# Development of Trade-Econimic Relations between Azerbaijan-EU Countries in the Field of Natural Gas Supply

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*Abstract:* - The research work is devoted to the analysis of mutual relations between the European Union and the Republic of Azerbaijan in the field of gas supply. In addition, the short-term and long-term measures implemented by the European Union countries in response to the changes in the political arena in recent times were reviewed. The relevance of the topic is related to the opening of economic and transport communications after the Second Karabakh war. The region is an important link between Asia and Europe, and Azerbaijan is an important energy partner of the EU as an exporter of oil and natural gas. In addition, considering the existing gas production potential of the Republic of Azerbaijan, the development of this field is a very important field for the country's economy. The article focuses on the directions of cooperation of the parties in the matter of production and transit of energy resources. The main result is that it is designed as a framework that allows the two parties to develop their relations in the form of mutually beneficial projects based on market principles.

Key-Words: - economy, oil, industry, natural gas, petroleum product, Azerbaijan, external policy.

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### **1** Literature Review

In the research [1], the reaction to changes in the demand, price, and production volume of natural gas in the production sectors. The regression estimation method, which takes into account heterogeneous demand responses in different areas for each country, is used to measure the elasticity of demand Short and long evaluated and investigated during the period. Also, as a result, it was noted that the decrease in production caused by demand shocks hurts gas demand more than the increase in natural gas prices.

In his research [2], studied the features of the EU's foreign energy policy. Special attention is paid to the European "green agreement", which affects the EU's energy relations with third countries. Azerbaijan was chosen as an object of analysis since this country is one of the most important suppliers of natural gas to the European Union. The author concludes that the Europeanization of Azerbaijan with the help of mechanisms of conditionality and externalization is

beneficial to both the EU and Azerbaijan, and this, in turn, will push Azerbaijan to follow the European "green agreement".

In the research work of [3], a study was conducted on meeting the natural gas demand of the European Union and increasing the volume of imports shortly. Recognizing the need to ensure the supply of natural gas imports, the European Union has decided to diversify its sources of supply, including obtaining natural gas from Azerbaijan through the Southern Gas Corridor. Hamji's report uses a combination of cost economics and Rational Choice Institutionalism framework to explain the EU's policy choice to support the SGC. As a result, there was a choice to use the Southern Gas Corridor as a source of supply, even though it is relatively expensive to deliver Azerbaijani natural gas to the EU.

In the research stated that the research work paves the way for conducting investigations in this direction for oil-exporting countries in the future.

The results in the article show that fiscal policy has a statistically significant positive effect on the nonoil sector in both the long and short term. However, due to low oil prices and the different specifications used, the magnitude of the effect is small compared to previous studies. Azerbaijani politicians should take measures to compensate for the declining share of oil revenues in state revenues. Although the increase of tax rates, import and export duties, energy, and other tariffs is considered a quick means to fill the budget, it can simultaneously weaken economic development. Alternative and less harmful means would be the optimization of public spending, strict monitoring of ongoing projects, and a gradual rejection of social and infrastructure projects that contribute less to economic growth, [4].

In this article analyzed the impact of disruptions in Russian gas on Europe's balance and economic output. Our results show that in the short term, the most vulnerable countries of Central and Eastern Europe - Hungary, Slovakia, and the Czech Republic - face the risk of gas consumption shortages of up to 40 percent and gross domestic product reduction of up to 6 percent. The effects on Austria, Germany, and Italy will also be significant, but will depend on the exact nature of the remaining bottlenecks during the shutdown and the resulting ability of the market to adjust; as reported, [5].

In [6]'s article analyzes the potential of the discovery of natural gas fields on the Eastern Mediterranean shelf to increase the security of natural gas supplies to the EU. It provides an overview of the status quo of the EU-28's dependence on natural gas imports, and efforts to increase energy security through various measures and supply diversification challenges. This is followed by an analysis of the energy and marine resources sector of Egypt, Israel, Cyprus, and Lebanon. The paper presents projections of domestic natural gas consumption needs for the period 2012-2042, and the results indicate potentially large volumes for export.

# 2 Introduction

It is expected that the European Union's increased demand for natural gas will lead to increased gas imports into these countries shortly. In addition, changes in the political arena in the region are encouraging EU countries to reconsider and reduce issues of dependence on gas supplies from the Russian Federation. To this end, the European Union (EU), recognizing the need to ensure uninterrupted and safe supplies of imported natural gas at all times, is trying to diversify its sources of supply, including receiving natural gas from Azerbaijan through the Southern Gas Corridor (SGC).

The research work examined the current gas supply system of the European Union countries. In addition, short-term and long-term measures taken by European Union countries in response to recent changes in the political arena were reviewed. One of the main goals set in the research work is to calculate the cost of gas supplies from the Republic of Azerbaijan to the countries of the European Union.

#### 2.1 The Existing Gas Supply System of the European Union Countries

The European Union is largely dependent on foreign countries, especially the Russian Federation, for its hydrocarbon resources. This relationship varies significantly depending on the types of energy sources. The share of net imports in total domestic consumption for the EU in 2020 for all types of energy was 57.5 percent. Although gas is primarily used for power generation and heating, it is also very important in some industries. The EU's dependence on natural gas from foreign countries in 2020 was 84 percent. In 2020, Russia, the EU's largest gas supplier, accounted for more than 40 percent of total natural gas imports. Natural gas dependence on Russia for total energy varies significantly between countries, [6].

To determine the significance of the gas supply system for the EU, it is first necessary to clarify the structure of the EU's energy supply sources. For this purpose, Figure 1 was prepared by collecting statistical data on the main energy sources of EU countries for 2010-2020 using the Eurostat database.

The second largest component of the energy supply system is natural gas resources, followed by solid fuels such as coal, nuclear power, and renewable energy sources. However, if we look at the trend in recent years, it is clear that the demand for renewable energy has increased over the years. However, the use of natural gas resources has not decreased as much as the use of oil and petroleum products, with only a slight decline. Thus, if we compare the structure of energy supply for 2020 with 2010, it becomes clear that 43% in solid fuels, 20% in nuclear energy, 19% in oil and petroleum products, and 10% in natural gas supplies and renewable energy sources. Sources and experienced a 38 percent increase, [7].

# **3** Problems

Looking at the natural gas consumption pattern in 2020, it can be seen that the bulk of natural gas consumption was used in the energy conversion, domestic, and industrial sectors. About 10-20 percent was consumed in the transport and non-energy sectors.

The European natural gas market is not fully integrated. Thus, the European gas pipeline passes through Russia, Norway, Great Britain, North Africa, and the Caspian region. Russian pipelines enter Europe through Germany, Poland, Ukraine and Turkey. Norwegian gas is exported through Germany, the Netherlands, Belgium, the UK, and Denmark (and Poland once the Baltic Pipeline is completed by the end of this year). Gas moves from North Africa and Azerbaijan through Spain, Italy, Turkey, and Greece. In addition, Turkish also supplies gas from Iran. Just 30 percent of gas imports come from non-Russian pipelines, and 42 percent from Russian pipelines. In addition, 28 percent of total gas imports come from liquefied gas resource terminals. Regarding the use of potential pipeline capacity, it should be noted that in 2021 Norway used 81 percent of its potential, and other non-Russian countries used 50-60 percent. Actual capacity may be less than stated because pipelines typically do not operate at 100 percent capacity throughout the year due to maintenance shutdowns. Table 1 presents data on EU gas imports and import potential in 2021.

Table 1. EU gas import and potential import statistics for 2021

111	iport stuti	5005 101	2021			
Country name	Annual	Curren	Remainin	Volum		
	l potentia	t now	g capacity	e or use		
Russian Federation	276	153	123	55%		
Norway	109	88	21	81%		
South Africa	79	40	38	51%		
Azerbaijan	13	8	5	62%		
General	477	289	187	61%		
LPG terminals						
Spain	69	19	50	28%		
France	43	18	26	42%		
Italy	20	10	10	50%		
Belgium	17	4	13	24%		
Netherlands	14	8	6	57%		
Greece	7	2	5	29%		
Portugal	7	6	1	86%		
Poland	6	4	2	67%		
Lithuania	4	2	2	50%		
Croatia	3					
General	190	73	115	38%		
Russia	276	153	123	55%		
Not Russian	391	209	179	53%		

Source: International Monetary Fund, 2022

As can be seen from Table 1, the Russian Federation covered 41% of EU gas imports, using only 55% of its total potential. The Republic of Azerbaijan used 62 percent of its total potential and covered 2 percent of EU gas imports.

LNG terminal capacity represents 28 percent of the EU's total gas import capacity, and in 2021 it used about 39 percent of its capacity. However, not all of the specified capacity can be used (due to technical limitations such as seasonal demand, maintenance, and system redundancy). In the last months of 2022, imports of liquefied gas increased significantly. In April 2022, 66 percent of liquefied natural gas imports came from Europe, of which 22 percent came from Spain, [8].

The existing infrastructure may create conditions for a partial cessation of Russian gas transportation to individual countries. Russian gas supplies to Poland, Bulgaria, Finland, Denmark, and the Netherlands have already been stopped, and to Germany, Italy, France, and other countries have been reduced. Poland was able to replace Russian imports with LNG imports through the Lithuanian Klaipeda LNG terminal and a new interconnector with other EU countries, especially Germany. Bulgaria has opportunities to increase gas imports from Azerbaijan and imports of liquefied natural gas through Greece and Turkey. Finland expects to fully offset Russian imports by the end of the year from a recently leased floating LNG terminal, Denmark gets most of its flow from Germany, and the Netherlands imports from suppliers with regular access to Russian gas.

However, transmission in Europe is subject to some technical limitations, meaning larger outages could partially fragment the market. For this reason, Spain, the largest liquefied natural gas hub in the EU, with more than 35 percent import capacity, can only export 10 percent of its import capacity to France. France, for its part, poses a serious obstacle to its operation, given the existing barriers to north-south transit within France (the time required to restore flows in pipelines from Germany (gradually up to a year) and the regulatory and technical restrictions associated with smell). So French gas contains additives, basically chemicals, that give the gas an odor that helps people detect leaks. They are not added to German gas because they are incompatible with some industrial processes. North-South corridors not only restrict the flow of gas within Germany and Italy but also limit gas imports into Central and Eastern Europe. Spain is limiting the potential for LNG imports through North Africa through existing pipelines. As a result, gas flows from Greece and Italy to southeastern Europe are limited, [9].



Fig. 1: Natural gas price statistics in Europe (based on TTF), May-October 2022

The infrastructure is starting to weaken over time, with Russian flows down about 35 percent compared to last year. Natural gas pipelines from Britain and Belgium to Europe are running at 100 percent capacity, and European wholesale prices have begun to fluctuate in recent months. For example, on 20 June the TTF price in the Netherlands (the main European reference price is the Dutch Title Transfer Facility (TTF)) is €48 higher than in the UK.

As can be seen in Figure 1, from May to September 2022, natural gas prices increased approximately 6 times. This, in turn, had a rather negative impact on the energy supply of EU countries.

Natural gas storage can in principle help accommodate disruptions in the natural gas market and seasonal fluctuations in demand, but when inventory levels fluctuate significantly:

• Storage capacity is significant but unevenly distributed. Outside Russia and Belarus, Ukraine and Germany have the largest gas storage capacity, accounting for about 40 percent of total European capacity. Some countries store gas for other countries, and this idea could lead to the collapse of established plans. Gazprom also owns large storage facilities in Germany and Austria, which account for 7 percent of EU storage capacity, and are considered to be in crisis because they fall under European jurisdiction. Gazprom did not fill these stations until last winter, leaving the overall average occupancy level across Europe below historical norms. In April 2022, German energy regulator Gazprom Germany took over the company and effectively took operational control of it.

• European gas inventories were at record lows in winter 2022, but stockpiling has accelerated since April. At the end of June, EU gas storage capacity was at 58 percent capacity, close to the average level over the past decade. The differences between countries and regions are large, both in terms of high capacity as a share of available capacity and high capacity as a share of annual consumption. The share of gas reserves in annual consumption is very small in countries with good connections to international liquefied natural gas markets: the UK, Belgium, Portugal, and Spain. In countries with limited access to alternative international supplies of liquefied gas, including Austria, Hungary, and Slovakia, the share of gas reserves in annual consumption is very high, [10].

Therefore, taking into account the above, the following key facts about the EU gas supply need to be noted:

- a) Gas accounts for 21.5% of primary energy consumption in the EU and is the main source of energy for households (32.1%).
- b) About 40% of households are connected to the gas network. They spend an average of €700 per month on petrol, which is 2.5% of their average income (€27,911). However, it should be noted that there are significant differences between Member States.
- c) The energy households receive from gas is approximately three times lower than from electricity.
- d) The EU imports 80% of its total gas needs, and domestic production has halved over the past 10 years.
- e) The majority of gas demand in the EU (40%) comes from the residential sector, followed by industry and electricity consumption. While industrial consumption has fallen by 20% since 2000, gas use for electricity has increased by 15% over the same period. These trends are linked to the transition of the EU economy

from industry to energy services and structural changes in energy-intensive industries. [11].

### 4 Analysis and Revolution

Along with the oil and gas sector, the electric power industry plays a leading role in the socioeconomic development of Azerbaijan. Since 2009, major investments in power generation and transmission have led to noticeable improvements in the quality of power supply. Electricity production is currently sufficient to satisfy domestic demand, and the energy system is capable of providing electricity of acceptable quality to almost the entire population. Figure 1 shows the capacity of power plants of the Republic of Azerbaijan in megawatts for 2013-2020.

Table 2 shows the distribution of power of power plants operating in the Republic of Azerbaijan by energy source. As can be seen from the table, more than 83% of the electricity generated in our country comes from fuel power plants and CPPs. Recently, the use of alternative energy sources, such as solar and wind energy, has increased significantly in our republic. Thus, compared to 2015, solar energy increased 10 times, and wind energy increased 9 times.



Fig. 1: Power plant capacity of the Republic of Azerbaijan, 2013-2020, in megawatts

	Power plant capacity by the end of the year	including:						
Years		Parallel ES and IES - total	SES	Wind ESE	Sun ES	Municipal solid waste plant	Municipal solid waste plant	
2015	7,806.7	6,652.8	1,103.4	7.7	4.8	37.0	1.0	
2016	7,910.4	6,726.8	1,105.0	15.7	24.9	37.0	1.0	
2017	7,941.5	6,748.0	1,106.4	15.7	28.4	42.0	1.0	
2018	7,828.9	6,552.2	1,130.8	66.0	34.9	44.0	1.0	
2019	7,641.6	6,350.3	1,144.8	66.1	35.4	44.0	1.0	
2020	7,621.6	6,326.1	1,149.4	66.0	35.1	44.0	1.0	
2021	7,965.2	6,649.4	1,157.2	66.0	47.9	44.0	0.7	

Table 2.	Electricity	production	in the	Republic	of Azerbaijan	, 2015-2021.	in kilowatts
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Fig. 2: Share of the oil and gas sector and non-oil and gas sector in the GDP of the Republic of Azerbaijan, 2010-2021, in percent

Oil and gas production occupies a significant place in the country's economy and government revenues, and forms the basis of its exports. Thus, according to official data from the State Statistics Committee of the Republic of Azerbaijan, 37% of GDP comes from the oil and gas sector. Figure 2 shows the dynamics and dynamics of the share of the oil and gas sector in the GDP of the Republic of Azerbaijan during the period from 2010 to 2021.

Natural gas production in the Republic of Azerbaijan developed after the discovery of the Garadag gas field in 1955 and the exploitation of new offshore fields in the Caspian Sea in 1970. The turning point in this area was associated with the country gaining independence and attracting new foreign investment in this area. Thus, in 1996, the British Petroleum Company signed an agreement on the exploitation of the Shah Deniz gas field, which is one of the largest gas fields in the world, and in 2006, the specified gas field began to be exploited. This increase in natural gas production in 2007, in turn, created the opportunity for gas exports to the country, [12]. Natural gas was exported to Georgia and Turkey via the Baku-Tbilisi-Erzurum pipeline. Thus, with an increase in domestic gas consumption in 2007-2017 gas exports increased by 20.7% from 1.8 cubic meters. km in 2007 to 8.9 cubic meters. km in 2017, which is 4.9 times more compared to the corresponding year. Along with more large-scale geological exploration work, the volume of probable natural

gas reserves in our country increased from 1,100 cubic meters. km up to 1300 cubic meters km, [13].

The next phase of the Shah Deniz project, Shah Deniz 2, was approved in 2013 and has become one of the largest and most complex gas projects in the world. It represents the first subsea gas field in the Caspian Sea and the world's largest subsea infrastructure operated by BP.

One of the largest gas fields in the world, Shah Deniz 2 is also the gateway to the Southern Gas Corridor (SGC), which for the first time delivers natural gas from the Caspian Sea directly to European markets. The Shah Deniz 2 project includes 26 wells, 500 km of subsea pipelines, and flow lines, including a new double platform connected by a bridge. Natural gas is transported through an 85 km pipeline to the Sangachal terminal, which is being significantly expanded to accommodate a new increase in gas production. The project also expanded the UCP - adding 428 km in Azerbaijan and 59 km in Georgia, as well as 3 new compressor units with 3,500 km of gas to Europe. Shah Deniz will produce 16 billion cubic meters of gas in 2 years. Together with the production of the first stage of development, the total production of the Shah Deniz field will amount to 26 billion cubic meters of gas and 100 thousand barrels of condensate per day. In addition, the Shah Deniz-2 project included the expansion of the Sangachal terminal to accommodate new gas processing and compression facilities.



Fig. 3: Natural gas production in the Republic of Azerbaijan, 2010-2021, m3

As a result, on May 29, 2018, the official opening ceremony of the Southern Gas Corridor took place at the Sangachal terminal. After this, on June 30, 2018, as planned, supplies of commercial gas from the Shah Deniz 2 gas field to Turkey began, [14].

After the discovery of the Shah Deniz gas field, oil and gas production increased significantly and reached a record level in 2010. The government and international companies have invested heavily in the energy sector, building several new power plants, rehabilitating and modernizing gas and electricity networks, and improving the reliability and security of supply. Figure 3 shows the volume of gas production of the Republic of Azerbaijan in the period from 2010 to 2021. As can be seen from Figure 3, compared to 2010, natural gas production increased by 67% or 17,555 cubic meters. Although there were 11 years of high growth in natural gas production, declines of 1-3% were recorded in 2011, 2015, and 2017, [15].

The export of natural gas is of strategic importance for the country, and for this reason, it receives special attention from the state. In 2010-2016 Oil and gas revenues accounted for more than 70% of all budget revenues. Oil and gas products account for 97% of total export earnings. In 2014, lower oil prices led to a decline in overall oil export revenues. In 2010-2017 Oil revenues declined as production fell 3.8% and domestic consumption increased 3.7%. In addition, this reduction in oil production continued as OPEC countries agreed to reduce it by 7 million barrels per day by 2022 and by 6 million barrels by 2040. As a result, the Republic of Azerbaijan is trying to compensate for the decline in oil revenues by exporting natural gas. For this reason, the export of natural gas has become a priority issue for the Republic of Azerbaijan.

· · · · ·	2021			
Name of product	Quantity	Amount, thousand US dollars		
Crude oil, according to SOCAR and ABEC reports, thousand tons	28,095.8	13,928,519.3		
Oil, thousand tons	27,116.1	13,218,936.1		
According to reports of natural gas companies, SOCAR and ACE,				
million dollars. cubic meter	18,944.9	6,468,717.5		
Natural gas, million cubic meters	20,046.7	5,534,398.3		
Heavy distillates or gas oils for other purposes, thousand tons	1,100.6	528,333.4		
Fresh fruit, tons	361,898.0	403,550.6		
Cotton fiber, tons	122,990.5	207,980.0		
Fresh vegetables, tons	173,812.0	179,786.5		
Ethylene polymers in primary form, tons	139,324.9	175,428.7		
Acyclic alcohols, their derivatives, tons	368,874.9	98,732.1		
Raw aluminum, tons	30,374.4	75,507.1		
Electricity, million rubles kWh	1,588.4	69,343.4		

Table 3. Commodity structure of exports of the Republic of Azerbaijan, 2021

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To analyze the role of natural gas exports in our country's exports, it is important to look at the data on imports and exports of basic goods from the State Statistics Committee of the Republic of Azerbaijan. Table 3 presents the commodity structure of products exported from the Republic of Azerbaijan in 2021, [16].

As can be seen from Table 3, in 2021, the second place in total export revenues is occupied by the export of natural gas, which amounts to \$12 billion. Quantitatively, 38 million cubic meters of natural gas are exported. Looking at the commodity structure of exports, it is clear that oil exports were in first place in 2021, bringing in US\$27 billion in revenue to the country, [17].

Another issue for a detailed analysis of natural gas exports is the analysis of statistical data on natural gas exports by year. Table 3 shows the growth in natural gas exports for each year compared to the previous year in percentage terms. Since the start of gas production from the Shah Deniz gas field in 2010, there has been a high degree of increase in natural gas production. Only in 2012, 2014 and 2016, there was a decrease of 1-4 percent, [18].

# **5** Conclusion and Suggestions

Thus, taking into account the above, it is necessary to note the following key facts about the gas supply of the EU:

a) Gas accounts for 21.5% of the EU's primary energy consumption and is the main source of energy for households (32.1%).

b) About 40% of households are connected to the gas network. They spend an average of  $\notin$ 700 per month on gas, which is 2.5% of their average income ( $\notin$ 27,911). However, it should be noted that there are significant differences between Member States.

c) The energy obtained by households from gas is approximately three times lower than from electricity.

d) The EU imports 80% of its total gas needs and domestic production has halved in the last 10 years.

e) The majority of the EU's gas demand (40%) is accounted for by the residential sector, followed by industrial and electricity use. While industrial consumption has decreased by 20% since 2000, gas use for electricity generation has increased by 15% over the same period. These trends are related to the EU's economic transition from industry to energy services and structural changes in energy-intensive industries.

The Russian-Ukrainian war has prompted the European Union to reconsider its energy supply system and look for alternative sources to the Russian Federation. For this reason, he began to take fundamental steps in the direction of expanding cooperation opportunities in the field of energy and especially gas supply with the Republic of Azerbaijan. The Southern Gas Corridor project can be attributed to the largest energy supply project implemented in the Republic of Azerbaijan and supported by the European Union, [19].

The main components of the Southern Gas Corridor (SGC) project are the South Caucasus Pipeline Expansion Project, the Trans-Anatolian Pipeline (TANAP) project, and the Trans-Adriatic Pipeline (TAP) project. The South Caucasus Pipeline started operating in 2006. Its total length is 691 km, 443 km of which pass through the territory of the Republic of Azerbaijan, and 248 km through Georgia. The South Caucasus Pipeline expansion project, is planned to ensure the connection of the mentioned pipeline with the TANAP pipeline and increase its transmission capacity from 7.4 billion m3 to 16 billion m3. As mentioned above, the second largest pipeline project of the Southern Gas Corridor project is the Trans-Anatolian Pipeline (TANAP) project. The total length of the belt is 1850 km and it has been put into operation since 2019. The third key element of the Southern Gas Corridor project is the Trans-Adriatic Pipeline (TAP) project. The belt has a total length of 880.8 km and passes through Greece, Albania, the Adriatic Sea, and Italy. The pipeline was commissioned in 2020. Although the annual transmission capacity is 10 billion m3, it can be increased to 20 billion m3. In 2021, 8.15 billion m3 of gas was produced in Europe through TAP, [20].

As the TAP project will bring positive results for the countries of the European Union, it has its advantages for the Republic of Azerbaijan:

- Increase of export revenues by 666-787 million US dollars;
- Reduction of CO2 emissions;
- Attracting new investments to the country in the amount of 2,460-3,389 million US dollars;
- Employment of 118-123 thousand people as a result of the creation of new jobs. The EU's energy needs are met by energy produced within the EU and imported from other countries. Energy supply and demand in the EU fall into five main categories: oil (including crude oil), natural gas, solid fossil fuels, renewable energy, and nuclear energy. Oil and natural gas continue to play an

important role in the EU's energy demand. However, the demand for oil and natural gas varies depending on the energy needs of EU member states. Despite the low production of oil and natural gas resources in the EU, the main burden on the energy consumption of EU countries falls on these two categories.

The European Union is largely dependent on foreign countries. especially the Russian Federation, for its hydrocarbon resources. This relationship varies significantly depending on the types of energy sources. The share of net imports in total domestic consumption for the EU in 2020 for all types of energy was 57.5 percent. Although gas is primarily used for power generation and heating, it is also very important in some industries. The EU's dependence on natural gas from foreign countries in 2020 was 84 percent. In 2020, Russia, the EU's largest gas supplier, accounted for more than 40 percent of total natural gas imports. Natural gas dependence on Russia for total energy varies significantly between countries. Looking at the natural gas consumption pattern in 2020, it can be seen that the bulk of natural gas consumption was used in the energy conversion, domestic, and industrial sectors. About 10-20 percent was consumed in the transport and non-energy sectors, [21].

The European natural gas market is not fully integrated. Thus, the European gas pipeline passes through Russia, Norway, Great Britain, North Africa, and the Caspian region. Russian pipelines enter Europe through Germany, Poland, Ukraine and Turkey. Norwegian gas is exported through Germany, the Netherlands, Belgium, the UK, and Denmark (and Poland once the Baltic Pipeline is completed by the end of this year). Gas moves from North Africa and Azerbaijan through Spain, Italy, Turkey, and Greece. In addition, Türkiye also supplies gas from Iran. Just 30 percent of gas imports come from non-Russian pipelines, and 42 percent from Russian pipelines. In addition, 28 percent of total gas imports come from liquefied gas resource terminals. Regarding the use of potential pipeline capacity, it should be noted that in 2021 Norway used 81 percent of its potential, and other non-Russian countries used 50-60 percent. Actual capacity may be less than stated because pipelines typically do not operate at 100 percent capacity throughout the year due to maintenance shutdowns. LNG terminal capacity represents 28 percent of the EU's total gas import capacity, and in 2021 it used about 39 percent of its capacity, [22]. However, not all of the specified

capacity can be used (due to technical limitations such as seasonal demand, maintenance, and system redundancy). In the last months of 2022, imports of liquefied gas increased significantly. In April 2022, 66% of liquefied natural gas imports were consumed in Europe, of which 22% came from Spain. The existing infrastructure may create conditions for a partial cessation of Russian gas transportation to individual countries. Russian gas supplies to Poland, Bulgaria, Finland, Denmark, and the Netherlands have already been stopped, and to Germany, Italy, France, and other countries have been reduced. Poland was able to replace Russian imports with LNG imports through the Lithuanian Klaipeda LNG terminal and a new interconnector with other EU countries, especially Germany. Bulgaria has opportunities to increase gas imports from Azerbaijan and imports of liquefied natural gas through Greece and Turkey. Finland expects to fully offset Russian imports by the end of the year from a recently leased floating LNG terminal, Denmark gets most of its flow from Germany, and the Netherlands imports from suppliers with regular access to Russian gas, [23].

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c) The energy households receive from gas is approximately three times lower than from electricity.

d) The EU imports 80% of its total needs in

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The authors equally contributed to the present research, at all stages from the formulation of the problem to the final findings and solution.

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#### **Conflict of Interest**

The authors have no conflicts of interest to declare.

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