.7*	*2.5*	*2.4*	*2.4*	*2.6*	*2.6*	*2.6*	*2.6*	*2.6*
sheep	*6.8*	*6.7*	*6.3*	*6.0*	*6.0*	*6.6*	*6.8*	*7.0*	*7.1*	*7.1*
others animals	*3.7*	*3.6*	*3.5*	*3.3*	*3.4*	*3.6*	*3.6*	*3.5*	*3.5*	*3.5*
Manure management	56.1	56.4	52.8	51.3	54.9	57.1	58.3	59.5	60.2	61.0

big horned cattle	*9.6*	*9.1*	*8.5*	*8.0*	*9.0*	*9.8*	*10.3*	*10.8*	*11.1*	*11.5*
pigs	*33.7*	*35.1*	*32.5*	*31.8*	*34.2*	*34.8*	*35.5*	*36.2*	*36.6*	*37.0*
horses	*0.3*	*0.3*	*0.3*	*0.2*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*
goats	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
sheep	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*
bird	*11.6*	*11.0*	*10.7*	*10.4*	*10.6*	*11.3*	*11.3*	*11.4*	*11.4*	*11.3*
others animals	*0.7*	*0.6*	*0.6*	*0.5*	*0.6*	*0.6*	*0.6*	*0.6*	*0.6*	*0.6*
Growing rice	3.3	3.0	0.4	1.7	1.9	3.0	3.1	3.1	3.2	3.3
N2O emissions	102.1	119.2	88.4	91.6	104.5	115.4	124.5	131.9	137.2	140.4
including:										
Manure management	3.2	3.1	2.9	2.8	3.0	3.2	3.2	3.3	3.4	3.4
direct emissions	*1.7*	*1.6*	*1.5*	*1.5*	*1.5*	*1.6*	*1.7*	*1.7*	*1.8*	*1.8*
indirect emissions	*1.5*	*1.5*	*1.4*	*1.4*	*1.4*	*1.5*	*1.6*	*1.6*	*1.6*	*1.6*
Agricultural soils	98.9	116.1	85.5	88.8	101.5	112.2	121.3	128.6	133.8	137.0
introduction of nitrogenous fertilizers	*30.6*	*31.4*	*22.1*	*19.8*	*21.8*	*28.3*	*31.5*	*34.6*	*37.0*	*39.3*
introduction of organic fertilizers	*2.6*	*2.5*	*2.3*	*2.3*	*2.4*	*2.5*	*2.6*	*2.6*	*2.7*	*2.7*
urine and manure on fields / in squads	*3.3*	*3.1*	*2.9*	*2.8*	*3.1*	*3.3*	*3.4*	*3.6*	*3.7*	*3.7*
vegetable remains	*31.2*	*37.6*	*28.3*	*30.0*	*32.4*	*33.5*	*37.2*	*39.4*	*40.9*	*40.8*
mineralization/immobilization soil carbon	*4.2*	*11.2*	*6.3*	*10.0*	*15.4*	*15.4*	*15.4*	*15.4*	*15.4*	*15.4*
cultivation of organic soils	*5.9*	*5.9*	*5.9*	*5.9*	*5.9*	*5.9*	*5.9*	*5.9*	*5.9*	*5.9*
indirect emissions	*21.1*	*24.4*	*17.6*	*17.9*	*20.5*	*23.3*	*25.4*	*27.1*	*28.3*	*29.2*
CO2 emissions	643.3	688.4	466.6	512.8	528.4	627.6	643.3	659.0	675.5	692.0
including:										
Liming of soils	131.3	176.2	110.0	65.9	72.5	115.5	118.3	121.2	124.3	127.3
Application of urea	512.0	512.2	356.6	446.9	455.8	512.2	525.0	537.8	551.2	564.7

Table A.2.3. Greenhouse gas emissions in the Agriculture sector and their forecast under the WAM scenario

Category	2025	2030	2035	2040	2045	2050
million t CO_{2-eq}						
Promoting the development of organic crop production	**0.013**	**0.032**	**0.083**	**0.222**	**0.159**	**0.127**
Climate- smart Agriculture	**0.005**	**0.070**	**0.106**	**0.241**	**0.343**	**0.669**
Improvement of manure management systems and biogas production	**0.011**	**0.031**	**0.050**	**0.061**	**0.073**	**0.089**
Total	***0.028***	***0.134***	***0.239***	***0.525***	***0.575***	***0.886***
t CH_4						
Promoting the development of organic crop production	-	-	-	-	-	-
Climate- smart Agriculture	**34.6**	**668.5**	**1 385.9**	**4 321.5**	**7 552.0**	**18 294.2**
Improvement of manure management systems and biogas production	**288.6**	**928.7**	**1 358.4**	**1 678.2**	**2 005.6**	**2 518.4**
Total	***323.3***	***1 597.2***	***2 744.3***	***5 999.7***	***9 557.6***	***20 812.5***
t N2O						
Promoting the development of organic crop production	**47.9**	**119.8**	**311.5**	**838.7**	**599.1**	**479.2**
Climate- smart Agriculture	**14.6**	**195.2**	**254.8**	**453.8**	**497.7**	**592.0**
Improvement of manure management systems and biogas production	**9.6**	**20.6**	**45.6**	**54.7**	**63.0**	**71.5**
Total	***72.2***	***335.6***	***611.8***	***1 347.2***	***1 159.8***	***1 142.8***

Annex 3 to the Plan.

Methodology modeling development energy systems Ukraine in models TIMES-Ukraine

Model TIMES-Ukraine — linear optimization energy system model (like "from below" up"), which describes in detail all energy flows in Ukraine [177][168] .

In the TIMES-Ukraine model, the energy system of Ukraine is divided into seven sectors (Fig. A3.1), which includes all energy flows from the extraction of primary energy resources to their final consumption with intermediate stages of transformation (processing, production of secondary energy resources, etc.), import, export and transportation. This corresponds to the methodological approach of the State Statistics Service, which in turn is harmonized with the relevant methodologies of the European Commission (Eurostat) and the International Energy Agency (IEA).

TIMES-type models contain a significant number of technologies in different sectors of the energy system, which provides information on different types of energy, technologies, etc. Currently, the TIMES-Ukraine model contains almost 2,000 technologies, both existing in Ukraine and those that exist on international markets and can be implemented in Ukraine. The data source for cost and technical characteristics is materials IEA, Danish Energy Agency (DEA), National the US National Renewable Energy Laboratory (NREL), specialized associations in Ukraine, scientific institutes, and energy companies.

The TIMES-Ukraine model complies with the methodological recommendations of the Framework Convention Secretariat UN Climate Change on the development of energy and environmental projections[169] . A recent model is capable of achieving net-zero greenhouse gas emissions across the economy, which has been highlighted in a number of peer-reviewed publications[170,171,172].

[168] Podolets R.Z., Dyachuk O.A. Strategic planning in fuel and energy complex on base model "TIMES-Ukraine": scientific assistant of the NAS of Ukraine; Inst. of Economics and Forecasting – Kyiv, 2011. – 150 p.

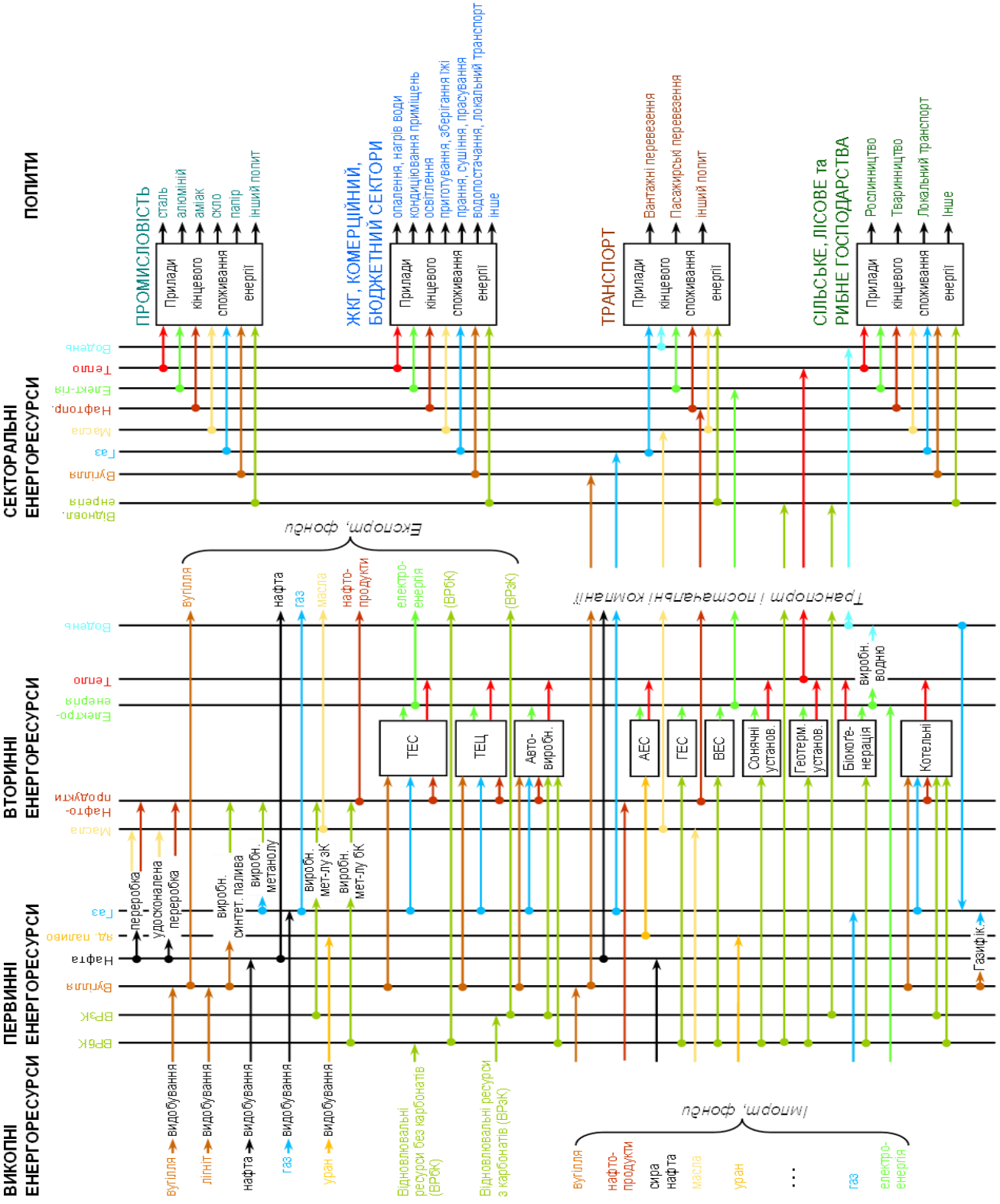
[169] The UNFCCC Resources Guide for preparing the National Communications of No. n-Annex i Parties. Module 4: Measures to mitigate climate change // United Nations Framework Convention on Climate Change, https://unfccc.int/resource/docs/publications/08_resource_guide4.pdf

[170] Roman Podolets, Oleksandr Diachuk, Andrii Semeniuk, Bohdan Serebrennikov, Galyna Trypolska, Roman Yuhymets, Olha Yevstihnieieva. Rebuilding Ukraine with a resilient, carbon neutral energy system // United Nations Eco№mic Commission for Europe, 2023 https://unece.org/sites/default/files/2023- 07/EN_Rebuilding%20Ukraine%20with%20a%20Resilient%20Carbon-Neutral%20Energy%20System_V8.pdf

[171] Maksym Chepeliev, Oleksandr Diachuk, Roman Podolets, and Andrii Semeniuk. What is the future of nuclear power in Ukraine? The role of war, tech-economic drivers, and safety considerations // Energy Policy, Volume 178, July 2023. - https://doi.org/10.1016/j.enpol.2023.113612

[172] Maxim Chepeliev, Oleksandr Diachuk, Roman Podolets, Andrii Semeniuk (2023), Can Ukraine go "green" on the post-war recovery path? // Joule, https://doi.org/10.1016/j.joule.2023.02.007

Fig. A3.1. Basic structure of the energy system in the TIMES-Ukraine model



The TIMES-Ukraine model database is filled with economic and energy data for 2005-2020, as well as estimates relevant data for 2022, taking into account their changes in future. The main sources of the database are statistical observations of the State Statistics Service, the National Bank of Ukraine, data from Ukrainian ministries and departments, housing and communal services, energy generating and energy supply companies, specialized associations, scientific institutions, etc. In addition, data from international organizations (IEA, IAEA, OECD, IMF, World Bank, UN, etc.) are used in the forecasting of energy and economic development.

Energy system models, such as TIMES-Ukraine, are commonly used for long-term analysis of energy system development paths around the world, including those widely used in the European Union at both the pan-European and national levels. By varying assumptions about useful energy demand, technologies, prices or other external variables, numerous scenarios can be created and analyzed, including scenarios for decarbonizing the building sector. First, a scenario (or set of scenarios) is developed without implementing

relevant measures (Baseline, Business As Usual scenario), and in the next step, policy scenarios (e.g., policies for increasing energy efficiency, developing renewable energy sources (RES) or reducing GHGs, decarbonization) are developed by imposing additional constraints or targets on the energy system (or its component, such as the building sector) to assess the impact (effect) of implementing the policies under study. The result of the modeling is an assessment of the least costly solutions for the entire energy system under given conditions and constraints.

The TIMES-Ukraine model was used to prepare a number of strategic documents approved by the Government of Ukraine in 2016-2021, in particular: National Energy Efficiency Action Plans for 2020 and 2019-2030; Ukraine's Expected Nationally Determined Contribution to the Paris Agreement and its updated version; Strategy for Low-Carbon Development of Ukraine until 2050, Strategy for Thermal Modernization of Buildings of Ukraine until 2050, etc.

In recent years, the Institute of Economics and Forecasting of the NAS of Ukraine has been applying and developing this model in cooperation with US national laboratories, in particular with the Pacific Northwest National Laboratory (Pacific Northwest National Laboratory), the National Renewable Energy Laboratory (National Renewable Energy Laboratory, NREL), Argonne National Laboratory and Lawrence Berkeley National Laboratory as part of the initiative Net Zero World. In December 2023 at COP28 in Dubai as part of the Ukrainian pavilion program, the results of modeling the post-war low-carbon development of the Ukrainian energy sector were presented[173], which were also presented in the form of a report[174]. Also, a joint study was recently conducted with the DIXI group, REKK, Austrian Institute of Technology, and Regulatory Assistance Project on long-term decarbonization paths for the Ukrainian electricity sector, where the TIMES-Ukraine model was used in combination with the EPMM and Green-X models[175].

Table A.3.1. Short list of promising technologies for the production of electricity and heat

Technologies	*Capital expenditures (CAPEX), €/kWe*										
	2020	2025	2030	2035	2040	2045	2050	*Efficiency (electric), %*	*CF, %*	*Expiry term, years*	*Coefficiof heat*
Thermal power plants (TPP) and Combined heat and power plants (CHP)											
Nuclear power plant											
New large power units	4400							33	88	60	0.03
Extending the service life of existing power units	254							33	80	30	0.04
New small modular reactors	4400							33	90	80	0.04
Nuclear high-temperature reactor with production of hydrogen	7650- 6885							33	94	60	0.1- 0.12
Gas (natural/biomethane/synthetic methane)											
Gas turbine combined cycle	1000							60	50	35	0.15
Gas turbine open cycle	600							40	50	30	0.15
Gas piston engine fast start (maneuverable power)	1000							50	75[176]	35	–
Gas turbine combined cycle + Carbon capture	2450							51	50	35	0.05
Gas turbine open cycle + Carbon capture	2050							34	50	30	0.05
CHP combined cycle	800							50	50	35	0.84
CHP open cycle	920							45	50	35	0.95
Extending the operating life of existing CHPs	280- 650							19- 43	50	15	1.1- 3.0
CHP combined cycle + carbon capture	2250							45	50	35	0.84
Bioenergy											
TPP on woody biomass	2800	2750	2700	2650	2600	2550	2500	24	50	30	–
TPP on burned household waste	2900	2850	2800	2750	2700	2650	2600	23	50	30	0.3
Biogas TPP	3200	3200	3200	3200	3200	3200	3200	42	50	30	–

[173] https://cop.climateoffice.org.ua/deep-dive-into-modeling-for-net-zero-world-and-ukraines-national-energy-and-climate-plan/

[174] Clean Energy Roadmap: From Reconstruction to Decarbonization in Ukraine. http://ief.org.ua/wp-content/uploads/2023/11/NZW-IEF-TIMES-Ukraine-Description_and_Assumption.pdf

[175] https://dixigroup.org/en/analytic/long-term-decarbonisation-pathways-for-ukraines-power-sector/

[176] https://www.nerc.gov.ua/news/oprilyudnyuyutsya-propoziciyi-shchodo-viznachennya-granichnoyi-cini-zakupivli- poslugi-iz-zabezpechennya-rozvitku-generuyuchoyi-potuzhnosti

TPP on woody biomass + Carbon capture	3650							24	50	30	–	
Biogas TPP + Carbon capture	5350							42	50	30	–	
TPP on energy plants + Carbon capture	3750							24	50	30	–	
Reconstruction of existing CHP for use of biomass from waste	1918							23	21-60	20	0.7- 5.3	
CHP on woody biomass	3400	2850	2800	2750	2700	2650	2600	23	50	35	2.0	
CHP on biomass with waste	3400	2950	2850	2850	2900	2750	2700	23	50	35	1.9	
CHP on energy plants	3400	3150	3100	3050	3000	2950	2900	23	50	35	2.0	
CHP on woody biomass + Carbon capture	4450							20	50	35	1.5	
CHP on energy plants + Carbon capture	4450							20	50	35	1.5	
Wind farms (wind power plant)												
Wind farms terrestrial basing	1100	1075	1050	1000	950	900	850	–	32	30	–	
Wind farms marine basing	2120	1960	1800	1700	1680	1660	1640	–	42	30	–	
Solar power plants (SES)												
Industrial solar power plants without tracker	560	470	380	350	320	305	290	–	12.5	25	–	
Industrial solar power plants with tracker	650	550	450	415	380	365	350	–	14.5	25	–	
Rooftop solar power plants	900	580	510	480	445	430	410	–	13.5	25	–	
Geothermal power plants (GeoES)												
Geothermal power plant	4300- 3600							–	35-55	25	–	

Hydropower plants (HPP)												
Small hydroelectric power plants	3250- 3080							–	30	40	–	
Large hydroelectric power plants	3300- 3100							–	33-36	60		
PSPP	1715							–	26	60	–	
Settings storage energy (BESS)												
Electric batteries, euro/(kW + 4 kWh)	1042	832	622	508	394	324	255	92	17	25	–	
Underground storage hydrogen, euro/GJ·year	980	750	700	650	600	550	500	100	100	30	–	
Tanker storage hydrogen, big volumes, euro/GJ·year	4600	3600	3400	3200	3000	2800	2500	100	100	22	–	
Tanker storage hydrogen, small volumes, euro/GJ·year	2650	2075	1900	1800	1700	1600	1500	100	100	22		
Fuel cells (Hydrogen)												
TPP and CHP on fuel cells	2530	1125	1125	844				50	60	10	0.64	
Thermal power plants (Boiler rooms)												
Gas boiler house (with possibility of bio- or synthetic methane)	300							92	50	40	–	
Boiler house on woody biomass	145	142	140	138	136			85	50	35	–	
Boiler house on biomass with industrial waste	350	320	300	280	270	260	250	80	50	35	–	
Boiler house on aerothermal energy	1100							250	50	25	–	
Hydrogen boiler house	390							64	50	35	–	
Others important technology												
Direct air carbon capture (DAC)	2.32	2.05	1.86	1.8	1.7	1.6	1.5	0.014-0.007 PJ/kt CO_2	90	25	–	
Metanation	600	500	450	400	350	300	250	75- 83 (H_2)	95	25	–	
Direct reduced iron with hydrogen (DRI)	360	355	350	345	340	333	324	17 PJ H_2/mt	85	40	–	
Low-carbon production of iron ore concentrate	96							64- 75	1	30	–	
Electrolyzer alkaline	650	500	450	375	300	275	250	67- 75	97	25- 35	–	
Electrolyzer with proton exchange membrane (PEM)	925	800	650	550	450	425	400	58- 71	97	20- 30	–	
Electrolyzer with solid oxide cell (SOEC)	4500	3200	1900	1620	1340	1060	780	77.5-83.5	91	10- 20	–	
Steam reforming methane, large plant			10.6					77	90	20	–	
Steam reforming methane, small plant			22					69	80	20	–	
Solar steam reforming methane, large plant			9.8					120	90	20	–	

Solar steam reforming methane, small plant			27		60	90	20	–	
Gasification biomass in hydrogen, large plant			63.4	47.6	50	90	20	–	
Gasification biomass in hydrogen, small plant			111	95	33	71	20	–	
Steam reforming of ethanol			234		67	90	20	–	

Appendix 4

to the Plan.

Methodology for forecasting greenhouse gas emissions in the waste management sector

The assessment of GHG emissions in the waste management sector was carried out in accordance with the principles and methodologies of the 2006 IPCC Guidelines for National Gas Inventories[177] (hereinafter referred to as the 2006 IPCC Guidelines), therefore the sources of GHG emissions do not correspond to types of economic activities, but to the categories recommended in the above-mentioned methodologies (IPCC categories) in the "Waste" sector. Accordingly, emissions from agricultural residue management, as well as relevant GHG emission reduction policies, were taken into account either in the LULUCF sector or in the energy sector, if such activities were accompanied by the production of useful energy. GHG emissions that are accompanied by beneficial energy use during waste treatment, such as biogas recovery at landfills, as well as energy production at waste incineration plants and waste combustion in cement production, were accounted for in the Energy sector, but the GHG emission reduction effect resulting from the relevant activities was accounted for in the Waste Management sector.

The assessment of GHG emissions in the Waste sector was carried out in strict accordance with the methods and taking into account the emission factors used for reporting[178] Ukraine's national GHG emissions within the framework of its obligations under the UN Convention on Climate Change and the Paris Agreement. For example, the assessment of methane emissions from waste disposal at landfills and landfills was carried out using the first-order decay method, as recommended in the 2006 IPCC Guidelines.

General assumption and methodological principles definition data about activity in sector "Waste"

The following indicators and trends were used in the modeling of the Waste sector by category, where indicators specific to the sector are highlighted in italics:

Burial solid waste: number population, *specific volumes formation household waste per inhabitant, waste management practices (share of landfill, recycling use, recycling, composting, incineration), coverage of the population with a centralized waste collection system, construction of new sanitary (deep controlled) landfills WWTP, WWTP composition, share of flaring and biogas recovery at landfills* .

To ensure the principle of transparency, the mass balance model of the PV used in the modeling of GHG emissions in the "Waste" sector is shown in Fig. A4.1, from which the following basic results follow: mathematical modeling provisions:

1. The total amount of generated solid waste corresponds to the sum of officially and illegally buried solid waste[179]. The initial data for assessing the volume of solid waste generation are: population size, coverage of the population by the centralized solid waste collection system, specific volumes of solid waste generation per inhabitant.

2. After assessing volume formation PV, these volumes are separated on separate streams of components household waste, the value of which is determined on the basis of their component (morphological) composition. Such flows are: paper and cardboard, food waste and food industry waste at all stages of production and consumption, waste from green spaces, wood, cleaning products personal hygiene products, rubber and leather, textiles and non-biodegradable components (including ferrous metals, non-ferrous metals, glass, plastic, hazardous and other inorganics). At the same time, WP not covered by the centralized collection system is subject to disposal in unmanaged shallow landfills.

3. Waste food products and waste food industry on all stages production and consumption and waste from green spaces as part of the mixed waste stream form a composting stream (biological processing), amount whose is determined by general fraction composting.

4. Glass forms a reuse stream, the volume of which is determined by the reuse rate.

5. Paper, cardboard and non-biodegradable components (in particular, plastic and metals) form flow for recycling, the volume of which is determined by the total recycling share.

6. The remaining part (residue) of the waste is divided into two streams: incineration and disposal, which in turn are determined by the incineration fraction.

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[177] https://www.ipcc-nggip.iges.or.jp/public/2006gl/

[178] https://unfccc.int/documents/628276#main-content

[179] Unspecified practices (e.g., home composting, gray recycling, etc.) of waste management with PV, What not covered system centralized collection, excluded with balance masses, ago that it does not lead to significant GHG emissions.

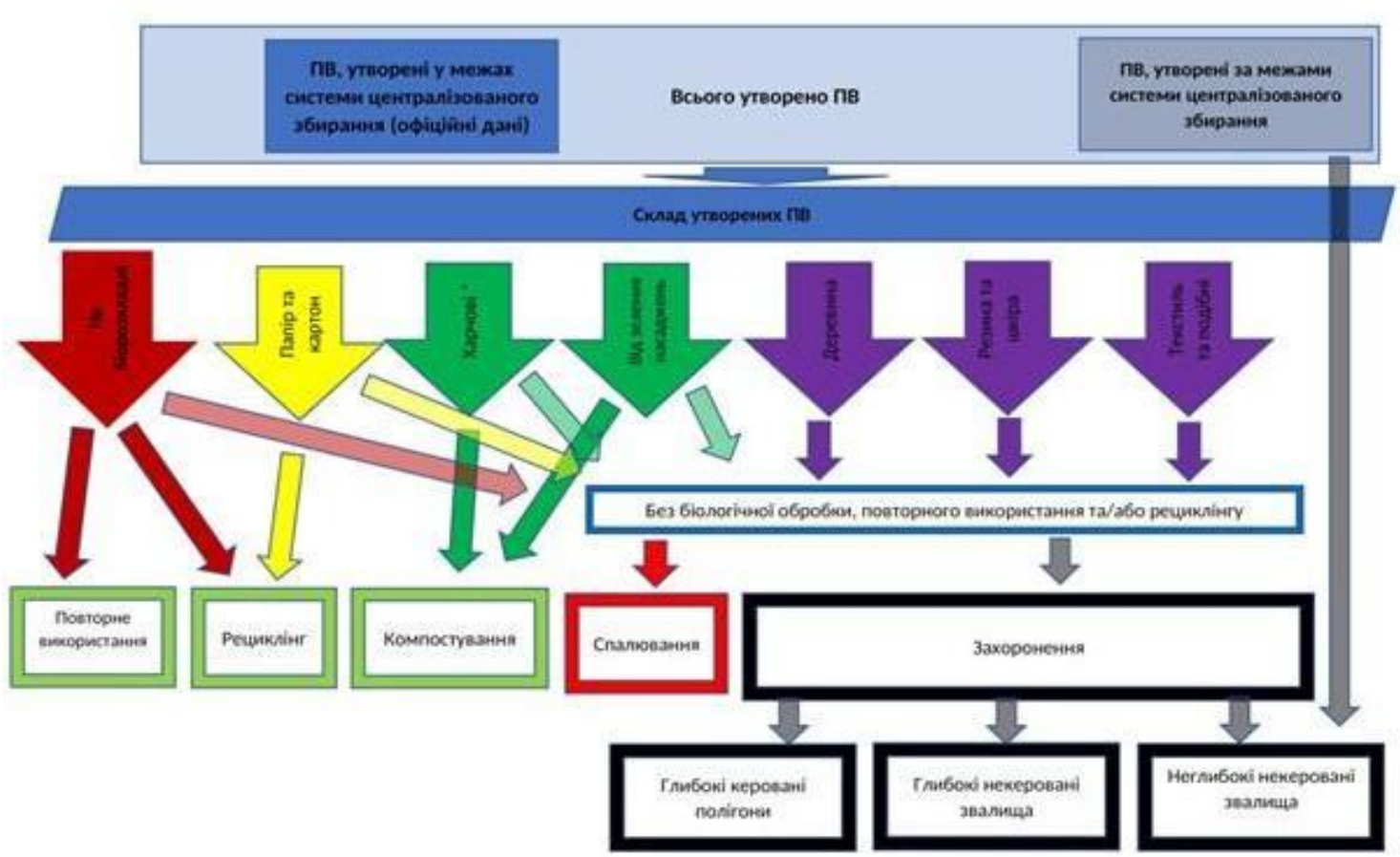
7. Distribution by type of place Disposal is determined by the construction of new sanitary landfills for waste.

Biological treatment (composting) of solid waste : population, indicators of industrial and agricultural development sectors, *specific volumes of solid waste generation per inhabitant, composting share and composting technologies* .

Incineration and open burning of waste : GDP growth, industrial sector development indicator, *category-specific legislation (ban on burning of waste without energy use).*

Cleaning and dropping sewage water: population, share of urban and rural population, sector development indicators (energy, ferrous metallurgy, agriculture, food industry, etc.), *share of treatment and discharge; consumption of meat products, dairy products and fruit per capita, development of technologies, share of flaring and methane recovery, formed during wastewater treatment*.

Fig. A4.1. General scheme models balance masses PV (flows mass)



Note: ** Waste food products and waste food industry on all stages production and consumption*

It should be noted that the issue of increasing RES waste (including solar panel and wind turbine components) and methods of their processing for the purposes of modeling GHG emissions in the Waste sector was not considered, as such emissions are insignificant in the context of forecasting emissions by IPCC emission sources in the Waste sector. The issue of growing biomass for its further use for energy purposes was also not considered in the Waste sector, as according to the IPCC definitions, such activities in the Waste sector are not assessed.

Adherence to the principle of "Do no significant harm" in the context of technological development thermal treatment of waste

The principle of " Do No Significant Harm" to the environment and climate change is fundamental to prioritizing the development of a particular technology in the context of sustainable development of the country. It is based on the concept that development cannot be *encouraged* species activities, which cause considerable negative influence on ecological goals, defined in Article 17 of Regulation (EU) 2020/852.

Considering that only modern technologies for thermal waste treatment can comply with the principle of "Do no significant harm" and taking into account the five-level waste hierarchy defined Directive of the European Parliament and of the Council 2008/98/EC of 19 November 2008 on waste and repealing certain directives, in which thermal treatment methods are in the penultimate place in terms of priority, in both WEM and WAM scenarios, thermal waste treatment technologies have found limited application. Thus, under the WEM scenario, the share of thermal treatment will reach 7% by 2030 and 10% by 2050; and under the WAM scenario – 7% by 2030 and 15% by 2050. These indicators are significantly lower than the corresponding indicators of those European countries that have achieved significant progress in the transition to a circular economy: for example, the share of thermal treatment of municipal solid waste in Switzerland is about 48%, in Belgium – 46%; in Sweden – 59%; in Denmark – 39%, etc. For more details, see Fig. 5.5, which shows the main indicators of municipal waste management in European countries for 2022.

Moreover, it is possible that in the long term, with the further development of thermal treatment technologies, the role of these technologies in the waste management system in Ukraine may be revised towards intensifying their distribution, provided that the principle of "Do no significant harm" is observed.

Targets for thermal treatment of solid waste in Ukraine in both WEM and WAM, on the one hand, was coordinated with regulatory documents in the field of waste management in Ukraine, and on the other hand, it complies with the recommendations provided within the framework of a number of international technical assistance projects to Ukraine on sustainable and low-carbon development of the waste management system in Ukraine, in particular:

- project international technical assistance “Rating technological needs in Ukraine” for waste sector, implemented in 2018-2020 under GEF funding, and implemented by UN Environment and UNEP DTU Partnership;
- international technical assistance project "Supporting Investments in Sustainable Municipal Waste Management in Ukraine" with financial support from the Multi-Donor Account for Ukraine, implemented by the European Bank for Reconstruction and Development in 2017.

Annex 5 to the Plan.

Calculation of target indicator for annual energy consumption reduction

Calculation of the target annual energy consumption reduction (hereinafter referred to as the target indicator) was carried out in accordance with the Methodology for determining the target indicator of annual energy consumption reduction, approved by order of the Ministry of Development of Communities, Territories and Infrastructure of Ukraine dated November 2, 2023 No. 1006, registered in the Ministry of Justice of Ukraine on December 8, 2023 under No. 2144/41200. The target indicator is calculated in absolute values of final consumption energy. Target the indicator has be no less than than 0.8 percent of the total annual volume of energy supply to consumers, averaged over the period from January 1, 2017 year to December 31, 2019. Energy supply volumes in the transport sector are not taken into account when calculating and setting the target.

Target indicator calculated in thousands tons oil equivalent by by the formula:

$$CPU = JV \times 0.008 \quad (1),$$

CPU - installed targeted indicator, thousand t not.;

JV - total annual energy supply to consumers, averaged over period with 01 January 2017 year on 31 December 2019 year, thousand t not., which is calculated by the formula:

$$СП = \frac{\sum_{p=2017}^{2019} КСр}{3} \quad (2),$$

CSR - the volume of final consumption of energy resources for the relevant year according to official data from the State Statistics Service on the energy balance of Ukraine (by exception final consumption energy resources in field transport) in 2017, 2018 and 2019 years, thousand t

Data State Statistics Committee, used for calculation target indicator given in tables lower.

Table. A5.1. Final energy consumption by 2017-2019 years, thousand t not.

Sector	2017	2018	2019
Industry	15098	16487	16122
Homemade farms	16487	16201	14007
Sector services	4337	4742	4831
Rural, forest and fish household	1847	1880	1882
Others types of activities	0	0	0
Non-energy using energy	2515	2645	2796
General final energy consumption (by exception transport)	39786	41328	36842
Medium final energy consumption (by exception transport) by 2017-2019 years	39319		

Source: State Statistics Service