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GB Gas Industry FOR DUMMIES®

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Stuart Fowler

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CGI has been at the heart of every major change in the UK energy market since privatisation, helping clients to thrive in changing times. We can trace our solutions all the way back to the systems originally set up to support gas competition and we even owned one of the first off-the-shelf gas supply systems in the UK. Our industry expertise stretches from gas distribution and transportation to gas retail, as well as supporting gas storage operators with innovative solutions.

GB Gas Industry

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By Stuart Fowler

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Introduction

Welcome to *GB Gas Industry For Dummies,* your essential pocket guide to the GB gas sector.

One promise: we try not to go overboard on jokes about the production of gas – natural or otherwise. This book isn't a *Carry On* production after all. So we let that go and put it all behind us (sorry!).

About This Book

As with all the CGI *For Dummies* guides, this one is designed to take newcomers through the basics. We don't intend to cover every last chapter and verse of the mechanics of the industry – that would seriously test your mettle and take forever to write too.

The book gives you a whistle stop tour of what on earth goes on in the gas industry. As with the electricity and water guides, we explain the jargon, the process of getting gas from the well to the household or business and all the bits that go on in between.

At the time of writing, the gas industry is going through a wholesale change due to the refresh of the supporting industry systems. Clearly this situation means that some of what we describe is subject to change. We try to cover what we can, but unfortunately we haven't been able to find *Crystal Ball Gazing For Dummies* yet and so please bear that proviso in mind.

We discuss some of the changes in Chapter 7. The Gas Transporters' network codes set out the arrangements that govern the settlement rules. Organisations shipping gas on the British gas network have to agree to the relevant network codes for the areas in which they plan to ship gas. The descriptions we set out in this book apply to the current arrangements set out in the industry's Uniform Network Code

(UNC). The regulator has agreed significant modifications to the UNC, to be implemented by all parties impacted on a future date (to be determined). Chapter 7 summarises the key changes that will come into effect with these modifications.

Foolish Assumptions

We made some assumptions about you while writing, because otherwise condensing the whole industry into a book this size would be impossible:

- You're new to the gas industry or are just plain interested in how it works.
- You're not interested in opinions, only facts.
- You want to know only about England, Scotland and Wales; we don't cover Ireland because that would require a totally different book.

How This Book Is Organised

If you're familiar with CGI *For Dummies* books, you'll feel right at home with this one. We arrange it into nine concise chapters as follows:

- **Chapter 1: Getting to Grips with the Basics:** We look at the evolution of the gas industry from the very beginning: in fact dinosaurs are even involved. Read this chapter if you want a straightforward introduction to the industry.
- **Chapters 2 to 8:** We take a closer look at the individual bits of the industry: exploration and production, transmission, distribution, the retail market, the wholesale market, settlements and regulation.

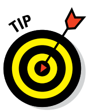
  We don't include the Smart Metering Implementation Programme in this book because it recently had a book to itself. But we do often include a useful 'jargon buster' sidebar to help you hold your own in coffee-machine conversations (in case the machine is particularly well-informed).

- **Chapter 9: Ten Take-Away Points to Remember:** We provide a few (well, ten actually) observations about the British gas industry.

For your delectation, we also include an appendix detailing the key milestones in the development of the British gas industry.

Icons Used in This Book

We use the following icons to direct you to key pieces of text.



This icon points you to helpful hints.

We use this icon to highlight important information that's worthwhile bearing in mind.

Your eyes need to widen slightly on seeing this icon! It tells you about scary aspects to watch out for.

Where to Go from Here

You can read this book in whatever way you like. You can treat it like a swimming pool, don your nose-clips and jump right in, or you can read it cover to cover.

We use plenty of headings and cross references to guide you precisely to what you want to know.

Whatever your chosen approach, we hope you enjoy the book and find it useful. If you require any more information, feel free to visit us at `www.cgi-group.co.uk/utilities`.

Chapter 1

Getting to Grips with the Basics

In This Chapter

- Seeking the origins of natural gas
- Structuring the gas industry
- Facing up to some industry challenges

The UK gas industry has arguably been at the forefront of industry deregulation for many years. Some people would perhaps argue that it has been through too much change; workers have certainly seen lots of transformations in parts of the industry, though perhaps less in other parts.

This chapter looks specifically at how the gas industry developed, what shaped it into its current form and how it continues to evolve, particularly as it responds to the changing nature of energy usage in the UK. We describe the changes to the supply and distribution of gas, particularly influenced by the discovery of natural gas in the North Sea. One key development is the impact of the smart-metering rollout and the replacement of the gas central systems.

To see where it all began, check out the nearby sidebar 'A potted history of gas in the UK' and the Appendix's timeline.

A potted history of gas in the UK

The first key year in the development of the British gas industry is 1792, when William Murdoch used coal gas for gas lighting in his house in Redruth, Cornwall. The UK really started to develop gas, however, through Frederick Albert Winsor, who'd seen Philippe Lebon's gas lighting experiments in Paris.

Winsor founded the Gas Light and Coke Company (GLCC), the world's first public utility company. The company gained its Royal Charter in 1812 and opened in Westminster the following year, bringing gas lights to the streets of London by burning coal. It continued to thrive for the next 136 years, expanding into domestic services while absorbing many smaller companies.

On 1 May 1949, the town gas companies (including the GLCC that formed the major part of the new North Thames Gas Board) became the 12 regional Gas Boards (comprising 1,064 individual companies). Until the discovery of North Sea oil, the gas was coal gas; after 1967 it was replaced by natural gas. In 1972, the Gas Act merged the 12 regional Gas Boards into British Gas.

Tracing the Beginning of Natural Gas

You can trace the roots of natural gas back millions of years, to when dinosaurs walked the planet and Joan Collins was just a young girl. Natural gas is called a *fossil fuel* because it was formed over millions of years from the remains of animals and plants.

Most of the gas used today in the UK comes from beneath the North Sea. Over time, as mud and sand covered the remains of these animals and plants, they formed rocks. As the pressure and heat from the rocks above increased, they formed into oil and gas, which are found together because of this process of decay and compression (see Figure 1-1 for an illustration).

Gas extraction is a key part of the whole value chain and one that we cover in more detail throughout this book.

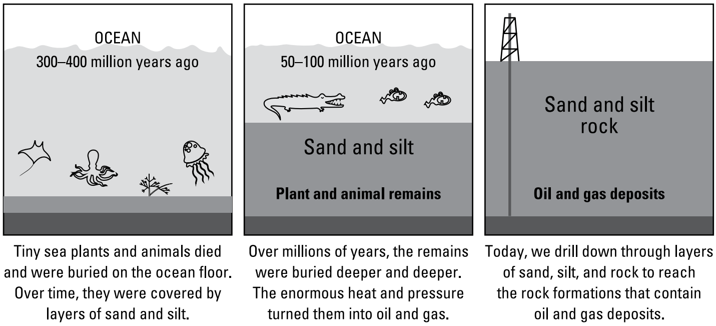


Figure 1-1: Oil and natural gas formation.

Understanding the Gas Industry Structure

Gas has been the fuel of choice in the UK for heating since the 1970s and gas usage has increased ever since. With the discovery of North Sea oil, the use of natural gas has seen a massive increase in use. Only now that costs are increasing does that use show signs of levelling out.

Considering costs

A household or business's gas bill comprises the following elements:

- Energy costs (including supplier costs and profit)
- Transportation charges (transmission and distribution)
- Metering charges
- VAT
- Environmental charges

Although for presentation purposes customers normally don't see the individual elements broken down, domestic customers do see a unit charge for gas and possibly a standing charge that covers some of the standard charging elements.

The biggest cost in the gas bill is the energy cost – this is supplier costs that are incurred procuring gas from shippers. Recently, these costs have drawn much public attention with the increasing volatility and subsequent rise in energy costs.

Following the chain

Here are the main participants in the gas supply chain (also see Figure 1-2):

- **Producers:** Responsible for extracting and transporting gas from the field to the beach, and flowing it onto the system. Typically they own fields and rigs. Chapter 2 describes exploration and production in more detail.
- **National Grid Gas (NGG):** At the beach, the gas enters a terminal for processing and is then transported to the National Transmission System (NTS). National Grid Gas is responsible for the operation of the NTS (more on this aspect in Chapter 3).
- **Shippers:** Purchase gas from producers and tell them to flow it onto the system. Shippers are required to nominate daily quantities of gas entering and/or exiting the network (with various tools and techniques) to balance inputs and outputs. (For all about the wholesale gas market, flip to Chapter 6.)
- **Suppliers:** Responsible for ensuring that they've bought enough gas for their end customers and for rendering a bill. We discuss the retail side of things in Chapter 5.

Figure 1-2: Gas industry supply chain.

The distribution businesses (see Chapter 4) sit between NGG and shippers.

Reviewing How We Got Here

The gas market has been through significant change and shifts throughout its development to arrive at the current market structure. For the pre-privatisation years, check out this chapter's sidebar 'A potted history of gas in the UK'.

Going private

The Conservative Government created the Gas Act of 1986, which led to the privatisation of British Gas; on 8 December 1986, its shares floated on the London Stock Market. To encourage the public to become shareholders, the offer was advertised with the 'If you see Sid . . . Tell him!' campaign. The initial public offering of 135 pence per share valued the company at around £9 billion.

At the same time, the industrial and commercial retail market was prepared for competition for very large industrial customers (such as steel works) and fairly large commercial properties (for example, potteries) using more than 732,000 kilowatt hours (kWh) per annum (25,000 therms per annum in old money).

TIP

For context, the average household uses about 29,300 kWh per annum. The first customers transferred in 1990 and the threshold was reduced to 73,200 kWh per annum (2,500 therms) in 1992.

In 1994 the government introduced legislation to move to full market competition, enabling domestic customers to switch supplier. The first ones did so in 1998.

In order to facilitate competition, British Gas plc was broken into two distinct companies at first: Centrica (supply) and British Gas plc (infrastructure). British Gas was then split into two further companies: BG plc (exploration and production) and Lattice Group (British pipeline infrastructure). More recently Lattice Group plc merged with National Grid plc to form the major infrastructure provider in the UK, responsible initially for electricity and gas transmission and gas distribution across the UK. In 2004 National Grid plc disposed of some of the gas distribution network (we talk more about this in Chapter 4).

Buying up and joining together

During this time the industry went through some significant mergers and acquisitions, with new players making inroads into the gas market with dual-fuel offerings. This market activity drove these companies into *vertical integration* – owning most elements of the electricity supply chain (generation, distribution and supply) – though this is less true within the gas industry, where only a few of the big six supply companies had a gas infrastructure position.

Since that time the industry has continued to be at the forefront of change, with the introduction of metering competition and more recently smart metering. There is now the need to replace all the systems that support the gas industry centrally. Therefore, although a lot of what the gas industry does will remain the same, inevitably some changes will also occur – for example, to support *smart metering.* (Smart meters enable two-way communications. They also have the ability to remotely obtain reads and to be remotely instructed and reconfigured.)

Throughout this book we try to ensure that we consider the implications of this period of change, but of course we don't have all the answers. One thing is for certain though: change.

Outlining the Key Industry-Wide Challenges

Here's a heads-up of some of the big issues currently occupying the industry as a whole:

- **Security of supply:** Where will the country get its energy from in an increasingly volatile future? Oil and gas reserves may well deplete in the not too distant future. Finding alternatives forms of heat is one of a number of thought-provoking challenges facing the industry.
- **Decarbonisation of the economy:** Gas is used in the generation of electricity, which has an impact on the gas industry. Couple this use with the depletion of the country's oil and gas reserves and you have a significant challenge for both industries.

- **Smart metering:** The response to changing patterns of energy usage is the rollout of smart metering. The government hopes that this helps users better manage their energy usage.
- **Innovation-based regulation:** The scale of investment required in the country's gas infrastructure requires a new approach to designing and operating networks. But how do you incentivise regulated, monopoly network providers to challenge old ways of working and start thinking out of the box? Ofgem's response to this quandary was a radical change to the regulatory regime, which places greater emphasis on delivering innovation (more on this aspect in Chapter 8).
- **Europe:** We expect to see increasing harmonisation across energy markets within Europe.

Chapter 2

Exploration and Production

In This Chapter

- Understanding the E&P lifecycle
- Considering E&P changes over time
- Examining the big issues

Exploration and production is the search for profitable gas fields, and the extraction and refinement of that gas into something people can transport and use. This part of the industry is often referred to as the Exploration and Production sector (E&P) or the Upstream Oil and Gas sector.

Like young lovers, oil and gas go hand in hand. The techniques and processes used in the search for oil and gas are identical. Therefore, although we're talking about gas in this book, you can apply much of what we say in this chapter to oil as well.

Semi-interesting exploration and production fact

Humans have been drilling oil wells since the 4th century BC, when people in China used bamboo poles to drill wells as deep as around 250 metres. This oil was burned to heat and evaporate salt water to produce salt. By the tenth century, extensive bamboo pipelines connected oil wells with salt springs.

The ancient records of China and Japan are said to contain many allusions to the use of natural gas for lighting and heating.

This chapter takes a look at the E&P lifecycle, touches on the history of E&P in the UK and briefly examines some of the big issues concerning the industry today.

What's Exploration and Production All About?

REMEMBER

The gas E&P lifecycle has the following five stages, which we discuss in this section:

1. **Exploration:** Search for hydrocarbon (oil and gas) deposits suitable for extraction.
2. **Appraisal:** Assess the discovery and decide whether to proceed or not.
3. **Development:** Decide how best to produce the gas, the facilities required and what to do with the produced gas.
4. **Production:** Extract the first hydrocarbons and process the produced gas into something the firm can sell.
5. **Decommissioning:** Remove the production facilities and restore the site.

Exploration: Searching for gas

Oil and gas are trapped in deposits beneath the earth's surface, after organic material falls to the earth and over millions of years becomes buried. The material is slowly squashed and heated as it gets buried, and this 'cooking' process over millions of years creates hydrocarbons (organic compounds consisting entirely of hydrogen and carbon). So-called traps and reservoirs are formed when tectonic forces (the processes which control the structure and properties of the Earth's crust, and its evolution through time) bend and break the rocks that make up the earth's surface, trapping hydrocarbons (oil and gas) inside.

REMEMBER

Exploration is the search for hydrocarbon deposits. In the UK, this search primarily takes place offshore, but in many countries exploration also occurs onshore using the same techniques.

Tools

In order to find these traps, oil and gas exploration workers have a number of tools at their disposal:

- **Geology:** Studying rock formations and rock types above the surface gives clues as to what's happening beneath the surface. Geologists can use satellite imagery and surveys, coupled with data from nearby wells, to determine where reservoirs may be located.
- **Geophysics:** Seismic surveys use the reflection of sound waves to build up a picture of the geology up to 500 metres beneath the earth's surface.
- **Computing technology:** Plays a huge part in helping to discover traps. Advancing computing technology has improved the ability to interpret and visualise seismic data:
  - 3D data acquisition and analysis can be time-consuming and require huge amounts of data.
  - Processing data involves multiple stages of complex signal processing and computing power.
  - Virtual reality rooms allow experts to display 3D subsurface images on large screens and view them from almost any angle. Remote monitoring now removes the need for personnel to be present continually at production platforms.
- **Drilling:** Seismic surveys can't detect hydrocarbons – eventually workers have to drill an *exploration well* to gather physical rock and fluid (oil, water and gas) samples.

Risks

Exploration is a risky business. Here are some of the typical risks that operators have to consider:

- **Cost:** How much do operators need to spend in order to perform this exploration? Factors to consider include geological factors such as rock density, as well as climate, cost of labour and cost of infrastructure.
- **Location:** How close is the exploration to existing infrastructure? Does this distance make exploration easier or harder?

- **Sensitivity:** Environmental factors may preclude further exploration due to potential damage to marine life and habitats.
- **Politics:** In the UK, the government grants offshore exploration rights to companies, but in other countries landowners and private individuals may grant these rights.
- **Safety:** Accidents can happen during all phases of the E&P lifecycle, which can cause injury or death to workers.

REMEMBER

Operators continually assess these risks throughout the E&P lifecycle, although the potential rewards can outweigh the risks. In order to assess whether to take a discovery further, operators need to appraise the discovery.

Appraisal: Finding out how much gas is there

REMEMBER

The appraisal phase starts after operators discover a reservoir and consider it promising. The aim of the appraisal phase is to increase confidence about the properties of the discovery; it culminates in a decision to develop the discovery or not.

Appraisal wells

Each oil and gas reservoir is a unique system of rocks and fluids that operators must understand before they can plan development and production. To do so, appraisal wells are drilled to confirm the discovery.

Seismic

Additional seismic surveys may also take place to improve the mapping of the gas field. More precise mapping can confirm the exact location of hydrocarbons and identify areas where no hydrocarbons exist.

Recovery factor

REMEMBER

A crucial question is how much oil and gas will be recovered and how easily will it be produced? The recovery factor (RF) is vital here:

- RF tells companies how much of the discovery can be safely brought to the surface, or *recovered.*
- RF is calculated using various parameters: reservoir dimensions, pressure, nature of the hydrocarbon and the development plan.
- RF for most North Sea oil fields is ~35 per cent; but it can be as low as 9 per cent or as high as 70 per cent where reservoir properties are exceptionally good. The RF in gas fields is much higher ≥ 85 per cent.

Costs

Operators also consider cost parameters such as construction requirements, cost inflation and future oil prices when deciding whether to develop an oil or gas field.

The most efficient production method is assessed. Production must repay, with profit, the huge costs of offshore development and day-to-day operation. It must also do so safely and responsibly.

TIP

Appraisal can take several years to complete and is very costly.

REMEMBER

Some factors can stop a discovery from being viable:

- Too difficult or expensive to get at, such as it being too deep or too far away
- Too risky to get at (uncertainty of what's there, environmental issues, danger)
- Quality of product not high enough
- Predicted price of oil too low

Development: Extracting and building the infrastructure

When the appraisal phase in the preceding section results in a decision to produce gas from the discovery, the process moves into the development phase (see Figure 2-1).

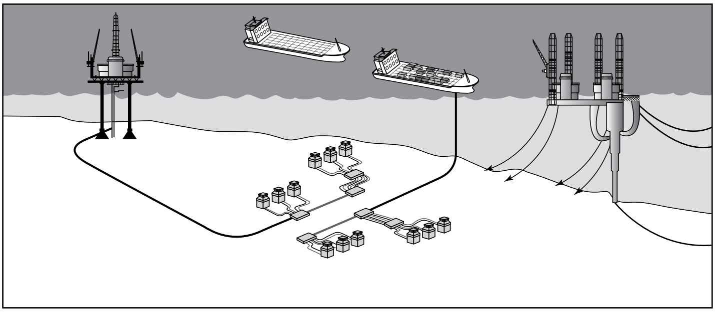


Figure 2-1: Platform types used in the gas and oil industry.

Companies examine the best way to produce from the gas field, what facilities are required and what to do with the produced gas.

Development wells

Operators plan and drill development wells in order to maximise production. A development well may be a gas-producing well or an injection well for pumping water or gas into to maintain pressure. Some producing wells may be converted to injection wells during the lifetime of the reservoir.

Production facilities

Three main offshore production facility options exist, all with or without additional underwater production facilities:

- Fixed platform
- Floating platform
- Floating Production, Storage and Offloading (FPSO) vessel, which can be used for processing and export but is more expensive than fixed platforms

As well as the platforms, production facilities also include:

- Production wells and water and gas injection wells.
- Equipment to process crude oil and/or natural gas.
- Equipment to pump the oil onshore.
- Living and working facilities for offshore workers. Some platforms house 100 people whereas others are Normally Unmanned Installations (NUIs).

Pipelines and onshore processing facilities may also be required, although many of these facilities already exist and can be tapped into. Some production facilities are offshore rigs with onboard processing facilities. Construction of these facilities is a complex and costly task.

TIP

The challenge of the development phase is to move to production as quickly and cheaply as possible. The average time between discovery and oil pumping is 5 years for the North Sea.

Production: Producing crude oil/gas

Production starts when the first hydrocarbons are extracted from a gas field. The produced oil and gas are then processed into something sellable – liquid hydrocarbons and gas – and these products sold.

REMEMBER

The company starts to make money during the production phase, at the point when the profits from the sales are greater than the cost of investment.

Operating and maintaining the production facilities costs money (surprise, surprise!). Depending on the cost, production can last several years or even decades.

REMEMBER

Operations and maintenance

Engineers usually operate and maintain the production facilities:

- Reservoir engineers check on the health and performance of the field to plan how best to maintain production. Additional wells may need to be drilled or the production facilities improved to maximise recovery of the oil or gas.
- Gas separated from oil on the platform may also be compressed and re-injected into the reservoir rocks to maintain pressure.
- Flow from oil and gas wells is tested and monitored throughout the life of the well.

- Platforms are involved in drilling, preparing water or gas for injection into the reservoir, processing the oil and gas before sending it ashore, and cleaning the produced water for disposal into the sea.
- Power is generated on the platform to drive production equipment and support life. All production systems are constantly monitored for leaks, because oil and gas are hazardous and extremely flammable.

Production sites often handle crude oil from more than one well. Oil is nearly always processed at a refinery; natural gas may be processed to remove impurities in the field or at a natural gas processing plant.

To purify raw natural gas,

- Hydrocarbons are extracted, separating the mixture of liquid hydrocarbons, gas, water and solids.
- Constituents that aren't sellable are removed.
- Deep fields, with high pressures and temperatures, may yield *condensate* (or 'wet' gas), a valuable light oil that exists as dissolved in gas in the reservoir.

Crude oil can contain acidic fluids including hydrogen sulphide and carbon dioxide, which corrodes casing.

North Sea production issues

The North Sea is a particularly harsh environment. Wind, waves and weather create challenges to engineers and workers. In the 1970s, when production in the North Sea first started, the industry had never operated in such a harsh environment. Production facilities had to be designed to hold up in these extreme conditions, which required innovation and impressive feats of engineering.

Oil production in the North Sea peaked in 1999. Gas production in the UK peaked in 2000, though it's still increasing in the North Sea overall. The North Sea has been largely explored, but new, smaller fields are still being discovered.

Gas processing (mid-stream)

Gas is typically transported to a processing plant by pipeline. Further processing and purification of the 'wet' gas is undertaken to remove water and Non-Gas Liquids (NGLs). The exact processing depends on the origin of the gas, because the composition of the gas differs between fields. During processing:

- Water and contaminants are removed from the gas.
- The gas is chilled or undergoes other processing to remove NGLs, leaving mostly methane.
- NGLs are further split into components, for example, propane, butane and 'wet' gas, for sale.

Gas sales

TIP

The output of gas processing is a number of products suitable for sale:

- **Pipeline quality 'dry' natural gas:** Entered into the National Transmission System (see Chapter 3) for use by consumers, or sold to industry users.
- **Condensate ('wet' gas):** Dilutes thick oil products.
- **Ethane:** Used primarily in the further production of ethylene.
- **Propane:** A domestic fuel for barbeques.
- **Butane:** Another domestic fuel, commonly found in camping shops!

Economics

At some point, the costs of operating and maintaining a gas field exceed the profit. Several factors can cause this, but the primary reasons are oil price, increasing maintenance costs and the rising cost of extraction.

REMEMBER

The break-even point is between $50–85 a barrel for some companies, less for others. Smaller companies can run leaner operations, keeping extraction costs lower than a company with larger overheads. But when a field is no longer profitable, the firm moves it into the decommissioning phase.

Decommissioning

Decommissioning involves removing the production facilities and restoring the site. Typically, decommissioning applies to an offshore rig and its associated wells, but the term can also apply to the onshore production facilities.

Production facilities are rarely the same – ranging from small steel platforms to large structures with concrete bases, pipeline and cables. Therefore, the decommissioning process is different for every installation.

The UK has been producing oil and gas since the 1970s. All the infrastructure built in that time will need to be decommissioned in a way that protects the environment. Potentially some facilities can be re-purposed, for example, into wind farms or for use in new sectors such as carbon, capture and storage (CCS). Many parts can be brought onshore for dismantling, recycling or disposal.

The Department of Energy and Climate Change (DECC) regulates the decommissioning of offshore oil and gas installations. An operator must submit a proposal for decommissioning, describing exactly how it will take place. The DECC has to approve this process before the field can be begin decommissioning.

Decommissioning can take several years and cost a lot of money. The cost of decommissioning depends on a number of factors including the complexity of the infrastructure, the amount of the equipment that can be reused or recycled, and the location of the field, that is, water depth and weather conditions.

How has Exploration and Production Changed?

In this section we take a closer look over the years since 1970 to see how exploration and production has changed.

Early days – 1970s oil boom

In 1964, the UK Continental Shelf Act came into force, and the government granted the initial exploration licences for the

North Sea. The first UK discovery of gas was in 1965, with the major finds of the Montrose, Forties and Brent fields being discovered in the following years.

These discoveries coincided with a period of relatively high world oil prices, which made investment in the North Sea economically viable and led to an explosion in discoveries in the North Sea.

By the mid-1980s, the North Sea had over 100 installations. The UK became a net exporter of oil by the early 1980s, and of gas by the mid-1990s. But in 2013, the UK had become a net importer, meaning that the country now imports more oil and gas than it produces. Oh, how times change!

Oil and gas today

Oil and gas production in the North Sea is currently in decline. New fields are being discovered but they tend to be on a much smaller scale than the discoveries of earlier years.

Many known oil and gas reserves in the North Sea haven't moved into a production phase, because the cost to extract the oil and gas wasn't economical. New technology, balanced against oil prices, will determine whether these reserves become economical in future. Industry experts estimate that up to 50 billion barrels of oil and gas may still be present to recover in the North Sea although, of course, estimates do vary quite widely with the Scottish Government estimating 24 billion barrels.

Today's industry in numbers

Here are some key facts about the UK Oil and Gas Industry in 2014:

- Capital Investment in UK offshore oil and gas was £14.8 billion.
- £9.6 billion was spent operating existing assets.
- 450,000 people are employed in the industry.
- 475 offshore installations exist and 15 onshore terminals.
- 10,000 kilometres of pipeline is in place.

How is Exploration and Production Regulated?

After the Continental Shelf Act of 1964, the government passed a number of additional laws relating to UK oil and gas, including the 1975 Oil Taxation Act and many others. This section gives the lowdown about the governing bodies and their responsibilities.

Department of Energy and Climate Change

The Department of Energy & Climate Change (DECC) works to ensure that the UK has secure, clean and affordable energy supplies and promotes international action to mitigate climate change.

The DECC acts to regulate UK oil and gas under powers in the Petroleum Act 1998. In April 2015, some functions passed to the Oil and Gas Authority (OGA), a new Executive Agency of DECC.

TIP

The OGA is responsible for administering offshore environmental regulations, and for regulating the decommissioning of fields to ensure that it's done safely and to minimise the environmental impact. (Check out the earlier 'Decommissioning' section for more details.)

Granting of licences

The OGA is responsible for administering the UK's licensing system for oil and gas exploration. When the OGA issues a production licence to a company, it gives the licensee exclusive rights to drill and produce oil and gas within a specific region.

REMEMBER

Operators compete for licences, with the OGA choosing winners based on a range of technical and other criteria, instead of solely on price.

The licences the OGA grants include terms and conditions to regulate specific activities including the following:

- Drilling
- Field development and production
- Licence transfers and operatorship
- Storage and confidentiality of data

What are the Big Issues?

Most of the oil and gas that's easy to reach and relatively cheap to extract in the UK has now been found. As a result, exploration often needs to focus on more challenging environments.

Deeper water

The main new area for exploration in the UK is to the West of Shetland. This area is estimated to hold around 20 per cent of the UK's remaining oil and gas reserves. The difficulty in extracting oil and gas from this area is that it's located in much deeper water than the rest of the North Sea.

Deeper water presents a number of physical challenges:

- **Increased pressure:** At depths of 1,500 metres or deeper, the pressure is much greater than in shallower wells.
- **High temperatures:** In deep-water sites, the wells also often need to be deep to reach the oil and gas.
- **The need for Remote Operated Underwater Vehicles:** Instead of using divers to carry out underwater tasks.
- **Difficulty positioning and manipulating the extra-long riser pipe:** This pipe connects the wellhead to the surface rig.

The combination of these factors makes deep-water drilling a more risky and expensive option than conventional wells.

Alternative sources

As easy-to-reach resources of oil and gas start becoming less available, energy companies are increasingly looking at alternatives. A number of non-conventional hydrocarbon sources are already available in the UK: oil shale, tar sands and coal.

In line with government policies to reduce carbon emissions, a lot of research is currently going on into greener alternative energy sources: geothermal energy, solar, hydro, wind power and biomass.

Natural gas is 20 per cent cleaner than other hydrocarbon resources. Experts agree that it will continue to provide a large proportion of UK energy for many years, and that this fact is consistent with meeting carbon emission targets.

Fracking

Hydraulic fracturing is a technique used in the North Sea offshore fields since the late 1970s and in UK onshore oil and gas wells since the early 1980s. It became a high profile controversial issue only after Cuadrilla Resources (an oil and gas exploration and production company) proposed its use in the extraction of shale gas in 2007.

The controversy is largely due to pollution incidents in the US, where hydraulic fracturing of shale gas is more common, and also a worry about an increased risk of earthquakes.

Security of supply

While the UK's supply of gas is in decline, it has to import gas from other countries via pipelines and by sea in the form of Liquified Natural Gas (LNG). This increasing reliance on imported gas means that potentially the UK's supply of gas is becoming less and less secure.

Oil price

The oil market had a period of stability from March 2011, when the price stayed close to $110 for over 3 years, with only a few fluctuations up to $123 (April 2011 and March 2012) and a drop to $95 (June 2012). The price then dropped sharply from $111 in June 2014 to $48 in January 2015 (see Figure 2-2)!

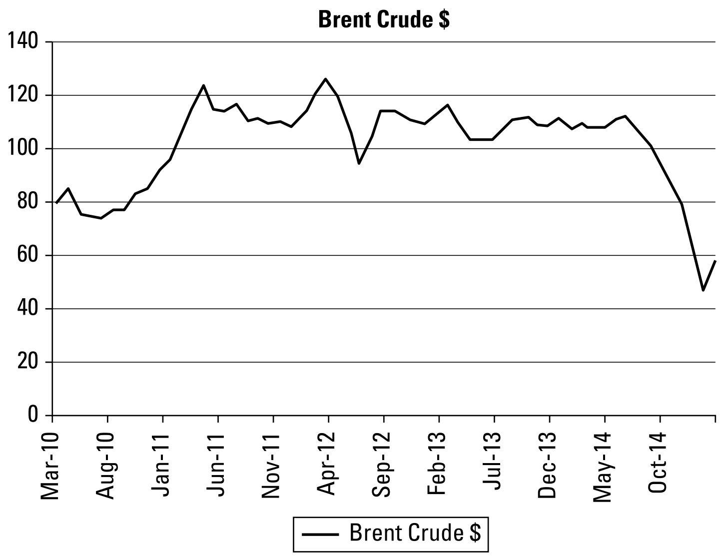


Figure 2-2: Price of Brent crude in dollars; note the price tumble in late 2014.

Unsurprisingly, this fall had an immediate impact on the oil and gas industry. Many fields in the North Sea would be operating at a loss if the oil price remains at this level, and so companies operating in the North Sea started cutting costs.

Analysts in this area have varying opinions on the future price of oil. Although most agree that the oil price will increase again, most also caution that this is unlikely to be at the same rate as recoveries from previous oil price drops.

The factors that experts think influenced the drop in price – slowing economic growth in China, removal of subsidies, currency depreciation and growth in supply from North American shale gas – are unlikely to change in the near future. On the other hand, any restrictions on supply from other factors, for example, political unrest, could restrict supply and cause prices to rise quicker than expected.

Economic viability

When oil and gas price drops to a level when a field isn't making a profit, the operator considers decommissioning. But decommissioning is an expensive undertaking, and if the price were to rise again the firm has no way to restart operations. Therefore, operators often run at a loss for a time, in the expectation of making the loss back in the future.

Yet, at times of low oil prices, plans for future projects and exploration are likely to be postponed or dropped completely. Decommissioning in the North Sea will be the next big phase of work for the industry as a whole. We discuss this issue in the earlier 'Decommissioning' section.

Technology

The oil and gas industry is continually finding ways to innovate, in order to extract hydrocarbons in a safer, more efficient and cleaner way. Here are some current trends in new technology:

- **Digital oil fields:** Having all the data for a field integrated and updated in real time allows the best possible analysis and decision-making.
- **Increasing the percentage of recovery from a field:** Fields can now often recover up to 50 per cent more than was originally estimated.
- **Better use of the less valuable products:** For example, new techniques for processing heavy oils and bitumen into light oil, or processing coal into gas.
- **Cleaner extraction and less pollution:** Many people see this aspect as an alternative to green energy production.

Health and safety

Extracting oil and gas from the North Sea has always been extremely hazardous. The first oil rig to discover gas in the UK, the Sea Gem, sank soon afterwards, killing 13 crew members.

The worst disaster in the North Sea was the Piper Alpha explosion in 1988, killing 167 people, with only 61 survivors. This tragic event led to the adoption of the Offshore Safety Act in 1992, and the moving of responsibility for offshore safety to the Health and Safety Executive.

The UK Health and Safety Executive identifies key areas it expects to be the largest risk factors in the industry in the coming years:

- The key new location identified for future exploitation is the area west of Shetland, which represents particular risks, due to extreme weather and sea conditions, distance from shore and lack of onshore facilities (flip to the earlier 'Deeper water' section).
- New wells increasingly tend to be in deep water. The associated high pressure and temperatures presents additional safety concerns.
- Much of the North Sea facilities have been in place for many years, often beyond the initial predicted lifetime of the field. This issue brings challenges in maintaining aging infrastructure.
- Floating production installations now account for 30 per cent of production in the UK continental shelf, and this figure is likely to increase. These installations present additional safety concerns, including a higher rate of accidental hydrocarbon release and a greater chance of loss of stability or station.

Environment

A large amount of research is carried out into the impact of the oil and gas industry on the environment. Oil and Gas UK publishes an annual Environmental Report that summarises the current situation.

The impact of leaks from oil and gas platforms is currently high profile in the media due to the oil spill from the Deepwater Horizon platform in the US.

Collaboration

As the availability of offshore gas reduces, the importance of companies working together increases. Such collaboration between offshore operators can help to maximise the lifetime of fields and the benefits of the industry to the UK economy.

Jargon buster

Like most businesses, the gas industry contains its own jargon that can make newcomers feel uneasy. Well, no more. Note these terms and abbreviations and feel at home when you're next chatting to a multinational's CEO!

- **Block:** A sub-division of the North Sea measuring around 10×20 kilometres.
- **Blow-out:** When well pressure exceeds the ability of the wellhead valves to control it.
- **Christmas tree:** The fittings and valves on the drill pipe that control the production rate of oil.
- **Derrick:** The tower on a platform that holds most of the drilling controls.
- **Dry gas:** Natural gas composed mainly of methane.
- **Fishing:** Removing unwanted objects from the borehole, such as broken drillstring, or tools.
- **Jacket:** The lower section of an offshore platform, usually below the water surface.
- **Mud:** A mixture of base substance and additives used to lubricate the drill.
- **Payzone:** Rock in which oil and gas are found in exploitable quantities.
- **Roughneck:** Drill crew members who work on the platform, screwing together sections of drillpipe or pulling a drillstring.
- **Roustabout:** Drill crew members who handle the loading and unloading of equipment and assist in general operations around the rig.
- **Spudding:** Drilling the first part of a new well.
- **Topside:** The superstructure of a platform.
- **UKCS:** United Kingdom Continental Shelf.
- **Vantage POB:** An IT shared service for personnel and certification tracking of offshore personnel.

Chapter 3

Transmission

In This Chapter

- Introducing the transmission network
- Charging for transmission
- Checking out regulation and future issues

Like Jimmy Tarbuck's jokes, the principles for transmission of natural gas in the UK haven't changed in practical terms since 1967. That was the date of the creation of the natural gas network, which was constructed as you know it today mainly through to the early 1980s.

TIP

In order to detail its history and operation over the years, think of the transportation of gas as being a bit like the country's road system. The pipelines are akin to the national road network with vehicles representing the gas molecules. The National Transmission System (NTS), owned and operated by National Grid Gas (NGG), is the motorway system and the Local Distribution Zone (LDZ) systems (see Chapter 4 for more) are the A and B roads.

One thing to note though is that traffic jams and pileups don't occur on the NTS. National Grid Gas operates as a combination of the police and the Highways Agency, assuring the flow of traffic (gas molecules) around the network. It's the System Operator for Great Britain and so is responsible for the safe operation of the high-pressure system and residual balancing, both of which we discuss in this chapter.

Apart from that, we also discuss the transmission network as it stands today, the commercial realities involved and some future challenges it faces.

Getting a Feel for the Transmission Network

In this section we talk about what NGG does in more detail, including its role in getting gas around the country and how it looks towards the future.

Moving gas in and out of the country

As we mention in Chapter 1, today's gas network developed as a result of the discovery of North Sea oil and gas in the 1960s. At this point the construction of a high-pressure grid system occurred with gas coming onto the network at key entry points.

Of course, these entry points have changed over time. Today gas enters onto the NTS via ten main terminals. Some of these terminals are beach terminals; some are Liquefied Natural Gas (LNG) terminals (for container ships full of super-cooled liquid gas that's then warmed back up into a gas) and three are interconnectors to Belgium, the Netherlands and Ireland. Check out the map in Figure 3-1.

National Grid Gas is responsible for the gas NTS, but it doesn't own the beach terminals, only the pipes and the means of moving it around the country. The producers own the terminals and assure the quality of the gas being injected into the system.

Similarly, NGG doesn't control the flow of gas onto the system; that's the shipper's responsibility. The shipper purchases gas (from producers and traders) and obtains the rights to put gas into the national system. It gets those rights by purchasing capacity (see 'Covering the Commercial Operation of the System' later in this chapter).

The interconnector terminals allow gas from other countries to be delivered onto and off the British gas system, although it was originally thought that the country would only be exporting. Currently the interconnector from Belgium is bi-directional, the one from the Netherlands is single direction importing and the other to Ireland is exporting only.

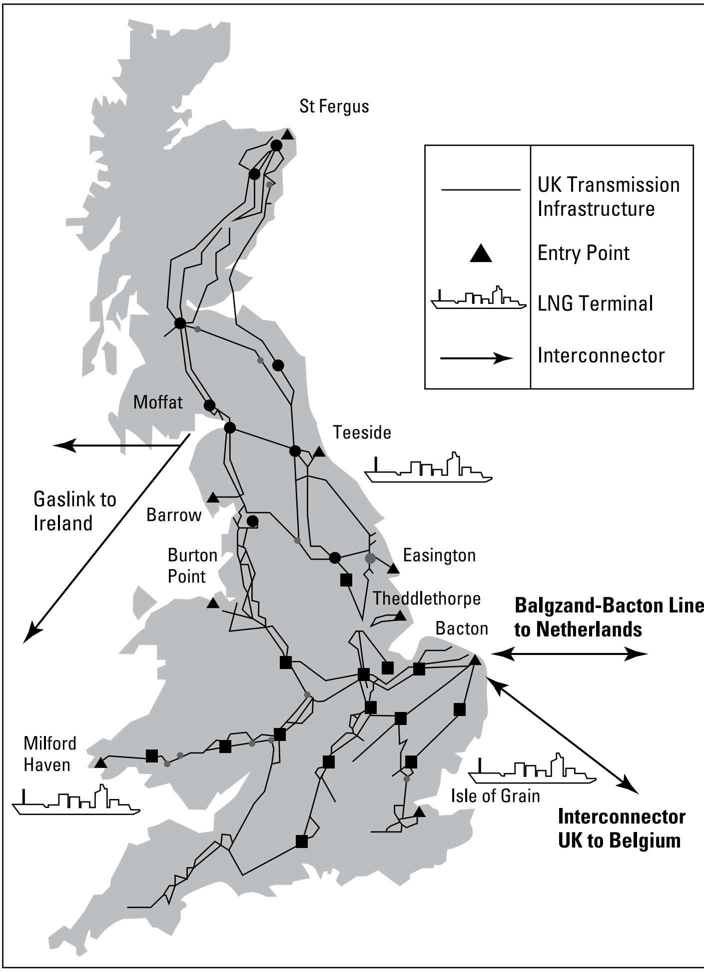


Figure 3-1: The gas transmission system.

Shippers can also store their excess gas and remove it at a later point (something we discuss in the later 'Ensuring the necessary gas capacity' section).

Some very large customers – such as industrial plants or power stations – are directly connected to the NTS. These customers tend to use gas in much larger quantities and at much higher pressures than the average domestic user. The pressure of the gas though is reduced at the local distribution level at Pressure Reduction Stations (see Chapter 4).

Processing gas after it arrives

Gas producers arrange delivery of the gas from offshore to onshore facilities, where they measure it for quality and calorific value at processing plants.

TIP

Calorific value is the amount of energy that the gas contains.

Stringent legal requirements apply to gas transported around the system; these must be met before gas is allowed onto the system. Gas isn't yet odorised to give it that distinctive smell; the 'smellification' takes place at the LDZ level (hold your nose and flip to Chapter 4 for more on LDZs).

After processing, the gas is sent to NGG terminals and pushed onto the network and around the system via 23 strategically placed compressor stations dotted around the country. These compressors are a mix of Rolls Royce jet engines and some electrically powered ones. Within each station, several compressors of varying types build resilience into the network. These engines push the gas around the system.

Of course, the system today is much larger than when first constructed. Over 8,200 kilometres of pipework transport the gas around the UK. The pipes range from 450 to 1,220 millimetres in diameter. The NTS contains some 200 exit points, 130 of which are distribution exit points with the rest being directly connected large customers.

Planning investment requirements

National Grid Gas provides the industry's eyes and ears on the future.

REMEMBER

The Ten Year Statement, published annually, sets out its forecast of future demand and supply, and its subsequent plans for the transmission network. The Statement is a useful guide to what the system's doing now and is expected to do into the future.

National Grid Gas also produces the Future Energy Scenarios, which aim to help the long-term development of the transmission system.

Semi-interesting transmission facts

Check out these tidbits, fact fans:

- **Highest ever demand in a day:** 465 million cubic metres (mcm) of gas and nine out of the ten highest days have occurred since 2010.
- **Lowest ever demand in a day:** September 2012; 117 mcm.
- **Annual *throughput* (that is, the volume of gas that is carried on a pipeline):** Approximately 100,000 mcm.

Covering the Commercial Operation of the System

Here we describe how NGG ensures sufficient gas capacity for the country's needs and we discuss the commercial concerns of shippers.

We set out the gas industry value chain from producer, via NGG, shippers, supplier to the end customer in Chapter 1, but Figure 3-2 adds some gloss on that.

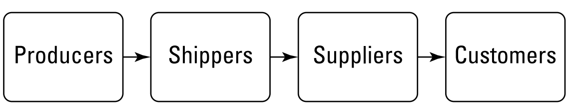


Figure 3-2: How the gas changes hands.

Ensuring the necessary gas capacity

National Grid Gas is responsible for the safe operation of the system at a physical level. But the shippers need to make sure that they put as much gas into the system as their customers take out.

REMEMBER

Although NGG provides information to the market to help shippers work out what's happening each day, when a shipper fails to deliver enough gas at the end of the day, it has to pay more than the market price for the difference. On the other hand, when it over-delivers it receives less than the market price for the extra amount.

This system acts as an incentive for shippers to be 'balanced'. But if too much or not enough gas overall appears likely on any given day, NGG can (and does) take residual balancing actions (as in electricity) to maintain the integrity and safety of the system. These actions sharpen the so-called imbalance prices and help to inform the market about the likely condition of the NTS. The market then has to react accordingly.

National Grid Gas's role is to make capacity available on the transmission system to shippers. A supplier can't supply gas to a customer without a shipper having acquired entry capacity onto the NTS system and exit capacity off the NTS system and then onto the distribution system.

TIP

Think of capacity like this: if you travel north up the M6 from London, when you hit Birmingham you can choose to use the M6 toll road, but doing so requires you to pay for its traffic-free facilities. The toll fee is like capacity: shippers purchase a bunch of tolls to move the gas through the transmission (and distribution) networks.

Buying and storing gas

After purchasing the gas, shippers are responsible for the commercial aspects of making their inputs equal outputs (supply versus demand). They trade to do so, using the tools and techniques we describe in Chapter 6. They pay NGG to transport the gas around the NTS and distributors to transport it to homes and businesses. Suppliers pay shippers for the gas and its transportation.

Shippers can also put their excess gas into storage for removal later. They may choose to buy cheap gas on some days and store it ready for when demand and the market price are higher on other days. Storage can be in the form of underground storage sites or LNG storage tanks (the latter need the gas to be super-cooled).

TIP

Storage takes basically two forms within the UK gas network: offshore storage at Rough, which is a large disused oil field owned by a standalone business within Centrica, and onshore storage facilities owned by a variety of storage operators.

How is Transmission Regulated?

As in the electricity industry, the huge investment in the gas transmission infrastructure means that transmission is a natural monopoly. As such, the regulator is the Office of Gas and Electricity Markets (Ofgem).

Again as for electricity, the transmission company had been regulated by an RPI-X price control called Transmission Price Control Review (TPCR). From April 2013, however, that was replaced by a new incentive-based price control mechanism called RIIO (Revenue = Incentives + Innovation + Outputs), a framework for setting price controls for network companies. RIIO – T1 (T1 = the transmission flavour of RIIO), replaced RPI-X.

Other regulation occurs through legislation called the Gas Safety (Management) Regulations (GSMR) 1996, which provides the legal framework for the safe operation of the gas network. GSMR is a key piece of legislation that makes sure that all those transmitting and distributing gas around the system do so in a way that ensures safety first.

What Are the Big Issues?

One huge current issue in transmission is the increasing harmonisation of gas markets across all countries in the EU. As a result, shippers have the same market rules in different countries across Europe, which should make getting gas to where it's needed easier and cheaper.

All these EU-wide changes need to be made to the commercial rules in the UK – the Uniform Network Code (we provide more on that in Chapter 8) – and so for everyone in the British gas industry to make the necessary changes to contracts and IT systems is a major project.

Some changes to the EU market rules were made in late 2013, with quite a lot more being introduced in late 2015, and yet more planned for 2016/17.

Jargon buster

We keep the list of jargon in this chapter short (we can hear your sigh of relief from here)!

- **Gas Safety (Management) Regulations (GSMR) 1996:** Primary legislation for the safe operation of the UK Gas Network.
- **National Transmission System (NTS):** The big pipes from beach to local distribution areas.
- **System Operator:** The party responsible for managing and operating the transmission network.

Chapter 4

Distribution

In This Chapter

- Introducing the distribution network
- Checking out regulation and areas of future focus

As we mention in Chapter 3 on transmission, you can think of the distribution network as being like the A and B roads of the UK. The history of distribution is slightly different to that of transmission, however, as we explain in this chapter.

The gas distribution network is in principle similar to the electricity network. It involves taking the energy from the big pipes down to customers who use it and making sure that interruptions to supply are kept to a minimum.

Gas distribution has one difference to transmission – gas transporters. Transportation in gas isn't a total monopoly, Independent Gas Transporters (IGTs) also exist.

We help you make sense of this situation as we examine what makes up a distribution network, what distribution network operators currently do and what they'll need to do in the future.

Getting a Feel for the Distribution Network

Today's gas distribution networks came into being with the Gas Act of 1972, which saw the establishment of British Gas Corporation. When privatisation hit in 1986, this organisation was split into two companies, which eventually created BG

Group and Centrica (you can find more on the industry's history in Chapter 1 and the Appendix). The distribution networks were originally under Lattice Group before becoming part of National Grid Gas. In 2005 a number of networks were sold off by National Grid Gas with only four areas being retained together with the National Transmission System (NTS).

Change within distribution has therefore largely been limited to ownership and structure as opposed to the physical aspects of managing the network.

In this section we discuss the basics of the UK's gas distribution network, describing the roles of such mysterious entities as LDZs, transporters and governors, and how charging is organised.

Looking into LDZs

The gas comes from the NTS and exits at a point on the distribution network called a Local Distribution Zone (LDZ) *offtake*. Figure 4-1 shows the system from the sea to the local consumer.

The LDZs are the geographic areas for which each network operator is responsible. We list the UK's 13 LDZs in Table 4-1.

TIP: Before the gas moves into the local pipes, two things happen: its pressure is reduced and it's odorised with the distinctive smell so that if it leaks out, everyone knows about it.

Handling the pressure of transportation

The various transporters are responsible for the safe transportation of gas around their network of pipes. They do so by monitoring the flow of the gas onto the network at the point of entry.

Governors manage the pressure. On the distribution networks, gas transporters store gas in their high-pressure pipes, called *line pack*. This enables them to store gas from the NTS overnight and provide it to consumers when required to meet the daytime peaks in demand.

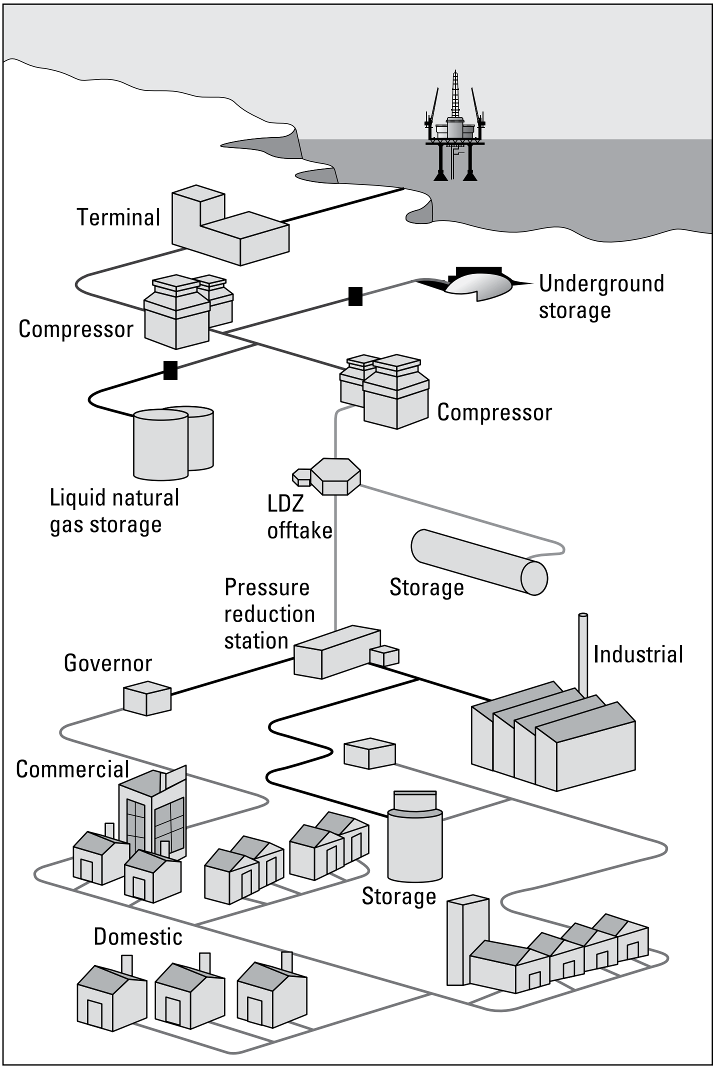


Figure 4-1: Gas distribution system from beach to consumer.

TIP

Gas holders are no longer required for gas storage and are gradually being removed.

Table 4-1 UK's Local Distribution Zones

Area	*Code*	*Owner*
Scotland	SC	Scotia Gas Networks
Northern	NO	Northern Gas Networks
North East	NE	Northern Gas Networks
North West	NW	National Grid Gas
East Midlands	EM	National Grid Gas
West Midlands	WM	National Grid Gas
Eastern	EA	National Grid Gas
North Thames	NT	National Grid Gas
Wales North	WN	Wales and West Utilities
Wales South	WS	Wales and West Utilities
South West	SW	Wales and West Utilities
Southern	SO	Southern Gas Networks
South East	SE	Southern Gas Networks

Investigating independent Gas Transporters

REMEMBER

As part of the deregulation of the gas market, the introduction of competition in the building of infrastructure meant that *independent Gas Transporters* (iGTs) can build gas networks and connect their pipes to the local network: they connect at something called a Connected System Exit Point (CSEP).

The most common type of iGT network is new housing; so when you move into your new house you can find that the pipework belongs to someone else. As a result, your gas supplier has to contact a different gas transporter in order to register your meter. We provide more information on this aspect in Chapter 5.

As part of the replacement central systems, the Uniform Network Code committee proposed that all iGT supply points are migrated onto Xoserve's central systems. At present there is no set process or governance for suppliers to interact with IGTs. This change will ensure that processes (like change of supply) occurring between gas suppliers and all gas transporters are consistent.

The six current iGTs are Energetics, ES Pipelines, Fulcrum Pipelines, GTC Pipelines, Independent Pipelines and Indigo Pipelines Limited.

Charging for distribution

Gas distribution is paid for via charges for the use of the space in the pipes as well as the energy travelling through the pipes. Sound complicated? Not really. Think of the road network: you pay for fuel in your car and other costs associated with putting the car on the road, such as car tax.

REMEMBER

In the same way, shippers receive bills from the gas transporters, mostly based on *LDZ capacity* (charges for the space used) and *LDZ commodity* (charges for the energy used). Gas transporters don't own the gas and therefore don't charge for the gas flowing through their pipes; they charge only for the use of their pipes.

As we mention throughout this book, Xoserve carries out invoicing to shippers for these charges on behalf of the distribution networks.

How Is Distribution Regulated?

Distribution companies were regulated by the same RPI-X price control mechanism applied to the transmission companies (see Chapter 3). And, just like the transmission companies, the RPI-X mechanism was replaced with RIIO (Revenue = Incentives + Innovation + Outputs).

RIIO–GD1 (the gas distribution variant of RIIO) took over from RPI-X in April 2013 and runs for eight years until 2021.

What Are the Big Issues?

Similarly to transmission, the big topics in distribution are as follows:

- **Changes to the Gas Day:** To align Britain's flows with Europe, as we mention in the Chapter 3.
- **Aging workforce:** As with the electricity industry, the gas industry faces a potential skills shortage. Transporters have been addressing this since 2005 by apprenticeship programmes.
- **Smart metering:** The UK-wide rollout of smart metering is sure to impact on distributors through the massive replacement programme.

Chapter 5

The Retail Market

In This Chapter

- Getting to know the retail market
- Identifying the big shots in the retail market
- Discovering some hot topics

Primarily, the UK's retail market is what differentiates the British gas industry from other gas (or energy) industries around the world – and not just because the country completed its journey to full retail competition in 1998, which was before any other country across the world. The difference also lies in how the authorities went about it (even the two approaches for gas and electricity have some variations).

This chapter looks at some of the characteristics that make the British retail gas market unique, introduces the major players in the sector and touches on some key issues.

Semi-interesting retail facts

Here are some facts to whet your appetite:

- Approximately 23 million households in the UK have a gas supply, which is in addition to around 1 million business users and 500 very large users (for example, gas-fired power stations).
- Currently, domestic use accounts for approximately a third of all gas demand, and industrial and commercial about a quarter (with gas generation another quarter and the remainder being exports).

This chapter should resonate if you've read *GB Electricity Industry For Dummies:* the two books are written deliberately to complement and support each other.

What's the Retail Market All About?

Suppliers buy gas in bulk on the wholesale market (see Chapter 6) and sell it on to customers in the retail market.

REMEMBER

Both wholesale and retail markets in Britain are now fully competitive. Therefore, suppliers get to choose from whom they buy their gas in the wholesale market and customers get to choose which supplier they buy from in the retail market. This freedom has been possible since 1990 for large users of gas and 1998 for domestic consumers.

Being a supplier

As with electricity, being a gas supplier involves more than simply buying in bulk and selling on. The two industries are remarkably similar, but as you'd expect slight differences also exist.

To start with, a gas supplier needs to do the following:

- Win initial customers.
- Forecast customers' gas consumption and buy this amount on the wholesale market (check out Chapter 6).
- Bill customers; in other words, be able to read their meters.
- Respond to queries when things go awry. If they go really wrong (for example with customers who have bad debt), they need to be able to process losses of their customers to another supplier.

The regulator, the Office of Gas and Electricity Markets (Ofgem), takes a great interest in the activities of suppliers, given its mission to protect the interests of consumers.

Therefore, to become a supplier, you need to attain a licence from Ofgem, which comes with a set of obligations called *Supply Licence Conditions* (SLCs). These requirements cover a wide range of areas such as compliance with industry codes (see Chapter 8), marketing, metering, prepayment, arrangements for site access, financial reporting and, more recently, Green Deal obligations (see the later 'Getting a greener deal' section).

In the not-too-distant future, a new obligation will require suppliers to provide all domestic customers with smart meters (see *Smart Metering Implementation Programme For Dummies*).

Collecting the cash

In general, domestic customers can choose from three different payment methods for paying their gas bills:

- **Direct debit:** Suppliers like direct-debit customers, because their payments are reliable and cheap to process. As a result, they often give a direct-debit discount. 52 per cent of customers use this method.
- **Credit:** Those who pay quarterly by cash or cheque are less attractive to suppliers, because payments don't always arrive on time, and when they do they're more expensive to process. 27 per cent of customers use this method.
- **Prepayment:** These customers pay for their gas in advance, often at corner shops, and then load the credit onto their gas meters, usually using a smart card or token. 15 per cent of customers use this method.

In theory, suppliers should love prepayment, because customers pay for their gas in advance. But prepayment meters are expensive to install and operate and they've been plagued with problems (see the later appropriately named section 'Preventing prepayment problems').

As such, prepayment tariffs tend to be higher than other forms of payment to recover installation and maintenance costs. Although some customers like prepayment meters, because they help with budgeting, approximately 17 per cent of prepayment customers have them as a means of repaying debt.

How Has the Retail Market Changed?

In the last 25 years or so, the gas retail market has altered almost out of all recognition.

Until 1990, gas supply was a monopoly activity, like transmission and distribution. The British Gas Corporation supplied gas via one of their regional businesses, which were part of a much larger group responsible for the whole of the gas supply chain.

The Gas Act 1986, however, paved the way for opening up the market to competitors in the supply of gas, but not transmission or distribution. The Gas Act introduced the concept of competition, but to ensure that it was carried out in a orderly fashion, the process was phased in with the largest users going first (see Chapter 1 for details). Also, different regions came on in stages: Devon, Cornwall and Somerset in 1996; Avon, Dorset, Kent, Sussex in 1997; and throughout Great Britain starting on a single date between 1 January 1998 and 31 December 1998.

TIP

Since that time the gas industry has introduced competition in meter reading and metering and more latterly in the emergence of more, smaller, independent suppliers.

Who Are the Major Players?

Here we take a look at the major organisations involved in the UK gas market.

Suppliers

At the time of writing, 145 organisations hold supply licences (75 for domestic and non-domestic customers and 70 for non-domestic customers only).

REMEMBER

Nonetheless, the 'Big Six' companies (British Gas, EDF Energy, E.ON, RWE npower, ScottishPower, and Scottish and Southern Energy) dominate the market, supplying between them around 90 per cent of domestic customers. The dominant player in the UK is still British Gas.

A number of players in the UK gas market focus solely on Industrial and Commercial (I&C) customers, but most players supply into all segments (domestic, small and medium enterprise customers, and I&C).

Agents

In order to service customers and meet their supply licence obligations, suppliers need to have a series of agents in place. Figure 5-1 shows the relationships within the gas market from a supplier's perspective.

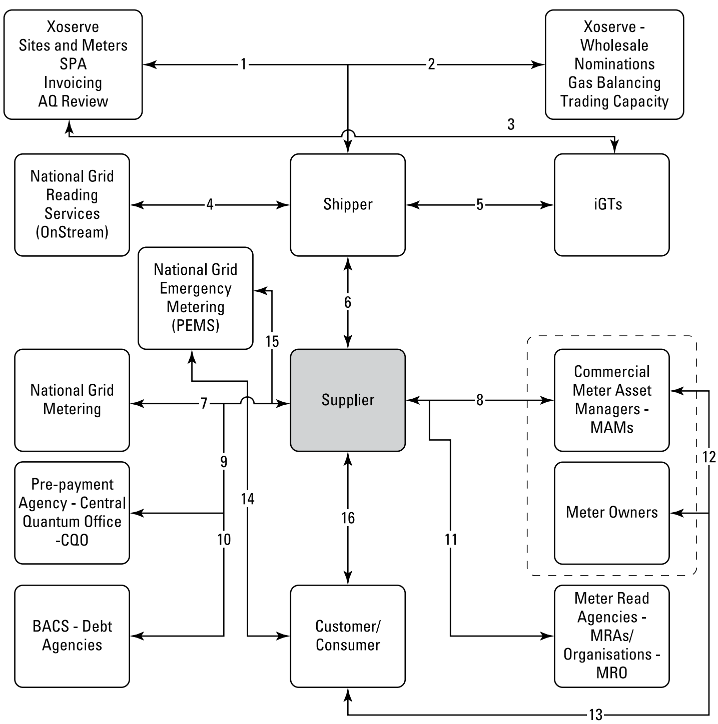


Figure 5-1: Supplier and agent relationships. MRA collects and validates meter readings; MAM installs and maintains meters.

Shippers

In the gas market, the shipper connects with Xoserve (see Chapter 8) and the gas transporters, which means that suppliers need to have a relationship with a shipper.

But to really confuse matters, most suppliers are shippers as well! Why is that? Well, the shipper invariably has the trading relationships, because it's responsible for the overall gas position. The forecast for the day's demand has to come from the supplier, because it has information about the customer's likely demand based on historic consumption and passes this information to the shipper.

Invariably, shippers are directly involved in the day to day workings of a supplier, because they operate on the wholesale markets and are signatories to the Uniform Network Code (UNC; check out Chapter 8). Plus, they're the commercial interface into the network operators as well.

What Are the Big Issues?

In this section we take a look at what's hot in gas retail – and leave what's not hot to the tabloids! We include opportunities and challenges for the gas industry.

Staying warm: UK's Heat Strategy

In 2013, through the Department of Energy and Climate Change (DECC), the government published its Heat Strategy. This document discusses the challenges of heating UK homes and businesses in the face of climate change targets and diminishing oil and gas reserves on the UK Continental Shelf (UKCS) – the region of waters surrounding the UK for which the country claims mineral rights, including for gas.

This document represents a significant debate that's far from concluded: expect more in the coming months and years. You can find the report at `www.gov.uk/government/publications/the-future-of-heating-meeting-the-challenge`.

Refreshing the system: Project Nexus

The systems that support competition in the gas industry were built in 1996 and are currently undergoing a refresh called Project Nexus.

This massive change for the industry will take time to implement. Of course, Project Nexus is going to have to reflect the changing nature of gas supply through the introduction of smart meters (see the next section). It's currently expected to go live in the second quarter of 2016.

Metering the smart way

Smart metering is such a hot topic right now that CGI devote two *For Dummies* guides to it: *Smart Metering For Dummies* and *Smart Metering Implementation Programme For Dummies*.

REMEMBER

The rollout of gas smart meters entails significant work for suppliers, to ensure that they provide meters to their customers. But the benefits are better billing performance and potentially better forecasting of demand, which may in turn lead to lower prices through reduced risk, though everyone will have to wait and see.

Getting a greener deal

The *Green Deal* is a government initiative launched in January and February 2013 that enables private firms to offer consumers energy-efficiency improvements to their homes, community spaces and businesses at no upfront cost. The firms recoup the costs of the improvements through an increment to the customer's energy bill.

REMEMBER

The idea is to get people to spend money in order to save money. Homeowners can borrow money to implement efficiency improvements on their homes (loft insulation, cavity insulation, double glazing and so on) and pay for them using the resulting savings from their energy bills.

Under the Green Deal's Golden Rule, the expected financial savings must be equal to or greater than the costs attached to the energy bill, and the repayment period must be less than or equal to the lifetime of the energy-efficiency measures. The impact on suppliers is that they're required to collect Green Deal payments as part of the customer's energy bill.

According to the DECC's statistics, as of the end of February 2015, 529,354 Green Deal assessments had been lodged and £87.8 million in contracts had been lent.

Preventing prepayment problems

Prepayment has always been a problem child to suppliers. Up until now, prepayment meters have cost more than credit meters to buy and operate – and this additional cost has often been reflected in higher prepayment tariffs than for other payment methods. Perversely, the result is often that the highest electricity tariffs are levied on those least able to pay.

Companies have tried various prepayment technologies (cash, token, smartcard) but all have issues. Misdirected payments are a multi-million pound problem in which payments made at the corner shop end up with the wrong supplier.

REMEMBER

Smart meters are set to solve many of these problems. They can operate in credit or prepayment mode and remotely switch between the two. With no smart cards, misdirected payments become a thing of the past, and with remote top-ups replacing top-up keys, prepayment fraud should disappear too.

WARNING!

But many suppliers view smart prepayment as complex and difficult. They've put it on the back burner, which is ironic given the benefits that smart metering will bring.

Using local power: Collective purchasing and switching

REMEMBER

A recent development in the retail market is the emergence of *collective purchasing and switching* initiatives. The idea's simple: instead of individuals searching around for the best available tariff, a group of like-minded customers band together and invite suppliers to bid against each other for the right to supply them, in a so-called reverse auction.

The Big Switch campaign run by *Which?* and *38 Degrees* (one the UK's biggest campaigning communities) is probably the most high-profile example of this kind of initiative. Members of *Which?* and *38 Degrees* were offered the chance to participate by completing an online form providing their gas and electricity usage. It received interest from over 280,000 people and resulted in over 37,000 customers switching supplier. *Which?* claims that the average savings for these customers was £223 per year.

Anything that enables customers to save money is good for the end user, and anyone can club together in this way, whether it's the local rural community or a housing estate in an urban area.

In addition, this collective to pull people together may also mean more community energy schemes within the UK. Community energy may see locals coming to together to build their own energy infrastructure and even extend to communities forming their own supply businesses.

Putting the customer first

On 26 June 2014, Ofgem referred the UK energy market to the Competition and Markets Authority (CMA) for formal investigation.

This referral was in response to a joint assessment of the energy retail market by Ofgem, the Office of Fair Trading and the CMA, which found that competition in retail energy markets may not be achieving 'good outcomes for all consumers and small businesses'. This investigation is expected to last until November/December 2015.

Other initiatives have already taken place in the last few years to improve value for gas customers.

Price rises

Up until 2011, suppliers increasing their prices had 65 working days to inform customers of the price increase after it had taken place. In early 2011, Ofgem decided this wasn't in the customers' best interest and changed Supply Licence Condition 23. Now suppliers must provide customers with 30 working days advance notice of a price increase.

Jargon buster

Here's a taster of some common jargon you may hear in gas retail businesses:

- **Annual Quantity (AQ):** Annual consumption over a 365-day year, under conditions of average weather conditions.
- **British thermal unit (BTU):** The heat required to raise the temperature of 1 pound of water by 10 degrees Fahrenheit at or near 39.2 degrees Fahrenheit.
- **Correction factor:** Used to convert gas units into kilowatts per hour (kWh). The correction factor (1.02264) takes into account changes in the volume of gas based on temperature and pressure.
- **Daily-metered (DM) customers:** Large or interruptible customers whose daily gas consumption is measured and transmitted to shippers or National Grid Gas, typically through a datalogger.
- **Energy Supply Ombudsman:** An independent body established by Energy UK (the trade association for the energy industry), which resolves disputes between customers and their energy suppliers associated with billing and transfer issues. It's a name worth dropping into the conversation if you're complaining to your energy supplier!
- **Meter Asset Manager (MAM):** A company that works on behalf of a supplier to install and maintain customers' gas meters.
- **Meter Asset Provider (MAP):** A company that owns a meter and rents it to the supplier.
- **Meter Reading Agent (MRA):** A company that reads gas meters on behalf of a supplier.
- **Non-daily metered (NDM) customers:** All customers that don't have a daily meter-reading facility.
- **Prepayment meter (PPM):** A meter that requires customers to purchase energy in advance of consumption.
- **Supply Licence Condition (SLC):** A regulatory obligation placed on the holder of a supply licence.
- **Supplier of Last Resort (SoLR):** A supplier, appointed under a Supply Licence Condition, to take on the role of supplier should the previous supplier have had its licence revoked due to insolvency.
- **Supply Point Administration (SPA):** The system (and associated processes) that suppliers use to register customers with Xoserve.

Faster supplier switching

After government pressure for customers to be able to change their suppliers more quickly, a change to the UNC was brought in during November 2014 to reduce the time to change supplier from 15 working days to 12 calendar days.

Chapter 6

The Wholesale Market

In This Chapter

- Introducing the wholesale gas market
- Observing the changing market
- Looking to the future

No company is going to invest billions of pounds in the complex task of producing gas if it can't sell on the product.

The competitive GB wholesale gas market allows gas producers to sell their output and suppliers to buy the gas they need to meet the demand of their end consumers. Shippers are the wholesale middlemen who buy from producers, sell to suppliers to balance production with demand and arrange physical delivery by adhering to the rules of the Uniform Network Code (UNC).

In this chapter we talk about the wholesale gas market and how it's changed over the years. We also introduce you to the front-line organisations involved in it and the issues facing them in the future.

What's the British Wholesale Gas Market All About?

REMEMBER

The GB wholesale market in gas (which is also sometimes called *mid-stream*) enables shippers to buy physical gas from upstream producers, liquefied natural gas (LNG) imports and trade gas through *interconnectors* (pipes connecting the UK mainland to Ireland, Europe and beyond). Shippers also use storage facilities to park gas for use at a later date, then selling the gas on to suppliers to meet their end consumers' demands.

Shippers can also trade gas with other shippers and with non-physical traders, or *speculators,* who themselves don't handle any physical deliveries but trade on price movements in and differentials between the GB and European gas markets.

TIP

Typically, though not necessarily, a shipper and supplier is the same organisation. Sometimes the shipper/supplier is even part of the same organisation as the producer (which is called *vertical integration*).

The UNC governs the operation of the wholesale market in respect of its physical supply chain. The wholesale trading (buying, selling) of gas in the GB market is a competitive market and can be done bilaterally, via brokers or on organised exchanges. Conduct of such trading activities is governed by (global and local) financial and energy markets and regulators, such as Ofgem and European Agency for the Cooperation of Energy Regulators (ACER).

In this section we talk about getting gas to customers, the ins and outs of trading it, as well as storage, hedging and shippers paying for out-of-balance usage.

Moving gas via pipeline and ship

The physical supply chain underpinning the GB wholesale gas market involves shippers arranging the entry of their gas from producers, LNG imports, interconnectors and storage into National Grid Gas's (NGG's) high-pressure National Transmission System (NTS; see Chapter 3). They then arrange exit for suppliers into the Local Distribution Zones (LDZ), where typically end consumers are connected, or to supplier's large industrial users directly connected to the NTS (for example, a gas-fired power station). They may also arrange exit from the NTS to interconnectors and storage facilities. Shippers have to balance the aggregate NTS entry/exit of their gas on a daily basis, known as the Gas Day (we discuss LDZ and Gas Days in Chapter 7).

In the UK a large (though reducing) proportion of gas is produced from the North Sea and brought ashore through a series of offshore pipeline networks. Shippers typically acquire (through contracts) this gas production and take delivery at 'the beach' (which is usually more friendly than the one in the Leonardo DiCaprio movie!), via one of the terminals where the offshore pipes connect to the NTS.

Shippers can also secure supplies of gas from other sources farther afield: from the continent via interconnector pipelines and from around the world via LNG super tankers.

Several UK interconnector pipelines allow shippers to procure gas from as far away as Russia and have it shipped across the European gas network and through the interconnectors to the UK. Norway is currently the largest source of UK gas imports via the Langeled interconnector pipeline.

Of course when the price of gas in Europe is sufficiently higher than the price in the UK, shippers can decide to sell gas abroad and it flows in the opposite direction through interconnectors from UK to Europe. In order to use an interconnection a shipper must acquire sufficient pipeline capacity, as it does with the NTS.

Semi-interesting wholesale market facts

The movement of LNG around the world is dictated by price (essentially where gas is needed the most): it's a global competitive market. Recently, much of the available LNG has gone to Japan to support the loss of power generation from nuclear; in other words, Japan is willing to pay a higher price.

LNG entitlement can change hands during transport. For example, a LNG shipment on route to the US may be asked to divert to UK while the LNG on board is traded.

Around 12 per cent of GB gas comes from LNG imports.

Shippers can transport natural gas from around the world to other markets in super tankers in liquid form (super cooled to –162 degrees Celsius to take up less space than in gas form). The UK has several LNG terminals where such cargoes can be re-gasified and enter the NTS. As this mode of transporting gas has increased, the market has become more global, taking on some characteristics of the global oil market. Transport yourself to the later section 'Seeing the emergence of liquefied natural gas' for more on LNG.

Trading gas and deciding prices

In this section, we take a look at the reasons why companies buy and sell gas and the scenarios that may impact the gas price.

Shippers need to procure physical gas to meet the forecast demand of their customers (suppliers) for today and in the future. Producers of gas require a mechanism to sell what they produce and store today, and what they expect to produce in future. Shippers and suppliers need access to a wholesale market to trade what they have to sell and what they need to buy.

REMEMBER

Contracts buying and selling gas cover a variety of delivery periods and locations:

- **Long-term bilateral structured contracts:** For example, lasting 15 years or more. These can include complex clauses (so called *embedded optionality*) that allow for variation over time of the amount of gas to be taken (also known as a *swing contract*) and whether the gas is *firm* (guaranteed) or *interruptible* ('curtailable'). These contracts typically deliver to an NTS entry point.
- **Standard medium to short-term contracts:** For example, fixed quantity at fixed price for a season, month, balance of week, or day ahead. These can be 'over-the-counter' (OTC) bilateral contracts agreed between two parties, often through a broker, and are also known as *physical forwards.* Even more standardised contracts, known as *physical and financial futures,* are traded on organised marketplaces know as *exchanges.* These all typically deliver at the *National Balancing Point* (NBP; a daily gas balancing regime).

- **Within-day contracts:** Also known as *balance of day* and used by shippers to balance their NTS entry/exit over the Gas Day, for example, in response to changes in demand due to weather. All these deals typically involve gas that has already entered the NTS and delivery is deemed to occur at the NBP. Such contracts are traded via the *On the day Commodity Market* (OCM).

TIP

The GB NBP is the biggest gas market hub in Europe: its prices are often used as an indicator for Europe's wholesale gas market.

Why do companies buy and sell gas?

Buyers and sellers of gas trade for a number of reasons:

- **Physical supply-chain fulfillment:** To balance sources of gas to forecast demand.
- **Hedging purposes:** To manage the risk of price changes (price volatility that can result in gains or losses) for the volume they forecast will be required (or what they intend to produce) up to a number of years in the future.
- **Financial speculation:** To profit from changes in market price without involving physical delivery. They aim to buy gas when the price is low, sell when the price increases and make a profit (they hope!). The selling is done before the physical delivery of the contracted gas.

What affects the gas price?

Prices in energy markets change, sometimes dramatically – as was seen in 2014/15 with the sharp decrease of the global oil price and with it the price of gas in the UK. In most cases price change is driven by a tangible condition.

Gas market liquidity

Around 50 per cent of the UK's required gas is traded via exchanges, with the other 50 per cent delivered through bilateral OTC trades. The NBP traded volume of gas is around 20 times more than the physical volume delivered, meaning that gas is frequently changing hands (known as *title transfer*) before physical delivery. This so called *churn ratio* is evidence of a very liquid market.

One of the main influences on changes to the gas price is the seasonal changes in weather, resulting in an increase or decrease in gas demand. When a cold winter is forecast, the price is likely to increase because demand will be high. Conversely, if a warmer than average winter is forecast, demand will be less and the price is driven lower.

The availability of gas can also affect the price. For areas with lots of gas available, the price is typically lower, or if a pipeline becomes unavailable and access to supplies impacted, the price increases.

Bidding for gas capacity

Having obtained contracts to take delivery of gas, shippers must ensure that they've purchased sufficient entry capacity from National Grid Gas (NGG) to allow their gas to enter the NTS. Purchasing this capacity entitles them to flow gas on to the NTS.

A shipper needs to buy 1 unit of entry/exit capacity in order to flow 1 unit of energy into/out of the system: called the 'ticket to ride' principle. Units for capacity and energy are in kilowatt hours per day.

Shippers can purchase firm and interruptible capacity: NGG can curtail the latter when capacity is overbooked or the system is oversupplied. If a shipper exceeds its capacity entitlement, it's subject to overrun charges.

Shippers obtain entry capacity by making bids on NGG's Gemini system through a number of auctions. These bids are allocated or rejected in accordance with the UNC. Xoserve operates and administers the auction (and Gemini system) on behalf of NGG.

A number of auctions cover long- and short-term requirements. National Grid Gas uses long-term capacity auctions as a means of identifying investment signals at a particular terminal (or Aggregated System Entry; ASEP). In other words, based on a forward view of capacity demand, does the infrastructure need investment to increase capacity required? Shippers can also use the Gemini platform to trade capacity with other shippers, that is, where one has surplus capacity and the other needs more.

Using storage as a hedge

Shippers can also use storage to balance their positions and hedge prices in the wholesale market. A number of such facilities operate competitively in the GB gas market.

Shippers can compete (often through an auction mechanism) to buy injection, withdrawal and inventory capacity covering a period of time at a storage facility. They can then use these rights to store gas in order to take it out later.

Typically shippers use this approach to buy gas more cheaply in the summer and store until needed over the (more expensive) winter months when demand is higher.

Settling imbalanced accounts

As well as settling all the various wholesale market contracts and trades with their counterparties, shippers are also subject to *imbalance settlement* on NTS usage.

The entry and exit points are all metered and the overall quantity of gas is allocated between all the shippers flowing gas through those locations. Any imbalance between a shipper's entry and exit positions that requires NGG to trade gas to keep the pipeline physically balanced is then apportioned to out-of-balance shippers as a cost.

Check out Chapter 7 for more on settlement in general.

How Has the Wholesale Market Changed?

Since the start of the industry's privatisation in the early 1980s, the GB wholesale market has changed into one of the most liberal and liquid gas markets in the world. But it hasn't been all plain sailing. The impact of the ENRON collapse caused significant changes in the market.

This section discusses a number of events that have contributed to the market in operation today.

Describing the early days after privatisation

Privatisation of the UK gas industry began in the early 1980s with the steady breakup of British Gas Corporation (BGC). Before privatisation, BGC was the sole purchaser of all gas produced in Great Britain, supplied the gas directly to customers and balanced supply and demand on a monthly basis. BGC held long-term contracts with producers, which varied in complexity and price.

Then came a series of Monopolies and Mergers Commission (MMC) reviews and further unbundling of BGC, resulting in a significant change to the Gas Act in 1995. This opened the way for domestic supply competition, and importantly the development of the Network Code, and a role for wholesalers/ mid-stream players (called *shippers* under the UNC).

REMEMBER

The main reason why the UK has a traded gas market today is largely down to the creation of the Network Code (the legal document that set out the rules for users of the British gas transportation network). It defined the National Balancing Point (NBP) and with it the need for a short-term physical gas traded market with standard contracts and products, such as Day Ahead (DA) and Balance of Week (BoW).

In late 1999, the New Gas Trading Arrangements (NGTA) introduced improved efficiency of the gas balancing mechanism and capacity auctions. From this came the (OCM), where shippers and the system operator (NGG) are able to act anonymously to balance the gas entered into the system with what's consumed on a daily basis.

TIP

Today, approximately 95 counterparties are registered to trade gas in the British market, helping to support a liquid market.

Moving from the dash for gas to the collapse of ENRON

Alongside the liberalisation of the gas market we describe in the preceding section came a period termed the 'dash for gas'. This important development helped form the basis for early bilateral OTC contracts in the British gas market. The period was driven by the development of lower-cost more efficient gas-fired power stations, in the form of Combined Cycle Gas Turbine (CCGT) plant, and with it the need for shorter-term contracts to manage peak electricity demand.

Favourable market conditions created by the 1995 Gas Act allowed other interested companies to participate and trade: banks, electricity companies, producers and trading houses, such as ENRON. Active participants grew within a short period following 1995, and the engagement helped to increase liquidity and importantly generate published prices (price indexes), giving price transparency and certainty.

Following the opening, in 1998, of the interconnector pipeline between Great Britain and Belgium, European companies joined the growing list of participants. Development of this interconnector allowed gas to flow to and from Europe (and farther afield).

In 1997, the UK-based major oil marketplace, the International Petroleum Exchange (IPE), started listing GB gas futures contracts, which standardised contracts and increased liquidity for physical and financial players.

Then, in 2001, ENRON collapsed, bringing a significant decrease in trading activity and liquidity in the British gas market. Companies retreated from the market and introduced tighter controls on existing contracts and trader activity (limiting financial exposure).

Growing the gas traded market

Since 2005, the natural gas traded market in the UK has seen considerable stabilisation. The NBP has been the most liquid natural gas market in Europe for many years with significantly more gas traded than any of its European equivalents.

The reference prices created from trading at the NBP are now widely used across Europe for setting wholesale prices, as contracts linked to oil become less and less. The development of the traded market was supported by the emergence of the InterContinental Exchange (ICE), which was formed by a group of oil majors to rival and eventually take over disparate exchanges around the world, including the IPE.

Emergence of this exchange, coupled with the OCM has meant that approximately 50 per cent of the amount of physical gas volumes in the UK are now traded, with the reminder provided through OTC bilateral and longer term contracts.

Seeing the emergence of liquefied natural gas

In January 1959 at Canvey Island, the UK took delivery of the first international cargo of LNG, from Louisiana, USA: it subsequently became the world's first commercial LNG importer. Today, Britain has four LNG reception terminals with a combined LNG import capacity of 48.3 billion cubic meters per annum.

Over the last two decades, LNG has played an increasingly important role in meeting global gas demand, with growth of about 7 per cent per year since 2000. Whereas 90 per cent of global gas trade is via pipelines, LNG reaches the parts that pipelines can't reach. In Asian markets, such as Japan, South Korea and Taiwan, LNG is the sole source of supply, because no domestic production or pipeline network exists to import gas. Asia is expected to be by far the biggest consumer of LNG by 2020, with the additional demand growth coming from China and India.

LNG is a global market and so the amount of LNG imported into the UK is typically dependent on the attractiveness of the NBP price relative to other markets. Japanese demand recently accounted for up to 35 per cent of global LNG imports, following the Fukushima disaster in 2011 and subsequent closure of all nuclear reactors in the country. During 2014, however, weaker Asian demand and increased availability of LNG (due to the rise in US shale gas production) resulted in an increase of LNG being imported into the UK market.

Qatar is the biggest supplier of LNG to UK (over 90 per cent of all supplies). It has also been top of the worldwide league table of LNG exporters since 2006, but it's due to be overtaken by Australia in a few years. Qatar and Australia have been the main contributors to the doubling of global liquefaction capacity since the year 2000, which was previously dominated by Algeria, Malaysia and Indonesia.

Following the recent advent of large-scale shale gas production, North America and Canada are also set to be significant LNG exporters, allowing them to benefit from LNG market prices in Asia.

Who Are the Major Players?

Over 170 distinct organisations are licensed as GB gas shippers trading in the GB wholesale market. In fact, the number of individually licensed companies is higher, but some organisations have multiple subsidiaries licensed.

Typically the major gas suppliers are also licensed as their own shipper: for example, British Gas (also known as Centrica), nPower, EON, EdF, ScottishPower and SSE. The oil majors, who are also gas producers, are typically also gas suppliers in the Industrial and Commercial (I&C) market and so are gas shippers in wholesale market as well, including the likes of BP, Shell, Statoil, Total, GdF and Gazprom. In all these cases, their largest end customers (which they may also own) are likely to be gas-fired power stations.

Smaller independent suppliers may use the services of one of these larger shippers in order to fulfil their delivery commitments. They may also use a dedicated shipper service provider such as GMSL, which provides a software platform and/or a business process outsource.

As the most liquid in Europe, the GB NBP wholesale market attracts other participants who use it for hedging their wider European positions or simply for speculation. Commodities trading houses (typically Swiss-based) such as Glencore, Vitol, Gunvor and others, along with European (non-UK) utilities such as Vattenfall, DONG and Axpo, look to trade on price differentials between the GB and European gas markets.

Large banks (for example, Goldman Sachs, Citi, BNP Paribas), who treat energy as just another type of commodity (so called 'asset class') in their global portfolios, may also trade GB gas financially (that is, they don't take physical delivery) and provide gas indexation swaps to physical players hedging their longer-term floating price risks (converting variable gas price to an agreed fixed price, rather like fixing the rate on your mortgage). Some, for example, Australian bank Macquarie, even gain exposure to the 'asset class' by becoming gas infrastructure asset owners in their wider investment portfolio.

ICE (IPE as was) is a global wholesale energy exchange and the largest for GB gas trading. It also provides clearing settlement of these trades, although generally gas market participants aren't exchange clearing members and have to settle via such members – typically big banks. ICE Endex also operates the OCM for in-day gas balancing.

Brokers, who bring together sellers and buyers (rather like estate agents), also play a significant role in the wholesale bilateral gas trading market and include GFI, Spectron, Prebon, ICAP and TFS. These days they primarily operate online through a common trading platform service provided by Trayport (similar to, for example, Zoopla in the estate agency world).

The larger utility and oil major shippers are also the holders of the import capacity at the UK LNG import facilities, whereas the likes of Centrica, EON and SSE own and operate gas storage facilities, ring-fenced from their producer/shipper/supplier activities.

What Are the Big Issues?

REMEMBER

As with any liberalised market, changes occur constantly in the gas market, some arising from changes in the electricity market, thus demonstrating the close relationship between the two markets:

- **Gas as the renewable transition fuel:** Coal-fired power stations with no plans to upgrade to comply with European emission standards will close over the short term, leaving a gap in the British power generation mix.

  Coal is still currently the largest generation fuel in the British electricity market (approximately 30–35 per cent). Renewable generation won't be at the levels required to fill this gap in the time required, therefore power generation through gas is seen as the fuel to manage the transition to a low carbon economy.

- **Electricity market reform:** A number of initiatives driven within the electricity market will have a tangible impact on the wholesale gas market. Some of these contribute to the increase in gas generation including:

- *Carbon floor price:* A tax on generators who emit CO_2, thereby increasing the cost of operation.
- *Capacity market:* Auctions to contract for long-term generation and/or demand reduction to address the need for spare generation capacity when intermittent renewable generation isn't available. Gas generation through CCGT is seen as a key contributor in this market.

European integration

The EU continues to create policies aimed towards establishing a single European gas market. To date these moves have been largely based on the British market model, and covered areas such as common physical and commercial structures supporting capacity allocation and system balancing.

TIP

The EU has also suggested being more involved in long-term gas contract negotiations involving agreements with non-EU countries. The EU members could see this change as a signal to remove their reliance on some non-EU countries for their supply of gas (can you guess who we're talking about?).

In addition, the development of new legislation on trading of energy commodities, in particular the *Regulation of Wholesale Energy Markets Integrity and Transparency* (REMIT) from 2011, aims to create transparency and prevent market abuse and manipulation. Participants active in the wholesale gas market are obligated by law to adhere to these rules.

UK shale gas

UK natural gas supplies from the UKCS (United Kingdom Continental Shelf) have been steadily decreasing since the early 2000s. The UK is now heavily dependent on imports of gas from Western Europe, and farther afield through shipping LNG (Qatar as an example) to meet demand. But a new potential source of indigenous natural gas – shale gas – is on the horizon through a process called fracking.

In the UK, uncertainty remains around the potential for production (is it technically and economically recoverable?), even though licences to explore areas of the country for shale gas are in place and increasing with the government's backing. If successful, UK shale gas is likely to increase steadily, helping to reduce reliance on imports and potentially higher prices and increased security of supply.

The British Geological Survey (BGS) estimates that 1,329 trillion cubic feet of gas in shale formations exist across central Britain. How much of this amount can be realised is uncertain: perhaps around 10 per cent of potential reserves based on the US experience.

Jargon buster

Here's a list of some terms and abbreviations to help you navigate the world of the wholesale gas market:

- **Churn rate:** A ratio determining the amount of times an amount of a given commodity (in this case natural gas) has been traded from initial trade to final delivery to a customer. British gas is seen as a very liquid market, and has a churn rate between 15–25, meaning that on average rights to gas changes hands between this many times before physical delivery.
- **Clearing:** The procedure by which an organisation acts as an intermediary and assumes the role of a buyer and seller for transactions to reconcile orders between transacting parties. Clearing is necessary for the matching of all buy and sell orders in the market. It provides smoother and more efficient markets, because parties can make transfers to the clearing corporation, rather than to each individual party with whom they've transacted.
- **Dash for Gas:** Describes the significant shift to the use of gas for power generation in the UK from the early 1990s. The drivers for this trend were linked to privatisation of electricity companies, the removal of legislation preventing the use of gas as a generation fuel and advances in gas generation technology, namely cheaper and efficient Combined Cycle Gas Turbines (CCGTs).
- **Hedging:** A hedge is an action intended to offset potential losses/gains that may be incurred by a future change in a given market or commodity price. Simply put, a hedge is used to reduce any substantial

losses/gains suffered by an individual or organisation.

- **Market liquidity:** A market's ability to facilitate the purchase or sale of an asset without causing drastic change in the asset's price. A gas market's liquidity is indicated by its churn ratio and the *bid/offer spread* (the difference between sell and buy prices, the narrower the better). European regulators minimum target for gas market liquidity is a churn ratio 8, and only the GB and Dutch gas markets currently exceed this.
- **National Balancing Point (NBP):** A virtual point on the British gas system through which rights to physical gas volumes are transferred in support of balancing and financial settlement. The NBP was developed under the UNC and is essentially 'operated' by NGG.
- **On the day Commodity Market (OCM):** A screen-based anonymous trading exchange operated by ICE Endex that allows physical gas within-day trading. Shippers and NGG use the OCM to balance near real-time changes between gas demand and allocated volumes. Trades on the OCM are automatically submitted to NGG's Gemini system for balancing purposes.
- **Price index:** An averaged price for gas during a given interval of time (for example, index price for Day Ahead natural gas).
- **Spark Spread:** The difference between electricity and gas market prices which indicates efficiency needed by gas fired power station to make money.
- **System Average Price (SAP):** For a day, the weighted average price of all trades on the OCM.
- **System Entry Capacity (SEC):** Gas entry capacity (the amount of gas a shipper is permitted to flow into the NTS at a particular terminal on a given day) offered in auctions by NGG covering a number of periods: annual, quarterly, monthly, daily. Shippers can trade capacity in a secondary market with other shippers: that is, shippers with spare capacity sell to shippers who require more. Capacity auctions and capacity trading is managed via the Gemini system.
- **System Marginal Buy Price (SMPBuy):** The greater of the System Average Price (SAP) + £0.95 per therm and the price in pence therm equal to the highest market offer accepted by NGG in relation to a market balancing action taken for that day (on the OCM).
- **System Marginal Sell Price (SMPSell):** The greater of the System Average Price (SAP) – £0.84 per therm and the price in pence per therm is equal to the lowest market offer accepted by NGG in relation to a market balancing action taken for that day (on the OCM).

Chapter 7

Settlement

In This Chapter

- Accounting for billing basics
- Settling up three times a day
- Identifying unidentified gas

Everything has to be paid for and gas is no exception. In the context of this chapter, *settlement* covers the accounting and billing processes for sharing out all gas transported through the British gas network on a day, and the subsequent revisions to those shares that happen through the reconciliation processes.

This process is, of course, complex, but in this chapter we provide a thorough explanation as simply as we can.

Noting the Settlement Basics

REMEMBER

Here are the four key principles of gas settlement:

- Gas is shared out on a local distribution zone (LDZ) by LDZ basis (an LDZ is a self-contained geographical area of supply).
- Gas is shared out for a unit of time known as a Gas Day, which currently runs from 6 a.m. to the following 6 a.m.
- All gas for a day must be accounted for and allocated: no gas is left unallocated at the end of the Gas Day.
- Gas consumed at Non-Daily Metered (NDM) sites is the balancing figure in each LDZ.

Splitting the Gas Day into Three Phases

Gas settlement take place at three different times in the lifespan of a Gas Day:

- **Gas nominations:** A The forecast quantity of gas is shared out before the Gas Day.
- **Allocation:** The actual known quantity of gas transported is shared out after the Gas Day.
- **Reconciliation:** Shares of gas within an LDZ are revised as more information is received.

We discuss these processes in this section.

Forecasting quantities: Gas nomination process

A forecast quantity of gas is shared out before the Gas Day, as an aid to gas-buying decisions, especially for those shippers with a portfolio of NDM customers.

Following the nomination process

Gas nominations are re-run several times before the Gas Day, and after the Gas Day has started, each time using updated data if available. The final nominations should be published on behalf of the gas transporters (GTs) by 2 a.m. on the Gas Day itself.

Gas nomination is a four-step process:

1. **Determine a forecast total quantity of gas usage for the LDZ for the Gas Day.**

   The total LDZ forecast is determined by the appropriate GT (Distribution Network Operator) for the LDZ in question. Forecast is based on day of the week, time of year, weather forecast, recent demand trends and other factors, at the discretion of the GT.

2. **Deduct a quantity for shrinkage.**

   Shrinkage is defined as gas lost or used in the process of transporting gas to individual premises. LDZ Shrinkage is a fixed daily quantity, determined in advance of a Financial Year, and the GT provides the daily value to Xoserve. The same value is used in nominations and allocations (see the later section 'Sharing out the gas: The allocation process').

3. **Assign forecast quantities to Daily Metered (DM) sites.**

   The relevant gas shippers provide forecast gas quantities for the DM sites in their portfolios. Larger sites are forecast individually, whereas smaller sites are aggregated at Exit Zone level (an ***Exit Zone*** is a sub-division of an LDZ: all LDZs consist of one or more Exit Zones).

4. **Calculate NDM nominations (forecasts).**

   Total NDM energy is the balancing figure in each LDZ for each day, calculated as follows:

   Total LDZ forecast – Shrinkage – DM nominations

   NDM nominations are then calculated at shipper, End User Category and Exit Zone level, using the NDM algorithm, so that all forecast gas has been shared out.

Working on the NDM algorithm

The NDM algorithm is used both before and after the day to share out gas. The aim is to take account of differing consumer behaviours, due to (among others):

- Time of the year
- Day of the week
- Sensitivity to changes in the weather
- Impact of bank holidays and other times of low consumption

We reproduce and explain the NDM algorithm in the nearby sidebar 'Calculating the NDM algorithm'.

Calculating the NDM algorithm

The formula for Supply Point Demand is:

$SPD = (AQ/365) \times ALP \times (1 + (WCF \times DAF)) \times SF$

where

- AQ is Annual Quantity: Calculated before the start of the Gas Year by Xoserve on behalf of the GTs and notified to the relevant gas shipper who accepts or amends the value.
- ALP is Annual Load Profile: Calculated before the start of the Gas Year by Xoserve on behalf of the Demand Estimation Sub-Committee of the UNC Committee, which approves all values prior to implementation.
- WCF is Weather Correction Factor: Calculated just before the Gas Day (for nominations) or after the Gas Day and re-calculated until D+5.
- DAF is Daily Adjustment Factor: Calculated as for ALP.
- SF is a Scaling Factor: Calculated as for WCF.

Here's a breakdown of the components of the NDM algorithm and the source of the data:

Abbreviation	***Explanation***	***Source of Data***	***Timing of Calculation***
AQ	An estimate of consumption for 365 days under seasonal normal (SN) weather conditions	Derived from the site's read history, adjusted to SN weather conditions	Annually in advance at a site level, to go live on 1 October
ALP	Profiled daily consumption under average weather conditions, specific to an End User Category (EUC). When applied to AQ/365, it gives a view of how much gas the site would use on that day under seasonal normal conditions.	Demand estimation processes, based on recorded daily consumption at a sample of sites in that EUC	Annually in advance at EUC level, to go live on 1 October

WCF	Adjustment to take account of prevailing weather in the LDZ. A value of 0 means weather is in line with seasonal normal; >1 means colder than SN; <1 means warmer than SN	Formula is: (Total NDM Demand – SN NDM Demand)/ SN NDM Demand	LDZ specific, calculated using forecast NDM demand before the day, and actual NDM demand after the Gas Day
DAF	A measure of the weather sensitivity of the EUC, compared to the total LDZ NDM weather sensitivity. When combined with the WCF, this estimates the impact on the EUC profile of the actual weather conditions for the day.	Demand estimation processes, based on recorded daily consumption at a sample of sites in that EUC	Annually in advance at EUC level, to go live on 1 October
SF	An adjustment, to bring the total of all NDM Allocations into line with total NDM LDZ consumption. A value of >1 increases individual allocations; <1 decreases individual allocations	Total NDM Demand / Total Profiled NDM Demand (Total Profiled NDM Demand = the sum of the individual NDM allocations prior to the application of the Scaling Factor)	LDZ specific, calculated using forecast allocations (Nominations) before the day, and actual allocations after the Gas Day

Notes on the NDM algorithm:

- The WCF doesn't currently reference any forecast or actual weather data: instead it compares total NDM demand to SN NDM demand for the day, and assumes that the deviation is due to the weather differing from SN.
- Sites are assigned to EUCs based on their LDZ, their AQ and, in some cases, their proportion of gas used in winter.
- The WCF and SF are calculated at LDZ level, and work together

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to ensure that all gas for the day is shared out.

- An additional constraint is applied to the clause (1 + (WCF × DAF)), which prevents its result falling below a certain level. This constraint prevents NDM allocation ever becoming negative in normal circumstances. Currently, if the clause would otherwise give a result below 0.01, it defaults to 0.01: that is, weather-corrected consumption can't be less than 1 per cent of profiled consumption.

Sharing out the gas: The allocation process

The actual measured quantity of gas used in an LDZ is shared out after the Gas Day has finished.

Following the gas allocation process

Like nomination, gas allocation is also a four-step process:

1. **Determine the total quantity of gas used in the LDZ for the Gas Day.**

   The total LDZ consumption is determined by the appropriate GT (Distribution Network Operator) for the LDZ in question. Measuring equipment at each input point to the LDZ calculates the amount of gas brought into the LDZ for the Gas Day.

2. **Deduct a quantity for shrinkage.**

   Shrinkage is defined in the earlier section 'Forecasting quantities: Gas nominations'. The same value for shrinkage is used in nominations and allocations.

3. **Determine the quantity of gas used at DM sites for the Gas Day.**

   Gas allocations for DM sites are derived from daily measurements or estimates, using the specific calorific value of gas for that LDZ for that Gas Day. The relevant GT has an obligation to obtain measurements of the volume of gas consumed at DM sites in its LDZ. Where the recording equipment fails, the GT's systems calculate an estimate and meanwhile it tries to get a measurement before the calculations are finalised.

4. **Calculate NDM allocations.**

   Total NDM allocation is the balancing figure in each LDZ for each day, calculated as follows:

   Total LDZ quantity – Shrinkage – DM allocations

   NDM allocations are then calculated at shipper, End-User Category and Exit Zone level, using the NDM algorithm, so that all actual gas has been shared out.

Figure 7-1 shows these four steps for a single LDZ for a day.

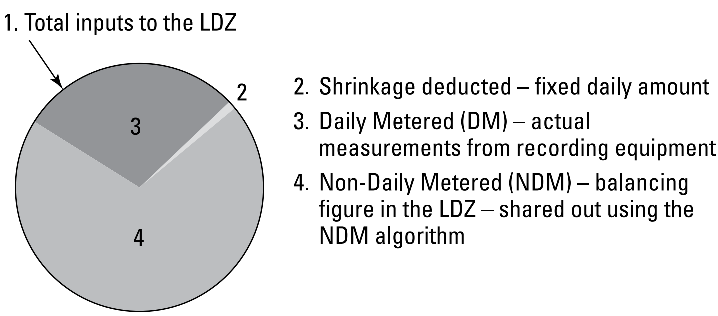

Figure 7-1: The four-step gas allocation process (not intended to be to scale).

The same NDM algorithm is used for both nominations and allocations. The sources of data differ slightly between the two processes, however, and we explain the differences in the 'Calculating the NDM algorithm' sidebar.

Finalising gas allocations

The gas allocation process runs every day from the first to the fifth day after the Gas Day, each time using the latest available data (the data may change during this period due, for example, to revised metered consumption for LDZ inputs or DM measurements). Therefore, NDM energy, as the balancing figure, can continue to change until the fifth following day.

TIP

The process of finalising gas allocations is often referred to as *Exit Close-Out,* because no further changes are made to allocations after the fifth day.

The 'fifth day following the Gas Day' is often shortened to 'D+5'. For example, the Gas Day referred to as 1 October in any given year would start at 6 a.m. on the calendar day 1 October and end at 6 a.m. on 2 October. D+5 would be 6 October.

Paying for the gas

The relationship between gas nominations and allocations and a shipper's financial transactions is shown in Figure 7-2.

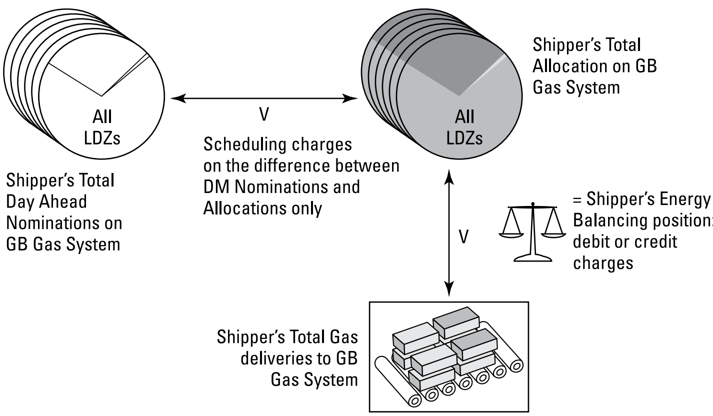

Figure 7-2: How shippers pay for gas.

REMEMBER

Here are the crucial points to note:

- A gas shipper's total allocation on the British gas system (including any gas used by its customers on the National Transmission System) is termed *system outputs.* The shipper's total gas delivered to the system for the Gas Day is referred to as *system inputs.*
- The *Energy balancing* process compares these two figures (system inputs and outputs). Any difference between inputs and outputs results in a charge, where outputs exceed inputs, or a credit, where inputs exceed outputs. In other words, a shipper isn't billed for its total energy allocation on the network, but only for any excess or shortfall against the gas that it delivered to the system. This is a system-wide calculation, not LDZ by LDZ.

- *Scheduling charges* apply to DM sites only where a significant difference exists between the final DM gas nomination for any given day and the final DM allocation for that day: in other words after the last run of allocation, 5 days after the end of the Gas Day.

  This process is intended to provide an incentive to achieve an accurate nomination. No scheduling charges apply to NDM nominations and allocations.

Reconciling actual gas consumption with allocations

Although the NDM allocations, which we describe in the earlier 'Sharing out the gas: The allocation process' section, are derived from measured total throughput, the sharing out is based on historical profile and usage information and doesn't use meter point level consumption information.

REMEMBER

Reconciliation is the process of comparing actual gas consumption to allocations, which is conducted when meter readings are made available. As we describe in this section, the current regime employs three types of reconciliation:

- DM reconciliation
- NDM Larger Supply Point reconciliation
- NDM Smaller Supply Point reconciliation

DM reconciliation

REMEMBER

Reconciliation takes place at DM sites in the following two circumstances:

- Where estimates were used in the allocation process (when actual DM reads haven't been received by D+5) reconciliation takes place the next time an actual read is received, to correct the estimated daily consumptions since the last actual read.
- When the recording equipment at the site is resynchronised with the meter itself, every 12 months or so, equipment drift may be identified. *Drift* means that the meter manager's derived records have got out of line from the actual index of the meter, most often

with the actual meter read being the higher number. Reconciliation corrects all the individual days since the last re-synchronisation, to account for that drift.

NDM Larger Supply Point reconciliation

For gas nominations and allocations, all NDM sites are treated consistently. But for the purposes of reconciliation, two different processes are involved.

NDM Larger Supply Points (LSPs) are those with an estimated annual usage (an annual quantity) of over 73,200 kilowatt hours. For these sites, as and when the relevant gas shipper provides a meter reading, reconciliation compares the total allocated consumption since the last actual meter reading against the actual usage, derived from the most recent and previous meter readings.

The resulting energy difference can be positive or negative and is apportioned across all the days since the last meter reading in accordance with set rules.

All LSP reconciliations result in either debit charges (where actual consumption exceeds the original allocations) or credit charges (where actual consumption is less than the original allocations). These debits and credits are issued on a separate set of reconciliation invoices, consisting of Transportation Commodity and Reconciliation Energy charges.

Charges are based on the difference in energy between actual and allocated, at the price rates that prevailed on each day in the period between the start and end meter readings. The original energy balancing calculations aren't re-opened at this stage.

Under the GTs' network codes, the gas shipper is obligated to provide meter readings for use in NDM reconciliation.

NDM Smaller Supply Point reconciliation

NDM Smaller Supply Point (SSP) reconciliation is performed in aggregate, without reference to actual meter reads.

This process is known as *reconciliation by difference*. Its key principle is that due to the large volume of meter points in the SSP market and their low individual materiality, they aren't currently subject to individual meter point reconciliation.

Instead, the equal and opposite energy value of all DM and larger NDM meter point reconciliations is applied to all SSPs in the LDZ, in proportion to its annual quantity.

This process is based on two principles:

- Total energy within the LDZ must remain whole, so that if reconciliation reveals that energy wasn't consumed in one sector, it must have been consumed in another sector.
- Across each shipper's portfolio of SSPs within an LDZ, on average they have a similar response to weather and other influencing factors, and can therefore have reconciliation energy attributed to them proportionally.

Individual meter point reconciliation continues for between 3 and 4 years after the end of the Gas Day, with the opposite entries being passed to the SSP market through reconciliation by difference.

Accounting for Unidentified Gas

You can see from the preceding section that we make no mention of the concept of Unidentified Gas within the daily allocation processes: all energy is shared out to supply points each day, with NDM energy being the balancing figure.

Since 2010, however, the Uniform Network Code (UNC) has included the concept of Unidentified Gas (UG). Currently, however, UG isn't part of daily allocation, but a separate monthly process, whereby LSPs (check out the earlier section 'NDM Larger Supply Point reconciliation' for a definition) make a fixed monthly contribution to UG.

The process works as follows:

- An independent Allocation of Unidentified Gas Expert (AUGE) determines an estimated amount of UG that can be attributable to LSPs for the coming year under seasonal normal conditions.
- The process for determining the estimate is set out in a UNC supporting document.

- The energy value is determined at a national level, not by LDZ.
- The UG energy quantity is billed to LSP shippers, in proportion to their national share of LSP Annual Quantity (AQ), in 12 equal monthly instalments, after the end of each billing month, using the billing month's average gas price.
- The equal and opposite monthly UG energy amount is credited to the SSP market (which we define earlier in 'NDM Smaller Supply Point reconciliation'), in proportion to each shipper's share of national SSP AQ.
- Debit and credit transactions happen on the same day after the end of each calendar month.

Future changes to settlement

Significant modifications to the UNC have been agreed for implementation. Here we summarise the key changes of these modifications.

As a result of extensive discussion among UNC signatories and changes driven from the EU, the Project Nexus and Gas Day UNC Modifications have been agreed and therefore several areas of future change will occur to British gas settlement arrangements:

- **Change to the Gas Day:** The Gas Day (currently 6 a.m. to 6 a.m.) will change to run from 5 a.m. to the following 5 a.m. with effect from 1 October 2015. This change was introduced by UNC Modification 0461.
- **Project Nexus UNC Modification 0432 – impacts on Settlement:** Xoserve is due to replace its key UK Link systems during 2016. This suite of systems delivers Supply Point Administration, Customer Switching and invoicing services to the Gas industry. The Replacement Programme began with an industry Consultation and Requirements Definition Phase, known as *Project Nexus.* Industry requirements were consolidated into a single consensus view.

When the replacement for UK Link is implemented (currently planned for 2016), the Project Nexus Requirements will also be implemented, including the following changes:

- **Introduction of meter point Classes:** From the effective date of the 'Nexus' Modifications DM and NDM meter point categories are to be replaced with four new Meter Point Classes. In brief the

Classes have the following characteristics:

- **Class 1:** The equivalent of the existing DM process whereby DM Mandatory Supply Meter Points are read daily by the Daily Metered Service Provider (DMSP). Allocation and energy balancing processes will be based on the daily read. This service is mandatory where the AQ is above 58.6 million kilowatt hours and not available below that threshold.
- **Class 2:** An elective DM service where the shipper provides daily reads for allocation and energy balancing processes. The shipper can elect any meter point below the Class 1 threshold to be in this Class.
- **Class 3:** A non-daily metered service where the shipper provides daily reads monthly in batches. The reads will be used for NDM reconciliation based on daily actual consumption. The Demand Estimation process will be used for daily allocation. This service will be available to any Supply Meter Point below the mandatory Class 1 threshold.
- **Class 4:** A non-daily metered service where the shipper provides a periodic read (for example, monthly/annually) for reconciliation. The reads will be used for NDM reconciliation and the current calculation methodology won't change. The Demand Estimation process will be used for daily allocation. This service will be available to any Supply Meter Point below the mandatory Class 1 threshold.

✓ **New gas nomination and allocation arrangements:** From the effective date of the 'Nexus' Modifications NDM Energy will no longer be the balancing figure in each LDZ. Instead an amended NDM algorithm will use actual weather data to derive a bottom-up estimate of NDM demand. Unidentified Gas will be the balancing figure each day using the following formula:

$UG_{(LDZ)}$ = Total LDZ throughput – Shrinkage – DM measurements/estimates – NDM estimates

UG will be shared out to all live sites in the relevant LDZ, on the basis of their recorded/estimated throughput for the day, adjusted with a set of pre-agreed weighting factors. The weighting factors will target more or less energy to different Classes of meter points, based on an assessment of their contribution to UG. The UG volume will be the balancing figure in each LDZ, and so could change up to D+5 as the inputs to the calculation change.

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UG will be another element of the shipper's total system outputs for energy balancing purposes, and so the shipper only pays (or is credited) for the difference between total inputs and outputs (see Figure 7-2 in this chapter). UG will no longer be charged/credited via a separate monthly invoice.

- **Changes to reconciliation arrangements:** From the effective date of the 'Nexus' Modifications, reconciliation by difference will cease. Instead all meter points, including those in the SSP category, will be subject to individual meter point reconciliation, based on their actual meter reads.

  The equal and opposite effect of all individual reconciliations will result in a change to UG, which could be an increase or decrease in UG. The total energy difference each month will be shared out in the same way as UG up to D+5, using the weighting factors, but based on the latest recorded/estimates/reconciled energy for each site.

Chapter 8

Governance and Regulation

In This Chapter

- Reading about regulators
- Covering the industry codes
- Investigating important issues

Producing, transmitting, distributing and selling gas is a complex and expensive business (as we discuss in Chapters 2, 3, 4 and 5, respectively); it requires significant investment and more importantly stringent regulation.

Customers in Britain can choose from which supplier they buy their gas, but they have no choice over who delivers it to their home. As with the electricity industry, regulation protects customers where no effective competition exists. The paramount purpose of regulation is first and foremost safety.

In this chapter we explore the regulatory hierarchy and legal requirements for the gas industry as well as some future challenges.

Looking up at the Regulatory Hierarchy

Each participant in the industry has its own set of rules and regulations with which it has to comply – but as with all such things, these rules are subject to change. The gas industry is going through a major change at the time of writing this book and so bear with us.

The Regulator, the Office of Gas and Electricity Markets (Ofgem), is the primary vehicle for regulating the gas industry. Changes to the codes and regulations invariably involve consultation with the Regulator. For the gas market, the Health and Safety Executive also has a keen interest and a number of regulations are backed up with safety legislation.

The primary code since 1996 has been the Network Code, which was an agreement between the shipper and Transco (see the Industry Timeline in the Appendix). In 2005, this agreement was replaced by the Uniform Network Code (UNC), following the sale of some of the Distribution Networks by NGG.

Complying with Industry Codes

A common industry licence condition is to comply with one or more industry codes, which set out the rules for operating in the industry. The codes can be heavy-going and subject to change. Here's a quick summary of the codes you need to be aware of (check out Table 8-1 for the organisations on which the first three codes impact):

- **Independent Gas Transporter Uniform Network Code (iGT UNC):** Implemented on the 1 May 2007 following designation by Ofgem. This code is between independent gas transporters (iGTs) and gas shippers.

  The iGT UNC was implemented to streamline and harmonise the Network Code arrangements of the iGTs as much as possible; the aim was to allow gas shippers to use common arrangements in their activities with iGTs when accessing the pipeline system. Each iGT has an individual network code for arrangements/services, which aren't contained in the iGT UNC (for more information see `www.igt-unc.co.uk`).

- **Supply Point Administration Agreement (SPAA):** Sets out the inter-operational arrangements between gas suppliers and gas transporters in the UK retail market. It's a multi-party agreement to which all domestic gas suppliers and all gas transporters are parties.

  The SPAA was created to provide a governance arrangement covering processes that aren't ordinarily covered by existing contracts or agreements, but which are nonetheless considered important to the effective and efficient transfer of consumers between suppliers. The SPAA provides a robust mechanism for making changes to the operational arrangements that are required to enable the flow of gas within the industry (for more information, visit www.spaa.co.uk).

- **Uniform Network Code (UNC):** The code between gas transporters and gas shippers and the hub around which the competitive gas industry revolves. It comprises a legal and contractual framework to supply and transport gas. It has a common set of rules, which ensure that competition can be facilitated on level terms. Gas transporters use the services of a common agency (Xoserve) where the process is common to a number of transporters, to ensure that gas shippers can use the same processes with each gas transporter.

  TIP: Each gas transporter has an individual network code for arrangements/services, which aren't contained in the UNC (for more, see www.gasgovernance.co.uk).

- **Code Administrators Code of Practice (CACoP):** The code for energy code administrators and users of the modification (change) to UNC process. It's also intended to encourage participation from those involved in the energy business who may not be code users, as those codes strictly state.

  TIP: Although each code has specific rules in place with which the code administrator aims to comply, the CACoP is a set of principles to harmonise the change process where possible. The CACoP was developed by the energy industry and is published by Ofgem at https://www.ofgem.gov.uk/licences-codes-and-standards/codes/industry-codes-work/code-administration-code-practice-cacop.

- **Code Modification Panels or Executive Committees:** Each code has an overseeing panel or committee that recommends or rejects the implementation of modifications (changes) to UNC, usually comprising representatives from each party to the code or other interested industry-related groups.

  REMEMBER: A number of the codes allow consumer representation on their Modification Panels; this role is nominated by Ofgem and usually undertaken by a representative of Citizens Advice or Citizens Advice Scotland.

Table 8-1 Industry Code Impact

Participant	*iGT UNC*	*SPAA*	*UNC*
Gas producers	X		
Storage operators	X		
Gas transporters	X	X	X
Independent gas transporters	X	X	X
Gas shippers	X	X	
Gas suppliers	X		
Traders	X		

Facing the Industry's Regulation Challenges for the Future

The gas industry is going to have to deal with a number of future regulatory issues, many of which are similar to those facing the electricity industry.

Examining European Energy Codes

The European Third Energy Package came into law on 3 March 2011, with the aim of developing a more harmonised European internal energy market. It consists of two Directives and three Regulations. The main Regulation prescribes conditions for access to the gas transmission network in each member nation.

Although not specifically a United Kingdom code, where the gas regulatory framework is considered non-compliant with the European codes, modifications have been or are being made to the specific codes in order to achieve legal compliance with the European ones.

TIP: You can find further information for the specific EU regulation at `http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:211:0036:0054:en:PDF`. For an overview of UNC code changes currently being progressed, check out `http://www.gasgovernance.co.uk/euronetcodes`.

Anticipating Project Nexus and UK Link replacement programme

Gas transporters use a common agent or agency (Xoserve) to communicate with gas shippers on their behalf so that parties can adopt the same process and therefore streamline communications.

The systems (UK Link) and processes used by the agency are due for replacement and Ofgem has allowed funding for this project. Industry parties have been involved with establishing the requirements for the new systems and processes called *Project Nexus*.

One aim of the project is to review the current settlement regime to allow gas shippers to reconcile the energy used at individual meter points on a more frequent basis. This would also allow for the provision of more meter-reads being made available by the adoption of smart metering (see Chapter 5).

Currently the UK Link replacement system being delivered by the UK Link Replacement Programme is expected to go live during 2016, but the actual date is still subject to discussion.

Considering a common iGT agency

Currently iGTs (which we define in the earlier section 'Complying with Industry Codes') don't use a single agent for the provision of common services between themselves and gas shippers, although individually they may use the same process.

But a number of modifications have been raised, by the various code modification panels, to the iGT UNC and UNC to centralise common services through the gas transporters agent, Xoserve. Industry parties believe that this will improve the efficiency of communications by the adoption of common process across all transporters and shippers where applicable.

Currently, the delivery of common agency services is expected to go live on 1 October 2015.

Jargon buster

As you may expect, governance and regulation involves more than its fair amount of abbreviations and acronyms:

- **Gas Distribution Network (GDN):** A network through which gas is taken from the high-pressure transmission system and distributed through low-pressure networks of pipes to industrial complexes, offices and homes. The eight GDNs in Britain each cover a separate geographical region.
- **Gas and Electricity Markets (GEMA) Authority:** The main onshore gas and electricity regulator in Britain: in effect, the executive board of Ofgem.
- **Gas transporters (GTs):** Formerly public gas transporters (GTs) such as NGG, are licensed by GEMA to transport gas to consumers.
- **Independent gas transporter (iGT):** An operator of a small local gas network, most of which are built to serve new housing: iGTs may levy distribution charges on shippers.
- **Office of Gas and Electricity Markets (Ofgem):** UK regulator for gas and electricity, which were previously separate as Ofgas and Offer.
- **Uniform Network Code (UNC):** The UNC replaced the Network Code. As well as covering the arrangements within the Network Code, it covers the arrangements between NGGTransmission and the Distribution Network Operators.
- **Xoserve:** A joint venture delivering transportation transactional services; owned by the five major GDNs and NGG.

Chapter 9

Ten Take-Away Points to Remember

In This Chapter

- Realising that the industry is complicated
- Staying ahead in the UK

Here's a collection of observations on the British gas industry based on years of experience. We make no apology if some of them are the same as the electricity ones: the industries have been through the same experiences.

Operating at the Cutting Edge

The British gas industry is frequently at the sharp end of major industry change (for example, the introduction of metering competition, let alone supply), but that doesn't mean it always gets things right.

Other countries often take a great interest in what's done in the UK – but they don't always choose to follow.

Keeping up to Date

The British gas market has changed dramatically over the past two decades, and continues to do so: change is part of what makes it such an interesting place to work. Indeed, with the advent of the UK Link System replacement (check out Chapter 8), we see this fact as being truer today than ever before.

Staying Patient

Change doesn't always arrive quickly. Dynamic though the British gas industry is, with so many different parties involved, implementing change can take a long time. For example, the Review of Gas Metering Arrangements (RGMA) took around 4 years from start to finish.

So, don't hold your breath.

Understanding that Nothing's New under the Sun

What comes around, goes around. Just because something's been tried before, doesn't mean that the industry won't return to it later.

A number of market developments have been through the process of consideration and come back again. One that might come back is half-hourly balancing to align the two industries, but that's just speculation, of course.

Expecting a Lack of Consensus

Getting industry stakeholders to agree on industry change is sometimes harder than you'd initially imagine – or perhaps not. Unsurprisingly, with so many different roles within the industry, not everyone shares the same goals. For example, within the gas industry are suppliers who don't operate in the domestic market and this often means that there are conflicting views on change when that change covers both markets.

Anticipating Future Challenges

The British gas industry has been at the forefront of competition for decades. But although it has seen most things, it hasn't seen everything. Undoubtedly, more challenges are to come.This will be especially true with increasing integration with European energy markets.

Turning Gas into Cash

The UK has an incredibly liquid gas market (that is, one where trading is easy) – probably one of the most liquid in the world (wade your way to Chapter 6 for more details). Therefore, the country is at the forefront of the competitive energy markets, which is something to be genuinely proud of.

Putting Your Experience to Work

If you think that you've got a good idea, it probably is a good idea.

The utilities sector tends to occupy the bottom quartile of service industries with notoriously high levels of customer complaints. So if you're new to the industry and have seen something being done better in another sector, try to apply that experience in the utilities space.

But keep in mind the point we make in the next section.

Knowing when to Find out More

If something seems simple, you probably haven't understood it! Things that, on the face of it, seem simple usually aren't. Settlement is a good example of this. The principles of settlement are relatively easy to understand, but underneath lies a whole heap of complex industry stuff.

Leading the Way in the UK

Further alignment and integration with European energy markets and more alignment of the electricity and gas industries will undoubtedly continue.

In addition, the future contains the development of shale gas (drill into Chapter 2), the Heat Strategy (Chapter 5 has more on things hotting up in this area) and the move towards a low-carbon economy. All these innovations are improving the reputation of the UK as leaders in the world of gas market development.

Appendix: Timeline

Here's a handy list of some of the key milestones in the development of the British gas market.

1792: William Murdoch uses coal gas for gas lighting in his house in Redruth, Cornwall.

1806: The first commercial gas lighting contract is granted for lighting a factory at Henry Lodges Mill, Sowerby Bridge, Yorkshire.

1807: Frederick Winsor demonstrates gas street lighting on London's Pall Mall to celebrate the Prince of Wales's birthday.

1812: Gas Light and Coke Company (GLCC) is granted a Royal Charter.

1813: First street lights in London are powered by coal gas.

1826: James Sharp experiments with the possibility of cooking with gas, installing an experimental gas cooker in his home.

1847: The Gasworks Clauses Act is introduced to regulate the construction of gasworks and the supply of gas.

1855: Robert Bunsen invents the atmospheric gas burner, which allows gas to be used in commercial and domestic heating applications.

1859: The Sale of Gas Act is introduced to regulate the measures used in the sale of gas.

1860: The Metropolis Gas Act is introduced, laying down the principal of *districting,* where companies become responsible for supplying specified districts, thus preventing wasteful competition.

1870: TS Lacey invents prepayment gas meters, opening up the gas market to the working classes and fuelling growth in the British gas industry.

1887: Carl Auer invents the incandescent gas mantle, which allows a much brighter light to be produced more efficiently and helps gas lighting to compete with electric lighting until the 1950s.

1920: The Gas Regulation Act changes the basis of charging for gas from illuminating power to calorific value. It also introduces a national basis for the testing and reporting of gas quality.

1932: Eric Fraser creates 'Mr Therm' as an advertising symbol for the Gas Light and Coke Company and later the wider gas industry.

1939: The gas industry provides a vital role in powering British industry and producing chemical by-products for use in the war effort.

1948: Clement Attlee's government passes the Gas Act, creating a state-owned integrated industry comprising 12 area Gas Boards and a central Gas Council.

1949: More than 1,000 private and publically owned gas undertakings are nationalised and transferred to the new area Gas Boards. The Gas Light and Coke Company becomes part of North Thames Gas Board.

1959: First import of liquefied natural gas (LNG) from the Gulf of Mexico to Canvey Island. Later Britain imports LNG from Algeria.

1964: The UK Continental Shelf Act comes into force.

1967: The conversion of all British gas appliances from manufactured gas to town gas commences. (The exercise is completed in 1977: a key feature is the construction of a National Transmission System.)

1972: The Gas Act restructures the industry: British Gas Corporation (BGC) replaces the central Gas Council, the industry is consolidated and 12 area Gas Boards are renamed as regions of BGC.

1982: The Oil and Gas (Enterprise) Act enables competition for large gas users.

1986: The Gas Act enables privatisation of British Gas Corporation as British Gas plc. The Act also creates Ofgas to oversee competition.

1989: Monopolies and Mergers Commission recommendations are implemented. British Gas plc creates the Gas Transportation Services department (later renamed Transco).

1990: New entrant industrial gas suppliers arrive and the first companies transfer to new market entrants.

1992: Threshold for competition is reduced to 73,200 kilowatt hours (kWh) per annum, thus allowing the remainder of UK businesses into the competitive market.

1995: The Gas Act legislation enables domestic competition (from a pilot in 1996 to full rollout in 1998).

1996: The Network Code is introduced to manage the commercial relationship between gas shippers and Transco.

1997: British Gas plc demerges into two separate companies: British Gas plc is renamed BG plc; Centrica plc (which had rights to the British Gas brand in the UK) is spun off.

2000: BG plc demerges into two separate companies. Lattice Group plc (including Transco) is spun off and the Utilities Act merges OFGAS and OFFER.

2002: Lattice Group plc merges with National Grid plc and is renamed National Grid Transco.

2004: Review of Gas Metering Arrangements (RGMA) introduces competition in metering services.

2005: National Grid Transco is renamed National Grid plc. On 26 July 2005, National Grid Company is renamed National Grid Electricity Transmission plc and on 10 October 2005, Transco is renamed National Grid Gas plc.

National Grid Gas plc sells four of its eight gas distribution businesses, Joint Office of Gas Transporters is set up to manage the now 'Uniform' Network Code and Xoserve is created to handle central systems for industry.

2008: Ofgem announces review of price controls for transmission and distribution of gas, with Revenue = Incentives + Innovation + Outputs (RIIO) replacing the Retail Price Index (RPI-x). First new RIIO controls run from 2013 to 2021.

About the Author

Stuart Fowler has worked in the UK energy market for nearly 29 years, in retail for British Gas and then E.ON UK before moving to the dark side of consulting in 2007. He also has an understanding of the electricity industry.

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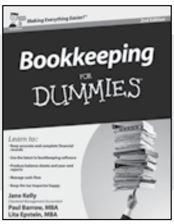

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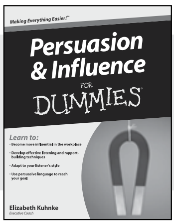

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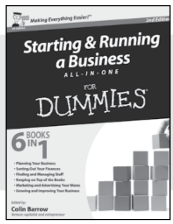

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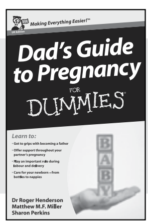

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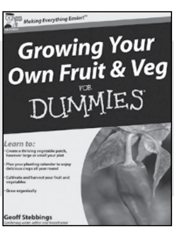

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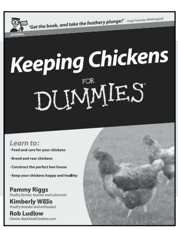

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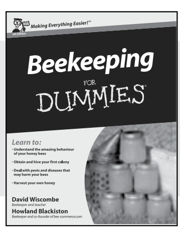

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