
Some aspects regarding the energy security of the European Union

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Abstract

The European Union's dependence on single suppliers has long been a matter of concern and is a fundamental component of energy security. Thus, this problem is among the priorities of the European Union. Over time, EU representatives have made efforts to improve energy security by forming a solid internal market. The armed conflict between Russia and Ukraine has caused many difficulties for Europe's energy system, generating supply problems and steep increases in energy prices and hardships for consumers, both households and businesses. These challenges highlighted the European Union's substantial energy dependence on Russian fossil fuels.

The geopolitical events manifested in recent years emphasize the role of energy security control and the need to decrease dependence on energy imports. Energy dependence on imports exposes the European economy, first of all, to the risk of supply shortages, but also to volatile prices on the world market. In this article, the authors intended to carry out a study on the evolution of some indicators that characterize the energy sector in the European Union. To fulfill this research objective, the data published by Eurostat were used, in the period 2013-2023, regarding the dependence on energy imports, respectively on natural gas in the EU and in the member states, as well as the market shares of natural gas suppliers to the EU. To highlight the data more clearly, they were represented graphically and in the form of tables.

Cuvinte cheie: energy dependence, natural gas, energy import, liquefied natural gas, energy suppliers

Clasificarea JEL: O13, Q40.

Introduction

Since the year 2020, there has been a significant change in the sphere of world trade and foreign investment. In addition to the effects of the COVID-19 pandemic, the Russia-Ukraine war has led to fuel, food and financial crises in many countries around the globe. The unexpected and substantial increase in energy prices observed in Europe following the developments of the war in Ukraine has increased the concern of governments and civil society about the potential impact of these price increases on consumers and in particular on the most vulnerable. In this context, although financial and political measures were adopted at the beginning of the energy crisis, it is important to reflect on the recent experience of high volatility in energy prices to assess the ability of different households to withstand and adapt suddenly to the significant increase in prices.

During periods of high energy consumption, energy suppliers usually find themselves in the position of price setters. When the armed conflict between Russia and Ukraine began, many European countries were dependent on Russian gas, the interruption of supplies from Russia having a strong impact on their security by cutting off natural gas supplies. For example, because of its historical dependence on Russian natural gas, Germany has faced an enormous challenge in securing natural gas supplies. Also in Italy, Russia was considered a key guarantor of Italy's energy security. Moving towards the use of clean energy can be the solution both to meet the growing energy demands, but at the same

time to limit CO₂ emissions, as energy consumption is often considered the main contributor to atmospheric carbon emissions and global warming.

Literature review

Barner (2024) believes that limiting natural gas consumption would end a period of high import dependence in the EU. Brodny and Tutak (2023) highlighted the fact that, depending on the availability of energy sources at affordable prices, only four EU countries are characterized by a high level of energy security, including Romania, which, among other things, is based on the production indigenous gas.

Di Bella et al (2024) assessed that EU member states have failed to have a common approach to supply diversification and external energy relations. Dinçer (2024) pointed out that Azerbaijan is a country with which the EU has friendly relations in the Caucasus region, so it can play an important role in meeting the EU's energy needs. Also Mammadov (2022) appreciated that Azerbaijan can hold a remarkable position in the energy structure of Europe.

Dong et al (2022) showed that gas supply disruptions are particularly difficult to deal with, given that most of the natural gas supply comes from Russia. Gritz and Wolff (2024) considered that, in the context of current geopolitical events, the addition of new gas infrastructure and the accelerated expansion of renewables are essential. Moskalenko (2024) highlighted that in the long run, to bridge the supply gap, the reduction in natural gas imports can be supported by an increase in LNG imports and domestic natural gas production.

Nikas et al (2024) consider that substituting Russian gas imports with imports from other countries generates additional costs, which could affect electricity system costs and, consequently, end-user prices. According to Sampedro et al (2024), improvements in energy efficiency and the use of renewable sources could mitigate the impact of Russian pipeline disruption.

Data, results and discussion

For an overview of the energy security of the European Union, we have presented some data on the dependence on energy imports, starting from the consideration that this indicator shows the share of a country's total energy needs, satisfied by imports from other countries.

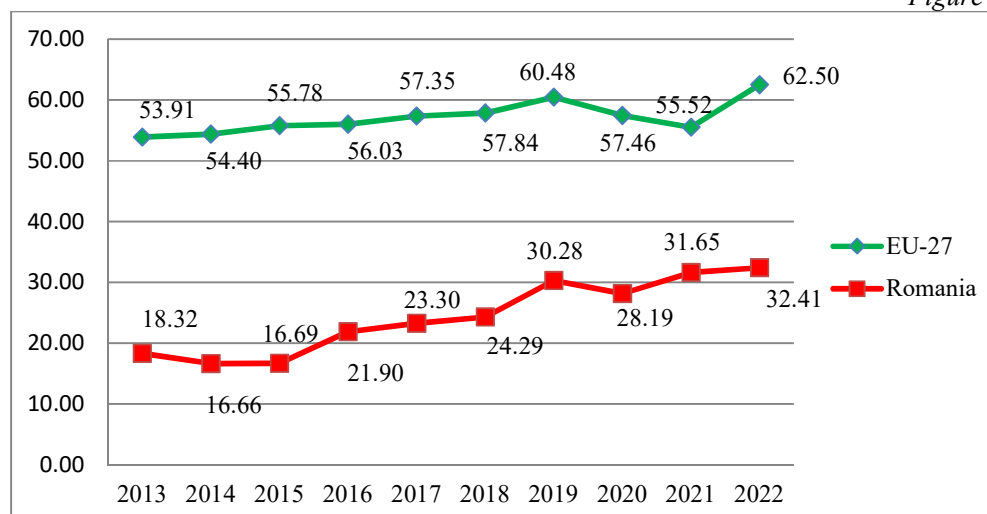
Basically, the rate highlights the proportion of energy an economy must import. Based on the available Eurostat data, in figure no. 1 graphically represents the evolution of energy import dependence in Romania and the European Union, in the period 2013-2022.

The European Union is highly dependent on energy imports, with values over 53% in the entire analyzed interval (in fact, the minimum value was 53.91% in 2013), reaching a maximum of 62.50% in 2022. Thus, it can be seen that the dependence on energy imports has increased in recent years.

Romania has a low dependence on energy imports and is characterized by high energy self-sufficiency, relying on domestic gas production. Throughout the analyzed interval, Romania had a strong position compared to the European Union average, recording values three times lower compared to the EU average.

The evolution of energy import dependence in Romania and the European Union, during the period 2013-2022 (%)

Figure 1



Source: own representation, based on Eurostat data.

Few countries have the necessary energy resources. The most difficult situation is found in Malta with 99.01% in 2022 (the maximum being reached in 2013, respectively 104.14%). High values are also in: Luxembourg, over 90% in the whole range, Cyprus with values over 89% in the whole range (with a maximum of 97.32% in 2015), Greece almost 80% in 2022, considerable increase compared to the year 2013 (61.75%), Ireland 77.16% in 2022 (still down from 91.55% in 2013, Italy shares between 73.35% and 79.17%, Belgium high shares throughout the period, including between 70.82% in 2021 and 82.97 in 2018, Germany with weights above 60% throughout the period.

Taking into account the continuous increase in energy consumption, the situation at the European level is complicated, especially in the context of the existence of tensions, including armed conflicts and the introduction of sanctions and restrictions. The member states of the European Union use natural gas, mainly, for the production of electricity and thermal energy. At the same time, they are used in households, industry and services. Considering the importance of natural gas in the lives of Europeans, we consider it useful to carry out a study on the degree of energy dependence on the import of natural gas in the European Union, as a whole, as well as in the member states. The period selected for this analysis is 2013-2022, the data can be found in Table no. 1.

Dependence on the import of natural gas in the European Union, during the period 2013-2022 (%)

Table 1

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
EU - 27	68.28	71.91	74.49	75.69	80.16	83.26	89.66	83.59	83.64	97.60
Belgium	100.52	101.18	99.32	100.56	98.41	100.55	101.80	99.13	99.89	100.80
Bulgaria	92.83	94.07	97.01	96.45	97.61	98.73	100.40	96.42	96.24	106.10
Czechia	100.22	96.27	95.09	95.71	101.86	96.84	109.75	86.04	92.13	113.38
Denmark	-23.23	-46.86	-48.15	-44.60	-56.07	-38.49	-7.16	37.42	27.76	27.96
Germany	86.92	89.43	90.06	88.56	91.37	95.89	100.07	89.10	90.69	105.9
Estonia	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ireland	96.30	96.24	96.33	40.03	32.68	38.78	52.99	63.74	71.14	73.94

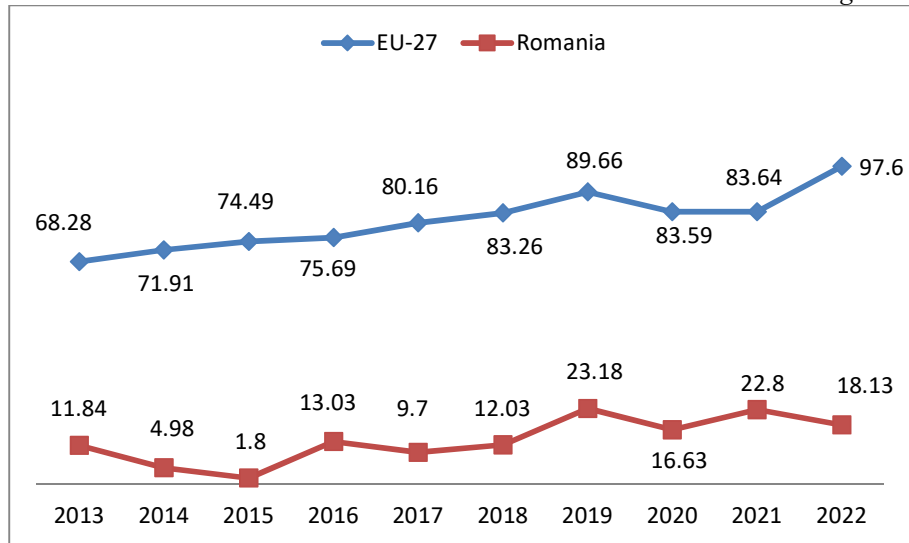
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Greece	99.95	99.29	99.88	99.22	100.51	100.67	98.99	100.69	99.41	101.56
Spain	98.62	103.54	96.89	98.74	101.29	101.42	101.50	97.47	100.07	103.22
France	97.91	103.82	98.51	98.98	98.03	104.72	104.47	94.72	96.13	109.04
Croatia	31.83	28.59	27.10	33.52	53.80	53.27	66.41	68.77	74.48	77.46
Italy	88.11	89.68	90.41	91.76	92.32	92.87	95.06	92.85	93.74	99.23
Cyprus	-	-	-	-	-	-	-	-	-	-
Latvia	115.59	72.12	98.57	82.89	101.99	98.83	100.03	100.10	99.97	99.78
Lithuania	100.04	104.14	99.71	100.61	99.32	98.92	99.97	98.93	100.82	101.22
Luxembourg	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Hungary	72.13	97.67	69.67	78.88	96.25	77.94	115.21	75.62	67.21	99.11
Malta	0.00	0.00	0.00	0.00	105.20	109.48	103.62	96.17	103.48	100.16
Netherlands	-86.94	-74.85	-36.65	-32.79	-4.34	14.96	26.25	45.00	33.70	64.68
Austria	74.71	98.28	72.60	85.90	90.22	88.16	122.85	73.38	51.02	149.12
Poland	74.20	71.97	72.21	78.38	77.77	77.60	82.37	78.25	83.57	81.22
Portugal	101.52	100.04	100.36	98.57	100.42	101.06	99.93	99.28	100.05	104.00
Romania	11.84	4.98	1.80	13.03	9.70	12.03	23.18	16.63	22.80	18.13
Slovenia	99.63	99.59	99.61	99.39	99.03	98.12	99.20	99.38	99.44	99.46
Slovakia	95.34	104.81	95.05	92.85	105.59	89.56	136.63	88.05	69.04	137.29
Finland	100.00	100.00	100.00	100.00	98.89	100.25	100.56	100.29	99.63	103.11
Sweden	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Eurostat, accessed on September 15, 2024.

Throughout the analyzed interval, the European Union's dependence on natural gas imports was continuously increasing, registering worrying values, but the value reached in 2022 was even alarming (97.6%). High values were recorded in almost all member states, throughout the analyzed period. In the year 2022, we meet: Austria 149.12%, Slovakia 137.29%, Czech Republic 113.38%, France 109.04%, Bulgaria 106.10%, Germany 105.90%, Portugal 104.00%, Spain 103.22%, Greece 101.56%, Italy 99.23%.

The evolution of dependence on the import of natural gas in Romania and the European Union, during the period 2013-2022 (%)

Figure 2



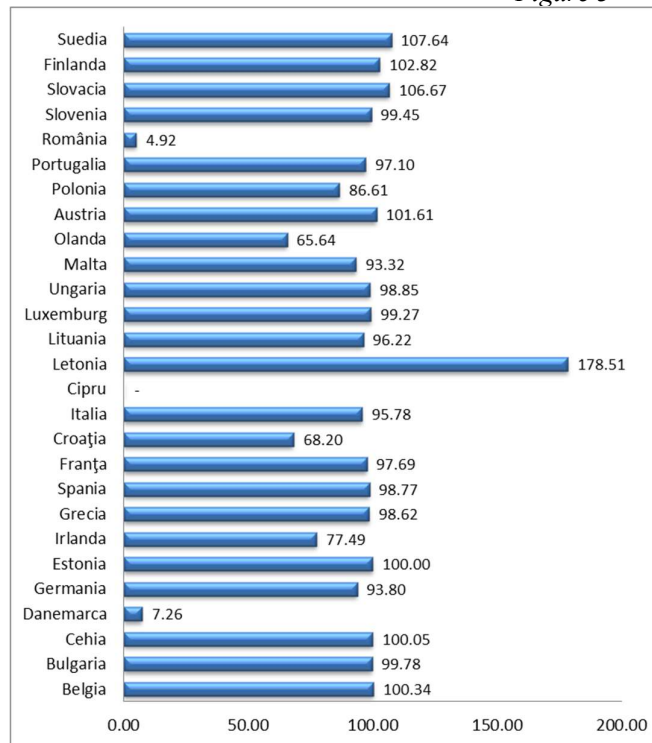
Source: own representation based on Eurostat data, accessed on September 15, 2024.

Analyzing the data from table no. 1 states that, in the period 2020-2022, Romania is the country least dependent on imported gas. Moreover, throughout the analyzed interval, Romania had a strong position compared to the average of the European Union (see the comparative evolution in Figure no. 2), but also compared to the other member states.

At the time of the elaboration of this paper, the data related to this indicator for the year 2023 are provisional and can be found in Figure no. 3.

The degree of energy dependence on natural gas in the member states of the European Union in 2023 (%) – provisional data

Figure 3



Source: own representation based on Eurostat data, accessed on September 15, 2024.

Another analyzed indicator is the total natural gas imports. In table no. 2 shows data on the total gas import from the EU (pipeline + LNG) carried out by the European Union, in the period 2021-2023.

At the level of the European Union, in 2023, the total import of natural gas from was 289.9 billion cubic meters, down 13% compared to 2022, when 335 billion cubic meters were recorded and with 14% less than in 2021 (336 billion cubic meters). Norway supplied 30%, United States 19%, Russia 15%, North Africa 14%, Great Britain 6%, Qatar 5%, Azerbaijan 4%, Nigeria 3%, Trinidad and Tobago 1% and other LNG suppliers 3% from the EU.

Total natural gas imports in the European Union, according to suppliers (bcm)

Table 2

No. crt.	Country	2021	2022	2023
1.	Russia	150.2	78.8	42.9
2.	Norway	79.5	89.7	87.8
3.	North Africa	44.1	40.4	41.0
4.	United States	18.9	50.1	56.3
6.	Qatar	13.9	17.0	15.5
7.	Nigeria	9.4	9.6	7.6
8.	Azerbaijan	8.1	11.3	11.4
9.	United Kingdom	5.5	24.0	16.6

No. crt.	Country	2021	2022	2023
10.	Trinidad and Tobago	4.7	3.3	3.3
11.	Other LNG		9.9	7.5
Total		334.3	334.1	289.9

Source: European Commission, Quarterly report On European gas markets with focus on annual overview for 2023, volume 16, issue 4, own systematization.

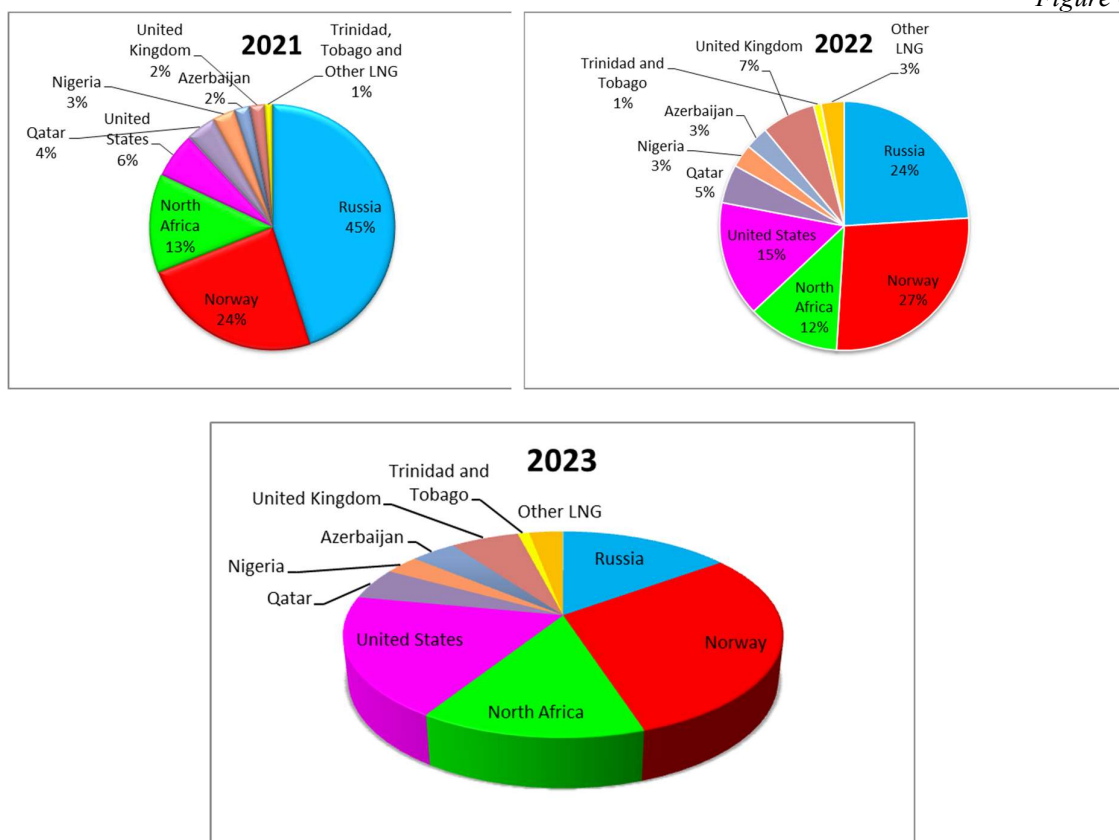
Note: Pipeline gas and LNG (liquefied natural gas) were considered; bcm = billion cubic meters

In the context of the measures regarding the diversification of energy supply implemented by the European Union, in order to decrease the dependence on Russian fossil fuels, it is noted that, in 2023, the volume of natural gas imports from partners such as Norway and the United States increased.

In figure no. 4 provides data on the structure of natural gas suppliers with whom the European Union has developed commercial relations during the period 2021-2023.

Market shares of natural gas suppliers in the European Union during the period 2021-2023 (share in total imports)

Figure 4



Source: own representation based on European Commission data, Quarterly report On European gas markets with focus on annual overview for 2023; pipeline gas and LNG were considered.

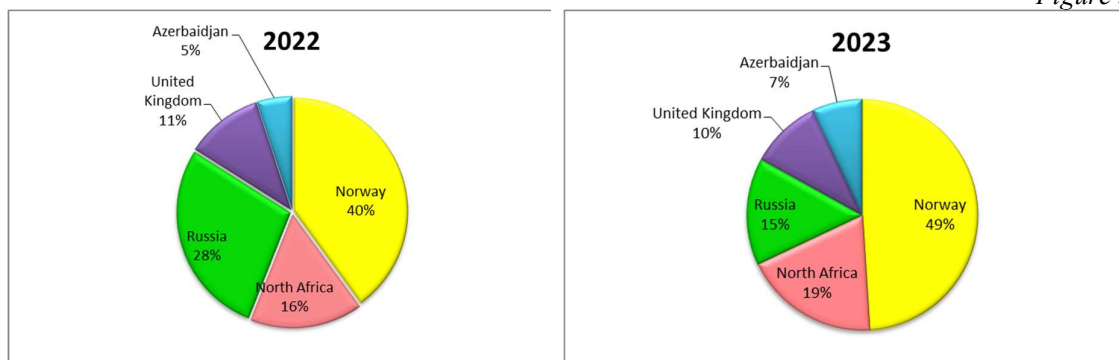
From the analysis of the data in figure no. 4, it is observed that the main supplier of natural gas to the European Union, in 2023, was Norway, with a 30% market share, by increasing imports from this country from 79.5 billion cubic meters in 2021 to 87.7 billion cubic meters in 2023. The second place is occupied by the United States, with a share of 19%. US imports were 56.3 billion cubic meters in 2023, up from 18.9 billion cubic meters in 2021.

Significant increases in contractual relations for the purchase of natural gas were also recorded with the United Kingdom, starting from 5.5 billion cubic meters in 2021, representing a market share of 2% and reaching 24.0 billion cubic meters in 2022 (the market share being 7%). In 2023, the EU imported 16.6 billion cubic meters of natural gas from the UK. There is also an increase in contracted imports from other suppliers, from 80.2 billion cubic meters in 2021 to 86.3 billion cubic meters in 2023. This category includes mainly Qatar and Azerbaijan, both with increases, and imports from North Africa and Nigeria have fluctuated. Through these actions, Russian natural gas imports fell from over 150 billion cubic meters in 2021 to less than 43 billion cubic meters.

In 2023, the total pipeline gas imports of the European Union were 169 billion cubic meters, down 22% compared to 2022 (when 216 billion cubic meters were imported), respectively down 37 % compared to 2021.

Structure of total EU pipeline gas imports by supplier in 2022 and 2023 (%)

Figure 5



Source: own representation based on European Commission data, *Quarterly report On European gas markets with focus on annual overview for 2023*.

In 2023, Norway was the largest supplier of pipeline gas in the EU, with a market share of 49%, from which 83 billion cubic meters were imported into the EU. Its market share increased from 40% (87 billion cubic meters) in 2022 and from 30% (79 billion cubic meters) in 2021.

North Africa was the second largest source of pipeline gas to the EU with a market share of 19% (33 billion cubic meters), which was up from 16% (34 billion cubic meters) in 2022 and 14% (37 billion cubic meters) in 2021.

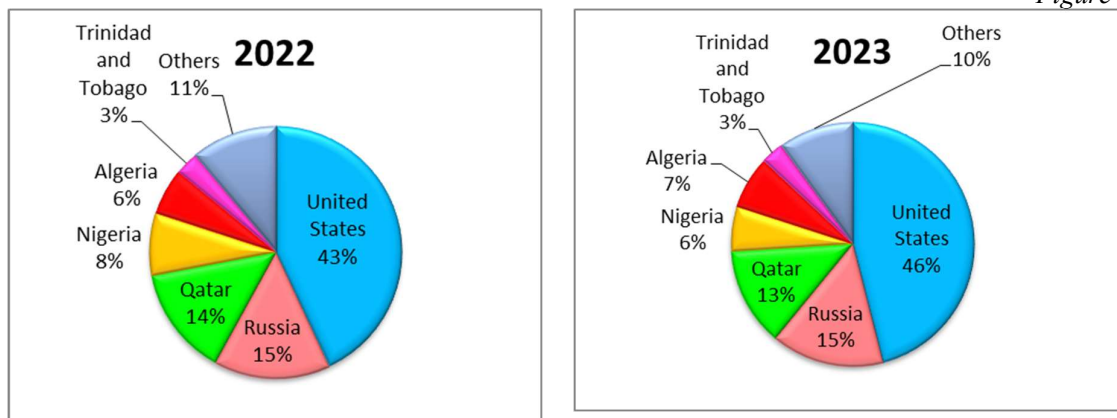
Russia's imports fell into third place with a market share of 15% (25 billion cubic meters) in 2023, a significant decrease from 28% (61 billion cubic meters) in 2022 and an even greater decrease from to a 51% market share (137 billion cubic meters) in 2021.

Azerbaijan has steadily increased its market share from 3% (8 billion cubic meters) in 2021 to 5% (11 billion cubic meters) in 2022 and 7% (11 billion cubic meters) in 2023.

The UK was a balancing supplier exporting large volumes to the EU during the most critical period of the transition from Russian gas, providing 10% (17 billion cubic meters) of EU imports in 2023, 11% (24 billion cubic meters) in 2022, while only 2% (5 billion cubic meters) in 2021.

Structure of EU LNG imports by supplier in 2022 and 2023 (%)

Figure 6



Source: own representation based on European Commission data, Quarterly report On European gas markets with focus on annual overview for 2023.

In 2023, EU LNG imports amounted to 121.1 billion cubic meters, an increase of 3 (from 117.6 billion cubic meters) in 2022 and 78% (67.9 billion cubic meters) more than in 2021.

In terms of supply, the largest exporter of LNG to the EU was the USA with a share of 46% (56.3 billion cubic meters), followed by Russia (15%, 17.8 billion cubic meters) and Qatar (13%, 15.5 billion cubic meters) in second and third place respectively. Algeria (7%, 8.5 billion cubic meters), Nigeria (6%, 7.6 billion cubic meters) were, also major exporters of LNG to the EU, occupying the fourth, fifth and sixth market shares respectively.

European Union LNG imports in 2023 (billion cubic meters)

Table 3

Country	2023
United States	56.3
Russia	17.8
Qatar	15.5
Nigeria	7.6
Algeria	8.5
Trinidad and Tobago	3.3
Others	12.1
Total	121.1

Source: European Commission. Quarterly report On European gas markets with focus on annual overview for 2023. volume 16. issue 4. own systematization.

The largest LNG importer was France (22%. 26.7 billion cubic meters) in 2023. Spain (18%. 22.8 billion cubic meters) and the Netherlands (17%. 20.7 billion cubic meters) occupied the second and third positions. They were followed by Italy (11%. 14 billion cubic meters) and Belgium (10%. 12.8 billion cubic meters) in the fourth and fifth positions as LNG importers.

In figure no. 6 graphically represents the evolution of the total import of natural gas registered by each member state of the European Union, in the years 2022 and 2023.

In 2022, Germany imported 5211611.66 terajoules, followed by Italy (2758559.00 terajoules), Belgium (2379565.40 terajoules), France (2296693.67 terajoules), Netherlands (2064384.63 terajoules).

In 2023, the situation of the countries with the largest imports is as follows: Germany 3560327.55 terajoules, Italy 2347074.30 terajoules, Belgium 2022307.50 terajoules, the Netherlands 1960603.46 terajoules, France 1916925.82 terajoules, Spain 1427223.62 terajoules.

The main suppliers from which the member states of the European Union imported natural gas in the period 2015-2020 (the period for which the data is available on the Eurostat website) are Russia, Norway, the United States and Algeria. During this period, most countries showed dependence on Russia, with the exception of Belgium, Ireland or France, which imported natural gas from Norway, as well as Spain, with Algeria as the main supplier. Germany, the engine of Europe, is characterized by a high level of dependence on the import of natural gas, hovering around 90%. In the 2015-2020 period, almost half of the imported natural gas came from Russia. For example, in 2020, Germany's dependence on natural gas imports from Russia was 68.66%, and from Norway over 23%.

Conclusions

The reduction in gas supplies from Russia has caused uncertainty about energy security in Europe. Following the analysis carried out and presented in this article, it can be concluded that the measures implemented at the level of the European Union, which aimed at diversifying the energy supply, recorded some desired results in this regard, with natural gas imports from Russia falling from 45% in 2021 to 15% in 2023. However, these results require some discussion from several points of view. Although the dependence on natural gas imports from Russia has decreased significantly (three times), it has not been completely eliminated. The second, perhaps more important, finding is that dependence on imports from Russia has only been exchanged for dependence on imports from other countries, bypassing Norway. Thus, dependence on individual countries is maintained. It is true that dependence on natural gas imports from Russia has decreased significantly, but dependence on natural gas imports has increased greatly in recent years, reaching 97.6% in 2022.

In this context, Europe's energy security does not seem to have improved significantly, being still dependent on imports. Thus, the main issue is not which countries the European Union depends on, but why it depends on them and what needs to be done to rectify the situation. Measures aimed at increasing the level of energy independence are required. The improvement of this situation requires decisive and solidarity actions on the part of the entire European community.

The Energy Security Strategy emphasizes the need to increase domestic energy production, including the need to increase local renewable energy production, energy efficiency and provide the missing infrastructure. To accelerate the transition to an affordable, reliable and sustainable energy system, countries must facilitate access to clean energy research, promote investments in energy infrastructure and clean energy technology.

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