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The future of European energy:

scenarios after the Russo-Ukrainian war and its impacts on gas supply

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Index

Abstract

This thesis will go over the evolution of European energy sources in the last decades and analyse future possibilities for the European market following the impact of the Russo-Ukrainian war, with a special focus on the gas market and related impacts.

It will first analyse the energy mix in Europe historically up until before the war, the European policies that were ongoing before February 2022, with a focus on the main policies implemented amidst the Covid crisis.

The paper will then look at the short-term effects of the Russo-Ukrainian war, how the market evolution and specific policies has allowed Europe to rapidly shift in dramatically reducing gas flows from Russia, how market failures were handled across the European Union (hereinafter also “EU”), alongside the incremental promotion of investments in renewable energies in the same period.

Lastly, this paper will examine the EU longer term targets for 2030 and beyond, with a focus on the long-term impact on States and in particular consumers of said States.

Abstract (Italiano)

Questa tesi ripercorrerà l'evoluzione delle fonti energetiche europee negli ultimi decenni e analizzerà le possibilità future per il mercato europeo a seguito dell'impatto della guerra russo-ucraina, con particolare attenzione al mercato del gas e ai relativi impatti.

Si analizzerà innanzitutto il mix energetico in Europa storicamente fino a prima della guerra, le politiche europee in corso prima di febbraio 2022, con un focus sulle principali politiche attuate nel contesto della crisi Covid.

Il documento esaminerà quindi gli effetti a breve termine della guerra russo-ucraina, come l’evoluzione del mercato e le politiche specifiche hanno consentito all’Europa di cambiare rapidamente riducendo drasticamente i flussi di gas dalla Russia, come sono state implementate quantità incredibili di sussidi e come i fallimenti del mercato sono stati gestiti in tutta l’Unione Europea (di seguito anche “UE”), parallelamente alla promozione incrementale degli investimenti nelle energie rinnovabili nello stesso periodo.

Infine, questo documento esaminerà gli obiettivi a lungo termine dell’UE per il 2030 e oltre, con un focus sull’impatto a lungo termine sugli Stati e in particolare sui consumatori di detti Stati, con una breve panoramica di come questa situazione potrebbe aver influenzato l’Europa di giugno 2024.

Introduction

Europe has long been at the forefront of global energy consumption and production, relying on a diverse mix of energy sources to power its economies. In the past, the region has faced challenges in ensuring a stable and secure energy supply, with some countries heavily dependent on imports from outside sources. However, recent events, such as the Russo-Ukrainian war, have brought new attention to Europe's energy situation and the need for greater energy security.

Historically, Europe has been heavily reliant on fossil fuels, particularly oil and gas, for its energy needs. Countries such as Germany and the United Kingdom have long been major importers of these resources, often relying on imports from outside sources to meet domestic demand. This dependence on fossil fuels has not only had environmental consequences, but also made Europe vulnerable to fluctuations in global energy markets and geopolitical tensions.

The first chapter will focus on energy consumption in Europe before the war, as to get a clear picture of what came before the Russo-Ukrainian war. It will focus on the historical evolution of the natural gas system in Europe, from the first discoveries in the late 1950s to the natural gas crisis of winter 2021/2022, before the beginning of the war. The aim of the chapter is to understand how the natural gas market in Europe evolved and to explain why Europe was so highly dependent on Russian natural gas imports at the moment of the invasion of Ukraine in February 2022. It will be first described the birth of the European natural gas market in the 1960s thanks to the discoveries of significant gas reserves in Northern Europe.

Then, the chapter will analyse the emergence of the relationship on natural gas between Western Europe and the Soviet Union during the 1960s and 1970s and the subsequent construction of four main pipeline systems, beginning from the Brotherhood system to the more recent Nord Stream 2, describing as well as the failed project of South Stream.

Thirdly, it will be illustrated the impact of the oil shocks of 1973 and 1979 on the evolution of the European gas market and how it led Italy to sign an agreement with Algeria for the construction of the Transmed pipeline connecting the two countries and bringing Algerian natural gas to Italy. Moreover, the chapter will give a clear picture of the natural gas context before the beginning of the war in Ukraine, by analysing the main trends of production, consumption and import dependency of natural gas in Europe and the role of the liquefied natural gas (LNG).

Lastly, it will discuss how the European Union used policies such as the Green deal or Fit for 55 to speed up the process of energy transition from fossil fuels to more clean energy sources, with a focus on renewables, also focusing on the role played by the national and international regulators in this transition.

The second chapter will focus on the impact of the war in Ukraine on the European natural gas market. It will first illustrate the pathway which led to the decline of Russian gas supplies to Europe, explaining the decree adopted by the Russian President Vladimir Putin imposing on European buyers the payment of Russian natural gas in roubles. It will then focus on the response of the European Union to the gas crisis through the adoption of several legislative packages, which contributed to the reduction of gas demand and the security of gas supply during winter 2022/2023. Subsequently, it will be analysed the diversification attempts of the European Union and its Member States, paying attention to the feasibility of the agreements sealed with natural gas suppliers.

Finally, the challenges that the European Union will have to face during winter 2023/2024 will be discussed, with a focus on investments in the fields of renewable energy.

The final chapter will analyse the future prospects for the natural gas system in the European Union, particularly taking into consideration both the climate targets, which require a reduction of natural gas consumption, and the estimated decline of the European gas demand in the near future, with a particular attention to customers across the Union. It will be discussed how the European Union could secure the necessary natural gas supplies, given the import gap left by the substantial reduction of Russian gas deliveries during the last months, without undermining the ambitious, but fundamental, climate goals for the transition towards a clean energy system based on a high share of renewable sources. To achieve this, some policy recommendations will be put forward.

Lastly, the final chapter will also briefly discuss how the situation of these last 2 years has impacted the last European Parliament elections of June 2024, at least at time of writing, that is, a few days after the elections.

1 Context and energy policies in Europe before the conflict

1.1 Natural gas global framework

To understand the situation of the market today, it is necessary to understand how the gas market in Europe has evolved, and in order to do so, a more global perspective has also been taken in consideration.

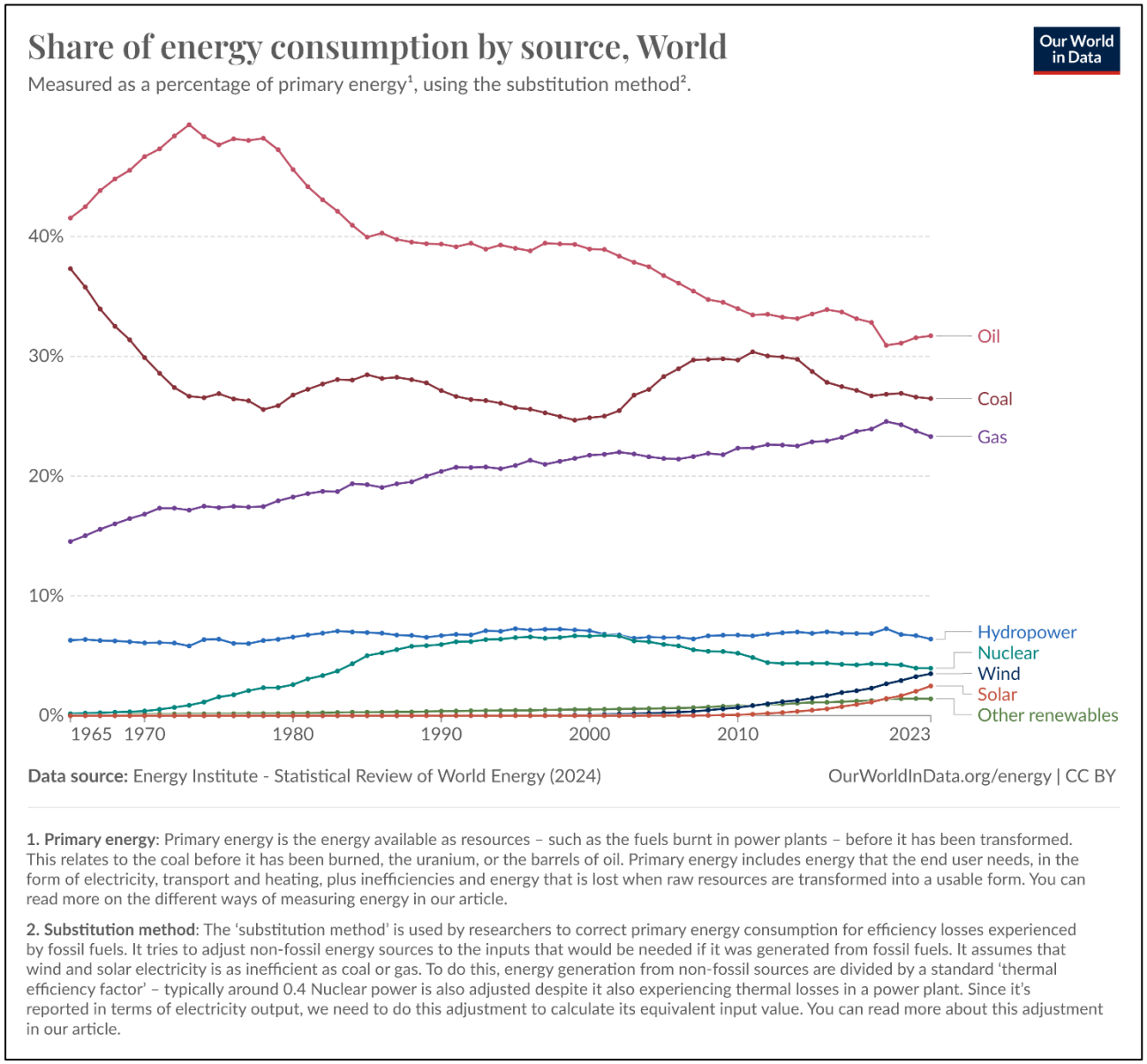
In fact, the United States were one of the first countries to develop a natural gas market. In fact, in 1950, they represented 90% of the production and consumption of natural gas globally[1].

To provide a worldwide perspective of the contribution of the different energy sources and their dynamics over the last 50+ years, the figure below draws an immediate attention to the clear increasing relevance of natural gas, moving from around 15% in 1965 to about 25% in the recent past.

As shown, in 1965 the global shares of energy consumption saw a clear dominance of coal and oil, with very low shares of hydropower and other renewables and natural gas had a limited role.

Gas incremental growth was driven by important findings and a more widespread utilization in different sectors, among which power generation has been a driving force since the early years of the century.

[1] Joe Barnes et al., “Introduction to the Study”, in Natural Gas and Geopolitics: From 1970 to 2040, ed. David G. Victor, Amy M. Jaffe, and Mark H. Hayes (Cambridge: Cambridge University Press, 2006), 3–26, p. 7.



Global share of energy consumption by source (1965-2022), https://ourworldindata.org/grapher/share-energy-source-sub

1.2 Natural gas industry development in Europe

In Europe, the era of natural gas began only at the end and after the Second World War, with the first gas fields discoveries in Italy, the Netherlands and the North Sea.

It is important to notice that back in the 1960s, Europe was still fundamentally reliant from the United States, both economically and politically, in large part due to the NATO treaties and the general fear of the USSR.

The United States had the perfect environment for the development of a natural gas market in these years: large reserves, advanced technology, especially in the metallurgical industry, a very active market and most of all, a regulatory void that allowed for quick and unchecked expansion[2].

At first, natural gas was looked at as production waste, but in the 1980s Standard Oil, an American company that operated from 1870 to 1911 in the production, transportation, refinement and marketing of oil, created the Natural Gas Trust, which began piping the natural gas thrown off by the oil industry throughout the United States.

One of the factors which most influenced the direction of the development of the European natural gas market during the last 70 years was the progressive development of gas reserves, but – at the same time – the incremental role of imported gas, with a key role of the USSR and then Russia as we will see.

Most of European (considering it from a geographical and not from an EU perspective) reserves are currently located in Norway, the Netherlands, the United Kingdom, Romania, Germany, Italy, Denmark and Poland (from the largest to the smallest producer) and their development was started during the Second World War.

Here below a focus on Italy and the Northern Europe developments.

[2] Thane Gustafson, Bridge: Natural Gas in a Redivided Europe (Cambridge: Harvard University Press, 2020), p.12.

1.2.1 Italy

Agip, the Italian state oil company, while carrying out exploration activities for oil, discovered relatively large natural gas fields in the Po Valley in the early 1940s'.

Already in 1943, Agip conducted exploratory drillings in Caviaga, near Milan, which showed that it had gas reserves which amounted to several billions of cubic metres, which was further proved in 1945-1946: it was an extraordinary discovery, the biggest reserve discovered in a single field in Western Europe until that time[3].

After 1945, Enrico Mattei took the leadership of Agip and further explorations led to the discovery of other natural gas fields in the Po Valley, namely in Ripalta (1947) and Cortemaggiore (1949). Other discoveries followed contributing to make Italy the third global gas producer, after USA and Canada[4].

Mattei understood the potential of natural gas, which was not only a substitute for oil but could also represent a strategically important fuel, a cheaper and more functional substitute for imported coal for Italian industries of the North, which were growing a lot in that period[5].

For this reason, several pipeline facilities were laid by the two state-owned companies, Agip and Snam, to supply the industrial activities in the area, leading to more economic growth and revenues from natural gas sales, which were re-invested in the gas sector. In 1953, Ente Nazionale Idrocarburi (ENI) was established under the leadership of Enrico Mattei and was given the mission by the Italian government to meet the growing Italian energy demand, resulting in Italy growing to be, by 1965, the largest gas market in Western Europe, both in terms of production and consumption. However, it soon became evident that Italian national resources were not enough for the Italian growing economy[6].

[3] Fabio Catino, "L'Italia Non è Un Paese Povero: Dall'Agip All'Eni," Treccani, 2013, https://www.treccani.it/enciclopedia/l-italia-non-e-un-paese-povero-dall-agip-all-eni_%28IlContributo-italiano-alla-storia-del-Pensiero:-Tecnica%29/.
[4] https://www.eni.com/it-IT/visione/scenari-energetici/gas.html#:~:text=La%20produzione%20di%20gas%20naturale,nascita%20di%20Eni%20nel%201953.
[5] Mark H. Hayes, "The Transmed and Maghreb Projects: Gas to Europe from North Africa,". In Natural Gas and Geopolitics: From 1970 to 2040, ed. David G. Victor, Amy M. Jaffe, and Mark H. Hayes (Cambridge: Cambridge University Press, 2006), 49–90, p. 55.
[6] Ivi, p.56

1.2.2 The Netherlands and the North Sea

A strong push to natural gas in Europe came in the late ‘50s and early ‘60s with important discoveries in other parts of the continent: the Groningen field in the Netherlands in 1959 and the North Sea fields in the 1960s by the United Kingdom and Norway.

The Groningen field in particular was a crucial discovery. For the first time ever, Europe could count a “world-class gas field”[7], which not only could serve the domestic market but also allowed the export to other countries, all while being cheap enough to compete with coal effectively.

From that moment, production and construction of pipelines started, in order to reach Belgium, Germany, France and Italy. The growth of production was fast: since the year of its creation in 1963, Gasunie, a company founded by a public-private partnership between the State of the Netherlands (50%), ExxonMobil (25%) and Royal Dutch Shell (25%), went from shipping 500 million cubic metres to 95 billion cubic metres (bcm) per year by the mid-1970s. Pipelines, then, connected Groningen to Belgium and Germany in 1965, to France in 1966 and to Italy in 1977[8].

The North Sea witnessed the next great discoveries in the 1960s. In 1965 a gas field was discovered by British Petroleum (BP) at West Sole, in the British sector. Later, in 1969 the Ekofisk field and in 1971 the Frigg field were discovered in the Norwegian sector, where gas production started in 1977. At first, in Norway market and policy considerations restrained the full development of gas resources: oil production and export represented a top priority for the Norwegian government. Three factors were holding back the full development of the gas sector: the need to find European customers willing to sign long-term deals, the need to find investments for building new infrastructures and pipelines and the government’s decision to prohibit the gas flaring offshore. The restraints went away with the discovery of the large Troll field in 1979-83, whose natural gas was first produced in 1996 and the resulting contracts for gas sales to continental European countries were agreed in 1986-1990[9].

[7] Gustafson, Bridge: Natural Gas in a Redivided Europe, p. 20.
[8] Ivi, pp.21-29
[9] Ivi, p. 137

Besides the important discoveries in the North Sea, the United Kingdom was the first country in the world to house an import Liquid Natural Gas (LNG) terminal, the Canvey Island LNG Terminal, now shut down, which started to receive LNG from Louisiana on the U.S. Gulf Coast and then in 1964 from Azrew, Algeria. In 1965, France received LNG from Algeria as well, followed in 1969 by Spain[10].

LNG technology is what allowed the natural gas market to become truly global, especially during that time. A limitation of pipelines is that most often, they're tied to a specific area, while LNG is more flexible, can be easily stored and transported, thus favouring trade over long distances, but due to technical limitations, especially at the time, it had a slower rise in the gas market scene.

1.2.3 USSR developments and the nascent role of Russian gas in Europe

While the start of USSR gas production started in the early 1940s, very small quantities of Soviet gas had been exported to Poland since the late 1940s, but the idea of large-scale imports of Soviet gas into Western Europe seemed to some both unworkable and unwise. The focus of Soviet natural gas production was moving from the Volga/Urals, North Caucasus and Ukraine, to Siberia, which would require additional transportation amounting to several thousand kilometres[11].

As transnational pipelines were being built from Groningen to other European countries, in the east other natural gas connections were being made: in 1944, Ukrainian gas fields were connected to Poland and in 1967 to Czechoslovakia. It seemed, thus, that in 1966-67 two distinct regional pipeline systems were under construction: on the one hand, Dutch gas served NATO members and the European Economic Community (EEC), on the other, Soviet gas was destined for Poland and Czechoslovakia, building on the cooperation system of the Council for Mutual Economic Assistance (COMECON)[12].

European demand for natural gas was growing fast, thus requiring not only domestic production but imports.

During the 1960s, new gas fields were discovered in the Soviet Union. In particular, the huge reserves of West Siberia gave the Soviets the opportunity to establish a commercial relationship with Europe utilizing natural gas reserves.

[10] Grigas, New Geopolitics of Natural Gas, pp. 137-174
[11] http://www.centrex.at/en/files/study_stern_e.pdf
[12] Per Högselius et al., "Natural Gas in Cold War Europe: The Making of a Critical Infrastructure," in The Making of Europe's Critical Infrastructure, ed. Per Högselius, Arne Kaijser, and Anique Hommels (London: Palgrave Macmillan, 2013), 27–61, p. 30.

Austria was the first country of the European Communities to import Soviet gas resulting from a three-year contract signed with Soviet authorities in 1968 in a context where Italy played a relevant role as well.

On the one hand, Austria had the strongest need, among the Western European countries, to import Soviet gas: it lacked domestic coal resources and, even though it had been one of the first countries to turn to natural gas industries, thanks also to relatively large gas deposits near Vienna, gas demand was growing and domestic gas production could not meet it[13].

However, the growing necessity of imports could not explain alone how a contract between a Western country and the Soviet Union came into being during the Cold War. Two factors can explain it: Austria had become a neutral country only a few years before and, more importantly, it had already built gas relations with Czechoslovakia, importing natural gas in exchange for steel pipe[14], thus creating a loophole in the Iron Curtain.

For this reason, when the Austrian state-owned oil and gas company Österreichische Mineralölverwaltung (ÖMV) came to know about the Soviet-Czechoslovak Bratsvo project, which would bring Soviet natural gas just 5 km from the Austrian border, in 1965, it started a dialogue with Moscow to build a cross-border pipeline and to join the Bratzvo system. However, Soviet authorities did not agree with this project due to the limited natural gas supply on their part[15].

In this framework Italy became a leading party to develop the first routes to bring USSR gas into Europe as the gas market dimensions and its potential made the fundamental difference to reach an agreement for this first historical step.

This set a precedent for future relationships, and just a few years later, the Soviet Union and Italy, through ENI, started exploratory dialogues in order to build gas relations, in connection with the exploitation of the new gas field discoveries in West Siberia. In particular, they were discussing the building of the so-called Trans-European pipeline. As a result, ÖMV acted in two directions: in 1966, it approached Italy, hoping to get involved in this new project, and opened a dialogue with Moscow authorities again. ÖMV achieved its goal also thanks to the new cooperation with the Austrian state-owned steel company VOEST: in exchange for gas imports from the Soviet Union, it offered a large amount of steel pipe, to be used for the construction of the gas pipeline[16].

The agreement was signed in June 1968 and the first natural gas deliveries began on 1st September.

It’s important to notice that the Italian state-owned ENI had good relations with the Soviet Union. In 1958, they had already concluded a contract on crude oil supply to Italy: around 80,000 tons of crude oil in exchange for 10,000 tons of synthetic rubber,

[13] Per Högselius et al., “Natural Gas in Cold War Europe: The Making of a Critical Infrastructure,” in The Making of Europe’s Critical Infrastructure, ed. Per Högselius, Arne Kaijser, and Anique Hommels (London: Palgrave Macmillan, 2013), 27–61, p.33.
[14] Gustafson, Bridge: Natural Gas in a Redivided Europe, p. 42.
[15] Högselius et al., "Natural Gas in Cold War Europe: The Making of a Critical Infrastructure," p. 32-33.
[16] Ivi, p.33.

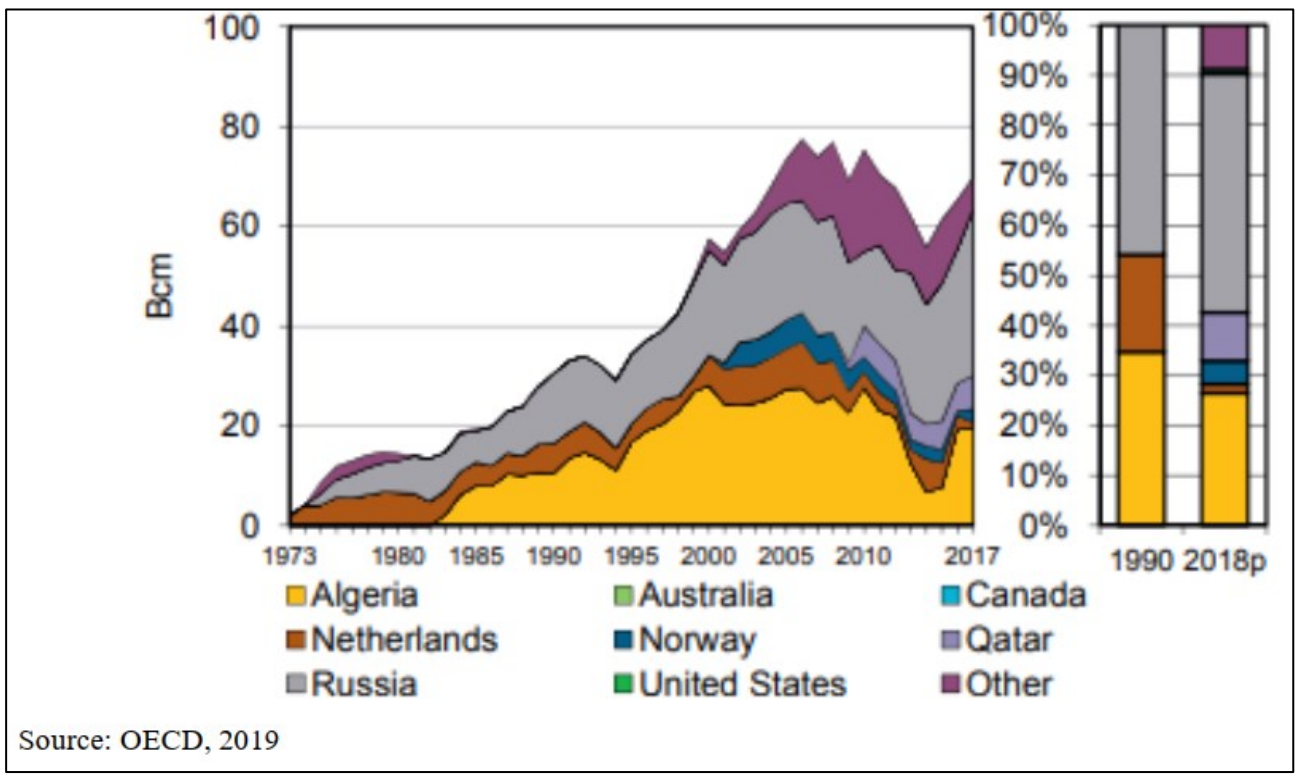
various equipment and 240,000 tons of steel pipes, destined for the Soviet Union's industry sector. Another important agreement was signed in 1960, later renewed and extended in 1963, between ENI and Soyuzneftexport (later part of Gazprom), which first granted 12 million tons of Soviet oil supply between 1961 and 1965 and then a further 25 million from 1965 to 1970[17].

In 1965, the newly appointed head of ENI, Eugenio Cefis, made a proposal to the Soviet Minister of Foreign Trade, Nikolay Osipov: in exchange for the supply of Soviet gas, Italy would provide the materials and technology necessary for the construction of the pipeline (at that time, the Soviet plans aimed at the realisation of a 6,000 km network of oil and gas pipelines). In 1967, the negotiations came to a stop, but in 1969 in Rome the Soviet Minister for Foreign Trade, Nikolay Osipov, and Eugenio Cefis signed a twenty-year contract, which stipulated that ENI would receive 6 bcm of natural gas per year via Ukraine through the Austrian-Czechoslovak border and in exchange it would grant Moscow a loan of 200 million dollars to buy the materials needed for the pipeline construction from Italian companies[18], with deliveries starting in 1975, after the expansion of the "Brotherhood system"[19] in 1973[20].

1.2.4 The expansion of Soviet gas in the European gas market

The Soviet Union gas production grew from 17 bcm in 1956 to 346 bcm in 1977[21], with an impressive 17% average annual increase, which allowed a strong additional penetration towards other European markets.

[17] Giovanna De Maio and Nicolò Sartori, "Le Relazioni Tra Italia e Russia," Osservatorio Di Politica Internazionale, November 2018, p. 13.
[18] Bellodi and Caracciolo, Gas e Potere: Geopolitica dell'energia dalla Guerra fredda a oggi, p. 11.
[19] The name of the pipeline system crossing Ukraine to connect southern Europe. The system is envisaged to stop flowing Russian gas at the end of 2024, with the termination of the current transit contact in place.
[20] Grigas, New Geopolitics of Natural Gas, pp. 95-136.
[21] https://www.cia.gov/readingroom/docs/DOC_0000292296.pdf



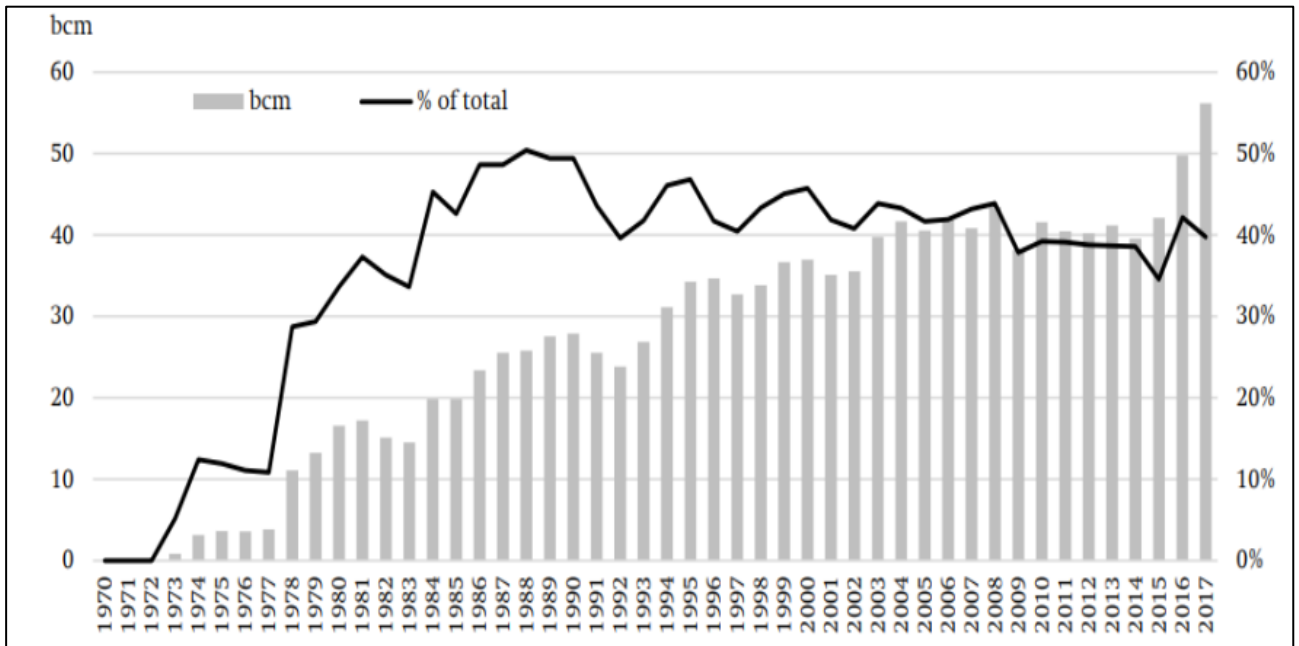
Volumes of imported gas in Italy by source, OECD 2019

The figure above shows the volume of imported natural gas in billion cubic metres by origin, from 1973 to 2018, in Italy. It can be noted the growing share of Soviet (and later Russian) gas imports over other suppliers, along with Algeria, which, until the Russia invasion of Ukraine, was the second exporter of natural gas to Italy.

Italy wasn't the only European country to interact with the Soviet Union during these years, in fact, during the same years of the negotiations between Italy and the Soviet Union, Western Germany started negotiations with the Soviet Union for the supply of natural gas as well. In fact, in the 1960s, German demand for natural gas was growing fast, around 30-60% per year: especially in the Bavaria region, the urgency of importing more gas was clear[22]. On the German side, people who made possible an agreement between the two parties were Willy Brandt, the Minister of Foreign Affairs and Chancellor in 1969, Egon Bahr, advisor in the Foreign Office, and Klaus von Dohnavi, State secretary at the Ministry of Economy[23]. Willy Brandt, in particular, pursued a policy called Ostpolitik, which aimed at the reunification of the "two Germanies", by promoting détente and re-rapprochement with the

[22] Gustafson, Bridge: Natural Gas in a Redivided Europe, p. 73.
[23] Högselius et al., "Natural Gas in Cold War Europe: The Making of a Critical Infrastructure," p. 33.

Soviet Union[24], and this new agreement was designed within the framework of Ostpolitik[25]. Finally, on 1st February 1970, West German gas company Rhurgas, the largest gas distribution company in Germany (dissolved in 2013), signed a twenty-year contract for the import of Soviet gas, determining the first step towards the future Ruhrgas and Gazprom's cooperation[26], and as the graph below shows, this trade agreement was long-lasting in nature.

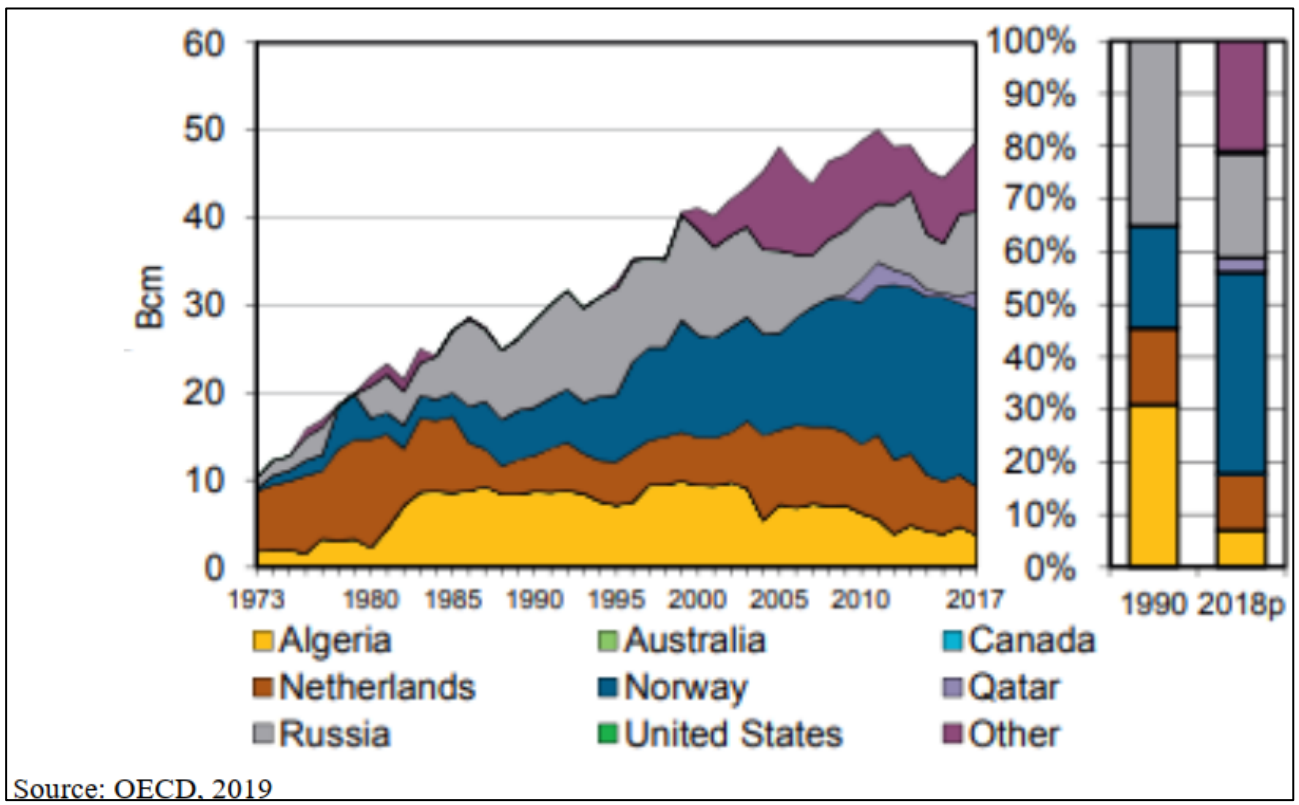


Source: Aurélie Bros, Tatiana Mitrova, and Kirsten Westphal, 2017

It's important to notice that, similarly to Italy, Germany also relied mainly on the Soviets, and afterwards on Russia, for their natural gas.

A similar case can be made for France, that signed a contract in 1969 with the Soviets for the import of natural gas in exchange for the delivery of pipe and equipment for the Soviet gas industry, starting in 1976. Moreover, to be able to receive Soviet natural gas (the Brotherhood pipeline system only reached West Germany in 1980), it sealed swap arrangements with Italy: France would receive the Groningen gas contracted by Italy, while Italy would receive the Soviet gas destined for France[27]. It has to be noted that, as highlighted in the graph below, Soviet gas was never the predominant supplier of natural gas in the country.

[24] Gordon A. Craig and Timothy Garton Ash, "Did Ostpolitik Work? The Path to German Reunification, "Foreign Affairs 73, no. 1 (1994): 162–67, https://doi.org/10.2307/20045899.
[25] Tatiana Mitrova, Aurélie Bros, and Kirsten Westphal, "German-Russian Gas Relations A Special Relationship in Troubled Waters," Stiftung Wissenschaft Und Politik German Institute for International and Security Affairs, 13, RP (December 2017): 5–48, https://doi.org/10.13140/RG.2.2.33394.56003, p. 12
[26] Grigas, New Geopolitics of Natural Gas, pp. 95-136.
[27] Ivi



Source: OECD, 2019

Other countries in the Union received Soviet gas as well, although in lower amounts, with Finland and Bulgaria receiving the first Soviet supplies in 1974, Hungary in 1975 and Yugoslavia in 1978[28].

1.3 The 1970s, the oil shocks and their impact on the European gas market

The 1970s marked the cornerstone for the development of the European gas market: the oil shocks turned the European countries towards natural gas as the preferred fuel. The first consequence of the 1973 oil shock was the setting as priority goal of the importing countries to reduce their dependency on oil from the Middle East countries[29].

Moreover, the price of oil became too high, and therefore it was substituted by coal, nuclear and natural gas, whose price grew as well, being indexed to the oil price, but not so dramatically. On the Soviet side, the oil shock in 1973 with the subsequent increase

[28] Högselius, Åberg, and Kaijser, "Natural Gas in Cold War Europe: The Making of a Critical Infrastructure," p. 36.
[29] Bellodi and Caracciolo, Gas e Potere: Geopolitica dell'energia dalla Guerra fredda a oggi, p. 14.

of natural gas price, indexed to the oil price, boost gas exports, allowing, at the same time, the maintenance of low internal gas prices. In the 1970s and 1980s, the Soviet Union had a twin-track approach to natural gas export.

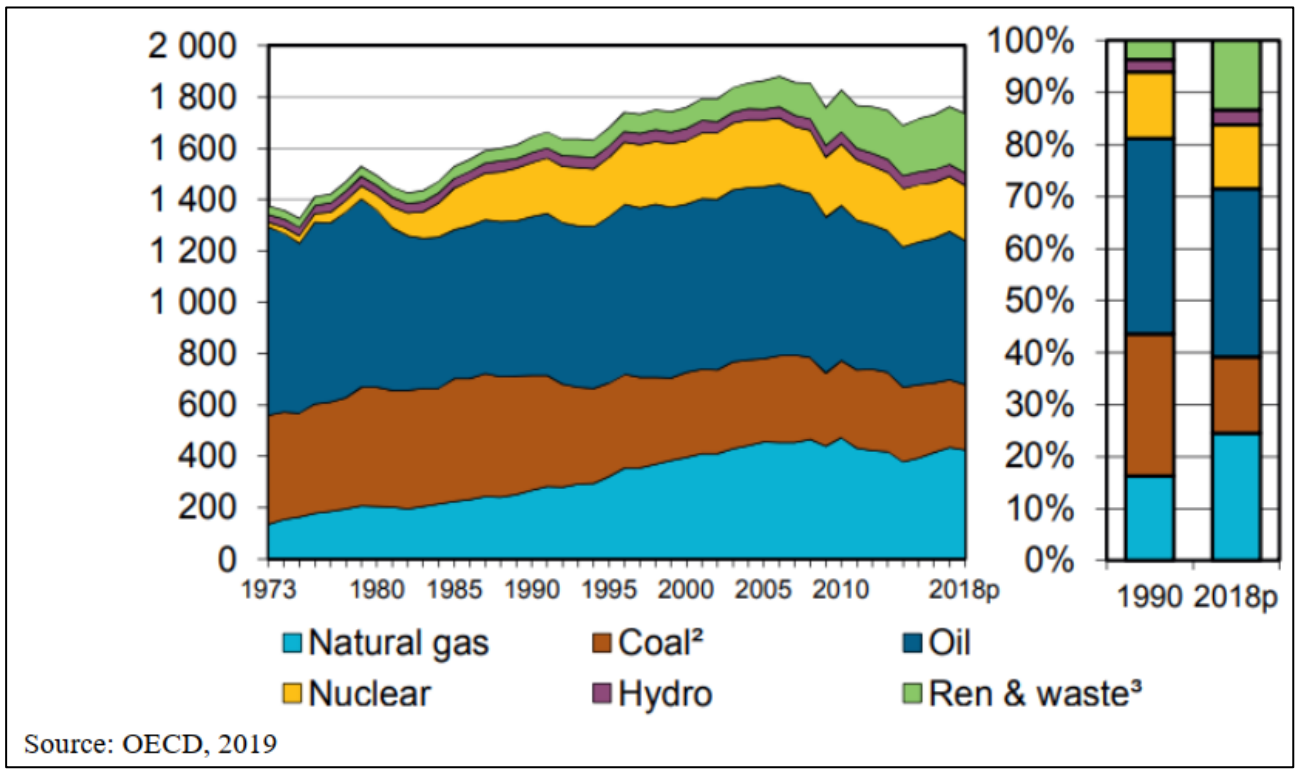
The case of the Council of Mutual Economic Assistance (CMEA), an organization that was set up in 1949 by the Soviet Union and the European countries which had adopted a Soviet-type socialist system after the War, was partly the formal expression of economic solidarity within the newly formed bloc, partly a response to the challenge of the Organisation for European Economic cooperation, set up in 1948 by 16 West European nations[30].

For the countries of CMEA, the Soviet authorities sold natural gas at lower prices and by barter exchanges, while exports to Western European countries were negotiated with higher prices, indexed at the oil ones. Moreover, exchanges with the West, facilitated by the period of détente of the 1970s, involved also the exchange of technologies and equipment necessary for the development of the industry sector in the Soviet Union. As a result, in 1980, 62.3% of the Soviet total hard currency revenues came from gas and oil exports, which amounted to $14.7 billion[31].

The European countries, in particular, increased natural gas consumption in order to diversify away from oil. First of all, they reacted to the oil shocks by diversifying their energy mix, reducing their vulnerability due to dependency on oil from OPEC countries. Secondly, after the first period of high excitement for nuclear energy, disappointment for it grew due to rising technical and environmental concerns. In the same way, coal was increasingly considered harmful to the environment. It naturally followed that natural gas was seen as the most eco-friendly of the big three[32].

The graph below shows this evolution of natural gas through the years, alongside other energy sources in Europe forming the Total Primary Energy Supply (TPES) by fuel.

[30] Domenico Mario Nuti, “Economic Relations between the European Community and CMEA,” EUI Working Papers, November 1988.
[31] Nadejda M. Victor and David G. Victor, "Bypassing Ukraine: exporting Russian gas to Poland and Germany," in Natural Gas and Geopolitics: From 1970 to 2040, ed. David G. Victor, Amy M. Jaffe, and Mark H. Hayes (Cambridge: Cambridge University Press, 2006), 122-68, pp. 131-132.
[32] Högselius et al., "Natural Gas in Cold War Europe: The Making of a Critical Infrastructure," p. 36.



Source: OECD, 2019

Natural gas was thus seen as more important than ever before, and as direct result of the oil shocks and the growing concerns for nuclear power, the Netherlands decided to limit natural gas exports from the Groningen field. The policy goal was to retain as much natural gas as possible: Gasunie, the Dutch gas company, was obliged to give up any additional contract for export and could only fulfil the existing ones. The impact of the policy change on European importers was mitigated by the discovery of new gas fields in the North Sea, beginning at the end of the 1960s, particularly in the Norwegian, British, Dutch and Danish sectors.

All Scandinavian countries but Finland (that started to receive Russian gas in 1974) were isolated from the European natural gas pipeline system. At the start of the 1980s, Denmark started to supply Southern Sweden and Germany, but, at the same time, the project to connect the North Sea to Soviet gas, by using pipelines across Sweden and the Baltic Sea, failed[33].

It is worth pointing out how, despite the growing importance of natural gas after the oil shocks, at first there was a twin-track approach to it: on the one hand, natural gas was considered “too valuable” for power generation, as clearly stated by a directive from the European Commission in 1975, but, on the other, there was a high demand of natural gas for the industrial and residential sectors. In fact, there was this idea of gas being a scarce good and therefore could not be wasted in power generation.

[33] Högselius et al., "Natural Gas in Cold War Europe: The Making of a Critical Infrastructure,", p. 37

On 13th February 1975, the Council of the European Communities adopted a directive on "the restriction of the use of natural gas in power stations": it dictated that, given that natural gas "quantities available are limited" and has "great advantages for certain specific uses", it should be "converted into electricity only when it cannot be used for other purposes, or in cases of technical or economic necessity". However, it recognised the environmental importance of preferring natural gas over other fuels, by allowing that "special reasons relating to the protection of the environment" could "likewise necessitate the use of natural gas in power stations"[34]. The United States adopted the Fuel Use Act of 1977 with a similar aim.

Following these policies, gas consumption in power generation among the European OECD countries peaked at 32.5 bcm in 1975 and then started decreasing, reaching 25 bcm in 1985. There were, however, some differences among the countries. French and British share of natural gas consumption in the power generation sector was close to zero due to, respectively, pro-nuclear and pro-coal policies. Very differently, in these same countries, natural gas demand reached two-thirds of total energy demand in the industrial and residential sectors. Residential heating with natural gas boomed in the 1970s and 1980s, improving significantly the quality of life of the European citizens. However, in the 1990s, thanks to the high efficiency in power generation from natural gas sources achieved with the use of combined-cycle gas turbine technology, the "too valuable to waste" belief was overcome and a "dash for gas" began in those years[35].

1.3.1 Nuclear energy

In Europe, the response to the oil shocks in the 1970s was not homogeneous and two countries, in particular, decided to invest greatly in the nuclear sector, with two different outcomes. They were France and Germany. French vulnerability in the energy sector was already an issue before the first oil shock: national coal production was very low and therefore France had to import it, but the share of coal in primary energy demand went from 85% in 1950 to 16% at the beginning of the 1970s. The gap was met by cheap oil import, which reached 70% of primary energy demand on the eve of the crisis. Natural gas did not have a relevant role in the energy mix yet. Therefore, on 6th March 1974, after the first oil shock, the French Council of Ministers opted for a massive development of the nuclear sector: in the following two years, thirteen new reactors and a total of 12 gigawatts of new nuclear capacity should have been realised. Although the plan was presented as an emergency remedy to the situation, it was

[34] Council Directive 75/404/EEC of 13 February 1975 on the restriction of the use of natural gas in power stations [1975] OJ L 178/24.
[35] Gustafson, Bridge: Natural Gas in a Redivided Europe, p. 87.

instead the result of a twenty year-long planning, which enabled the development of skills and techniques needed for the program[36].

The development of nuclear energy in West Germany had a different course. As a reaction to the crisis, the oil primary consumption was cut back to 40% of the share by the 1990s and coal share declined as well and went from 75% in 1960 to 30% in 1980. In households, natural gas became the main fuel consumed, in particular for heating. However, in the power sector natural gas suffered from the “too valuable” belief and its share in power generation went from 0% to 18% in 1975 and then declined to 5% in 1980. As a consequence, the power generation sector was fuelled by coal and nuclear energy. The latter, in particular, grew fast, going from 1% in 1965 to 33% in 1990. However, after this strong growth and support, in the 1980s a new movement rose and shattered the consensus for the nuclear program: the anti-nuclear movement.

What differentiated the German experience from the French one was the level of preparedness and expertise at the time of the presentation of the nuclear policy: while, as already mentioned, in France the program was the result of two decades of research and preparation, in West Germany, there was, first of all, a lack of attention to safety issues and, given the lack of preparedness, its program started at a slower pace. On the eve of the first oil shock in 1973, West Germany had already built eight nuclear plants. Then, in September 1973, the Social Democratic Party of Germany (SPD) adopted measures to have fifty nuclear units by 1985. However, after just ten years the support for the program declined and the SPD itself began to oppose it[37].

In Germany, the anti-nuclear movement was successful in slowing the process through protests, electoral gains and the support of the administrative courts[38], ultimately making the share of nuclear energy in the German energy mix decline over the years, with Statista reporting a 11.8% share of the total mix in 2021, as opposed to the almost 30% of 20 years prior.

[36] Ivi, p.93.
[37] Gustafson, Bridge: Natural Gas in a Redivided Europe, pp. 89-95.
[38] Sarah Elise Wiliarty, “Nuclear Power in Germany and France,” Polity, April 2013, 281–96, https://doi.org/10.1057/pol.2013.9.

1.4 XXI century main trends of the European gas market up to 2021

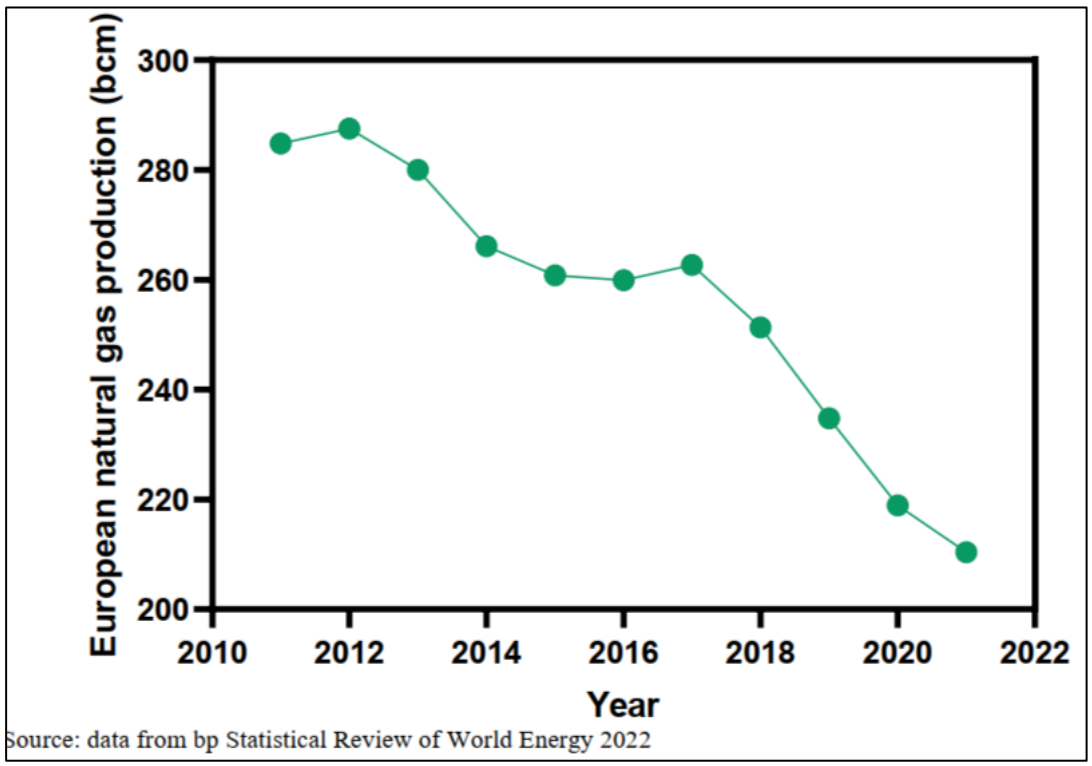
Having briefly looked at the development of important “gas relations” between Europe and Russia from the end of the 1960s, this section will provide a synthetic picture of the last 20 years, before the war between Russia and Ukraine of 2022, considering four different perspectives:

1. Natural gas production
2. Demand
3. Import
4. Prices

1.4.1 Natural gas production

Natural gas production in Europe declined over time: between 2011 and 2021, production in Europe decreased by 3%, going from 284.8 bcm in 2011 to 210.44 bcm in 2021 (for comparison, the United States in 2021 produced over 934.2 bcm[39] also as a result of the so-called shale gas revolution which contributed to about 77% of the total in 2023[40]).

[39] Bp Statistical Review of World Energy 2022, 71st ed. (London: British Petroleum, 2022), p. 29.
[40] https://www.eia.gov/tools/faqs/faq.php?id=907&t=8

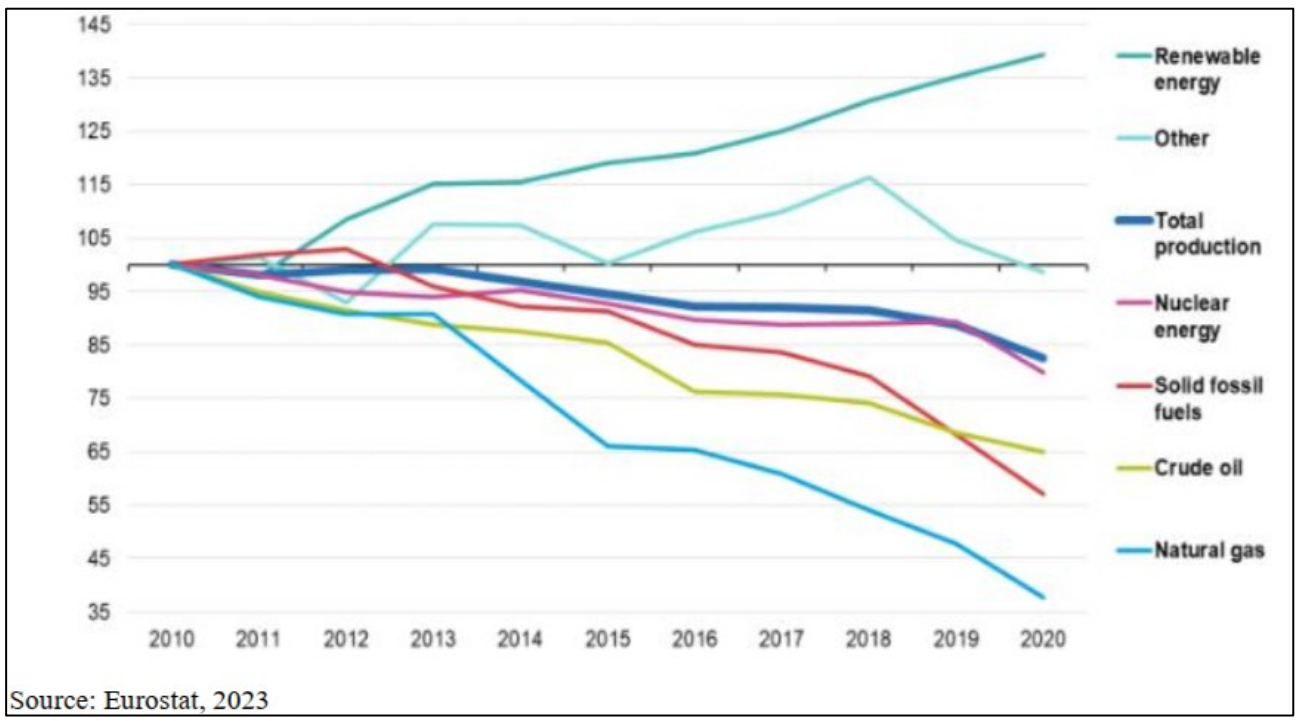


Source: data from bp Statistical Review of World Energy 2022

The above figure shows how production of natural gas declined in Europe during the last 20 years preceding the war. Production in the European Union declined even more sharply, from 83 bcm in 2017 to 51 bcm in 2021. Domestic production met only 15% of demand in 2021, while in 1980 it met 36%[41].

[41] Bellodi and Caracciolo, Gas e Potere: Geopolitica dell'energia dalla Guerra fredda a oggi, p. 56.

The graph below the production of energy by fuel type between 2010 and 2020, with 2010 as the basis.

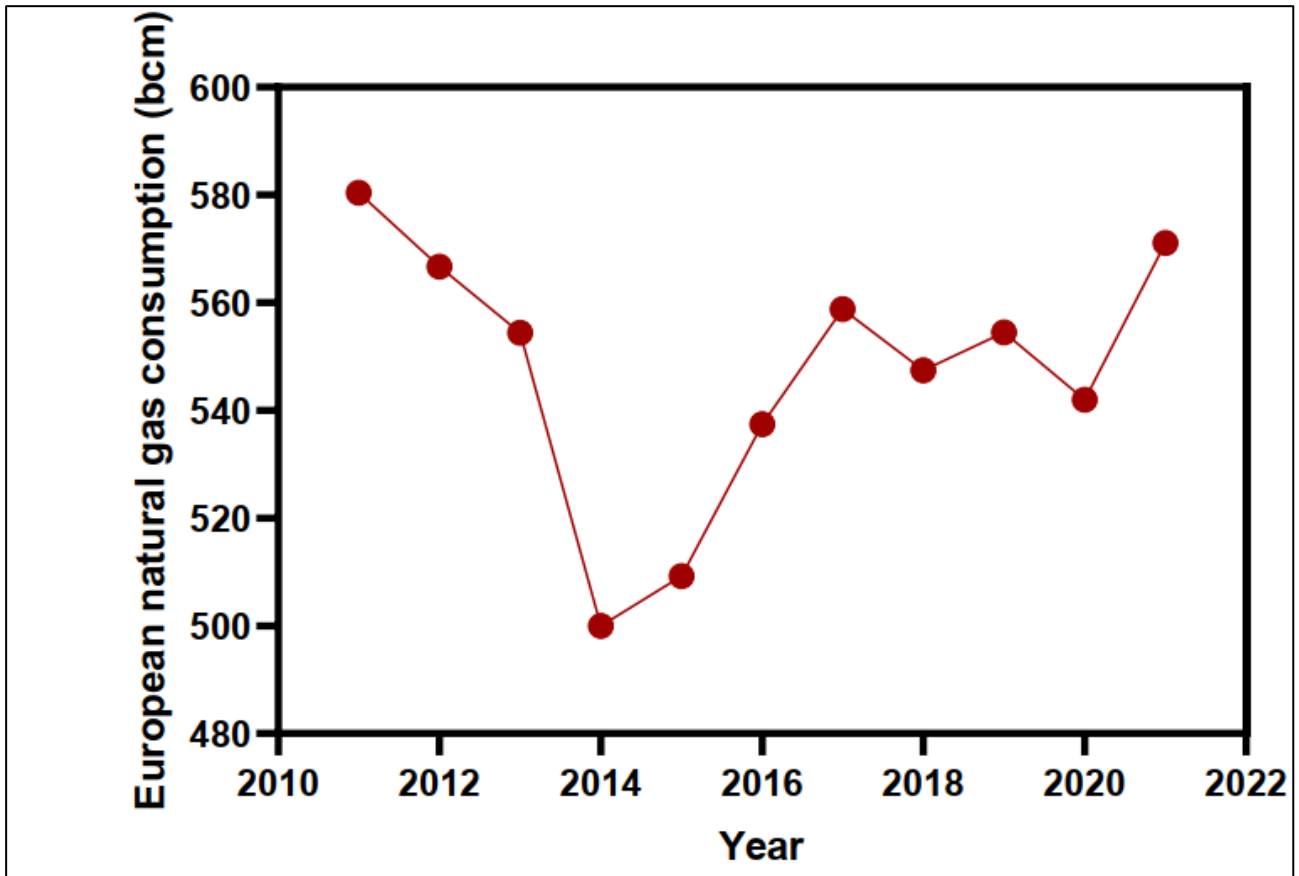


Source: Eurostat, 2023

The negative trend in European natural gas production can be explained mainly by the decline of the Groningen field in the Netherlands, where the production went from 53 bcm in 2013 to 20 bcm in 2018. The production of natural gas in the United Kingdom is declining as well, from 113 bcm in 2000 to 28 bcm in 2021.

1.4.2 Natural gas demand

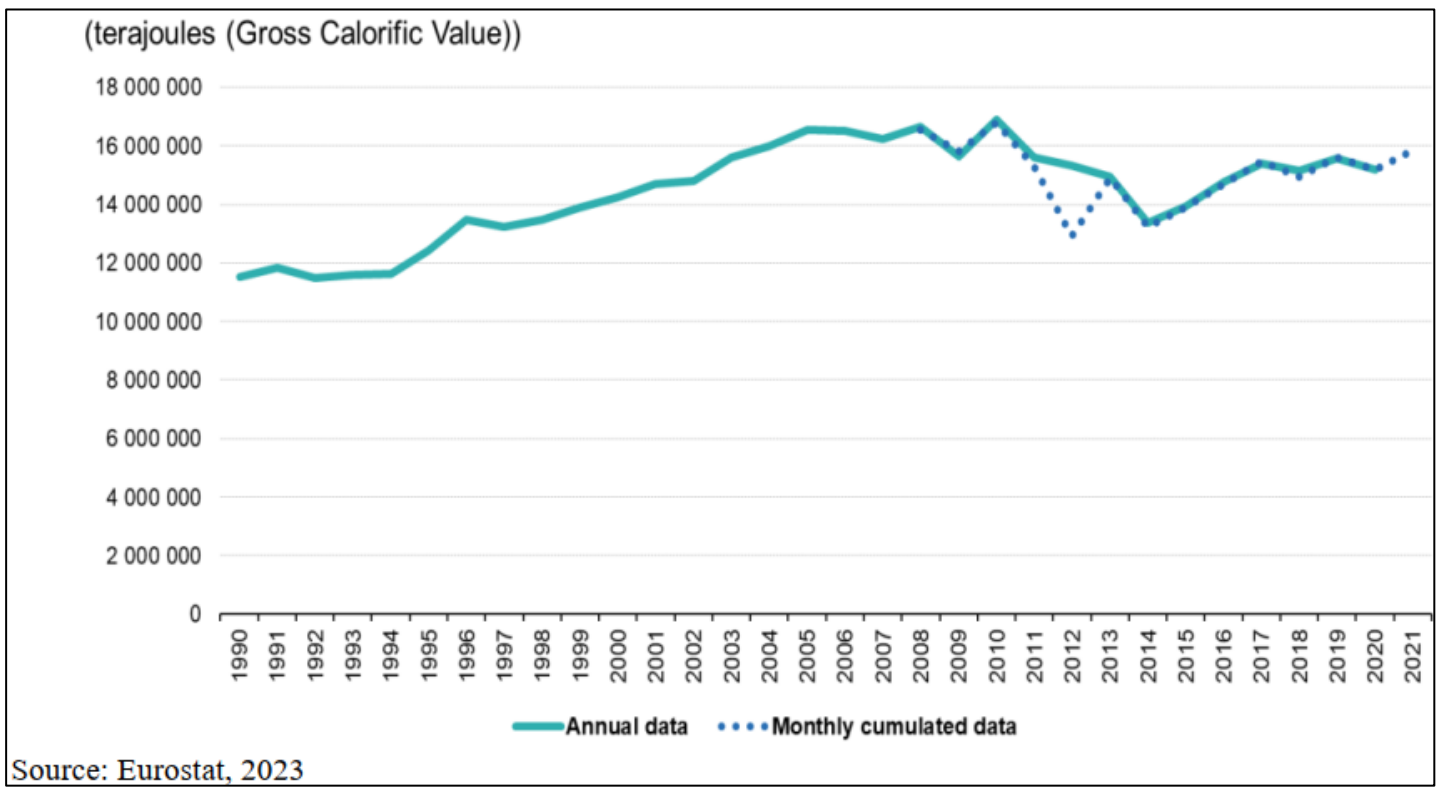
Natural gas consumption in Europe remained relatively stable. Consumption in Europe first had a negative trend between 2011 to 2014 due to the global economic and financial crisis, declining from 580.4 bcm to 500.0 bcm. From 2014 to 2021 the trend changed and consumption of natural gas went from 500.0 bcm to 571.6 bcm. In conclusion, from 2011 to 2021 European consumption declined by 0.2%[42], also shown in the graph below.



Source: data from BP Statistical Review of World Energy 2022

Similarly, the inland demand for natural gas in the European Union has followed the same trend and consumption reached 399.6 bcm in 2020. The following figure shows the change in demand for natural gas in the EU during the period 1990-2021.

[42] Bp Statistical Review of World Energy 2022, p. 31.



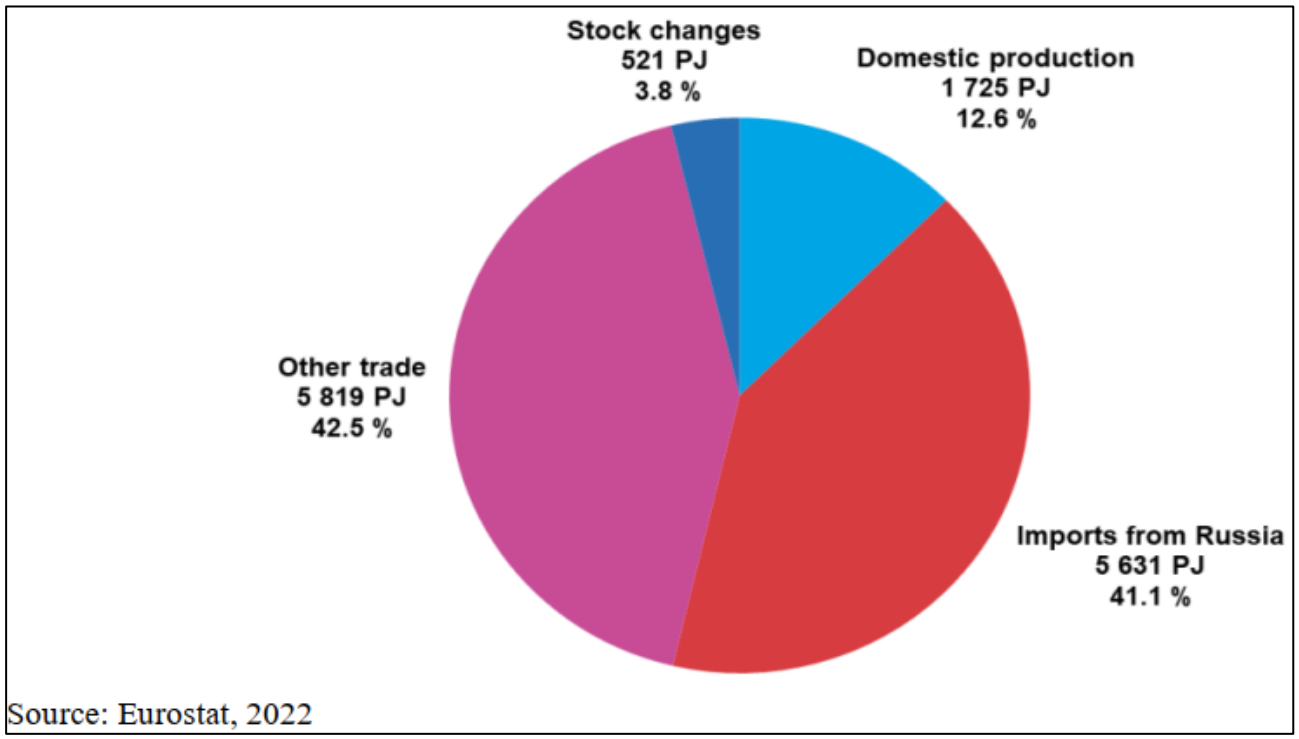
Source: Eurostat, 2023

1.4.3 Import dependency

The results seen in the section above, flattening consumption and declining production of natural gas, meant a natural increased dependency on imports. In particular, in 2020, while the consumption of natural gas amounted to 399.6 bcm, the production fell to 55.7 bcm. For this reason, in the same year, EU import dependency was 84%[43]. In the first semester of 2021, the main exporters of natural gas to the European Union were: Russia (46,8%), Norway (20,5%), Algeria (11.6%) and the two LNG suppliers, the USA (6.3%) and Qatar (4.3%)[44].

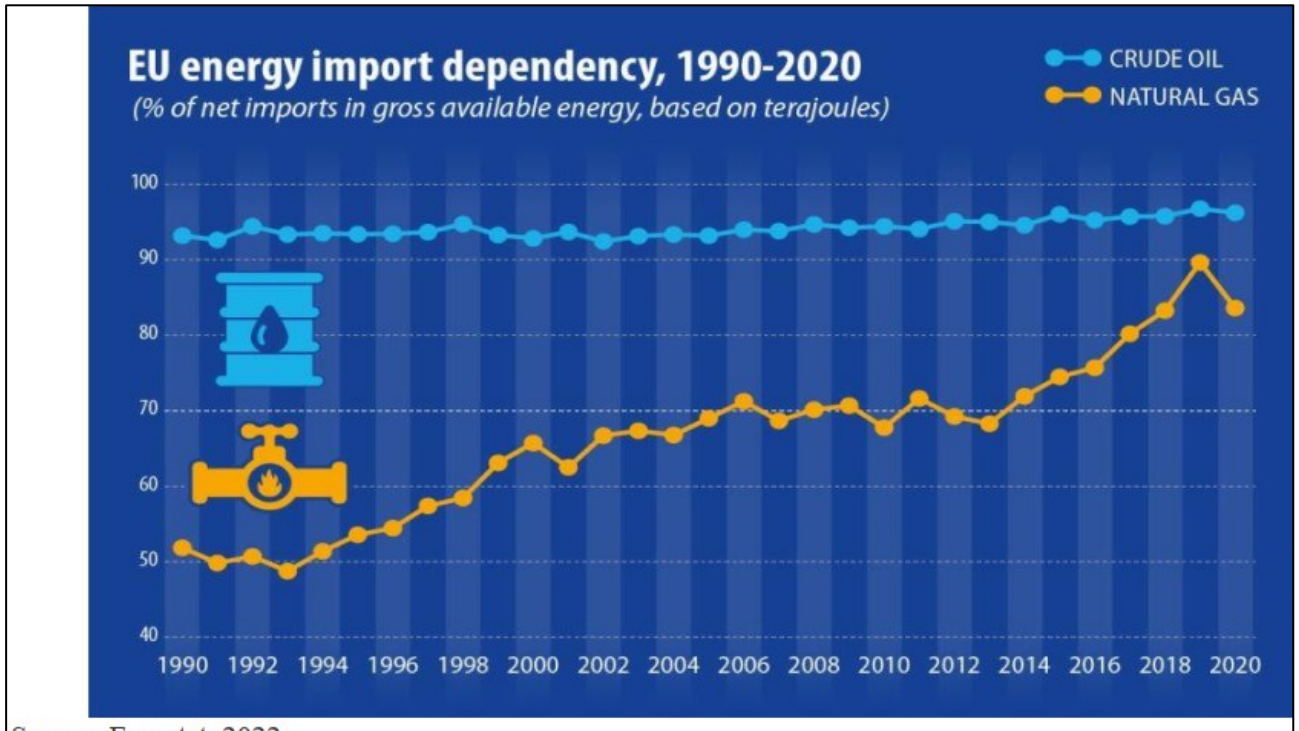
The graph below shows the percentage of imports from Russia to Europe, measured in petajoules (PJ).

[43] Gabriel Di Bella et al., "Natural Gas in Europe: The Potential Impact of Disruptions to Supply," IMF Working Papers 2022, no. 145 (July 2022): 1–47, https://doi.org/10.5089/9798400215292.001, p. 7.
[44] Bellodi and Caracciolo, Gas e Potere: Geopolitica dell'energia dalla Guerra fredda a oggi, p. 55.



Source: Eurostat, 2022

Differently from the high stable dependency on oil imports, an increasing dependency on gas imports, going from around 50% in 1990 to 84% in 2020, as shown in the figure below.



Source: Eurostat, 2022

Finally, the degree of dependency on natural gas imports is not homogeneous among EU countries, but Europe overall proves to be quite reliant on natural gas imports.

1.4.4 Natural gas pricing dynamics

The 2000s witnessed a change in the contracts for natural gas trade. They went from being predominantly long-term (20-25 years) to being partially substituted by spot (short-term) transactions. They are based on a supply-demand mechanism and are quoted on hub platforms[45].

Natural gas hubs are interconnection points between pipelines and LNG terminals and are used as “central pricing points for the network’s natural gas”[46]. In these hubs services and quantities of natural gas can be exchanged. Some of the main gas hubs in Europe are the British National Balancing Point (NBP), the Dutch Title Transfer Facility (TTF), created by Gasunie in 2003, the Central European Gas Hub and the two German hubs (Net Connect Germany and Gaspool, created in 2009)[47].

The traditional long-term contracts, which marked the birth of a European gas market in the 1960s, were first proposed by the Dutch minister, J.W. de Pous, in 1962, following the discovery of Groningen field. It has been applied since 1984 by the Dutch gas company Gasunie. The structure of the contracts allowed for a balanced risk-sharing between the producing and consuming countries[48]. The main risk for the suppliers was to invest large amounts of capital in the production and transport infrastructures and not sell its gas, in this way not covering the initial, large, investments. In addition, a second risk was that the gas price would not been high enough to ensure fair profits. The answer was long-term contracts, therefore guaranteeing the coverage of the initial investments, with a take-or-pay clause and an annual contract quantity (ACQ). This clause mandates a minimum annual volume that importers must buy or pay for, this level being usually set at 80-90% of the ACQ level. Additionally, these contracts link gas prices to crude oil and oil products prices, guaranteeing stability. For importers, the price mechanism ensured the competitivity of natural gas in comparison with the other energy sources, thus allowing a subsequent reselling of gas going down in the supply chain. In these contracts is usually present a periodic review mechanism (“re-opener”) for prices, which guarantees a degree of flexibility[49].

[45] Clô, "Il gas naturale liquefatto: Evoluzione di un mercato sempre più globale," p. 132
[46] “Q&A: What Is a Gas Trading Hub, and How Are They Established?,” Reuters, 29th December 2017, https://www.reuters.com/article/us-china-gas-exchange-q-a-idUSKBN1EN0I1.
[47] Stern and Rogers, “The Dynamics of a Liberalised European Gas Market – Key Determinants of Hub Prices, and Roles and Risks of Major Players”, p. 12.
[48] Clô, "Il gas naturale liquefatto: Evoluzione di un mercato sempre più globale," p. 133.
[49] Luca Franza, “Contratti Di Importazione Del Gas in Europa: Evoluzione Dei Meccanismi Di Pricing,” Energia, May 2015, 38–41

The rise of short-term contracts and transactions on the spot market in Europe have been the result of the ongoing liberalisation process of the energy markets in the EU to create a “single market” therefore favouring the development of trading platforms and have been also stimulated by effects of the financial crisis period. The economic crisis led to a fall in European gas demand: in 2011 it was 5.7% below 2008 levels and in 2013 it was 11%.

In the same years, as already mentioned, LNG supply in the global market grew by 100 bcm, 30 of which went to Europe, not tied to long-term contracts[50]. In addition to the decline in demand and increase in supply, gas prices were increasing, driven by the oil price increase, while hub-based prices remained relatively low. Hub prices, determined by the supply-demand mechanism, had fallen as a consequence of the gas oversupply.

1.5 The first signals of a rising tension

During winter 2021-2022, Europe witnessed a deep energy crisis and gas prices reached an unprecedented level: 180 €/MWh on 21st December 2021. The first signs of the crisis started to emerge during the late spring of 2021 and could be explained by an intertwin of factors: low gas production, high demand and low storage levels, which led to dramatically increasing gas prices. European gas production, taking into consideration the European Union and the United Kingdom, in January-August 2021 amounted to 39.9 bcm, while in 2019 it reached 52.4 bcm, a reduction of 12.5 bcm, due to the temporary planned maintenance of the British and Danish production facilities, but also to the already mentioned planned closure of the Groningen field in the Netherlands, due to seismic risks connected to production activities[51].

Net pipeline gas imports declined as well. While supplies from Azerbaijan and North Africa increased in January-August 2021, respectively by 4.5 bcm and 8.8 bcm in comparison to the same period in 2019, Norwegian and Russian gas imports declined sharply. Exports from Norway to Europe declined by 3.1 bcm, one-third of which to the UK and two-thirds to Continental Europe. Nonetheless, the most evident drop in supplies was from Russia, which in January-August 2021 reduced export to Europe by 19.3 bcm compared to the same period in 2019[52].

[50] Stern and Rogers, “The Dynamics of a Liberalised European Gas Market – Key Determinants of Hub Prices, and Roles and Risks of Major Players”, pp. 11-12.
[51] Mike Fulwood and Jack Sharples, “Why Are Gas Prices So High?,” The Oxford Institute for Energy Studies, September 2021, 1–11, p. 5.
[52] Ivi, p.6.

While Nord Stream 1 maintained stable its gas flow and Turkstream, launched in January 2020, started deliveries, transferring 7.7 bcm in January-August 2021 up from zero in 2019, the real decline of gas flow was registered via Ukraine, with a fall of 27.1 bcm, from 53.2 bcm in 2019 to 26.1 bcm in 2021. Therefore, considering also the additional 7.7 bcm via Turkstream, the net decline of Russian gas to Europe has been of 19.4 bcm. It has been suggested that the reason for the lowering of the volume of gas exports from Russia was due to an attempt by Gazprom to maintain high prices and to exert pressure for the authorisation by the German regulator (BNetzA) of Nord Stream 2 operations. However, it could be explained also by a lack of spare volumes of natural gas to Europe which, to ensure an image of reliability, was not expressed publicly[53].

In addition to the decline in production and pipeline imports, LNG imports dropped as well. Due to the fact that LNG global export focused mainly on the premium Asian market due to its higher demand, prices began to raise and Europe imported 7.8 bcm of LNG less than in 2019.

Finally, gas demand increased by 1.0 bcm due to the economic recovery which followed the softening of Covid-19 restrictions and spending plans adopted by governments. These three factors, lower production, less imports and higher demand, led to a difference in gas supply between 2019 and 2021 of 30.4 bcm. This gap was met by an increase in net storage withdrawals, equal to 30.5 bcm[54].

This resulted, in September 2021, in the lowest European gas storage level of the last years, totalling a fill rate of only 77%, compared to 95% in 2020[55]. Finally, another intervening factor was the reduced wind energy production in Northern Europe due to milder wind speeds than usual. In fact, Britain, Germany and Denmark, the European largest wind producers, used only 14% of installed capacity, in comparison to 20-26% of the previous years. The reduction in wind power generation led to an increasing demand of natural gas at thermal power plants, rising its price and lowering gas storage levels[56].

This was the situation in Europe at the dawn of the Russian invasion of Ukraine: an energy crisis already underway, destined to be highly aggravated by the consequences of the war.

[53] Fulwood and Sharples, “Why Are Gas Prices So High?”, p. 6.
[54] Ivi, p.7.
[55] Bellodi and Caracciolo, Gas e Potere: Geopolitica dell'energia dalla Guerra fredda a oggi, p. 50.
[56] Nora Buli and Stine Jacobsen, “Analysis: Weak Winds Worsened Europe’s Power Crunch; Utilities Need Better Storage,” Reuters, December 22, 2021, https://www.reuters.com/markets/commodities/weak-winds-worsened-europes-power-crunch-utilitiesneed-better-storage-2021-12-22/.

2 The European energy and climate policy evolution

Before tackling the effects of the war on the European market, it is essential to have a general perspective on the policies related to energy and climate that were set in place by the European Union before the war, as to give a better idea of the situation through a legislative lens.

This section will focus therefore on a high-level description of the three main blocks of European energy and climate legislation: the “European Green Deal”, the “Fit for 55”, and the “Recovery and Resilience Facility”.

2.1 The “Green Deal”

In 2019, the European Commission adopted the European Green Deal, with the aim of making the European Union a “fair and prosperous society, with a modern, resource-efficient and competitive economy”[57].

Through this Communication, the Commission committed to put forward a plan to achieve climate neutrality in the EU by 2050 and to increase the GHG emissions reduction target by 2030, from 40% set in 2018 to 55% compared to 1990 levels.

The European Green Deal is a package of policy initiatives, which aims to set the EU on the path to a green transition, with the ultimate goal of reaching climate neutrality by 2050.

The Green Deal is a response to numerous global challenges, as stated in its introduction[58], and where economic growth is projected to decouple from fossil resources’ use to allow the European Union to be the first “climate-neutral continent” in the world. “It also aims to protect, conserve and enhance the EU's natural capital, and protect the health and well-being of citizens from environment-related risks and impacts. At the same time, this transition must be just and inclusive”[59].

The European Commission estimated that at least €1 trillion in sustainable investments would have been needed over the decade till 2030 to accomplish these challenging targets. The EGD Investment Plan (“EGDIP”) is the main vehicle to mobilise the required sustainable investments over the decade. This consists of both public and private money, as the public sector alone cannot cover

[57] European Commission, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions - The European Green Deal COM/2019/640 final, [2019].
[58] https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF, p.2.
[59] Ivi.

all necessary investments[60]. €500 billion comes directly from the EU Budget, while the majority of the remaining funds are to be mobilised through the investment programme InvestEU[61]. The four key investment areas:

- Sustainable infrastructure
- Research, innovation and digitisation
- Small and Medium Sized Enterprises
- Social Investment and Skills

Over these four investment areas, at least 30% of investments is dedicated to climate related problems. The programme consists of three pillars. Firstly, it aims to mobilise private and public funding for projects that promote the four key areas, using guarantees from the EU budget. Secondly, the InvestEU Technical Advisory Hub advises projects that seek funding. Finally, the InvestEU Portal brings together projects and interested investors[62]. The overall mechanism relies therefore on a policy push from the European Commission, to be coupled with Member States actions to “green” their budgets by screening and benchmarking budgeting practices, thus allowing for broad-based tax reforms on the national level, such as removing fossil fuel subsidies, shifting tax burden from labour to pollution and taking into account social considerations. It also proposes to Member States to adjust their VAT to reflect environmental costs[63]. It also proposes to Member States to adjust their VAT to reflect environmental costs[64].

This set of policies define several objectives to reach:

1. Climate change mitigation and adaptation
2. Sustainable resource use and management
3. Transition to a circular economy
4. Pollution control
5. Protection and restoration of biodiversity

[60] European Commission. (n.d.-d). Overview of Sustainable Finance. Ec.Europa.Eu. Retrieved 23 November 2020, from https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainablefinance/overview-sustainable-finance_en
[61] InvestEU is a continuation of the Investment Plan for Europe, https://www.consilium.europa.eu/en/policies/investment-plan/

[62] European Commission. (n.d.-j). What’s next? The InvestEU Programme (2021-2027). Ec.Europa.Eu. Retrieved 7 December 2020, from https://ec.europa.eu/commission/priorities/jobs-growth-and-investment/investmentplan-europe-juncker-plan/whats-next-investeu-programme-2021-2027_en
[63] Communication on the European Green Deal, 2019
[64] Communication on the European Green Deal, 2019

Alongside these objectives, the Just Transition Mechanism was established to protect and support regions that will face the greatest challenges in the transition away from a fossil fuel-based economy. Often, these are regions in which a great number of jobs rely on fossil fuel heavy industries. The Just Transition mechanism is meant to help by supporting the transition to low-carbon activities, re-skilling of workers and providing easy access to loans and financial support for these activities[65].

At large therefore, it is clear that – from the European policy perspective and among other fossil fuels – also natural gas was included in the fuel sourcing to be drastically reduced, even though in a medium-long term perspective.

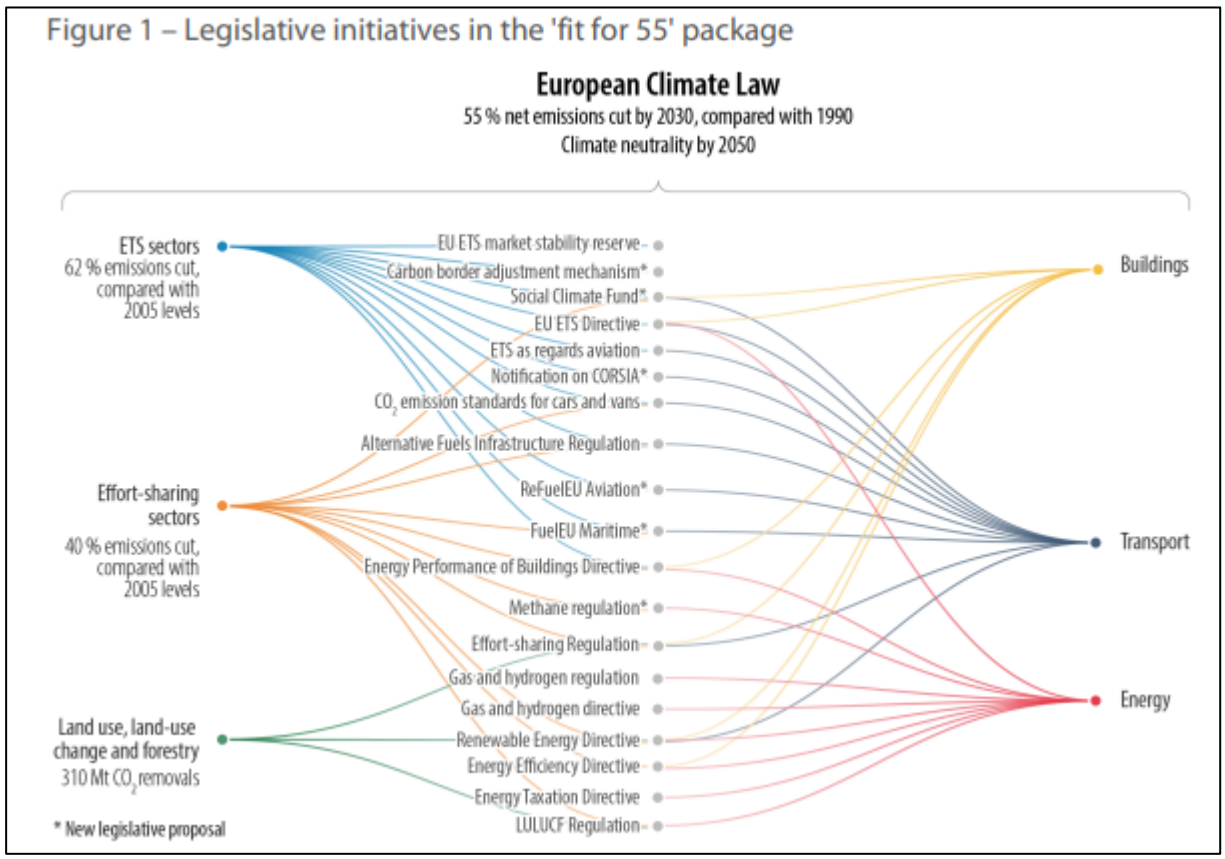
2.2 The “Fit for 55” package

The “Fit for 55” (or “FF55”) package of July and December 2021 was designed to realise the European Climate Law objectives included in the EGD. The FF55 consists of 13 interlinked proposals to revise existing EU climate and energy laws, and 6 new legislative proposals. All proposals, except the Energy Taxation Directive[66], have been adopted or agreed by the European Parliament and the Council of the EU.

In line with the EGD, its ultimate aim is to cut 55% of the total net emissions by 2030, and achieve climate neutrality by 2050.

The graph below shows the main objectives of the reforms.

[65] European Commission, 2020. The Just Transition Mechanism: Making Sure No One Is Left Behind. European Commission.
[66] As for taxation, the EU legislation requires unanimity and it has not been achieved to modify current rulings: https://taxation-customs.ec.europa.eu/taxation/decision-making-eu-tax-policy_en



Source: Fit for 55 package, European Parliament

Energy is the central theme tackled by Fit for 55.

Several laws in it address energy-related GHG emissions. The principal targets set to contribute to the overall 55% net emissions reduction are a 42.5-45% share of renewable energy sources at EU level by 2030, and a substantial reduction of primary and final energy consumption. A higher carbon price through EU ETS and the set of policy targets defined should drive the roll-out of renewables and energy efficiency improvements which are the backbone of the EGD implementation.

The “Fit for 55” package also includes four laws intended to raise the ambition of the EU ETS, improve its functioning, broaden its scope to maritime transport, road transport and buildings, and provide for the participation of airlines in the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)[67]. These are complemented by a regulation introducing a carbon border

[67] https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx

adjustment mechanism to safeguard international competitiveness by pricing the carbon emissions of imports, and a regulation on a Social Climate Fund[68] to address the social impacts of extending the EU ETS to road transport and buildings.

Transport is a sector tackled by the package of reforms, as GHG emissions from the transport sector have stagnated over the past decade, while other sectors such as electricity generation and industry have achieved substantial emissions reductions, also thanks to European policies on these fronts. To ensure that the transport sector contributes to the EU's climate objectives, the maritime and road transport sectors are included in the EU Emission Trading System (ETS) (while still covered by the Effort-sharing Regulation).

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2.3 Recovery and Resilience Facility (RRF)

The Recovery and Resilience Facility (RRF)[69] is a temporary instrument, launched in 2021, to help the EU emerge stronger and more resilient from the coronavirus pandemic and increase the resilience of the national economies.

It is the largest EU funding programme, with €648 billion committed overall.

This program has the two-fold objective of helping EU countries recover from the COVID-19 pandemic, as well as bolstering their resilience and making EU economies and societies greener, more digital and more competitive.

[68] https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/social-climate-fund_en
[69] https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility_en#:~:text=The%20Recovery%20and%20Resilience%20Facility%20(RRF)%20is%20a%20temporary%20instrument,resilient%20from%20the%20current%20crisis.

The RRF is deeply interlinked with REPowerEU plan established in May 2022 to decouple EU from Russian energy supplies, accelerate the clean energy transition and boost EU competitiveness.

Through the RRF, the EU Commission raises funds by borrowing on the capital markets, issuing bonds on behalf of the EU, which are then available to EU countriesfor their implementation of reforms and investments to make their economies and societies more sustainable, resilient and prepared for the green and digital transition.

These funds are distributed[70] to countries that have presented a Recovery and Resilience Plan (RRP), with the plan itself approved by the European Council.

The RRPs aims at helping EU countries achieve the 2030 targets for renewables and energy efficiency, and paves the way towards reaching the EU's objectives for 2040. Already by 2026, the RRPs are expected to bring tangible deliverables, such as:

A. 60 GW of additional renewable capacity, including more than 15 GW for offshore wind;
B. promote 28 million MWh of savings in annual primary energy consumption;
C. develop 14,000 km of electricity transmission and distribution lines;
D. deploy more than 2.5 GW of hydrogen electrolyser capacity[71].

The RRPs are a significant part of the measures included in the National Energy and Climate Plans (NECPs). The measures included in the REPowerEU chapters, and more generally in the RRPs, will also bring tangible results aligned with the EU Solar Energy Strategy, the Wind Power Package, the Action Plan on electricity grids and the recommendation and guidance on speeding up permit-granting for renewable energy and related infrastructure projects[72].

[70] On allocation criteria for RRF:
https://www.camera.it/application/xmanager/projects/leg18/attachments/upload_file_doc_acquisiti/pdfs/000/004/970/SLIDES.pdf
[71] Some challenges to these targets were also in the recent report by the European Court of Auditors: https://www.eca.europa.eu/en/news/NEWS-SR-2024-11
[72] https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility_en

3 Short-term effects of the Russo-Ukrainian war

On 24th February 2022 Russia invaded Ukraine, after having unilaterally recognised the independentist Ukrainian regions of Donetsk and Luhansk on 21st February as part of the Russian territory.

In this Chapter we will examine how – from the perspective of energy dynamics in the European Union – the war has deeply and structurally affected a long standing and apparently resilient relationship with Russia.

In particular, we will illustrate the impact of the war and its consequences on the European gas market and the resulting European policy on natural gas. First of all, a reconstruction of the breakdown of Russian gas supplies to Europe will be conducted, in order to understand the urgent need of the European Union to guarantee security of gas supplies. Secondly, the EU regulations and directives adopted as a response to the energy "insecurity" will be examined, highlighting both their real impacts on gas security and their limits. Finally, the important aspect of diversification from Russian gas will be analysed, focusing on the new investments in renewable energy as possible alternatives.

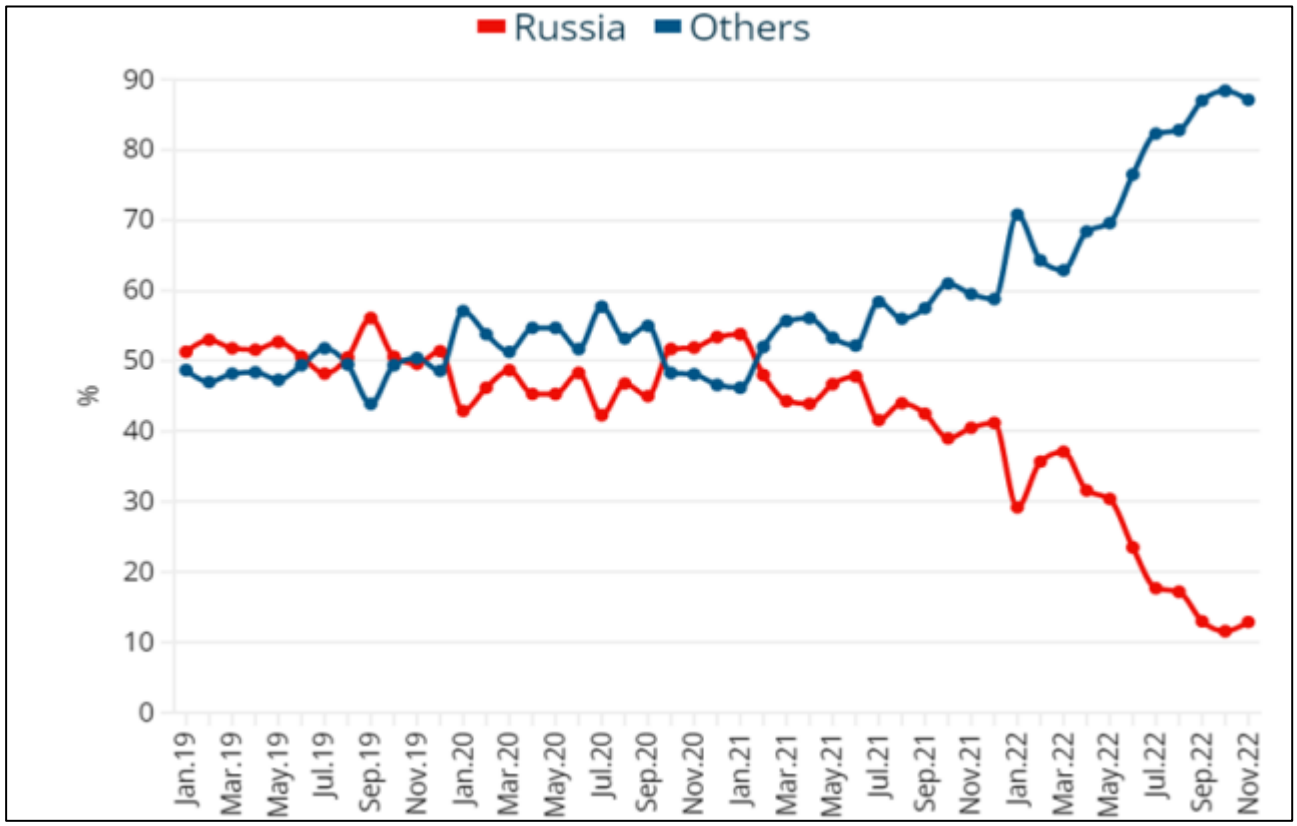
3.1 2022 Russian gas flow reductions

The breakout of the war and the support of the European Union and its Member States to Ukraine led to a significant reduction of Russian gas flows to Europe. In fact, the share of Russian gas in the total of imported gas decreased from 31.3% of the first quarter of 2022 to 9.9% of the last quarter of the same year[73].

Notably, Russian pipeline imports between July and September 2022 were 74% less in comparison to the same period in 2021. In particular, gas through Belarus was 96% less, via Nord Stream 1 -85%, via Ukraine -63%, while through Turkey – via TurkStream pipeline – imports increased by 21%[74] .

[73] "Translate EU Imports of Energy Products - Latest Developments," Eurostat - Statistics Explained, March 2023, https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=EU_imports_of_energy_products_recent_developments&oldid=554503#.
[74] European Commission, Quaterly report on European gas markets, Market Observatory for Energy DG Energy, No. 15, 3, 2023, p. 4

The graph below shows how the European Union gradually shifted away from Russian gas. The decrease of the share of Russian gas on total imported gas began already in 2021, but since the outbreak of the war it declined more sharply. Since June 2022, the share of Russian gas on EU total gas imports is below 20%. In November 2022, it represented only 12.9% of it[75].



Source: Euronews 2023

The dramatic reduction of Russian gas imports and the measures adopted by the European Union in order to face gas shortage in fact led to increasing gas prices and, in particular, of the price of the TTF[76] European gas benchmark.

However, since October 2022, earnings decreased to €130 million a day, mostly because of the significant reduction of gas export to Europe after the damages to Nord Stream 1 and 2, on 26th September 2022[77] and the price progressive decrease from historic heights.

[75] "Infographic - Where Does the EU's Gas Come from?," European Council | Council of the European Union, February 7, 2023, https://www.consilium.europa.eu/en/infographics/eu-gas-supply/.

[76] TTF stands for Title Transfer Facility, based in the Netherlands, and it is the main gas trading platform in the EU.
[77] Alessandro Gili, "Between Transition and Security: The EU's Response to the Energy Crisis," ISPI, November 29, 2022, https://www.ispionline.it/en/publication/between-transition-and-security-eusresponse-energy-crisis-36819.

3.2 Western sanctions and gas payments

Another key element emerging after the Russian invasion of Ukraine on 24th February 2022 has been Western (United States, European Union and other countries) sanctions adopted against Russia.

Immediately after the breakout of the war, the U.S. and the EU began coordinating with the Society for Worldwide Interbank Financial Telecommunication (SWIFT)[78], to understand if it was possible to remove Russian banks from the financial payments service without preventing the country to trade oil and natural gas, thus minimising the negative consequences on Europe and the world[79].

A first series of measures – and "countermeasures" – were adopted between March and April of 2022.

- On 2nd March, the European Union, in coordination with the United States, the United Kingdom and Canada, decided to exclude some key Russian banks from SWIFT.

  The sanction became effective on 12th March 2022.

The President of the European Commission Ursula von der Leyen commented this decisions declaring that: "Today's decision to disconnect key Russian banks from the SWIFT network will send yet another very clear signal to Putin and the Kremlin"[80].

Seven Russian banks were removed from SWIFT system, all connected to the State and to the war effort: VEB, Bank Rossiya Novikombank, Promsvyabank, Bank Otkritie and Russia's second-largest bank VTB. Substantially, the ban prevented them from making international transactions using SWIFT. The banks closely related to energy transactions were not included in the list, being Europe concerned about a possible cut off of energy flows. In particular, Sberbank, Russia's largest lender, and Gazprombank (the bank of the Russian gas pipeline exporter) were not included in the SWIFT system, due to their important role in the transactions for energy exports to Europe.

[78] "What it does is allow banks to send each other instructions on how to transfer funds across borders. With no globally accepted alternative, it is essential plumbing for global finance". Source: Charles Riley, "What Is SWIFT and How Is It Being Used against Russia?," CNN Business, February 28, 2022, https://edition.cnn.com/2022/02/28/business/swift-sanctions-explainer/index.html.

[79] Lili Bayer, Ben Lefebvre, and Alex Ward, "Western Leaders Agree New Russia Sanctions, Including SWIFT Curbs," Politico, February 27, 2022, https://www.politico.eu/article/commission-proposes-newfinancial-sanctions-on-russia/.

[80] "Ukraine: EU Agrees to Exclude Key Russian Banks from SWIFT," European Commission, March 2, 2022, European Commission, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1484.

Polish Prime Minister Mateusz Morawiecki harshly criticised this decisions to exclude them and demanded that "all Russian entities, thanks to which Russia finances the war in Ukraine, be effectively and fully covered by sanctions"[81].

Moreover, G7 countries and European Union governments decided to prevent the Central Bank of Russia to access almost half of its $630 billion worth of foreign currency and gold reserves[82].

These sanctions put in great restraint Russian economy and greatly limited its ability to pay foreign debts, due to the lack of access to foreign currency.

- The Kremlin replied imposing that payments for pipeline gas would switch from dollar and euro to Russian roubles. On 28th March, Putin ordered to the Russian Central Bank, the Government and Gazprom to propose a measure for imposing on unfriendly countries, among which EU Member States, the payments for gas in roubles.

  On 31st March, he adopted the Presidential Decree No. 172, demanding that companies in the list of unfriendly countries use roubles as the currency for gas transactions, starting from 1st April 2022.

  Until the entry into force of this Decree, buyers in the European Union used to deliver their payment in euros to Gazprom through a direct transfer from their accounts in a European bank to Gazprom's designated account in a European bank as well, which acted as correspondent bank for Gazprombank. The payment procedure was considered completed once the transfer to Gazprom's designated account in the European bank was over. The Decree changed this mechanism, adding new intermediate steps. The European buyer had to open two accounts in Gazprombank, one in euros and the other one in roubles, and deliver the payment in euros in the correspondent account. Then, Gazprombank had to convert it into roubles through the Moscow Exchange, to which it would sell euros and buy roubles. The payment is considered completed after this last step is over[83].

The net effects of these measures anyhow did not structurally impede the flows of gas to arrive to Europe, even though – as already commented – at reduced rates.

[81] Philip Blenkinsop, "EU Bars 7 Banks from SWIFT, but Spares Those in Energy," Reuters, March 3, 2022, https://www.reuters.com/business/finance/eu-excludes-seven-russian-banks-swift-officialjournal-2022-03-02/.

[82] Mike Dolan, "Column: Russia Central Bank Freeze May Hasten 'Peak' World FX Reserves" Reuters, March 2, 2022, https://www.reuters.com/markets/europe/russia-central-bank-freeze-mayhasten-peak-world-fx-reserves-mike-dolan-2022-03-02/.

[83] Katja Yafimava, "The EC Guidance on the Russian 'Gas for Roubles' Decree: All Things to All People," The Oxford Institute for Energy Studies, May 2022, 1–6, p. 3.

The main issue from the European Union perspective was to understand whether the new payment procedure was compatible with the sanctions imposed on Russia. Notwithstanding the declarations of some of the representatives of the EU bodies, the Decree did not seem to violate any specific measure of the sanctions. First of all, Gazprombank, as already mentioned, was not included in the March sanction removing the main Russian banks from the SWIFT system. Moreover, no role in the procedure is played by the Russian Central Bank, included in the sanctions. Finally, even though the Decree does not establish a precise timeframe within which the transaction must take place, therefore rising the perception that payments from the European gas companies could be considered a short-term loan, not allowed by sanctions, it does not really envisage payments as loans[84].

At first, EU governments seemed primarily relieved by the mechanism proposed by the Decree. For instance, the Italian Minister for the Energy Transition of the time, Roberto Cingolani, said: “If things remain like this, not a lot will change…Putin could show that the Europeans are paying in roubles and Europe could pay in euros”[85].

However, shortly after, the Netherlands advised companies not to sign new contracts with Gazprom and a spokesperson for the Ministry of Economic Affairs and Climate Policy declared that “We informed [Dutch companies] that the Commission and Council assessment concluded that the rouble payment system is illegal and therefore companies can’t sign contracts”[86].

Germany as well warned companies not to agree to Russian demands and German Minister for Economic Affairs and Climate Action, Robert Habeck, in an interview declared that “there is an expert opinion that says that this second bank account, which is to be set up, would be a way of circumventing the sanctions” and that they “cannot allow any circumvention of the sanctions through the back doors”[87].

In a guidance published on 22nd April, the European Commission answered to frequently asked questions about the Decree No. 172 and its compatibility with obligations upon Member States arising from the sanctions imposed on Russia. In the guidance, the Commission expresses its “preference” that Member States follow the old payment procedure, for example by inviting them to consider applying for derogations, granted under the Decree[88].

[84] Yafimava, “The EC guidance on the Russian ‘gas for roubles’ decree: all things to all people”, p. 3.

[85] Stephen Jawkes and Francesca Landini, “Russia Gas Payment Decree Does Not Change Much – Italy Minister,” Reuters, April 1, 2022, https://www.reuters.com/business/energy/russia-gas-payment-decreedoes-not-change-much-italy-minister-2022-04-01/.
[86] Paola Tamma, Leonie Kijewski, and Hans von der Burchard, “Brussels Warns EU Countries That Ruble Gas Payments May Breach Sanctions,” Politico, April 14, 2022, https://www.politico.eu/article/brussels-warns-eu-countries-that-ruble-gas-payments-may-breachsanctions/.

[87] Ibidem.
[88] Yafimava, “The EC guidance on the Russian ‘gas for roubles’ decree: all things to all people”, p. 5.

However, the Commission did not exclude explicitly the compatibility of the Decree with the sanctions and recognised that "The existing sanctions do not prohibit engagement with Gazprom or Gazprombank" and that "they do not prohibit opening an account with Gazprombank"[89]. It did not specify, however, whether the opening of an account in roubles with Gazprombank was allowed or not. However, on 28th April, the EC chief spokesperson, Eric Mamer declared that it "cannot accept" that "companies are obliged to open a second account in roubles and that the payment is complete only when payment is converted in roubles" and that the new payment procedure was a "circumvention" of the sanctions imposed by the EU to Russia[90].

Finally, the guidance identified two main critical issues which could make the Decree incompatible with EU sanctions: the possible intermediary role of the Central Bank of Russia (CBR) and the lack of the definition of a time limit for the new payment method. In the first case, as already mentioned, the Decree does not envisage any role for CBR. Moreover, on 4th May 2022, another presidential decree was adopted by the Kremlin and clarified that the currency conversion would be carried out by the National Clearing Centre, owned by the Moscow Exchange, therefore excluding the involvement of the CBR[91].

As one can see, the situation was not clear at all and Member States were on their own in the decision of what to do, whether to prohibit to their companies to abide by the new payment procedure or to allow it. Contractual deadlines came up in the end of April and May, therefore making the issue urgent.

In the first 9 months of 2022, eleven Member States issued early warning notices, while Germany declared alert level under its gas emergency plan, under Regulation (EU) 2017/1938. The German government explained its decision by linking it to the announcement of the Kremlin of the Decree which would be adopted in the following day and that it constituted "a breach of the private supply contracts"[92], and as a consequence of the early warning, in Germany "every gas consumer" was "required to reduce their consumption as much as possible"[93].

The first significant consequence of the Presidential Decree issued by Putin which imposed the new natural gas payment procedure happened on 26th April 2022, when Gazprom announced the complete stop of gas deliveries to Poland via the YamalEurope and to Bulgaria from the following day. In fact, as a consequence of the refusal from both Poland and Bulgaria to pay in roubles, Russia decided to suspend gas supplies from 27th April, "until the payments are made according to the procedure

[89] European Commission, "Frequently asked questions on gas imports concerning sanctions adopted following Russian invasion of Ukraine", April 2022.

[90] Yafimava, "The EC guidance on the Russian 'gas for roubles' decree: all things to all people", p. 5.
[91] Ivi, p.4.
[92] Nikolaus J. Kurmayer, "Germany Declares 'Early Warning' on Gas Supplies," Euractiv, March 30, 2022, https://www.euractiv.com/section/energy/news/germany-declares-early-warning-on-gassupplies/.
[93] Ibidem.

outlined in the Decree"[94]. PGNiG, the Polish gas utility, declared that the decision had no contractual basis, while Polish Prime Minister Mateusz Morawiecki considered the halt to gas deliveries as a "direct attack on Poland"[95]. Bulgarian Minister of Energy Alexander Nikolov explained that the two-stage payment procedure was not clear enough and that it would leave the entire control of the operation to Russian hands. He added that "obviously, natural gas is used as a political and economic weapon, from a legal and trade point of view, the Bulgarian side has no violation"[96].

Finally, the unilateral decision by Gazprom was strongly criticised by the Commission President Ursula von der Leyen, who highlighted the "unreliability of Russia as a gas supplier" and called that decision as "an instrument of blackmail". Moreover, she called for coordination and solidarity between Member States[97].

As a consequence of the decision by Russia to cut off gas supply to Poland and Bulgaria, gas prices of the EU benchmark TTF trading hub on 27th April in the morning jumped to 125 €/MWh and then stabilised on 108 €/MWh[98].

3.3 The Nord Stream pipeline case

Despite the cut off of gas deliveries to Poland and Bulgaria, gas destined for other customers continued to transit through pipelines. Both Polish and Bulgarian authorities expressed their preparedness to face the stop of Russian gas imports. Polish Climate and Environment Minister Anna Moskwa declared that Poland had gas storage at 80% and the necessary gas reserves and sources of supply to meet gas demand. Moreover, the country would continue to buy gas on the European and international markets. On the Bulgarian side, which at the time of the halt imported 90% of its gas from Russia, authorities declared that there was no need to restrict gas consumption in the country[99].

On 11th May, Ukraine's state-owned gas grid operator GTSOU suspended gas flows through the Sokhranovka transit point, which processed 32.6 mcm/day, equal to 8% of Russian gas supply to Europe. It was the first interruption of Russian gas flowing

[94] "Gazprom Fully Suspends Gas Supplies to Bulgaria, Poland Due to Failure to Pay in Roubles," TASS, April 27, 2022, https://tass.com/economy/1443811.
[95] America Hernandez and Zosia Wanat, "Russia Halts Gas Shipments to Poland and Bulgaria," Politico, April 26, 2022, https://www.politico.eu/article/poland-russia-gas-europe-halt-shipments-ukraine-war/.
[96] "Bulgarian Ministry of Energy: We Have Enough Gas for a Sufficiently Foreseeable Period," Novinite.com - Sofia News Agency, April 27, 2022, https://www.novinite.com/articles/214883/Bulgarian+Ministry+of+Energy%3A+We+have+Enough+Gas+for+a+Sufficiently+Foreseeable+Period.

[97] "Statement by Commission President von Der Leyen Following the Announcement by Gazprom on the Disruption of Gas Deliveries to Certain EU Member States," April 27, 2022, European Commission, https://ec.europa.eu/commission/presscorner/detail/en/statement_22_2682.
[98] Ibidem.
[99] Hernandez and Wanat, "Russia halts gas shipments to Poland and Bulgaria".

through Ukraine since the outbreak of the Ukrainian war. As a consequence of the interruption, Russian gas destined for Europe declined by 25%. The decision to stop the use of the Sokhranovka transit point was justified by Kyiv as due to "interference by the occupying forces"[100]: since the pipeline passing through Sokhranovka runs through Lunhansk, one of the two separatist regions, Kyiv accused Russia of closing two valves in the gas network in the territory under its control. GTSOU proposed to divert gas flows to Europe to the Sudhza entry point, which is located north-west of the country. Gazprom declared it not technically feasible. The halt to Russian gas supplies through the Sokhranovka transit point caused a new peak in gas prices: Europe's benchmark TTF gas price reached 100€/MWh on 11th May. At that point, gas price was 250% higher than in the same period in 2021. The following day, on 12th May, gas flows through Sudzha transit point declined to 53 mcm/day from 70 mcm/day of the day before. However, the European Commission did not consider the Ukrainian halt of Russian gas as an immediate emergency[101].

Gazprom subsidiaries subject to the sanctions operated mostly in countries which had already imposed sanctions on Russia as a consequence of the invasion of Ukraine, such as Italy, Germany, Poland, France and Austria. YamalEurope pipeline was one of the major routes for Russian gas destined for Europe and Gazprom subsidies in Europe were significantly involved in the European gas market and in the delivery of gas to industries and households[102]. Russia made clear that it was not allowed to make deals and to export products or raw materials to companies included in the sanction list. This decision was explained to be a reaction to sanctions from the United States and its allies against Russia[103].

Gazprom declared that "a ban on transactions and payments to entities under sanctions has been implemented. For Gazprom, this means a ban on the use of a gas pipeline owned by EuRoPol Gaz to transport Russian gas through Poland"[104]. Consequently, Gazprom completely suspended gas deliveries through Yamal-Europe pipeline[105].

[100] Anna Cooban, "Europe Is Running out of Time to Find Alternatives to Russian Gas," CNN Business, May 12, 2022, https://edition.cnn.com/2022/05/12/energy/russian-gas-ukraine-europe/index.html.
[101] "Europe Faces Gas Supply Disruption after Russia Imposes Sanctions," Aljazeera, May 12, 2022, https://www.aljazeera.com/news/2022/5/12/europes-gas-supply-crisis-grows-after-russia-imposessanctions.
[102] Georgi Gotev, "Russia Puts Sanctions on Gazprom Subisidiaries in Europe," Euractiv, May 12, 2022, https://www.euractiv.com/section/global-europe/news/russia-puts-sanctions-on-gazprom-subsidiariesin-europe/.
[103] Ibidem.
[104] "Europe Faces Gas Supply Disruption after Russia Imposes Sanctions," Aljazeera, May 12, 2022, https://www.aljazeera.com/news/2022/5/12/europes-gas-supply-crisis-grows-after-russia-imposessanctions#:~:text=Europe%20is%20facing%20increased%20pressure,transit%20route%2C%20pushing%20prices%20higher.
[105] Anna Cooban, "Europe is running out of time to find alternatives".

On 20th May, Gasum, the Finnish state-owned gas wholesaler, issued a communication declaring that Gazprom informed them that from the following day, on 21st May, gas supplies to Finland would be cut off[106]. Russia decided to halt flows of natural gas to Finland after Gasum refusal to pay in roubles.

Since June 2022, Gazprom gradually halted gas flows through Nord Stream 1, due to, according to official statements, maintenance issues. On 15th June, Gazprom announced a cut to gas supplies through the pipeline, bringing Nord Stream 1 flows at just 40% capacity, meaning 67 mcm/day. The Russian company at first blamed delays in getting Siemens Energy equipment from Canada, where it was under maintenance, but German energy regulator disproved it. German Minister for Economic Affairs and Climate Action Robert Habeck declared that “the Russian side’s argument is simply a pretext. It is obviously a strategy to unsettle and raise prices”[107].

Following the cut off of gas flows through Nord Stream 1 pipeline, on 23rd June Germany triggered the “alarm stage”, the second crisis level in its emergency gas plan, after having triggered the first level, the “early warning”, on 30th March. According to the Emergency Plan for Gas for the Federal Republic of Germany, pursuant to Art. 8 of Regulation (EU) 2017/1938, the alert level is triggered when one or more of the following indicators occur: “absence/lack/serious reduction of gas flow at key physical entry points; long-lasting very low storage levels; shutdown of important sources of supply; lengthy technical failure of major infrastructure with the possibility of alternative supply; extreme weather conditions coupled with very high demand; high risk of long-term shortage; request for solidarity to Germany”[108].

In the period 11 - 21st July 2022, Nord Stream 1 shut down for maintenance, as it was previously announced and after ten days gas flow started again, but only at 20% of capacity, for which Kremlin blamed Germany. In particular, according to Moscow, Germany failed to return important equipment due to the sanctions against Russia[109], and at the end of August, Gazprom again shut down Nord Stream 1 for technical issues, but it is largely considered that it was a way to raise gas prices and to exert

[106] “Natural Gas Imports from Russia under Gasum’s Supply Contract Will Be Halted on Saturday 21 May at 07.00,” Gasum, May 20, 2022, https://www.gasum.com/en/About-gasum/for-themedia/News/2022/natural-gas-imports-from-russia-under-gasums-supply-contract-will-be-halted-onsaturday-21-may-at-07.00/.
[107] Madeline Chambers and Christoph Steitz, “Nord Stream 1 Gas Supply Cut Aimed at Sowing Uncertainty, Germany Warns,” Reuters, June 15, 2022, https://www.reuters.com/business/energy/german-minister-accuses-russia-finding-excuse-cut-nordstream-1-gas-2022-06-15/.
[108] Federal Ministry for Economic Affairs and Energy of the Federal Republic of Germany, “Emergency Plan for Gas for the Federal Republic of Germany”, September 2019, section 6.3.2.
[109] Kate Connolly, ““Nord Stream 1: Russia Switches off Gas Pipeline Citing Maintenance,” The Guardian, August 31, 2022, https://www.theguardian.com/business/2022/aug/31/nord-stream-1-russiaswitches-off-gas-pipeline-citing-maintenance.

pressure on European countries, as it was noted that a stop had come after G7 countries had agreed on how to put a cap on Russian oil price.

Lastly, on 26th September 2022, both Nord Stream 1 and 2 were hit by explosions and suffered a complete rupture: even though Nord Stream 1 was operating at reduced capacity and Nord Stream 2 was not active but contained a certain amount of gas, the leaks of gas due to the blasts caused "the worst release of methane in history" and a consequent huge environmental damage[110]. It has to be noted that both explosions occurred in the economic zones of Denmark and Sweden respectively, thus it was considered an act of sabotage, not an accident.

As direct consequence of the sabotage, the only pipelines carrying Russian gas to Europe that remained into operation are the one running through Ukraine, via the Sudhza transit point, and Turkstream.

4 EU response to the energy crisis

As seen in the previous chapter, the European Union from the beginning took a firm stance against Russia, condemning its aggression against Ukraine, and faced the subsequent threat to the energy, and specifically gas, supply. Through the adoption of exceptional measures, the Union bodies tackled the gas crisis with a multilateral approach, taking into consideration storage levels, demand reduction, rising prices and need to boost energy efficiency and promote the use of renewable sources of energy.

Diversification of gas supplies also became a pillar of the European Union strategy to guarantee the security of supply.

On 1st March 2022, the European Parliament in a special plenary session called for the reduction of the European Union energy dependence on Russia. In particular, it called "for the import of the most important Russian export goods, including oil and gas, to be restricted"[111]. In this resolution the European Parliament calls for the end of gas dependence on Russia, to be achieved through different, but complementary strategies, such as diversification of gas sources, increase of LNG supply and acceleration of the clean energy transition.

On 3rd March 2022, the European Commission and the International Energy Agency presented a joint plan, the "10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas", to be implemented in 2022. In order to reduce gas dependence on Russia, the plan proposed ten goals to be pursued: among them, not to sign new gas supply contracts with Russia; to diversify away from Russian gas through alternative gas sources; to set a minimum gas storage obligation; to increase the share of

[110] Matthew Lee, "A Global Mystery: What's Known about Nord Stream Explosions," Associated Press, March 9, 2023, https://apnews.com/article/us-germany-russia-denmark-ukraine-gas-pipeline-attacknord-stream-2561f98ba6462db700f7609352a28c24.
[111] European Parliament resolution of 1 March 2022 on the Russian aggression against Ukraine (2022/2564(RSP)) [2022] OJ C 125/2, art. 17

renewable sources in the energy mix and of low-emission sources, such as bioenergy and nuclear; to enact short-term measures to shelter vulnerable electricity consumers from high prices; to speed up the replacement of gas boilers with heat pumps; to promote energy efficiency and decarbonization efforts. According to the International Energy Agency, the implementation of these measures could have reduced gas imports from Russia by over 30%. Moreover, this Plan was said to be consistent with the EU climate goals and the Green Deal, as well as with the IEA Net Zero Emissions by 2050 Roadmap[112].

On 10 - 11th March 2022, the 27 European Union Heads of State or Government issued the Versailles Declaration, in which they demanded Russia to withdraw “immediately and unconditionally” from Ukraine and agreed on the need for the EU to become independent from Russian gas, oil and coal. In the document, the States identified several actions to achieve this goal: “accelerating the reduction of our overall reliance on fossil fuels”; “diversifying our supplies and routes including through the use of LNG and the development of biogas”; “further developing a hydrogen market for Europe”; “speeding up the development of renewables and the production of their key components”; “completing and improving the interconnections of European gas and electricity networks”; “reinforcing EU contingency planning for security of supply”; “improving energy efficiency and the management of energy consumption”[113].

On 18th May 2022, the European Commission issued a Communication and presented the REPowerEU Plan, as a response to the double challenge that 2022 presented to Europe: ending of the EU’s dependence on Russian fossil fuels and mitigation of climate change. The Plan is based on three main pillars: energy savings, diversification of energy supplies and acceleration of fossil fuels replacement with renewable sources of energy.

Regarding energy savings, the Commission proposed to increase the energy efficiency target by 2030 from 9%, identified by the Energy Efficiency Target under the “Fit for 55” package, to 13%.

The second pillar is diversification of supplies: to this aim, on the same day the Commission adopted a Communication on the “EU external energy engagement in a changing world”. According to the Commission, the EU external energy policy should have aimed at 1) strengthening its energy security, 2) accelerating the green energy transition, and 3) supporting Ukraine and the countries affected by the Russian invasion at building of long-lasting international partnerships.

[112] Iea, “A 10-Point Plan to Reduce the European Union’s Reliance on Russian Natural Gas – Analysis,” IEA, March 3, 2022, https://www.iea.org/reports/a-10-point-plan-to-reduce-the-european-unionsreliance-on-russian-natural-gas
[113] European Council, “Versailles Declaration”, Informal meeting of the Heads of State or Government, March 2022.

Finally, the third pillar of the REPowerEU plan is the acceleration of renewable energy share in power generation, industry, buildings and transport, both in compliance with EU climate goals and with the aim of achieving its energy independence.

Therefore, the Commission proposed to increase the target by 2030 under the “Fit for 55” package of the share of renewable sources of energy in the EU energy mix from 40% to 45%.

The Commission calculated that pursuing the REPowerEU Plan would require an additional investment of €210 billion between the 2022 and 2027, which could be supported by the Recovery and Resilience Facility (RRF).

While the above measures require time and investments to deploy their potential effects, the EU also implemented some more short-term actions to reduce the impact of the reduction of gas flows from Russia and their consequences for the European consumers. For this purpose, the next sections will go over the solutions proposed to tackle the lack of energy in Europe.

4.1 Gas storage in Europe

The legislators recognised that high gas prices, as a result of the war, could lower the incentives to fill underground gas storage facilities[114], undermining gas security of supply.

For this reason, on the basis of the Commission and the Gas Coordination Group[115]’s analysis on the reinforced risk preparedness at the Union level and the Commission analysis on the adequacy of measures to secure gas supply, Regulation 2022/1032 envisages an obligation upon Member States to ensure that underground gas storage facilities are filled at, at least, 90% of their capacity by 1st November of every year, with intermediate targets in May, July, September and February.

[114] Gas storage is normally used in Europe to cope with seasonal demand variations but it can accommodate also for emergency supplies. In the case of Italy, there is an explicit part of storage devoted to “strategic stocks” to be available under emergency conditions.
[115] The Gas Coordination Group was set up with the first EU Regulation on Security of Gas Supply (n.994/2010) and is the “adviser to the Commission to facilitate the coordination of security of supply measures in the event of a Union or regional emergency”; https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&do=groupDetail.groupDetail&groupID=1096

The Regulation envisaged a solidarity mechanism as well: “to share the burden sharing of ensuring that underground gas storage facilities in the Union are sufficiently filled to safeguard the security of gas supply, in a spirit of solidarity, Member States without underground gas storage facilities should use underground gas storage facilities in other member States”[116].

4.2 Demand reduction

Demand reduction, alongside filling gas storage, before the upcoming winter period of 2022/2023 was considered a key priority by the European Union in order to ensure security of gas supply and avoid excessively high gas prices. However, differently from gas storage, demand reduction does not depend only on Member State measures, but on the actions of all consumers and market participants.

Taking into consideration this aspect, the European Commission, in May 2022, adopted the Save Energy plan, encouraging both voluntary actions individuals can adopt to save energy and structural measures Member States may pursue to reduce gas (and oil) demand by increasing energy efficiency.

In relation to the first strategy, the Commission identified some personal choices consumers and market participants could make in order to achieve immediate energy savings, mainly related to the residential and household sector, considering that natural gas contributes to 42% of the energy used for space heating. Moreover, attention has been given to saving electricity as well, since gas is also used for power generation. Member States can have the role of providing for support actions, mainly divided in two categories: information actions, e.g. making energy users understand what they can do and why it is important to reduce energy consumption; incitement and supporting actions, e.g. concrete support to energy users through incentives and other instruments. Some of the gas-related measures proposed by this plan are: “savings from turning down heating”, “providing information about keeping condensing boiler temperatures below 60 degrees”, “information about servicing boilers, simple insulation measures” and “consider modifying the energy pricing and introduce progressive tariff structures”[117].

Finally, it proposed to increase to 13% by 2030 the binding target set in the Energy Efficiency Directive, up from the current 9%. On 10th March 2023, the Council and the Parliament reached a provisional agreement for the amendment of the Directive. In particular, they agreed upon setting a new target: Member States must collectively reduce final consumption at EU level by at

[116] Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage [2022] OJ L 173/17, p. 4.
[117] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions “EU Save Energy”, COM (2022) 240 final, [2022], p.4.

least 11.7% by 2030, compared with the 2030 energy consumption forecasts estimated in 2020. The provisional agreement also set a gradual increase of the annual energy saving targets between 2024 and 2030: each year Member States must save 1.49% of final energy on average and reach 1.9% on 31st December 2030[118].

On 5th August 2022, the Council of the European Union adopted Council Regulation (EU) 2022/1369 on coordinated demand-reduction measures for gas. The Council accused Russia to use gas supply as a "political weapon" and noted gas deliveries from Russia have been reduced to less than 30% than the average gas deliveries in the period 2016-2021. The decrease in Russian gas imports led to high energy prices. The Council highlighted the need as well to prepare "for the possibility of a full disruption of gas supply from Russia at any moment"[119].

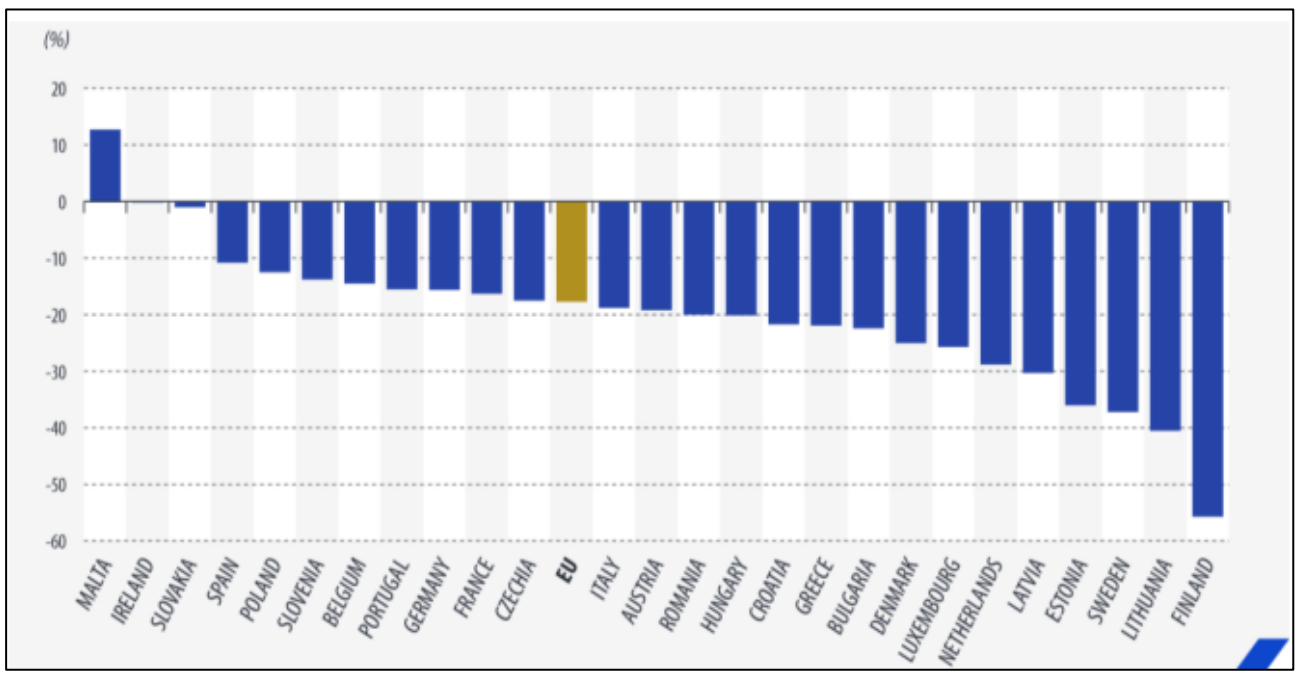
Thanks to these policies, in the period August 2022 – March 2023, gas consumption decreased by 17.7% in comparison to the average of the same period in the years 2017-2022[120].

As noted by the graph below, most of EU Member States achieved the 15% gas consumption reduction, with the only exception of Belgium (-14.5%), Slovenia (-13.8%), Poland (-12.5%), Spain (-10.8%), Slovakia (-1.0%), Ireland (-0.2%) and Malta (recording an increase but with very low volumes and not supplied via pipeline).

[118] "Council and Parliament Strike Deal on Energy Efficiency Directive," March 10, 2023, Council of the EU, https://www.consilium.europa.eu/en/press/press-releases/2023/03/10/council-and-parliamentstrike-deal-on-energy-efficiencydirective/#:~:text=The%20Council%20and%20Parliament%20agreed%20to%20a%20gradual%20increase%20of,1.9%25%20on%2031%20December%202030.

[119] Council Regulation (EU) 2022/1369 of 5 August 2022 on coordinated demand-reduction measures for gas [2022] OJ L 206/1.

[120] "EU Gas Consumption Decreased by 17.7%," EU gas consumption decreased by 17.7% - Products Eurostat News - Eurostat, April 19, 2023, https://ec.europa.eu/eurostat/web/products-eurostatnews/w/DDN-20230419-1.



Source: Eurostat 2023

While milder winter temperatures contributed to the overachievement of the 15% target for the reduction of gas consumption, policy-driven changes have been crucial. Moreover, some weather anomalies caused an increase in gas demand in some sectors: in Southern Europe low levels of rainfall led to a crisis of the hydropower sector and a surge of gas-fired power. Finally, high prices, as already mentioned, significantly contributed to reducing gas demand, most notably in gas-intensive industrial sectors[121].

As a whole, the power sector was the only one that increased gas demand in comparison to 2021, with some exceptions. Policy support in the renewable sector led to the installation of 50 GW of wind and solar plants in the EU during 2022, which could meet the equivalent of 11 bcm of natural gas in the power sector. On the other hand, the nuclear and hydropower sector registered a declined in energy output, which led to an increase demand for gas-fired power and to a net increase of gas consumption in the power sector. Finally, in the European Union in 2022 there was a decrease in electricity demand by 3%, meaning a 14 bcm reduction in gas demand for this sector[122].

[121] Peter Zeniewski, Paul Hugues, and Gergely Molnar, "Europe's Energy Crisis: What Factors Drove the Record Fall in Natural Gas Demand in 2022? – Analysis," IEA, March 14, 2023, https://www.iea.org/commentaries/europe-s-energy-crisis-what-factors-drove-the-record-fall-innatural-gas-demand-in-2022.
[122] Ibidem.

4.3 Market regulation

Gas prices during 2022 were very volatile and reach historically high peaks, with the record one in August of €343 MWh.

Within the European Union there has been a strong debate on the necessity, on one hand, to prevent speculations and to protect consumers and industries from such high prices, and, on the other, to avoid a significant distortion of the functioning of the European gas (and electricity) markets.

In December 2022, to this aim, two Regulations were adopted: Council Regulation (EU) 2022/2576 of 19th December 2022, which established a joint gas purchasing mechanism and measures to avoid excessive price volatility, and Council Regulation (EU) 2022/2578 of 22nd December 2022, which established a "new market mechanism" to put a cap on very high gas prices.

Regulation 2022/2576 not only laid down the legal framework for the EU Energy Platform and regulated the joint gas purchasing mechanism, but also dealt with pricing as well.

In fact, the Council recognised how the "weaponization of the gas supply and the Russian Federation's manipulation of the markets through international disruptions of gas flows have led to skyrocketing energy prices in the Union"[123]. The EU Energy Platform is envisaged as an instrument to increase to security of supply and to lower import prices of gas purchased at the global market, but cannot deal with intra-day volatility of gas prices.

For this reason, the Council established a mechanism "to ensure that operators essential for the security of the energy supply in all Member States benefit from safeguards against large price movements that are detrimental to the continued operation of their business, which would also be detrimental to the end consumers"[124]. To this end, Article 15 of the Regulation mandated that, no later than 31st January 2023, each trading venue had to identify price boundaries (upper and lower ones), above and below which orders cannot be executed.

Finally, this Regulation regulates LNG price assessment as well. In fact, the Council recognised that the European Union needs to diversify its gas supplies and that LNG additional supply is one of the main instruments. However, the LNG price formation is

[123] Council Regulation (EU) 2022/2576 of 19 December 2022 enhancing solidarity through better coordination of gas purchases, reliable price benchmarks and exchanges of gas across borders [2022] OJ L 335/1.
[124] Council Regulation (EU) 2022/2576 of 19 December 2022 enhancing solidarity through better coordination of gas purchases, reliable price benchmarks and exchanges of gas across borders [2022] OJ L 335/1.

relatively different from piped gas traded at “hubs” and therefore it is “difficult to assess the accuracy of prices that prevail in this marketplace”[125].

For this reason, the Regulation, in Article 8, gives the mandate to the European Union Agency for the Cooperation of Energy Regulators (ACER) to produce a daily LNG price assessment starting non later that 13th January 2023 and, starting on 31st March 2023, to “publish a daily LNG benchmark determined by the spread between the daily LNG price assessment and the settlement price for the TTF Gas Futures front-month contract established by ICE Endex Markets B.V”[126,127].

4.4 Faster development of renewable energy

Renewable sources of energy have the strategic role of contributing to the mitigation of climate change and to the improvement of energy security, enabling Europe to phase-out fossil fuels, the majority of which is imported. For both reasons, in the REPowerEU Communication, published on 18th May 2022, the Commission proposed to increase the target by 2030 under the “Fit for 55” package of the share of renewable sources of energy in the EU energy mix from 40% to 45%, even though the legally binding target for 2030 was still 32%, as set by the Directive (EU) 2018/2001, which revised Directive 2009/28/EC.

On 22nd December 2022, Council Regulation (EU) 2022/2577 was adopted, laying down a framework to accelerate the deployment of renewable energy, recognising the important role of renewables in counteracting the “weaponization” of natural gas by Russia.

In particular, it defined the “planning, construction and operation of plants and installations for the production of energy from renewable sources, and their connection to the grid, the related grid itself and storage assets” as “overriding public interest and serving public health and safety when balancing legal interests in the individual case”[128]. Moreover, it allows Member States to accelerate the approval of renewable projects introducing exemptions from some compulsory assessments required by the EU

[125] Ibidem.
[126] Council Regulation (EU) 2022/2576, art. 18.
[127] https://aegis.acer.europa.eu/terminal/price_assessments
[128] Council Regulation (EU) 2022/2577 of 22 December 2022 laying down a framework to accelerate the deployment of renewable energy [2022] OJ L 335/36, art. 3.

environmental legislation. In particular, the exemptions can be granted to if two conditions are met: in the case that “the project is located in a dedicated renewable or grid area” and if “the area has been subjected to a strategic environmental assessment”[129].

4.5 Reforms and limitations

EU Regulation 1938/2017 introduced a solidarity mechanism that envisaged a reduction of gas supply to customers of a Member States, except for solidarity-protected customers, in case another Member State, connected to the first one, is unable to provide natural gas to its protected customers, declares a national emergency and requests the activation of the solidarity mechanism.

To this aim, the Regulation required the conclusion of bilateral agreements between Member States, which had to laid down the specific technical and financial measures for the implementation of this mechanism, by 31st December 2018.

As of September 2023 however, only six such agreements have been concluded, for a total of nine Member States taking part in the mechanism, making this strategy quite ineffective in the long run, mostly due to poor incentives for the States who should provide the support to third countries.

In December 2022, to avoid that the lack of bilateral agreements undermines the effectiveness of the important solidarity mechanism, the Council adopted Council Regulation (EU) 2022/2576, which, beside establishing a better coordination purchasing mechanism and price benchmarks, introduced in Article 27 default rules for solidarity measures in absence of bilateral agreements. It enables the triggering of the solidarity mechanism without the need of a pre-existent agreement between Member States, which, if in place, prevails on the default rules. Article 23, moreover, envisages the enforcement of solidarity measures also in case of threats to critical gas volumes for security of supply of electricity. Finally, Article 26 extends the obligation to provide solidarity measures to Member States with LNG facilities as well, “provided the necessary capacity in the relevant infrastructure, including the LNG vessels and carriers, is available”[130].

However, despite the strengthening of the solidarity mechanism, its actual applicability and effectiveness is undermined, among other technical matters, by the topology of the European Union natural gas network and LNG facilities. The gas network does not allow for significant west-east flows, and the most vulnerable countries to Russian supplies disruption are Eastern and Central

[129] Ivi, art.6.
[130] Council Regulation (EU) 2022/2576 of 19 December 2022 enhancing solidarity through better coordination of gas purchases, reliable price benchmarks and exchanges of gas across borders [2022] OJ L 335/1, art. 26.

European Member States with no direct access to LNG. Consequently, these countries cannot rely completely on Western European Member States' support and need to count on each other for the sharing of their gas, when possible. However, thanks to the extension of the obligation to provide solidarity measures to Member States with LNG facilities, and considered that Hungary, Czechia, Austria, Slovakia (land-locked countries) could theoretically access other countries' LNG imports terminal capacities, therefore softening the aforementioned limits, the implementation of this mechanism would have a "positive non-negligible impact"[131].

4.6 Diversification of natural gas supply

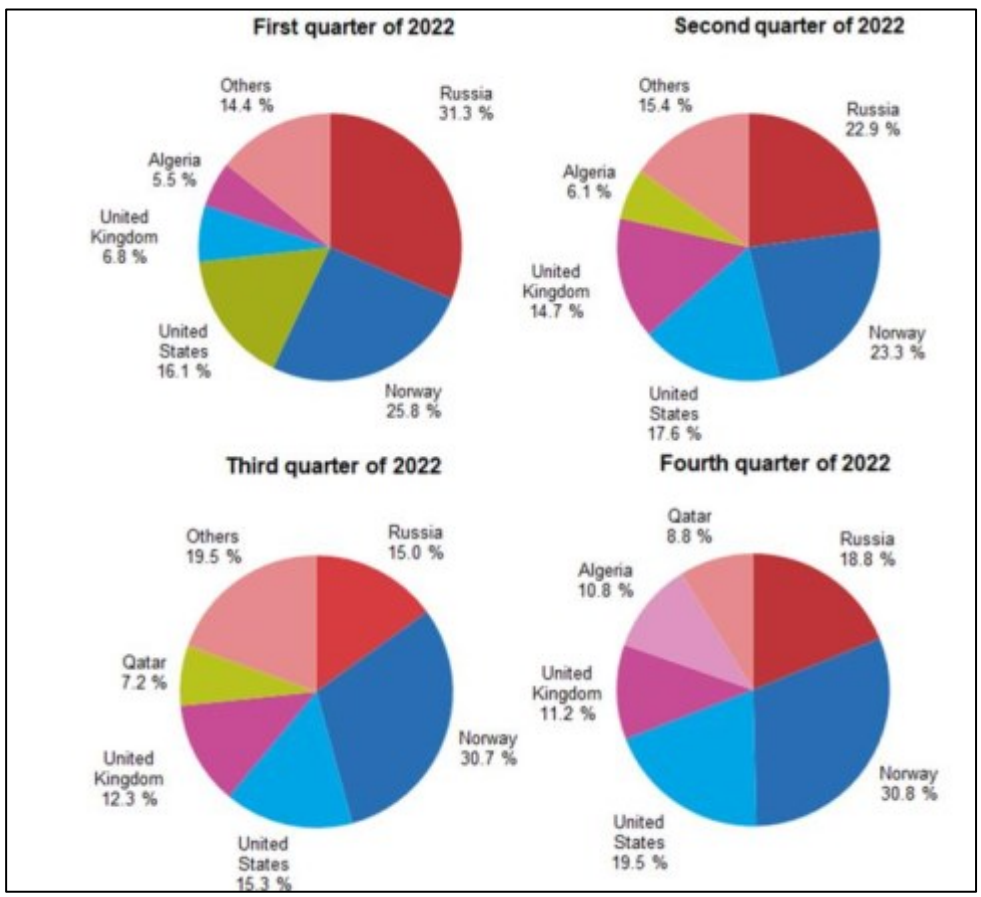
Diversification is the other key explanation for the successful management of winter 2022/2023 for what concerns security of gas supply in the European Union. As expressed by the European Commission in the REPowerEU, the third pillar to face the energy crisis, alongside energy saving and acceleration of renewables, is diversification of energy supplies, in this case of natural gas. As observed in Chapter 1, Europe has been always reliant for its vast majority of imports on a small number of natural gas suppliers, namely the Russian Federation (and before, the Soviet Union), Algeria, Norway and Libya.

Due to this, and also to the fact that Russia was the main gas provider at the eve of the conflict (with 41% of total share of natural gas imports), the need to diversify gas suppliers became a key priority.

As shown in the figure below, Russia was the largest supplier of natural gas to the European Union in the first quarter of 2022, with a share of 31.3% of trade in value. While Norway (with 25.8%) kept a stable role, already in this period United States LNG flows reached a very significant contribution with 16.1%.

During the second quarter of 2022 (April-June) the picture changed considerably: Russian share decreased to 22.9%, surpassed by Norway which represented 23.3% of total extra-EU imports. Finally, during the fourth quarter of 2022, the contributions of main extra-EU natural gas suppliers were: Norway (30.8%), United States (19.5%), Russia (18.8%), United Kingdom (11.2%), Algeria (10.8%), and Qatar (8.8%).

[131] K. Yafimava, "EU solidarity at a time of gas crisis: even with a will the way still looks difficult", p. 24.



Source: Eurostat 2023

Overall, between January and November 2022, Russian total gas imports decreased by 64 bcm in comparison to 2021: pipeline gas imports decreased by 69 bcm, but LNG increased by 4.5 bcm during the same months[132].

LNG incremental imports were crucial to handle the crisis. The European Union (even though it could be better said, European Member States) adopted a twofold approach: on one side trying to increase the sourcing of new volumes and, on the other hand, through the fast-tracking of new import terminals.

As shown, The largest LNG exporters to the European Union were the United States and Qatar, while also Norway has improved its role as an important LNG supplier as well[133]. We have also seen that LNG from Russia has increased notwithstanding the ongoing confrontation.

[132] Market Observatory for Energy of the European Commission, Quarterly report on European gas markets, p. 4.
[133] "Liquefied Natural Gas," European Commission - Energy, accessed June 17, 2024, https://energy.ec.europa.eu/topics/oil-gas-and-coal/liquefied-natural-gas_en.

The development of new LNG contracts and the strengthening of already-in-place contracts with reliable LNG suppliers allows, from the European point of view, was a clear way to reconcile two important sides of the current EU energy policy: security of energy supply and decarbonisation of the EU economy to achieve carbon neutrality by 2050. LNG, as already mentioned, is more flexible and does not require necessarily signing of long-term contracts as in the case of pipeline gas (given its greater flexibility from existing exporting terminals)[134]. Therefore, Member States and the European Union could, in the short term, focus on improving gas supply and, at the same time, not jeopardise their climate targets by committing to long-term gas contracts.

However, as mentioned, the distribution of LNG import terminals in the EU is highly uneven, with the main bulk of LNG regasification facilities being in Spain and North-Western Europe (UK and France).

For this reason, throughout 2022, many EU Member States sought to build new LNG facilities, in particular floating storage and regasification units (FSRUs), which are specialised ships or offshore vessels with regasification capacity.

FSRUs are offshore facilities and became very popular in the last two decades, especially in developing countries, as they are cheaper to build than onshore units, quicker to enter into operation and more flexible in terms of timing[135]:

New FSRUs have been deployed and are under construction in Germany (which had no LNG regasification capacity till 2022), Italy, the Netherlands, among others.

Thanks to new FSRUs, European LNG capacity is expected to grow by one third by the end of 2024[136].

4.7 European existing and new partnerships

Moving away from its historical dependency from Russian gas, the European Union sought to strengthen existing partnerships and to develop new ones for better satisfying its gas necessities.

[134] A different, long-term perspective and contractual agreement structure would be required in case of new LNG exporting facilities to be built.
[135] "Offshore LNG Technologies & Facilities," Office of Fossil Energy and Carbon Management Home, February 24, 2021, https://www.energy.gov/fecm/articles/offshore-lng-technologies-facilities.
[136] Victoria Zaretskaya, "Europe Was the Main Destination for U.S. LNG Exports in 2022," U.S. Energy Information Administration (EIA), March 22, 2023, https://www.eia.gov/todayinenergy/detail.php?id=55920.

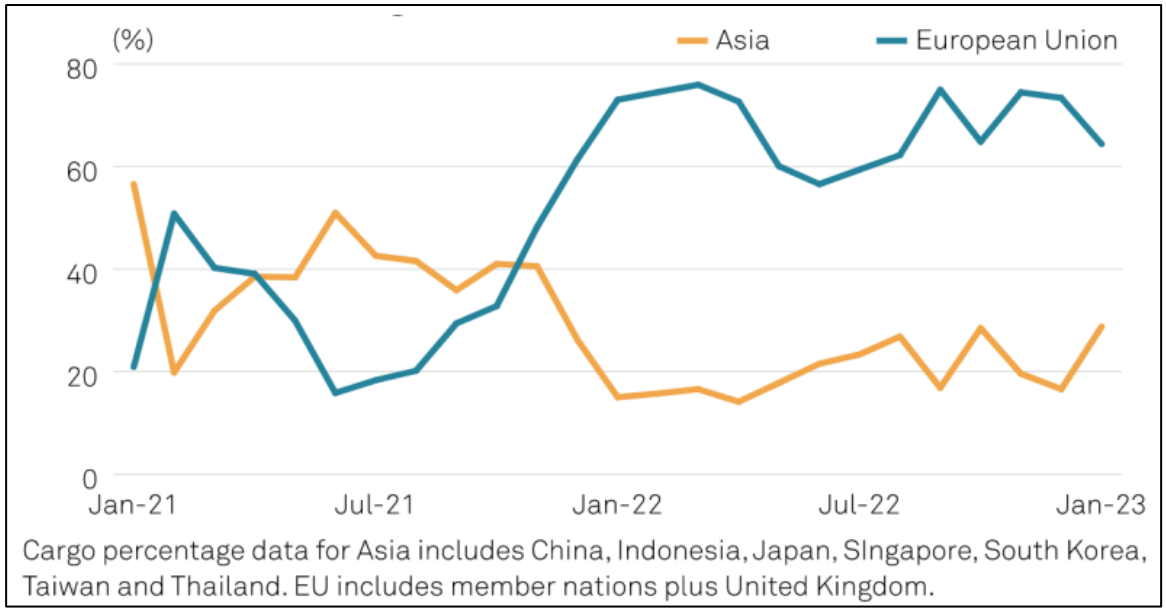
United States, Qatar and Australia are the major global LNG exporters: while Australia only exported a very low percentage of LNG to Europe given high costs related to long distance shipments, the United States and Qatar contributed significantly to the security of energy supply of Europe.

The United States in particular have the advantage of a lower freight cost[137]. US LNG exports to the European Union and the UK increased by 141% in comparison to 2021, equal to approximately 113 mcm/day and represented 64% of total U.S. exports: France, the United Kingdom, Spain and the Netherlands together accounted for 74% of it.

This sharp increase of exports to Europe was led by several concurrent factors. The reduction of Asian LNG demand by 46% in comparison to 2021, with the most significant decline in China, which decreased its demand by 20%[138] was among the most significant ones as LNG has been – and still is – the major source for Asia gas demand.

Europe "benefitted" from the persistent economic slow-down derived from Covid. At the same time, given price increases, many developing areas, were not able to compete for LNG cargoes and therefore suffered from energy shortages (a mostly forgotten side-effect of EU policies)[139].

The figure below shows this change.



Source: S&P Global Commodity Insights, 2023

[137] Gavin Maguire, "Column: U.S. LNG Exports Both a Lifeline and a Drain for Europe in 2023," Reuters, December 21, 2022, https://www.reuters.com/business/energy/us-lng-exports-bothlifeline-drain-europe-2023-maguire-2022-12-20/.
[138] Victoria Zaretskaya, "Europe Was the Main Destination for U.S. LNG Exports in 2022," Homepage - U.S. Energy Information Administration (EIA), March 22, 2023, https://www.eia.gov/todayinenergy/detail.php?id=55920.
[139] https://www.dw.com/en/lng-european-thirst-for-natural-gas-puts-bangladesh-and-pakistan-in-the-dark/a-63401354

Consistently with other measures and sanctions adopted after the Russian invasion of Ukraine, the United States and the European Union announced on 25th March 2022 the establishment of an energy task force with the aim of reducing European dependency on Russian fossil fuels and agreed on the supply of 15 bcm of additional LNG from the U.S. to the EU.

This target was more than doubled: in 2022, the U.S. exported to the European Union 53 bcm of LNG, up from 22 bcm in 2021[140]. On 4th April 2023, during the 10th EU-U.S. Energy Council, the United States committed in exporting “at least” 50 bcm to Europe in 2023[141].

Qatar is the other major supplier of LNG to the European Union.

On November 2022, Germany and Qatar agreed on the first long-term deal for LNG imports to the EU since the beginning of the war in Ukraine. They agreed for almost 3 bcm/year of LNG export to Germany for at least fifteen years, beginning from 2026. Supplies will come from the Qatari North Field East and North Field South projects, which are going to enable the increase in Qatari LNG production from the current approximate 108 bcm/year to 177 bcm/year by 2027[142].

Norway was a key natural gas exporter to the European Union in 2022: while before the beginning of the war in Ukraine Norwegian gas represented 20% of total EU imports, and in 2022 it met 25% of its gas demand, surpassing Russia as the largest supplier of natural gas to Europe[143]. Main importers of Norwegian gas were United Kingdom, France, Germany and Belgium. On 23rd June 2022, the European Commission Executive Vice-President Frans Timmermans, Commissioner for Energy Kadri Simson and Norwegian Minister of Petroleun and Energy Terje Aasland signed an agreement for the strengthening of energy cooperation between the European Union and Norway, “underscoring the reliability of Norway as a safe and prudent supplier of oil

[140] EU – U-S- Task Force on Energy Security, Progress Report and Outlook 2022-2023, April 2023.
[141] Federica Di Sario and Antonia Zimmerman, “US Pledges to Keep Pumping Natural Gas to Europe,” Politico, April 4, 2023, https://www.politico.eu/article/us-supply-natural-gas-lng-eu-antonyblinken/.
[142] Shotaro Tani and Guy Chazan, “Qatar to Supply Germany with LNG as EU Seeks Secure Energy Options,” Financial Times, November 29, 2022, https://www.ft.com/content/43f60031-c0cf-41f7-8a93-cf931006507a.
[143] Lisa Jucca, “Norway Gas Lifeline for Europe Is the Smart Move,” Reuters, September 9, 2022, https://www.reuters.com/breakingviews/norway-gas-lifeline-europe-is-smart-move-2022-09-09/.

and gas to Europe over the last 50 years"[144]. While Norway plays a fundamental role in serving EU gas demand via pipeline, it also played a role in some additional flows via LNG, which is about 5% of their total exported volumes[145].

North Africa, due to its geographical proximity and its endowment with significant resources, specifically fossil fuels, became the natural target for incremental volumes and for additional diversification attempts after the sharp decline of Russian gas supplies, especially for the Southern part of Europe.

Algeria provided to the European Union 11.6% of total gas imports in 2022, totalling 22 bcm, up from 20 bcm in 2021, and since April 2022 surpassed Russia as the major gas supplier for Italy. In fact, in this same month, Italian company ENI and Algerian national oil company Sonatrach signed a new deal for the increase of gas flows. On January 2023, the Italian Prime Minister Giorgia Meloni visited Algeria: during the visit ENI and Sonatrach signed two Memoranda of Interest, outlining future cooperation partnership between them in the areas of energy supply, energy transition and decarbonisation. The agreement was signed by Giorgia Meloni and Algerian President Abdelmadjid Tebboune as well.

However, notwithstanding the enhanced cooperation between Algeria and Italy and the increase in gas supplies, Algerian gas exports to Europe decreased by 6 bcm in 2022, totalling 44 bcm, due to a reduction in LNG exports to Europe and in gas pipeline to Spain. In late 2021, the GME line, connecting Algeria to Spain, was closed and the only other gas route, the Medgaz pipeline, increased its supplies just from 8 to 9 bcm. As a result, Spain registered a reduction in Algerian imports by 35% in 2022 in comparison to 2021. Moreover, LNG exports to Europe decreased as well, totalling just 13 bcm in 2022, down from the 17 bcm in 2021[146]. To remain a reliable gas supplier for Europe, Algeria needs to face two main issues: the depletion of its gas fields, even more considering the recent surge of domestic gas demand, and the environmental concerns for its gas production.

In the first case, there have been some recent development and in June 2022 a new formation at the huge Hassi R'Mel field has been discovered. Nonetheless, it needs to attract new investments, especially considering potential reforms in its regulatory and fiscal framework[147].

[144] "Joint EU-Norway Statement on Strengthening Energy Cooperation," European Commission, June 23, 2022, https://ec-europaeu.translate.goog/commission/presscorner/detail/en/statement_22_3975?_x_tr_sl=en&_x_tr_tl=it&_x_tr_hl=it&_x_tr_pto=sc&_x_tr_hist=true.
[145] https://www.norskpetroleum.no/en/production-and-exports/exports-of-oil-and-gas/#:~:text=Norway%20is%20the%20fourth%20largest,the%20Norwegian%20shelf%20is%20exported.
[146] Hassan Butt, "Algerian Gas Flows to Europe Shrink, but Italy Gains as Trade Ties Strengthen," S&P Global Commodity Insights, January 31, 2023, https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/013123-algerian-gas-flows-to-europe-shrink-but-italy-gains-as-trade-ties-strengthen.
[147] Raimondi, "Natural Gas in Italy: Features and Perspectives in Light of Russia's War in Ukraine", p. 25.

For what regards environmental concerns, Algeria has a high methane intensity of production and Hassi R'Mel basin is a global methane emissions' hotspot[148]. For this reason, the European Union cannot avoid taking into consideration this environmental aspect if it wants to be coherent with its climate commitments.

Libya, the other North African country which could play a significant role in the EU diversification strategy, has important gas reserves, representing the fifth African country with the largest gas reserves. Considering that its only LNG terminal, the Marsa el-Brega, is not operative since 2011, the only Libyan route for gas exports to Europe is the Greenstream pipeline with a capacity of 12 bcm/year which connects Libya to Italy.

After the Arab Springs and the highly unstable political context in the country, natural gas flows have declined to 3.2 bcm in 2021. Libya has a great gas potential, in particular in its offshore fields[149]. On January 2023, ENI and Libyan National Oil Corporation (NOC) agreed on a $8 billion gas production deal in order to increase Libyan gas production for domestic needs and exports to Europe through Italy. The projects could guarantee an output of around 21 million cubic metres per day starting from 2026, through the development of two offshore gas fields. The project include the construction of a carbon capture and storage (CCUS) plant at Mellitah[150].

The Eastern Mediterranean region has a great potential for the diversification of the European gas supply. In particular, the European Union mainly focused on two countries: Israel and Egypt. In April 2022, ENI agreed with Egypt for the supply of 3 bcm of Egyptian LNG to Europe and Italy in 2022. Then, in June 2022, the European Commission signed a trilateral Memorandum of Understanding (MoU) with Israel and Egypt for the supply of Israeli gas via Egyptian LNG export infrastructure to Europe. In fact, Egypt has two key LNG export facilities, the Idku facility, with a capacity of 10 bcm/year and operated by Shell, and the Damietta plant, with a capacity of around 7 bcm/year and operated by ENI[151]. Both terminals have been mothballed for some years due to the lack of sufficient gas volumes available for export, given the strong growth of internal demand.

Using the existing terminals was the most cost-effective solution for increasing Israeli gas exports to Egypt and then to Europe.

[148] Ibidem.
[149] Ivi, p.29.
[150] "Eni Avvia Un Importante Progetto Di Sviluppo Del Gas in Libia," Eni.Com, January 28, 2023, ENI, https://www.eni.com/it-IT/media/comunicati-stampa/2023/01/eni-avvia-un-importante-progetto-disviluppo-del-gas-in-libia.html.
[151] Stuart Elliott, "EC Inks Trilateral MOU for Supply of Israeli Gas to Europe via Egypt," S&P Global Commodity Insights, June 15, 2022, https://www.spglobal.com/commodityinsights/en/marketinsights/latest-news/natural-gas/061522-ec-inks-trilateral-mou-for-supply-of-israeli-gas-to-europe-viaegypt.

Given the evolution in domestic gas production and consumption, Egypt is now turning back to become a net importer[152], so limiting its contribution to gas supplies to Europe.

In the same area, another country has a great potential, even though it is not a gas producing country yet: Cyprus. In the last years, offshore gas fields have been discovered near its coast, but exploratory activities have been made difficult by the political situation of the island and the traditional rivalry in the region between Greece and Turkey[153].

Another important new recent supplier to Europe has been Azerbaijan, through the development of the Southern Gas Corridor, connecting the country to Greece, Albania and Italy – its main destination – via Georgia and Turkey.

On 18th July 2022, Commission President Ursula von der Leyen and President of Azerbaijan Ilham Aliyev signed a Memorandum of Understanding on a Strategic Partnership in the Field of Energy and undertook the commitment to double the capacity of the Southern Gas Corridor by 2027, in order to guarantee the supply of 20 bcm of natural gas per year.

In 2022, Azerbaijan supplied around 11.3 bcm of natural gas to Europe, up from 8.2 bcm in 2021. Even though the Southern Gas Corridor, which was finalised in 2020 with the entry into operation of its last section, the Trans-Adriatic Pipeline, is considered to be one of the most strategic opportunities to phase out from Russian gas, “politics are nearly in place, but project deliverability is not”[154].

In fact, analysts have argued that the target set by the MoU is far from being easily achievable: the main issues are the mismatch between the timing by which the European Union needs to receive the additional gas supplies and the timing required to increase gas production from new fields or via other regional agreements. In fact, the field from which natural gas flowing through the Southern Gas Corridor comes from, the Shah Deniz field, is almost at its full production capacity.

In January 2022, Azerbaijan started to receive natural gas from Turkmenistan thanks to an Iran 1-2 bcm/year swap. Moreover, it received around 1 bcm between November 2022 and March 2023 from Russia[155].

Apart from the key issue of where to source additional natural gas in order to achieve the goal set by the MoU between the European Commission and the President of Azerbaijan of 20 bcm/year by 2027, another problem regards the infrastructure. In fact, the Southern Gas Corridor at this moment has not the capacity to increase its gas deliveries and, for this reason, investments

[152] https://www.reuters.com/business/energy/egypt-ramp-up-lng-imports-output-drops-summer-nears-2024-04-22/
[153] Raimondi, “Natural Gas in Italy: Features and Perspectives in Light of Russia’s War in Ukraine”, p.34.
[154] John Roberts and Julian Bowden, “Europe and the Caspian: The Gas Supply Conundrum,” Atlantic Council, December 12, 2022, https://www.atlanticcouncil.org/blogs/energysource/europe-and-thecaspian-the-gas-supply-conundrum/, p. 1.
[155] Ivi, p.4.

will be necessary. Moreover, additional investment would be needed to increase production from potential offshore natural gas projects, adding 3 bcm/year to the total Azeri gas output[156].

Therefore, if Azerbaijan wants to export more natural gas, it needs to import it from elsewhere or to invest in new resources which would require long term agreements which are an issue from the EU's climate policy standpoint[157].

Finally, new pipeline capacity will be needed in the Italian pipeline network, starting from the point the Azeri gas reaches the European Union. In fact, with the increasing imports from Algeria through Italy, there is not enough spare capacity for the envisaged additional gas coming through the Southern Gas Corridor. For this reason, in January 2023, Snam, the Italian gas grid operator, announced its investment plan for the period 2022-2026: 10 billion euros, 23% more than in the previous plan. 9 billion euros will go to the construction of the Adriatic Line, to be completed by 2027, in order to increase natural gas pipeline capacity from Southern to Northern Italy, included gas coming from the Trans-Adriatic Pipeline[158].

5. The future of the European energy policy on natural gas

With the outbreak of the war in Ukraine, energy security has gained momentum. It is not a new concept at all, but for the first time Europe could not ignore the consequences of the strong dependency on energy imports, specifically on Russian fossil fuels. The previous Chapters have analysed the development of the natural gas market in Europe, the energy policy regarding natural gas of the European Union and, finally, the impact of the Russian invasion of Ukraine on EU gas market and the subsequent reactions by the European Union and its Member States.

This study would be incomplete if it did not include some considerations on the future prospects for the natural gas market in Europe and, even more importantly, a reflection on which should be the next steps in the EU energy policy on natural gas matters.

What the current energy crisis has made clear is that a proper energy policy with a long-term view has to take into consideration three fundamental aspects: energy security, environmental sustainability and energy equity, the latter meaning an affordable and

[156] Ivi, p.6.
[157] https://www.ft.com/content/99772c5e-6506-4331-82f3-90d9b6911ed5
[158] Francesca Landini, "Snam Bets on Italy's Role in Europe with Higher Gas Investments," Reuters, January 19, 2023, https://www.reuters.com/business/energy/snam-invest-10-bln-euros-2026-italys-gassecurity-2023-01-19/#:~:text=Snam%2C%20whose%20efforts%20were%20vital,than%20in%20the%20previous%20plan.

universal access to energy. This is the so-called “energy trilemma”, a concept that underlines the difficult challenge to guarantee the three factors at the same time.

As shown in Chapter 4, energy security in the last years suddenly came back to being one the main topics (or the major one) to tackle for the European Union, alongside affordability and sustainability in the long run as well. In 2022, the EU had to face the serious issue of finding other natural gas sources, after the steep reduction of Russian gas supply.

It succeeded in ensuring continuous gas supplies, thanks both to the adoption of several legislative packages and to some exceptional and non-controllable factors, such as a warmer weather than usual and low LNG demand in Asia, particularly in China.

In addition, natural gas prices reached unprecedented levels (343 €/MWh in late August 2022) and price volatility was significantly high, seriously undermining the energy purchasing power of customers and industries alike, therefore prompting an important demand reduction/destruction.

The European Union reached an agreement for a price cap mechanism in December 2022 and took important actions to avoid an excessive financial burden on final customers, with public interventions which were greatly varying according national fiscal and budgetary constraints.

Environmental stability and clean energy transition gained momentum in these past years, and although it is considered to be one of the most effective ways to ensure energy security, the share of total demand covered by renewable energy is still too small to consider an immediate transition to renewables only, which has to take into consideration many additional elements not part of this analysis.

It has been argued that the European Union does not need to build new natural gas infrastructure to face the decreasing Russian supplies[159]. Critics have been moved towards the new investments in the European Union for new gas projects and the signing of new agreements, some of which are long-term and could be considered to be incompatible with climate targets set by the European Union for 2030 and with the binding carbon neutrality goal by 2050, as laid down by the EU Climate Law of 2021. On the other hand, however, security of gas supply needs to be guaranteed and the disruption of Russian natural gas deliveries left Europe in need of alternative gas contracts.

[159] Julian Schwartzkpoff, “The Future Role of Gas in a Climate-Neutral Europe,” Heinrich-Boll-Stiftung European Union and Environmental Action Germany, June 2022, 6–70, p. 22.

These critics are, in my opinion, short-sighted and do not consider, for instance, the possibilities deriving from technological innovation.

There are several arguments that could be used against these critics, from energy supply safety to storage (as it is harder to store electricity generated directly from renewable sources than natural gas or LNG) and more, with hydrogen being a good example here.

In the last years, hydrogen gained new traction as an all-new form of renewable energy. A primary driver propelling its advancement is its inherent sustainability, derived from the use of renewable energy sources in its production process. The increasing urgency to mitigate climate change and reduce carbon emissions has spurred widespread recognition of green hydrogen as a key solution in achieving these goals. Additionally, the versatility of green hydrogen as a clean energy carrier, suitable for various sectors such as transportation, industry, and power generation, has garnered significant attention from governments, industries, and investors worldwide.

However, despite this enthusiasm, several challenges stand in the path of its widespread implementation. Technical complexities, cost-intensive production methods, infrastructural inadequacies, and regulatory uncertainties present large barriers, demanding thorough examination and strategic interventions.

One way to deal with the energy trilemma might be to disentangle the monolithic concept of “energy policy” in two, or three, segments: short-term, medium-term and long-term measures. This separation allows policymakers to not having to consider environmental sustainability, energy security and energy equity all at once, but to focus on each of them at the proper time and with the proper perspectives for the future.

This seems to be the case for the European Union strategy, at least formally: secure short-term and flexible natural gas contracts and, at the same time, accelerate clean transition in order to meet its climate goals by 2030 and 2050. As a general rule, whenever there’s a crisis, States prefer (need) prioritizing energy security over sustainability and equity, as proven by the crisis brought by the lack of Russian gas.

In the next paragraphs, it will be examined how the European Union should act on natural gas matters, specifically on diversification projects and interconnection capacity of the European gas markets, in order to compensate for the disruption of Russian gas supplies. In parallel, the analysis and the proposals will be constantly weighted against the EU climate targets.

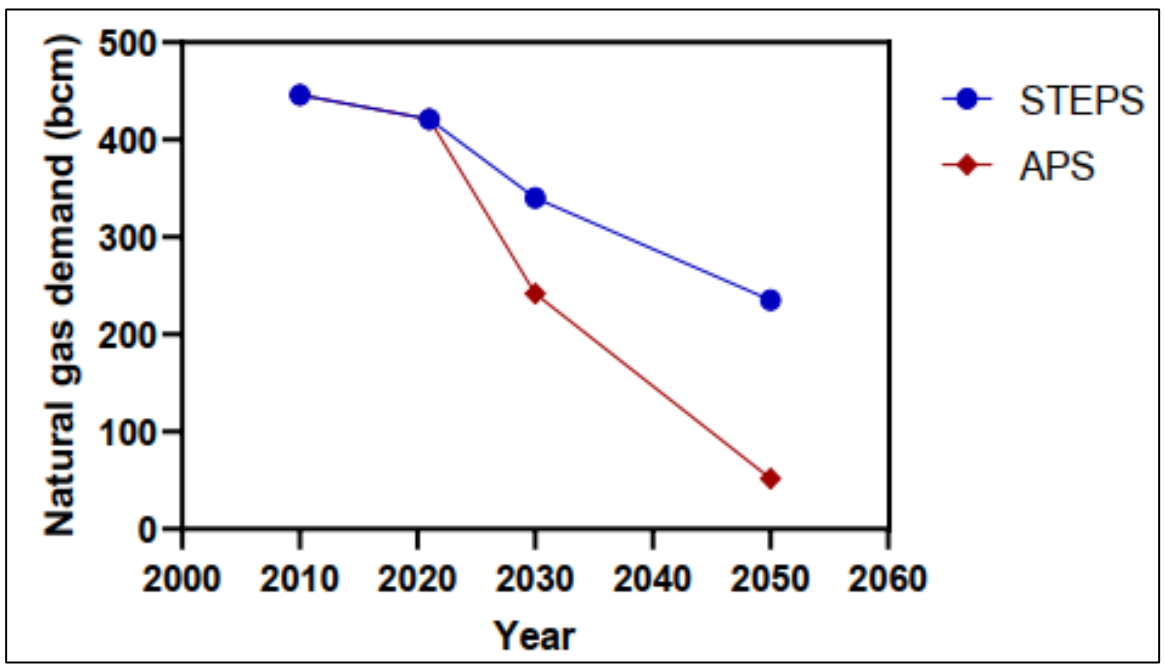
5.1 New gas sources and decreasing natural gas demand

The key dilemma for the European Union in the current energy and geopolitical scenario is where to source additional natural gas supplies given the decreasing Russian deliveries, taking also into consideration the estimated decline of EU gas demand in the future decades. In fact, in order to secure additional gas imports from countries with which a pipeline connection already exists, such as Algeria and Azerbaijan, new long-term investments would be needed, as it will be explained. However, given the uncertainty over the trend of natural gas demand globally and specifically in Europe, investors doubts over whether to invest or not.

The International Energy Agency in its Would Energy Outlook 2022 has estimated the natural gas demand trend in the European Union based on three different scenarios. The scenarios are, respectively: the Stated Policies Scenario (STEPS), the Announced Pledges Scenario (APS) and the Net Zero Emissions by 2050 (NZE) Scenario. The first one shows the evolution of the energy system on the basis of the current policy setting, without taking into consideration climate goals and pledges declared by States, unless they are supported by concrete and detailed plans of how to achieve them. Secondly, the APS analyses the evolution of the energy system taking for granted that all the targets set by States are fully and timely achieved. Finally, the NZE illustrates a path (not the only possible one), through which the goal of zero emissions by 2050 in order to maintain the rise of global temperature in comparison to pre-industrial levels under 1.5°C can be achieved.

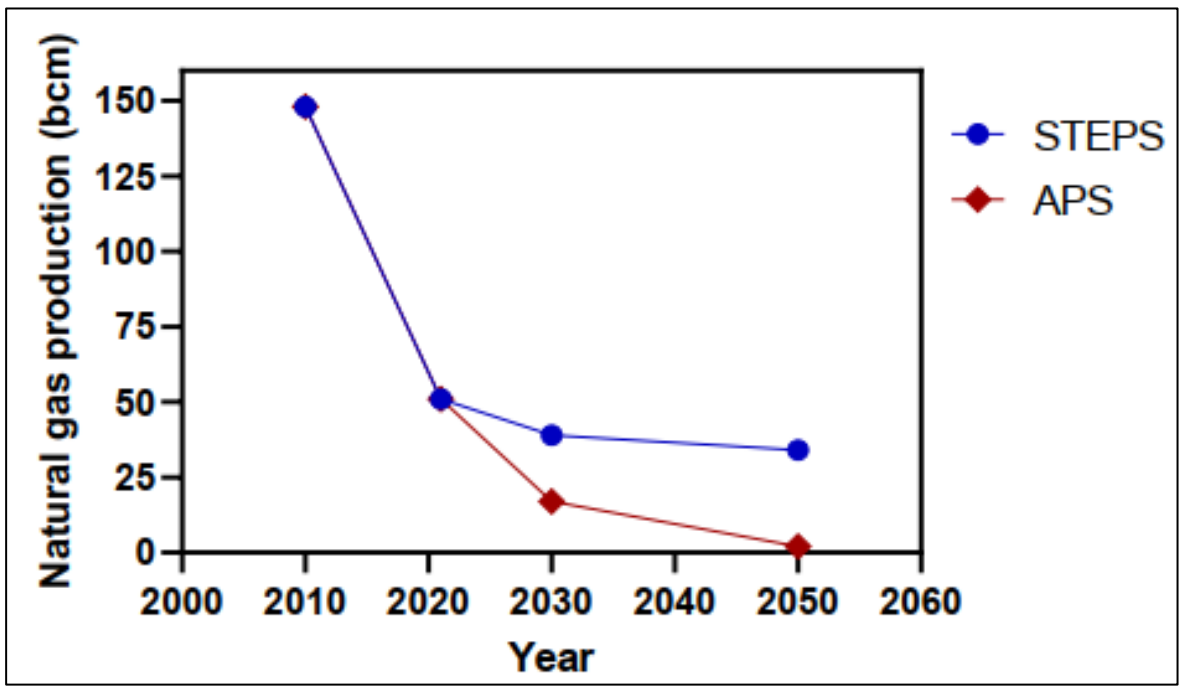
According to this report, natural gas demand in the European Union, regardless of the scenario, will decrease significantly over the next years. In particular, the figure below shows, according to STEPS, demand will go from 421 bcm/year in 2021 to 340 bcm/year in 2030, around 20% less. Differently, according to APS, natural gas demand in the EU in 2030 will be 242 bcm/year, around 60% less than in 2021, and 52 bcm/year in 2050.

It means that by 2030, even if EU Member States do not implement measures adopted under the “Fit-for-55” package, natural gas demand will register a decline of 20%. If, on the other hand, the European Union and its Member States comply with their climate and energy targets, the demand reduction will exceed 50%.



Source: data from World Outlook 2022 by International Energy Agency

The World Outlook 2022 estimated a significant decline in natural gas production in the European Union as well, continuing a long-lasting trend. As discussed in the previous chapters, domestic production of natural gas slowly went from meeting 36% of the total demand in 1980 to meeting 15% of it in 2021, and this decline is likely to continue. In particular, in the Stated Policies Scenario, EU domestic production will decrease from 51 bcm/year in 2021 to 39 bcm/year in 2030 and to 34 bcm/year in 2050. Differently, in the Announced Pledges Scenario, it will decrease to 17 bcm in 2030 and to 2 bcm in 2050. It means that, by 2030, the production of natural gas in the European Union will register a decline of between 25% and 75%, as shown in the figure below.



Source: data from World Outlook 2022 by International Energy Agency

The International Energy Agency furthermore explained in the report that, even in the most optimistic scenario between the two in terms of natural gas demand reduction, the European Union, as a consequence of the increasing decline of Russian gas deliveries following the war in Ukraine, will need more imported gas than what foreseen under the currently existing contracts with natural gas suppliers. In particular the chart compares the European Union natural gas contract balance to import requirements under the Announced Pledges Scenario (which foresees a greater decrease in gas demand than STEPS), assuming that Russia will continue to reduce its natural gas supplies to the EU.

Therefore, in APS the European Union import demand is envisaged to go from 370 bcm/year in 2021 to 230 bcm/year in 2030 and decrease to 140 bcm/year by 2035. However, besides the “Take-or-Pay” Russian contracts and the maximum contracted for Russian and non-Russian LNG, the EU will need a maximum of 170 bcm/year of additional natural gas by 2030 and 70 bcm/year by 2035[160].

[160] International Energy Agency, The World Energy Outlook 2022, p. 391.

During the first quarter of 2024, OECD Europe's primary natural gas supply fell by an estimated 6% (or almost 15 bcm), as lower gas demand and high storage levels reduced the call on LNG imports while the region's domestic production continued to decline[161].

Europe's LNG imports declined by almost 20% (slightly over 17 bcm) in this first period as well. The continued decline in demand, together with high inventory levels and stronger piped gas deliveries, kept European hub prices below Asian spot LNG prices, the de-facto price leaders in LNG right now.

Regarding imports in the European Union, regional dynamics were somewhat more stable and clear-cut, with the continuation of high-level trends that had been in place during much of 2023. European LNG imports fell by 19% y-o-y (or 17 bcm) in H1 2024, with the downward trend accelerating in the spring months. The United Kingdom, Spain and Turkey were the largest downside markets, taking in 58%, 23% and 30% less LNG year-on-year, respectively[162].

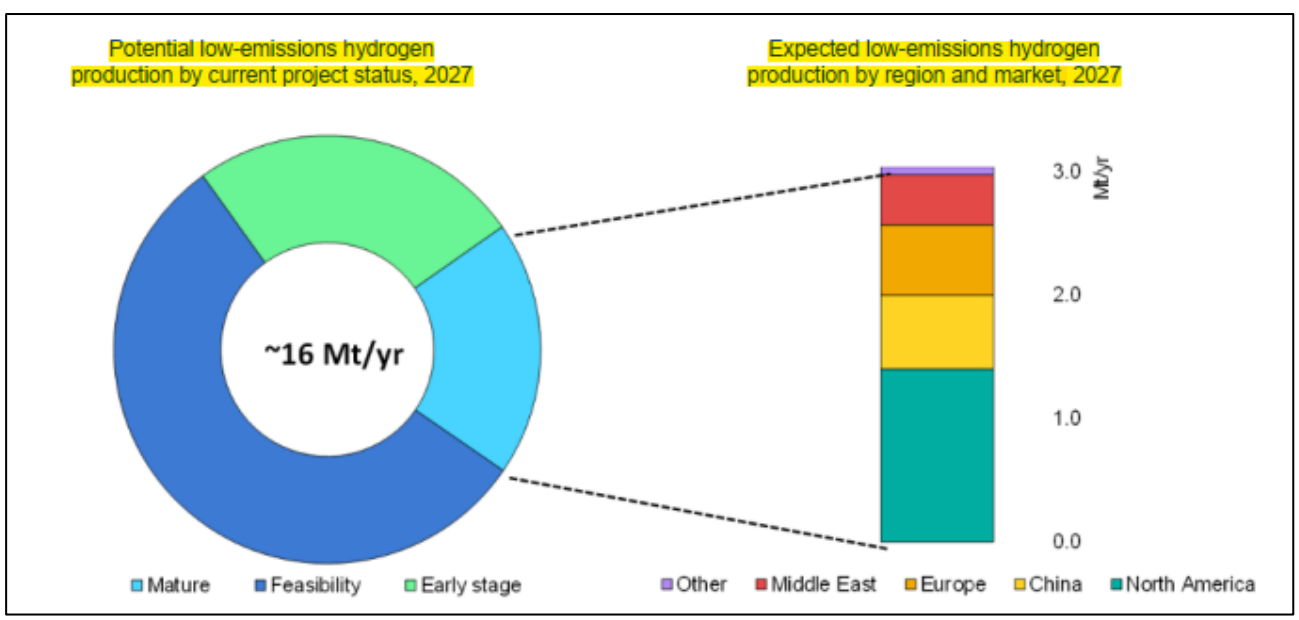
In the medium to long term, biomethane is set for rapid expansion, as proved by its production more than doubling between 2018 and 2022. This strong growth was largely driven by Europe and North America, accounting for more than 90% of incremental biomethane supply during this period, with signs of this trend continuing into 2024.

In Europe biomethane production expanded almost sevenfold during 2012-2022, reaching around 4 bcm. Preliminary data suggest that biomethane output grew by just over 10% to almost 4.5 bcm in 2023. Germany, France, and Denmark in particular kept their roles as primary producers of biomethane in Europe, with other countries such as Italy making plans to increment the country's biomethane production by 2026, making use of the PNRR plan and the funds given by the European Commission to fuel these projects. Overall, Europe's biomethane production is expected to expand by over 85% between 2023 and 2027, with overall output reaching 8.5 bcm by the end of the forecast period. France, Italy, Denmark and the Netherlands are expected to account for over 80% of this growth.

Considering recent policy developments and new subsidy schemes, the medium-term outlook for biomethane developments in Europe has been significantly revised upwards. Nevertheless, more policy support will be required to put the European Union on track to reach its 35 bcm/yr biomethane production target by 2030[163].

[161] International Energy Agency, Gas Market Report Q3 – 2024, p. 31.
[162] Ivi, p.34.
[163] Ivi, p.49.

Regarding new energy sources, low-emissions hydrogen project pipelines are progressively gaining momentum, setting global supply on track to grow fivefold by 2027, although after three years of flat low-emissions hydrogen production, there's a significant gap to meet medium-term targets for many countries, especially European countries.



Source: IEA (2024), Hydrogen production and Infrastructure Projects

The graph above shows the medium-term outlook for low-emission gases projects worldwide, where Europe covers a decent portion of the total mature projects.

5.2 New European scenarios

Taking into account what has been said in the previous Chapters, the European Union could follow a multi-tiered approach: new agreements with "old" natural gas suppliers to bring the pipeline gas at its maximum capacity, where it is possible without the need to invest in long-term projects for the increase of productive capacity, and sponsor the development of new flexible LNG trade projects with reliable suppliers. In fact, even assuming new LNG infrastructure not necessary to meet the future EU gas demand, the European Union needs new LNG supplies, especially considered the rebound of Asian LNG demand that's happening in these years. The immediate question is what the future reliable natural gas trade partners for the European Union could be, in terms of both capacity and internal political stability.

Previously, it has been analysed how the European Commission and some EU Member States have planned to replace Russian natural gas supplies with additional gas coming from, mainly, North Africa, Azerbaijan and Eastern Mediterranean. During 2022, there has been a significant increase of U.S. LNG imports as well, but as already mentioned, the United States supplies only are not sufficient to meet EU gas demand, thus requiring more engagement with other countries, such as Norway, Azerbaijan and other prominent exporters of natural gas.

In particular, the Commission signed a Memorandum of Understanding with Azerbaijan in order to double gas deliveries through the Southern Gas Corridor from 10 bcm/year to 20 bcm/year by 2027. Secondly, Italian state-owned company ENI signed new deals with its Algerian and Libyan counterparts in order to increase natural gas imports through, respectively, the Transmed and Greenstream pipelines, but it remains to be seen whether these countries can significantly increase their production to meet demand in the future. Algeria and Libya have both significant gas reserves, having, respectively, the African second and fourth largest proven gas reserves. ENI agreements with Algeria Sonatrach and Libyan NOC could enable additional gas supplies to Italy (and then to the European Union) equivalent to 10 to 15 bcm of incremental annual volumes in the next years[164], enabling Italy to become a potential European gas “hub” in the future. In order to expand gas supply from the two North African countries, new long-term international investments would be needed. Moreover, Libya is still a highly politically unstable State and for the European Union it would be a hazard to increase its import dependency on that country. Finally, even though international long-term investments are realised and productive capacity is expanded in Libya and Algeria, their only natural gas buyers are European countries and therefore could not re-direct their exports to other markets when Europe will not need anymore their gas supplies.

Other potential partners that reinforced their role in the Middle East and North Africa region (MENA) in 2022 are Cyprus, Egypt and Israel, thanks to the discovery of gas fields, especially offshore. The graph below shows the main gas fields discovered in 2022.

[164] Mostefa Ouki, “Italy and Its North African Gas Interconnections: A Potential Mediterranean Gas ‘Hub’?,” The Oxford Institute for Energy Studies, March 2023, 1–6, p. 4.

Site	Estimated size, in billion cubic meters (bcm)	Operator	Country	Discovered
Athena	8 bcm	Energean	Israel	May
Cronos-1	70 bcm	Eni	Cyprus	August
Hermes	7-15 bcm	Energean	Israel	October
Zeus-1	13 bcm	Energean	Israel	October
Zeus-01	57-84 bcm	TotalEnergies	Cyprus	December
Narges-1X	99 bcm	Chevron	Egypt	December

Source: The Middle East Institute, 2023

Both the attack of Hamas on 7th of October 2023 with the impacts on Israeli gas production and the fast-increasing Egyptian internal gas demand, are creating a more complex picture to consider the region a potential reliable exporter of LNG to the EU.

5.3 Italy as new European gas hub?

Since the inaugural speech of the Italian Prime Minister Giorgia Meloni, the new Italian government has presented its project called “Piano Mattei”. The high-level principle behind it consists in a renewed and closer collaboration with African countries on a range of matters, with energy as a top priority. In fact, the government has expressed the aspiration for Italy to become a new energy hub for Europe, with a focus on natural gas.

The idea of transforming Italy in a gas hub actually first took shape in the 1990s, with the entry into operation of Transmed and the construction of the Greenstream pipeline connecting Libya to Sicily. European natural gas demand was increasing and pushed Italy to sponsor several gas projects in the Mediterranean, including the Trans-Adriatic Pipeline. Another project was conceived but not completed, the Galsi (“Gasdotto Algeria Sardegna Italia”) pipeline, that would have connected Algeria with Northern Italy via Sardinia. However, the shale gas revolution and the consequent increase of global LNG trade and the Arab springs, which left

North Africa with extremely instable and fragile political systems, did not make possible for Italy to become a gas hub for Europe[165].

With the outbreak of the war in Ukraine and the sharp decrease of Russian natural gas deliveries to Europe, the newly established Italian government saw the opportunity to exploit the Italian geographical position in the middle of the Mediterranean to make the country a gas hub, through the intensification of the relationship on natural gas with, in particular, Algeria, Libya and Azerbaijan. In January 2023, ENI and a delegation of the government started negotiations with the North African countries in order to increase natural gas imports. Moreover, during the same month, Snam, the Italian gas grid operator, announced its investment plan for the period 2022-2026: 10 billion euros, 23% more than in the previous plan. 9 billion euros will go to the construction of the Adriatic Line, to be completed by 2027, in order to increase natural gas pipeline capacity from Southern to Northern Italy, included gas coming from the Trans-Adriatic Pipeline[166]. Finally, the plan envisages the construction of two additional fixed import LNG plants in addition to the FSRUs (floating storage regassification units) in Ravenna and Piombino[167].

However, the feasibility of such a project is currently under debate. The main concern is the one already discussed: timing. In fact, the European Union needs new natural gas sources now in order to replace Russian gas supplies, while a significant increase in natural gas production in Algeria, Libya and Azerbaijan would require new investments and more time, making the gas hub project incompatible with the pace of natural gas demand reduction in the European Union and its climate targets.

5.4 Resilience and ecological transition: completing the Energy Union

Building an integrated European gas market has been one of the key drivers of the legislation on natural gas adopted by the European Union in the past decades. The European Commission, particularly under the Presidency of Jean-Claude Juncker, has explicitly pushed for the creation of an Energy Union. The consequences of the war in Ukraine on the EU gas system has shown that this goal is still far from being achieved.

On the one hand, during 2022, the EU bodies and its Member States have successfully come together and decided collectively to reduce natural gas demand, to set ambitious targets for gas storage levels and to establish a cap price mechanism in order to avoid an excessive burden on consumers and industries, even though with some oppositions. The European Commission

[165] Arturo Varvelli, "Gassy Ambitions: The Obstacles to Italy's Planned Gas Hub for Europe," European Council on Foreign Relations (ecfr.eu), February 14, 2023, https://ecfr.eu/article/gassy-ambitions-theobstacles-to-italys-planned-gas-hub-for-europe/.
[166] Francesca Landini, "Snam bets on Italy's role in Europe with higher gas investments".
[167] "Italy, a Renewable Energy Hub," ECCO - The Italian climate change think tank, February 1, 2023, https://eccoclimate.org/italy-a-renewable-energy-hub/.

established an Energy Purchase Platform for the common purchase of gas, LNG and hydrogen and at its core it has been set up the AggregateEU mechanism, which enables, on a voluntary basis, companies to register their gas purchase needs in order to prepare for a joint purchasing of gas at the European Union level.

Diversification efforts by Member States and the Commission are bringing to the European Union natural gas from new and, hopefully, more reliable sources. Therefore, the role of the European Union in coordinating the response to the gas crisis has been a success; however, there are some criticalities that have been highlighted in the previous Chapters that the European Union should address in order to build a stronger and more resilient Energy Union, considering in particular infrastructural constraints and uncoordinated paths towards the clean energy transition.

5.5 Solving infrastructure bottlenecks

The sharp reduction of natural gas from Russia to the European Union since the beginning of the war in Ukraine has clearly shown the importance of having a truly interconnected gas system, able to divert natural gas to the most vulnerable regions in situations of emergency. Previously, when highlighting the effectiveness of the EU solidarity mechanism, it has been said that, while the most vulnerable countries to Russian supplies disruption are Eastern and Central European Member States, the European natural gas network does not allow for significant West-East flows, as it has been conceived for East-West flows. As a consequence, these countries cannot rely completely on Western European Member States' support and need to count on each other for the sharing of their gas, when possible.

A financing system for building a more integrated and interconnected system is already in place, and the European Union should continue and increase interconnection projects and as suggested by the International Monetary Fund in July 2022, solve the infrastructure bottlenecks. Some short-term measures have also been suggested, such as enabling reverse flows from West to East and to harmonise gas quality among EU Member States[168], although the presence of different quality standards has made this more complicated. Fortunately, ideas for international standards are already being explored, as can be seen in the regulation of the European Parliament and of the Council on the internal markets for renewable and natural gases and for hydrogen[169].

[168] Gabriele Di Bella et al., "Natural Gas in Europe: The Potential Impact of Disruptions to Supply," IMF Working Papers 2022, no. 145 (July 2022): 1–47, pp. 29-30.
[169] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021PC0804

Final considerations

Natural gas has been, and still is, an important fuel for Europe and enabled European States to reduce their dependency on oil after the two oil shocks of 1973 and 1979. Since then, the share of natural gas in the European energy mix has steadily increased and began being considered as a “bridge fuel” for the clean energy transition. In fact, even though it is a fossil fuel, natural gas is less polluting than both coal and oil. However, with the increasingly ambitious climate goals set at the European Union level, Member States need to replace the use of natural gas with renewable sources of energy, in order to achieve the important target of net zero emissions by 2050 and keep the rise of global temperature under the threshold of 1.5°C above pre-industrial levels.

The factor which most impacted on the development of the natural gas market in the European Union has been the scarcity of gas reserves in its territory. High import dependency characterises the EU natural gas system and historically Member States have relied on a small number of suppliers, particularly on the Soviet Union first and on the Russian Federation after. The European Commission since the 1980s called upon States to diversify their gas sources, but geopolitical and economic reasons did not allow for it, as well as due to the intrinsic characteristics of natural gas. Already with the gas crises of 2006, 2009 and 2014, the European Union could witness the frailty of its gas system and the vulnerability of the Member States highly reliant on Russian gas imports. The outbreak of the war in Ukraine and its consequences threatened the security of supply of the European Union.

The measures adopted during 2022 by the European Union and its diversification efforts, combined with an exceptional warm weather and low LNG demand in Asia, guaranteed the security of gas supply during winter 2022/2023.

With new policies, new partnerships, and new challenges on the horizon, such as the objectives set to combat climate change, the European Union will need to focus on a more integrated gas market and the completion of an Energy Union, providing the Member States with better, faster regulation and standards common to every State.

Right now, it’s safe to say that natural gas, while decreasing over time, will continue to play a major role in the European Union’s energy economy.

Policy should be constantly recalling the need to deal with the energy trilemma in a dynamically moving and ever more interconnected international framework as the fundamental tool to progress on both serving energy needs of the consumers while reducing the carbon footprint in an economically sensible manner.

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