

The repercussions of the gas crisis on the European economy

LARAB Sarah *

University of Algiers 3, Algeria 

larab.sarah@univ-alger3.dz

Received: 28/05/2023

Published: 01/01/2024

Abstract:

Europe has been going through an unprecedented energy crisis for almost eleven months, because since the spring, Russia has used its remaining supplies as leverage to force countries to ease sanctions on financial transactions and technologies. Since the beginning of July, it has only sent a third of the volumes planned. Gas prices in the European Union have therefore increased more than tenfold and European governments are trying to protect consumers against this price shock, by distributing billions in subsidies. EU sanctions against Russia have led to a significant reduction in Russian supply.

This research paper aims to determine the particularities of gas and thus study the consequences of the gas crisis on the European economy.

Keywords: Natural gas, Hydrocarbons, Renewable energies, Economic crisis, European economy.

JEL Classification Codes : L95, Q35, Q49, G01, O52.

* Corresponding author.

Introduction:

Like oil, natural gas is a fossil fuel that is formed from the decomposition of organic matter at the bottom of the oceans. One of the main specificities of the gas chain concerns transport, an essential link which, due to its high cost, has a major influence on the development of natural gas.

Natural gas is a fossil fuel found naturally in gaseous form in porous underground rocks. Used as an energy source, gas is composed of hydrocarbons: mainly methane but also propane, butane, ethane and pentane.

The production and resources of natural gas, in all its forms, are concentrated in a small number of countries that are highly specialized in this resource. This includes Russia. Despite relatively high natural gas consumption in France, the French natural gas market remains relatively obscure. Thus, contrary to widespread belief, France does not exclusively source Russian natural gas, but benefits from a highly developed natural gas market.

Thus, during the development of this research document we will try to answer the following question:

What are the repercussions of the gas crisis on the European economy?

In the debates on this issue, two questions remain:

- Where are the main natural gas reserves in the world?
- What is the future of natural gas at a time when fossil fuels are increasingly decried?
- We made the following assumptions:
 - The country with the largest reserve is Russia, with an average of 37.4 trillion m3.
 - Fossil fuels should still represent nearly 80% of the energy used, the current challenges will be even greater by 2030.

Our research paper aims to determine the particularities of gas and thus study the impact of the gas crisis on the European economy.

This article is structured as follows: We plan first of all to approach some basic elements on the gas, we are interested in the second place in a case study, this part will be the occasion to illustrate concretely the incidences of the gas crisis on the European economy.

1- Theoretical framework of gas:

Natural gas is a fossil fuel well known to French households. They are a third party to use it, for heating, hot water or cooking. Who says fossil energy, says deposit and extraction.

1-1 Definition of natural gas:

Natural gas is a fossil energy also called primary energy because it does not come from a transformation of another energy (unlike electricity). We mainly think of natural gas for domestic use (feeding the boiler or cooking hobs), but it is also very useful in other areas

such as industry or transport. Its consumption has been growing for more than 30 years, in particular because of its environmental qualities: it hardly emits any fine particles. In addition, it is also the hydrocarbon that returns the least greenhouse gases to the atmosphere once consumed (Bilan énergétique 2022, 2022).

● The formation of natural gas deposits:

Before being marketed, natural gas must be extracted from deposits, then processed and finally transported to the place of consumption.

The natural gas that men extract from the depths is in fact of organic origin and was formed from the decomposition of plankton and algae over several million years. Indeed, most organic waste is destroyed and digested by bacteria. A tiny part of the residual material (0.1%) however settles at the bottom of the oceans (where it is protected from the action of bacteria because the environment is too low in oxygen) and mixes with sediments (sand, clay, salt). This mixture forms a layer of mud which hardens over the years to become "mother rock". Under the weight of the new sediments deposited there, the source rock sinks very slowly into the earth's crust: it can cover a few meters to a few hundred meters per million years. Pressure and temperature increase as the mother layer sinks deeper. The organic matter composing it is transformed into Kerogen then, from 2000 meters below sea level, into hydrocarbon (carbon and hydrogen):

- * between 2000 and 3800 meters, kerogen turns into oil;

- * between 3800 and 5000 meters the sediments form hydrocarbons which are no longer liquid but gaseous: methane gas (the lightest of the hydrocarbons);

- * below 8000 meters, we no longer find hydrocarbons because the very high temperatures destroy them.

Hydrocarbons rise to the earth's surface because they are lighter than water. If nothing stops them, they escape and seep to the surface of the earth or solidify into bitumen losing their volatile constituent. If they encounter an impermeable layer called a cover, they remain enclosed in a pocket called a reservoir rock where the gaseous part rises above the oil, pushing the water table downwards. Sedimentation changes on average by 50 meters per million years, so it takes about 60 million years for dead plankton to turn into liquid hydrocarbon (petroleum) and 85 million for gaseous hydrocarbon to form. It is therefore understandable why oil or natural gas are not considered renewable energies. Initially, natural gas operations appeared to be a derivative of oil operations. The initial prospecting of the deposit being carried out with a view to oil exploitation, the natural gas was initially burned with flares in order to limit the risks of incidents on the mining sites. (IFP Energies nouvelles).

1-2 Natural gas production steps:

Natural gas is not "produced" strictly speaking. It is rather an extraction followed by the refining of a raw material available in nature. Thus, there are several essential steps before obtaining natural gas that can be used by individuals. (Connaissance des énergies)

1-2-1 Finding natural gas deposits:

The search for natural gas and the estimation of the volumes contained are based on seismology: special sensors are used to record data relating to the propagation of artificial shock waves, making it possible to obtain information on the geological structures present. Maps of the subsoil are established from these data to assess the presence of natural gas.

Several types of basins appear during explorations, they are differentiated according to: (Les gisements de gaz naturel, 2022)

* Their hydrocarbon consultation:

- The prolific basins which are rich in hydrocarbons such as in the south of the Gulf of Guinea for oil, the Nile delta for gas or the Niger delta, some deposits of which are rich in oil and gas;
- Sterile basins whose concentration of hydrocarbons does not allow profitable exploitation.

* The progress of their exploitation:

- There are basins that have been discovered for a long time and which have already been drilled several times, these are the mature basins whose exploitation continues but with very little chance of encountering new giant deposits;
- The immature basins have not been drilled extensively and are the preferred prey of oil companies;
- Finally, the virgin basins have been very little exploited or even never explored due to the geography which makes them less accessible.

1-2-2 Natural gas extraction:

When the natural gas field is considered sufficiently certain in its volumes and in its economic conditions of exploitation, the installations necessary for its exploitation can be built: extraction wells and gas pipelines connecting the wells to the collecting networks. The extraction operation consists in bringing the natural gas locked up in the subsoil to the surface, by digging a hole, sometimes up to 6000 m deep. A drilling derrick is installed, it is a metal tower up to 30 meters high which will allow the vertical insertion of the drill rods. The first rod is equipped with a bit with teeth which will be used to dig, in the case where the rock is very hard the teeth can be in diamond so that they do not break. In many cases, the natural gas will come out of the wells without outside intervention due to the pressure, but sometimes pumping equipment is necessary.

The expansion of the natural gas wellhead allows the condensation of part of the recovered product: these are natural gas well liquids, from which high-value substances such as naphtha are produced. The rest of the products, in the gaseous state, is transported by gas pipeline to the natural gas processing unit.

Offshore natural gas extraction infrastructures are more expensive than those deployed to exploit onshore gas deposits. Offshore indeed requires drilling platforms and/or special vessels.

Once the gas has been extracted, the pressure in the circuit is brought back to that intended for transport before injecting the gas into the transport pipeline.

1-2-3 Lifetime of a natural gas deposit:

The life of a deposit is very variable, it generally varies from 15 to 30 years, some gigantic deposits can be exploited for 50 years. Conversely, deep sea deposits, whose operating costs are much higher, make the life of the deposit much shorter (between 5 and 10 years). The exploitation of a deposit comprises 3 stages:

- * A first "start-up" phase takes place during the first 3 years. Wells are drilled progressively, which increases the production of natural gas;
- * A plateau period during which production is stable: its duration may vary depending on the size of the basin;
- * Finally, a period of decline which will precede the closure of the site: during this phase the production of hydrocarbons drops between 1 and 10% per year.

1-2-4 End of a deposit:

The exploitation of a deposit ends when the cost of extraction becomes higher than the profit produced by the sale of the gas: (La crise énergétique, 2022)

- Either because the residual water that rises with the hydrocarbon is increasingly important and the separation of the water (dehydration) then becomes much too expensive;
 - Either assisted recovery processes are too expensive to continue operating profitably.
- The reserves are never completely exhausted, so the gas field recovery rate reaches 60 to 80%, which is relatively higher than that of oil fields, which does not exceed 50%.

Lacq 2030 France also has its natural gas field, in Lacq, in the south-west of France. This deposit is nearing the end of its life. This is why Total, GDF and Arkema have launched the conversion project for this industrial basin: Lacq Cluster Chimie 2030 (LCC30 for short). The goal is to transform the gas field into a center of excellence in fine and specialty chemicals. A way to ensure the maintenance of jobs in the region.

1-2-5 Natural gas treatment:

Natural gas facilities can be located more or less upstream in the value chain, close to natural gas extraction sites or consumption areas. The treatment of natural gas amounts to dehydrating it by dew point and separating its components:

- * Liquefied petroleum gas such as butane or propane (LPG, not to be confused with Liquefied Natural Gas LNG);
- * Carbon dioxide (CO₂) released into the atmosphere, sequestered or transmitted to a nearby industrial user;
- * Sour gas sold to the chemical industry or sequestered;
- * Helium, sold if it is present in sufficient quantities (which makes it possible to create an important source of income for the deposit).

The rest of the gas, which represents the vast majority of the natural gas extracted and essentially consists of methane (CH₄), is injected into the gas transport networks to the places of consumption.

Natural gas condensates (recovered in liquid state when leaving the well) and liquefied petroleum gas are the two products with the highest market value. Some gas operations have only been set up to extract these products, and reinject the rest of the natural gas into the deposit instead of exploiting it commercially.

1-2-6 Transport infrastructure:

After extraction and processing, natural gas still suffers from significant transportation costs. The construction of long-distance gas pipelines corresponds to heavy investments. Transport by LNG tanker in the form of liquefied natural gas (LNG) is also very capital intensive, requiring the construction of a liquefaction plant at the point of export, the construction of a re-gasification plant near the point of consumption and the construction of specialized vessels, LNG carriers. This is why small natural gas deposits far from consumption points are not necessarily exploited. In the absence of suitable transport infrastructure, natural gas from oil fields can be burned on site in flares, instead of being recovered. Today, ecological concerns and rising energy prices are prompting gas players to act to avoid the use of flares.

1-3 Forms of natural gas:

The designation of unconventional gas brings together different forms of natural gas requiring specific exploitation techniques: the combination of horizontal drilling and hydraulic fracturing has in fact made possible the exploitation of these gases which until now required much too expensive to extract. Although these gases remain more difficult to exploit than conventional gases, the size of the reserves and the new extraction methods explain why producers are increasingly interested in them. Conventional gases include, among others: (ACPP, Juin 2018)

1-3-1 Shale gas:

Among the non-conventional gases, it is certainly the gas that has been talked about the most. Also called mother rock gas or shale gas in Quebec, it is a natural gas found in marl or clayey rocks rich in organic matter. Unlike conventional gas, which is trapped in permeable rocks, shale gas is contained in impermeable rocks. Its exploitation, source of many controversies, is complex. The countries with the largest shale gas reserves are China, Argentina, Algeria and the United States. The latter are today the pioneers in the exploitation of shale gas, from the 2000s.

The extraction of shale gas poses a number of environmental problems:

- Significant use of water to fracture rock;
- Pollution of groundwater;
- Increase in the number of earthquakes;
- Emission of greenhouse gases;
- Durability and surface of deposits.

These issues make shale gas a controversial resource. In France, a moratorium passed in 2013 prohibits both research and exploitation of shale gas in France. Other countries have adopted similar legislation.

1-3-2 Coal gas:

Coal gas is less known, its exploitation is much older: used as gas for lighting until the end of the 19th century, it was then dethroned by electricity and town gas. It comes from the transformation of coal into coke, a highly polluting fuel commonly used in Europe during the industrial revolution. Coal gas was extremely toxic to produce.

1-3-3 Compact tank gas:

Gas from tight reservoirs, such as shale gas, requires complex extraction techniques in order to be exploited, such as hydraulic fracturing of soils. It is stored in rock-reservoirs with low permeability, sandstone or limestone. These deposits differ in particular from Shale Gas in that the product has "migrated" out of its source rock, and is contained in more porous rocks.

1-4 Environmental impact of natural gas extraction:

Gas is one of the least polluting fossil fuels. Ideally, that is to say if its combustion is perfect, it only emits water and carbon dioxide. However, the extraction, transport and combustion of the gas, in reality, cause significant emissions of methane. However, methane is a major greenhouse gas, considered to be much more important than carbon dioxide in climate change.

However, there are indeed more environmentally friendly alternatives to natural gas. This is the case of biogas, which comes from the fermentation of organic matter. In short, it is a renewable and non-fossil version of natural gas. This gas can be used for the same purposes. It seems a much safer and more sustainable alternative than unconventional gases (Maudou, 2022).

Natural gas extraction is detrimental to the environment in more ways than one: (Economiques, 2022)

- The infrastructures for the exploitation and processing of hydrocarbon deposits are particularly energy-consuming;
- The transportation of natural gas generates significant greenhouse gas emissions. Methane leaks, which are particularly powerful in terms of the greenhouse effect, can be significant on gas pipelines. The liquefaction of natural gas for transport by the LNG sector, for its part, leads to high energy consumption and losses in the volumes transported;
- The extraction of shale gas is accused of causing a deterioration of the landscape by the multiplication of drill heads, significant pollution of the basements and groundwater by chemicals. Water consumption in the hydraulic fracturing technique is also very high.

1-5 Natural gas reserves:

Russia (19.8% of world reserves), Iran (16.2%) and Qatar (12.5%) are the three countries best endowed with gas, concentrating between them three times more than half of the the world's proven natural gas reserves. However, proven reserves change rapidly, and this classification can be quickly revised following new analyses. The United States has thus overtaken Saudi Arabia in proven natural gas reserves following the intense

development of shale gas extraction and subsequent soil analyzes (Bilan énergétique 2022, 2022).

Table number (01): Proven reserves of natural gas in the world in 2017

Rank	Country	Reserves (in billions of cubic meters)
1	Russia	35000
2	Iran	33200
3	Qatar	24900
4	Turkmenistan	19500
5	United States	8700
6	Saudi Arabia	8000
7	Venezuela	6400
8	United Arab Emirates	5900
9	Nigeria	5200
10	Algeria	4300
11	Iraq	3500
12	Australia	3600
13	Europe (excluding Russia)	3000
14	Indonesia	2900
15	Malaysia	2700
16	Egypt	1800
17	Norway	1700
18	Kuwait	1700
19	Uzbekistan	1200
20	European Union	1200

Source: (BP World Energy, 2018).

1-6 Natural gas extraction areas:

The United States and Russia are by far the world's largest producers of natural gas, with nearly 40% of the volumes extracted worldwide. Here again, rapid changes are possible from one year to the next: depending on extraction costs and market variations, certain productions can fluctuate very significantly. Australia saw its production increase by 18% from 2017 to 2018 (Bilan énergétique 2022, 2022).

Table number (02): Annual production of natural gas in the world

Rank	Country	Production (in billions of cubic meters)
1	UNITED STATES	734,5
2	Russia	635,6
3	Iran	223,9
4	Canada	176,3
5	Qatar	175,7
6	China	149,2
7	Norway	123,2
8	European Union	117,8
9	Australia	113,5
10	Saudi Arabia	111,4
11	Algeria	91,2
12	Malaysia	78,4
13	Indonesia	68,0
14	Turkmenistan	62,0
15	United Arab Emirates	60,4
16	Uzbekistan	53,4
17	Egypt	49,0
18	Nigeria	47,2
19	United Kingdom	41,9
20	Mexico	40,7

Source: (BP World Energy, 2018).

2- The gas crisis in Europe:

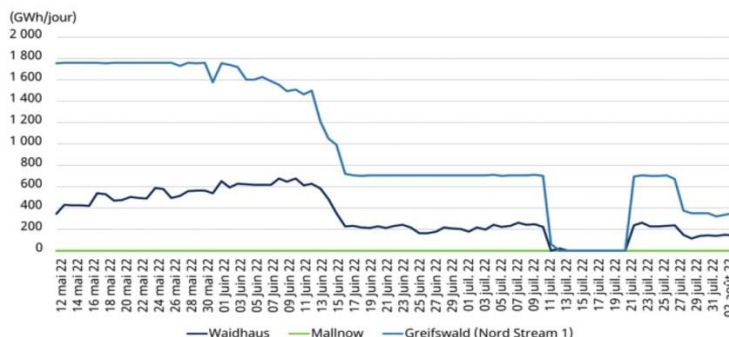
Europe faces high gas prices and possible shortages as deliveries from Russia shrink. We are going to discuss a few points to find out what the consequences are for companies, the energy transition and the economy of the euro zone.

The precarious situation of gas supplies in Europe has been a priority issue for the markets since the invasion of Ukraine by Russia at the end of February.

The European Union (EU) and other countries promptly imposed sanctions on Russian oil. However, gas is a more complex issue given the dependence of major European economies, especially Germany, on natural gas from Russia.

The situation became even more critical when a major gas pipeline – Nord Stream 1 – was closed for maintenance in July. The latter is now reopened, but gas deliveries are made at a lower rate.

Figure number (01): Gas flows from Russia



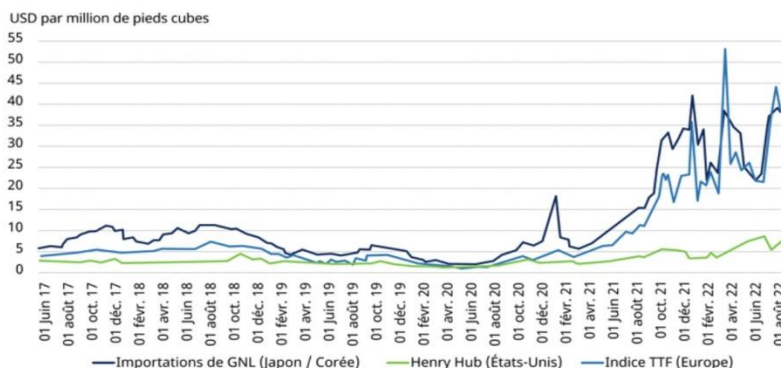
Source: (Agence fédérale des réseaux, 03 Août 2022).

Gas demand is weaker in the summer, but this reduction in supply jeopardizes the EU's goal of filling its gas storage sites to 80% by November this year, and to 90% in 2023.

2-1 The impact on gas prices:

Europe will have to face an 18 to 24 month period of very high gas and electricity prices. It has become the market of choice for gas during this period and will remain so, with prices higher than those practiced in Asia or the United States. This premium should last until we start to see significant new volumes delivered from 2024/2025 (Schroders).

Figure number (02): Regional gas prices



Source: (Bloomberg, Prix régionaux du gaz , Juillet 2022).

There are two methods of dealing with high prices: a reduction in demand or an increase in supply. European countries are taking steps to tackle the demand side problem.

Azad Zangana, Senior Economist and Strategist for Europe: “EU member states recently agreed to a voluntary 15% reduction in gas consumption, but this could become mandatory if supply continues to be disturbed.

Although the rise in energy prices has slowed from 42% to 39.7% year on year according to the latest figures, further increases are expected to keep energy prices and headline inflation high in the second half of this year, which will reduce the purchasing power of households ».

These high prices could themselves lead to a drop in demand, as users limit their gas consumption.

Mark Lacey says: “After a price increase of around 400% over one year, it is inevitable that some of the demand will disappear. Gas demand in Europe is expected to fall by around 10% in 2022. Even at lower prices, it is unlikely to increase significantly in 2023 given the risk of recession”.

The table below shows the expected reduction in gas demand in most parts of Europe over the coming months (Schroders).

Table number (03): Demand in the European gas market

(Mmc - milliards de mètres cubes)

	2020	2021	2022E	2023E
Allemagne	92	98	84	84
Royaume-Uni	68	71	65	68
Belgique	17	17	15	16
Pays-Bas	36	36	31	34
France	40	43	41	42
Péninsule ibérique	39	41	42	38
Italie	70	75	70	70
Autres pays européens	102	108	97	100
Total	464	489	445	452

Source: (bloomberg, Juillet 2022).

2-2 The short-term consequences for businesses:

Germany's reliance on the Nord Stream 1 gas pipeline and lack of alternatives makes it the major economy most at risk from gas shortages. Earlier this year, the German government unveiled a three-stage gas rationing plan in which supply to industrialists could be reduced in order to ensure distribution to households and critical institutions like hospitals.

In such a scenario, energy-intensive sectors such as metal production and chemicals would be the most affected in the short term.

Arianna Fox, European equity analyst, said: “The chemical industry is directly exposed to the risk of gas shortages given its energy intensity and the concentration of

the sector in Germany. The government could introduce rationing, but many questions remain about the modalities of such rationing.”

For example, would all sectors face the same degree of rationing? It could be that the government is trying to protect sectors like agribusiness or health care providers. If so, other industries like chemicals will have to endure greater rationing, which will further strain their production.

The problem is that chemical compounds are used in a huge number of products and processes. In the end, each sector would be affected by a reduction in supply or an increase in the price of chemicals. Companies could try to import the chemicals they need from countries outside Europe, but supply chains remain disrupted following Covid, and there is no guarantee that factories outside Europe will have excess capacity.

Granted, rationing is not currently in place, but financial markets hate uncertainty and share prices of European chemicals companies have in fact already fallen sharply (Schroders).

Figure number (04): The MSCI Europe Chemical index



Source: (Bloomberg, les anticipations de réduction de demande de gaz, Août 2022).

Added Arianna Fox: "Certain chemical companies could potentially represent attractive investment opportunities given the extent of the stock decline involved, particularly if the 'worst-case scenario' of a complete shutdown of gas supplies Russian, does not come true".

And as a result, the dreaded total shutdown of Russian gas supplies may not materialize.

Mark Lacey says: "We believe continued pipeline deliveries (albeit at a reduced rate) are more likely than a complete shutdown. The suspension of deliveries would cause Russia to lose all its political and economic influence over Europe. In addition, the loss of revenue from gas sales would certainly have too significant an impact on the country's export earnings.

It could also be that households will have to make a greater effort, which would help to protect businesses. Germany has unveiled a gas tax project that would also affect households (Schroders).

2-3 The different impacts within Europe:

EU countries have very different profiles regarding the volumes of gas previously supplied by Russia.

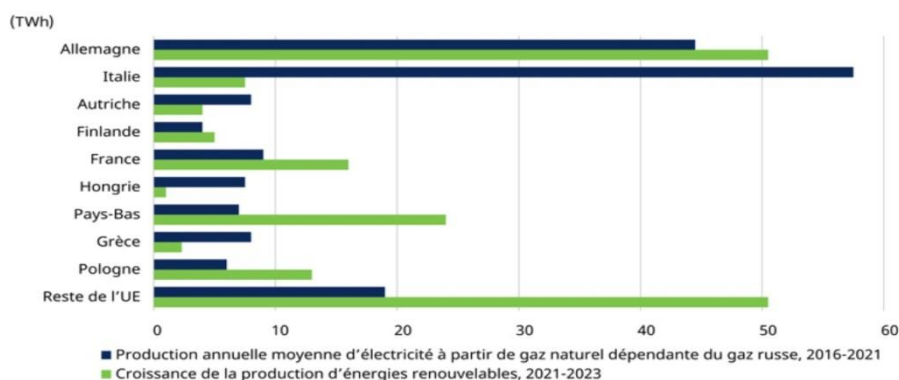
Irene Lauro, Environmental Economist, says: “The EU imports 90% of its gas consumption, with Russia supplying around 45% of these imports in 2021. Austria and Poland imported over 80% of Russian gas in 2021 and Germany more than 50%, compared to less than 8% in the case of France and Spain”.

Some countries have alternatives to delivering Russian gas through pipelines. Countries like the UK and Spain have significant LNG (liquefied natural gas) capacities, which means they can receive imported LNG cargoes. Italy recently signed a series of gas agreements with Algeria.

However, the infrastructures (gas pipelines or LNG regasification plants) are not always present to supply this gas to the central regions of Europe where the needs are greatest.

The graph below shows the average annual share of electricity production dependent on Russian natural gas (in blue), and the projected growth of renewable energy for the period 2021-2023 (in green), i.e. the extent to which renewables can be part of the answer to the gas shortage (Schroders).

Figure number (03): Dependence on Russian gas for electricity and growth of renewables for selected EU countries



Source: (AIE, Les énergies renouvelables face à la pénurie de gaz, Mai 2022).

Irene Lauro adds: "Germany and Italy are heavily dependent on Russia in terms of absolute electricity production." However, given the IEA's forecast for wind and solar development over the next two years, and given current policies, the potential for renewables to help reduce this dependency is significantly higher in Germany than in Italy.

On the other hand, France and the Netherlands are relatively less dependent on Russian gas, with a significant possibility that renewable energies will take over from Russian gas (Baron, 2022).

2-4 The risk of economic recession:

High gas prices are just one of the factors that could weigh on economic activity. German GDP growth was flat in the second quarter, although that of the first quarter was revised upwards.

Azad Zangana said: “We continue to expect reasonable growth from southern EU countries, which have not experienced a full tourist season since 2019”.

However, Germany's performance clearly shows that global capital investment has slowed due to rising interest rates and growth concerns. For their part, the draconian containment measures in China have hardly helped the situation. Given their heavy reliance on Russian gas, it appears that northern member states are particularly vulnerable over the next two to three quarters.

The possibility of a more general economic slowdown, or even a recession, further complicates the situation for companies such as chemical manufacturers who may be forced to reduce production volumes due to the gas shortage.

Typically, companies facing declining volumes try to protect profits by raising prices. But this is difficult for chemical manufacturers in the current environment where customers have already suffered price increases. It is rather the demand that could be likely to decrease (Schroders).

2-5 The possibility of lower prices:

The demand for gas is high not only in Europe but all over the world. Countries are looking to shut down their dirty coal-fired power plants and switch to natural gas as an interim step towards reducing their greenhouse gas emissions. This means that Europe is currently competing with countries like India and China for LNG, and cargoes go to those who can pay the highest prices.

The other problem is that the additional supply of LNG put on the market will be limited over the next two years.

The main reason for this lack of supply is underinvestment in upstream gas projects and the postponement of projects. This is largely due to the Covid-19 pandemic, as well as weak regional gas prices.

However, beyond the next two years, Europe will begin to have new options for sourcing gas. On this date, we will indeed begin to see an increase in supply from the United States and Qatar.

However, even when this additional supply of LNG is brought to market, gas prices are unlikely to return to their previous levels given the growing demand from other regions and the demand for gas as fuel of transition.

Gas prices in Europe (and Asia) are clearly likely to fall from current levels, but once they normalize, they are likely to be higher than before. For example, instead of a long-

term price of 15 to 30 cents per cubic meter, one should probably assume a price of 40 to 60 cents.

This would have lasting consequences for energy-intensive sectors like chemicals, even after the current crisis is over. They would indeed continue to face higher costs than before, which would have an impact on their profitability.

This could induce a lasting structural change that would reduce the competitiveness of chemical manufacturers established in Europe. The latter could seek to transfer their production to countries where the cost of gas is lower (Schroders).

2-6 Beneficiary sectors:

In the medium to long term, the renewable energy sector should clearly benefit from the gas crisis. The need to reduce harmful emissions and the need to reduce dependence on Russian fossil fuel imports go hand in hand.

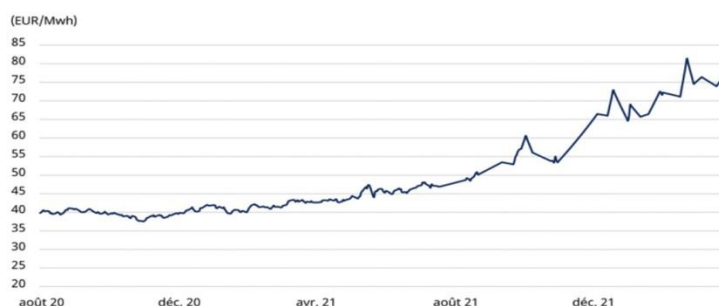
Renewable energy projects such as wind or solar are not instant solutions to the problem, but they are much faster to put into operation than a nuclear power plant, for example.

Rising power prices are also fueling long-term contract prices, meaning the return on investment in these projects now looks more attractive.

Power purchase agreements (PPAs) increased from 40 euros/mwh in March 2021 to just under 100 euros/mwh in June 2022.

This has a direct impact on returns from renewable energy projects, with developers noting that some projects' internal rate of return (a metric used to estimate profitability) fell from 5% to 6% two years ago to more than 11 to 12% today (Agence fédérale des réseaux, 03 Août 2022).

Figure number (05): European average price of 10-year solar power purchase agreements



Source: (PEXA, Juin 2022).

Last May, the EU unveiled its “RePowerEU” plan which aims to phase out dependence on Russian gas and ensure a more diversified supply of electricity from sources with lower emissions. The crisis that occurred this summer and the low volumes of gas from

Russia reinforce the need to accelerate this gradual exit. Ultimately, this will lower prices and make the EU more self-sufficient in terms of electricity production.

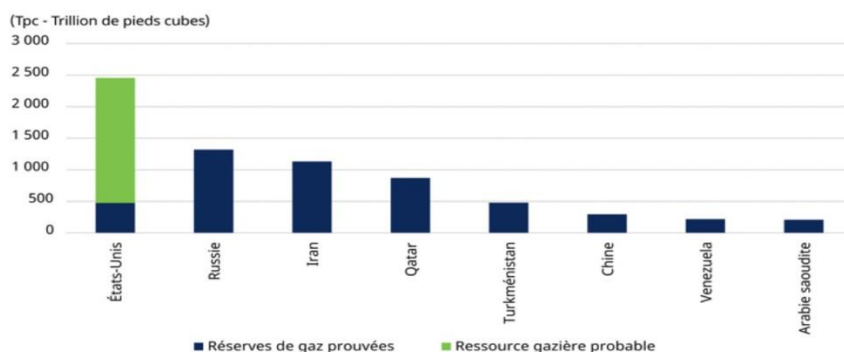
But the transition to renewable energy may not go smoothly. In particular, measures to cushion the impact of rising gas prices on consumers could have unintended consequences.

Economist Irene Lauro explains: “Governments are taking action to protect vulnerable households from rising energy prices through subsidies, waiver of surcharges or capping electricity prices”.

Subsidizing energy consumption is important to help households cope with the short-term cost of living crisis. But this policy can have drawbacks, in particular because it indirectly encourages the use of fossil fuels and makes the necessary transition from polluting technologies to clean technologies even more expensive in the long term.

However, in the short term, the current crisis is showing clear winners: US gas producers. Rising gas prices are making it economically viable to exploit American gas fields that could not have been exploited at a price of 10 cents per cubic meter (Agence fédérale des réseaux, 03 Août 2022).

Figure number (06): World gas reserves by country



Source: (écologique, 2022).

Importantly, nearly two-thirds of total gas resources in the United States are found in Texas, Pennsylvania, West Virginia and Oklahoma. These markets all have access to transport routes to international markets and are ideally located to export gas to Europe at an attractive price of around 28 cents per cubic metre.

This should also boost US gas prices over the long term. Instead of returning to their previous level of around 10 cents per cubic metre, prices look more likely to us to trade around 15 to 20 cents per cubic metre. Obviously, this development increases the attractiveness of American gas companies in the eyes of investors (Agence fédérale des réseaux, 03 Août 2022).

2-7 Impact on the global economy:

The escalation of the energy crisis in Europe will also have negative repercussions beyond the Old Continent, as it will drive up fuel prices worldwide and accentuate inflation, which has already reached levels not seen for decades.

Therefore, a “Russian winter” could make it harder for central banks to get inflation under control. This would be another unfortunate supply-side shock to the global economy. Economies around the world would risk becoming bogged down in the problems they are currently facing, a combination of low growth and high inflation, which could lead to stagflation.

Our analysis shows that the UK and Asia are the most vulnerable to any rise in EU natural gas prices. The table below illustrates the statistical relationship over the past six months between natural gas prices in the euro area and those of other major commodity markets, thus showing their "correlation", i.e. the extent to which the development of one market is comparable to that of another. The closer the numbers are to one, the greater the sensitivity. According to this table, a 10% increase in natural gas prices in the EU could be associated with a 9% increase in UK gas prices and an 8% increase in liquefied natural gas prices (LNG) in Asia (Vanguard, 2022).

Table number (04): The impact of natural gas prices in the EU

Trois principaux producteurs pétroliers	1,0								
Gaz naturel au Royaume-Uni	0,9	1,0							
GNL en Asie*	0,8	0,8	1,0						
Charbon	0,7	0,6	0,6	1,0					
Blé	0,3	0,3	0,2	0,2	1,0				
Pétrole brut Brent	0,3	0,2	0,2	0,4	0,4	1,0			
Minerai de fer	0,2	0,2	0,2	0,2	0,3	0,3	1,0		
Pétrole brut WTI	0,2	0,1	0,2	0,2	0,4	0,9	0,3	1,0	
Gaz naturel américain	0,1	0,1	0,1	0,1	0,2	0,2	0,1	0,3	1,0
	Gaz naturel en zone euro	Gaz naturel au Royaume-Uni	GNL en Asie*	Charbon	Blé	Pétrole brut Brent	Minerai de fer	Pétrole brut WTI	Gaz naturel américain

Source: (Vanguard, 2022).

In contrast, the impact on US natural gas prices is more limited, as the correlation is close to zero. This weak correlation is partly attributable to the fact that the United States itself exports more natural gas than it imports. It also stems from the segmented nature of gas markets. The gas is more difficult to transport and store: it must be transported by pipeline and stored in special facilities or liquefied before being transported.

On the other hand, oil is a more tradable commodity than natural gas: it can be barreled and shipped anywhere.

However, the domino effect of gas prices on oil prices and other forms of energy, such as coal, may be less pronounced. This is because businesses and households that are able to switch from more expensive fuels to cheaper fuels will do so. This surge in demand will drive up prices for crude oil, diesel and gasoline, which are already high, and put further pressure on the U.S. economy.

Restrictions on the flow of Russian gas to Europe do not bode well for energy prices and risk tipping the already weakened European economy into recession. The effects will be felt in global energy markets, particularly in Europe, including the UK, and Asia. Even if gas prices in the United States remain largely sheltered, it could be otherwise for oil prices in the United States.

Times could be even tougher. It is more important for long-term investors to adopt a strategic perspective and thus stay focused on their objectives and focus on what they can control, such as costs, in addition to remaining disciplined and retaining a diversified portfolio (Vanguard, 2022).

2-8 Actions taken in the face of the gas crisis:

Faced with Russia's use of energy as a weapon, the European Union will remain united to protect its citizens and businesses, and it will take the necessary measures as a matter of urgency.

The European Council invites the Council and the Commission to come forward with concrete decisions on the following additional measures as a matter of urgency, as well as on the Commission's proposals, after having assessed their impact, in particular on existing contracts, including the lack of impact on long-term contracts, and taking into account the diversity of energy mixes and national situations: (européen, 2022)

- The joint purchase of gas on a voluntary basis, with the exception of the mandatory aggregation of demand for a volume equivalent to 15% of the filling needs of stocks, according to national needs, and the acceleration of negotiations with reliable partners in order to seek mutually beneficial partnerships, exploiting the Union's collective commercial weight and making full use of the EU's energy platform, which is also open to the Western Balkans and the three countries of the Eastern Partnership associates;
- A new complementary benchmark by early 2023 that more accurately reflects gas market conditions;
- A temporary dynamic price corridor for natural gas transactions in order to immediately limit episodes of excessive gas prices, taking into account the safeguards set out in Article 23(2) of the draft Council Regulation proposed on October 18, 2022;
- A temporary EU framework to cap the price of gas used in electricity generation, including a cost-benefit analysis, without changing the economic order of precedence, while preventing gas consumption from increases, taking into account financial and distributional effects and its impact on flows beyond EU borders;
- Improvements to the functioning of energy markets to increase their transparency, ease liquidity pressures and eliminate factors that amplify gas price volatility, while ensuring stability is preserved financial;

- Accelerating the simplification of permit granting procedures in order to stimulate the deployment of renewable energies and networks, including through emergency measures on the basis of Article 122 of the TFEU;
- Energy solidarity measures in the event of gas supply disruptions at national, regional or Union level, in the absence of bilateral solidarity agreements;
- Increased efforts to achieve energy savings;
- The mobilization of relevant tools at national and EU level.

Conclusion:

Natural gas is a fossil resource whose reserves are limited and which should also experience the equivalent of "peak oil", i.e. reach the point where production can only decline due to the arrival mature gas fields. The estimates diverge markedly, the only certainty being that natural gas is a more abundant resource than oil, and that its deposits will be depleted less rapidly. The extraction of natural gas deposits exploited offshore and of unconventional gases will thus delay the peak of natural gas production by entire decades.

Results:

- The International Energy Agency (IEA) estimates that proven reserves of natural gas represent 180,000 Gm³, more than half of which is in Russia, Iran and Qatar. These reserves correspond to approximately 60 years of natural gas production at its current level. Opinions differ. At Total, we are talking about more than 100 years. On the other hand, the 2018 BP Statistical Review puts the figure at 55 years, (Total includes shale gas reserves in its calculations, as well as the potential reserves that the company intends to find through significant prospecting work);

- Proven world reserves of natural gas Between 1986 and 2018 more than doubled, research work on gas deposits bore fruit and led to giving the natural gas sector great visibility on its future production capacities;

- The long-term recoverable natural gas resources could reach 850000 Gm³ if we consider only the exploitable resources under current economic conditions. So-called unconventional gases could represent approximately 45% of these 850000 Gm³, essentially in the form of coal gas, compact gas reservoirs, and shale gas;

- Cumulatively since the beginning of the history of natural gas extraction and until 2009, only 66000 Gm³ of gas have been extracted from the ground. World gas reserves therefore seem to be able to ensure the future of the gas industry for many decades;

- Gas is not available in all countries. If the import of Norwegian gas does not pose geopolitical problems, certain producing countries are more problematic. For example the case of Russia, which was able to use gas during certain conflicts as a means of pressure on importing or transit countries. This was notably the case on several occasions during the Ukrainian events of Euro Maidan in 2013;

- The transport of gas by pipeline also poses geopolitical problems. As these are fixed routes, which cross politically unstable countries, the outbreak of conflicts may pose a risk of shortage;
- The European Council reaffirms the need to increase investment in energy efficiency, future-proof energy infrastructure, including interconnections and storage, and innovative energy technologies renewable;
- The European Council calls on the Commission to speed up work on the structural reform of the electricity market, including an impact assessment, and calls for further progress towards an Energy Union in its own right, serving the dual objective of energy sovereignty and climate neutrality at European level.

References

- BP World Energy. (2018). Consulté le Mars 15, 2023, sur Gaz naturel dans le monde: <https://selectra.info/energie/guides/comprendre/gaz/production#impact-environnemental-de-l-extraction-de-gaz-naturel>
- Bilan énergétique 2022. (2022). Consulté le Mars 31, 2023, sur Effy: <https://www.effy.fr/magazine/bilan-energetique-2022-une-facture-historique-en-france>
- La crise énergétique. (2022). Consulté le Février 26, 2023, sur Les Echos: <https://www.lesechos.fr/economie-france/social/crise-energetique>
- Les gisements de gaz naturel. (2022). Consulté le Mars 6, 2023, sur Green peace: <https://www.greenpeace.fr/crise-energetique-4-pistes-immediates-pour-faire-face/#:~:text=En%20France%2C%2012%20millions%20de,et%20tr%C3%A8s%20consommateurs%20en%20C%29nergie>
- Vanguard. (2022, Juillet 28). Consulté le Mars 11, 2023, sur <https://www.vanguard.ca/fr/investor/insights/europes-energy-woes>
- ACPP. (Juin 2018). Les producteurs de pétrole et de gaz naturel du Canada. Canada.
- Agence fédérale des réseaux, B. (03 Août 2022). Rapport sur l'état de l'approvisionnement en gaz. Allemagne: Schrodgers.
- AIE. (Mai 2022). Les énergies renouvelables face à la pénurie de gaz. Paris: Agence Internationale de l'Energie.
- Baron, C. (2022). Classement des dix plus grands pays du monde producteurs de gaz naturel. Allemagne: Statista.
- Bloomberg. (Août 2022). les anticipations de réduction de demande de gaz. Allemagne: PV Magazine.
- Bloomberg. (Juillet 2022). Prix régionaux du gaz . Allemagne: Schrodgers.
- bloomberg, E. s. (Juillet 2022). Allemagne.
- Connaissance des énergies. (s.d.). Consulté le Mars 20, 2023, sur CDE: <https://www.connaissancedesenergies.org/fiche-pedagogique/gaz-naturel>

- écologique, M. d. (2022). DATA LAB. Consulté le Mars 16, 2023, sur Statistiques développement durable: <https://www.statistiques.developpement-durable.gouv.fr/edition-numerique/chiffres-cles-energie-2021/14-gaz-naturel>
- Economiques, I. N. (2022). La hausse des prix de l'énergie. France: Insee.
- européen, C. (2022, Octobre 21). Conseil de l'Union Européenne. Consulté le Mars 10, 2023, sur <https://www.consilium.europa.eu/fr/press/press-releases/2022/10/21/european-council-conclusions-on-energy-and-economy-20-october-2022/>
- IFP Energies nouvelles. (s.d.). Consulté le Mars 28, 2023, sur IFP: <https://www.ifpenergiesnouvelles.fr/enjeux-et-prospective/decryptages/energies-fossiles/tout-savoir-gaz-naturel>
- Maudou, T. (2022). GRDF. France.
- PEXA. (Juin 2022). La mesure proposée par la commission européenne face à la crise énergétique. France: PEXA.
- Schroders. (s.d.). Consulté le Mars 26, 2023, sur <https://www.schroders.com/fr/fr/consumer/paroles-d-experts/marches/crise-du-gaz-en-europe--quelles-consequences-pour-les-investisseurs/>

