NATURAL GAS TRANSMISSION SYSTEM OPERATOR'S TEN YEAR NETWORK DEVELOPMENT PLAN

2022–2031

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Amber Grid

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INTRODUCTION

Amber Grid AB (hereinafter referred to as the "Company") is the natural gas (hereinafter referred to as the "gas") transmission system operator in Lithuania responsible for the safe operation and development of the gas system, creating favourable conditions for competition in the gas market and development of renewable energy sources, and regional integration.

The intensive development of renewable energy production and the significant increase in the share of RES in the overall energy balance as well as the current and future challenges of balancing the electricity grid and integrating it into the electricity transport system, create opportunities for the development of one of the most potential technologies, i.e. „Power-to-Gas", a green hydrogen technology produced from renewable electricity. In order to more broadly contribute to the development of hydrogen and Power-to-Gas technologies in the country and the region, the Company participates in the Lithuanian Hydrogen Platform established by the Ministry of Energy, and is a member of the European Clean Hydrogen Alliance and the Lithuanian Hydrogen Energy Association. In 2021, the Company joined the European Hydrogen Backbone initiative which brings together 31 transmission system operators from across Europe. The initiative is aimed at to creating a hydrogen transmission infrastructure that connects all countries in Europe. Together with the transmission system operators in the Baltic States and Finland, the Company has developed a research and development plan for 2021 to identify the technical feasibility and required investments for hydrogen transport in the region. The first phase of the research and development plan will start in 2022.

The National Energy Independence Strategy (NEIS) identifies the following key objectives to be achieved by 2050:

Energy from renewable energy sources (RES) will become the mainstream energy source in all sectors, i.e. electricity, heating and cooling, and transport, in Lithuania.

100 %
of the country's total electricity consumption will come from locally produced electricity.

80 %
of the country's energy needs are planned to come from non-polluting (low greenhouse gas and air pollutant) sources.

50 %
of the energy consumed in the transport sector will come from RES.

In 2021, the first 10 megawatt hours (MWh) of green gas were imported into Lithuania through the Guarantee of Origin system, with guarantees of origin to prove it. In 2021, the Company was active in the Working Group on Harmonisation of Green Gas Guarantee of Origin Registers established by Finnish, Estonian and Latvian transmission system operators. In order to allow for a regional exchange of guarantees of origin, the draft general rules and an agreement were drawn up in 2021.

In 2021, the Company continued its successful participation in REGATRACE (Renewable GAs TRAde Centre in Europe), a project funded by the EU's Horizon 2020 research and innovation programme to establish a European registry of origin for biomethane and other renewable gases, and to stimulate the development of the green gas production and market.

In order to achieve the afore-mentioned objectives, it is important to continue the efficient development of the transmission system, which has been seamlessly interconnected to the European natural gas transmission

system with the construction of the Lithuanian-Polish interconnector (GIPL) in 2021 and create the widest possible opportunities for gas market participants to access diversified sources of gas supply. To this end, it is envisaged to continue with the priority projects envisaged in the National Energy Independence Strategy of the Seimas of the Republic of Lithuania which must be implemented in the natural gas sector in order to ensure a technically reliable and diversified supply of the country's consumers with natural gas on the basis of the principles of efficiency and economy, at reasonable costs and competitive prices, and integrate the Baltic States and Finland into the common natural gas market of the European Union. In the light of the already achieved results and the potential of the regional gas market, ensuring long-term continuity of LNG supply and creating opportunities for the most efficient use of the Klaipėda LNG terminal to meet the needs of not only Lithuania, but also the countries in the surrounding region are of strategic importance for Lithuania. One of the Company's strategic activities is to enable producers of green gas (in particular, biomethane and green hydrogen) to connect their systems and transport gas from renewable sources through transmission pipelines. Taking into account the provisions of the strategic state documents, the Company's strategy and environmental policy, the needs of Lithuanian natural gas users, the objectives of ensuring the reliability of supply and the efficient operation of the transmission system, the Company has prepared a ten-year (2022-2031) Network Development Plan for the Operator of the Natural Gas Transmission System (hereinafter referred to as the "Plan"). The Plan is based on the long-term objectives set out in the National Energy Independence Strategy, as well as on the provisions of other legislation defining the activities and principles of transmission system operators and the gas industry.

The gas transmission system consists of main gas pipelines, gas compressor stations, gas distribution stations (hereinafter referred to as "GDS"), gas metering stations ("GMS"), pipeline corrosion protection equipment, data transmission and communication systems and other assets assigned to the transmission system. The Lithuanian gas transmission system is interconnected with the infrastructure of the LNG terminal in Klaipėda and the gas transmission systems of Kaliningrad Oblast in Russia, Belarus, Poland and Latvia. Gas is supplied to the Lithuanian transmission system via the LNG terminal in Klaipėda and can also be transported via the GIPL pipeline from Poland, via a pipeline coming from the Latvian side, and from Russia (via a pipeline coming from Belarus via the Kotlovka DAS).

A joint project between the Lithuanian and Latvian natural gas transmission system operators to increase the capacity of the interconnector between the two countries (ELLI) is expected to be implemented by the end of 2023. The ELLI project will increase transmission capacity to Latvia to 130.5 GWh/day and to Lithuania to 119.5 GWh/day. This project of common interest (PCI) is relevant for the regional gas market formation processes in the Eastern Baltic region and will also facilitate the transmission of gas-to-gas market participants in other countries of the region.

A number of major transmission rehabilitation and modernisation projects are also planned for the period 2022-2031, a part of which is expected to be financed by the EU structural assistance funds:

2018–2022	Installation of control device start-up and reception chambers and implementation of operational technological control of the gas transmission system (Phase II);
	Implementation of the Operational Technological Control of the Gas Transmission System (Phase I);
2020 –2022	Modernisation of the gas treatment plant at the Panevėžys Gas Compressor Station;
2020 –2023	Reconstruction of individual sections of the Vilnius-Kaunas gas pipeline;
	Replacement of the closure devices and connection to the SCADA remote control system (Phase II);
	Modernisation of the Šiauliai gas distribution station and the Telšiai gas distribution station;
	Modernisation of the Grigiškės, Kėdainiai and Vievis gas distribution stations;
	Modernisation of gas compressor station control and installation of a data centre;
	Installation of a pressure relief unit on the gas pipeline branches to the Marijampolė GDS;
2021–2023	Reconstruction of individual sections of the trunk gas pipeline (Phase II);
2023–2024	The first biogas plants are expected to be connected to the natural gas transmission system owned by the Company;
2022–2025	A research and experimental development project is planned to determine how to adapt the existing gas system to transport hydrogen, in particular, green hydrogen (hydrogen produced from renewable energy sources). The project will connect electrolysis facilities for hydrogen production to renewable electricity generation facilities and the gas transmission and distribution system. The hydrogen gas produced by the P2G (Power-to-Gas) electrolysis plant will be mixed in various proportions with natural gas and transported to consumers. The measure will enable up to 10% of green hydrogen gas to be injected into the existing gas transport system (replacing natural gas) in 2030.

SOURCES OF SUPPLY OF NATURAL GAS AND DEMAND FOR TRANSMISSION SERVICES

Forecasting gas consumption, cross-border gas flows and consumption capacity is a key factor in planning transmission system development. The gas transport forecasts for 2022–2031 have been prepared taking into account the data provided by existing system users on the planned future gas transport volumes and the forecast of cross-border gas flows.

Sources of Supply (Incoming Flows)

Since 2015, when the LNG terminal in Klaipėda became operational, gas has been supplied to Lithuania (for European Union and Lithuanian consumers) from two main sources, i.e. via the LNG terminal in Klaipėda and from Russia via Belarus via the Kotlovka, GMS, and, if necessary, gas can be transferred to Lithuania from Latvia via the Kiemenai DAS. As of 1 April 2022, gas from Russia via Belarus will no longer be supplied to Lithuania where the Lithuanian suppliers no longer place orders. As of 1 May 2022, gas transport from Lithuania to Poland via the GIPL interconnector via the Santaka inlet/outlet point started. Gas can be transported from Poland to Lithuania via the Santaka point if needed.

The Klaipėda LNG terminal remains the most important source of gas supply for Lithuania and the Baltic States. In 2021, 62% of the gas (16.34 TWh out of 26.33 TWh injected) was injected from Klaipėda LNG terminal (77% of the gas was injected through Klaipėda LNG terminal in 2020, 21.90 TWh out of 33.52 injected). Thus, in 2021, 26% of gas was injected through Kotlovka GMS and 12% through Kiemenai GMS.

The geopolitical situation in Europe has led to the need for diversification the supply of natural gas, i.e. European countries will seek to reduce their dependence on natural gas imports from Russia (in 2020, the EU countries imported about 40% of their gas from Russia) and to increase gas imports from alternative sources.

In view of the objective to reduce the volume of gas imports from Russia, it is planned that in the coming years there will be no natural gas injection through Kotlovka GMS or gas will be transported for non-Lithuanian consumers (transit to Kaliningrad). In 2023, it is forecast that around 78.7% of the gas will be injected via Klaipėda, GMS, the rest via Santaka GMS (11.6%), Kiemenai GMS (9.7%). No gas is expected to be transported via Kotlovka GMS for the Lithuanian domestic needs and the EU needs.

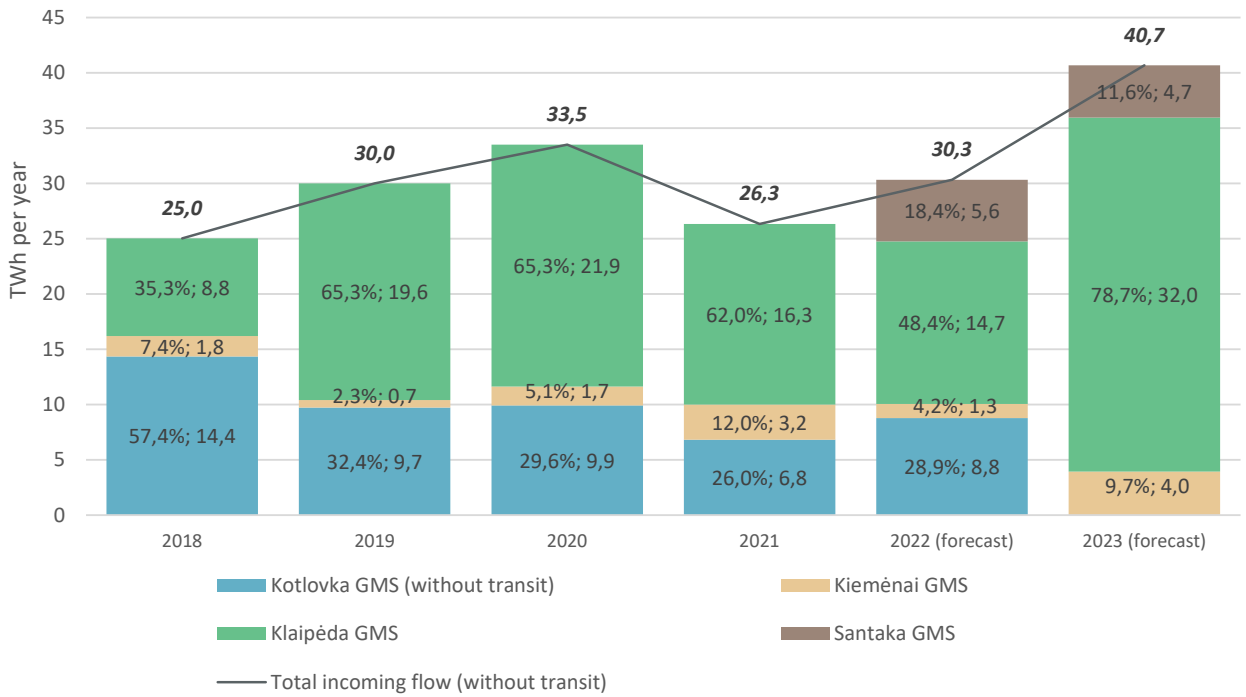


Figure 1. Sources of natural gas supply by entry point, 2018-2023 actual and projected flows, % and TWh/year.

Both in 2022 and in the future, the distribution of gas volumes by entry point will depend on the competitive and geopolitical situation on the gas market. In 2021, due to extremely high gas prices (see Figure 2 for the gas price evolution), Achema AB has reduced its gas demand by almost 50% since July (in 2021, gas volumes of Achema AB in January-June averaged 1.25 TWh/month, in July-December - 0.68 TWh). In 2020, competitive LNG prices resulted in the highest ever natural gas volumes transferred to Latvia, see section 1.3 "Cross-Border Gas Flows" of the Plan.

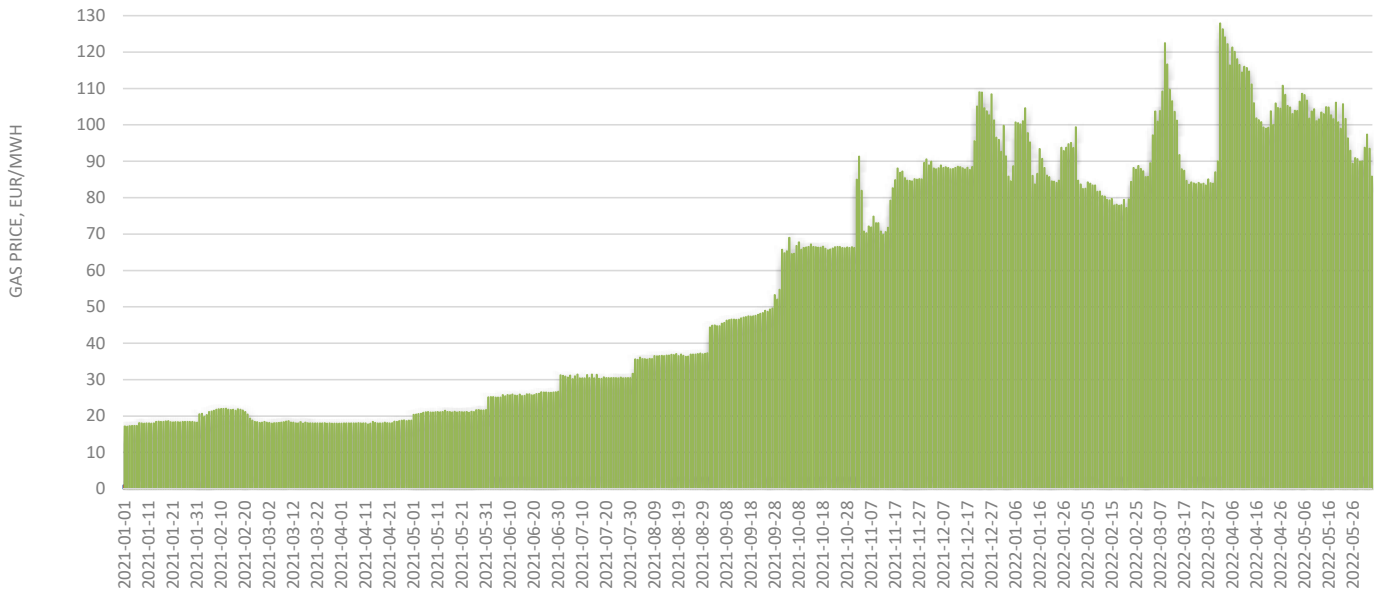


Figure 2. Natural gas price development in 2021-2022 (source: GET Baltic, gas prices at the Lithuanian trading floor from 1 January 2021 to 28 April 2022).

It is also expected that, within 10 years, a part of the gas transported through the transmission system will be domestically produced from renewable sources. In order to attract green gas supplies to the gas transmission networks, decisions have been taken on the adaptation of the national registry of guarantees of origin to the international trade in guarantees of origin, the implementation of a demonstration project on the blending of green hydrogen into the gas grids is continuing, and there is a close cooperation with biogas producers on the connection of biogas plants to the gas transmission networks in Lithuania.

As of 2019, Amber Grid administers the national register of guarantees of origin for gas produced from RES, i.e. it fulfils the functions of issuing, transferring and cancelling guarantees of origin, supervising and controlling the use of guarantees of origin, and recognising guarantees of origin issued in other countries in Lithuania. Green gas is produced from biomass and other RES. The guarantee of origin shall be granted for one unit of energy, i.e. one megawatt hour (MWh) delivered to the natural gas transmission and distribution network. In 2021, the first 10 (10 MWh) of green gas with guarantees of origin were imported into Lithuania through the Guarantee of Origin system.

In 2030, the amount of RES gas entering the gas system (with guarantees of origin) is projected to reach 1.6 TWh or about 8% of Lithuania's total natural gas demand (which will be about 20 TWh) including 0.7 TWh of energy from green hydrogen and 0.9 TWh from biogas.

Domestic Demand in Lithuania

In order to ensure the most accurate planning of gas volumes required to meet the domestic needs of Lithuania, stakeholders, i.e. existing and potential transmission system users, supply companies, state authorities, and producers of gas from renewable sources, are consulted. The system users were asked to provide volumes and capacities for gas consumption in Lithuania that meet their needs for the next ten years.

The declared/defined consumption capacity of the Lithuanian transmission system users declared/defined for the year 2022 (the required maximum daily gas volume to meet the maximum gas consumption needs) is 181.1 GWh/day.

In recent years, the volume of gas transmitted through the Company's transmission system for the Lithuanian market needs has been slightly changing every year: in 2018 – 22.3 TWh of gas, in 2019 – 23.5 TWh, in 2020 – 25.1 TWh, in 2021 – 24.1 TWh (in the period 2018–2021 – 23.8 TWh per year on average). The largest consumer of natural gas is Achema AB the gas volumes of which in 2018–2021 ranged from 11.6 TWh (2021) to 14 TWh (2019). According to the data provided by the system users, the planned gas volumes to be transmitted to the Lithuanian consumers will be around 20.2 TWh in 2022 and 22.6 TWh in 2023. From 2024 onwards, annual volumes are expected to reach around 20.5 TWh/year.

The actual demand for long-term transmission system capacity for Lithuanian consumers in the period 2018–2021 has steadily increased from 86.3 GWh/day (2018) to 115.1 GWh/day (2021). Similar capacity demand is expected in the coming years. In 2022, the projected demand for long-term transmission system capacity for Lithuanian consumers is expected to reach 105.9 GWh/day and in 2023 101.6 GWh/day.

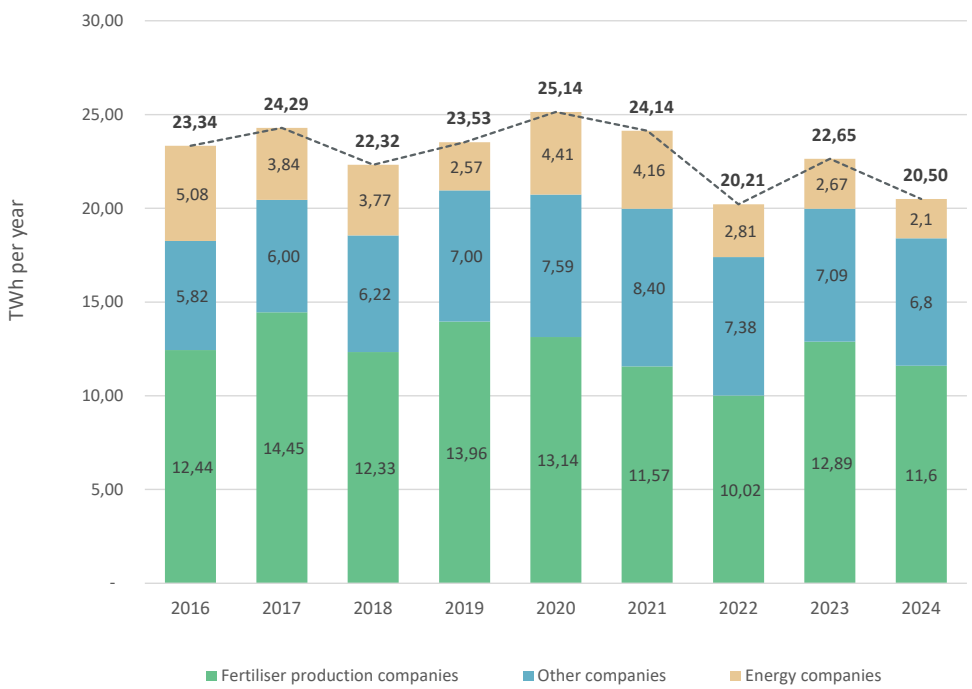


Figure 3. Structure of gas volumes transported at the internal outlet by transmission system user, 2016-2031 actual and forecast, TWh/year.

Cross-border Gas Flows

In recent years, the volume of gas transported to Kaliningrad Oblast in Russia has fluctuated between 25 and 28 TWh, with an average of 26.4 TWh in 2018–2021. 26 TWh of gas was transported in 2019 and 24.9 TWh in 2020. In 2021, the volume of gas in transit increased slightly with 26.7 TWh. In the following years, it is expected that around 26¬-27 TWh of gas will be transmitted per year.

In 2015, using the alternative created by the LNG terminal in Klaipėda, gas supplies to the other Baltic countries via Lithuania were launched via Kiemėnai exit point. The average volume of gas transported between 2018 and 2021 was 4.5 TWh. In recent years, there have been significant fluctuations in the volumes of gas transported through Kiemėnai outlet, mainly due to the competitive environment. In 2020, with the prevailing low gas price, market participants were active in buying and supplying gas to Baltic consumers/supply companies/Inčiukalnis storage facility, and in 2021, as the price of gas significantly increased, the flows through Kiemėnai significantly decreased. In 2020, 7.96 TWh of gas (a fixed historical maximum) was transferred via Kiemenai cross-border release point to other Baltic consumers/supply companies/storage facilities, and in 2021, 1.90 TWh of gas was transferred to Inchinchukaljö storage facility, which is 4.2 times lower than in 2020.

From the beginning of 2022, gas flows through Kiemenai interconnector are also mainly influenced by the geopolitical situation driving the need of the EU countries to minimise their dependence on the Russian gas. The data in Figure 4 shows that at the beginning of the year gas flows were moving from Latvia to Lithuania, but after 24 February 2022, when Russia launched a war against Ukraine, the direction of the gas flow has changed. During the period from 1 January 2022 to 18 April 2022, 1.77 TWh of gas was transferred to Lithuania (2.4 TWh in the same period in 2021) and 3.15 TWh of gas was transferred to Latvia (there were no gas transfers from Lithuania to Latvia in the corresponding period in 2021).

Looking ahead, the construction of a new LNG terminal in Finland or Estonia may have a major impact on the flows through the Kiemenai point. Once operational, it is likely to reduce the need for import of gas via Klaipėda LNG terminal for the needs of the countries to the North.

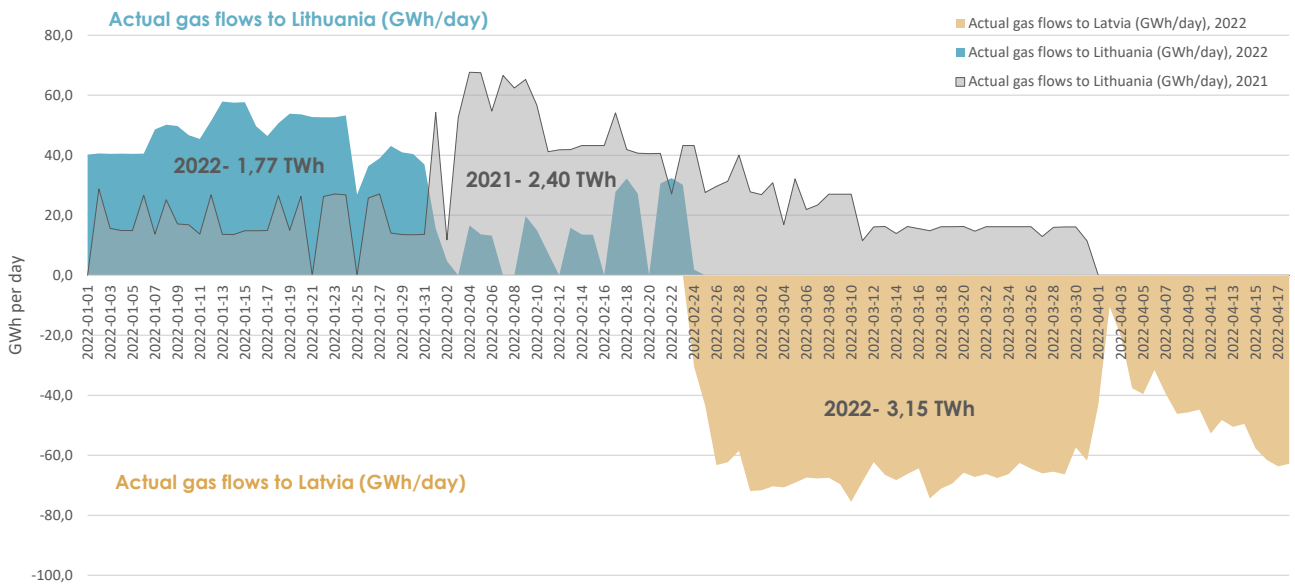


Figure 4. Kiemėnai inlet/outlet flows (for the periods from 1 January 2021 to 18 April 2021 and from 1 January 2022 to 18 April 2022, GWh/day

Following the completion of the construction of the GIPL gas pipeline connecting Lithuania and Poland in December 2021, an additional entry/exit point at Santaka was added to the gas transmission system. As of 1 May 2022, gas market participants started to use the GIPL pipeline and commercial gas flows between Lithuania and Poland started. Volumes of gas transported via Santaka entry/exit point towards Poland are forecast to reach around 8 TWh in 2022 and similar volumes are expected in 2023.

Latvia and Estonia have created a common gas market area since 2020 and have formed a common tariff area with Finland, with a zero transmission price on the interconnector with Finland from 2020 and transmission prices for entry into the tariff area being aligned.

Cross-border gas flows are projected to increase as the Baltic TSOs apply various market integration measures, the possible finalisation of a common Baltic-Finland transmission price area and gas market, and the implementation of infrastructure projects of common interest in the region. It should be noted that discussions between TSOs and national regulators on the conditions under which Lithuania would join the common area are actively ongoing with regard to the integration measures to be applied. The aim is to create a single market on the terms acceptable to all parties including citizens and businesses of Lithuania. A study on the integration of the Lithuanian, Latvian, Estonian and Finnish natural gas markets, including the possibility for Lithuania to join between 2023 and 2024, has also been carried out on behalf of the TSOs of Lithuania, Latvia, Estonia and Finland for the period 2020–2021. This includes the establishment of an Inter-TSO Compensation (ITC) mechanism (hereinafter referred to as the "Integration Study").

At the end of 2021, a joint application for the creation of a common tariff area and the introduction of an ITC mechanism was submitted by the transmission system operators of Finland and the Baltic States to the Finnish and Baltic regulators for evaluation. Comments were received from the regulators and a revised application was requested and submitted in March 2022. If the Government of the Republic of Lithuania agrees with the submitted decision, a public consultation on the establishment of the common tariff area and the implementation of the ITC mechanism is foreseen for 1 October 2023.

The intensity of additional gas flows through the Lithuanian transmission system will depend on the regional natural gas market conditions, the geopolitical situation in Europe, the application of integration measures and the use of regionally important infrastructures (Inčiukalnis underground gas storage facility, Klaipėda LNG terminal) as well as the start-up of the operation of the LNG terminal in the Gulf of Finland and its further volumes.

EXISTING GAS TRANSMISSION SYSTEM

Lithuanian Transmission System

The Lithuanian gas system is interconnected with the gas transmission systems of four countries, i.e. Latvia, Belarus, Poland, the gas transmission systems of Kaliningrad Oblast in Russia, Klaipėda LNG terminal and the systems of Lithuanian gas distribution operators. The well-developed Lithuanian gas transmission system serves as a regional corridor for gas transmission northwards towards Latvia and southwards towards Poland.

The total length of gas pipelines in the Lithuanian territory is more than 2.28 thousand km. There are 64 DSSs and 4 DASs to ensure the operation of the transmission system and supply natural gas to the distribution systems. For interconnections with transmission systems of other countries, 3 DASs are installed on the territory of Lithuania owned by the Company. Panevėžys and Jauniūnai gas compressor stations and agreements with the operators of the adjacent systems from which the gas is sourced to ensure the required gas pressure parameters throughout the transmission system.

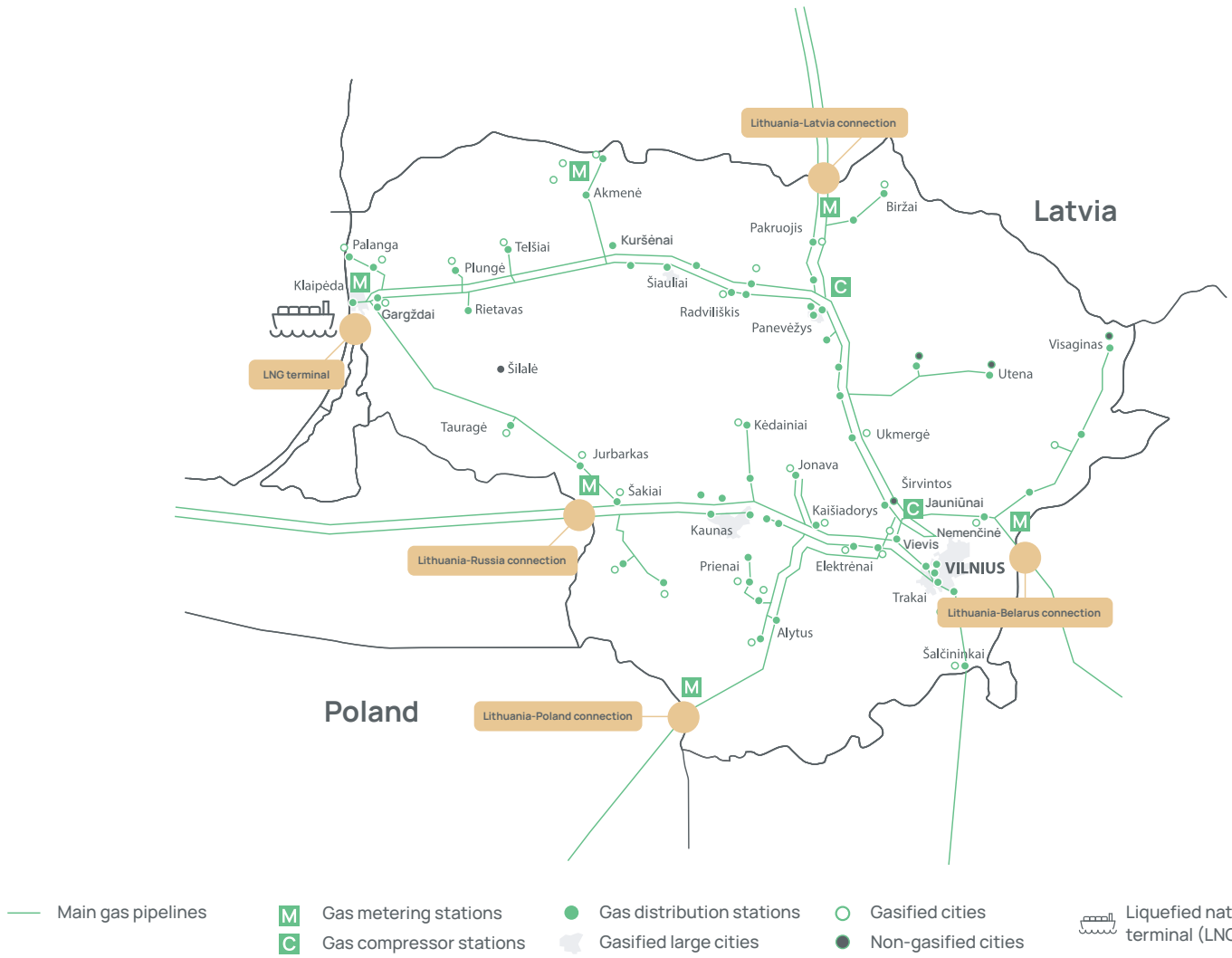


Figure 5. Natural gas transmission system of Lithuania, 2022

The technical capacity of gas pipeline interconnections with transmission systems in other countries and LNG terminal:

122,4 GWh/day
at Klaipėda GMS entry point (the point of interconnection of the transmission system with the LNG terminal system)

65,1 GWh/day
at Kiemenai DAS entry point to Lithuania

67,6 GWh/day
from Lithuania at Kiemenai GMS discharge point

325,4 GWh/day
at Kotlovka GMS entry point

73,3 GWh/day
(from mid-2022) at Santaka GMS entry point to Lithuania

58,0 GWh/day
(from mid-2022) at the discharge point via Santaka GMS from Lithuania

114,2 GWh/day
at Šakiai GMS discharge point

The existing capacity of the transmission system at interconnection points with Lithuanian distribution systems and directly connected system users is sufficient to meet the needs of Lithuanian consumers. Furthermore, at Kiemėnai GMS point, since the beginning of 2022, transmission operators have applied a dynamic technical capacity calculation model whereby each day, based on the availability of the relevant volumes to be transported through this point, an assessment is made as to whether more technical capacity can be provided. Such calculation model may be applied in the future to other points where the commercial demand for transmission is close to the technical capacity.

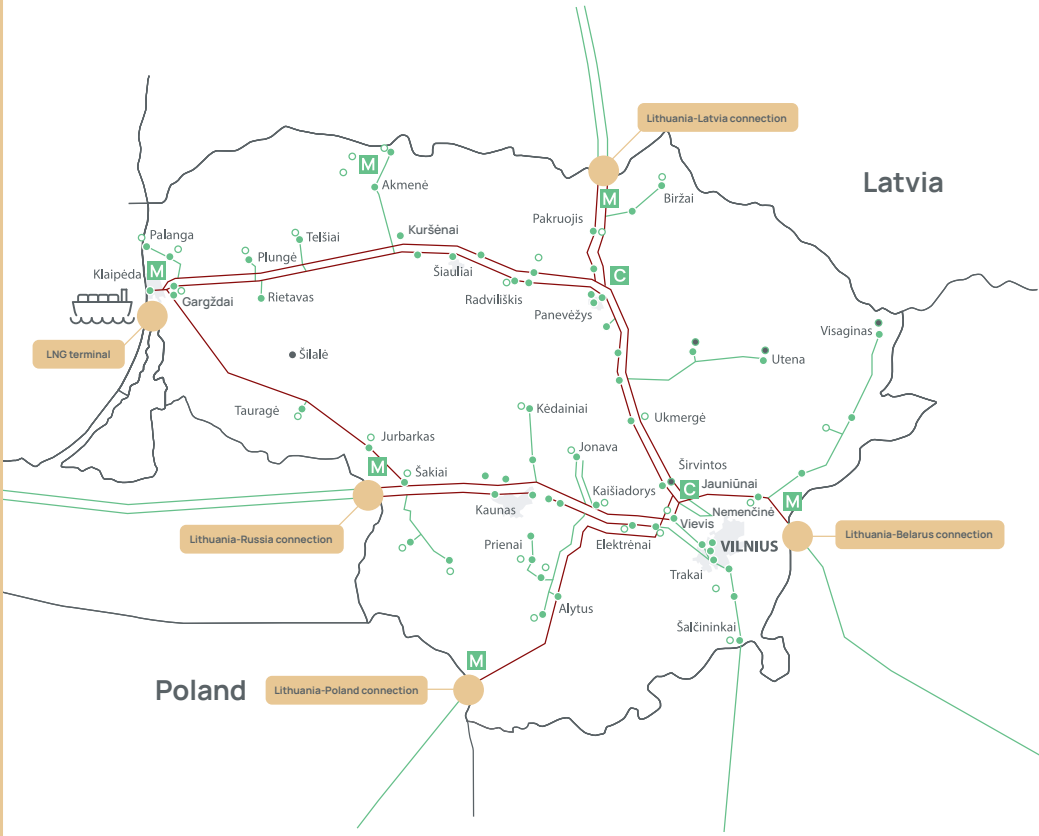


Figure 6. Main and local natural gas transmission network, 2022

The high-pressure pipeline network operated by the Company (most of the transmission system has a design pressure of 54 bar) is divided into:

a transmission (core) network of about 1,480 km (marked in dark red in Figure 6)

the regional distribution network/local network which only transfers gas to Lithuanian natural gas consumers, i.e. about 800 km (marked in green in Figure 6).

Gas Infrastructure in the Eastern Baltic Region

The Company is actively involved in the development of the common gas market in the Eastern Baltic region, with the aim of reducing international barriers to the functioning of gas markets, promoting competition and liquidity in the gas market, and increasing the efficiency of the use of gas infrastructures.

Key infrastructure projects under development in the Baltic region, included in the 5th list of the EU Projects of Common Interest approved on 19 November 2021. :

- Increasing the capacity of the gas pipeline link between Latvia and Lithuania (ELLI)
- Modernisation of Inčiukalnis underground gas storage facility (Latvia)
- The Baltic Pipe pipeline link between Poland and Denmark

Figure 7. Gas infrastructure in the Eastern Baltic region, 2022.

Further Development of the Transmission System

In order to assess the reliability and security of the Lithuanian gas transmission system, its ability to transmit gas flows to the Lithuanian gas consumers and supply gas to the systems of other countries, and ensure efficient maintenance of the system condition, the Company continuously performs hydraulic calculations of the system and models various gas supply scenarios. The modelling takes into account the actual and forecasted volumes and capacities of gas to be transmitted at the domestic outlet point, at cross-border inlet/outlet points, potential damage to certain parts of the system (pipelines) and other circumstances.

In the Company's view, the existing infrastructure provides sufficient capacity and capacity to handle the flows required by the system users and is resilient in the event of adverse circumstances.

The company's plans for the future development of the transmission system:

Maintaining Sufficient Capacity of the Core Network of the Transmission System, Maintaining a Diluted Structure

It is important to ensure the stable and reliable operation of cross-border entry/exit points and the LNG terminal in Klaipėda, as well as sufficient capacity in the core network of the transmission system. The Lithuanian transmission system is diluted and the structure of the system will be maintained in the future due to its capacity to operate the LNG terminal, which is important in the context of the whole region. A number of the main gas pipelines in the transmission system have parallel pipelines which allow for cheaper and more flexible operation of the transmission system without interruption of gas supply. Furthermore, the results of internal pipeline diagnostics have a significant impact on the scope of pipeline rehabilitation works. Internal diagnostics are currently the most reliable, up-to-date and rational way of checking the condition of underground pipelines, both for the core network and the local network.

Reliable Operation of the Local Transmission Network with Gradual Restructuring and Optimisation to Meet the Needs of the Lithuanian Consumers

As for the TSO, it is important to maintain the reliable operation of the gas pipelines to the, GDS, ensuring stable gas supply to the Lithu-

anian consumers, while at the same time optimising the costs of the transmission system when historically built capacity is not necessary. During the reconstruction of the transmission system facilities, new technical parameters are chosen taking into account the results of hydraulic modelling, where necessary, options for reducing transmission capacity, reducing pressures or pipeline diameters, and optimising GDS capacity are assessed.

Innovation and Green Energy

At the end of 2019, the European Commission unveiled the European Green Deal, an ambitious project to help the citizens and businesses of Europe benefit from the transition to sustainability and greening. The measures, presented alongside an initial roadmap of key policies, include large-scale emission reductions, investment in advanced research and innovation, and preserving the European natural environment.

The European Commission agrees that the gas sector and networks can effectively contribute to the creation and development of a European hydrogen economy and aims to facilitate the integration of renewable and low-carbon gases, in particular, hydrogen and biomethane, into the energy system. The plan is to reduce methane emissions by 55% below 1990 levels by 2030 and to achieve climate neutrality in the EU by 2050. With the recent rapid growth in demand for gas produced from renewable energy sources (RES), also known as green gas, in Europe this renewable form of energy is making its way to Lithuania. The development of green gas brings Lithuania closer to its goal of reducing its impact on climate change and becoming a green energy country. The Company supports and contributes to the promotion of green energy development in Lithuania in order to meet the country's goals of reducing its impact on climate change and becoming a green energy country.

In 2021, Amber Grid approved its corporate strategy for 2021–2023 which foresees that the Company will focus on the following areas in line with the European Green Deal:

Meeting EU and national climate change targets for 2030 and 2050

Accelerating the transition to clean and smart mobility

Clean and affordable energy supply and energy security

The ambition of the European Green Deal will require significant investment. The European Commission has earmarked funds to finance the specific measures.

As of 2019, Amber Grid administers the national register of guarantees of origin for gas produced from RES, i.e. it provides the functions of issuing, transferring and cancelling guarantees of origin, supervising and controlling the use of guarantees of origin, and recognizing guarantees of origin issued in other countries in Lithuania.

Given the growing demand for green gas, we seek to create the best possible conditions for the development of gas produced from RES:

From 2023

We seek to set up an exchange scheme for guarantees of origin with sustainability certificates between the Baltic States and Finland

From 2024

We seek to ensure the free exchange of the Guarantees of Origin between Lithuania and EU countries by participating in European Guarantee of Origin schemes.

In December 2021, for the first time in Lithuania, support for biomethane production projects was granted. Almost the total amount of EUR 15 million has been allocated to 8 companies. Besides, during the year 2021, the Company received 14 applications from potential green gas producers for connection conditions to the transmission network. The first biomethane producers are expected to start their operations already in 2023.

2021

2022

The GIPL interconnector enables to exchange the guarantees of origin with sustainability certificates between the countries of Western Europ

The standard EN 16325 KG info force

2023 - 2024

The exchange scheme for guarantees of origin between the Baltic States and Finland starts

In 2023 - 2024, it is planned to connect the first biomethane and hydrogen (h_2 demo)plant to the gas network

2025

The possibility for the participants of the market to exchange the guarantees of origin with the EU Member States is ensured

The provisions of the Law on Alternative Fuels obliges the gas fuel supplers to supply the respective quantinity of green gas in the final gas mixture. The suppliers must perform the afore-mentioned obligations through use of the guarantees of origin

Figure 8. Objectives of the Guarantee of Origin at regional level

Green hydrogen

In 2020, the European Commission presented a European hydrogen strategy (A hydrogen strategy for a climate-neutral Europe). The strategy aims to boost the decarbonisation of Europe's industrial, transport and energy generation sectors with green and low-carbon hydrogen. The strategy looks at how to make the potential of hydrogen a reality by stimulating investment, market creation, research and innovation, and regulatory change.

On 18 May 2022, the European Commission presented the REPowerEU plan to put an end to the EU's dependence on Russian fossil fuels and accelerate the fight against climate change. The proposed objectives are as follows: saving energy, diversifying energy supplies and accelerating the use of renewable energy. Hydrogen is also a key component of the plan, with production targets almost twice as ambitious as those in the European Hydrogen Strategy, i.e.10 million tonnes of green hydrogen to be produced in Europe by 2030, and 10 million tonnes to be imported to displace natural gas, coal and oil in hard-to-decarbonise industries and transport sectors. To accelerate hydrogen projects, the plan includes an additional €200 million in funding.

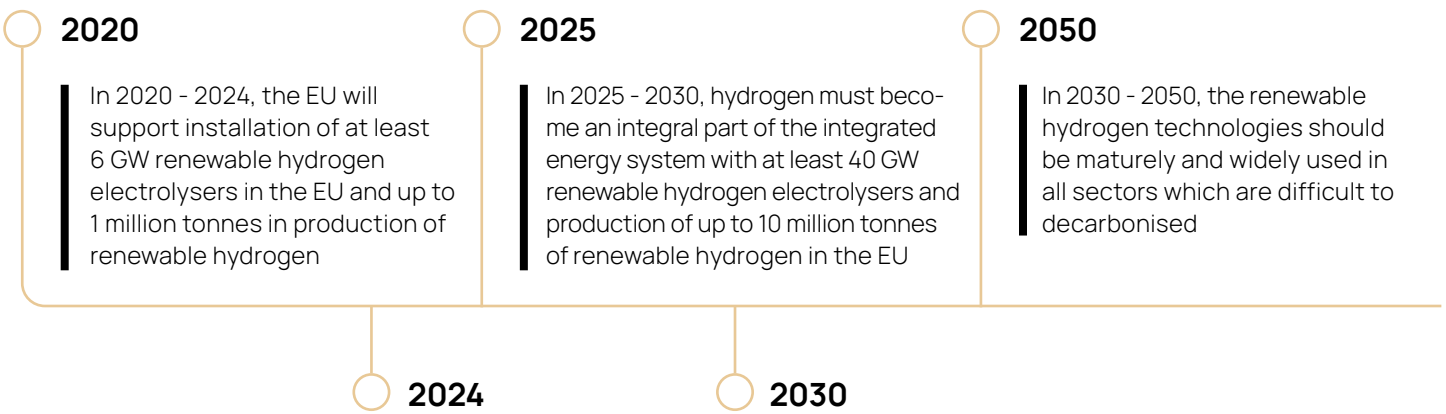


figure 9. Targets of the European Hydrogen Strategy to be achieved till 2050.

The Company will focus on the following activities in order to achieve the objectives of the European Hydrogen Strategy:

- connecting hydrogen producers to the transmission system
- adapting the gas transport system to transport a mixture of green hydrogen and methane
- developing a hydrogen transport system and adapting an existing gas system to transport pure hydrogen
- building and developing competences in hydrogen technology

2021 december

In December 2021, a hydrogen research programme was developed with the support of a scientific organisation to identify the most risky elements of the gas infrastructure, the research measures and the actions to be carried out during the implementation of the pilot project in order to establish a safe limit for the concentration of hydrogen in the mixture with methane gas in the gas transmission and distribution networks.

2022–2024

In addition, taking into account the growing demand for pure green hydrogen in the transport, industrial and energy sectors as well as the rapidly growing production capacity of electricity from renewable energy sources in the region, the Company will initiate a feasibility study for a regional (transit) hydrogen network project in 2022–2024 together with the regional transmission system operators. In addition to technical and economic calculations, the possibility of connecting national hydrogen consumers to the regional hydrogen grid will also be examined during the study.

2022–2025

During the period 2022–2025, the Company is planning to implement a Power-to-gas (P2G) pilot project to determine how to adapt the existing gas system to transport green hydrogen. The project will connect hydrogen production electrolysis facilities to renewable electricity generation facilities and the gas transmission and distribution system. The hydrogen gas produced by the P2G electrolysis plant will be blended in various proportions with natural gas and transported to consumers.

2026

Based on the results of the pilot project and the study phase, the Company plans to gradually adapt the gas transmission system infrastructure to transport the hydrogen/methane mixture. The implementation of the measure will enable up to 10% (i.e. over 200 million m3 or 0.7 TWh) of the existing gas transport system to be injected with hydrogen green gas in 2030, replacing natural gas.

2030

According to information published by the European Hydrogen Backbone initiative, a regional hydrogen network could be operational after 2030. Investments in Lithuania could reach more than EUR 500 million.

TRANSMISSION SYSTEM DEVELOPMENT IN 2022–2031

The transmission system development investment projects are planned for the period 2022–2031 to diversify gas supply sources in Lithuania and the other Baltic States and improve the security and reliability of gas supply.

The investment volumes are presented in the Plan in the current prices excluding value added tax (VAT).

Projects of Common Interest to the European Union

At the end of 2021, the Company completed the project "Gas Interconnector between Poland and Lithuania" (GIPL). The pipeline creates a bi-directional trunk gas pipeline link between the natural gas transmission systems of Poland and Lithuania, which will allow the elimination of energy islands, regions that have not been integrated into the EU's common energy market so far, such as Lithuania, Latvia, Estonia and Finland. The GIPL not only enhances the security of energy supply in the Baltic region, but also generates significant economic benefits for gas market participants in Poland and the Baltic States. As of May 2022, the EU will have a major share in the GIPL. In 2022, the GIPL pipeline has been used by the participants of the gas market and the transfer of commercial gas flows between Lithuania and Poland has started.

The Company continues the implementation of the strategic gas transmission infrastructure project "Increasing the Capacity of the Gas Pipeline Interconnection between Latvia and Lithuania" which is included in the European Union's 5th list of projects of common interest (PCIs), the Ten-Year Development Plan of the European Network of Transmission System Operators for Gas (ENTSOG), the Baltic Energy Market Interconnection Plan (BEMIP) and the National Implementation Plan for Priority Projects in Electricity and Natural Gas Transmission Infrastructure approved by the Resolution of the Government of the Republic of Lithuania.

Increasing the Capacity of the Gas Pipeline Link between Lithuania and Latvia /TRA-N-382[1]

The project "Enhancing the Capacity of the Gas Pipeline Interconnector between Latvia and Lithuania" (ELLI) is aimed at increasing the capacity of the gas interconnector between Latvia and Lithuania, ensuring the security and reliability of natural gas supply, more efficient use of the infrastructure, and better integration of the gas markets in the Baltic States and the functioning of the common market. It will also improve access to Inčiukalnis underground gas storage facility in Latvia. The integration of the Baltic gas markets into the EU's common gas market will make this interconnector an important part of the route linking the European and Eastern Baltic markets.

The project is operated by –

Amber Grid

conexus BALTIC GRID

10,2 MEUR
total investment
for this project

4 MEUR
Lithuania's investment
in the project

The project will increase the capacity of Kiemėnai gas metering station and rebuild the pipeline to Panevėžys compressor station on the Lithuanian side while in Latvia work is underway to rebuild the main gas pipeline to increase the maximum operating pressure from 40 to 50 bar. The investments will increase the capacity of the gas interconnector to 130.47 GWh/day in the Latvian direction (currently 67.6 GWh/day) and 119.5 GWh/day in the Lithuanian direction (currently 65.1 GWh/day). The project will create the capacity to transport up to 47.6 TWh of gas per year to Latvia and up to 43.6 TWh per year to Lithuania.

[1] Number assigned by ENTSOG.

On 21 December 2019, a tripartite agreement for the financing of the construction works of the Lithuania-Latvia Gas Pipeline Capacity Enhancement Project under the Connecting Europe Facility (CEF) was signed with the Executive Agency for Climate, Infrastructure and the Environment (CINEA) of the European Commission and AS Conexus Baltic Grid. The EU support covers up to 50% of the eligible project costs.

The project is scheduled to start operation in the second half of 2023.

Figure 10. Route of the Latvia-Lithuania gas pipeline interconnection project (ELLI).

Estimated funding requirements for the project "Increasing the Capacity of the Gas Pipeline Interconnection between Lithuania and Latvia" in the territory of Lithuania (million EUR):

2020-2021	0,15
2022	3,05
2023	0,8

Total: 4

Transmission Reliability Development Projects

In addition to projects of common interest, other projects are planned to ensure the uninterrupted operation of the transmission system.

Reconstruction and Modernisation of the Transmission System

In order to ensure the reliability and safety of the trunk gas pipelines, the Strategy for Ensuring the Safety and Reliability of the Transmission System of the Company (hereinafter referred to as the "Strategy") which provides for continued and new measures including the reconstruction and modernisation of the linear part of the trunk gas pipelines, the reconstruction and modernisation of the gas distribution stations and the compressor stations is being implemented. For the purposes of compliance with the physical and information security requirements of undertakings of strategic or critical importance for national security, measures are being implemented to enhance the information security of the Company.

On 22 July 2014, the Government of the Republic of Lithuania approved the National Implementation Plan for Electricity and Natural Gas Transmission Infrastructure Projects in order to implement the National Energy Independence Strategy and the National Progress Programme which also provides for the implementation of projects to modernise the existing transmission system infrastructure. Information on the investments foreseen over the next 5 years is provided below.

Some of the projects to rebuild the transmission system are partly financed by EU funding.

The need for funding necessary for reconstruction and modernisation of the transmission system (EUR million):

Seq. No.	Name	Until 2022*	2022	2023	2024	2025	2026	2027–2031	Total investments under the Plan	Including: Donations, third party funding
1	Reconstruction of the linear part of gas trunk lines and connection of green gas producers, including:	16.4	8.2	22.6	2.0	1.2	15.8	80.7	**146.9**	21.44
1.1	incl. Connecting biogas producers***		0.07	0.33	0.20	0.20			**0.8**	0.8
1.2	incl. Adaptation of trunk gas pipelines to transport a mixture of hydrogen and natural gas***			0.5	0.82		5.0	45.0	**51.32**	**
2	Reconstruction of gas distribution and metering stations	0.7	4.9	8.3	0.7	4.8	2.2	33.0	**54.6**	4.94
3	Reconstruction and modernisation of compressor stations, including:	0.8	1.0	0.8	5.0	4.9	2.1	18.1	**32.7**	0.97
3.1	incl. Adaptation of compressor stations to transport hydrogen and natural gas mixtures***						2.0	18.0	**20.0**	**
4	Reconstruction and modernisation of other transmission system dependencies and equipment (corrosion protection, instrumentation, telemetry), including:	0.3	0.6	1.4	1.0	0.7	1.0	8.2	**13.2**	
4.1	incl. Adaptation of other transmission system components and facilities for the transport of hydrogen and natural gas mixtures***						0.25	2.25	**2.5**	**
	Total investment	**18.2**	**14.7**	**33.1**	**8.7**	**11.6**	**21.1**	**40.0**	**247.4**	**27.35**

* share of continuing projects invested until 2022.

** will be aimed at obtaining support from the European Union funds for measures related to the adaptation of the transmission system for the transport of the gas-hydrogen mixture.

*** investments for the transport of biogas and hydrogen/natural gas mixtures (green energy development) are excluded.

In 2023, a significant increase in investment is planned, as work will be carried out on the completion of a number of major transmission modernisation/reconstruction projects (projects listed in the introduction to the Plan), partly supported by the EU Structural Funds. A project to adapt the gas transmission system infrastructure to transport a mixture of hydrogen and methane is scheduled to start in 2026, which will also have an impact on the higher level of investment.

Reconstruction of the Linear Part of Trunk Gas Pipelines

One of the key measures identified in the Strategy is the internal diagnostics of gas pipelines, carried out with the help of special monitoring devices, thus determining the actual technical condition of the pipelines. In order to achieve this objective, it is planned to install control chambers in the pipelines, replace linear shut-off devices (SODs), pipe curves and branch nodes.

1,837 km (80% of all pipelines) of the total 2,285 km of pipelines in operation can be adapted for internal diagnostics:

1321 km
(58% of all pipelines) km of gas pipelines have already been adapted and tested

516 km
(22% of total pipelines) km of pipelines have been adapted (installation of start-up/reception chambers for control devices) and are currently undergoing inspection

The aim is to have all suitable pipelines equipped for internal diagnostics by 2025.

The connection of the SODs to the remote control system will continue. It is planned that by 2023, around 60% of all major SODs will be remotely controlled and the target level of operational control of the trunk gas pipelines will be achieved.

It is also planned to implement the projects of Reconstruction of Individual Sections of Trunk Gas Pipelines in Phases I and II by the end of 2023.

Once the actual technical condition of the pipelines has been established, a risk and project alternatives analysis is carried out in accordance with the established procedures and the most cost-effective solutions are selected before a decision on the upgrading of the pipeline line section is taken.

Upgrade of Gas Distribution Stations

Currently, the Company operates 64 GDSs and 4 GMSs (including Santaka GMS which became operational on 1 May 2022).

When planning a GDS upgrade, existing and prospective gas flows are assessed and equipment with the optimum capacity is chosen in order to make efficient use of the upgrade funds. One of the major projects envisaged is the upgrade of Elektrėnai GDS (2023–2035) due to the need of Ignitis Production AB to continue operation of power units 7 and 8.

In 2020–2023, modernisation works are carried out in Šiauliai, Telšiai, Mažeikiai, Grigiškės, Kėdainiai and Vievis GDSs.

The afore-mentioned solutions ensure proper functioning of the gas infrastructure and optimise maintenance costs.

Upgrade and Modernisation of Compressor Stations

2010
Jauniūnai Compressor Station is equipped with 3 compressor units with the total capacity of 34.5 MW.

Panevėžys Gas Compressor Station has operated 7 reciprocating gas compressor units with the installed capacity of 7.7 MW since 1974. The station's technological equipment is gradually modernised.

2017
The installation of additional combustion chambers and the modernisation of the air supply systems at Panevėžys Compressor Station was completed.

2018

The modernisation of the automated control and fuel supply system was completed, and the replacement of the gas filters in 2020-2022. In addition, the investment project „Modernisation of Control of the Gas Compressor Stations and Equipment of a Data Centre" will be completed in 2020–2023.

These measures will ensure safer and more efficient operation of Panevėžys Gas Compressor Station, reducing gas consumption for engine fuels by 8-10% and reducing air emissions.

2020-2023

Upgrading of Jauniūnai gas compressor station control and installation of a data centre will be carried out.

Furthermore, taking into account the changing gas flows and the objective to ensure efficient management of the transmission system flows, a feasibility study on modernisation and possible expansion of the compressor stations will be carried out in the period 2022–2023 and, based on the results of the study, the Company will decide on further modernisation and investment needs for the compressor stations.

ANNEX 1

Planned Investments (EUR million)

Seq. No.	Name	Until 2022*	2022	2023	2024	2025	2026	2027–2031	Total investments under the Plan	Including: Donations, third party funding***
	Projects of common interest:									
1	Gas pipeline connection between Poland and Lithuania**		0.6						**0.6**	0.27
2	Increasing the capacity of the gas pipeline link between Lithuania and Latvia	0.15	3.05	0.8					**4.0**	2.0
	Other investment in the transmission system:									
3	Vilnius-Kaunas and Kaunas-Šakiai gas pipeline interconnection (second strand)	0.55						11.0	**11.55**	
4	Reconstruction and modernisation of the transmission system	18.2	14.7	33.1	8.7	11.6	21.1	140.0	**247.4**	27.35
	Total investment	**18.9**	**18.35**	**33.9**	**8.7**	**11.6**	**21.1**	**151.0**	**263.55**	**29.62**

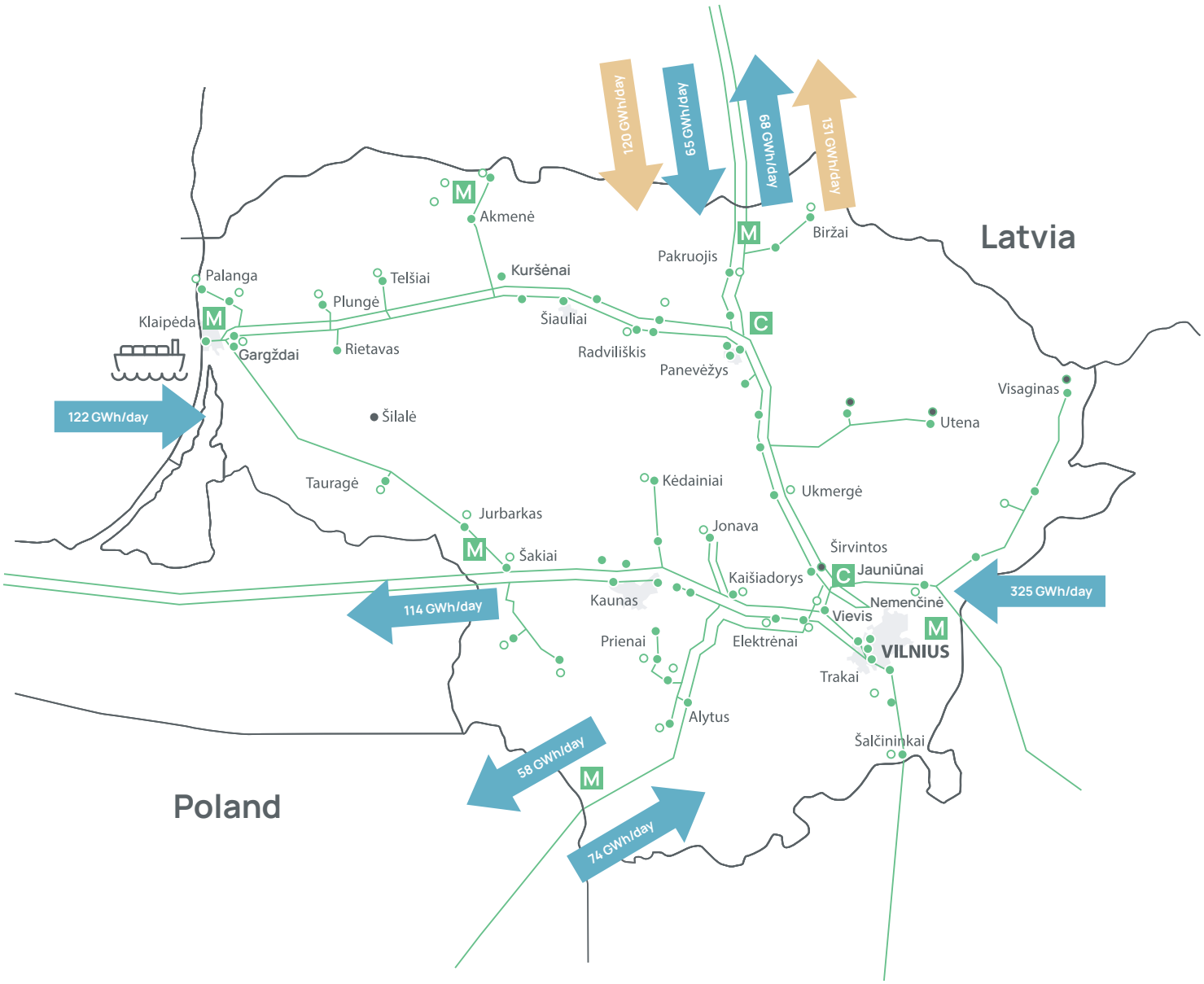
* the share of funds invested in continuing projects until 2022

** additional investment after 2021 - EUR 0.6 million

*** Measures to adapt the transmission system for the transport of the gas-hydrogen mixture will also seek support from European Union funds

ANNEX 2

Lithuanian Transmission System with the Transmission System Development Projects to be Implemented in 2031



Main gas pipelines
M Gas metering stations
C Gas compressor stations
Gas distribution stations
Gasified large cities
Gasified cities
Non-gasified cities
Technical capacity of intel/outlet points in 2022
Capacity upon implementation of the Plan
Liquefied natural gas terminal (LNGT)

Amber Grid

www.ambergrid.lt

2022