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## Natural Gas Markets in the U.K.

Competition, industry structure, and market power of the incumbent

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**The deregulation of the U.K. natural gas industry has facilitated new entry and competition in almost all segments of the industry except pipeline transportation. The new regulatory framework, developed largely by the Office of Gas Regulation (Ofgas), has allowed market forces to stimulate a variety of specialized services and market transactions to meet customer needs. But the entire process has been difficult because of a flaw in the initial industry structure: the government privatized British Gas as a vertically integrated company. The U.K. experience shows that leaving gas supply integrated with pipeline transportation and tying up gas in long-term contracts impede competition. This Note reviews the U.K. reform and the development of new spot, on-system, and "Flexibility Mechanism" markets.**

### The U.K. experience

Before 1986 British Gas operated as the publicly owned, vertically integrated transporter and supplier of natural gas in the United Kingdom. Only gas production was open to competition, and this segment was dominated by multinational oil companies. In 1986 the government privatized British Gas, choosing to leave it a single, vertically integrated company in order to speed the transaction and maximize the sale proceeds. At the same time it separated the gas market into three major segments:

- The wholesale market, where gas is traded between producers, traders, British Gas, and independent suppliers.
- The contract market, where gas is supplied to large consumers (initially those consuming more than 25,000 therms a year, now those consuming more than 2,500 therms a year) by British Gas or independent suppliers.
- The tariff market, where gas is supplied to small consumers (those with annual consumption below the threshold for large consumers) by British Gas.

The government opened the wholesale and contract gas markets to promote efficiency and lessen the traditional dominance of British Gas. It permitted large consumers to contract for natural gas directly with producers. And it allowed independent gas shippers, traders, and suppliers to arrange gas supplies for large consumers in order to create competition in wholesale supply.<sup>1</sup> The tariff market remained closed to competition, and British Gas continued to be the sole supplier of natural gas to small consumers. The government believed, rightly at the time, that competition in gas supply to small consumers was not economically feasible. Wholesale and contract gas prices were liberalized, while Ofgas regulated retail tariffs to protect consumers from the market power of British Gas.

### Structural lessons

The initial decision not to unbundle British Gas in 1986 hindered development of a competitive gas market. Because British Gas controlled the entire pipeline system and held long-term gas supply contracts with producers, it was able to



retain a de facto monopoly in the wholesale and contract gas markets and control entry by independent gas suppliers. In an attempt to improve access to gas supplies and transportation, Ofgas introduced the 90:10 rule in 1989, which prohibited British Gas from contracting more than 90 percent of gas deliveries from any field on the U.K. continental shelf. The 90:10 rule effectively forced producers to market their gas to independent suppliers, promoting the development of wholesale gas trading at the “beach,” the entry terminals of the British Gas pipeline system.

The 90:10 rule did not, however, remove the main source of the problem: the ability of British Gas to control access to its pipeline network. Complaints about the company’s market power prompted another set of regulatory

business, and BG plc, a transportation and storage business. This separation, or “demerger,” of British Gas was completed in 1997.

The demerger finally corrected the government’s failure to restructure the industry at the time of the privatization. The costs of the failure had been significant. The industry’s flawed structure resulted in frequent regulatory interventions in the markets and disputes between Ofgas and British Gas. This increased the regulatory risk and cost of capital for British Gas, which saw a big drop in the market value of its assets. Between the fall of 1993 and mid-1996, when the disputes were particularly intense, the market value of the assets fell by half—from £15.5 billion to £7.7 billion. And the demerger itself was a costly exercise, with the company paying millions of pounds in accounting and legal fees.

The U.K. experience shows that if a single company controls access to gas supplies and transportation capacity, as British Gas did, competition may be inhibited. Simply removing administrative barriers to entry in gas supply and deregulating gas prices are not enough to ensure competitive gas markets. A move from monopolized to truly competitive gas markets requires structural and regulatory changes that protect new entrants from the market power of the incumbent. It took almost a decade to remedy the failure to unbundle British Gas before its privatization. Only after U.K. regulatory authorities intervened in the acquisition of natural gas from producers and the incumbent’s operation of the pipeline network could real competition emerge in natural gas supply.

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measures in the early 1990s, when Ofgas asked British Gas to release more natural gas to independent suppliers and to build “Chinese walls” separating its gas supply and pipeline transportation businesses. The intention was to increase independent suppliers’ access to natural gas from producers and to level the playing field for suppliers contracting for pipeline transportation.

British Gas complied by selling about 5 billion cubic meters of natural gas (roughly 3 percent of the total gas supply) to independent suppliers and by creating two divisions, British Gas Energy and British Gas TransCo. But the prospect of further regulatory intervention on liberalization of the retail gas market led the company to seek more permanent structural change. In 1996 it decided to split its assets into two companies: Centrica, a gas production, sales, and supply

### **New markets**

Competition has fostered new ways of trading natural gas, reflecting market participants’ need for more flexible gas supply arrangements. Spot markets have formed at major terminals, allowing market participants to balance their short-term supply and demand by trading natural gas. As a result of new pipeline operating rules, a flourishing spot market has developed

within the pipeline system. The pipeline operator also uses market pricing to determine the costs of balancing supply and demand over the pipeline network.

While the natural gas markets are substantially deregulated, gas transportation remains heavily regulated because of the natural monopoly characteristics of pipeline transportation. British Gas—followed by its transportation spin-off, BG—has remained the single operator of the U.K. pipeline system, and transportation charges are regulated. The secondary transportation market is just beginning to emerge, with resale of pipeline capacity among shippers allowed only since 1996.

As markets for wholesale (and, increasingly, retail) gas supply have become more and more competitive, the quantity and quality of services available to market participants have improved, and consumers have benefited from declining real prices for natural gas even as consumption has been increasing. Residential prices fell by 24 percent in real terms between 1986 and 1995, and industrial prices by 47 percent. During the same period consumption increased by 38 percent.<sup>2</sup> The deregulation of wholesale and contract markets has attracted more than forty suppliers, all competing fiercely. The increased competition in the contract market is reflected in the diminishing market share of British Gas, which fell from 80 percent in 1992 to 33 percent by the end of 1996. The industry operates much more efficiently than it did before 1986, and consumers have been able to benefit.

### Market dynamics

The trading and contracting of natural gas in the United Kingdom have changed dramatically since the privatization of British Gas in 1986. Traditionally, most natural gas was sold under long- and medium-term contracts between producers and British Gas at the wholesale level and between British Gas and consumers at the retail level. After the contract market was liberalized in 1986, long-term contracting became insufficient to meet the needs of the growing

number of participants in the wholesale and contract gas markets. Independent suppliers and large consumers demanded contractual and supply flexibility to allow them to efficiently balance their short-term supply and demand. Independent suppliers also sought a trading location that would give them unrestricted access to gas deliveries, outside the control of British Gas.

Aided by regulatory measures, the market response to the demand for greater flexibility and better location was the development of spot markets. First, wholesale gas trading moved to the “beach.” Here natural gas supply from more than forty producers promised sufficient availability of natural gas and flexibility in delivery conditions. Second, the concentration of trading at entry terminals promoted the development of spot markets, where natural

*The on-system market has become increasingly popular among shippers because of its central location, accessibility, and low transaction costs.*

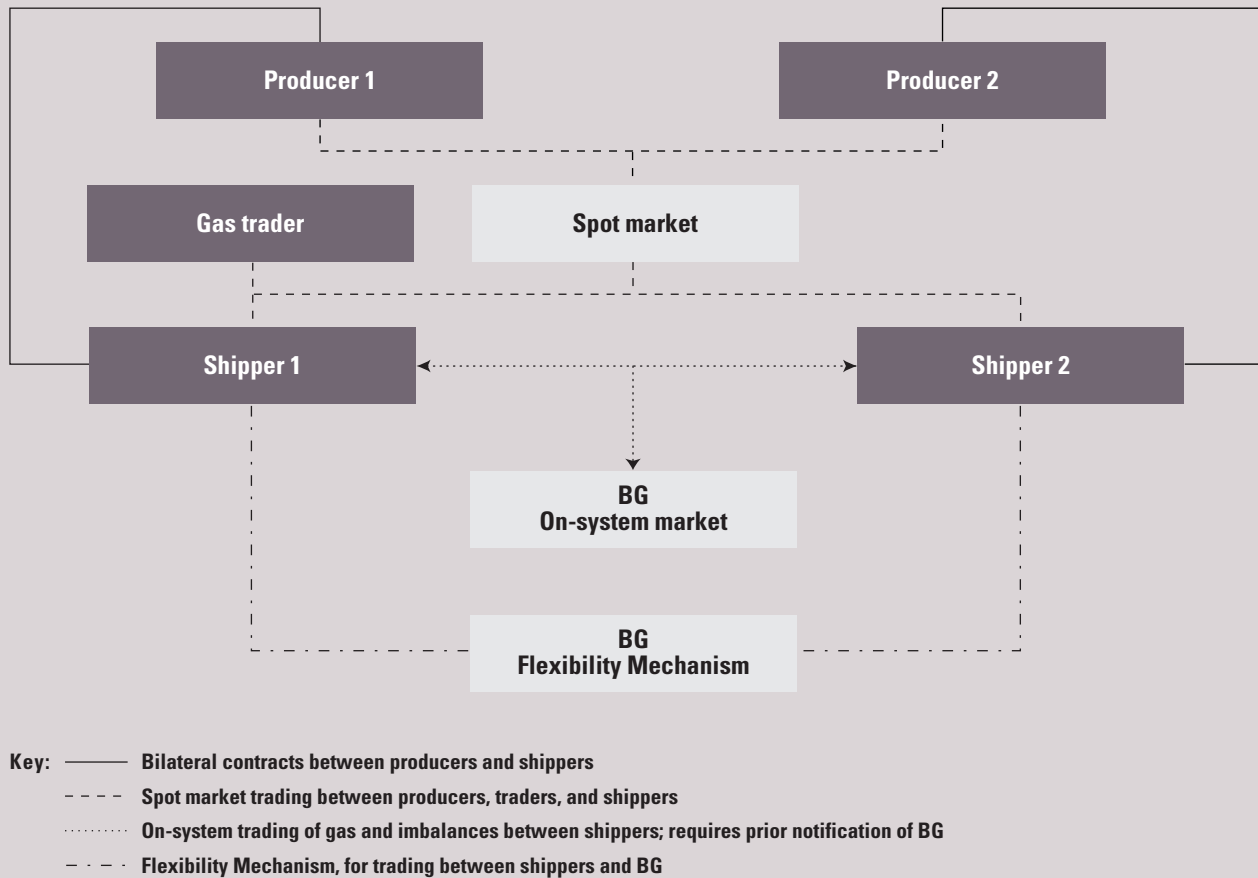
gas is continuously traded. More trading opportunities were created when British Gas separated its gas supply and pipeline transportation operations. The introduction of the British Gas Network Code in 1996, which set out the rights and responsibilities of users of BG’s pipeline network, created two additional gas markets within the pipeline system of British Gas.

Participants in the U.K. gas market now use four mechanisms for trading natural gas (figure 1):

- Bilateral contracts.
- Spot markets.
- The on-system market.
- The Flexibility Mechanism.

#### Bilateral contracts

Bilateral contracts represent the traditional form of trading natural gas in the United Kingdom.

**FIGURE 1 MECHANISMS FOR NATURAL GAS TRADING IN THE UNITED KINGDOM**


Producers and British Gas typically concluded long-term take-or-pay, or “depletion,” contracts under which British Gas covered a share of the financing of a producer’s field development cost in exchange for assured future gas deliveries.

The opening of natural gas supply to competition has introduced new contractual relations in the gas market as producers and independent suppliers have looked for ways to achieve greater supply and price flexibility. This has initiated the development of a wide range of long-, medium-, and short-term supply contracts with delivery provisions to meet specific

demand and supply characteristics of contracting parties.

But the opening of the gas market to competition also exposed British Gas to transition costs, net liabilities resulting from overcontracting. In 1996 it held take-or-pay obligations to purchase about 4.6 billion cubic feet of gas a day (bcfd) from producers over the next five years, while gas sales were projected at 4.35 bcfd, on the assumption that BG would maintain a 90 percent share in the tariff market in 1998. That resulted in an estimated surplus of 0.25 bcfd, or 5 percent of take-or-pay obligations, with a value of £528 million.<sup>3</sup> Although this surplus is

not a significant volume, it still represented almost 30 percent of spot market sales in 1996. Thus if BG delivered its surplus gas to spot markets, it would drive down spot market prices and potentially harm its position in the retail gas market. In the event, the losses have probably been mitigated by delays in the introduction of retail competition.

### Spot markets

Spot market trading has developed with the opening of natural gas supply to competition. As the large number of contractual relations between producers and suppliers made it infeasible to always negotiate all aspects of supply contracts, demand arose for the standardized contracts suited for spot market trading. Another factor in the development of spot market trading has been the gradual shift in natural gas transactions to locations where producers and suppliers can rely on standardized delivery conditions and have the best access to the pipeline system.

Natural gas spot markets have developed at six onshore terminals of the British Gas pipeline network, where the concentration of producers' gathering pipelines and the transportation pipelines of British Gas promised good availability of both gas supplies and transportation capacity. The spot markets enable participants to balance their supply and demand in the short term by buying or selling natural gas in one or more central delivery locations. The high volume of natural gas trading in the spot market has led to greater standardization in supply conditions, such as in the duration of delivery, and thus in gas supply contracts. This standardization of contracts promotes market liquidity and efficiency in spot gas prices.

Spot market gas trading in the United Kingdom is bilateral, involving producers and shippers, or on a brokerage basis, with traders often acting as intermediaries. Spot trading started in 1989–90 as a bilateral telephone market between producers and independent suppliers, but trade volumes were low because most pro-

ducers' gas supply was contracted by British Gas. Over time there has been a large increase in volume and in the number of traders.

The most active spot markets are at the Bacton and St. Fergus terminals, which are well connected with large producer and consumer areas. The most common contracts traded in these

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markets are day-ahead and monthly gas contracts, specifying delivery on the next day and in the coming month. Other contracts traded in spot markets include:

- Balance gas contracts, for delivery in the rest of the current month.
- Quarterly and annual gas contracts, for delivery in a specific quarter and year.
- Time spread contracts, for the exchange of contracts with different delivery periods.

Despite the increasing volume of gas traded in spot markets, trading remains relatively thin and illiquid. Trading volumes at Bacton in 1996 ranged from 2 million to 8 million therms a day, only 5 to 10 percent of the total daily supply. Prices at the terminal varied accordingly—from 9 pence to 14 pence a therm. The U.K. gas market appears to be relatively small to support efficient functioning of five to six spot markets. Perhaps a more central location is needed where most of the country's natural gas supplies could be traded. British Gas, inspired by the growing use of natural gas spot trading, introduced a central location within

its pipeline system when it launched its on-system market in 1996.

#### **The on-system market**

The on-system market is basically a natural gas spot market with the delivery point at the National Balancing Point (NBP), a notional point in BG's pipeline network at which BG balances its high-pressure pipeline system. In effect, all gas supplies transported through BG's high-pressure pipelines can be traded at the NBP.

A transaction in the on-system market typically involves shippers that own transportation contracts and are willing to sell or purchase natural gas. Selling shippers use their reserved pipeline capacity to deliver natural gas to the NBP, where they sell it to interested buyers. Buying shippers then use

gas contracts have led the International Petroleum Exchange (IPE) in London to develop its first natural gas futures contract based on delivery at the National Balancing Point. The introduction of the IPE Natural Gas NBP contract on January 31, 1997, marked the beginning of financial gas trading in the United Kingdom and in Europe. The contract has found broad acceptance among gas traders because of its central delivery location and smooth administration. By July 31, 1997, the volume traded under such contracts had reached almost 30 million therms, equal to about 40 percent of the United Kingdom's daily production of natural gas.

The BG's Network Code requires all shippers to balance their gas shipments through the pipeline system—that is, to maintain their injections and withdrawals of natural gas below a specified tolerance level—on both a daily and a monthly basis. Shippers can balance their shipments by buying or selling natural gas in the highly liquid on-system market, where the price of natural gas determines the cost of maintaining their balance. But shippers do not always maintain their daily balance, and the whole pipeline system may become unbalanced if the sum of individual imbalances exceeds a certain tolerance level. The pipeline operator must then inject or withdraw natural gas to restore the balance in the pipeline system. The value of the natural gas in these transactions is not reflected in the on-system price, because BG cannot participate in on-system trading. To facilitate the pricing of this gas, British Gas introduced the Flexibility Mechanism in 1996.

#### **The Flexibility Mechanism**

The Flexibility Mechanism allows market-based determination of the value of the natural gas needed to restore the balance in BG's pipeline system. BG trades this natural gas in an auction. Interested shippers post their bids, specifying volumes and the prices at which they want to buy or sell, on an electronic network. BG buys natural gas if it expects that injections into the system will be less than withdrawals, and sells natural gas if it expects the reverse.

*The Flexibility Mechanism allows market-based determination of the value of the natural gas needed to restore the balance in BG's pipeline system.*

their pipeline capacity to transport the gas from the NBP to the desired location. Transactions are facilitated by BG, which keeps track of traded volumes and provides transportation services.

The on-system market has become increasingly popular among shippers because of its central location, accessibility, and low transaction costs. The whole range of natural gas contracts, much the same as those traded in a spot market, are traded daily in the on-system market. Traded volumes in the on-system market, and possibly in other spot markets, are likely to increase as the share of Centrica, the British Gas supply and trading spin-off, in the liberalized retail market diminishes and more gas becomes available from producers as a result.

The strong prospects of the on-system market and its potential for efficient pricing of physical



BG accepts the bids that cover the expected system imbalance and that either minimize the cost of buying natural gas or maximize the revenue from selling it. The price of the last accepted bid determines the system marginal price at which transactions between BG and shippers are concluded. BG solicits bids from shippers daily, so that they are always available.

As in any auction, competition among shippers promotes efficient pricing of natural gas traded under the Flexibility Mechanism. If shippers want to ensure that BG accepts their bids, they will reveal their true willingness to buy or sell natural gas. BG can construct a market (supply and demand) from shippers' bids, and decide which ones minimize the cost of restoring the system balance. Since the last accepted bid determines the price for all transactions, the system marginal price reflects the economic value of natural gas needed to restore the balance in BG's pipeline system.

The cost of restoring the system balance under the Flexibility Mechanism is recovered from the shippers that cause the imbalance. Undisciplined shippers must either pay the system marginal price for the natural gas below the tolerance level of their shipments or accept the system marginal price for natural gas that is above the tolerance level. Since the system marginal price is typically higher than the price of natural gas sold or lower than the price of natural gas purchased in the spot market, undisciplined shippers experience losses on their imbalances in addition to any imbalance penalties imposed by BG. These potential losses deter shippers from violating the balancing rules of the Network Code.

## Conclusion

The U.K. experience shows that the development of competitive natural gas markets must be supported by an appropriate industry structure and regulation to protect new entrants from the market power of the incumbent. To promote competition, the liberalization of entry to gas supply and of gas prices must be

accompanied by open access to gas supplies from producers and to transportation capacity for delivering natural gas to consumers. The practices of tying up natural gas in long-term supply contracts and integrating gas supply with pipeline transportation must be eliminated to enable independent suppliers to acquire natural gas in the wholesale market, gain equal access to pipelines, and start to compete on equal footing with the incumbent gas company.

Developing competitive natural gas markets can require frequent regulatory changes and interventions, as it did in the United Kingdom. But these interventions can lead to many controversies and disputes among industry participants and between the industry and the regulator, often with harmful effects for both companies and consumers. The cost of increased regulatory risk

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and the risk of political intervention discourage investment in the gas sector. So it is important to introduce structural changes at the beginning of the reform to set the stage for developing markets and competition later in the reform.

Market forces have proved to be vital and effective in the gas industry, once appropriate structural and regulatory measures establish some breathing room. New entrants in gas

trading, shipping, and supply can emerge overnight and introduce new methods of transacting business, such as spot market trading. By concentrating trading in one location, spot markets like the U.K. on-system market can serve a vital function for market participants that require flexibility in gas supply and efficient pricing of natural gas. And spot market pricing of natural gas can be used for valuation of system balancing, as it is in the Flexibility Mechanism of BG.

<sup>1</sup> Categories of market participants are defined in the Network Code of BG plc, the pipeline transportation spin-off of British Gas. Shippers are firms with shipper licenses that buy gas from producers, sell it to suppliers, and contract with BG to transport the gas to consumers. Suppliers are firms with supplier licenses that buy gas from shippers and then sell it to consumers. They do not deal directly with producers or BG. Since many companies in the United Kingdom have both supplier and shipper licenses, these terms are used interchangeably here. Traders are firms that buy and sell natural gas in a spot market and do not deal directly with consumers or BG.

<sup>2</sup> Based on data from the U.K. Department of Trade and Industry.

<sup>3</sup> Gundi Royle, "British Gas: Light at the End of a Long Tunnel," (Morgan Stanley International, Investment Research U.K. and Europe, London, 1996).

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