The Dynamics of the World Gas Trade

The steadily growing distances between the world's gas rich regions and consumer zones foreshadow a powerful expansion of the international trade, at an annual rate of around 3.5% by 2020. Flows could then account for about 32% of marketed production. Trade by LNG tanker is very likely to emerge as the winner of this dynamic, with the flexibility it procures exploited to adjust supply to the demand of a more global market. This is today's gamble of an industry which, driven by technological improvements and market potential, is investing massively in new infrastructures.

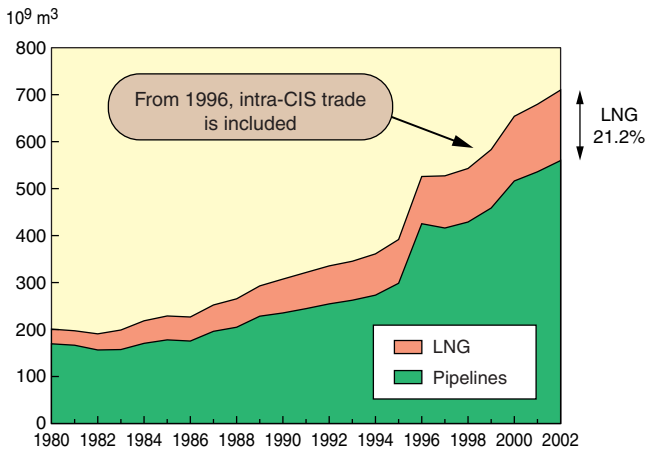
In 1950, the international natural gas trade was limited to exports from the United States to Mexico and Canada, and from the former USSR to Poland, a total of 0.78 10^9 m^3. Fourteen years later, the year 1964 marked the advent of another inter-regional itinerary, with the first commercial delivery of Algerian LNG to the British Canvey Island terminal.

Since then, gas flows between countries and continents have grown unchecked, accompanied by the installation of new, sophisticated and costly transport chains. In 2003, international flows will be close to 750 10^9 m^3, covering about 28% of marketed production. Inter-regional flows should account for about 36% of the total trade.

The Development of International Networks

With 79% of the total, pipeline flows between countries and nearby continents largely dominate the international gas trade.

Fig. 1 Evolution of imports by pipelines and LNG tankers



Source: Cedigaz

Primarily focused around the growth of the American and European markets, international pipelines were progressively installed in the 1950s to convey gas sometimes extracted thousands of kilometers from consumer areas.

LNG receiving terminals then gradually supplemented the import infrastructure of these regions, to permit a more effective irrigation of the areas concerned.

North America and the Pre-Eminent Role of Canada

Starting in 1958, many pipelines were laid to transport West Canadian resources to the United States, first to California and the Midwest, and then to northeastern markets. A densely interconnected network progressively helped to integrate Canadian, American and Mexican supplies in a vast North American market. With 109 10^9 m^3 exported in 2002, Canada is the world's second gas exporting country after Russia.

For a decade, the persistent energy shortages of the early 1970s and the rise in oil prices offered LNG an ideal position on the American market. The drastic change in market conditions associated with the deregulation of the gas industry voted in 1978 dealt a fatal blow to the penetration of LNG, making it too expensive. As of 1980, two of the four regasification terminals built were mothballed, and from 1984, imports by tanker on this market fell to around 1 10^9 m^3/year. In 1987, no LNG was imported. Production capacity constraints and soaring prices later sparked the return to LNG in the United States.

The Trans-European Network: Vast and Very Interconnected

The true resumption of the international trade in the region is still closely linked to the discovery of the Groningen field in the Netherlands and to the construction of the first international pipelines connecting this field to Belgium, Germany and France. The construction of trans-European networks then gathered speed between 1970 and 1990, after the first oil

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shock. These pipelines laid the foundations of a vast inter-connected network across Europe, from Siberia to Ireland, from Norway to Spain, from Algeria to Portugal and Central Europe.

Europe now has a pipeline import capacity of around 285 10^9 m^3/year, including 88 10^9 m^3/year from Norway (Norpipe, Zeepipe, Europipe I & II, Franpipe and Frigg/Vesterled), 165 10^9 m^3/year from Russia (including capacities to Central Europe and Turkey) and 32.5 10^9 m^3/year from Algeria (Enrico Mattei and P. Duran Farell).

From 1964 to the mid 1990s, supplies by LNG tanker rose at a fairly steady rate, evolving with the liquefaction capacities available in Algeria, by far Europe's leading LNG supplier. Marked by the increase in spot purchases by Spain and the arrival of new supplies, the end of the decade saw a very clear acceleration of imported volumes, going from 25 10^9 m^3 in 1998 to 39.5 10^9 m^3 in 2002. Although its share of the supply of certain countries is high (57.6% in Spain and 25.8% in France), LNG only accounts for 8.1% of Europe's gas supplies.

Recent improvements to several receiving terminals and the commissioning of new installations in Spain have favored the arrival of new sources (Trinidad and Tobago, Nigeria and the Middle East) and boosted the total receiving capacity of the region to 55 10^9 m^3/year. Spain and France share 63% of the total.

Pipeline and LNG tanker imports of 186 10^9 m^3 come from sources outside the region, and account for 26.2% of world flows.

Asia: the LNG Kingdom

The geographic situation of Asia has promoted the growth of LNG tanker trade between the producing countries of the south (Australia, Brunei, Indonesia and Malaysia) and the consumer countries in the north. About 70% (105 10^9 m^3) of world LNG trade is concentrated in three countries (Japan, South Korea and Taiwan). The recent development of liquefaction plants in the Middle East marked a major step in the supply of these countries, opening them up to new sources.

The installation of an intra-regional transport network is a relatively recent event, limited to the supply of Singapore with gas from Malaysia and Indonesia, and the supply of volumes (6.2 10^9 m^3/year) produced in Myanmar on the Yadana and Yetagun offshore fields and transported to Thailand. This may represent the first step towards a wider regional integration.

Emerging Markets and Networks

With the exception of Latin America, the development of intra- and inter-regional networks in the other parts of the world is still rather limited.

While for several years, about 2.5 10^9 m^3/year crossed the border between Bolivia and Argentina, the growth potential of gas demand for the power sector in Chile and Brazil has sparked the development of a network in the Southern Cone countries. The volumes traded in this region amount to about 10 10^9 m^3/year.

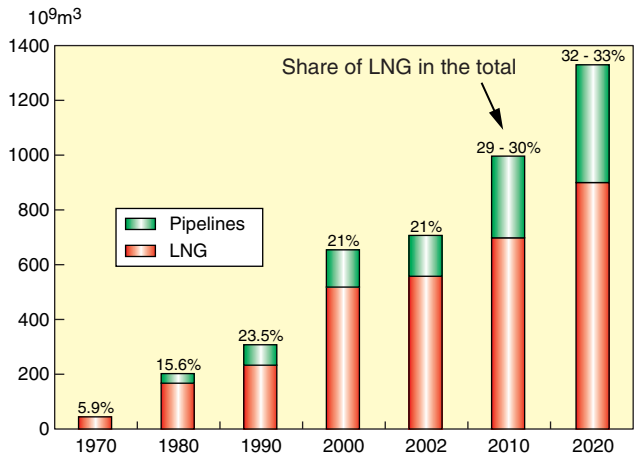
In the Middle East, apart from trade in the United Arab Emirates, gas exports to distant destinations have so far proved to be easier to set up than a intra-regional network.

While Africa was hitherto only connected to Europe by Algeria, via Tunisia and Morocco, a new export route from Egypt to the Middle East (Jordan) was inaugurated in July 2003.

Sharp Growth of Inter-Regional Trade

Although natural gas reserves are fairly abundant and in any case available in sufficient quantities to satisfy markets for many decades to come, their geographic distribution is not in harmony with the size and anticipated growth of the different markets. Whereas the gas consumption of the OECD industrialized countries is expected to continue to grow, their share of gas reserves, no more than 10% today, or 18 10^{12} m^3, is steadily declining. By contrast, the OPEC countries have 43.8% of world gas reserves and regularly reassess their potential upward, thanks to new discoveries and to a closer knowledge of existing reservoirs.

Fig. 2 Growth prospects of international gas trade



Source: Cedigaz

This imbalance presages a substantial increase in the international trade, and particularly in inter-regional flows in the coming decades. By the 2020 horizon, international gas flows, by pipelines and tankers, could account for about 32% of world gas production, reaching nearly 1 330 10^9 m^3/year.

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Although the technological advances associated with deep water pipelaying and high-pressure technology also offer interesting growth prospects to the pipeline option, the maritime alternative for LNG is expected to experience faster growth, about 6%/year. This is because the excellent modularity and progressiveness in building the installations allows for a better match between potential supply and market demand, where visibility is often hampered by liberalization processes.

This expansion of LNG tanker trade should help intensify the growth of inter-regional gas flows, which could triple by 2020 and reach 750 10^9 m^3, against 243 10^9 m^3 in 2002.

LNG Promotes a More Global Market

LNG tanker transport, which has gone up 6.4%/year on average in the last ten years, should approach 160 to 165 10^9 m^3 in 2003, involving a dozen exporting countries and as many buying countries. Cedigaz estimates that the LNG trade could reach about 295 10^9 m^3 by 2010 and 430 10^9 m^3 by 2020, or about 32% of world trade. Many developments underlie the evident dynamism of this industry.

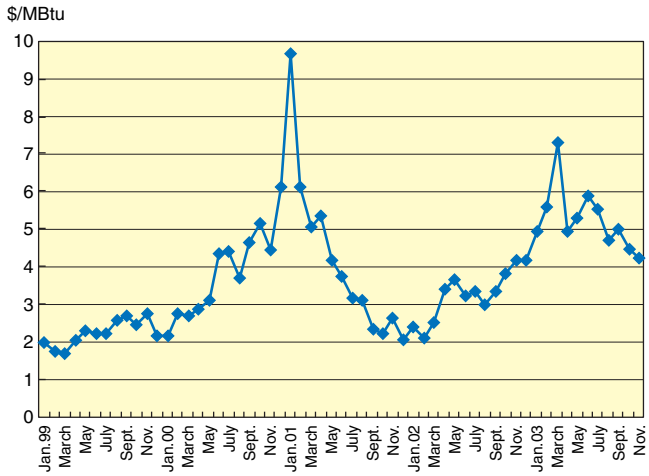
Rising Gas Prices on the American Market

The recovery of gas prices on the American market has set the stage for LNG exports to the United States, and is responsible for the development of price arbitrage in the Atlantic basin.

Many factors explain this rise in prices and LNG demand forecasts. First, we can perceive the limits of domestic production, which has been running out of steam for some years already, and the need to develop more distant and very likely more costly resources. Canada, the major supplier to the American market, should also reach the upper limit of its export capacities in the coming ten to twenty years. In addition, gas would be used primarily for the exploitation of extra-heavy crude oils. The construction of the pipeline connecting Alaska to the American market also raises difficulties and is probably inconceivable before 2015 or 2020. Faced with these supply challenges are the strong growth prospects of demand, which, according to the Energy Information Administration, could grow 1.8% by 2025 to reach about 990 10^9 m^3/year. These forecasts, based on a reference scenario that ignores any legislative amendment or change in energy policy, should be viewed with caution. In fact, the questioning of the Clean Air Act, could drastically alter the American energy landscape, particularly with the comeback of coal for power generation, which would jeopardize the growth of gas in this sector. Moreover, as we have observed in the past, gas demand is narrowly linked to its price level which, if too high, tends to downgrade gas in favor of petroleum products, distillates or coal.

Today, the prospects of a sustainably and reasonably supported price of 3.5 to 4 $/MBtu on this market, have spawned numerous receiving terminal projects. Thus in addition to currently available regasification capacity of about 32 10^9 m^3/year, more than twenty projects are on the boards, most of them offshore the American, Canadian and Mexican coasts, in order to avoid extremely stringent onshore environmental constraints.

Fig. 3 Spot prices at the Henry Hub



Despite the uncertainties surrounding a future level of gas demand, LNG should again boost its share of the North American market to reach about 45 10^9 m^3/year in 2010 and 90 10^9 m^3/year in 2020. The management of sales to seize price opportunities in the Atlantic basin is only in its inception, its development having stemmed from the abandonment of destination clauses and a greater availability of non-dedicated ships.

Sharper Competition between the LNG Alternative and Pipelines in Europe

Today, 38.5% of OECD Europe's gas supplies come from Russia (63%) with the remainder from Algeria (30%), Nigeria and Libya (4%), Trinidad and Tobago and the Middle East (3%). A comparison of production and demand prospects reveals that the gas deficit will widen considerably. According to Cedigaz, by 2010, traditional and new outside suppliers will provide up to 52% of European consumption, or 330 10^9 m^3/year (high scenario). Of this figure, 315 10^9 m^3/year has already been purchased from producers, 241 10^9 m^3/year to be transported by pipeline and 74 10^9 m^3/year delivered by tanker. Cedigaz estimates that LNG demand in the region could reach 80 to 95 10^9 m^3/year by 2010. However, the volume actually available on the European market should fluctuate according to price arbitrage

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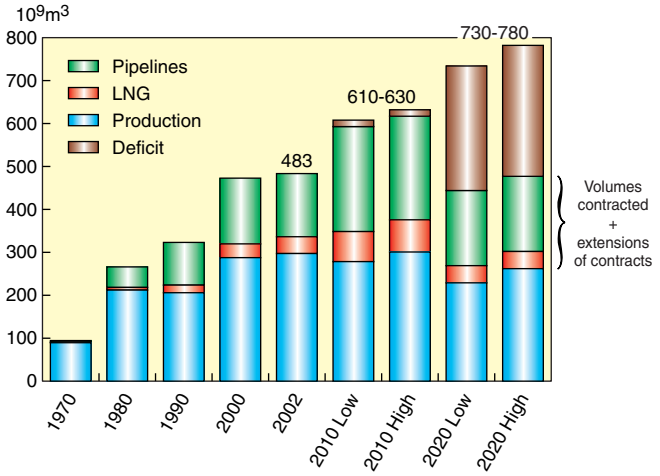
opportunities. By 2020, the gap between supply and demand should exceed 65%. Considering the contracts in force and signed as well as the extension of some contracts due to expire between 2015 and 2020, the remaining volume to be purchased is about 290 to 305 10^9 m^3/year. By this horizon, LNG demand should reach 120 to 150 10^9 m^3/year.

Fig. 4 — Gas balance of OECD Europe 2020 Horizon



Source: Cedigaz

In Europe, LNG competes with pipeline imports which account for 79% of supplies from outside the region. In the years to come, this gas-to-gas competition will intensify, as attested by the numerous pipeline projects (Green Stream between Libya and Italy, Britpipe between Norway and the United Kingdom, Russia's Baltic Pipeline, Galsi and Medgaz from Algeria, BBL between the Netherlands and the United Kingdom, etc) and regasification terminals (in Italy, the United Kingdom, Spain and France).

Asia: Ever More Diversified Supply Sources

Although an intra-regional network is being set up progressively in the southern countries of the region, and it would be a mistake to underestimate the pipeline projects from Russia, LNG remains the simplest option to implement today.

In the coming years, the tanker trade will intensify in the Pacific Basin. Apart from the traditional buyer countries, India and China will swell the ranks of liquefied gas importers in the short term. In the longer term, receiving terminals could be built in Singapore, Indonesia and the Philippines. LNG demand in the region could reach 150 10^9 m^3/year by 2010, largely driven by the LNG demand prospects in Japan to balance its power generation capability, and in South Korea for its use in the residential and tertiary sector in particular. By 2020, it could grow to about 220 10^9 m^3/year.

While they supply around 27% of the volumes imported by LNG tanker into the region and supplement the quantities delivered by traditional Asian producers, the Middle East countries (Qatar, Oman and Abu Dhabi) should continue to provide a growing share of the region's LNG needs. They will be joined in the medium term by other sources like Russia (Sakhalin project).

Towards a More Global and More Fluid Trade

The major market upheavals engendered by the restructuring of the gas industry have led buyers to seek greater flexibility of supply. Shorter contract terms and the emergence of contractual combinations (spot/long-term purchases, lowering of minimums in conventional Take-or-Pay contracts) allow a better matching of supply to market contingencies. The abandonment of destination clauses will also assist the development of a spot market on a larger scale (20% of the LNG trade in 2020?).

The expansion of trade will require the consolidation of the infrastructures already in place and the creation of new gas routes between the different regions of the world. Many projects can be identified. At different stages of advancement or realism, the international pipelines planned represent an export capacity of about 250 10^9 m^3/year. As for LNG, 49 10^9 m^3/year of existing capacity extensions and new units is already under construction, to which we must add about 80 10^9 m^3/year of potential extensions and 175 to 200 10^9 m^3/year for projects on the boards. Cost reductions will therefore be essential more than ever to ensure their implementation.

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