

Natural gas as a strategic product in the energy market

BETTAYEB Ibrahim Yassin ¹, BRAHAMI Mohamed Amine ²

¹Oran Graduate School of Economics (Algeria),

ibrahimyassine,bettayeb@ese-oran.dz

² Oran Graduate School of Economics (Algeria), amine.brahami@ese-oran.dz

Received: 01/01/2022

Accepted: 24/02/2022

Published: 01/04/2022

Abstract:

International gas market horizons have changed significantly. The shift towards gas as the main source of energy imposed a new dynamic especially with the increasing interest in the environmental issues. Therefore, this paper aims to show the importance of this resource through tackling the development of its exploitation and use and the size of its reserves. Furthermore, we try to shed light on the development of the prices and the trade worldwide using a descriptive analytical method for the available data and statistics. Consequently, we deduce that having influence on the gas market and its plans and projects is a necessary part of the geopolitical power measures currently.

Keywords: Energy; natural gas; natural gas prices; international trade of gas.

JEL Classification Codes : Q4 , Q41, Q43.

Corresponding author: Bettayeb Ibrahim Yassin , **e-mail:** ibrahimyassine.bettayeb@ese-oran.dz.

1. INTRODUCTION

Recently, the coverage of natural gas to the international needs has increased considerably. It exceeded 24% in 2018 which gives an increase average of 5.3%. This has never been witnessed in the producers' exports-USA knew an increase of 3.4%, i.e. 132 million m³. This increase is related firstly to the characteristics of this resource that are: cleanliness and

comfortable usage. Moreover, chemically speaking, the gas does not release ash and carbon oxide or sulphuric products when burned, just carbon dioxide and water vapour. Thus, gas is a good tool for fighting pollution and serves better in regions with high populations (such as Japan). It also requires the solidity of the gas transport chains and the importance of the investments are needed to develop this sector.

As for the consuming countries that did not have this resource locally, they could not use gas significantly due to the costly investments in other sectors. In the same regard, gas covered only 22.5% of the Japanese needs in 2018. On the other hand, the industrial countries developed their production such as in USA, Canada, and Russia because they invested rapidly in this resource and established transmission networks.

In a different context, the consecutive shocks that this resource faced led many countries to reduce energy waste and to free themselves from dependency on oil. They tried to take advantage of their resources; this made countries that are rich with gas use it rather than waste it through, for example, replacing the oil products with the locally extracted gas. This enabled them to reduce their oil imports and to increase their gas exports (Qatar for instance). This proves that gas has a place in the different countries or the geographic regions that are still related strongly to the nature of the available resources and the economic growth averages, and the economic type that the government seeks to develop and to apply policies of consumption rationalization on. (Jarriage & Vrignon, 2020, p. 8)

From this perspective, we see that the world economy became industrial, par excellence, with the existence of a surplus in energy nonconventional alternatives, and other factors related to their cost of development this alternative, and to the consumers, and the environmental international engagements. Based on the main axes of our research, we will try to answer the following problem: What is the extent and the role the natural gas plays in maintaining an important place as a demanded energy in the middle and near future?

This study focuses on deciphering the codes and indexes of demand on energy especially natural gas through studying geographic and economic data of the world, and through giving a historical overview on the natural gas and

the study of its markets according to the geographic distribution of reserves and prices increase compared to oil prices and the impact on production and consumption. Moreover, we shall focus on the natural gas trade worldwide and the main developments of its markets and the near future changes.

In order to go deeper in the topic, the paper is organized as follows: Section 2 discusses the development of international energy consumption. Section 3 highlights the glo

Bal gas market's development and characteristics. The development of the international prices of natural gas, and the international trade of natural gas, are detailed in section 4, and section 5 respectively. The most recent changes to the gas market and its prospects for the future are outlined in section 3.

2. The development of international consumption of primary energy

The energy market, especially oil, had witnessed many positive and negative shocks in prices since 1970 until 2014 due to different reasons throughout time. Each factor has a certain effect on the market in each shock. This makes it difficult to predict the shocks and to determine the duration between one shock and another. As a result, experts studied this effect relying on energy consumption index for each PIB unit to measure the changes in a time where each additional point of PIB reflected an increase of 1.2% in the total demand on energy.

The first shock was during 1970 and 1982 where the consumption intensity decreased from 0.90 to 0.71 point until it became stable in 1989. However, the movement is clearer in the countries where the consumption was higher during the 1st decade of the 21st century (0.13 in OCED countries), i.e., a change of 22% during 2000-2014, and during 2014-2018 the decrease was relatively less important as the previous shocks led to changing energies with renewable ones. (Fleury, 2018, p. 34)

Table 1. Primary energy supply and use intensity

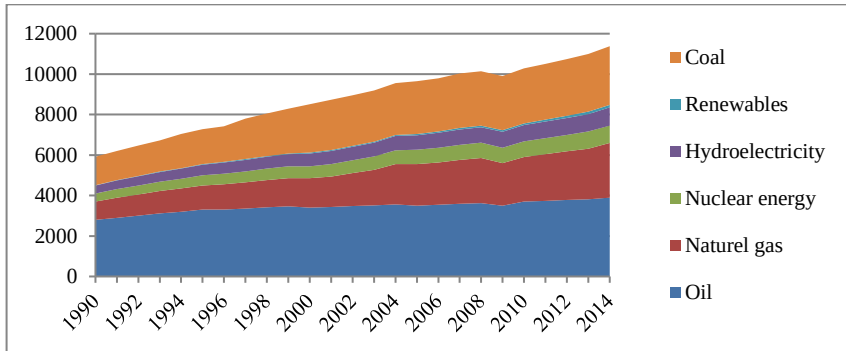
Total Supply			Intensity per unite GDP	
	Mtoe	Variation In%	Tap/1000 USD	Variation In%
	2014	2000-2014	2014	2000-2014
Unites state	2206	-3.0	0.15	-25.0
France	242	-3.9	0.12	-17.4
Japan	441	-15.0	0.11	-24.4
OCDE	5238	-1.0	0.13	-22.0
World	13555	34.8	0.16	-16.5

Source: IEA- World energy balances, 2015, (database)

We see from the percentages in table (01) that the first to be impacted with shocks is the share of hydrocarbons in primary energy consumption of the whole world. Since 1973, the hydrocarbons satisfied 74.1% of the total international energy needs to reach its peak in 2014 with 81% in (67.7 % of hydrocarbons consumption and 66.3% production in USA). However, there is an opposite orientation in the Eastern countries as they use coal mainly. Thus, the hydrocarbons share did not exceed 48.5% in 2014 except in Russia which had 68%.

As for the underdeveloped countries, hydrocarbons covered more than 68% of energy needs in 2014. From the first sight, we notice the convergence of numbers especially in the industrial countries. However, this convergence of consumption numbers does not reflect whether the energy source is local or external. Japan relies on fuels imports for energy while Russia and USA are the biggest producers and exporters of OECD region.

Fig.1. World Consumption (Million tones oil equivalent)



Source: IEA- World energy balances, 2015, (database)

From figure (01), we see the increasing interest in the international energy mixture as natural gas contributed slightly to the total international energy needs; it increased from 2698.8 m³ in 2003 to 3381.0 m³ in 2013. This development is fast in the countries that are rich with natural gas such as Russia, and the USSR generally, where the increase was the highest. Gas covered 16.7% of the needs in 2014.

The USA is the dominant on the energy market (759.4 Mtoe of gas consumption in USA in 2014 versus 728.3 Mtoe of production). This power of the USA reflects the general trends of production and consumption in the world and is considered as a measurement standard especially in OECD countries (Abdelhamid, 2019, p. 84)

3. The development of natural gas use and characteristics of the gas market in the world

China was the first to use gas in a primitive way as a fuel in 940 B.C as they could transport it through Bamboo pipes from its earthly sources into the sea to use it in sea water evaporation to get salt. In the modern era, it has been used for the first time in 1820 in USA. However, it was not used as much as the other extracted gazes from coal and oil. Furthermore, the first well of natural gas had been dug in the USA near Fredonia in New York. It was a superficial well with 8 metres of depth. In 1826, another well had been dug on the shores of Ira lake what allowed supplying some houses and commercial institutions with gas in the end of 1858. Later, gas discovery increased with the efforts to dig other wells such as in Virginia in 1940.

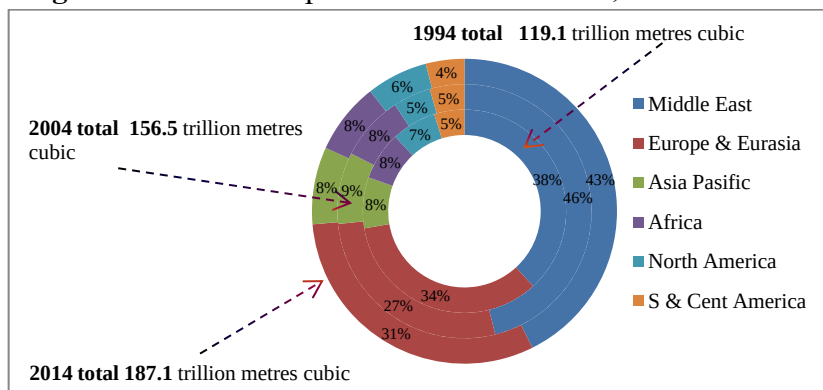
The world had not taken advantage of gas only until the end of WWI. The natural gas was burned completely in its production sites without benefitting from it. Its use started after WWII due to its abundance in huge quantities in Italy and France, and due to the existence of a big reserve in the North Sea, Netherlands, North Africa, and other regions of the world. This increased the interest in natural gas to keep up in pace with the technological advance especially in the 70s leading to more investments in this resource especially in the producing countries. Moreover, it was used extensively in the energy sector through extending pipes to transport it in huge networks to satisfy the world demand that increased tremendously. (IEA, 2015, p. 29)

The natural gas is currently one of the alternative energy resources since it is seen as the ideal fuel source and a carbonic component that contains the same main elements of oil. However, the components of the natural gas differ from one region to another that there are wells that contain only Nitrogen as in Volga Ural in Russia; these wells are excluded from the scope of the wells under study as they cannot be used as a fuel because Nitrogen is an inert gas and inflammable.

In the same context, statistics and numbers on the world reserves differ from one year to another according to discoveries, production, and consumption. The international reserve reached 658 trillion m³ in 2014, double more than 230% of the reserve in 1997 which was 153 trillion m³. As for the international consumption, it reached 3.34 trillion m³ which indicates the clear development of the importance of the gas discoveries and its place among the energies.

Moreover, statistics indicate that the most important reserves had been in the USA until the late 70s when the geographic distribution of natural gas reserves changed on behalf of the USSR. The reserves reached around 43.7% on the 1st January 1984 in the Middle-East countries, i.e. more than 24% of the international reserves. It was noticed as well that some late discoveries in Western Europe that did not exceed 5% in one year have improved. (IEA, 2015, p. 30)

Fig.2. Distribution of proved reserves in 1994, 2004 and 2014



Source: IEA- World energy balances, 2015, (database)

We can notice from figure (02) that the natural gas reserves from 1994 to 2014 are increasing continuously with a percentage that exceeds 5% per year. This increase is attributed to the USSR (Russia) and the Middle-East (Iran and Qatar). Starting from 2014, North America possessed 6.5% of the reserves (Most of this percentage is in the USA whose share exceeds 5.2% versus 4.6% in 1994). In the same context, the USA surplus of reserves pushed it to reduce its exploitation in the beginning of the century. Moreover, the predicted crises led the USA to reduce its investments. However, after overcoming these crises, the USA started thinking about a new revolution in the shale gas (we shall not discuss this gas as it needs a whole study).

In the same continent (Southern America), Venezuela recorded the highest reserve with 30% making it one of the most important countries in the field of fuels; it is the second in the world in reserves improvements. In addition Argentina recorded an increase of 0.2% what strengthens the position of the gas inside the country. Besides, Western Europe has almost 5% of the international reserves with an increase of 0.4% compared to the previous year due to the Norwegian wells and the slight decrease of the Dutch reserves. The UK is in the last rank with 0.8%. On the other hand, Eastern Europe is the region that has the biggest confirmed reserves of natural gas with 31%, i.e. more than 1152 trillion m³ of which 17.4% is in Russia alone, and the highest percentage of increase with 56% since years.

Africa as a whole has 7.6% of the international reserves of which the biggest part is in Algeria with 2.4% despite the decrease since years due o the consumption and lack of local investments. This made Nigeria in the top

of the gas countries in Africa. The Middle East covers 25% of the international reserves with 8% alone for Iran which has been ranked the 2nd after Russia for a long time and which does not have competitors in the Middle-East except Qatar that left a clear touch in the gas trade. Saudi Arabia has 4.4% of the Middle East reserves as it gives more attention to the crude oil of which it covers 25% of the international reserves. (BP, 2015, p. 19)

4. The development of the international prices of natural gas

The 2 oil shocks had little effect on the gas prices due to many reasons namely the nature of contracts between the seller and the purchaser and the very heavy size of investments. In this regard, the seller is linked to the resource zone and the size of the transportation tools, in addition to reconversion of gas into liquid. On the other hand, the purchaser has to install a pipes network to transport gas and establish gas factories to transport it towards the country. However, there is no international trustworthy index for the prices of natural gas export unlike oil. Moreover, the contract provisions are generally secret and differ from one customer to another and from one region to another.

In the 20th century, two American markets emerged in the beginning of the 60s with a high price and a continuous growth. During 1970 and 1983, a European market had been established and was led by “Gaz de France”. Later, another market had been established in Japan where the prices are the highest internationally followed by the European market prices that had been inked for a long time from the supply of East Europe countries, Russia, and Algeria. (Ahmed, 2016, p. 182)

Table 2. Evolution of world natural gas prices
(US Dollar per million Btu)

Price	LNG Japan Cif	US Henry Hub	Crude oil OECD Countries Cif
1984	5.10	/	5.00
1989	3.28	1.70	3.01
1994	3.18	1.92	2.72
1999	3.14	2.27	2.98
2004	5.18	5.85	6.27
2009	9.06	3.89	10.41
2014	16.33	4.35	16.80

Source: Energy Intelligence Group, 2015, natural gas week

Note: Cif=Cost+ Insurance+ Freight (average prices)

Table 02 shows the international prices of gas since 2014 and for 20 years before. We notice that during the 1st decade, the gas prices redoubled in Japan more than 168% until 2003 when the American prices became the highest for the first time compared to the crude oil. The gas prices in markets became more convergent than before due to many points that are: the good American performance, the good clean environmental characteristics of gas, climatic factors such as the drought that hit the American West, and the big increase of natural gas use in electricity generation. (Benabbou, 2012, p. 28)

In 2009, the world witnessed a decrease in gas prices with a percentage of 11.3% from 2009 till July 2014. This raises many questions on this period and what comes after pushing the experts to declare that the gas market witnessed the peak of its wealth and with reference to the change on the pricing formula. Furthermore, the sensitivity of the natural gas prices fluctuations in the international markets is seen as a reflection of the position of this resource compared to the other resources.

5. The international trade of natural gas

The sector of the natural gas is completely different from the oil despite the structural correlation between the two sectors in the phase of production. The main differences are seen in the transportation chain and storage which

are harder and more costly for the natural gas. The natural gas trade had been limited for a long time to the costly long pipes projects. Moreover, there are risks of supply cut and difficulty of contracts between producers and consumers, and other obstacles. This led to the emergence of the sector of natural gas trade in the form of big projects between the big producers and consumers dually in long-term contracts. Therefore, the small consumers could not have access to natural gas. (Hichem, 2007, p. 104)

The natural gas international trade emerged for the first time in 1964 thanks to gas liquefaction and development of maritime transportation techniques. The technique of gas liquefaction, i.e. making the known gas cold (Methane gas mainly) to a -162°C to reduce the size of the gas 600 times, made its transportation easy, increased its storability, and reduced its costs. The natural gas trade started changing gradually with the 1st loads between Algeria from one side and France and Britain from another side. Gas became accessible through harbors like oil and from other sources of import without the need to correlate with one supplier through the pipelines project and all the related difficulties.

In 1985, almost 22% of the exported gas was sent through methane tankers while the transportation in the form of liquid was only 16% in 1980 and 6% in 1970. These numbers reflect the importance of the liquefied gas in the international supply of natural gas especially towards the large-consumption regions such as Western Europe and Japan. Due to geographical reasons, all their imports were in the form of liquefied gas. In the same year, a study of the international center CEDIGAZ confirmed that the natural gas reserves exceeded for the first time the crude oil reserves, i.e. more than 16.3 million tons which is 97748 billion m^3 . (Abdelaziz, 2019, p. 03)

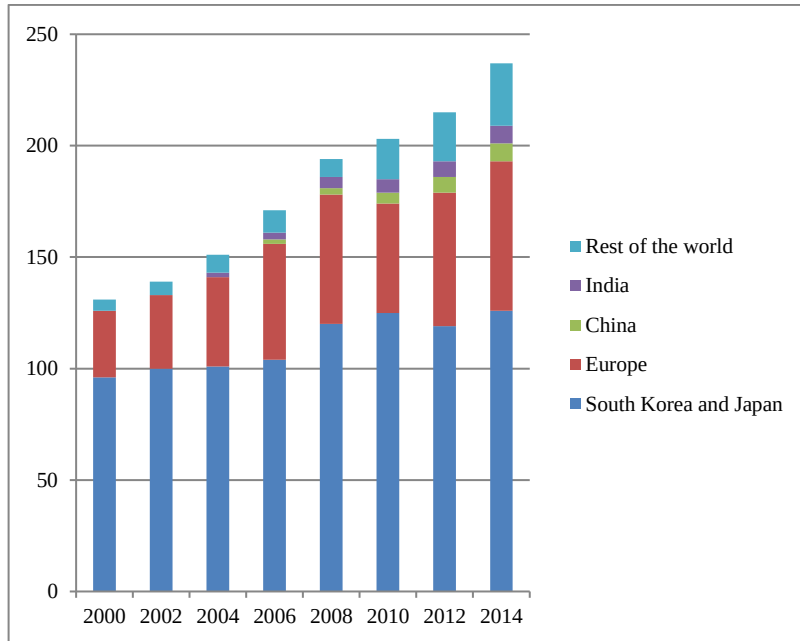
On the other hand, the gas production in 1994 was almost 2693 billion m^3 of which the industrial countries had 44% while the pre-planned economies had 35% (the industrial countries have only 11% of the international reserves of natural gas what pushes us to predict a decrease in these countries' share of natural gas production in the upcoming years.

The natural gas international trade witnessed an increase in 1995 with the increase in international exports with 9.2% to reach 390.8 billion m^3 compared to 362.8 billion m^3 in 1994. This is mainly due to the increase of

gas exchange through pipelines which increased with 10.4% to reach 303.7 billion m³ which is the highest percentage witnessed in the last decade for these exchanges. On the other hand, the liquefied natural gas exports increased with 5.3% to reach 92.5 billion m³ with the lead of Russia with a percentage of 30% of the total international trade of gas followed by Canada with 30%, Netherlands with 10%, and Algeria with 9%.

The production of liquefied natural gas kept increasing and redoubled from 140 billion m³ in 2000 to reach 431 billion m³ exchanges in 2018. Figure (03) shows the international trend towards the demand on the liquefied gas with the lead of Asia. Moreover, it shows the high level of European imports in 2010 and the effect of shale gas on the decrease of the demand by the North America.

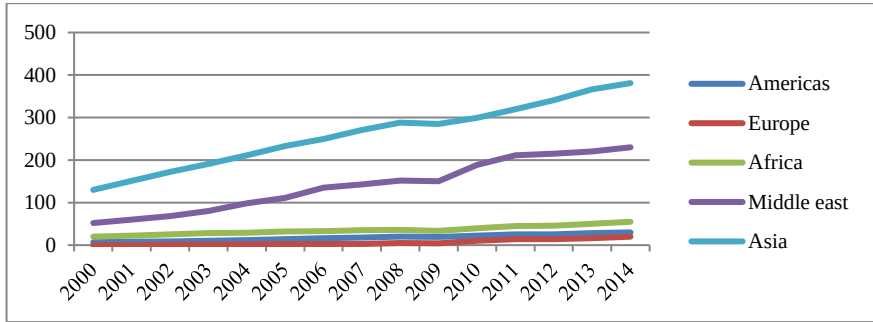
Fig.3.The most important destinations of LNG (billion cubic meters)



Source: BP Statistical Review of World Energy, 2015

Figure (04) shows the most important countries that satisfy the increasing international demand on liquefied natural gas. We notice the big role of the Middle East countries in supplying North Asian countries such as China, Japan, and South Korea.

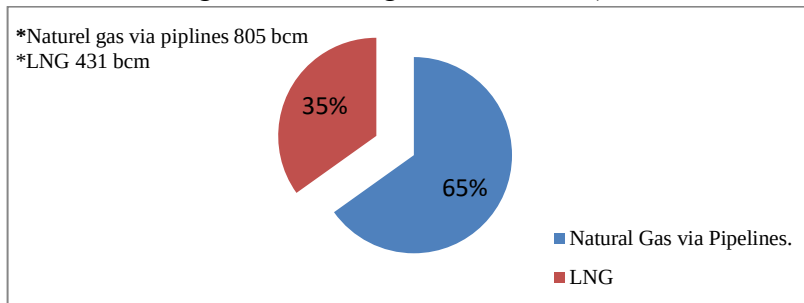
Fig.4. Exports of liquefied natural gas - 2014(billion cubic meters)



Source: BP Statistical Review of World Energy, 2015

Despite the big increase in the quantities of liquefied natural gas trade, it is necessary to put these quantities in the context of the global natural gas trade (liquefied and transported via pipelines) to know the amount of increase of the natural gas as a whole.

Fig.5. The volume of the global natural gas trade - 2014(billion cubic meters)



Source: BP Statistical Review of World Energy, 2015

Figure (05) shows the size of the global natural gas trade in 2018 for each type. The numbers show that most of natural gas trade is still through pipelines due to 4 main reasons that can be summed up as follows:

5.1The pipelines projects are tremendous and require high costs. They require making long-term contracts that may reach 25 years. This explains their efficiency till nowadays. Most of the pipelines projects are limited to Europe, Russia, and China. Russia is present in most of these projects as a supplier of natural gaz. For example, there is a dual line of the project “Nord Stream 2” that will redouble the quantity of the previous line “Nord Stream 1” that goes to Germany and the neighboring countries. Moreover, there is the Turkish line “Turk Stream” that transports gas from Southern regions of

Russia to Turkey and South European countries. In addition, there is a pipelines project towards Europe, but, not from Russia such as “Shah Denis 2” that shall transport gas from Azerbaijan to Turkey. Furthermore, Russia is working on “Power of Siberia” project that aims at establishing natural gas pipelines from the center of Russia towards China.

5.2 The cost of natural gas import decreases through pipelines in the same territory. This decreases the enthusiasm of the current importers through pipelines to import liquefied natural gas.

5.3 Despite that the natural oil is part of a certain supply chain; the pipelines are a major part to transport it through the borders and territories towards regions that do not have maritime points to establish harbors to import gas directly. The liquefied natural gas is not consumed directly from the harbor; rather, it is transported via pipelines to other regions to be consumed.

5.4 The immediate international markets of the natural gas are not stable and the producers and consumers face many risks in the new projects Green Field of liquefied natural gas compared to the other established projects (AONG, 2021, p. 01)

6. The last developments and future expectations of gas markets

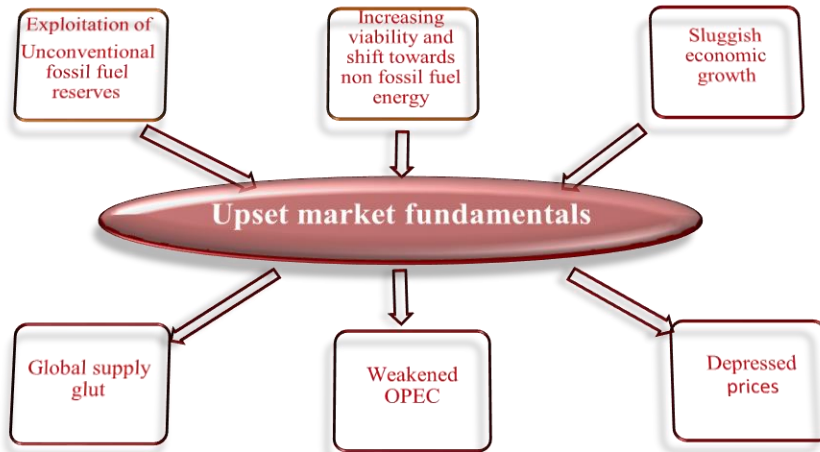
The gas markets enter a new normalcy according to a report from the International Energy Agency in 2012 entitled “the golden principles of a golden era for gas”. This report says that the world is witnessing an era where the gas is in its peak. It provided numbers on the size of gas international supplies and the high exports especially in the light of the growth of the USA’s production of shale gas, this reshaped the international trade of liquefied gas mainly.

In 2012-2013, the expenditure on discoveries and gas production increased considerably. The interest of the large companies in exploiting gas increased. The companies promised good revenues due to the high prices of the gas worldwide.

However, starting from 2014, many factors such as the increasing use of the unconventional reserves, the bloom of the renewable energies, and the low economic development led to a change in the basics of the gas market tremendously. This had an effect on the market outcomes as there was a big

surplus in the supply of gas especially in the light of the weakness of OPEC organization, what had an effect on gas prices and led to their decrease for a long time. (Pierre, Paturel, 2021, p. 02)

Fig.6.The change in the basics of the international markets of gas



Source: A report by Xerfi Institute: Gas markets, Oct. 2017.

The decrease in the prices led to the return of dynamism to the Asian markets and, thus, the Chinese company SINOPEC and Petrochine outperformed the Europeans and Americans and possessed almost 33% of the international demand on gas with a growth average of 0.4 in 2016. Thus, the big companies reconsidered their activities and aimed at finding a new balance between the growth and the budgetary rigorousness to be aware of the new challenges and the high fluctuations of gas markets. (Xerfi, 2021, p. 03)

However, the renewable energies sources developed with a faster average than the expected for many analysts and became able to compete with the natural gas as a trustworthy economic resource of a clean energy that shall have a golden age. 2019 witnessed the return of the conventional producers of natural gas as the investments grew and resulted in projects of liquefaction led by Qatar through an expansionist project that aims at increasing the export of the natural gas from 77 million tons per year to 110 million tons in 2024, and 126 tons per year starting from 2027 according to Cedigaz. (Cedigaz, org, 2020)

This explains the view of the gas supporters that says that it must be the bridge to a future with a clean energy. Thanks to the liquefaction technique, the natural gas sector will continue its expansion to be the first resource of energy worldwide by the end of the 20s of this century.

7. CONCLUSION

We can sum up the findings of the paper as follows:

- The natural gas has an important position in the international energy mixture. This resource has got 23.3% of the total consumed energy in 2013 with the 3rd position after oil and coal which represented 32.9% and 30% of the total international energy reserves. The gas share shall witness a considerable increase in 2040 to reach 29%. This will make the gas the 2nd energy source after oil whose share will decrease from 40% in 1980 to 33% in 2040.
- The importance of the natural gas increases with the increase of the international demand especially in the light of the promising reserves in the world. This explains the bloom of its exploitation and the increasing efforts of research and discovery and the improvement of extraction averages in the exploited fields. This is due to the fact that the use of the natural gas is less expensive than the other energy products and that its burning releases less quantity of carbon dioxide and sulfuric oxide without dust.
- The non-conventional resources boosted the gas position and increased its reserves. Shale gas has alone added 100 years of the real exploitation of this energy resource from one side, and the increase of oil prices and the size of investments what impacted the biggest producing countries and was seen in the loss of gas by American markets leaving a surplus that must be sent to the other markets. Consequently, the competition between the exporters increased in finding a consuming market especially that most of the future demand will be from China which has the most important reserve of shale gas.
- Natural gas may not be the ideal solution to face the climatic challenges. However, it is the less polluting. This strengthens its position especially with the increase of the international reserves and the wealth of the shale gas in USA.

- The gas trade depends mainly on the long-term contracts either in investments or supply and on provisions that can be negotiated. Therefore, any attempt of modification of the legal frames of the international markets shall have a big effect on the exporters' shares making it difficult to adapt with the situations and new cases and leads to the dominance of the country that has the less marginal costs compared to its competitors. This explains the Russian dominance on the European market even in the long run.
- All long-term contracts for gas are only through pipes. Therefore, more than 62% of gas trade is done through pipes towards the industrial countries. These pipes have always been a centre of political debate namely the Russian-Ukrainian crisis of 2014 on Nord stream 1 project.
- The high fluctuations of natural gas complicate determining an international referential price of trade. Thus, each main market (Europe, USA, and Japan) had specific determinants of price according to the circumstances of that market such as the type of gas production, the geographical zone of gas resources (because the farther the resource is, the higher the price is), the local production and consumption rates, and the rate of pipelines gas and liquefied gas. We should note that there are many determinants of the prices that shall emerge in the future such as the nature of the demand and supply on gas compared to the other alternative energy resources such as oil, the technological advance, the climatic and international geo-political conditions.
- The international reserves are centered currently in specific areas. Therefore, we can predict a new shape of the geo-political map of each region between allies and enemies with each discovery because the incarnation of any energetic convergence gives a strategic depth to the region and increases its economic influence thanks on the big gas wealth. This explains the international race towards exploitation and discoveries to stop dependency on conventional suppliers and rethink the energy policies and their effectiveness.
- The entrance of the non-conventional gas an energy competition and the American supplies to the European and Asian markets will lead to a new market with different dimensions that allows the immediate

exchanges and uses short-term contracts, a decrease in the prices and emergence of new powers of production and consumption and international trade; this makes us predict a golden age for the gas in the near future.

In the end, we recommend that the producing countries like Algeria must recognize that the natural gas will be among the main international economic data as a source of energy in the near future. Therefore, countries must unite under one organization that creates a new style to govern the international gas market with a unified price.

8. Bibliography List :

- Abdelaziz, A. (2019). Dirassa istratijia limostaqbal aswaq al ghaz attabii al mossal. The Bahraini center for strategic, international, and energy studies , 03.
- Abdelhamid, R. (2019). Tatawor al gaz ghayer taqlidi fil alam wa taathiratoho ala aswaq al ghaz al kobra. Mina for economic studies , 02 (03), 84.
- Ahmed, B. (2016). Al asaar al alamia lilghaz wa tataworoha. Economic roaa , 11 (01), 182.
- AONG. (2021, 03 12). AONG. Retrieved 08 17, 21, from arab-oil-naturalgas.com: <https://www.arab-oil-naturalgas.com/category/arabic-natural-gas-articles>
- Benabbou, S. (2012). EXPANSION DU MARCHÉ MONDIAL DU GAZ NATUREL LIQUÉFIÉ ET STRATÉGIES DES ACTEURS. ÉTUDE COMPARATIVE DES STRATÉGIES ALGÉRIENNE, QATARIE ET RUSSE. Innovations , 01 (37), 28.
- BP. (2015, 06 30). BP. Retrieved 09 17, 2021, from BP.com: <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2015-full-report.pdf>
- Cedigaz, org. (2020, May 24). Cedigaz. Retrieved 09 17, 2021, from www.cedigaz.org: <https://www.cedigaz.org/shop-with-selector/?type=publications>,
- Fleury, N. (2018). le gaz naturel dans le monde. Economie et prévision , 02 (68), 34.

- Hichem, A. (2007). Attijara Al alamia lil ghaz attabii wa motaghayirato ha al assassia. Economics institute journal , 01 (06), 104.
- IEA. (2015, 06 30). IEA. Retrieved 09 30, 2021, from IEA.org: <https://www.iea.org/reports/gas-2015/2014-cool-down>
- IEA. (2015, 06 30). IEA. Retrieved 09 30, 2021, from IEA.Org: <https://www.iea.org/reports/gas-2015/2014-cool-down>
- Jarriage, F., & Vrignon, A. (2020). Introductio. Une histoire alternative de l'énergie. La decouverte , 02 (76), 8.
- Pierre, Paturel. (2021, Septembre 11). Xerfi Innovation . Retrieved 09 17, 2021, from https://www.xerfi.com:https://www.xerfi.com/presentationetude/Le-boom-du-marche-du-stockage-de-l-energie-en-France-et-dans-le-monde_21SCO17
- Xerfi;. (2021, June). Xerfi Innovation. Retrieved 09 11, 2021, from [www.xerfi.com: https://www.xerfi.com/presentationetude/L-industrie-mondiale-du-petrole-et-du-gaz_21XCHE08](https://www.xerfi.com:https://www.xerfi.com/presentationetude/L-industrie-mondiale-du-petrole-et-du-gaz_21XCHE08)