

Analysis of Actions for Ukraine to Replace Russian Natural Gas

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ABSTRACT

Purpose of the article is to identify and analyse ten most important actions for Ukraine to completely reject Russian natural gas. The analysis was performed taking into account the following basic provisions: territorial integrity of Ukraine is within its state as of February 23, 2022; total energy consumption is at the level of 2021. Under current conditions, Ukraine urgently needs to elaborate and implement an effective and ambitious program to refuse Russian natural gas and other fossil fuels imported from Russia within several years. Such a program will be much required immediately after the end of the military operations at Ukraine's territory and should be a solid basis for energy recovery of the country at the post-war period. Taking into account Ukraine's potential of renewable energy sources and other relevant factors, the program must include such important actions as replacement of natural gas with biomass and solid biofuels for heat production, further construction of wind and solar power plants, production of biomethane, introduction of heat pumps, improving energy efficiency in district heating (DH) systems, buildings and industry and some others. Implementation of these actions will give Ukraine the opportunity to reduce the consumption of natural gas and completely replace its imports in the amount of up to 10 billion m³/yr by 2030. Realization of each action requires some specific organizational and legislative measures. To a high extent, these measures coincide with ones needed to overcome barriers to bioenergy development and expansion of district heating in Ukraine. Representative examples of the measures are introducing an electronic trade system for solid biofuels through electronic auctions; starting auctions for the state support of renewable electricity projects; starting auctions for load following units and energy storage systems; adopting the National Renewable Energy Action Plan until 2030; creating a Register for biomethane; introducing competitive heat market in DH systems; introducing incentive tariffs for electricity for heat pumps, including the "night" tariffs.

Keywords: renewable energy, renewable energy sources, bioenergy, biomass, biomethane, energy efficiency.

INTRODUCTION

During last months, there has been a considerable increase and fluctuations in natural gas (NG) prices in Europe. Current prices remain rather high at about 1100–1200 EUR/1000 m³, which means that under such conditions, biomethane and all types of solid biofuels become economically competitive with natural gas.

The urgent task for the European Union and for Ukraine is to completely reject Russian natural gas. However, even after switching to other potential suppliers, such as Qatar or the USA for importing LNG, prices are unlikely to fall due to the declining supply of Russian gas in

the market and increasing competition for this energy source. Among the priority measures to replace Russian natural gas, most experts name the large-scale development of renewable energy sources (RES) and active implementation of energy efficiency measures.

In early March 2022, the International Energy Agency (IEA) presented a series of concrete actions that the EU can take to reduce Russian natural gas imports by more than a third by the end of 2022 (IEA 2022). These measures correlate with the basic provisions of the European Green Deal adopted in late 2019 (Zheliezna 2021). Some of the proposed actions, in particular, increasing energy efficiency, accelerating the development of

solar and wind energy, raising the share of low-carbon sources to improve flexibility of the energy system are based on the IEA's Roadmap to net zero emissions by 2050.

The European Commission recently proposed a concept of REPowerEU plan. The goal of this plan is to make Europe completely independent on Russian fossil fuels well before 2030, starting with natural gas. REPowerEU plan includes three areas of activity such as urgent actions on prices, refilling gas storages for next winter, and diversifying energy sources. The implementation of these measures can reduce the EU's demand for Russian gas by two thirds by the end of 2022.

It is worth noting that some European countries have already achieved good progress in reducing their dependence on fossil fuels, including natural gas. Such countries as Denmark, Sweden, Lithuania, and Austria have significantly decreased their fossil fuel consumption over the past decade having ambitious targets for decarbonisation, GHG emission reductions, and wide introduction of RES into their energy systems. European countries are moving towards energy independence by stimulating the production of renewable electricity through premium tariffs, supporting the development of DH on local biofuels by subsidies and simplified taxation, encouraging the production of renewable gases for further injection into the gas network via introduction of different support schemes.

Following the example of Europe, Ukraine has to urgently identify and implement some effective actions to get rid of Russian natural gas and other fossil fuels imported from Russia. Expert opinion is that two main directions for that are the accelerated development of renewable energy sources and considerable increase in the energy efficiency. According to the Ministry of Energy, consumption of natural gas in Ukraine in 2021 amounted to 28 billion m³; the volume of own gas production in the country has been about 20 billion m³/yr lately. Natural is imported from Slovakia, Hungary and Poland. Legally, the imported gas is not Russian, however, actually it is, so Ukraine needs to change the situation as soon as possible.

MATERIALS AND METHODS

Purpose of the article is to identify and analyse the most effective actions for Ukraine to completely reject Russian natural gas. The analysis was performed taking into account the following basic

provisions: territorial integrity of Ukraine is within its state as of February 23, 2022; total energy consumption is at the level of 2021 (it is believed that it will be restored within 1–2 years after the war).

Ukraine has a considerable potential of renewable energy sources, one of the biggest being biomass. Based on data of 2020, the potential of biomass available for energy production is nearly 22 Mtoe/yr. The main components of the bioenergy potential are agricultural residues (9.4 Mtoe/yr or 43% of the total) and energy crops (7.5 Mtoe/yr, 34%), which are jointly defined as agrobiomass (Tryboi 2018). Despite some fluctuations, the volume of agricultural biomass in Ukraine increases almost every year due to the general trend of growth in the production and yield of major crops. Thus, in 2019 the country harvested a record for the last 20 years amount of sunflower, corn for grain, and some other cereals. Since 2000, the energy potential of straw of cereal eared crops, by-products and waste of grain corn and sunflower production in Ukraine has tripled, from 2.8 Mtoe in 2000 to 8.5 Mtoe in 2020.

The contribution of wood biomass to the bioenergy potential is relatively small, about 2.6 Mtoe/yr or 12% of the total. The remaining components of Ukraine's bioenergy potential (about 10%) are liquid biofuels (biodiesel, bioethanol) and biogas obtained from various raw materials such as waste and by-products of agroindustrial sector, industrial and municipal wastewater, municipal solid waste.

The situation with the consumption of biomass for energy and biofuels production in Ukraine is, in fact, the opposite to the structure of the available potential. Currently, wood biomass is most actively used (more than 90% of its economic potential), while the use of waste and by-products of agricultural origin remains low (except for sunflower husk). On average, the bioenergy potential is utilized by ~11% in Ukraine.

At present, it is difficult to accurately assess the impact of war in Ukraine on the size and structure of the bioenergy potential and, in general, on the features of bioenergy development in the country in the post-war years. However, based on expert estimation, we can assume the following:

- Agrobiomass (agricultural residues and energy crops) will remain the main type of bioenergy potential in Ukraine. To expand the use of agricultural residues, it is necessary to work out technologies for baling corn and sunflower stalks.

- Energy crops for solid biofuels will continue to be grown on unused (low-yield) agricultural lands.
- The post-war period is likely to be characterized by high prices and shortages of mineral fertilizers, especially nitrogen fertilizers, which are produced using natural gas. Under such conditions, it is advisable to introduce fertilizing with digestate, which is a residue of biomass anaerobic digestion. To obtain a sufficient amount of digestate, the appropriate amount of raw materials for fermentation, such as corn silage, is required.
- For the sake of the country's energy survival in the post-war period, some deviation from the sustainability criteria (or temporary change of these criteria) may be allowed. For example, corn for silage as a raw material for the production of biomethane (a substitute for natural gas) and digestate (fertilizer) will be grown on agricultural land.
- Biomethane production will be actively developing. For this, it is necessary to master and implement modern technologies for its production from lignocellulosic raw materials (up to 50% of the total mixture) using best foreign practices.
- Production and consumption of liquid biofuels of the first and second generation, which is a promising direction for the development of bioenergy in Ukraine, will increase. According to the draft National Renewable Energy Action Plan until 2030 (NREAP 2030), the consumption of liquid biofuels in the country by 2030 will increase up to 325 ktOE/yr, including 65 ktOE/yr of second-generation biofuels.

As for energy efficiency issues, now, the level of energy efficiency in Ukraine is 3-5 times lower than in the EU. If Ukraine had the level of energy efficiency as in today's Poland, it could cease the import of energy at all and become an energy-independent state.

One of the consequences of the war in Ukraine is a large number of completely or largely destroyed houses and enterprises. The construction of new buildings in the post-war period should be carried out taking into account modern requirements for energy efficiency of buildings. The construction of new industrial enterprises or reconstruction of destroyed ones should be realized with the introduction of modern technologies at these enterprises. Implementing energy efficiency measures is one of the important ways to reduce natural gas consumption in Ukraine.

RESULTS AND DISCUSSION

Taking into account Ukraine's potential of biomass and other renewable energy sources as well as some other relevant factors and conditions, the following actions are suggested for consideration as measures to reduce the consumption of natural gas and reject Russian NG:

Replacement of natural gas with biomass and solid biofuels for heat production

Substitution of natural gas with biomass and solid biofuels for heat production is one of the most cost-effective ways to replace NG, especially given the current and projected high prices of natural gas in the EU, where Ukraine is currently buying it. The draft NREAP 2030 envisages the production of 10,328 ktOE of thermal energy from biomass in 2030, including 9,328 ktOE from solid biomass and 1,000 ktOE from biogas.

Scenario for the introduction of bioenergy equipment elaborated in the Roadmap for bioenergy development in Ukraine until 2050, allows the total replacement of NG in the amount of 9.2 billion m³/yr in 2030 and 19 billion m³/yr in 2050 (Geletukha, 2021a). The largest contribution to this substitution will be made by solid biomass: 8.9 billion m³/yr in 2030 and 17.9 billion m³/yr in 2050 due to the installation of all types of equipment such as boilers, combined heat and power (CHP) plants, thermal power plants. Individual contribution from the introduction of solid biomass boilers is additional replacement of 2.7 billion m³/yr of NG in 2030 and 9.3 billion m³/yr in 2050 as compared to 2020. A similar estimate for CHP plants on solid biomass (in terms of heat production) is additional substitution of about 0.4 billion m³/yr of NG in 2030 and 1.0 billion m³/yr in 2050 as compared to 2020.

The reality of this action is demonstrated by the shares of heat produced from RES, mainly from biomass, achieved in many EU countries, for example, Sweden – 66%, Estonia and Finland – 58%, Latvia – 57%. In the EU as a whole, this figure is 23% growing steadily from 12% in 2004.

Further construction of wind and solar power plants

One of the key objectives of the draft NREAP 2030 is to achieve 25% of RES in the gross final electricity consumption. The document provides

for a significant increase in the installed capacity of solar and wind power plants: up to 9,947 MW and 5,033 MW in 2030, respectively. Compared to 2020 data, this is increase by 1.5 times for solar power plants and 3.8 times for wind power plants. A feature of the development of wind energy in Ukraine in the period from 2028 will be the construction of offshore wind power plants: by 2030, it is planned to reach their installed capacity of 300 MW.

The growth of electricity production by wind and solar power plants requires a corresponding increase in load following units' capacity. Such capacities mainly run on natural gas, which means its additional consumption compared to existing ones. National Energy Company "Ukrenergo" prepared a Report on the assessment of adequacy of generating capacity to cover the projected demand for electricity and provide the necessary reserve in 2020 (approved in 2021). The Report considers the Target Scenario for the development of generating capacities of Ukraine's energy system. The Scenario takes into account current trends in energy saving and provides for further growth of the share of all renewables in the structure of electricity production during next 10-11 years. Implementation of such a scenario of RES development in Ukraine requires increasing flexibility of the energy system. To achieve this, in the near future it is necessary to construct minimum 1 GW of load following units with quick start and 0.5 GW of energy storage systems, given that RES are involved in balancing the energy system and providing reserves. Without the involvement of RES in balancing or forced limitation of nuclear power plants capacity, the need for energy storage may increase up to 2 GW.

Production of biomethane

Potentially, Ukraine can produce up to 10 billion m³ of biomethane/yr, mainly from agricultural waste and residues such as manure, cereal straw, corn stalks, sunflower stalks, sugar beet bagasse, molasses, corn silage, as well as municipal waste and others. Estimation shows that actual production of biomethane in Ukraine could reach 1 billion m³ in 2030 and 4.5 billion m³ in 2050.

Biomethane is completely ready for injection into the gas network right now. No investment is required for the modernization of gas networks and gas equipment (gas burners and fittings, gas-piston engines and gas turbines). In the field of biomethane production, Ukraine can compete

with any country in the world as it has the largest area of agricultural land in Europe and, accordingly, one of the world's best potentials of agricultural raw materials. Thus, Ukraine can offer the cheapest raw materials for biomethane production. A byproduct of biomethane production, digestate, can become the main organic fertilizer needed for the revival of Ukrainian soils.

Now, biomethane is the cheapest of the possible renewable gases. The cost of biomethane, which makes it profitable for investors to produce it, is about 1000 \$/1000 m³. At the current gas prices in Europe (about 1200 \$/1000 m³ on Dutch TTF gas hub in the middle of April 2022), it is absolutely cost-effective to produce biomethane in Ukraine for both domestic consumption and export. There is high probability that the price of natural gas will continue to rise due to a probable reduction in consumption or a complete embargo on Russian gas in the EU markets.

Increasing the flexibility and level of decarbonization of Ukraine's energy system

At present, Ukraine has one of the lowest levels of energy system flexibility in the world, which is a technical barrier to the further development of wind and solar generation. To overcome it, it is necessary to construct new energy storages and load following units on natural gas and biomethane. It is planned to use both gas-piston and gas-turbine power generating capacities.

The main barrier to the development of load following units on NG is considered to be the lack of sufficient amount of natural gas of own production. That means that any new load following units on NG will require additional volumes of this fuel, which are not available in the country and will have to be imported at a high price. At that, the use of biomethane can both, increase the flexibility and level of decarbonization of Ukraine's energy system.

Improving energy efficiency in district heating systems, buildings and industry

The National Energy Efficiency Action Plan until 2030 (adopted in 2021) sets the following national energy efficiency target: primary and final energy consumption in 2030 should not exceed 91.5 Mtoe and 50.5 Mtoe, respectively. To achieve this goal, the National Plan includes several sectoral and inter-sectoral actions to improve energy efficiency. They cover housing and public

sector, transport, industry and energy. The actions include promoting energy efficiency of industrial enterprises and residential buildings, energy labelling and ecodesign, full commercial accounting of public utilities, reduction of losses in electricity transmission and distribution networks, natural gas distribution networks etc.

A draft concept of the State Energy Efficiency and Renewable Energy Program for 2022–2026 was developed recently. Among others, the concept envisages support to population and enterprises for the implementation of energy efficiency actions; to population for the installation of solar panels and heat pumps; to business entities for the introduction of biogas plants running on agricultural waste and power plants of up to 150 kW producing electricity from the biogas; to business entities for growing energy crops.

Substitution of Russian supplies with natural gas from other sources

During the period of 2016–2020, Ukraine imported a significant amount of natural gas (10–15 billion m³/year). Legally, this gas was supplied from Slovakia, Hungary and Poland, but in fact, it was of Russian origin. Gas imports to Ukraine in 2021 decreased significantly to 2.6 billion m³, which was 6 times less than in 2020. The main reasons for the abrupt decline in the imports in 2021 were the dramatic rise in NG cost in world markets, a certain decrease in its consumption in Ukraine, and the available gas reserves in storage facilities left from the previous heating season. We forecast that the need for NG imports will return to the level of up to 8 billion m³/year with the stabilization of the situation in Ukraine regarding the war and the COVID pandemic. In 2021, gas was imported mainly by virtual reverse (backhaul), which Ukraine's Gas Transmission System Operator introduced in early 2020. Main volume of the imports came from Hungary (1.5 billion m³, which was -64% compared to 2020), Slovakia (285.3 million m³, -97%), and Poland (78.6 million m³, -95%).

Due to the military aggression of the Russian Federation against Ukraine, the EU countries are planning to reject Russian natural gas and are already actively looking for alternative sources of gas supply. Probably, this will increase competition between consumers in the gas market and may affect the opportunities or conditions of gas exports to Ukraine.

The United States has committed to supply an additional 15 billion m³ of LNG to the EU by the end of 2022, which should cover about 10% of the EU gas imports from Russia. In addition, the EU aims to increase LNG imports from the United States to about 50 billion m³ per year by 2030 at the latest, which could replace about a third of this year's gas imports from Russia.

Italy is considered one of the EU's most dependent on Russian gas. As of the end of 2021, the share of Russian gas was 43% in the structure of its gas imports, and 19% in the country's energy sector, which was considerably more than even in Germany (12%). The situation gets complicated by the fact that at the beginning of the century Italy closed all the nuclear power plants and is now very dependent on energy import. So, now the country is trying to find a replacement for half of the volume of gas imported from Russia within two months. Negotiations are under way to increase LNG imports and supplies through existing pipelines from Algeria and Libya.

Germany is gradually rejecting Russian gas and has already agreed with Qatar the supply of LNG. Earlier, Germany's largest energy trader E.ON announced plans to stop buying gas from Russia's Gazprom.

In April 2021, Ukraine and Qatar signed a memorandum of understanding in the energy sector, which will remain in force for three years and may be automatically extended for the same period. The Memorandum sets out the intentions of the states to develop cooperation in the field of Qatar's investments in gas exploration and production in Ukraine, as well as LNG supplies from Qatar to Ukraine. As Qatar does not have common borders with Ukraine, as well as a gas pipeline, it is also a question of construction of an LNG terminal.

It should be noted that about ten years ago Ukraine was already considering a project on building an LNG terminal near Odesa and even signed an agreement with Spanish company Gas Natural Fenosa in 2012. Unfortunately, the project was not implemented. In the absence of a domestic LNG terminal, liquefied gas supplies are possible through the terminal in Poland, as well as through the Bosphorus (with the consent of Turkey).

Thus, the option of replacing Russian gas with alternative sources of supply, which is considered a priority in the EU, is unlikely to be such for Ukraine. The construction of LNG terminals

in the Black Sea is currently problematic due to both, current military actions and Turkey's disapproval of liquefied gas carriers passing through the Bosphorus. In addition, given deficit in the world's natural gas market, especially Russia's potential embargo, Ukraine will find it extremely difficult to compete with other countries and to find new sources of natural gas.

Introduction of heat pumps

As a result of shutdown of many industrial enterprises on the territories of military actions in Ukraine, there is a surplus of electricity, mainly from nuclear and coal power plants. In these circumstances, a partial electrification of the heat supply sector with heat pumps (HPs) is a logical and justified action. The action envisages HPs for individual households, autonomous systems in individual multi-storey buildings and DH systems. Given that the electricity used to drive heat pumps becomes more renewable, the heat produced by HPs, will also become more renewable and decarbonized. We suppose that biomass boilers and CHP plants together with heat pumps will form the basis for future heat supply systems in Ukraine.

The draft NREAP 2030 provides for the production of 700 ktoe of heat by heat pumps in 2030, including 460 ktoe by aerothermal, 160 ktoe by geothermal, and 80 ktoe by hydrothermal HPs. Thus, by 2030 it is planned to increase the production of heat by heat pumps by 13.5 times compared to 2020 (52 ktoe).

Extension of the service life of existing nuclear power plants

Currently, nuclear power plants (NPPs) cover more than half of Ukraine's electricity needs. According to 2020 data, 52% (71249 GWh) of the total 137197 GWh of the power produced was generated by NPPs. The design operation life of Ukrainian NPP units is 30 years; by 2019, all but five existing units exhausted their operation life. According to the Ministry of Energy of Ukraine, expert assessments show that decommissioning of NPP units that have exhausted their design operation life may lead to energy crisis in the country in the absence of replacement capacity. The world experience shows that extending the service life of NPP units is one of the most effective ways to partially solve the problem of replacing generating capacity provided that nuclear and radiation safety standards are strictly met.

Under the shortage of gas and coal, as well as significant environmental problems created by coal generation, the maximum possible extension of service life of the existing nuclear power plants (with IAEA's permission) is a logical and economically sound solution for Ukraine. This is in line with objectives of the current Energy Strategy of Ukraine until 2035 and the Comprehensive Work Program to extend the operation life of existing NPP units (approved as far back as in 2004). However, the construction of new nuclear power plants in Ukraine we consider inexpedient as the existing and new solar and wind power plants, when balanced by load following units on gas and by energy storage, can produce cheaper electricity than newly-built NPPs.

Encouraging consumers to temporarily reduce the room temperature by 1°C

In the EU, the average temperature in buildings that are heated is at present above 22°C, which allows to reduce it by at least 1°C not affecting comfort noticeably. In Ukraine, living spaces are often heated to the temperatures above 22°C, which is confirmed by the opened windows for cooling premises. According to standards of heating services in Ukraine, the air temperature should be 18°C in living quarters and 20°C in corner rooms. Therefore, a similar action to encourage consumers to temporarily reduce the temperature in their rooms by 1°C can be introduced in Ukraine.

One of the least expensive and most effective methods of heat control in the apartment is the installation of radiator thermostats on each heater in a room. In addition, the action will save households on energy bills. Similar energy-saving actions should be implemented in offices and other premises, except for premises where it is necessary to provide other temperature conditions (hospitals, schools, kindergartens etc.). Besides, the heating temperature can be further reduced on weekends and during periods when there are no people in the premises.

Reducing the indoor temperature by 1°C saves up to 6% of thermal energy. Thus, taking into account the consumption of natural gas by heating plants and in the domestic sector in 2020 (without NG spent for cooking), the estimated reduction in gas consumption in Ukraine from the implementation of this action will be up to 0.7 billion m³ per year.

Introduction of natural gas storage obligations

It can be stated that this action has already been largely implemented in Ukraine and it is more relevant and urgent for the European Union. The network of underground NG storage facilities is an important element of Ukraine's energy system. Stable and uninterrupted functioning of the gas storages is necessary for providing heating seasons, for the operation of industrial enterprises and for the fulfilment of obligations to foreign partners. The total active capacity of Ukrainian underground storage facilities is over 30 billion m³. They are the largest storages in Europe (21% of the total) and the third-largest in the world, after the United States and Russia. Such facilities provide Ukraine with significant opportunities not only to meet its own needs but also to attract customers for gas storage, including European ones.

Effect of the proposed actions (in terms of the reduction/replacement of NG consumption) is assessed based on the main forecasted indicators for RES, energy efficiency and energy sector development in accordance with the program documents of Ukraine and expert estimation of the authors. The results are presented in Table 1: Ukraine can reduce/replace NG consumption by 10 billion m³/year until 2030 and by about 26 billion m³/year until 2050.

Realization of each action requires a number of specific organizational and legislative measures (Table 2). To a high extent these measures coincide with ones needed to overcome barriers to bioenergy development and to the expansion of district heating in Ukraine (Geletukha 2018,

Geletukha 2021b). For example, to widely replace natural gas with biomass and solid biofuels for heat production, it is necessary to create an electronic trade system for solid biofuels through electronic auctions; further construction of wind and solar power plants requires starting auctions for the state support of renewable electricity projects; increasing the level of flexibility and decarbonization of Ukraine's energy system needs introduction of auctions for load following units and energy storage systems as well as removal of price-caps on the cost of balancing services.

CONCLUSIONS

Under the current conditions, Ukraine urgently needs to elaborate and implement an effective and ambitious program to refuse Russian natural gas and other fossil fuels within several years. Among others, the program should include actions described above. Considering the projected development plans, by 2030, Ukraine can completely reduce/replace the imported natural gas in the amount of up to 10 billion m³/year and become completely independent of the gas import. However, we consider the deadline for achieving this target set in the program documents of Ukraine to be too long. In the current political and economic situation, which has been significantly affected by Russia's military actions, these policy documents must be revised. We suppose that independence of the imported natural gas should be achieved much earlier, maximum within several years.

Table 1. Projected volumes of the reduction and replacement of natural gas consumption in Ukraine from the implementation of the proposed actions

Type of action	Projected NG consumption reduction / replacement, billion m ³ /year	
	Until 2030	Until 2050
Replacement of natural gas with biomass and solid biofuels for heat production (boilers, CHP plants)	3.0	10.3
Further construction of wind and solar power plants	1.7	3.5
Production of biomethane	0.8	3.7
Increasing the flexibility and level of decarbonization of Ukraine's energy system	0.2	0.8
Improving energy efficiency in district heating systems, buildings and industry	2.8	5.6
Introduction of heat pumps	0.8	1.2
Encouraging consumers to temporarily reduce the room temperature by 1°C	0.7	0.7
TOTAL	10.0	25.8

Table 2. Measures required for implementation of the suggested actions for Ukraine to refuse Russian natural gas

Type of action	Main organizational and legislative measures required
Replacement of natural gas with biomass and solid biofuels for heat production	<ul style="list-style-type: none"> • Introduction of a market price for natural gas for all categories of consumers, including the population and heat producers. • Introduction of an electronic trade system for solid biofuels through electronic auctions to ensure quality standards and guarantees for the supply of biofuels. • Introduction of a state support for companies growing energy crops. • Exemption from CO₂ emissions tax for the plants burning solid biofuels and biogas/biomethane.
Further construction of wind and solar power plants	<ul style="list-style-type: none"> • Ensure the financial stability of the State Enterprise “Guaranteed Buyer”. • Introduce a market price for electricity for all categories of consumers, including the population. Protect vulnerable groups of population through a system of monetized subsidies. • Give the right to producers of electricity from RES to leave the balancing group of the Guaranteed Buyer and freely sell electricity on the market with the possibility of receiving compensation (contracts for difference). • Start auctions for the state support of renewable electricity projects as soon as possible. • Develop and implement a mechanism to guarantee the origin of electricity generated by RES. • Develop a regulatory field that will allow the implementation of direct contracts for the supply of electricity produced by RES to consumers. • Develop a regulatory environment for the construction of RES facilities for the own consumption of electricity generated. • Adopt the National Renewable Energy Action Plan until 2030.
Production of biomethane	<ul style="list-style-type: none"> • Introduce a system of guarantees of origin for biomethane. • Create a Register for biomethane. • Remove the requirement for mandatory state registration for digestate. • Develop and approve a national standard for digestate for the use as an organic fertilizer or soil improver. • Approve acceptable for biomethane requirements for oxygen content (0.2-1%) in the technical regulations for natural gas.
Increasing the level of flexibility and decarbonization of Ukraine's energy system	<ul style="list-style-type: none"> • Start auctions for the load following units and energy storage systems as soon as possible. • Remove price-caps on the cost of balancing services.
Improving energy efficiency in district heating systems, buildings and industry	<ul style="list-style-type: none"> • Full-scale reform of the CO₂ tax with the transition to an energy tax with the taxation of carbon content in fuel at the time of entry into the customs territory of Ukraine or the first sale. • Establishment of a decarbonization fund. • Introduction of a competitive heat market in DH systems. • Ensuring non-discriminatory access of independent producers to DH networks. • Introduction of the zoning principle in the development of urban heat supply schemes. • Introduction of the administrative ban on disconnecting consumers from DH systems in DH areas. • Giving heat supply schemes the status of those obligatory for the development and implementation.
Introduction of heat pumps	<ul style="list-style-type: none"> • Introduction of a market price for natural gas for all categories of consumers, including the population and heat producers. • Introduction of incentive tariffs for electricity consumed by heat pumps, including the "night" tariffs.

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