

UABIO

Development of Business Model
for Biomethane Production
in Ukraine

Deliverable 4-1

**Guideline for Export of Biomethane
from Ukraine to the EU**

Version 1.1

Developed by UABIO

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Content

1. Introduction	3
2. Overview of the Biomethane Sector in Ukraine	3
2.1. Key benefits of biomethane as a renewable energy source	3
2.2. Current state of biomethane production in Ukraine	5
2.3. Overview of biomethane production potential and feedstock availability in Ukraine	6
2.4. Biomethane logistics (GTS and GDS injection, Bio-CNG, Bio-LNG)	6
2.5. Economic Potential of Biomethane	10
3. Legal and Regulatory Framework	11
3.1. Relevant Ukrainian Legislation	11
3.2. Basic EU Legislation and Requirements	15
3.3. Certification and Sustainability Criteria	16
4. Technical Requirements and Procedures	17
4.1. Connection to Gas Infrastructure	17
4.2. Gas Quality Standards	21
4.3. Measurement and Accounting	24
4.4. Transmission	30
5. Commercial and Logistical Aspects	31
5.1. Step-by-step practical guidance for Ukrainian producers/exporters	31
5.2. Tariffs and Costs	37
6. Strategic and Policy Context	40
Conclusion	44

1. Introduction

This Guideline provides practical recommendations and key insights on the export of biomethane produced in Ukraine. It serves as a comprehensive roadmap to assist stakeholders in navigating the regulatory, technical, and market dimensions of cross-border biomethane trade.

The document is designed for a broad audience, including businesses engaged in biomethane production and commerce, policymakers responsible for shaping the regulatory framework, and investors seeking opportunities within Ukraine's emerging biomethane sector. It is equally relevant to gas transmission and distribution system operators, certification bodies, governmental authorities in both Ukraine and European countries, and international organisations advancing renewable gas development in Ukraine.

The export of biomethane from Ukraine is closely aligned with the objectives of the EU's REPowerEU strategy, which seeks to bolster energy security and accelerate the transition to renewable energy sources. For Ukraine, fostering biomethane exports offers a strategic pathway to strengthening its economy, diversifying its energy markets, and contributing to regional energy independence.

2. Overview of the Biomethane Sector in Ukraine

2.1. Key benefits of biomethane as a renewable energy source

Biomethane is upgraded biogas from which carbon dioxide and impurities have been removed. Biomethane is purified to a methane concentration of at least 96-98% vol., which makes it comparable in properties to fossil natural gas (NG). Biomethane is produced by anaerobic fermentation (i.e. without oxygen) of organic materials - crop residues, manure, food waste, sewage sludge, or by gasification of solid biomass with subsequent methanation.

Unlike fossil NG, biomethane is a renewable energy source, as it is obtained from organic raw materials. The high methane content provides properties and energy value similar to natural gas, the calorific value of biomethane is about 9.5-10 kWh/m³.

Biomethane is universal fuel that can be used in the same areas as natural gas including:

- **Transport fuel.** Biomethane can be compressed (bio-CNG) or liquefied (bio-LNG) and used as a fuel for vehicles, including cars, buses, trucks and ships, offering an alternative to petrol and diesel with lower emissions of harmful pollutants and greenhouse gases (GHG).
- **Electricity generation.** Biomethane can be used to produce electricity in cogeneration plants or gas turbines. It is potentially a dispatchable (manageable and flexible) renewable energy source, capable of complementing intermittent sources such as solar and wind power. Unlike solar or wind power, biomethane production is largely weather-independent, which can ensure a stable supply of electricity throughout the year.
- **Industrial processes.** Many industrial processes that require heat or steam can use biomethane as a cleaner alternative to fossil fuels. It can also be used as a feedstock in the chemical industry.
- **Heating and cooking.** Biomethane is suitable for use in residential, commercial and industrial buildings for heating, as well as for cooking. It can be directly used in existing gas appliances and infrastructure.

- **Injection into gas networks.** After upgrading to the required standards, biomethane can be fed into existing gas transmission or distribution systems and delivered to end users using existing infrastructure or can be exported.

Biomethane production offers a number of significant benefits, making it an important element in the transition to more sustainable energy systems. The main benefits of biomethane as renewable energy source include the following:

- **Significant reduction in GHG emissions.** By using organic waste that would otherwise decompose and release methane (a powerful GHG) into the atmosphere, biomethane production can significantly reduce overall GHG emissions. In some cases, such as when methane emissions from solid waste landfills or agricultural sources are prevented, biomethane can even have a negative carbon balance. In addition, replacing fossil natural gas with biomethane directly reduces the carbon footprint of electricity generation, heating or transport.
- **Waste management and circular economy.** Biomethane production provides an efficient and sustainable solution for managing various organic waste streams, including agricultural residues (manure, crop residues), household food and industrial waste, and sewage sludge. This reduces the amount of waste going to landfills and dumps, preserves their resource, and minimizes the environmental problems associated with waste disposal. The production process produces digestate, a nutrient-rich by-product that can be used as a biofertilizer or soil improver, closing the loop and contributing to the development of a circular economy.
- **Energy security and independence.** Energy production from locally available resources can increase the region's energy security and reduce its dependence on imported fossil fuels, which are often vulnerable to price fluctuations and geopolitical instability. Such localized production can contribute to more sustainable and reliable energy systems. On the domestic Ukrainian market, biomethane can contribute to partial reduction in natural gas imports from the EU, as well as partial replacement of domestically produced natural gas.
- **Versatility of application and compatibility with infrastructure.** Biomethane is chemically similar to fossil natural gas, which allows it to be used in almost all the same areas. This includes heating and cooling, electricity generation (in gas turbines and cogeneration plants), and as fuel for transport (in the form of compressed or liquefied biomethane). Importantly, biomethane can be injected into existing gas pipelines and used in existing appliances and infrastructure, reducing the need for new infrastructure.
- **Supporting the rural economy and creating jobs.** The construction and operation of biomethane plants can provide new economic opportunities and create jobs, especially in rural areas where significant amounts of raw materials are concentrated. This will help to revitalize the local economy and open up new sources of income for farmers and waste management businesses.
- **Improving air quality.** When used as a transport fuel, biomethane can help reduce emissions of harmful pollutants into the air compared to traditional diesel and gasoline vehicles, which has positive impact on air quality, especially in urban areas.
- **Improving soil.** The digestate, a by-product of anaerobic digestion, is a valuable organic fertilizer or soil improver. Its use in agriculture can improve soil structure, moisture retention capacity and nutrient availability, potentially reducing the need for synthetic fertilizers and supporting more sustainable farming practices.

Therefore, the production and use of biomethane is a multifunctional solution that simultaneously addresses the challenges of climate change, efficient waste management, increased energy security and stimulating economic development, making it an integral part of a sustainable energy future.

2.2. Current state of biomethane production in Ukraine

The total number of biogas installations constructed in Ukraine within the last 20 years is more than 80 units. Most of them have a license from the National Regulator¹ for electricity generation and sell it under the feed-in (“green”) tariff scheme. The total number of projects with licenses for “green” tariffs was 68 in 2023, with a total installed electrical capacity of 135 MW. However, about a third of them by number were not in operation.

Totally 580 GWh of electricity was generated from biogas and landfill gas (LFG) in 2023. Forty-five active projects produced electricity under the “green” tariff scheme. These include 20 agricultural biogas plants. The individual projects ranged from 125 kW to 26.1 MW in installed power capacity. Additionally, some small projects produced electricity without “green” tariffs, and at least two projects produced only heat for their own and industry needs. At the same time, there were 25 active LFG recovery systems, all of which were used for electricity production. Several biogas units operate as a part of industrial wastewater treatment systems, primarily at breweries, where biogas is utilized for heat production only.

The technical scope of Ukrainian biogas plants covers a wide range of industries and different types of feedstocks including pig, cattle, and chicken farms, sugar plants, breweries, and food production enterprises. According to the UABIO’s estimation, in Ukraine, approx. 2 million tones (by raw mass) of feedstocks were used to produce biogas in 2022, 51% of the feedstocks were industrial wastes, mainly sugar beet pulp (SBP). Agriculture residues and energy crops combined made up 46% of the feedstocks. This estimation does not cover LFG originated from landfilled municipal solid waste (MSW).

Currently, there is a great interest in the production of biomethane from large Ukrainian agricultural companies that have sufficient amounts of their own raw materials. The Gals-Agro company obtained the first Ukrainian biomethane in March 2023. This happened based on one of the company's four biogas plants. The company intends to sell biomethane to European traders and has obtained an ISCC certificate for this purpose. Feedstock for biomethane production is SBP, maize straw, and other agricultural residues. The upgrading of biogas is carried out through membrane technology. The annual capacity of the plant is 3 million cubic meters (mcm) of biomethane.

The second biomethane plant was built in Ukraine in 2024. It is a plant of the VITAGRO group of companies located in the Khmelnytskyi region. Feedstock for biomethane production is agricultural residues (straw and other harvest materials) and livestock waste (cattle manure and chicken litter). The biogas upgrading technology designed by the Bright Renewables company of the HOST energy holding from the Netherlands is used. The annual capacity here is also 3 mcm. Biomethane is fed into the gas distribution system (GDS).

At least seven biomethane projects are expected to be operational by the end of 2025. These projects belong to Gals-Agro LLC, VITAGRO, MHP, Teofipol energy company, and Yuzefo-Mykolaivska biogas company. All these projects are being actively built and are close to completion. Except for one project of VITAGRO, all of them are based on existing biogas plants.

¹ National Energy and Utilities Regulatory Commission of Ukraine (NEURC)

2.3. Overview of biomethane production potential and feedstock availability in Ukraine

Despite the lack of a specific target for biogas and biomethane, there is considerable untapped potential for a widespread implementation of biogas and biomethane projects in Ukraine. Ukraine has the largest area of agricultural land in Europe, one of the highest agricultural areas per capita, and a developed agricultural industry. There is a big share of large- and medium-sized agricultural enterprises. It means that the structure of agriculture is favourable for biogas and biomethane production.

The Ukrainian natural gas transportation system (GTS) is internationally connected, potentially enabling biomethane and other renewable gases to be physically or virtually delivered from Ukraine to European countries. Currently, the transit of natural gas to Europe through Ukraine's GTS is declining. An ambitious goal is to maximise the utilisation of the Ukrainian GTS by supplying domestically produced natural gas and alternative renewable gases.

The Ukrainian biogas sector has potential in terms of both the availability of raw materials and the demand for biogas. By UABIO's recent estimation, the total energy potential of biogas/biomethane production in Ukraine is 21.8 billion cubic meters (bcm) CH₄/year (18.7 mill toe/year).

Potential feedstock includes animal breeding waste (manure, litter), harvesting residues of agricultural crops, food industry by-products, the organic fraction of municipal solid waste and wastewater, energy crops, cover or intermediate crops, and woody biomass for thermal gasification.

Considering favourable conditions, biomethane production in Ukraine is anticipated to reach 250 mcm by 2027. The most optimistic projection envisions the production of one billion cubic meters (bcm) of biomethane by 2030. This ambitious goal depends on the end of the military invasion of Ukraine, highlighting the critical importance of a peaceful environment for sustainable growth. Biomethane is projected to become a major export commodity in Ukraine's trade with European countries.

The new biogas production would be based, in particular, on the utilisation of agricultural-based by-products, but new technologies and feeds would also play a role. That may include thermal gasification of lignocellulose derived from agriculture and forests, and a power-to-gas process. Potentially, in energy systems with a large share of renewable energy sources, excess electricity could be used to produce hydrogen by electrolysis of water followed by the methanization of hydrogen with carbon dioxide from the process of biogas upgrading the biomethane.

2.4. Biomethane logistics (GTS and GDS injection, Bio-CNG, Bio-LNG)

If the produced biomethane is not used locally, then for further use it must either be fed directly into the gas networks, or transported to consumers in another way - for example, by road or rail in compressed (Bio-CNG) or liquefied (Bio-LNG) form.

The gas network system of Ukraine creates broad opportunities for the delivery of natural gas and biomethane to consumers. Ukraine has a developed gas infrastructure, which includes a gas transportation system, gas distribution networks, underground gas storage facilities (UGS), gas production enterprises and all necessary facilities, such as compressors and gas distribution stations, etc.

According to the Ukrainian Gas Transmission System Operator, the total length of gas pipelines is 33.4 thousand km, and the number of gas distribution stations reaches 1390 units, which ensures reliable gas transportation throughout the country. The system of main gas pipelines of Ukraine is one of the largest in Europe and is second only to the German gas transportation system in length. Most of the main gas pipelines that are part of the Ukrainian GTS have a diameter of more than 500

mm, and the largest ones have a diameter of more than 1000 mm, due to which they are able to transport from 4.5 to 30 billion m³ of natural gas per year. The pressure in the gas transportation system is maintained at 5.5–7.5 MPa in the main pipelines and about 3.0–5.5 MPa in the branches leading to the gas distribution stations. The creation and maintenance of the required pressure is ensured by numerous compressor stations located along the main pipelines.

The main purpose of gas distribution stations is to reduce the pressure of natural gas coming from the gas transmission system to a level that is safe and suitable for the gas distribution points, through which the vast majority of consumers receive gas. The pressure in main gas pipelines usually significantly exceeds the standard pressure range in the gas distribution points. Therefore, at gas distribution stations, it is usually reduced to 0.25–0.35 MPa for supply to distribution networks. In some cases, when large industrial consumers are connected to the gas distribution stations, the pressure can be regulated at a level of 0.6–1.2 MPa, but such stations do not exceed 10% of the total number. In addition to pressure regulation, gas odorization (addition of odorous substances to detect leaks) and its accounting are also carried out at gas distribution stations.

Gas distribution networks are technological complexes that combine organizationally and technologically interconnected facilities designed to distribute natural gas from the distribution system directly to consumers. The operating pressure in such networks usually does not exceed 1.2 MPa.

Natural gas enters the gas distribution system at the physical connection points with the gas transmission system, from adjacent gas distribution systems, as well as from the networks of gas producing enterprises (GPE), biomethane producers or other types of gas from alternative sources, whose installations are connected to the gas distribution system. Special gas distribution points are used to connect gas pipelines of different pressures within the gas distribution system. The total length of gas distribution networks managed by gas distribution system operators in Ukraine is about 309,000 km. Such networks are mainly organised at the regional level: within each region, there is one gas distribution system operator, which is responsible for the operation and maintenance of the local gas distribution system. Recently, there has been an active consolidation of gas distribution system operators under the management of NJSC Naftogaz of Ukraine, and now most of the approximately 44 operators are part of the Naftogaz Group.

The selection of a connection point for a biomethane plant to the gas network is mainly influenced by **two factors**:

- 1) the plant's proximity to the nearest gas infrastructure, and
- 2) the capacity of that infrastructure to absorb the full annual output of biomethane on a steady basis.

The second factor often becomes decisive. This is explained by the fact that gas consumption in Ukraine has a pronounced seasonality: during the heating season, which lasts on average from mid-October to mid-April, gas consumption increases significantly. On the contrary, in the summer period, consumption drops sharply. The average summer intensity is only 18–30% of the annual average, or 15–20% of the winter one.

This imbalance is particularly evident in regions without large industrial enterprises that could provide stable year-round gas consumption. Most biomethane plants are not designed to cope with major fluctuations in output, as such variability significantly undermines their economic efficiency. For example, if restrictions from the gas distribution system mean that a plant operates at 100% of its planned capacity in winter but only 25–30% in summer, it would be running at reduced productivity for most of the year, negatively impacting the project's payback period.

When connecting a biomethane plant to the GTS, there is a much greater probability that the system will be able to accept all produced biomethane evenly throughout the year. This is an important advantage of this option. At the same time, the GTS operates under significantly higher pressure than the GDS, which requires additional costs for compressing biomethane to feed it into the system. Also, in the case of connection to the GTS, stricter requirements apply to the quality of biomethane, in particular to the maximum permissible oxygen content.

The requirements for the quality indicators of biomethane supplied to gas networks, as well as the procedure for connecting biomethane producers to these networks, are determined by the Gas Transmission System Code² and the Gas Distribution Systems Code³.

To connect to the system, the applicant must contact the operator of the relevant gas network with a request for connection. In some cases, it is advisable to simultaneously contact both the GTS operator and the GDS operator to determine the optimal technical conditions for the future connection.

A special option for connecting a biomethane plant to gas pipeline is the **concept of using reverse compressors**, provided by the GTS and GDS Codes. The essence of this scheme is that the biomethane plant is connected to the GDS, which in turn is connected to the GTS through a specially installed reverse compressor. Such a compressor is able to pump excess gas from the GDS to the GTS if necessary. If there is a shortage of gas in the GDS, the compressor stops, and gas flows from the GTS to the GDS in the usual mode. This provides the biomethane plant with the possibility of connecting to the gas distribution network with guaranteed supply of the entire volume of produced biomethane to the system, even under conditions of variable gas consumption in the GDS.

To generate the pressure required for injecting biomethane into the gas grid, different types of compressors are employed. For gas distribution networks, screw or rotary vane compressors are typically used, as they are more cost-effective than piston compressors. However, the cost of a compressor station is primarily determined not by the type of compressor, but by the required final gas pressure, which directly affects the required electrical power. It is the electrical power of the compressor that is often the main factor determining its cost.

Piston compressors allow achieving much higher pressures at relatively low productivity and are usually used to supply biomethane to the GTS, where the operating pressure can reach 7.5 MPa. At the same time, in some cases, an additional compressor is not required at all to supply biomethane to the gas pipeline. This is possible, for example, when using membrane upgrading technology, which requires a high preliminary pressure of biogas and provides a biomethane pressure at the outlet of 1.0–1.4 MPa, sufficient for direct supply to the gas network.

Other ways of delivering biomethane to consumers are its transportation in a **compressed or liquefied state**, which is carried out not by pipeline, but by conventional land or sea transport in specialised containers. Compression or liquefaction of biomethane is carried out in order to reduce its volume and increase energy density. Production of bio-CNG and bio-LNG allows for a significant increase in energy density, which facilitates their more efficient transportation by land and sea. However, this is accompanied by additional energy costs for compression or liquefaction.

Bio-CNG is produced by compressing biomethane to a pressure of 25–30 MPa, mainly using piston compressors. It is used as a transport fuel for land transport, in particular trucks, buses, cars, as well as tractors and other vehicles with internal combustion engines. Similar to natural gas, bio-CNG is filled into appropriate fuel cylinders installed on vehicles, under a pressure of 20–25 MPa. The density of compressed gas is 140–190 kg/m³. The cylinders are combined into containers of 8–12 cylinders

² <https://zakon.rada.gov.ua/laws/show/z1378-15>

³ <https://zakon.rada.gov.ua/laws/show/z1379-15>

and transported by truck to filling stations. There, the cylinders are connected to refuelling systems, or vehicles are refuelled directly at the bio-CNG production site.

Bio-LNG, unlike bio-CNG, is obtained in liquid form by cooling biomethane, after additionally removing unwanted components that may have remained after the upgrading process. Refrigeration machines operating on the Brayton, Rankine, Linde or Stirling refrigeration cycles are used for cooling. A simpler method is also used for the production of bio-LNG - cooling in a heat exchanger using liquefied nitrogen, which has a lower temperature than the liquefaction temperature of methane. In this case, nitrogen evaporates and biomethane turns into a liquid state. Depending on the scale of the installation, the specific electricity consumption when using refrigeration machines is from 0.6 to 1.7 kWh per kilogram of biomethane. Biomethane, like natural gas, liquefies at atmospheric pressure at a temperature of $-162\text{ }^{\circ}\text{C}$. If the pressure increases, the required liquefaction temperature may be higher. At atmospheric pressure and a temperature of minus $162\text{ }^{\circ}\text{C}$, the density of liquefied biomethane is $426\text{--}430\text{ kg/m}^3$.

Unlike bio-CNG, bio-LNG, due to its higher energy density, can be efficiently transported over much longer distances. That is why it is used for international trade, delivered to other countries by both land and sea transport in special cryogenic containers. Unlike bio-CNG cylinders, these containers do not operate under high pressure, but must maintain a low temperature close to the liquefaction temperature of biomethane. Bio-LNG is used as a fuel for trucks and marine transport. In addition, bio-LNG, like liquefied natural gas, can be returned to a gaseous state and fed into the natural gas system, which is a common practice when importing it from other countries.

To supply biomethane in the form of bio-CNG as a transport fuel, the owner of the biomethane plant can consider the following options:

- 1) Supplying the produced biomethane to the natural gas network and organising a filling station in a convenient location. The gas will be supplied from the gas network, compressed to $20\text{--}25\text{ MPa}$, and supplied for refuelling vehicles.
- 2) A similar option, but with the construction of its own gas pipeline to the location of the filling station.
- 3) Organising the so-called “mother station” directly at the biomethane production plant, where the gas will be compressed to $25\text{--}30\text{ MPa}$ and transported in the form of bio-CNG by road in special cylinders to the location of the “daughter station”, where the cylinders will be connected to the vehicle refuelling system. Empty cylinders will be returned to the plant by road. This option is used in the absence of the possibility or inexpediency of connecting to the gas system or building its own gas pipeline.

The scheme for supplying biomethane to consumers in Ukraine and abroad in the form of bio-LNG involves its liquefaction at a biomethane plant, after which the bio-LNG is transported in special cryogenic tanks to places of consumption. These can be LNG filling stations or LNG terminals, from where the bio-LNG is supplied for further use, taking into account possible regasification and supply to the gas system in gaseous form.

Thus, in Ukraine, there are wide opportunities for the use of biomethane due to the extensive system of gas networks, which allows it to be supplied both to GDS and directly to the GTS. The choice of the optimal connection point is determined by the technical parameters of the networks and gas consumption in the region. In addition to supplying the gas system, important options are the production of bio-CNG and bio-LNG for use as motor fuel or long-distance transportation. These solutions create additional ways to sell biomethane, increase the flexibility of its sales and contribute to the development of the domestic and export market for biomethane in Ukraine.

2.5.Economic Potential of Biomethane

In Ukraine, a medium-scale biogas plant processing agricultural feedstock and producing 1–5 million m³ of methane annually may cost between €1.6 and €4.6 million. By contrast, larger facilities with a capacity of 10–20 million m³ of CH₄ per year require investments ranging from €10 to €18 million.

The capital costs of a biogas upgrading plant depend on the chosen upgrading technology and, most importantly, the project's scale. However, once output reaches around 400–500 m³ CH₄/h, the cost variations between technologies diminish. For a plant with a capacity of approximately 500 m³ CH₄/h, the specific capital cost is about €2 910–€3 185 per 1 m³ CH₄/h.

The income of a biomethane project can be generated from several sources that ensure the monetisation of the technological process. The main ones are the sale of biomethane as a product, the sale or beneficial use of CO₂ formed during the biogas upgrading process, and the sale or accounting for the equivalent cost of digestate. Such a comprehensive approach allows increasing the economic efficiency of the project by maximising the use of biomethane production products.

Currently, there are two main options for the sale of biomethane:

- 1) selling on the domestic market through supply contracts between producers and end-users, and
- 2) exporting biomethane either virtually or physically via Ukraine's gas transmission system to European countries, or by transport in the form of bio-LNG.

A potential possibility is the sale on the domestic market as a transport fuel or for the production of electricity during peak load hours. The sale of biomethane at the price of natural gas or in the form of thermal energy is less attractive, especially taking into account NG tariffs for the population. Given that the cost of biomethane production can reach 500–700 euros per 1000 m³, at the current level of natural gas prices in Ukraine, the production of biomethane for the purpose of its direct substitution of natural gas on the domestic market is economically unprofitable.

The highest income from the sale of biomethane can be expected in the case of its export. When exporting biomethane, its price will be formed according to the equation:

$$\textbf{Biomethane price} = \textbf{NG exchange price} + \textbf{Premium}$$

Stock exchange prices for natural gas at the TTF site (the Netherlands) over the past five years have fluctuated widely from 4 to 339 euros/MWh. The year 2022 was exceptional, characterised by a sharp increase in prices due to the Russian Federation's military aggression and the introduction of sanctions against Russian pipeline gas. Starting from 2023, prices have relatively stabilized and are kept within the range of 24–54 euros/MWh.

The premium for biomethane is the subject of contractual terms between the producer and the trader and is determined individually for each project. The size of this premium significantly depends on two key factors:

- 1) The type of raw material used for biomethane production. Preference is given to raw materials included in Annexe IX of the EU REDII/REDIII Directive, which provides for the promotion of the use of waste and residues.
- 2) The volume of GHG emissions throughout the biomethane value chain - so-called carbon footprint, measured in grams of CO₂ equivalent per megajoule of biomethane energy (gCO₂eq/MJ).

The lower the carbon footprint and the more sustainable the origin of the raw material, the higher the premium embedded in the price of biomethane can be. It is also worth noting that the size of the premium and the total contract price for biomethane, even with the same carbon footprint, can differ

significantly depending on the sales market and the country of export. This is explained by the different levels of demand, regulatory support, the availability of sustainability certification systems and the working conditions of traders in specific countries. Today, the estimated market price of biomethane can be within 800–900 euros per 1000 m³, which significantly exceeds the average cost of natural gas and reflects the environmental and climate value of biomethane.

The export potential of Ukrainian biomethane is significant and has prospects for successful competition in international markets, especially in the European Union. Ukraine has a powerful agricultural sector that generates a large amount of organic residues suitable for biomethane production. As previously mentioned, the total energy potential of biogas and biomethane production in Ukraine is estimated at approximately 21.8 billion m³ per year.

The types of input raw materials include both waste and by-product streams generated in various industries at existing production capacity, and energy crops (mainly corn silage), which can potentially be grown on an area of up to 1 million hectares. In the European Union, energy crops are considered to compete with food and feed; therefore, they do not meet the sustainability criteria set out in the EU REDII/REDIII Directive. Because of this, the prospects for their involvement in biomethane production, especially for export, remain unclear and likely negative. However, the potential for advanced biomethane production in Ukraine, which meets sustainability requirements and does not include biogas from corn silage, is at least 17.8 billion m³ of methane per year.

The main buyers of Ukrainian biomethane in Europe may be consumers and industrial enterprises seeking to reduce CO₂ emissions, especially in industries where natural gas is difficult to replace with electricity, such as the metallurgical industry.

The key factors for success are the creation of a Ukrainian biomethane register issuing guarantees of origin recognised in the EU and other European countries, and the harmonisation of national requirements with EU standards. Biomethane production opens up a unique opportunity for Ukraine to launch a new transparent, innovative, export-oriented sector of the economy with the potential export revenue of up to 9 billion euros annually (provided that 50% of the biomethane produced is exported), as well as the creation of up to 250,000 new jobs.

3. Legal and Regulatory Framework

3.1. Relevant Ukrainian Legislation

The legal regulation of biomethane production and export in Ukraine is grounded primarily in the **Law of Ukraine “On Alternative Fuels”**⁴. This foundational act establishes the legal, economic, environmental, and organizational framework for the production and use of alternative fuels, including biomethane, and defines its regulatory status as a renewable energy carrier produced from biomass.

Under Article 1 of the Law, biomethane is defined as biogas that meets the physical and chemical standards of natural gas for injection into the gas transmission or distribution systems or for use as a motor fuel.

The export of biomethane via pipeline transport is regulated by Article 8-3 of the Law of Ukraine “On Alternative Fuels”. According to this provision, biomethane may be exported only if:

- 1) It is fully produced within the customs territory of Ukraine;
- 2) The producer has a registered account in the Biomethane Register;

⁴ Law of Ukraine “On Alternative Fuels” (No. 1391-XIV of 14.01.2000), as amended.
<https://zakon.rada.gov.ua/laws/show/1391-14#Text>

- 3) The biomethane is injected into the gas transmission or distribution systems and measured by certified equipment (automatic chromatographs and gas metering units);
- 4) A Guarantee of Origin (GoO) is issued for the exported volume.

In the transitional phase, while the Ukrainian Biomethane Register is not yet integrated with the European Union's Union Database (UDB) for renewable gases, producers may temporarily export biomethane based on Proof of Sustainability (PoS) documentation issued under an internationally recognized voluntary certification scheme (e.g., ISCC EU or REDcert). Customs declarations must include references to sustainability certificates and the corresponding PoS documentation.

The adoption of the **Law on amendments to the Customs Code of Ukraine**⁵ introduced a legal framework enabling the export of biomethane from Ukraine via pipeline transport under customs procedures aligned with those applicable to natural gas.

As of 4 March 2022, due to the beginning of the full-scale invasion, Ukraine introduced a zero-export quota for natural gas of Ukrainian origin and, in fact, a ban on natural gas exports. As biomethane is analogous to natural gas, Energy Customs of Ukraine classified biomethane injected into the grids as natural gas, de facto extending the export ban to biomethane. The mentioned Law has been adopted to address this problem and enable the export of biomethane from Ukraine. The adoption of this Law in 2024 legally opened the door to biomethane exports from Ukraine. Biomethane can be exported through Ukraine's gas transmission system via interconnectors with EU countries, including Poland, Slovakia, and others, or via bio-LNG and bio-CNG.

According to the Law, customs control and customs clearance of biomethane are carried out in the same manner as for natural gas. However, as there is a ban on the export of natural gas, the seller of biomethane must provide additional documents confirming that it is biomethane that is being exported.

According to the amended Article 232 of the Customs Code, biomethane transported via pipeline across the Ukrainian customs border under foreign economic contracts is subject to customs control and clearance under the same procedures as natural gas. This includes recording data in energy units (e.g., kWh) based on entry and exit metering points at the border.

Pursuant to Articles 19 and 19-1 of the **Law of Ukraine "On the Natural Gas Market"**⁶ (No. 329-VIII of 09.04.2015), producers of biogas and other types of gas from alternative sources, including biomethane, are legally entitled to access and connect to the gas transmission system, gas distribution systems, underground gas storage facilities, and LNG installations.

Such access is granted on a non-discriminatory basis, provided that:

- 1) The gas complies with the technical and safety regulations applicable to natural gas under national legislation;
- 2) The physical and chemical characteristics of biogas or biomethane conform to the normative requirements for natural gas quality.

Under Article 19, these producers have equal rights with natural gas producers and suppliers concerning system access, as long as their gas products meet the regulatory thresholds for injection

⁵ Law of Ukraine "On Amendments to the Customs Code of Ukraine and Other Laws of Ukraine Concerning Peculiarities of Customs Control and Customs Clearance of Certain Categories of Goods" (Law No. 3613-IX of 20 March 2024). <https://zakon.rada.gov.ua/laws/show/3613-20#Text>

⁶ Law of Ukraine "On the Natural Gas Market" (No. 329-VIII of 09.04.2015). <https://zakon.rada.gov.ua/laws/show/329-19#Text>

into the gas infrastructure. Notably, biomethane, which is biogas upgraded to match the quality of natural gas, qualifies for full legal treatment as equivalent to natural gas.

According to Article 19-1, connection to the GTS or GDS is subject to a standardized technical process. Producers must comply with connection procedures and technical specifications, including pressure, calorific value, and gas composition standards, as established in the Gas Transmission System Code and Gas Distribution System Code.

Furthermore, paragraph 8 of Article 19-1 confirms that gas production facilities, including those producing biogas or biomethane, may act as eligible applicants for system connection under the same conditions as conventional gas extraction enterprises. In practice, this legislative provision ensures the legal integration of renewable gas producers into Ukraine's natural gas market infrastructure.

The Gas Transmission System Code⁷ and Gas Distribution System Code of Ukraine⁸, as adopted and regularly updated by the National Energy and Utilities Regulatory Commission (NEURC), establish the legal, technical, and organizational conditions for operating Ukraine's gas infrastructure. These Codes have been amended to explicitly include biomethane as a marketable gas, provided it meets the physical and chemical standards of natural gas.

Under both Codes, biomethane is legally defined as biogas that has been upgraded to the quality level required for injection into the gas transmission or gas distribution system. This recognition ensures that biomethane producers are considered equal participants in the natural gas market. Accordingly, biomethane producers have the right to access and connect to the gas networks on a non-discriminatory basis, subject to compliance with applicable safety and technical regulations. These include gas composition, calorific value, and pressure compatibility with the respective grid.

The Codes also establish that metering systems at injection points must be equipped with automated gas chromatographs and devices for continuous gas quality control. If the transmission volume exceeds 3,000 cubic meters per hour, an automated in-line device for determining the physicochemical properties (PCPs) of natural gas is required. For transmission volumes below 3,000 cubic meters per hour, the injection point must be equipped with sampling ports for periodic determination of physicochemical properties. Remote data transmission systems are required to ensure real-time monitoring of injected volumes and quality parameters.

Recent amendments introduced the *reverse compressor station*, an important infrastructure component. This facility enables the injection of biomethane from distribution systems into the transmission network. The reverse flow capability ensures the physical movement of biomethane from decentralised production sites (typically connected to the GDS) to high-pressure transmission pipelines, thus enabling further transportation, including export. These stations must be equipped with appropriate compression and gas quality control technology to ensure compatibility with the GTS operational standards.

The biomethane producer may initiate a connection request if the local GDS cannot accept excess biomethane volumes due to limited capacity. The GTS Operator will issue technical conditions for connection only upon receiving a written confirmation from the GDS Operator about the lack of sufficient capacity during at least one gas day per calendar year.

The technical conditions must include, inter alia, the design and commissioning of a reverse compressor station, installation of a commercial metering station (prior to compression equipment), and installation of gas quality monitoring equipment or sampling points, depending on the transfer

⁷ <https://zakon.rada.gov.ua/laws/show/z1378-15#Text>

⁸ <https://zakon.rada.gov.ua/laws/show/z1379-15#Text>

volumes. The station must be physically connected to pipelines owned or operated by the GTS Operator.

All infrastructure developed during the connection process and not owned by the GTS Operator must either be transferred to the GTS Operator or used under an appropriate infrastructure use agreement. The biomethane producer must finance any related capacity upgrades, including modifications to the compressor or metering stations.

Once the connection is complete, the GTS Operator shall provide the GDS Operator with a copy of the technical conditions for further capacity allocation planning. After gas flow commences, the GTS and GDS Operators must update their Technical Agreement and ensure formal acceptance of the commercial metering unit within 20 business days, in accordance with the Gas Transmission Code.

Despite the regulatory framework being in place, no practical examples of biomethane injection into the GTS through a reverse flow from the GDS have been implemented to date.

The legal foundation for the functioning of Ukraine's **biomethane registry** is established by Article 8-1 of the Law of Ukraine "On Alternative Fuels" and implemented through the Cabinet of Ministers Resolution No. 823 of 22 July 2022 (as amended by Resolution No. 1065 of 17 September 2024)⁹. The biomethane registry is a state-administered digital platform designed to record volumes of biomethane injected into or withdrawn from the gas transmission and distribution systems, as well as volumes of liquefied or compressed biomethane. The system enables the issuance, transfer, and cancellation of Guarantees of Origin for biomethane.

The State Agency on Energy Efficiency and Energy Saving of Ukraine (SAEE) serves as both the administrator and holder of the registry. It is responsible for maintaining the digital infrastructure, managing access, verifying submitted data, and issuing electronic Guarantees of Origin. Biomethane producers, gas system operators, and buyers may register to use the system to conduct transactions.

GoOs are essential for verifying the renewable origin of biomethane and serve as the basis for issuing export documentation. Until the Ukrainian biomethane registry is integrated into the EU Union Database, temporary export procedures allow the use of Proof of Sustainability issued under recognised voluntary certification schemes instead of registry-based GoOs.

Currently, Ukraine's registry is preparing for technical and legal interoperability with the UDB. Once integrated, Ukraine's registry will facilitate automated transfer and mutual recognition of GoOs within the EU market framework.

Ukraine has officially adopted the **European standard EN 16723-1:2023 as DCTV EN 16723-1:2023**, which establishes the technical requirements for biomethane intended for injection into natural gas transmission and distribution networks. This standard ensures full regulatory and operational alignment with the EU and supports the safe and efficient integration of biomethane into the national and cross-border gas systems.

The standard defines essential physical and chemical quality parameters, including methane concentration, calorific value, Wobbe index, carbon dioxide and oxygen content, hydrogen sulphide limits, as well as thresholds for ammonia, siloxanes, total hydrocarbons, and moisture content. Biomethane must meet these specifications at the injection point to guarantee compatibility with the existing natural gas infrastructure and downstream consumer equipment.

Biomethane must be odourised prior to injection unless it is performed within the grid. Safety considerations are central to the standard, ensuring that biomethane does not pose risks to pipeline

⁹ <https://zakon.rada.gov.ua/laws/show/823-2022-%D0%BF#Text>

integrity or public health. In addition, biomethane must be fully interchangeable with natural gas to ensure seamless blending or substitution in all types of end-use systems.

The standard mandates continuous gas quality monitoring through chromatographic equipment, which can transmit data remotely to the system operator. Transmission or distribution system operators are entitled to suspend biomethane injection if gas quality is found to be non-compliant.

Enforcing this standard is a key element of Ukraine's integration into the EU energy market and a prerequisite for the recognition of biomethane exports under European technical and safety norms.

3.2. Basic EU Legislation and Requirements

The legal framework for recognition of biomethane from third countries, including Ukraine, into the European Union is primarily governed by **Directive (EU) 2018/2001 (RED II), as amended by Directive (EU) 2023/2413 (RED III)**¹⁰. These Directives establish binding sustainability, traceability, and GHG reduction criteria that must be met for biomethane to be eligible for counting towards EU Member States' renewable energy targets and for access to EU financial incentives.

RED II sets out the overall EU renewable energy target of at least 32% by 2030, while RED III increases this target to at least 42.5%, with a collective ambition of 45% (Article 3, RED III). One of the instruments to meet these goals is the promotion of biomethane, with a specific EU-wide objective of producing 35 billion cubic meters (bcm) of sustainable biomethane per year by 2030, as highlighted in the REPowerEU Plan and confirmed in the RED III preamble (Recital 9).

Biomethane imported into the EU must comply with the sustainability criteria specified in Article 29 of RED II (as amended), which include:

- 1) Feedstock must not be sourced from high-carbon stock or high-biodiversity land;
- 2) GHG emission savings must be at least 65% compared to the fossil fuel comparator (for installations starting operation after 2021);
- 3) Full lifecycle GHG emissions must be calculated using default, actual, or combined values, following the methodology in Annexe VI of RED II.

For biomethane produced in non-EU countries, such as Ukraine, to be recognised under RED II/III, the following conditions must be met:

- 1) Sustainability must be verified through a voluntary certification scheme approved by the European Commission (e.g., ISCC EU, REDcert);
- 2) Each shipment must be accompanied by a Proof of Sustainability issued under such a scheme;
- 3) Information must be submitted to and recorded in the Union Database, the EU's central platform for tracking renewable fuels.

Ukraine has not yet fully integrated its national biomethane registry with the UDB. However, under a transitional mechanism, Ukrainian exporters may temporarily rely on PoS and sustainability certificates for customs clearance and market recognition within the EU. RED III introduces additional provisions to support cross-border renewable gas trade. Biomethane must be injected into the gas grid and tracked through mass-balance systems.

It is believed that confirmation from the European Commission is needed that biomethane injected into Ukraine's gas grid and accompanied by Proof of Sustainability under an EU-recognised voluntary scheme (ISCC EU, REDcert EU) may be counted towards the EU renewable energy targets. Confirmation that Ukraine's gas grid is part of the EU interconnected systems under Regulation (EU)

¹⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02018L2001-20240716>

2022/996 and RED III is required as well to ensure equal conditions for biomethane trade and to strengthen Ukraine's integration into the EU market.

Directive (EU) 2024/1788¹¹ establishes common rules for the internal markets for renewable gas, natural gas, and hydrogen. It sets a comprehensive regulatory framework for the integration of renewable gases, including biomethane, into the EU energy system, and expressly supports the import and market participation of sustainable biomethane from third countries such as Ukraine.

Article 3 and related provisions require Member States to ensure that producers of renewable gas, including biomethane, have the right to connect to gas transmission and distribution networks under non-discriminatory, transparent, and cost-reflective conditions. National regulatory authorities must monitor and, where necessary, enforce the timely processing of grid connection requests. Importantly, the Directive allows grid operators to prioritise connections for renewable gas over fossil-based gas to accelerate the decarbonisation of the gas system.

Member States and transmission system operators are required to take biomethane into account in network development plans. Infrastructure planning must reflect the projected growth of renewable gases and identify potential bottlenecks that could hinder injection or cross-border transport of biomethane. The Directive encourages the development of decentralised injection infrastructure and reverse flow solutions to enable the transfer of biomethane from local distribution networks to the high-pressure transmission system.

Biomethane producers must be granted access to wholesale gas markets and trading hubs under the same conditions as natural gas suppliers. The Directive prohibits discriminatory practices and encourages Member States to establish market-based mechanisms to support the sale of biomethane, including guarantees of origin, contracts for difference, and feed-in premiums, where justified by national policy.

3.3. Certification and Sustainability Criteria

Sustainability is a fundamental criterion for the development of the biomethane sector within the European Union and plays a pivotal role in enabling the integration of Ukrainian biomethane into the EU market. It determines not only the environmental integrity of production but also compliance with EU legislation governing alternative fuels. In the European context, this means adherence to the requirements of Directive (EU) 2018/2001 (RED II) and the updated Directive (EU) 2023/2413 (RED III), which establish mandatory environmental and social sustainability criteria for biomethane production. Fulfilment of these criteria is essential for Ukrainian biomethane to be recognised as sustainable at the EU level, which is a prerequisite for legal and commercially viable export.

According to RED II and RED III, the sustainability of biomethane is defined through a set of criteria that biogas and biomethane must meet to qualify as renewable energy and to be eligible for participation in EU support mechanisms (e.g., quotas, feed-in premiums):

Greenhouse Gas Emission Reduction: Biomethane must achieve at least a 65% reduction in GHG emissions compared to fossil fuels, applicable to installations commissioned after 2021. This calculation includes the full life cycle, from feedstock collection to biomethane injection into the gas grid.

Land-Use Requirements: Feedstock cultivation on land with high ecological value is prohibited. This includes primary forests, wetlands, peatlands, high-carbon-stock lands, and protected nature reserves.

¹¹ <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32024L1788>

Traceability and Transparency: Full documentation of feedstock origin, place of cultivation or generation, and supply chain traceability is required. Each stage of the value chain must be auditable.

Sustainability Certification: Sustainable biomethane production must be verified through independent third-party audits under certification schemes recognised by the European Commission, such as ISCC EU or REDcert.

For instance, sustainability certification under the ISCC EU scheme consists of multiple audit stages, each requiring documented compliance. Upon successful certification, the producer is entitled to market certified sustainable biomethane under the ISCC EU standard and use the certification logo and related designations in its business operations.

In the context of RED II/RED III compliance, the feedstock list provided in Part A of Annex IX is particularly important. Biomethane produced from these raw materials is considered “advanced”. The use of such feedstocks ensures higher environmental performance, avoids competition with food and feed production, prevents deforestation or land conversion, and contributes to biodiversity preservation and soil protection. Moreover, the choice of feedstock directly influences the carbon intensity of biomethane and therefore its market value. The biomethane price includes the energy value of natural gas and a premium, the level of which is determined by the carbon footprint of the biomethane and the feedstock's eligibility under Annex IX of RED II.

In accordance with EU legislation, particularly **Commission Implementing Regulation (EU) 2022/996**, biomethane exported to the EU must be traceable via the Union Database. The Ukrainian registry is expected to implement the necessary protocols for interoperability with the UDB, facilitating the transmission of proof of sustainability and volume data for biomethane exported from Ukraine. This integration is critical to allow recognition of Ukrainian biomethane as sustainable under RED II/III and to enable its eligibility for use in EU renewable energy targets and compliance schemes.

4. Technical Requirements and Procedures

4.1. Connection to Gas Infrastructure

Table 1 shows general requirements for connecting natural gas/biomethane producers to the gas distribution and transmission systems.

Table 1. Requirements for connection to the GDS and GTS

Requirements	GDS	GTS
Pressure at the network inlet	0.2-1.2 MPa	basic: 5.5/7.5 MPa (in some areas < 5.5 MPa)
Requirements for physical and chemical parameters of natural gas:		
Oxygen content, mol .%		
➤ From 03-08-2022 until the entry into force of the Technical Regulations for Natural Gas	1.0	0.2
➤ After the entry into force of the Technical Regulations for Natural Gas ¹²	up to 1.0	in general up to 0.2, by agreement - up to 1.0
Other conditions	According to Chapter 1 of Section III GTS Code	According to Chapter 1 of Section III GTS Code
Required equipment for connection:		
Telemetry	Yes	Yes

¹² Not yet implemented. See the published Draft Regulation: <https://www.drs.gov.ua/wp-content/uploads/2024/03/1831.pdf>

Requirements	GDS	GTS
Gas consumption measurement point at the boundary of the networks as part of: ➤ gas metering unit; ➤ flow chromatograph; ➤ flow meter for dew point temperature for water and hydrocarbons		
Odorization unit	Yes	In some cases, depending on the connection location
Pressure control unit Switching node	Yes	No
Connection unit (consisting of ball valve and shut-off valve)	No	Yes
Booster compressor	No	Yes
Available input capacity depends on local demand volume	Yes	No/Yes (in some cases, depending on the connection location)
The need to ensure high inlet pressure to the network	No	Yes

The key provisions governing the procedure and stages of connection to **Ukraine's GTS** are as follows:

- I. The procedure for connecting to the GTS is carried out in accordance with the GTS Code. Section VI of the GTS Code determines the procedure for connecting the Customer's facilities to the gas transportation system, which was approved by the resolution of the National Regulator (NEURC) No. 2493 dated 30.09.2015¹³.
- II. Information on the connection conditions is posted on the operator's (GTS) official website at <https://tsoua.com/en/business-services/how-to-become-a-customer/connection-to-the-gts/>.
- III. Contacts regarding connection of a facility to the GTS¹⁴:
 - Contact person: Kamarchuk Oleg Mykhailovych
 - E-mail: connection-GTS@tsoua.com
 - Phone: (044) 461-21-54
- IV. Main stages of connecting a facility to the GTS:
 - 1) The Customer's application to the GTS Operator of Ukraine (OGTSU) with the relevant Application for connection¹⁵.
The following are attached to the application (see clause 1 of chapter 2 of section VI of the GTS Code):
 - ✓ **a completed questionnaire**¹⁶ in the specified form, which indicates the technical parameters of the customer's facility that is to be connected to the gas transportation system;
 - ✓ **a mandatory appendix to the questionnaire** - a draft scheme for delimiting the balance sheet ownership of gas pipelines and the operational responsibility of the parties;
 - ✓ **copies of documents** confirming the **customer's ownership or use rights** to the facility planned for connection, or to the land plot where such a facility is planned to be built;

¹³ <https://www.nerc.gov.ua/acts/pro-zatverdzhennya-kodeksu-gazotransportnoi-sistemi?id=18007>

¹⁴ <https://tsoua.com/kliientam/yak-statyi-kliientom/pryednannya-do-gts/>

¹⁵ <https://tsoua.com/wp-content/uploads/2023/01/application-for-GTS-connect-2.docx>

¹⁶ <https://tsoua.com/wp-content/uploads/2024/04/Opytuvalnyj-lyst-2024.docx>

- ✓ **copies of the customer's documents** confirming the authority of the representative to conclude a connection agreement.

List of documents confirming **the authority of the representative** to conclude an agreement on accession:

- ✓ Copy of the charter of the counterparty, certified by an authorised person of the enterprise;
 - ✓ Copy of the order on the appointment of the head of the counterparty, certified by an authorised person of the enterprise;
 - ✓ Copy of the minutes of the meeting of the founders on the appointment of the head of the counterparty, certified by an authorised person of the enterprise;
 - ✓ Certified copy of documents for signature verification;
 - ✓ Copy of the Power of Attorney of the signatory, customer of transportation services.
- 2) Consideration of the application of the OGTSU, issuing an invoice for payment for services for preparing the technical conditions and the draft agreement for connection to the GTS.
 - 3) Payment by the Customer for the preparation of the technical conditions.
 - 4) The customer is provided with the technical conditions for connection, the draft agreement for connection to the GTS, and the act of acceptance of the services provided.
 - 5) Conclusion of the **GTS connection agreement**¹⁷ by the OGTSU and the Customer.
 - 6) Development of the connection design (provided by the Customer, performed by any licensed contractor).
 - 7) Submission by the Customer of the developed design and estimate documentation for OGTSU approval.
 - 8) State examination of the design and estimate documentation (provided by the Customer).
 - 9) Determination of the cost of connection (additional document to the GTS connection agreement with determination of the cost of connection to the GTS). The cost of connection to the GTS is determined according to the Methodology approved by the NEURC Resolution No. 3054 as of 24.12.2015.
 - 10) Construction work carried out in accordance with the design and estimate documentation by any licensed certified organisation.
 - 11) Commissioning of the constructed facility in accordance with current legislation.
 - 12) Ensuring the connection of the Customer's facility to the GTS by the OGTSU in accordance with the terms of the GTS connection agreement.
 - 13) Gas start-up in accordance with current legislation and the terms of the GTS connection agreement.

V. Receiving transportation services after connection¹⁸:

Becoming a Customer:

- Obtain the EIC code of the natural gas market entity or register the EIC code of the electricity market participant in the electronic database of the GTS Operator.
- Conclude a transportation contract with the GTS Operator of Ukraine.
- Register on the IT platform since the natural gas transportation service is carried out using the operator's Informational Platform, which is a web application.

¹⁷ <https://zakon.rada.gov.ua/laws/file/text/94/f450132n2669.doc>

¹⁸ More details: https://tsoua.com/wp-content/uploads/2021/04/TSO_How_to_become_a_Customer.pdf

- Obtain a Shipper Code (obtained by a customer who plans to import, export, transit, or store gas in a gas storage facility in the "customs warehouse" mode).

Conduct operational activities:

- Capacity booking and payment: make payment for capacity and create the necessary financial security.
- Upload a scanned copy of the periodic customs declaration (PCD) to the Informational Platform.
- Submit a nomination via the GTS Operator Informational Platform
- Submit a Trade Notification via the GTS Operator Informational Platform.

According to the Methodology approved by the NEURC Resolution No. 3054 of December 24, 2015, the fee for connecting customer facilities, which is non-standard (this is exactly the case for cases of connecting biomethane plants), is determined by the operator of the gas transmission/distribution system in the connection agreement, taking into account:

- the cost of developing the design and its estimate part, if the design was developed by the gas transmission/distribution system operator;
- the cost of constructing external gas networks to the connection point, which is determined by the estimated part of the design, developed in accordance with the requirements of the technical conditions for connection;
- the cost of installing a metering unit at the measurement point with its protection from adverse weather conditions and unauthorised access, which is determined by the design and its estimated cost;
- the cost of connecting external and internal gas networks, as well as the cost of gas start-up, which are determined in accordance with the requirements of Section IV of the abovementioned Methodology.

According to the GDS Code, the algorithm for connecting to the **gas distribution system** of facilities (installations) of producers of biomethane and/or other types of gas from alternative sources that intend to connect to the gas distribution system in order to transfer the produced gas to the GDS is as follows:

1. A business entity engaged in, or planning to engage in, biomethane production must submit an application to the Gas Distribution System (GDS) Operator requesting a conclusion on the technical feasibility or infeasibility of receiving biomethane from the production facility into the distribution system for at least one day within a calendar year. The assessment is carried out based on the facility's design capacity, consumption and flow volumes, as well as the technical limitations of the gas distribution system.

Within ten (10) working days, the GDS Operator shall issue a written conclusion on the technical feasibility or infeasibility of such receipt, specifying:

- potential technical solutions to enable connection of the required facility capacity, and/or
- the necessity of applying to the GTS Operator for the construction or reconstruction of GTS facilities, and other relevant measures.

These conclusions shall be provided free of charge.

2. For the connection of facilities operated by gas production enterprises, including producers of biomethane or other types of gas from alternative sources, to the gas distribution system, the Customer

shall submit to the GDS Operator and the Customer Service Centres of the branches of LLC “Gas Distribution Networks of Ukraine” a **complete and exclusive set of required documents**:

- application for connection¹⁹;
- questionnaire²⁰;
- copies of documents determining the customer's right of ownership or use of the object and/or land plot, etc.;
- copies of documents certifying the identity of the customer or the customer's representative (for individuals);
- copies of documents certifying the status of a legal entity or an individual entrepreneur and its representative (for legal entities and individual entrepreneurs);
- a copy of a duly executed Power of Attorney for the customer's representative.

Within 10 working days²¹ from the date the application for connection is registered, the GDS Operator shall provide the customer with a draft connection agreement signed by the GDS Operator, draft technical conditions for connection, and relevant invoices for payment.

3. After concluding the connection agreement, the design and estimate documentation (DED) for external gas supply is developed and approved based on the signed technical conditions and the development of the DED for internal gas supply. The customer shall indicate the DED executor in the questionnaire.

4. The GDS Operator performs the construction and commissioning of external gas supply networks, including a commercial gas metering unit and a flow chromatograph. The customer provides the construction and commissioning of internal gas supply networks.

5. Access to the GDS is provided on the condition and on the basis of a technical agreement concluded with the GDS Operator on the conditions for receiving and transferring biomethane to the GDS (see Appendix 2 to the Code of Gas Distribution Systems)²².

6. Transfer of produced biomethane to the GDS.

For a sample of the **Technical Conditions** for connection to the gas distribution system of facilities (installations) producing biomethane and/or other types of gas from alternative sources, see Appendix 18 to the GDS Code²³. For a sample of a **non-standard connection agreement**, see Appendix 16 to the GDS Code²⁴.

4.2. Gas Quality Standards

According to the GTS Code, natural gas supplied to the GTS must meet the following basic requirements (Table 2).

Table 2. Requirements of the GTS Code of Ukraine for the supply of natural gas and biomethane to the GTS network

¹⁹ [Application for connection/reconstruction of the gas distribution system of facilities \(installations\) of gas producing enterprises and producers of biomethane or other types of gas from alternative sources](#)

²⁰ [Questionnaire for the application for connection/reconstruction of the gas distribution system of facilities \(installations\) of gas producing enterprises and producers of biomethane or other types of gas from alternative sources](#)

²¹ the specified period is extended by the period necessary to clarify the data or eliminate comments on the submitted documents or obtain the consent of the owner of the gas networks.

²² <https://zakon.rada.gov.ua/laws/file/text/108/f450132n2751.docx>

²³ <https://zakon.rada.gov.ua/laws/file/text/121/f450132n2845.docx>

²⁴ <https://zakon.rada.gov.ua/laws/file/text/94/f450132n2669.doc>

No.	Parameter	Value
1.	methane content (C1), mol %	≥ 90
2.	ethane content (C2), mol %	≤ 7
3.	propane content (C3), mol %	≤ 3
4.	butane content (C4), mol %	≤ 2
5.	content of pentane and other heavier hydrocarbons (C5+), mol %	≤ 1
6.	nitrogen content (N2), mol %	≤ 5
7.	carbon content (CO2), mol %	≤ 2
8.	oxygen content (O2), mol %	≤ 0.2
9.	higher calorific value (25°C / 20°C)	min. 36.20 MJ/m ³ (10.06 kWh /m ³)
		max . 38.30 MJ/m ³ (10.64 kWh /m ³)
10.	higher calorific value (25 °C/0 °C)	min. 38.85 MJ/m ³ (10.80 kWh /m ³)
		max . 41.10 MJ/m ³ (11.42 kWh /m ³)
11.	lower calorific value (25 °C/20 °C)	32.66 MJ/m ³ (9.07 kWh /m ³)
		34.54 MJ/m ³ (9.59 kWh /m ³)
12.	humidity dew point temperature °C at absolute gas pressure 3.92 MPa	≤ -8
13.	dew point temperature for hydrocarbons at a gas temperature not lower than 0 °C	$\leq 0^{\circ}\text{C}$
14.	content of mechanical impurities:	missing
15.	hydrogen sulfide content, g/m ³	≤ 0.006
16.	mercaptan sulfur content, g/m ³	≤ 0.02

The specified requirements apply insofar as they do not contradict the requirements specified in the Technical Regulation of Natural Gas. Although several drafts have been published, the Technical Regulation of Natural Gas has not yet been put into effect. Therefore, with its implementation, the specified list of requirements may be supplemented.

Natural gas supplied to the GDS must comply with the natural gas standards specified in the GTS Code in terms of its physical and chemical characteristics. The requirements of the GDS Code (which differ from the requirements of the GTS Code) are as follows: the oxygen content must not exceed 1.0%, and the requirements for the mercaptan sulfur content are not specified.

Natural gas injected into or withdrawn from a gas storage facility must comply with the GTS Code's requirements²⁵.

To be fed into the European natural gas transmission and distribution systems, biomethane must comply with harmonised EU standards and regulations. The main documents defining the relevant requirements are:

- EN 16726: “Quality of gas—Group H” applies to natural gas. This standard sets out general parameters (calorific value, gravimetric properties, sulphur and oxygen limits). It is currently being revised to include hydrogen and strengthen sulphur/oxygen limits. This standard has been adopted and entered into force in Ukraine.
- EN 16723-1: “Natural gas and biomethane for use in transport and biomethane for injection in the natural gas network” – supplements EN 16726 with additional restrictions for biomethane. It defines requirements for the content of pollutants specific to biomethane (siloxanes, halogenated hydrocarbons, ammonia, HF). In particular, the maximum total content of volatile silicon compounds (in terms of Si) should be from 0.3 to 1.0 mg/m³, the molar fraction of carbon monoxide (CO) should not exceed 0.1%, the mass fraction of

²⁵ In accordance with paragraph 2, item 10, chapter 1, section III of the Gas Storage Code.

ammonia (NH₃) - not more than 10 mg/m³, the content of amines - also not more than 10 mg/m³. Biomethane must meet the requirements of EN 16726 for general parameters and the above requirements, only for parameters specific to biomethane. This standard has also been adopted and entered into force in Ukraine.

- Regulation (EU) 2024/1789: On the internal markets for renewable gas, natural gas and hydrogen – requires the daily publication of specific gas quality parameters at entry and exit points of the transmission system for renewable gas, natural gas, and hydrogen. This includes the Wobbe index, gross calorific value, methane content, hydrogen content, and oxygen content. This transparency aims to facilitate the integration of these gases into the energy system and support the EU's climate goals.

Table 3 compares the requirements of the EN 16726 standard with those of the Ukrainian GTS and GDS Codes.

Table 3. Comparison of the requirements of the EN 16726 standard and the requirements of the Ukrainian GTS Code and GDS Code

Indicator	GTS and GDS Codes	EN 16726
Relative density	no requirement	min. 0.555 max . 0.700
Methane content (C1), mol .%	min 90	no requirement
Ethane content (C2), mol %	max 7	no requirement
Propane content (C3), mol %	max 3	no requirement
Butane content (C4), mol %	max 2	no requirement
Content of pentane and others (C5+), mol. %	max 1	no requirement
Nitrogen content (N2), mol %	max 5	no requirement
Carbon content (CO2), mol %	max 2	max 2.5 or 4.0
Oxygen content (O2), mol %	max 0.2 – GTS max 1.0 – GDS	max 0.001 (avg/24) or max. 1.0 under certain conditions
Hydrogen content (H2), mol %	no requirement	no requirement
Higher calorific value (25 °C/20 °C):		no requirement
minimum	36.20 MJ/m ³ (10.06 kWh /m ³)	
maximum	38.30 MJ/m ³ (10.64 kWh /m ³)	
Higher calorific value (25 °C/0 °C):		
minimum	38.85 MJ/m ³ (10.8 kWh /m ³)	
maximum	41.10 MJ/m ³ (11.42 kWh /m ³)	
Lower calorific value (25 °C/20 °C):		
minimum	32.66 MJ/m ³ (9.07 kWh / m ³)	
maximum	34.54 MJ/m ³ (9.59 kWh / m ³)	
Wobbe number higher, kWh /m ³	no requirement	according to EN 437:2018
Methane number	no requirement	min. 65
Dew point temperature (°C) by humidity at an absolute gas pressure of 3.92 MPa	does not exceed (– 8)	does not exceed (– 8) at a pressure of up to 7 MPa
Dew point temperature (°C) for hydrocarbons at gas temperature not lower than 0 °C	does not exceed 0 °C	does not exceed (–2) °C
Content of mechanical impurities	missing	no requirement
Hydrogen sulfide content, mg/m ³	max. 6	max. 5

Mercaptan sulfur content , mg/m ³	max. 20	max. 6 (without odorant)
Total sulfur content, mg/m ³	no requirement	max. 21 (30)

4.3.Measurement and Accounting

Chapter II, Section III of the GTS Code, “Procedure for Natural Gas Metering,” establishes requirements for gas metering systems and devices.

In the event of a biomethane producer connecting directly to the gas transmission system:

- Determination of the physicochemical parameters of natural gas at the entry points of the gas transmission system is carried out at commercial gas metering units of operators of adjacent systems or other entities directly connected to the gas transmission system using automatic flow devices (automatic chromatographs and moisture meters) and/or measuring chemical and analytical laboratories (Clause 5, Chapter III, Section I of the GTS Code). For new entry/exit points to/from the gas transmission system through which natural gas is supplied, the norm for equipment with devices that continuously ensure control of the physicochemical parameters of natural gas is mandatory regardless of the volume of natural gas transmission (Clause 7, Chapter III, Section I of the GTS Code).

In case of connection of a biomethane producer to the gas transmission system through the gas distribution system:

- In accordance with paragraph 4 of Chapter III, Section VI of the GTS Code “Features of connection of biomethane production facilities for supplying biomethane to the gas transmission system through the gas distribution system”, it is necessary to equip an automatic flow device for determining the physicochemical parameters of natural gas in the case of a natural gas transmission volume of more than 3000 cubic meters per hour, and for transmission volumes of less than 3000 cubic meters per hour, it is necessary to equip sampling points for determining the physicochemical parameters.

In addition, according to the Law of Ukraine “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”²⁶, the export of biomethane transported across the customs border of Ukraine by pipeline is carried out by biomethane producers for whom an account has been created in the biomethane register provided for in Article 8-1 of this Law, and who are connected to a gas transportation or gas distribution system **using an automatic flow device (automatic chromatograph) and a gas metering unit.**

Thus, if biomethane is to be exported, the installation of an automatic chromatograph is mandatory in any variant of connecting a biomethane producer to gas networks.

The volume and physicochemical parameters of natural gas are determined under normal and standard conditions (Table 4).

Table 4. Pressure and temperature values for normal and standard measurement conditions

Measurement	Normal conditions			Standard conditions		
Determining the volume of gas:	Pressure Pn	Temperature Tn		Pressure Ps	Temperature Tc	

²⁶ zakon.rada.gov.ua/laws/show/3613-20#Text

	101.325 kPa	273.15 K (= 0 °C)		101.325 kPa (760 mm Hg)	293.15 K (= 20 °C)	
Definition of the higher calorific value:	Pressure P _n	Combustion temperature T _c	Measurement temperature T _n	Pressure P _s	Combustion temperature T _c	Measurement temperature T _s
	101.325 kPa	298.15 K (= 25 °C)	273.15 K (= 0 °C)	101.325 kPa	298.15 K (= 25 °C)	293.15 K (= 20 °C)

Section III of the GTS Code defines the main provisions of the procedure for accounting for natural gas.

Procedure for accounting for natural gas (Chapter 2 of Section III of the GTS Code):

- Gas is received and transferred at entry/exit points exclusively through a commercial gas metering unit (CGMU).
- If the supplying party does not have its own CGMU, accounting is carried out at the CGMU of the receiving party.
- The CGMU at the entry point into the gas transportation system must be located within the balance sheet ownership between the operators of adjacent systems.
- If necessary, the CGMU owner transfers the relevant infrastructure to the GTS operator for maintenance under a cost-reimbursement agreement.
- The volume of transmitted gas is adjusted for losses between the CGMU and the balance boundary based on the results of instrumental measurements.
- Other production and technological losses after the CGMU (on regulators, safety devices, etc.) are determined according to the schedule or calculation agreed in the Technical Agreement.
- The volume of gas is recorded in m³ per hour, day, month and converted into MWh according to the appropriate formula.
- In automated accounting, correctors/calculators connected to a flow chromatograph are used; in semi-automatic mode, specialised programs with fixed or hourly values of the calorific value are used.
- Daily and monthly volumes are calculated as the sum of the corresponding hourly or daily values; weighted average calorific values are determined similarly.
- The technical regulations of the central regulation body in the oil and gas complex (Ministry of Energy) regulate requirements for CGMU and metering devices, their operation, and software protection.
- The owner ensures the uninterrupted operation of CGMU, carries out repairs and informs the operator of the adjacent system via dispatch communication.
- The GTS Code and rules for the safety of gas supply regulate joint inspections, interaction in emergency situations, and dispute resolution.
- The operator of the adjacent system has the right to install redundant correctors or a separate CGMU outside the owner's balance sheet. The installation of redundant equipment is carried out according to the agreed technical conditions and should not affect the operation of the main CGMU. The commissioning of redundant equipment is formalised by a bilateral act, and access to data is equal for both parties.

Procedure for exchanging data on measured gas volumes and organisation of the data collection and transmission system (chapter 6 of Section III of the GTS Code):

- By the 5th of the following month, the CGMU owner sends the other party hourly printouts with gas volumes, physicochemical parameters, and information on accidents and interventions.
- By agreement, the GTS operator may publish data on its own website.
- If publication is not applied, the supplying party provides permanent electronic access according to the agreed data transmission system design (equipment, communication channels).
- The GTS operator and other connected entities agree on the frequency and conditions of access to telemetric data in technical agreements.
- In the event of a lack of telemetry or an accident, data is transmitted according to the rules of this chapter or additional technical agreements.
- When connecting a new point, the GTS operator establishes requirements for the installation of telemetry systems and access to data in the technical conditions.
- If the operator is not the owner of the GMU, he has the right to install telemetry devices at the metering node (the devices belong to the person who installed them) and receive data from them.
- In the event of a telemetry accident, the responsible entity notifies other data users no later than the next business day (or within the period established by the technical agreement).

Documentary registration of natural gas acceptance and transfer (chapter 7 of Section III of the GTS Code):

- The procedure for accepting and transferring natural gas at entry points and exit points on the interstate connection is determined by the relevant agreement on interaction between the gas transmission system operator and the operator of the adjacent gas transmission system. The transportation customer, together with both operators, signs acceptance and transfer acts by the 5th day of the month following the reporting month for the volumes of gas at the interstate connection points.
- Registration of acceptance and transfer acts of natural gas between the gas transmission system operator and the adjacent gas production enterprise, the operator of the adjacent system or the direct consumer is carried out in accordance with the requirements of this section, the technical agreement and taking into account the following:
 - 1) The acceptance and transfer of natural gas between the gas transmission system operator and the adjacent gas production enterprise shall be formalised by acceptance and transfer acts²⁷ signed by representatives of these parties no later than the 5th day of the month following the reporting month. If other gas production enterprises are connected to the networks of the adjacent gas production enterprise, the adjacent gas production enterprise shall be obliged to detail in the annex to the acceptance and transfer act the total volume of gas for all gas production enterprises that supply gas to the gas transmission system through its networks, as well as for the gas transmission system operator (for the volumes of natural gas that is transmitted by the gas transmission system operator at the exit point to the adjacent gas production enterprise and is taken by the gas transmission system operator at the entry point from the adjacent gas production enterprise (through whose networks

²⁷ https://tsoua.com/wp-content/uploads/2021/12/2_Act_VTP_21_03_2019.doc?cfchl tk=8KJdebHRaLdbQGq.jUj2.ym1JRltxlKbaJHi71xY1Y-1754502663-1.0.1.1-QAgIv iZmaPxKdetjPaLmRTusfR_FKpwMg6mhDsoESg

natural gas of another gas production enterprise or group of gas production enterprises may be transmitted);

- 2) the acceptance and transfer of natural gas between the gas transmission system operator and the LNG operator shall be formalised by acceptance and transfer acts signed by representatives of these parties no later than the 5th day of the month following the reporting month;
 - 3) The acceptance and transfer of natural gas between the gas transmission system operator and the gas storage facility operator shall be formalised by acceptance and transfer acts signed by representatives of these parties no later than the 5th day of the month following the reporting month;
 - 4) The acceptance and transfer of natural gas between the gas transmission system operator and the gas distribution system operator takes place at the points of commercial gas metering at gas distribution stations and is formalised by acceptance and transfer acts signed by representatives of these parties no later than the 5th day of the month following the reporting month;
 - 5) The acceptance and transfer of natural gas between the gas transmission system operator and the direct consumer take place at the points of commercial gas metering and are formalised by acceptance and transfer acts signed by representatives of these parties no later than the 5th day of the month following the reporting month.
- The owner of a commercial gas storage facility (CGSF) must prepare and provide to the other party by the 5th day of the month following the reporting month a monthly passport-certificate of the physical and chemical characteristics of gas, which indicates all the physical and chemical characteristics subject to control in accordance with paragraph 13 of Chapter 1 of Section III of the GTS Code, including the weighted average value of the gross calorific value for the month (in kWh/m³ with a display resolution of two digits after the integer).
 - By the 8th day of the following month, the gas production enterprise and the adjacent gas production enterprise shall provide the gas transmission system operator with a report on the actual production of natural gas for this gas month. By the 8th day of the following month, the gas transmission system operator shall provide:
 - 1) the LNG facility operator, on the basis of gas acceptance and delivery acts issued in accordance with subparagraph 2 of paragraph 7 of this chapter, - consolidated natural gas registers on the volumes of gas that were submitted at the entry points to the gas transportation system operator for this gas month in terms of transportation service customers;
 - 2) the gas storage facility operator, on the basis of gas acceptance and delivery acts issued in accordance with subparagraph 3 of paragraph 7 of this chapter, - consolidated natural gas registers on the volumes of gas that were submitted at the entry points and/or received at the exit points for this gas month in terms of transportation service customers.
 - The information specified in this paragraph shall be provided in accordance with the forms of the gas transmission system operator and shall be posted on its website.
 - The transfer of natural gas supplied to the gas transmission system between customers of transportation services shall be carried out at a virtual trading point by submitting trade notifications to the gas transmission system operator in accordance with the requirements of Chapter 2, Section XIV of the GTS Code.

As for the requirements for measuring and accounting for biomethane volumes for producers connected to the GDS, these requirements are determined by Section VIII of the GDS Code. The procedure for the relationship of the GDS Operator with a gas production enterprise and producer of biomethane or other gas from alternative sources, which is connected to the GDS in accordance with the procedure established by law, as well as with the adjacent GDS Operator regarding the quality of natural gas supplied to the GDS, is regulated by Chapter 1 of Section VIII of the GDS Code and the technical agreement on the conditions for the acceptance and transfer of natural gas or biomethane to the GDS.

The numerical values of the physicochemical parameters of natural gas supplied to the gas distribution system from the natural gas or biomethane production enterprise (adjacent GDS Operator) must comply with the parameters and principles defined in the GTS Code, as for GTS exit points, with the exception of the requirements for the mercaptan sulfur content and the molar fraction of oxygen content (the oxygen content must not exceed 1.0%).

Determination of the physicochemical parameters of natural gas, the numerical values of which are used to calculate the volume of gas entering the gas distribution system, shall be performed by chemical and analytical laboratories (hereinafter referred to as chemical laboratories) of the natural gas or biomethane production enterprise, or by independent chemical laboratories authorised in accordance with applicable legislation.

Gas sampling shall be conducted by the natural gas or biomethane production enterprise (the adjacent GDS Operator) at sampling points agreed upon with the GDS Operator. Sampling must be carried out periodically and in accordance with the procedure established by DSTU ISO 10715:2009 "Natural Gas. Guidelines for Sampling", approved by Order No. 485 of the State Committee of Ukraine for Technical Regulation and Consumer Policy dated December 30, 2009 (hereinafter referred to as DSTU ISO 10715:2009).

Authorised representatives of the GDS Operator are entitled to be present during gas sampling and/or analysis to determine the physicochemical parameters.

Points (places) of natural gas reception and transmission to the GDS, in which a natural gas market entity adjacent to the gas distribution system transmits natural gas in an average monthly volume of more than 30,000 cubic meters per hour, must be equipped by the specified entities with devices (in particular, a chromatograph, a flow density meter, a dew point meter) that continuously ensure control of the physicochemical parameters of gas, with the possibility of remote control and data transmission and prompt shutdown of the supply of poor-quality gas to the gas distribution system.

The natural gas or biomethane production enterprise (the adjacent GDS Operator that transmits gas) shall provide the GDS Operator by facsimile (or other means of electronic communication) daily by 12:00 noon with operational data on the physicochemical parameters of natural gas at all points of its sampling agreed with the GDS Operator, which shall contain the following numerical values:

- gas density;
- nitrogen content;
- carbon dioxide content;
- dew point;
- Wobbe index;
- calorific value.

Based on the operational data regarding the physicochemical parameters of natural gas delivered to the GDS Operator, the natural gas or biomethane production enterprise (the adjacent GDS Operator) shall, on a daily basis from 14:00, ensure the entry of numerical values of these parameters into the databases of calculators or gas volume correctors that form part of the CGMU at the GDS (i.e., at the gas reception and transmission points). This process shall be carried out in coordination with the GDS Operator.

By the 2nd day of the calendar month following the reporting month (inclusive), the natural gas or biomethane production enterprise (the adjacent GDS Operator) shall provide the GDS Operator with a comprehensive passport of the physicochemical parameters of natural gas for all sampling points agreed upon with the GDS Operator. This document (the monthly physicochemical parameters passport) must be reviewed and approved by the GDS Operator.

Odorization of natural gas supplied to the gas distribution system by natural gas or biomethane production enterprises shall be carried out by these enterprises in accordance with applicable regulatory documents. Exceptions are permitted when, with the prior agreement of the gas distribution system operator, natural gas intended for technological purposes of specific consumers connected to (or via) the gas distribution system is required to be supplied without odorization.

The natural gas or biomethane production enterprise is responsible for ensuring the proper quality of odorization of the gas it supplies to the gas distribution system. The gas distribution system operator retains the right to monitor and verify the quality of odorization of natural gas entering the system.

The procedure for commercial accounting of natural gas – including the determination of its volumes and monetary value – at the points of receipt into the GDS from gas production enterprises, biomethane producers, or producers of other gases from alternative sources, as well as at the boundaries of balance ownership between adjacent gas distribution systems, shall be carried out in accordance with the technical agreement on the conditions for acceptance and transmission of gas within the GDS.

This agreement is concluded between the GDS Operator and the respective natural gas or biomethane production enterprise, and, where applicable, between adjacent GDS Operators. All procedures must comply with the requirements set forth in the GDS Code.

Section VI of the GDS Code defines the process for concluding a technical agreement on the conditions for accepting and transmitting gas within the GDS.

The actual volume of natural gas entering/leaving the GDS (including at consumer facilities) for a certain period is determined at commercial metering points (at the balance sheet boundary) based on data from CGMU installed at metering points and other regulated procedures in cases provided for by the GDS Code.

The volume of natural gas at commercial metering points must be brought to standard conditions (exclusively in the case of metering of natural gas used by a non-domestic consumer) and converted into energy units (volume) in accordance with Section XV of the GDS Code.

The GDS Operator determines the volume of transmitted (consumed) energy in three units of measurement: kWh/Gcal/MJ.

The volume of natural gas transmitted at the balance sheet boundary between the GDS Operator and either a natural gas or biomethane production enterprise, or an adjacent GDS Operator, shall be determined based on data from commercial metering points specified in the relevant technical agreement on the conditions for acceptance and transmission of natural gas.

This determination shall be carried out in accordance with the provisions of the GDS Code and the terms of the applicable technical agreement governing gas acceptance and transmission within the gas distribution system.

To determine the volume of natural gas entering the GDS from the natural gas or biomethane production enterprise, data from the GDS Operator's commercial metering point is accepted. In the absence of a commercial metering point, the GDS Operator accepts data from the GDS Operator's commercial metering point of a natural gas or biomethane production enterprise.

Volumes (in cubic meters and in kWh, Gcal, MJ) of natural gas reception and transmission at the points of its entry into/from the GDS must be documented no later than the fifth day of the month following the reporting month, by drawing up acts of natural gas reception and transmission, which are signed between adjacent entities of the natural gas market.

4.4. Transmission

Obtaining access to capacity, providing transmission services, including taking actions to resolve daily imbalances, are components of the natural gas transmission service and are carried out exclusively on the basis of a **transmission contract**²⁸. The gas transmission system operator has no right to refuse to conclude a transportation contract provided that the applicant complies with the requirements for concluding it.

This standard contract establishes the legal and technical conditions for providing natural gas transmission services between the GTS operator and the service customer in accordance with the Law "On the Natural Gas Market" and the GTS Code.

It defines the subject of the agreement, key terms, the procedure for allocating capacities (annual, quarterly, monthly and daily), the rules for nominations and renominations, as well as the mechanisms for commercial accounting of volumes and physical and chemical characteristics of gas. The document prescribes tariffs for access to capacities, calculation of fees for imbalances and neutrality of balancing, penalties for exceeding the agreed indicators or low gas quality.

Separate sections regulate the procedure for financial security, liability of the parties, force majeure, confidentiality, dispute resolution, and the terms of validity, amendments, and termination of the contract.

The main obligations of the GTS operator under this agreement:

- Provision of gas transmission services in a timely manner and of proper quality.
- Ensuring the receipt of nominations and renominations, as well as applications for capacity allocation in accordance with the GTS Code.
- Posting on the website the current tariffs, the Model Agreement and the GTS Code.
- Organisation and uninterrupted operation of the dispatching service.
- Publication of information on the customer's rights to capacity, emergency restrictions and other data provided for by the GTS Code.
- Notifying the customer about changes in the terms of the contract, delays in creating new capacities, or other changes in the projects.
- Compensation to the customer in case of violation of gas quality parameters or interruption of access to guaranteed capacity.

²⁸ <https://zakon.rada.gov.ua/laws/file/text/120/f450028n41.docx>

- Monthly publication and payment of the fee for neutrality of balancing and settlements for daily imbalances according to the established deadlines.

Main obligations of the service customer

- Timely and full payment of the cost of transportation services, advance payment of funds for booked capacities and daily imbalances.
- Provision of financial security in accordance with the requirements of the GTS Code and the contract.
- Compliance with the ordered capacity volumes, timely balancing of the portfolio and immediate execution of dispatching service orders.
- Notification to the operator of changes in conditions, details or other circumstances affecting the performance of the contract.
- Ensuring round-the-clock communication with authorised representatives of the operator.
- Timely payment of additional fees for excess capacity, inadequate gas quality or unauthorised withdrawal.
- Registration of own consumers in the supplier's register on the operator's information platform.

Registration of acceptance and transfer of performed services:

- all services (except daily imbalances) are registered in joint acts of the services provided.
- the operator sends the customer two copies of the act by the 15th day of the month following the reporting month.
- the customer must return one signed copy or reasonably refuse within 2 days.
- the settlement of daily imbalances is registered in a unilateral act of the operator with a list of volumes and prices by day.
- the payment for neutrality of balancing is also fixed in a unilateral act of the operator with the calculation of the rate and volumes.
- once a quarter, the parties conduct a reconciliation of settlements and register it in a reconciliation act.

5. Commercial and Logistical Aspects

5.1.Step-by-step practical guidance for Ukrainian producers/exporters

Table 5. Main steps and key actions

Step	Key Actions
1. Legal entity and site preparation	Register a legal entity with appropriate NACE codes. Secure land rights and ensure compliance with land use and urban planning requirements. Obtain permits and prepare technical documentation.
2. Grid Connection	Apply for connection to the GDS or GTS Operators. Conclude connection and technical agreements. Install required infrastructure and metering units. Obtain EIC and Shipper Codes. Register on the GTS Operator's IT platform.
3. Biomethane Production Compliance	Install chromatographic and metering equipment. Coordinate gas quality data flow to the network operator.
4. Sustainability Certification	Obtain certification from an EU-recognised scheme (e.g. ISCC EU, REDcert EU). Pass audit, receive Certificate of Sustainability. Ensure ongoing audit compliance.

Step	Key Actions
5. Export Preparation and Customs	Conclude a contract. Submit periodic and additional customs declarations. Provide a sustainability certificate, chromatograph and metering commissioning acts, and signed gas transfer documents. Follow procedures in accordance with Order No. 380 (01.08.2024).
6. Integration with EU Systems	Register in the EU Union Database (UDB) as an economic operator.

1. Legal entity and site preparation

The initial step for entering the biomethane production and export sector in Ukraine involves establishing a fully compliant legal entity. This includes the following:

- 1) *Company registration.* Establishment of a legal entity in accordance with Ukrainian legislation. The company must be duly registered in the Unified State Register of Legal Entities, with appropriate NACE codes²⁹ related to energy production.
- 2) *Preliminary Grid Capacity Assessment:* Before initiating construction, it is advisable to request a preliminary assessment of available connection capacity from the relevant GDS or GTS operator to ensure the feasibility of future injection into the gas system.
- 3) *Land rights and site access.* It is important to secure ownership or long-term lease rights to the land intended for the construction of the biomethane production facility. The proper land use status is crucial. According to Article 22 of the Land Code of Ukraine, land classified for agricultural purposes may include non-agricultural land plots, including land designated for biomethane production facilities, provided such facilities are part of an integrated complex for the production, processing, or storage of agricultural products.

Therefore, the construction of a biomethane plant that forms part of such a complex is legally permitted on non-agricultural land parcels within agricultural land categories. Importantly, in such cases, the land category remains "agricultural land", in accordance with Article 22 of the Land Code.

However, if the biomethane facility is designed as a standalone industrial installation—not integrated into an existing agricultural complex—then the facility must be located on land designated for industrial, transport, communications, energy, defence, or other purposes. In such cases, the appropriate land use designation is code 14.01, which explicitly covers: "placement, construction, operation, and maintenance of buildings and structures of energy-generating enterprises."

- 4) *Urban Planning and Permitting:* Before commencing biomethane production or grid connection works, project developers must complete a series of urban planning and permitting procedures in accordance with national construction and energy regulations. The key steps include:
 - ✓ Obtaining Urban Planning Conditions and Restrictions from the local urban planning authority. This document defines land use and technical constraints for the project site.
 - ✓ Obtaining Technical Specifications or an electricity grid connection from the relevant DSO. These specifications define the technical parameters and conditions for connecting to the electricity network.
 - ✓ Approval of project design documentation by the relevant authority, followed by the state or independent technical review (expertise) to assess compliance with construction, environmental, and safety standards.
 - ✓ Obtaining a permit for preparatory works, such as land clearing, fencing, and excavation, issued by the State Architectural and Construction Inspectorate or its delegated body.
 - ✓ Obtaining a construction permit for the main phase of the biomethane plant.

²⁹ **NACE codes** are the official classification system of economic activities.

- ✓ Filing a Declaration or obtaining a Certificate of Readiness for Operation, which confirms that the facility complies with design and regulatory requirements and is authorised for commissioning.

These procedures form the legal basis for construction and commissioning. Compliance is mandatory and subject to inspection by state regulatory bodies.

2. Biomethane Production Compliance

According to the provisions of the Gas Transmission System Code and the Gas Distribution System Code, facilities (installations) of biomethane producers intending to connect directly to deliver produced gas into the Gas Transmission System must ensure that, at the point of delivery, the gas complies with the physical and chemical characteristics established for natural gas standards.

In particular, connection to the GTS requires that the point of gas transfer be equipped with devices that continuously monitor the gas's physical and chemical parameters.

Furthermore, in order to export biomethane, producers must install certified chromatographic analysers (automated gas chromatographs) and commercial metering stations that allow for continuous monitoring and measurement of biomethane's physical and chemical properties.

The chromatograph must be installed upstream of the compressor or injection point, in accordance with national technical requirements, and must enable automatic transmission of gas quality data to the network operator.

3. Sustainability Certification

Obtaining sustainability certification is a mandatory prerequisite for biomethane producers aiming to access the EU market and to qualify for possible inclusion under renewable energy targets and financial support mechanisms as defined in RED II and RED III.

Sustainability certification confirms that the production of biomethane complies with the environmental, social, and GHG emission reduction requirements established by EU law.

Compliance with RED II/III can be demonstrated through certification under EU-recognised voluntary schemes, approved by the European Commission under Article 30 of RED II. The most commonly used schemes in the biomethane sector include ISCC EU (International Sustainability and Carbon Certification), REDcert EU, and SURE (Sustainable Resources Verification Scheme).

These schemes operate based on harmonised audit protocols, mass balance principles, GHG emission calculations, and traceability rules across the supply chain. Certification Process envisages that a producer applies to a certification body affiliated with a voluntary scheme, defining the scope of certification (e.g., type of feedstock, process technology, location). An independent auditor conducts an on-site inspection to verify compliance with RED II/III sustainability criteria, proper documentation of feedstock origin and sustainability claims, and the correct application of the GHG emissions calculation tool.

Upon successful completion of the audit, the certification body issues a Sustainability Certificate, valid for 12 months (typically), and provides access to Proof of Sustainability documentation for each batch of certified biomethane. Producers must undergo regular audits (at least annually) to maintain certification status and eligibility for export and market recognition.

4. Grid Connection

A critical step in preparing for biomethane export is obtaining a formal connection to the gas distribution or gas transmission system. The grid connection process must be planned and executed in full compliance with the Gas Distribution System Code and Gas Transmission System Code.

Biomethane producers must identify whether a connection will be made to the GDS or directly to the GTS.

The GTS and GDS operator is obliged, upon an applicant's request, to ensure the connection of the applicant's facility, subject to compliance with the requirements of the applicable Codes.

If the applicant's biomethane production facility can be technically connected and if there is available capacity in the GTS, the applicant may connect the facility directly to the transmission system. Alternatively, the applicant may connect the facility to the GDS, provided there is available capacity in the relevant distribution system. The connection service to either GTS or GDS is fee-based and provided by the respective operator under a Connection Agreement.

Connection process

To connect a biomethane production facility to the GTS or GDS, and to enable transportation and/or storage of biomethane in underground gas storage facilities, the applicant must:

- 1) Obtain a *connection permit* from the GTS or GDS operator;
- 2) Conclude a *Connection Agreement* with the respective operator (GTS or GDS), which includes receiving *technical conditions*, securing legal title or rights to the land plots needed for the pipeline route from the connection point, complying with urban development and construction regulations, commissioning the internal gas networks up to the connection point in accordance with applicable legislation and paying the connection service fee and fulfilling all other requirements under the Connection Agreement and Ukrainian law. In turn, the relevant operator must implement the connection of external gas networks, install a commercial metering unit at the connection point, connect the internal and external networks, and launch gas supply operations.
- 3) A *Technical Agreement* must also be signed with the GTSO and/or GDSO concerning the conditions for the physical transfer of natural gas.

To receive transportation and storage services, the applicant must³⁰:

- 1) Obtain an EIC Code as a market participant in the gas market;
- 2) Conclude a Natural Gas Transmission Agreement with the TSO³¹, which provides access to system capacity, transportation services, and daily imbalance resolution in the GTS;
- 3) Conclude a Natural Gas Storage Agreement³² (for injection into or withdrawal from storage) with the Storage System Operator (SSO);
- 4) Register on the TSO's IT Platform³³, as gas transportation services are administered via a dedicated web application.
- 5) Obtain a Shipper Code, required for entities intending to import, export, transit, or store natural gas under the "customs warehouse" regime.

After registration and contracting, the biomethane producer must:

³⁰ https://tsoua.com/wp-content/uploads/2021/04/TSO_How_to_become_a_Customer.pdf

³¹ <https://tsoua.com/en/business-services/how-to-become-a-customer/transportation-agreement/>

³² <https://utg.ua/en/utg/gas-transportation-system/storage-agreement.html>

³³ <https://tsoua.com/en/business-services/how-to-become-a-customer/information-platform/>

- 1) Order and pay for capacity distribution (at internal entry/exit points or interconnection points), transportation services, and storage services (injection and withdrawal);
- 2) Provide the required financial guarantees and fulfill all other obligations under the relevant transportation and storage contracts;
- 3) Submit nominations and re-nominations for gas transportation via the TSO's IT Platform, and for storage via the SSO's IT platform³⁴;
- 4) Upload scanned copies of the Periodic Customs Declaration to the IT platform;
- 5) Submit Trade Notifications through the GTS Operator's IT Platform;
- 6) File periodic market activity reports in accordance with gas market regulations.

In accordance with decisions adopted by the Cabinet of Ministers of Ukraine under Articles 16 and 17 of the Law of Ukraine "On Foreign Economic Activity," temporary restrictions (a ban) were imposed on the export of natural gas in a gaseous state.

During the effective period of the ban, the export of biomethane transported via pipeline across the customs border of Ukraine is only permitted under the following condition.

Export is restricted exclusively to the volumes of biomethane accumulated by the exporter (economic entity) in Ukrainian underground gas storage facilities as of the end of the calendar month preceding the month of export.

This restriction applies regardless of contract terms and reflects national energy security policy objectives. Therefore, biomethane intended for export must be demonstrably injected and stored in a UGS facility prior to the start of the export month. Exporters must be able to verify storage volumes through official acts issued by the Underground Gas Storage Operator of Ukraine (Ukrtransgaz).

Compliance with this requirement is a mandatory condition for customs clearance, and any attempt to export pipeline biomethane outside this framework may result in refusal of export registration.

5. Final export preparation and compliance

When transporting goods via pipeline, the following documents must be submitted to the customs authority in accordance with Paragraph 5, Part One of Article 335 of the Customs Code of Ukraine:

- 1) foreign economic agreement (contract) or other documents confirming the right of ownership, use and/or disposal of goods;
- 2) the act of acceptance and transfer of goods or a certificate confirming the quantity of goods;
- 3) commercial and accompanying documents (if any) for goods transported across the customs border of Ukraine, and at the time of customs clearance - an invoice;
- 4) name and address of the sender of the goods;
- 5) name and address of the recipient of the goods;
- 6) documents (permits, certificates) confirming the characteristics of the goods (with regard to biomethane, also regarding the nature of its origin).

The cross-border movement of goods through Ukraine's customs territory by pipeline transport is carried out on the basis of a periodic customs declaration.

The cornerstone regulatory instrument establishing customs procedures for the export of biomethane via pipeline transport is Order of the Ministry of Finance of Ukraine No. 380, dated 01 August 2024. This Order introduced amendments to existing customs regulations to accommodate biomethane's

³⁴ <https://iplatforma-ogu.utg.ua/sap/bc/gui/sap/its/webgui>

unique characteristics and establish a lawful framework for its export in compliance with EU and international sustainability requirements.

Order No. 380 introduces a temporary regulatory mechanism for customs control and clearance of biomethane moved via gas transmission systems across the customs border of Ukraine. It sets out detailed procedures and documentation requirements for both:

- 1) Customs passage — physical transport of biomethane through the customs border based on a periodic customs declaration;
- 2) Customs release — legal release of biomethane volumes under the export regime via supplementary declarations.

Under the Order, the customs passage of biomethane is permitted upon submission of:

- 1) A periodic customs declaration;
- 2) A valid certificate of compliance with sustainability criteria issued under an EU-recognised voluntary certification scheme;
- 3) Documents proving connection to the gas infrastructure, including commissioning acts for the metering points and automated chromatograph;
- 4) An act of biomethane transfer and acceptance signed by the producer and the gas transmission/distribution system operator, stating volumes in energy and volume units;
- 5) An act from the gas storage operator confirming movement of biomethane in storage.

Customs release (export clearance) is granted upon submission of:

- 1) An additional customs declaration detailing actual exported volumes;
- 2) A valid Proof of Sustainability;
- 3) A general act of gas transfer and acceptance signed by Ukrainian and foreign TSOs, confirming cross-border flow;
- 4) A commercial gas flow statement issued by the transmission system operator, confirming the accounting of the customer's (biomethane producer's) commercial injections and withdrawals of natural gas, gas mixtures, or biomethane within the gas transmission system.

Order No. 380 applies temporarily, during the period in which the following conditions are met. The national biomethane registry is not yet fully integrated with the EU Union Database and export restrictions or quotas are in force under decisions of the Cabinet of Ministers. During this transitional period, the legal validity of customs clearance relies on the presentation of the full set of supporting documents as defined by Order No. 380.

Consequently, Order No. 380 of 01 August 2024 constitutes the operative legal basis for the export of biomethane from Ukraine by pipeline. It enables compliance with both national customs law and EU sustainability criteria during the transitional integration of Ukrainian biomethane into the European renewable gas market. The Order ensures legal clarity, procedural transparency, and traceability – critical for international trade and recognition of biomethane under EU energy and climate policy frameworks.

Table 6. List of necessary documents for customs control and clearance

Document	Issued by	Purpose
Certificate of Compliance with Sustainability Criteria	Voluntary Certification Scheme (e.g. ISCC EU)	Confirm the sustainability of the production site
Proof of Sustainability (PoS)	Producer	Confirm the sustainability of the exported volume/batch
Periodic Customs Declaration	Exporter	Allow physical passage through the customs border
Additional Customs Declaration	Exporter (filed after physical export)	Declare a specific exported volume for customs release
Act of Transfer and Acceptance (Producer – GTSO/GDSO)	Producer and Network Operator	Verify physical volume accepted into the network
Act of the Storage System Operator of Ukraine	Ukrainian Storage System Operator	Movement of biomethane in gas storage facilities, recorded in the customer's storage account
Act and scheme of separation of balance ownership and operational responsibility between the parties Commissioning Act of the commercial metering unit with a chromatograph, or separate commissioning acts if installed independently	GTSO/GDSO and producer	Confirming the connection of the biomethane producer Verify compliance with gas quality monitoring requirements
General Act of Gas Transfer between System Operators	Ukrainian GTSO and the GTSO of the adjacent country	Confirming the transmitted volume of biomethane
Confirmation Statement from the Ukrainian GTSO	GTSO	Metering of commercial injections and withdrawals of biomethane

6. Integration with EU Systems

Although UDB is not yet obligatory for gaseous fuels, to enable the official recognition of Ukrainian biomethane within the European Union's renewable energy framework, producers and exporters may complete registration in it as economic operators.

As of mid-2025, Ukrainian biomethane producers and traders are not yet permitted to register their biomethane volumes directly in the Union Database³⁵ as third-country economic operators. While the UDB has been operational for renewable fuels and its gas module is being launched, formal integration for Ukrainian operators requires regulatory and technical arrangements that remain pending.

5.2. Tariffs and Costs

Connection

³⁵ <https://webgate.ec.europa.eu/UnionDatabase/welcome>

The cost of connection services provided by the GDSO and the GTSO consists of the price of connecting the facility to the GDS or GTS, as well as additional services (works) related to connection and the GDSO or GTSO's ongoing operations.

The connection fee is determined by the GDSO/GTSO in the connection agreement, in accordance with the Methodology for Setting Fees for Connection to Gas Transmission and Gas Distribution Systems, approved by the Regulator's Resolution No. 3054 dated 24 December 2015³⁶.

The standard connection fee includes, in particular, services for installing a commercial metering unit at the measurement point, protecting it against adverse weather conditions and unauthorised access, connecting external and internal gas supply networks, and initiating gas flow. If the producer engages third-party entities to arrange and install the commercial metering unit, the cost of such works is not included in the GDSO/GTSO connection fee.

The cost of a standard connection is calculated based on the type of connection, location (urban or rural), and the requested connection capacity, among other parameters.

Regulator Resolution No. 2281 approved the maximum level of the standard connection fee to gas distribution systems for 2025 as of 24.12.2024³⁷. A connection fee calculator is available on the Regulator's official website³⁸.

The GDSO/GTSO determines the maximum level of the non-standard connection fee in the connection agreement. According to the Methodology, the cost of preparing and issuing technical specifications for connection to the GTS in 2025 will total UAH 30,236.24, including VAT³⁹.

Transmission

The NEURC adopted Resolution No. 2387 as of 30 December 2024, which set the tariffs for LLC "Gas TSO of Ukraine" for natural gas transmission services at entry and exit points for the 2025–2029 regulatory period⁴⁰.

Gas transmission services include a neutrality charge for balancing, which is calculated proportionally to the volume of gas transported by the customer, based on a specific formula set out in the Gas Transmission System Code⁴¹.

The neutrality charge for balancing may be:

- Positive (≥ 0) – in which the charge is payable by the customer to the GTSO;
- Negative (< 0) – in which the charge is payable by the GTSO to the customer.

In addition, gas transmission services include a daily imbalance charge, which is also calculated for the customer using a specific formula defined in the GTS Code⁴².

Storage

The following tariffs and coefficients have been established for the gas storage operator (excluding VAT):⁴³.

Storage of natural gas: UAH 0.40 per 1,000 m³ per day

³⁶ <https://zakon.rada.gov.ua/laws/show/z0396-16#Text>

³⁷ <https://zakon.rada.gov.ua/rada/show/v2281874-24#Text>

³⁸ <https://www.nerc.gov.ua/calculator-gas>

³⁹ <https://tsoua.com/kliientam/yak-staty-kliientom/pryednannya-do-gts/>

⁴⁰ <https://tsoua.com/en/business-services/tariffs/transmission-tariffs/>

⁴¹ <https://tsoua.com/en/business-services/order-and-payment/balancing-neutrality/>

⁴² <https://tsoua.com/en/business-services/order-and-payment/daily-imbalance/>

⁴³ <https://zakon.rada.gov.ua/rada/show/v0656874-22#Text>

Injection of natural gas: UAH 243.52 per 1,000 m³ per day

Withdrawal of natural gas: UAH 253.03 per 1,000 m³ per day

The tariff structure (projected annual tariff revenue) for storage, injection, and withdrawal services is provided in the annexe to the regulatory resolution.

Approved coefficients applied to the above tariffs based on the booking term:

Coefficient for monthly capacity booking (for storage, injection, or withdrawal): 1.1.

Coefficient for day-ahead capacity booking (for storage, injection, or withdrawal): 1.2.

A customer ordering natural gas storage (injection, withdrawal) services who has been allocated annual capacity is required to make a monthly advance payment of 100% of the cost of the ordered annual capacity for the gas month, five banking days before the start of the gas month in which the service will be provided.

Tax and export issues

The provision of biomethane transportation services through the gas transmission and distribution systems and gas storage in gas storage facilities, carried out on Ukraine's territory by VAT-paying Ukrainian residents, is subject to VAT at a rate of 20%.

The sale of biomethane by a Ukrainian resident to a non-resident (e.g., an EU resident company) is subject to VAT at a rate of 0%, provided that the biomethane is exported outside Ukraine's customs territory under the customs regime of export, duty-free trade, or free customs zone.

The Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine" establishes that, except for exports to member states of the Energy Community, gas exports are subject to a duty of 35 per cent of the customs value of such goods⁴⁴.

Taking into account the provisions of the mentioned Law, such exports without the imposition of export duties may be carried out exclusively to countries of the Energy Community, which do not include European countries such as Switzerland, Great Britain, and a number of other potential buyers.

Therefore, the draft Law on Amendments to Certain Legislative Acts of Ukraine regarding the simplification of exports of Ukrainian-produced biomethane to global markets was registered⁴⁵. The draft law provides for the introduction of a separate customs tariff line for domestically produced biomethane under the Ukrainian Classification of Goods of Foreign Economic Activity (UCG FEA) code 2711 29 00 00. This category covers biomethane transported via pipeline, which, during transmission, is physically substituted by an equivalent volume of natural gas or a natural gas-biomethane blend, in accordance with its physicochemical characteristics.

The draft legislation also proposes to exempt such biomethane from export duties, thereby facilitating its cross-border transmission and supporting Ukraine's integration into the European renewable gas market.

Thus, the costs of the customer for connecting a biomethane plant to the GTS or GDS are mainly determined by the cost of developing design and estimate documentation, the cost of constructing pipeline networks and installing the necessary measuring devices, as well as the cost of network

⁴⁴ <https://zakon.rada.gov.ua/laws/show/309-17#Text>

⁴⁵ <https://itd.rada.gov.ua/billInfo/Bills/Card/56610>

operator services - connecting gas networks of external and internal gas supply and the cost of gas start-up. Approximate costs for some of the above components are presented in Table 7.

Table 7. Estimated costs for some components of connecting a biomethane plant to gas distribution or gas transportation networks

Types of expenses	Estimated costs
Development of design and estimate documentation	Including design and survey work - from 400,000 UAH (from 8,000 euros).
Pipeline laying ⁴⁶ :	
- steel, DN 80 mm	78 euros/m incl. VAT
- steel, DN 150 mm	187 euros/m incl. VAT
- plastic (PE 100), DN 80 mm	56 euros/m incl. VAT
- plastic (PE 100), DN 150 mm	134 euros/ m incl. VAT
Installation of gas metering unit	From 15,000 euros
Installing a flow chromatograph	From 80,000 euros
Installation of odorization equipment	From 35,000 euros
Gas start-up	About 10,000 UAH (200 euros)

6. Strategic and Policy Context

Memorandum of Understanding (MoU) between Ukraine and the EU: Strategic Partnership in the Biomethane, Hydrogen, and Other Synthetic Gases Sectors

The Memorandum of Understanding on a Strategic Partnership on Biomethane, Hydrogen and other Synthetic Gases between the European Union and Ukraine⁴⁷, signed in 2023, represents a landmark initiative aimed at deepening energy cooperation and aligning Ukraine's gas market with the EU's decarbonisation agenda. The document outlines a comprehensive framework for cooperation across the full value chain of renewable gases—particularly biomethane and hydrogen—with the overarching goals of energy security, economic integration, and climate neutrality.

The Partnership is grounded in key EU strategic objectives, including the European Green Deal, the REPowerEU Plan, and commitments under the Paris Agreement. It is closely tied to the EU-Ukraine Association Agreement and Deep and Comprehensive Free Trade Area, as well as Ukraine's broader ambitions for EU membership and energy sector reform.

One of the central components of the MoU is the focus on regulatory convergence. Both sides commit to enhancing alignment with EU energy legislation, including the implementation of the Renewable Energy Directive (EU) 2018/2001 (RED II), the Revised Renewable Energy Directive (EU) 2023/2413 (RED III), and the Directive (EU) 2024/1788 on internal markets for renewable gas and hydrogen. These directives establish legally binding sustainability criteria, gas market integration frameworks, and certification regimes, all of which are critical to enabling Ukrainian biomethane to enter the EU market.

A key ambition of the MoU is to harmonise sustainability frameworks and certification systems, thereby facilitating the mutual recognition of Ukrainian biomethane as a compliant renewable fuel within the EU. To this end, Ukraine has committed to developing a domestic biomethane registry, integrating it with the EU's Union Database, and ensuring full traceability and certification of biomethane in accordance with EU methodologies and definitions.

⁴⁶ Without taking into account possible cases of passing along river bottoms or laying bridge crossings

⁴⁷ https://energy.ec.europa.eu/publications/memorandum-understanding-between-european-union-and-ukraine-strategic-partnership-biomethane_en

Furthermore, the MoU prioritises actions aimed at accelerating investment, infrastructure modernisation, and innovation across the biomethane sector. It encourages the development of cost-effective production and transmission systems, market-based incentives, and public-private partnerships to scale up biomethane output and export capacities.

The strategic partnership also includes provisions for regional market cooperation and cross-border trade facilitation, particularly with Ukraine's neighbouring EU Member States. This includes regulatory streamlining, enhanced grid interconnection, and the establishment of trading platforms for renewable gases.

In summary, the MoU institutionalises the joint efforts of the EU and Ukraine to develop a transparent, competitive, and sustainable market for biomethane and other renewable gases. By establishing shared rules and long-term commitments, it provides a strategic roadmap for integrating Ukraine into the EU renewable gas market and advancing the decarbonisation of both economies.

REPowerEU Plan

In response to the energy crisis triggered by Russia's full-scale invasion of Ukraine and the subsequent disruptions to global energy markets, the European Commission adopted the REPowerEU Plan in May 2022. This strategic initiative aims to eliminate the EU's dependence on Russian fossil fuels by accelerating the transition to clean energy, diversifying energy supplies, and enhancing system resilience. Through REPowerEU, the EU has effectively protected households and businesses from energy shortages, supported Ukraine by weakening Russia's energy leverage, and stabilised volatile energy markets.

REPowerEU operates along three key pillars:

- 1) Energy savings;
- 2) Diversification of energy imports;
- 3) Accelerated deployment of renewables and domestic clean energy production.

One of REPowerEU's most consequential policy targets is promoting biomethane as a secure, renewable, and dispatchable energy source. Under the Plan, the EU has set an ambitious objective to increase sustainable biomethane production to 35 bcm per year by 2030, a tenfold rise from the 2020 baseline. Achieving this volume would enable biomethane to substitute a significant share of imported natural gas, particularly Russian pipeline gas, while stimulating rural economies and decarbonising hard-to-abate sectors.

Since REPowerEU's launch, several legislative milestones have reinforced its implementation. In November 2023, the revised Renewable Energy Directive (EU) 2023/2413 – RED III entered into force, raising the EU-wide binding target for renewables to 42.5% by 2030, with an aspirational level of 45%.

In July 2024, the Electricity Market Design Reform was adopted to increase resilience, decouple energy bills from short-term price shocks, and facilitate greater integration of renewable sources such as biomethane.

A suite of complementary measures, including the Net-Zero Industry Act, Critical Raw Materials Act, and Energy Efficiency Directive, has also been enacted to reinforce industrial decarbonisation, streamline regulatory procedures, and accelerate clean energy roll-out.

Additionally, by mid-2025, the EU adopted a regulatory roadmap for the full phase-out of Russian fossil fuels, with the following targets:

- 1) End all imports of Russian pipeline and LNG gas by 2027;

- 2) Cease Russian oil imports and block sanctions evasion by 2027;
- 3) Eliminate reliance on Russian nuclear materials (including uranium and fuel assemblies).

By 1 March 2026, all EU Member States are required to submit national diversification plans, outlining particular steps for reducing and eliminating direct and indirect imports of Russian fossil fuels. These plans are intended to complement the EU's broader transition strategy and ensure a coordinated, secure transformation of its energy system.

The REPowerEU Plan creates a strong policy and market rationale for Ukraine to scale up biomethane production for export. As the EU pivots away from Russian gas, it will increasingly rely on neighbouring countries to provide sustainable, certified alternatives. Ukrainian biomethane—when aligned with the RED II/RED III sustainability criteria and integrated into the Union Database—can play a vital role in this diversification.

Furthermore, Ukraine's participation in the Energy Community, its alignment with the EU Green Deal, and its signing of the Strategic MoU on Biomethane, Hydrogen and Synthetic Gases position it as a natural and strategic renewable gas partner for the EU.

Ukraine's Energy Strategy

The Energy Strategy of Ukraine until 2050, approved by the Cabinet of Ministers in April 2023⁴⁸, articulates the country's long-term vision for a secure, sustainable, and integrated energy future. The Strategy defines the transformation of Ukraine's energy sector as a core enabler of national economic development and climate resilience, while also supporting deep integration into the European energy market.

The central mission of the Strategy is to create the conditions for the sustainable development of Ukraine's economy through a reliable, resilient, and modern energy supply. By 2050, Ukraine's energy system is expected to closely align with the objective of climate neutrality, ensuring access to clean energy, eradicating energy poverty, supporting innovation, and enabling decentralised energy systems. The Strategy also envisions fully functional national energy markets integrated into regional and global energy frameworks, particularly those of the European Union.

The Strategy is guided by several fundamental principles:

- 1) Economic justification: Energy reforms must be financially and economically viable;
- 2) Environmental sustainability: The sector must reduce its environmental footprint;
- 3) Affordability: Energy must remain accessible to consumers and industry;
- 4) Social justice: Policies must be inclusive and equitable;
- 5) Market orientation: Competitive energy markets must function effectively.

These principles are aligned with Ukraine's National Economic Strategy until 2030, the EU–Ukraine Association Agreement, and the Paris Climate Agreement.

Ukraine's Energy Strategy sets out the following key objectives:

- 1) Achieve the highest possible level of climate neutrality in the energy sector;
- 2) Minimise coal use across power generation and heating;
- 3) Modernise and upgrade energy infrastructure, including networks and generation facilities;
- 4) Improve resource efficiency in the production, transmission, and consumption of energy;
- 5) Ensure full integration with the energy markets of the European Union and effective functioning of Ukraine's internal energy markets;

⁴⁸ <https://zakon.rada.gov.ua/laws/show/373-2023-%D1%80#Text>

- 6) Develop domestically available energy resources in a manner that is economically and environmentally sound;
- 7) Promote the growth of alternative energy sources, innovative products, and new technologies.

*Ukraine's National Energy and Climate Plan (NECP) until 2030*⁴⁹, officially adopted by the Government of Ukraine, is a strategic document that aligns national energy and climate policy with the European Union's legislative framework. It aims to ensure sustainable economic development, post-war recovery, and compliance with Ukraine's international obligations under the EU-Ukraine Association Agreement and the Paris Climate Agreement. It outlines clear and ambitious objectives across all five dimensions of the Energy Union: decarbonisation, energy efficiency, energy security, internal market integration, and research and innovation.

The NECP establishes several quantitative targets, including:

- 1) 65% reduction in GHG emissions by 2030 relative to 1990 levels;
- 2) Climate neutrality of the energy sector by 2050, and economy-wide neutrality by 2060;
- 3) Phase-out of coal-fired power generation by 2035;
- 4) 30% reduction in methane emissions by 2030 (vs. 2020 baseline);
- 5) 27% share of renewable energy sources (RES) in total final energy consumption by 2030;
- 6) Indicative RES targets for energy sectors by 2030:
 - a. Heating and cooling – 35%
 - b. Electricity – 25.4%
 - c. Transport – 14%
- 7) 25% share of RES in total electricity generation by 2030;
- 8) 30% share of RES and secondary energy resources in district heating by 2025, and 40% by 2035;
- 9) 50% share of alternative fuels and electricity in transport (including electricity from RES and biofuels) by 2030.

The NECP explicitly recognises biomethane as a strategic component of Ukraine's decarbonisation and energy diversification efforts. It sets the following production goals:

- 1) Minimum production target of 100 million cubic metres (m³) per year of biomethane by 2030;
- 2) Declared ambition to achieve 1 billion m³/year of biomethane production by the same year.

To support these goals, the NECP includes provisions for:

- 1) Increasing the availability of biomass resources and conversion infrastructure;
- 2) Enhancing the legal framework for the production, certification, and use of biofuels and energy from biomass;
- 3) Considering additional policy instruments to support biomethane production and facilitate market development, including fiscal and regulatory incentives;
- 4) Aligning sustainability requirements for bioenergy with the EU Renewable Energy Directive (RED II/RED III) and integrating biomethane tracking systems with the EU Union Database.

The NECP underscores Ukraine's determination to harmonise its energy and climate policies with EU law and decarbonisation objectives. It serves as a platform for deepening integration with the EU energy market, improving internal governance, and attracting financial assistance and private investment.

⁴⁹ <https://zakon.rada.gov.ua/laws/show/587-2024-%D1%80#Text>

For the biomethane sector, the NECP offers a clear policy signal for expanding production, enabling exports, and integrating with European regulatory and certification systems.

*The National Renewable Energy Action Plan (REAP) until 2030*⁵⁰, adopted on 13 August 2024, outlines Ukraine's strategic course for increasing the share of renewable energy in the country's final energy consumption. This document is a key implementation tool for achieving the targets set by the National Energy and Climate Plan (NECP) and harmonising Ukraine's legislation and energy policy with the requirements of the EU Renewable Energy Directive (RED II/RED III).

General Strategic Objectives include the goal to reduce the consumption of fossil fuels and increase the use of bioenergy, solar, wind, hydro, and green hydrogen, promote decentralisation and energy democratisation, including through community-based RES projects, strengthen the regulatory framework and state support instruments for project development, financing, and grid access.

The REAP 2030 includes targeted policy and market actions for supporting biomethane development. The Plan confirms the national target to reach at least one billion m³/year of biomethane production by 2030, in line with the NECP. This volume is seen as instrumental for replacing natural gas imports and contributing to the EU's REPowerEU strategy.

REAP provides for the adoption of secondary legislation on grid access, quality standards, and guarantees of origin for biomethane. Specific attention is paid to interconnection procedures for injecting biomethane into gas transmission and distribution networks. The Plan foresees the integration of the Ukrainian biomethane registry with the EU Union Database to enable export certification and traceability.

Biomethane is envisaged for use across multiple sectors: as a substitute in the natural gas grid, in district heating, and in transport (as bio-CNG or bio-LNG). The Plan encourages the blending of biomethane with conventional fuels and promotes demand-side instruments.

Conclusion

The export of biomethane from Ukraine is closely aligned with the objectives of the EU's REPowerEU strategy, which seeks to bolster energy security and accelerate the transition to renewable energy sources. For Ukraine, fostering biomethane exports offers a strategic pathway to strengthening its economy, diversifying its energy markets, and contributing to regional energy independence.

Thus, Ukraine offers wide opportunities for using biomethane due to its extensive gas network system, which allows it to be supplied both to GDS and directly to the GTS. The choice of the optimal connection point is determined by the technical parameters of the networks and gas consumption in the region.

Ukrainian biomethane has significant export potential and prospects for successful competition in international markets, especially in the European Union. Ukraine's powerful agricultural sector generates a large amount of organic residues suitable for biomethane production. The total energy potential of biogas and biomethane production in Ukraine is estimated at approximately 21.8 billion m³ per year.

Consumers and industrial enterprises seeking to reduce CO₂ emissions, especially in industries where natural gas is difficult to replace with electricity, may be the main buyers of Ukrainian biomethane in Europe.

⁵⁰ <https://zakon.rada.gov.ua/laws/show/761-2024-%D1%80#Text>

The key factors for success are the creation of a Ukrainian biomethane register recognised in the EU and other European countries and the harmonisation of national requirements with EU standards. Biomethane production opens up a unique opportunity for Ukraine to launch a new transparent, innovative, export-oriented sector of the economy with the potential to produce more than 20 bcm of biomethane per year, export revenue of up to 9 billion euros annually (provided that 50% of the biomethane produced is exported), as well as the creation of up to 250,000 new jobs.