CHAPTER 4

Oil, Gas and Coal

In chapter 1 we set out the challenging international context against which the UK needs to maintain the security of its energy supplies. A key feature is the growing global demand for fossil fuels, with damaging implications for climate change. To meet growing global demand for energy, substantial investment will be needed to extract, transport and process primary energy reserves, which particularly for oil and gas, are concetrated in regions that include less stable parts of the world. The UK is expected to remain reliant on fossil fuels for many years and to become increasingly dependent on imports of these fuels from international energy markets.

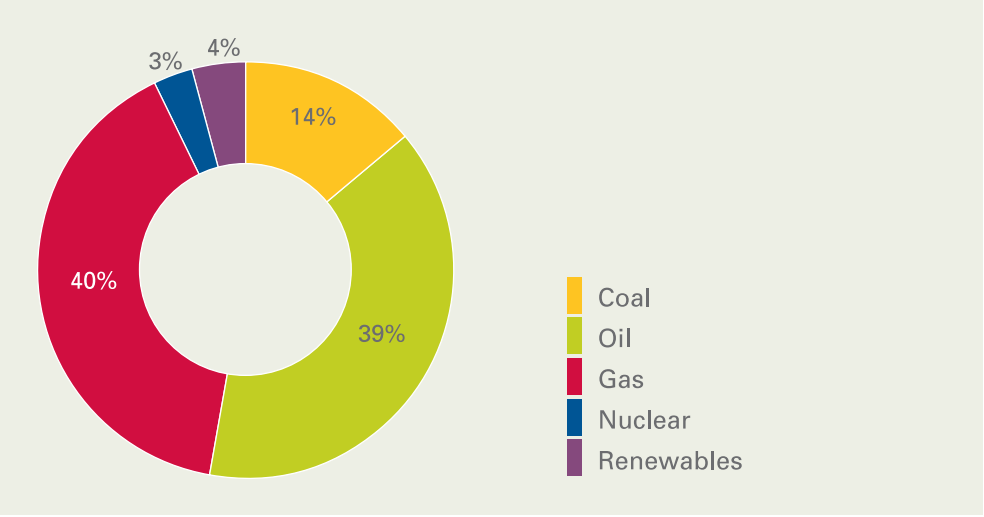
4.01 This chapter:

- Looks at the current UK energy market outlook, the prospects for future energy demand and the need for increasing energy imports;
- describes the UK's strategy to address and manage energy security of supply risks;
- sets out how we will encourage efficient use of fossil-fuels and stimulate production of non fossil fuel energy;
- sets out how we will improve the regulatory and policy framework to ensure we maximise economic recovery of the UK's fossil fuels reserves;
- highlights the role of effective energy markets in delivering security of energy supplies;
- sets out our plans to improve energy market information and analysis of medium-term trends in energy supply and demand;
- sets out our plans to ensure the UK is meeting the challenge of increased gas imports by strengthening the conditions for investment in gas storage and import infrastructure and through changes to the planning and licensing regime; and
- outlines our plans to ensure we have robust emergency planning arrangements.

Current UK energy market outlook

4.02 Today around 90% of the UK's energy needs are met by oil, gas and coal. Renewables and other low carbon technologies will play an increasing role in our energy mix over the longer term; however, fossil fuels will continue to be the predominant source of energy for decades to come. In fact, global fossil fuel resources are still plentiful, and markets are well-developed to deal with increased trade. By 2020, fossil fuels are expected to still supply the great majority of UK energy needs (see Figure 4.1).

FIGURE 4.1 PRIMARY ENERGY DEMAND BY FUELS (2020)[103]



Source: DTI, 2007

4.03 While the UK has benefited from indigenous reserves of oil and gas for many years, as the North Sea matures, we will become increasingly dependent on imported energy. By 2010, gas imports could be meeting up to a third or more of the UK's total annual gas demand, potentially rising to around 80% by 2020 on the basis of existing policies. The UK is also already a net importer of oil, and by 2020 imports could be meeting up to around 75% of the UK's coal demand.

4.04 We therefore need to be confident that the market for fossil fuels, supported by appropriate Government policies, continues to ensure reliable supplies of these fuels at competitive prices to people and businesses (see Box 4.1). We also need to make sure that an appropriate market framework is in place to mitigate the impact of the use of fossil fuels as we move towards a low-carbon economy.

BOX 4.1 DRIVERS OF SECURITY OF SUPPLY

Security of supply requires that sufficient fuel and infrastructure capacity is available to avoid socially unacceptable levels of interruption to physical supply and excessive costs to the economy from unexpectedly high or volatile prices.

Security of energy supplies requires sufficient, diverse and reliable:
- supplies of energy to meet customers' demand;
- capacity on the import, transmission and distribution networks to deliver supplies to customers.

In turn, ensuring these conditions are met requires:
- sufficient investment globally in production, storage and transportation of fuels;

103 Based on DTI projections – for more details, see *UK Energy and Carbon Emissions Projections*, May 2007 www.dti.gov.uk/energy/whitepaper

BOX 4.1 continued

- diversity of supply sources and types of capacity for example storage, import capacity, demand flexibility (e.g. through fuel switching by power stations or large consumers) in order to minimise the risk of large amounts of supply being unavailable at the same time;
- reliability of infrastructure such as producing fields, pipelines, import terminals and the rail network to bring primary fuels into the UK market, especially when demand is high; and
- effective price signals: to indicate where scarce fuels are most valued; to inform short-term consumption decisions that influence demand; and to influence longer-term investment decisions.

In addition, due to the high variability of demand and the inevitable risk of physical outages in some part of the supply chain, flexibility or "spare" capacity on the system is required to act as a buffer in these circumstances. This "spare" capacity can take a number of different forms such as oversized import infrastructure; storage and stocks capacity; or demand-side flexibility.

Our strategy to manage energy security of supply risks

4.05 Whilst imports are not in themselves a threat to security of supply, our reliance on fossil fuels and higher levels of import dependence will bring new associated risks, as the UK will face greater exposure to developments in the global energy system (these risks are highlighted in chapter 1). However, we have a clear strategy to manage these risks.

4.06 Our starting point for addressing these risks must be to reduce our overall energy use through greater energy efficiency. The measures to achieve this are set out in chapter 2. Beyond that we must also support the development and deployment within the UK of non fossil fuel energy to reduce our dependence on fossil fuels and to diversify the range of energy sources available to the UK[104]. This includes renewables and, subject to the consultation being launched with this White Paper, new nuclear power. At the same time, as we will continue to rely on fossil fuels for the foreseeable future, we need to encourage the adoption of low-carbon technologies, such as carbon capture and storage, to mitigate the impact on the climate of the continued use of fossil-fuels. Measures to achieve these are set out in chapter 5.

4.07 Given our own hydrocarbon reserves, the UK can also to some extent reduce its dependence on imported fossil fuels by ensuring that that we maximise economic recovery of the oil and gas from the UK Continental Shelf (UKCS) and from remaining coal reserves.

4.08 However, it is clear that even with these measures we are set to become increasingly reliant on imported energy over the longer term. This

104 Though renewables may bring their own security of supply risks, such as intermittency.

brings exposure to longer supply chains and a wider range of markets, broadening the range of political, infrastructure-related, weather-related and other risks with the potential to affect supplies into the UK.

4.09 Many of these risks are outside our immediate control and cannot be totally avoided. Given the complex interplay of factors that determine the supply of and demand for energy, we believe that well-functioning markets are the best way to deliver security of energy supplies, and to diversify sources, supply routes and import points for energy. With the regulators, we will work to ensure the UK has an effective market framework conducive to investment, supported by improved arrangements for providing energy market information to increase the transparency of the energy market.

4.10 Given the particular risks associated with our increasing reliance on gas, and since it is through pipelines in other EU Member States that our companies need to get much of the gas they need, we will push for the completion of the EU energy market liberalisation. In addition, we will continue to promote efficient, open and transparent energy markets abroad to ensure fair access to gas infrastructure. We have consulted on the robustness of our gas market framework and are publishing our response alongside this White Paper. The consultation was published on 16 October 2006 and concluded on 12 January 2007[105]. We will also propose to legislate and reform the planning and licensing system to ensure timely investment in storage and new import infrastructure and take steps to improve our emergency planning arrangements.

Encouraging energy efficiency and non fossil fuel energy

4.11 Our efforts to improve the energy efficiency of our economy by directly reducing energy demand and by promoting alternative technologies are a key part of helping to ensure security of supply. Government is committed to increasing energy efficiency in the industrial, commercial, public and domestic sectors. Chapter 2 sets out our measures to promote energy efficiency by providing incentives and better information. We also set out our ambition for the roll out of smart meters to allow consumers to become more flexible and responsive to market signals. Government and Ofgem will also continue to encourage consumers to become more flexible and responsive to changes in prices through continued dialogue with market participants.

4.12 There is also potential to reduce our demand for fossil fuels by using fuels more efficiently, e.g. through Combined Heat and Power (CHP), while other distributed energy (DE) solutions could bring forward renewable technologies. The Government wants to remove barriers to the deployment of DE technologies so that they can grow (see Chapter 3).

4.13 In the transport sector, as part of the Government's overall strategy for carbon emissions reduction, we will introduce a Renewable Transport Fuels Obligation. This obligation is designed to ensure that by 2010 at least 5% of all road transport fuel will come from renewable sources, thus reducing the expected demand for oil. Chapter 7 provides more detail.

105 Responses are available on the DTI website at: http://www.dti.gov.uk/energy/review/implementation/gas-supply/cons-responses/page37145.html.

4.14 As outlined in chapter 5, we will also encourage the adoption of low carbon technologies, including carbon capture and storage, and we will support the development and deployment of non-fossil fuel energy, such as from renewable sources, and, subject to the consultation being launched with this White Paper, new nuclear power.

Maximising economic recovery of fossil fuels in the UK

Oil and gas

4.15 The UK still has significant oil and gas resources. While some 37 billion barrels of oil equivalent (boe) have been produced to date, estimates of the hydrocarbons remaining to be produced from the UK Continental Shelf (UKCS) range from 16 to 25 billion boe.

BOX 4.2 OUTLOOK FOR UKCS OIL AND GAS PRODUCTION

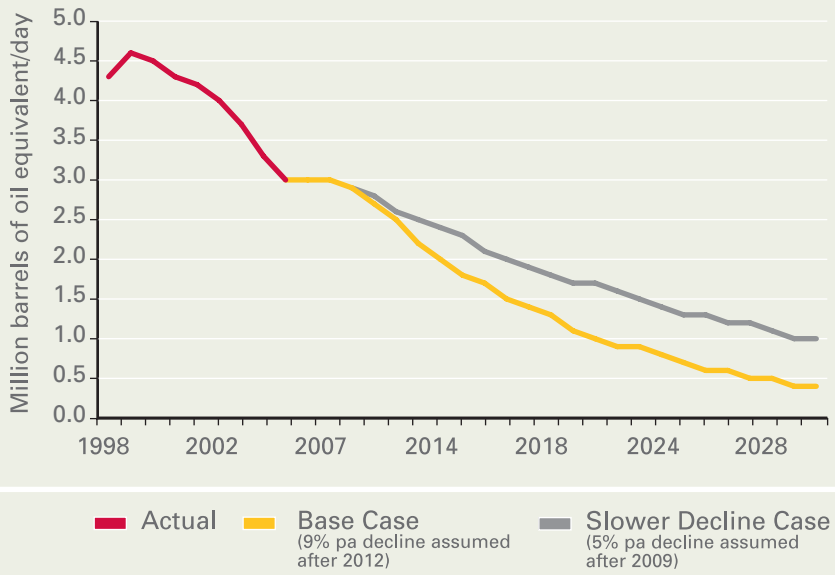


FIGURE 4.2 ACTUAL AND POSSIBLE FUTURE UKCS OIL AND GAS PRODUCTION

Source: DTI, 2007

Total oil and gas production from the UK Continental Shelf (UKCS) peaked in 1999 and has been declining since. If recent trends continue production could fall from three million barrels of oil equivalent (boe) a day now to around 1 million boe a day by 2020. However, if a high level of investment is maintained, the rate of decline could be slowed. This would deliver significantly higher production (an extra 0.6 million boe a day from 2020 to 2030) and, consequently, greater recovery of the UK's remaining oil and gas reserves (4 billion boe extra production by 2030). The challenge is to maintain the competitiveness of the UKCS as it becomes increasingly mature, in order to maximise economic recovery of known and "yet-to-find" reserves.

4.16 If we are to maximise economic recovery of remaining UKCS reserves we must maintain a supportive regulatory environment that attracts a wide range of companies to exploit existing and prospective fields.

4.17 Government is already working closely with industry to boost UKCS investment over the next 10 to 15 years:

- Under the **Stewardship initiative** Government works with individual companies and joint venture groups to identify areas where additional investment would be beneficial and to optimise improvements of mature fields; and
- **PILOT** – the high level industry/Government forum set up in 1999 – has brought forward the introduction of the "Promote" licence and "Fallow" exercise. The **"Promote" licence**, introduced in 2003 encourages smaller companies with limited resources to work up plans to either sell to or bring in other investors. The **"Fallow" exercise**, introduced in 2002, places areas of the UKCS in the hands of those able and willing to exploit it, thereby avoiding unnecessary inactivity.

4.18 As the large fields in the North Sea become fewer there will be a natural progression to multiple smaller developments, of interest to smaller companies or joint ventures. An important part of facilitating this transition will be to reduce and remove the bureaucratic barriers to commercial deal-making. A small group of industry participants, initiated by PILOT, has started to explore how best to rapidly tackle the various issues associated with reducing barriers. In parallel, we will introduce web-based systems for both licence applications and licence assignments which will substantially speed up transactions and reduce costs, especially for smaller firms.

4.19 The Government also recognises that the North Sea fiscal regime has an important role to play in delivering the best possible future for the UKCS through promoting investment and production, whilst ensuring a fair return for the UK taxpayer from our national resources. Since the 2005 Pre-Budget Report the Government has been engaged in discussions with industry on wider structural concerns over areas of the North Sea fiscal regime. A discussion paper was published alongside the Budget 2007 that summarised these discussions and set out the Government's initial conclusions, and the criteria that any changes to the regime should meet[106]. The conclusions included a statement that will alleviate existing industry concerns by clarifying that Government is not attracted to any mechanism that would remove Petroleum Revenue Tax and then rebalance the fiscal regime through an increase in the Supplementary Charge. The discussion paper will now form the basis for further, more focused, discussions with industry over the coming months that will assist Government in its consideration of the issues raised and possible options for further action.

4.20 The growing proportion of smaller independent operators working on the UKCS have also stressed the need to pool knowledge and resources and share outcomes. Supporting the development and deployment of new technology will help address the challenges of exploiting more technically difficult and undeveloped areas of the UKCS.

106 Details available at: www.hm-treasury.gov.uk/media/708/8E/bud07_northsea-222.pdf.

4.21 Following *The Energy Challenge*, we launched a fresh £5 million call for proposals for collaborative R&D projects, with priority given to projects that: identify additional and incremental hydrocarbon reserves; help to access such reserves cost-effectively; sustain and improve existing production from mature fields; and improve environmental performance with specific technology development. DTI will continue to work closely with ITF (the Industry Technology Facilitator – an industry not-for-profit organisation) to effect technology "brokerage" between funding bodies and the industry.

4.22 The measures outlined above will encourage maximum economic exploitation of existing fields in the North Sea. However. there are also areas of the UKCS where some reserves remain untapped. The reserves in the West of Shetland are estimated to represent around 17% of the UK's remaining oil and gas. There is already some oil production in the area – the challenge is to unlock gas potential (about 60 billion cubic metres has already been discovered) in this particularly challenging location. The West of Shetland Task Force, announced in *The Energy Challenge* is a joint industry/Government group which includes DTI, BP, Chevron, DONG Energy, ExxonMobil and Total. It is tasked with finding technical and economic solutions which will allow for infrastructure (including pipelines) to be put in place that could allow gas development and exploration of this area.

4.23 The Task Force is seeking a collective approach that will result in new infrastructure to promote wider development of the area. Four main development scenarios have been identified that have potential to go forward for more detailed analysis. Currently, overall development costs are expected to be in the region of £4 billion and the economics are sufficiently encouraging for the Task Force to consider more detailed technical and commercial assessment of specific options. The economic and technical analysis so far has shown the need to drive down project costs and find additional reserves to underpin any development.

4.24 Commercial agreements will play a major role in the decision to proceed and the Task Force will be actively engaged in finding innovative solutions to the commercial issues. Further appraisal drilling is already underway on Chevron's Rosebank field and, encouraged by the Task Force, Total and their partners are making plans for drilling an exploration target in the Laggan area. The DTI is hopeful that further appraisal drilling, on another discovery in the area, will take place next year. The Task Force anticipates making a report to Ministers in summer 2007.

Coal

4.25 A key driver of UK coal investment is demand from coal-fired generators in the UK. *The Energy Challenge* recognised that coal-fired generation makes an important contribution to the UK's energy security and the flexibility of the UK energy system, while acknowledging that in order to have a long term future its environmental impact must be managed effectively.

4.26 Generators have already committed significant investment to enable 20 gigawatts of existing coal-fired power stations to comply with new EU emissions legislation[107]. Plans for new coal-fired power stations have also been

107 The EU Large Combustion Plant Directive restricts emissions of sulphur dioxide and nitrogen emissions from coal and oil plants.

announced which use state-of-the-art cleaner coal technologies and are designed to accept carbon capture and storage (CCS) equipment when this becomes commercially viable. Details about the Government's actions to promote cleaner coal and CCS on fossil fuels are set out in section 5.4

4.27 England, Wales and Scotland still have significant recoverable coal reserves. These reserves have the potential not only to help to meet our national demand for coal and to reduce our dependence on imported primary fuels, but also to contribute to the economic vitality and skills base of the regions where they are found. However, a number of factors affect the extent to which these reserves may be recovered, including the costs of recovery compared with the market value of the coal and the implications of planning considerations including potential environmental impacts.

4.28 Following the publication of the Energy Review Report the Government convened a Coal Forum. This brings together coal producers, generators, unions and equipment manufacturers and the Government to examine the opportunities and challenges facing coal in the UK, to bring forward ways of strengthening the industry, and working to ensure that the UK has the right framework to secure the long-term future of coal-fired power generation; optimise the use of our coal reserves, where recovery is economic; and stimulate investment in clean coal technologies[108].

BOX 4.3 UK COAL PRODUCTION

British coal production fell significantly over the last decade. In 1998 over 40 million tonnes was produced, while by 2006 production had fallen to 18.6 Mt, with the shortfall made good through imports. The main sources of imported coal (used mainly but not exclusively for generation) were Russia (22.6 million tonnes – 51% of steam coal imports) and South Africa (13.1 million tonnes – 30% of steam coal imports). Some projections show UK coal production in 2020 at 13 million tonnes, with net imports at 35 million tonnes. However, the total demand for coal in the UK will depend on commercial decisions, particularly those made by generators, within the regulatory and economic environment that develops over this period.

Table 4.1 Coal production and demand – Million tonnes

	1998	2003	2004	2005	2006
Indigenous production	41.2	28.3	25.1	20.5	18.6
Imports	21.2	31.9	36.1	43.9	50.3
Total demand	63.2	63.0	60.4	61.9	68.2
Of which: Generation	48.6	52.5	50.4	52.1	57.7

Source: DTI, Energy Trends March 2007

108 Further details of the Forum and its papers may be found on the Energy pages of the DTI web site: http://www2.dti.gov.uk/energy/sources/coal/forum/page37276.html

4.29 The Coal Forum does not discuss commercial matters, though the Forum has acted as a catalyst for meetings between producers and generators outside the Forum, which have generated a wider appreciation of the long-term investment needs of mine operators. The Coal Forum will publish an interim overview report in summer 2007[109].

4.30 Emerging findings from the Coal Forum suggest that continuing access to supplies of UK produced coal benefits both the generating industry and other industrial coal users; such supplies can help to manage any potential risk to supplies from international coal markets.

4.31 Making the best use of UK energy resources, including coal reserves, where it is economically viable and environmentally acceptable to do so, contributes to our security of supply goals. The Government believes that these factors reflect a value in maintaining access to economically recoverable reserves of coal.

Ensuring effective energy markets

4.32 Even taking account of the measures outlined above, we will need to import increasing quantities of oil, gas and coal from international markets. It is therefore vital that international energy markets function in an effective and transparent way so that energy companies can access international energy supplies and have the confidence to invest in new infrastructure to bring them to the UK. At the same time we need the UK energy market to operate within a clear and credible regulatory framework that provides a supportive environment for investment, and is sufficiently flexible and resilient in the event of shocks.

4.33 Overall, our market framework to date has provided a high level of security and diversity, as evidenced by the UK's record of continuous energy supply and lack of involuntary interruptions. However, we recognise that periods of market tightness, as seen for example in the gas market during winter 2005/06, can lead to high and volatile prices causing real difficulties for energy consumers. And so we have reviewed our market-based approach and identified a number of steps to improve the effectiveness of our energy market framework.

Energy security of supply information

4.34 Transparent credible information is essential if markets are to function effectively. Both energy consumers and producers need to take a long term view of future energy supply, demand and prices, and to understand the information underpinning the Government's policy decisions. Energy suppliers need to be able to anticipate changes in energy needs sufficiently far in advance to provide the necessary supply capacity and delivery infrastructure. Energy consumers need access to reliable and credible information about future trends in energy, so they can make informed decisions about the terms under which they purchase energy supplies.

109 The report will include details of the work of the Forum and its sub-groups and will put forward members' ideas for the future of the Forum.

4.35 Despite inevitable uncertainties over future events, we believe that in-depth, high-quality scenario analysis, making use of current information and trends has a role to play in providing early warnings of market tightness and assisting energy market participants with their investment decisions. It can also enable Government to assess security of supply risks and, help early identification of areas where policy may need to be reviewed to ensure security of supply.

4.36 In this White Paper, we therefore commit to introduce a new security of supply information service the Energy Markets Outlook from autumn 2007 with a remit to provide professional and clear forward-looking energy market information relating to security of supply. We also support the proposal included in the European Commission's Strategic Energy Review, to establish an Office of the Energy Observatory to collate and monitor data on the energy supply and demand balance across the EU, in the short and medium term, and identify the potential need for future investment.

4.37 The Energy Markets Outlook, which will replace the Joint Energy Security of Supply Working Group (JESS), will be jointly run by DTI and Ofgem and will draw on analysis from National Grid, the wider industry and other sources. It will gather information on the likely drivers of the future energy demand and supply balance, and develop ways of analysing and interpreting this information. We will seek to engage market participants in discussion on the strategic challenges for the security of UK energy markets and their economic impact.

4.38 The principal output will be an annual report, which will provide an update on key drivers of security of energy supply, and provide scenario-based analysis of the future supply-demand balance. The report will focus on a limited number of key indicators and scenarios, but it will be supported by in-depth analysis looking across a range of primary fuels (oil, coal and uranium as well as gas and electricity); demand drivers; and developments in the international energy and carbon markets. This analysis, along with more detailed background information, will be published on a new and regularly updated website.

Meeting the challenge of increased import dependence

Oil market

4.39 As UKCS oil production declines, we will continue to rely on the global oil market to source our oil supplies. Currently, the UK is well integrated into global markets for oil. The majority (66%) of UK oil demand is derived from demand for transport fuels which is expected to increase modestly over the medium term. Although the UK currently produces about the same quantity of oil as it consumes, commercial reasons mean that more than 60% of this production is exported (mostly to the EU or United States). More than three-quarters of the crude oil refined in the UK comes from either the UKCS (35%) or from Norway (46%), with the remaining supplies mainly sourced from Russia (8%) and the Middle East (2%).

4.40 International policies (see chapter 1) to improve the functioning of the global oil market, in order to ensure that companies have access to a wide range of reliable, flexible, and competitively and transparently priced supplies are important in ensuring security of oil supplies. Given the high volumes of oil the UK already imports, existing infrastructure is well placed to cope with higher volumes.

4.41 We have, however, reviewed our oil refinery capacity (see Box 4.4) and taken steps to ensure our oil emergency stocking system is better placed to deal with the increasing levels of oil import dependence we face.

BOX 4.4 REVIEW OF OIL REFINING CAPACITY

To meet end-consumer demand, crude oil is refined into various products such as petrol, diesel, or jet fuel. The UK currently has nine refineries which produce around 82 million tonnes of oil products per year. UK refineries were originally designed to produce a greater proportion of petrol rather than diesel. While investment has taken place to increase the yield of diesel and jet fuel from UK refineries – in line with rising demand – it has typically been more economic for companies to rely on international trade in oil products to balance the mismatch between domestic product demand and production.

We commissioned a review* of UK oil refining capacity last year to inform future Government policy. The review was undertaken by Wood Mackenzie and is published alongside this White Paper. It found that refining continues to add considerable value to the UK economy. The review also identifies key challenges affecting the dynamics and competitiveness of the UK refining industry:

- evolving trends in UK demand for oil products. The industry faces the challenge of responding to rising demand for diesel and jet fuel and falling demand for petrol both here and in export markets;
- declining availability of North Sea crude oils. As local crude oil supplies decrease, refiners face increased costs from either importing similar quality crude oils from further away or investing in capital equipment to process lower quality crude oils; and
- evolving qualities of oil products, including the introduction of biofuels.

We will continue to work closely with UK refiners as they address these challenges.

* Wood Mackenzie, *Review of UK Oil Refining Capacity* May 2007

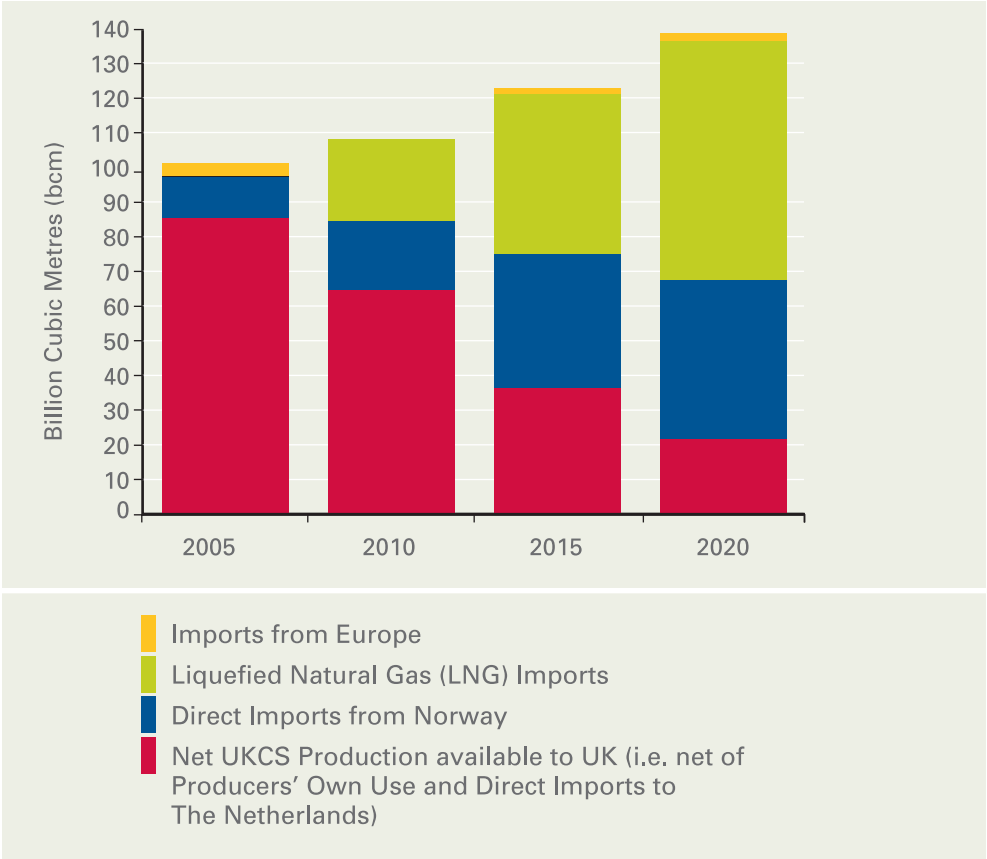
4.42 The Government has also established with industry an Aviation Fuel Task Group. It will analyse future jet fuel demand at Heathrow and other UK airports up to 2030 and what fuel supply infrastructure may be needed to meet demand. We will also look at the infrastucture needed for other oil products.

Gas market

4.43 It is, however, in the gas market where the significant rise in expected import levels presents the most significant challenge. UK gas demand is set to continue growing over the next fifteen years, driven mainly by increased demand from the power sector. As gas production from the UKCS declines, we will import increasing quantities of gas from international markets.

4.44 By 2010, imports could be meeting up to a third or more of the UK's total gas demand, potentially rising to around 80% by 2020. In the medium term, limited liquidity in the market and shipping distances mean that gas will still be largely supplied regionally through pipelines. Norway will remain a key supplier and is expected to provide up to around a third of our supplies by 2020. Other supplies will come from continental Europe, and from the development of the Liquefied Natural Gas (LNG) market[110]. Overall, as a result of this increase in imports, we will benefit from greater diversity of supply, but be more exposed to the risk and impact of any overseas disruptions to energy supplies as supply routes become longer and across more countries. Figure 4.3 shows a possible scenario for the future gas supply mix to the UK, including supplies from Norway, LNG and continental Europe[111].

FIGURE 4.3 POSSIBLE SCENARIOS FOR UK ANNUAL GAS SUPPLY MIX



110 Liquefied Natural Gas (LNG) is natural gas which has been liquefied by reducing its temperature to minus 160 degrees Celsius at atmospheric pressure, usually to allow for transportation by ship.

111 This chart is based on Wood Mackenzie estimates for supply sources to the UK to 2020. This represents only one potential picture of what our future gas supply mix might look like. Other estimates are available, for example in National Grid Ten Year Statement.

4.45 Worldwide LNG supplies and import capacity are expected to double by 2010[112]. This means LNG will play an increasingly important part in the gas supply mix for both the UK and Europe, and could play a particularly important role in creating a global market for gas by linking the two largest consuming regions: Europe and North America. LNG can also enable gas importing countries to have more diverse gas supplies and import routes, thereby potentially increasing security of supply and competition.

4.46 Since liberalisation of the gas market, we have sought to establish a commercial and regulatory framework that provides incentives to market participants to ensure that conditions for security of supply are met: sufficient investment, infrastructure reliability, source and import route diversity. Details of our approach are described in Box 4.5.

BOX 4.5 GAS MARKET FRAMEWORK

It is not possible to entirely eliminate all risks of gas supply shortfalls, so the UK's gas market framework provides an environment within which participants in the market can consider the costs and benefits of mitigating the risks of potential supply shortfalls and deliver an appropriate level of security of supply.

Our market framework relies on the price mechanism to balance demand and supply. Prices provide signals to gas market participants (producers, shippers, suppliers and consumers) who then respond with the appropriate consumption and investment decisions.

In the short term price signals provide incentives for market participants to take action to bring the gas supply and demand into balance, for example by encouraging suppliers who have the ability to do so to increase the amount of gas provided; and large consumers (such as gas-fired power stations) to reduce their consumption. In the longer-term, price signals indicate the need for greater capacity or market flexibility, and encourage market participants to undertake investments to provide new capacity, and to improve their demand responsiveness or the diversity of their supply sources.

In connection with the price mechanism, the regulatory framework further ensures that market participants have incentives to ensure security of supply to gas customers, through four main mechanisms:

- **Cash-out arrangements** by which shippers/suppliers that fail to provide enough gas to deliver on their contracts on a daily basis must pay an imbalance charge or cash-out price, exposing themselves to potentially very high costs;

112 National Grid's Ten Year Statement notes that 2007 and 2008 should see the delivery of over 30 LNG tankers, including those with capacities of over 200,000 cubic metres, some 50% higher than the capacities of existing tankers. These changes will improve the economics of LNG transportation, making it increasing viable to transport LNG over longer distances.

BOX 4.5 continued

- **emergency cash-out arrangements** which apply when there is insufficient gas to meet demand, further enhance the incentives for shippers to avoid a gas emergency by increasing the penalty that they would pay for having insufficient supply to meet their customers' needs;
- **supplier/Shipper obligations** – Ofgem implements the relevant EU legislation, licence conditions and the Uniform Network Code (UNC) that place the necessary economic incentives on suppliers to ensure availability of supplies to domestic customers even in the event of severe conditions (conditions which may be expected to be exceeded in only 1 year out of 50, i.e. a "1 in 50 winter"); and
- **safety monitors** (otherwise known as storage monitors) ensure that there is a minimum amount of gas available in storage, across all storage sites in the UK to underpin the safe operation of the gas transportation system in a severe winter. These safety monitors act to protect the gas supply of domestic and other non-daily metered customers.

4.47 This framework has already supported major investments by market participants in a wide range of new gas import (pipelines and terminals) and storage infrastructure, as a response to the challenge of increasing import dependency. In total around £10 billion of investment in new facilities is in place or planned over the next few years.

4.48 In winter 2006/07 new investments in import capacity were completed, such as the expansion of the Interconnector from Belgium (IUK), the construction of the Langeled pipeline from Norway and the BBL Interconnector from the Netherlands, which all became operational in the latter part of 2006, as well as the Teeside Gas Port project providing additional LNG import capacity, which started operation in February 2007. In addition, there are LNG import facilities being constructed in Milford Haven, which will further diversify the sources of gas used to supply the UK.

4.49 Storage capacity available in Great Britain is also set to increase substantially. If all the planned storage projects go ahead the proportion of peak day demand that could be met by storage operating at its maximum level would increase from 24% in 2006/07 to between 40% and 60% by 2015/16[113]. Our current forecasts of gas demand also imply that, depending on the severity of the winter, we will need to increase our import capacity by 2020 by an extra 12bcm to 24bcm – equivalent to 15%-30% of 2006/07 import capacity[114]. Plans are already in train to deliver some of this investment.

4.50 Whilst this is encouraging evidence of our energy market responding to increasing import dependence we need to ensure this framework is fit for purpose in managing the risks of import dependence over the longer term. Given this and considering the difficulties of winter 2005/2006 we have

113 Peak day demand here is assumed to be "1 in 20 winter" demand.
114 This figure implies capacity is not fully utilised – source Oxera, *An assessment of the potential measures to improve gas security of supply,* 2007

recently consulted on security of supply arrangements in the gas market[115]. The consultation looked at the effectiveness of current gas security of supply arrangements and at possible options to improve market functioning.

4.51 Alongside the consultation we commissioned further analysis of the potential risks to security of supply in the medium term and to quantify the costs and benefits of the options considered in the consultation[116]. Fuller details of the responses and the analysis can be found in the Government response to this consultation published alongside this document.

4.52 Many respondents to the consultation as well as the analytical work carried out for this Energy White Paper indicated that the current framework, although effective, does not eliminate all the risks to security of supply. The analysis illustrated that the probability of gas supply interruptions was very low until the middle of the next decade[117]. After that, modelling shows that the risk of supply interruptions increases, but overall the probability and the average size of possible interruptions is low (the expected annual supply shortfall is significantly less than 1% of demand).

4.53 However, both the consultation responses and analysis highlighted that none of the options considered in the consultation are without downsides and could potentially hinder rather than improve security of supply[118]. The responses and analytical results indicated that:

- actions to facilitate and encourage greater flexibility and energy efficiency among consumers and suppliers in all sectors were welcome;
- the benefits of installing distillate back-up at new gas-fired power stations need to be balanced against the potential for displacing investment in other gas infrastructure and the full costs and impact on the electricity generation sector;
- further regulation of the use of gas storage or further changes to imbalance pricing, given Ofgem's recent modifications, would not deliver net benefits to security of supply.
- the benefits of extending supplier obligations to cover industrial and commercial customers, or introducing some form of capacity mechanism were very uncertain given the potential for displacing commercial investment, and, as indicated by the analysis, would most likely generate a net cost to society.

4.54 Our conclusions, therefore, based on the consultation responses and analytical work suggest that the supply side policies considered in the consultation would potentially not deliver any substantial net benefit and could instead have an adverse impact on market participants incentives to provide security of supply. Hence, as highlighted by respondents, to manage future gas security of supply risks better, Government will take action to:

115 The consultation was published on 16 October 2006 and concluded on 12 January 2007. Responses are available on the DTI website at at: http://www.dti.gov.uk/energy/review/implementation/gas-supply/cons-responses/page37145.html

116 See www.dti.gov.uk/energy/whitepaper for the report "An assessment of the potential measures to improve gas security of supply" by Oxera Consulting Ltd. 2007

117 The analysis assumes that all infrastructure currently in the process of being constructed will come forward as expected, that £5.4bn of additional investment takes place over the period to 2020 and that potential demand side response will remain at the levels observed over winter 2005/06.

118 See Oxera Consulting report and the Government response to the consultation for more detail on the analytical results and the consultation responses.

- **Reduce gas consumption** by encouraging energy efficiency and demand-side flexibility through the measures outlined in chapter 2 such as smart metering and billing through the Carbon Emission Reduction Target (CERT) scheme;
- **ensure effective markets** by improving the effectiveness of the gas market, through improved energy market information and working with Europe to improve competition in the EU gas market; and
- **increase gas storage and import infrastructure** by facilitating the construction of gas supply infrastructure both onshore and offshore, through reforms to the planning and licensing regime.

4.55 Our actions to address the first area is set out above in the context of our measures aimed at reducing the use of fossil fuels and improving the efficiency with which we use them. Details of our responses under the last two areas are set out below, alongside our commitments to manage gas quality issues and to improve gas emergency planning procedures. Taken together, we consider this is a clear strategy to manage the risks to security of supply.

Improvement to the effectiveness of the gas market

4.56 It is essential that the UK and international gas markets function in an effective and transparent way in order to be sufficiently flexible and resilient in the event of shocks, and to provide a supportive environment for investment. In particular, the liberalisation of the EU energy market is necessary to ensure that the UK will have access to adequate and competitively priced gas from an open, transparent and liquid European gas market. Chapter 1 outlines the actions we are taking to ensure EU gas market liberalisation is achieved.

4.57 It is not possible, however, to eliminate all risks of gas supply shortfalls. In this context, the European Commission, in its Strategic Energy Review, considered the need for effective mechanisms to be put into place to ensure flexibility in the event of an energy crisis – in particular the role of strategic gas stocks in providing security of supply. In the Energy Review Report, the Government has already considered and rejected the case for domestic strategic gas storage[119]. We continue to believe that the key to security of supply lies with a regulatory framework that incentivises commercial storage and with liberalisation of the gas market in Europe. However we look forward to seeing a robust cost-benefit analysis from the Commission on the issue of strategic stocks, including a robust assessment of how to mitigate some of the potentially serious unintended consequences of administered "strategic" gas storage (e.g. the displacement of investment in commercial storage and market flexibility).

Changes to the Planning and Licensing regime

4.58 One of the biggest issues raised by all interested parties in the responses to the gas consultation was the delays and bureaucracy of the UK planning system, and the impact this can have on security of supply. More than 5.6bcm of new gas storage capacity (compared to 2005/2006 levels) is either under construction, planned or proposed. This could equate to more

119 The analysis of the option to build strategic storage, in fact, did not resolve the uncertainty over the impact such a Government intervention would have on the UK market. Strategic storage would dull the incentives for commercial investment into storage, thus reducing the volume available commercially, and possibly reducing the overall level of security of supply.

than doubling UK storage capacity in the UK by the middle of the next decade, if projects are not unduly delayed by planning, technical, or other factors.

4.59 Last year the Secretary of State announced measures to review the current regulatory framework in the UK for gas supply infrastructure onshore and offshore. The Government is consulting on proposals to address this need for simplification of the onshore gas planning regime as part of the planning White Paper 2007, *Planning for a Sustainable Future*. This sets out proposals for the new planning system and consults on rationalising the regime for nationally significant gas supply infrastructure projects in England to bring all decision making under the proposed independent infrastructure planning commission[120]. More detail on measures to improve planning matters related to streamlining of onshore gas consents regimes can be found in chapter 8.

4.60 Offshore developers can also face undesirable regulatory uncertainty, as well as a complex regulatory framework. This can result in increased risks and costs for developers that may act as a barrier to entry, in obtaining finance, or to agreeing to invest in a project.

4.61 A consultation on offshore gas supply infrastructure activities was published on 24 November 2006 and concluded on 16 February 2007. The consultation put forward proposals that aimed to clarify and modernise legislation for specific offshore activities, namely the storage of natural gas under the seabed and the unloading of Liquefied Natural Gas (LNG) at sea. Developments in technology mean that it is possible to store gas under the sea in man-made salt caverns and other geological structures, as well as in depleted oil or gas fields (such as the existing Rough storage facility in the North Sea). There is also commercial interest in creating "energy platforms" offshore where LNG can be transported, regasified, and piped to the UK mainland, avoiding the need to build and gain consent for LNG terminals.

4.62 The Government response to the consultation is published alongside this White Paper[121]. To summarise, respondents were generally extremely supportive of proposals to explicitly provide for these new offshore developments in legislation. New legislation would provide a simpler consents procedure, involving two determining authorities – the Crown Estate, who would issue geographically bound authorisations for the use of the sea-bed or water column, and the DTI, who would issue a Gas Storage Licence for offshore gas storage, or an LNG unloading licence as appropriate. Because offshore gas storage and pipeline developments may often be associated with offshore petroleum developments, for which the DTI is the regulator, it is appropriate to build in this way on the existing arrangements. Gas storage in partially depleted oil and gas fields would still require a Petroleum Production Licence.

4.63 The benefits of a new, bespoke regulatory framework, which would be achieved by new legislation were thought to include: a clear route to investment decision making; a reduction in administrative burden; and certainty over legal operation and construction of such facilities. This would

120 In the light of the wider proposals for planning reform, the White Paper, Planning for a Sustainable Future, consultation question on this topic meets the proposal made in the Energy Challenge to consult this autumn on gas supply infrastructure.

121 See www.dti.gov.uk/energy/whitepaper

meet the concerns of respondents, many of whom indicated that the current framework, whilst not prohibiting such activities, gave rise to real legal uncertainties and presented an unnecessary burden to developers.

4.64 We will bring forward legislation as soon as Parliamentary time allows, as the market is keen to take forward a number of new offshore projects.

BOX 4.6 GAS QUALITY ISSUES

The UK's increasing dependence on imported gas has also raised the issue of the relationship between our regulated gas quality specification and the qualities of gas available on international markets (especially LNG transported by ship). The Government has accordingly commissioned substantial research. In the light of the initial results, we have announced our intention to propose changes in Great Britain's regulated gas specification to take effect before the end of the next decade. We undertook a public consultation and we will soon publish a response document. Meanwhile Ofgem is leading an exercise to assess the potential impact of gas quality constraints on the supply of gas to the GB market in the short-to-medium term, in order to inform market participants' investment decisions on options to mitigate the impact. This work will help to resolve uncertainties about the regulatory and commercial framework for managing gas specification, and it will also ensure that the UK remains in the best position to influence developing proposals at the EU level.

Changes to ensure robust emergency planning arrangements

4.65 The UK market has delivered high levels of reliability for the supply of gas and oil, to consumers. But no matter how robust our arrangements, there is always a possibility – although very small – of there being an unexpected shortfall in supply.

4.66 The UK has international obligations to hold stocks of oil for use in the event of international or local disruption. UK industry successfully responded to the aftermath of Hurricane Katrina in the US Gulf of Mexico in 2005 by releasing stocks as part of its contribution to the international response coordinated by the IEA. These stocking obligations will increase as the UK becomes an increasing net importer of oil, with a significant and progressive net increase expected from about 2016. We are currently changing the basis of the UK oil-stocking system so that it is better suited to meet these obligations in the long term. We will also work with industry to ensure that there continues in the future to be sufficient storage to meet our international obligations and that our contingency arrangements remain regularly tested and reviewed. Domestically, we expect to complete this year an update of the emergency plan, for disruption to road fuel supplies.

4.67 DTI consulted in 2006 on proposals to update our response to an unexpected disruption in gas supply, focusing on the protection of vulnerable consumers. In parallel, Ofgem has been working with gas consumers on the market and operational response to any problem with gas supply. We are currently analysing the responses to our consultation and discussing the issues raised with network operators and other involved parties. We will publish proposed changes this summer. We have already put in place streamlined administrative procedures to make the system work better.

Impact of our proposals

4.68 Using energy and therefore fossil fuels more efficiently is a cost-effective method of both tackling emissions and increasing energy security. By reducing our demand for gas and oil, we reduce our exposure to security of supply risks, including the potential risks associated with imported energy. Our proposals can reduce gas consumption directly by reducing demand for gas i.e. in heating our homes; but also indirectly by reducing demand for electricity so reducing the need for new gas-fired power stations. If we assume that this reduction in electricity demand comes from gas-fired plants, our measures could in total lead to up to 15bcm of gas savings in 2020. This is up to 13% below what it would otherwise have been.

4.69 Our proposals to improve the framework for investment in the UK Continental Shelf (UKCS) aim to maintain the competitiveness of the UKCS in order to maximise economic recovery. If a high level of investment is maintained, this could potentially deliver substantially higher oil and gas production – up to an extra 0.6 million barrels of oil equivalent (boe) a day from 2020 to 2030. About half or slightly more of this extra production would be oil and the remainder would be gas.

4.70 Overall, the reduction in gas demand would reduce our projected gas imports by up to around 17%, which, combined with the possible increase in domestic gas production, could bring our gas import dependence down to around 60% of projected gas demand in 2020, compared to around 80% if we did not implement our measures.

4.71 A diverse mix of supply sources and routes is also fundamental in the management of our import risks. Strengthening our market based approach will improve the flexibility and responsiveness of the market, and help to manage the risks to security of supply. Changes to the planning regime and new and better market information arrangements will help market players to bring forward timely investments in infrastructure and provide sufficient supply capacity.

Oil, gas and coal
Summary of Measures

Our policies recognise the continuing importance of fossil fuels in maintaining reliable and affordable energy supplies, but aim to manage our reliance on them, their potential environmental effects and the risks associated with higher levels of import dependency, by:

- **Encouraging energy efficiency to reduce the use of fossil fuels by;**
  - **saving energy and encouraging energy market flexibility through the promotion of energy efficiency measures and information and the rollout of smart gas meters (see chapter 2);**
  - **reducing our reliance on fossil fuels by boosting the development and deployment of renewables and, subject to consultation, enabling new nuclear power to be an option for the private sector (see chapter 5); and**
  - **encouraging the adoption of technologies which mitigate the environmental impact of fossil fuels e.g. carbon capture and storage (see chapter 5).**
- **Supporting and maximising economic production of fossil fuels in the UK, we:**
  - **will continue to work with the industry to maximise economic recovery of the UK's oil and gas reserves, including assessment of the potential for establishing infrastructure West of Shetland and by maintaining an appropriate fiscal regime to attract investment; and**
  - **believe that, where it is environmentally acceptable to do so, there is a value in maintaining access to economically recoverable reserves of coal.**
- **Ensuring effective energy markets at home and abroad; we will:**
  - **introduce in Autumn 2007 a new security of supply information and analysis service helping to provide the information about supply and demand trends that market participants need to take decisions, including on new investments;**
  - **support the European Commission's efforts to secure effective liberalisation of EU energy markets and work to secure more open and transparent energy markets elsewhere;**
  - **set out a comprehensive package of measures to improve the onshore Energy Planning System and, following the consultation on the planning White Paper, establish a new consenting regime for all major energy infrastructure;**
  - **legislate to modernise the regulatory framework so that we have a fit for purpose licensing regime for offshore gas storage and unloading of Liquefied Natural Gas (LNG); and**
  - **improve the UK economy's resilience in the face of shocks to energy supplies by improving our emergency planning arrangements.**