gas in focus

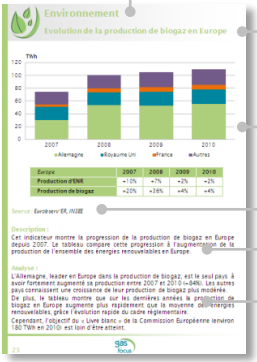
Gaz observatory

Guidelines

Information units' signage :

In order to make the navigation in this memo easier and more entertaining, we have chosen to point out each information unit with a color and a pictogram :

Page template :



Indicator's information unit

Indicator name

Graphic representation of the indicator

Source of the data used to calculate the indicator

Indicator description

Indicator analysis

Today, more than ever, energy is a major social issue.

Beyond economic and environmental considerations, national energy policies, once the realm of a few experts, have become a matter of societal choices.

Today, our world must seek less abundance and a more informed use of energy. In this context, natural gas plays a crucial role, yet unknown to the general public.

Gas in Focus aims at shedding light on the role of natural gas in this transitional period by providing public access to consolidated, enlightening and reliable information.

Thanks to the expertise of its founding members, GRTgaz and Sia Partners, this natural gas "observatory" positions itself as a leading guide in this sector. It is composed of five information units: Infrastructures, Uses, Environment, Markets and Supply.

You can find the content of this handbook with regularly updated information, outlooks and analyses at www.gasinfocus.com.

Summary

Infrastructures

Usages

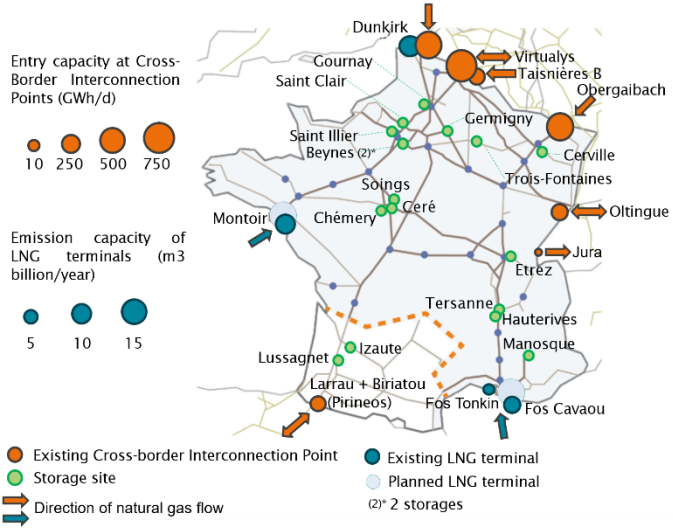
Environment

Markets

Supply

Infrastructures

Major gas infrastructures in France



Sources : GRTgaz, Teréga (2018)

Description :

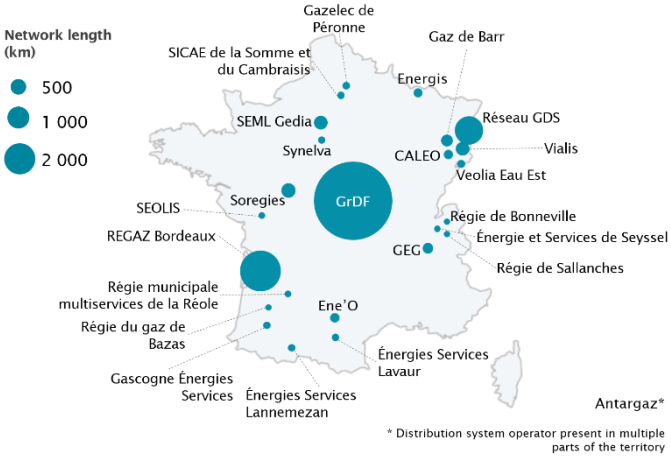
This map shows the major gas infrastructures in France (transmission, storages and LNG terminals), as well as the main interconnection points with bordering countries.

Analysis :

France no longer has any major natural gas resources within its territory. 80% of the consumed natural gas is imported by pipeline from interconnection points (Norway, Russia, the Netherlands, etc.), and 20% is imported by sea via the LNG terminals (Algeria, Nigeria, Qatar, etc.).

Close to 15 underground storage sites ensure a balance between supplies, which are relatively constant throughout the year and consumption levels, which vary seasonally.

Natural gas distribution system operators in France



Sources : CRE, SPEGNN, gtg2007 (2018)

Description :

This map shows the location of the main Distribution System Operators (DSOs) for natural gas in France and the length of the network under concession to each operator. For ease of reading, the size of the GrDF icon is not proportional to the length of its network (198,886 km for approximately 9,568 municipalities served).

Analysis :

The Law of April 8th 1946, which structured the nationalization of the energy sector, preserved the rights of municipalities in matters related to the public distribution of electricity and gas. Therefore, while private companies have been nationalized, certain local publicly-owned companies remained in business.

Today, approximately 400 municipalities in France hire a local operator to manage their natural gas distribution network as part of a public service agreement. Distribution System Operators are regulated companies, whose mission is to guarantee access to their network and ensure natural gas flows through this network transparently and without discrimination.

Infrastructures

Gas transmission operators in Europe

Source : *ENTSOG (2018)*

Description :

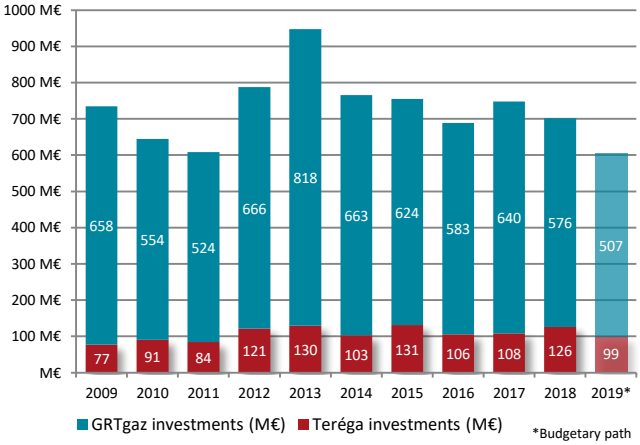
This map shows the locations of European Transmission System Operators (TSO).

Analysis :

The EU-28 has approximately 50 Transmission System Operators today, managing around 200,000 kilometers of network. For the most part, these companies are located in their historical geographical scope. The size of the networks varies to a great degree as it is directly related to the size of the countries in which the Transmission System Operators operate.

The Transmission System Operators are regulated companies that build and operate gas pipelines, and sell transmission capacities on their networks.

Transmission system operators' investment programmes in France



Source : CRE (2018)

Description :

This graph presents the evolution of investments made by the two natural gas transmission operators in France.

Analysis :

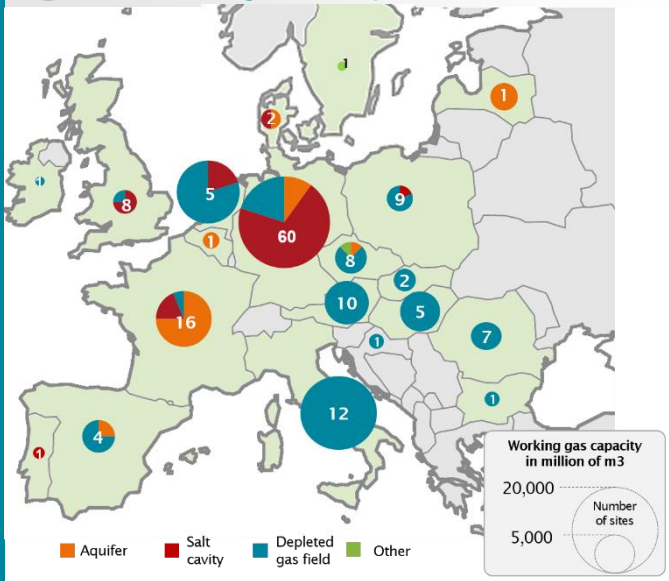
Since 2007, investments in gas transmission networks have increased to allow the emergence of the TRF (Trading Region France), which is a single market area in France, liquid and interconnected with the European market, and also to upgrade facilities to comply with regulations, in particular those related to safety.

The amounts invested are mainly allocated to the development of the main network, the strengthening of the safety infrastructures, and the renewal of obsolescent facilities.

All these investments are subject to approval by the French Energy Regulatory Commission ("Commission de Régulation de l'Énergie"). Transmission System Operators annually publish their ten-year investment plan.

Infrastructures

Underground storage sites for natural gas in Europe



Source : GIE (2017)

Description :

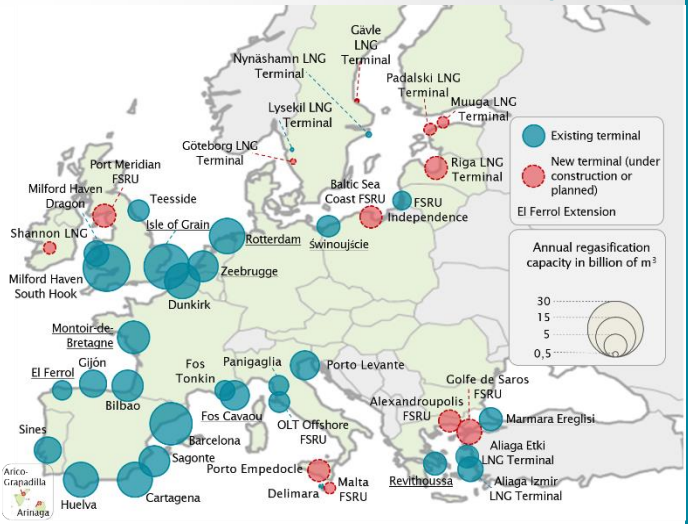
This map represents the working gas capacities of underground storage sites in millions of m^3 and the number of storage facilities in each European country.

Analysis :

The total working gas capacity in Europe today is around 158 billion m^3, including 116 billion m^3 in the UE-28. Global storage capacities are currently estimated at over 360 billion m^3.

France, Germany and Italy can hold approximately 1/3 of their annual requirement in stock. These countries store natural gas in a unique logistics chain to maintain a balance between supply and demand.

Existing and planned LNG terminals in Europe



Sources : GIIGNL (2018), GLE (2017)

Description :

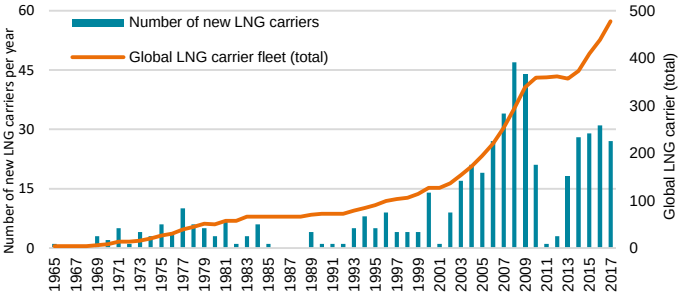
This map shows the natural gas regasification facilities in Europe that are either currently in operation, under construction or planned. The final investment decision has not been taken for all planned LNG terminals indicated on the map.

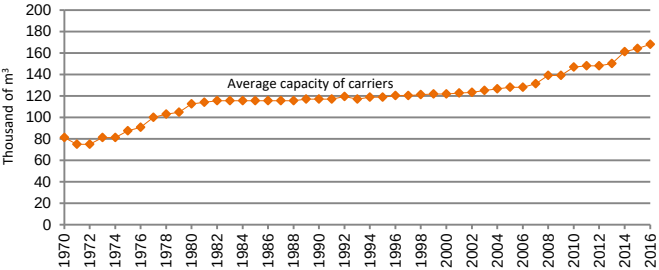
Analysis :

LNG regasification capacities in Europe represent approximately 20% of world capacity, near the USA (16%) but behind Japan (24%). In 2018, the deployment of 4.8 billion m³ additional emission capacity, should increase the European total capacity to 227.8 billion m³. This will allow to compensate in domestic production and to diversify the sources of supply.

Infrastructures

Evolution of the global LNG carrier fleet





Source : IGU - WORLD LNG REPORT (2018)

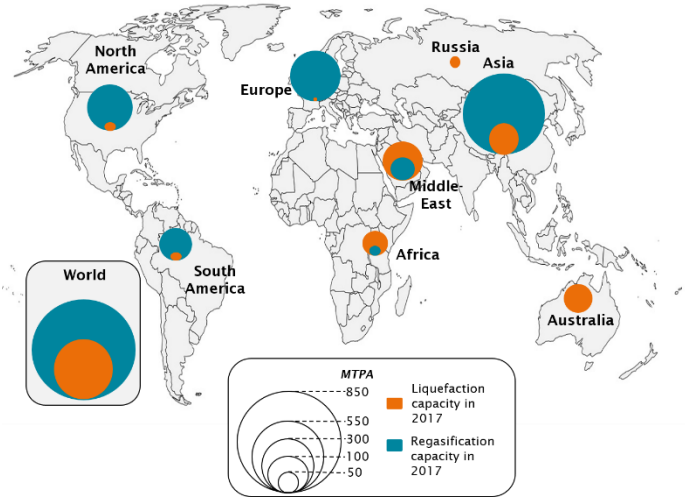
Description :

These graphs show the evolution of the global LNG carrier fleet : annual vessels commissioned, total number of LNG carriers in service and average capacity.

Analysis :

The implementation of new LNG carriers remains high with 27 new vessels in 2017.

At the same time, the average capacity of LNG carriers is increasing, reaching more than 173,000 m³ in 2017 and is expected to rise to 175,000 m³ in 2020.



Sources : GRTgaz, GIIGNL, IGU (2018)

Description:

This map shows both the natural gas liquefaction and regasification global capacities in different areas of the world.

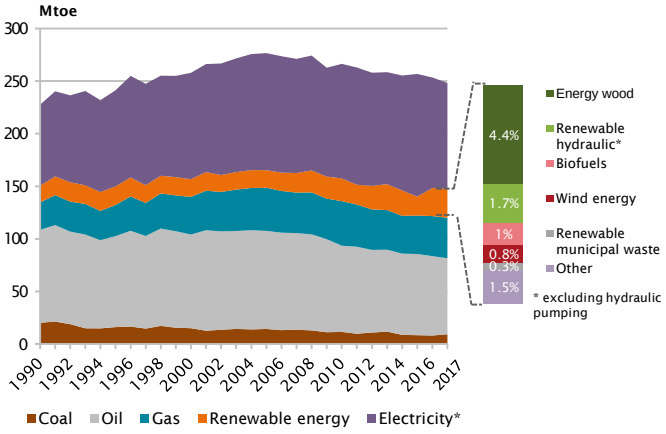
Analysis:

In liquefied form, natural gas can be easily transported by ship over long distances: it facilitates world trade. In 2017, 291.3 million tonnes (Mt) of LNG were trade in the world. Due to strong demand (since the Fukushima nuclear disaster), most LNG has been redirected to Asia. On the contrary, LNG deliveries in Europe dropped by half.

Moreover, both global liquefaction and regasification capacities are constantly increasing. In 2017, global nominal liquefaction capacity stood at 369 Mt while global regasification capacity reached 851 Mt.

Uses

Breakdown of the consumption of primary energy in France



* Excluding renewable primary electricity and hydraulic production by pumping

Sources : SDES, Insee (2018)

Description:

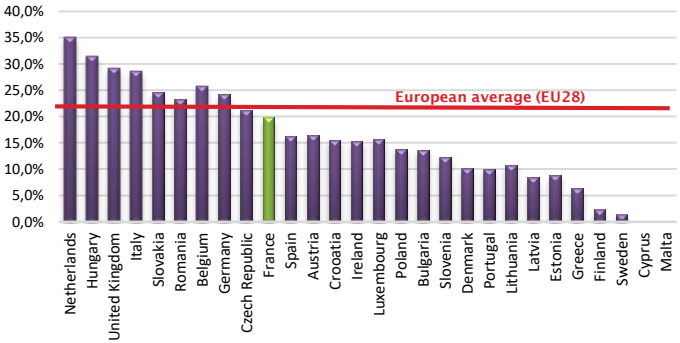
This graph represents the evolution of primary energy consumption in France by type of energy. Primary energy refers to the energy content of the resource as found in nature (fossil material for nuclear generated electricity, natural gas, coal, etc.).

Analysis:

The breakdown of primary energy sources has not changed significantly over the past 20 years, except for a significant decrease in the contribution of coal.

We can also note the growth of renewable energies, now added to the traditionally-used hydraulic-based resource.

Share of natural gas in Europe's final consumption of energy



Source : Eurostat (2018)

Description :

The share of natural gas in the final consumption of energy refers to the ratio between the total consumption of natural gas (industrial, residential/service and production of electricity) and the final total consumption of energy for the year 2016.

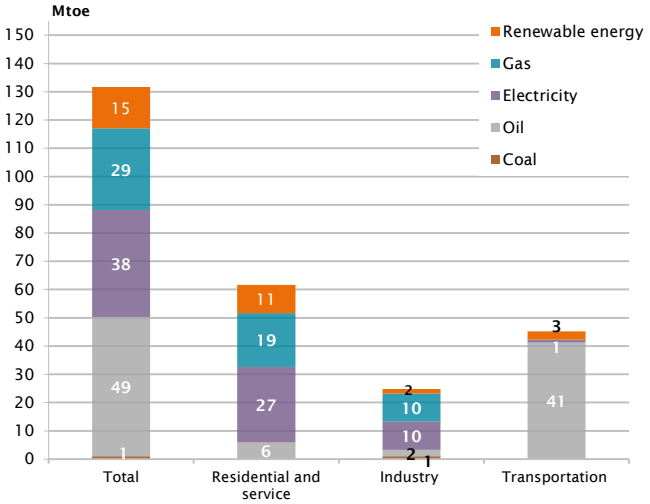
Analysis :

In 2016, the share of natural gas in the final consumption of energy for the EU-28 was 21.5%. In France, the share was 19.8%: it is a slightly below the European average and it is due to the widespread use of electricity to heat housing. This situation is specific to France, which has a large number of nuclear power plants.

The producing countries, or countries close to producing countries, obviously have a greater share of gas in their final consumption of energy.

Uses

Final energy consumption by sector in France



Source : SDES - Bilan énergétique de la France pour 2016 (2018)

Description:

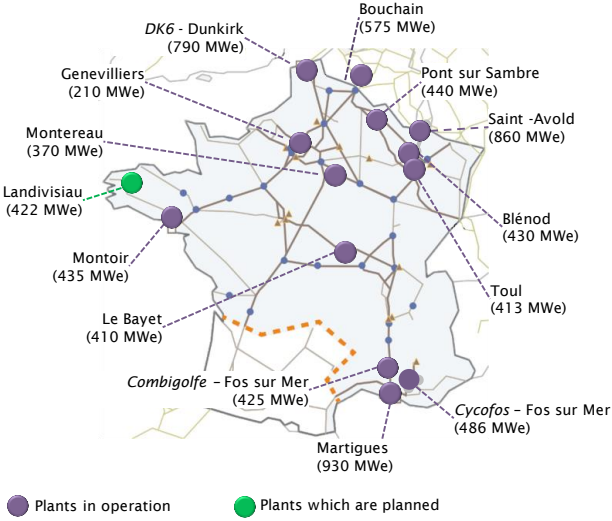
This graph represents the breakdown of the different sources of energy used in the total consumption of energy in France in 2016, both in general and respectively for Transportation, Industry and Housing and Service sectors.

Analysis:

The use of natural gas is equivalent to the use of electricity in industry and residential. However, in the service sector, because of specific uses such as air conditioning, gas ranks second after electricity.

In industry, gas is mainly used for process heating and also as a raw material for the chemical industry (fertiliser and refining).

Centralized production of electricity from natural gas



Source : GRTgaz (2018)

Description :

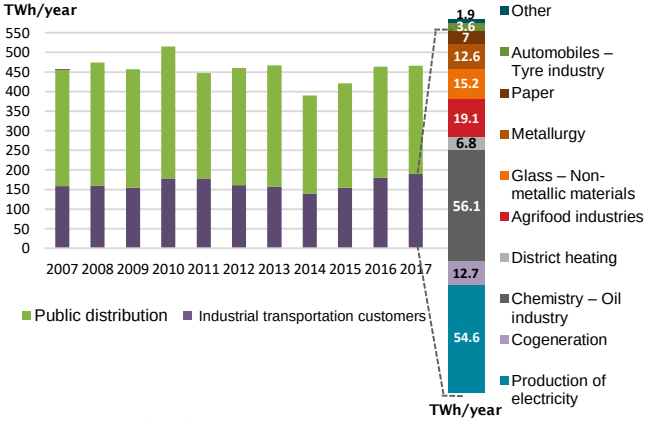
This map shows the locations of French centralized electricity production sites from natural gas currently in operation or planned in France as of July 1st, 2018.

Analysis :

In 2018, the total electric power of French natural gas-fired power plants is 6.7 GWe. Winter 2017-2018 was caracterised by an important decrease in production (40 TWh, which represents -31% compared to the previous winter) due to better availability of nuclear power plants and favourable weather conditions for hydraulic generation.

Uses

Breakdown of natural gas consumption in France



Source : GRTgaz (2018)

Description:

This graph presents the breakdown of natural gas consumption by customer type in the GRTgaz's zone. For 2017, industrial consumer's consumption is distributed according their economic sector of activity.

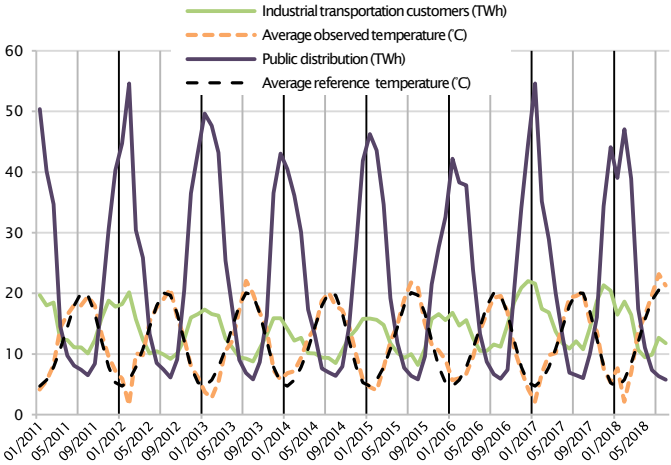
Analysis:

Public distribution, which supply household customers, and SMEs represent close to 2/3 of total natural gas consumption.

Certain industrialists, that are major consumers of natural gas, are connected directly to the transmission network. There are close to 1,000 sites of this type in France, representing 1/3 of total consumption.

N.B. *In France, natural gas transmission is provided by two different transmission operators, each having its own zones: GRTgaz and Teréga. In 2017, 94% of total consumption was located on the GRTgaz's network, 6% on the Teréga's network.*

Seasonality of the consumption of natural gas in France



Source : GRTgaz (2018)

Description:

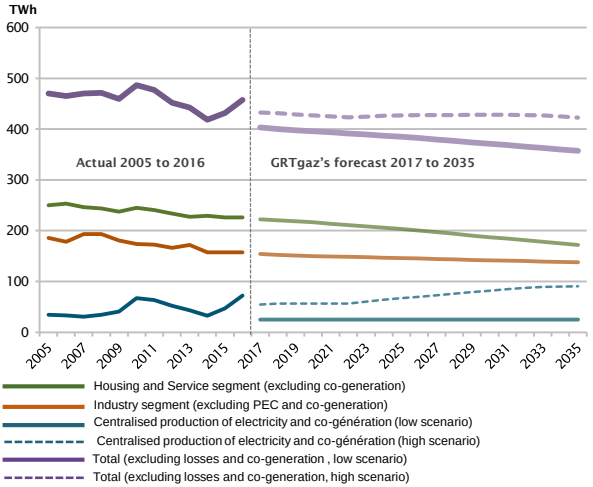
This graph represents the evolution of the average temperature weighted by consumption (observed in GRTgaz's zone) as well as the evolution of the consumption of public distribution and industrial customers directly connected to GRTgaz's transmission network.

Analysis:

The comparison of temperature and consumption trends indicates that the weather has a direct and overriding effect on the seasonal fluctuations of natural gas consumption. We can also note the impact of the slowdown in industrial activity during the summer period.

Uses

Forecasted evolution of the annual consumption of natural gas



Source : Ten years plan for the development of GRTgaz' network (2017)

Description:

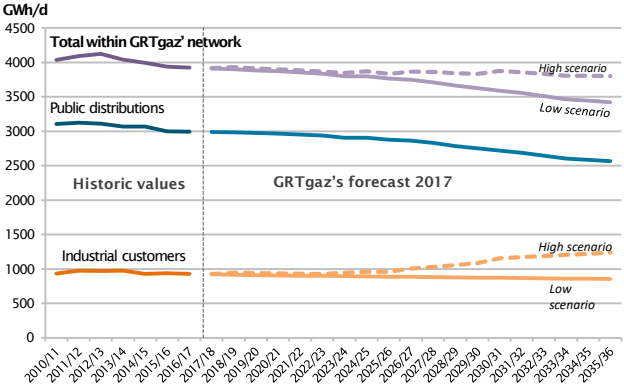
This graph shows GRTgaz' forecasts for annual natural gas consumption broken down by segment according to its reference scenario.

Analysis:

As environmental policies governing buildings are increasingly demanding, the consumption by residential-service should drop over the coming years. However, the progressive elimination of direct electrical heating (by convector) could cause a future rise in demand for natural gas as a substitute.

Changes in demand for combined cycle plants gas, whose consumption is increasing since the end of 2015, is still uncertain. The high scenario corresponds to the building of new power plants in 2021. On the contrary, the low scenario shows the stagnation of installed capacity.

Forecasted evolution of consumption peaks for natural gas



Source : Ten years plan for the development of GRTgaz' network (2017)

Description:

This graph presents forecasts for the demand in natural gas at peak times as established by GRTgaz according to its reference scenario, with a breakdown between public distribution and industrial customers connected directly to the transmission network. High and low scenarios correspond to the evolution of centralised production of electricity and co-generation.

Analysis:

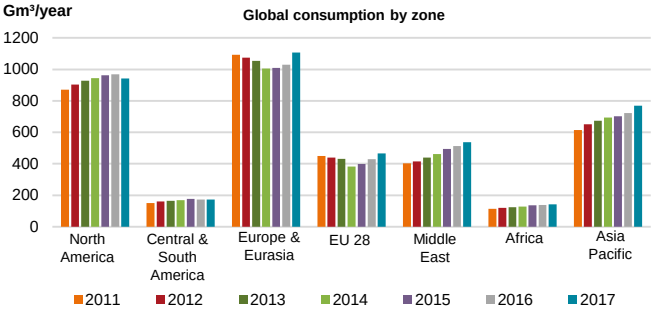
Peak consumption is a criterion when sizing energy transmission networks. The peak allows for an evaluation of the maximum capacity a network must face when conditions of use are extremely intense. With regard to consumption that is very sensitive to weather (public distribution and residential-service), the most stringent conditions are considered established when the temperature adopted is the lowest that has been observed over 50 years (2% risk, hence the term "P2 peak").

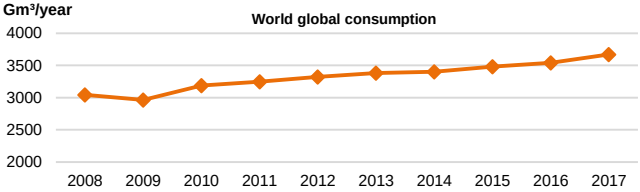
With regard to industrial consumption, except in a few specific cases, the maximum nominal power drawn by the industrial site is used.

We assume that the consumption peak forecast changes in parallel with forecasts for volumes consumed. The total peak increase is therefore mainly attributable to power plants.

Uses

Global consumption of natural gas





Source: BP Statistical Review (2018)

Description:

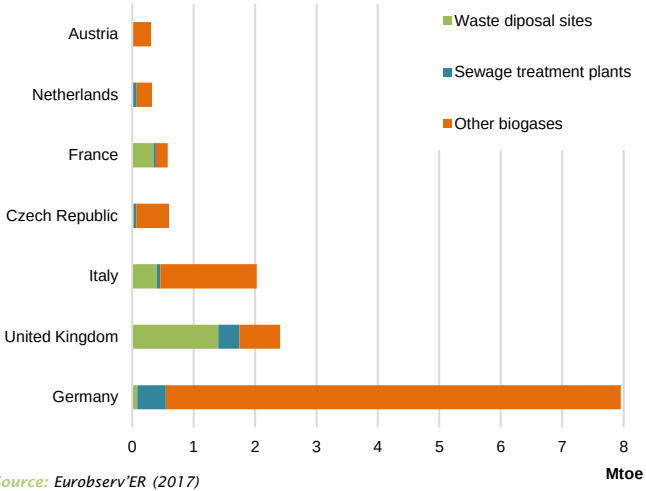
These graphs represent the global evolution of the natural gas consumption by zone and worldwide over the years.

Analysis:

Gas is the third most important source of energy, just after oil and coal. Apart from a decrease during the 2008-2009 crisis, world global consumption of natural gas is increasing over the years, and it reached 3,670.4 Gm³ in 2017.

World global consumption of natural gas is driven by the demand in America and in Asia, due to a strong economic and demographic growth combined with low gas prices. EU represents 12% of world's global consumption of natural gas.

Biogas production channels in Europe



Source: Eurobserv'ER (2017)

Description:

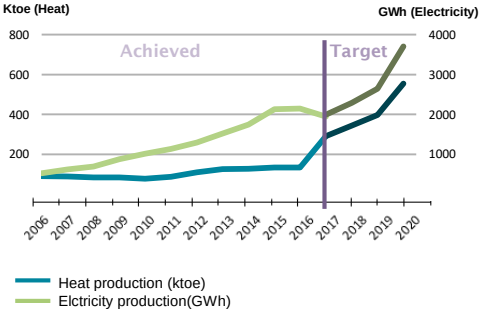
Biogas is produced from organic matter in the absence of oxygen. Production can take place in waste storage facilities, treatment plants or using organic waste from agriculture and the agro-food industry (on the graph, "Other biogases").

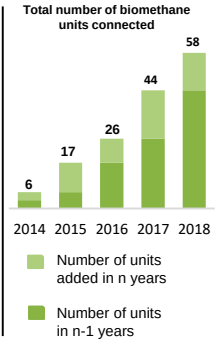
Analysis:

Thanks to its proactive policy, Germany is the main producer of biogas in Europe with a production of 7,956 ktoe in 2016 (half of Europe's production). This production is essentially based on waste from agriculture and the agro-food industry. For its part, the United Kingdom produces a significant proportion of biogas in waste storage facilities. These two examples illustrate the existence of a potentially large yet undeveloped production of biogas in Europe. France is the 5th largest European country with 0.58 Mtoe of biogas produced. Biogas is usually used to produce electricity : 62.5 TWh in 2016.

Environment

Evolution of biogas production in Europe





Sources: SDES, PNA 2020 and GRTgaz (2018)

Description:

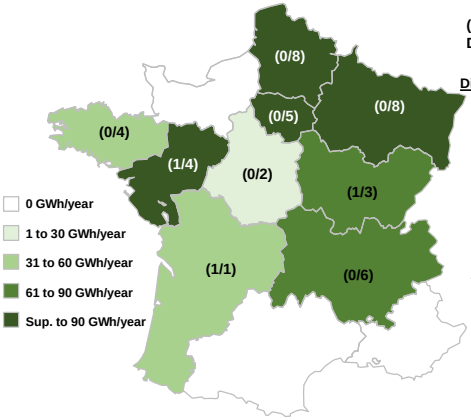
This indicator shows the evolution of biogas production in France since 2006 and the trajectory to follow in order to achieve the PNA 2020 objectives (National Action Plan for renewable energy). This indicator can be correlated with the number of biomethane injection units in France.

Analysis:

Electricity production based on biogas has slowed over the past three years, moving away from the target trajectory in order to achieve the 625 MWe installed capacities objective (and a production of 3,700 GWh). Moreover, heat production continues to get below the target trajectory. The objectives set by the multiannual programming of energy, aiming for a production of 900 ktoe by 2023 seem difficult to reach, unless an accelerated effort of the installation is made on the new production capacities. The number of biomethane units has increased between 2017 and 2018. From now on, there are 58 biomethane injection units. The projects being ever more numerous, heat production is expected to increase in the coming years.

The “Plan Énergie Méthanisation Autonomie Azote” (Methanisation Autonomy Nitrogen Energy Plan), announced by the French government in 2013, plans the construction of 980 new mechanization projects per year from 2013 to 2020. Today, there are already 356 agricultural methanizers, mainly located in Brittany, Pays de la Loire and Grand Est.

Biomethane units connected to the gas network in France



(0/0) : (Transport Unit/ Distribution Unit)

Distribution network units

Agricultural and industrial effluents: 31

Urban waste: 4

Water treatment plants: 7

Non-hazardous waste landfill: 2

Transport network units

Agricultural and industrial effluents: 3

Urban waste: 1

Source: GRTgaz (2018)

Description:

This map identifies all the biomethane units connected to the gas network in France in December 2017.

Analysis:

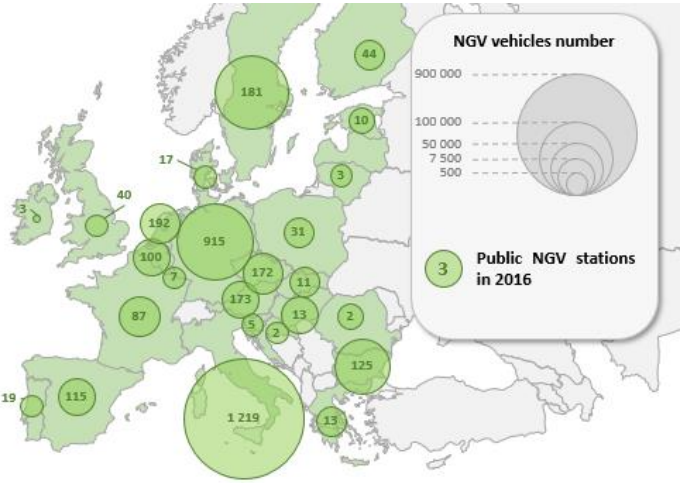
In December 2017, 44 units were injecting biomethane into the French gas network, mostly from agricultural and urban waste. It represents around 696 GWh of production capacity per year.

The first water treatment plant opened in 2015 in Strasbourg.

The two biggest units in France are the ECOCEA tri-methanisation unit with a production capacity of 49.9 GWh/year and Bioloie with 62.6 GWh/year. Both are recycling urban waste.

Environment

Vehicles and NGV stations in Europe



Sources: NGVA Europe (2017), Mobilité Gaz Open Data (2018)

Description:

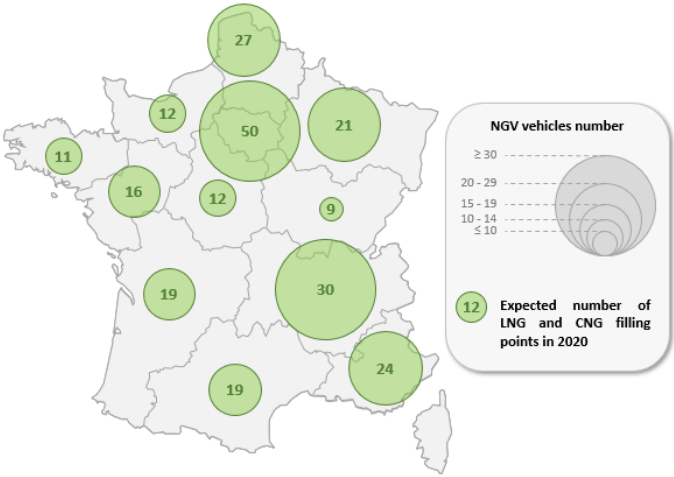
This map represents the number of vehicles and NGV stations across European countries (E.U 28) in 2017.

Analysis:

The utilization of natural gas for mobility purpose significantly differs from one country to another. Italy (1,219 stations) and Germany (915 stations) are currently leading the European market while other countries such as Ireland, Latvia, Croatia or Romania are currently implementing their first NGV stations. The sector is supported by the EU which adopted a new regulation in 2014. The AFI directive (Alternative Fuel Infrastructures) aims to guarantee a sufficient cover in NGV supply stations across the E.U.

The involvement of the E.U to support this sector can be seen through significant progresses within some countries in 2017. For example, Belgium (+22 stations), Finland (+15), the Czech Republic (+29), and Spain (+49) have significantly increased their NGV supply network.

NGV filling points' projection in 2020 in France



Sources: AFGNV, Mobilité Gaz Open Data (2018)

Description:

This map represents the localization of the 250 NGV filling points (1 L-CNG station = 2 filling points) expected to be deployed in France before the end of the year 2020**.**

Analysis:

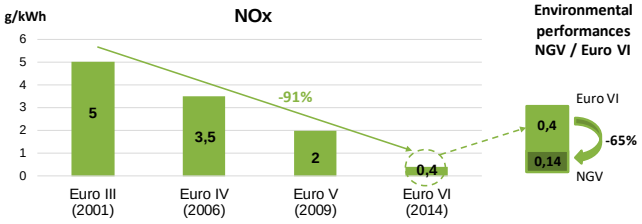
Nowadays, France has around 87 NGV operational stations to supply ~16 100 vehicles. Currently, these vehicles are for the major part buses, business fleet and garbage dumpsters.

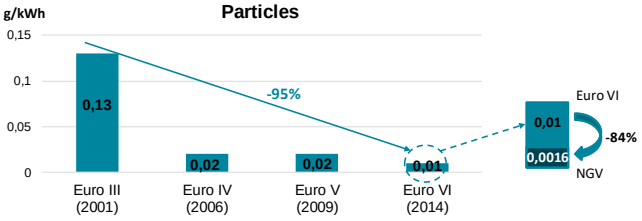
The French law for energy transition (Loi de transition énergétique pour la croissance verte) as well as the energy development plan set the objectives for natural gas mobility development. Thus, 10% of the trucks and 250 000 personal-use vehicles are supposed to be fueled by NGV in 2030.

In order to match these objectives, the supply network should be concentrated in priority within major urban areas and alongside strategical commercial routes (highways, logistical hubs, major ports).

Environment

Evolution of the antipollution applicable standards in heavy trucks and NGV positioning





Sources: Ministère de la Transition écologique et solidaire (2018), IVECO-AFGNV (2015)

Description:

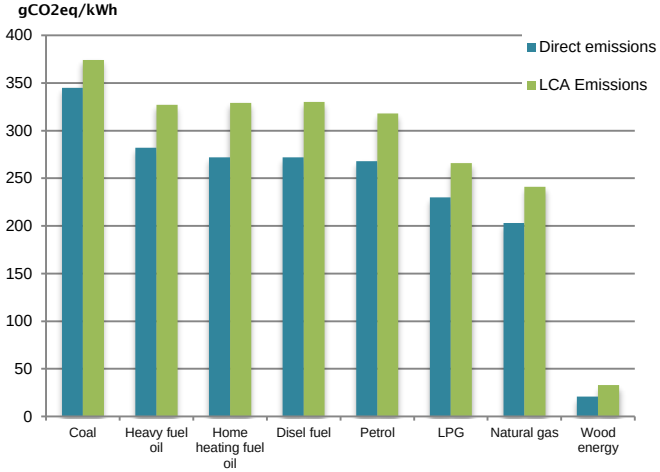
This graph presents European emission standards (Euro standards) of nitrogen oxides and particles for heavy trucks, as well as measured emissions for NGV's vehicles (WHTC cycle).

Analysis:

The Euro emission standards set the maximal limits about rejections of pollutants (nitrogen oxides, carbon monoxide, hydrocarbons and particles) for vehicles. These standards, which have been considerably strengthened, aim to limit the air pollution due to road transport.

NGV environmental efficiency is far better than traditional fuels' one. This efficiency can be seen through nitrogen oxides emissions or micro particles emissions. Both pollutants are strongly concentrated in high-density urban areas.

Carbon content of common fuel



Source: ADEME (2018)

Definition:

This graph compares CO_2 emissions of the various fuels commonly used. The content excluding Life Cycle Assessment (LCA) only takes only into account CO_2 emissions from combustion. The LCA content highlights the CO_2 emissions generated throughout the supply chain (extraction, transmission and distribution).

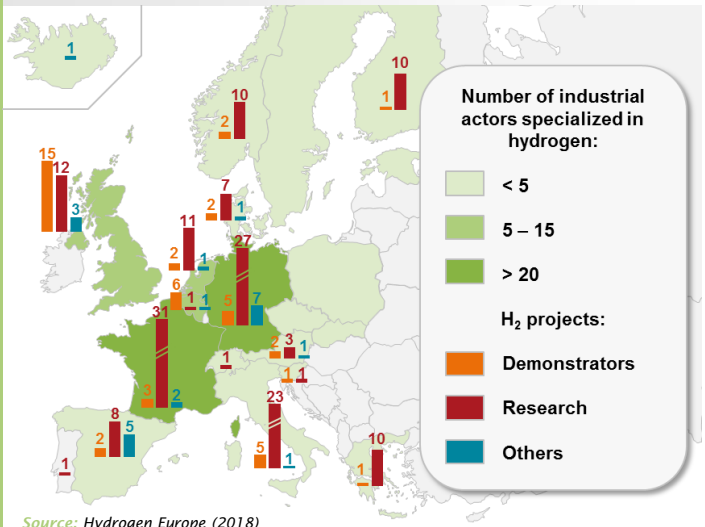
Analysis:

Natural gas plants have the lowest output rate of CO_2 per kilowatt-hour and emit 42% less CO_2 than coal plants.

Among fuels, natural gas is the most interesting as its supply chain cycle has one of the lowest CO_2 emissions. It has, therefore, one of the best LCA ratios among all fossil energies.

Environment

European projects for hydrogen development



Source: Hydrogen Europe (2018)

Description:

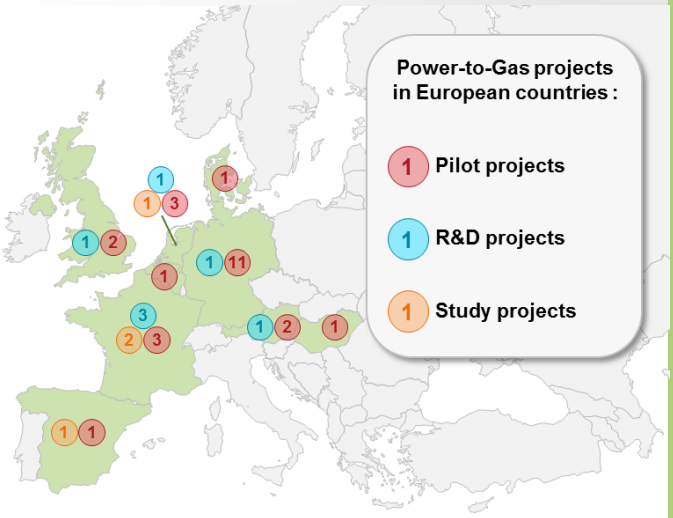
This map represents the number of European projects committed to the development of hydrogen (for industrial use, mobility, energy...). "Others" projects include communication initiatives and economic, social or technical studies favoring hydrogen technologies' deployment.

Analysis:

Currently, hydrogen is mainly used in fertilizers' production or petrochemical / refining processes (87% of global uses). Nevertheless, it is also an energy vector that can foster environmental transition by allowing energy storage, carbon free mobility, green chemistry or the production of synthetic methane.

Germany is the historic leader of hydrogen in Europe with major industrial actors (Daimler, Shell, Linde). However, in June 2018, France announced the implementation of an ambitious plan aiming, among other things, to strengthen its industrial sector, already led by international leaders.

Power-to-Gas projects in European countries



Source: EnergyLab study (Sia Partners 2018)

Description:

This map represents European Power-to-Gas (P2G) projects and studies. These projects and studies are either being implemented or already operational.

Pilot projects concern real size plants expected to be used as models for P2G industrialization. R&D projects concern the development of technologies used for P2G while study projects gather technical, economic and feasibility studies.

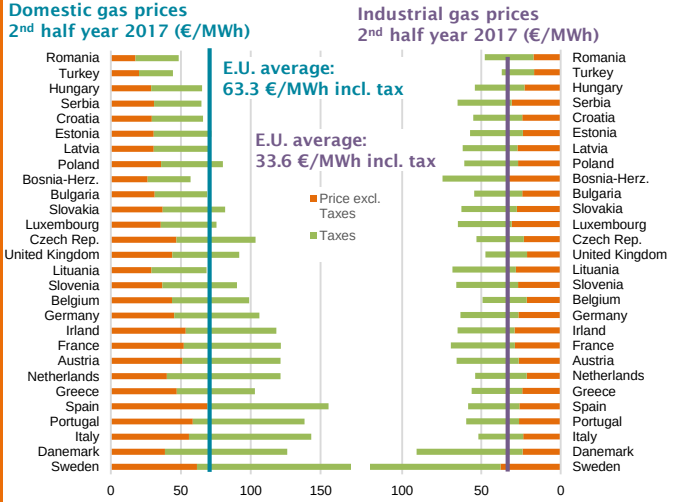
Analysis:

The Power-to-Gas technology is a technology at the junction between electricity and gas networks. It also supports the sustainable mobility development thanks to its complementarity with NGV.

Several European countries have launched pilot projects allowing an optimization of P2G business models. Such an increasing profitability is progressively attracting specialized SME and public actors. Considering the number of projects and studies, French actors expect to become leaders on this technology, thanks to the support of regional and national initiatives.

Markets

Comparison of gas prices paid by European consumers



Source: Eurostat (2018)

Description:

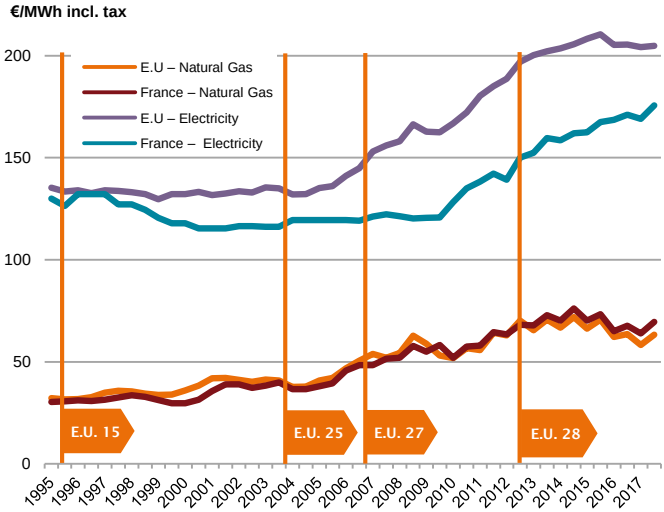
This benchmark compares prices in the domestic and industrial segments for the countries of the European Union. The prices are based on the average price invoiced at the end of the second semester of 2017 and for each country, the tax component is highlighted. The European average is weighted by volumes consumed in each country.

Analysis:

On average, the price of natural gas in the European Union was 33.6€/MWh for industrial consumers and 63.3€/MWh for domestic consumers at the end of 2017. On the industrial market, the average price has decreased by 6.7% in one year (it was at 36€/MWh incl. tax in 2016). In the domestic market, the average price for natural gas, after having increased since 2008, fell by 10% between 2015 and 2016 and by 0.5% between 2016 and 2017.

Mainly due to taxation and geographic distance from producing countries, gas prices – tax included – may vary by up to 100% in some E.U. countries on both markets.

Evolution of domestic prices for gas and electricity



Source: Eurostat (2018)

Description:

This chart presents the evolution of prices on the domestic market in France and the EU-28 average, with an electricity/gas comparison.

Analysis:

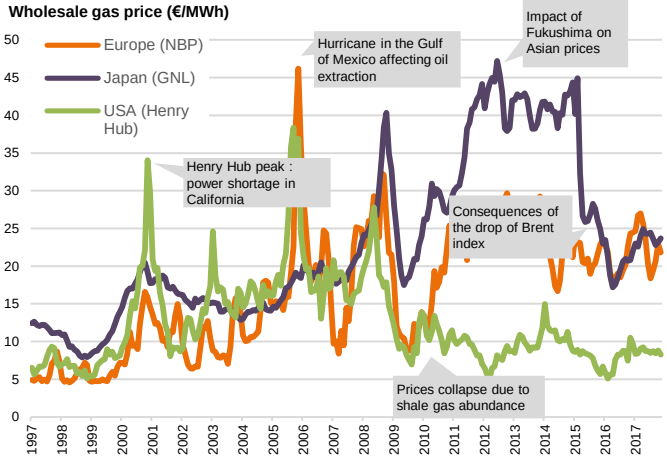
Unlike electricity, the price of natural gas for final household consumers in France follows the European trend.

The domestic price of electricity in France is one of the lowest in Europe because of its historic nuclear power strategy.

The domestic price for the natural gas MWh is lower than the electric MWh, mainly due to the yield differences all along the value chains.

Markets

Evolution of the prices of natural gas in the main market zones



Sources: SDES, World Data Bank, Energy Information Administration (2018)

Definition:

This graph presents the evolution of wholesale prices for the three main market zones: Western Europe, North America and Southeast Asia (including Japan).

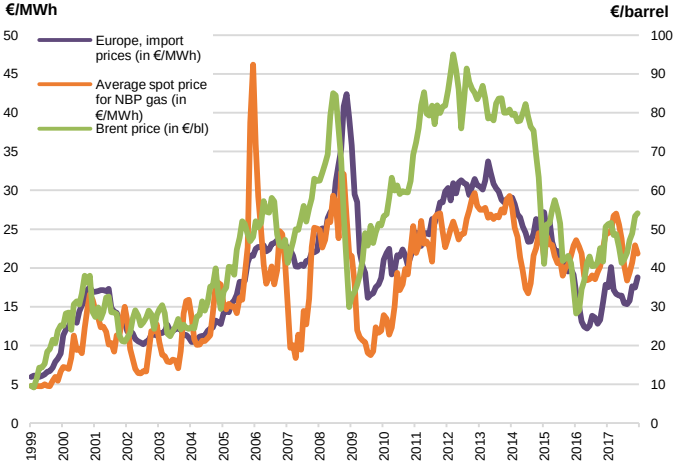
Analysis:

Until 2009, general trends in the three zones where mostly in line. In 2009, a real divergence started. On one hand, the price of gas in Asia skyrocketed mainly because of the Fukushima nuclear disaster. On the other hand, the rise of unconventional natural gas exploitation in the United States explains the sustained drop in prices on the American continent since 2008. Under theses circumstances, the spread between these two countries has reached a record level (39.05€/MWh in 2012).

Since 2016, LNG prices in Asia have almost halved. This is due to the indexation of many long-terms contracts on oil prices, which have decreased by 50% in 6 months.

Since the beginning of 2016, prices have increased, reflecting the oil barrel's price continuous rise. It can be explained by a re-balance of supply and demand. In January 2017, OPEC finally reached an agreement to reduce oil production worldwide, resulting in the increase of stock market price. The gas being indexed on the oil price, this translates into an increase in the price of gas on the different markets.

Correlation between gas prices and oil products' prices



Sources: SDES, World Data Bank, Energy Information Administration (2018)

Description:

This graph shows the evolution of prices for long-term natural gas supply contracts in Europe (BAFA: import price in Germany), the market price for natural gas on the London stock exchange (NBP Spot) and the price of oil products represented by the Brent index (€/barrel).

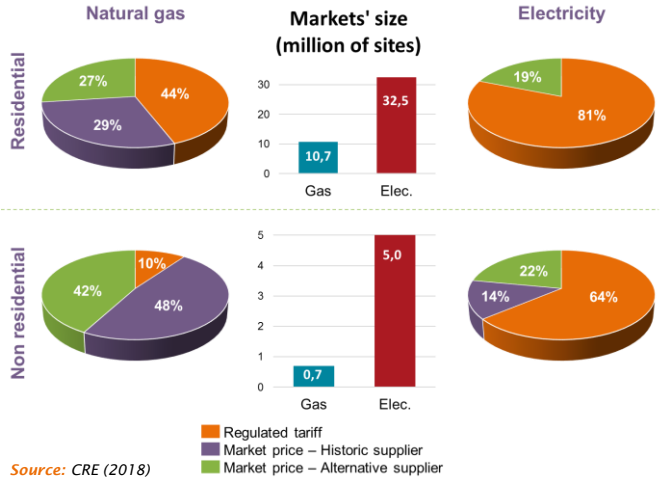
Analysis:

This indicator underlines the strong correlation between the prices of natural gas and oil products. The prices of long-term natural gas supply contracts are indexed to the Brent price. The three to six month discrepancy in the long-term contract prices as compared to the Brent price is due to the smoothing of the indexing formulas.

After 3 years of relative stability (between 80 and 90 €/bl), the Brent index dropped drastically: it was halved between June 2014 and January 2015. The weak recovery in Brent prices in early 2016 was reflected in spot gas prices in the second half of 2016. After a drop in Brent crude oil prices in the first quarter of 2017, the latter has been rising again since the second half of 2017. This is also observed on the spot price of gas.

Markets

Gas and electricity markets opening in France



Source: CRE (2018)

Description:

Diagrams and charts above illustrate gas and electricity markets opening rates in France at the end of the 2018 first semester (considering the number of supplied sites).

Analysis:

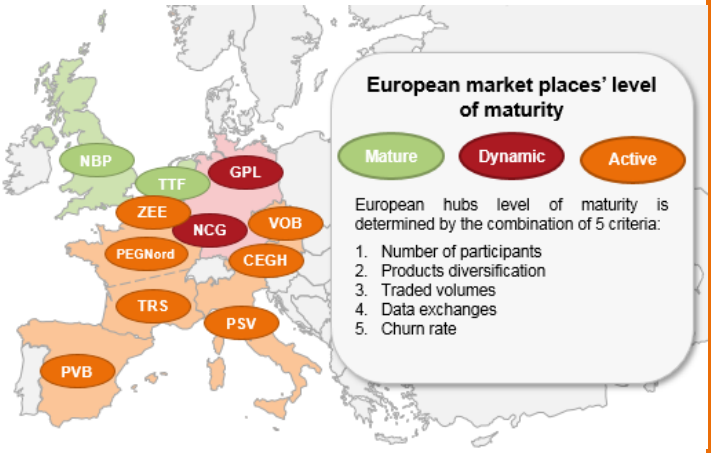
Electricity market and gas market have been opened up since 2004 for businesses and 2007 for households.

The openness rate is significantly higher in the gas market, especially for businesses.

In 2016, the end of regulated tariffs for professional consumers with a natural gas consumption higher than 30 MWh per year led to a huge switch toward market price contracts established with the historical supplier. This trend had slowed down between 2016 and 2018 benefiting to alternative suppliers. On July the 19th, 2017, the Council of State canceled a decree adopted in 2013 governing regulated tariffs for the sale of natural gas, however the latter would not be effective before 2023.

The growth of alternative suppliers market share has been even more important within the residential market where new contracts are essentially established with this kind of new suppliers.

Maturity level of the major European market places for natural gas trade



Sources: The Oxford Institute for Energy Studies (May 2018), CRE (2018)

Description:

This map represents the maturity level of the European major market places for natural gas trade.

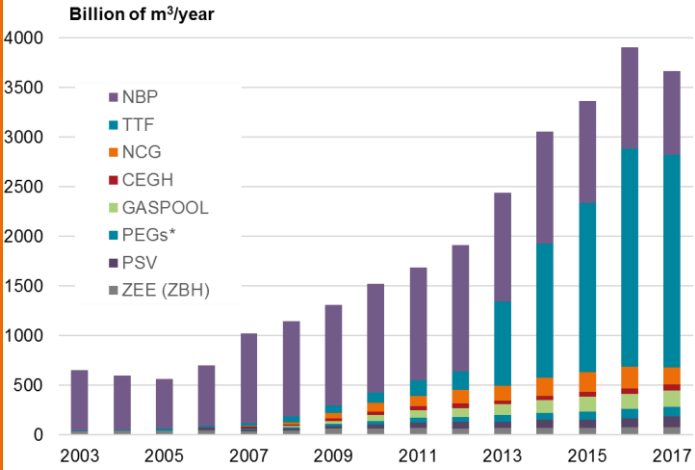
Analysis:

To be reached, the long-term objective to implement a unique European market for natural gas needs a deeper harmonization of existing market places. The maturity level of these market places can be evaluated considering five drivers: number of participants, products diversification, traded volumes, data exchanges and Churn ratio.

Product diversification (day-ahead contracts, within-day contracts, OTC…) are significantly different from one place compared to another. However, the gap between traded volumes is the main reason to explain why English and Dutch market places are currently considered as the only mature hubs in Europe. In France, a merger between PEG Nord and TRS will be effective from the 1st of November, 2018, creating a unique PEG market with a single price for gas in France, a more competitive market and increased security of supply.

Markets

Evolution of natural gas traded volumes on European market places



Source: Gas in Focus consolidated data
** PEG Nord and TRS (before 2015)*

Description:

This graph represents the volume of natural gas which is traded on the main European market places. These markets allows the implementation of energy exchanges, which set common « spot » prices for the area.

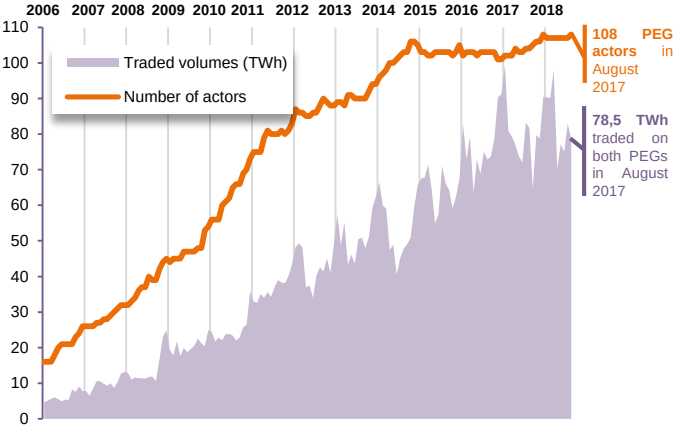
Analysis:

Considering traded volumes, the gap between the different gas markets can be huge. Together, the two mature markets (United Kingdom and Netherlands) weights more than 81% of 2017 traded volumes.

However organized markets still represent a small percentage of natural gas exchanges on the wholesale market: over-the-counter (OTC) contracts still represent the major part of European exchanges.

In France, the market is organized in the form of the « Points d'Echange de Gaz » (PEG) and Powernext operates the energy market.

Evolution of the « Points d'Échange de Gaz » (PEG) activity in France



Source: GRTgaz (2018)

Description:

This indicator illustrates the evolution of natural gas traded volumes on PEGs (PEG Nord and TRS) between 2006 and August 2018. It also shows the number of actors operating on these market places.

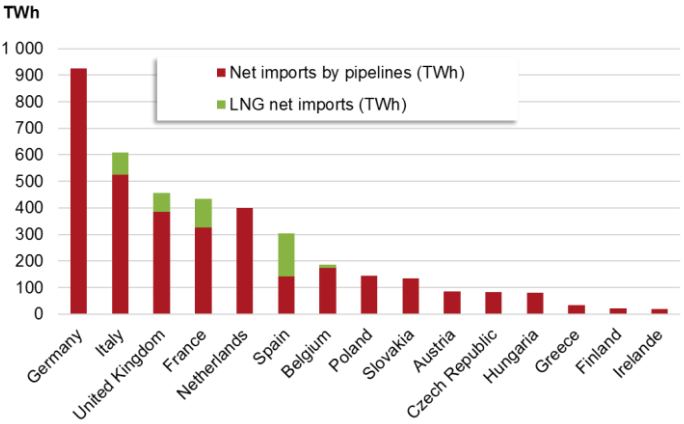
Analysis:

In France, market players can use two virtual transfer points : PEG Nord and TRS (resulting from the merger of PEG Sud and TIGF, now Teréga, in April 2015). Actors operating on this market place can be from different natures: gas consumers, gas suppliers, producers, traders…

PEG Nord covers most of the gas trading in France. Since the launch of these virtual transfer points, both the PEGs have been recording a continuous trade expansion (even thought it is strongly linked to seasonality), whereas the stable number of players since the end of 2014 shows a maturity in the market. The implementation of a unique PEG market expected on the 1st of November 2018 aims to, among other things, to increase the attractiveness of the French natural gas marketplace.

Supply

Gross imports of natural gas into Europe



Source: *BP Statistical Review of World Energy (June 2018)*

Description:

This graph represents European countries natural gas imports based on the supply source : whether pipeline or liquefied natural gas (LNG).

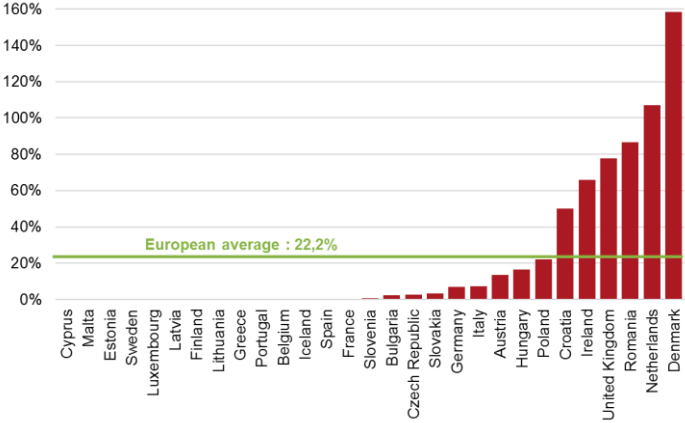
Analysis:

In 2017, natural gas importations of European countries reached 3,908 TWh. LNG volumes accounted for 11% of the gross imports (433 TWh). This figure represents a small increase compared to 2016.

However, LNG weight in European total imports has been plunging since 2011 because of European declining consumption and gas flows heading more and more toward Asia. Nevertheless, the IEA forecasts that the proportion of LNG in European imports is expected to reach 35% in 2030.

Thanks to their geographical location, Spain, France and the United-Kingdom own strong regasification capacities. These installations allow massive LNG imports accounting for 53%, 20% and 15% of their total natural gas supplies.

Natural gas and energy independence in Europe



Source: Eurostat (2018)

Description:

Energy independence is defined as the ratio between primary natural gas production and the country's gross domestic consumption. This ratio defines a country's ability to cover its own natural gas needs.

A country whose ratio exceeds 100% is an exporting country : its national production exceeds the gross needs of consumers in the country.

Analysis:

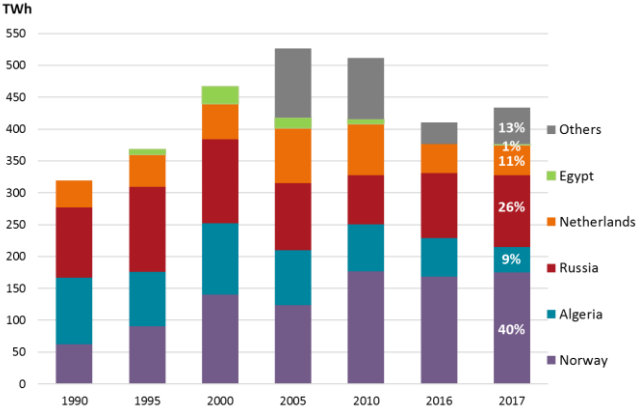
The European Union average rate for natural gas supplies independence is around 22.2%. While two countries are above 100% and able to export their production surpluses, only the Netherlands gets a real weight in international gas trade regarding the weak volumes of the Danish production (5th producer in Europe).

This indicator underlines the importance of a diversified supply strategy in Europe to mitigate geopolitical risks threatening supplies.

As an example, in France where natural gas production for commercial purposes stopped in 2013, LNG terminals are expected to strengthen energy security through the diversification of importations.

Supply

Sources of natural gas imported in France



Sources: *SDES, BP Statistical Review of World Energy (June 2018)*
Imports from Algeria are a mix of LNG and pipeline supplies

Description:

This chart represents France main suppliers for imported natural gas.

N.**B.** *The « Other » category includes, among others, Nigeria, Qatar, Peru, Trinidad, Angola, and natural gas from the North Sea.*

Analysis:

The French portfolio for natural gas supplies is one of the most diversified in Europe. This strategy aims to secure natural gas supplies.

Representing more than 40% of gross imports, Norway is the main supplier for France. The steady growth of Norwegian gas' imports has balanced the gradual decline of imports from the Netherlands and Russia.

LNG terminals' development has been strengthening the position of new exporting countries such as Nigeria, Qatar, Trinidad and Tobago even though LNG imports have been declining because of the growing demand from Asian countries.

European Union natural gas main imports

Source: BP Statistical Review of World Energy (June 2018)

Description:

This map represents the EU-28's main natural gas imports flows based on their origin country in 2017. Blue arrows represent LNG flows, the red ones represent pipeline flows.

N.B. *$^{2}/_{3}$ of Algerian natural gas is exported through pipelines.*

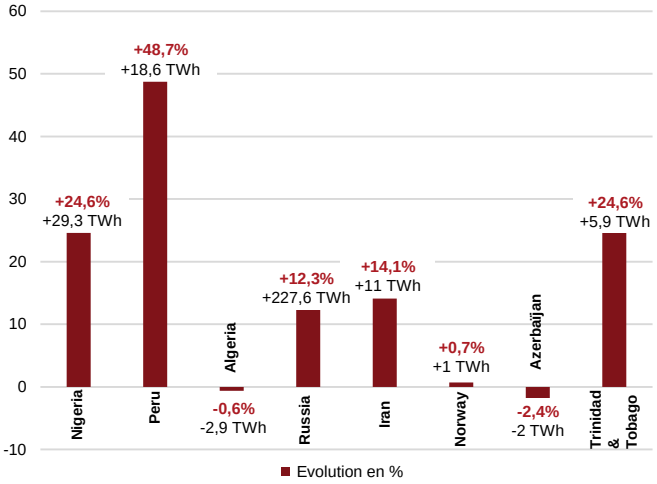
Analysis:

The European Union has adopted a diversification strategy for its natural gas supplies. This strategy is key to reduce its dependency toward exporting countries.

However, Russia and Norway remain Europe's main suppliers of natural gas, accounting for 39% and 23% of all its imports.

Supply

Evolution of the sources of gas supplied to the EU-28 in 2017 vs 2016



Source: BP Statistical Review 2018 et 2017

Description:

This graph represents the evolution of the natural gas volumes exported to the EU-28 between 2016 and 2017 from the main producing countries.

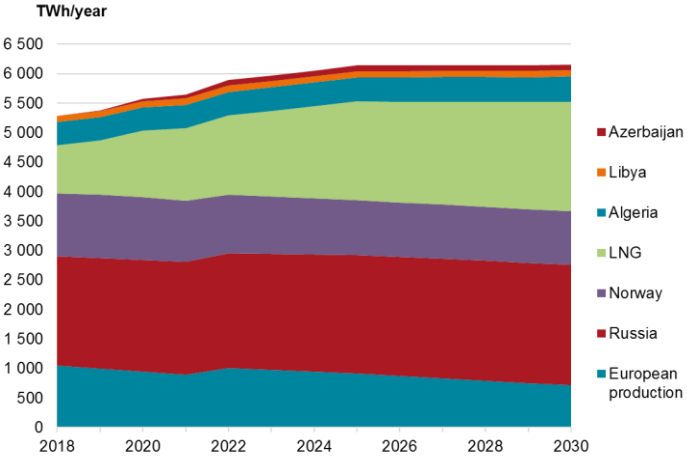
Analyse:

European strategy of diversifying supplies led the EU-28 to seek new sources of natural gas. Imports to Europe have slightly increased in 2017 (+3.4%). Moreover, the drop in the imports from Qatar can be explained by the redirection of LNG to Asia.

Imports via pipelines from Russia increase again after a drop between 2013 and 2014 following the Ukrainian dispute.

Between 2016 and 2017, imports from Nigeria, Trinidad & Tobago and Peru are increasing, while those from Algeria and Azerbaijan have decreased respectively by 0.6% and 2.4%.

European supply capacities forecasts up to 2030



Source: ENTSOG (2018)

Description:

This graph represents ENTSOG's forecasts for European supply capacities of natural gas up until 2030. LNG supplies do not differentiate the exporting countries. Algerian supplies are mixed (LNG and pipeline supplies).

Analysis:

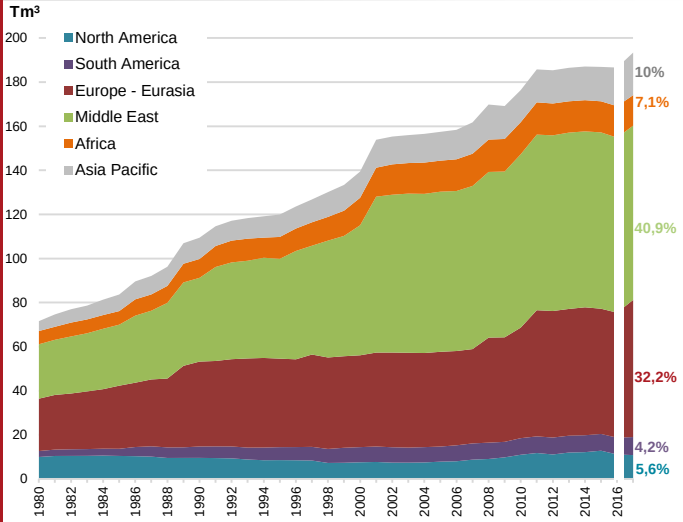
European natural gas production is expected to decline by 30% until 2030. This intra-European sourcing for natural gas should be compensated by the growing imports capacities from exporting countries thanks to new streams of supplies. LNG technologies are expected to play a key role in the European strategy for energy supplies.

To this end, Europe is relying on new LNG terminal projects.

Similarly, investments in transmission infrastructures would allow negotiations with new suppliers as it is the case with Azerbaijan whose first natural gas delivery should flow in 2019 or Russian supplies with the new pipeline project Nord Stream II.

Supply

Evolution of conventional natural gas reserves



Source: *BP Statistical Review 2018*

Description:

Proven reserves are the quantities of known conventional natural gas deposits (see the Glossary), which, according to geological data and current technological progress, have a high probability of being exploitable in the future under existing technical and economic conditions.

Analysis:

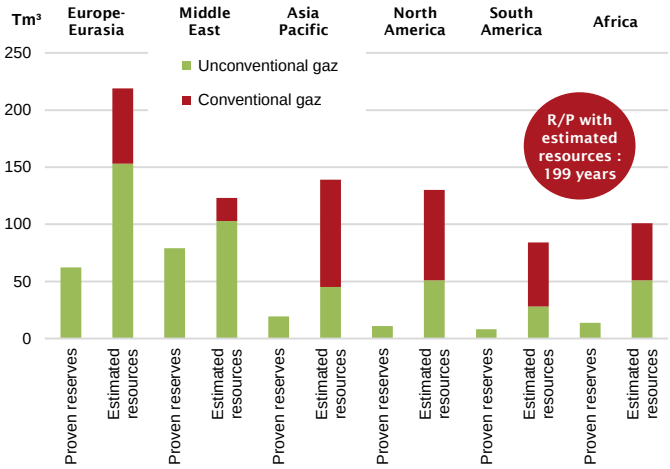
Conventional gas reserves are large, with estimates continuing to change as new exploration or extraction techniques are developed.

Resources are relatively well distributed across the world. Today, Russia, Qatar and Iran share close to 48% of the proven reserves.

Figures have been stable since 2011, with new discoveries in North America and Asia offsetting global consumption of older reserves.

A number of analysts believes that a major share of conventional natural gas is still to be discovered.

Global natural gas reserves (conventional and unconventional)



Sources: *BP Statistical Review 2018, IEA 2017*

Description:

The Reserves-to-Production (R/P) ratio in years represents the availability of a non-renewable resource under current technical and economic conditions.

Estimated reserves cover unconventional natural gas deposits (see the Glossary), but also conventional natural gas deposits that are inoperable today with existing technologies.

Analysis:

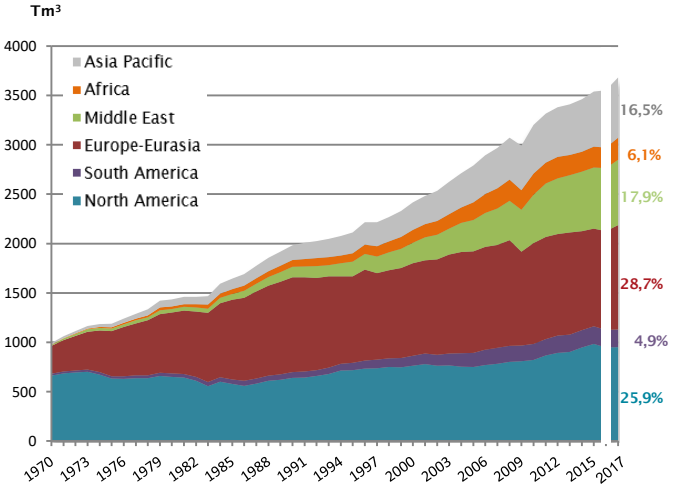
Unconventional gas represents more than half of estimated resources, in particular in the United States where the sector has allowed the country to reduce its energy dependency rate.

It can also be noticed that the reserves in Asia Pacific and Europe-Eurasia, are thought to be larger than the North American reserves.

The R/P ratio is approximately 54 years, taking proven resources into account only. With estimated resources, the total comes to 199 years.

Supply

History of the world's production of natural gas



Source: *BP Statistical Review (2018)*

Description:

This graph illustrates the production of natural gas in thousands of billions of cubic meters (both conventional and unconventional).

Analysis:

Global production of natural gas has been rising constantly over the past 40 years. It tripled between 1970 and 2010.

In 2017, the largest worldwide producers were the United States and Russia, with respective shares of 20% and 17.3% of global production (including unconventional natural gas). Iran (6.1%), Qatar (4.8%), and Canada (4.8%) follow. Global production growth is 2.2% between 2016-2017, driven by American and Asian productions. The EU (-2.3%) is still on a decreasing trend.

Two thirds of the global production take place in 10 countries.

Annual Benchmark Consumption ("CAR"): Annual benchmark consumption indicated by the Transmission or Distribution System Operator.

Energy content: The quantity of energy, expressed in MWh, contained in a given quantity of gas and determined on the basis of the Gross Calorific Value of the gas.

Gas B: A gas whose Gross Calorific Value falls between 9.5 and 10.5 kWh HCV/m^3 (n) and the Wobbe index between 11.8 and 13.0 kWh HCV/m^3 (n), i.e. 42.5 and 46,8 MJ/m^3 (n).

Gas H: A gas whose Gross Calorific Value falls between 10.7 and 12.8 kWh HCV/m^3 (n) and the Wobbe index between 13.4 and 15.7 kWh HCV/m^3 (n), i.e. 48.25 and 56.5 MJ/m^3 (n).

Conventional gas: Gas referred to as "conventional" migrated from the source rock to accumulate in an area where the rock is sufficiently porous and permeable, and covered by a watertight layer of rock that prevents the gas from continuing to migrate to the surface.

Unconventional gas: Unconventional gas is a natural gas that has been trapped in rock that is not very permeable and difficult to access. The extraction of this gas requires specific methods.

Kilowatt-hour (kWh): Unit in which the quantities of energy are expressed as defined in ISO 6976.

Distribution Pricing Option: The price for transmission over the distribution network, as set by regulations. For information, there are three options that do not require a subscription (T1, T2 and T3) and two with subscriptions (T4 and TP, referred to as the "proximity price").

Consumption point ("PDC"): The point in a Distribution or Transmission Network at which the Transmission or Distribution System Operator delivers the gas to a customer. It bears the number allocated by the Transmission or Distribution System Operator.

Point d'Échange de Gaz ("PEG"): A virtual point related to a Transmission System's Balancing Zone in which quantities of gas may be traded between suppliers who have entered into a transmission contract with the Transmission System Operator.

Glossary

Transmission Distribution Interface Point ("PITD"): Point from which a Distribution System Operator transmits the gas pursuant to a Distribution Transmission Contract. Unless expressly stated otherwise, this refers to the upstream bridle of the Delivery Station between the Transmission Network and the Distribution Network.

Gross Calorific Value (or GCV): The quantity of heat in kWh produced by the full combustion of one (1) Nm^3 of Gas at 0 degrees Celsius and an absolute pressure of 1.01325 bars, with excess air at the same temperature and pressure as the gas, once the product of the combustion has been cooled to 0 degrees Celsius and the water provided by the combustion has been condensed to liquid state, the product of the combustion containing the same total mass of water vapour as the gas and air prior to combustion.

Distribution Network: All works, facilities and systems operated by or under the responsibility of a Distribution System Operator based on which the Distribution System Operator provides the service that is the subject of the Distribution Contract.

Transmission Network: All works, facilities and systems operated by or under the responsibility of a Transmission System Operator based on which the Transmission System Operator provides the service that is the subject of a Transmission Contract.

Season: Summer period that corresponds to the following months: April, May, June, July, August, September, October; the Winter Period corresponds to the following months: November, December, January, February, March.

Balancing Zone: all entry and exit points of a Transmission Network in which a supplier who has entered into a Transmission Contract with the Transmission System Operator must provide a balance as defined by the rules of the relevant Network's Operator.

ADEME: "Agence de l'Environnement et de la Maîtrise de l'Énergie" (environment and energy agency)

IEA: International Energy Agency

BP: British Petroleum

CRE: "Commission de Régulation de l'Énergie" (French energy regulating commission)

ENTSOG: European Network of Transmission System Operators for Gas

EurObserv'ER: "Observatoire des Énergies Renouvelables" (renewable energy observatory)

Eurostat: European Commission's statistical office

GIE: Gas Infrastructure Europe

GIIGNL: The International Group of Liquefied Natural Gas Importers

GRTgaz: Natural gas transmission system operator in France

GSE: Gas Storage Europe

GTG2007: "Groupe de Travail Gaz 2007" (2007 working group on gas)

IGU: International Gas Union

INSEE: "Institut National de la Statistique et des Études Économiques" (national institute for statistics and economic studies)

MEDDTL: French Ministry of Ecology, Sustainable Development, Transport and Housing

SDES: "Service de la Donnée et des Etudes Statistiques" (observation and statistics department)

SPEGNN: "Syndicat Professionnel des Entreprises Gazières Non Nationalisées" (non-nationalised gas companies union)

TEREGA: Natural gas transmission system operator in France (ex TIGF)

Gas conversion units

	1 Kwh	1 GJ	1 Therm	1 MBTU	1 m^3 of natural gas	1 boe	1 toe
1 Kwh	1	0.0036	0.0341	0.0034	0.0949	0.00059	0.000086
1 GJ	277.8	1	9.48	0.948	26.35	0.1634	0.0239
1 Therm	29.3	0.10551	1	0.1	2.78	0.0172	0.0025
1 Million de BTU (MBTU)	293.1	1.06	10	1	27.81	0.1724	0.0252
1 m^3 of natural gas	10.54	0.038	0.36	0.036	1	0.0062	0.0009
1 barrel of oil equivalent (boe)	1700.0	6.12	58.01	5.80	161.29	1	0.15
1 tonne of oil equivalent (toe)	11630	41.87	397	39.7	1103	6.8	1

Sia Partners is an independent management and operational strategy consulting firm. With 20 offices located in 15 countries across the world, Sia Partners gathers 1 200 consultants and achieved a turnover of €160 million in 2018.

In France, its client portfolio includes the major part of CAC40 firms as well as leading unlisted public corporations.

Its missions involve supporting transformation at all levels of a corporate enterprise: strategy, marketing, human resources and governance of information systems. Its services and expertise are divided into five major sectors: Banks & Insurance, Energy & Environment, Telecommunications & Media, Transportation & Logistics, and Public Service.

For more information: www.sia-partners.com

GRTgaz builds, operates and develops France's high-pressure natural gas transmission network which covers most of the country. GRTgaz delivers the natural gas provided by its customers to consumption points directly connected to the transmission system: the public distribution networks to supply households, communities and companies, large industrial consumers and power stations that use the natural gas to produce electricity. With over 32,000 km of gas pipelines and 28 compressor stations, GRTgaz is constantly investing to transport natural gas under the best safety and fluidity conditions, and to improve security of supply by providing access to evermore diversified sources.

For more information: www.grtgaz.com

www.gasinfocus.com

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