The Gas Industry in the Year 2020

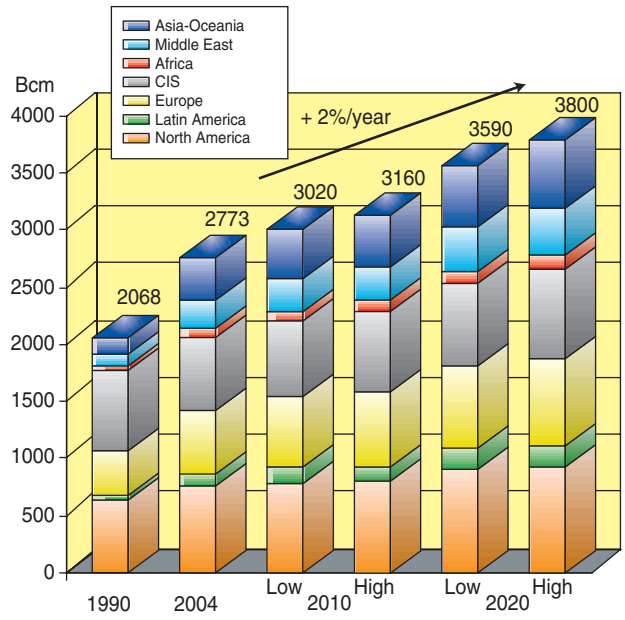
Having been reserved for decades primarily for the more noble uses of industry, natural gas, which basically has no captive market, is now the energy of choice in a multitude of applications. Although gas resources are limited in the very long term, they are yet sufficiently abundant to make a major contribution to the energy industry of the 21st century. Endowed with intrinsic qualities that make it less pollutant than its competitors, natural gas is the commercial energy harboring the strongest growth potential in the future energy balance.

In half a century, the gas industry has been marked by a number of essential occurrences. First, the demonstration of its major role as a world scale energy source as early as the 1970s, resembling what happened in the United States from the dawn of the last century. Second, the progressive decline of natural gas reserves in the OECD countries, accompanied by growing demand for environment friendly energy. And third, many and essential technological breakthroughs, which have spectacularly expanded the possibilities of transporting this energy.

This gas expansion has also been marked by reversals and trends. Fears of a scarcity of resources that sparked the adoption of energy policy measures aimed to reserve natural gas for noble uses (European directive prohibiting the use of gas in thermal power plants, abrogated in March 1991) offer the best example of this. Over the last ten years, the power sector has become the locomotive for world gas growth.

As competition between energy sources, linked to higher prices, intensifies, natural gas remains the energy that will continue to grow fastest in the energy balance in the years to come.

Fig. 1 Gas demand prospects by region



Source: CEDIGAZ.

Future Market Expansion

The latest demand forecasts are significantly lower than those of the late 1990s, which suggested an increase of 3%/year. This decrease is due to the slowdown of energy demand and of economic growth, the implementation of energy conservation programs in a context of globally higher prices, and growing competition with competing energies.

However, despite prospects for durably high prices, a steady economic growth rate of about 2.5%/year, combined with the obligations to fulfill the national pledges made at Kyoto, continue to offer bright growth prospects for natural gas. World gas demand should accordingly rise at a rate of about 2%/year to reach 3,800 Billion cubic meters (Bcm) by 2020, accounting for 26 to 27% of world primary energy demand.

Widely Contrasting Growth Rates in Different Areas

The markets of **North America and Europe**, where the gas share is 24 to 25%, could continue to grow at an annual rate of 1.7% and 2.2% respectively.

In the United States, the signature of the Energy Policy Act (EPACT 2005) in 2005 will be accompanied by measures aimed to limit the growth of energy demand in the residential-tertiary sector. These improvements, concerning the operation of facilities (boilers, ceiling fans, etc.) and tax credits on solar and microturbines technologies, will impact the use of gas in this sector. According to the latest prospects published by the *Energy Information Administration*, gas demand would accordingly grow very little in this sector (+ 43 Bcm between 2004 and 2025).

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The substantial rise in the price of gas could also slow down the growth of gas in the power sector, in favor of new coal-fired plants. In the longer term, the measures adopted by EPACT 2005 also include the commissioning of 6 GW of new nuclear capacity by 2030.

In Europe-OECD, the economic and environmental advantages of gas, which have become very significant, are attracting a growing number of consumers in the residential-tertiary sector (Belgium, Spain, etc.). Particularly in southern Europe (Spain, Italy), but also in the United Kingdom, as well as the Netherlands and even France, the power sector remains without any doubt the driver of gas expansion in the region.

In Spain, where 19 combined cycle plants already offer installed capacity of 8,420 MWe, another 70 plants representing installed capacity of 50,896 MWe are in the commissioning or planning stage. In Italy, 10,000 MWe will be added by the end of 2008 to already installed capacity (20,000 MWe) of combined cycle plants. In the United Kingdom, Transco estimates that 12 new combined cycle plants with a total capacity of 12,000 MWe will have to be built to offset the shutdown of certain fuel oil and coal-fired plants, which will fail to meet the new emission standards, and of nuclear power plants.

According to the World Bank, more than 90% of population growth over the 2000-2030 period (+ 2 billion inhabitants) will be concentrated in the developing countries of Latin America and, above all, Asia. The impact of demographic growth in these areas will very strongly impact the energy demand of the countries concerned and the growth potential of gas demand.

In the non-OECD countries of Asia, and in the Middle East, gas demand could grow about 3.5% annually by 2020. Besides the power sector, which will also play a major role in this growth, the industrial sector, whose gas share is much smaller than in the industrialized countries, should be the main growth vector. In Asia (India, Indonesia, etc.), fertilizer production will require growing volumes of natural gas, both as fuel and as raw material for the production of urea and ammonia. In the Middle East, gas will be increasingly used in seawater desalination plants and in industry in general.

An annual growth rate of about 3% could be registered in Latin America and Africa.

A Consolidated Power Sector

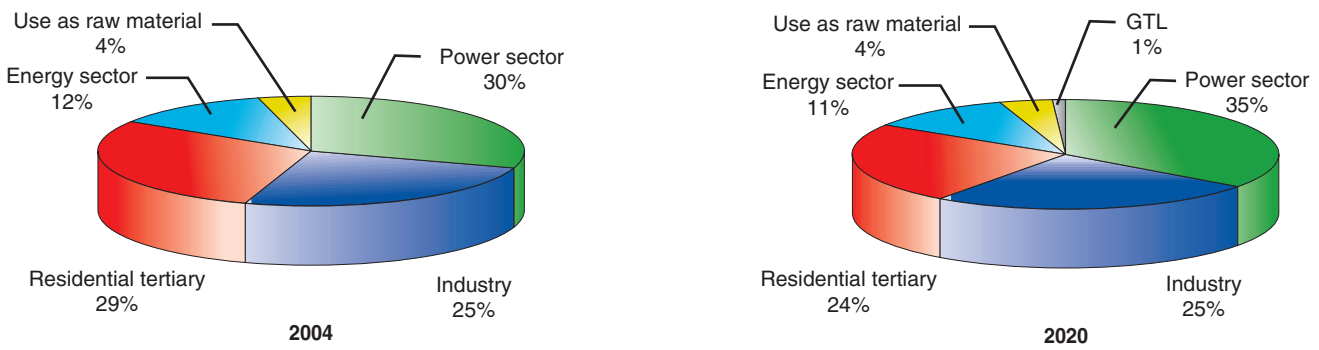
By 2020, the power sector should absorb about 35% of marketed gas each year. Chemical conversion of gas to petroleum products (GTL), a new outlet for gas, and although an attractive alternative, is only expected to see moderate growth, at least in the medium term. This emerging sector is opening up the huge motor fuels market (especially diesel) to natural gas. However, its development is difficult, handicapped mainly by low energy efficiency (55 to 60%), a costly process, and high CO_2 emissions.

Abundant Supply but Concentrated

Since 1980, proved world natural gas reserves have grown an average 3.6% per year (2.4% for oil), a figure backed by the numerous discoveries and reassessments of reserves of existing fields. The volume of reserves thus more than doubled between 1980 and 2005, going from 77 Trillion cubic meters (Tcm) to 180 Tcm, growing 4 Tcm on average each year.

About 70% of world gas reserves are concentrated in two areas — Middle East and CIS — and the geopolitical distribution of gas reserves is rather similar to that of oil. With 88.9 Tcm, the OPEC countries have about half of total

Fig. 2 Breakdown of gas uses in 2004 and 2020



Source: CEDIGAZ.

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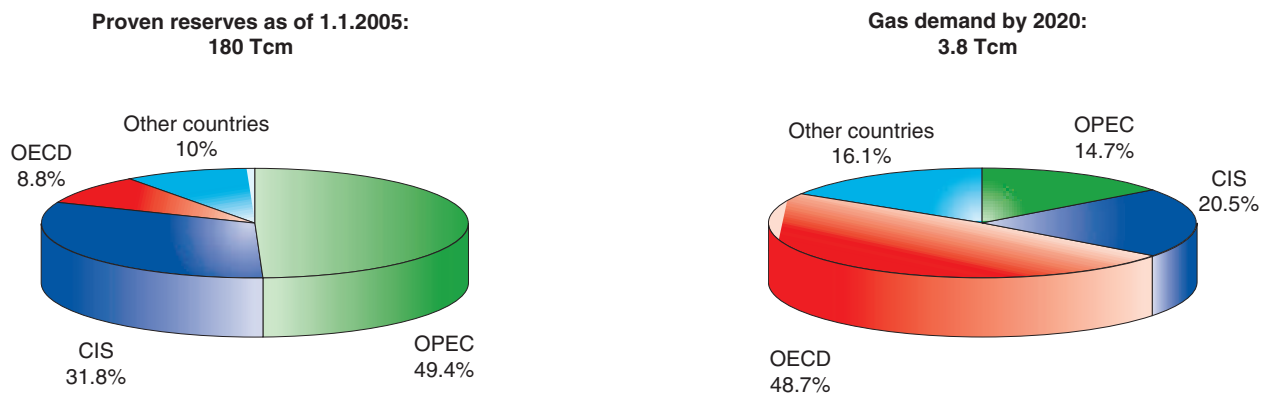
Fig. 3 Gas reserves vs future demand



Source: CEDIGAZ.

gas reserves, compared with 75% for oil. The CIS enjoys a more advantageous situation for gas, with 32% of gas reserves against only 10.2% of oil reserves. In the OECD countries, the situation is barely different for either of the energy sources, with 10% of gas reserves and 7% of oil reserves.

In the coming years, the gas production map will see significant upheavals:

– In the CIS, the Russian fields of Eastern Siberia and Sakhalin will start producing and help to balance the Asian markets. In Western Siberia, it will soon become necessary to bring in new fields (Bovanenkovo, etc.) to make up for declining production of the old giant fields (Urengoy, Yamburg), suppliers to Europe. Given their high gas potential, the Central Asian countries (Kazakhstan, Azerbaijan) will ultimately also play a major role on the international market, either by direct export or via the Russian gas network.

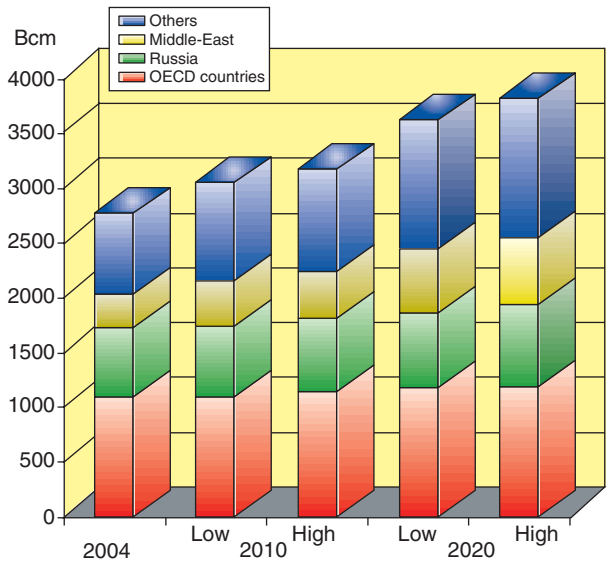
– The development of the American reserves of Alaska and a growing contribution of unconventional gas to local gas production.

– The emergence of new important producing countries in Latin America (Bolivia, Peru, Brazil) will offset the slowdown of Argentinian production.

– The start of production on associated gas fields for liquefaction plants (Angola, Nigeria), is progressively limiting the volumes of flared gas and improving the utilization ratio.

– The bulk of gas expansion will rely on the single supergiant accumulation of non-associated gas, produced by Qatar (North Field), and Iran (South Pars), where proved reserves account for 21% of the world total.

Fig. 4 Gas production prospects



Source: CEDIGAZ.

Toward a "Complexification" of Gas Trading

The growth of the international gas trade (by pipeline and tanker) has been particularly rapid in the last ten years, posting annual growth of 6.7% between 1994 and 2004. By 2020, about 1,350 Bcm/year could be traded worldwide by pipeline and tanker (800 Bcm in 2004), representing about 36% of world marketed production.

Apart from the growing regional imbalances between the production and demand areas, at continental scale as well as local country scale, many new factors will act to boost the international gas trade. The discarding of destination clauses

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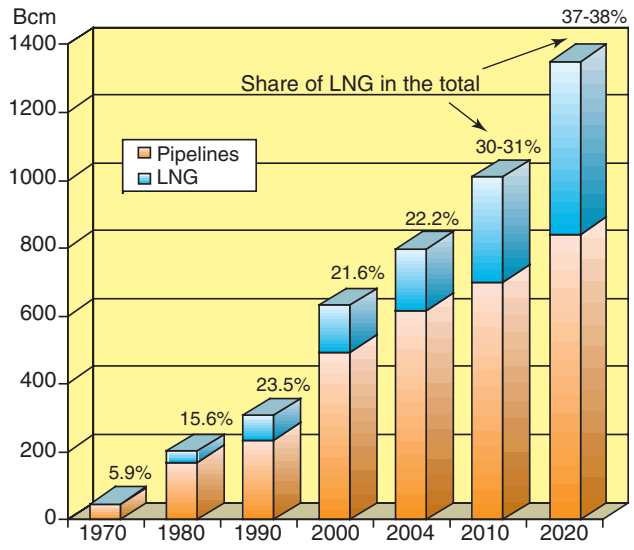
in international contracts, and the resulting price arbitrage operations, favor the burgeoning tanker trade between the various consumer areas. Market liberalization and the emergence of many new players (in Europe as well as Asia), and the establishment of gas hubs, are further developments destined to increase and improve the circulation of gas flows.

Fig. 5 Increasing role of international gas trade



Source: CEDIGAZ.

LNG will have an essential role in world trading, and its share can be expected to grow faster than that of pipeline flows. Tanker trading is expected to grow about 7% annually by 2020, raising the LNG share of world trade to about 38%, against 22% today.

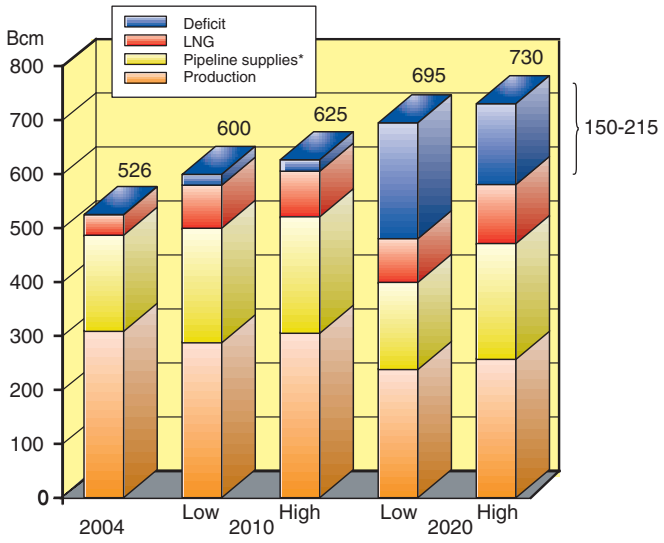
The Comeback of LNG in North America

After having seen more or less favorable periods to LNG, the American market has returned to a growth pattern. About 140 Bcm (104 Mt/year) of LNG could be imported in North America (including Canada and Mexico) to supplement insufficient local and regional supply. Besides the large receiving capacities already in service on the US eastern seaboard, new facilities are under construction and planned in Mexico and Canada. While Canadian exports to the United States are expected to shrink in the short term due to growing gas needs of the Canadian energy industry, this input of outside gas should ultimately foster the growth of intra-regional trading, particularly between Canada and the US northeast and between Mexico and the southern US, deals facilitated by the availability of substantial transport capacity.

The Growing Dependence of Europe

The EU-25, where 89% of gas reserves are concentrated in only three countries (Norway, Netherlands and United Kingdom), will see growing dependence on outside suppliers. Despite the high Norwegian potential, European production is only likely to preserve its level of 310 Bcm up to the end of this decade, subsequently declining to about 260 Bcm (Norway included) by 2020. By then, demand in the area could reach nearly 730 Bcm, boosting its gas dependence to some 65%, against 40% today. LNG would then account for 15 to 18% of Europe's total gas supplies.

Fig. 6 Gas supply and demand balance in Europe 2020 Outlook



Europe: EU-25, Norway, Switzerland and Turkey.
The high assumption includes firm purchases, HoA, and extensions of existing contracts.
* Pipeline supplies: Not including European suppliers.

Source: CEDIGAZ.

While many regasification facilities are under construction and planned to import growing quantities from the Middle East or Africa (Nigeria, Egypt, etc.), pipeline projects from Algeria, Norway, Russia and even Central Asia, are advancing toward commissioning in the medium and long term.

Besides this very strong contribution (about 465 Bcm by the year 2020) of Europe to the growth of inter-regional flows, the opening up of the market to competition will also powerfully alter intra-regional flow patterns. Although still sometimes limited by the lack of capacity or limitations due to the yet incomplete opening of the markets, liberalization should shortly lead to a proliferation of transborder trade. Over and above the construction of new pipelines needed to

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improve the circulation of the flows, and the role that the hubs will play (subject to sufficiently high liquidity), toward the creation of a greater European gas market, LNG could also make a significant contribution to the balancing of domestic markets within the region itself. The recent period saw a number of cargoes traded between operators in the Mediterranean basin (loaded in one receiving terminal and unloaded in another).

Asia will Remain the Place for LNG

At present, only Thailand and Singapore have developed capacity for pipeline imports from Myanmar, Malaysia and Indonesia. The determination of certain countries in the area (South Korea, etc.) to diversify their supply sources could promote the development of international gas pipelines in the region. Russian gas resources in the Irkutsk area could be developed and transported to the Southeast Asian countries (South Korea, China, etc.). However, due to the geographic configuration of the region, LNG should continue massively to supply most of the area's buying countries. It could also help improve the gas irrigation of Indonesia.

Price arbitrage operations could ultimately develop in the area's tanker trade. In fact, many LNG receiving terminal projects on the design boards on the US western seaboard could offer the Asian market players an opening to an "opportunity" market.

Substantial Growth of Intra-Regional Flows

Networks are progressively being set up in the Middle East and Latin America.

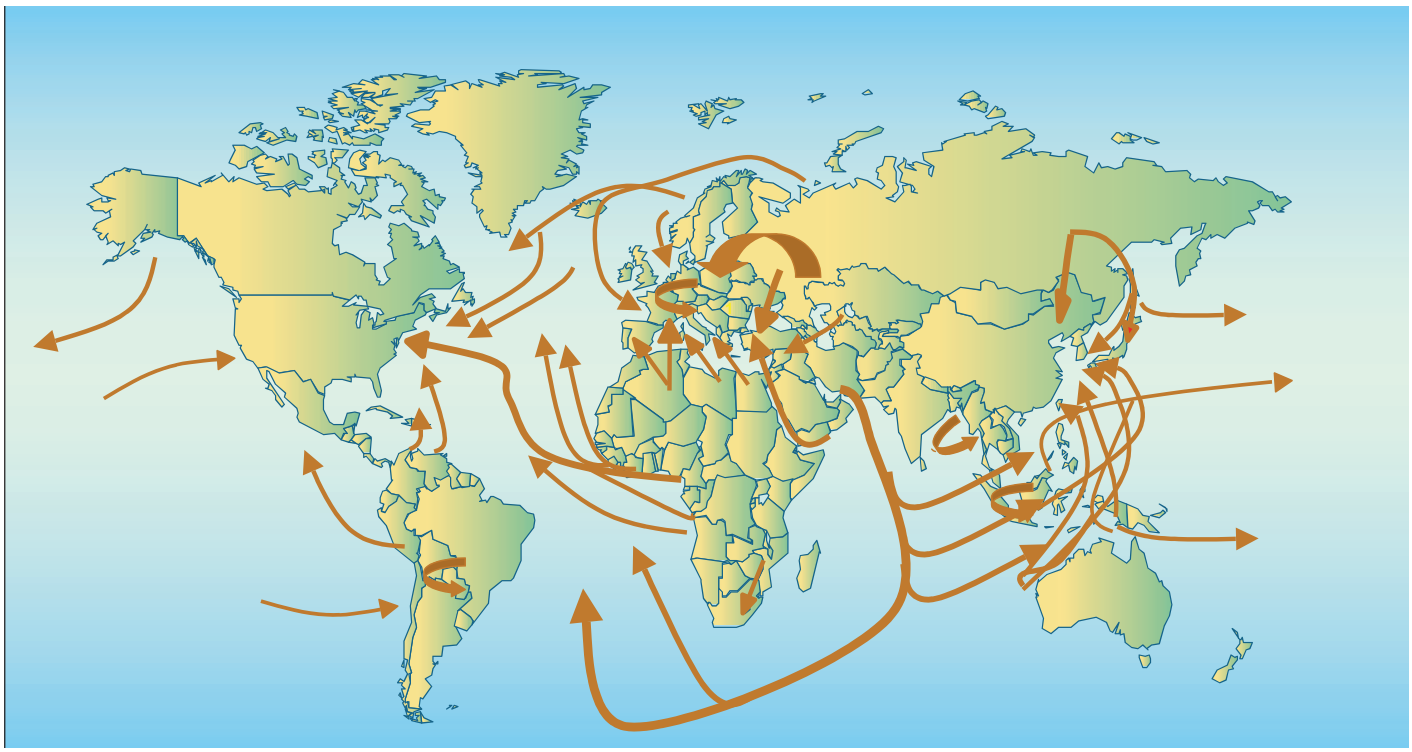
In the Middle East, the commissioning of the Dolphin project starting in 2007 will help to transport large quantities of gas from Qatar (up to 20 Bcm/year) to the United Arab Emirates. Other pipelines are planned between the countries in the region.

In Latin America, the decline of Argentinian production is opening up a growth opportunity for the reserves of Bolivia, hitherto limited to exports to Brazil.

Toward a Global Gas Market?

Despite the many upheavals gradually reshuffling the industry, a world gas market is unlikely to materialize in the short and medium term. Although LNG is one essential vector, the development of a gas market similar to the oil market is probably unrealistic. Natural gas demands a volume 1,000 times larger than oil for the same energy content,

Fig. 7 The multiplication of flows toward a global market



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making gas transport at least five times more expensive. In addition, to the contrary of oil, the number of loading/unloading ports is limited. Only the GTL option, if it develops on a relatively large scale, in more favorable economic conditions, could perhaps accelerate the process.

And yet, beyond the factor of transport flexibility, the internationalization of the players, traditional and new, and their positioning on the various links of the gas chain as a whole, is a major development toward this globalization of trade.

Marie-Françoise Chabrelie, Cedigaz
m-francoise.chabrelie@ifp.fr

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www.ifp.fr

IFP (Headquarters)
1 et 4, avenue de Bois-Préau - 92852 Rueil-Malmaison Cedex - France
Tel.: +33 1 47 52 60 00 - Fax: +33 1 47 52 70 00

IFP-Lyon
BP 3 - 69390 Vernaison - France
Tel.: +33 4 78 02 20 20 - Fax: +33 4 78 02 20 15