

The market for liquefied natural gas is ripe for expansion, given the scarcity of oil and its cleaner burning properties, and a short-term market is emerging for the first time. *Eric Fishhaut* looks at the evolving structure of this international market

# LNG makes headway

★ Liquefied natural gas (LNG) is a global emerging market set for significant expansion in the next few years. Buyers are gradually demanding more favourable contracts and terms, and a short-term market is emerging. Some estimate short-term trades could reach 15% to 20% of LNG imports in the next decade. According to the Groupe International des Importateurs de Gaz Liquefie, contracts covering the sale of nearly 30 million tons per year to Asian countries alone will come up for renewal in the next 10 years.

The appeal of natural gas over oil has always been its cleaner burning properties, and more recently, its abundance in comparison with oil reserves. However, the fact that it has to be piped adds cost and has confined markets to discrete regional entities. LNG, however, can be shipped on specially built ocean tankers, thus providing global access to the world's largest underused natural gas resources. The rising cost of oil production is also beginning to make LNG more economically viable.

Liquefaction – the conversion of natural gas into liquid – is achieved through refrigeration, and reduces the volume by approximately 600 times. This makes it more economical to transport between continents in specially designed ships. LNG is converted back to gas by passing the liquid through vaporisers

that warm it. Both processes are performed using advanced technologies with a proven safety record.

Natural gas is composed primarily of methane (typically, at least 90%), but may also contain ethane, propane and heavier hydrocarbons with small quantities of nitrogen, oxygen, carbon dioxide, sulphur compounds and water typically found in normal pipeline delivery. The liquefaction process can be designed to remove the non-methane elements of the gas in order to safeguard against the formation of solids during the cooling process. This process results in the purification of the LNG to nearly 100% methane. Upon reaching its destination, LNG is then turned back into a gas at import terminals and sent out via pipelines as ordinary natural gas.

Natural gas accounts for about one quarter of all energy used in the US. Industry consumes 40%, the business sector 15%, while residential use accounts for around 22%. Over 14% is used for electricity generation. The US Energy Information Administration (EIA) forecasts natural gas demand in America will grow by more than 38% by 2025. LNG could play an increasingly important role in meeting that demand if more LNG terminal and storage facilities are built. Worldwide, there are currently 12 countries that export LNG. There are approximately 40 LNG import terminals with many more planned.

In the US, eight new terminals have recently been approved by the Federal Energy Regulatory Commission, while many others are currently under consideration. A total of 55 North American terminals are in various phases of submission for approval. And in Europe, there are several terminals under construction with approval being sought for many more.

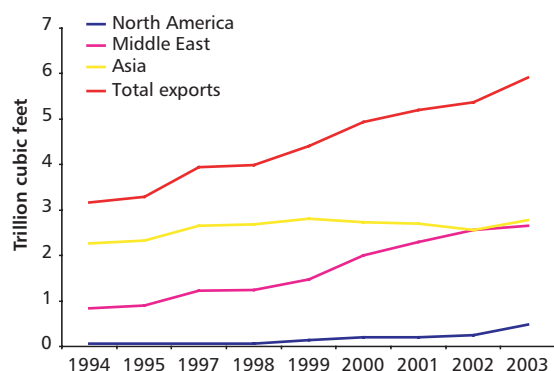
Opponents to new LNG facilities question the safety inherent in them. With high alerts on for terrorism, the LNG ships and terminals are considered prime targets. Factually, no death or serious accident has occurred at US onshore LNG facilities in more than 25 years. And there has never been a fire, significant spill, or accidental death (because of an LNG release) on an LNG ship in the history of the industry.

## LNG demand

According to the EIA, natural gas production in the US is predicted to grow from 19.1 trillion cubic feet (tcf) in 2000 to 28.5 tcf in 2020, while the total US demand for natural gas is expected to rise from 22.8 tcf in 2000 to about 33.8 tcf by 2020 (adjusted for forecasted gains in energy efficiency and conservation). These projections suggest that the US could face a

Source: EIA

F1. Global LNG exports



The total global LNG export levels have nearly doubled over the past ten years with that coming from the Middle East bringing the greatest increase.

gap in supply of about five tcf by 2020. The bulk of the natural gas used in the US comes from domestic production, mostly from fields that are decades old and beginning to decline. New natural gas reserves are constantly being discovered, but with advanced recovery technologies these fields are quickly depleted.

Consequently, meeting future shortfalls will mean increased imports. Pipeline imports of natural gas from Canada currently make up about 15% of total US consumption. But it is unlikely that Canada will be able to sustain increasing volumes of exports to the US due to its own increasing demand and depletion.

Currently, LNG imports account for less than 1% of the total US consumption of natural gas. There are at least 113 active LNG facilities in the US, including marine terminals, storage facilities and operations involved in niche markets such as vehicular fuel. Most of these facilities were constructed between 1965 and 1975 and were dedicated to meeting the storage needs of local utilities. Approximately 55 local utilities own and operate LNG plants as part of their distribution networks.

### Regional markets

The evolving structure of the international LNG market is complex – most notable are the differences in history and pricing mechanisms between the Atlantic and Pacific Basins. Other key issues include the declining trend of LNG costs throughout the supply chain, the addition of new participants to the market, and recent market changes that increase flexibility in LNG trade.

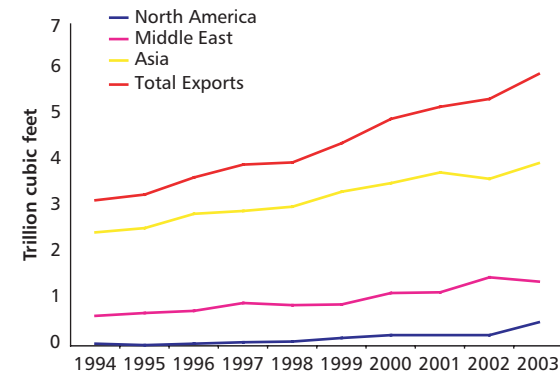
LNG trade evolved differently in the Atlantic and Pacific basins, and this affects import volume, pricing and contract terms. While importing countries in the Pacific Basin are almost totally dependent on LNG, countries in the Atlantic Basin have domestic supplies and pipeline imports, and use only limited LNG to meet natural gas demand. Accordingly, LNG makes up a small portion of the natural gas market in the US and Europe. Conversely, major LNG importers in the Pacific Basin – Japan, South Korea and Taiwan – have little or no domestic gas production with no pipeline sources for imports. As these countries sought alternatives to oil in the 1980s and early 1990s, LNG imports into the region increased significantly.

Costs of liquefaction, shipping and regasification have declined over time due to technology improvements. Liquefaction costs have declined 35% to 50% in the past 10 years, according to the Gas Technology Institute. Meanwhile, the cost of building an LNG tanker has fallen by over 45% in the last twenty years. However, because the LNG market is predominantly composed of long-term contracts with pricing mechanisms pegged to other energy products, lower operating costs do not always translate into lower LNG prices. The LNG market has shown signs of increased flexibility with looser contracts terms on price and volume. Additionally, growth and flexibility in LNG shipping has led to an increase in short-term contracts.

Gas hubs integrating both LNG and pipeline gas are emerging in the US, Belgium and the UK, presenting opportunities for increased trading activity and price arbitrage. Meanwhile, the Middle East LNG supply is expanding, aiming to increase supply to European and North American markets. Supply and demand

Source: EIA

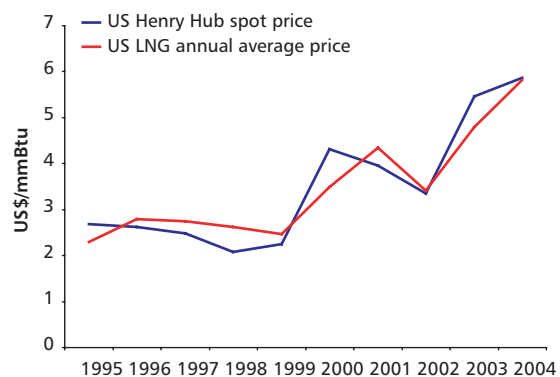
### F2. Global LNG imports



Global imports of LNG are in line with the export totals with the largest consumer being the Pacific Rim.

Source: EIA and Platts

### F3. US LNG prices



The price of LNG in the US closely follows the natural gas market as we compare annual average prices to the Henry Hub spot price.

has grown steadily over the past 10 years (see figures 1 and 2).

And market participants have been taking on new roles. Buyers have been investing in the upstream, primarily liquefaction plants – for example, Tokyo power companies have invested in an Australian plant. Traditional sellers, such as BP and Shell, are extending their role into trading, and have leased capacity at terminals. New buyers have joined the market, including independent power producers in Puerto Rico and the Dominican Republic.

### Global pricing

LNG prices are typically expressed in US dollars per million British thermal units (mmBtu). Prices are mostly calculated on a free-on-board (FOB) basis, as buyers realise more control over the landed price and can trade surplus cargoes. There are three

distinct and relatively independent markets for LNG, each with its own pricing structure: the US, Europe and Asia. Each region uses a competing fuel for its benchmark. The degree of price risk is inherent in each pricing structure, with distinct risk differences between the markets. Historically, LNG prices have been higher in the Pacific than in the Atlantic Basin, typically by about one dollar.

In the US, the competing fuel is pipeline natural gas, and the benchmark price is either a specified market in long-term contracts or the Henry Hub price for short-term deals (see figure 3). US LNG transactions are exposed to a significant level of risk given the high degree of price volatility in US natural gas markets.

LNG prices in Europe have been historically related to competing fuel prices, such as low-sulphur residual fuel oil. More recently, LNG has started to be linked to natural gas spot and futures market prices as that market experiences growth in liquidity.

In Asia, prices are directly linked to imported crude oil. The pricing formula typically includes a base price indexed to crude-oil prices, a constant, and perhaps a mechanism for the review/adjustment of the formula (see figure 4). Asian prices are commonly the highest in the world.

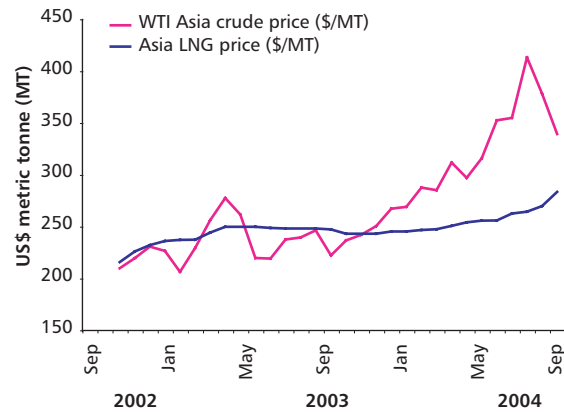
### Recent market changes

As the LNG market evolves, importing companies are seeking increased flexibility and better contract terms. Traditional LNG contracts focused on security of supply for the buyer and capacity utilisation for the seller. Contracts were long-term (often 20–25 years) and rigid. Take-or-pay clauses shifted the volume risk to the buyer. LNG was generally shipped delivered ex-ship (DES), meaning the product was transported in designated tankers and contracts contained “destination clauses” preventing buyers from reselling the cargos to third parties.

Changes to the market have been under way since the mid-1990s. Suppliers offered more favourable terms, including substantially lower prices, to new importers in India and China, leading traditional buyers to seek lower prices when renegotiating their contracts. Additionally, the European Union is insisting that LNG sellers remove destination clauses from their contracts. As prices for natural gas in the US have risen over the past few years, the LNG price differential between the Pacific and Atlantic markets has been reduced. LNG production costs are now just under \$4 per mmBtu, with the source natural gas well under \$1. With current natural gas prices consistently over \$6, the LNG alternative has become attractive.

Source: EIA and Platts

F4. Asia LNG prices



The LNG prices in Asia are based on petroleum prices as shown in this comparison to Asian crude.

These changes have boosted short-term LNG sales, although these sales still only comprise a small percentage of the market. These include cargoes traded under one-year contracts as well as individual cargoes of LNG that are bought and sold. The short-term LNG market was virtually nonexistent until a few years ago, and new facilities were built only when sales contracts were signed for the entire capacity. More recently, some projects have gone forward with capacity unclaimed – another contributing factor to an increase in short-term sales. The leading short-term sellers have been Algeria, Oman, Qatar, Trinidad and Tobago, and the UAE. Short-term imports have been dominated by the US and Spain, followed by South Korea and France.

There is no doubt that demand for LNG will grow, in the US and globally, as natural gas demand grows and new terminal projects come online. As the volumes increase, there will naturally be trading market expansion and evolution. There are those that predict healthy increases in short-term trading, principally in the Atlantic Basin. With present trends, that appears probable. However, the pace of market growth remains very much a matter of debate. [ER](#)

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