

Natural Gas in Central and Southeastern Europe: Market Unification and New Challenges

András Giday

Public Finance Quarterly
andras.giday@gmail.com

László Fritsch

MVM CEEnergy Ltd.
fritsch.laszlo@ceenergy.hu

SUMMARY

Gas consumption and its source are a strategic issue for all European countries. Our study examines the consumption of natural gas in Central and Southeastern Europe, the level and structure of consumption in the region, and analyses the network developments and the construction of LNG ports over the past decade and a half. The rules adopted by the EU created a unified market by providing access to the use of the network. Since the construction of natural gas pipelines in the 1970s, gas imports from Russia have played a dominant role in the supply of Central and Southeastern Europe. In the last 10–2 years, further large capacity pipelines have been built from the east to Europe, which created an opportunity for new connection points for the countries in the region.

With the interconnectors built between the individual countries of the region, the market of the region can be now considered unified, where access to the network is provided at moderate costs. At the same time, the consumption and transport of natural gas in the region have been and still are highly politicised issues. On the one hand, the new climate policy concepts and agreements announced have a considerable impact and, on the other hand, geopolitical tensions also affect the transport of natural gas. In 2021, an increase in consumption was still likely. This was due to the fact that the states in the region wished to shift from coal-fired power plants to electricity generation based on a combination of renewables and natural gas, while the new southern pipelines in the Balkans would have allowed for greater imports than before. In the changed circumstances, the previously planned level of natural gas use is expected to be reduced. High prices and the fact that access to Russian gas imports may even be limited due to the atmosphere reminiscent of the Cold War are also factors that point in this direction.

KEYWORDS: Trade Policy, Hydrocarbon Fuels, Gas Utilities and Pipelines, Energy, Macroeconomy

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Gas consumption and its source are a strategic issue for all European countries. For 40–50 years, natural gas has been used in large quantities by several sectors: electricity and heat production, industry and the population. In this part of Europe, natural gas is mostly transported through pipelines, and in the winter, peak consumption generated by heating is met by storing gas extracted in the summer underground. The maritime transport of liquefied natural gas (LNG) has also been playing an increasing role in international trade for three decades.

There is a strong link between electricity and natural gas prices: in the past 15 years, the price of electricity in the EU has been determined by the cost of electricity produced by gas-fired thermal power plants. Although 20 years ago, large, integrated and usually state-owned energy companies were responsible for transporting, storing and supplying gas to consumers, today, all of this is done on a market basis, where gas traders are able to transport gas between countries without restraint.

This article is about the consumption of natural gas in Central and Southeastern Europe. Since the construction of eastern natural gas pipelines in the 1970s, gas import from Russia has dominated the supply of Central and Southeastern Europe (with the exception of two larger countries). In the past two decades, the consumption and transport of natural gas in the region have been and still are highly politicised issues. On the one hand, the new climate policy concepts and agreements announced 3 years ago have a considerable impact. On the other hand, the countries' internal political conflicts also affect the supply of natural gas. Instead of actively shaping these issues, the region rather suffers from them. In 2009, Ukraine blocked the natural gas transit pipeline passing through the country. The EU's climate policy

increasingly seeks to have a say in who uses what energy source. Moreover, Russia, one of the region's major gas suppliers, has been at war with a country in the region since February 2022.

This article examines the level and structure of consumption in the region. It explains that the rules adopted by the EU have created a frame towards a unified gas market by providing access to the use of the network. It analyses the network developments of the last 15 years, and the construction of LNG ports.

The high energy prices, partly due to the war between Russia and Ukraine, are inducing both the population and the energy-intensive industries to replace less efficient energy sources with gas or electricity as soon as possible. Furthermore, the availability of natural gas will influence its further expansion and use.

We asked two questions. One: How have the gas supply routes to Central and Southeastern Europe changed over the past 15 years? Two: How do natural gas consumption and infrastructure in the region differ from those in Western Europe?

LITERATURE REVIEW

The economic literature on natural gas supply in the region is extensive.

Regarding the expected trends in natural gas consumption, network construction and the market impact of regulatory changes, the following can be highlighted:

- publications on energy strategy,¹
- regulatory changes required or expected by the EU,
- plans concerning infrastructure projects and their implementation.

With regard to the role of gas, on the one hand, there is the 2011 IEA report (IEA

WEO, 2011), proclaiming the coming of a golden age of gas. The other side of the coin is greatly illustrated by the EU's climate and energy policy strategy, published in 2019, which proclaimed the absolute priority of renewables (Clean energy for all Europeans).

Jirusek (2017) specified which of the planned pipeline projects from the East to the region were implemented (with or without modifications) in the past one and a half decades, and which were not built in the end. The study by *Hancher and Salerno* (2017) presented the results of the 2006 EU energy sector survey. *Szulecki* (2016) drew attention to a trend in the EU's 'energy governance'. He stated that the EU will gain more and more leverage (over member states) by instructing them what energy and climate plans to make and what indicators to include. *Stern* (2019) suggested that the scope for competition in the gas market is likely to be significantly constrained by the EU's climate policy expectations. In his view, although the EU created a competitive natural gas market 10–12 years earlier, today it restricts competition.

The energy structure and policies of the Balkan countries differ considerably, through which the importance of certain areas of strategy change was demonstrated by *Deák et al.* (2021). In the case of the Visegrad countries, it should be highlighted that their energy strategies largely outlined the issues of shifting away from coal. In the 2020 decade, for example, gas consumption in the Czech Republic was expected to rise by 20%, and in Slovakia by 5%.² The analysts of Ukrainian gas sector pointed out that in the past, gas and district heating services received a considerable amount of subsidies.³

A relatively large amount of information on changes in the region's energy sector can be found in the EU's DG Energy studies and in publications by the Regional Centre for Energy Policy Research (REKK).

METHOD

The region under review includes the former socialist countries of Central Europe, the Balkans and Ukraine (the three Baltic countries are excluded). The reason for the examination of this region together is that through gas pipelines, these countries' energy sectors are linked.

The article, using indicators based on energy data, demonstrates how much natural gas is used in the region and in each country, and how it is divided between the various uses. The data are obtained from EU and national energy organisations, and from Gazprom. Recent data for 2020 can be found on the Eurostat website, while data for the future is provided by the European Network of Transmission System Operators for Gas (ENTSO-G).

The article describes the regulatory changes in the EU, and analyses which infrastructure projects have helped to improve the supply of natural gas. It summarises the impact of the region's energy targets for the next decade on natural gas demand.

Natural gas consumption was very low in two countries (Bosnia and Herzegovina and Albania), while in Montenegro and Kosovo, there is no natural gas. These countries are not shown in the tables, however, their data are included in the calculation of the regional indicators.

COMPARING THE NATURAL GAS SECTOR IN THE REGION AND WESTERN EUROPE⁴

In Central and Southeastern Europe, the role of gas is less important than in Western Europe. There are historical and developmental reasons for that. On the one hand, some countries in the region, due to their mining resources, have relied on coal for electricity

generation. On the other hand, with relatively low income levels in Southeastern Europe, there were not enough resources to switch from coal or wood to gas.

In 2020, total gas consumption in the Central and Southeastern European region of 161 million inhabitants was close to 116 billion m³, and total domestic production was 38 billion m³. All the markets in the region are net importers, only Romania and possibly Ukraine have self-sufficiency potential in terms of natural gas. Western Europe, however, used 329 billion m³ a year,

producing only 38 billion m³ and importing the rest.

Natural gas consumption

Table 1 shows the gross energy available per capita, and the sectors that used it in 2020. On the Eurostat website, 2020 data were available concerning the sectoral breakdown of natural gas consumption, the indicators were calculated from these.

Per capita consumption in the region is only

Table 1

NATURAL GAS CONSUMPTION (2020)

	Available (m ³ /capita)	Power plant sector (m ³ /capita)	For non-energy purposes (m ³ /capita)	For industrial energy purposes (m ³ /capita)	For residential energy purposes (m ³ /capita)	Trade etc. (m ³ /capita)	For the operation of pipelines (m ³ /capita)
Bulgaria	381	129	23	167	17	15	5
Czechia	766	197	10	260	214	111	4
Greece	495	321	38	63	51	14	0
Croatia	698	212	109	132	147	54	0
Hungary	988	249	62	193	381	120	6
Poland	507	91	60	139	112	33	10
Romania	546	149	26	156	173	43	0
Slovakia	837	198	79	206	258	73	15
Ukraine	629	242	60	92	178	22	17
Slovenia	406	81	3	293	62	14	0
Serbia	297	102	22	74	43	29	0
Moldova	267	108	0	32	134	26	1
North Macedonia	147	125	0	23	0	3	0
The region together	546	168	44	128	145	38	8
Western Europe	876	283	32	254	241	97	3
Region/Western Europe (%)	62	59	137	50	60	40	281

Source: author's calculations, based on Eurostat data

62% of the Western European EU average.⁵ Interestingly, the line of the rivers Danube and Sava divides the region into two parts. To the north, consumption is above average, while to the south, the indicator is significantly below average (with the exception of Greece, where consumption is average).

Power plants in the region use 40% less gas (per capita) than those in Western Europe. The average per capita consumption of natural gas from power plants is 168 m³. This indicator is significantly above average in Greece, as well as Slovenia, Hungary, Ukraine and Croatia. However, per capita consumption is only half to a third of the average in Poland, Bulgaria, Moldova, Slovenia and Serbia. Approximately a third of the natural gas consumed by the power plant sector in the region is used to meet the energy needs of the population (district heating and hot water).

The industry in the region uses half the specific level of Western Europe. In Slovenia and the Czech Republic, consumption levels are double the average. However, this indicator is only one third to one fifth of the average in Greece, Moldova and North Macedonia.

Residential use is less than two-thirds of that in Western Europe, and commercial use is only 40% thereof. This indicator is average or above in the middle part of the region. The indicators for Moldova and Poland are somewhat lower. Residential gas consumption is around half the average in Slovenia, Bulgaria and Serbia. Consumption is also low in the other Balkan countries.

It should be taken into account that district heating using natural gas is also mainly used for fulfilling the energy needs of the population. For this, the region uses 10–11 billion m³ of gas per year, on average a third of the gas used by the population. This number is higher where at least 80% of the district heating sector's energy source is natural gas (Ukraine, Moldova, Hungary, Serbia). The

high residential gas consumption figures for Romania, Moldova and Ukraine are sometimes deceptive, as a significant proportion of it is for heating multi-apartment buildings that were still connected to district heating in 1990.

The lower level of residential use of natural gas is due to the fact that the heating of buildings in areas with detached houses and rural areas is traditionally provided by wood or coal. The disadvantage is that these methods emit a lot of particulates, nitrogen oxide, carbon monoxide etc. into the air in winter, polluting the air of that area. Of the top 50 most polluted cities in Europe, 47 are in the region (35 in the Western Balkans and 7 in Poland).⁶

Non-energy use (as chemical feedstock) in the region is 44 m³/year per capita, higher (by 37%) than in Western Europe. Another minor items are the energy sector's own consumption⁷ and the energy needed to operate pipelines.

Table 2 shows the characteristics of natural gas consumption in western EU countries and for each group in the region. It can clearly be seen that the Benelux countries, Germany and Italy consume a considerable amount of gas. However, the northern states use little natural gas.

Changes in the consumption of natural gas over the last thirty years indicate an equalisation trend in the region. Consumption fell in Ukraine and Romania, which used to be heavy users, but increased in Poland, which used to be a light user, while Greece appeared as a new consumer.

The consumption of natural gas in the region generally demonstrates a high degree of stability over time. Ukraine's gas consumption has fallen by a third compared to 2004. From 2014 onwards, the IMF has been encouraging a reduction in the massive subsidies on gas and district heating, resulting in a drop in consumption (in 2020, the population and

Table 2

NATURAL GAS CONSUMPTION IN EACH GROUP OF THE REGION AND THE WESTERN EU COUNTRIES (2020)

Countries, groups of countries under review	Total domestic consumption m ³ /capita	Final consumption, for energy		Share of electricity generated from natural gas (%)
		industrial m ³ /capita	residential m ³ /capita	
Western Europe*				
Benelux states	2,139	417	402	47
Northern countries**	314	103	36	2
Baltic states	647	109	69	11
France	585	202	196	7
Germany	1,096	319	322	17
Italy	1,195	185	329	48
Austria	986	405	197	14
The rest of the Western EU member states	686	260	93	30
Together	965	254	241	21
Central and Southeastern Europe				
Poland and Czechia	636	166	134	10
Countries in the middle part of the region***	767	176	226	17
The Balkans, except for Greece	248	73	19	3
Greece	544	63	51	40
Ukraine and Moldova	693	88	175	10
Together	620	128	145	13

Notes: *EU states, except for EU states in the region. **Denmark, Sweden, Finland. ***Romania, Hungary, Croatia, Slovakia, Slovenia

Source: author's calculations based on Eurostat data

industry used half of the 2012–2013 level). However, natural gas consumption in Poland and Greece has increased. It should also be noted that, compared to 2004, there has been a slight decrease in consumption in countries with significant natural gas-fired power plants. In recent years, these have been less able to compete on price with lignite power plants in the unifying European electricity market.

The structure of natural gas consumption in the countries of the region can be divided into three types. The first is the dominance of industrial consumption in Bulgaria and Slovenia, the second is Moldova, where the majority of natural gas is consumed by the population, and the third is Greece, where power plant use prevails (for generating electricity).

Table 3 shows the weight of each type of energy in gross available energy by country in 2020. At 23%, the average share of natural gas in the region is similar to that of Western Europe. The rate is highest in Hungary and significantly above average in Ukraine, Croatia and Romania.

DEVELOPMENT OF THE NATURAL GAS NETWORK

Around 70% of the region’s annual net import needs are met directly by Gazprom, however, the majority of the remaining import needs are also covered by Russian sources. Source

Table 3

DISTRIBUTION OF GROSS AVAILABLE ENERGY (2020, %)

Countries, regions under review	Coal	Petroleum and petroleum products	Natural gas	Renewable energy sources	Waste	Atomic heat	Electricity
Bulgaria	24	25	14	14	0	24	-2
Czechia	30	21	18	13	1	19	-2
Greece	8	52	22	15	0	-	3
Croatia	4	34	30	26	0	-	5
Hungary	6	29	34	11	1	15	4
Poland	40	29	17	13	1	-	1
Romania	11	30	30	19	1	9	1
Slovenia	16	33	11	18	1	23	-3
Slovakia	14	22	25	13	1	25	0
Montenegro	38	33	-	29	-	-	1
North Macedonia	29	38	11	14	-	-	8
Albania	7	44	2	38	-	-	9
Serbia	51	23	13	16	0	-	-0
Bosnia and Herzegovina	56	22	2	24	-	-	-5
Kosovo	58	28	-	15	-	-	-1
Moldova	3	34	28	24	-	-	11
Ukraine	26	16	28	6	1	23	-0
EU states of the region	25	29	21	14	1	9	1
Non-EU countries	31	19	23	10	1	17	0
The region together	27	26	22	13	1	11	1
Western Europe	7	36	24	18	1	14	-0

Note: distribution of the weight of each type of energy in crude oil equivalent, in %

Source: Eurostat, https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_bal_s&lang=en

and route diversification have been part of the region’s political agenda for 15 years.

Various ideas have emerged in the wake of the halt of transit through Ukraine in 2009. One approach focused on building such connections whereby Russia would not be forced to transport through Ukraine. The main idea behind another approach was to diversify the region’s gas supply by building pipelines to new natural gas sources. An important pipeline construction programme was the 10-year development plan to interconnect the pipeline systems of individual countries with high-capacity interconnectors to create an interoperable gas market, thus ensuring the flow of gas in both directions. The EU provided considerable amount of subsidies for these investments.

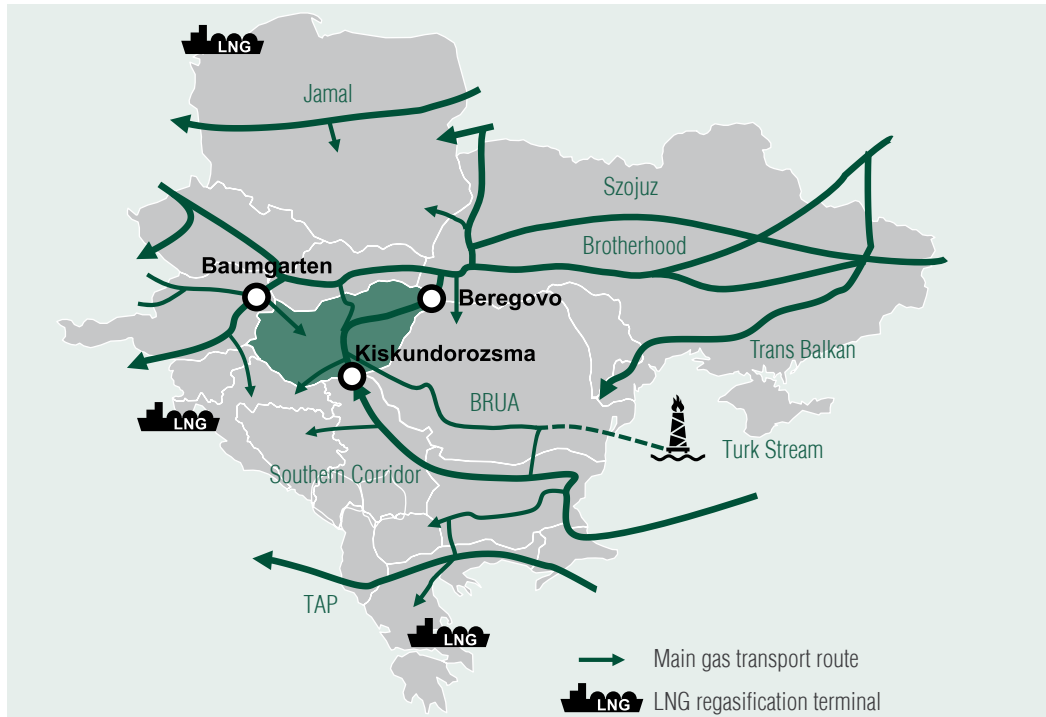
Figure 1 shows the main gas import pipelines to Central and Southeastern Europe. The region has excellent natural gas storage infrastructure for its winter consumption, however, for geological reasons, 85% of the capacity is concentrated in Ukraine and Central Europe (half of it in Ukraine).

For the time being, the LNG regasification capacity in the region is largely of local importance. Nevertheless, at a local level, they represent a real and strategic source and route diversification perspective and additional liquidity.

Table 4 shows how much gas each country purchased from Gazprom, in addition to their production and consumption. Austria is also included in order to demonstrate that some countries re-export some of the gas they buy

Figure 1

CURRENT MAIN GAS SUPPLY ROUTES IN THE CENTRAL AND SOUTHEASTERN EUROPEAN REGION



Source: own edit

Table 4

NATURAL GAS SITUATION IN CENTRAL AND SOUTHEASTERN EUROPE (2020, BILLION M³)

Countries under review	Production	Consumption	Gazprom import
Bulgaria	0.1	3	2.3
Czechia	0.2	6.9	4
Croatia	0.9	3.2	1.8
Greece	0	6	3.1
Hungary	1.7	10.7	8.6
Poland	5.6	21.2	9.7
Romania	9	12.1	1
Slovakia	0.1	5	7.6
Slovenia	0	0.9	0.4
Bosnia and Herzegovina	0	0.2	0.2
North Macedonia	0	0.1	0.3
Moldova	0	3.1	3.1
Serbia	0.4	2.7	1.4
Ukraine	19.5	29.8	0
Austria	0.8	8.8	13.2

Source: Eurostat; Gazprom, 2020

from Russia. In 5 years, Gazprom achieved considerable flexibility regarding the supply of gas, as it can supply its regional markets from Ukraine via a dedicated route, in addition to its established alternative pipelines. In Gazprom’s publications, export data by country are available for 2020, and for the sake of consistency, we have included production and consumption data for the same year in the other two columns of the table.

Gas supply in each area of the region

Romania imports little gas today, and will be self-sufficient in the future. Natural gas consumption is expected to increase slightly over the next 10 years, as gas-fired power plants are going to help replace the lignite

plant that is to be shut down. Moreover, the combined heat and power (CHP) plants that will be introduced to replace the outdated capacity in the district heating sector are expected to require more natural gas. During the cogeneration period, these will also be able to produce electricity.

Large gas fields along the Black Sea coast of the country are coming on stream. The programme was launched at the end of 2021 by involving the Midia and Ana Doina fields, with an annual production of 1 billion m³, in the production. Due to its 440 billion m³ of recoverable assets, Neptun Deep is of much greater importance. In this case, start-up is also delayed by regulatory debates, as a result of which Western companies are cautious about investing in production. Production is expected to start in late 2026 or early 2027 at

best.⁸ Although, a few years ago, negotiations were underway about a Hungarian purchase, we do not see Neptun Deep as a source of Hungarian gas supply in the medium term. At any rate, up until 2030, Hungary may receive a maximum of 1 billion m³ of gas, which may of course contribute to Hungarian source diversification, but will not change the baseline situation.

Poland covers a quarter of its natural gas demand from its own production of 5 billion m³ per year. Under the EU Green Deal, the Polish government committed to phasing out coal-based energy production; the new energy mix would be based on a trio of natural gas, nuclear power and renewables. The Warsaw government forecast a 60% increase in natural gas consumption over a 10-year period. Before the Russia–Ukraine war, the Polish government made an about-turn regarding imports. While until 2021, natural gas from Russia was the main source, from 2022, it is replaced by Norwegian pipeline gas and LNG (mainly from the US and Qatar). To this end, a large LNG regasification plant has been built in Świnoujście, which will be further expanded. The Baltic Pipe pipeline, which is able to transport 10 billion m³ of Norwegian gas per year via Denmark, will come on stream in 2022.

Over the past 10 years, the Polish pipeline network has been interconnected with the Slovak, Lithuanian⁹ and Czech networks. A high capacity north–south pipeline has been built in the eastern part of the country. The natural gas storage system is also being developed. The substitution of natural gas for coal, which is widely used today, could lead to an increase in the use of natural gas in industry.

Ukraine may be self-sufficient regarding natural gas. It has a large consumption (30 billion m³ per year), but also a significant production (20 billion m³), furthermore, it has an explored gas reserve of 1,000 billion m³.

Bringing this amount of gas into production would ensure that the country does not need to import for decades. Over the last 15 years, Ukraine has been known to be dependent on gas from Russia, however, the parties have been unable to agree on a price. One of Ukraine's trump cards was to shut down the transit pipeline going through the country, so that other countries do not receive Russian gas. In 2009, it did just that, what is more, in winter. In fact, a high-capacity gas pipeline crosses Ukraine, and the foreign exchange revenue from transit is 3% of Ukraine's GDP.

Blocking the transit pipeline has been the main motivating factor for Russia to construct high-capacity pipelines to supply Europe north and south over the past 12 years. The dispute between the two countries (and their gas companies) was settled by a deal in 2018. As part of the 'peace agreement' between Gazprom and the Ukrainian government, Gazprom signed a 'ship-or-pay' agreement with the Ukrainian company for the period 2021–2024, under which it has to pay even if it does not deliver through the Ukrainian pipeline. Gazprom agreed to transit 40 billion m³ of natural gas per year through Ukraine on a ship-or-pay basis from 2021 to 2024.

In late February 2022, war broke out between Russia and Ukraine. In the case of Ukraine, the expected demand for natural gas after the end of the war and the hoped-for reconstruction can only be discussed in hypothetical terms. Industrial gas consumption could increase if the situation returns to normal. The amount of natural gas required for construction materials is expected to be particularly high.

In the Balkan countries, natural gas consumption is relatively low on average. Until now, they have mainly used Russian gas¹⁰, with only Croatia having significant gas production (which covers a third of their needs). An LNG port near Athens has made it

possible to meet the country’s gas needs from sources outside Europe.

Three developments over the last 5–6 years have redefined the Balkan countries’ gas supply:

▶Most significantly, the TurkStream pipeline brings 12 billion m³ of Russian gas per year to the region.

▶The other is the construction of a pipeline that takes production from an Azerbaijani gas field to the Balkans and southern Italy. The Southern Gas Corridor, which channels 10 billion m³ per year of Shah Deniz 2’s gas production from Azerbaijan to Italian and Balkan markets, was fully operational by 31 December 2020 with the introduction of the Trans Adriatic Pipeline (TAP), operated by TAP AG.

The Southern Gas Corridor covers about 20% of the Greek annual consumption, 33% of the Bulgarian and 8–10% of the Italian consumption. This does not undermine Gazprom’s dominance, however, locally, it is a strategically important diversification. In July 2022, the EU agreed with the Azerbaijani government to gradually increase its gas purchases to 25 billion m³/year by 2027.

▶The third is the construction of two LNG regasification plants (Krk, in Croatia, is completed, and Alexandroupoulos, in Greece, is under construction). The recently announced expansion of the Krk terminal should also be mentioned: it already has a total capacity of 2.9 billion m³, and could reach 6.1 billion m³ by 2026.

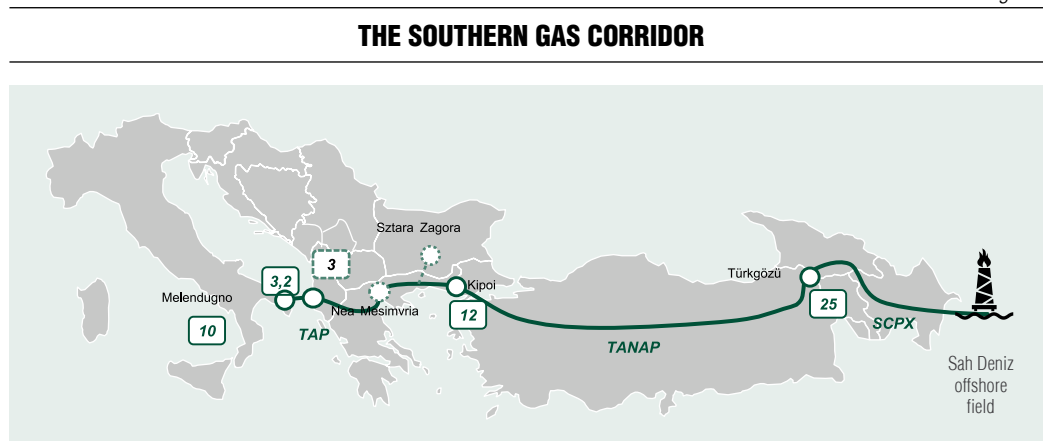
A better connection to the transit pipelines is going to provide an opportunity to increase consumption. This will partly mean connecting new residential customers (e.g. in Bulgaria), and partly help to replace district heating plants in housing estates with combined cycle gas power plants.

Figure 2 shows the route of the Southern Gas Corridor pipelines.

Table 5 shows the characteristics of the 3 new pipelines built from the south. In 2021, the Krk LNG regasification terminal with the following characteristics was put into operation; Table 6 shows its main data.

The four central countries in the region (the two Czechoslovak successor states, Hungary and Slovenia) have so far used Russian gas, which they received from the east via a pipeline through Ukraine. Now this could change.

Figure 2



Source: own edit

Table 5

THE SOUTHERN GAS PIPELINES

Pipeline	Annual capacity (billion m ³)	Pipeline length (km)	In operation
SCPX	25	692	29. 05. 2018
TANAP	16	1 850	12. 06. 2018
TAP	10	878	31. 12. 2020

Source: NS Energy, <https://www.nsenenergybusiness.com/projects/trans-anatolian-natural-gas-pipeline-tanap/>

Table 6

THE KRK LNG REGASIFICATION TERMINAL

Type of the terminal	Floating Storage Regasification Unit (FSRU)
Annual capacity (billion m ³)	2.6
In operation from	1 January 2021
CAPEX (million EUR)	234
Project owner	LNG Croatia LLC
CEF support (million EUR)	101.4

Source: NS Energy <https://www.nsenenergybusiness.com/projects/krk-lng-terminal/>

Hungary will now receive Russian gas from the south, and the two Czechoslovak successor states will receive gas from Russia via pipelines running through eastern Germany when Nord Stream 2 comes on stream. Hungary is hoping for reduced consumption as a result of residential energy saving measures, while in the Czech Republic, coal-based power plants will be partly replaced by natural gas-fired plants. All four countries are connected by pipeline to Baumgartner in Austria, where a large natural gas distribution centre is located.

By 2021, our region completed the infrastructure development supported by the EU to promote security of supply and diversification of gas sources and routes. The isolation of individual national markets is more and more a thing of the past.

The 2015 Central and South Eastern Europe Energy Connectivity (CESEC) initiative concentrated the planned regional gas

infrastructure developments in the region on seven major projects. These projects (including Krk LNG, TAP, BRUAI) have also been completed, with two exceptions (IGB, IBS¹¹).

Figure 3 shows the border crossing points and priority CESEC developments. Nine new points connecting markets have been built. Their potential transport volume in both directions is 95.9 billion m³/year. The new LNG terminals have a capacity of 7.6 billion m³/year.

Figure 4 shows how natural gas supply routes have changed since October 2021.

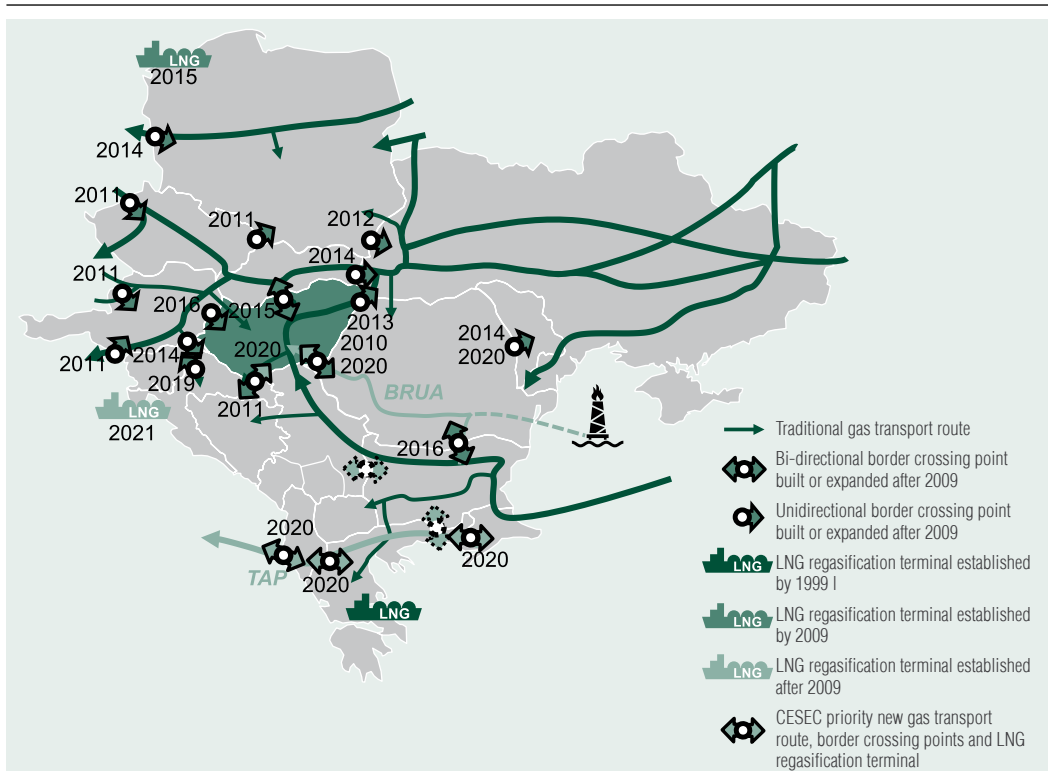
MARKET BUILDING AND THE EU'S CLIMATE AND ENERGY POLICY NARRATIVE

A Market building

For a long time, the EU could only make recommendations on energy supply and

Figure 3

NEW OR EXPANDED PHYSICAL BORDER-CROSSING CAPACITIES IN CENTRAL AND SOUTHEASTERN EUROPE AND CESEC PRIORITY DEVELOPMENTS AFTER 2009



Source: own edit based on ENTSOG, <https://www.entsog.eu/maps#system-development-map>

security, as energy management was within the member states' competence. The Treaty of Lisbon marked a turning point. It was declared that energy management is a shared responsibility, i.e. member states and the EU are jointly responsible for energy strategy and management. It was stated that the EU could have duties related to energy solidarity.

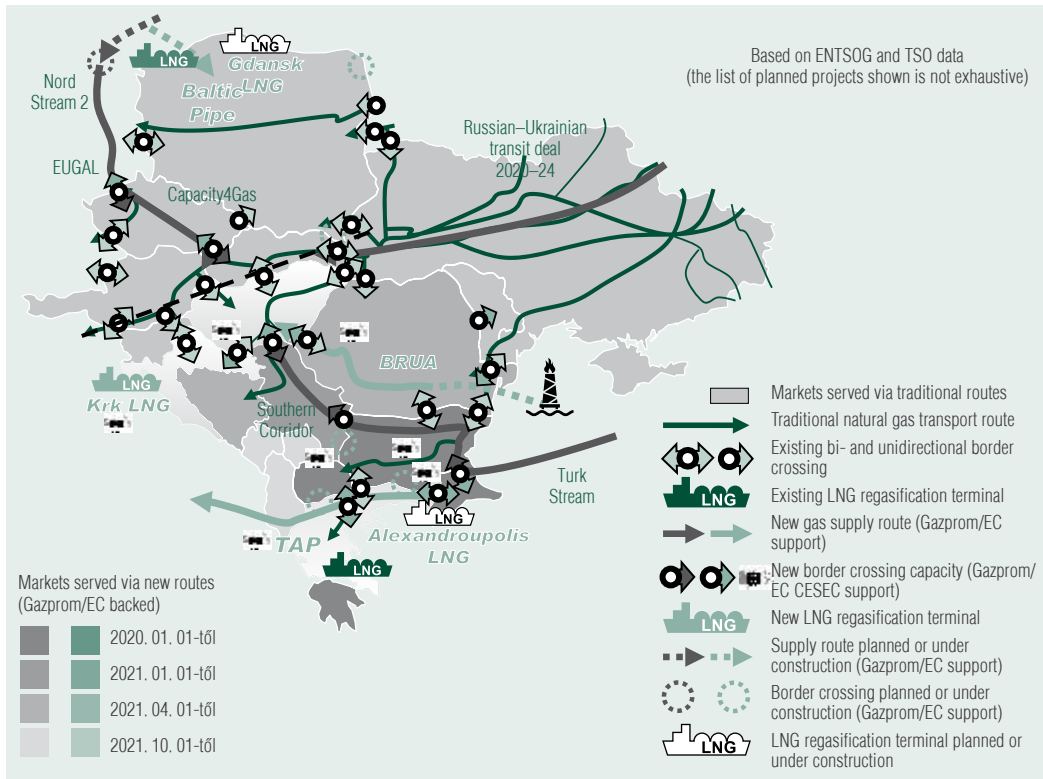
Since the 1990s, the liberal philosophy has been dominant in Western Europe. The interconnection of previously isolated national systems and the proclamation of freedom of market entry were expected to bring lower prices and greater security of supply. Gas market liberalisation was based on the use of 3 main instruments:

- interconnection of national networks with high-capacity pipelines for bi-directional transport;
- unbundling (ownership unbundling between pipeline and storage operators and suppliers);
- freedom of access to the network.

The second energy package (2003) aimed to speed up the creation of a competitive gas market. In line with requirements, the main framework for a competitive gas market was established. In 2006, a survey was conducted on the functioning of the gas market. According to *Hancher and Salerno* (2017), this showed that pipeline and storage operators occasionally favoured companies in their

Figure 4

CHANGES TO GAS SUPPLY ROUTES IN THE CENTRAL AND SOUTHEASTERN EUROPEAN REGION FROM 01.10.2021



Source: based on ENTSOG (the list of planned projects is not exhaustive), https://www.entsog.eu/sites/default/files/2021-11/ENTSOG_CAP_2021_A0_1189x841_FULL_066_FLAT.pdf

ownership group. Competition across borders was limited. Gas prices depended on the price of oil, and market entry was hindered by long-term contracts. The observations of the survey gave way to the change brought about by the Third Energy Package in 2009. It stated the need for ownership unbundling between pipeline (and storage) operators and suppliers. ACER (the Agency for the Cooperation of Energy Regulators) was established to manage the national authorities. National regulators were to be independent entities from governments and parliaments. The EU supported gas source and route diversification

projects, prioritised them (PCI¹² and CESEC lists), created measure packages to safeguard the security of natural gas supply (SOS Regulations 2010 and 2017), and established a strategy for LNG and storage to be renewed every 2–3 years.

A system of authorising the companies operating the network (transmission system operators, TSOs) was introduced to filter out the presence of entities with ownership etc. links to each other. The network code system regulates how much can be charged for using the pipeline. From 2017, the cost plus profit method has been chosen, with the

provision that any charges different from those offered must be justified, and the assumptions made when determining the charges must be explained. This helped to ensure that the principle of equal treatment was applied.

Every spring and autumn, ENTSOG carries out a thorough modelling exercise to assess the EU's expected gas supply.

B One or the other of two narratives, which contradict each other in many ways, prevails in the EU climate and energy policy.

NATURAL GAS IS PART OF THE SOLUTION, A USEFUL TOOL TO SOLVE THE PROBLEM.

Being the cleanest fossil fuel, natural gas is of strategic importance. It is the main driver for the expansion of renewables in the energy transition. The International Energy Agency (IEA), in its 2011 World Energy Outlook, wrote about the golden age of gas (IEA WEO 2011 Special report).

NATURAL GAS IS PART OF THE PROBLEM.

The decarbonisation agenda calls for all fossil fuels to be phased out as soon as possible. Instead, electrification and the use of hydrogen gas should be promoted. In this context, the strategic role of the EU's gas supply has faded. A shift to green policies was announced at the World Economic Forum in Davos in 2019. In December 2019, the EU Green Deal was launched, with a focus on achieving carbon neutrality as soon as possible. In 2020, the EU Taxonomy Package (EU classification system) was issued.¹³

THE IMPACT OF THE RUSSIA–UKRAINE WAR

On 24 February 2022, Russia launched a military attack against Ukraine. The main parts of

the natural gas network have so far not been affected by the war. The Western world has imposed a series of sanctions on Russia due to the war. Concerning this study, the main question is how the natural gas system and transport will be affected. As a result of Russia's recognition of the two Donetsk People's Republics, Germany withheld the approval of the Nord Stream 2 pipeline as early as February 2022. Most of the economic sanctions relate to what Western countries (including the EU) do not sell to or buy from Russia. Within the EU, there is an agreement to ban sea imports of Russian oil, however, the EU has not (so far) sought to stop importing gas. The main issue for gas supply in Europe is whether the EU can get enough natural gas in the summer to fill up its storage facilities for the next heating season. Parenthetically, Gazprom has and will continue to supply the contracted quantities of gas even during the war. Overall, European gas supply cannot be solved without Gazprom even in the medium term, as the capacity of LNG terminals and the volume of world LNG exports will only allow Europe to obtain a finite amount of LNG.

The EU's new gas strategy rethinks LNG sources, which is likely to lead to a shift to LNG imported from the US. A pan-European strategic gas procurement policy is going to be developed, and a storage policy has been agreed upon. The latter will require storage capacity in the various countries to reach 80%, or 30% in proportion of average consumption by November 2022. By 2023, 90% of storage capacity should be filled.

The EU decided in the summer of 2022 to reduce gas consumption by 15% (compared to 2021 levels). Although it is not binding on individual member states, if the EU decides that there is a gas emergency, each state must reduce consumption by at least 15% (such an emergency requires 55% of votes in the EU).

If the war between Russia and Ukraine continues for years, the EU's eagerness to enforce embargos could put considerable pressure on countries where cutting off Russian gas imports could create a serious economic and social crisis (production shutdown, restrictions on domestic gas consumption). In addition, insufficient supply of LNG could further increase natural gas prices on the world market.

The other party could also cause imports to halt, i.e. Russia itself could reduce its sales in response to new restrictions on its own imports. Decreasing natural gas exports may raise sales prices, nevertheless, this could backfire, as Russia risks losing its European gas market. It should be noted that the Russian company has reduced its sales on the free market in the period so far in 2022, thus contributing, among others, to high prices.

In the wake of the war and the news of the embargo policy, natural gas prices on the Western European market have continued to rise since February 2022, hovering in the EUR 80–130/MWh range until mid-2022. Persistently high energy prices are adding to the already high inflationary pressures.

EVOLUTION OF NATURAL GAS PRICES

The second half of 2021 saw a rapid rise in European gas prices. LNG prices were driven up by large purchases by East and South Asian countries, while in Europe, demand was boosted by the rapid recovery from the pandemic and the replenishment of stocks. In contrast, in Europe, supply was reduced by the shutdown of Dutch gas fields and by Gazprom selling less gas on the free market than before. Furthermore, although the Nord Stream 2 pipeline was completed by autumn 2021, the

German authorities have not authorised the pipeline to be put into operation.

The high cost of producing natural gas and developing infrastructure means that producers are trying to lock in the volume they sell through long-term contracts. Long-term contract imports are still the backbone of natural gas supply in most markets.

Due to increased market liquidity as a result of market liberalisation, integration and market shocks, the duration of contracts is decreasing, their flexibility is increasing, and pricing is now predominantly gas market pricing instead of traditional oil indexation.

As a result of market transformation in Europe over the last decade, natural gas distribution hubs have been playing an increasingly important role in trading and pricing. TTF in the Netherlands has become the reference price market for continental Europe, while VTP in Austria has become the reference price market for Central Europe. *Figure 5* shows the main gas pipelines to TTF and VTP. The most frequently observed metric in our markets is the VTP–TTF price spread. Its evolution is a key indicator for operators with TTF-indexed contracts when they (also) operate in markets that move with VTP.

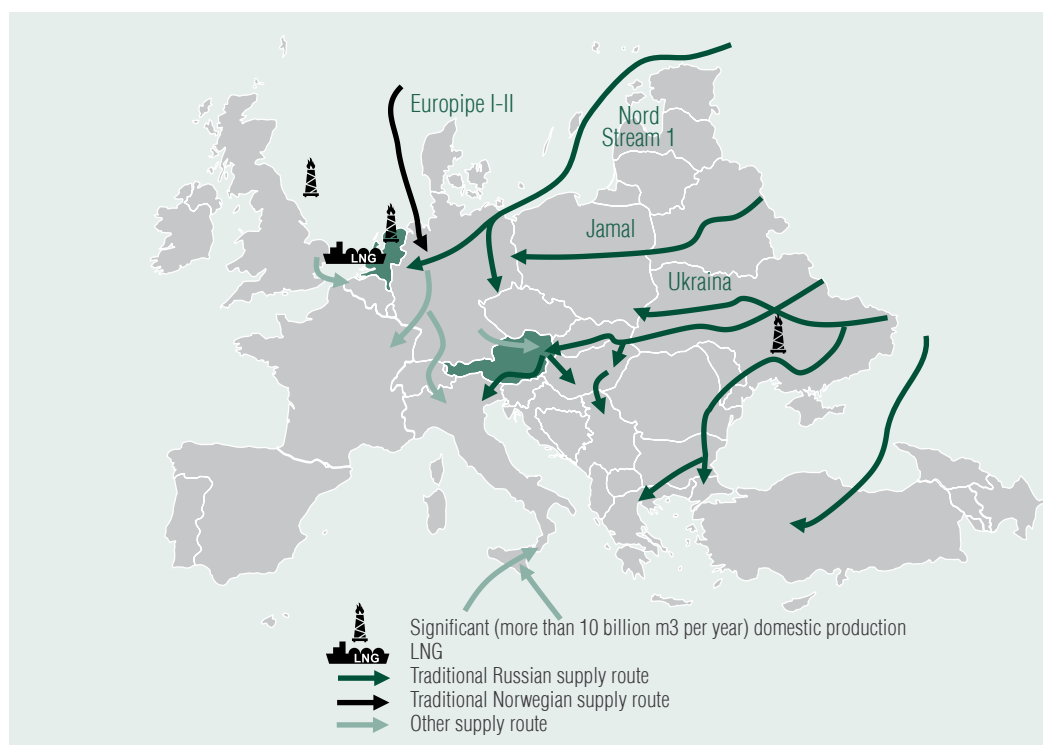
Table 7 shows the main data for the Vienna and Dutch stock exchanges. Although the Vienna stock exchange is still much smaller, it is showing signs of development.

For structural, commercial and infrastructural reasons, the liquidity of VTP markets is far below that of the Northwestern European markets. With the transformation of natural gas supply routes in the region, further segmentation within the region is emerging.

Figure 6 shows Gazprom's export routes to the region, and LNG terminals in Europe. The emergence of LNG regasification terminals in the region has not changed the fundamental market conditions, however, it has connected the region to the globalising LNG markets,

Figure 5

THE DUTCH AND VIENNA GAS EXCHANGES AND MAJOR EUROPEAN IMPORT PIPELINES



Source: own edit, based on OIES and CEER data

Table 7

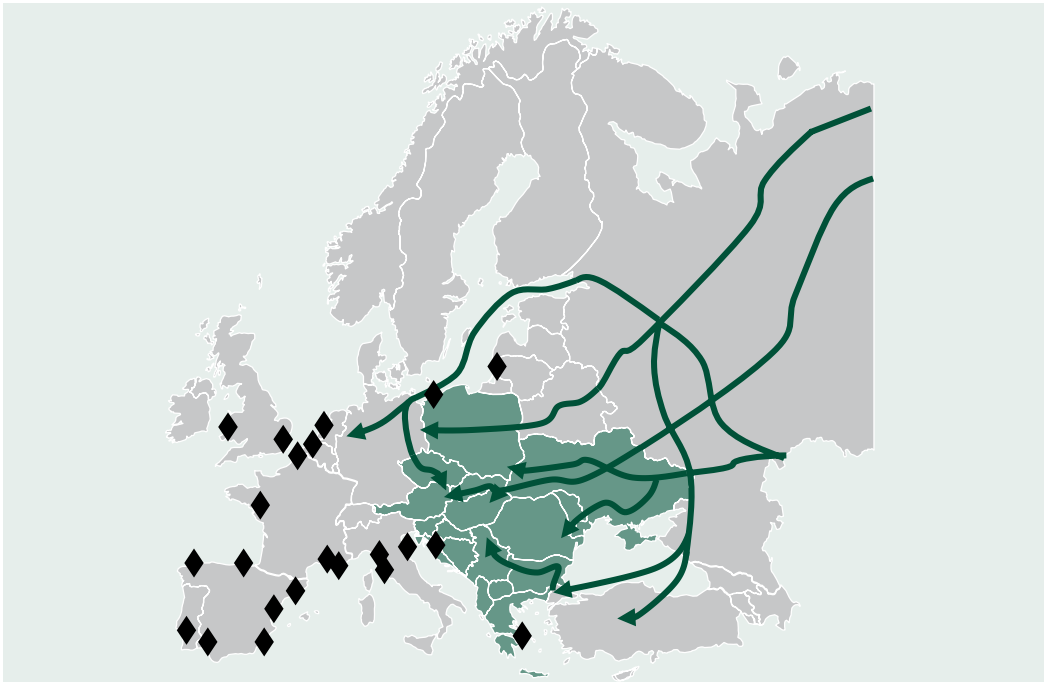
MAIN INDICATORS OF TTF AND VTP DEVELOPMENT, 2011–2019

Years under review	TTF (Est: 2003)		CEGH/VTP (Est: 2005/2013)	
	2011	2019	2011	2019
Active operators	60	167	40	72
Number of products	15	52	6	17
Trade (TWh)	6,292	40,390	170	970
Churn rate	13.9	97.1	2.2	9
Time horizon of transactions (months)		37		18
Share of top 3 operators (MA)		16		30
Natural gas sources	Gazprom, LNG, domestic production		Gazprom	Gazprom

Source: European Traded Gas Hubs, OIES, CEER

Figure 6

GAZPROM'S MAIN GAS SUPPLY ROUTES AND LNG REGASIFICATION TERMINALS IN EUROPE



Source: ENTSOG, own edit based on data, https://www.entsog.eu/sites/default/files/2021-11/ENTSOG_CAP_2021_A0_1189x841_FULL_066_FLAT.pdf

and increased the region’s exposure to global market influences to some extent.

Since 2008, European markets have undergone a series of transformations, spreading into the region through increasing interconnectivity and regulatory convergence. There is price convergence between European markets, but it may be temporarily diverted by market shocks.

CONCLUSIONS

In the last 10–12 years, a number of high-capacity pipelines have been built from the east to Europe, offering the possibility of connecting countries in the region. Some of

these pipelines can provide an alternative route to a previously connected source, and others allow for new gas imports from an area not previously used by the region. There are LNG regasification developments at three points, two of which are in the process of expanding capacity.

It can be argued that with interconnectors built between countries in the region, the regional market can now be considered as a single market. A market where the gas trader has access to the network at a moderate cost.

Natural gas consumption in the region under review is below that of Western Europe. This is due to the fact that, on the one hand, many countries have built their power plants largely on coal and, on the other hand,

some countries have been averse to heavy dependence on Russian imports. Thirdly, the poorly developed network in some countries is also a limiting factor. In the Balkan countries in particular, the combination of poorly developed gas infrastructure and low end-consumer prices that do not allow for accumulation have prevented more new customers from being connected.

In the case of the above factors, a later rise in consumption still looked likely in 2021. High CO₂ emissions led to a shift from coal-fired power plants to electricity generation based on

a combination of renewables and natural gas, and the new southern pipelines in the Balkans would have allowed for greater imports than before. However, a war broke out in February, and the EU responded by announcing its intention to become as independent from Russian energy as possible. In these changed circumstances, the previously planned level of natural gas use is expected to be reduced. High prices and the fact that access to Russian gas imports may even be limited due to the atmosphere reminiscent of the Cold War are also factors in this direction. ■

NOTES

- ¹ It should be noted that these strategies were prepared before the current war.
- ² Expected Electricity And Gas Balance Report 2019, p. 47; Integrated National Energy and Climate Plan for 2021 to 2030, Slovakia, 2019 December
- ³ In 2014, gas sector subsidies accounted for 6.4% of Ukraine's GDP. <https://pubdocs.worldbank.org/en/721741520534548015/SSLF18-Economic-Shocks-Ukraine.pdf>
- ⁴ Data for EU countries without data for EU countries in the region
- ⁵ EU consumption excluding countries analysed in the region
- ⁶ <https://www.iqair.com/world-most-polluted-cities?continent=59af92ac3e70001c1bd78e52&country=&state=&page=1&perPage=50&cities=>
- ⁷ Generally used in mining and petroleum refining
- ⁸ Although the Romanian government promised to overhaul the unfavourable regulatory framework for offshore gas production in 2018 by 2021, it is not realistically expected before the Romgaz–Exxon Mobil transaction.
- ⁹ It should be mentioned that an LNG port and regasification plant was built in Lithuania a few years ago.
- ¹⁰ Serbia received natural gas via Hungary and Bulgaria via a pipeline through Romania.
- ¹¹ Greek–Bulgarian and Bulgarian–Serbian inter-connections
- ¹² Projects of common interest
- ¹³ The classification system helps businesses and investors determine which economic activities are environmentally sustainable.

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