2010

OIL & GAS SECURITY
Emergency Response of IEA Countries

UNITED KINGDOM

List of Figures

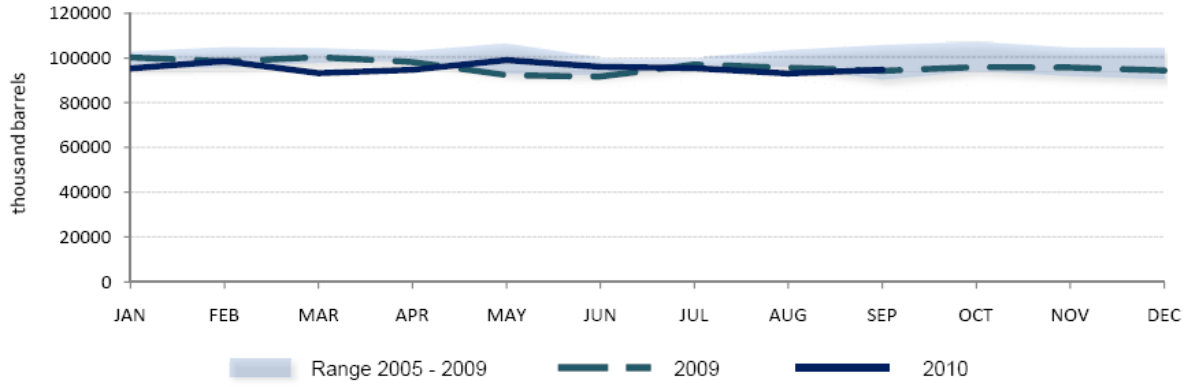
International Energy Agency

United Kingdom

Key Oil Data

	1985	1990	1995	2000	2005	2007	2008	2009
Production (kb/d)	2 674.1	1 939.9	2 793.9	2 704.5	1 838.0	1 663.0	1 564.0	1 473.0
Demand (kb/d)	1 617.4	1 775.9	1 816.2	1 765.4	1 822.8	1 738.2	1 729.3	1 667.0
Motor gasoline	*472.3*	*562.8*	*508.2*	*498.8*	*435.2*	*410.0*	*388.5*	*369.6*
Gas/diesel oil	*379.0*	*414.4*	*459.1*	*511.5*	*559.0*	*579.6*	*570.4*	*548.9*
Residual fuel oil	*337.7*	*269.7*	*182.3*	*80.7*	*89.8*	*86.8*	*94.9*	*72.9*
Others	*428.4*	*529.0*	*666.6*	*674.6*	*738.7*	*661.7*	*675.6*	*675.6*
Net imports (kb/d)	- 1 056.7	- 164.0	- 977.7	- 939.1	- 15.2	75.2	165.3	194.0
Import dependency	*-65.3%*	*-9.2%*	*-53.8%*	*-53.2%*	*-0.8%*	*4.3%*	*9.6%*	*11.6%*
Refining capacity (kb/d)	2 008	1 831	1 869	1 785	1 825	1 887	1 858	1 858
Oil in TPES	37.8%	37.3%	36.0%	33.0%	32.7%	32.2%	32.6%	32.7%

End-Month Total Oil Stock Levels[1] - Five Year Range

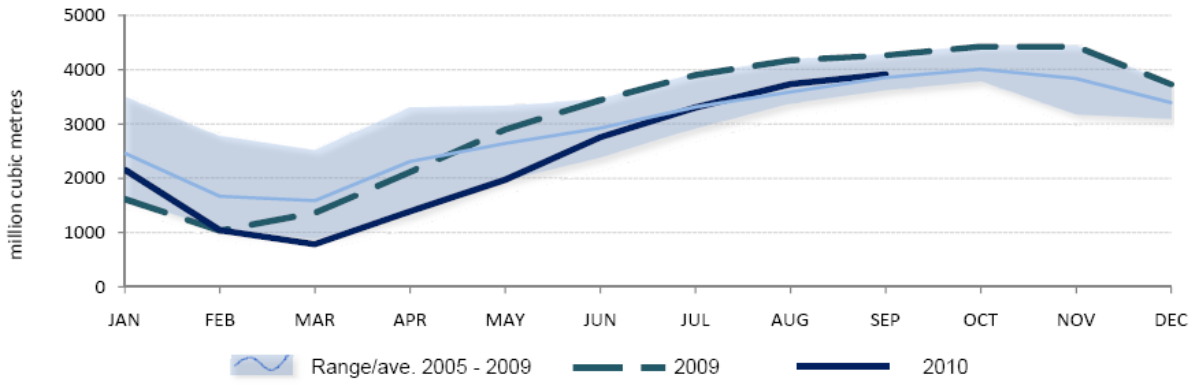


Key Natural Gas Data

	1985	1990	1995	2000	2005	2007	2008	2009 *
Production (mcm/y)	43 104	49 672	75 539	115 386	92 805	76 074	73 540	62 125
Demand (mcm/y)	56 373	58 313	75 179	101 812	99 643	95 949	99 020	90 495
Transformation	*921*	*1 374*	*13 780*	*31 641*	*31 803*	*33 993*	*36 070*	-
Industry	*15 839*	*14 754*	*15 073*	*17 831*	*14 572*	*13 198*	*12 873*	-
Residential	*26 478*	*28 678*	*29 883*	*33 451*	*34 745*	*31 971*	*32 982*	-
Others	*13 135*	*13 507*	*16 443*	*18 889*	*18 523*	*16 787*	*17 095*	-
Net imports (mcm/y)	13 269	8 641	- 360	- 13 574	6 838	19 875	25 480	28 370
Import dependency	*23.5%*	*14.8%*	*-0.5%*	*-13.3%*	*6.9%*	*20.7%*	*25.7%*	*31.3%*
Natural Gas in TPES	*23.2%*	*23.0%*	*30.3%*	*39.4%*	*38.6%*	*39.1%*	*40.7%*	*39.5%*

** based on monthly data submissions to the IEA.*

End-Month Natural Gas Stock Levels[2] - Five Year Range



1 -Primary oil stocks on national territory; these exclude utility stocks and including pipeline and entrepot stocks where known.
2 -Stocks held on national territory, as reported to the IEA in monthly data submissions.

OVERVIEW

The United Kingdom (UK) is one of the major oil producers among IEA member countries, and until recently, was one of only four IEA net exporting countries. However, the United Kingdom's North Sea oil and gas production has been declining since its peak in 1999. In 2004, the country became a net importer of natural gas, and in 2006 it also became a net importer of oil.

Reliance on imports is only marginal (as of 2010), and oil stocks in the country represent well beyond the IEA's 90-day minimum net import cover. However, as a member of the European Union, the United Kingdom also has a minimum stockholding obligation, which it meets by placing compulsory stock requirements on oil companies operating in the country.

In an IEA co-ordinated action, the United Kingdom's contribution to the collective response would be to lower the stockholding obligation placed on industry. Of note, the country also has a well-developed demand restraint programme which could be implemented at short notice in the event of a crisis, but would not be used as part of any UK contribution to an IEA collective action.

As domestic production declines further, the country will face a growing need to hold larger volumes of emergency reserves.

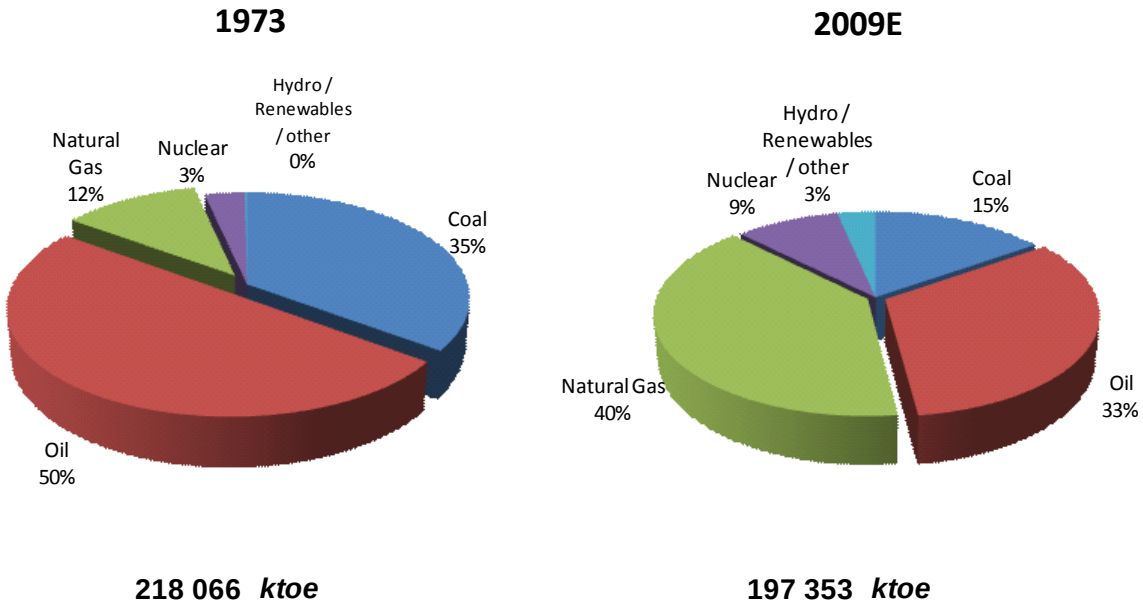
1. Energy Outlook

Oil and gas dominate the United Kingdom's Total Primary Energy Supply (TPES) mix, accounting for almost three-quarters of the total.

Increased exploitation of substantial gas reserves in the UK Continental Shelf in the North Sea led to greatly expanded natural gas use, particularly in the 1990s, when the country built substantial gas-fired, combined cycle gas turbines for electricity generation.

The United Kingdom's TPES has remained quite constant since 1973, but has declined marginally since 2005, dropping to an estimated 197 Mtoe in 2009. The shares of oil and, particularly, coal have declined considerably over the same period, in favour of somewhat "cleaner" fuels.

Total Primary Energy Supply



218 066 *ktoe*

197 353 *ktoe*

**Data excludes electricity trade.*

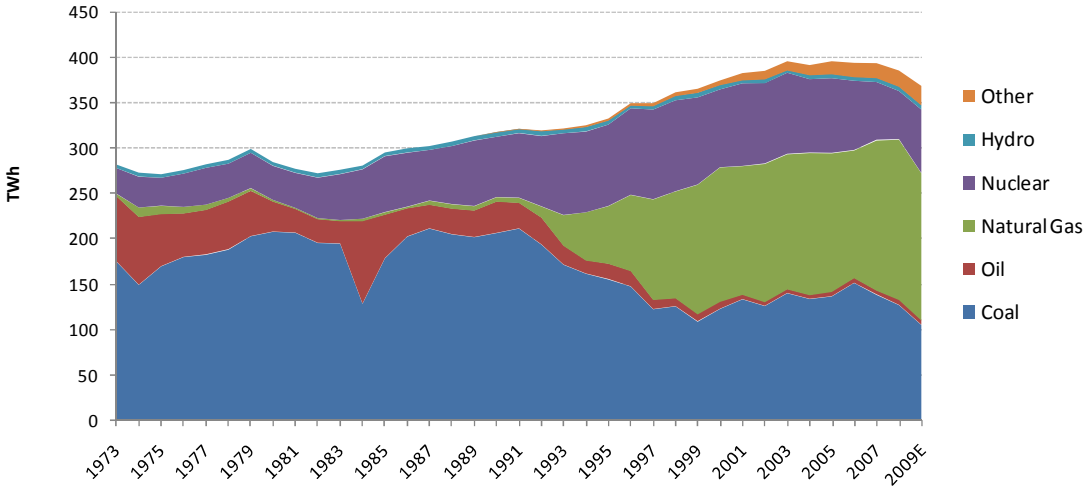
Source: Energy Balances of OECD Countries, IEA

Oil accounts for around one-third of the United Kingdom's inland energy consumption, with around 70% of refined oil used in the transport sector.

The share of natural gas in TPES has continued to soar over the past decades, and in 2009 accounted for some 40% of the United Kingdom's inland energy consumption. Industry, electricity generation and domestic heating, and cooking each account for around a third of gas consumption.

As indicated in the graph below, natural gas became the largest source of fuel for the electricity generated in the United Kingdom, accounting for 44% of total power generation inputs.

Electricity Generation by Fuel



Source: Energy Balances of OECD Countries, IEA

2. Oil

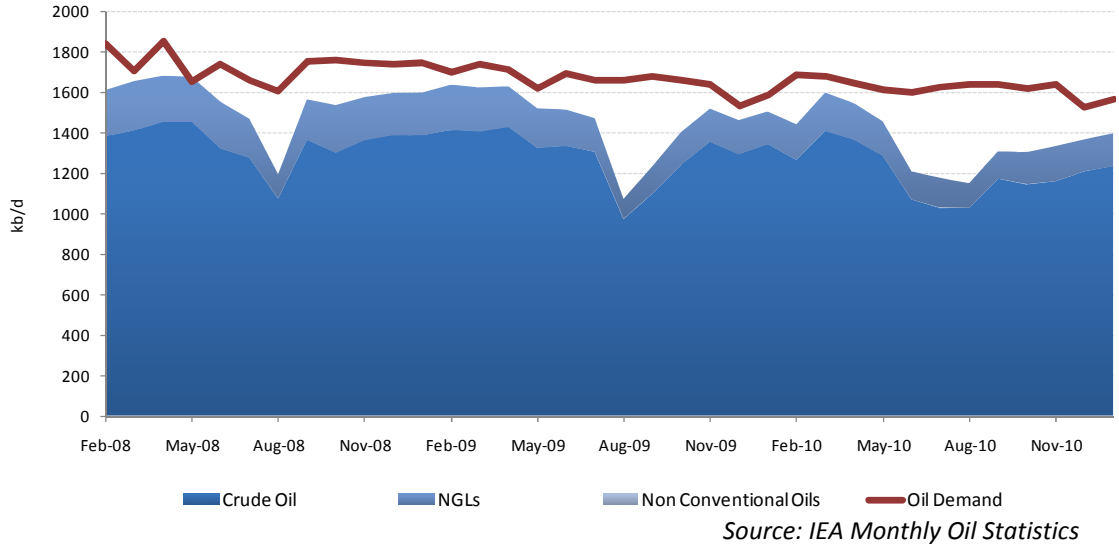
2.1 Market Features and Key Issues

Domestic oil production

The United Kingdom is one of the major oil producers among IEA member countries, and was until recently a net exporting country. In 2006, the country became a net importer of oil.

The bulk of domestic crude oil is produced from platforms operating in the North Sea. From the platforms, the crude oil is transported to onshore oil terminals either by pipeline or by loading onto oil tankers for transportation to oil refineries. Three refineries have direct pipeline links with the oil terminals. UK North Sea oil production has been declining steadily since its peak in 1999. Domestic crude oil / NGL production (based on current reserves and technology) is expected to drop by some 40% (from 2009 levels) by 2020.

Domestic Oil Production and Demand



Source: IEA Monthly Oil Statistics

Oil demand

Total UK oil demand in 2009 averaged 1.67 mb/d. The United Kingdom's total oil demand has been declining gradually since 2005 (as is the case in many OECD countries), decreasing by a compound average rate of 2.2%. Overall demand is expected to continue along this gradual downward trend in the period until 2020, mainly because of a progressive ebbing of gasoline demand.

The transportation sector accounted for over two-thirds of oil demand, with motor gasoline, gas/diesel oil, and jet kerosene being the main transportation fuels. Future oil demand growth will be the result of increases in the use of these fuels.

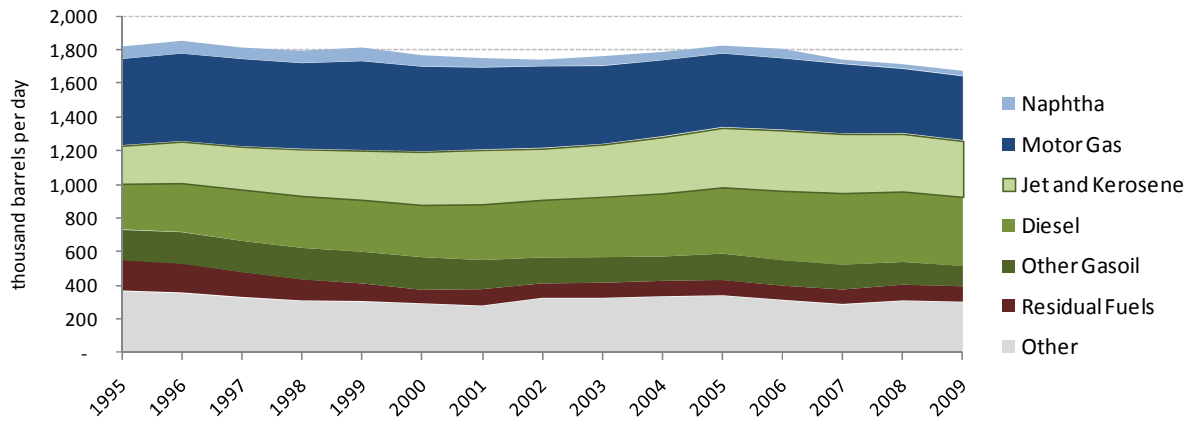
Oil Demand in 2009 (kb/d)

LPG and Ethane	156
Naphtha	22
Gasoline	370
Kerosene	342
Diesel	446
Heating/other Gasoil	103
Residual Fuels	73
Other Products	156
Total Products	**1,667**

Source: IEA Monthly Oil Statistics

Oil use has grown ever more concentrated in the transport sector, representing around 70% of total oil demand in 2009, compared to just 58% in 1990 and 66% in 2000 (see Figure 15 in the Oil Demand Restraint section below).

Oil Consumption by Product



Source: Monthly Oil Statistics, IEA

Taxes and maximum price mechanism

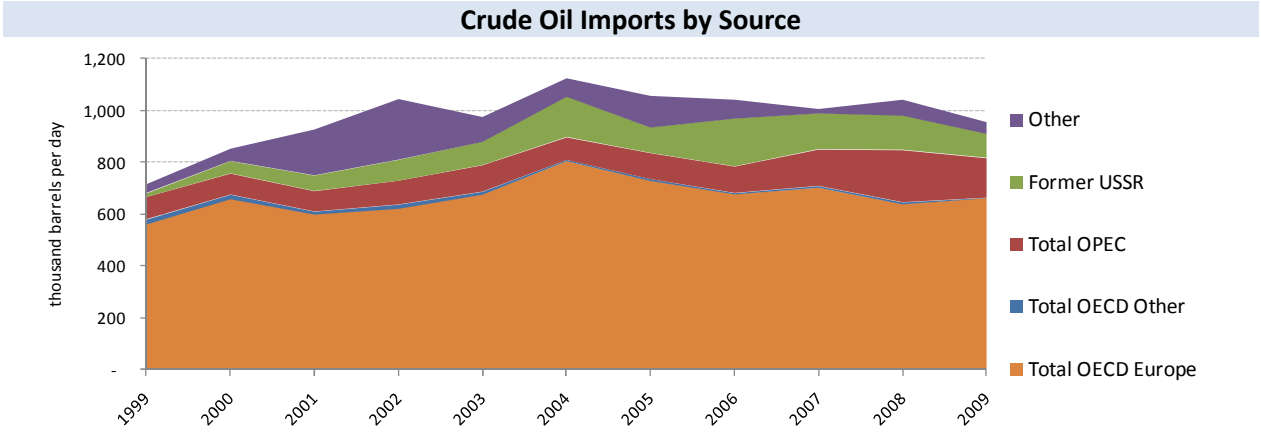
The British oil market is fully open. Imports, exports, trade and prices are free. The government intervenes only to protect competition and to avoid abuse of dominant positions. Excise duty is the only duty on motor fuels, although VAT is charged on non-commercial usage. Unlike in most countries in Europe, since late 2006, there is no differential between taxes on gasoline and diesel.

As a result of this tax regime, the United Kingdom has suffered less from the "dieselisation" phenomenon that has affected the vehicle fleets of many European countries over the last decade. As such, although the United Kingdom also suffers from a mismatch of refinery output and demand (excessive volumes of gasoline, and rising diesel imports), this mismatch is less acute than in other European countries.

Imports/exports and import dependency

Since 2005, the United Kingdom has been a consistent net importer of crude oil, with net imports accounting for 12% of the crude oil refined in the United Kingdom in 2009. The majority of the United Kingdom's crude oil imports are sourced from Norway, with most of the remaining imports sourced from Russia, Algeria and Venezuela.

The United Kingdom usually exports over 60% of the oil produced. Key export markets are the United States and EU countries. The United Kingdom produces a light/high quality crude oil, but imports some lower quality, heavier grades of crude oil, such as those produced in the Middle East and in Africa, to produce a complete range of oil products from light spirits to heavy bitumens. This does expose the United Kingdom to disruptions in the international supply of oil, although to a lesser extent than other countries that are more import-dependant.



Source: Monthly Oil Statistics, IEA

The projections from the Department of Energy and Climate Change (DECC), published in the UK Low Carbon Transition Plan of 2009, indicate that the United Kingdom's net imports of oil are expected to increase over the next two decades, as indigenous production continues to decline. UK consumption of oil is expected to decline marginally (by 2015, a 3% decrease from 2008 levels, increasing to a 5% fall by 2020), abetted by government measures set out in the Low Carbon Transition Plan designed to improve the efficiency of the vehicle fleet, increase the use of alternative transport fuels (e.g. biofuels and electricity) and change transport behaviour (*e.g.* greater use of public transport, eco-driving, etc). While these measures will help limit the extent of reliance on oil, they will not be sufficient to prevent the United Kingdom from becoming significantly more import-reliant over the next two decades. Imported oil could be accounting for around 44% of the United Kingdom's consumption of oil by 2020. In the absence of the impact of the measures set out in the Low Carbon Transition Plan, this figure would be 47%. This will have a significant impact on the United Kingdom's oil security.

The United Kingdom has a significant refining industry, with a total crude distillation capacity of 1.79 mb/d[1]. It produces more refined petroleum products than it consumes and is therefore a net exporter of refined products. As a result, net imports of total oil (primary oils plus petroleum products) accounted for around 12% of the United Kingdom's oil consumption in 2009.

Based on this level of refinery capacity, the United Kingdom has the potential to remain a net exporter of refined products for the next two decades. However, a mismatch between the United Kingdom's refinery mix and its petroleum product demand means that the country is currently (as of early 2010) a net importer of aviation turbine fuel (around half of which is imported from the Middle East) and gas/diesel oil (the majority of which come from EU and FSU countries), while it is a net exporter of fuel

[1] does not include the 100 kb/d Teesside refinery, which Petroplus converted into a storage terminal in 2009

oil and gasoline. In the future, aviation fuel and diesel are likely to increase their share of the United Kingdom's oil mix. The UK petroleum industry will face a decision as to how much to invest in altering its refining capacity to meet this trend and how much to rely on imports.

Oil Company Operations

Petroleum products are trucked from the distribution terminals to final consumers (such as road fuel sites) or on to commercial depots for further distribution. About 800 to 1000 large tankers are in use in the United Kingdom to supply the network of retail stations, with most of these tankers owned and operated by sub-contracted haulage companies rather than by the oil companies directly. The average road tanker carries 40 000 litres of fuel (around 30 - 35 tonnes).

The commercial and domestic fuels markets are supplied by around 200 fuel distributors. The majority are independent companies separate from the refining industry and fuel suppliers, although one, Total Butler, remains a wholly-owned subsidiary of Total UK Ltd.

At the end of 2008, there were 9 283 retail filling stations in operation in the United Kingdom selling Motor Spirit and DERV fuel (data comes from the Energy Institute's Retail Market Survey based on data collected by Experian Catalist). This is 50% of the number of filling stations in operation in 1990. Roughly 1 250 are owned by super/hypermarket companies and about 1 670 are owned by the major suppliers (BP, Chevron, Esso, Murco and Shell). Around 4 000 additional sites are owned by independent dealers selling branded fuel under franchise agreements, with a further 2 400 dealer-owned sites marketing fuels under local or regional fuel suppliers' brands (*e.g.* Gulf, GB Oils, Pace, Power and Maxol). Of these sites, many of the supermarket sites have higher throughput (> 3.5 million litres/year) and have led to the supermarkets supplying about 40% of the retail fuels market.

The majority of these retail sites are supplied from primary distribution terminals operated by the six major oil companies that operate in the United Kingdom, although independent traders and fuel suppliers (e.g. Greenergy, Harvest Energy and Mabanaft) are of increasing importance and have secured significant supply to the supermarket chains with imported product.

2.2 Oil Supply Infrastructure

Refining

There are eight major refineries and three smaller refineries in the United Kingdom, with total distillation capacity standing at 1.79 mb/d (88 million tonnes) at end-2010, including notable reforming, cracking and conversion capacity. The refining sector has traditionally been the preserve of vertically integrated oil companies, but since 2000, merchant refiners and private equity firms have acquired assets in the country. The small refiners at Harwich, Eastham and Dundee have relatively small production capacities and are dedicated to specific products, e.g. solvents, process oils or road-making materials. Data for refinery capacity are collected annually by the ministry (DECC) from individual oil companies.

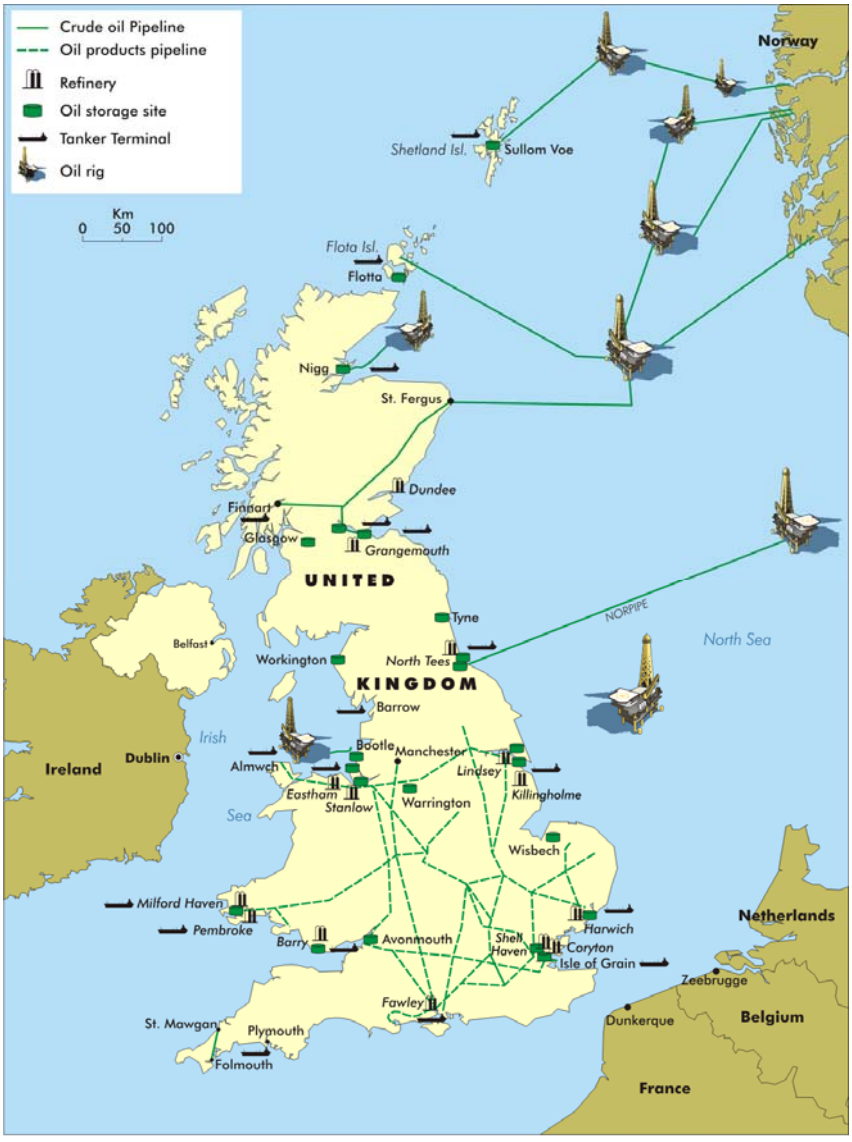
There have been significant ownership changes within the refining sector, including numerous asset sales (notably by the oil majors). In February 2009, Petroplus announced an economic shutdown and strategic review of operations at their Teesside refinery. Because of the poor outlook for refining margins in the upcoming years, the UK Administration has expressed some concern about potential closures.

UK refineries have sufficient capacity to produce more than enough of the country's needs for motor gasoline. However, the United Kingdom imports significant quantities of gas/diesel oil and aviation kerosene fuel due to strong demand for these products.

Ports and Pipelines

There is an extensive network of private- and Government-owned oil pipelines in the United Kingdom, with around 4 800 km of pipeline in use, as of 2010. They are used both for short distance transport (*e.g.* from jetty or import terminal to storage terminal or refinery) and over long distances (*i.e.* cross country) to supply inland distribution terminals.

Oil Infrastructure Map



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

The 2 400 km of privately-owned UK pipeline network carries a variety of oil products, from road transport fuels to heating oil and aviation fuel. These often comprise single pipelines that distribute several different products using batch flows, *e.g.* a volume of petrol being followed by a volume of gas/diesel oil, etc. The network provides an efficient and robust distribution system across the United Kingdom and directly provides jet fuel to some of the UK's major airports, including Heathrow, Gatwick, Manchester and Birmingham. The Government also operates a separate oil pipeline system - the

Government Pipeline and Storage System (GPSS), supplying a number of military airfields and with connections to some commercial airports, for example, Stansted and Manchester.

Pipelines also connect the United Kingdom to offshore North Sea oil and gas production (both from domestic fields and from Norwegian fields).

There are four major land-based port terminals through which approximately two-thirds of the United Kingdom's crude oil production flows. They are: Sullom Voe (Shetlands), Flotta (Orkneys), Forties (Northeast of Aberdeen) and Teesside on the East Coast. There is one other mainland terminal, Hamble, which deals with oil coming from several onshore oil fields in the South of England, including production from the largest of the United Kingdom's onshore oil field, Wytch Farm. These terminals supply UK refineries with over a third of their crude oil supplies each year. The crude oil terminals do have some storage facilities associated with them, but these tend to be limited in size.

Storage capacity

Refineries contain the main storage facilities for crude oil and oil products in the United Kingdom, and therefore represent one of the major locations of the UK emergency oil reserves. Additionally, there are major product distribution terminals which are self-contained, separate storage and distribution facilities, linked to refineries either by rail or pipeline. Altogether, these refinery and stand-alone terminals comprise a total of 64 larger-scale distribution terminals. These terminals supply products either directly to final consumers (such as individual petrol retail stations) or to commercial depots (which manage further distribution). The major distribution terminals usually handle higher capacity deliveries using large-size tankers. Commercial depots cover smaller scale deliveries, such as those to depots owned by road haulage companies and used as central supply points for their own vehicles.

Finished petroleum products are distributed from the refineries to around 60 major distribution terminals in the United Kingdom by pipeline (51%), sea via coastal tankers (34%) or rail (15%). Some of the coastal terminals also import finished products from abroad. As no company has refineries or terminals close to every major area of consumption, it is common practice to minimise distribution costs by collecting products from other companies' refineries or terminals under exchange transactions.

2.3 Decision-making Structure for Oil Emergencies

The Department of Energy and Climate Change (DECC) has Lead Government Department (LGD) responsibility for coordinating the response to major incidents for a number of key services and industries. These include upstream oil and gas, downstream oil, electricity and gas supplies, civil nuclear accidents and UK response to overseas nuclear accidents.

Within the Ministry, the DECC Energy Resilience Team (ERT) serves as the National Emergency Strategy Organisation (NESO). This team is responsible for maintaining and implementing emergency response measures in an oil supply disruption and also for supervising the guidelines companies are required to follow with regards to security of natural gas supplies. Its responsibilities also include collecting data and monitoring the domestic oil and gas markets, and industry's compulsory oil stockholding.

The Energy Act 1976 is the legal basis for emergency policy; it provides the principal statutory authority for NESO and recognises the UK obligations under the Agreement to the International Energy Program. A key component of the UK emergency response system is the joint industry and government response team. In the event of an international crisis, DECC can also call upon industry experts. Industry would be closely involved through the UK Petroleum Industry Association (UKPIA), with representation at both chief executive and technical levels.

The UK Administration has two key policy measures in place for responding to an emergency: 1) the lowering of stock holding obligations on industry, and 2) demand restraint policies (authority derived from the Energy Act 1976). In the context of the IEA-coordinated collective action in 2005, the United Kingdom contributed to the collective action by lowering its stock holding obligation on industry.

2.4 Stocks

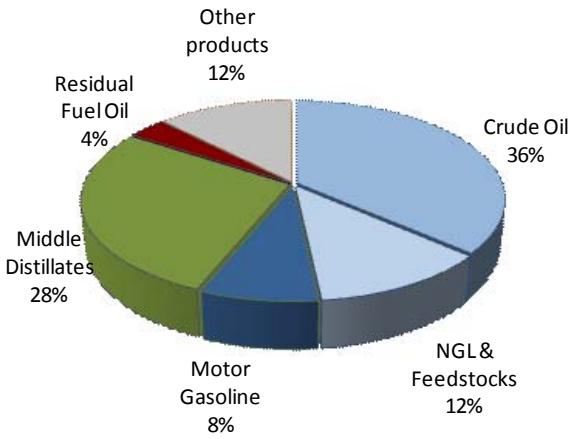
Stockholding Structure

The United Kingdom does not have a public stockholding agency and does not hold public stocks. The country's minimum stockholding requirements are met by placing obligations on industry.

Section 6 of the Energy Act 1976 allows the Secretary of State for Energy and Climate Change to give directions to businesses producing, supplying or using petroleum products within the UK market, requiring them to hold minimum levels of oil stocks. Obligated companies must ensure that they are compliant at all times in each of three separate product categories (based on the country's current EU stockholding obligations): motor spirit and gasoline-based aviation fuels, middle distillates (gas oil, diesel oil, kerosene and kerosene-based aviation fuels) and fuel oils. In the event of an emergency, the Secretary of State for Energy and Climate Change has the power to force obligated companies to release part or all of their obligated stocks to the market.

Companies that supplied petroleum products to the inland UK market (production and net imports) in the previous four calendar quarters have a stocking obligation. These stocks are co-mingled with company operating stocks. Other stocks, predominantly stocks held offshore, also contribute towards the UK total. In both cases, obligated companies bear the totality of the operating cost of this system. The Government revised how it attributes stockholding obligations in 2007-2008.

Total UK Oil Stocks by Type
End September 2010



Source: Monthly Oil Statistics, IEA

Crude or Products

Crude oil and other feedstocks may be counted towards the stock obligations in accordance with directions by the authorities. Blending components (including naphtha where applicable) are counted directly on a tonne-for-tonne basis towards the three EU product categories.

Roughly a third of the stocks held in the United Kingdom are in the form of crude oil or feedstock.

Location and Availability

There are no restrictions on the location of compulsory stocks in the United Kingdom. However, companies must report, on a monthly basis, the location of all stocks held towards an obligation. Compulsory stocks are not held separately from commercial stocks.

Compulsory stocks can be held in three ways:

- by the company itself in the United Kingdom;
- by third parties, on behalf of the company, within the United Kingdom; or

- by the company, by an affiliate or by third parties in another EU member state, provided that the stocks concerned are recorded and held under a bilateral agreement between the United Kingdom and the relevant member state.

The United Kingdom has formal bilateral agreements with Denmark, Ireland, Sweden and the Netherlands, as well as informal agreements with France and Belgium. Companies wishing to have stocks held for them overseas must notify DECC in writing.

Companies holding stocks abroad under bilateral agreements must have plans in place to repatriate such stocks in case of an emergency, thereby ensuring that those stocks would be available in the United Kingdom as soon as reasonably possible. The emergency plans would be stipulated in any consent given by the UK government to the stocks being held under the relevant bilateral agreement.

Monitoring and Non-compliance

The United Kingdom has been consistently compliant with its IEA stockholding obligations. Prior to 2006, the United Kingdom was a net importer, and as such, had no stockholding obligation to the IEA.

Petroleum companies and importers submit monthly oil returns to DECC. Information provided on these forms is used to monitor obligated companies' compliance. Tickets and bilateral agreements are cross-checked with DECC's own records and other companies' returns. Data anomalies are discussed and resolved. A compliance report that also shows inconsistencies (data missing or misreported) is then sent to each company monthly. Both the data systems that produce the data returned to DECC, and the physical stocks, are subject to audit.
In cases where there is a failure to comply with the regulatory powers, DECC has a number of powers under Schedule 2 of the Energy Act 1976 to help ensure compliance. These powers include prosecution for significant non-compliance.

Stock Drawdown and Timeframe

A decision about compulsory stock drawdown in the United Kingdom would lie with the Department of Energy and Climate Change (DECC), in consultation with Cabinet colleagues. DECC officials would liaise closely with the IEA, the European Commission and other member countries to agree on the actual emergency measures to be taken, how they would be implemented and the volume of oil involved.

For the United Kingdom, the initial measure implemented is likely to be stockdraw, implemented by a reduction in companies' obligations to hold stocks. Companies would be asked to decide upon their individual implementation plans and advise DECC. Stocks will be expected to be drawn down within an agreed time frame (probably one month). DECC would always prefer to proceed by consent; however, if company-specific implementation plans cannot be agreed, DECC would use its legal powers to direct companies to release stock. The price of the stock released would be determined by their market value at that time.

DECC would monitor stock reporting by compulsory stockholders and advise the IEA of progress. The monitoring process would generally be on a monthly basis although more frequent reporting (weekly) could be required, dependent on the situation. Using these data, DECC would also determine if the stockdraw has been successful and liaise directly with any company unable to meet the stockdraw targets.

At the conclusion of an emergency response, DECC would advise compulsory stockholders when the stockdraw is no longer required (following decision by the IEA) and agree on a reasonable timeframe for companies to rebuild stocks.

Financing and Fees

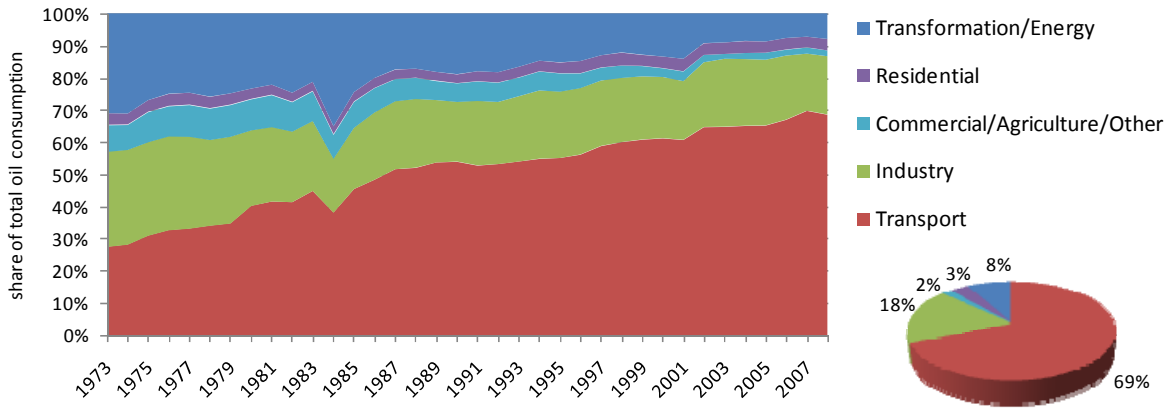
The costs of compulsory oil stocks are financed by the companies operating in the market, and thus implicitly passed on to consumers through market prices.

3. Other Measures

3.1 Demand Restraint

The transport sector makes up the vast majority of oil consumption in the United Kingdom, representing 69% in 2009. Thus the likely, most effective demand restraint measures would be targeted at the use of transport fuels.

Oil Consumption by Sector[2]



Source: Oil Information, IEA

Under the Energy Act 1976, the UK government has the authority to control the production, supply, acquisition and use of oil and oil products, as it deems necessary. In principle, the United Kingdom seeks to allow market mechanisms to resolve temporary disruptions as much as possible. In a disruption requiring government action, light-handed measures are preferred; more heavy-handed demand restraint and allocation measures would be unlikely. However, should a serious crisis emerge, these could be introduced as necessary.

Demand restraint measures in the United Kingdom are set out in the National Emergency Plan for Fuel (NEP-F). A number of measures can be considered as part of an emergency response to any situation involving fuel supply disruption, ranging from light-handed measures to the allocation and rationing of oil products.

Demand Calming Measures cover a series of sensible measures that consumers could use to reduce consumption of petroleum products at any time. These would be communicated to the general public according to prepared plans for dissemination (including media involvement) to ensure that adequate and appropriate information is available to the public, as well as to suppliers and retailers.

Maximum Purchase Scheme (MPS) is a process to restrict the amount of fuel that retail customers may purchase at any one time. The MPS has three main purposes:

- To quickly conserve the fuel available at sites by restricting supply to customers at times of very high demand, thereby ensuring as wide availability of fuel as possible;

[2] Total Consumption (including refinery consumption), does not include international marine bunkers.

- To provide fair allocation of fuel to customers, if there are long-term shortages of transport fuels; and
- To encourage drivers not to keep their fuel tanks fuller than they normally do.

FSM measures would be introduced under the emergency powers in the Energy Act 1976, which also provides for the imposition of criminal penalties upon parties that do not adhere to FSM measures.

Designated Filling Stations (DFS) provides defined customers with priority access to road transport fuels. DFS would be introduced under the emergency powers of the Energy Act 1976. DECC would implement the scheme by designating a number of filling stations for the provision of fuel for priority use only, under both the Utilities Fuel Scheme and Emergency Services Scheme. Fuel suppliers would be instructed to give priority deliveries of fuel to these sites. If the DFS is implemented, DECC would publish a list of the DFS locations on its website.

Priority Schemes make provision for emergency services and other defined responders (such as utility companies) in an emergency. Truck stops would also be prioritised to refuel heavy goods vehicle fleets needed to support the movement of food and health products. These schemes would be implemented in conjunction with DFS, as a process to control the supply of road transport fuels to a defined number of UK filling stations that will receive supplies for priority use only. Unlike the previous priority use scheme, these schemes work on the basis of identification by vehicle type and logo rather than driver-based pre-registration. The purpose of priority schemes is to make the best use of reduced quantities of fuel to minimise the impact on emergency and other essential services that underpin daily life. The schemes would be introduced quickly. The priority schemes would be introduced under the emergency powers in the Energy Act 1976, which also allows for the imposition of criminal penalties if it is found that fuel products supplied for priority use are used for other purposes.

Bulk Distribution Scheme provides a framework for the allocation and prioritisation of fuels to bulk customers of petroleum fuels. The scheme applies to all petroleum fuel consumed within the UK inland market in the following product groups: petrol, diesel, burning oil (kerosene), gas oil, fuel oil, LPG, and marine and aviation fuels (UK allocation for Priority Use).

The bulk distribution scheme applies to individual grades of fuel. Hence, if there is no supply or distribution problems of a particular grade(s) of fuel within any given region, that grade(s) should be available as normal. The scheme does not apply to international marine and air bunkering, in which case IEA-determined criteria would apply; however, the scheme does cover domestic allocation of marine and aviation fuels.

3.2 Other measures (Fuel Switching, Surge Production)

The UK Administration would not resort to surge production or fuel switching measures in an oil emergency.

Nevertheless, the relevant powers for surge production are available under the Energy Act 1976, but the UK Administration would not propose to force increased production. Indigenous UK oil production is assumed to be operating at maximum economic rates. Therefore, the Administration would not generally consider surge production since this could damage oil fields and reduce their long-term viability.

As oil-fired electricity generation in the United Kingdom is minimal (1.6% in 2009), the scope for fuel-switching is limited. Some 15 Combined Cycle Gas Turbine power stations have stocks of middle distillate to provide back-up generation ability in order to keep functioning for up to seven days in the absence of gas supply.

4. Natural Gas

4.1 Market Features and Key Issues

Gas production and reserves

Since the 1970's, the United Kingdom has progressively developed large offshore gas fields. Most of these reserves occur in three distinct areas: associated fields on the UK Continental Shelf, non-associated fields in the Southern Gas Basin, located adjacent to the Dutch sector of the North Sea, and non-associated fields in the Irish Sea.

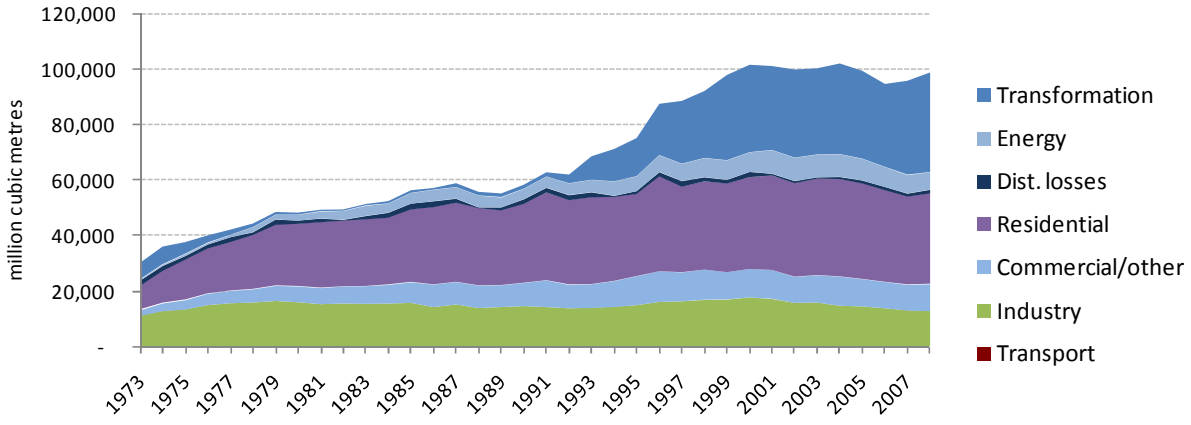
Production peaked in 2000 at 115 bcm, and has steadily declined, standing at around 62 bcm in 2009. Gas production is expected to decline by a further 38% by 2020, according to current UK Administration forecasts.

Gas demand

In order to take advantage of its domestic reserves, the UK government encouraged the use of natural gas, including its substitution for coal and oil in industrial consumption and electricity production. As a result, from 1990 to 2008, demand for natural gas grew by 70%, at an average annual rate of 3%, increasing from some 58.3 billion cubic metres (bcm) to just over 99 bcm, before declining again to 90.7 bcm in 2009 amidst the economic downturn. The bulk of the additional demand has come from the transformation sector (due to a significant increase in gas-fired power plants), which accounted for 37% of total demand in 2008[3]. The residential sector is the second biggest source of demand, accounting for 33% of gas demand in 2008.

Natural gas is the largest source of fuel for the electricity generated in the United Kingdom, accounting for 44% of total power generation inputs in 2009.

Natural Gas Consumption by Sector



Source: Natural Gas Information, IEA

In the longer term, natural gas will remain an important, but declining, part of the United Kingdom's energy mix. Gas will continue to be important in the domestic and industrial sectors, but its use in electricity and heat generation will decline in favour of renewable energies, and consumption is also likely to fall as a result of improvements in energy efficiency. By 2015, consumption is likely to fall by 13% from 2008 levels, and could fall by around 14% to 27% by 2020. However, domestic production will

[3] Sector-by-sector breakdown of demand unavailable for 2009 at the time of writing

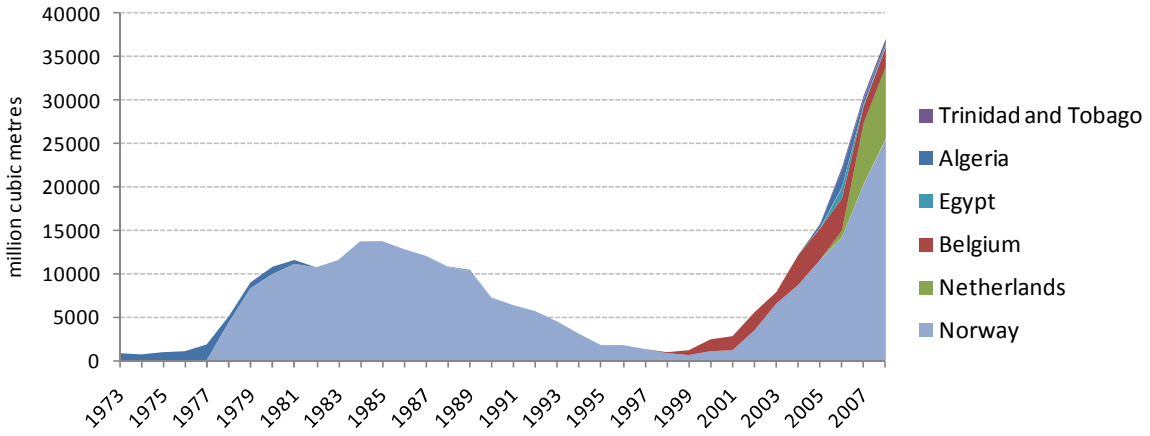
drop by more than 45% over the period to 2020, meaning that the United Kingdom's import dependency will rise sharply.

In assessing the United Kingdom's emergency preparedness, it is important to consider potential crises during moments of peak demand. The National Grid's estimated 1-in-20 maximum daily winter demand stands at around 500 mcm/d. This is over 80% percent above the annual average (circa 100 bcm in 2008, or 273 mcm/d). The United Kingdom experienced exceptionally cold weather in December 2009 and January 2010, and the country experienced record peak demand levels of between 450-470 mcm/d. In January 2010, the tightness of the UK market was exacerbated by supply problems on the Langeled pipeline from Norway, resulting in the United Kingdom issuing four *Gas Balancing Alerts* (GBA) in a row – the only precedent for a GBA having been during the closure of the United Kingdom's largest storage site (Rough) in 2006 due to a fire. In December 2010, two Gas Balancing Alerts were issued because of exceptionally cold weather.

Gas import dependency

The United Kingdom has been a net importer of gas since 2004; in 2009, net imports accounted for 31% of consumption. This percentage of the total gas consumption will increase, and demand is expected to be more volatile than at present, with peaks of demand during cold, still periods when gas-fired generators will be supplying a high proportion of the electricity required. The latest DECC projection, published in the UK Low Carbon Transition Plan, is that by 2020, net imports of gas could account for 45% of the United Kingdom's gas consumption. In the absence of the renewable energy target, this figure would be 54%.

Natural Gas Imports by Source



Source: Natural Gas Information, IEA

From abroad, the United Kingdom also receives pipeline gas supplies from Norway (23.5 bcm in 2009, via the Langeled pipeline), the Netherlands (6.5 bcm in 2009, via the BBL pipeline) and Belgium (1.4 bcm in 2009, via the Interconnector). The United Kingdom also has four LNG import terminals, which can source natural gas from numerous overseas exporters.

Gas company operations

The UK natural gas sector is privately-controlled, including production, distribution, and transmission. The largest gas supplier in the United Kingdom is Centrica, a spin-off of the assets of formally state-owned British Gas. National Grid controls the domestic gas transmission system.

4.2 Natural Gas Supply Infrastructure

Ports and Pipelines

There are four main pipeline systems in the United Kingdom that carry natural gas from offshore platforms to coastal landing terminals.

The United Kingdom's gas network is linked internationally to Norway (incoming flows from North Sea fields), Ireland (outgoing flows), Belgium (reversible flows) via the (Zeebrugge-Bacton) Interconnector and the Netherlands (incoming flows) via the (Bacton-Balgzand) BBL pipeline.

Gas Infrastructure Map

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

The extent and diversity of gas import capacity, and the diversity of sourcing of imports helped to ensure that the British gas market was not heavily affected by the Russia-Ukraine dispute in January 2009. In January 2010 however, during a period of exceptionally strong gas demand due to cold weather (which coincided with technical problems on the Langeled pipeline from Norway), there were some constraints in local distribution pipelines due to very high demand for gas from domestic consumers. This affected gas supply to industrial end-customers, resulting in the temporary cutting of interruptible contracts and fuel switching to coal (of note, these consumers received a discount on their transportation charges in return for their supply being interruptible). The UK Administration indicates that National Grid issued "Gas Balancing Alerts" over eight days. These alerts enabled the market to

adjust, including fuel switching within the power generation sector, and there was no impact on consumer supplies or prices.

The United Kingdom has four LNG import terminals, which can source natural gas from numerous overseas exporters, namely Teesside GasPort (capacity 4 bcm), Isle of Grain (capacity 13.5 bcm), South Hook Milford Haven (21 bcm) and Dragon LNG (6 bcm). More LNG import capacity is planned at Dragon and Isle of Grain. The UK Administration indicates that the United Kingdom's gas import capacity has increased by a factor of 5 over the last decade. Peak gas import flows over the past four years stand at around 340 mcm/d (or some 72% of estimated peak demand for 2009/2010).

Before 1997, Northern Ireland was not connected to the rest of the United Kingdom's gas supply. The construction of a natural gas pipeline from Portpatrick in Scotland to Northern Ireland was completed in 1996 and provided the means of establishing such a system. The initial market was Ballylumford power station, which was purchased by British Gas in 1992 and converted from oil to gas firing (with a heavy fuel oil back up). A second gas-fired power station was built at Coolkeeragh in 2005. The onshore line has been extended to serve wider industrial, commercial and domestic markets, and this extension is continuing. In late 2007, the South-North gas pipeline was completed, to allow gas to be imported to Northern Ireland from the Republic of Ireland. Around 80% of all gas supplies in Northern Ireland were used to generate electricity. There are also two gas interconnectors from Scotland to the Republic of Ireland.

Storage

The United Kingdom historically had less need of gas storage capacity than other major gas markets within the European Union[4] because of "swing production capacity" provided by indigenous gas fields. As these fields age and lose their swing capability, there will be a need for replacement "swing supply capacity", including from additional gas storage capacity. The United Kingdom's gas storage capacity expanded from 3.5 bcm in 2000 to approximately 4.4 bcm in 2010.

The maximum daily deliverability from storage is 124 mcm/d. This is less than 30% of the peak demand estimate (500 mcm/d) or the highest actual demand (465 mcm/d) in January 2010. The United Kingdom's peak supply capability is in excess of its peak demand at present, notably thanks to its domestic production levels. However, the progressive decline in domestic production, combined with potentially increasing peak demand (with gas being used as a back-up for the growing share of renewable energies in the power generation mix), will stretch the ability for current infrastructure to balance peak supply and demand in the future.

As of early 2010, additional LNG import capacity is under construction, at South Hook. More generally, there is strong commercial interest in providing additional gas storage capacity. Some 22 commercial gas storage projects are announced.

4.3 Emergency Policy for Natural Gas

The United Kingdom has a market-based regulatory regime that encourages demand and supply to balance in the most efficient and low cost way. The framework primarily uses the price mechanism to balance demand and supply and to give signals to market participants about consumption and investment decisions. However, the framework does not rely on price signals alone. Indeed, gas shippers must balance their gas supply/demand on a daily basis, and National Grid (the gas transmission and pipeline network operator) is responsible for residual gas balancing.

[4] The storage capacity of other major European gas markets in relation to the United Kingdom's is as follows: United Kingdom: 4.4 bcm, France: 12 bcm, Germany: 20 bcm, Italy: 13 bcm.

The United Kingdom's gas market has experienced a number of testing events in recent years. In February 2006 a fire at the Rough storage facility (the country's largest storage site) caused supplies to be tight. In January 2009, gas flows from Russia into Europe were disrupted due to the Russia-Ukraine dispute, causing shortages in some EU Member States. The United Kingdom, which receives little or no gas directly from Russia, remained well supplied due to its access to gas from diverse sources via diverse routes, but UK gas was diverted to Europe to replace lost Russian gas. In January 2010, exceptionally cold weather (coinciding with disrupted flows from Norway) caused bottlenecks on the UK distribution network due to increased demand, and National Grid issued *Gas Balancing Alerts* over eight days, bringing in extra supplies from the North Sea, Belgium and the Netherlands by pipeline, and by tanker as LNG (there was a minimal impact on price, and supplies to all customers were maintained, except for some companies on interruptible contracts).

In the event of a major gas supply emergency, both industry and government have significant roles to play in managing the incident and its consequences. The gas companies would be responsible for the practical and operational management of the incident in order to ensure that the situation is contained, managed safely and effectively recovered. The companies have well-established plans and procedures in place to achieve this, which can range from the management of a moderate supply deficit to restoration from a major loss of gas supplies impacting on domestic consumers.

The gas companies manage complex operational situations on a day-to-day basis and have plans and contingencies for dealing with abnormal events. Although major supply emergencies can occur either very suddenly or as a result of a developing situation, it is highly likely that the companies will have taken independent action to mitigate or manage the incident before government becomes involved.

The role of government is to understand and manage the wider consequences that may arise from a major gas supply emergency. In most situations, DECC would be the lead government department, with responsibility for liaising with the Cabinet Office and other government departments to ensure that details of the incident are communicated. This could include the protection of vulnerable people, managing civil unrest and the provision of advice to services such as hospitals and schools. In some circumstances, local and regional resilience plans may need to be activated.

Special Powers under the 1976 Energy Act are available to the Secretary of State, and can be used to direct certain actions, such as the use and stocking of fuels, or to maximise the volume of gas produced and brought ashore.

The successful management of a major supply emergency will require effective communication and cooperation between industry and government. For example, industry will have the most up-to-date information on the incident, which government will require in order to determine the actions it needs to take. Similarly, some of the wider consequences of an incident could be mitigated by the choices that industry is able to make, and some of the practical aspects of managing an incident could be assisted by the activities of government. This National Emergency Plan sets out a framework for industry and government to work together to manage a major supply emergency.

Emergency Measures

The United Kingdom does not have a distinct category of "strategic gas storage", held by the Government or industry and reserved for use in an emergency.

The National Emergency Plan for Gas & Electricity (NEP-G&E) sets out the arrangements between the gas and electricity industries and DECC for the safe and effective management of gas and electricity supply emergencies. The NEP-G&E could involve the use of Emergency Powers under the Energy Act 1976, which would only be activated in significant emergencies. The plan applies to:

- The electricity supply network from generator to consumers' meter or electricity supply terminal in Great Britain; and
- The downstream gas supply network from reception terminal or storage site to customer isolation valve in Great Britain.

Gas and electricity supply emergencies in Northern Ireland are covered by separate arrangements.

The Electricity Supply Emergency Code enables DECC to direct Electricity Distribution Network Operators to impose rotating disconnections under the Electricity Priority User Arrangements, whereby those non-priority consumers would be subjected to interruptions in electricity supplies for periods of three hours at a time for one or more periods per day, depending on the level of demand reduction required at the time. This could be implemented locally or across the whole of the island of Great Britain.

For gas emergencies, the Network Emergency Coordinator would direct the Gas Distribution Networks to achieve demand reductions. This is done under industry arrangements independent of the NEP G&E. It would be achieved by directing large industrial users of gas to either cease all use of gas or, for protected sites under the Gas Priority User Arrangements, to reduce their demand for gas significantly, with the aim of maintaining safe minimum pressures within the gas network. The last customers to be affected would be domestic premises.

The United Kingdom's power sector is quite flexible. Fuel switching is possible for those gas-fired generators (CCGTs) that have 'distillate' (oil) back-up. There are a number of reasons why CCGTs might invest in distillate back-up:

- To provide 'black start' services to the grid, i.e. the ability to start without offsite power;
- As insurance against interruption if they opted for an interruptible contract with their supplier;
- As insurance in the event of a major disruption in gas supplies even if they are on a 'firm' (non-interruptible) contract;
- To take advantage of times when gas prices are high and use of distillate is more economical.

At present, there are 15 CCGTs with distillate back-up. National Grid estimates that these CCGT plants have an overall capability of 5.3 GW and their combined gas use per day comes to around 12 mcm/day.

There are commercial incentives to invest in fuel-switching capability, like the discount for accepting an interruptible shipper contract (rather than a firm contract). There has been a fixed discount for distribution network interruptible contracts (as distinct from supplier interruption). However, how the discount is determined is moving to a more auction-based approach that is intended to be more efficient and better reflects the volume of gas on interruptible contracts required by the distribution network. Network interruptible contracts were last called upon in early January 2010, at a time of exceptional demand because of cold weather[5].

In times of market tightness, there are also incentives provided through the price mechanism to reduce the demand for electricity for gas-fired generators through sourcing electricity from other generators, such as coal-fired generators. The importance of the price mechanism in prompting security-enhancing, private sector responses was demonstrated in the winter of 2005-2006, which saw two wholesale price spikes. One spike occurred at the beginning of that winter, due to a cold snap (peaking at over 150 p/therm on the day ahead wholesale market – up from 30-40 p/therm price range the year before the crisis) and another at the end of that winter, due to another cold snap at a time when Rough was not operational (peaking at close to 200 p/therm on the day ahead wholesale market). Key to ensuring that the market balanced at that time were reductions in demand from gas-fired electricity generation – with coal-fired electricity generation replacing CCGTs to some degree and also through fuel switching at CCGTs (*i.e.* use of distillate backup) – and reductions in industrial demand. In the case of the Rough

[5] Of note, transporter interruption can only be used if there are constraints on the transportation network or a gas supply emergency has been declared

storage fire, for example, coal-fired generation rose from around 35% to some 45% of total power generation. However, the Large Combustion Plant Directive will force a significant amount of coal-fired generation to be closed down (some 5-6 GW perhaps, by 2015-2016), thereby reducing the fuel switching abilities of the United Kingdom's power generation system.

Furthermore, the UK government supports a strong push for the development of renewable energies (*e.g.* wind, wave, etc.) as an increasing share of the country's electricity generation, and these renewable fuels (particularly wind) are expected to contribute progressively more to the country's power generation mix in the upcoming years. Whilst commendable from an environmental point of view, the intermittent nature of wind and other renewable sources means that power generation based on these renewables will require additional back-up capacity from hydrocarbon-based generation, and the bulk of this back-up capacity is expected to be gas-fired (particularly in view of the phasing out of coal-fired power plants). Thus, gas is set to play an increasing role in the country's power generation system, particularly in times of low wind. More importantly, volatility of gas demand will increase, due to potential spikes in demand for fuel-switching purposes in the electricity sector. These demand spikes could be met by increased use of interruptible gas contracts or the provision of further supply and storage capacity.

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its mandate is two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply and to advise member countries on sound energy policy.

The IEA carries out a comprehensive programme of energy co-operation among 28 advanced economies, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency aims to:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

IEA member countries:

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Austria
Belgium
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Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Japan
Korea (Republic of)
Luxembourg
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

The European Commission also participates in the work of the IEA.

International Energy Agency

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